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Report of the Working Group on North Atlantic Salmon (WGNAS)

30 March–8 April 2016

Copenhagen, Denmark

ICES CIEM
International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

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Contents

Executive Summary

Working Group on North Atlantic Salmon [WGNAS], ICES HQ, 30 March–8 April 2016.

Chair: Jonathan White (Ireland).

Number of meeting participants: 23 representing ten countries from North America (NAC) and the Northeast Atlantic (NEAC): Canada, USA, Iceland, Norway, Finland, Ireland, UK (England & Wales), UK (Scotland), UK (Northern Ireland), Russia and France. Information was also provided by correspondence or by WebEx link from Greenland, Sweden, Faroes, Denmark and Spain for use by the Working Group.

WGNAS met to consider questions posed to ICES by the North Atlantic Salmon Conservation Organisation (NASCO) and also generic questions for regional and species Working Groups posed by ICES.

The terms of reference were addressed by reviewing working documents prepared prior to the meeting as well as development of analyses, documents and text during the meeting.

The report is presented in five sections, structured to the terms of reference. Sections include:

1) Introduction;
2) Catches, farming and significant developments, threats and opportunities;
3) The status of stocks in the Northeast Atlantic Commission area;
4) The status of stocks in the North American commission area; and
5) The status of stocks in the Atlantic salmon in the Greenland commission area.

The need to develop catch advice in 2016 was dependent on the outcome of applying two indicator frameworks prior to the meeting.

- The Framework of Indicators (FWI) for West Greenland was updated during the Working Group in 2015, with the advice that there were no mixed-stock fishery options: 2015 to 2017 in either NAC or WGC that would be consistent with a 75% chance or greater of simultaneously meeting the seven (for West Greenland) and six (for NAC) management objectives for 2SW salmon. The West Greenland FWI was applied in January 2015. It did not indicate the need to update catch options, hence no new management advice for this fishery was requested by NASCO for 2016.
- The Faroes FWI for multi-annual catch options for NEAC stocks was also updated in 2015 and applied in January 2016. This did indicate a need to update the assessment of catch options and new management advice. These were requested by NASCO for 2016 to 2018. An updated Framework of Indicators for the Faroes fishery was also requested, to identify significant changes over the years 2017 to 2018 in the provided multi-annual management advice.

In summary of the findings of the Working group on North Atlantic Salmon:

- In the North Atlantic, exploitation rates on Atlantic salmon continue to be among the lowest in the time-series.

- Nominal catch in 2015 was 1285 t. This is up on the previous two years (1134 t in 2014 and 1270 t in 2013) though the third lowest in the time-series.
- The Working Group reported on a range of new findings regarding salmon assessment and management, including tracking of Icelandic salmon, changes in the trophic structure in the Northwest Atlantic, evidence of disease and parasites, development of national assessment methods and review of stocking measures, opportunities for sampling salmon at sea and a review of achievement of river level conservation limits.
- Exploitation rates on NEAC stocks continues to be among the lowest recorded, while the practice of catch-and-release in rod fisheries continues to increase.
- On average, 1SW fish comprise a higher percentage of the catch in Iceland and Russia than in the other Northern NEAC countries while the percentage of 1SW salmon in the Southern NEAC area has remained reasonably consistent. Pooling data from all countries showed an overall decline in the proportion of 1SW fish in the catch over the period 2001–2015.
- Northern NEAC stock complexes, prior to the commencement of distant-water fisheries in the latest available Pre-fishery Abundance (PFA) year (2015) were considered to be at full reproductive capacity. The southern NEAC maturing 1SW stock complex however, was considered to be at risk of suffering reduced reproductive capacity and the non-maturing 1SW stock complex to be suffering reduced reproductive capacity. The country level PFA of one maturing 1SW southern NEAC stock was considered at risk of suffering reduced reproductive capacity and three to be suffering reduced reproductive capacity while two non-maturing 1SW stocks were suffering reduced reproductive capacity. Of the country level northern NEAC stocks, one was considered at risk of suffering reduced reproductive capacity.
- Sources of uncertainties and possible biases in the assessment of catch options for the Faroes fishery were investigated in a sensitivity analysis. Ten potential sources of uncertainty were investigated. Results indicated that Faroese catch advice would not be affected by any of these except potentially the stock composition, derived from samples collected between 1993 and 1995. Historic tagging studies and genetic stock identification have shown that salmon from the full range of NEAC countries have been exploited in the fishery in the past, and this may be expected to be the case in future. Obtaining new data on stock composition could be achieved through further genetic analysis of scale samples taken from salmon caught in the Faroes fishery area. More up-to-date estimates than those currently used could be obtained by conducting a research fishery, however, to provide reliable data this would need to cover the extent of any expected fishery in both space and time, and data would need collecting over a number of years. It would not be worth conducting such surveys to improve the precision of parameter values as simulations indicated that this has negligible effects on assessment results. Recommended initial steps are made in the report to improve current parameters.
- Forecasts of the PFA for NEAC countries were made, applied in assessing Faroese catch options and in compiled a new framework of indicators. Southern NEAC stock complex show an initial increase into 2015 before

declining from 2016 to 2019, with the median dropping below the spawner escapement reserve (SER) for the first time in 2017. The non-maturing PFA stock component fell below the SER for the first time in 2013, is forecast to rise slightly into 2015 before declining below SER from 2016 to 2019. Northern NEAC stock PFA for both maturing and non-maturing fish are forecast to have a high probability of being above the SER.

- Catch options for the 2016/2017–2018/2019 fishing seasons were developed with an assessment of risks relative to the objective of exceeding stock conservation limits. A risk framework was applied to the four NEAC management units (maturing and non-maturing 1SW recruits for northern and southern NEAC) and for the two age groups in ten NEAC countries. This estimates the probability that PFAs will meet or exceed their respective SERs at different catch levels. Catch option indicated that the northern NEAC maturing and non-maturing 1SW stock complexes have a high probability (≥95%) of achieving their SERs for TACs at Faroes of ≤ 60 t in the 2016/2017 season and ≤40 t in the 2017/2018 season. However, the southern NEAC stock complexes both have less than 95% probability of achieving their SERs with any TAC option in any of the forecast seasons. Therefore, there are no catch options that ensure a greater than 95% probability of each stock complex achieving its SER.
- The probabilities the maturing 1SW national management units achieving their SERs in 2016/2017 vary between 20% and 99% for the different countries with no TAC at Faroes, while non-maturing 1SW national management units achieving their SERs in 2016/2017 vary between 16% (Ireland) and 100% (Norway) with no TAC allocated for the Faroes fishery.
- The Faroese Indicator Framework (FWI) previously developed by the Working Group to check on the status of NEAC stocks in the interim years of a multi-annual catch advice cycle was updated and is available for use in any new multiyear agreements. An alternative FWI was also developed and is recommended, owing to a potential for the current structure to be triggered by a stock complex already known to be above its SER.
- Advice provided in 2015 indicated there were no mixed-stock fishery catch options on 1SW non-maturing salmon for the 2015 to 2017 PFA years. The NASCO Framework of Indicators for the West Greenland Commission did not indicate the need for a revised analysis and therefore no new management advice for 2016 is provided. This year's assessment of the contributing stock complexes confirms that advice.
- The majority of harvest fisheries on NAC stocks were directed toward small salmon, while mandatory catch and release of small salmon was implemented in the 2015 recreational fishery for the Gulf region and mandatory release of large salmon continued.
- The total estimate of small salmon returns to North America in 2015 was the highest on record (641 110), representing a 27% increase on 2014 (504 350). Small salmon returns increased in 2015 from the previous year in five of the six geographical regions, with returns to Labrador and Newfoundland together represent 87% of the 2015 total small salmon returns.
- The total estimate of large salmon returns to North America in 2015 (200 200) was 52% higher than for 2014, with returns increased from the previous year in five of the six regions. Returns to Labrador and Newfoundland together represent 64% of the total large salmon returns.

- Total estimate of 2SW salmon returns to North America in 2015 (116 000) was 50% higher than the 2014 estimate. 2SW salmon returns increased from the previous year in five of six regions. In 2015 2SW returns were the highest on record for Labrador (57 880) and the tenth highest for Newfoundland (5170), whereas they were the lowest on record for Scotia-Fundy and to the USA (761), the sixth lowest on record. 2SW salmon returns from Labrador, Québec and Gulf regions combined represent 94% of 2SW salmon returns to North America.
- Spatially, there is a divergence of salmon returns to NAC; returns in the more northern regions were generally at greater abundance in 2015 than in previous years. However, returns to more southerly regions were generally among the lowest in their time-series. This spatial trend of increasing abundance in northern regions against decreasing abundance in southern regions generally applies across the time-series. Regional return estimates in 2015 are reflected in the overall 2015 NAC return estimates, with Labrador and Newfoundland collectively comprise 87% of small salmon returns and 64% of the large salmon and Labrador, Québec, and Gulf collectively comprising 94% of the 2SW salmon returns.
- The estimated PFA of 1SW non-maturing salmon ranked 25th (descending) of the 44-year time-series and estimated PFA of 1SW maturing salmon ranked 10th (45-year time-series). The continued low abundance of salmon stocks across North America, despite significant fishery reductions, and generally sustained smolt production strengthens the conclusions that factors acting on survival in the first and second years at sea are constraining abundance of Atlantic salmon.
- A sampling programme for Labrador Aboriginal fisheries continued in 2015 with a total of 880 samples (5.8% of harvest) collected. Based on scale samples 77% were 1SW, 19% 2SW, one sample was a 3SW salmon (<1%), and 4% had previously spawned. The majority were river ages 3 to 5. There were no river age 1 and few river age 2 (0.5%) salmon, suggesting, as in previous years (2006 to 2014), that very few salmon from the most southern stocks of North America were exploited in these fisheries. Genetic analyses of tissue samples are planned and will be reported accordingly to ICES when completed.
- In 2015 109 tissue and 106 scale samples were obtained from the Saint Pierre & Miquelon fishery. They were predominantly river age 2 (32%) and 3 (52%) with the majority 1SW (73%). Genetic analyses of tissue samples are planned and will be reported accordingly to ICES.
- In Greenland a total catch of 56.8 t of salmon was reported in 2015 compared to 57.9 t in 2014. A harvest of 1 t was reported from East Greenland (1.6% of reported catch; this is not included in assessments owing to a lack of information on stock composition). From West Greenland 33.8 t was reported as commercial, 19.2 t for private consumption and 3.8 t as factory landings.
- Five out of the seven stock complexes exploited at West Greenland are below CLs.
- Greenland Authorities issued 310 licences and received 938 reports from 189 fishers in 2015 (669 reports from 114 fishers out of 321 licences in 2014).

- A phone survey conducted in 2015 estimated 5001 kg of non-reported harvest. A similar survey in 2014 identified 12.2 t. These catch figures were added to reported landings for use in future stock assessments. The Working Group acknowledges the valuable information gained on catch in this fishery through the post-season telephone surveys.
- Estimates of exploitation rates of Atlantic stock complexes at West Greenland were made: NAC (9.4%) was lower than in 2013 although higher than the proceeding five year mean, and the second highest since 2001; southern NEAC (2.0%) increased on the previous year, although remains among the lowest in the time-series, while changes in southern NEAC exploitation rates compared to previous estimates were noted.
- The international sampling programme for the fishery at West Greenland agreed by the parties at NASCO continued in 2015 with a total of 1964 salmon observed by sampling teams. Of these, 1708 were sampled for biological characteristics, 163 checked for an adipose clip, and 93 documented but not sampled or examined further. Approximately 1708 fork lengths and weights, 1704 scale samples for age determination, and 1674 useable tissue samples for DNA analysis and continent of origin assignment were collected.
- The Working group compared contemporary indices of abundance of salmon in the West Greenland fishery to historical estimates and found recent cpue values to be low compared to historic estimates, and in support of previous conclusions of ICES (2015) that stock abundance at West Greenland is low. Anecdotal reports of high abundances may be the result of localized concentrations, localized catch success, or shifting baselines of perception. There is scope to explore alternative fishery-independent methods to estimate stock abundance such as: hydroacoustic surveys, standardised gillnet surveys or test fishing, or open trawl surveys.
- Possible effects of modifying the timing of the West Greenland fishery on harvest and exploitation of contributing stocks were found through simulations. Results indicated that based on characteristics of the fish in the fishery, estimated changes in weights over the period and natural mortality, there would be some small gains in escapement (2.5% for NAC). These could be realized by delaying the opening of the fishing season to mid-September, and the number of fish killed may be reduced by almost 15% from the base scenario, resulting in a lower exploitation rate on the stock overall, and could favour protection of weaker stocks assuming equal availability to the fishery.
- Investigations and recent literature gives no clear evidence that temporal or spatial changes in fishery patterns at Greenland would provide increased protection for weaker stocks. It is noted that samples sizes may not be optimal, but the best available information suggests that the contributing North American and European stocks sufficiently mix along the coast of West Greenland and across the fishing season.

1 Introduction

1.1 Main tasks

At its 2015 Statutory Meeting, ICES resolved (C. Res. 2015/2/ACOM10) that the **Working Group on North Atlantic Salmon** [WGNAS] (chaired by: Jonathan White, Ireland) would meet in ICES HQ, Copenhagen, Denmark from March 30th to April 8th 2015 to consider: (a) relevant points in the Generic ToRs for Regional and Species Working Groups for each salmon stock complex; and (b) questions posed to ICES by the North Atlantic Salmon Conservation Organisation (NASCO).

The terms of reference were met. The questions posed in the Generic ToRs for Regional and Species Working Groups for each salmon stock complex overlap substantially with the questions posed by NASCO. As such, responses to the former were restricted to a limited subset of the questions; brief responses are provided at Annex 5. The sections of the report which provide the answers to the questions posed by NASCO are identified below:

QUESTION		SECTION
1	With respect to Atlantic salmon in the North Atlantic area:	Section 2
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 2015[1];	2.1
1.2	report on significant new or emerging threats to, or opportunities for, salmon conservation and management[2];	2.2
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];	2.3
1.4	advise on possible effects of salmonid aquaculture on wild Atlantic salmon populations focusing on the effects of sea lice, genetic interactions and the impact on wild salmon production[4];	2.4
1.5	provide a time-series of numbers of river stocks with established CLs and trends in numbers of stocks meeting their CLs by jurisdiction;	2.5
1.6	provide a compilation of tag releases by country in 2015; and	2.8
1.7	identify relevant data deficiencies, monitoring needs and research requirements.	2.9
2	With respect to Atlantic salmon in the North East Atlantic Commission area:	Section 3
2.1	describe the key events of the 2015 fisheries[5];	3.1
2.2	review and report on the development of age-specific stock conservation limits;	3.2
2.3	describe the status of the stocks;	3.3
2.4	advise on the source of uncertainties and possible biases in the assessment of catch options for the Faroes fishery resulting from the use of samples and data collected in the fishery in the 1980s and 1990s. Should it be considered that biases are likely to compromise the catch advice, advise on any new sampling which would be required to improve these assessments;	3.4
	In the event that NASCO informs ICES that the Framework of Indicators (FWI) indicates that reassessment is required:*	

Question		Section
2.5	provide catch options or alternative management advice for 2016/2017–2018/19 fishing seasons, with an assessment of risks relative to the objective of exceeding stock conservation limits, or predefined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding[6]; and	3.5–3.6
2.6	update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice.	3.7
3	With respect to Atlantic salmon in the North American Commission area:	Section 4
3.1	describe the key events of the 2015 fisheries (including the fishery at St Pierre and Miquelon)[5];	4.1
3.2	update age-specific stock conservation limits based on new information as available;	4.2
3.3	describe the status of the stocks;	4.3
	In the event that NASCO informs ICES that the Framework of Indicators (FWI) indicates that reassessment is required:	
3.4	provide catch options or alternative management advice for 2016–2019 with an assessment of risks relative to the objective of exceeding stock conservation limits, or predefined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding6; and	NA†
3.5	update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice.	NA†
4	With respect to Atlantic salmon in the West Greenland Commission area:	Section 5
4.1	describe the key events of the 2015 fisheries[5];	5.1
4.2	describe the status of the stocks[7];	5.2
4.3	compare contemporary indices of abundance of salmon in the West Greenland fishery to historical estimates and suggest options for improving future estimates;	5.3
4.4	estimate the effects of modifying the timing of the West Greenland salmon fishery, including altering the start date, with regard to harvest and exploitation of contributing stocks;	5.4
4.5	advise on changes to temporal and/or spatial fishery patterns that may provide increased protection for weaker stocks;	5.5
	In the event that NASCO informs ICES that the Framework of Indicators (FWI) indicates that reassessment is required:	
4.6	provide catch options or alternative management advice for 2016–2019 with an assessment of risk relative to the objective of exceeding stock conservation limits, or predefined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding6; and	NA†
4.7	update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice.	NA†

Notes:

*** NASCO informed ICES in January 2015 of the outcome of utilising the FWI.**

[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 regards to question 1.3, NASCO is particularly interested in case studies highlighting successes and failures of various restoration efforts employed across the North Atlantic by all Parties/jurisdictions and the metrics used for evaluating success or failure.

[4.] In response to question 1.4, ICES is requested to review and update the findings of the ICES/NASCO symposium on the impacts of aquaculture and the request for advice from OSPAR in June 2010.

[5.] 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 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.

[6.] In response to questions 2.5, 3.4 and 4.6, 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.

[7.] 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.

NA[ǂ]: With regard to questions 3.4 and 3.5, 4.6 and 4.7, the FWI did not indicate that reassessment was required and so these questions were not posed.

In response to the Terms of Reference, the Working Group considered 37 Working Documents submitted by participants (Annex 1); other references cited in the Report are given in Annex 2. Additional information was supplied by Working Group members unable to attend the meeting by correspondence and or Video links. A full address list for the meeting participants is provided in Annex 3. A complete list of acronyms used within this document is provided in Annex 7.

1.2 Participants

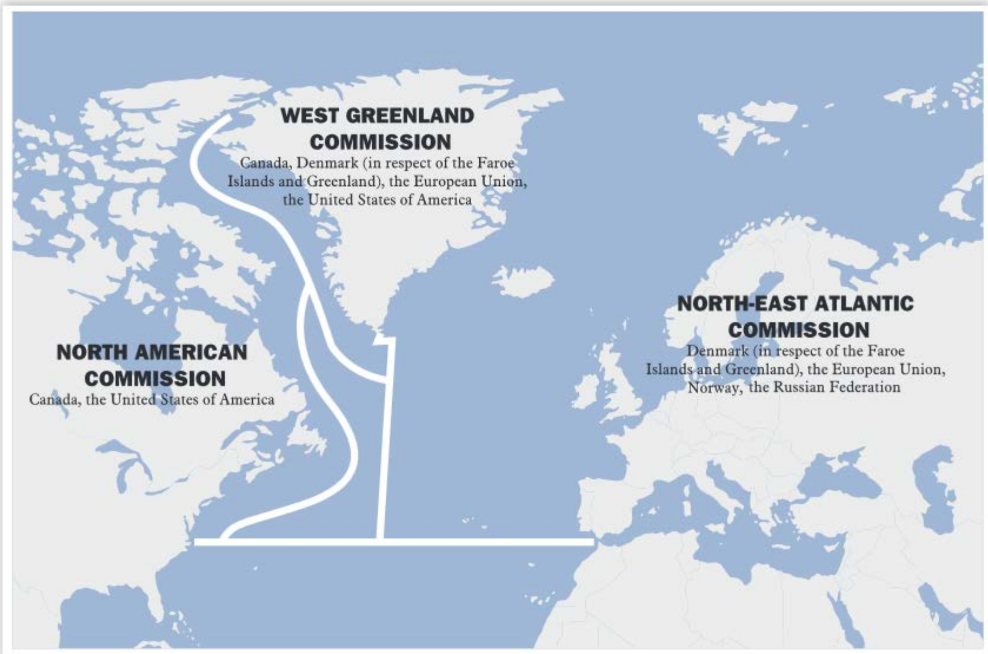
Member	Country
Bolstad, G.	Norway
Breau, C.	Canada
Chaput, G.	Canada
Degerman, E.	Sweden
Ensing, D.	UK (Northern Ireland)
Erkinaro, J.	Finland
Fiske, P.	Norway
Gudbergsson, G.	Iceland
de la Hoz, J.	Spain (Correspondence)
Levy, A.	Canada
Meerburg, D.	Canada
Millane, M.	Ireland
Nygaard, R.	Greenland (Video link)
Ó Maoiléidigh, N.	Ireland
Olmos, M.	France
Penil, C.	France
Potter, T.	UK (England & Wales)
Prusov, S.	Russian Federation
Rasmussen, G.	Denmark (Correspondence)
Rivot, E.	France
Russell, I.	UK (England & Wales)

MEMBER	COUNTRY
Sheehan, T.	United States
Smith, G.	UK (Scotland)
Veinott, G.	Canada
Wennevik, V.	Norway
White, J.	Ireland

1.3 Management framework for salmon in the North Atlantic

The advice generated by ICES in response to the Terms of Reference posed by the North Atlantic Salmon Conservation Organisation (NASCO), is pursuant to NASCO's 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. While 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 discharges these responsibilities *via* three Commission areas shown below:



1.4 Management objectives

NASCO has identified the primary management objective of that organisation as:

"To contribute through consultation and cooperation to the conservation, restoration, enhancement and rational management of salmon stocks taking into account the best scientific advice 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, 1999) provides interpretation of how this is to be achieved, as follows:

- "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".

1.5 Reference points and application of precaution

Conservation limits (CLs) for North Atlantic salmon stock complexes have been defined as the level of stock (number of spawners) that will achieve long-term average maximum sustainable yield (MSY). In many regions of North America, the CLs are calculated as the number of spawners required to fully seed the wetted area of the river. The definition of conservation in Canada varies by region and in some areas, historically, the values used were equivalent to maximizing / optimizing freshwater production. These are used in Canada as limit reference points and they do not correspond to MSY values. Reference points for Atlantic salmon are currently being reviewed for conformity with the Precautionary Approach policy in Canada. Revised reference points are expected to be developed. In some regions of Europe, pseudo stock–recruitment observations are used to calculate a hockey-stick relationship, with the inflection point defining the CLs. In the remaining regions, the CLs are calculated as the number of spawners that will achieve long-term average MSY, as derived from the adult-to-adult stock and recruitment relationship (Ricker, 1975; ICES, 1993). NASCO has adopted the region specific CLs (NASCO, 1998). These CLs are limit reference points (S_{lim}); having populations fall below these limits should be avoided with high probability.

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 MSY approach is aimed at achieving a target escapement (MSY $B_{escapement}$, the 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, similar to the basis for estimating B_{pa} in the precautionary approach. In short-lived stocks, where most of the annual surplus production is from recruitment (not growth), MSY $B_{escapement}$ and B_{pa} might be expected to be similar.

It should be noted that this is equivalent to the ICES precautionary target reference points (S_{pa}). Therefore, stocks are regarded by ICES as being at full reproductive capacity only if they are above the precautionary target reference point. This approach parallels the use of precautionary reference points used for the provision of catch advice for other fish stocks in the ICES area.

Management targets have not yet been defined for all North Atlantic salmon stocks. When these have been defined they will play an important role in ICES advice.

For the assessment of the status of stocks and advice on management of national components and geographical groupings of the stock complexes in the NEAC area, where there are no specific management objectives:

- ICES requires that the lower bound of the confidence interval of the current estimate of spawners is above the CL for the stock to be considered at full reproductive capacity.
- When the lower bound of the confidence limit 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 be suffering reduced reproductive capacity.

For catch advice on fish exploited at West Greenland (non-maturing 1SW fish from North America and non-maturing 1SW fish from Southern NEAC), ICES has adopted, a risk level of 75% of simultaneous attainment of management objectives (ICES, 2003) as part of an management plan agreed by NASCO. ICES applies the same level of risk aversion for catch advice for homewater fisheries on the North American stock complex.

NASCO has not formally agreed a management plan for the fishery at Faroes. However, the Working Group has developed a risk-based framework for providing catch advice for fish exploited in this fishery (mainly MSW fish from NEAC countries). Catch advice is currently provided at both the stock complex and country level (for NEAC stocks only) and catch options tables provide both individual probabilities and the probability of simultaneous attainment of meeting proposed management objectives for both. 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.

Full details of the assessment approaches used by the Working Group are provided in the Stock Annex, and this includes a general introduction in Section 1. Readers new to this report would be advised to read the Stock Annex in the first instance. (See Annex 6).

2 Atlantic salmon in the North Atlantic area

2.1 Catches of North Atlantic salmon

2.1.1 Nominal catches of salmon

The nominal catch of a fishery is defined as the round, fresh weight of fish that are caught and retained. Total nominal catches of salmon reported by country in all fisheries for 1960–2015 are given in Table 2.1.1.1. Catch statistics in the North Atlantic also include fish-farm escapees and, in some Northeast Atlantic countries, ranched fish (see Section 2.2.2). Catch and release has become increasingly commonplace in some countries, but these fish do not appear in the nominal catches (see Section 2.1.2).

Icelandic catches have traditionally been split into two separate categories, 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 rod fisheries in two Icelandic rivers continued into 2015 (Table 2.1.1.1). Catches in Sweden have also now been split between wild and ranched categories over the entire time-series. The latter fish represent adult salmon which have originated from hatchery-reared smolts and which have been released under programmes to mitigate for hydropower development schemes. These fish are also exploited very heavily in homewaters and have no possibility of spawning naturally in the wild. While ranching does occur in some other countries, this is on a much smaller scale. Some of these operations are experimental and at others harvesting does not occur solely at the release site. The ranched component in these countries has therefore been included in the nominal catch.

Figure 2.1.1.1 shows the total reported nominal catch of salmon grouped by the following areas: 'Northern Europe' (Norway, Russia, Finland, Iceland, Sweden and Denmark); 'Southern Europe' (Ireland, UK (Scotland), UK (England & Wales), UK (Northern Ireland), France and Spain); 'North America' (Canada, USA and St Pierre et Miquelon (France)); and 'Greenland and Faroes'.

The provisional total nominal catch for 2015 was 1285 t, 151 t above the updated catch for 2014 (1134 t) and 126 and 297 t below the averages for the last five and ten years, respectively. Catches were below the previous five and ten-year averages in the majority of countries, except France and Greenland.

Nominal catches (weight only) in homewater fisheries were split, where available, by sea age or size category (Table 2.1.1.2). The data for 2015 are provisional and, as in Table 2.1.1.1, include both wild and reared salmon and fish-farm escapees in some countries. A more detailed breakdown, providing both numbers and weight for different sea age groups for most countries, is provided in Annex 4. Countries use different methods to partition their catches by sea age class (outlined in the footnotes to Annex 4). The composition of catches in different areas is discussed in more detail in Sections 3, 4, and 5.

ICES recognises that mixed-stock fisheries present particular threats to stock status. These fisheries predominantly operate in coastal areas and NASCO specifically requests that the nominal catches in homewater fisheries be partitioned according to whether the catch is taken in coastal, estuarine or riverine areas. Figure 2.1.1.2 presents these data on a country-by-country basis. It should be noted, however, that the way in which the nominal catch is partitioned among categories varies between countries, particularly for estuarine and coastal fisheries. For example, in some countries these catches are split according to particular gear types and in other countries the split is based on whether fisheries operate inside or outside headlands. While it is generally easier to allocate the freshwater (riverine) component of the catch, it should also be noted that catch and release (C&R) is now in widespread use in several countries (Section 2.1.2) and these fish are excluded from the nominal catch. Noting these caveats, these data are considered to provide the best available indication of catch in these different fishery areas. Figure 2.1.1.2 shows that there is considerable variability in the distribution of the catch among individual countries. There are no coastal fisheries in Iceland, Spain, Denmark, or Finland. Coastal fisheries ceased in Ireland in 2007 and no fishing has occurred in coastal waters of UK (Northern Ireland) since 2012. In most countries in recent years the majority of the catch was taken in rivers and estuaries except in UK (Scotland), Norway and Russia where roughly half of the total catch was taken in coastal waters and except in UK (England & Wales) where roughly $^2/_3$ of the total catch was taken in coastal waters in 2010–2015.

Coastal, estuarine and riverine catch data for the period 2005 to 2015 aggregated by region are presented in Figure 2.1.1.3. In northern Europe, catches in coastal fisheries have been in decline over the period and are reduced from 522 t in 2005 to 267 t in 2015. Freshwater catches have been fluctuating between 763 t (2008) and 492 t (2014) over the same period. At the beginning of the time-series about half the catch was taken in coastal waters and half in rivers whereas since 2008 the proportion of the coastal catch represents only one third of the total. In southern Europe, catches in coastal and estuarine fisheries have declined dramatically over the period. While coastal and estuarine fisheries have historically made up the largest component of the catch, these fisheries have declined from 410 t and 142 t in 2005 to 89 t and 40 t in 2015, respectively, reflecting widespread measures to reduce exploitation in a number of countries. At the beginning of the time-series about half the catch was taken in coastal waters and one third in rivers. From 2007 to 2009 the proportion of the coastal catch represents only $^1/_5$ of the total catch and came up to one third from 2010 to 2015.

In North America, the total catch has been fluctuating around 140 t over the period 2005 to 2015. The majority of the catch in this area has been taken in riverine fisheries; the catch in coastal fisheries has been relatively small in any year with the biggest catch taken in 2013 (13 t).

In Greenland the total catch has steadily increased over last ten years from 15 t in 2005 to 57 t in 2015.

2.1.2 Catch and release

The practice of catch and release in rod fisheries has become increasingly common as a salmon management measure to maintain recreational fisheries opportunities and on a voluntary basis by anglers. In some areas of Canada and USA, catch and release has been practised since 1984, and since the beginning of the 1990s it has also been widely used in many European countries both as a result of statutory regulation and through voluntary practice.

The nominal catches presented in Section 2.1.1 do not include salmon that have been caught and released. Table 2.1.2.1 presents catch-and-release information from 1991 to 2015 for countries that have records. Catch and release may also be practised in other countries while not being formally recorded or where figures are only recently available. There are large differences in the percentage of the total rod catch that is released: in 2015 this ranged from 19% in both Sweden and Norway, to 84% in UK (Scotland) reflecting varying management practices and angler attitudes among these countries. For all countries, the percentage of fish released has tended to increase over time. There is also evidence from some countries that larger MSW fish are released in larger proportions than smaller fish. Overall, over 195 000 salmon were reported to have been released around the North Atlantic in 2015, 8% above the average of the last five years (180 000).

Summary information on how catch and release levels are incorporated into national assessments was provided to the Working Group in 2010 (ICES, 2010).

2.1.3 Unreported catches

Unreported catches by year (1987 to 2015) and Commission Area are presented in Table 2.1.3.1 and are presented relative to the total nominal catch in Figure 2.1.3.1. A description of the methods used to derive the unreported catches was provided in ICES (2000) and updated for the NEAC Region in ICES (2002). Detailed reports from different countries were also submitted to NASCO in 2007 in support of a special session on this issue. There have been no estimates of unreported catch for Russia since 2008 and for Canada in 2007 and 2008. There are also no estimates of unreported catch for Spain and St Pierre & Miquelon (France), where total catches are typically small.

In general, the derivation methods used by each country have remained relatively unchanged and thus comparisons over time may be appropriate (see Stock Annex). However, the estimation procedures vary markedly between countries. For example, some countries include only illegally caught fish in the unreported catch, while other countries include estimates of unreported catch by legal gear as well as illegal catches in their estimates. Over recent years efforts have been made to reduce the level of unreported catch in a number of countries (e.g. through improved reporting procedures and the introduction of carcass tagging and logbook schemes).

The total unreported catch in NASCO areas in 2015 was estimated to be 325 t. The unreported catch in the Northeast Atlantic Commission Area in 2015 was estimated at 298 t, and that for the West Greenland and North American Commission Areas at 10 t and 17 t, respectively. The 2015 unreported catch by country is provided in Table 2.1.3.2. It was not possible to partition the unreported catches into coastal, estuarine and riverine areas.

Summary information on how unreported catches are incorporated into national and international assessments was provided to the Working Group in 2010 (ICES, 2010).

2.2 Farming and sea ranching of Atlantic salmon

2.2.1 Production of farmed Atlantic salmon

The provisional estimate of farmed Atlantic salmon production in the North Atlantic area for 2015 is 1649 kt, which is at the same level as the updated production for 2014 (1633 kt). The production of farmed Atlantic salmon in this area has been over one million tonnes since 2009. The 2015 total represents a 14% increase on the previous five-year mean (Table 2.2.1.1 and Figure 2.2.1.1). 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 Russia, farmed salmon production in 2015 was above the previous five-year average in all countries. Data for UK (N. Ireland) since 2001 and data for east coast USA since 2011 are not reported to the Working group.

Worldwide production of farmed Atlantic salmon has been over one million tonnes since 2002 and has been over two million tonnes since 2012. It is difficult to source reliable production figures for all countries outside the North Atlantic area and it has been necessary to use 2014 data from the FAO Fisheries and Aquaculture Department database for some countries in deriving a worldwide estimate for 2015. The total production in 2015 is provisionally estimated at around 2375 kt (Table 2.2.1.1 and Figure 2.2.1.1), which is at the same level as in 2014 (2359 kt). Production of farmed Atlantic salmon outside the North Atlantic is estimated to have accounted for 23% of the total in 2015. Production outside the North Atlantic is still dominated by Chile and is now in excess of what it was prior to an outbreak of infectious salmon anaemia (ISA virus) which impacted the industry in that country from 2007.

The worldwide production of farmed Atlantic salmon in 2015 was over 1800 times the reported nominal catch of Atlantic salmon in the North Atlantic.

2.2.2 Harvest of ranched Atlantic salmon

Ranching has been defined as the production of salmon through smolt releases with the intent of harvesting the total population that returns to freshwater (harvesting can include fish collected for broodstock) (ICES, 1994). The release of smolts for commercial ranching purposes ceased in Iceland in 1998, but ranching with the specific intention of harvesting by rod fisheries has been practised in two Icelandic rivers since 1990 and these data are now included in the ranched catch (Table 2.1.1.1). A similar approach has been adopted, over the available time-series, for one river in Sweden (R. Lagan). These fish originate from hatchery-reared smolts released under programmes to mitigate for hydropower development schemes with no possibility of spawning naturally in the wild. These have therefore also been designated as ranched fish and are included in Figure 2.2.2.1.

The total harvest of ranched Atlantic salmon in countries bordering the North Atlantic in 2015 was 40 t (Iceland, Ireland and Sweden; Table 2.2.2.1; Figure 2.2.2.1) with the majority of catch taken in Iceland (29 t). No estimate of ranched salmon production was made in Norway in 2015 where such catches have been very low in recent years (<1 t) and UK (N. Ireland) where the proportion of ranched fish was not assessed between 2008 and 2015 due to a lack of microtag returns.

2.3 NASCO has asked ICES to report on significant, new or emerging threats to, or opportunities for, salmon conservation and management

2.3.1 Ocean migration and feeding areas of DST tagged Icelandic hatchery smolts

Relatively little information has been available on the main feeding areas for Icelandic salmon in the sea since the closure of the ocean fishery for salmon in 1932. In 2005 and 2006 a total of 598 hatchery smolts (ranging from 60–100 g) with internal data storage tags (DST) were released in a small river in west Iceland (Gudjonsson *et al.*, 2015). The DST tags measured depth (pressure) and temperature at one hour intervals. Five of these tagged salmon returned in 2006 and two in 2007, all of which had spent one year at sea. Six of the tags had a complete temperature and depth profile of the entire ocean migration and one tag had partial measurements. The depth profiles showed that the salmon stayed close to the surface most of the time but also showed some degree of diurnal behaviour, staying deeper during the day. The tagged salmon also took shorter and deeper dives (>100 m) during the latter part of their ocean migration. The temperature data indicated that salmon remained in areas where temperatures ranged from 6 to 15 °C, with warmer temperatures being experienced in summer. The DST recorded temperature data were compared to sea surface temperature from an available National Oceanic and Atmospheric Administration (NOAA) database to identify the location of the fish at different times and within the observed temperature range. Solar noon was estimated each day during winter by examining the diurnal behaviour of the salmon. Sea surface temperatures and diurnal activity were used to estimate daily locations using an established Hidden Markov Model for fish geolocation where potential swimming speed was also taken into account. This allowed longitudinal geolocation to be added to the information for each fish. As a result the combined information from the tagged fish was used to estimate the area occupied by the tagged fish for each year quartile (Figure 2.2.1.1). All fish stayed southwest of Iceland in the Irminger Sea during the first summer before migrating east towards the Faroe Islands during autumn and early winter. In late winter they migrated south and westward back to the Irminger Sea before they returned back to the river where they were released. These results show further support for the use of DST tags in studying migrations, migration behaviour and feeding areas of salmon at sea.

2.3.2 Changing trophic structure and energy dynamics in the Northwest Atlantic: implications for Atlantic salmon feeding at West Greenland

Changes in large climate forcing mechanisms and resultant cascades through the Northwest Atlantic ecosystem have caused a phase shift in productivity, which has altered trophic pathways that influence the growth, survival, and abundance of many species, including Atlantic salmon (Chaput *et al.*, 2005; Mills *et al.*, 2013). Despite diverse population structures and management regimes, concurrent abundance declines of disparate North America and European Atlantic salmon populations suggests that conditions experienced at common marine areas may be causative. To investigate if altered trophic mechanisms are contributing to population declines, Atlantic salmon stomachs were collected and examined from individuals caught between 2006 and 2011 at the West Greenland feeding grounds. These contemporary data were compared to historic samples collected in the late 1960s/early 1970s from the sampled Greenland feeding areas (Templeman, 1967; Templeman, 1968; Lear, 1972; Lear, 1980).

Primary prey items in both the contemporary and historic samples were capelin (*Mallotus villosus*) and amphipods (Themisto sp.), accounting for over 60% of the diet. Contemporary samples had 12% less biomass and 21% less capelin biomass compared to historic sample. Further, from 1968–2008 the mean size of capelin in the Northwest Atlantic decreased by 12% and its mean energy density (kJ/g of wet weight) have decreased by approximately 34% (Figure 2.2.2.1). Energy density estimates for all identified Atlantic salmon prey were applied to the stomach contents data to estimate the total amount of energy consumed at the time of sampling. Applying prey-specific energy densities, including the high capelin energy density values for the historic sample and the low capelin energy density values for the contemporary samples, resulted in lower estimates of total energy consumption (20–58%) by Atlantic salmon over time given historic and contemporary consumption levels (Figure 2.2.2.2).

Small pelagic fish are critical components in marine foodwebs, linking lower and higher trophic levels by providing a vector for energy transfer. The close link between predator, prey quality and climate is not unique to the Atlantic salmon-capelin coupling described here. As a keystone forage species, capelin is a primary energetic link between the zooplankton and higher trophic levels. Capelin are distributed differently, are physically smaller and are of lower condition and quality, with lower energy density than they were 40 years ago. Productivity of predatory fish, seabirds, marine mammals, and even polar bear have all been directly or indirectly impacted by capelin quality in the Northwest Atlantic. The reduction in energy transfer from lower marine trophic levels to higher trophic levels is pervasive in the Northwest Atlantic marine ecosystem, and is having negative consequences for production of larger predators. Determining the factors that influence lower trophic level dynamics is paramount to understanding mechanisms that affect the survival, abundance and productivity of higher trophic predators.

2.3.3 Diseases and parasites

2.3.3.1 Update on Red Vent Syndrome (Anisakiasis)

Over recent years, there have been reports from a number of countries in the NEAC and NAC areas of salmon returning to rivers with swollen and/or bleeding vents (ICES, 2015). The condition, known as red vent syndrome (RVS or Anisakiasis), has been noted since 2004, and has been linked to the presence of a nematode worm, *Anisakis simplex* (Beck et al., 2008). A number of regions within the NEAC area observed a notable increase in the incidence of salmon with RVS in 2007 (ICES, 2008). Levels in the NEAC area were typically lower from 2008 (ICES, 2009; ICES, 2010b; ICES, 2011).

Trapping records for rivers in UK (England & Wales) and France suggested that levels of RVS increased again in 2013, with the observed levels being the highest in the time-series for some of the monitored stocks (ICES, 2014). Monitoring for the presence of RVS has continued on three rivers (Tyne, Dee and Lune) in UK (England & Wales). In 2015, RVS levels on the Tyne and Dee, 10% and 24% respectively, were at or close to the highest values recorded for these rivers. The level on the Lune (14%) was at the lower end of the range of observed values, although the sample size was small.

In Ireland in 2015, reports were also received of a high prevalence of red vent in fish taken in the Galway weir salmon fishery.

There is no clear indication that RVS affects either the survival of the fish in freshwater or their spawning success. Recent results have also demonstrated that affected vents show signs of progressive healing in freshwater (ICES, 2014).

2.3.3.2 Update on sea lice investigations in Norway

The surveillance program for sea lice infection on wild salmon smolts and sea trout at specific localities along the Norwegian coast continued in 2015 (Nilsen *et al.*, 2015). In 2015, the surveillance program focused on further development of the model-based approach for evaluating infection pressure, where data from weekly sea lice counts at fish farms are coupled with a detailed hydrodynamic model to predict the distribution of seal lice larvae and infection pressure on wild salmonids. The results from the model are verified by field sampling of wild salmon and trout in the modelled areas. Predictions of infection levels from the model, and observed levels from field investigations were in good agreement for most investigated locations, demonstrating the usefulness of the model based approach for predicting sea lice infections.

In general, the surveillance program demonstrated varying infection pressure along the coast during the salmon smolt migration period in 2015. Although infection levels were low at some of the field sampling stations, there was a general increase in infection levels compared to 2014. In the counties Hordaland (areas Hardanger and Nordhordland), Sogn og Fjordane (outer Sognefjord area), Møre og Romsdal (Storfjord area) and Nordland (Nordfolda area), the migrating salmon smolts were probably negatively affected by salmon lice infections in 2015.

In general, sea lice are still regarded as a serious problem for salmonids (Skilbrei *et al.*, 2013; Krkošek *et al.*, 2013) and especially sea trout (Nilsen *et al.*, 2015). The use of chemicals to keep lice levels on fish below a threshold value of 0.5 mature female lice per salmon has shown a sharp increase in later years, as sea lice have developed resistance towards one or several of the most commonly used chemical agents. Multiresistant sea lice are now present in all areas including Finnmark County in northernmost Norway (Aaen *et al.*, 2015; www.mattilsynet.no). As chemical treatments have become less effective alternative methods, some of them based on mechanical removal of sea louse from the fish, are being developed and increasingly put to use to try to reduce the use of chemicals. The increased application of such methods is expected to reduce the use of chemicals in future.

2.3.3.3 UDN in Sweden and Russia

During the summer of 2015 sick and dead salmon infected with the fungus *Saproplegnia* were observed in some northern Baltic rivers in Sweden. Skin samples were taken from salmon in the border river Tornijoki between Finland and Sweden. The Swedish National Veterinary Institute found that tissue deformations typical of UDN (Ulcerative dermal necrosis) were present in the dead fish. It was not possible to quantify the total mortality. A similar outbreak in 2014 did not reduce the number of salmon fry (0+) in 2015. These outbreaks have coincided with large spawning runs, i.e. dense populations.

In Russia in 2015 a mass mortality of adult salmon occurred in the Kola River, Murmansk region. Two hundred salmon died in the cage used for holding broodstock near the river's counting fence and another 500 salmon were found dead on the counting fence. Dead adult salmon were also regularly found by rod anglers over the whole catchment. In August, the decision was taken by the Murmansk Regional Commissions on Regulation of Harvesting Anadromous Fish to close the salmon recreational fisheries in the Kola River for the remainder of the 2015 season. A sample of dead salmon was analysed in Murmansk, Moscow and at the Norwegian Veterinary Institute, Oslo however no common disease agents or pathogens were identified. The outward symptoms appear similar to those often described for UDN but there is no diagnostic test available with which to confirm this suggestion. The total number of salmon killed by this outbreak is unknown. However, electrofishing parr surveys conducted in September showed no adverse effect on salmon juvenile densities. The impact of this event on the spawning stock will be assessed in autumn 2016.

2.3.4 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). This system was based on an earlier proposal by the Norwegian Scientific Advisory Committee for Atlantic Salmon Management (Anon, 2011). A more detailed description of the Quality Norm is given in ICES (2014). Recent progress in 2014 involved establishing a preliminary classification according to the conservation limit and the harvest potential dimension of the Quality Norm, based on assessments for the period 2010–2013. In 2016, the first classification of populations based on both dimensions (conservation limit and harvest potential, and genetic integrity) was conducted. An estimate of the degree of introgression from farmed Atlantic salmon in a large number of salmon populations was available, and a combined classification in both dimensions of the quality norm could be made. Of the 104 populations considered, 23 (22%) were classified as being in good or very good condition, 29 (28%) populations were classified as being in moderate condition, while 52 (50%) were in poor or very poor condition.

2.3.5 Progress on development of reference points for Atlantic salmon in Canada that conform to the Precautionary Approach

The Working Group was presented with an update on progress undertaken in Canada to review and revise reference points for Atlantic salmon in the context of the Precautionary Approach Framework (PA). In 2009, Fisheries and Oceans Canada published the Sustainable Fisheries Framework that provides the basis for ensuring Canadian fisheries are conducted in a manner which support conservation and sustainable use. The framework is comprised of a number of policies for the conservation and sustainable use of fisheries resources including "A Fishery Decision-Making Framework Incorporating the Precautionary Approach" (DFO, 2009a). Fisheries and Oceans Canada (DFO) Ecosystems and Fisheries Management Branch asked for science advice on the development of reference points for Atlantic salmon. The request follows on an action item associated with implementation of the Wild Atlantic Salmon Conservation Policy (DFO, 2009b) to review benchmarks / reference points for Atlantic salmon which conform to the PA.

Currently, there are five regionally specific reference values for Atlantic salmon in eastern Canada referred to as conservation objectives, which are considered equivalent to limit reference points. Reference points have been informally used to provide advice for Atlantic salmon fisheries management since the 1970s (CAFSAC, 1991; Chaput *et al*., 2013) and predates the development of the Sustainable Fisheries Framework (DFO, 2009a). The conservation requirement has been used both domestically and internationally to guide fisheries management actions including the provision of catch advice for the mixed-stock Atlantic salmon fishery at West Greenland. Individual river values based on the conservation requirement have also been proposed as limit reference points that conform to the PA for stocks in DFO Maritimes Region (DFO, 2012).

The reference points and the population dynamics of Atlantic salmon have most often been presented as a stock and recruitment diagram with spawning stock abundance on the horizontal axis and the subsequent recruitment abundance resulting from the spawning stock on the vertical axis (Figure 2.2.5.1). The conservation requirement for Atlantic salmon is expressed in terms of a spawning stock value. This is somewhat different from the PA framework that presents stock status on the horizontal axis and the removal rate on the y-axis. In the PA framework, the stock status axis refers to total stock abundance or an index of total abundance prior to fishing. The single reference point and fixed escapement strategy used for Atlantic salmon can be reconciled with the PA framework by translating the recruitment indicator from the stock and recruitment plot onto the PA framework stock status indicator (Figure 2.2.5.1).

As the Limit Reference Point (LRP) is defined as the stock level below which productivity is sufficiently impaired to cause serious harm, DFO (2015) recommended that the LRP should be defined on the basis of conservation of the salmon population rather than to fishery exploitation objectives. One approach consistent with this objective is to maintain production from freshwater to provide for sufficient numbers of adult returns, despite wide variations in environmental conditions in the marine environment, for the purpose of ensuring adequate opportunity for expression of the diversity of adult phenotypes and to maintain genetic variability. Potential candidate reference points that could satisfy this objective include:

- $S_{0.5Rmax}$: spawner abundance that produces 50% of maximum recruitment
- S_{gen}: spawner abundance that will result in recruitment to S_{MSY} in one generation in the absence of fishing under equilibrium conditions
- S_{LRP}: spawner abundance that results in a risk of <=25% of recruitment being less than 50% of maximum recruitment.

As a minimum, the LRP should be determined based on a risk analysis of the spawning escapement that results in an agreed probability of the recruitment being less than 50% R_{max}. A risk tolerance of no greater than 25% of recruitment being <50% R_{max} is proposed.

For small populations, conservation genetics should be considered in complement to stock and recruitment information to establish a LRP. For conservation purposes, maintaining 90% of genetic diversity over 100 years, as used for other species, could be an appropriate objective (Frankham *et al.*, 2014).

A number of candidate Upper Stock Reference (USR) points were considered:

- 80%B_{msy}: recruitment corresponding to 80% of R_{MSY} as per the PA policy.
- R_{MSY}: recruitment at S_{MSY}.
- X%R_{MAX}: a percentage (X%) of maximum recruitment expected for the stock.

No recommendation for a specific USR was made as the choice depends upon the objectives of the users and the risk profile and risk tolerance of the management strategy. Upper stock reference points are best determined using full life cycle considerations as recruitment could be subject to reduced productivity and therefore increased risk of the stock abundance falling to the LRP. At a minimum, the USR must be greater than the LRP and there should be a very low probability (<5%) of the recruitment falling below the LRP when the stock at USR is exploited at the maximum removal rate.

DFO (2009a) indicated that the maximum removal rate in the healthy zone should not exceed the value corresponding to F_{MSY}. The maximum removal rate in the healthy zone could be calculated once the upper stock reference level is defined.

Considerations for changes in productivity

Changes in productivity in either the freshwater or marine phase of the life cycle can have consequences on the derivation of reference points. The effects of lower productivity, manifest in either phase, would reduce adult recruitment. Lower recruitment rates (recruits per spawner) result in lower reference point values. Reference points based on full life cycle models may not be robust to systematic and sustained changes in the density-independent dynamics occurring at sea. As density-dependent population regulation is considered to occur during the freshwater phase, if the average productivity in freshwater has not changed, then limit reference points defined on the basis of maintaining a portion of the freshwater carrying capacity (R_{MAX}) would be robust to temporal changes in average conditions during the marine phase. The proposed LRP ($S_{0.5Rmax}$) as well as S_{gen} have been shown by simulation in Pacific salmon to be robust to changes in productivity (Holt *et al*., 2009).

Estimation and transport of reference points

Stock and recruitment modelling is the favoured approach for examining population dynamics and developing reference points for Atlantic salmon. Bayesian approaches that provide a framework for incorporating multiple levels of uncertainty are well developed and can be applied to single population stock and recruitment analyses. Hierarchical Bayesian Modelling (HBM) provides a framework for incorporating information from multiple stock and recruitment series, and accounting for the additional uncertainties associated with multiple stock and recruitment time-series.

Results of HBM analyses of egg to smolt time-series from 14 rivers in eastern Canada show that the stock and recruitment dynamic of Atlantic salmon is highly variable and uncertain within and among stocks (Chaput *et al*., 2015). Since it is not possible to obtain stock and recruitment data from all the rivers with Atlantic salmon populations in eastern Canada, consideration must be made to transferring reference values from monitored populations to rivers which lack such information. Scaling production and spawning stock on the basis of the amount of habitat area is the first scale of consideration for salmon. If reference points are defined in terms of rates, such as eggs or spawners per wetted fluvial area, these reference points can be transferred across a set of exchangeable rivers if the habitat areas are known. Examples of LRP values for rivers grouped by presence/absence of lacustrine habitat used for juvenile rearing, are shown in Figure 2.2.5.2. Options for transferring reference points among rivers based on exchangeability assumptions for habitat quantity, presence of lacustrine habitat, mean age of smolts, and proportions of eggs from multi-sea-winter (MSW) salmon are shown in Figure 2.2.5.3 (Chaput *et al*., 2015).

The science advisory report on the development of reference points for Atlantic salmon (*Salmo salar*) that conform to the Precautionary Approach (DFO 2015) is available on the Fisheries and Oceans Canada Canadian Science Advisory Secretariat website (www.dfo-mpo.gc.ca/csas-sccs/). Specific revisions and establishment of reference points for the PA are expected to take place in some regions over the next two years, based on regional priorities. The Working Group will be informed of future progress on the development of the reference values that conform to the PA when they are developed.

Revised reference points for management of salmon fisheries in the province of Québec

Conservation limits for managing Atlantic salmon fisheries in the province of Québec (eastern Canada) were developed by Caron *et al*. (1999) based on a hierarchical analysis of adult to adult stock and recruitment relationships from six rivers of Québec. In 2014, time-series of adult to adult stock and recruitment data from twelve rivers in Québec, extending as far back as 1972 for some rivers were analysed using a Ricker stock and recruitment function. The habitats of individual rivers were scaled to units of productive habitat (fluvial type, substratum, width of river, and temperature index). A full hierarchical model with reference points transported to individual rivers based on estimated habitat within the model was used to define reference points for 105 rivers in Québec. The management plan for Atlantic salmon fisheries for the period 2016 to 2026 was published in March 2016 (www.mffp.gouv.qc.ca/faune/peche/plan-gestion-saumon.jsp).

The new management measures announced in the management plan are founded on the status of Atlantic populations in individual rivers, prescribed by three status zones:

- healthy zone: that defines populations not put in peril by a sustainable exploitation rate;
- cautious zone for which abundance is less than optimal but not alarming, and the exploitation rate is adjusted to favour rebuilding; and
- critical zone for which populations are at low abundance and thus in peril and the exploitation rate would be held to the lowest level possible.

Reference values to categorize the status of populations in each zone were defined as follows:

- genetic limit reference point: the objective is for a 90% chance of maintaining genetic diversity within 100 years. Any salmon population with adult abundance less than 200 fish is considered to be in peril (in the critical zone) and no exploitation is allowed on these rivers;
- demographic limit reference point: spawner abundance (egg deposition) that results in 75% or greater chance of achieving 50% R_{MAX} (as described in DFO 2015);
- upper stock reference: defined as the egg deposition rate corresponding to the 95th percentile of the posterior distribution of S_{MSY};
- management targets: at the discretion of the managers, for example to favour catch and release opportunities (R_{max}) rather than yield to harvests, and by default must be greater than the upper stock reference.

Revised reference points for 105 rivers were defined and reference points for four rivers in the northern portion of Québec in Ungava Bay are under development. The previously defined conservation limits for Atlantic salmon for the province of Québec generally correspond mid-range between the demographic limit reference point and the upper stock reference point (Figure 2.2.5.4).

2.3.6 Review of proposed smolt-to-adult supplementation (SAS) activity

Increased marine mortality over the past two decades has contributed to declines of anadromous Atlantic salmon populations throughout the North Atlantic. Marine mortality is currently considered to be the most important threat to recovery of salmon populations in the southern regions of NAC (Section 4). For many populations at high risk of extinction, a number of recovery actions are undertaken, including live gene banking and adult captive-reared supplementation, to prevent extirpation and minimize loss of genetic diversity until conditions, primarily marine survival, become favourable to population persistence (DFO, 2008).

In response to particularly low returns of Atlantic salmon to the Northwest Miramichi River (New Brunswick, Canada) in 2012 to 2014, a group of non-government organizations in New Brunswick proposed a stock supplementation program consisting of the capture of wild Atlantic salmon smolts, rearing these in captivity in freshwater to the adult stage, and subsequently releasing the adult captive-reared fish back to the river. This activity, smolt-to-adult supplementation (SAS), is intended to circumvent the low smolt-to-adult marine return rates of Atlantic salmon and to increase spawning escapement.

SAS activities consisting of the capture of wild juvenile salmon (parr, autumn presmolts, smolts) and rearing in captivity with the intention to release the mature captive reared adults to targeted rivers to spawn, has been undertaken by Fisheries and Oceans Canada (DFO) in the Scotia-Fundy region in support of populations of salmon at risk of extinction, however, it has not been done for salmon populations in the Gulf region that are not considered at risk of extinction.

As a precedent setting activity for supplementation of Atlantic salmon populations not considered to be at risk of extinction, a science peer review was conducted to support an assessment of risks and benefits of SAS activities to fitness of wild Atlantic salmon (DFO, 2016). The advice was provided to DFO Fisheries and Aquaculture Management, the sector responsible for issuing the permits for the collection of fish from and release to rivers. The science review addressed the following objectives:

- a review of the genetic risks of SAS to short and long-term fitness of wild anadromous Atlantic salmon;
- the ecological risks of SAS;
- criteria and metrics for assessing risk of SAS;
- conditions under which SAS could be considered a negligible risk to wild Atlantic salmon fitness; and
- a specific assessment of risk to wild salmon of a proposed SAS activity of the Miramichi River, New Brunswick, Canada.

The science review was challenging due to the paucity of information available to assess the benefits and risks of SAS. The bulk of the scientific studies and literature regarding effects of captive-rearing and supplementation of Atlantic salmon have addressed the impacts of spawning in hatcheries and supplementation of various juvenile stages from eyed eggs to the smolt stage though some research on SAS has been carried out on Atlantic and Pacific salmonids (Dempson *et al.*, 1999; Fraser, 2008). Due to its recent development, much less empirical data are available to adequately describe the risks and benefits of SAS programs to wild populations of Atlantic salmon. SAS is being used in areas where salmon populations are at high risk of extinction and in cases where very small numbers of adult salmon are putting the population at risk of loss of genetic diversity which could affect long-term population viability.

The science advisory report includes a table of activities associated with SAS that could affect the characteristics of SAS produced fish and progeny and result in deviations of these traits from those of the wild population. The greater the deviation of traits from those of wild salmon, the more likely there will be a loss of fitness. SAS activities that could result in deviations of characteristics from wild traits are encompassed in the entire process from collection of juveniles, transfer to captive-reared environment, feeding regimes and food type, rearing at high densities, different rearing environments from those of wild fish even when reared in seawater based containment facilities, to release strategies, and deviations in characteristics passed on to progeny.

Based on literature, it was concluded that adaptive genetic changes associated with captivity through unintentional selection, domestic selection, and relaxation of natural selection can occur rapidly, even within one generation. An immediate benefit resulting from an abundance of breeding/spawning of SAS fish may be offset by the expectation that mean fitness of the captive-reared progeny will be reduced relative to wild fish, in particular if survival at sea of progeny inherited from the parents is lower than that of wild fish.

As the intention of SAS is to release captive reared fish to the wild and to contribute to spawning and recruitment, genetic mixing by interbreeding of SAS fish with wild fish is expected to occur. As long as there is some risk that SAS will cause phenotypic and genetic changes that reduce fitness of progeny in the wild, there is a risk that genetically mixed progeny may have reduced fitness in the wild.

Considering the currently high marine mortality rates of Atlantic salmon in eastern Canada, the anadromous salmon that are returning are likely those which have the best combination of fitness traits for the current environment. The review concluded that any dilution of these traits via SAS activities and particularly via SAS/wild interbred progeny may delay the recovery in abundance of the wild anadromous phenotype which is currently subjected to strong natural selection at sea, or worse, it may increase the risk of further declines in abundance of the anadromous phenotype due to an increased proportion of progeny which are maladapted to surviving the current marine conditions.

It is clear that juvenile Atlantic salmon can be reared in captivity, in either freshwater or marine conditions, to the adult stage, and that once released SAS adults can at least to some extent behave like their wild counterparts, successfully spawn and produce offspring in the wild, and that some of the offspring can complete the anadromous life cycle and return as adults to spawn to their river of origin. What is uncertain is whether the progeny of SAS adults are less fit than the progeny of their exclusively wild counterparts.

SAS reduces some of the known risks associated with traditional programs consisting of wild captured broodstock spawned in the hatchery and stocking of juvenile stages but it introduces risks at other points in the anadromous life cycle whose effects are uncertain, particularly those associated with selection during the marine phase (Fraser, 2016). Whether or not captive-rearing technologies can be used to effectively increase the abundance of anadromous adult salmon in future generations while minimizing genetic and ecological risks is highly uncertain and unproven. Many uncertainties remain with respect to best captive-rearing practices and there have been few attempts to rigorously assess through quantitative modelling the demographic-genetic trade-offs to inform management decision-making for supplementation programs. In addition, in the absence of improved marine survival conditions from those that contributed to low abundance of anadromous salmon, the objective of increasing abundance of adult anadromous salmon in subsequent generations will be difficult to realize.

Risks to wild populations will in general be greater when SAS generates reductions to fitness of progeny relative to wild fish, when SAS is continuously practised over successive generations, and when SAS releases represent an increasing proportion of the total number of adults in the population at spawning time.

In-depth research, evaluation and modelling of existing or proposed SAS activities are required. Due to the large uncertainties on the benefits and risks of SAS activities to wild Atlantic salmon fitness, it was concluded that if a SAS activity is conducted, it should be at a geographic and demographic scale that allows and includes an adequate monitoring and assessment capability to address the vast knowledge gaps on benefits and risks to wild salmon population persistence and productivity from such activities. The compilation of these additional assessment results would facilitate proper decision-making on when, where, and how SAS might provide desired, net demographic benefits to wild salmon populations.

The science advisory report (DFO, 2016) and supporting documents for the review (Chaput *et al*., 2016; Fraser, 2016; Pavey, 2016) are available on the Internet site of Fisheries and Oceans Canada Canadian Science Advisory Secretariat (www.dfo-mpo.gc.ca/csas-sccs/).

2.3.7 Progress in stock assessment models–Embedding Atlantic salmon stock assessment within an integrated Bayesian life cycle modelling framework

As part of the inputs to the Atlantic salmon case study within the UE-FP7 ECOKNOWS project (http://www.ecoknows.eu/), Massiot-Granier *et al.* (2014) and Massiot-Granier (2014) developed a hierarchical Bayesian integrated life cycle model which is considered to be an improvement on the stock assessment approach currently used by ICES. The model was applied to the stock units considered by ICES for stock assessment in the Southern European stock complex: France, UK (England and Wales), Ireland, UK (Northern Ireland), UK (Scotland) and Southwest Iceland. In this new approach, the stock assessment is fully integrated in an age and stage-based life cycle model (Figure 2.2.7.1), that explicitly considers the variability of life histories (river and sea ages) and the demographic link between age classes. It makes explicit hypotheses about the demography and the migration routes that are easier to interpret and critically examine than in the PFA modelling approach. In addition, this is an expandable framework which offers the possibility to use additional information through the Bayesian updating framework. Finally, the model estimates trends in marine productivity and proportion maturing for the first year at sea for all stock units in Southern Europe, which forms the basis for forecasting homewater returns based on catch options at sea fisheries.

As a new contribution, the Working Group reviewed an extension of the life cycle modelling framework to the six stock units considered in North America: Labrador, Newfoundland, Québec, Scotia-Fundy, Gulf regions and USA. This new model now considers the dynamics of both 1SW and 2SW fish which incorporates a time-trend for the proportion of fish maturing as 1SW and differs from the current model used by ICES which considers only 2SW fish in the PFA forecasting model (Figure 2.2.7.2). Partitioning the life cycle into the first and second year survivals at sea provide a model that aligns with the dynamics of the European stock units and this constitutes a critical step forward in the harmonization of the stock assessment models across stock units in the North Atlantic (Figure 2.2.7.2).

Cross comparison with estimates of the PFA forecasting models show that the Bayesian life cycle approach can be applied to provide estimates and forecasts that are comparable with the PFA forecasting modelling approaches (Figure 2.2.7.3). Differences in trends in the productivity parameter for North America stock units arise from the contribution of 1SW to the total eggs deposition (more than 50% in some stock units in North America) that is considered in the life cycle approach but not in the PFA forecasting model (only 2SW fish).

Also, by comparison with the model developed by Massiot-Granier (2014) for the Southern NEAC stock units, both demographic transitions and likelihood functions (data assimilation) are simplified to speed up the Bayesian MCMC sampling process (JAGS code in R). The model can now run in a few hours (instead of several days for previous versions) and therefore has the potential to be used as a routine assessment tool by the Working Group.

Finally, we quantify the level of synchrony in trends in marine productivity and proportion maturing after the first year at sea among all stock units of Southern NEAC and NAC. Taken together, the results provide a broad picture of Atlantic salmon population dynamics in the North Atlantic, and provide evidence of a decline in the marine survival and an increase in the proportion of maturing PFA, common to all stock units in NAC and Southern NEAC. The time-series of marine survival are negatively correlated with the AMO, a proxy of average SST in the North Atlantic. Taken together, results strongly suggest a common response to large-scale environmental changes impacting Atlantic salmon during the marine phase.

Ongoing issues include: (1) Further improvement of computational tractability of the model, including R-routines to easily pass results of the run-reconstruction as input to the life cycle model; (2) In depth comparisons of the results with those provided by the PFA forecasting models used by ICES; (3) Extending the methodology to the stock assessment model for Northern NEAC stock units.

2.3.8 New opportunities for sampling salmon at sea

The International Ecosystem Survey of the Nordic Seas (IESSNS) is a collaborative programme involving research vessels from Iceland, the Faroes and Norway; surveys are carried out annually in July–August and present an opportunity for improving our knowledge of salmon at sea. The area surveyed (2.7 million km^2 in 2015) overlaps in time and space with the known distribution of post-smolts in the North Atlantic, and as these cruises target pelagic species such as herring and mackerel, bycatch of salmon post-smolts and adult salmon is not uncommon. In 2015 a total of 51 post-smolt and adult salmon were caught by the participating vessels in different regions of the North Atlantic (Figure 2.2.7.4). The Working Group has been liaising with the coordinator of the IESSNS surveys to clarify sampling protocols and a number of samples have been collected and frozen for subsequent analysis. A plan for collecting samples from individual salmon caught in earlier years, as well as those from last year's cruises, for a number of analyses is currently under development at the Institute of Marine Research in Bergen, Norway.

The samples are expected to provide valuable information on the distribution of salmon at sea, the size, sex and diet of individual fish and will also enable stock origin to be investigated using genetic techniques. The IESSNS survey data will also provide information on salmon distribution in relation to other pelagic species, hydrography and plankton abundance. It has also been suggested that some of the IESSNS research effort could be focused more on surface trawling, potentially increasing the number of salmon samples obtained from these cruises.

2.4 NASCO has asked ICES to 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

The Working Group on the Effectiveness of Recovery Actions for Atlantic salmon (WGERAAS) met for a third and final time from the 10th to the 12th of November 2015 at ICES HQ in Copenhagen.

WGERAAS has completed analysis of both the case studies and the Database on Effectiveness of Recovery Actions for Atlantic Salmon (DBERAAS). A total of 15 case studies were received, together with a total of 568 individual river stocks entered in DBERAAS (Table 2.3.1). Analysis of case studies and DBERAAS is ongoing, but some preliminary results were presented at WGNAS 2016.

Of the 15 case studies examined, five achieved their stated goals with regard to effective recovery while nine failed to do so. One cases study reported a "partial" success.

Characteristics of the successful projects included:

- A limited number of stressors acting on the population;
- Successfully addressing all stressors acting on the population;
- A river stock with moderate to high marine survival estimates;
- Good project evaluation (pre-, mid-, post project).

Based on the analysis of DBERAAS 'Stressor' entries the following stressors were most often reported as having a ***high*** or ***very high*** impact:

1. Climate Change;
2. Barriers to migration;
3. Freshwater habitat degradation.

Similarly, on the basis of the analysis of the DBERAAS 'Action' entries the following recovery and restoration actions were most often reported as having a high or very high benefit:

1. Improvements in connectivity;
2. Improvements in freshwater water quality;
3. Freshwater habitat restoration.

A final report will be submitted in 2016 to ICES for the attention of NASCO. In 2017 WGERAAS will report again to WGNAS.

2.5 NASCO has asked ICES to advise on possible effects of salmonid aquaculture on wild Atlantic salmon populations focusing on the effects of sea lice, genetic interactions and the impact on wild salmon production

Given the broad remit of this question from NASCO, ICES decided that the development of advice required the input of experts from a range of disciplines and different Expert Groups, in particular the Working Group on Aquaculture (WGAQUA), the Working Group on Pathology and Diseases of Marine Organisms (WGPDMO), and the Working Group on the Application of Genetics in Fisheries and Mariculture (WGAGFM), in addition to the Working Group on North Atlantic Salmon (WGNAS). Given the timing of the annual meetings of these different Expert Groups and the requirement for the advice to be drafted, reviewed and made available by early May 2016, it was decided that an independent workshop needed to be arranged to address this question.

ICES therefore convened the workshop on the possible effects of salmonid aquaculture on wild Atlantic salmon populations in the North Atlantic (WKCULEF). This was chaired by Ole Torrissen (Norway) and Ian Russell (UK (England & Wales)) and met in Copenhagen 01–03 March 2016. ICES Workshops are open to all interested parties and participants from academic and stakeholder organisations also registered to attend.

The terms of reference for WKCULEF were to:

a) Identify the possible effects of salmonid aquaculture on wild Atlantic salmon populations, focusing on the effects of sea lice, genetic interactions and the impact on wild salmon production.
b) Based on the issues identified in (a):
    i) Update the findings of the 2005 ICES/NASCO symposium on the impacts of aquaculture.
    ii) Update the ICES advice provided to OSPAR in 2010 and 2014 (ICES, 2010; 2014).
    iii) Prepare the first draft of the advice to address the NASCO request.

WKCULEF reported by 11 March 2016, for the attention of the ICES Advisory Committee. The advice will be reviewed by ICES, independent of the other questions to WGNAS, and is expected to inform a NASCO Theme-based Special Session on the topic of developments in relation to minimizing the impacts of farmed salmon on wild salmon stocks. This session is scheduled to take place during the NASCO annual meeting in June 2016.

2.6 NASCO has asked ICES to provide a time-series of numbers of river stocks with established CLs and trends in numbers of stocks meeting their CLs by jurisdiction

In this section the attainment of CLs is assessed based on spawners, after fisheries.

In the NAC area, both Canada and the USA currently assess salmon stocks using river-specific CLs (Table 2.5.1 and Figure 2.5.1).

- In Canada, CLs were first established in 1991 for 74 rivers. Since then the number of rivers with defined CLs increased to 266 in 1997 to 476 since 2014. The number of rivers assessed annually has ranged from 61 to 91 and the annual percentages of these rivers achieving CL has ranged from 26% to 67% with no temporal trend.
- Conservation limits have been established for 33 river stocks in the USA since 1995. Sixteen of these are assessed against CL attainment annually with none meeting CL to date.

In the NEAC area, seven countries currently assess salmon stocks using river-specific CLs (Tables 2.5.2 and 2.5.3 and Figures 2.5.2 and 2.5.3).

- For the River Teno (Finland/Norway), the number of major tributary stocks with established CLs rose from nine between 2007 and 2012 (with five annually assessed against CL), to 24 since 2013 (with seven to ten assessed against CL). None met CL prior to 2013 with 29%, 40% and 20% meeting CLs in 2013, 2014 and 2015, respectively.

- Since 1999, CLs have been established for 85 river stocks in Russia (Murmansk region) with eight of these annually assessed for CL attainment, 88% of which have consistently met their CL during the time-series.
- CLs were established for 439 Norwegian salmon rivers in 2009, but CL attainment was retrospectively assessed for 165–170 river stocks back to 2005. An average of 178 stocks are assessed since 2009. An overall increasing trend in CL attainment was evident from 39% in 2009 to provisionally 73% in 2015.
- In France, CLs were established for 28 river stocks in 2011, rising to 33 by 2015. The percentage of stocks meeting CL peaked in 2014 at 74% dropping to 59% in 2015.
- Ireland established CLs for all 141 stocks in 2007, rising to 143 since 2013 to include catchments above hydro-dams. The mean percentage of stocks meeting CLs is 39% over the time-series, with the highest attainment of 43% achieved in 2014. This was followed by a drop to 38% in 2015.
- UK (England & Wales) established CLs in 1993 for 61 rivers, increasing to 64 from 1995 with a mean of 46% meeting CL. In recent years, a downward trend was observed from 66% attainment in 2011 to a minimum of 20% in 2014, followed by an increase to 38% in 2015.
- Data on UK (Northern Ireland) river-specific CLs are presented from 2002, when CLs were assigned to ten river stocks. Currently, 16 stocks have established CLs and five to ten rivers were assessed annually for CL attainment over the time-series. A mean of 41% have met their CLs over the presented time-series and an upward trend is evident from 2011, with 50% of assessed stocks attaining CL in 2015.

River stocks in UK (Scotland) are not currently assessed against CLs. As part of the regulations to control the killing of wild salmon in UK (Scotland), stocks will be assessed annually at the district scale from the 2016 season onwards (Section 3.2.3). Work is continuing to extend this analysis to the river scale. Iceland and Sweden are working towards developing river stock-specific CLs. No river-specific CLs have been established for Denmark, Germany and Spain.

2.7 Reports from ICES expert group relevant to North Atlantic salmon

2.7.1 WGRECORDS

The Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (WGRECORDS) was established to provide a scientific forum in ICES for the coordination of work on diadromous species. The role of the Group is to coordinate work on diadromous species, organise Expert Groups, Theme Sessions and Symposia, and help to deliver the ICES Science Plan. WGRECORDS held an informal meeting in June 2015, during the NASCO Annual Meeting in Goose Bay, Canada. Discussions were held on the requirements for Expert Groups to address new and ongoing issues arising from the NASCO Annual Meeting. The annual meeting of WGRECORDS was held in September 2015, during the ICES Annual Science Conference in Copenhagen, Denmark. Updates were received from expert groups of particular relevance to North Atlantic salmon which had been established by ICES following proposals by WGRECORDS. The following are expert groups ongoing, recently held or currently being considered.

Ongoing

The Working Group on Effectiveness of Recovery Actions for Atlantic Salmon (**WGERAAS**). Convener Denis Ensing (UK, N. Ireland). An update is provided in Section 2.3.

Recent expert groups

The Working Group on Data Poor Diadromous Fish (**WGDAM**) Conveners Karen Wilson (USA) and Lari Veneranta (Finland).

Workshop on sea trout (**WKTRUTTA2**) Conveners Ted Potter (UK, England and Wales) and Johan Höjesjö (Sweden). A report of this meeting is available in Section 2.6.2.

Proposed Expert groups of relevance to NASCO

> Expert Group on Marine Sampling at West Greenland, Faroes and other marine areas relevant to salmon migrations. This will facilitate the current development of marine projects (NASCO Telemetry Subgroup of the International Atlantic Salmon Research Board, IASRB) to examine ocean migrations of salmon in relation to changing environmental conditions and provide information on where significant mortality is occurring at sea (i.e. bottlenecks to survival).

> Expert Group on Current Catch and Biological Sampling Procedures at West Greenland to provide feedback and analyses on the current catch and sampling programmes. This may include phone surveys currently in use to collect catch data and also post-season interviews and to integrate these data with existing data and assessments. Recreational fisheries have employed phone surveys and interview techniques in many countries and experience of these techniques would be helpful in estimating catch and other information in commercial and recreational fisheries in West Greenland where telephone surveys have recently been introduced. The potential for developing Internet surveys along with or to replace phone surveys should also be examined and these should be integrated with current sampling and data collection.

In addition, theme sessions and symposia may be developed and proposed by WGRECORDS.

A Theme Session for the ICES ASC in 2016 has been accepted by ICES entitled:

> "Ecosystem changes and impacts on diadromous and marine species productivity." Conveners Katherine Mills (USA), Tim Sheehan (USA) and Mark Payne (Denmark).

In addition, theme session proposals for 2017 and 2018 are being considered which are of relevance to NASCO:

> "From freshwater to marine and back again - population status, life histories and ecology of least known migratory fish." Conveners Karen Wilson (USA) and Lari Veneranta (Finland) in 2017.

> "Options for mitigating against poor marine survival and low stock levels of migratory fish stocks including endangered fish species without jeopardising long-term fitness of wild populations." Conveners to be announced (2018).

2.7.2 WGTRUTTA2

An ICES Workshop was held in February 2016, under the chairmanship of Ted Potter (UK) and Johan Höjesjö (Sweden) to focus on the development of models to help address key management questions and to develop Biological Reference Points (BRPs) for use in the management of sea trout stocks and fisheries.

The decline of sea trout stocks, for example in areas where marine mixed-stock fisheries prevail (e.g. the Baltic) and where there is salmon farming, have raised concerns about our lack of knowledge of the true status of stocks. Sea trout have historically taken second place to Atlantic salmon in national fishery assessment programmes and management priorities and as a result relatively few sea trout stocks have been studied for sufficient time to allow the development of population models. Initiating such studies now will be very expensive and will take many years to provide results that will be useful for modelling. There is therefore a need to consider alternative modelling approaches, for example based on catch data or juvenile surveys, to provide information on stock status to inform management.

The Workshop reviewed current national monitoring and assessment programmes. Data collection for sea trout in many countries is poor. Catch reporting is often unreliable and in some countries is not required, although this is generally improving. There are few index river studies on sea trout, and although juvenile surveys are conducted in most countries, it is unclear how representative these are of total stocks.

Relatively little population modelling of sea trout has been undertaken to date, and very little work has been undertaken to develop BRPs. A range of modelling approaches were discussed by the group, although it was recognised that their application would generally be restricted by the lack of data. BRPs would ideally be established on the basis of stock–recruitment relationships for index river stocks, and some such work has been undertaken (e.g. River Burrishoole, Ireland). But the transport of BRPs from index sites to other rivers is constrained by the limited number of studies that have been undertaken and the complex and variable nature of trout populations. Two alternative approaches were considered for setting BRPs or alternative management standards. The first, based on the use of catch data to develop 'pseudo-stock–recruitment relationships', showed promise, but its application is likely to be limited by the relatively small number of rivers throughout the Northeast Atlantic for which good historic (and current) catch data are available. This work is expected to be developed further in England and Wales. The second approach was based on establishing Trout Habitat Scores for pristine/optimal juvenile trout populations. This approach is being applied in the Baltic, and the Workshop recommended that a Working Group be established to further advance the approach, test its application more widely outside the Baltic and develop a clearer method setting reference levels.

The final report of the Workshop is expected to be produced in summer 2016.

2.8 ICES and the International Year of the Salmon

In 2002, NASCO, ICES, the North Pacific Anadromous Fish Commission (NPAFC), the North Pacific Marine Science Organization (PICES) and the International Baltic Sea Fishery Commission (IBSFC) cooperated in holding a workshop entitled 'Causes of Marine Mortality of Salmon in the North Pacific and North Atlantic Oceans and in the Baltic Sea'. The report of the meeting was published as an NPAFC Technical bulletin and is available on the NPAFC website (http://www.npafc.org/new/pub_technical4.html). The workshop demonstrated the benefits of, and the need to maintain and enhance, cooperation and information exchange within and between the North Pacific and North Atlantic Oceans and the Baltic Sea. Those attending the workshop supported holding an expanded international symposium on the marine survival of salmon. While symposia have been held in relation to the BASIS Programme in the North Pacific and the SALSEA Programme in the North Atlantic there has not, as yet, been a follow-up joint meeting or symposium.

NPAFC has now endorsed, in principle, the concept of an International Year of the Salmon (IYS) and has already held the first scoping meeting to further develop ideas for the IYS a multiyear (2016–2022) programme centred on an "intensive burst of internationally coordinated, interdisciplinary, stimulating scientific research on salmon, and their relation to people". It considers that new technologies, new observations and new analytical methods, some developed exclusively during the IYS, will be focused on gaps in knowledge that prevent the clear and timely understanding of the future of salmon in a rapidly changing world. It considers that the current pace of research is too slow in the face of this change and that a burst of activity is needed to develop new tools, a coordinated approach to their development and application and field observations to close information gaps.

This first scoping Workshop was held in February 2015, and ICES was identified as a key potential partner. NPAFC note that ICES share alignment with the goals of the IYS. The NPAFC hosted a Second IYS Scoping Meeting in March 15–16, 2016, in Vancouver, BC, and invited ICES to join this meeting to advise and support in planning this initiative.

ICES recognises this opportunity to raise awareness of the salmon globally, the issues facing these species and the considerable efforts being made to conserve and restore stocks and that it endorses the concept of an IYS. Therefore ICES is currently considering their involvement in and contribution to, such an initiative and the resources it wishes to make available to support the IYS, so that informed discussions can be held with NPAFC.

2.9 NASCO has asked ICES to provide a compilation of tag releases by country in 2015

Data on releases of tagged, finclipped and otherwise marked salmon in 2015 were provided to the Working Group and are compiled as a separate report (ICES, 2016). In summary (Table 2.8.1), about 3.8 million salmon were marked in 2015, a decrease from the 4.2 million fish marked in 2014. The adipose clip was the most commonly used primary mark (3.0 million), with coded wire microtags (0.4 million) the next most common primary mark and 334 937 fish were marked with external tags. Most marks were applied to hatchery-origin juveniles (3.7 million), while 75 609 wild juveniles and 8276 adults were also marked. In 2015, 83 359 PIT tagged salmon, and 2610 Data Storage Tags (DSTs), radio and/or sonic transmitting tags (pingers) were also used (Table 2.8.1).

From 2003, the Working Group has recorded information on marks being applied to farmed salmon. These may help trace the origin of farmed salmon captured in the wild in the case of escape events. Iceland and USA have opted for a genetic "marking" procedure. The broodstock has been screened with molecular genetic techniques, which makes it feasible to trace an escaped farmed salmon back to its hatchery of origin through analysis of its DNA. Genetic assignment has also been applied for hatchery juveniles that are released in two large rivers southwest of France.

2.10 NASCO has asked ICES to identify relevant data deficiencies, monitoring needs and research requirements

Issues pertinent to particular Commission areas are included in subsequent sections and, where appropriate, carried forward to the recommendations (Annex 8).

Table 2.1.1.1. Total reported nominal catch of salmon by country (in tonnes round fresh weight), 1960–2015. (2015 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	1,636	1	-	1,659	1,100	100	-	40	0	-	-	743	283	139	1,443	-	33	-	-	60	-	7,237	-	-
1961	1,583	1	-	1,533	790	127	-	27	0	-	-	707	232	132	1,185	-	20	-	-	127	-	6,464	-	-
1962	1,719	1	-	1,935	710	125	-	45	0	-	-	1,459	318	356	1,738	-	23	-	-	244	-	8,673	-	-
1963	1,861	1	-	1,786	480	145	-	23	0	-	-	1,458	325	306	1,725	-	28	-	-	466	-	8,604	-	-
1964	2,069	1	-	2,147	590	135	-	36	0	-	-	1,617	307	377	1,907	-	34	-	-	1,539	-	10,759	-	-
1965	2,116	1	-	2,000	590	133	-	40	0	-	-	1,457	320	281	1,593	-	42	-	-	861	-	9,434	-	-
1966	2,369	1	-	1,791	570	104	2	36	0	-	-	1,238	387	287	1,595	-	42	-	-	1,370	-	9,792	-	-
1967	2,863	1	-	1,980	883	144	2	25	0	-	-	1,463	420	449	2,117	-	43	-	-	1,601	-	11,991	-	-
1968	2,111	1	-	1,514	827	161	1	20	0	-	-	1,413	282	312	1,578	-	38	5	-	1,127	403	9,793	-	-
1969	2,202	1	-	1,383	360	131	2	22	0	-	-	1,730	377	267	1,955	-	54	7	-	2,210	893	11,594	-	-
1970	2,323	1	-	1,171	448	182	13	20	0	-	-	1,787	527	297	1,392	-	45	12	-	2,146	922	11,286	-	-
1971	1,992	1	-	1,207	417	196	8	17	1	-	-	1,639	426	234	1,421	-	16	-	-	2,689	471	10,735	-	-
1972	1,759	1	-	1,578	462	245	5	17	1	-	32	1,804	442	210	1,727	34	40	9	-	2,113	486	10,965	-	-
1973	2,434	3	-	1,726	772	148	8	22	1	-	50	1,930	450	182	2,006	12	24	28	-	2,341	533	12,670	-	-
1974	2,539	1	-	1,633	709	215	10	31	1	-	76	2,128	383	184	1,628	13	16	20	-	1,917	373	11,877	-	-
1975	2,485	2	-	1,537	811	145	21	26	0	-	76	2,216	447	164	1,621	25	27	28	-	2,030	475	12,136	-	-
1976	2,506	1	3	1,530	542	216	9	20	0	-	66	1,561	208	113	1,019	9	21	40	<1	1,175	289	9,327	-	-
1977	2,545	2	-	1,488	497	123	7	9	1	-	59	1,372	345	110	1,160	19	19	40	6	1,420	192	9,414	-	-
1978	1,545	4	-	1,050	476	285	6	10	0	-	37	1,230	349	148	1,323	20	32	37	8	984	138	7,682	-	-
1979	1,287	3	-	1,831	455	219	6	11	1	-	26	1,097	261	99	1,076	10	29	119	<0,5	1,395	193	8,118	-	-
1980	2,680	6	-	1,830	664	241	8	16	1	-	34	947	360	122	1,134	30	47	536	<0,5	1,194	277	10,127	-	-
1981	2,437	6	-	1,656	463	147	16	25	1	-	44	685	493	101	1,233	20	25	1,025	<0,5	1,264	313	9,954	-	-
1982	1,798	6	-	1,348	364	130	17	24	1	-	54	993	286	132	1,092	20	10	606	<0,5	1,077	437	8,395	-	-
1983	1,424	1	3	1,550	507	166	32	27	1	-	58	1,656	429	187	1,221	16	23	678	<0,5	310	466	8,755	-	-
1984	1,112	2	3	1,623	593	139	20	39	1	-	46	829	345	78	1,013	25	18	628	<0,5	297	101	6,912	-	-
1985	1,133	2	3	1,561	659	162	55	44	1	-	49	1,595	361	98	913	22	13	566	7	864	-	8,108	-	-
1986	1,559	2	3	1,598	608	232	59	52	2	-	37	1,730	430	109	1,271	28	27	530	19	960	-	9,255	315	-
1987	1,784	1	2	1,385	564	181	40	43	4	-	49	1,239	302	56	922	27	18	576	<0,5	966	-	8,159	2,788	-
1988	1,310	1	2	1,076	420	217	180	36	4	-	36	1,874	395	114	882	32	18	243	4	893	-	7,737	3,248	-
1989	1,139	2	2	905	364	141	136	25	4	-	52	1,079	296	142	895	14	7	364	-	337	-	5,904	2,277	-
1990	911	2	2	930	313	141	285	27	6	13	60	567	338	94	624	15	7	315	-	274	-	4,925	1,890	180-350

Table 2.1.1.1. 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	-	4,106	1,682	25-100
1992	522	1	2	867	167	174	462	46	3	10	77	630	171	91	600	20	11	23	5	237	-	4,119	1,962	25-100
1993	373	1	3	923	139	157	499	44	12	9	70	541	248	83	547	16	8	23	-	-	-	3,696	1,644	25-100
1994	355	0	3	996	141	136	313	37	7	6	49	804	324	91	649	18	10	6	-	-	-	3,945	1,276	25-100
1995	260	0	1	839	128	146	303	28	9	3	48	790	295	83	588	10	9	5	2	83	-	3,629	1,060	-
1996	292	0	2	787	131	118	243	26	7	2	44	685	183	77	427	13	7	-	0	92	-	3,136	1,123	-
1997	229	0	2	630	111	97	59	15	4	1	45	570	142	93	296	8	4	-	1	58	-	2,364	827	-
1998	157	0	2	740	131	119	46	10	5	1	48	624	123	78	283	8	4	6	0	11	-	2,395	1,210	-
1999	152	0	2	811	103	111	35	11	5	1	62	515	150	53	199	11	6	0	0	19	-	2,247	1,032	-
2000	153	0	2	1,176	124	73	11	24	9	5	95	621	219	78	274	11	7	8	0	21	-	2,912	1,269	-
2001	148	0	2	1,267	114	74	14	25	7	6	126	730	184	53	251	11	13	0	0	43	-	3,069	1,180	-
2002	148	0	2	1,019	118	90	7	20	8	5	93	682	161	81	191	11	9	0	0	9	-	2,654	1,039	-
2003	141	0	3	1,071	107	99	11	15	10	4	78	551	89	56	192	13	9	0	0	9	-	2,457	847	-
2004	161	0	3	784	82	111	18	13	7	4	39	489	111	48	245	19	7	0	0	15	-	2,157	686	-
2005	139	0	3	888	82	129	21	9	6	8	47	422	97	52	215	11	13	0	0	15	-	2,155	700	-
2006	137	0	3	932	91	93	17	8	6	2	67	326	80	29	192	13	11	0	0	22	-	2,028	670	-
2007	112	0	2	767	63	93	36	6	10	3	58	85	67	30	171	11	9	0	0	25	-	1,548	475	-
2008	158	0	4	807	73	132	69	8	10	9	71	89	64	21	161	12	9	0	0	26	-	1,721	443	-
2009	126	0	3	595	71	126	44	7	10	8	36	68	54	16	121	4	2	0	0.8	26	-	1,318	343	-
2010	153	0	3	642	88	147	42	9	13	13	49	99	109	12	180	10	2	0	1.7	38	-	1,610	393	-
2011	179	0	4	696	89	98	30	20	19	13	44	87	136	10	159	11	7	0	0.1	27	-	1,629	421	-
2012	126	0	3	696	82	50	20	21	9	12	64	88	58	9	124	10	7	0	0.5	33	-	1,412	403	-
2013	137	0	5	475	78	116	31	10	4	11	46	87	84	4	119	11	5	0	0.0	47	-	1,270	306	-
2014	118	0	4	490	81	51	20	24	6	9	58	57	54	2	84	12	7	0	0.1	58	-	1,134	287	-
2015	134	0	4	583	80	103	29	9	7	9	45	63	69	5	68	16	6	0	1.0	56	-	1,285	325	-
Average																								
2010-2014	143	0	4	600	84	92	29	17	10	11	52	84	88	8	133	11	5	0	0.5	41	-	1,411	362	-
2005-2014	139	0	3	699	80	104	33	12	9	9	54	141	80	19	153	10	7	0	0.3	32	-	1,582	444	-

Key:

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

Table 2.1.1.2. Total reported nominal catch of salmon in homewaters by country (in tonnes round fresh weight), 1960–2015. (2015 figures include provisional data). S = Salmon (2SW or MSW fish). G = Grilse (1SW fish). Sm = small. Lg = large; T = S + G or Lg + Sm.

	NAC Area				NEAC (N. Area)												NEAC (S. Area)										
Year	Canada (1)			USA	Norway (2)			Russia (3)	Iceland Wild	Iceland Ranch	Sweden Wild	Sweden Ranch	Denmark	Finland			Ireland (4,5)			UK (E&W)	UK(N.I.) (4,6)	UK(Scotland)			France	Spain	Total
	Lg	Sm	T	T	S	G	T	T	T	T	T	T	T	S	G	T	S	G	T	T	T	S	G	T	T	T	T
1960	-	-	1,636	1	-	-	1,659	1,100	100	-	40	0	-	-	-	-	-	-	743	283	139	971	472	1,443	-	33	7,177
1961	-	-	1,583	1	-	-	1,533	790	127	-	27	0	-	-	-	-	-	-	707	232	132	811	374	1,185	-	20	6,337
1962	-	-	1,719	1	-	-	1,935	710	125	-	45	0	-	-	-	-	-	-	1,459	318	356	1,014	724	1,738	-	23	8,429
1963	-	-	1,861	1	-	-	1,786	480	145	-	23	0	-	-	-	-	-	-	1,458	325	306	1,308	417	1,725	-	28	8,138
1964	-	-	2,069	1	-	-	2,147	590	135	-	36	0	-	-	-	-	-	-	1,617	307	377	1,210	697	1,907	-	34	9,220
1965	-	-	2,116	1	-	-	2,000	590	133	-	40	0	-	-	-	-	-	-	1,457	320	281	1,043	550	1,593	-	42	8,573
1966	-	-	2,369	1	-	-	1,791	570	104	2	36	0	-	-	-	-	-	-	1,238	387	287	1,049	546	1,595	-	42	8,422
1967	-	-	2,863	1	-	-	1,980	883	144	2	25	0	-	-	-	-	-	-	1,463	420	449	1,233	884	2,117	-	43	10,390
1968	-	-	2,111	1	-	-	1,514	827	161	1	20	0	-	-	-	-	-	-	1,413	282	312	1,021	557	1,578	-	38	8,258
1969	-	-	2,202	1	801	582	1,383	360	131	2	22	0	-	-	-	-	-	-	1,730	377	267	997	958	1,955	-	54	8,484
1970	1,562	761	2,323	1	815	356	1,171	448	182	13	20	0	-	-	-	-	-	-	1,787	527	297	775	617	1,392	-	45	8,206
1971	1,482	510	1,992	1	771	436	1,207	417	196	8	17	1	-	-	-	-	-	-	1,639	426	234	719	702	1,421	-	16	7,574
1972	1,201	558	1,759	1	1,064	514	1,578	462	245	5	17	1	-	-	-	32	200	1,604	1,804	442	210	1,013	714	1,727	34	40	8,356
1973	1,651	783	2,434	3	1,220	506	1,726	772	148	8	22	1	-	-	-	50	244	1,686	1,930	450	182	1,158	848	2,006	12	24	9,767
1974	1,589	950	2,539	1	1,149	484	1,633	709	215	10	31	1	-	-	-	76	170	1,958	2,128	383	184	912	716	1,628	13	16	9,566
1975	1,573	912	2,485	2	1,038	499	1,537	811	145	21	26	0	-	-	-	76	274	1,942	2,216	447	164	1,007	614	1,621	25	27	9,603
1976	1,721	785	2,506	1	1,063	467	1,530	542	216	9	20	0	-	-	-	66	109	1,452	1,561	208	113	522	497	1,019	9	21	7,821
1977	1,883	662	2,545	2	1,018	470	1,488	497	123	7	9	1	-	-	-	59	145	1,227	1,372	345	110	639	521	1,160	19	19	7,755
1978	1,225	320	1,545	4	668	382	1,050	476	285	6	10	0	-	-	-	37	147	1,082	1,229	349	148	781	542	1,323	20	32	6,514
1979	705	582	1,287	3	1,150	681	1,831	455	219	6	11	1	-	-	-	26	105	922	1,027	261	99	598	478	1,076	10	29	6,340
1980	1,763	917	2,680	6	1,352	478	1,830	664	241	8	16	1	-	-	-	34	202	745	947	360	122	851	283	1,134	30	47	8,119
1981	1,619	818	2,437	6	1,189	467	1,656	463	147	16	25	1	-	-	-	44	164	521	685	493	101	844	389	1,233	20	25	7,351
1982	1,082	716	1,798	6	985	363	1,348	364	130	17	24	1	-	49	5	54	63	930	993	286	132	596	496	1,092	20	10	6,275
1983	911	513	1,424	1	957	593	1,550	507	166	32	27	1	-	51	7	58	150	1,506	1,656	429	187	672	549	1,221	16	23	7,298
1984	645	467	1,112	2	995	628	1,623	593	139	20	39	1	-	37	9	46	101	728	829	345	78	504	509	1,013	25	18	5,882
1985	540	593	1,133	2	923	638	1,561	659	162	55	44	1	-	38	11	49	100	1,495	1,595	361	98	514	399	913	22	13	6,667
1986	779	780	1,559	2	1,042	556	1,598	608	232	59	52	2	-	25	12	37	136	1,594	1,730	430	109	745	526	1,271	28	27	7,742
1987	951	833	1,784	1	894	491	1,385	564	181	40	43	4	-	34	15	49	127	1,112	1,239	302	56	503	419	922	27	18	6,611
1988	633	677	1,310	1	656	420	1,076	420	217	180	36	4	-	27	9	36	141	1,733	1,874	395	114	501	381	882	32	18	6,591
1989	590	549	1,139	2	469	436	905	364	141	136	25	4	-	33	19	52	132	947	1,079	296	142	464	431	895	14	7	5,197
1990	486	425	911	2	545	385	930	313	146	280	27	6	13	41	19	60	-	-	567	338	94	423	201	624	15	7	4,327

Table 2.1.1.2. Continued.

	NAC Area				NEAC (N. Area)												NEAC (S. Area)										
								Russia	Iceland		Sweden						Ireland			UK	UK(N.I.)						
Year	Canada (1)			USA	Norway (2)			(3)	Wild	Ranch	Wild	Ranch	Denmark	Finland			(4,5)			(E&W)	(4,6)	UK(Scotland)			France	Spain	Total
	Lg	Sm	T	T	S	G	T	T	T	T	T	T	T	S	G	T	S	G	T	T	T	S	G	T	T	T	T
1991	370	341	711	1	535	342	876	215	129	346	34	4	3	53	17	70	-	-	404	200	55	285	177	462	13	11	3,530
1992	323	199	522	1	566	301	867	167	174	462	46	3	10	49	28	77	-	-	630	171	91	361	238	599	20	11	3,847
1993	214	159	373	1	611	312	923	139	157	499	44	12	9	53	17	70	-	-	541	248	83	320	227	547	16	8	3,659
1994	216	139	355	0	581	415	996	141	136	313	37	7	6	38	11	49	-	-	804	324	91	400	248	648	18	10	3,927
1995	153	107	260	0	590	249	839	128	146	303	28	9	3	37	11	48	-	-	790	295	83	364	224	588	10	9	3,530
1996	154	138	292	0	571	215	787	131	118	243	26	7	2	24	20	44	-	-	685	183	77	267	160	427	13	7	3,035
1997	126	103	229	0	389	241	630	111	97	59	15	4	1	30	15	45	-	-	570	142	93	182	114	296	8	3	2,300
1998	70	87	157	0	445	296	740	131	119	46	10	5	1	29	19	48	-	-	624	123	78	162	121	283	8	4	2,371
1999	64	88	152	0	493	318	811	103	111	35	11	5	1	29	33	63	-	-	515	150	53	142	57	199	11	6	2,220
2000	58	95	153	0	673	504	1,176	124	73	11	24	9	5	56	39	96	-	-	621	219	78	161	114	275	11	7	2,873
2001	61	86	148	0	850	417	1,267	114	74	14	25	7	6	105	21	126	-	-	730	184	53	150	101	251	11	13	3,016
2002	49	99	148	0	770	249	1,019	118	90	7	20	8	5	81	12	94	-	-	682	161	81	118	73	191	11	9	2,636
2003	60	81	141	0	708	363	1,071	107	99	11	15	10	4	63	15	75	-	-	551	89	56	122	71	193	13	7	2,432
2004	68	94	161	0	577	207	784	82	111	18	13	7	4	32	7	39	-	-	489	111	48	159	88	247	19	7	2,133
2005	56	83	139	0	581	307	888	82	129	21	9	6	8	31	16	47	-	-	422	97	52	126	91	217	11	13	2,133
2006	55	82	137	0	671	261	932	91	93	17	8	6	2	38	29	67	-	-	326	80	28	118	75	193	13	11	1,999
2007	49	63	112	0	627	140	767	63	93	36	6	10	3	52	6	59	-	-	85	67	30	100	71	171	11	9	1,511
2008	57	100	157	0	637	170	807	73	132	69	8	10	9	65	6	71	-	-	89	64	21	110	51	161	12	9	1,680
2009	52	74	126	0	460	135	595	71	122	44	7	10	8	25	13	38	-	-	68	54	16	83	37	121	5	2	1,278
2010	53	100	153	0	458	184	642	88	124	36	9	13	13	37	13	49	-	-	99	109	12	111	69	180	10	2	1,525
2011	69	110	179	0	556	140	696	89	98	30	20	19	13	29	15	44	-	-	87	136	10	126	33	159	11	7	1,579
2012	52	74	126	0	534	162	696	82	50	20	21	9	12	31	33	64	-	-	88	58	9	84	40	124	10	8	1,368
2013	66	72	138	0	358	117	475	78	116	31	10	4	11	32	14	46	-	-	87	84	4	74	45	119	11	4	1,217
2014	41	77	118	0	319	171	490	81	51	20	24	6	9	31	26	58	-	-	57	54	2	58	26	83	12	7	1,072
2015	54	80	134	0	430	153	583	80	103	29	9	7	9	32	13	45			63	69	5	39	29	68		6	1,210
Average																											
2010-2014	56	87	143	0	445	155	600	84	88	27	17	10	11	32	20	52	-	-	84	88	8	91	43	133	11	5	1352
2005-2014	55	83	138	0	520	179	699	80	101	32	12	9	9	37	17	54	-	-	141	80	19	99	54	153	10	7	1536

1. Includes estimates of some local sales, and, prior to 1984, by-catch.
2. Before 1966, sea trout and sea charr included (5% of total).
3. Figures from 1991 to 2000 do not include catches of the recreational (rod) fishery.
4. Catch on River Foyle allocated 50% Ireland and 50% N. Ireland.
5. Improved reporting of rod catches in 1994 and data derived from carcase tagging and log books from 2002.
6. Angling catch (derived from carcase tagging and log books) first included in 2002.

Table 2.1.2.1. Numbers of fish caught and released in rod fisheries along with the % of the total rod catch (released + retained) for countries in the North Atlantic where records are available, 1991–2015. Figures for 2015 are provisional.

Year	Canada [4]		USA		Iceland		Russia [1]		UK (E&W)		UK (Scotland)		Ireland		UK (N Ireland) [2]		Denmark		Sweden		Norway [3]		Total
	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	catch & release
1991	22 167	28	239	50.1			3 211	51															25 617
1992	37 803	29	407	66.7			10 120	73															48 330
1993	44 803	36	507	76.9			11 246	82	1 448	10													58 004
1994	52 887	43	249	95.0			12 056	83	3 227	13	6 595	8											75 014
1995	46 029	46	370	100.0			11 904	84	3 189	20	12 151	14											73 643
1996	52 166	41	542	100.0	669	2	10 745	73	3 428	20	10 413	15											77 963
1997	50 009	50	333	100.0	1 558	5	14 823	87	3 132	24	10 965	18											80 820
1998	56 289	53	273	100.0	2 826	7	12 776	81	4 378	30	13 464	18											90 006
1999	48 720	50	211	100.0	3 055	10	11 450	77	4 382	42	14 846	28											82 664
2000	64 482	56	0	-	2 918	11	12 914	74	7 470	42	21 072	32											108 856
2001	59 387	55	0	-	3 611	12	16 945	76	6 143	43	27 724	38											113 810
2002	50 924	52	0	-	5 985	18	25 248	80	7 658	50	24 058	42											113 873
2003	53 645	55	0	-	5 361	16	33 862	81	6 425	56	29 170	55											128 463
2004	62 316	57	0	-	7 362	16	24 679	76	13 211	48	46 279	50					255	19					154 102
2005	63 005	62	0	-	9 224	17	23 592	87	11 983	56	46 165	55	2 553	12			606	27					157 128
2006	60 486	62	1	100.0	8 735	19	33 380	82	10 959	56	47 669	55	5 409	22	302	18	794	65					167 735
2007	41 192	58	3	100.0	9 691	18	44 341	90	10 917	55	55 660	61	15 113	44	470	16	959	57					178 346
2008	54 887	53	61	100.0	17 178	20	41 881	86	13 035	55	53 347	62	13 563	38	648	20	2 033	71			5 512	5	202 145
2009	52 151	59	0	-	17 514	24			9 096	58	48 418	67	11 422	39	847	21	1 709	53			6 696	6	147 853
2010	55 895	53	0	-	21 476	29	14 585	56	15 012	60	78 357	70	15 142	40	823	25	2 512	60			15 041	12	218 843
2011	71 358	57	0	-	18 593	32			14 406	62	64 813	73	12 688	38	1 197	36	2 153	55			14 303	12	199 511
2012	43 287	57	0	-	9 752	28	4 743	43	11 952	65	63 370	74	11 891	35	5 014	59	2 153	55			18 611	14	170 773
2013	50 630	59	0	-	23 133	34	3 732	39	10 458	70	54 003	80	10 682	37	1 507	64	1 932	57			15 953	15	172 030
2014	41 613	54	0	-	13 616	41	8 479	52	7 992	78	37 270	82	6 537	37	1 065	50	1 918	61	445	15	20 281	19	139 216
2015	64 159	64	0		29 341	40	7 028	50	9 925	79	45 973	84	9 374	37	111	100	2 989	70	725	19	25 433	19	195 058
5-yr mean 2010-2014	52 557	56.1			17 314	32.6	7 885	47.5	11 964	66.9	59 563	75.7	11 388	37.4	1 921	46.8	2 134	57.6			16 838	14.3	180 075
% change on 5-year mean	22.1	14.1			69.5	21.2	-10.9	5.3	-17.0	18.1	-22.8	10.9	-17.7	-1.1	-94.2	113.7	40.1	21.5			51.0	34.8	8.3

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 is for the DCAL area only; the figures from 2010 are a total for UK (N.Ireland). Data for 2015 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.

[5] 2014 information based on Loughs Agency, DCAL area only.

Table 2.1.3.1. Estimates of unreported catches (tonnes round fresh weight) by various methods within national EEZs in the Northeast Atlantic, North American and West Greenland Commissions of NASCO, 1987–2015.

Year	North-East Atlantic	North-America	West Greenland	Total
1987	2 554	234	-	2 788
1988	3 087	161	-	3 248
1989	2 103	174	-	2 277
1990	1 779	111	-	1 890
1991	1 555	127	-	1 682
1992	1 825	137	-	1 962
1993	1 471	161	< 12	1 644
1994	1 157	107	< 12	1 276
1995	942	98	20	1 060
1996	947	156	20	1 123
1997	732	90	5	827
1998	1 108	91	11	1 210
1999	887	133	12,5	1 032
2000	1 135	124	10	1 269
2001	1 089	81	10	1 180
2002	946	83	10	1 039
2003	719	118	10	847
2004	575	101	10	686
2005	605	85	10	700
2006	604	56	10	670
2007	465	-	10	475
2008	433	-	10	443
2009	317	16	10	343
2010	357	26	10	393
2011	382	29	10	421
2012	363	31	10	403
2013	272	24	10	306
2014	256	21	10	287
2015	298	17	10	325
Mean 2010-2014	326	26	10	362

Notes:

There were no estimates available for Canada in 2007-08 and estimates for 2009-10 are incomplete.

No estimates have been available for Russia since 2008.

Unreported catch estimates are not provided for Spain and St. Pierre et Miquelon.

Table 2.1.3.2. Estimates of unreported catches by various methods in tonnes by country within national EEZs in the Northeast Atlantic, North American and West Greenland Commissions of NASCO, 2015.

Commission Area	Country	Unreported Catch t	Unreported as % of Total North Atlantic Catch (Unreported + Reported)	Unreported as % of Total National Catch (Unreported + Reported)
NEAC	Denmark	6	0,4	39
NEAC	Finland	6	0,4	12
NEAC	Iceland	4	0,3	3
NEAC	Ireland	6	0,5	9
NEAC	Norway	250	17,9	30
NEAC	Sweden	3	0,2	14
NEAC	France	3	0,2	16
NEAC	UK (E & W)	13	0,9	16
NEAC	UK (N.Ireland)	0	0,0	6
NEAC	UK (Scotland)	7	0,5	9
NAC	USA	0	0,0	0
NAC	Canada	17	1,2	11
WGC	West Greenland	10	0,7	15
	Total Unreported Catch *	325	20,2	
	Total Reported Catch of North Atlantic salmon	1 283		

* No unreported catch estimate available for Russia in 2015.

Unreported catch estimates not provided for Spain & St. Pierre et Miquelon

Table 2.2.1.1. Production of farmed salmon in the North Atlantic area and in areas other than the North Atlantic (in tonnes round fresh weight), 1980–2015.

Year	North Atlantic Area										Outside the North Atlantic Area						World-wide
	Norway	UK (Scot.)	Faroes	Canada	Ireland	USA	Iceland	UK (N.Ire.)	Russia	Total	Chile	West Coast USA	West Coast Canada	Australia	Turkey	Total	Total
1980	4 153	598	0	11	21	0	0	0	0	4 783	0	0	0	0	0	0	4 783
1981	8 422	1 133	0	21	35	0	0	0	0	9 611	0	0	0	0	0	0	9 611
1982	10 266	2 152	70	38	100	0	0	0	0	12 626	0	0	0	0	0	0	12 626
1983	17 000	2 536	110	69	257	0	0	0	0	19 972	0	0	0	0	0	0	19 972
1984	22 300	3 912	120	227	385	0	0	0	0	26 944	0	0	0	0	0	0	26 944
1985	28 655	6 921	470	359	700	0	91	0	0	37 196	0	0	0	0	0	0	37 196
1986	45 675	10 337	1 370	672	1 215	0	123	0	0	59 392	0	11	0	10	0	0	59 392
1987	47 417	12 721	3 530	1 334	2 232	365	490	0	0	68 089	41	196	0	62	0	299	68 388
1988	80 371	17 951	3 300	3 542	4 700	455	1 053	0	0	111 372	165	925	0	240	0	1 330	112 702
1989	124 000	28 553	8 000	5 865	5 063	905	1 480	0	0	173 866	1 860	1 122	1 000	1 750	0	5 732	179 598
1990	165 000	32 351	13 000	7 810	5 983	2 086	2 800	<100	5	229 035	9 478	696	1 700	1 750	300	13 924	242 959
1991	155 000	40 593	15 000	9 395	9 483	4 560	2 680	100	0	236 811	14 957	1 879	3 500	2 653	1 500	24 489	261 300
1992	140 000	36 101	17 000	10 380	9 231	5 850	2 100	200	0	220 862	23 715	4 238	6 600	3 300	680	38 533	259 395
1993	170 000	48 691	16 000	11 115	12 366	6 755	2 348	<100	0	267 275	29 180	4 254	12 000	3 500	791	49 725	317 000
1994	204 686	64 066	14 789	12 441	11 616	6 130	2 588	<100	0	316 316	34 175	4 834	16 100	4 000	434	59 543	375 859
1995	261 522	70 060	9 000	12 550	11 811	10 020	2 880	259	0	378 102	54 250	4 868	16 000	6 192	654	81 964	460 066
1996	297 557	83 121	18 600	17 715	14 025	10 010	2 772	338	0	444 138	77 327	5 488	17 000	7 647	193	107 655	551 793
1997	332 581	99 197	22 205	19 354	14 025	13 222	2 554	225	0	503 363	96 675	5 784	28 751	7 648	50	138 908	642 271
1998	361 879	110 784	20 362	16 418	14 860	13 222	2 686	114	0	540 325	107 066	2 595	33 100	7 069	40	149 870	690 195
1999	425 154	126 686	37 000	23 370	18 000	12 246	2 900	234	0	645 590	103 242	5 512	38 800	9 195	0	156 749	802 339
2000	440 861	128 959	32 000	33 195	17 648	16 461	2 600	250	0	671 974	166 897	6 049	49 000	10 907	0	232 853	904 827
2001	436 103	138 519	46 014	36 514	23 312	13 202	2 645	-	0	696 309	253 850	7 574	68 000	12 724	0	342 148	1 038 457
2002	462 495	145 609	45 150	40 851	22 294	6 798	1 471	-	0	724 668	265 726	5 935	84 200	14 356	0	370 217	1 094 885
2003	509 544	176 596	52 526	38 680	16 347	6 007	3 710	-	300	803 710	280 301	10 307	65 411	15 208	0	371 227	1 174 937
2004	563 914	158 099	40 492	37 280	14 067	8 515	6 620	-	203	829 190	348 983	6 645	55 646	16 476	0	427 750	1 256 940
2005	586 512	129 588	18 962	45 891	13 764	5 263	6 300	-	204	806 484	385 779	6 110	63 369	16 780	0	472 038	1 278 522
2006	629 888	131 847	11 905	47 880	11 174	4 674	5 745	-	229	843 342	376 476	5 811	70 181	20 710	0	473 178	1 316 520
2007	744 222	129 930	22 305	36 368	9 923	2 715	1 158	-	111	946 732	331 042	7 117	70 998	25 336	0	434 493	1 381 225
2008	737 694	128 606	36 000	39 687	9 217	9 014	330	-	51	960 599	388 847	7 699	73 265	25 737	0	495 548	1 456 147
2009	862 908	144 247	51 500	43 101	12 210	6 028	742	-	2 126	1 122 862	233 308	7 923	68 662	29 893	0	339 786	1 462 648
2010	939 575	154 164	45 391	43 612	15 691	11 127	1 068	-	4 500	1 215 128	120 000	8 408	70 831	31 807	0	231 046	1 446 174
2011	1 065 974	158 018	60 473	41 448	12 196	6 031	1 083	-	8 500	1 353 723	254 570	7 467	83 144	36 662	0	381 843	1 735 566
2012	1 232 095	162 223	76 564	52 951	12 440	-	2 923	-	8 754	1 547 950	386 607	8 696	79 981	43 982	0	519 266	2 067 216
2013	1 168 324	163 234	75 821	47 550	9 125	-	3 018	-	22 500	1 489 572	470 256	6 834	74 673	42 776	0	594 539	2 084 111
2014	1 295 105	179 022	86 454	40 839	9 368	-	3 965	-	18 675	1 633 428	622 992	6 368	54 971	41 591	0	725 922	2 359 350
2015	1 315 538	186 508	86 454	40 839	13 116	-	3 260	-	3 232	1 648 947	622 992	6 368	54 971	41 591	0	725 922	2 374 869
5-yr mean 2010-2014	1 140 215	163 332	68 941	45 280	11 764		2 411		12 586	1 447 960	370 885	7 554	72 720	39 364	0	490 523	1 938 483
% change on 5-year mean	+15	+14	+25	-+10	11		+35		-+74	+14	+68	-16	-+24	+6		+48	+23

Notes: Data for 2015 are provisional for many countries.

Where production figures were not available for 2015, values as in 2014 were assumed.

West Coast USA = Washington State.

West Coast Canada = British Columbia.

Australia = Tasmania.

Source of production figures for non-Atlantic areas: http://www.fao.org/fishery/statistics/global-aquaculture-production/en

Data for UK (N. Ireland) since 2001 and data for East coast USA since 2012 are not publicly available.

Source of production figures for Russia and for Ireland since 2008: http://www.fao.org/fishery/statistics/global-aquaculture-production/en

Table 2.2.2.1. Production of ranched salmon in the North Atlantic (tonnes round fresh weight), 1980–2015.

Year	Iceland (1)	Ireland (2)	UK(N.Ireland) River Bush (2,3)	Sweden (2)	Norway various facilities (2)	Total production
1980	8,0			0,8		9
1981	16,0			0,9		17
1982	17,0			0,6		18
1983	32,0			0,7		33
1984	20,0			1,0		21
1985	55,0	16,0	17,0	0,9		89
1986	59,0	14,3	22,0	2,4		98
1987	40,0	4,6	7,0	4,4		56
1988	180,0	7,1	12,0	3,5	4,0	207
1989	136,0	12,4	17,0	4,1	3,0	172
1990	285,1	7,8	5,0	6,4	6,2	310
1991	346,1	2,3	4,0	4,2	5,5	362
1992	462,1	13,1	11,0	3,2	10,3	500
1993	499,3	9,9	8,0	11,5	7,0	536
1994	312,8	13,2	0,4	7,4	10,0	344
1995	302,7	19,0	1,2	8,9	2,0	334
1996	243,0	9,2	3,0	7,4	8,0	271
1997	59,4	6,1	2,8	3,6	2,0	74
1998	45,5	11,0	1,0	5,0	1,0	64
1999	35,3	4,3	1,4	5,4	1,0	47
2000	11,3	9,3	3,5	9,0	1,0	34
2001	13,9	10,7	2,8	7,3	1,0	36
2002	6,7	6,9	2,4	7,8	1,0	25
2003	11,1	5,4	0,6	9,6	1,0	28
2004	18,1	10,4	0,4	7,3	1,0	37
2005	20,5	5,3	1,7	6,0	1,0	35
2006	17,2	5,8	1,3	5,7	1,0	31
2007	35,5	3,1	0,3	9,7	0,5	49
2008	68,6	4,4	-	10,4	0,5	84
2009	44,3	1,1	-	9,9	-	55
2010	42,3	2,5	-	13,0	-	58
2011	30,2	2,5	-	19,1	-	52
2012	20,0	5,3	-	8,9	-	34
2013	30,7	2,8	-	4,2	-	38
2014	17,9	2,8	-	6,2	-	27
2015	29,1	4,6	-	6,6	-	40
5-yr mean 2010-2014	28,2	3,2		10,3		42
% change on 5-year mean	3	45		-36		-3

1 From 1990 to 2000, catch includes fish ranched for both commercial and angling purposes. No commercial ranching since 2000.

2 Total yield in homewater fisheries and rivers.

3 The proportion of ranched fish was not assessed between 2008 and 2015 due to a lack of microtag returns.

Table 2.3.1. Overview of the number of case studies examined and the database on Effective Recovery Actions for Atlantic salmon (DBERAAS) river stock entries per nation.

Nation	Region	Number rivers DBERAAS	Number Case Studies
Iceland	N/S NEAC	84	0
Faroe Islands	N NEAC	0	0
Norway	N NEAC	0	1
Sweden	N NEAC/HELCOM	77	1
Russian Federation	N NEAC/HELCOM	0	1
Finland	N NEAC/HELCOM	69	1
Poland	HELCOM	0	0
Lithuania	HELCOM	0	0
Estonia	HELCOM	12	0
Denmark	N NEAC/HELCOM	9	0
Germany	S NEAC/HELCOM	4	1
France	S NEAC	0	2
Spain	S NEAC	10	0
Ireland	S NEAC	148	4
UK (England & Wales)	S NEAC	93	2
UK (Scotland)	S NEAC	0	0
UK (Northern Ireland)	S NEAC	19	0
Canada	NAC	0	1
USA	NAC	43	1
Greenland	WGC	0	0
total		568	15

Table 2.5.1. Time-series of NAC area with established CLs and trends in the number of stocks meeting CLs.

	Canada				USA			
Year	No. CLs	No. assessed	No. met	% met	No. CLs	No. assessed	No. met	% met
1991	74	64	34	53				
1992	74	64	38	59				
1993	74	69	30	43				
1994	74	72	28	39				
1995	74	74	36	49	33	16	0	0
1996	74	76	44	58	33	16	0	0
1997	266	91	38	42	33	16	0	0
1998	266	83	38	46	33	16	0	0
1999	269	82	40	49	33	16	0	0
2000	269	81	31	38	33	16	0	0
2001	269	78	29	37	33	16	0	0
2002	269	80	21	26	33	16	0	0
2003	269	79	33	42	33	16	0	0
2004	269	75	39	52	33	16	0	0
2005	269	70	31	44	33	16	0	0
2006	269	65	29	45	33	16	0	0
2007	269	61	23	38	33	16	0	0
2008	269	68	29	43	33	16	0	0
2009	375	70	32	46	33	16	0	0
2010	375	68	31	46	33	16	0	0
2011	458	75	50	67	33	16	0	0
2012	472	74	32	43	33	16	0	0
2013	473	75	46	61	33	16	0	0
2014	476	69	20	29	33	16	0	0
2015	476	74	43	58	33	16	0	0

Table 2.5.2. Time-series of northern NEAC area with established CLs and trends in the number of stocks meeting CLs.

	Teno River (Finland/Norway)				Norway				Russia			
Year	No. CLs	No. assessed	No. met	% met	No. CLs	No. assessed	No. met	% met	No. CLs	No. assessed	No. met	% met
1999									85	8	7	88
2000									85	8	7	88
2001									85	8	7	88
2002									85	8	7	88
2003									85	8	7	88
2004									85	8	7	88
2005					0	167*	70	42	85	8	7	88
2006					0	165*	73	44	85	8	7	88
2007	9	5	0	0	80	167*	76	46	85	8	7	88
2008	9	5	0	0	80	170*	87	51	85	8	7	88
2009	9	5	0	0	439	176	68	39	85	8	7	88
2010	9	5	0	0	439	179	114	64	85	8	7	88
2011	9	5	0	0	439	177	128	72	85	8	7	88
2012	9	5	0	0	439	187	139	74	85	8	7	88
2013	24	7	2	29	439	185	111	60	85	8	7	88
2014	24	10	4	40	439	167	116	69	85	8	7	88
2015	24	10	2	20	439	172	126	73	85	8	7	88

*** CL attainment retrospectively assessed.**

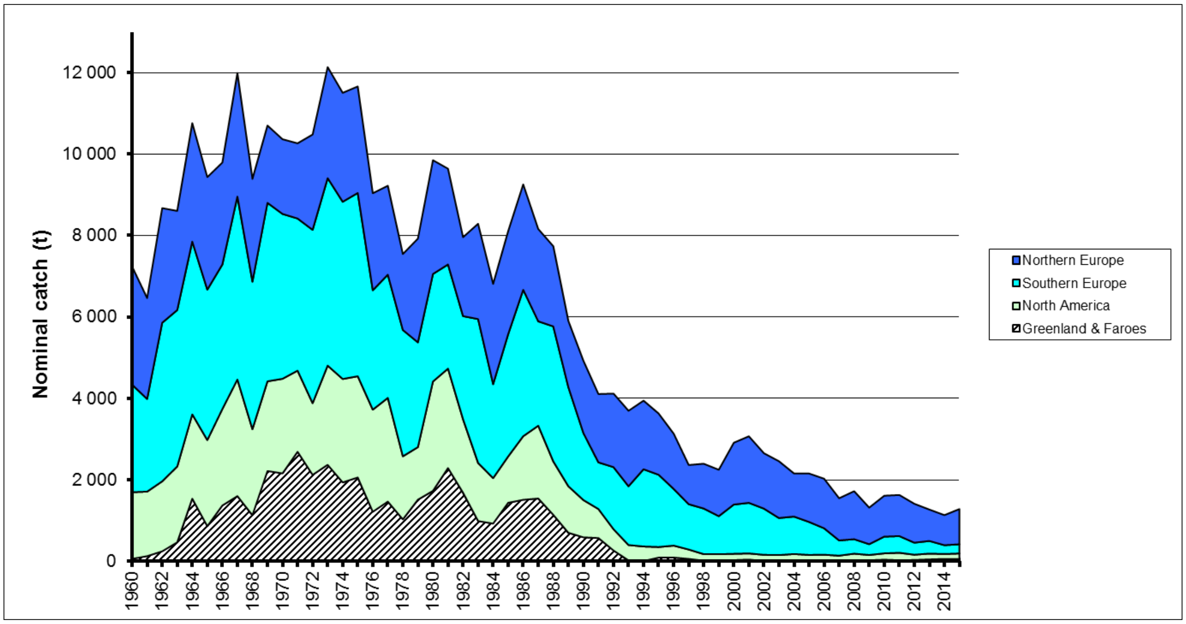
Table 2.5.3. Time-series of southern NEAC area with established CLs and trends in the number of stocks meeting CLs.

	France				Ireland				UK (England & Wales)				UK (Northern Ireland)			
Year	No. CLs	No. assessed	No. met	% met	No. CLs	No. assessed	No. met	% met	No. CLs	No. assessed	No. met	% met	No. CLs	No. assessed	No. met	% met
1993									61	61	33	54				
1994									63	63	41	65				
1995									63	63	26	41				
1996									63	63	31	49				
1997									64	64	21	33				
1998									64	64	30	47				
1999									64	64	19	30				
2000									64	64	26	41				
2001									64	58	21	36				
2002									64	64	27	42	10	10	4	40
2003									64	64	19	30	10	10	4	40
2004									64	64	41	64	10	10	3	30
2005									64	64	32	50	10	10	4	40
2006									64	64	38	59	10	10	3	30
2007					141	141	45	32	64	64	33	52	10	6	2	33
2008					141	141	54	38	64	64	43	67	10	5	3	60
2009					141	141	56	40	64	64	22	34	10	6	2	33
2010					141	141	56	40	64	64	39	61	10	7	2	29
2011	28	28	15	54	141	141	58	41	64	64	42	66	11	9	3	33
2012	28	28	16	57	141	141	58	41	64	64	34	53	11	8	4	50
2013	30	27	20	74	143	143	57	40	64	64	20	31	13	8	5	63
2014	33	30	22	73	143	143	62	43	64	64	13	20	15	9	4	44
2015	33	27	16	59	143	143	55	38	64	64	24	38	16	10	5	50

Table 2.8.1. Summary of Atlantic salmon tagged and marked in 2015 - 'Hatchery' and 'Wild' juvenile refer to smolts and parr.

		Primary Tag or Mark				
Country	Origin	Microtag	External mark[2]	Adipose clip	Other Internal[1]	Total
Canada	Hatchery Adult	0	1,904	315	1,476	**3,695**
	Hatchery Juvenile	0	38	212,180	0	**212,218**
	Wild Adult	0	4,234	0	238	**4,472**
	Wild Juvenile	0	19,390	9,303	1,061	**29,754**
	Total	**0**	**25,566**	**221,798**	**2,775**	**250,139**
Denmark	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	68,000		424,700	10,000	502,700
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	0	0
	Total	**68,000**	**0**	**424,700**	**10,000**	**502,700**
France	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile[3]	0	0	205,876	0	205,876
	Wild Adult[3]	29	0	0	0	29
	Wild Juvenile	860	0	0	0	860
	Total	**889**	**0**	**205,876**	**0**	**206,765**
Iceland	Hatchery Adult	0	102	0	0	102
	Hatchery Juvenile	32,209	0	0	0	32,209
	Wild Adult	0	92	0	0	92
	Wild Juvenile	2,406	0	0	0	2,406
	Total	**34,615**	**194**	**0**	**0**	**34,809**
Ireland	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	208,481	0	0	0	208,481
	Wild Adult	0	0	0	0	0
	Wild Juvenile	6,480	0	0	0	6,480
	Total	**214,961**	**0**	**0**	**0**	**214,961**
Norway	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	58,996	9,660	0	22,187	90,843
	Wild Adult	0	753	0	58	811
	Wild Juvenile	0	2,371	0	3,051	5,422
	Total	**58,996**	**12,784**	**0**	**25,296**	**97,076**
Russia	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	0	1,532,971	0	1,532,971
	Wild Adult	0	1,751	0	0	1,751
	Wild Juvenile	0	0	0	0	0
	Total	**0**	**1,751**	**1,532,971**	**0**	**1,534,722**
Spain	Hatchery Adult	0	0	0	0	**0**
	Hatchery Juvenile	0	170,920	0	0	**170,920**
	Wild Adult	0	0	0	0	**0**
	Wild Juvenile	0	0	0	0	**0**
	Total	**0**	**170,920**	**0**	**0**	**170,920**
Sweden	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	3999	163,870	0	167,869
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	489	0	0	489
	Total	**0**	**4,488**	**163,870**	**0**	**168,358**
UK (England & Wales)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	0	23,493	0	23,493
	Wild Adult	0	613	0	3	616
	Wild Juvenile	6,468	0	9,494	10	15,972
	Total	**6,468**	**613**	**32,987**	**13**	**40,081**
UK (N. Ireland)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	12,147	0	39,776	0	51,923
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	0	0
	Total	**12,147**	**0**	**39,776**	**0**	**51,923**
UK (Scotland)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	0	183,475	2,045	185,520
	Wild Adult	0	505	0	0	505
	Wild Juvenile	3,130	0	4,758	6,288	14,176
	Total	**3,130**	**505**	**188,233**	**8,333**	**200,201**
USA	Hatchery Adult	0	488	0	2,687	3,175
	Hatchery Juvenile	0	117,628	206,182	2,480	326,290
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	50	50
	Total	**0**	**118,116**	**206,182**	**5,217**	**329,515**
All Countries	Hatchery Adult	0	2,494	315	4,163	6,972
	Hatchery Juvenile	379,833	302,245	2,992,523	36,712	3,711,313
	Wild Adult	29	7,948	0	299	8,276
	Wild Juvenile	19,344	22,250	23,555	10,460	75,609
	Total	**399,206**	**334,937**	**3,016,393**	**51,634**	**3,802,170**

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



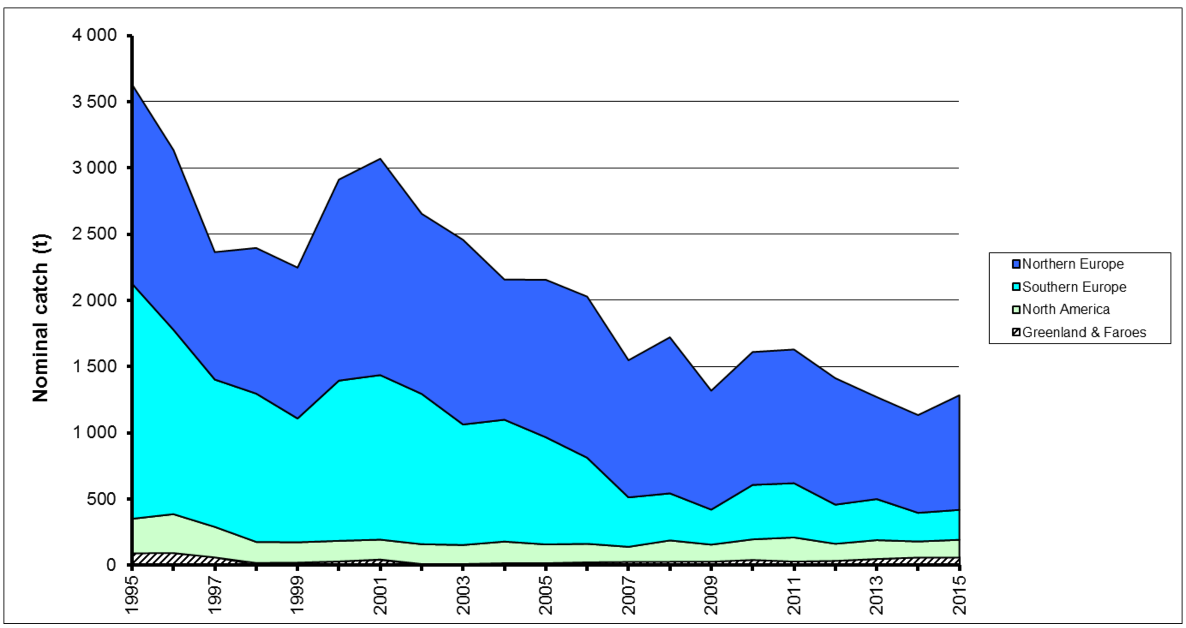


Figure 2.1.1.1. Total reported nominal catch of salmon (tonnes round fresh weight) in four North Atlantic regions, top: 1960–2015 and bottom 1995–2015.

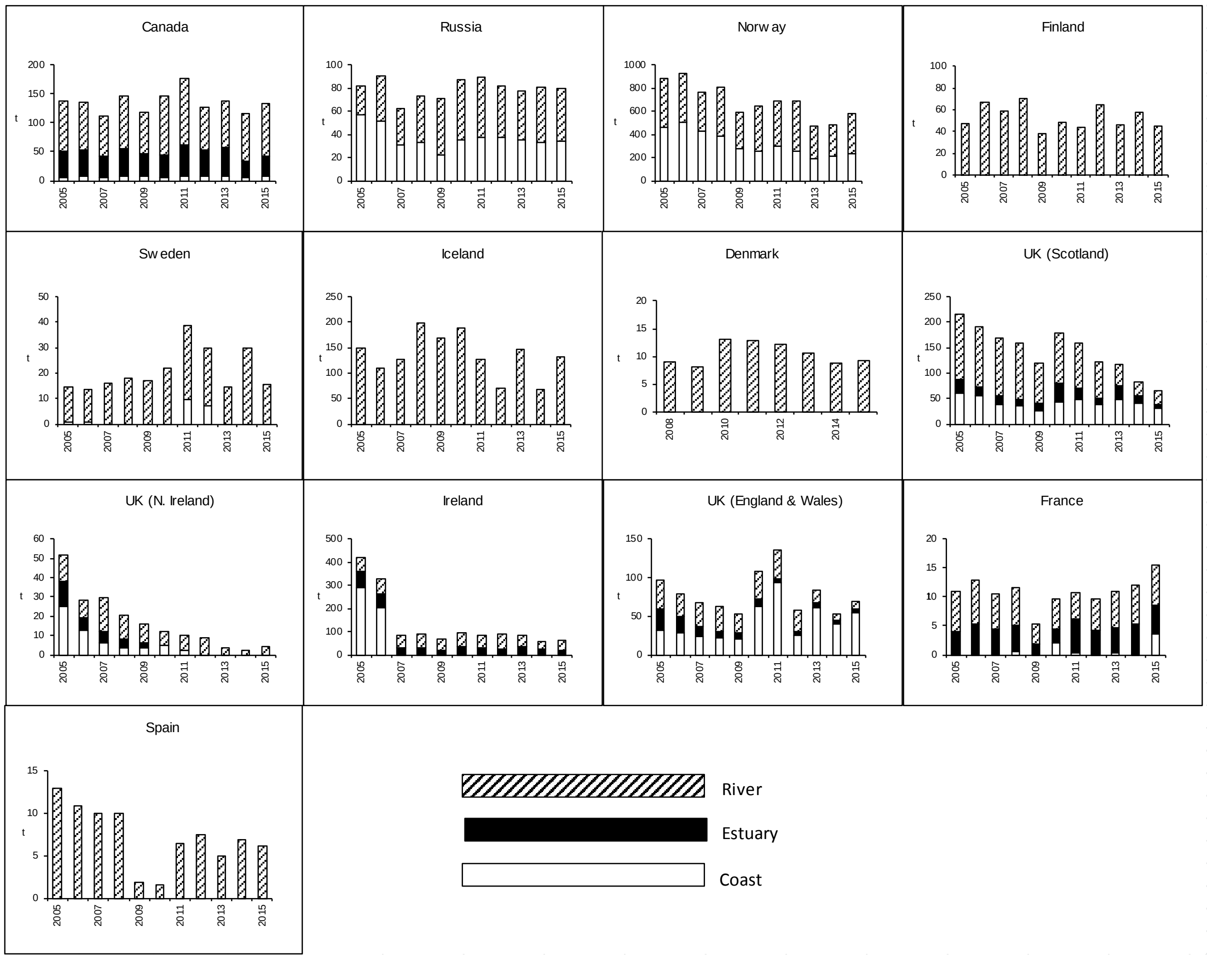


Figure 2.1.1.2. Nominal catch (tonnes) taken in coastal, estuarine and riverine fisheries by country (2005–2015). The way in which the nominal catch is partitioned among categories varies between countries, particularly for estuarine and coastal fisheries; see text for details. Note also that the y-axes scales vary.

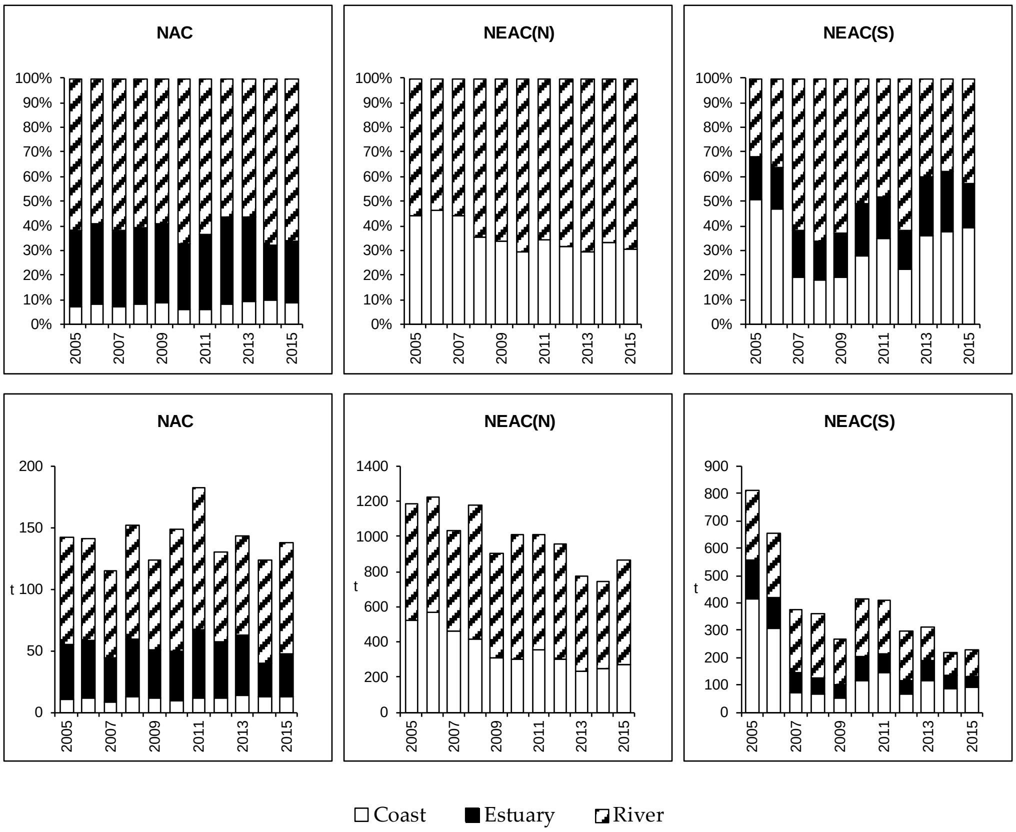


Figure 2.1.1.3 Nominal catch percentages (top) and tonnes (bottom) taken in coastal, estuarine and riverine fisheries (2005–2015) for the NAC area and for NEAC northern and southern areas. Note y-axe vary.

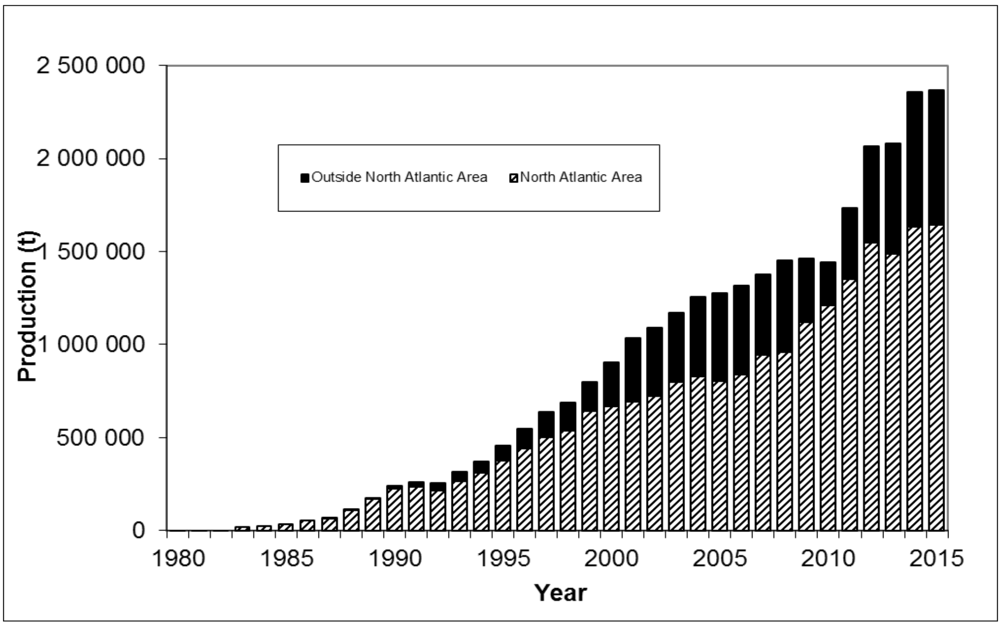


Figure 2.2.1.1. Worldwide farmed Atlantic salmon production, 1980–2015.

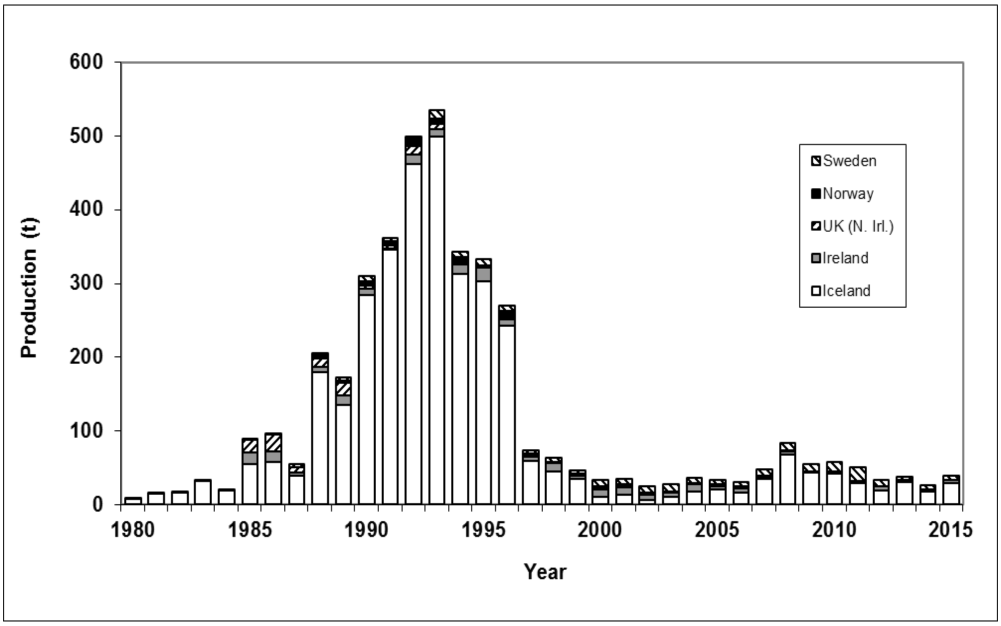


Figure 2.2.2.1. Production of ranched salmon (tonnes round fresh weight) in the North Atlantic, 1980–2015.

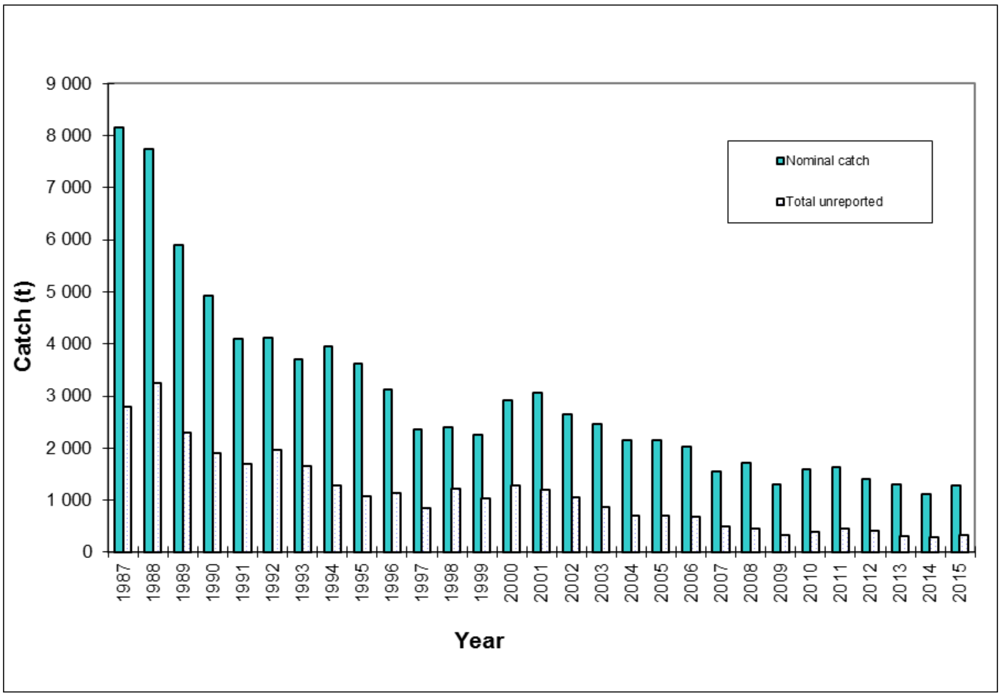


Figure 2.1.3.1. Nominal North Atlantic salmon catch and unreported catch in NASCO Areas, 1987–2015.

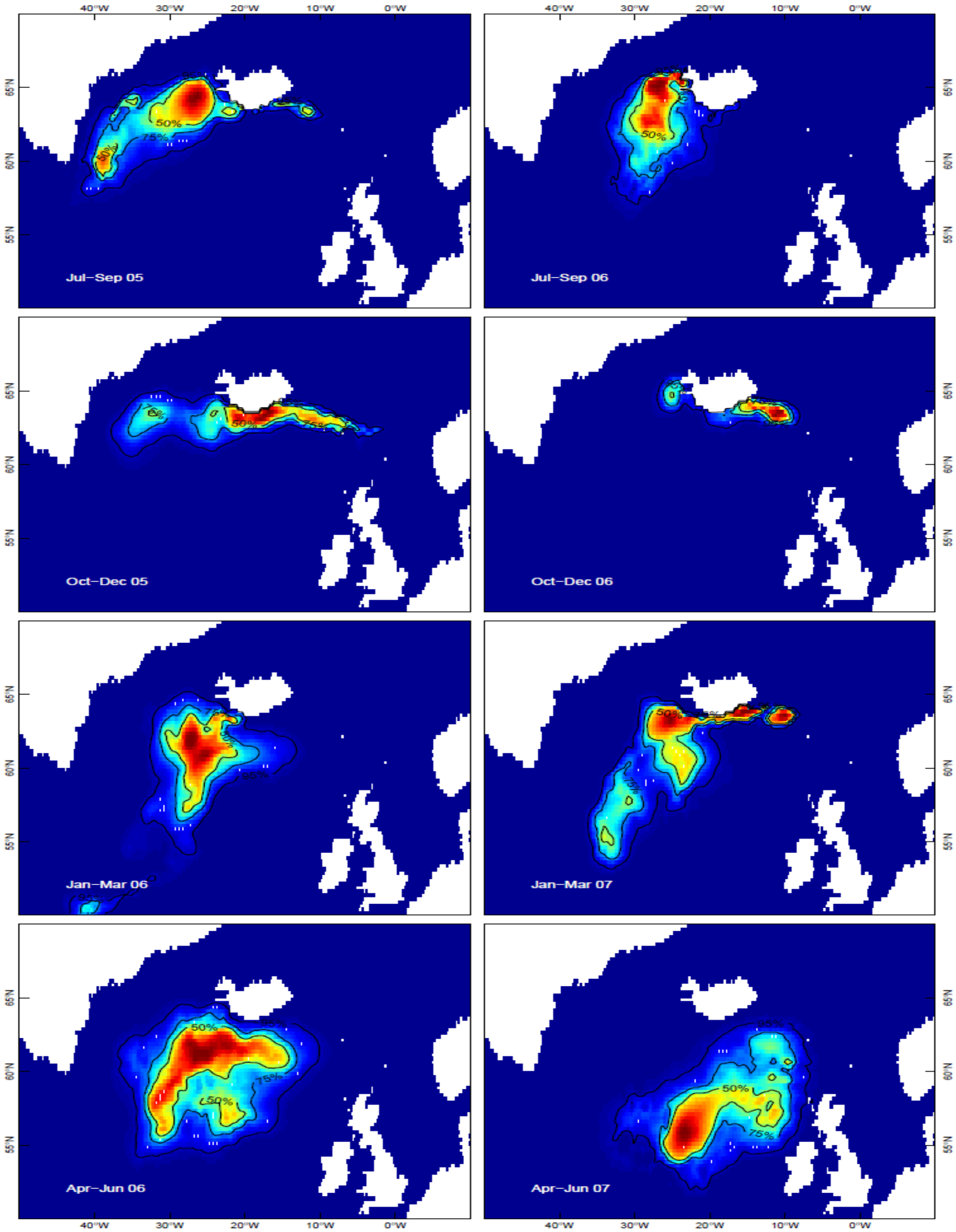


Figure 2.2.1.1. Probability density of the likely estimated location of Icelandic salmon tagged with DST tags, divided into year-quarters. Five fish (5) released in 2005 are on the left, and two fish released in 2006 are on the right. The mean posterior probability is calculated for each cell, and the top 50%, 75%, and 95% areas are shown along with a more precise distribution by the colour gradient (Gudjonsson *et al.*, 2015).

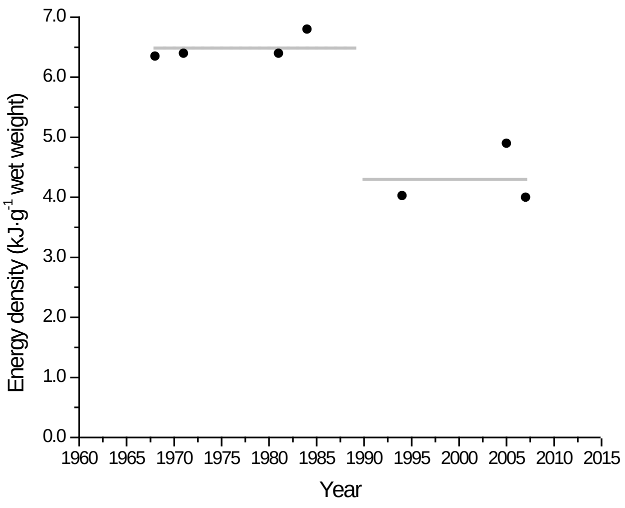


Figure 2.2.2.1. Energy density estimates (black dots; kJ·g^{-1} wet weight) of capelin and mean (grey bars) energy densities before (6.49 kJ/g) and after (4.30 kJ/g) the year 1990. See Renkawitz *et al.*, 2015 for data sources used in this figure.

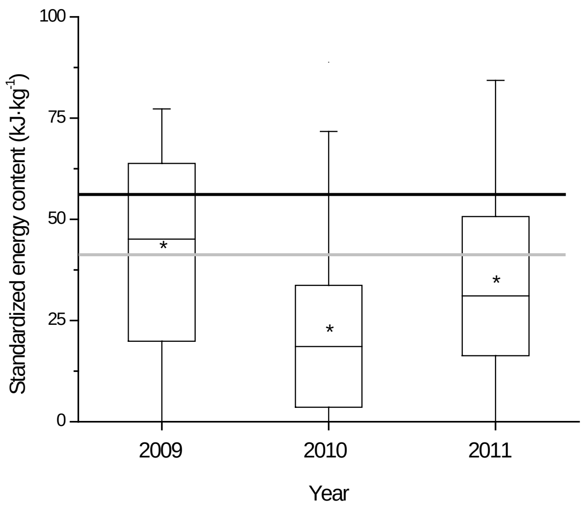


Figure 2.2.2.2. Standardized energy content (kJ/kg fish weight) of frozen stomach contents from Atlantic salmon sampled from West Greenland during 2009–2011. The box denotes the upper and lower quartile and the whiskers indicate the 5% and 95% confidence intervals. The horizontal line in the box is the median and the asterisk (*) indicates the mean. The grey horizontal line represents the mean standardized energy content of stomach contents from research surveys from 1965–1970 using contemporary energy equivalents, and the black horizontal line represents the energy equivalent adjusted for the higher energy content of capelin in historical samples.

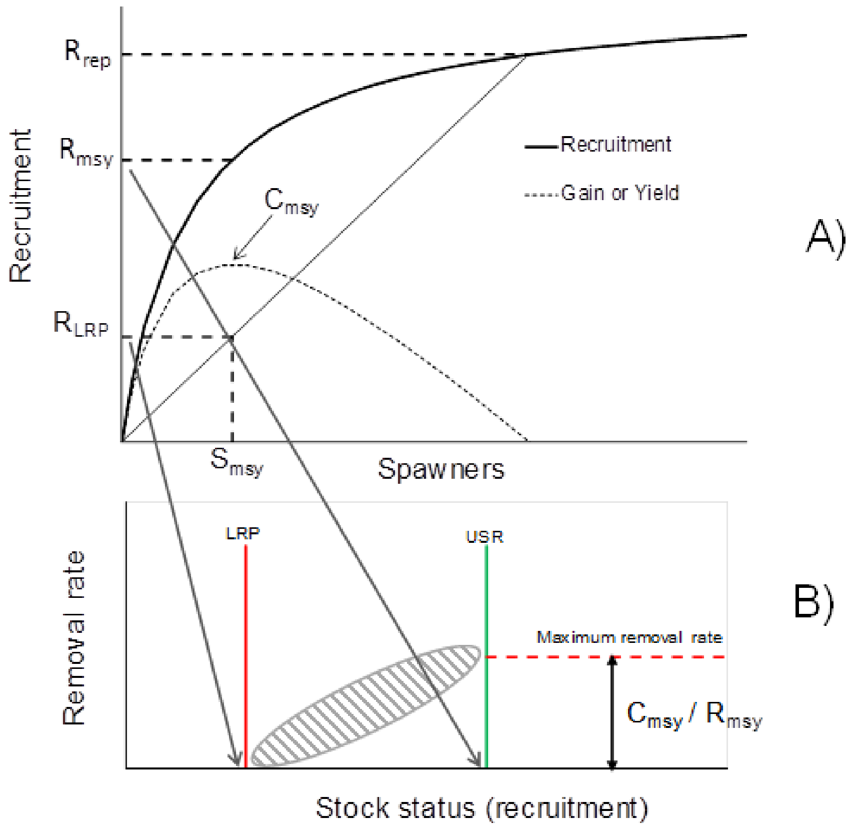


Figure 2.2.5.1. Transposing a spawning stock to recruitment relationship (upper panel A) to the removal rate and stock status axes (lower panel B) within the PA framework. The example is for an upper stock reference corresponding to R_{MSY}, a limit reference point equal to S_{MSY}, and a removal rate corresponding to F_{MSY}. The exploitation rate in the cautious zone (grey hatched oval) could be defined on the basis of a risk analysis of the chance that abundance after exploitation would be less than the LRP. R_{rep} is the abundance at replacement.

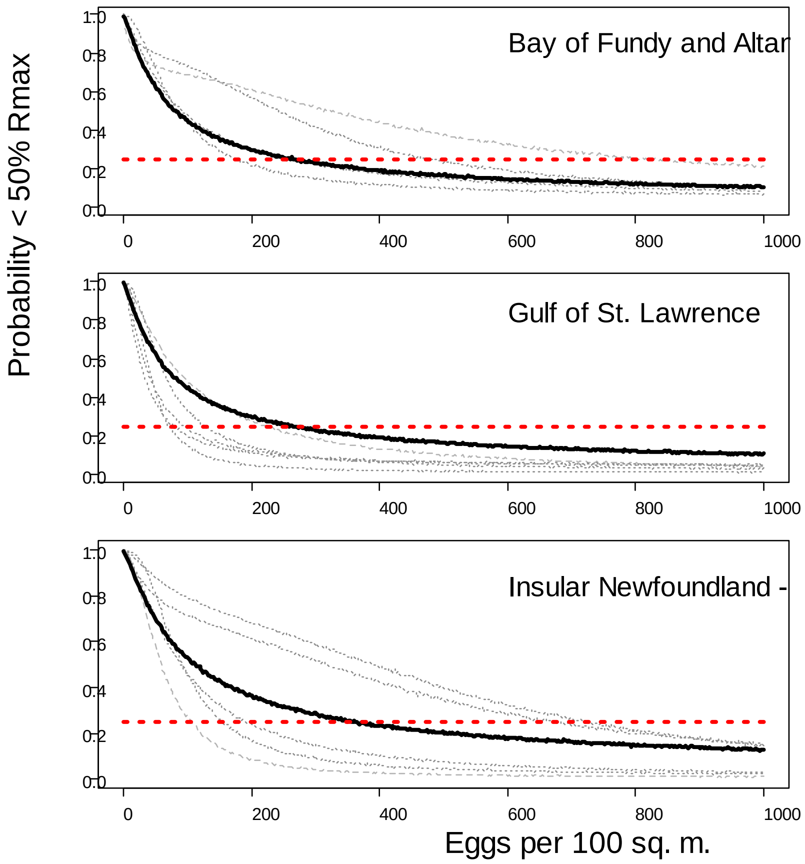


Figure 2.2.5.2. Example risk plots of recruitment being less than 50% R_{max} for different levels of egg depositions for the 14 rivers with egg to smolt data and the posterior predictions for rivers grouped by fluvial only and lacustrine habitat categories. The stock and recruitment model was Beverton–Holt with the presence/absence of lacustrine habitat modelled as a covariate of R_{max}. The light grey lines are the individual river profiles and the solid black lines are the predicted profile for rivers without lacustrine habitat (Bay of Fundy and Atlantic Coast of NS, upper panel; Gulf of St Lawrence, middle panel) and with lacustrine habitat (Insular Newfoundland, bottom panel). The dashed horizontal red line is the 25% probability risk level and the corresponding egg deposition would be S_{LRP}.

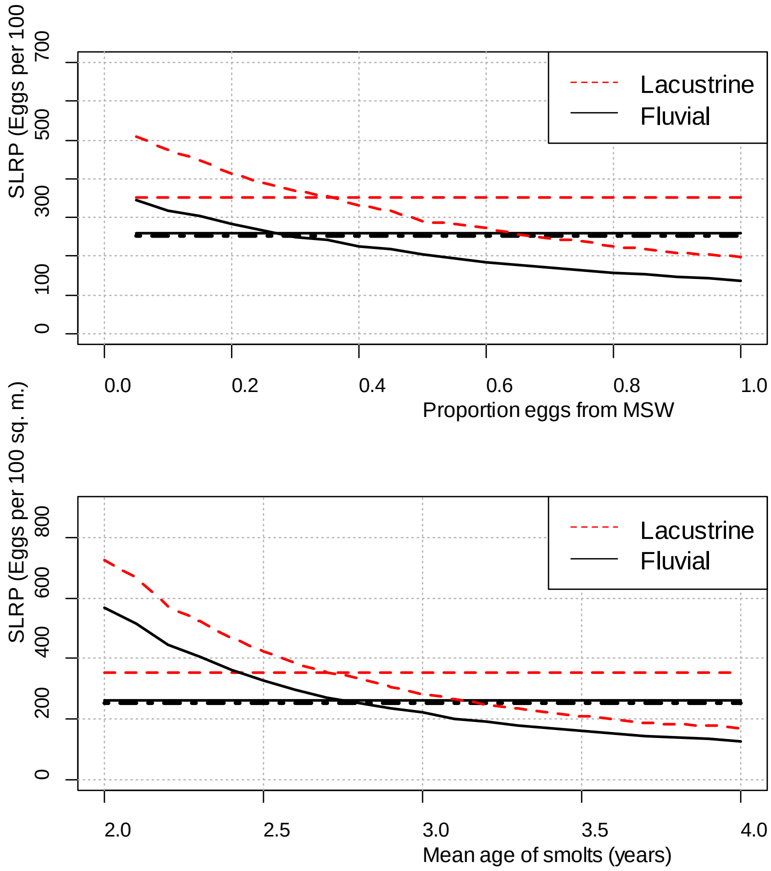


Figure 2.2.5.3. SLRP (expressed in eggs per 100 m^2 of fluvial habitat) values from the HBM analysis with different exchangeability assumptions based on egg to smolt stock and recruitment data from 14 rivers in eastern Canada. The black horizontal dash–dotted line is the SLRP value (252 eggs per 100 m^2) corresponding to a model with only fluvial habitat area as a covariate. The black horizontal line (SLRP = 260 eggs per 100 ^{2}) and the red horizontal dashed line (SLRP = 352 eggs per 100 m^2) correspond to the SLRP values for the model with the presence of lacustrine habitat as a covariate on the carrying capacity of fluvial habitat only rivers (black) and rivers with lacustrine habitat (red). The curved lines represent the SLRP values for the model with presence of lacustrine habitat and with proportion of eggs from MSW salmon (upper panel) or mean age of smolts (lower panel) as covariates for rivers with only fluvial habitat (black solid line) and rivers with lacustrine habitat (red dashed line).

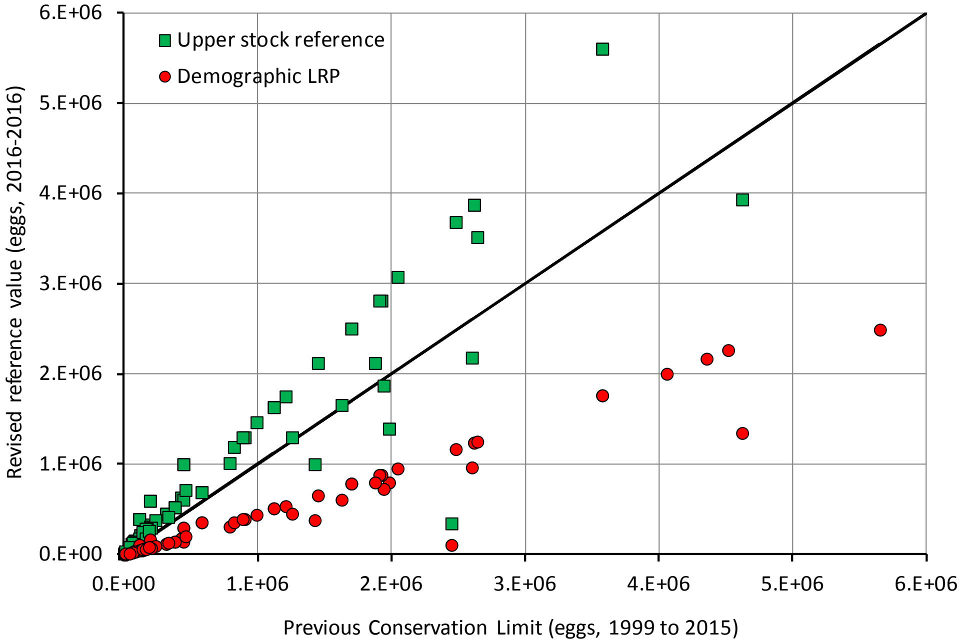


Figure 2.2.5.4. Correspondence between the previous river-specific conservation limits defined by Caron *et al.* (1999) and the new river-specific demographic limit reference points and the upper stock reference points for rivers of Québec. Data were extracted from the table in Annex 1 of Ministère des Forêts, de la Faune et des Parcs (2016).

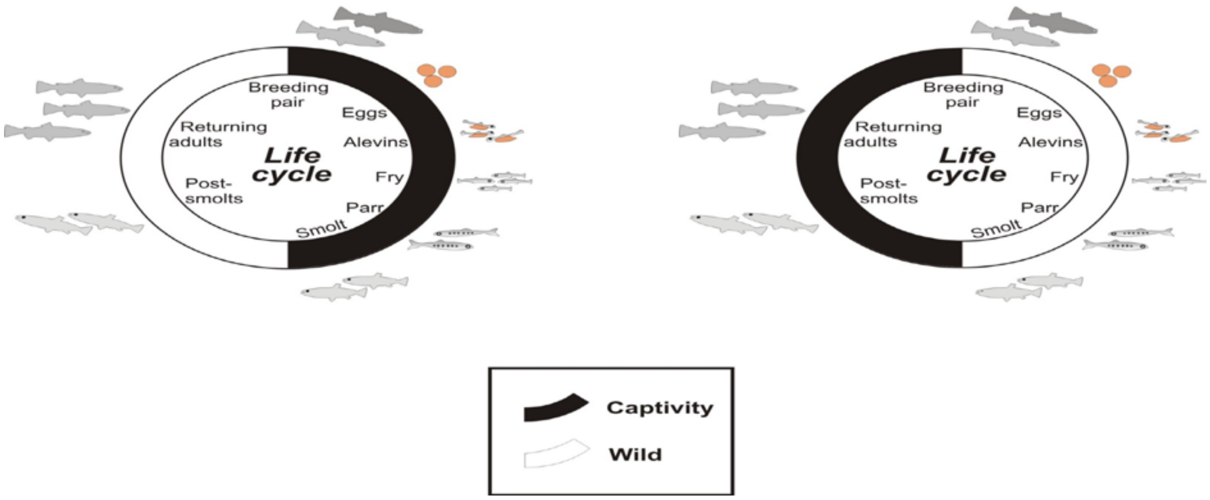


Figure 2.2.6.1. Contrasts between juvenile supplementation programs (left panel) and juvenile/smolt-to-adult supplementation (SAS) programs (right panel) in terms of life stages and processes which are impacted by captive rearing and those which occur in the wild (figure courtesy of P. O'Reilly, DFO).

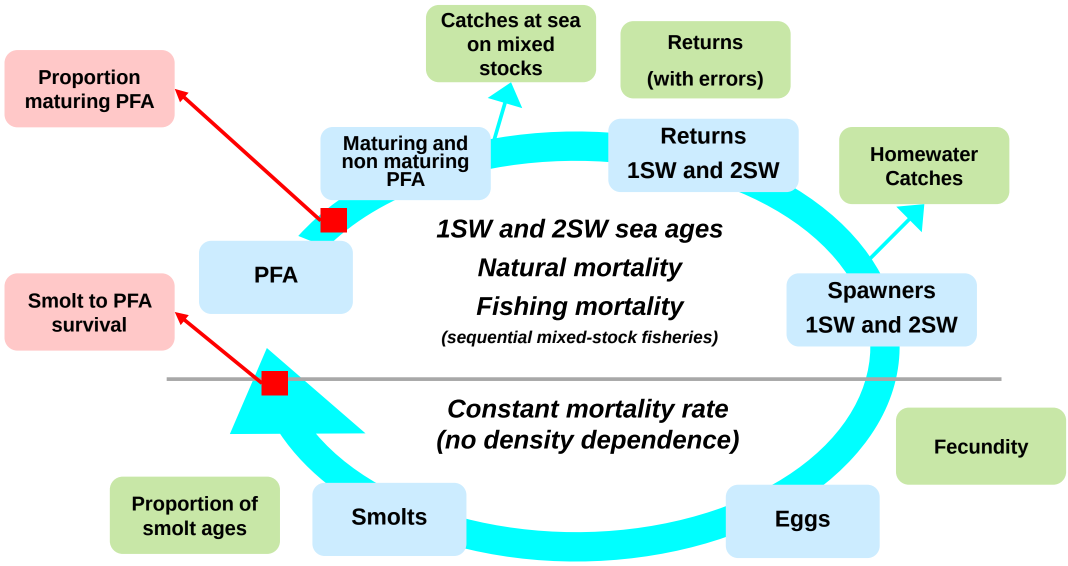


Figure 2.2.7.1. The Bayesian life cycle model developed for each stock unit of North America (six stock units: Labrador, Newfoundland, Québec, Scotia-Fundy, Gulf region and USA) and Southern Europe (Southern NEAC, eight stock units: France, UK England and Wales, Ireland, UK Northern Ireland FB + FO, Scotland East and West and Southwest Iceland). Variables in light blue are the main stages considered in the age- and stage-structured model. Variables in light green indicate the main sources of data assimilated in the model. Observation errors are introduced in returns (variance of observation errors directly derived from the run reconstruction) and catches at sea. The smolt to PFA survival and the proportion of maturing PFA are estimated as time-series (North America: 1970–2014; Southern Europe: 1971–2014), with specific time-trends for each stock unit.

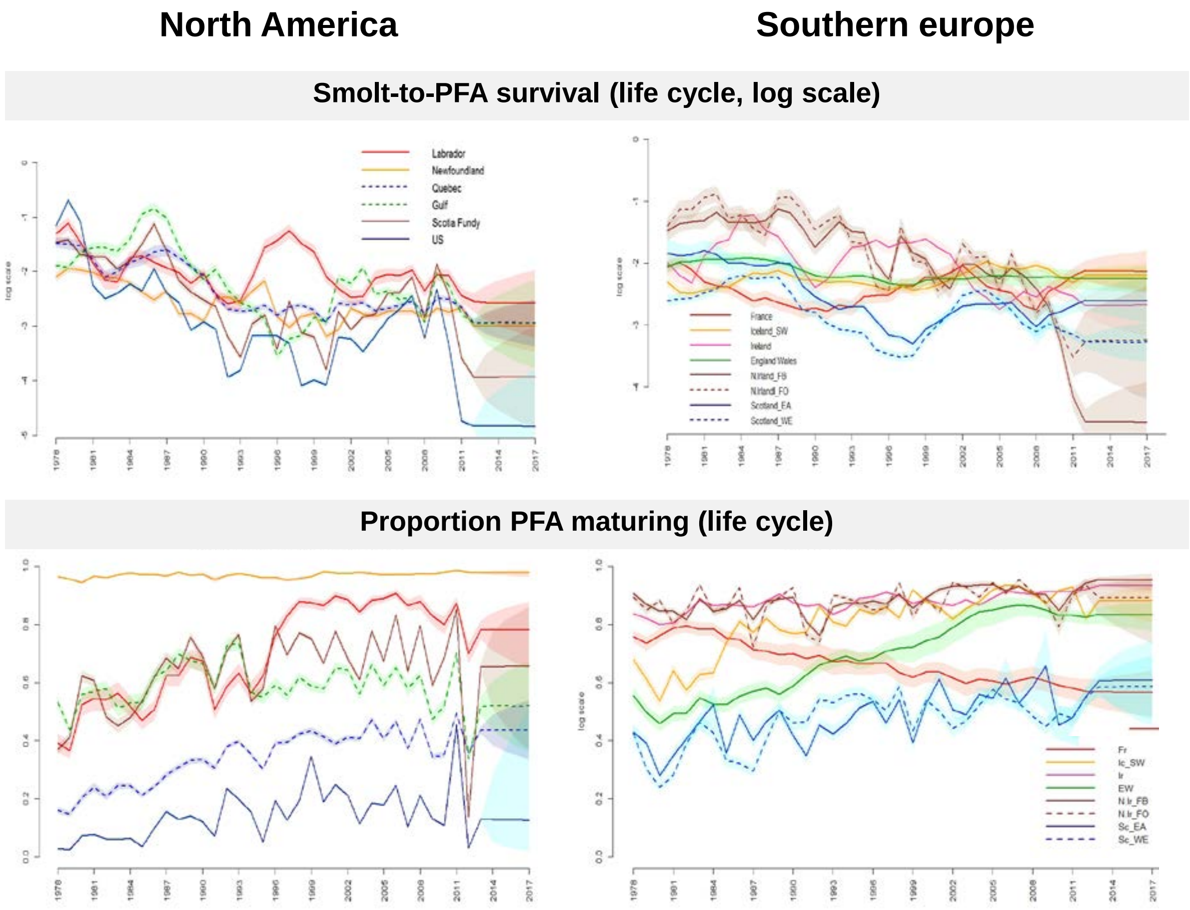


Figure 2.2.7.2. Estimates from the Bayesian life cycle models. Time-series of estimates of smolt to PFA survival (log scale; upper line) and proportion of maturing PFA (lower line) for stock units in North America (left column) and Southern Europe (right column). Lines: medians of Bayesian posterior distributions. Shaded areas: 50% BCI. Forecasting is presented for three years.

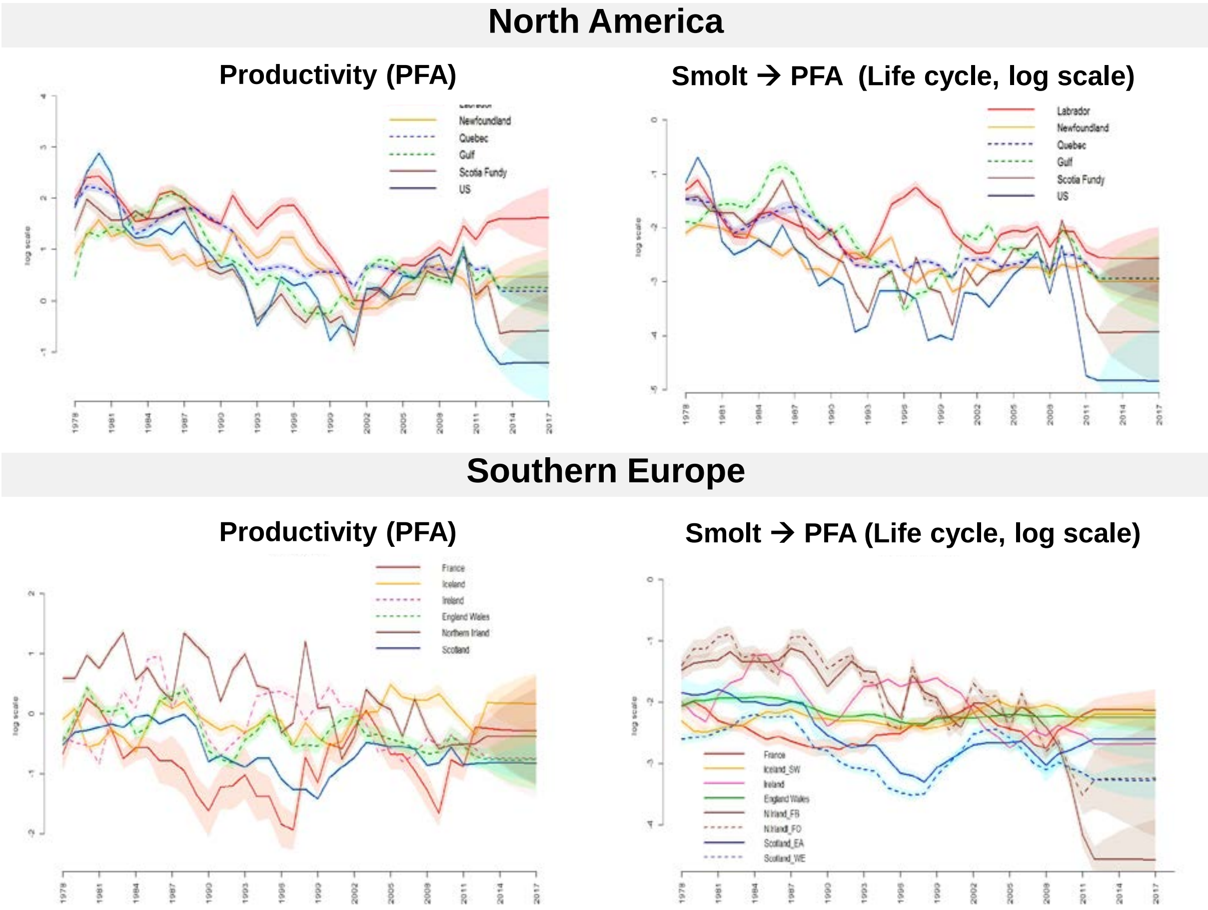


Figure 2.2.7.3. Comparison between the productivity parameter estimated from the PFA and the smolt to PFA survival estimated from the Bayesian life cycle model. Productivity parameter estimated from the PFA (left column) and smolt to PFA survival (log scale; right column) for North America (upper line) and Southern Europe (lower line). Lines: medians of Bayesian posterior distributions. Shaded areas: 50% BCI. Forecasting is presented for three years.

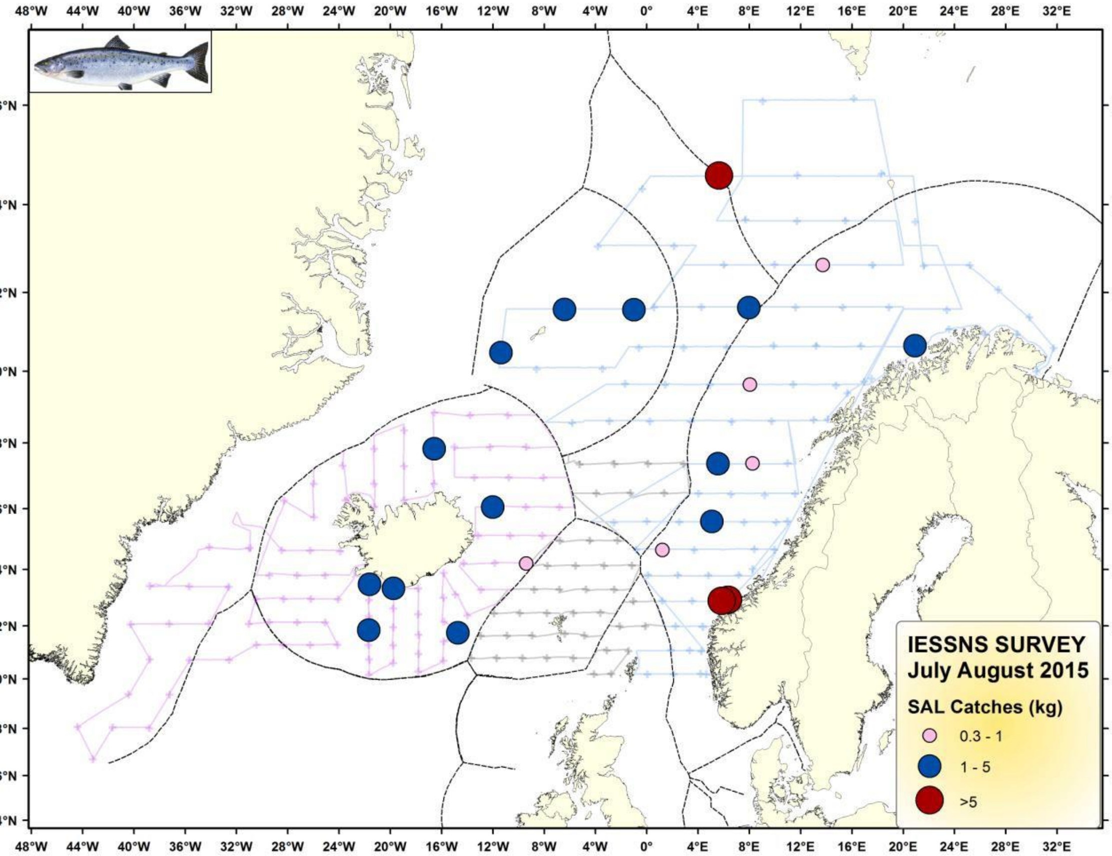


Figure 2.2.7.4. Distribution of salmon catches at surface trawl stations during the IESSNS survey in July and August 2015. (From Nøttestad *et al.,* 2015).

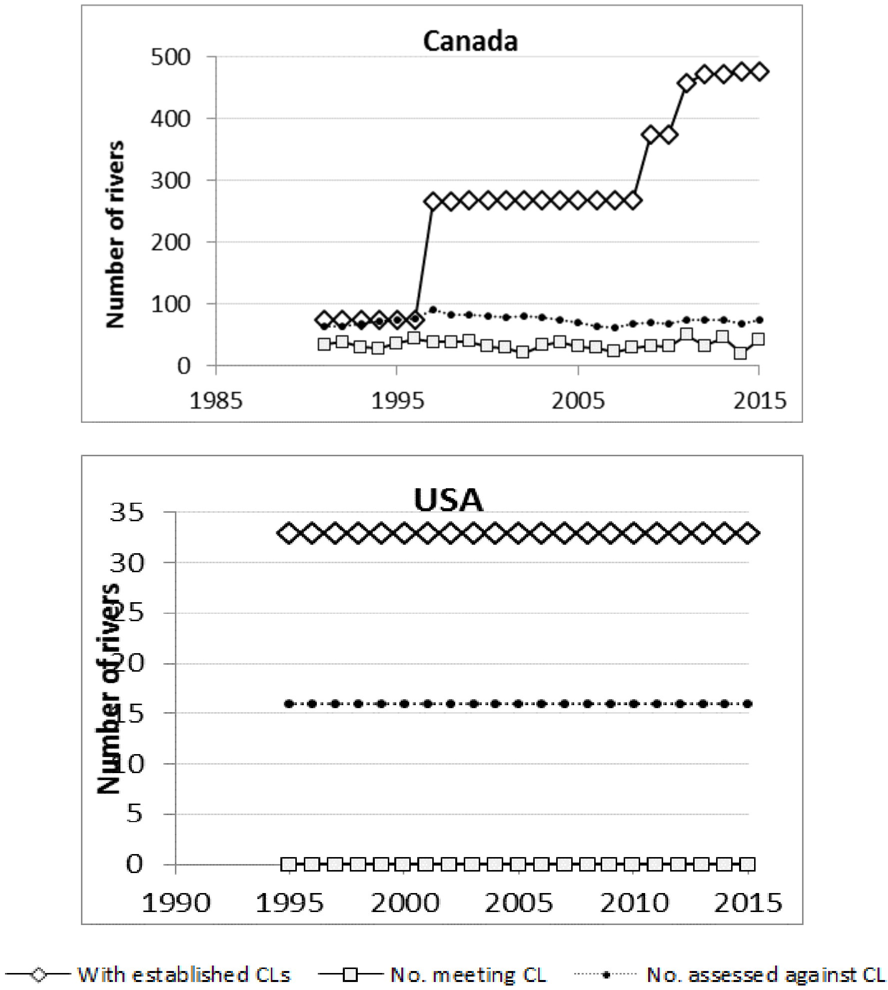


Figure 2.5.1. Time-series of NAC area with established CLs and trends in the number of stocks meeting CLs (year on x-axis).

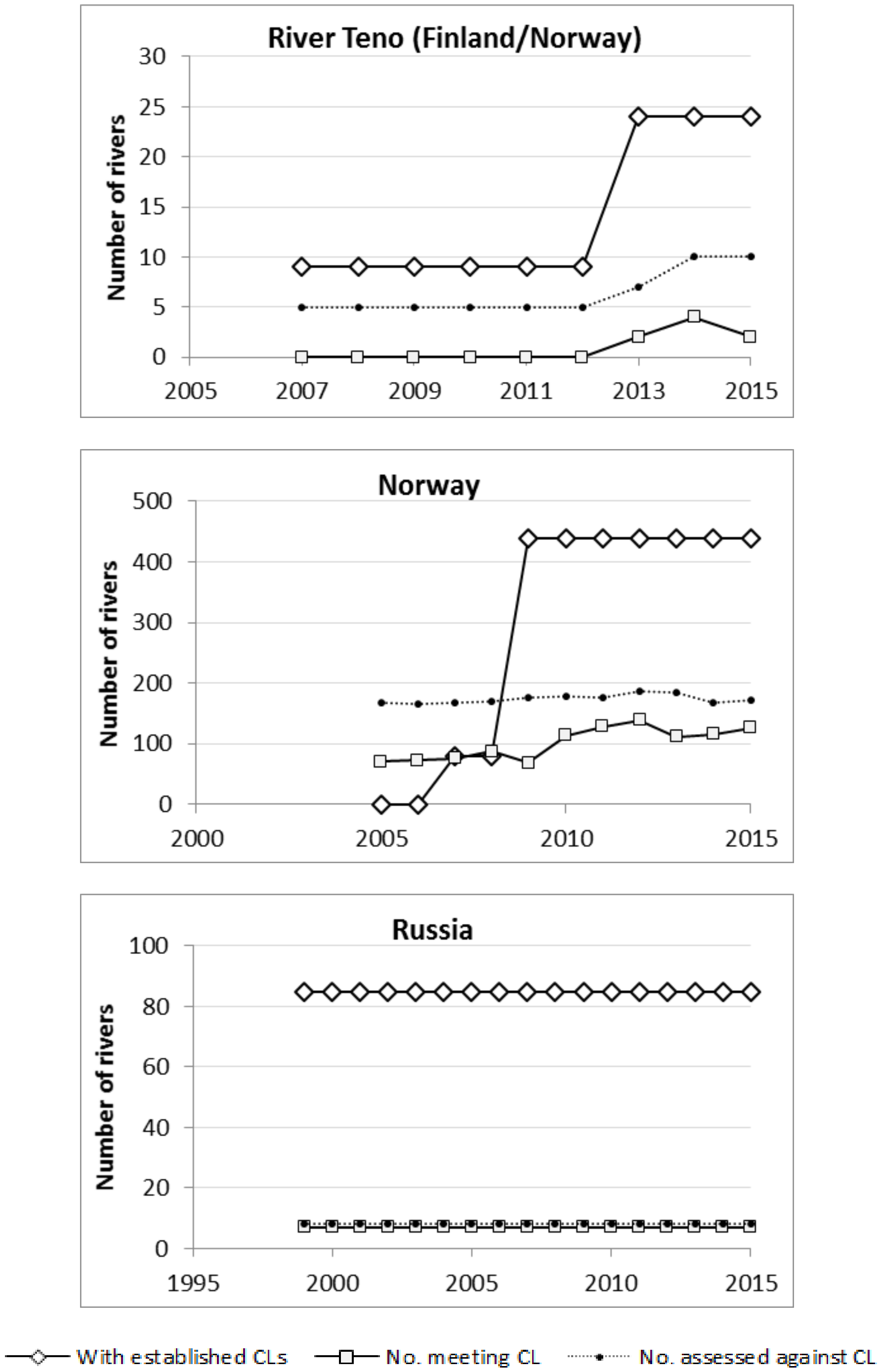


Figure 2.5.2. Time-series of northern NEAC area with established CLs and trends in the number of stocks meeting CLs (year on x-axis) (For Norway: CL attainment retrospectively assessed 2005–2008).

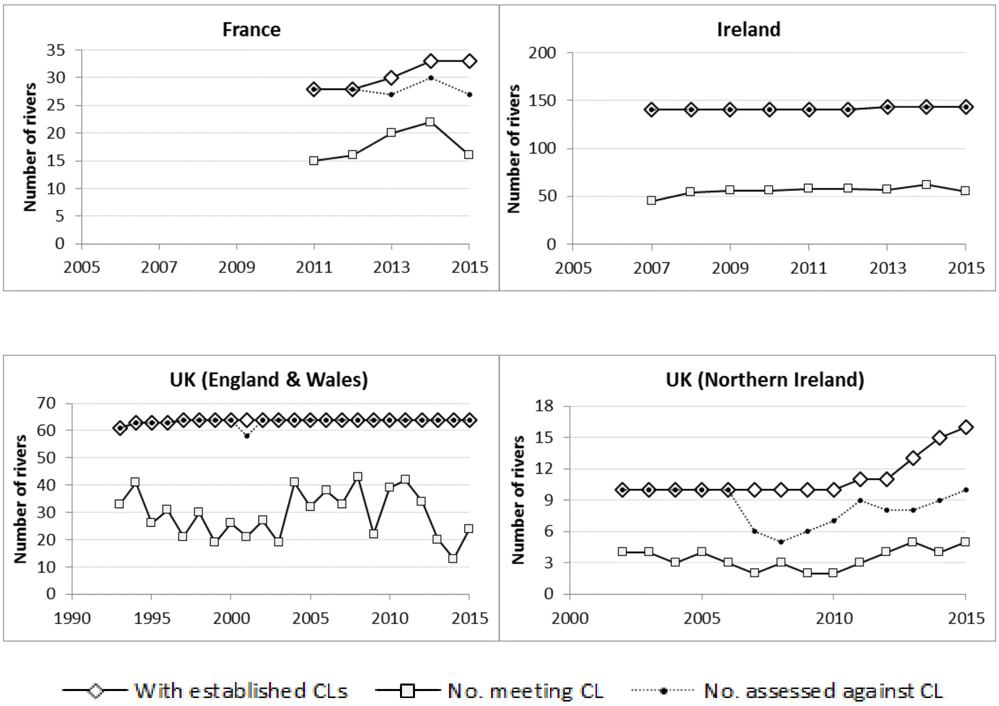


Figure 2.5.3. Time-series of southern NEAC area with established CLs and trends in the number of stocks meeting CLs (year on x-axis).

3 Northeast Atlantic Commission area

3.1 NASCO has requested ICES to describe the key events of the 2015 fisheries

- There were no significant changes in fishing methods used in 2015.
- There has been a marked decline in fishing effort by nets and traps in all NEAC countries over the available time-series. This reflects the closure of many fisheries and increasingly restrictive measures to reduce levels of exploitation.
- The practice of catch-and-release in rod fisheries continues to increase.
- The provisional nominal catch in 2015 (1091 t) increased from 2014, but remained among the lowest in the time-series.
- Exploitation rates on NEAC stocks are among the lowest recorded.

3.1.1 Fishing at Faroes

No fishery for salmon has been prosecuted since 2000.

3.1.2 Key events in NEAC homewater fisheries in 2015

Sweden

In order to phase out mixed-stock fishing in coastal waters in Sweden, a ban was imposed in 2014 on fishing Atlantic salmon with gillnets at water depths >3 m. Restriction on gillnet use in shallower water was already in place (a maximum of six nets per person, with an allowed mesh size of 120 mm). The reported catches of salmon in the coastal fishery have averaged 60% of the total salmon catch in Sweden 1995–2014. In 2015, this catch was 0 for the first time on record.

UK (Scotland)

Following consultation in 2014, spring conservation regulations for UK (Scotland), which sought to underpin a range of existing voluntary and statutory measures, came into effect in January 2015. Under these regulations, the start of the net fishing season is delayed at least until 1 April while fishing by rod and line is restricted to catch and release until 31 March (http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/fishreform/licence/spring). The measures are to be reviewed annually.

A Wild Fisheries Review was undertaken during 2014, the aims of which were to determine those reforms required to develop a modern, evidence-based management system for wild fisheries in Scotland. The final report included 54 recommendations covering both conservation measures to control the killing of wild salmon and wider fisheries reform. (http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/fishreview/WFRFinal.)

Wide ranging consultation on proposed conservation measures was conducted during 2015 which resulted in regulations to control the killing of wild salmon (http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/fishreform/licence/status). These regulations are designed to run on from the existing spring conservation regulations and came into force in 2016. The measures included:

- killing beyond estuary limits will be prohibited for three years;

- killing in inland waters will be managed on an annual basis according to the conservation status of the stock in a given area (Section 3.2.2);
- local salmon management bodies will be required to develop a Conservation Plan irrespective of the conservation status of stocks in their area;
- carcass tagging for net caught fish in estuaries and rivers will be mandatory.

During 2015, consultations also took place regarding the wider reform agenda (http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/fishreform), which has resulted in draft provisions for a Wild Fisheries (Scotland) Bill and draft Wild Fisheries Strategy (https://consult.scotland.gov.uk/wild-fisheries-reform-team/draft-wild-fisheries-strategy).

UK (England and Wales)

In UK (England and Wales) returning stock estimates and counts from nine rivers showed a highly variable picture and suggest north–south differences in salmon returns in 2015 that differ from previous years. Five out of six rivers in the south reported returns above the recent 5-year average and, for two rivers, these were the highest recorded for over 25 years. In contrast, two out of three counted rivers in the north of the country had returns that were at or close to the minimum recorded in the 24 to 27-year time-series. In recent years, runs in northerly rivers have typically been relatively high and those in the south low.

River flow is a key factor affecting angler effort. In 2015, flows were typically below the long-term average for much of the fishing season and were particularly low in October. The early autumn represents an important period for most rod fisheries and the very low flows at this time are likely to have affected runs of fish and provided conditions that were unfavourable for angling, particularly for 1SW salmon since these only start to return to rivers in summer. Runs of 1SW salmon were reported as being poor in many areas, and the number of days fished by anglers in 2015 was 21% below the average of the previous five years. These factors are likely to have contributed to a relatively low in-river catch in 2015.

3.1.3 Gear and effort

No significant changes in gear type used were reported in 2015, however, changes in effort were recorded. The number of gear units licensed or authorised in several of the NEAC area countries provides a partial measure of effort (Table 3.1.3.1), but does not take into account other restrictions, for example, closed seasons. In addition, there is no indication from these data of the actual number of licences actively utilized or the time each licensee fished.

The numbers of gear units used to take salmon with nets and traps have declined markedly over the available time-series in all NEAC countries. This reflects the closure of many fisheries and increasingly restrictive measures to reduce levels of exploitation in many countries. There are fewer measures of effort in respect of in-river rod fisheries, and these indicate differing patterns over available time-series. Rod effort, measured as the numbers of days fished, has increased in Finland and Russia (Kola Peninsula) in the Northern NEAC area, while there are no clear trends in rod effort (licence sales) in three Southern NEAC countries. However, anglers in all countries are making increasing use of catch-and-release (see below).

Trends in effort are shown in Figures 3.1.3.1 and 3.1.3.2 for the Northern and Southern NEAC countries respectively. In the Northern NEAC area, driftnet effort in Norway accounted for the majority of the effort expended in the early part of the time-series. However, this fishery closed in 1989, reducing the overall effort substantially. The number of bag nets and bendnets in Norway has decreased for the past 15–20 years and in 2015, was the lowest in the time-series for bendnets and the second lowest for bag nets. The number of gear units in the coastal fishery in the Archangelsk region in Russia has been relatively stable and was close to the long-term average. The number of units in the in-river fishery decreased markedly between 1996 and 2002, since when it has remained relatively stable.

The number of gear units licensed in UK (England & Wales) and Ireland (Table 3.1.3.1) was among the lowest reported in the time-series. In UK (Scotland) the number of fixed gears was the lowest and net and coble was the second lowest in the time-series. For UK (Northern Ireland) driftnet, draftnet, bag nets and boxes decreased throughout the time-series and there has been no fishing with these gears for the past four years.

Rod effort trends, where available, have varied for different areas across the time-series (Table 3.1.3.1). In the Northern NEAC area, the number of anglers and fishing days in Finland has shown an increase throughout the time period. In the Southern NEAC area, rod licence numbers increased from 2001 to 2011 in UK (England & Wales), but have decreased subsequently. In Ireland, there was an apparent increase in the early 1990s owing to the introduction of one-day licences. Licence numbers then remained stable for over a decade, before decreasing from 2002 due to fishery closures. In France, the effort has been fairly stable throughout the time period.

The overall trends have tended to be for a reduction in effort and these are reflected in the reductions in the national exploitation rate outputs from the NEAC PFA Run Reconstruction model (Figure 3.1.9.2).

3.1.4 Catches

NEAC area catches are presented in Table 3.1.4.1. The provisional nominal catch in the NEAC area in 2015 (1091 t) was 138 t above the updated catch for 2014 (954 t), but 11% and 22% below the previous 5-year and 10-year averages respectively. It should be noted that changes in nominal catch may reflect changes in exploitation rates and the extent of catch and release in rivers, in addition to stock size, and thus cannot be regarded as a direct indicator of abundance.

The provisional total nominal catch in Northern NEAC in 2015 (865 t) was 128 t above the updated catch for 2014 (738 t), but 3% and 13% below the previous five-year and ten-year averages respectively. Catches in 2015 were close to or below long-term averages in most Northern NEAC countries. Although the catch in Norway in 2015 (583 t) increased compared to 2014 (490 t) and 2013 (475 t).

In the Southern NEAC area the provisional total nominal catch for 2015 (226 t) was 10 t above the updated catch for 2014 (216 t), but was 31% and 45% below the previous 5-year and 10-year averages respectively. Catches in 2015 were below long-term averages in most Southern NEAC countries except France where the catch in 2015 (16 t) was above both the 5- and 10-year averages (11 t and 10 t respectively). The greatest reductions in catches in Southern NEAC in 2015 were observed in Ireland, UK (England & Wales), UK (Scotland) and UK (Northern Ireland), with 21–49% and 13–76% reductions compared to the previous 5- and 10-year means respectively.

Figure 3.1.4.1 shows the trends in nominal catches of salmon in the Southern and Northern NEAC areas from 1971 until 2015. The catch in the Southern area has declined over the period from about 4500 t in 1972 to 1975 to below 1000 t since 2003, and has been between 216 t and 411 t over the last nine years. The catch fell sharply in 1976, and between 1989 and 1991, and continues to show a steady decline over the last ten years. The catch in the Northern area declined over the time-series, although this decrease was less distinct than the reductions noted in the Southern area. The catch in the Northern area varied between 2000 t and 2800 t from 1971 to 1988, fell to a low of 962 t in 1997, and then increased to over 1600 t in 2001. Catch in the northern area has exhibited a downward trend since and has been consistently below 1000 t since 2012. Thus, the catch in the Southern area, which comprised around two-thirds of the total NEAC catch in the early 1970s, has been lower than that in the northern area since 1999.

3.1.5 Catch per unit of effort (cpue)

Cpue is a measure that can be influenced by various factors, such as fishing conditions and perceived likelihood of success. Both cpue of net fisheries and rod cpue may be affected by measures taken to reduce fishing effort, for example, changes in regulations affecting gear. If more than one factor changes, a pattern in cpue may not be immediately evident, particularly over larger areas. It is, however, expected that for a relatively stable effort, cpue can reflect changes in the status of stocks and stock size.

The cpue data are presented in Tables 3.1.5.1–3.1.5.6. The cpue for rod fisheries have been derived by relating the catch to rod days or angler season. Cpue for net fisheries were calculated as catch per licence-day, trap month or crew month.

In the southern NEAC area, cpue has generally decreased in the net fisheries in UK (England & Wales) although a slight increase was evident in 2015 (Figure 3.1.5.1). The cpue for the net and coble fishery in UK (Scotland) shows a general decline over the time-series, while the fixed engine fishery shows a slight increase for the last three years (Table 3.1.5.5). The cpue values for rod fisheries in UK (England & Wales) showed a general increasing trend to 2010; there was then a decrease until 2014, but a slight increase in 2015 (Table 3.1.5.4). In UK (Northern Ireland), the River Bush rod fishery cpue showed a decrease from 2013 with the cpue in 2015 being the lowest in the time-series (Table 3.1.5.1). The rod fishery cpue in France showed an increase from 2014 and was close to the long-term mean.

In the northern NEAC area, the cpue for the commercial coastal net fisheries in the Archangelsk area, Russia, showed a general decreasing trend, while the cpue for the in-river fishery has increased (Figure 3.1.5.1 and Table 3.1.5.2). In Finland, cpue for the River Teno has been relatively stable for the past five years, while the River Naatamo cpue has increased from 2013 and is above the 5-year mean. An increasing trend was observed for the Norwegian net fisheries cpue. The cpue values for salmon <3 kg were lower than the previous year, but cpue values for the other year classes were close to the 5-year means (Figure 3.1.5.1 and Table 3.1.5.6).

The greater number of indices showing declining cpue values in southern NEAC stocks compared to northern stocks is consistent with the indications from both the run-reconstruction (Figure 3.3.4.2) and forecast modelling (Figures 3.5.2.1–3.5.2.2), that sharper declines have been noted in southern NEAC stocks compared with northern NEAC stocks.

3.1.6 Age composition of catches

The percentage of 1SW salmon in NEAC catches is presented in Table 3.1.6.1 and shown separately for northern and southern NEAC countries in Figures 3.1.6.1 and 3.1.6.2, respectively. Except for Iceland, the proportion of 1SW has declined over the period 1987–2015.

The overall percentage of 1SW fish in the northern NEAC area catch remained reasonably consistent at 66% in the period 1987 to 2000 (range 61% to 72%), but has fallen in subsequent years to 59% (range 50% to 69%), when greater variability among countries and years has also been evident. Comparing the two periods the decreased proportion of 1SW was significant in four northern countries (Finland, Norway, Russia, Sweden), while a significant increase was noted for Iceland.

On average, 1SW fish comprise a higher percentage of the catch in Iceland and Russia than in the other northern NEAC countries (Figure 3.1.6.1).

In the southern NEAC area, the percentage of 1SW fish in the catch averaged 60% (range 49% to 65%) in 1987–2000, and 56% (range 45% to 64%) in 2001–2015. The percentage of 1SW salmon in the Southern NEAC area remained reasonably consistent over the time-series, although for Spain (data from the Asturias region) there was a significant decline in 1SW salmon comparing the two periods (Figure 3.1.6.2).

Pooling data from all countries showed an overall decline in the proportion of 1SW fish in the catch over the period 2001–2015 (Pearson correlation, $r=-0.575$, $p=0.025$).

3.1.7 Farmed and ranched salmon in catches

The contribution of farmed and ranched salmon to national catches in the NEAC area in 2015 was again generally low in most countries, with the exception of Norway, Iceland and Sweden, and is similar to the values that have been reported in previous years. Such fish are usually included in assessments of the status of national stocks (Section 3.3).

The estimated proportion of farmed salmon in Norwegian angling catches in 2015 was at the lower end of the range (3%) in the time-series, whereas the proportion in samples taken from Norwegian rivers in autumn was the lowest in the time-series (9%). No current data are available for the proportion of farmed salmon in coastal fisheries.

The number of farmed salmon that escaped from Norwegian farms in 2015 is reported to be 160 000 fish (provisional figure), down from the previous year (287 000). An assessment of the likely effect of these fish on the estimates of PFA has been reported previously (ICES, 2001).

The release of smolts for commercial ranching purposes ceased in Iceland in 1998, but ranching for rod fisheries in two Icelandic rivers continued in 2015. Icelandic catches have traditionally been split into two separate categories, wild and ranched. In 2015, 29.1 t were reported as ranched salmon in contrast to 102.6 t harvested as wild. Similarly, Swedish catches have been split into two separate categories, wild and ranched (Table 2.1.1.1). In 2015, 9.1 t were reported as ranched salmon in contrast to 8.6 t harvested as wild. Ranching occurs on a much smaller scale in Ireland and Norway. Some of these operations are experimental while for others harvesting does not occur solely at the release site.

3.1.8 National origin of catches

3.1.8.1 Catches of Russian salmon in northern Norway

Previously the Working Group has reported on investigations of the coastal fisheries in northern Norway where genetic methods have been applied to analyse the stock composition of this mixed-stock fishery (ICES, 2015) based on results from the Kolarctic Salmon project (Kolarctic ENPI CBC programme 2007-2013) (Svenning *et al.*, 2014).

Overall, the incidence of Russian salmon in the catches varied strongly within season and among fishing regions, averaging 17% for 2011–2012 in the coastal catches in Finnmark County, while nearly 50% of all salmon captured in the Varangerfjord, close to the border, were of Russian origin. The catch of Russian salmon decreased over time within the season, e.g. in Varangerfjord the incidence of Russian salmon decreased from about 70% in May to about 20% in August. Thus, catches of Russian salmon were much higher before the start of the formal fishing season in Eastern Finnmark (early June), but a fairly high amount of the recorded catch in this area still consisted of salmon stocks originating in Russian rivers.

It is expected that the results from these investigations will be taken into consideration in providing improved and more targeted regulations for the mixed-stock fishery in northern Norway.

3.1.8.2 Catches of salmon originating in UK (Scotland) in UK (England and Wales) coastal net fisheries

Genetic analysis using Single Nucleotide Polymorphic (SNP) genetic markers has been undertaken in UK (Scotland) and UK (England and Wales) to facilitate further resolution of the origin of fish caught in the coastal fishery in northeast England. Samples of salmon from northeast English rivers are being screened and together with information from Scottish rivers, the resolving power between different rivers and assignment success rates to each river will be determined for net caught fish. Results will be used to update stock assessments at both national and finer scales. A final report is expected in 2016.

3.1.9 Exploitation indices for NEAC stocks

Exploitation rates have been plotted for 1SW and MSW salmon from the Northern NEAC (1983 to 2015) and Southern NEAC (1971 to 2015) areas and are displayed in Figure 3.1.9.1. National exploitation rates are an output of the NEAC PFA Run Reconstruction Model. Data gathered prior to the 1980s represent estimates of national exploitation rates whereas post 1980s exploitation rates have often been subject to more robust analysis informed by projects such as the national coded wire tagging programme in Ireland.

The exploitation of 1SW salmon in both Northern NEAC and Southern NEAC areas has shown a general decline over the time-series (Figure 3.1.9.1), with a notable sharp decline in 2007 as a result of the closure of the Irish driftnet fisheries in the southern NEAC area. The total exploitation rate on 1SW salmon in the northern NEAC area was 41% in 2015 being at the same level as the previous 5-year average (41%) and similar to the 10-year average (42%). Exploitation on 1SW fish in the southern NEAC complex was 11% in 2015 indicating a slight decrease from the previous 5-year (12%) and the 10-year (16%) averages.

The exploitation rate of MSW fish also exhibited an overall decline over the time-series in both Northern NEAC and Southern NEAC areas (Figure 3.1.9.1), with a notable sharp decline from 2007 to 2012 in northern NEAC. Exploitation on MSW salmon in the northern NEAC area was 44% in 2015, being at the same level as the previous 5-year average (44%) but showing a decline from the 10-year average (49%). Exploitation on MSW fish in southern NEAC was 12% in 2015, being roughly at the same level as both the previous 5-year (12%) and 10-year (13%) averages.

The rate of change of exploitation of 1SW and MSW salmon in northern NEAC and southern NEAC countries over the available time periods is shown in Figure 3.1.9.2. This was derived from the slope of the linear regression between time and natural logarithm transformed exploitation rate. The relative rate of change of exploitation over the entire time-series indicates an overall reduction of exploitation in most northern NEAC countries for 1SW and MSW salmon (Figure 3.1.9.2). Exploitation in Finland has been relatively stable over the time period whereas the largest rate of reduction has been for 1SW salmon in Russia. The southern NEAC countries have also shown a general decrease in exploitation rate (Figure 3.1.9.2) on both 1SW and MSW components. The greatest rate of decrease shown for 1SW fish was in UK (Scotland), and for MSW fish in UK (England & Wales), while France (MSW) and Iceland (both 1SW and MSW) showed relative stability in exploitation rates during the time-series, while exploitation for 1SW salmon in France shows an increase.

3.1.10 Life-history stage and origin of salmon caught as bycatch in Icelandic mackerel and herring fisheries

Historically, there is scarce information on the occurrence and origin of salmon caught in Icelandic waters, since fishing of salmon at sea has been banned since 1932. When pelagic mackerel and herring fisheries commenced in Icelandic waters in 2010 using midwater trawls, the Icelandic Directorate of fisheries started screening and sampling the salmon taken as bycatch in these fisheries. Since the mackerel fishery mostly takes place during summer around the south and east coast of Iceland, most of the salmon have been caught in this area. The sampling provides an opportunity to investigate the life-history stage and origin of the salmon.

To date, samples from 186 salmon have been analysed (Olafsson *et al.,* 2015). A total of 184 samples were aged using scales, otoliths or in some cases both. Most of the samples were from individuals in their first year at sea (72.8%). The freshwater age varied from 1 to 5 years with an average of 2.6 years. The most common freshwater age was two years (42%), with a further substantial proportion of 3-year-old fish (28%). Genetic assignment of fish was performed using individual genetic assignments and all 186 samples of salmon were assigned to their most likely population of origin (Figure 3.1.10.1). Eight samples, from post-smolts and salmon caught close to Iceland, were determined to be of Icelandic origin. Of the remaining 178 samples, 121 individuals (68%) were from the southern NEAC area, i.e. from mainland Europe, the UK, and Ireland, 53 individuals (30%) were from the northern NEAC area, i.e. Scandinavia and northern Russia, and four individuals were from Iceland (2%).

Stock mixture analysis generally supported the individual assignments, but did not suggest a seasonal component to the distribution of salmon stocks. These results indicate that the sea area to the south and east of Iceland is important as a feeding area for migrating Atlantic salmon, particularly for salmon originating in the UK, Ireland, and southern Europe. Furthermore, the lack of adult Icelandic fish so close to Iceland is remarkable and suggests that Atlantic salmon from Icelandic stocks are using different feeding grounds. The sampling programme is ongoing, although samples from the latest years have not yet been analysed.

3.2 Management objectives and reference points

Management objectives and reference points are described in Section 1.5.

ICES has also developed a risk framework for the provision of catch advice for the NEAC area. Using this framework, the ICES catch advice provides the probability that the NEAC stock complexes or national stocks will exceed their CLs for different catch options at Faroes. This risk framework has not yet been formally adopted by NASCO, however, and the Working Group has advised (ICES, 2013) that NASCO would need to agree upon the following issues before it could be finalized:

- the season (January to December or October to May) over which any TAC should apply;
- the share arrangement for the Faroes fishery;
- the choice of management units for NEAC stocks;
- specific management objectives.

The proposed risk analysis framework is described in the Stock Annex (Annex 6).

3.2.1 NEAC conservation limits

River-specific Conservation Limits (CLs) have been derived for salmon stocks in most countries in the NEAC area (France, Ireland, UK (England & Wales), UK (Northern Ireland), Finland and Norway) (see Section 2.5), and these are used in national assessments. Preliminary results are also available for Sweden and a small number of rivers in Russia. CL estimates for individual rivers are summed to provide estimates at a country level for these countries. For countries that do not have river-specific CLs, an interim approach has been developed for estimating national CLs. This approach is based on the establishment of pseudo-stock–recruitment relationships for national salmon stocks; further details are provided in the Stock Annex (Annex 6).

CL estimates for all individual countries are summed to provide estimates for the northern and southern NEAC stock complexes (Table 3.2.1.1). These data are also used to estimate the Spawner Escapement Reserves (SERs, the CL increased to take account of natural mortality between the recruitment date, 1st January in the first sea winter, and return to homewaters). SERs are estimated for maturing and non-maturing 1SW salmon from the individual countries as well as northern NEAC and southern NEAC stock complexes (Table 3.2.1.1). The Working Group considers the current national CL and SER levels may be less appropriate to evaluating the historical status of stocks (e.g. pre-1985), that in many cases have been estimated with less precision.

3.2.2 Progress with setting river-specific conservation limits

A method for assessing Scottish salmon stocks with respect to CLs has been developed (Marine Scotland Science, 2015). In general, stocks will be managed at the salmon fishery district scale (Marine Scotland Science, 2014), of which there are 109. When districts include a Special Area of Conservation (SAC), these will be managed separately. There are 17 such SACs in Scotland designated under the Habitat’s Directive where salmon are a qualifying species. Work is continuing to allow assessment at the river scale.

Whole river stock and recruitment data, necessary to estimate CLs, are only available in Scotland for the North Esk river stock. In the absence of egg requirements for the range of river types in Scotland, it is assumed that they fall into the range of CLs (1.1 to 9.8 eggs m^{-2}) derived from internationally monitored rivers at the same latitudes (Crozier *et al.*, 2003). In assessing the status of individual stocks, a Monte Carlo simulation is run and, for each draw, a CL for each district/SAC is randomly generated from a uniform distribution bounded by this range. The exception to this is the North Esk where the derived CL of 9.8 eggs m^{-2} is used throughout.

Wetted area is used to scale CL to the total egg requirement for any given stock. The reported salmon distribution is used to determine appropriate wetted areas in each assessment area (Gardiner and Egglishaw, 1986), which have subsequently been updated in consultation with local biologists. These areas, categorised as salmon present, absent or unknown, are subsequently further split into rivers and lochs. The relative productivity of loch area was estimated following the approach outlined in Hindar *et al.* (2008).

The stock abundance associated with any given area is estimated from reported rod catches for that area together with exploitation rates derived from rod catch and fish counter data from a limited number of Scottish salmon rivers. Estimated egg depositions are derived for the most recent five years and compared to egg requirement for the area. To account for uncertainties in the model parameter inputs, Monte Carlo simulations are undertaken to estimate the probability that the stock will equal or exceed its CL. These probabilities are used to define the conservation status of the area and the consequent management measures.

From 2016, in-river salmon fisheries in Scotland will be managed according to the conservation status of the stock. Assessments will be carried out annually.

Progress has also been made in setting conservation limits for Icelandic salmon rivers. Estimates of salmon production range from 2.1 to 57.7 adults per ha wetted area indicating that large variation in the spawning requirements among rivers is likely. Currently, wetted area for 30 rivers has been measured. Progress is slow due to the need for field measurements with respect to each river, since high resolution maps are not yet available. Juvenile surveys will be used to calculate the relationship between spawning and recruitment and rod catch statistics to transfer CLs between rivers of similar origin and productivity.

Previously, CLs had been set for six Norwegian tributaries in the River Teno system, and a spawning stock evaluation undertaken for five of these tributaries: Máskejohka, Lákšjohka, Válljohka, Árášjohka and Iešjohka (Anon, 2015). Defining these reference points followed the procedures previously described for Norwegian salmon rivers (Hindar *et al.*, 2007; Forseth *et al.*, 2013). Conservation limits have recently been set for almost all of the tributaries and the main stem section of the River Teno (Falkegård *et al.*, 2014) although population-specific status evaluations are not yet available for most of these populations (Anon, 2015). In 2016, the national assessment for Finland (River Teno) was undertaken with respect to river-specific CLs for the first time.

3.3 NASCO has requested ICES to describe the status of stocks

3.3.1 The NEAC-PFA run-reconstruction model

The Working Group uses a run-reconstruction model to estimate the PFA of salmon from countries in the NEAC area (Potter *et al.*, 2004). PFA in the NEAC area is defined as the number of 1SW recruits on January 1st in the first sea winter. The model is generally based on the annual catch in numbers of 1SW and MSW salmon in each country which are raised to take account of minimum and maximum estimates of non-reported catches and exploitation rates of these two sea-age groups. These values are then raised to take account of the natural mortality between January 1st in the first sea winter and the mid-date of return of the stocks to freshwater.

Where the standard input data are themselves derived from other data sources, the raw data may be included in the model to permit the uncertainty in these analyses to be incorporated into the modelling approach. Some countries have developed alternative approaches to estimate the total returning stock, and the Working Group reports these changes and the associated data inputs in the year in which they are first implemented.

For some countries, the data are provided in two or more regional blocks. In these instances, model output is provided for the regions and is also combined to provide stock estimates for the country as a whole. The input data for Finland comprise the total Finnish and Norwegian catches (net and rod) for the River Teno, and the Norwegian catches from this river are not included in the input data for Norway.

A Monte Carlo simulation (10 000 trials) is used to estimate confidence intervals on the stock estimates. Further details of the model are provided in the Stock Annex, including a step-by-step walkthrough of the modelling process.

3.3.2 Changes to national input data for the NEAC PFA Run-Reconstruction Model

Model inputs are described in detail in Section 2.2 of the Stock Annex (Annex 6), and input data for the current year are provided in Appendix 3 of the Stock Annex. In addition to adding new data for 2015, the following changes were made to the national/regional input data for the model:

Finland: River-specific CLs (Falkegård *et al.*, 2014) were used in the assessment rather than the values derived from the pseudo S–R relationship.

Sweden: Preliminary river-specific CLs were used in the assessment rather than the values derived from the pseudo S–R relationship.

UK (Northern Ireland): In the UK (Northern Ireland) DCAL area, counts of adult returns to the rivers Bush and Bann were used as input data for the run-reconstruction model from 2000 onwards, along with a scaling factor based on a more detailed assessment of total returns in 2015. Adult counts were used because these data were more informative about the number of returning adults than very low nominal catches. The input data for the rest of UK (Northern Ireland) were unchanged.

3.3.3 Changes to the NEAC-PFA run-reconstruction model

The formulation of the run-reconstruction model for the UK (Northern Ireland) DCAL area was amended to accommodate the change in the national input data. The model was previously based on number of retained fish from catches and estimates of exploitation rates. Because the number of retained fish from catches has been very low in this area, the model output became very uncertain using these data alone. The model has therefore been modified to use counts from the River Bush trap and the River Bann counter for the year 2000 onwards. These values are scaled up to the estimated total run using a factor of 0.67 ± 0.05 for 1SW fish and 0.61 ± 0.05 for MSW fish, based on more detailed run estimates for 2015. The model for the UK (Northern Ireland) Loughs Agency area remains unchanged.

River-specific estimates of the CLs for Sweden and Finland were included in the model and replaced the estimates derived from the National (pseudo stock–recruitment) CL model.

The Working Group also considered new information provided on the approach currently used to establish district-specific CLs and spawner escapement estimates for UK (Scotland). A model has been developed which uses rod catch numbers and weights by sea age, district and month, and takes account of released fish and potential repeat captures. It was agreed that the full calculations should not be incorporated into the NEAC run-reconstruction model because it would be difficult to ensure that changes to the model used in UK (Scotland) were kept up to date in the ICES version. It was therefore agreed that from 2017, UK (Scotland) would provide a time-series of run estimates along with rod and net catches as their input data to the NEAC run-reconstruction model, and that the model would be modified to provide estimates of maturing and non-maturing 1SW PFA and lagged spawners as for other countries. Locally established CL estimates for Scotland would also be incorporated in the model.

The Working Group agreed that other countries that estimate returns to each river should also consider providing these data summed for the country or by regions, along with data on catches, for input to the NEAC run-reconstruction model. Appropriate modifications would then be incorporated into the NEAC run-reconstruction model. This may apply to UK (England and Wales), Ireland and Norway.

3.3.4 Description of national stocks and NEAC stock complexes as derived from the NEAC-PFA run-reconstruction model

The NEAC PFA Run-reconstruction model provides an overview of the status of national salmon stocks in the Northeast Atlantic. However, the limitation of a national assessment is that it does not capture variations in the status in individual rivers or small groups of rivers, although this has been addressed, in part, by the regional splits within some countries.

The model output for each country has been displayed as a summary sheet (Figures 3.3.4.1(a–j)) comprising the following:

- PFA and SER of maturing 1SW and non-maturing 1SW salmon.
- Homewater returns and spawners (90% confidence intervals) and CLs for 1SW and MSW salmon.
- Exploitation rates of 1SW and MSW salmon in homewaters estimated from the returns and catches.
- Total catch (including unreported) of 1SW and MSW salmon.
- National pseudo stock–recruitment relationship (PFA against lagged egg deposition), used to estimate CLs in countries that cannot provide one based upon river-specific estimates (Section 3.2.1). This panel also includes the river-specific CL where this is used in the assessment.

Tables 3.3.4.1–3.3.4.6 summarise salmon abundance estimates for individual countries and stock complexes in the NEAC area. The PFA of maturing and non-maturing 1SW salmon and the numbers of 1SW and MSW spawners for the Northern NEAC and Southern NEAC stock complexes are shown in Figure 3.3.4.2.

The model provides an index of the current and historical status of stocks based upon fisheries data. The 5th and 95th percentiles shown by the whiskers in each of the plots (Figures 3.3.4.1–3.3.4.2) reflect the uncertainty in the input data. It should also be noted that the results for the full time-series can change when the assessment is re-run from year to year as the input data are refined.

Based on the NEAC run-reconstruction model, the status of northern NEAC stock complexes, prior to the commencement of distant-water fisheries, in the latest available PFA year was considered to be at full reproductive capacity. The southern NEAC maturing 1SW stock complex was considered to be at risk of suffering reduced reproductive capacity prior to the commencement of distant water fisheries in the latest available PFA year. The non-maturing 1SW Southern NEAC stock complex was considered to be suffering reduced reproductive capacity prior to the commencement of distant-water fisheries in the latest available PFA year.

The abundances of both maturing 1SW and non-maturing 1SW recruits (PFA) for northern NEAC (Figure 3.3.4.2) show a general decline over the time period, the decline being more marked in the maturing 1SW stock. Both stock complexes have, however, been at full reproductive capacity (see Section 3.2) prior to the commencement of distant water fisheries throughout the time-series.

1SW spawners in the northern stock complexes have been at full reproductive capacity throughout the time-series. MSW spawners, on the other hand, while generally being at full reproductive capacity, have periodically been at risk of suffering reduced reproductive capacity.

The abundances of both maturing 1SW and of non-maturing 1SW recruits (PFA) for southern NEAC (Figure 3.3.4.2) demonstrate broadly similar declining trends over the time period. Both stock complexes were at full reproductive capacity prior to the commencement of distant water fisheries throughout the early part of the time-series. Since the mid-1990s, however, the non-maturing 1SW stock has been at risk of suffering reduced reproductive capacity in approximately 50% of the assessment years. The maturing 1SW stock, on the other hand, was first assessed as being at risk of suffering reduced reproductive capacity in 2009. In half of the years since then, it has either been at risk of suffering reduced reproductive capacity or suffering reduced reproductive capacity.

The 1SW spawning stock in the southern NEAC stock complex has been at risk of suffering reduced reproductive capacity or suffering reduced reproductive capacity for most of the time-series. In contrast, the MSW stock was at full reproductive capacity for most of the time-series until 1996. After this point, however, the stock has generally been either at risk of suffering reduced reproductive capacity or suffering reduced reproductive capacity.

Individual country stocks

Table 3.3.4.7 shows the assessment of PFA and spawning stocks for individual countries for the most recent PFA year. In this table PFA is compared against the SER, and spawning stock is compared against CL. The assessment of PFA and spawning stocks of individual countries for the latest PFA and spawning year (Figures 3.3.4.1(a–j)) show the same broad contrasts between northern (including Iceland) and southern NEAC stocks as was apparent in the stock complex data.

Thus, for all countries in northern NEAC, except for maturing 1SW stocks in Sweden, the PFAs of both maturing and non-maturing 1SW stocks were at full reproductive capacity prior to the commencement of distant-water fisheries, but some countries were at risk of suffering, or suffering, reduced reproductive capacity of spawners (Table 3.3.4.7). In southern NEAC, the maturing 1SW stocks for most countries were at risk of suffering, or suffering, reduced reproductive capacity both prior to the commencement of distant water fisheries and in the spawning populations. For southern NEAC non-maturing 1SW, UK (Northern Ireland), UK (England and Wales) and France were at full reproductive capacity before the commencement of distant-water fisheries, and UK (England and Wales) and UK (Northern Ireland) was at full reproductive capacity for spawners (Table 3.3.4.7).

3.3.5 Compliance with river-specific Conservation Limits (CLs)

The status of individual rivers with regard to attainment of national CLs after home-water fisheries is shown in Table 3.3.5.1. The total number of rivers in each jurisdiction and the number which can be assessed are also shown. Numerical evaluations can be provided for eight jurisdictions where individual rivers are assessed for compliance with CLs. The compliance estimate for France for individual rivers is provided for 1SW and MSW components separately. Of the four jurisdictions in northern NEAC, where individual stocks are being assessed for compliance, many individual rivers are failing to meet CL. For the River Tana/Teno (Finland/Norway) only two of the ten assessed tributaries are meeting CL. The percentage of rivers/major tributaries failing to meet CL ranges from 20% to 88%. In southern NEAC, compliance with CL for individual rivers ranges from 38% to 80% of assessed rivers in different countries.

At a country or jurisdiction level, spawner compliance with CLs varies, but generally indicates that many jurisdictions are failing to meet CLs (Table 3.3.5.1). In the case of two jurisdictions in northern NEAC, there was less than 95% probability that the national spawner estimate exceeded the 1SW CL and there were also two jurisdictions where this probability was not exceeded for MSW spawners. The situation in southern NEAC was more severe, with only one jurisdiction's national 1SW spawning estimates meeting the CL with 95% or greater probability and only two showed a high probability of meeting MSW CL in 2015.

3.3.6 Marine survival (return rates) for NEAC stocks

An overview of the trends of marine survival for wild and hatchery-reared smolts returning to homewaters (i.e. before homewater exploitation) is presented in Figures 3.3.6.1 and 3.3.6.2. The figures provide the percent change in return rates between five year averages for the smolt years 2005 to 2009 and 2010 to 2014 for 1SW salmon, and 2004 to 2008 and 2009 to 2013 for 2SW salmon. The annual return rates for different rivers and experimental facilities are presented in Tables 3.3.6.1 and 3.3.6.2. Return rates of hatchery-released fish, however, may not always be a reliable indicator of return rates of wild fish.

The overall trend for hatchery smolts in southern NEAC areas is generally indicative of a decline in marine survival. The overall trend for northern NEAC hatchery smolts shows a more varied picture with two out of three dataseries showing an increase in return rates. Note, however, that northern NEAC is now only represented by two rivers: River Imsa (1SW and 2SW) in Norway and River Ranga in Iceland. For the wild smolts a decline is also apparent for the northern NEAC areas where four out of six dataseries show a decline. For the southern NEAC areas, data show a general increase in return rates to 2SW in the most recent 5-year period compared to the 5-years before (Figure 3.3.6.1), and a decrease in return rates to 1SW. The percentage change between the averages of the five-year periods varied from an 81% decline (River Halseva 1SW) to a 106% increase (River Tamar MSW) (Figure 3.3.6.1). However, the scale of change in some rivers is influenced by low total return numbers, where a few fish more or less returning may have a significant impact on the percent change.

The return rates for wild and reared smolts for migration year 2014 (1SW) and 2013 (MSW) displayed a mixed picture with some rivers above and some below the previous 5- and 10-year averages (Tables 3.3.6.1 and 3.3.6.2). For northern NEAC, return rates decreased for 2014 compared to 2013 for wild 1SW smolts in two out of three dataseries in Norway and Iceland. For the southern NEAC area, wild 1SW return rates showed a general increase for the 2014 smolt cohort compared to 2013, with the exception of the River Bush in UK (Northern Ireland). Increased survival for wild 2SW returns from the 2013 smolt year compared to 2012 was noted in MSW survival in the River Imsa (northern NEAC). For southern NEAC, the River Bush in UK (Northern Ireland) indicated a decrease in marine survival for wild 2SW fish in 2013 relative to the previous year. The River Frome in UK (England & Wales) showed similar figures for both 2013 and 2012. No data were available for the rivers from France for migration year 2014.

The two remaining return rate dataseries for 1SW hatchery smolts in the northern NEAC area for the 2014 smolt year showed a decrease relative to 2013 for the River Imsa, and an increase on the River Ranga (Table 3.3.6.2). In the southern NEAC area, all return rates for hatchery smolts decreased in the same period. The only available MSW survival index for the 2013 smolt cohort, for the River Imsa in Norway (northern NEAC), showed increased survival relative to the previous year.

Least squared (or marginal mean) average annual return rates were calculated to provide indices of survival for northern and southern 1SW and 2SW returning adult wild and hatchery salmon in the NEAC area (Figure 3.3.6.3). Values were calculated to balance for variation in the annual number of contributing experimental groups through application of a GLM (generalised linear model) with survival related to smolt year and river, each as factors, with a quasi-Poisson distribution (log-link function). Each of the hatchery and wild, 1SW and 2SW, northern and southern area river survival indices were run independently, as presented in Tables 3.3.6.1 and 3.3.6.2. Only return rates given in separate 1SW and 2SW age classes were used. In summary:

- 1SW return rates of wild smolts to the Northern NEAC area (three river indices) although varying annually, have generally decreased since 1980 ($p<0.05$). The time-series can be seen as three periods, 1981 to 1993, 1994 to 2005 and 2006 to 2014. In the first period, survival ranges greatly but was generally high (averaging 6.1%), before declining sharply in 1994 to a period of low, but gradually improving survival (average of 2.8%), followed by a further decline from 2004 to 2006. Survival in the third period (2006 to 2014) has been at the lowest level (average of 1.4%). The return rate for the last point in the time-series (for the 2014 smolt cohort) of 1.8% is up on the 2013 return rate of 1.3%, but is the second lowest in the time-series. Compared to 1SW fish, there is no declining trend evident for the 2SW wild component (comprising three river indices), with the most recent return rate (for 2013 smolts) of 1.1% similar to the figure for the previous year.
- Return rates of 1SW wild smolts to the southern NEAC area (eight river indices) have generally decreased since 1980 ($p<0.05$). A steep decrease be-

tween 1988 and 1989 was followed by a decline from around 10% to around 6% over the period 2000 to 2008. An increase in 2009 was followed by two years of declining survival. This subsequently improved slightly for the 2012 smolt cohort to 6.0%, declined for the 2013 cohort to 2.9% (the lowest in the time-series), and increased to 3.7% for the 2014 cohort (still the third lowest in the time-series). There is no evident declining trend for the 2SW wild component (five river indices), though pre-1999 rates were generally higher than post-2000 rates. Following a slight increase in the return rate of the 2009 smolt cohort, the return rate of the most recent cohort (2013) was 1.6%, comparable to the average seen since 2006.

- 1SW return rates of hatchery smolts to the northern NEAC area (four river indices) although varying annually, have decreased since 1980 ($p<0.05$). A slight improvement was noted in the years preceding the most recent year, but the 2014 figure (0.9%) was close to the mean of the last nine years and among the lowest in the time-series. The declining trend is not evident for the 2SW hatchery component (four river indices). A notable increase from the 2007 to the 2009 smolt cohorts has not been maintained. The most recent return rate (the 2013 smolt cohort) is up on the preceding year, but still well below the average of the last nine years.
- 1SW return rates of hatchery smolts to the southern NEAC area (13 river indices) although varying annually, have decreased since 1980 ($p<0.05$). The returns of the 2013 cohort are the second lowest in the time-series (1.0%), and although the 2014 return increased relative to the previous year (1.2%), the six most recent years include the five lowest return rates in the time-series and again indicate a persistent period of poor marine survival.

In summary, the low return rates in recent years highlighted in these analyses are broadly consistent with the trends in estimated returns and spawners as derived from the PFA model (Section 3.3.4), and that abundance is strongly influenced by factors in the marine environment.

3.4 NASCO has asked ICES to advise on the source of uncertainties and possible biases in the assessment of catch options for the Faroes fishery resulting from the use of samples and data collected in the fishery in the 1980s and 1990s. Should it be considered that biases are likely to compromise the catch advice, advise on any new sampling which would be required to improve these assessments

3.4.1 The catch options model

The Catch Options Model is described in Section 3.4.3 of the Stock Annex. The assessment is based on the following management assumptions, as discussed by ICES (2013), but these factors have yet to be formally adopted by NASCO:

- TAC options are assessed for fishing seasons (October to May) and not calendar years; and
- the share arrangement for the Faroes fishery is set at 0.084.

ICES has also advised that the catch advice for the Faroes fishery should be based on the 20 national management units (1SW and MSW stocks in ten countries) and that the management objective should be to have at least a 95% probability of meeting the CL for each of these management units. However, in the absence of any formal decision on these two points by NASCO, ICES currently provides catch advice based on both the four NEAC stock complexes (northern and southern NEAC, 1SW and MSW stocks) and the 20 national management units. The catch options analysis currently takes no account of the status of stocks in Denmark, Germany or Spain, for which insufficient data are provided for ICES to conduct stock assessments. ICES also tabulates the results in such a way that NASCO can consider alternative probability levels for achieving the management objective. The following discussion is based on the assessment at the country level.

ICES has previously based the catch advice on the status of all four stock complexes and all 20 national management units regardless of the impact that the Faroese fishery would be expected to have on them (e.g. ICES, 2015). However, the Working Group has noted that some of the management units are exploited at very low levels and in the absence of a management decision on which units should be included in the framework, all management units are included in this analysis.

3.4.2 Uncertainties and biases in the assessment of Faroes catch options

The 'accuracy' of a set of parameter values is the measure of their closeness to the true values and is a combination of their 'precision', which is a description of the random errors among a set of measurements, and their 'trueness', which is a description of the systematic errors or the closeness of the mean of a set of measurements to the actual (true) value. Uncertainties and biases in the question from NASCO are taken to refer to precision and trueness, respectively, in the discussion below.

The catch options assessment is based on the following equation which is applied to each management unit:

> Surplus = Forecast PFA - expected number of fish killed (for a specific TAC) - SER

The equation is run for 20 000 simulations taking account of the uncertainties in both the stock forecasts and expected harvest (SER is estimated without uncertainty), and the proportion of the surplus values that are greater than zero determines the probability that the management unit will meet its CL.

It will always be necessary to use historic data to estimate the expected number of fish killed, because this relates to fisheries that may occur in future. Ideally, such data might be derived from very recent fisheries and be based on a well-planned sampling programmes. However, as no fishery has operated at Faroes for more than 15 years, it has been necessary to use data and samples collected in the Faroes fishery in the 1980s and 1990s. The parameters that are estimated in this way, along with the data sources, are listed below:

PARAMETERS ESTIMATED FROM HISTORIC DATA/SAMPLES:	SOURCE OF DATA/SAMPLES:
Mean weight of all fish caught	Sampling of commercial catches 1985/1986 to 1990/1991 seasons (ICES, 1997).
Proportion of 1SW in catch [NB: Proportion MSW = 1 - proportion 1SW]	Sampling of commercial catches 1985/1986 to 1990/1991 seasons (ICES, 1996).
Proportion of total catch discarded	Sampling of commercial catches 1985/1986 to 1990/1991 seasons (ICES, 1996).
Proportion of discards that die	Expert judgement by observers on commercial fishing vessels in early 1980s.
Proportion of farmed fish in catch multiplied by correction factor	Estimated proportion of farmed fish in catches at Faroes between 1980/1981 and 1990/1991 seasons (Hansen and Jacobsen, 2003); estimated proportion of farmed fish in catches in Norwegian coastal fisheries (ICES, 2011).
Proportion of 1SW fish not maturing	Experimental studies in early 1980s based on proportion of 1SW fish with raised vitellogenin in blood (ICES, 1994).
Mid-dates of the 1SW and MSW fisheries	Estimates from total catches in 1983/1984 to 1985/1986 fishing seasons (ICES, 1985, 1986, 1987).
Proportion of catch of North American origin	Genetic analysis of scale samples collected in 1993/1994 and 1995/1996 fishing seasons (ICES, 2015)
Composition of catches	Stock complexes: Genetic analysis of scale samples collected in 1993/1994 and 1995/1996 fishing seasons (ICES, 2015) National management units: PFA proportions applied to stock complex composition.

Most of these values only affect the estimates of the expected number of fish killed in the earlier equation. The exception is the data on stock composition which are also used in the run-reconstruction assessment of PFA to allocate the Faroes catch to the national PFA estimates and could therefore affect the stock forecast estimates. However, as there has been no fishery at Faroes for the past 15 years, the effect on current stock forecasts will be negligible or zero.

The precision of the historic parameter values will be affected by a range of factors including:

- sampling error (e.g. resulting from small sample sizes) when samples are collected from the fishery;
- natural year-to-year variability of biological characteristics (e.g. due to environmental conditions);
- variation in the pattern of exploitation of available NEAC stocks in the fishery;
- year-to-year variability of the way the fishery is prosecuted (e.g. due to weather conditions).

The trueness of these values may be affected by biases in the sampling programmes and systematic shifts in stock or fishery characteristics between that time and the present.

A sensitivity analysis was conducted to assess the effects of variation in the precision and trueness of the above input parameters. The Catch Option Model was run to estimate the probabilities of the national 1SW and MSW management units achieving their SERs if a 200 t TAC had been allocated to the Faroes fishery, using the 2015 input datasets. Parameter values were then adjusted by increasing or decreasing the mean, to test trueness effects, and by increasing or decreasing the spread of values, to test precision effects. The second column in Tables 3.4.2.1, 3.4.2.2 and 3.4.2.3 show the baseline estimate of the probability of each management unit (country and age group) achieving its SER, and the remaining columns show the increase or decrease in this value when each input parameter is modified. The size of the effect is roughly proportional to the TAC being assessed, so, the effects would be halved for a TAC option of 100 t and divided by four for a TAC option of 50 t.

3.4.3 Effects of parameter precision and trueness on the catch advice

It is important to note that if the Catch Option Model forecasts that one or more management units has less than a 95% probability of achieving its SER with a TAC option of zero (i.e. in the absence of a Faroes fishery), the advice will be that there should be no fishery. Under the above condition, this advice would not be affected by uncertainty or bias in any of the above model parameters, except potentially those relating to the stock composition.

Stock composition

The genetic stock assignment of scale samples collected between 1993 and 1995 is currently used to estimate the proportion of North American fish in the Faroes catch and then to split the remainder of the catch between northern and southern NEAC countries and Iceland. In the Catch Options Model at the country level, the northern and southern NEAC proportions are then divided between countries in proportion to the recent PFA estimates. If the estimated contribution of a country to the Faroes fishery is increased, the probability of that complex or country achieving its SER will be decreased and the probability of the remaining countries achieving their SERs will be increased.

If data on the stock composition of the catches indicated that salmon from one or more countries were not exploited in the Faroes fishery, then those countries might be excluded from the catch advice decisions. However, both tagging studies and genetic stock identification have shown that salmon from the full range of NEAC countries have been exploited in the fishery in the past, and this must therefore be expected to be the case in future.

Three sensitivity analysis scenarios were run with the proportion of North American fish increased and decreased by 50% and set to zero (Table 3.4.2.1). These changes generally had minimal effect on the probability of 1SW stocks achieving their SERs (range -0.1% to 0.1%). The effects on MSW stocks were slightly larger. A 50% decrease in the proportion North American decreased the probability of all NEAC countries meeting their SERs by an average of 2.6% (range 0.3% (Ireland) to 7.5% (Norway)) and setting the NAC proportion to zero had approximately twice this effect. A 50% increase in the NAC proportion had an approximately equal but opposite effect to the 50% decrease.

Decreasing the estimated proportion of the catch originating in southern NEAC from 0.88 to 0.78 for 1SW fish and from 0.29 to 0.19 for MSW stocks and increasing the northern NEAC contribution by the same, increased the probability of southern

NEAC countries achieving the SERs by averages of 0.2% for 1SW stocks (range 0% (Iceland-SW) to 0.3% (Ireland, UK (Northern Ireland) & UK (Scotland)) and 4.1% for MSW stocks (range 0.8% (Ireland) to 8.4% (Norway) (Table 3.4.2.1). At the same time, the probabilities of northern NEAC stocks achieving SERs were decreased by averages of 0.5% for 1SW (range 0.3% (Sweden & Norway) to 0.9% (Finland)) and 4.1% for MSW stocks (range 2.4% (Finland) to 8.4% (Norway)).

Further simulations were run in which the proportion of the catch originating in countries furthest from the Faroes area (Russia, UK (England and Wales) and France) were halved and the remaining proportions adjusted up accordingly (Table 3.4.2.1). This resulted in an increase in the probability of these countries achieving their SERs for both 1SW stocks (range 0.4% (Russia) to 1.1% (UK (England & Wales)) and MSW stocks (range 6.2% (France) to 32.2% (Russia)). The probabilities of the remaining countries achieving their SERs decreased by a small amount for 1SW stocks (range 0.1% to 0.3%) and from 0.3% (Ireland) to 9.6% (Norway) for MSW stocks. The effect of doubling the proportion of the catches derived from the distant countries had approximately double the effect in the opposite direction.

Finally, the uncertainty in the estimated stock composition was increased by doubling the standard error of the country proportions entered into the model (Table 3.4.2.1). This resulted in only very small changes (-0.2% to 0.2%) in the estimated probabilities of most management units achieving their SERs, although the probability for Icelandic MSW stocks decreased by 3.7%.

The sensitivity analyses indicate that biases in the estimates of stock composition could have the largest effects on the estimated probability of individual countries achieving their SERs for any TAC option. However, increases in the probability for one (or more) countries will be balanced by decreases in the probabilities for other countries, and so it is not clear that these uncertainties compromise the catch advice.

Obtaining new data on the stock composition could be achieved through further genetic analysis of scale samples taken from salmon caught in the Faroes fishery area. As a first step, it would be appropriate to analyse all the historic scale samples collected in the 1980s and 1990s to look for evidence of systematic spatial or temporal variation in the stock composition and to validate the current approach of attributing abundance at Faroes by national stock within the complexes using the PFA proportions. Depending on the nature of any variations in stock composition observed among these samples, decisions could be made about the need for new sampling programmes. However, it is likely to require an extensive research fishery to sample the stocks in the Faroes area effectively in both space and time.

Discard rate, discard mortality and delayed maturation

Simulations run with changes to the discard rate, discard mortality or delayed maturation all had zero or negligible effects on the probability of MSW stocks achieving their SERs and only small effects on 1SW stocks (Table 3.4.2.2). Reducing the discard rate to 0 increased the probability of 1SW stocks achieving their SERs by an average of 1.1% (range 0.2% (Norway) to 2.5% (UK (Northern Ireland)) and increasing the discard rate values by two standard deviations had an approximately equal effect in the opposite direction. Increasing the uncertainty in the discard rate by a factor of three had a similar effect to the increase in the discard rate by two standard deviations.

Increasing the discard mortality from 80% to 100% decreased the estimated probability of 1SW management units achieving their SERs by an average of 0.3% (range 0%

(Iceland) to 0.7% UK (Northern Ireland)), and decreasing the discard mortality from 80% to 60% had the opposite effect. Increasing the proportion of 1SW fish maturing from 0.22 to 0.5 increased the estimated probability of 1SW management units achieving their SERs by an average of 0.4% (range 0% (Iceland) to 0.8% (UK (Northern Ireland)) and had negligible effect on the MSW stocks; decreasing the proportion maturing to zero had an approximately equal but opposite effect (Table 3.4.2.2).

Given recent initiatives to limit or ban discarding, it is possible that the treatment of discards in any future fishery would be changed. If it could be assumed that there would be a requirement to land all fish caught, this could be incorporated into the current Catch Options Model and there would be no need to obtain new data on the discard rate or discard mortality. The sensitivity analysis shows that large changes in the proportion of 1SW fish that mature have relatively little effect on the assessment of catch options, and so a new sampling programme to obtain these data is not recommended.

Mean weights of catches

Data on the mean weight of the catch at Faroes have been obtained for the 1985/1986 to 1990/1991 seasons (ICES, 1997). Simulations were run with the mean weights increased and decreased by two standard deviations and with the precision decreased by multiplying the standard deviation by five (Table 3.4.2.3). The decrease in the mean weights decreased the probability of MSW management units achieving their SERs by an average of 2.5% (range 0.4% (Ireland) to 8.6% (Norway)) and the probability of 1SW management units achieving their SERs by up to 0.3%. Increasing the mean weights had similar but slightly smaller effects in the opposite direction. Increasing the uncertainty in the weight data decreased the probability of management units achieving their SERs by an average of 1.3% (range zero (Sweden & Iceland 1SW) to 3.4% (Norway MSW)).

Data provided from homewater fisheries in Norway and Iceland suggest that mean weights of both 1SW and MSW salmon have probably decreased since the 1980s and 1990s. This suggests that the probabilities of stocks achieving their SERs may be overestimated in the current assessments. New data could be obtained on the mean weights of fish in the Faroes area through a research fishery, although data would be required for a number of years. This could provide an improved (updated) estimate of the mean weight of the expected catch but is unlikely to affect the precision of the estimates (i.e. annual variability). Given the relative insensitivity of the advice to this parameter, it would be more sensible to include a weight correction factor in the model, based on changes in mean weights in homewaters. This could be implemented in the Catch Options Model before the next round of catch advice is requested.

Age composition of catches

Data on the mean weight and the age composition of the catch at Faroes have been obtained for the 1985/1986 to 1990/1991 seasons (ICES, 1996). In all but one of the seasons, 1SW fish comprised a very small (<2%) proportion of the landed catch, although in the remaining season they comprised about 9%. Running the Catch Options Model with these proportions doubled, decreased the probability of 1SW management units achieving their SERs by an average of 0.3% (range 0.1% (Norway, Sweden and Russia) to 0.7% (UK (Northern Ireland)) and increased the probability of MSW management units achieving their SERs by an average of 0.6% (range 0.1% (Ireland) to 1.6% (Norway)) (Table 3.4.2.3). Increasing the proportions of 1SW fish by two standard deviations had approximately double the above effects.

While new data on the proportion of 1SW fish in catches could be obtained from a research fishery at Faroes, it is also possible to obtain estimates of changes in the relative abundance of 1SW and MSW stocks from the estimates of PFA. There have been both increases and decreases in the proportions of maturing 1SW fish in the national PFA in both the northern and southern NEAC areas between 2009–2015 compared to 1985–1990. There has been no overall change in the proportion of 1SW in all southern NEAC countries combined, but a 20% reduction in all northern NEAC countries combined. As for the weights, these changes could be incorporated into the catch options model as a correction to the input data.

Mid-dates of the Faroes fishery

Mid-dates of the fishery have been obtained from records of catch by age reported by ICES (1984, 1985 and 1986) and are based on years when a full commercial fishery operated. A simulation was run in which these values were increased by one month (i.e. a one-month delay in the mid-date of the 1SW and MSW fisheries) (Table 3.4.2.3). This had a negligible (≤0.1%) effect on the probability of any 1SW stocks achieving their SERS and decreased the probability of MSW stocks achieving their SERs by an average of 0.7% (range 0.1% (Ireland) to 2.0% (Norway)). Advancing the season would have an approximately equal effect in the opposite direction.

If a TAC was allocated for a future fishery at Faroes, it is quite likely that it would be lower than the catch in the 1983/1984 to 1985/1986 seasons, and this may result in the fishery being prosecuted for a shorter period. While this might result in a change in the mid-date of the fishery it is not possible to predict this change. In addition, it is not clear that a reliable estimate of the midpoint of a commercial fishery could be estimated from a directed research fishery. Thus, unless mangers could indicate the period in which a fishery would be permitted to operate, this parameter value is unlikely to be improved. If managers determined that any fishery would operate earlier than the historic fisheries, the estimated probability of stocks achieving their SERs would be increased.

Proportion of fish-farm escapees in the catches

Data on the proportion of farmed fish in the catches at Faroes were obtained for the years 1980/1981 and 1990/1991 (Hansen and Jacobsen, 2003). Surveys conducted in Norwegian coastal fisheries have indicated that the proportion of farm escapees in catches had declined by a factor of 0.63 between the 1990s and the early 2000s, and so this value has been applied as a correction to the historic estimates. Decreasing the proportion of farm escapees in the catches would be expected to decrease the probability of all stocks achieving their SERs.

Increasing the correcting factor to 0.73 had a negligible (≤0.1%) effect on the probability of any 1SW management unit achieving its SER and increased the probability of the MSW management units achieving their SERs by an average of 0.8% (range 0.1% (Ireland) to 2.7% (Norway)); decreasing the correction factor to 0.53 had an approximately equal but opposite effect on each management unit (Table 3.4.2.3). Increasing the precision of the farm proportions (halving the standard deviation) or decreasing the precision (doubling the standard deviation) had a negligible effect on the probability of both 1SW stocks (≤0.1%) and MSW stocks (≤0.2%) achieving their SERs.

No new data are available on the proportion of farm escapees in coastal fisheries in Norway, but based on recent surveys in Norwegian rivers, it is thought that the proportion of farm escapees in the Faroes area may have declined slightly from the values currently used in the assessment. Based on the above sensitivity analysis this would be expected to have a negligible effect on the assessment results.

3.4.4 Need for new sampling

The parameter values used in the Catch Options Model to estimate the numbers of fish from each management unit that would be caught in any future fishery at Faroes will always have to be based upon historic data. More up-to-date estimates than those currently used could be obtained by conducting a research fishery in the Faroes area, but to provide reliable data these would need to cover the extent of any expected fishery in both space and time, and data would need to be collected for a number of years. It would not be worth conducting such surveys to improve the precision of the parameter values because the above simulations have indicated that improving the precision of the inputs has negligible effects on the assessment results. New surveys may improve the trueness of the parameter values, but alternative methods are available to correct the values currently used in the assessment. The Working Group therefore considers that the following initial steps should be undertaken to improve the current parameter inputs before any research fishery is undertaken:

- mean weight: apply an adjustment based on changes in the mean weights of 1SW and MSW salmon caught in homewaters between the 1980s and the present time;
- age composition: apply adjustments based on changes in the ratios of the estimated maturing to non-maturing PFA for the contributing management units;
- proportion maturing: no adjustment required;
- stock composition: undertake genetic analysis of all historic scale samples collected in the fishery area;
- discards: seek input from managers on how discards would be expected to be handled in any future fishery;
- mid-date of fishery: seek input from managers on when any future fishery might operate.

Should any fishery be authorised at Faroes in future, it is, of course, important that there should be a comprehensive data collection and sampling programme.

3.5 PFA forecasts

In 2016, the Working Group ran forecast models for the southern NEAC and northern NEAC complexes independently, and for countries within each stock complex. The model and its application is described in detail in the Stock Annex.

3.5.1 Description of the forecast model

The stock complex and country scale models follow the same basic structure although differences occur in the scale over which the data are aggregated. In the country scale models, parallel data streams and analyses for each of the countries comprising the stock complex are modelled. These data are aggregated in the stock complex models. The southern stock complex comprises: France, southwest Iceland, Ireland, UK (England & Wales), UK (Northern Ireland) and UK (Scotland). The northern stock complex comprises: Finland, northeast Iceland, Norway, Russia and Sweden.

PFA is modelled using the summation of lagged eggs from 1SW and MSW fish (*LE*) corresponding to a PFA year (*t*) together with an exponential productivity parameter (*a*).

$$PFA_t = LE_t * \exp(a_t)$$

The productivity parameter (*a*), is the proportionality coefficient between lagged eggs and PFA. This is forecasted one year at a time (a_{t+1}) in a random walk, using the previous year's value (*a*) as the mean value in a normal distribution, with a common variance for the time-series of *a*.

$$a_{t+1} = a_t + \varepsilon; \quad \varepsilon \sim N(0, a.\sigma^2)$$

The maturing *PFA* (*PFAm*) and the non-maturing *PFA* (*PFAnm*) recruitment streams are subsequently calculated from the proportion of *PFA* maturing (*p.PFAm*) for each year (*t*). *p.PFAm* is forecast as a value from a normal distribution based on a logit scale, using the previous year's value as the mean and a common variance across the time-series of *p.PFAm*.

$$logit.p.PFAm_{t+1} \sim N(logit.p.PFAm_t, p.\sigma^2)$$
$$logit.p.PFAm_t = logit(p.PFAm_t)$$

Uncertainties in the lagged eggs are accounted for by assuming that the lagged eggs of 1SW and MSW fish are normally distributed with means and standard deviations derived from the Monte-Carlo run reconstruction. The uncertainties in the maturing and non-maturing PFA returns are derived in the Bayesian forecast models.

For the stock complex models, catches of salmon in the West Greenland fishery (as 1SW non-maturing salmon) and at Faroes (as 1SW maturing and MSW salmon) are introduced as covariates and incorporated directly within the inference and forecast structure of the model. For southern NEAC, the data were available for a 37-year time-series of lagged eggs and returns (1979 to 2015) for the 1SW maturing, and 36-year time-series (1979 to 2014) for the 1SW non-maturing stock components. For northern NEAC, data were available for a 25-year time-series (1991 to 2015) for maturing 1SW, and 24 years (1991 to 2014) for non-maturing stock components. The models were fitted and forecasts were derived in a Bayesian framework.

Forecasts for maturing and non-maturing stocks were derived for each stock complex for five years, from 2015 to 2019. Risks were defined each year as the posterior probability that the PFA would be above the age and stock complex specific Spawner Escapement Reserves (SERs). For illustrative purposes, risk analyses were derived based on the probability that the maturing and non-maturing PFAs would be greater than or equal to the maturing and non-maturing SERs under the scenario of no exploitation, for both the northern and southern complexes. These were calculated for each of the five forecast years, 2015 to 2019.

For the country disaggregated model, country specific catch proportions at Faroes, lagged eggs and returns of maturing and non-maturing components were used. Models were run separately for the northern and southern complexes, incorporating individual country inputs of 1SW and MSW lagged eggs, 1SW and MSW returns, and SERs. Model structure is as described above, incorporating country and year indexing. Separate countries are linked in the model through a common variance parameter associated with the productivity parameter (*a*), which is forecast forward and used along with the forecast proportion maturing to estimate the future maturing and non-maturing PFAs. The proportion maturing (*p.PFAm*) parameter is forecast independently for each country, with individual variance for each.

3.5.2 Results of the NEAC stock complex Bayesian forecast models and probabilities of PFAs attaining SERs

The trends in the posterior estimates of PFA for both the southern NEAC and northern NEAC complexes match the PFA estimates derived from the run-reconstruction model (Section 3.3.4). From these, the productivity parameters (*a*) and the proportions maturing (*p.PFAm*) are derived and forecasts for the time period 2015 to 2019 modelled.

For the southern NEAC stock complex, the proportion of maturing 1SW parameter showed no clear trend over the time-series while the productivity parameter showed a general decline (Figure 3.5.2.1).

Forecasts of maturing PFA in the southern NEAC stock complex show an initial increase into 2015 before declining from 2016 to 2019, with the median dropping below the spawner escapement reserve (SER) for the first time in 2017. The median of the non-maturing PFA stock component is estimated to have declined for much of the time-series, falling below the SER for the first time in 2013. It is forecast to rise slightly into 2015 before declining with the median below SER from 2016 to 2019. These PFA ranges are mirrored in the probabilities of their maturing and non-maturing components exceeding the SERs (Table 3.5.2.1).

In the northern NEAC stock complex model, the parameter for proportion maturing is generally lower in the latter half of the time-series (Figure 3.5.2.2). The productivity parameter has shown a general decline over the time-series although not as pronounced as for the southern NEAC stock complex. The apparent cyclical trends in much of the model output for the northern NEAC stock complex may be indicative of the periodic appearance of strong cohorts in the stocks.

In the northern NEAC stock complex (Figure 3.5.2.2), forecast PFAs for maturing 1SW fish are within the range of estimates for the period since 2007, but lower than those for earlier in the time-series. PFA forecasts for the non-maturing stock complex are within the range of values estimated for the full time-series. PFA for both maturing and non-maturing fish are forecast to have a high probability of being above the SER (Table 3.5.2.1). In both maturing and non-maturing PFAs, the 5th percentile was below the SER for the last forecast year (2019).

3.5.3 Results of the NEAC country level Bayesian forecast models and probabilities of PFAs attaining SERs

Figures 3.5.3.1 to 3.5.3.11 show country level maturing and non-maturing PFA forecasts, with the probabilities of PFAs exceeding the SERs detailed in Table 3.5.3.1 for southern NEAC countries and Table 3.5.3.2 for northern NEAC countries.

3.6 NASCO has asked ICES to provide catch options or alternative management advice for 2016/2017–2018/2019 fishing seasons, with an assessment of risks relative to the objective of exceeding stock conservation limits, or predefined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding

When the Framework of Indicators (FWI) was applied in January 2016 (Section 3.7), this signalled that the PFA of the northern NEAC MSW stock complex of the most recent year was likely higher than previously forecast by ICES (ICES, 2015). In line with the FWI rules currently in place, the signalling of a potential underestimate for just one of the four NEAC stock complexes is sufficient to trigger the need for a reassessment. The Working Group has therefore developed catch options for the 2016/2017 to 2018/2019 fishing seasons at Faroes.

3.6.1 Catch advice for Faroes

The Faroes risk framework (ICES, 2013) has been used to evaluate catch options for the Faroes fishery in the 2016/2017, 2017/2018 and 2018/2019 fishing seasons (October to May). The assumptions and data used in the catch options assessment are described in the Stock Annex. The only change to the model this year is the inclusion of new estimates of the mid-date of the Faroes fishery for 1SW and MSW fish based on data from the 1983/1984 to 1985/1986 fishing seasons; this parameter affects the estimation of natural mortality between the PFA and the fishery and is now included in the model with uncertainty. The procedure used for estimating the stock composition was as described by ICES (2015); all other input data were as described by ICES (2013).

The Working Group applied the risk framework model to the four management units previously used for the provision of catch advice (maturing and non-maturing 1SW recruits for northern and southern NEAC) and also for the two age groups in ten NEAC countries (i.e. 20 management units). Germany, Spain and Denmark are not currently included in the PFA or catch advice assessments. The risk framework estimates the probability that the PFA of maturing and non-maturing 1SW salmon in each of the management units will meet or exceed their respective SERs at different catch levels (TAC options). ICES has advised that the management objective should be to have a greater than 95% probability of meeting or exceeding the SER in each management unit. As NASCO has not yet adopted a management objective, the advice tables provide the probabilities for each management unit and the probabilities of simultaneous attainment of all SERs for each TAC option.

As an example, a 20 t TAC option would result in a catch of about 5000 fish at Faroes. The great majority (>97.5%) of these would be expected to be MSW fish. Once the sharing allocation (8.4%) is applied, and the numbers are adjusted for natural mortality to the same seasons as the PFA, this equates to about 650 maturing and 84 000 non-maturing 1SW fish equivalents assumed to be caught by all fisheries. The maturing and non-maturing 1SW component are split according to the new catch composition estimates, and these values are deducted from the PFA values which are then compared with the following SERs (from Table 3.2.2.1):

Northern NEAC maturing 1SW:	192 348
Northern NEAC non-maturing 1SW:	216 422
Southern NEAC maturing 1SW:	724 023
Southern NEAC non-maturing 1SW:	465 465

Catch Advice based on Stock Complexes

The probabilities of the northern and southern NEAC stock complexes achieving their SERs for different catch options are shown in Table 3.6.1.1 and Figure 3.6.1.1. The probabilities with a zero TAC are the same as the values generated directly by the forecast model (Section 3.5). The catch option table indicates that the northern NEAC maturing and non-maturing 1SW stock complexes have a high probability

(≥95%) of achieving their SERs for TACs at Faroes of ≤60 t in the 2016/2017 season and ≤40 t in the 2017/2018 season. However, the southern NEAC stock complexes both have less than 95% probability of achieving their SERs with any TAC option in any of the forecast seasons. Therefore, there are no catch options that ensure a greater than 95% probability of each stock complex achieving its SER.

The slope of the curves in the catch option figures (Figure 3.6.1.1) is chiefly a function of the level of exploitation on the stocks resulting from a particular TAC in the Faroes fishery and the uncertainty in the parameter values used in the model. The relative flatness of some of the risk curves, particularly for the maturing 1SW stocks, indicates that the risk to these management units is affected very little by any harvest at Faroes, principally because the exploitation rates on these stock components in the fishery are very low (Table 3.6.1.2).

Catch Advice based on Countries

The probabilities of the NEAC national maturing and non-maturing 1SW management units achieving their SERs for different catch options are shown in Tables 3.6.1.3 and 3.6.1.4, respectively. The probabilities of the maturing 1SW national management units achieving their SERs in 2016/2017 vary between 20% (UK (England & Wales)) and 99% (Norway) for the different countries with no TAC at Faroes. These probabilities decline very little with increasing TAC options, reflecting the expected low exploitation rate on maturing 1SW stocks at Faroes (Table 3.6.1.2). The probabilities are also generally lower for the two subsequent seasons.

The probabilities of the non-maturing 1SW national management units achieving their SERs in 2016/2017 vary between 16% (Ireland) and 100% (Norway) with no TAC allocated for the Faroes fishery and decline with increasing TAC options. The only countries to have a greater than 95% probability of achieving their SERs with catch options for Faroes are Norway (TACs <80 t), Sweden (TACs <60 t) and Iceland (TACs <40 t). In most countries these probabilities are lower in the subsequent two seasons. There are therefore no TAC options at which all management units would have a greater than 95% probability of achieving their SERs.

The Catch Options Model indicates that the exploitation rates on national maturing 1SW management units in the northern and southern NEAC areas are low (<0.1% and <0.8%, respectively), at TACs up to 200 t (Table 3.6.1.5). Assuming any fishery at Faroes would be operated as in the past, and efforts would be made to minimise catches of 1SW fish, the stocks represented by these management units would be largely unaffected by a fishery. It should also be noted that the catch advice is based on the assumption that the exploitation rate at Faroes represents only about 8% of the total exploitation of this component of the stocks. This would not affect the current catch advice for the 2016/2017 to 2018/2019 seasons.

River-specific assessments

ICES (2012a) emphasised the problem of basing the risk analysis on management units comprising large numbers of river stocks and recommended that in providing catch advice at the age and stock complex levels for northern and southern NEAC, consideration should be given to the recent performance of the river stocks within individual countries. At present, insufficient monitoring occurs to assess performance of individual stocks in all countries or jurisdictions in the NEAC area (see Section 2.5). In some instances, CLs are in the process of being developed (UK (Scotland) and Iceland).

The status of river stocks within each jurisdiction in the NEAC area for which data are available with respect to the attainment of CLs before homewater fisheries is given in Table 3.6.1.6 for 2015 (except Norway where the data relate to 2014). The total number of rivers in each jurisdiction and the number which can be assessed against river-specific CLs are also shown. Numerical evaluations can only be provided for three jurisdictions where individual rivers are assessed for compliance prior to homewater fisheries taking place. In two jurisdictions in northern NEAC, 79% and 88% of the monitored rivers met their river-specific CLs before any homewater exploitation, whereas only 38% of assessed rivers met their CLs in one country in southern NEAC (Table 3.6.1.6). So, despite the absence of a fishery at Faroes since 1999, and reduced exploitation at West Greenland on the MSW southern NEAC component, the abundance at the PFA stage in a substantial proportion of rivers in the NEAC area has been below their river-specific CLs.

Compliance of jurisdiction specific returns before homewater fisheries with CLs varies greatly between northern NEAC and southern NEAC. Returns for all jurisdictions in northern NEAC, except Sweden, had a 95% or greater probability of meeting both 1SW and MSW CLs. For southern NEAC there was only one jurisdiction where returns of adult salmon had higher than 95% probability of meeting 1SW CLs. In contrast, MSW returns in three of the five jurisdictions had a high probability of meeting MSW CLs.

The Working Group therefore notes that there are no catch options for the Faroes fishery that would allow all national or stock complex management units to achieve their CLs with a greater than 95% probability in any of the seasons 2016/2017 to 2018/2019. While the abundance of stocks remains low, even in the absence of a fishery at Faroes, particular care should be taken to ensure that fisheries in homewaters are managed to protect stocks that are below their CLs.

3.6.2 Relevant factors to be considered in management

The management of a fishery should ideally be based upon the status of all river stocks exploited in the fishery. Fisheries on mixed-stocks pose particular difficulties for management, when they cannot target only stocks that are at full reproductive capacity. Management objectives would be best achieved if fisheries target stocks that are at full reproductive capacity. Fisheries in estuaries and especially rivers are more likely to meet this requirement. The Working Group also emphasised that the national stock CLs are not appropriate to the management of homewater fisheries. This is because fisheries in homewaters usually target individual or smaller groups of river stocks and can therefore be managed on the basis of their expected impact on the status of the separate stocks. Nevertheless, the Working Group agreed that the combined CLs for national stocks exploited by the distant-water fisheries could be used to provide management advice at the level of the stock complexes.

The Working Group has recently evaluated data indicating that a larger number of North American fish than previously thought may have been caught in the Faroes fishery in the past (ICES, 2015). North American fish have not been taken into account in the current catch advice pending a decision from NASCO on how they wish this to be undertaken.

3.7 NASCO has requested ICES to update the Framework of Indicators to identify any significant change in the previously provided multi-annual management advice

3.7.1 Background

In the intermediate years of a multiyear catch agreement, an interim assessment is made as a check of the PFA forecasts and to determine whether a full re-assessment of stock status and new catch advice might be required. This assessment relies on a framework of indicators (FWI) which the Working Group has developed to check whether stock status may have changed markedly in any year from that based on the PFA forecast. Full details of the FWI are provided in the Stock Annex. If the FWI suggests that the stock may have performed differently than that projected by the forecast model, a new assessment and new catch advice would be requested. After a period of three years, a full assessment is required regardless in order to inform a potential new multi-annual agreement. Thus, the FWI is not applied and the cycle is started over again.

Indicator time-series are included in the framework based on the following criteria:

- at least ten datapoints;
- an r^2 of at least 0.2 for a linear regression between the indicator time-series and the estimated pre-fishery abundance of the relevant stock complex;
- regression significant at the 0.05 probability level; and
- available for inclusion in the FWI in early January.

The FWI was first presented by WGNAS in 2012 (ICES, 2012a), and was first applied in 2013 (when the decision was to reassess). In 2013, the FWI was further developed, to include a rule that if the fishery is open, a two-sided test should be applied, while if the fishery is currently closed, a one-sided test indicating an underestimation of PFA is applicable (ICES, 2013). The rationale for this was that if the fishery is closed, there is no reason to reassess if the FWI suggests that the PFA forecast is an overestimate, since any new assessment would be even less likely to signal a fishery option. However, if an underestimate is suggested by the FWI, a new assessment would be warranted.

The FWI was applied again in 2014, when the decision was not to reassess. In 2015, the three-year cycle was restarted and a full assessment and new catch advice was provided by the Working Group; the FWI was also updated (ICES, 2015). When applied in January 2016, the updated FWI suggested that the forecast of PFA for one stock complex, northern NEAC MSW salmon, may have been underestimated. This therefore triggered a new assessment and catch advice.

3.7.2 Progress in 2016

During its meeting in April–May 2016 the Working Group updated the FWI. Summary statistics for the candidate indicator datasets are shown for the northern NEAC and southern NEAC stock complexes in Tables 3.7.2.1 and 3.7.2.2 respectively. For the northern NEAC stock complex, six indicator datasets for the 1SW component and five for the MSW component have been retained in the framework for 2016 (to be applied in January 2017) and 2017. For the southern NEAC stock complex, six indicator datasets for the 1SW component and ten for the MSW component have been retained in the framework for 2016 and 2017. One indicator was dropped from 2015 due to a reduced r^2 (from 0.20 to 0.19).

It is anticipated that the majority of datasets included in the updated FWI will be available in January (when the FWI is required to be run), although this represents a challenging time-scale for some indicators. The updated FWI is illustrated in Figure 3.7.2.1.

In January 2016, the FWI signalled that the PFA of the northern NEAC MSW stock complex was higher than forecast by the Working Group in 2015 and that a reassessment was necessary. In the catch advice provided in 2015 (ICES, 2015), however, it was the status of the southern NEAC stock complexes which indicated a zero catch option for Faroes. As there was no indication from the FWI analysis that the forecast PFAs for these stocks had been underestimated, a change in the status of the northern NEAC MSW stock complex alone would not have led to a change in the previous advice.

To address this issue, the Working Group developed an alternative FWI, where only stock complexes that would be appropriate to changing the multiyear advice are included in the framework in the years between the provision of full catch advice. If the FWI signals that the forecast underestimated the PFA for any of these stock complexes, a new assessment would be signalled. For 2017 and 2018, for example, this would mean that only the indicators for the southern NEAC 1SW and MSW should be considered. As future catch advice may be determined by the status of stocks in any of the four stock complexes, it will be necessary to retain indicators for all four stock complexes. The Working Group recommends that this alternative FWI (Figure 3.7.2.2) be applied in future.

3.7.3 Next steps

Updated FWI spreadsheets will be made available to NASCO in January 2017 to enable them to facilitate the intermediate assessment. The FWI has been structured such that it could be applied for the next two years (2017 and 2018). However, if NASCO decide that the assessment cycle for the Greenland and Faroes fisheries should continue to operate over synchronous periods, then full catch advice could be provided in 2018 together with an update of the FWI at the start of a new three-year-cycle.

Table 3.1.3.1. Number of gear units licensed or authorized by country and gear type.

Year	England & Wales					UK (Scotland)		UK (N. Ireland)			Norway			
	Gillnet licences	Sweepnet	Hand-held net	Fixed engine	Rod & Line	Fixed engine[1]	Net and coble[2]	Driftnet	Draftnet	Bagnets and boxes	Bagnet	Bendnet	Liftnet	Driftnet (No. nets)
1971	437	230	294	79	-	3080	800	142	305	18	4608	2421	26	8976
1972	308	224	315	76	-	3455	813	130	307	18	4215	2367	24	13448
1973	291	230	335	70	-	3256	891	130	303	20	4047	2996	32	18616
1974	280	240	329	69	-	3188	782	129	307	18	3382	3342	29	14078
1975	269	243	341	69	-	2985	773	127	314	20	3150	3549	25	15968
1976	275	247	355	70	-	2862	760	126	287	18	2569	3890	22	17794
1977	273	251	365	71	-	2754	684	126	293	19	2680	4047	26	30201
1978	249	244	376	70	-	2587	692	126	284	18	1980	3976	12	23301
1979	241	225	322	68	-	2708	754	126	274	20	1835	5001	17	23989
1980	233	238	339	69	-	2901	675	125	258	20	2118	4922	20	25652
1981	232	219	336	72	-	2803	655	123	239	19	2060	5546	19	24081
1982	232	221	319	72	-	2396	647	123	221	18	1843	5217	27	22520
1983	232	209	333	74	-	2523	668	120	207	17	1735	5428	21	21813
1984	226	223	354	74	-	2460	638	121	192	19	1697	5386	35	21210
1985	223	230	375	69	-	2010	529	122	168	19	1726	5848	34	20329
1986	220	221	368	64	-	1955	591	121	148	18	1630	5979	14	17945
1987	213	206	352	68	-	1679	564	120	119	18	1422	6060	13	17234
1988	210	212	284	70	-	1534	385	115	113	18	1322	5702	11	15532
1989	201	199	282	75	-	1233	353	117	108	19	1888	4100	16	0
1990	200	204	292	69	-	1282	340	114	106	17	2375	3890	7	0
1991	199	187	264	66	-	1137	295	118	102	18	2343	3628	8	0
1992	203	158	267	65	-	851	292	121	91	19	2268	3342	5	0
1993	187	151	259	55	-	903	264	120	73	18	2869	2783	-	0
1994	177	158	257	53	37278	749	246	119	68	18	2630	2825	-	0
1995	163	156	249	47	34941	729	222	122	68	16	2542	2715	-	0
1996	151	132	232	42	35281	643	201	117	66	12	2280	2860	-	0
1997	139	131	231	35	32781	680	194	116	63	12	2002	1075	-	0
1998	130	129	196	35	32525	542	151	117	70	12	1865	1027	-	0
1999	120	109	178	30	29132	406	132	113	52	11	1649	989	-	0
2000	110	103	158	32	30139	381	123	109	57	10	1557	982	-	0
2001	113	99	143	33	24350	387	95	107	50	6	1976	1081	-	0
2002	113	94	147	32	29407	426	102	106	47	4	1666	917	-	0
2003	58	96	160	57	29936	363	109	105	52	2	1664	766	-	0
2004	57	75	157	65	32766	450	118	90	54	2	1546	659	-	0
2005	59	73	148	65	34040	381	101	93	57	2	1453	661	-	0
2006	52	57	147	65	31606	364	86	107	49	2	1283	685	-	0
2007	53	45	157	66	32181	238	69	20	12	2	1302	669	-	0
2008	55	42	130	66	33900	181	77	20	12	2	957	653	-	0
2009	50	42	118	66	36461	162	64	20	12	2	978	631	-	0
2010	51	40	118	66	36159	189	66	2	1	2	760	493	-	0
2011	53	41	117	66	36991	201	74	2	1	2	767	506	-	0
2012	51	34	115	73	35135	237	79	1	1	2	749	448	-	0
2013	49	29	111	62	33301	238	59	0	0	0	786	459	-	0
2014	48	34	109	65	31605	204	55	0	0	0	700	436	-	0
2015	49	33	102	63	30738	127	57	0	0	0	724	406	-	0
Mean 2010-2014	50	36	114	66	33,988	214	67	1	1	1	752	468		0
% change[3]	-2.8	-7.3	-10.5	-5.1	-9.6	-40.5	-14.3	-100.0	-100.0	-100.0	-3.8	-13.3		0.0
Mean 2005-2014	52	44	127	66	34,138	239	73	27	15	2	974	564		0
% change[3]	-6.0	-24.5	-19.7	-4.5	-10.0	-46.9	-21.6	-100.0	-100.0	-100.0	-25.6	-28.0		0.0

[1] Number of gear units expressed as trap months.
[2] Number of gear units expressed as crew months.
[3] (2015/mean - 1) * 100
[3] (2015/mean - 1) * 100
[4] Dash means "no data"

Table 3.1.3.1. (Continued). Number of gear units licensed or authorized by country and gear type.

Year	Ireland				Finland				France			Russia		
					The Teno River			R. Näätämö				Kola Peninsula	Archangel region	
	Driftnets No.	Draftnets	Other nets Commercial	Rod	Recreational fishery Tourist anglers Fishing days	Recreational fishery Fishermen	Local rod and net fishery Fishermen	Recreational fishery Fishermen	Rod and line licences in freshwater	Com. nets in freshwater[1a]	Drift net Licences in estuary[1b,2]	Catch-and-release Fishing days	Commercial, number of gears Coastal	In-river
1971	916	697	213	10566	-	-	-	-	-	-	-	-	-	-
1972	1156	678	197	9612	-	-	-	-	-	-	-	-	-	-
1973	1112	713	224	11660	-	-	-	-	-	-	-	-	-	-
1974	1048	681	211	12845	-	-	-	-	-	-	-	-	-	-
1975	1046	672	212	13142	-	-	-	-	-	-	-	-	-	-
1976	1047	677	225	14139	-	-	-	-	-	-	-	-	-	-
1977	997	650	211	11721	-	-	-	-	-	-	-	-	-	-
1978	1007	608	209	13327	-	-	-	-	-	-	-	-	-	-
1979	924	657	240	12726	-	-	-	-	-	-	-	-	-	-
1980	959	601	195	15864	-	-	-	-	-	-	-	-	-	-
1981	878	601	195	15519	16859	5742	677	467	-	-	-	-	-	-
1982	830	560	192	15697	19690	7002	693	484	4145	55	82	-	-	-
1983	801	526	190	16737	20363	7053	740	587	3856	49	82	-	-	-
1984	819	515	194	14878	21149	7665	737	677	3911	42	82	-	-	-
1985	827	526	190	15929	21742	7575	740	866	4443	40	82	-	-	-
1986	768	507	183	17977	21482	7404	702	691	5919	58 [3]	86	-	-	-
1987	768	507	183	17977	22487	7759	754	689	5724 [4]	87 [4]	80	-	-	-
1988	836	507	183	11539	21708	7755	741	538	4346	101	76	-	-	-
1989	801	507	183	16484	24118	8681	742	696	3789	83	78	-	-	-
1990	756	525	189	15395	19596	7677	728	614	2944	71	76	-	-	-
1991	707	504	182	15178	22922	8286	734	718	2737	78	71	1711	-	-
1992	691	535	183	20263	26748	9058	749	875	2136	57	71	4088	-	-
1993	673	457	161	23875	29461	10198	755	705	2104	53	55	6026	59	199
1994	732	494	176	24988	26517	8985	751	671	1672	14	59	8619	60	230
1995	768	512	164	27056	24951	8141	687	716	1878	17	59	5822	55	239
1996	778	523	170	29759	17625	5743	672	814	1798	21	69	6326	85	330
1997	852	531	172	31873	16255	5036	616	588	2953	10	59	6355	68	282
1998	874	513	174	31565	18700	5759	621	673	2352	16	63	6034	66	270
1999	874	499	162	32493	22935	6857	616	850	2225	15	61	7023	66	194
2000	871	490	158	33527	28385	8275	633	624	2037 [5]	16	51	7336	60	173
2001	881	540	155	32814	33501	9367	863	590	2080	18	63	8468	53	121
2002	833	544	159	35024	37491	10560	853	660	2082	18	65	9624	63	72
2003	877	549	159	31809	34979	10032	832	644	2048	18	60	11994	55	84
2004	831	473	136	30807	29494	8771	801	657	2158	15	62	13300	62	56
2005	877	518	158	28738	27627	7776	785	705	2356	16	59	20309	93	69
2006	875	533	162	27341	29516	7749	836	552	2269	12	57	13604	62	72
2007	0	335	100	19986	33664	8763	780	716	2431	13	59		82	53
2008	0	160	0	20061	31143	8111	756	694	2401	12	56		66	62
2009	0	146	38	18314	29641	7676	761	656	2421	12	37		79	72
2010	0	166	40	17983	30646	7814	756	615	2200	12	33		55	66
2011	0	154	91	19899	31269	7915	776	727	2540	12	29		78	52
2012	0	149	86	19588	32614	7930	785	681	2799	12	25		72	53
2013	0	181	94	19109	33148	8074	785	558	3010	12	25		110	71
2014	0	122	37	18085	32852	7791	746	396	2878	12	20		57	74
2015	0	102	8	18460	33435	7809	765	232	2850	12	20		81	62
Mean 2010-2014	0	154	70	18,933	32,106	7,905	770	595	2,685	12	26		74	63
% change [6]	0.0	-33.9	-88.5	-2.5	4.1	-1.2	-0.6	-61.0	6.1	0.0	-24.2		8.9	-1.9
Mean 2005-2014	175	246	81	20,910	31,212	7,960	777	630	2,531	13	40	16,957	75	64
% change [6]	-100.0	-58.6	-90.1	-11.7	7.1	-1.9	-1.5	-63.2	12.6	-4.0	-50.0	-100.0	7.4	-3.7

[1a] Lower Adour only since 1994 (Southwestern France), due to fishery closure in the Loire Basin.

[1b] Adour estuary only (Southwestern France).

[2] Number of fishermen or boats using drift nets: overestimates the actual number of fishermen targeting salmon by a factor 2 or 3.

[3] Common licence for salmon and sea trout introduced in 1986, leading to a short-term increase in the number of licences issued.

[4] Compulsory declaration of salmon catches in freshwater from 1987 onwards.

[5] Before 2000, equal to the number of salmon licenses sold. From 2000 onwards, number estimated because of a single sea trout and salmon angling license.

[6] (2015/mean - 1) * 100

[7] Dash means "no data"

Table 3.1.4.1. Nominal catch of Salmon in the NEAC Area (in tonnes round fresh weight) (2015 figures are provisional).

Year	Southern countries	Northern countries (1)	Faroes (2)	Other catches in international waters	Total Reported Catch	Unreported catches	
						NEAC Area (3)	International waters (4)
1960	2,641	2,899	-	-	5,540	-	-
1961	2,276	2,477	-	-	4,753	-	-
1962	3,894	2,815	-	-	6,709	-	-
1963	3,842	2,434	-	-	6,276	-	-
1964	4,242	2,908	-	-	7,150	-	-
1965	3,693	2,763	-	-	6,456	-	-
1966	3,549	2,503	-	-	6,052	-	-
1967	4,492	3,034	-	-	7,526	-	-
1968	3,623	2,523	5	403	6,554	-	-
1969	4,383	1,898	7	893	7,181	-	-
1970	4,048	1,834	12	922	6,816	-	-
1971	3,736	1,846	-	471	6,053	-	-
1972	4,257	2,340	9	486	7,092	-	-
1973	4,604	2,727	28	533	7,892	-	-
1974	4,352	2,675	20	373	7,420	-	-
1975	4,500	2,616	28	475	7,619	-	-
1976	2,931	2,383	40	289	5,643	-	-
1977	3,025	2,184	40	192	5,441	-	-
1978	3,102	1,864	37	138	5,141	-	-
1979	2,572	2,549	119	193	5,433	-	-
1980	2,640	2,794	536	277	6,247	-	-
1981	2,557	2,352	1,025	313	6,247	-	-
1982	2,533	1,938	606	437	5,514	-	-
1983	3,532	2,341	678	466	7,017	-	-
1984	2,308	2,461	628	101	5,498	-	-
1985	3,002	2,531	566	-	6,099	-	-
1986	3,595	2,588	530	-	6,713	-	-
1987	2,564	2,266	576	-	5,406	2,554	-
1988	3,315	1,969	243	-	5,527	3,087	-
1989	2,433	1,627	364	-	4,424	2,103	-
1990	1,645	1,775	315	-	3,735	1,779	180-350
1991	1,145	1,677	95	-	2,917	1,555	25-100
1992	1,523	1,806	23	-	3,352	1,825	25-100
1993	1,443	1,853	23	-	3,319	1,471	25-100
1994	1,896	1,684	6	-	3,586	1,157	25-100
1995	1,775	1,503	5	-	3,283	942	-
1996	1,392	1,358	-	-	2,750	947	-
1997	1,112	962	-	-	2,074	732	-
1998	1,120	1,099	6	`	2,225	1,108	-
1999	934	1,139	0	-	2,073	887	-
2000	1,210	1,518	8	-	2,736	1,135	-
2001	1,242	1,634	0	-	2,876	1,089	-
2002	1,135	1,360	0	-	2,496	946	-
2003	908	1,394	0	-	2,303	719	-
2004	919	1,059	0	-	1,978	575	-
2005	809	1,189	0	-	1,998	605	-
2006	650	1,217	0	-	1,867	604	-
2007	373	1,036	0	-	1,408	465	-
2008	355	1,178	0	-	1,533	433	-
2009	266	898	0	-	1,164	317	-
2010	411	1,003	0	-	1,414	357	-
2011	410	1,009	0	-	1,419	382	-
2012	295	955	0	-	1,250	363	-
2013	310	770	0	-	1,081	272	-
2014	216	738	0	-	954	256	-
2015	226	865	0	-	1,091	298	-
Average							
2010-2014	328	895	0	-	1224	326	-
2005-2014	410	999	0	-	1409	405	-

1. All Iceland has been included in Northern countries
2. Since 1991, fishing carried out at the Faroes has only been for research purposes.
3. No unreported catch estimate available for Russia since 2008.
4. Estimates refer to season ending in given year.

Table 3.1.5.1. Cpue for salmon rod fisheries in Finland (Teno, Näätämö), France, and UK (Northern Ireland; River Bush).

	Finland (R. Teno)		Finland (R. Naatamo)		France		UK(N.Ire.)(R.Bush)
	Catch per angler season	Catch per angler day	Catch per angler season	Catch per angler day	Catch per angler season		Catch per rod day
Year	kg	kg	kg	kg	Number		Number
1974		2.8					
1975		2.7					
1976		-					
1977		1.4					
1978		1.1					
1979		0.9					
1980		1.1					
1981	3.2	1.2					
1982	3.4	1.1					
1983	3.4	1.2					0.248
1984	2.2	0.8	0.5	0.2			0.083
1985	2.7	0.9	n/a	n/a			0.283
1986	2.1	0.7	n/a	n/a			0.274
1987	2.3	0.8	n/a	n/a	0.39		0.194
1988	1.9	0.7	0.5	0.2	0.73		0.165
1989	2.2	0.8	1.0	0.4	0.55		0.135
1990	2.8	1.1	0.7	0.3	0.71		0.247
1991	3.4	1.2	1.3	0.5	0.60		0.396
1992	4.5	1.5	1.4	0.3	0.94		0.258
1993	3.9	1.3	0.4	0.2	0.88		0.341
1994	2.4	0.8	0.6	0.2	2.32		0.205
1995	2.7	0.9	0.5	0.1	1.15		0.206
1996	3.0	1.0	0.7	0.2	1.57		0.267
1997	3.4	1.0	1.1	0.2	0.44	1	0.338
1998	3.0	0.9	1.3	0.3	0.67		0.569
1999	3.7	1.1	0.8	0.2	0.76		0.273
2000	5.0	1.5	0.9	0.2	1.06		0.259
2001	5.9	1.7	1.2	0.3	0.97		0.444
2002	3.1	0.9	0.7	0.2	0.84		0.184
2003	2.6	0.7	0.8	0.2	0.76		0.238
2004	1.4	0.4	0.9	0.2	1.25		0.252
2005	2.7	0.8	1.3	0.2	0.74		0.323
2006	3.4	1.0	1.9	0.4	0.89		0.457
2007	2.9	0.8	1.0	0.2	0.74		0.601
2008	4.2	1.1	0.9	0.2	0.77		0.457
2009	2.3	0.6	0.7	0.1	0.50		0.136
2010	3.0	0.8	1.3	0.2	0.87		0.226
2011	2.4	0.6	1.0	0.2	0.65		0.122
2012	3.6	0.9	1.7	0.4	0.61		0.149
2013	2.5	0.6	0.7	0.2	0.57		0.270
2014	3.3	0.8	1.4	0.3	0.73		0.150
2015	2.6	0.6	1.7	0.3	0.77		0.050
Mean	3.1	1.0	1.0	0.2	0.8	#	0.3
2010-14	3.0	0.7	1.2	0.3	0.7		0.2

[1] Large numbers of new, inexperienced anglers in 1997 because cheaper licence types were introduced.

Table 3.1.5.2. Cpue for salmon in coastal and in-river fisheries the Archangelsk region in Russia.

	Archangelsk region	
	Commercial fishery (tonnes/gear)	
Year	Coastal	In-river
1993	0.34	0.04
1994	0.35	0.05
1995	0.22	0.08
1996	0.19	0.02
1997	0.23	0.02
1998	0.24	0.03
1999	0.22	0.04
2000	0.28	0.03
2001	0.21	0.04
2002	0.21	0.11
2003	0.16	0.05
2004	0.25	0.08
2005	0.17	0.08
2006	0.19	0.05
2007	0.14	0.09
2008	0.12	0.08
2009	0.09	0.05
2010	0.21	0.08
2011	0.15	0.07
2012	0.17	0.09
2013	0.12	0.09
2014	0.22	0.10
2015	0.16	0.09
Mean	0.20	0.06
2010-14	0.17	0.08

Table 3.1.5.3. Cpue data for net and fixed engine salmon fisheries by Region in UK (England & Wales). Data expressed as catch per licence-tide, except the Northeast, for which the data are recorded as catch per licence-day.

		Region (aggregated data, various methods)				
	North East					
Year	drift nets	North East	South West	Midlands	Wales	North West
1988		5.49				-
1989		4.39				0.82
1990		5.53				0.63
1991		3.20				0.51
1992		3.83				0.40
1993	8.23	6.43				0.63
1994	9.02	7.53				0.71
1995	11.18	7.84				0.79
1996	4.93	3.74				0.59
1997	6.48	4.40	0.70	0.48	0.07	0.63
1998	5.92	3.81	1.25	0.42	0.08	0.46
1999	8.06	4.88	0.79	0.72	0.02	0.52
2000	13.06	8.11	1.01	0.66	0.18	1.05
2001	10.34	6.83	0.71	0.79	0.16	0.71
2002	8.55	5.59	1.03	1.39	0.23	0.90
2003	7.13	4.82	1.24	1.13	0.11	0.62
2004	8.17	5.88	1.17	0.46	0.11	0.69
2005	7.23	4.13	0.60	0.97	0.09	1.28
2006	5.60	3.20	0.66	0.97	0.09	0.82
2007	7.24	4.17	0.33	1.26	0.05	0.75
2008	5.41	3.59	0.63	1.33	0.06	0.34
2009	4.76	3.08	0.53	1.67	0.04	0.51
2010	17.03	8.56	0.99	0.26	0.09	0.47
2011	19.25	9.93	0.63	0.14	0.10	0.34
2012	6.80	5.35	0.69		0.21	0.31
2013	11.06	8.22	0.54		0.08	0.39
2014	10.30	6.12	0.43		0.07	0.31
2015	12.93	7.22	0.64		0.08	0.39
Mean	9.07	5.57	0.77	0.84	0.10	0.61
2010-14	12.89	7.64	0.66	0.20	0.11	0.36

Table 3.1.5.4. Catch per unit of effort (cpue) for salmon rod fisheries in UK (England & Wales). [Cpue is expressed as number of salmon (including released fish) caught per 100 days fished].

Year	Region						NRW	England &
	NE	Thames	Southern	SW	Midlands	NW	Wales	Wales
1997	5.0	0.6	3.1	5.2	1.7	5.3	2.6	4.0
1998	6.5	0.0	5.9	7.5	1.3	8.6	3.9	6.0
1999	7.4	0.3	3.1	6.3	2.1	7.4	3.5	5.5
2000	9.2	0.0	5.2	8.8	4.9	11.7	4.4	7.9
2001	11.3	0.0	11.0	6.6	5.4	15.4	5.5	8.7
2002	9.4	0.0	18.3	6.0	3.5	10.0	3.6	6.8
2003	9.7	0.0	8.8	4.7	5.2	8.3	2.9	5.7
2004	14.7	0.0	18.8	9.6	5.5	17.4	6.6	11.4
2005	12.4	0.0	12.7	6.2	6.6	13.9	4.5	9.0
2006	14.2	0.0	15.6	8.7	6.6	13.3	5.9	10.1
2007	11.7	0.0	18.0	8.7	5.7	14.2	6.0	9.6
2008	12.7	0.0	21.8	10.9	5.8	15.3	7.3	10.5
2009	9.5	0.0	13.7	5.7	3.6	9.3	3.6	6.6
2010	16.7	2.8	17.1	9.9	4.3	14.1	6.5	10.2
2011	17.5	0.0	14.5	9.4	6.5	11.4	6.0	10.9
2012	15.4	0.0	17.3	9.2	6.3	9.1	6.5	10.6
2013	16.7	0.0	10.0	5.9	7.9	7.7	5.7	8.9
2014	12.1	0.0	11.9	4.8	5.0	6.9	4.4	7.1
2015	8.9	0.0	15.2	8.8	10.3	7.3	5.0	7.3
Mean	11.6	0.2	12.7	7.5	5.2	10.9	5.0	8.3
Mean (2010-2014)	15.6	0.6	14.2	7.8	6.0	9.8	5.8	9.6

Table 3.1.5.5. Cpue data for net fisheries in UK (Scotland). Catch in numbers of fish per unit of effort.

Year	Fixed engine	Net and coble CPUE
	Catch/trap month [1]	Catch/crew month
1952	33.9	156.4
1953	33.1	121.7
1954	29.3	162.0
1955	37.1	201.8
1956	25.7	117.5
1957	32.6	178.7
1958	48.4	170.4
1959	33.3	159.3
1960	30.7	177.8
1961	31.0	155.2
1962	43.9	242.0
1963	44.2	182.9
1964	57.9	247.1
1965	43.7	188.6
1966	44.9	210.6
1967	72.6	329.8
1968	47.0	198.5
1969	65.5	327.6
1970	50.3	241.9
1971	57.2	231.6
1972	57.5	248.0
1973	73.7	240.6
1974	63.4	257.1
1975	53.6	235.7
1976	42.9	150.8
1977	45.6	188.7
1978	53.9	196.1
1979	42.2	157.2
1980	37.6	158.6
1981	49.6	183.9
1982	61.3	180.2
1983	55.8	203.6
1984	58.9	155.3
1985	49.6	148.9
1986	75.2	193.4
1987	61.8	145.6
1988	50.6	198.4
1989	71.0	262.4
1990	33.2	146.0
1991	35.9	106.4
1992	59.6	153.7
1993	52.8	125.2
1994	92.1	123.7
1995	75.6	142.3
1996	57.5	110.9
1997	33.0	57.8
1998	36.0	68.7
1999	21.9	58.8
2000	54.4	105.5
2001	61.0	77.4
2002	35.9	67.0
2003	68.3	66.8
2004	42.9	54.5
2005	45.8	80.9
2006	45.8	73.3
2007	47.6	91.5
2008	56.1	52.5
2009	42.2	73.3
2010	77.0	179.3
2011	62.6	80.7
2012	50.2	46.7
2013	64.6	129.4
2014	60.6	80.6
2015	74.8	56.7
Mean	50.8	154.9
2010-2014	63.0	103.3

[1] Excludes catch and effort for Solway Region

Table 3.1.5.6. Catch per unit of effort for the marine fishery in Norway. The cpue is expressed as numbers of salmon caught per net day in bag nets and bend nets divided by salmon weight.

	Bagnet				Bendnet		
Year	**< 3kg**	**3-7 kg**	**>7 kg**		**< 3kg**	**3-7 kg**	**>7 kg**
1998	0.88	0.66	0.12		0.80	0.56	0.13
1999	1.16	0.72	0.16		0.75	0.67	0.17
2000	2.01	0.90	0.17		1.24	0.87	0.17
2001	1.52	1.03	0.22		1.03	1.39	0.36
2002	0.91	1.03	0.26		0.74	0.87	0.32
2003	1.57	0.90	0.26		0.84	0.69	0.28
2004	0.89	0.97	0.25		0.59	0.60	0.17
2005	1.17	0.81	0.27		0.72	0.73	0.33
2006	1.02	1.33	0.27		0.72	0.86	0.29
2007	0.43	0.90	0.32		0.57	0.95	0.33
2008	1.07	1.13	0.43		0.57	0.97	0.57
2009	0.73	0.92	0.31		0.44	0.78	0.32
2010	1.46	1.13	0.39		0.82	1.00	0.38
2011	1.30	1.98	0.35		0.71	1.02	0.36
2012	1.12	1.26	0.43		0.89	1.03	0.41
2013	0.69	1.09	0.25		0.38	1.30	0.29
2014	1.83	1.08	0.24		1.27	1.08	0.29
2015	1.32	1.61	0.30		0.41	1.16	0.22
Mean	1.17	1.08	0.28		0.75	0.92	0.30
2010-14	1.28	1.31	0.33		0.81	1.09	0.35

Table 3.1.6.1. Percentage of 1SW salmon in catches from countries in the Northeast Atlantic.

Year	Iceland	Finland	Norway	Russia	Sweden	**Northern countries**	UK (Scot)	UK (E&W)	France	Spain (Asturia)	**Southern countries**
1987		66	61	71		**63**	61	68	77		**63**
1988		63	64	53		**62**	57	69	29		**60**
1989	69	66	73	73	41	**72**	63	65	33		**63**
1990	66	64	68	73	75	**69**	48	52	45		**49**
1991	71	59	65	70	74	**66**	53	71	39		**58**
1992	72	70	62	72	69	**65**	55	77	48		**59**
1993	76	58	61	61	67	**63**	57	81	74	64	**64**
1994	63	55	68	69	67	**67**	54	77	55	69	**61**
1995	71	59	58	70	85	**62**	53	72	60	26	**59**
1996	73	79	53	80	68	**61**	53	65	51	34	**56**
1997	73	69	64	82	57	**68**	54	73	51	28	**60**
1998	82	75	66	82	66	**70**	58	82	71	54	**65**
1999	70	83	65	78	81	**68**	45	68	27	14	**54**
2000	82	71	67	75	69	**69**	54	79	58	74	**65**
2001	78	48	58	74	54	**60**	55	75	51	40	**62**
2002	83	34	49	70	62	**54**	54	76	69	38	**64**
2003	75	51	61	67	79	**62**	52	66	51	16	**55**
2004	86	47	52	68	50	**58**	51	81	40	67	**59**
2005	87	72	67	66	59	**69**	58	76	41	15	**61**
2006	84	73	54	77	61	**60**	57	78	50	15	**61**
2007	91	30	42	69	34	**50**	57	78	45	26	**61**
2008	90	34	46	58	36	**54**	48	76	42	11	**55**
2009	91	62	49	63	40	**59**	49	72	42	30	**54**
2010	82	50	56	58	49	**61**	55	78	67	32	**63**
2011	85	61	41	58	32	**50**	36	57	35	2	**45**
2012	86	76	47	70	30	**55**	49	50	38	18	**49**
2013	93	59	52	65	38	**64**	55	58	47	13	**55**
2014	80	65	59	63	46	**61**	49	58	40	4	**50**
2015	91	44	58	65	29	**63**	60	47	34	N/A	**52**
Means											
1987-2000	72	67	64	72	68	66	55	71	51	45	60
2001-2015	85	54	53	66	47	59	52	68	46	23	56

Table 3.2.1.1. Conservation limit options for NEAC stock groups estimated from river-specific values, where available, or the national PFA run- reconstruction model. SERs based on the CLs used are also shown.

	National Model CLs		River Specific CLs		Conservation limit used		SER	
	1SW	MSW	1SW	MSW	1SW	MSW	1SW	MSW
Northern Europe								
Finland			14,110	9,571	14,110	9,571	17,175	16,495
Icland (north & east)	5,826	1,652			5,826	1,652	7,199	2,847
Norway			61,937	72,558	61,937	72,558	78,888	121,319
Russia	66,906	38,697			66,906	38,697	85,138	69,971
Sweden			3,053	3,310	3,053	3,310	3,948	5,791
			Stock Complex		**151,832**	**125,788**	**192,348**	**216,422**

	National Model CLs		River Specific CLs		Conservation limit used		SER	
	1SW	MSW	1SW	MSW	1SW	MSW	1SW	MSW
Southern Europe								
France			17,400	5,100	17,400	5,100	22,499	9,479
Icland (south & west)	17,698	1,199			17,698	1,199	21,870	2,067
Ireland			211,471	46,943	211,471	46,943	269,344	78,490
UK (E & W)			54,812	30,203	54,812	30,203	69,812	52,051
UK (NI)			19,998	3,237	19,998	3,237	24,526	5,461
UK (Sco)	248,080	186,281			248,080	186,281	315,972	317,917
			Stock Complex		**569,460**	**272,964**	**724,023**	**465,465**

Table 3.3.4.1. Estimated number of returning 1SW salmon by NEAC country or region and year.

Year	Northern Europe								Southern Europe									NEAC Area		
	Finland	Iceland	Norway	Russia	Sweden	Total			France	Iceland	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total			Total		
		N&E				5.0%	**50.0%**	95.0%		S&W					5.0%	**50.0%**	95.0%	5.0%	50.0%	95.0%
1971	25,902	9,408		153,884	17,159				49,440	62,591	1,051,256	82,573	182,263	618,996	1,831,840	**2,060,667**	2,347,379			
1972	100,878	8,603		117,279	13,652				99,101	50,792	1,127,891	79,349	158,869	542,735	1,831,010	**2,073,378**	2,377,992			
1973	46,961	10,310		173,062	16,906				61,246	54,440	1,224,362	93,586	138,857	649,458	1,973,207	**2,238,617**	2,578,386			
1974	64,850	10,324		172,467	24,489				28,169	38,903	1,394,009	117,986	151,377	619,357	2,072,568	**2,358,961**	2,738,082			
1975	77,344	12,543		264,025	26,587				56,509	60,146	1,543,936	120,397	124,553	505,189	2,109,195	**2,423,200**	2,820,172			
1976	71,130	12,628		183,665	14,924				51,789	47,562	1,045,678	80,604	86,604	434,318	1,545,147	**1,755,295**	2,038,553			
1977	40,030	17,604		117,637	6,754				40,116	48,607	903,244	91,161	85,247	453,167	1,442,059	**1,630,699**	1,880,354			
1978	38,036	17,822		118,283	8,047				41,074	63,570	792,507	104,220	110,937	519,662	1,465,476	**1,641,184**	1,865,894			
1979	34,228	17,082		164,496	8,274				46,787	58,744	726,416	99,814	77,966	428,857	1,292,683	**1,448,808**	1,648,578			
1980	26,936	2,583		117,212	10,663				98,236	26,626	554,336	93,730	98,908	266,722	1,022,350	**1,149,883**	1,308,027			
1981	24,199	13,370		96,933	19,330				77,348	34,410	291,626	97,691	77,426	328,841	840,443	**917,262**	1,002,024			
1982	14,367	6,135		85,093	17,093				47,947	35,349	602,946	83,085	111,878	472,745	1,240,592	**1,362,961**	1,504,900			
1983	35,098	9,051	699,879	141,600	22,685	816,334	**911,093**	1,022,212	51,217	44,671	1,067,726	122,066	156,967	482,923	1,743,246	**1,934,286**	2,165,310	2,631,698	**2,848,611**	3,102,300
1984	38,262	3,284	730,342	152,299	32,149	857,995	**960,045**	1,080,695	84,897	27,457	559,297	107,049	61,691	509,633	1,237,792	**1,360,937**	1,502,359	2,161,547	**2,324,528**	2,505,635
1985	50,955	22,726	740,206	209,349	38,166	965,574	**1,065,322**	1,184,873	31,511	44,416	928,174	106,582	79,855	421,663	1,452,840	**1,619,231**	1,820,424	2,491,090	**2,690,763**	2,918,050
1986	40,134	28,309	646,171	178,774	39,814	851,147	**937,662**	1,033,994	48,623	73,293	1,038,866	123,648	89,856	522,249	1,718,567	**1,915,910**	2,156,544	2,634,251	**2,857,251**	3,109,561
1987	48,357	16,582	543,045	191,328	31,698	760,347	**835,133**	918,785	86,049	45,454	670,892	128,249	49,059	403,680	1,247,759	**1,408,674**	1,603,520	2,066,201	**2,246,027**	2,455,111
1988	28,554	24,134	499,310	131,821	26,645	650,569	**712,041**	782,752	29,297	82,060	906,760	176,243	115,632	611,666	1,748,356	**1,937,834**	2,159,870	2,447,938	**2,652,749**	2,884,359
1989	62,318	12,981	549,461	196,927	7,760	755,894	**830,409**	922,691	16,027	45,501	652,411	118,496	111,455	670,219	1,477,278	**1,625,045**	1,796,823	2,292,153	**2,458,572**	2,648,837
1990	62,214	9,691	490,788	163,271	17,962	680,278	**746,401**	824,402	26,781	42,036	407,709	85,171	92,185	320,778	894,092	**984,996**	1,091,239	1,617,247	**1,734,234**	1,859,178
1991	61,105	14,098	429,295	138,675	22,597	608,204	**668,237**	737,766	19,449	46,507	291,438	83,832	51,438	319,032	749,484	**819,095**	901,768	1,393,829	**1,490,953**	1,593,867
1992	86,379	26,529	361,902	171,470	25,056	618,740	**675,546**	737,975	35,664	53,057	422,396	87,823	104,260	464,932	1,076,937	**1,183,046**	1,302,261	1,739,407	**1,860,050**	1,991,849
1993	58,354	21,787	363,360	146,722	24,911	569,228	**618,325**	672,829	51,279	51,994	343,980	122,326	122,035	417,737	1,028,019	**1,126,467**	1,243,105	1,634,283	**1,746,846**	1,873,619
1994	32,316	6,987	490,920	173,344	19,312	658,022	**726,698**	812,147	40,355	42,929	440,406	135,127	83,866	445,583	1,098,617	**1,203,817**	1,326,006	1,805,113	**1,934,627**	2,076,187
1995	32,375	18,312	320,674	156,443	28,122	512,094	**559,499**	610,728	13,425	52,855	490,644	103,672	77,818	436,502	1,078,158	**1,182,316**	1,304,135	1,628,182	**1,742,412**	1,875,264
1996	54,806	9,774	244,491	211,534	16,746	497,412	**540,563**	591,622	16,456	45,720	456,799	77,015	80,422	314,085	902,834	**997,794**	1,109,083	1,435,109	**1,540,774**	1,660,718
1997	49,881	13,318	282,917	208,519	7,627	517,060	**564,730**	619,272	8,409	33,359	456,523	68,955	95,544	225,574	806,562	**893,733**	1,000,669	1,358,671	**1,461,293**	1,577,318
1998	62,294	22,726	368,667	227,377	6,167	631,634	**691,631**	759,360	16,441	45,608	478,813	75,599	207,932	307,293	1,039,229	**1,143,119**	1,263,743	1,716,280	**1,836,813**	1,969,952
1999	83,448	11,529	342,179	176,635	9,698	574,971	**626,463**	684,478	5,465	37,196	446,454	60,015	54,204	152,324	677,902	**760,260**	860,831	1,286,712	**1,388,292**	1,503,520
2000	90,451	12,118	563,569	192,743	17,862	804,504	**881,018**	970,596	14,278	32,976	620,972	91,276	78,671	297,715	1,026,395	**1,143,260**	1,286,126	1,885,767	**2,027,445**	2,190,144
2001	65,567	11,052	485,945	260,517	11,100	752,983	**841,121**	949,400	12,318	29,498	492,703	79,417	63,286	291,573	896,421	**978,625**	1,070,303	1,697,711	**1,823,307**	1,960,188
2002	44,697	19,071	297,284	236,919	10,632	545,194	**612,767**	705,207	27,491	36,813	430,377	75,287	114,610	234,840	856,834	**931,988**	1,014,688	1,441,929	**1,549,927**	1,670,018
2003	43,910	10,171	412,418	211,805	5,768	615,176	**688,842**	778,519	18,109	44,061	421,503	58,258	70,323	265,974	819,188	**889,745**	973,430	1,474,431	**1,581,670**	1,701,949
2004	18,680	27,399	250,031	147,709	4,806	406,800	**451,383**	507,126	22,192	44,100	310,464	104,918	67,458	316,520	803,243	**879,977**	968,333	1,242,908	**1,334,530**	1,435,483
2005	40,987	24,383	370,635	169,631	4,759	553,832	**615,287**	687,054	14,412	64,883	310,254	85,805	84,719	343,471	844,416	**915,218**	997,234	1,435,716	**1,532,924**	1,639,290
2006	71,827	25,596	299,646	203,716	5,275	548,909	**610,371**	687,821	20,209	46,038	236,769	84,162	57,431	333,554	719,974	**792,121**	875,023	1,306,599	**1,406,172**	1,515,252
2007	21,017	19,039	167,830	109,753	1,635	289,019	**321,502**	362,445	15,874	52,487	157,419	80,848	84,734	326,430	652,156	**740,643**	865,261	967,055	**1,064,600**	1,191,868
2008	22,647	17,425	210,126	114,426	2,562	332,565	**370,350**	416,785	15,629	63,832	254,480	79,364	53,227	281,531	655,392	**771,762**	978,609	1,018,611	**1,144,396**	1,355,568
2009	40,203	28,084	168,416	108,990	2,732	316,414	**350,707**	390,665	4,414	71,869	207,386	49,506	33,204	240,526	531,593	**624,887**	784,762	876,092	**977,525**	1,140,325
2010	32,313	22,383	249,957	123,500	4,632	392,469	**435,916**	484,648	15,066	73,758	272,743	97,363	38,171	439,369	824,117	**972,271**	1,199,047	1,252,973	**1,409,425**	1,642,168
2011	36,658	18,463	175,671	131,620	3,968	332,334	**368,926**	411,180	10,228	51,903	234,291	57,273	33,842	234,790	542,664	**642,028**	827,107	903,899	**1,013,065**	1,199,603
2012	63,535	9,604	195,999	152,476	5,593	388,096	**431,152**	483,900	11,129	29,521	244,400	35,104	54,835	311,566	592,307	**725,301**	935,273	1,016,185	**1,160,287**	1,372,122
2013	36,605	22,854	183,866	118,441	3,251	330,879	**369,187**	416,306	15,724	87,657	203,596	45,359	38,868	363,824	658,954	**797,617**	988,753	1,021,956	**1,168,051**	1,363,543
2014	51,961	10,809	251,414	111,486	8,961	391,451	**440,300**	496,792	14,001	21,724	136,224	26,726	21,559	277,273	425,011	**523,121**	657,647	852,593	**966,784**	1,108,727
2015	32,378	30,952	221,914	116,342	3,936	366,503	**410,328**	461,305	12,969	58,939	183,357	32,219	42,431	294,305	535,534	**663,884**	833,513	938,726	**1,075,672**	1,252,081
10yr Av.	40,914	20,521	212,484	129,075	4,254	368,864	410,874	461,185	13,524	55,773	213,066	58,793	45,830	310,317	613,770	725,363	894,499	1,015,469	1,138,598	1,314,126

Table 3.3.4.2. Estimated number of returning MSW salmon by NEAC country or region and year.

Year	Northern Europe								Southern Europe									NEAC Area		
	Finland	Iceland N&E	Norway	Russia	Sweden	Total 5.0%	Total 50.0%	Total 95.0%	France	Iceland S&W	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total 5.0%	Total 50.0%	Total 95.0%	Total 5.0%	Total 50.0%	Total 95.0%
1971	23,912	9,653		132,430	641				10,784	24,430	157,884	90,802	21,920	568,119	780,011	**881,651**	998,170			
1972	25,220	15,067		134,752	506				21,572	37,410	168,999	150,465	19,171	731,694	1,007,708	**1,139,387**	1,287,172			
1973	40,271	14,099		222,386	2,252				13,295	33,828	183,142	114,539	16,744	801,773	1,034,104	**1,172,147**	1,342,413			
1974	68,644	13,347		209,970	1,420				6,177	29,213	206,788	84,205	18,285	568,246	813,353	**920,923**	1,048,210			
1975	87,769	14,820		225,168	404				12,300	31,084	230,670	115,020	15,013	626,929	919,202	**1,041,992**	1,187,793			
1976	68,905	12,165		195,058	1,211				9,028	26,780	160,077	60,786	10,431	391,413	586,657	**664,447**	754,251			
1977	47,837	16,984		134,213	520				6,938	26,148	139,738	76,553	10,292	428,574	613,877	**694,637**	786,871			
1978	24,339	21,893		116,014	641				7,136	33,746	120,656	64,106	13,384	532,758	686,458	**778,098**	889,756			
1979	24,190	14,423		101,465	1,665				8,168	21,638	108,501	31,889	9,415	395,153	507,885	**579,730**	666,353			
1980	23,807	20,069		169,049	3,251				16,907	30,357	120,331	103,313	11,895	482,826	689,543	**774,399**	875,121			
1981	28,010	7,038		96,578	715				11,793	20,338	88,673	145,057	9,341	518,906	712,699	**803,011**	908,816			
1982	37,653	8,066		85,499	3,489				7,239	14,327	51,515	56,217	13,497	418,590	501,130	**565,356**	644,807			
1983	41,609	6,155	428,293	123,931	2,266	548,458	**604,490**	670,713	7,721	23,946	105,869	64,250	18,965	451,216	606,652	**676,338**	762,048	1,189,866	**1,282,792**	1,388,941
1984	34,849	7,954	438,579	123,611	3,180	554,308	**610,236**	675,250	12,699	20,278	76,384	51,767	7,445	376,414	492,025	**548,555**	618,452	1,079,938	**1,161,679**	1,252,656
1985	33,518	5,110	404,936	135,276	1,184	529,834	**581,993**	643,556	9,597	14,752	83,637	75,960	9,662	464,642	591,518	**662,077**	743,187	1,156,980	**1,246,023**	1,346,192
1986	27,592	13,944	485,641	134,113	602	600,721	**664,010**	736,054	9,677	12,273	94,674	103,118	10,855	593,798	736,522	**831,317**	945,383	1,380,855	**1,497,509**	1,630,333
1987	36,306	14,457	367,274	99,513	2,729	475,500	**521,940**	577,894	5,201	10,915	117,386	82,460	5,551	388,277	547,674	**613,658**	691,244	1,054,530	**1,138,520**	1,230,511
1988	25,577	9,314	306,274	99,773	2,929	408,012	**445,660**	489,145	14,092	12,417	84,745	107,430	15,612	601,462	748,680	**840,724**	951,860	1,186,757	**1,287,824**	1,406,555
1989	25,012	7,893	219,691	97,192	10,203	332,733	**361,285**	395,344	6,512	11,057	77,416	86,739	12,436	524,444	646,372	**723,744**	816,077	1,002,773	**1,086,555**	1,182,907
1990	27,597	8,325	260,177	124,620	5,302	392,498	**427,649**	467,538	6,650	11,026	37,142	106,873	11,324	438,119	547,719	**616,191**	694,534	967,561	**1,045,384**	1,132,660
1991	36,949	5,783	220,141	122,368	7,171	363,444	**394,329**	429,211	6,040	10,932	56,053	46,825	5,820	333,361	413,964	**462,488**	518,517	798,834	**857,459**	921,802
1992	36,041	8,594	239,279	116,294	9,946	379,071	**411,697**	448,801	7,606	12,345	42,970	36,180	13,326	444,022	499,048	**558,455**	633,365	902,485	**971,852**	1,053,382
1993	37,659	9,713	229,555	137,669	11,312	398,814	**427,497**	460,055	3,588	6,057	41,887	39,381	31,421	363,775	437,241	**491,861**	556,815	857,251	**920,682**	992,454
1994	35,514	8,264	224,780	121,769	8,578	370,190	**401,262**	434,057	7,674	9,786	67,412	55,598	11,032	441,577	534,502	**596,574**	674,119	926,949	**998,866**	1,081,892
1995	23,397	5,223	240,832	138,722	4,256	383,010	**414,079**	448,659	3,646	10,068	65,065	55,659	9,356	407,884	495,232	**555,759**	632,872	900,801	**970,996**	1,053,798
1996	23,974	6,862	241,402	104,569	6,989	355,972	**385,596**	420,083	6,477	6,504	43,671	57,665	10,267	312,525	392,040	**441,333**	500,375	769,471	**828,523**	896,109
1997	28,779	3,861	159,308	85,143	5,015	261,928	**284,185**	308,688	3,353	7,306	56,470	35,875	12,739	215,426	296,790	**337,381**	385,696	574,686	**622,134**	675,389
1998	27,654	5,628	191,142	105,361	2,762	309,275	**334,489**	362,074	2,827	4,521	32,850	23,284	17,517	227,747	278,511	**311,234**	351,550	603,393	**647,042**	694,831
1999	29,544	6,451	204,323	92,969	1,984	308,269	**336,691**	368,182	6,110	8,805	51,256	46,569	7,967	175,579	261,332	**306,243**	363,185	589,331	**643,944**	708,452
2000	56,130	3,776	282,501	162,257	7,102	476,329	**514,442**	557,719	4,269	2,388	63,924	48,370	10,613	223,897	319,544	**359,883**	409,149	818,526	**875,181**	939,194
2001	74,755	4,350	332,866	115,034	8,453	494,353	**537,915**	587,577	4,969	4,206	56,989	51,554	6,614	213,719	302,093	**344,889**	399,566	821,361	**884,050**	955,389
2002	66,119	4,120	289,163	125,489	5,784	452,015	**493,016**	538,020	4,608	4,548	65,772	46,954	8,471	175,350	274,473	**312,004**	357,834	748,463	**805,797**	868,615
2003	47,439	4,307	255,488	87,233	1,384	365,897	**397,924**	433,951	6,637	7,277	69,193	60,636	5,087	218,220	326,855	**374,574**	432,091	714,860	**773,705**	841,082
2004	21,534	4,244	231,722	67,137	4,261	301,401	**329,697**	363,303	12,415	5,883	37,980	51,388	5,352	282,375	352,765	**402,344**	462,853	675,212	**733,363**	800,443
2005	17,879	5,256	213,403	80,549	2,873	295,202	**320,876**	349,923	7,658	5,178	49,379	55,679	6,739	222,231	310,399	**352,882**	407,006	623,644	**674,576**	734,689
2006	28,066	5,040	270,640	77,192	2,990	353,999	**384,938**	420,723	7,674	4,304	35,608	50,184	5,305	230,817	296,321	**342,674**	398,027	670,124	**728,666**	793,126
2007	40,940	4,854	229,782	80,683	2,796	332,981	**360,080**	390,842	7,285	2,652	13,903	48,418	5,493	221,798	263,377	**305,379**	357,470	616,029	**666,720**	725,071
2008	40,998	6,259	265,536	126,144	3,929	407,301	**445,487**	489,777	8,043	3,024	18,725	53,061	4,292	249,111	293,948	**343,578**	405,488	724,577	**790,579**	864,528
2009	17,599	5,022	207,547	107,007	3,449	312,056	**342,201**	377,841	3,726	4,704	23,449	40,736	4,340	211,221	251,797	**294,263**	345,859	583,300	**638,257**	697,396
2010	28,352	7,109	228,540	132,270	4,005	367,738	**402,469**	442,107	3,058	9,719	21,927	60,374	6,925	279,042	330,639	**389,954**	463,273	722,847	**794,129**	875,808
2011	21,797	7,914	319,188	132,019	7,531	444,799	**490,388**	542,930	8,584	4,927	23,755	88,464	11,467	312,551	390,814	**462,543**	557,208	866,350	**954,120**	1,062,429
2012	26,219	4,490	279,012	65,061	10,704	350,183	**386,798**	430,379	6,868	2,813	20,996	73,733	19,119	248,586	319,985	**386,115**	466,772	696,185	**774,276**	864,672
2013	25,336	5,150	196,949	74,314	4,540	280,117	**307,461**	339,248	7,066	7,772	23,904	67,331	3,927	218,640	280,223	**338,880**	414,568	580,622	**647,873**	729,023
2014	27,480	6,154	201,993	73,517	9,170	288,275	**319,791**	357,174	8,775	4,760	13,276	45,237	2,622	185,428	221,165	**267,518**	328,490	529,981	**589,008**	659,045
2015	26,435	6,137	256,048	69,228	9,729	332,919	**369,163**	412,706	9,864	3,719	17,413	71,980	5,358	133,987	206,845	**251,006**	313,214	561,763	**622,901**	692,669
10yr Av.	28,322	5,813	245,524	93,744	5,884	347,037	**380,878**	420,373	7,094	4,839	21,296	59,952	6,885	229,118	285,511	**338,191**	405,037	655,178	**720,653**	796,377

Table 3.3.4.3. Estimated pre-fishery abundance of maturing 1SW salmon (potential 1SW returns) by NEAC country or region and year.

	Northern Europe								Southern Europe									NEAC Area		
Year	Finland	Iceland	Norway	Russia	Sweden	Total			France	Iceland	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total			Total		
		N&E				5.0%	**50.0%**	95.0%		S&W					5.0%	**50.0%**	95.0%	5.0%	50.0%	95.0%
1971	31,626	11,730	NA	NA	22,119	NA	NA	NA	64,082	77,347	1,339,867	105,897	223,248	792,133	2,274,376	**2,617,214**	3,056,800	NA	NA	NA
1972	123,032	10,716	NA	150,974	17,585	NA	NA	NA	128,515	62,895	1,437,297	101,894	194,934	693,727	2,280,242	**2,636,395**	3,091,453	NA	NA	NA
1973	57,264	12,837	NA	223,057	21,880	NA	NA	NA	79,249	67,297	1,564,960	120,299	170,380	831,615	2,456,276	**2,851,691**	3,344,030	NA	NA	NA
1974	78,866	12,821	NA	221,291	31,629	NA	NA	NA	36,659	48,159	1,773,507	150,623	185,268	790,211	2,577,356	**2,998,205**	3,550,537	NA	NA	NA
1975	94,163	15,607	NA	339,433	34,279	NA	NA	NA	73,368	74,575	1,965,469	154,192	152,999	647,391	2,623,484	**3,086,470**	3,663,848	NA	NA	NA
1976	86,589	15,658	NA	236,843	19,267	NA	NA	NA	66,969	58,721	1,333,336	103,155	106,362	554,902	1,919,579	**2,237,819**	2,648,670	NA	NA	NA
1977	48,735	21,756	NA	151,146	8,737	NA	NA	NA	51,994	60,061	1,153,801	116,260	104,510	577,477	1,786,740	**2,077,762**	2,434,889	NA	NA	NA
1978	46,308	22,026	NA	152,616	10,370	NA	NA	NA	53,063	78,556	1,008,798	133,088	136,066	662,015	1,816,139	**2,083,744**	2,416,455	NA	NA	NA
1979	41,656	21,165	NA	211,868	10,663	NA	NA	NA	60,677	72,713	927,501	127,525	95,708	547,973	1,607,615	**1,845,960**	2,146,945	NA	NA	NA
1980	32,974	3,346	NA	151,545	13,761	NA	NA	NA	127,255	33,256	714,084	120,954	122,107	347,757	1,284,344	**1,478,464**	1,712,353	NA	NA	NA
1981	29,698	16,670	NA	125,704	24,995	NA	NA	NA	100,745	42,973	380,139	126,641	96,310	428,086	1,059,995	**1,186,322**	1,331,600	NA	NA	NA
1982	17,638	7,715	NA	109,734	22,095	NA	NA	NA	62,326	44,027	771,687	107,213	137,692	607,501	1,542,949	**1,742,212**	1,967,616	NA	NA	NA
1983	42,898	11,353	892,433	182,547	29,363	1,013,815	**1,161,373**	1,333,536	66,913	55,544	1,367,038	157,659	193,125	624,081	2,173,452	**2,474,482**	2,831,689	3,259,742	**3,638,824**	4,085,041
1984	46,646	4,150	928,455	196,003	41,399	1,061,900	**1,220,934**	1,408,084	109,831	34,145	714,977	137,356	76,408	652,488	1,541,358	**1,739,449**	1,969,264	2,665,573	**2,963,848**	3,302,758
1985	62,183	28,101	941,428	269,802	49,155	1,195,738	**1,356,079**	1,547,489	40,956	55,028	1,184,918	136,658	98,308	540,847	1,811,069	**2,066,027**	2,372,638	3,076,805	**3,425,959**	3,832,647
1986	48,854	35,058	823,076	230,337	51,335	1,050,427	**1,193,278**	1,354,710	63,192	90,755	1,324,954	158,592	110,760	671,105	2,135,562	**2,445,479**	2,813,022	3,255,430	**3,642,410**	4,077,613
1987	58,951	20,587	691,609	246,526	40,853	943,214	**1,062,067**	1,201,579	111,406	56,368	857,666	164,501	61,053	518,036	1,561,860	**1,803,486**	2,101,597	2,558,533	**2,871,795**	3,228,386
1988	34,821	29,857	635,654	169,266	34,372	804,298	**906,046**	1,025,561	38,161	101,371	1,156,650	224,638	141,713	781,196	2,166,412	**2,464,506**	2,812,445	3,018,841	**3,375,346**	3,773,981
1989	75,802	16,059	699,003	251,541	10,017	931,950	**1,055,433**	1,202,300	20,977	56,317	828,508	151,351	136,471	855,106	1,825,848	**2,063,588**	2,344,234	2,813,688	**3,123,240**	3,476,937
1990	75,753	12,044	626,533	208,822	23,246	838,048	**948,551**	1,076,022	34,861	52,110	521,004	109,244	113,109	411,041	1,107,364	**1,256,323**	1,426,295	1,990,423	**2,207,756**	2,446,867
1991	74,335	17,423	545,129	177,988	29,143	751,453	**847,474**	961,432	25,236	57,404	370,376	107,188	63,115	406,326	925,549	**1,042,143**	1,178,056	1,711,961	**1,892,688**	2,096,045
1992	105,110	32,772	460,929	219,234	32,460	762,388	**855,757**	958,864	46,273	65,681	537,612	111,711	127,229	592,386	1,332,902	**1,498,518**	1,694,671	2,135,314	**2,355,228**	2,606,293
1993	70,957	26,973	462,178	187,840	32,215	699,492	**784,290**	880,072	66,269	64,191	436,381	155,914	148,995	531,335	1,266,178	**1,426,682**	1,615,872	1,998,991	**2,212,349**	2,451,489
1994	39,267	8,650	625,206	223,191	24,957	814,452	**925,816**	1,057,139	51,957	52,958	560,132	172,285	102,445	566,846	1,357,488	**1,526,730**	1,727,820	2,217,402	**2,457,131**	2,725,513
1995	39,452	22,650	408,372	200,296	36,367	633,554	**710,979**	800,061	17,408	65,357	623,412	131,988	95,031	555,757	1,329,491	**1,499,490**	1,696,360	1,998,562	**2,211,815**	2,454,534
1996	66,570	12,102	311,308	271,540	21,679	611,591	**687,661**	773,808	21,225	56,392	581,034	98,023	98,333	399,939	1,116,435	**1,265,189**	1,438,482	1,761,456	**1,954,862**	2,170,279
1997	60,569	16,425	359,949	267,618	9,870	637,826	**717,804**	809,573	10,863	41,149	580,764	87,685	116,546	286,999	994,944	**1,131,508**	1,294,904	1,667,155	**1,850,125**	2,060,599
1998	75,746	28,041	468,761	292,439	7,948	778,971	**877,447**	994,762	21,260	56,327	609,347	96,276	254,184	391,757	1,275,668	**1,442,040**	1,630,090	2,097,422	**2,323,138**	2,573,361
1999	101,522	14,226	435,236	226,167	12,529	705,182	**793,147**	892,229	7,059	45,767	567,594	76,456	66,157	193,971	838,012	**962,686**	1,114,685	1,580,827	**1,758,446**	1,960,542
2000	109,906	14,950	716,222	247,342	23,031	990,020	**1,116,647**	1,264,322	18,444	40,754	788,802	115,795	95,994	378,354	1,267,399	**1,449,843**	1,662,972	2,307,049	**2,569,055**	2,861,705
2001	79,747	13,644	617,920	335,208	14,325	935,000	**1,068,722**	1,235,789	15,934	36,455	627,066	101,057	77,286	370,995	1,103,574	**1,239,100**	1,397,443	2,085,236	**2,311,648**	2,569,244
2002	54,282	23,559	377,617	303,488	13,736	675,546	**779,969**	916,582	35,472	45,369	547,240	95,960	139,801	299,370	1,051,268	**1,176,860**	1,324,136	1,765,452	**1,961,728**	2,181,213
2003	53,476	12,581	524,539	270,289	7,442	762,290	**875,664**	1,014,628	23,460	54,416	537,713	74,317	85,938	338,595	1,005,558	**1,128,184**	1,269,039	1,808,712	**2,006,354**	2,229,523
2004	22,684	33,825	317,872	189,002	6,222	502,525	**573,769**	660,768	28,730	54,487	394,809	133,367	82,459	402,210	988,309	**1,114,342**	1,259,050	1,522,608	**1,690,122**	1,880,665
2005	49,793	30,083	471,444	217,460	6,147	684,069	**780,464**	895,180	18,653	80,157	394,582	108,944	103,462	436,682	1,037,072	**1,157,236**	1,294,893	1,755,033	**1,940,916**	2,143,994
2006	87,369	31,582	381,087	260,580	6,808	677,127	**772,682**	889,236	26,146	56,736	300,923	106,972	70,063	423,581	887,381	**1,001,738**	1,136,142	1,603,100	**1,777,147**	1,977,255
2007	25,571	23,486	213,423	140,624	2,114	355,787	**408,170**	470,720	20,480	64,804	200,269	102,910	103,465	415,761	801,987	**937,191**	1,110,025	1,187,972	**1,348,349**	1,542,341
2008	27,589	21,510	267,461	146,548	3,310	410,186	**470,410**	542,431	20,245	78,777	324,472	101,144	65,199	358,953	813,951	**978,493**	1,256,054	1,258,216	**1,455,281**	1,748,465
2009	48,841	34,759	213,770	137,657	3,527	389,359	**441,834**	504,355	5,739	88,625	263,830	62,858	40,541	306,436	658,692	**793,045**	1,000,538	1,078,497	**1,239,973**	1,464,387
2010	39,331	27,684	318,076	156,615	6,000	484,352	**551,744**	627,041	19,495	91,063	348,048	124,426	46,626	562,007	1,026,517	**1,234,665**	1,544,916	1,553,429	**1,789,577**	2,118,348
2011	44,626	22,780	223,484	167,324	5,130	409,002	**466,114**	531,591	13,245	64,103	298,714	72,892	41,390	299,065	676,334	**816,092**	1,056,435	1,116,843	**1,286,947**	1,538,602
2012	77,126	11,881	249,155	195,025	7,225	477,625	**545,245**	627,090	14,398	36,339	311,089	44,812	67,095	397,799	736,420	**918,393**	1,193,331	1,257,121	**1,469,720**	1,763,989
2013	44,515	28,253	234,009	152,169	4,195	408,589	**468,605**	539,643	20,263	108,239	258,333	57,772	47,477	463,015	820,597	**1,007,841**	1,270,007	1,265,608	**1,478,723**	1,760,740
2014	63,123	13,372	319,987	143,092	11,572	484,840	**558,001**	645,723	18,118	26,780	173,569	34,002	26,396	353,219	531,860	**664,572**	845,355	1,057,741	**1,227,380**	1,435,476
2015	39,405	38,218	282,342	149,557	5,088	453,090	**520,433**	599,541	16,678	72,729	233,875	41,102	51,575	375,080	668,611	**841,047**	1,066,328	1,165,746	**1,363,456**	1,616,063
10yr Av.	49,750	25,352	270,280	164,919	5,497	454,996	**520,324**	597,737	17,481	68,820	271,312	74,889	55,983	395,492	762,235	**919,308**	1,147,913	1,254,427	**1,443,655**	1,696,567

Table 3.3.4.4. Estimated pre-fishery abundance of non-maturing 1SW salmon (potential MSW returns) by NEAC country or region and year.

	Northern Europe								Southern Europe									NEAC Area		
Year	Finland	Iceland	Norway	Russia	Sweden	Total			France	Iceland	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total			Total		
		N&E				0.05	**0.50**	0.95		S&W					0.05	**0.50**	0.95	0.05	0.50	0.95
1,971	52,164	27,073	NA	266,905	4,433				60,414	65,451	389,524	370,376	32,838	1,718,304	2,242,753	**2,649,919**	3,137,487			
1,972	78,919	25,467	NA	428,906	7,103				39,871	59,153	385,797	282,129	28,908	1,720,339	2,120,732	**2,526,043**	3,032,128			
1,973	125,183	23,852	NA	397,819	4,645				21,485	50,953	398,075	200,916	31,273	1,203,644	1,604,529	**1,917,984**	2,309,557			
1,974	159,738	26,493	NA	430,866	3,353				34,803	54,323	448,725	264,942	26,000	1,344,192	1,826,218	**2,186,195**	2,624,971			
1,975	124,390	21,713	NA	367,256	4,548				30,698	46,724	341,267	182,488	17,993	998,750	1,379,642	**1,624,913**	1,922,730			
1,976	86,734	29,721	NA	253,841	2,360				20,363	45,436	272,674	173,990	17,616	905,786	1,206,939	**1,445,102**	1,723,790			
1,977	45,159	38,124	NA	218,640	2,641				22,723	58,636	252,342	163,618	22,693	1,130,047	1,386,714	**1,658,435**	1,989,151			
1,978	47,003	25,474	NA	198,897	4,297				20,326	37,669	208,548	84,044	16,307	791,708	964,537	**1,165,530**	1,413,193			
1,979	54,311	36,045	NA	346,416	8,794				40,341	53,548	246,528	230,383	21,213	1,034,773	1,371,727	**1,638,364**	1,951,335			
1,980	69,782	14,406	NA	239,355	5,781				31,232	37,066	193,684	306,881	17,778	1,106,984	1,423,275	**1,705,416**	2,038,546			
1,981	84,869	16,014	NA	214,143	10,241				21,648	26,586	126,099	146,535	24,582	908,590	1,058,279	**1,258,581**	1,509,164			
1,982	87,350	12,234	831,348	268,975	7,186	1,017,161	**1,210,309**	1,448,448	20,790	42,584	208,599	149,592	33,185	922,754	1,157,415	**1,383,412**	1,657,508	2,208,459	**2,599,441**	3,064,984
1,983	69,803	14,695	807,832	251,433	7,539	963,273	**1,153,692**	1,380,915	26,932	35,765	142,698	109,429	13,475	720,870	877,482	**1,053,530**	1,272,533	1,868,843	**2,210,938**	2,612,845
1,984	68,239	9,900	754,336	276,046	4,127	935,840	**1,116,103**	1,337,236	20,685	26,282	152,376	148,949	17,182	860,057	1,017,197	**1,231,831**	1,491,694	1,985,394	**2,349,473**	2,787,590
1,985	60,269	25,371	906,933	280,223	3,847	1,070,741	**1,280,637**	1,540,298	24,508	22,385	190,681	217,550	19,427	1,165,188	1,366,666	**1,647,181**	1,985,561	2,478,796	**2,930,135**	3,473,352
1,986	74,357	26,180	705,608	215,875	7,443	865,268	**1,032,668**	1,236,800	16,230	19,968	228,625	181,250	10,465	815,723	1,073,822	**1,276,608**	1,535,784	1,962,894	**2,310,649**	2,737,029
1,987	49,974	16,682	559,935	197,686	6,683	696,570	**834,415**	997,973	31,559	22,040	168,512	216,100	26,660	1,153,214	1,345,991	**1,627,314**	1,959,800	2,072,029	**2,463,869**	2,926,051
1,988	50,575	14,412	427,602	197,480	19,690	597,027	**710,840**	847,821	19,059	19,804	164,585	189,183	21,549	1,058,421	1,237,017	**1,479,018**	1,785,394	1,855,875	**2,190,641**	2,603,087
1,989	53,209	14,906	476,970	241,668	10,480	667,714	**799,743**	955,699	14,816	19,503	73,951	198,631	19,490	805,844	937,512	**1,138,291**	1,379,164	1,629,876	**1,939,300**	2,303,115
1,990	67,847	10,369	394,656	231,747	13,264	601,364	**720,250**	860,475	12,627	19,264	100,429	88,950	10,127	602,624	689,425	**839,410**	1,015,748	1,309,452	**1,561,599**	1,848,240
1,991	63,814	14,963	412,401	213,993	17,893	606,642	**725,972**	869,192	16,478	21,437	83,787	74,981	22,435	810,382	853,342	**1,033,017**	1,256,571	1,482,387	**1,758,773**	2,096,622
1,992	66,635	16,940	396,082	252,805	20,235	632,293	**755,482**	901,215	8,177	10,586	78,358	76,725	52,674	655,802	731,143	**890,268**	1,084,406	1,381,861	**1,647,651**	1,959,918
1,993	62,822	14,390	386,118	225,722	15,348	590,911	**707,891**	847,513	14,526	17,062	113,534	97,784	18,646	757,127	837,302	**1,024,275**	1,252,188	1,450,670	**1,733,543**	2,069,152
1,994	42,479	9,205	416,801	257,841	7,850	614,827	**736,175**	884,510	7,109	17,535	110,023	98,322	15,857	700,008	775,871	**953,888**	1,177,752	1,412,544	**1,689,748**	2,029,694
1,995	42,849	11,948	413,710	194,300	12,587	566,965	**678,404**	815,126	12,686	11,324	76,016	103,517	17,401	545,988	632,897	**772,939**	947,624	1,220,340	**1,453,305**	1,735,026
1,996	49,646	6,658	266,047	154,880	8,844	405,916	**488,570**	588,343	6,595	12,591	96,438	63,609	21,472	374,009	474,525	**583,330**	718,452	896,431	**1,072,532**	1,287,563
1,997	48,026	9,673	319,531	192,337	4,880	479,179	**576,716**	691,226	5,441	7,784	55,745	41,209	29,428	391,714	438,409	**535,848**	656,752	932,793	**1,113,827**	1,326,209
1,998	50,974	11,095	340,224	169,067	3,477	480,079	**576,256**	696,818	11,451	15,198	85,964	81,001	13,402	298,553	413,017	**521,226**	659,436	912,548	**1,098,193**	1,325,528
1,999	96,853	6,513	470,766	295,867	12,424	738,386	**884,965**	1,063,418	8,044	4,131	107,127	83,536	17,811	382,653	498,615	**612,016**	755,307	1,258,505	**1,497,340**	1,791,795
2,000	129,013	7,490	555,326	207,520	14,840	761,896	**916,171**	1,106,002	9,667	7,240	97,585	91,275	13,080	372,932	487,762	**601,104**	743,795	1,273,095	**1,519,809**	1,818,249
2,001	113,618	7,090	481,572	225,713	10,156	701,374	**840,418**	1,012,411	8,799	7,841	111,524	82,143	14,204	302,537	435,265	**536,362**	660,996	1,156,397	**1,377,016**	1,648,366
2,002	81,869	7,443	424,894	158,083	2,447	563,460	**676,739**	817,525	12,647	12,537	117,108	105,704	8,513	377,468	517,963	**645,220**	801,443	1,105,773	**1,324,604**	1,588,847
2,003	37,112	7,304	386,360	121,583	7,499	465,229	**562,032**	677,847	23,301	10,145	64,090	89,319	9,008	484,573	557,075	**691,040**	857,112	1,042,356	**1,255,380**	1,504,977
2,004	30,810	9,075	355,562	145,897	5,022	455,900	**547,497**	660,079	14,341	8,911	82,823	96,286	11,308	380,796	487,251	**604,562**	752,519	962,252	**1,155,249**	1,386,241
2,005	48,353	8,699	450,853	139,583	5,227	544,008	**654,694**	785,169	14,329	7,404	59,891	87,155	8,900	394,893	468,886	**583,863**	732,004	1,034,768	**1,240,163**	1,485,760
2,006	70,416	8,383	382,832	145,606	4,911	512,779	**613,426**	738,094	13,651	4,561	23,763	83,983	9,224	380,731	418,883	**523,857**	657,575	950,311	**1,138,369**	1,368,107
2,007	70,783	10,792	443,096	229,405	6,934	631,414	**762,374**	924,168	15,085	5,221	31,663	92,117	7,182	427,034	467,322	**589,376**	743,581	1,122,954	**1,352,576**	1,631,880
2,008	30,297	8,696	346,301	194,354	6,069	484,750	**587,685**	711,327	7,021	8,103	39,680	70,533	7,312	362,732	399,478	**504,317**	637,403	905,599	**1,092,414**	1,319,506
2,009	48,879	12,267	381,647	239,815	7,029	572,376	**691,974**	835,266	5,739	16,709	36,934	104,228	11,667	476,174	523,355	**663,436**	844,110	1,124,292	**1,360,513**	1,643,304
2,010	37,591	13,703	531,761	239,692	13,242	691,394	**839,251**	1,015,784	16,190	8,493	40,440	153,309	19,371	537,568	620,035	**790,864**	1,016,616	1,347,821	**1,633,783**	1,984,409
2,011	45,278	7,748	465,965	117,515	18,774	541,513	**657,961**	794,954	12,740	4,855	35,356	127,320	32,095	424,129	511,332	**657,631**	854,391	1,083,137	**1,318,979**	1,604,883
2,012	43,572	8,866	328,248	134,323	7,939	433,158	**524,680**	634,983	13,205	13,427	40,339	116,165	6,615	374,392	446,819	**578,530**	754,424	904,430	**1,107,241**	1,356,133
2,013	47,316	10,652	337,418	133,289	16,091	448,518	**547,750**	663,061	16,389	8,208	22,844	78,578	4,442	318,254	355,246	**458,764**	600,106	828,207	**1,009,142**	1,226,254
2,014	45,747	10,568	427,609	125,742	17,084	516,797	**630,398**	765,219	18,677	6,424	30,587	125,866	9,047	233,969	337,508	**437,825**	576,216	878,943	**1,070,100**	1,301,745
10yr Av.	48,823	10,037	409,573	169,932	10,330	537,671	**651,019**	786,802	13,302	8,340	36,150	103,925	11,586	392,988	454,887	**578,846**	741,643	1,018,046	**1,232,328**	1,492,198

Table 3.3.4.5. Estimated number of 1SW spawners by NEAC country or region and year.

Year	Northern Europe								Southern Europe									NEAC Area		
	Finland	Iceland N&E	Norway	Russia	Sweden	Total			France	Iceland S&W	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total			Total		
						5.0%	**50.0%**	95.0%							5.0%	**50.0%**	95.0%	5.0%	50.0%	95.0%
1971	12,901	4,703	NA	NA	8,062	NA	NA	NA	47,700	31,311	392,766	35,227	36,430	211,792	579,795	**764,984**	1,015,016	NA	NA	NA
1972	50,287	4,293	NA	71,848	6,431	NA	NA	NA	95,621	25,458	422,671	38,442	31,782	169,257	594,312	**796,447**	1,067,698	NA	NA	NA
1973	23,397	5,149	NA	78,166	8,015	NA	NA	NA	59,116	27,279	458,350	46,137	27,825	203,459	617,341	**837,041**	1,131,054	NA	NA	NA
1974	32,353	5,170	NA	93,781	11,569	NA	NA	NA	27,179	19,554	521,979	58,336	30,265	174,184	605,331	**840,513**	1,168,953	NA	NA	NA
1975	38,371	6,266	NA	111,744	12,515	NA	NA	NA	54,529	30,136	580,632	60,281	24,977	155,446	658,058	**915,322**	1,266,256	NA	NA	NA
1976	35,650	6,313	NA	109,370	7,024	NA	NA	NA	49,969	23,842	391,938	39,872	17,368	159,859	515,197	**691,267**	935,713	NA	NA	NA
1977	20,000	8,835	NA	74,422	3,195	NA	NA	NA	38,716	24,315	336,361	44,949	17,057	139,719	453,653	**611,776**	826,381	NA	NA	NA
1978	18,968	8,895	NA	58,825	3,802	NA	NA	NA	39,639	31,742	295,908	52,718	22,238	188,029	494,243	**639,508**	834,586	NA	NA	NA
1979	17,195	8,554	NA	74,763	3,894	NA	NA	NA	45,142	29,345	270,586	51,849	15,625	124,799	416,410	**547,995**	721,633	NA	NA	NA
1980	13,424	1,289	NA	73,450	5,039	NA	NA	NA	94,806	13,284	208,331	48,854	19,822	82,285	367,471	**480,193**	619,118	NA	NA	NA
1981	12,076	6,703	NA	53,946	9,095	NA	NA	NA	74,628	17,162	70,480	51,256	15,540	98,750	270,680	**338,216**	412,269	NA	NA	NA
1982	7,190	3,067	NA	49,855	8,083	NA	NA	NA	46,267	17,662	168,432	43,570	22,408	170,378	377,183	**479,163**	594,835	NA	NA	NA
1983	17,493	4,519	161,735	64,761	10,653	205,181	**260,630**	325,943	49,417	22,287	363,880	64,100	31,503	150,056	538,812	**691,072**	873,208	790,102	**952,956**	1,148,242
1984	19,062	1,641	164,358	80,387	15,194	223,444	**282,657**	351,541	81,937	13,713	197,653	56,254	12,344	188,561	458,329	**562,198**	683,024	721,621	**846,875**	982,766
1985	25,479	11,380	170,764	92,690	17,906	260,986	**321,424**	391,302	30,411	22,129	234,548	55,713	16,006	177,898	416,656	**546,397**	704,634	723,133	**870,433**	1,039,928
1986	20,073	14,187	152,605	102,216	18,795	257,661	**310,090**	370,595	45,223	36,668	323,559	65,353	17,948	223,169	572,391	**734,606**	931,807	872,376	**1,047,379**	1,248,419
1987	24,133	8,264	127,463	95,817	14,887	226,935	**272,699**	322,952	80,036	22,714	201,770	68,723	15,274	168,380	453,161	**583,432**	754,558	716,542	**858,061**	1,035,962
1988	14,282	12,115	117,684	86,836	12,629	205,696	**245,849**	290,088	27,234	41,162	342,240	95,822	41,132	383,475	798,778	**950,062**	1,126,679	1,040,013	**1,196,970**	1,379,181
1989	24,953	6,509	184,359	96,428	3,664	267,700	**317,205**	379,851	14,903	22,680	223,561	64,702	12,363	440,157	668,590	**790,450**	930,699	975,216	**1,111,458**	1,260,025
1990	24,800	4,844	165,027	97,189	9,838	258,879	**303,571**	357,510	24,895	21,017	160,271	46,493	35,071	197,647	420,708	**496,217**	583,494	710,300	**802,347**	900,776
1991	24,296	7,054	143,668	83,302	12,407	233,378	**272,921**	320,410	18,087	23,335	117,360	46,991	18,262	215,064	387,673	**447,446**	518,279	647,551	**722,874**	805,562
1992	34,466	13,268	122,034	116,212	13,771	264,089	**302,700**	345,766	33,174	26,535	159,546	49,634	45,840	332,733	572,495	**662,718**	766,397	866,637	**966,632**	1,075,947
1993	23,288	10,874	121,019	113,892	13,722	248,065	**284,916**	324,969	47,698	25,994	141,859	72,567	72,002	275,140	564,049	**652,827**	761,257	841,355	**939,384**	1,052,841
1994	12,909	3,502	165,815	116,067	10,596	262,170	**310,755**	370,474	37,545	21,490	125,518	80,100	25,185	298,532	513,637	**605,943**	711,059	811,584	**918,964**	1,038,254
1995	12,964	9,176	107,452	121,580	17,502	235,833	**271,010**	309,344	11,756	26,393	178,528	64,746	25,684	298,296	526,752	**614,932**	716,533	791,564	**887,124**	995,399
1996	27,451	4,896	81,011	138,164	10,468	232,690	**263,994**	298,075	14,393	22,866	182,391	49,562	34,731	228,363	461,498	**540,763**	634,274	720,126	**805,544**	905,854
1997	24,986	6,641	105,271	158,083	4,760	264,683	**301,627**	342,792	7,349	16,675	226,099	45,943	38,425	158,418	426,731	**499,217**	588,662	719,686	**802,254**	899,079
1998	31,056	11,355	138,210	163,009	3,822	305,900	**349,805**	399,523	14,376	22,799	220,388	51,851	156,155	233,251	622,774	**711,270**	814,444	962,210	**1,062,905**	1,174,862
1999	33,353	5,977	127,736	162,480	6,055	295,234	**337,556**	386,827	4,775	19,030	233,036	42,264	20,073	107,779	364,731	**432,097**	516,792	688,490	**771,938**	867,407
2000	35,941	6,287	213,476	141,321	11,145	352,807	**411,022**	479,498	12,486	16,817	352,920	64,186	33,101	219,239	607,194	**706,706**	827,677	1,002,650	**1,120,364**	1,256,509
2001	26,032	5,869	185,574	198,587	6,924	364,888	**427,233**	497,762	10,774	15,365	255,855	57,153	32,208	221,241	521,283	**602,903**	693,025	926,141	**1,031,414**	1,144,379
2002	22,382	10,288	111,462	210,834	6,636	308,384	**364,177**	430,377	23,956	19,166	215,370	54,388	61,689	179,757	492,359	**567,083**	648,676	835,200	**933,442**	1,038,565
2003	21,884	5,505	156,948	199,460	3,588	326,990	**390,460**	460,614	15,818	22,941	246,832	45,757	31,106	227,587	532,258	**601,574**	684,308	897,107	**994,291**	1,102,440
2004	9,313	15,086	94,127	145,508	2,982	228,370	**269,226**	316,594	19,431	22,929	156,845	81,711	36,659	267,150	522,804	**598,565**	686,283	782,101	**869,365**	967,218
2005	20,441	13,638	140,549	133,336	2,983	265,829	**313,633**	364,728	12,612	33,639	172,565	67,108	49,048	293,691	570,021	**639,998**	720,984	869,276	**955,028**	1,050,419
2006	35,792	14,059	111,040	162,336	3,291	280,618	**329,473**	384,782	17,671	24,000	126,443	67,720	37,612	287,536	503,786	**575,391**	657,515	817,817	**906,810**	1,003,422
2007	10,510	10,653	61,722	123,066	1,014	175,462	**208,542**	248,899	13,867	27,745	150,364	66,494	65,131	285,205	543,303	**631,327**	756,398	744,559	**842,705**	971,563
2008	11,328	10,122	87,793	93,461	1,860	175,682	**206,288**	240,342	13,677	33,882	232,202	65,410	40,292	251,223	544,015	**660,576**	867,226	746,521	**866,976**	1,076,213
2009	20,118	16,853	71,488	101,404	1,986	182,207	**214,093**	249,894	3,865	37,286	190,900	40,912	24,955	217,365	440,160	**533,157**	692,833	648,876	**748,344**	911,551
2010	16,176	13,395	116,094	92,636	3,360	209,137	**243,717**	283,309	13,139	39,045	250,286	80,144	30,833	390,539	692,258	**840,044**	1,066,794	930,866	**1,085,702**	1,315,596
2011	18,344	11,425	80,272	102,329	2,190	186,995	**216,221**	249,462	8,920	27,497	214,983	45,328	28,024	207,174	452,380	**551,522**	736,768	665,050	**770,163**	955,254
2012	31,783	5,751	90,360	109,473	4,066	210,591	**243,803**	280,696	9,718	15,666	222,413	29,249	49,734	287,118	519,848	**652,551**	862,890	758,480	**898,103**	1,110,254
2013	18,258	14,129	90,349	100,300	2,280	195,532	**228,187**	265,390	13,749	46,389	186,405	37,461	35,963	333,867	557,887	**696,589**	887,365	782,021	**925,318**	1,118,284
2014	25,877	6,690	137,462	90,752	6,270	229,134	**270,609**	318,666	12,224	11,773	124,792	22,495	19,963	258,735	377,685	**475,792**	610,220	639,019	**749,602**	889,174
2015	16,204	20,464	109,284	89,719	2,757	204,911	**241,235**	280,418	11,332	31,781	167,835	27,293	39,144	273,902	462,587	**591,031**	760,613	699,019	**832,524**	1,006,790
10yr Av.	20,439	12,354	95,586	106,548	2,907	205,027	**240,217**	280,186	11,816	29,506	186,662	48,251	37,165	279,266	509,391	**620,798**	789,862	743,223	**862,625**	1,035,810

Table 3.3.4.6. Estimated number of MSW spawners by NEAC country or region and year.

Year	Northern Europe								Southern Europe									NEAC Area		
	Finland	Iceland	Norway	Russia	Sweden	Total			France	Iceland	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total			Total		
		N&E				5.0%	**50.0%**	95.0%		N&E					5.0%	**50.0%**	95.0%	5.0%	50.0%	95.0%
1971	10,741	2,897	NA	NA	270	NA	NA	NA	6,724	7,337	82,547	52,098	10,966	307,045	386,542	**475,117**	580,520	NA	NA	NA
1972	11,390	4,513	NA	58,682	213	NA	NA	NA	13,452	11,154	88,240	93,237	9,599	389,648	501,129	**616,390**	751,330	NA	NA	NA
1973	18,015	4,235	NA	66,009	947	NA	NA	NA	8,325	10,157	96,094	71,609	8,378	433,281	517,028	**637,905**	788,288	NA	NA	NA
1974	30,860	3,986	NA	98,292	601	NA	NA	NA	3,867	8,777	108,223	52,808	9,157	283,809	379,431	**475,483**	590,448	NA	NA	NA
1975	39,527	4,475	NA	86,695	171	NA	NA	NA	7,680	9,403	120,910	72,571	7,524	311,092	430,186	**540,777**	671,647	NA	NA	NA
1976	30,884	3,643	NA	86,550	513	NA	NA	NA	5,648	8,024	83,708	38,085	5,217	225,544	301,857	**372,384**	453,921	NA	NA	NA
1977	21,588	5,106	NA	71,661	220	NA	NA	NA	4,338	7,886	73,127	47,909	5,147	210,114	283,272	**355,848**	438,158	NA	NA	NA
1978	10,925	6,590	NA	50,418	270	NA	NA	NA	4,471	10,091	63,117	40,808	6,707	287,856	338,707	**419,727**	518,104	NA	NA	NA
1979	13,275	4,321	NA	44,393	695	NA	NA	NA	5,113	6,482	57,032	20,646	4,711	202,901	239,026	**301,409**	380,050	NA	NA	NA
1980	13,113	5,997	NA	47,770	1,378	NA	NA	NA	10,537	9,069	63,114	66,566	5,947	243,387	329,114	**407,160**	502,412	NA	NA	NA
1981	15,391	2,108	NA	66,062	301	NA	NA	NA	7,713	6,132	46,623	93,949	4,682	255,729	340,256	**424,471**	524,213	NA	NA	NA
1982	20,820	2,412	NA	40,760	1,479	NA	NA	NA	4,719	4,308	32,618	36,583	6,744	238,220	268,616	**327,199**	401,471	NA	NA	NA
1983	22,944	1,847	101,137	49,209	958	142,743	**178,213**	219,189	5,021	7,182	63,123	41,885	9,514	242,333	309,399	**373,710**	454,022	478,407	**553,831**	641,791
1984	19,199	2,396	103,563	62,173	1,347	155,587	**190,271**	230,943	8,259	6,065	43,072	33,677	3,725	223,486	269,876	**322,302**	387,706	449,288	**514,059**	588,894
1985	18,421	1,528	95,587	51,141	498	136,651	**168,803**	205,586	6,267	4,450	53,372	49,276	4,843	297,070	353,741	**419,249**	495,984	515,116	**588,724**	674,834
1986	15,108	4,184	114,538	52,191	254	150,048	**188,223**	233,264	6,277	3,675	50,972	67,586	5,429	379,724	433,020	**520,355**	628,778	612,842	**711,462**	825,902
1987	19,974	4,337	89,520	53,599	1,150	138,579	**171,251**	207,409	3,395	3,278	79,350	54,520	3,005	244,665	331,637	**392,826**	465,408	495,308	**565,533**	643,899
1988	14,044	2,807	73,156	44,959	1,241	112,831	**137,911**	165,797	9,128	3,721	52,975	71,163	9,985	442,412	508,411	**595,384**	701,382	642,707	**733,884**	843,813
1989	11,238	2,370	77,704	50,831	4,281	126,621	**147,886**	172,023	4,230	3,292	40,694	57,813	4,984	390,124	430,564	**505,861**	596,227	576,352	**654,824**	747,475
1990	12,343	2,499	91,646	48,279	2,643	134,032	**158,744**	186,695	4,318	3,325	14,900	71,260	7,029	310,555	349,253	**416,363**	492,864	504,621	**575,678**	655,779
1991	16,572	1,737	76,669	60,443	3,578	137,405	**160,799**	186,333	3,915	3,267	41,204	31,626	3,321	251,512	291,018	**338,094**	392,949	446,378	**499,694**	558,841
1992	16,225	2,567	84,232	58,460	4,951	143,985	**168,000**	195,850	4,935	3,693	20,910	24,678	8,927	344,635	352,312	**409,945**	483,329	515,588	**579,898**	656,006
1993	16,915	2,902	78,248	55,838	5,690	138,347	**161,180**	186,280	2,334	1,814	24,169	27,721	27,651	274,430	310,717	**363,858**	428,104	466,739	**526,026**	594,281
1994	15,930	2,492	76,916	65,295	4,295	142,991	**166,167**	191,674	5,384	2,910	40,196	39,182	6,623	334,833	371,296	**432,192**	508,729	532,880	**599,202**	678,733
1995	10,567	1,566	83,596	64,267	2,452	139,469	**163,959**	191,437	2,551	3,009	37,874	40,513	5,432	305,614	339,698	**399,095**	474,710	498,178	**563,724**	642,218
1996	13,203	2,068	83,014	63,527	4,015	142,874	**167,237**	194,655	4,534	1,952	19,620	42,789	6,833	241,306	272,904	**321,318**	379,384	434,251	**489,089**	553,344
1997	15,734	1,162	57,809	52,836	2,875	112,025	**131,849**	154,010	2,352	2,192	39,157	27,347	8,430	164,472	209,737	**250,358**	297,729	337,427	**382,631**	434,343
1998	15,237	1,692	69,595	41,884	1,579	110,955	**131,419**	154,033	1,981	1,355	12,528	18,049	13,609	181,184	198,922	**231,292**	271,202	323,442	**363,791**	408,065
1999	14,742	2,251	72,135	54,432	1,139	122,964	**145,581**	170,288	4,279	2,807	33,848	38,322	5,405	133,473	183,345	**228,038**	284,693	323,359	**374,445**	435,710
2000	27,967	1,355	102,716	58,876	4,080	167,109	**196,371**	228,768	2,992	806	44,173	41,085	7,186	174,708	237,378	**277,424**	326,342	423,760	**474,593**	532,002
2001	37,201	1,654	122,695	89,262	4,862	220,466	**257,523**	299,420	3,480	1,388	37,003	44,158	4,269	167,047	221,928	**264,310**	318,686	465,502	**523,080**	589,336
2002	33,151	1,658	107,188	74,615	3,325	189,045	**221,651**	258,204	3,231	1,585	47,661	40,340	4,490	139,176	205,640	**242,829**	288,685	415,254	**465,647**	522,714
2003	23,728	2,023	95,748	63,331	796	159,736	**187,158**	218,585	4,647	2,326	54,259	54,157	2,137	184,688	262,331	**309,817**	367,017	441,584	**498,244**	562,088
2004	10,761	1,913	87,750	48,070	2,440	128,370	**151,979**	179,994	8,683	1,945	24,684	45,949	3,034	239,092	280,934	**330,302**	390,477	428,022	**483,388**	548,250
2005	8,962	2,419	79,535	36,390	1,653	109,398	**129,552**	152,074	5,359	1,803	37,804	49,764	4,054	187,970	250,713	**292,888**	346,515	374,929	**422,962**	479,943
2006	13,975	2,771	101,100	46,522	1,723	141,687	**167,287**	196,168	5,343	1,503	25,058	45,557	3,814	198,495	242,456	**288,579**	343,858	402,434	**456,981**	517,946
2007	20,491	3,113	83,662	39,972	1,609	127,341	**149,898**	175,064	5,099	904	11,789	44,359	4,242	193,333	223,715	**265,524**	317,281	367,958	**415,996**	472,479
2008	20,442	3,454	126,023	47,495	2,654	170,478	**201,196**	237,347	5,617	1,296	15,973	48,674	3,421	218,744	251,610	**301,024**	363,073	442,755	**503,998**	573,394
2009	8,783	3,217	99,797	70,234	2,328	157,724	**186,358**	220,145	2,607	1,748	19,999	37,380	3,422	188,343	217,388	**259,503**	310,730	394,245	**447,407**	506,755
2010	14,166	4,399	122,633	60,799	2,701	176,218	**206,182**	240,986	2,136	3,402	18,878	55,539	6,111	245,492	281,315	**340,388**	413,573	480,990	**547,445**	627,610
2011	10,879	5,206	178,726	72,760	3,756	231,812	**272,673**	320,827	6,007	1,869	20,121	79,434	9,532	272,954	330,851	**402,778**	497,104	590,841	**677,080**	782,841
2012	13,057	3,012	156,066	64,156	7,207	209,424	**245,424**	287,404	4,808	1,324	17,930	67,866	17,421	223,796	281,257	**347,143**	427,835	517,237	**594,117**	682,750
2013	12,651	3,563	111,343	33,758	2,951	140,841	**165,350**	193,891	4,945	3,499	20,546	61,588	3,635	194,530	240,463	**298,957**	374,529	400,013	**465,811**	545,088
2014	13,664	4,305	123,727	36,638	5,971	156,292	**185,739**	221,468	6,154	2,384	11,972	41,635	2,418	166,835	192,640	**238,867**	299,704	368,430	**426,056**	495,523
2015	13,201	4,285	147,673	33,826	6,798	173,848	**207,324**	248,141	6,893	1,828	15,146	66,453	4,990	117,887	177,925	**221,980**	284,008	372,999	**431,924**	500,538
10yr Av.	14,131	3,732	125,075	50,616	3,770	168,566	**198,743**	234,144	4,961	1,976	17,741	54,849	5,901	202,041	243,962	**296,474**	363,170	433,790	**496,682**	570,492

Table 3.3.4.7. Summary of stock assessments for individual countries prior to the commencement of distant water fisheries (PFA) and for spawners for both maturing 1SW and non-maturing 1SW salmon.

	Maturing 1SW		Non-maturing 1SW	
	PFA	Spawners	PFA	Spawners
Southern NEAC				
UK (England and Wales)	Suffering	Suffering	Full	Full
UK (Northern Ireland)	Full	Full	Full	Full
UK (Scotland)	At risk	At risk	Suffering	Sufffering
Ireland	Suffering	Suffering	Suffering	Sufffering
France	Suffering	Suffering	Full	At risk
Northern NEAC				
Russia	Full	Full	Full	Suffering
Finland	Full	At risk	Full	At risk
Norway	Full	Full	Full	Full
Sweden	At risk	Suffering	Full	Full
Iceland	Full	Full	Full	Full

Key: **Full = At full reproductive capacity.**

At risk = At risk of suffering reduced reproductive capacity.

Suffering = Suffering reduced reproductive capacity.

Table 3.3.5.1. Status of spawner escapement by jurisdiction in the NEAC area in 2015 and compliance (i.e. meeting or exceeding CL or other stock indicator) with river-specific conservation limits or other stock indicators for individual river stocks after homewater fisheries. Sweden do not have CLs, but status is based on attainment of required fry densities.

Country or jurisdiction	95% or higher probability of spawners meeting 1SW CL	95% or higher probability of spawners meeting MSW CL	No. rivers	No. with CL	No. assessed for compliance	No. attaining CL	% attaining CL
Northern NEAC	1SW	MSW					
Russia	Yes	No	112	85	8	7	88
Finland/Norway (Tana/Teno)	No	No	24	24	10	2	20
Norway	Yes	Yes	439	439	172	126	73
Sweden	No	Yes	23	22	22	8	36
Iceland	Yes	Yes	100	0	0	NA	NA
Southern NEAC	1SW	MSW					
UK (Scotland)	No	No	398	0	0	NA	NA
UK (Northern Ireland)	Yes	Yes	16	16	10	5	50
UK (England & Wales)	No	Yes	64	64	64	24	38
Ireland	No	No	143	143	143	55	63
France (1SW)	No		42	33	27	22	80
France (MSW)		No	42	33	27	16	60

Table 3.3.6.1. Estimated survival of wild smolts (%) to return to homewaters (prior to coastal fisheries) for various monitored rivers in the NE Atlantic Area.

Smolt	Iceland[1]			Norway[2]				Ireland			UK (Scotland)[2]		UK (NI)[7]		UK (E & W)						France[8]		
migration	Ellidaar	R.Vesturdalsa[4]		R. Halselva		R. Imsa		R. Corrib		B'shoole	North Esk		R. Bush		R. Dee		R. Tamar		R. Frome		Nivelle[5]	Scorff	Oir
year	1SW	1SW	2SW	1SW	2SW	1SW	2SW	1SW	2SW	1SW	1SW	MSW	1SW[3]	2SW[10]	1SW	MSW	1SW	MSW	1SW	MSW	All ages	All ages	All ages
1975	20.8																						
1980								17.9	1.1	5.3				0.6									
1981						17.3	4.0	9.2	3.8	12.3	8.2	3.8		0.9									
1982						5.3	1.2	20.9	3.3	12.2	11.2	5.0											
1983						13.5	1.3	10.0	1.8	8.6				1.7									
1984						12.1	1.8	26.2	2.0	19.8	6.0	4.0		1.4									
1985	9.4					10.2	2.1	18.9	1.8	19.3	13.6	5.4		1.9									
1986						3.8	4.2			20.0			31.3	1.9									
1987				2.0	0.3	17.3	5.6	16.6	0.7	26.9	10.4	3.9	35.1	0.4									
1988	12.7			5.8	0.7	13.3	1.1	14.6	0.7	22.9			36.2	0.9									
1989	8.1			2.1	1.0	8.7	2.2	6.7	0.7	7.1	6.6	4.2	25.0	1.4									
1990	5.4			3.9	1.6	3.0	1.3	5.0	0.6	16.0	6.0	3.1	34.7	1.8									
1991	8.8			2.1	0.3	8.7	1.2	7.3	1.3	21.7	7.6	3.1	27.8	2.2									
1992	9.6			2.1	0.4	6.7	0.9	7.3		15.9	10.9	6.5	29.0	2.0							7.09		5.30
1993	9.8			2.1	0.0	15.6		10.8	0.1	23.9	14.5	6.1		2.0	6.3	2.5					4.72		17.00
1994	9.0			0.6	0.4			9.8	1.4	26.9	10.9	3.6	27.1	0.8	1.3	1.2					1.34		3.54
1995	9.4		1.5	0.9	0.0	1.8	1.5	8.4	0.1	14.6	8.4	3.8		2.5	2.7	0.4					2.30	11.75	4.99
1996	4.6	2.5	0.4	2.8	0.6	3.5	0.9	6.3	1.2	18.3	5.9	2.7	31.0	2.1	4.8	2.1					2.53	15.06	4.83
1997	5.3	1.0	1.5	0.8	0.0	1.7	0.3	12.7	0.8	15.6	7.2	4.2	19.8	0.7	6.2	3.4					2.29	5.76	14.01
1998	5.3	1.5	1.0	1.5	0.6	7.2	1.0	5.5	1.1	12.4	2.6	1.4	13.4	0.5	2.3	3.7					2.65	6.73	6.58
1999	7.7	1.3	1.2	1.3	0.0	4.2	2.2	6.4	0.9	14.9	6.8	3.8	16.5	0.8	5.0	12.4					2.69	15.93	
2000	6.3	1.1	0.7	0.4	1.1	12.5	1.7	9.4		22.5	6.0	2.8	10.1	0.2	2.0	0.9					3.53	10.58	2.38
2001	5.1	3.4	1.3	2.5	2.5	3.6	2.2	7.2	1.1	16.6	4.7	2.9	12.4	0.3	4.3	0.0					0.44	6.15	3.68
2002	4.4	1.1	2.3	0.8	0.6	5.5	0.9	6.0	0.5	12.3	2.2	2.0	11.3	0.2	2.9	0.7	3.6	1.4	5.6	1.7	0.82	22.62	3.12
2003	9.1	5.5	0.6	4.9	1.6	3.5	0.7	8.3	2.1	19.4			6.8	0.3	2.6	0.4	6.1	1.8	4.8	0.9	1.35	12.02	5.70
2004	7.7	5.7	0.6	3.5	1.2	5.9	1.4	6.3	0.8	12.8			6.8	0.4	4.5	1.0	6.0	1.5	5.3	2.9	1.27	6.47	4.00
2005	6.4	2.5	0.9	3.0	1.0	3.7	1.8			8.1	6.7	2.8	5.9	0.6	5.1	0.5	6.4	1.2			1.00	8.50	6.60
2006	7.1	1.8	1.0	0.8	0.8	0.8	5.8	1.2	0.9	12.9	3.3	3.4	14.0	0.8	4.3	1.5	3.5	2.4	5.1	2.2	2.92	7.36	5.30
2007	19.3	0.9	0.3	0.3	0.0	0.8	0.6	0.9		8.4	5.0	4.0	8.3	0.8	1.3	0.7	3.5	3.4	5.7	1.3	2.64	4.42	4.00
2008	14.9	2.6	1.1	0.2	0.2	1.1	2.3	1.7	1.03	8.2	6.4		3.97	0.7	2.5	1.3	1.7	0.9	3.1	1.6	3.56	3.03	
2009	14.2	1.3	1.6	1.1	0.6	2.4	3.1	6	0.99	8.9	9	8.65	5.92	1.0	4.8	1.1	8.2	1.9	7.7	2.6	1.90	6.89	
2010	8.6	2.0	1.1	0.4	0.4	1.7	1.1	2.9	1.2	7.5			3.96	1.3	1.9	1.0	3.4	5.0	8.6	2.4	1.34	4.40	
2011	6.1	1.3	0.6	0		3.9	2.9	2.4	0	10.8			2.67	0.5	0.0	0.3	1.1	1.9[9]	1.5	1.8[9]		5.16	
2012	10.9	2.1				3.5	1.7	1.5	0	9.4			11.7	1.8	4.8[9]		2.5[9]		3.2[9]	2.1		7.35	
2013	4.3		0.3			2.2	2.4	2.2	0.3	4.5			4.6	0.91	1.9	1.4		4.7	1.5	2.1		6.00	
2014	7.2	1.6				2.9		2.9		8.00			2.9						2.0				
Mean																							
(5-year)	7.4	1.7	0.9	0.2	0.5	2.8	2.2	2.4	0.5	8.0	9.0	8.7	5.2	1.1	1.3	1.0	2.3	3.9	3.4	2.3	1.3	5.7	
(10-year)	9.9	1.8	0.8	0.8	0.6	2.3	2.4	2.4	0.6	8.7	6.1	4.7	6.4	0.9	2.9	1.0	4.0	2.6	4.4	2.2	2.2	5.9	5.3

[1] Microtags.
[2] Carlin tags, not corrected for tagging mortality.
[3] Microtags, corrected for tagging mortality.
[4] Assumes 50% exploitation in rod fishery.
[5] From 0+ stage in autumn.
[6] Incomplete returns.
[7] Assumes 30% exploitation in trap fishery.
[8] France data based on retruns to freshwater
[9] Minimum count. High flows hindered sampling effort
[10] Bush 2SW data based on retruns to freshwater

Table 3.3.6.2. Estimated survival of hatchery smolts (%) to return to homewaters (prior to coastal fisheries) for monitored rivers and experimental facilities in the NE Atlantic Area.

Smolt year	Iceland[1]		Norway[2]						Sweden[2]	
	R. Ranga		R. Halselva		R. Imsa[3]		R. Drammen		R. Lagan	
	1SW	2SW	1SW	2SW	1SW	2SW	1SW	2SW	1SW	2SW
1981					10.1	1.3				
1982					4.2	0.6				
1983					1.6	0.1				
1984					3.8	0.4	3.5	3.0	11.8	1.1
1985					5.8	1.3	3.4	1.9	11.8	0.9
1986					4.7	0.8	6.1	2.2	7.9	2.5
1987			1.5	0.4	9.8	1.0	1.7	0.7	8.4	2.4
1988			1.2	0.1	9.5	0.7	0.5	0.3	4.3	0.6
1989	1.6	0.1	1.9	0.5	3.0	0.9	1.9	1.3	5.0	1.3
1990	0.8	0.2	2.1	0.3	2.8	1.5	0.3	0.4	5.2	3.1
1991	0.0	0.0	0.6	0.0	3.2	0.7	0.1	0.1	3.6	1.1
1992	0.4	0.1	0.5	0.0	3.8	0.7	0.4	0.6	1.5	0.4
1993	0.7	0.1			6.5	0.5	3.0	1.0	2.6	0.9
1994	1.2	0.2			6.2	0.6	1.2	0.9	4.0	1.2
1995	1.1	0.1			0.4	0.0	0.7	0.3	3.9	0.6
1996	0.2	0.0	1.2	0.2	2.1	0.2	0.3	0.2	3.5	0.5
1997	0.3	0.1	0.6	0.0	1.0	0.0	0.5	0.2	0.6	0.5
1998	0.5	0.0	0.5	0.5	2.4	0.1	1.9	0.7	1.6	0.9
1999	0.4	0.0	2.3	0.2	12.0	1.1	1.9	1.6	2.1	
2000	0.9	0.1	1.0	0.7	8.4	0.1	1.1	0.6		
2001	0.4	0.1	1.9	0.6	3.3	0.3	2.5	1.1		
2002	0.4		1.4	0.0	4.5	0.8	1.2	0.8		
2003	0.2		0.5	0.3	2.6	0.7	0.3	0.6		
2004	0.6		0.2	0.1	3.6	0.7	0.4	0.4		
2005	1.0		1.2	0.2	2.8	1.2	0.3	0.7		
2006	1.0		0.2	0.1	1.0	1.8	0.1	0.6		
2007	1.9		0.3	0.0	0.6	0.7	0.2	0.1		
2008	2.4		0.1	0	1.8	2.2	0.1	0.3		
2009					1.3	3.3				
2010	0.5		1	0.2	2.6	1.9				
2011	0.9				1.7	0.8				
2012	0.9				1.9	0.2				
2013	0.3				2.9	0.7				
2014	0.3				1.5					
Mean										
(5-year)	0.6		1.0	0.2	2.0	1.4	0.2			
(10-year)	1.1		0.5	0.1	2.0	1.4	0.2	0.4		

[1] Microtagged.
[2] Carlin-tagged, not corrected for tagging mortality.
[3] since 1999 only 1 year old smolts included

Table 3.3.6.2. (Continued). Estimated survival of hatchery smolts (%) to return to homewaters (prior to coastal fisheries) for monitored rivers and experimental facilities in the NE Atlantic Area.

	Ireland										UK (N. Ireland)[3]		Iceland
Smolt year	R. Shannon	R. Screebe	R. Burrishoole[1]	R. Delphi/ R. Burrishoole[4]	R. Delphi	R. Bunowen	R. Lee	R. Corrib Cong.[2]	R. Corrib Galway[2]	R. Erne	R. Bush 1+ smolts	R. Bush 2+ smolts	Ranga 1SW
1980	8.6		5.6				8.3	0.9					
1981	2.8		8.1				2.0	1.5					
1982	4.0		11.0				16.3	2.7	16.1				
1983	3.9		4.6					2.8	4.1		1.9	8.1	
1984	5.0	10.4	27.1				2.3	5.2	13.2	9.4	13.3		
1985	17.8	12.3	31.1				15.7	1.4	14.5	8.2	15.4	17.5	
1986	2.1	0.4	9.4				16.4		7.7	10.8	2.0	9.7	
1987	4.7	8.4	14.1				8.8		2.2	7.0	6.5	19.4	
1988	4.9	9.2	17.2				5.5	4.5		2.9	4.9	6.0	
1989	5.0	1.8	10.5				1.7	6.0	4.8	1.2	8.1	23.2	1.6
1990	1.3		11.4		0.2		2.5	0.2	2.3	2.6	5.6	5.6	0.8
1991	4.2	0.3	13.6	10.8	6.2		0.8	4.9	4.0	1.3	5.4	8.8	0.0
1992	4.4	1.3	7.4	10.0	1.7	4.2		0.9	0.6		6.0	7.8	0.4
1993	2.9	3.4	12.0	14.3	6.5	5.4		1.0			1.1	5.8	0.7
1994	5.2	1.9	14.3	3.9	2.7	10.8			5.3		1.6		1.2
1995	3.6	4.1	6.6	3.4	1.7	3.5		2.4			3.1	2.4	1.1
1996	2.9	1.8	5.3	10.6	6.7	3.4					2.0	2.3	0.2
1997	6.0	0.4	13.3	17.3	5.6	5.3	7.0			7.7	-	4.1	0.3
1998	3.1	1.3	4.9	7.2	3.1	2.9	4.9	3.3	2.9	2.6	2.3	4.5	0.5
1999	1.0	2.8	8.2	19.9	8.2	2.0			3.6	3.3	2.7	5.8	0.4
2000	1.2	3.8	11.8	19.5	13.2	5.4	3.6	6.7		4.0	2.8	4.4	0.9
2001	2.0	2.5	9.7	17.2	7.4	3.2	2.0	3.4		6.0	1.1	2.2	0.4
2002	1.0	4.1	9.2	12.6	4.9	2.0	1.9		2.0	1.9	0.7	3.1	0.4
2003	1.2		6.0	3.7	1.5	1.6	4.3		1.2	1.0	2.5	1.9	0.2
2004	0.4	1.8	9.4	7.6	2.3	1.8	2.2		4.4	3.1	0.7	1.9	0.6
2005	0.6	3.4	4.4	11.0		1.0	1.0		4.8	0.9	1.8	1.7	1.0
2006	0.3	1.3	5.2	3.7	1.5	0.0	0.2	0.3	0.2	0.9	2.0	3.8	1.0
2007	0.5	0.8	7.1		3.6				3.5	0.7			1.8
2008		0.2	1.3		1.4		0.1		1.6				2.4
2009	0.3	0.2	2.3		1.5		0.1		1.3	1.1			
2010	0.2	0.1	3.0		1.9		0.1	1.4	1.4	0.9			0.5
2011	0.4		5.2		1.3		0.1	2.0	0.4	0.5	0.8	1.9	0.9
2012	0.5		3.2		1.8		0.2	6.6		1.9	2.2	3.5	0.9
2013	0.2	0.1	3.2		1.7		0.1	1.4	0.9	0.7	1.3	1.2	0.3
2014	0.1	0.7	4.4		2.3		0.1	1.6	1.2	1.0	0.8	0.7	0.3
Mean													
(5-year)	0.3	0.3	3.8		1.8		0.1	2.6	1.0	1.0	1.3	1.8	0.6
(10-year)	0.4	1.0	4.4	7.4	1.9	0.9	0.4	2.3	2.1	1.2	1.5	2.3	1.0

[1] Return rates to rod fishery with constant effort.
[2] Different release sites
[3] Microtagged.
[4] Delphi fish released at Burrishoole

Table 3.4.2.1. Sensitivity of the Faroes catch advice (for a TAC 200 t in 2016 based on 2015 assessment) to changes in the precision and trueness of model parameters values relating to the composition of the catches.

		Difference from baseline probability with revised data input:						
Management unit	Baseline probability of achieving SERs	prop. NAC minus 50%	prop. NAC plus 50%	prop. NAC = 0	S(NEAC)+0.1	S(NEAC)+2xsd	Comp-2xsd	Extremesx0.5
FR_1SW	39.6	0	0.0	-0.1	0.1	0.0	0.0	0.5
EW_1SW	42.1	0	0.0	-0.1	0.2	0.0	0.1	1.1
IR_1SW	45.4	-0.1	0.0	-0.2	0.3	0.1	0.1	-0.2
NI_1SW	66.8	-0.1	0.1	-0.2	0.3	0.0	0.0	-0.2
SC_1SW	71.5	-0.1	0.0	-0.2	0.3	0.1	0.0	-0.2
IC_1SW	99	0	0.1	0.0	0.0	-0.1	-0.1	0.0
SW_1SW	93.2	0	0.0	0.0	-0.3	0.0	0.0	-0.1
NO_1SW	97	-0.1	0.0	-0.1	-0.3	-0.1	-0.1	-0.1
FI_1SW	62	0	0.0	-0.1	-0.9	-0.2	-0.1	-0.3
RU_1SW	87	0	0.1	0.0	-0.6	-0.1	-0.1	0.4
av. all 1SW	70.4	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1
FR_MSW	57.9	-1.5	1.5	-3.1	4.2	0.0	-0.1	6.3
EW_MSW	63	-2.3	2.3	-4.5	6.1	-0.1	-0.2	9.2
IR_MSW	8.1	-0.3	0.3	-0.7	0.8	0.0	0.0	-0.3
NI_MSW	89.2	-1.1	1.1	-2.2	2.7	-0.3	-0.3	-1.0
SC_MSW	39	-2.3	2.5	-4.6	6.7	0.0	0.1	-2.1
IC_MSW	94.2	-1.5	1.2	-3.2	0.9	-3.4	-3.7	-1.9
SW_MSW	87	-2.6	2.5	-5.0	-2.7	0.0	-0.2	-3.5
NO_MSW	46.9	-7.5	7.9	-14.1	-8.4	0.2	0.4	-9.6
FI_MSW	14.1	-2	2.6	-3.9	-2.4	0.2	0.4	-2.4
RU_MSW	18.4	-4.7	5.9	-8.2	-5.3	0.0	0.8	32.5
av. all MSW	51.8	-2.6	2.8	-5.0	0.3	-0.3	-0.3	2.7

Table 3.4.2.2. Sensitivity of the Faroes catch advice (for a TAC 200 t in 2016 based on 2015 assessment) to changes in the precision and trueness of model parameters values relating to discarding and maturation of 1SW fish.

		Difference from baseline probability with revised data input:						
Management unit	Baseline probability of achieving SERs	Discard rate = 0	Discard rate plus 2 x sd	standard deviation of discard rate x 3	Disc mortality = 0.6	Disc mortality = 1.0	Prop.Delayed = 0	Prop.Delayed = 0.5
FR_1SW	39.6	0.9	-1.0	-0.8	0.2	-0.2	-0.3	0.4
EW_1SW	42.1	1.8	-2.1	-1.4	0.3	-0.4	-0.6	0.7
IR_1SW	45.4	1.9	-2.4	-1.7	0.5	-0.6	-0.8	0.8
NI_1SW	66.8	2.5	-2.8	-1.8	0.6	-0.7	-1.0	1.1
SC_1SW	71.5	2.0	-2.5	-2.1	0.5	-0.6	-0.8	0.9
IC_1SW	99	0.2	-0.2	-0.1	0.1	0.0	0.0	0.1
SW_1SW	93.2	0.3	-0.3	-0.2	0.1	-0.1	-0.1	0.2
NO_1SW	97	0.2	-0.3	-0.3	0.1	-0.1	-0.1	0.1
FI_1SW	62	0.6	-0.9	-0.7	0.1	-0.2	-0.3	0.3
RU_1SW	87	0.7	-0.6	-0.4	0.2	-0.1	-0.2	0.4
av. all 1SW	70.4	1.1	-1.3	-0.9	0.3	-0.3	-0.4	0.5
FR_MSW	57.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EW_MSW	63	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IR_MSW	8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NI_MSW	89.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SC_MSW	39	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IC_MSW	94.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SW_MSW	87	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO_MSW	46.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FI_MSW	14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU_MSW	18.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
av. all MSW	51.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 3.4.2.3. Sensitivity of the Faroes catch advice (for a TAC 200 t in 2016 based on 2015 assessment) to changes in the precision and trueness of model parameters values relating to the weight and age composition of the catches, numbers of farm escapees and timing of the fishery.

		Difference from baseline probability with revised data input:										
Management unit	Baseline probability of achieving SERs	mean weight plus 2 x s.d.	mean weight minus 2 x s.d.	s.d. of weight halved	s.d. of weight x 5	prop. 1SW plus 2 x s.d. 2sd	prop 1SW doubled	Mid-dates + 1 month	Farm correction = 0.53	Farm correction = 0.73	s.d. of farm prop. halved	s.d. of farm prop. doubled
FR_1SW	39.6	0.1	-0.1	0.0	-0.2	-0.6	-0.2	0.0	0.0	0.0	0.0	0.0
EW_1SW	42.1	0.2	-0.3	0.0	-0.4	-1.2	-0.5	-0.1	-0.1	0.1	0.0	0.0
IR_1SW	45.4	0.3	-0.5	0.0	-0.4	-1.4	-0.6	-0.1	-0.1	0.1	0.0	0.0
NI_1SW	66.8	0.3	-0.5	0.0	-0.5	-1.8	-0.7	-0.1	-0.1	0.1	0.0	0.0
SC_1SW	71.5	0.3	-0.4	0.0	-0.4	-1.4	-0.6	-0.1	-0.1	0.0	-0.1	0.0
IC_1SW	99	0.1	0.0	0.1	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0
SW_1SW	93.2	0.1	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0
NO_1SW	97	0.0	-0.1	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	0.0	0.0
FI_1SW	62	0.1	-0.1	0.0	-0.2	-0.5	-0.3	-0.1	-0.1	0.0	0.0	0.0
RU_1SW	87	0.1	-0.1	0.1	-0.1	-0.3	-0.1	0.0	0.0	0.1	0.0	0.0
av. all 1SW	70.4	0.2	-0.2	0.0	-0.2	-0.8	-0.3	-0.1	-0.1	0.1	0.0	0.0
FR_MSW	57.9	1.3	-1.7	0.0	-1.2	0.7	0.3	-0.4	-0.4	0.4	0.0	0.0
EW_MSW	63	2.0	-2.6	0.0	-1.5	1.1	0.4	-0.6	-0.7	0.6	0.0	0.0
IR_MSW	8.1	0.2	-0.4	0.0	-0.3	0.2	0.1	-0.1	-0.1	0.1	0.0	0.0
NI_MSW	89.2	1.0	-1.3	0.0	-0.7	0.6	0.2	-0.2	-0.3	0.3	-0.1	0.0
SC_MSW	39	2.2	-2.6	0.1	-1.5	1.2	0.6	-0.5	-0.6	0.8	0.0	0.1
IC_MSW	94.2	1.1	-1.8	-0.1	-1.2	0.6	0.3	-0.4	-0.4	0.3	0.0	-0.1
SW_MSW	87	2.3	-2.9	0.1	-1.9	1.2	0.5	-0.6	-0.7	0.7	0.0	-0.1
NO_MSW	46.9	6.9	-8.6	0.1	-3.4	3.7	1.6	-2.0	-2.2	2.1	-0.2	-0.1
FI_MSW	14.1	2.3	-2.3	0.1	-0.4	1.2	0.5	-0.5	-0.6	0.7	0.1	0.2
RU_MSW	18.4	5.2	-5.3	0.0	-0.6	2.7	1.2	-1.2	-1.5	1.5	-0.2	0.2
av. all MSW	51.8	2.5	-3.0	0.0	-1.3	1.3	0.6	-0.7	-0.8	0.8	0.0	0.0

Table 3.5.2.1. Probabilities that the forecast PFA for 1SW maturing and 1SW non-maturing fish will be greater than the age-specific Spawner Escapement Reserves (SERs) for the PFA years 2015 to 2019 for the northern and southern NEAC stock complexes.

	Southern NEAC		Northern NEAC	
	1SW Maturing	1SW Non-maturing	1SW Maturing	1SW Non-maturing
Spawner Escapement Reserve (SER)	724 023	465 465	192 348	216 422
PFA Year	Probability of PFA meeting or Exceeding SER			
2015	0.622	0.493	0.999	0.999
2016	0.515	0.422	0.997	0.997
2017	0.410	0.351	0.986	0.989
2018	0.324	0.286	0.958	0.965
2019	0.310	0.281	0.935	0.943

Table 3.5.3.1. Probabilities that the forecast PFA for 1SW maturing and 1SW non-maturing fish will be greater than the age-specific Spawner Escapement Reserves (SERs) for the PFA years 2015 to 2019 for the southern NEAC countries.

Maturing	France	Iceland–SW	Ireland	UK (England & Wales)	UK (N. Ireland)	UK (Scotland)
Spawner Escapement Reserve (SER)	22 499	21 870	269 344	69 812	24 526	315 972
PFA Year	Probability of PFA meeting or Exceeding SER					
2015	0.266	0.784	0.251	0.213	0.733	0.742
2016	0.331	0.557	0.274	0.205	0.713	0.626
2017	0.360	0.337	0.261	0.199	0.565	0.548
2018	0.377	0.637	0.186	0.169	0.569	0.472
2019	0.356	0.400	0.234	0.260	0.542	0.397

Non-Maturing	France	Iceland-SW	Ireland	UK (England & Wales)	UK (N. Ireland)	UK (Scotland)
Spawner Escapement Reserve (SER)	9479	2067	78 490	52 051	5461	317 917
PFA Year	Probability of PFA meeting or Exceeding SER					
2015	0.703	0.923	0.097	0.933	0.884	0.356
2016	0.694	0.797	0.157	0.841	0.828	0.335
2017	0.676	0.645	0.175	0.749	0.699	0.315
2018	0.658	0.776	0.144	0.645	0.690	0.286
2019	0.620	0.638	0.187	0.719	0.655	0.247

Table 3.5.3.2. Probabilities that the forecast PFA for 1SW maturing and 1SW non-maturing fish will be greater than the age-specific Spawner Escapement Reserves (SERs) for the PFA years 2015 to 2019 for northern NEAC countries.

MATURING	FINLAND	ICELAND–NE	NORWAY	RUSSIA	SWEDEN
Spawner Escapement Reserve (SER)	17 175	7199	78 888	85 138	3948
PFA Year	Probability of PFA meeting or Exceeding SER				
2015	0.951	0.947	0.999	0.921	0.878
2016	0.896	0.880	0.998	0.889	0.907
2017	0.845	0.794	0.986	0.860	0.821
2018	0.827	0.708	0.964	0.751	0.844
2019	0.800	0.736	0.950	0.662	0.838

Non-Maturing	Finland	Iceland-NE	Norway	Russia	Sweden
Spawner Escapement Reserve (SER)	16 495	2847	121 319	69 971	5791
PFA Year	Probability of PFA meeting or Exceeding SER				
2015	0.865	0.986	0.999	0.928	0.977
2016	0.802	0.955	0.998	0.884	0.978
2017	0.742	0.901	0.989	0.852	0.927
2018	0.735	0.840	0.967	0.739	0.932
2019	0.706	0.850	0.955	0.650	0.922

Table 3.6.1.1. Probability of northern and southern NEAC - 1SW and MSW stock complexes achieving their SERs independently and simultaneously for different catch options for the Faroes fishery in the 2016/2017 to 2018/2019 fishing seasons. Shaded cells denote achievement of SERs with ≥95% probability.

Catch options for 2016/17	TAC option (t)	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW	All complexes simultaneous
	0	99%	100%	40%	41%	22%
	20	99%	99%	40%	38%	20%
	40	99%	98%	39%	34%	18%
	60	99%	96%	39%	31%	16%
	80	99%	93%	38%	28%	14%
	100	99%	88%	38%	25%	12%
	120	99%	82%	37%	23%	10%
	140	99%	75%	37%	20%	8%
	160	99%	67%	36%	19%	7%
	180	99%	60%	36%	17%	6%
	200	99%	52%	35%	15%	4%

Catch options for 2017/18	TAC option (t)	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW	All complexes simultaneous
	0	96%	99%	32%	35%	16%
	20	96%	98%	32%	32%	14%
	40	96%	95%	31%	29%	13%
	60	96%	92%	31%	26%	11%
	80	96%	86%	30%	24%	10%
	100	96%	81%	30%	22%	8%
	120	96%	74%	30%	20%	7%
	140	96%	67%	29%	18%	6%
	160	96%	60%	29%	16%	5%
	180	96%	53%	29%	15%	4%
	200	96%	47%	28%	13%	3%

Catch options for 2018/19	TAC option (t)	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW	All complexes simultaneous
	0	94%	97%	31%	28%	12%
	20	94%	94%	30%	26%	11%
	40	94%	89%	30%	24%	10%
	60	94%	83%	29%	21%	8%
	80	94%	76%	29%	20%	7%
	100	94%	69%	29%	18%	6%
	120	94%	62%	28%	16%	5%
	140	94%	55%	28%	15%	4%
	160	94%	49%	28%	14%	3%
	180	94%	43%	27%	13%	3%
	200	94%	37%	27%	12%	2%

Table 3.6.1.2. Forecast exploitation rates for 1SW and MSW salmon from northern and southern NEAC areas in all fisheries (assuming full catch allocations are taken) for different TAC options in the Faroes fishery in the 2016/2017 to 2018/2019 fishing seasons.

Catch options for 2016/17 season:	TAC option (t)	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW
	0	0.0%	0.0%	0.0%	0.0%
	20	0.0%	0.6%	0.1%	0.4%
	40	0.0%	1.2%	0.1%	0.8%
	60	0.0%	1.8%	0.2%	1.2%
	80	0.0%	2.3%	0.2%	1.6%
	100	0.0%	2.9%	0.3%	1.9%
	120	0.1%	3.5%	0.3%	2.3%
	140	0.1%	4.1%	0.4%	2.7%
	160	0.1%	4.7%	0.4%	3.1%
	180	0.1%	5.3%	0.5%	3.5%
	200	0.1%	5.8%	0.6%	3.9%

Catch options for 2017/18 season:	TAC option (t)	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW
	0	0.0%	0.0%	0.0%	0.0%
	20	0.0%	0.6%	0.1%	0.4%
	40	0.0%	1.2%	0.1%	0.9%
	60	0.0%	1.8%	0.2%	1.3%
	80	0.0%	2.5%	0.3%	1.7%
	100	0.1%	3.1%	0.3%	2.2%
	120	0.1%	3.7%	0.4%	2.6%
	140	0.1%	4.3%	0.4%	3.0%
	160	0.1%	4.9%	0.5%	3.5%
	180	0.1%	5.5%	0.6%	3.9%
	200	0.1%	6.2%	0.6%	4.3%

Catch options for 2018/19 season:	TAC option (t)	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW
	0	0.0%	0.0%	0.0%	0.0%
	20	0.0%	0.7%	0.1%	0.5%
	40	0.0%	1.4%	0.1%	1.0%
	60	0.0%	2.1%	0.2%	1.5%
	80	0.0%	2.8%	0.3%	2.0%
	100	0.1%	3.5%	0.3%	2.5%
	120	0.1%	4.2%	0.4%	3.0%
	140	0.1%	4.9%	0.5%	3.4%
	160	0.1%	5.6%	0.5%	3.9%
	180	0.1%	6.3%	0.6%	4.4%
	200	0.1%	7.0%	0.7%	4.9%

Table 3.6.1.3. Probability (%) of National NEAC - 1SW stock complexes achieving their SERs individually and simultaneously for different catch options for the Faroes fishery in the 2016/2017 to 2018/2019 fishing seasons. Shaded cells denote achievement of SERs with ≥95% probability.

Catch options for 2016/17 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All 1SW MUs simultaneous
	0	86%	85%	99%	82%	60%	55%	56%	26%	20%	36%	0.2%
	20	86%	85%	99%	82%	60%	55%	56%	26%	20%	36%	0.2%
	40	86%	85%	99%	82%	59%	54%	56%	26%	19%	36%	0.2%
	60	86%	85%	99%	82%	59%	54%	55%	26%	19%	36%	0.2%
	80	86%	84%	99%	82%	59%	54%	55%	25%	19%	36%	0.2%
	100	86%	84%	99%	82%	58%	53%	54%	25%	19%	36%	0.2%
	120	86%	84%	99%	82%	58%	53%	54%	25%	19%	36%	0.2%
	140	86%	84%	99%	82%	58%	52%	53%	25%	19%	35%	0.2%
	160	86%	84%	99%	82%	58%	52%	53%	25%	18%	35%	0.2%
	180	85%	84%	99%	82%	57%	52%	53%	24%	18%	35%	0.1%
	200	85%	84%	98%	82%	57%	51%	52%	24%	18%	35%	0.1%

Catch options for 2017/18 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All 1SW MUs simultaneous
	0	75%	83%	97%	84%	76%	47%	57%	19%	17%	38%	0.1%
	20	75%	83%	96%	84%	76%	47%	56%	19%	17%	38%	0.1%
	40	75%	83%	96%	84%	76%	46%	56%	19%	17%	38%	0.1%
	60	75%	83%	96%	84%	76%	46%	56%	18%	16%	37%	0.1%
	80	75%	83%	96%	84%	75%	46%	55%	18%	16%	37%	0.1%
	100	75%	83%	96%	84%	75%	45%	55%	18%	16%	37%	0.1%
	120	75%	83%	96%	84%	75%	45%	54%	18%	16%	37%	0.1%
	140	75%	82%	96%	84%	75%	45%	54%	18%	16%	37%	0.1%
	160	75%	82%	96%	84%	75%	45%	54%	18%	16%	37%	0.1%
	180	74%	82%	96%	84%	74%	44%	53%	17%	16%	37%	0.1%
	200	74%	82%	96%	84%	74%	44%	53%	17%	16%	37%	0.1%

Catch options for 2018/19 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All 1SW MUs simultaneous
	0	66%	80%	95%	84%	63%	40%	54%	23%	26%	36%	0.1%
	20	66%	80%	95%	84%	63%	39%	54%	23%	26%	36%	0.1%
	40	66%	80%	95%	84%	63%	39%	53%	23%	26%	36%	0.1%
	60	66%	80%	95%	84%	62%	39%	53%	23%	25%	36%	0.1%
	80	66%	80%	95%	84%	62%	38%	53%	23%	25%	35%	0.1%
	100	66%	80%	95%	84%	62%	38%	52%	23%	25%	35%	0.1%
	120	66%	80%	95%	84%	62%	38%	52%	23%	25%	35%	0.1%
	140	65%	80%	95%	84%	62%	38%	52%	22%	25%	35%	0.1%
	160	65%	80%	95%	84%	61%	37%	51%	22%	25%	35%	0.1%
	180	65%	80%	95%	84%	61%	37%	51%	22%	25%	35%	0.1%
	200	65%	79%	95%	84%	61%	37%	51%	22%	24%	35%	0.1%

Table 3.6.1.4. Probability (%) of National NEAC - MSW stock complexes achieving their SERs individually and simultaneously for different catch options for the Faroes fishery in the 2016/2017 to 2018/2019 fishing seasons. Shaded cells denote achievement of SERs with ≥95% probability.

Catch options for 2016/17 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All MSW MUs simultaneous
	0	89%	80%	100%	98%	98%	33%	83%	16%	84%	69%	1.8%
	20	81%	72%	100%	97%	96%	31%	81%	15%	82%	67%	1.2%
	40	72%	64%	99%	96%	95%	29%	80%	15%	79%	66%	0.8%
	60	63%	56%	98%	95%	92%	27%	79%	14%	77%	64%	0.5%
	80	53%	49%	96%	94%	90%	25%	77%	14%	75%	63%	0.3%
	100	44%	44%	93%	93%	87%	23%	76%	13%	72%	61%	0.2%
	120	36%	39%	90%	92%	84%	21%	74%	13%	70%	60%	0.1%
	140	30%	34%	87%	91%	81%	20%	73%	12%	68%	58%	0.0%
	160	24%	30%	83%	89%	78%	18%	72%	12%	65%	57%	0.0%
	180	19%	27%	78%	88%	75%	17%	70%	12%	63%	56%	0.0%
	200	15%	24%	73%	86%	71%	16%	69%	11%	61%	54%	0.0%

Catch options for 2017/18 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All MSW MUs simultaneous
	0	85%	75%	99%	93%	93%	31%	70%	17%	75%	68%	1.2%
	20	78%	67%	98%	91%	90%	29%	69%	17%	73%	66%	0.8%
	40	71%	60%	96%	89%	87%	28%	67%	17%	70%	65%	0.5%
	60	62%	53%	93%	87%	84%	26%	65%	16%	67%	64%	0.3%
	80	55%	48%	90%	85%	80%	24%	64%	16%	65%	62%	0.2%
	100	47%	43%	86%	84%	76%	22%	62%	15%	63%	61%	0.1%
	120	41%	38%	82%	82%	73%	21%	60%	15%	60%	60%	0.1%
	140	35%	35%	78%	80%	69%	19%	59%	15%	58%	59%	0.1%
	160	30%	31%	73%	78%	66%	18%	58%	14%	56%	58%	0.0%
	180	25%	28%	68%	76%	62%	17%	56%	14%	54%	56%	0.0%
	200	21%	26%	64%	74%	59%	16%	55%	14%	52%	55%	0.0%

Catch options for 2018/19 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All MSW MUs simultaneous
	0	74%	74%	97%	93%	93%	28%	69%	14%	64%	66%	0.6%
	20	65%	67%	94%	92%	91%	27%	68%	14%	62%	65%	0.4%
	40	56%	61%	91%	90%	88%	25%	66%	14%	59%	63%	0.2%
	60	48%	55%	87%	89%	85%	24%	64%	13%	56%	62%	0.1%
	80	42%	50%	82%	87%	83%	22%	63%	13%	54%	61%	0.1%
	100	35%	46%	78%	86%	80%	21%	62%	13%	51%	60%	0.1%
	120	30%	42%	73%	84%	77%	19%	60%	13%	49%	59%	0.0%
	140	25%	39%	68%	83%	74%	18%	59%	12%	47%	58%	0.0%
	160	21%	36%	63%	81%	71%	17%	58%	12%	45%	57%	0.0%
	180	18%	33%	58%	80%	69%	16%	57%	12%	43%	56%	0.0%
	200	15%	31%	53%	78%	66%	15%	56%	11%	41%	55%	0.0%

Table 3.6.1.5. Forecast exploitation rates for 1SW and MSW salmon from northern and southern NEAC countries in all fisheries (assuming full catch allocations are taken) for different TAC options in the Faroes fishery in the 2016/2017 to 2018/2019 fishing seasons.

Catch options	TAC option	RU-1SW	RU-MSW	FI-1SW	FI-MSW	NO-1SW	NO-MSW	SW-1SW	SW-MSW	IC-1SW	IC-MSW	SC-1SW	SC-MSW	NI-1SW	NI-MSW	EW-1SW	EW-MSW	IR-1SW	IR-MSW	FR-1SW	FR-MSW
for 2016/17 season:	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	20	0.0%	0.8%	0.0%	0.8%	0.0%	0.4%	0.0%	0.1%	0.0%	0.3%	0.0%	0.4%	0.1%	0.1%	0.1%	0.2%	0.1%	0.3%	0.0%	0.1%
	40	0.0%	1.6%	0.0%	1.5%	0.0%	0.8%	0.0%	0.3%	0.1%	0.6%	0.1%	0.8%	0.1%	0.2%	0.2%	0.5%	0.1%	0.6%	0.1%	0.3%
	60	0.0%	2.3%	0.0%	2.3%	0.0%	1.2%	0.0%	0.4%	0.1%	0.9%	0.1%	1.2%	0.2%	0.3%	0.2%	0.7%	0.2%	0.9%	0.1%	0.4%
	80	0.0%	3.1%	0.0%	3.1%	0.0%	1.6%	0.0%	0.5%	0.1%	1.2%	0.2%	1.6%	0.2%	0.5%	0.3%	0.9%	0.2%	1.3%	0.1%	0.6%
	100	0.1%	3.9%	0.0%	3.8%	0.0%	2.0%	0.0%	0.7%	0.1%	1.5%	0.2%	1.9%	0.3%	0.6%	0.4%	1.2%	0.3%	1.6%	0.1%	0.7%
	120	0.1%	4.7%	0.0%	4.6%	0.0%	2.4%	0.0%	0.8%	0.2%	1.8%	0.3%	2.3%	0.3%	0.7%	0.5%	1.4%	0.4%	1.9%	0.2%	0.9%
	140	0.1%	5.4%	0.1%	5.4%	0.0%	2.8%	0.0%	0.9%	0.2%	2.2%	0.3%	2.7%	0.4%	0.8%	0.5%	1.6%	0.4%	2.2%	0.2%	1.0%
	160	0.1%	6.2%	0.1%	6.1%	0.1%	3.2%	0.0%	1.1%	0.2%	2.5%	0.3%	3.1%	0.4%	0.9%	0.6%	1.9%	0.5%	2.5%	0.2%	1.1%
	180	0.1%	7.0%	0.1%	6.9%	0.1%	3.6%	0.0%	1.2%	0.2%	2.8%	0.4%	3.5%	0.5%	1.0%	0.7%	2.1%	0.5%	2.8%	0.2%	1.3%
	200	0.1%	7.8%	0.1%	7.7%	0.1%	4.0%	0.0%	1.3%	0.3%	3.1%	0.4%	3.9%	0.5%	1.1%	0.8%	2.3%	0.6%	3.1%	0.3%	1.4%

Catch options	TAC option	RU-1SW	RU-MSW	FI-1SW	FI-MSW	NO-1SW	NO-MSW	SW-1SW	SW-MSW	IC-1SW	IC-MSW	SC-1SW	SC-MSW	NI-1SW	NI-MSW	EW-1SW	EW-MSW	IR-1SW	IR-MSW	FR-1SW	FR-MSW
for 2017/18 season:	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	20	0.0%	0.7%	0.0%	0.7%	0.0%	0.4%	0.0%	0.2%	0.0%	0.3%	0.1%	0.4%	0.0%	0.1%	0.1%	0.3%	0.1%	0.3%	0.0%	0.1%
	40	0.0%	1.5%	0.0%	1.4%	0.0%	0.9%	0.0%	0.3%	0.0%	0.7%	0.1%	0.8%	0.1%	0.3%	0.2%	0.5%	0.2%	0.6%	0.0%	0.2%
	60	0.0%	2.2%	0.0%	2.1%	0.0%	1.3%	0.0%	0.5%	0.1%	1.0%	0.1%	1.2%	0.1%	0.4%	0.3%	0.8%	0.2%	0.8%	0.1%	0.3%
	80	0.1%	2.9%	0.0%	2.8%	0.0%	1.7%	0.0%	0.6%	0.1%	1.4%	0.2%	1.6%	0.2%	0.5%	0.3%	1.0%	0.3%	1.1%	0.1%	0.4%
	100	0.1%	3.7%	0.0%	3.5%	0.0%	2.2%	0.0%	0.8%	0.1%	1.7%	0.2%	2.0%	0.2%	0.7%	0.4%	1.3%	0.4%	1.4%	0.1%	0.5%
	120	0.1%	4.4%	0.0%	4.3%	0.0%	2.6%	0.0%	1.0%	0.1%	2.0%	0.3%	2.4%	0.2%	0.8%	0.5%	1.5%	0.4%	1.7%	0.1%	0.6%
	140	0.1%	5.1%	0.0%	5.0%	0.1%	3.0%	0.0%	1.1%	0.1%	2.4%	0.3%	2.8%	0.3%	1.0%	0.6%	1.8%	0.5%	2.0%	0.1%	0.7%
	160	0.1%	5.8%	0.1%	5.7%	0.1%	3.4%	0.0%	1.3%	0.1%	2.7%	0.4%	3.2%	0.3%	1.1%	0.7%	2.0%	0.6%	2.2%	0.2%	0.8%
	180	0.1%	6.6%	0.1%	6.4%	0.1%	3.9%	0.0%	1.4%	0.2%	3.1%	0.4%	3.6%	0.4%	1.2%	0.8%	2.3%	0.7%	2.5%	0.2%	0.9%
	200	0.1%	7.3%	0.1%	7.1%	0.1%	4.3%	0.0%	1.6%	0.2%	3.4%	0.5%	4.0%	0.4%	1.4%	0.9%	2.5%	0.7%	2.8%	0.2%	1.0%

Catch options	TAC option	RU-1SW	RU-MSW	FI-1SW	FI-MSW	NO-1SW	NO-MSW	SW-1SW	SW-MSW	IC-1SW	IC-MSW	SC-1SW	SC-MSW	NI-1SW	NI-MSW	EW-1SW	EW-MSW	IR-1SW	IR-MSW	FR-1SW	FR-MSW
for 2018/19 season:	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	20	0.0%	0.9%	0.0%	0.6%	0.0%	0.5%	0.0%	0.1%	0.0%	0.3%	0.1%	0.4%	0.0%	0.1%	0.1%	0.3%	0.1%	0.3%	0.0%	0.1%
	40	0.0%	1.7%	0.0%	1.2%	0.0%	1.0%	0.0%	0.2%	0.0%	0.5%	0.1%	0.9%	0.1%	0.2%	0.1%	0.6%	0.1%	0.6%	0.0%	0.2%
	60	0.0%	2.6%	0.0%	1.7%	0.0%	1.4%	0.0%	0.3%	0.1%	0.8%	0.2%	1.3%	0.1%	0.3%	0.2%	0.9%	0.2%	1.0%	0.1%	0.2%
	80	0.1%	3.4%	0.0%	2.3%	0.0%	1.9%	0.0%	0.4%	0.1%	1.0%	0.2%	1.7%	0.1%	0.4%	0.2%	1.2%	0.2%	1.3%	0.1%	0.3%
	100	0.1%	4.3%	0.0%	2.9%	0.0%	2.4%	0.0%	0.5%	0.1%	1.3%	0.3%	2.1%	0.2%	0.5%	0.3%	1.5%	0.3%	1.6%	0.1%	0.4%
	120	0.1%	5.2%	0.0%	3.5%	0.0%	2.9%	0.0%	0.7%	0.1%	1.5%	0.3%	2.6%	0.2%	0.6%	0.3%	1.7%	0.4%	1.9%	0.1%	0.5%
	140	0.1%	6.0%	0.0%	4.1%	0.1%	3.4%	0.0%	0.8%	0.1%	1.8%	0.4%	3.0%	0.3%	0.7%	0.4%	2.0%	0.4%	2.2%	0.1%	0.6%
	160	0.1%	6.9%	0.0%	4.7%	0.1%	3.8%	0.0%	0.9%	0.2%	2.0%	0.4%	3.4%	0.3%	0.8%	0.5%	2.3%	0.5%	2.5%	0.1%	0.6%
	180	0.1%	7.7%	0.1%	5.2%	0.1%	4.3%	0.0%	1.0%	0.2%	2.3%	0.5%	3.9%	0.3%	0.9%	0.5%	2.6%	0.5%	2.9%	0.1%	0.7%
	200	0.1%	8.6%	0.1%	5.8%	0.1%	4.8%	0.0%	1.1%	0.2%	2.5%	0.5%	4.3%	0.4%	1.0%	0.6%	2.9%	0.6%	3.2%	0.2%	0.8%

Table 3.6.1.6. Compliance with river-specific conservation limits for individual river stocks, before homewater fisheries, within each jurisdiction in the NEAC area in 2015 (except Norway where data are for 2014). NA = not available. Sweden do not have CLs but status is based on attainment of required fry densities.

Country or jurisdiction	95% or higher probability of returns meeting 1SW CL	95% or higher probability of returns meeting MSW CL	No. rivers	No. with CL	No. assessed for compliance	No. attaining CL	% attaining CL
Northern NEAC	1SW	MSW					
Russia	Yes	Yes	112	80	8	7	88
Finland/Norway (Tana/Teno)	Yes	Yes	24	24	24	NA	NA
Norway	Yes	Yes	439	439	177	141	79
Sweden	No	Yes	23	22	0	NA	NA
Iceland	Yes	Yes	100	0	0	NA	NA
Southern NEAC	1SW	MSW					
UK (Scotland)	No	No	398	0	0	NA	NA
UK (Northern Ireland)	Yes	Yes	15	10	0	NA	NA
UK (England & Wales)	No	Yes	64	64	0	NA	NA
Ireland	No	No	143	143	143	55	38
France	No	Yes	33	30	0	NA	NA

Table 3.7.2.1. Summary statistics for the regressions for candidate northern NEAC stock complex indicators for inclusion in the updated Framework of Indicators (shading denotes retained indicators).

Summary Northern NEAC Stock complex indicators, 1SW					
Candidate indicator data set	**N**	**R^2**	**Significant?**	**R^2 > .2**	**Comments**
Returns all 1SW NO PFA est	32	0,95	significant at p 0.05	yes	
Survivals W 1SW NO Imsa	33	0,46	significant at p 0.05	yes	
Counts all NO Nausta	18	0,28	significant at p 0.05	yes	
Counts all NO Øyensåa	17	0,27	significant at p 0.05	yes	
Survivals H 1SW NO Imsa	32	0,30	significant at p 0.05	yes	
Catch rT&N 1SW FI	17	0,39	significant at p 0.05	yes	
Counts 1SW RU Tuloma	28	0,04	not significant at p 0.05	no	
Tot catch 1SW TanaTeno	33	0,13	significant at p 0.05	no	
Counts 1 SW Utsjoki	14	0,00	not significant at p 0.05	no	New 2015!
Counts 1 SW Pulmankjoki	12	0,01	not significant at p 0.05	no	Not updated
Counts 1SW Akujoki	13	0,26	not significant at p 0.05	yes	New 2015!
Summary Northern NEAC Stock complex indicators, MSW					
Candidate indicator data set	**N**	**R^2**	**Significant?**	**R^2 > .2**	**Comments**
Returns all 2SW NO PFA est	22	0,49	significant at p 0.05	yes	
PFA MSW Coast NO	32	0,87	significant at p 0.05	yes	
Counts all NO Orkla	17	0,57	significant at p 0.05	yes	Not updated
Counts all NO Nausta	18	0,34	significant at p 0.05	yes	
Counts all NO Målselv	25	0,06	not significant at p 0.05	no	
Counts MSW RU Tuloma	27	0,13	not significant at p 0.05	no	
Catch W rT&N 2SW FI	17	0,32	significant at p 0.05	yes	
Tot catch MSW TanaTeno	33	0,07	not significant at p 0.05	no	
Counts MSW M Utsjoki	14	0	not significant at p 0.05	no	New 2015

Table 3.7.2.2. Summary statistics for the regressions for candidate southern NEAC stock complex indicators for inclusion in the updated Framework of Indicators (shading denotes retained indicators).

Summary Southern NEAC Stock complex indicators 1SW					
Candidate indicator data set	**N**	**R^2**	**Significant?**	**R^2 > .2**	**Comments**
Ret. W 1SW UK(Sc.) North Esk M	35	0,61	significant at p 0,05	yes	
Ret. W 1SW UK(E&W) Itchen M	28	0,23	significant at p 0,05	yes	
Ret. W 1SW UK(E&W) Frome M	43	0,37	significant at p 0,05	yes	
Ret. Freshw 1SW UK(NI) Bush	41	0,26	significant at p 0,05	yes	
Surv FW 1SW UK(NI) Bush	32	0,09	not significant at p 0,05	no	New 2015
Surv 1SW UK(NI) Bush M	27	0,56	significant at p 0,05	yes	
Surv coast 1SW UK(E&W) Dee M	20	0,19	not significant at p 0.05	no	Not updated
Ret. W 1SW UK(E&W) Test M	27	0,11	not significant at p 0.05	no	
Ret. W 1SW UK(E&W) Dee M	24	0,31	significant at p 0,05	yes	
Ret. W 1SW UK(E&W) Tamar M	22	0,17	not significant at p 0,05	no	Not updated
Ret. 1SW UK(E&W) Lune M	27	0,00	not significant at p 0,05	no	
Count 1SW UK(E&W) Fowey M	21	0,04	not significant at p 0,05	no	
Ret. Riv 1SW UK(Sc.) North Esk	35	0,02	not significant at p 0,05	no	New 2015
Ret. 1SW UK(E&W) Kent	22	0,02	not significant at p 0.05	no	New 2015
Ret. 1SW UK(E&W) Leven	13	0,01	not significant at p 0,05	no	New 2015
Ret. 1SW UK(E&W) H-Avon	10	0,06	not significant at p 0,05	no	New 2015
Surv 1SW UK(E&W) Frome	11	0,21	not significant at p 0.05	yes	Not updated
Summary Southern NEAC Stock complex indicators MSW					
Candidate indicator data set	**N**	**R^2**	**Significant?**	**R^2 > .2**	**Comments**
Ret. W MSW UK(E&W) Itchen NM	28	0,09	not significant at p 0,05	no	
Catch W MSW Ice Ellidaar NM	44	0,57	significant at p 0,05	yes	
Ret. W 2SW UK(Sc.) Baddoch NM	28	0,47	significant at p 0,05	yes	
Ret. W MSW UK(E&W) Frome NM	43	0,48	significant at p 0,05	yes	
Ret. W 1SW UK(E&W) Tamar NM	21	0,12	not significant at p 0.05	no	
Ret. W 1SW UK(E&W) Frome NM	43	0,39	significant at p 0,05	yes	
Ret. MSW UK(E&W) Lune NM	27	0,10	not significant at p 0,05	no	
Ret. W 1SW UK(Sc.) North Esk NM	35	0,46	significant at p 0,05	yes	
Ret. W 1SW UK(E&W) Itchen NM	28	0,21	significant at p 0,05	yes	
Ret. Freshw 2SW UK(NI) Bush	40	0,23	significant at p 0,05	yes	
Count MSW UK(E&W) Fowey NM	21	0,02	not significant at p 0,05	no	
Ret. W 2SW UK(Sc.) North Esk NM	35	0,21	significant at p 0,05	yes	
Ret. W 2SW UK(Sc.) Girnoch NM	44	0,43	significant at p 0,05	yes	
Ret. W MSW UK(E&W) Test NM	28	0,01	not significant at p 0,05	no	
Count 1SW UK(E&W) Fowey NM	21	0,03	not significant at p 0,05	no	
Ret. W 1SW UK(E&W) Dee NM	24	0,11	not significant at p 0,05	no	
Ret. W All UK(Sc.) West water NM	25	0,19	significant at p 0,05	no	
Ret. W 1SW UK(E&W) Test NM	28	0,09	not significant at p 0,05	no	
Survival coast 1SW UK(E&W) Dee NM	20	0,00	not significant at p 0.05	no	
Ret. W All UK(Sc.) West water M	25	0,02	not significant at p 0,05	no	
Ret. W MSW UK(E&W) Dee NM	24	0,04	not significant at p 0,05	no	
Ret. W MSW UK(E&W) Tamar NM	22	0,01	not significant at p 0,05	no	
Survival coast MSW UK(E&W) Dee NM	19	0,00	not significant at p 0.05	no	Not updated
Ret. Riv MSW UK(Sc.) North Esk	34	0,05	not significant at p 0,05	no	New 2015
Ret. MSW UK(E&W) Kent	22	0,07	not significant at p 0.05	no	Not updated
Counts. MSW UK(E&W) Leven	12	0,05	not significant at p 0.05	no	Not updated
Ret. MSW UK(E&W) H-Avon	9	0,06	not significant at p 0.05	no	Not updated
Ret. MSW UK(E&W) Frome	10	0,06	not significant at p 0.05	no	Not updated

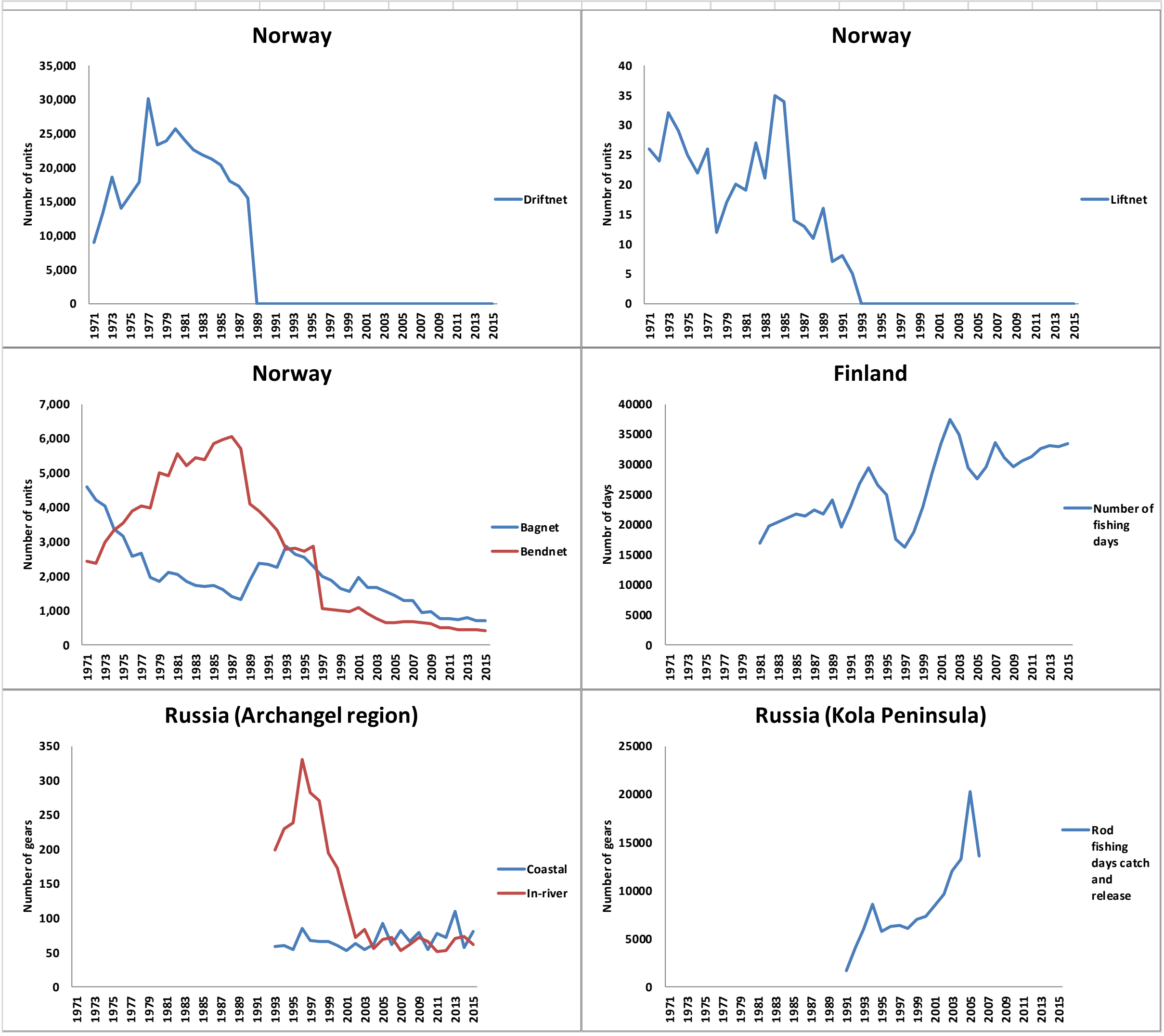


Figure 3.1.3.1. Overview of effort as reported for various fisheries and countries in the NEAC northern area, 1971–2015.

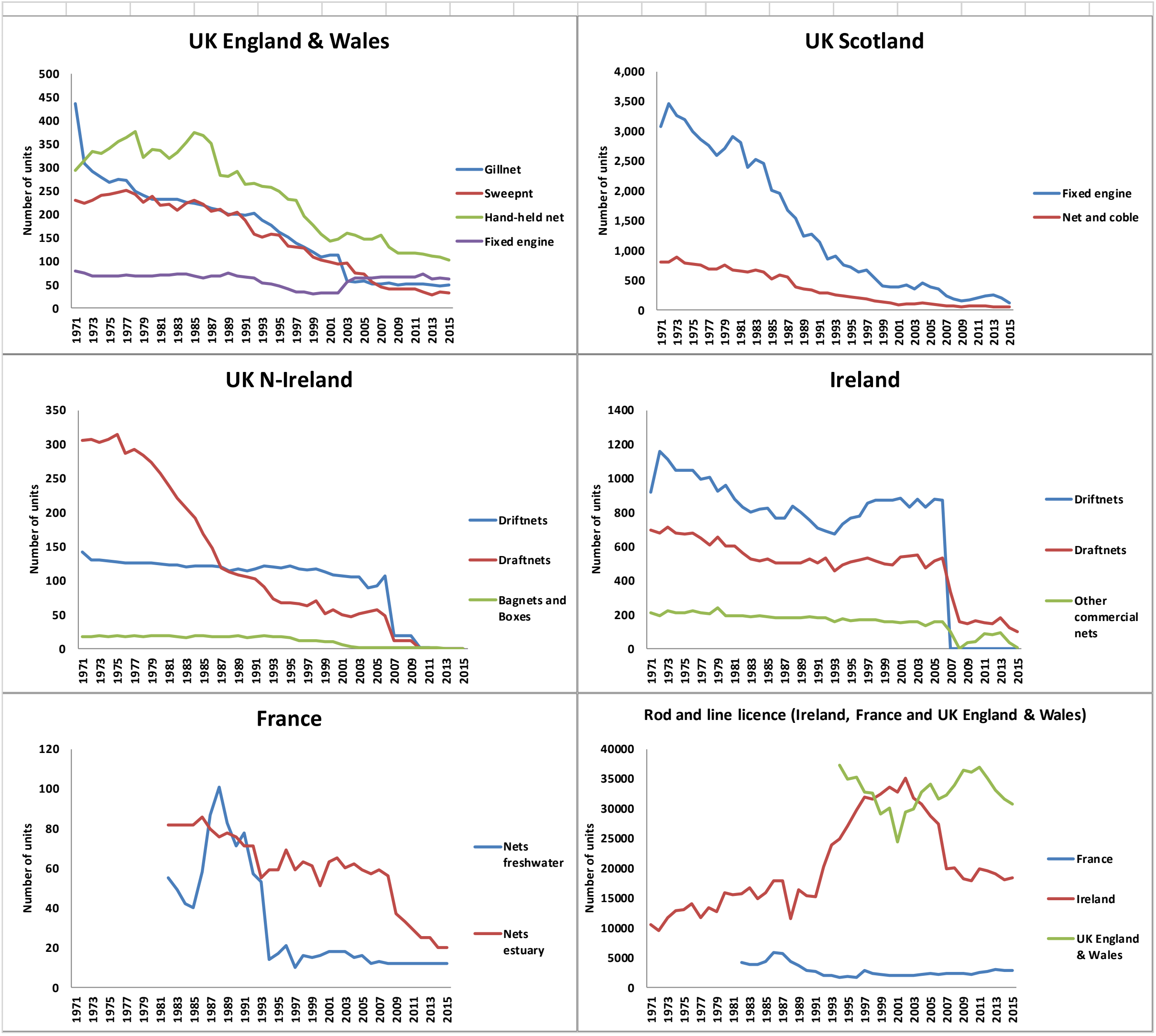


Figure 3.1.3.2. Overview of effort as reported for various fisheries and countries in the NEAC southern area, 1971–2015.

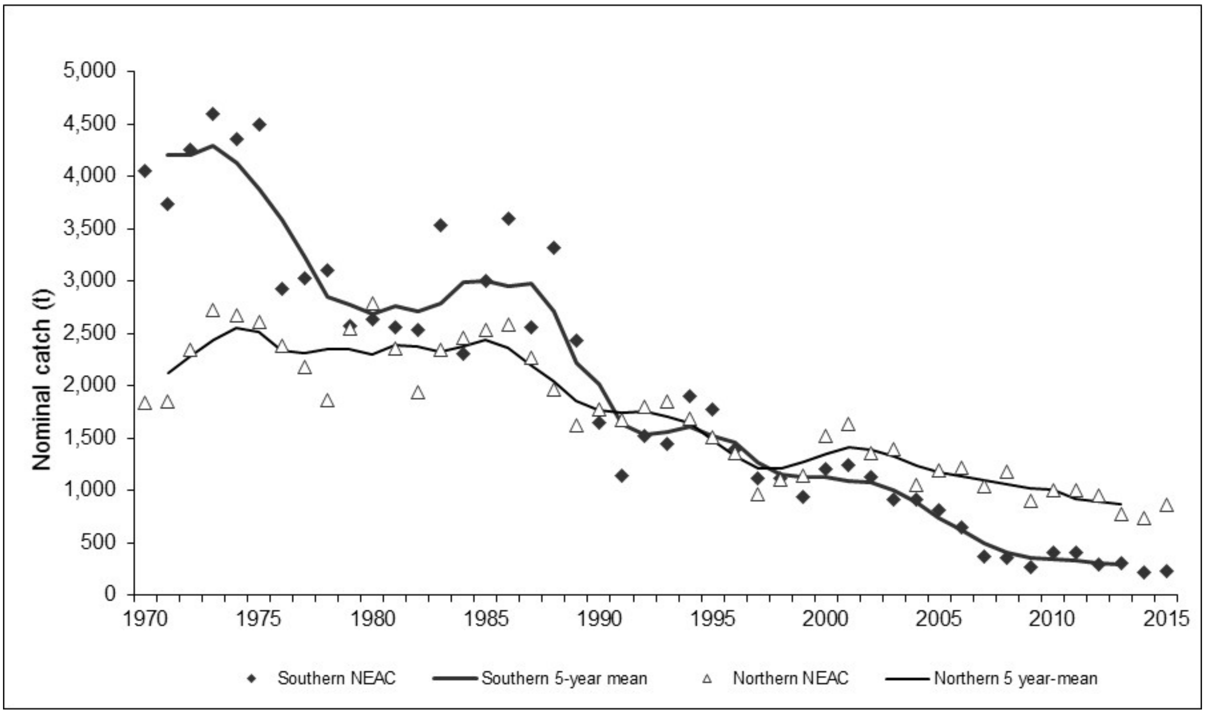


Figure 3.1.4.1. Nominal catches of salmon and 5-year running means in the southern and northern NEAC areas, 1971–2015.

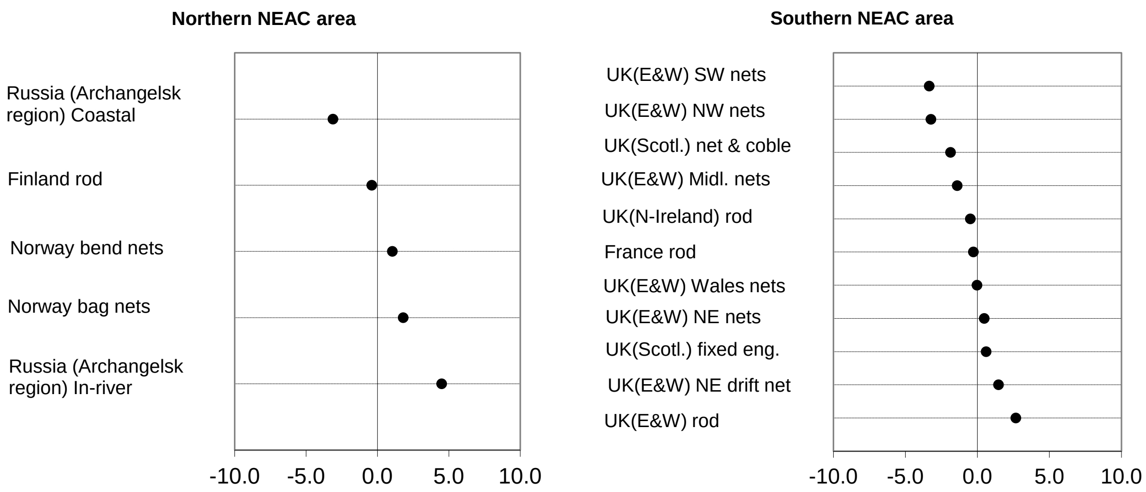


Figure 3.1.5.1. Percentage change (%) over years in cpue estimates in various rod and net fisheries in the northern and southern NEAC areas.

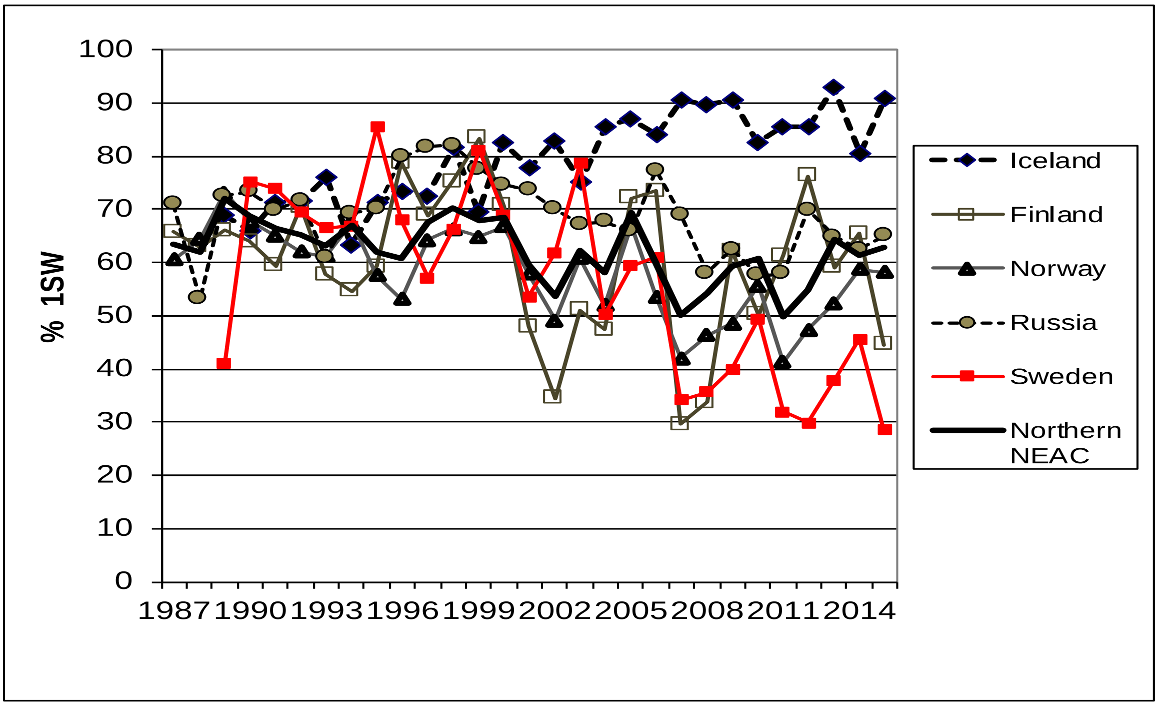


Figure 3.1.6.1. Percentage of 1SW salmon in the reported catch for northern NEAC countries, 1987–2015.

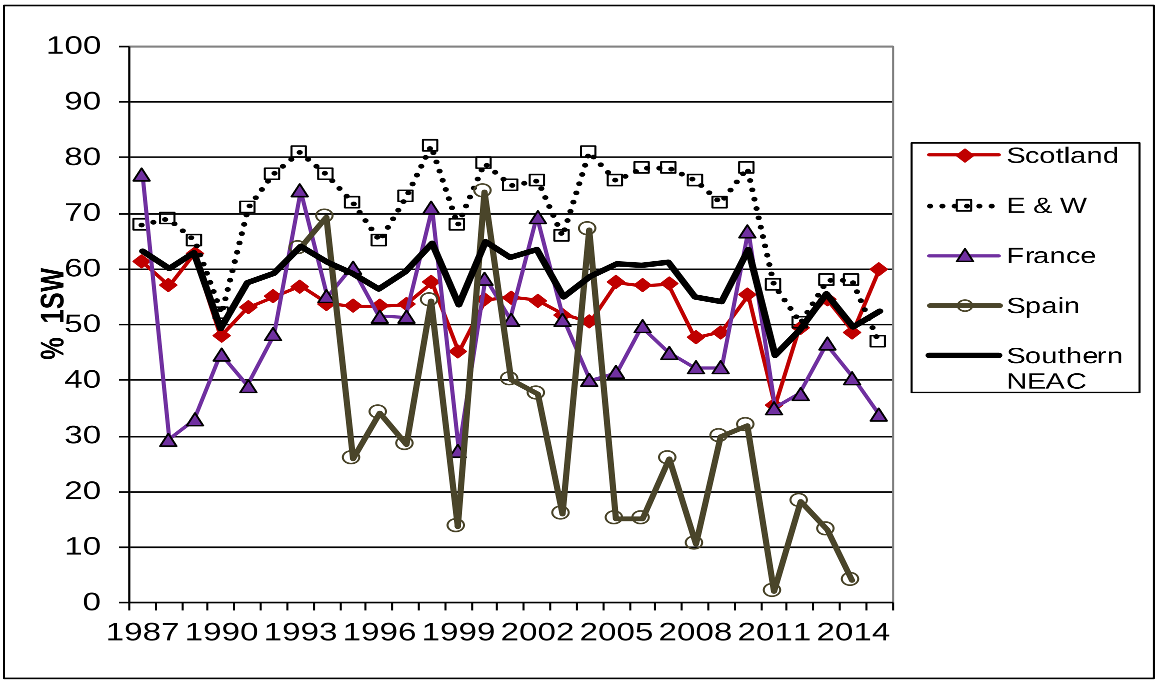


Figure 3.1.6.2. Percentage of 1SW salmon in the reported catch for southern NEAC countries, 1987–2015.

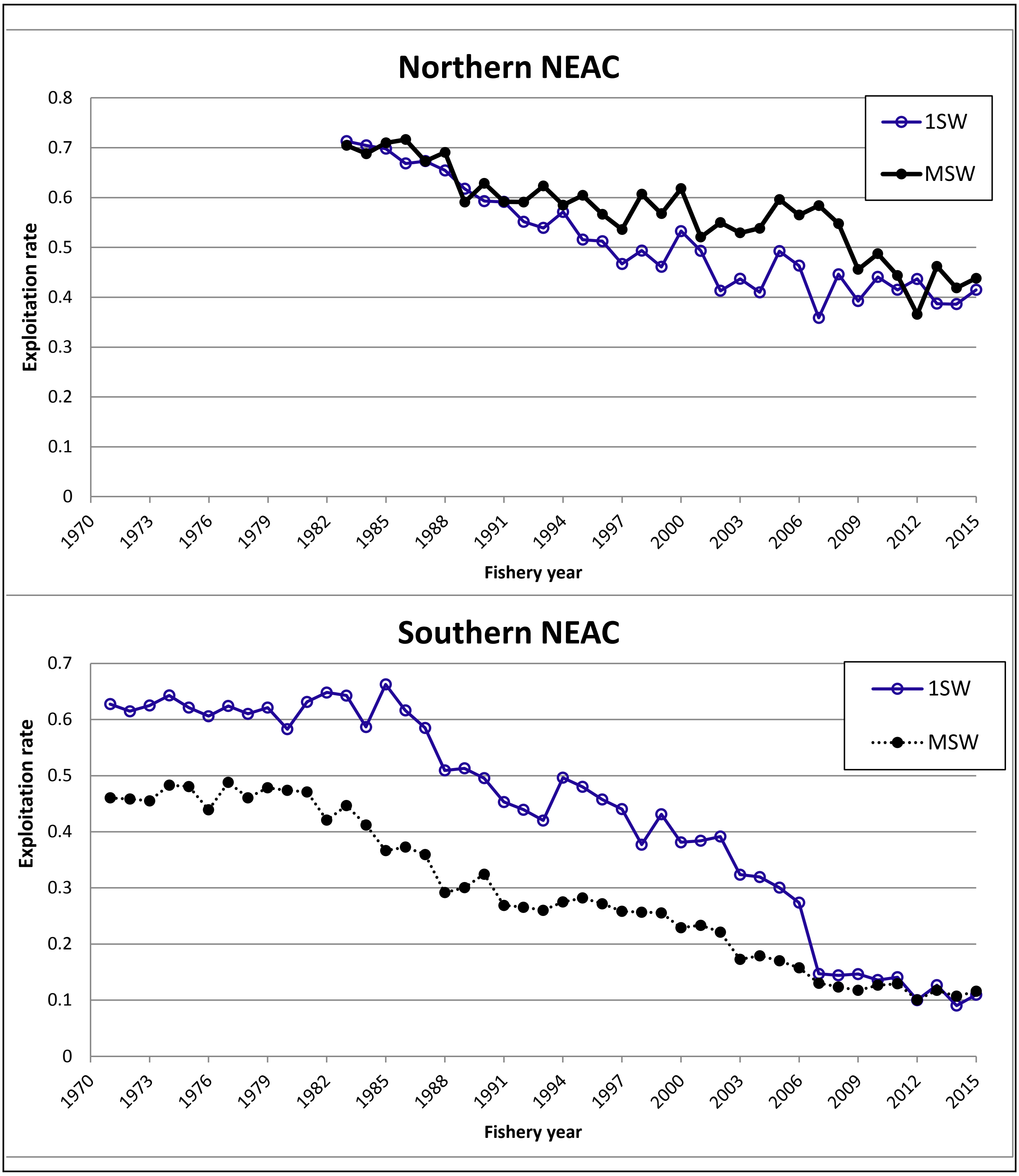


Figure 3.1.9.1. Mean annual exploitation rate of wild 1SW and MSW salmon by commercial and recreational fisheries in northern (above) and southern (bottom) NEAC countries, 1971–2015.

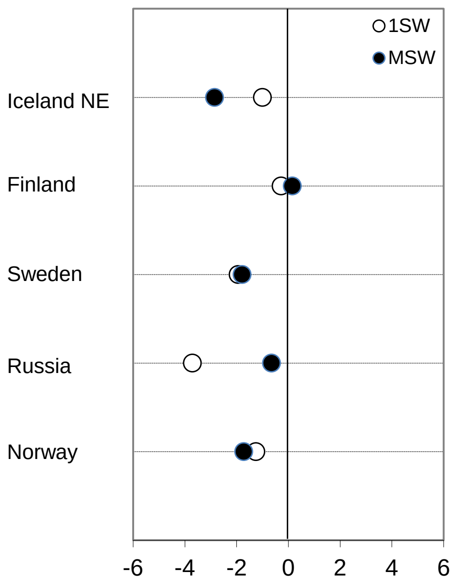


Figure 3.1.9.2. The rate of change of exploitation of 1SW and MSW salmon in northern NEAC (left) and southern NEAC (right) countries over the period 1971–2015, except for Norway (1983–2015).

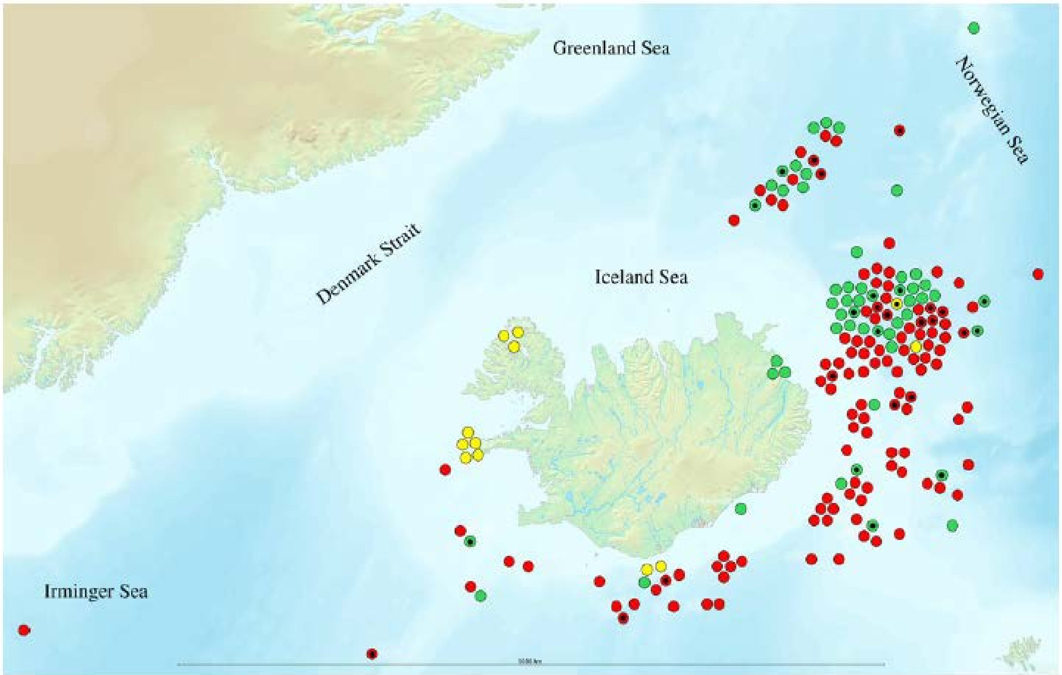


Figure 3.1.10.1. A schematic representation of the individual assignment to origin, where red indicates a southern group origin (mainland Europe, UK, and Ireland), green a northern group origin (Scandinavia and Northern Russia), and yellow an Icelandic origin. Samples with an assignment score lower than 70% have a black fill.

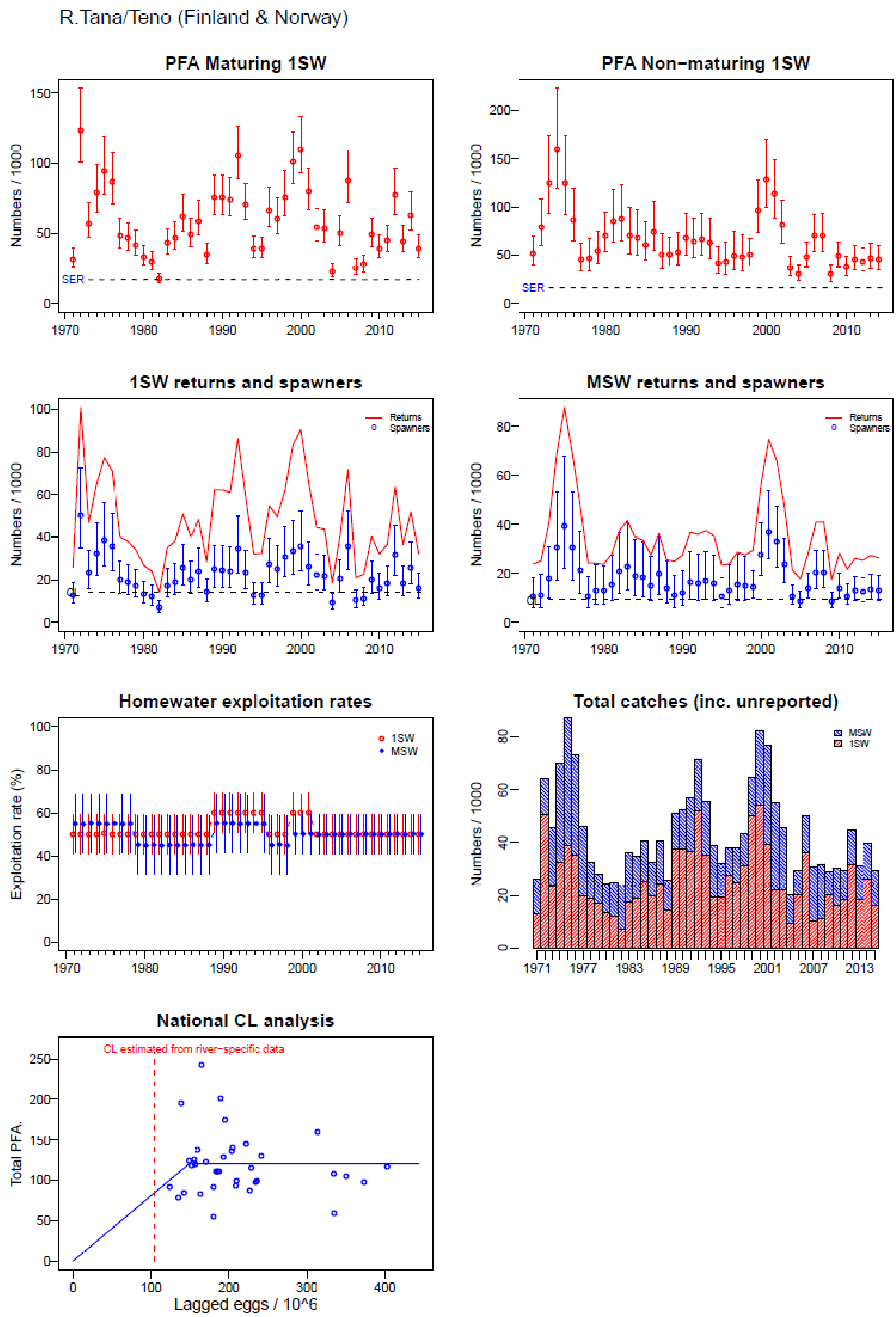


Figure 3.3.4.1a. Summary of fisheries and stock description, River Teno / Tana (Finland and Norway combined). The river-specific CL, which is used for assessment purposes, is included on the national CL analysis plot (for comparison, the CL estimated from the national S–R relationship is at the inflection point).

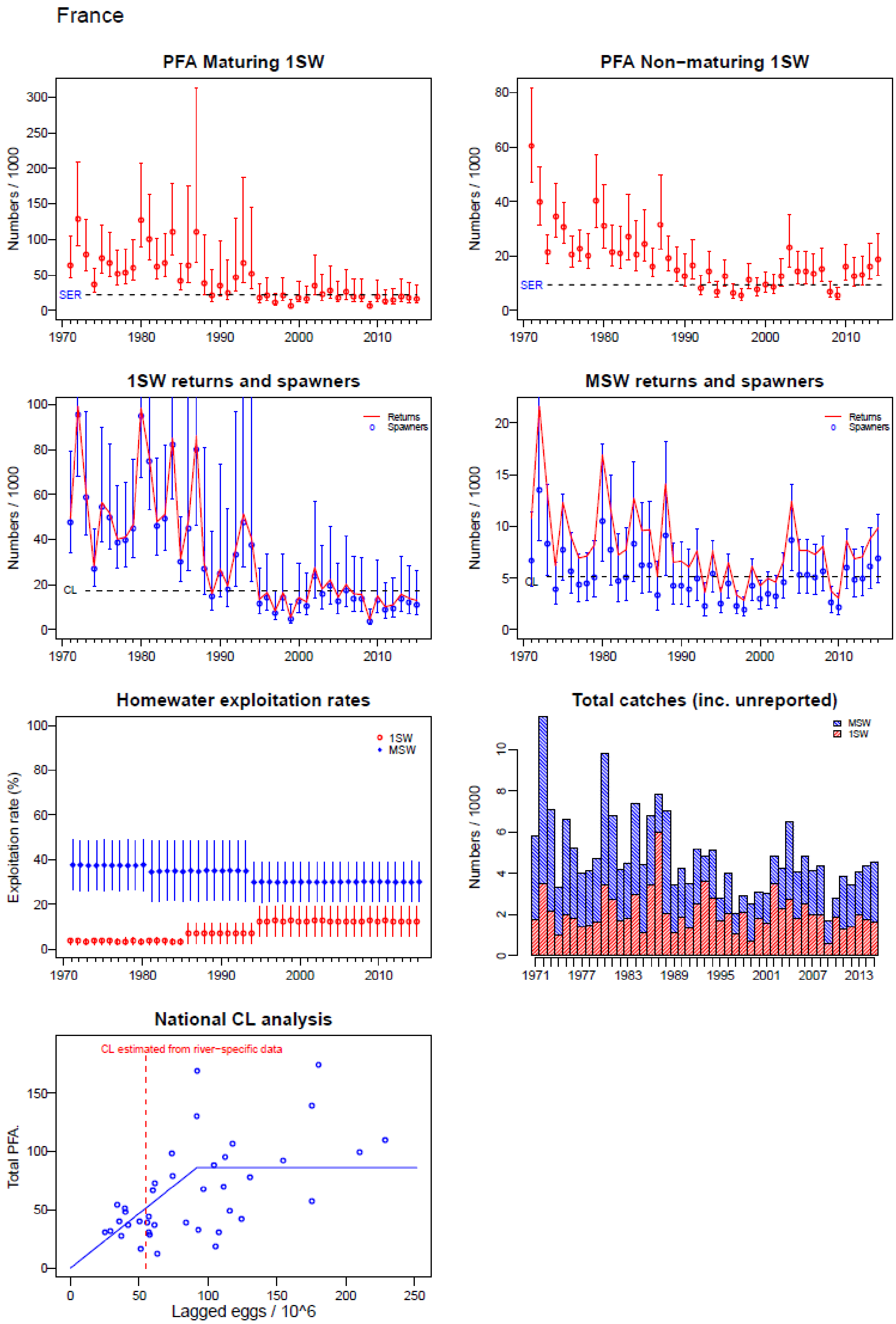


Figure 3.3.4.1b. Summary of fisheries and stock description, France. The river-specific CL, which is used for assessment purposes, is included on the national CL analysis plot (for comparison, the CL estimated from the national S–R relationship is at the inflection point).

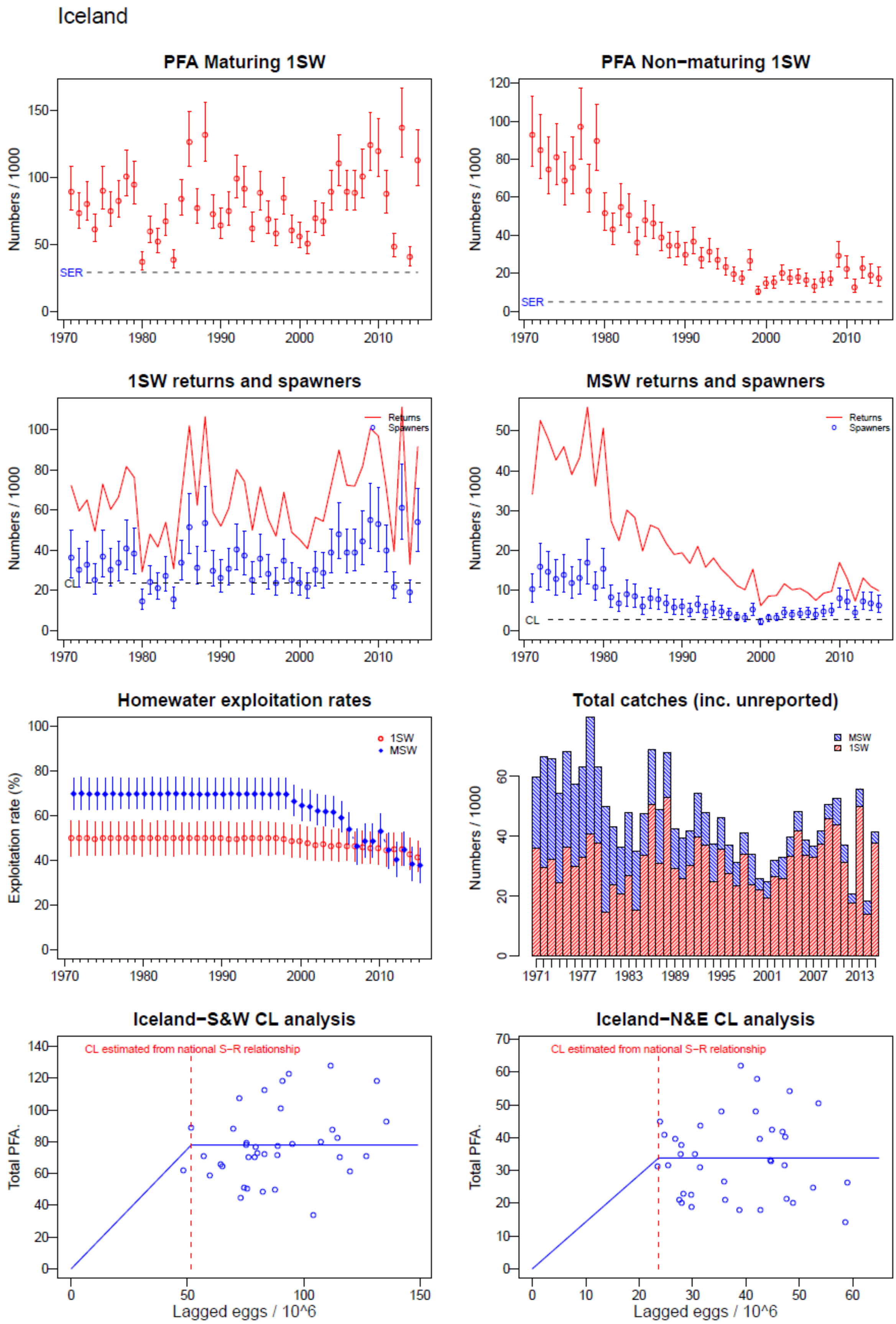


Figure 3.3.4.1c. Summary of fisheries and stock description, Iceland.

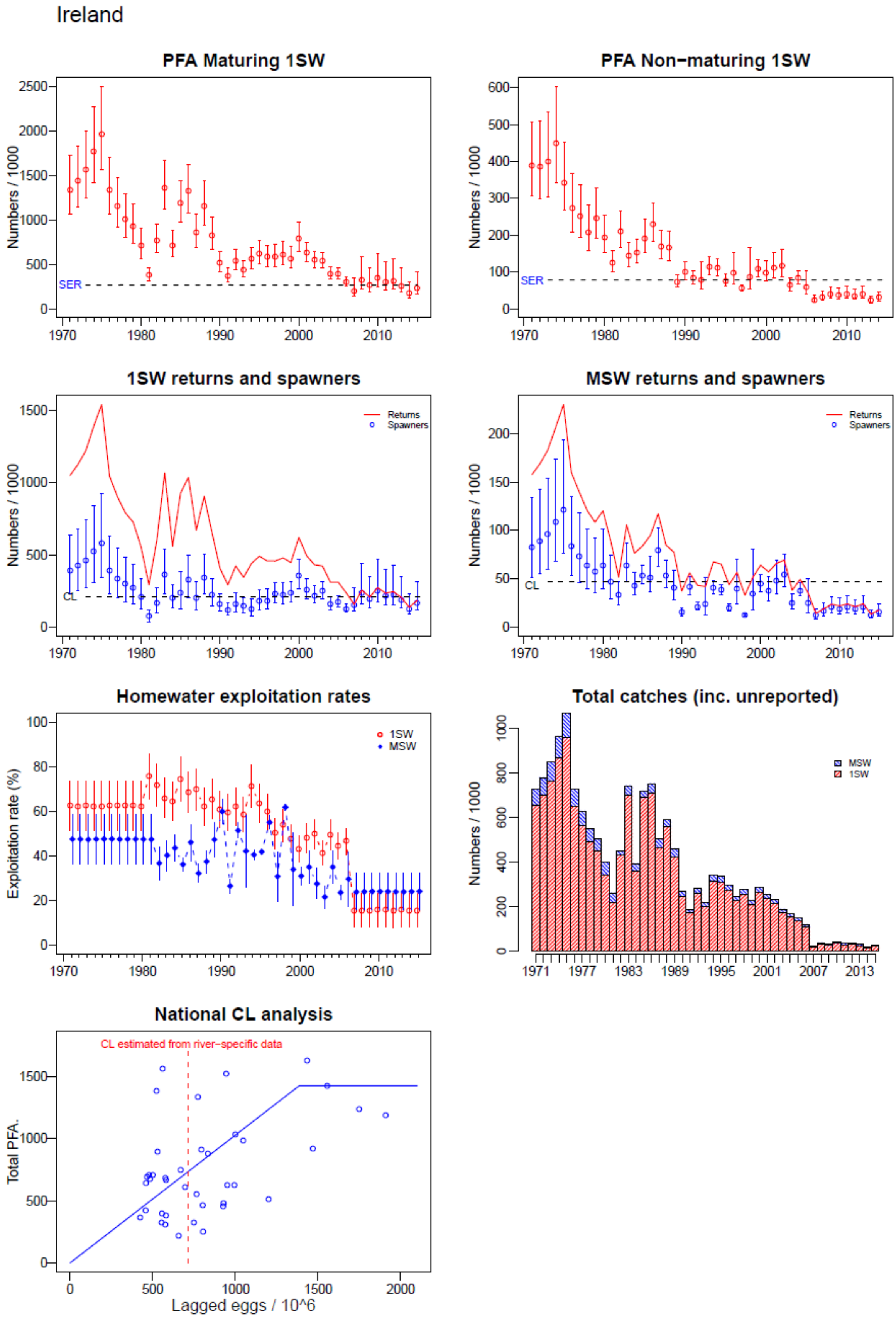


Figure 3.3.4.1d. Summary of fisheries and stock description, Ireland. The river-specific CL, which is used for assessment purposes, is included on the national CL analysis plot (for comparison, the CL estimated from the national S–R relationship is at the inflection point).

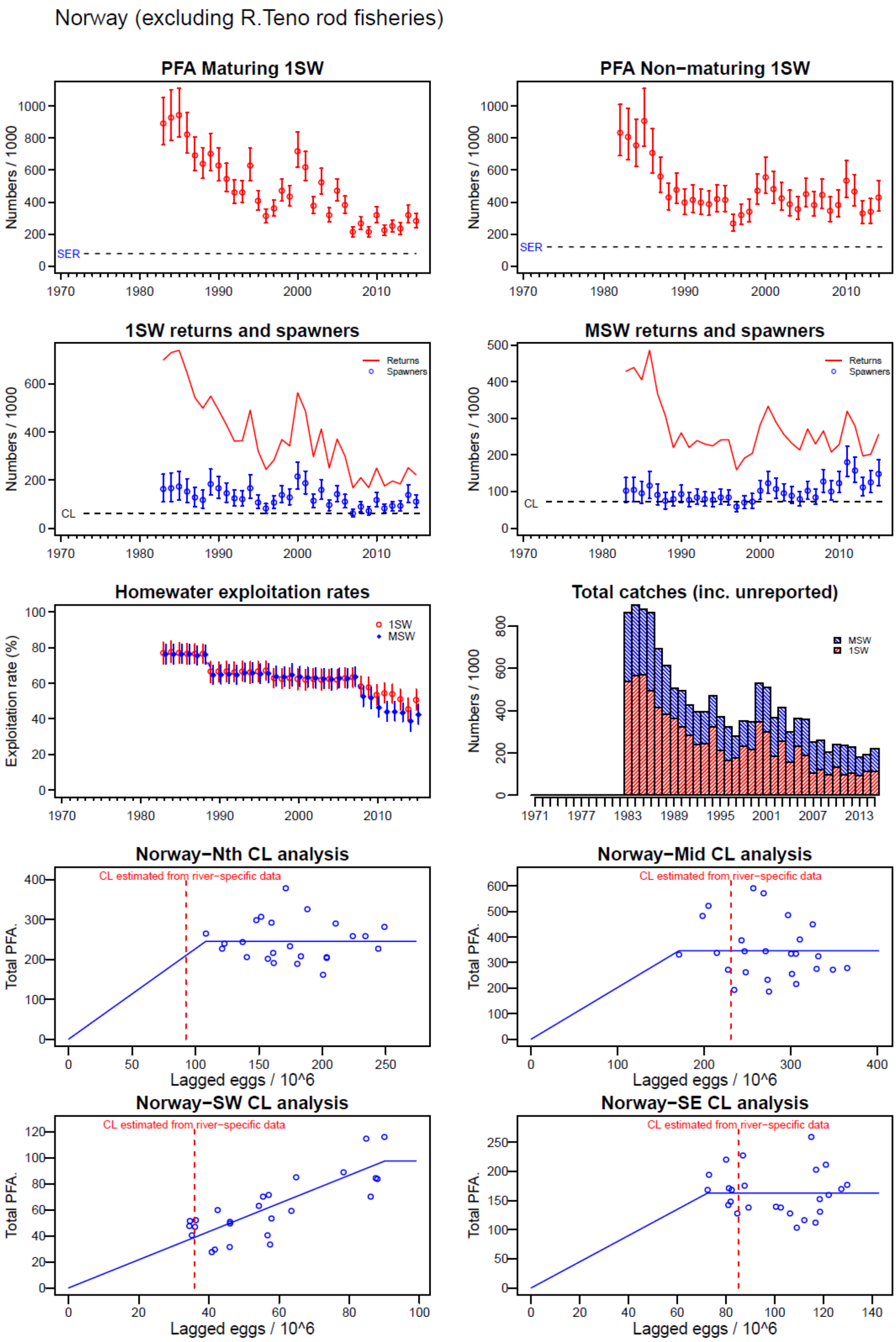


Figure 3.3.4.1e. Summary of fisheries and stock description, Norway (minus Norwegian catches from the R. Teno / Tana). The river-specific CLs, which are used for assessment purposes, are included on the regional CL analysis plots (for comparison, the CLs estimated from the regional S–R relationships are at the inflection points).

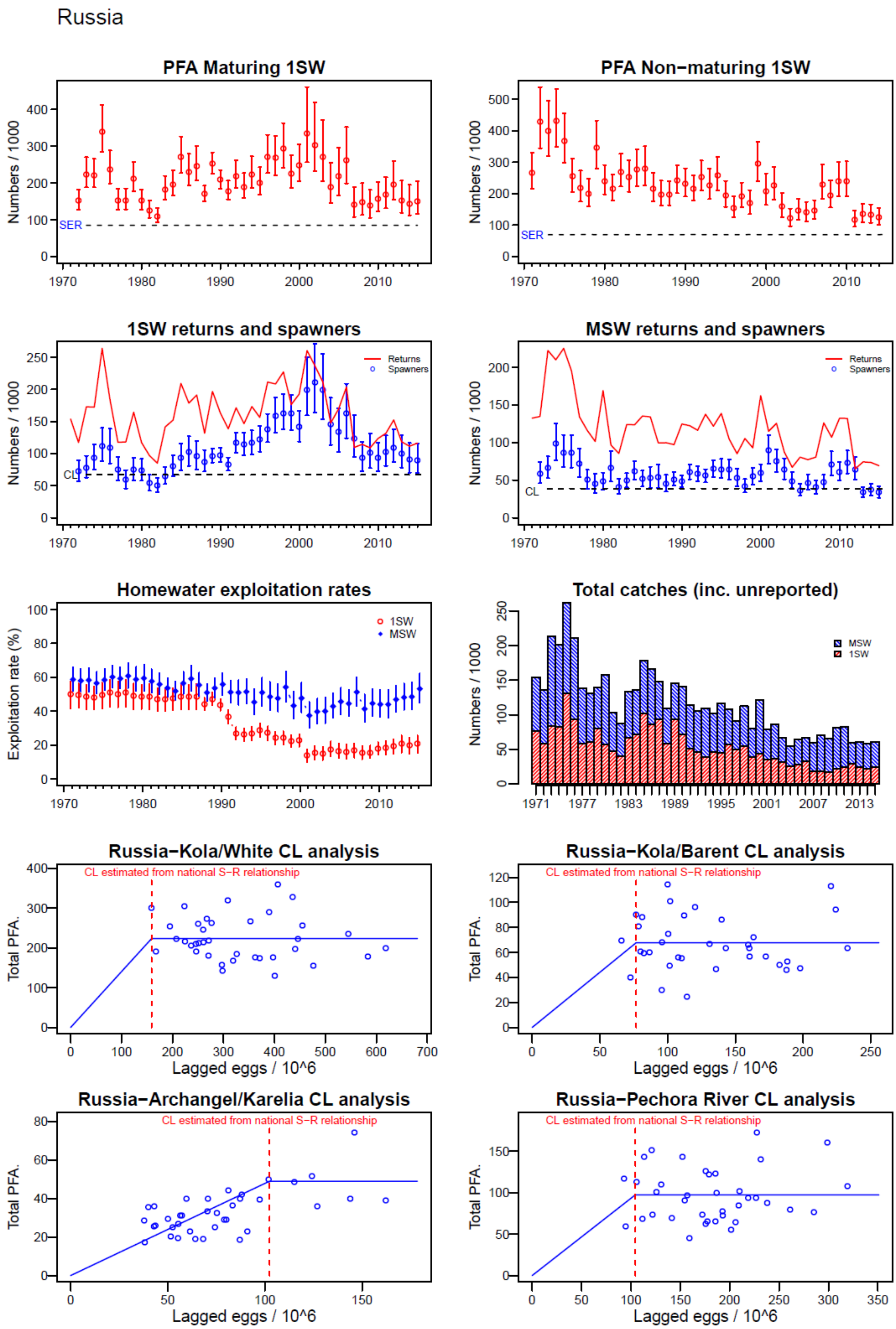


Figure 3.3.4.1f. Summary of fisheries and stock description, Russia.

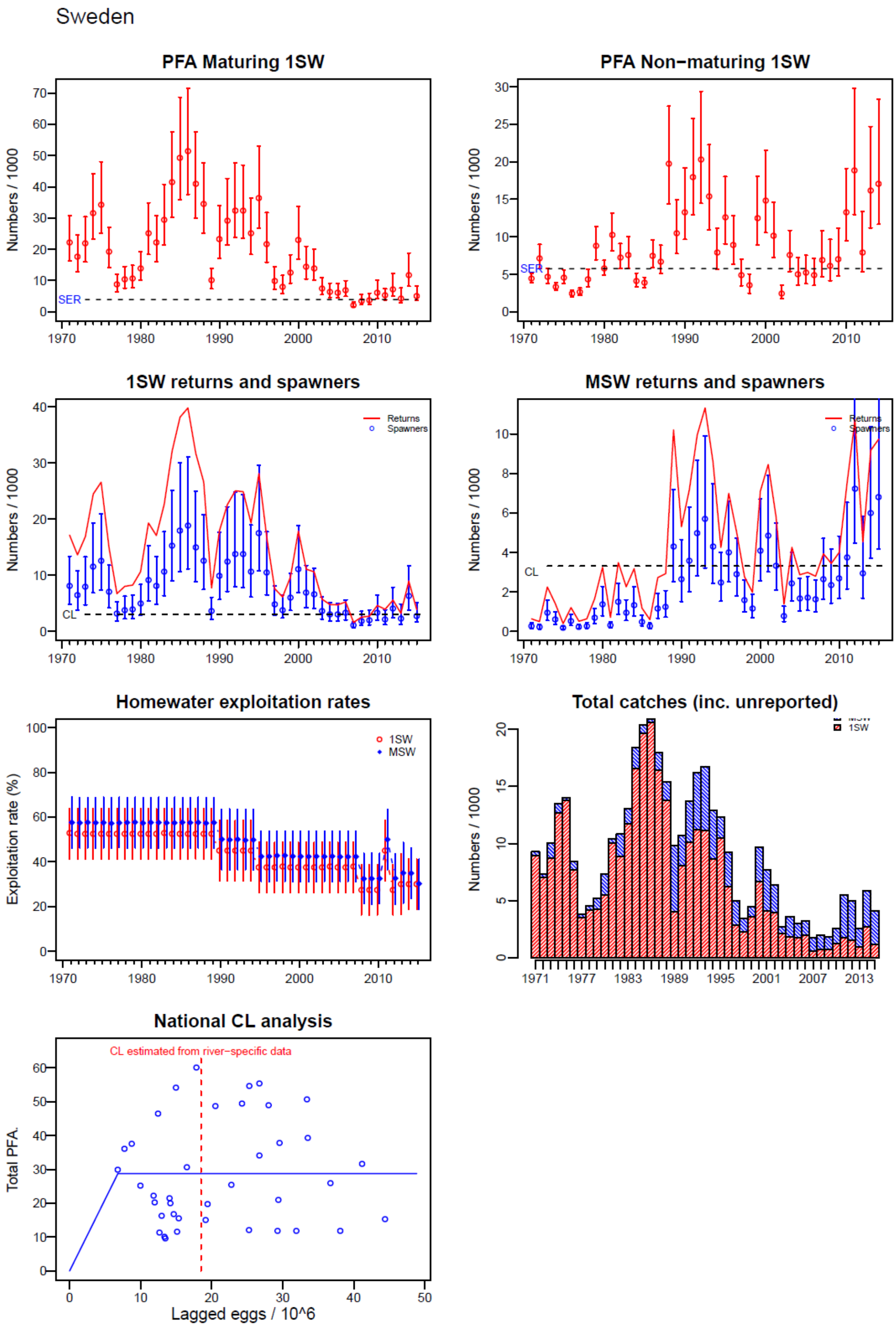


Figure 3.3.4.1g. Summary of fisheries and stock description, Sweden. The river-specific CL, which is used for assessment purposes, is included on the national CL analysis plot (for comparison, the CL estimated from the national S–R relationship is at the inflection point).

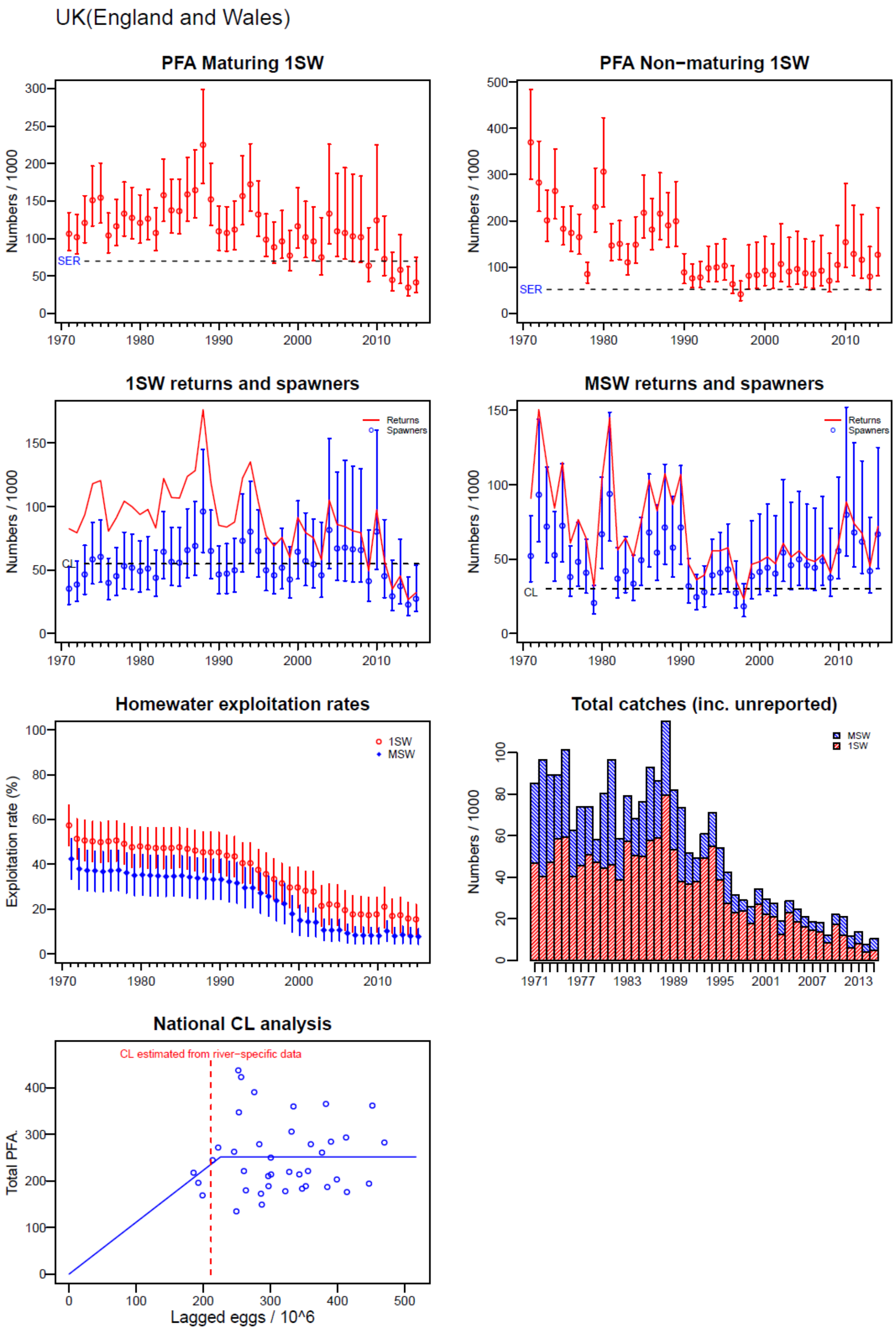


Figure 3.3.4.1h. Summary of fisheries and stock description, UK (England & Wales). The river-specific CL, which is used for assessment purposes, is included on the national CL analysis plot (for comparison, the CL estimated from the national S–R relationship is at the inflection point).

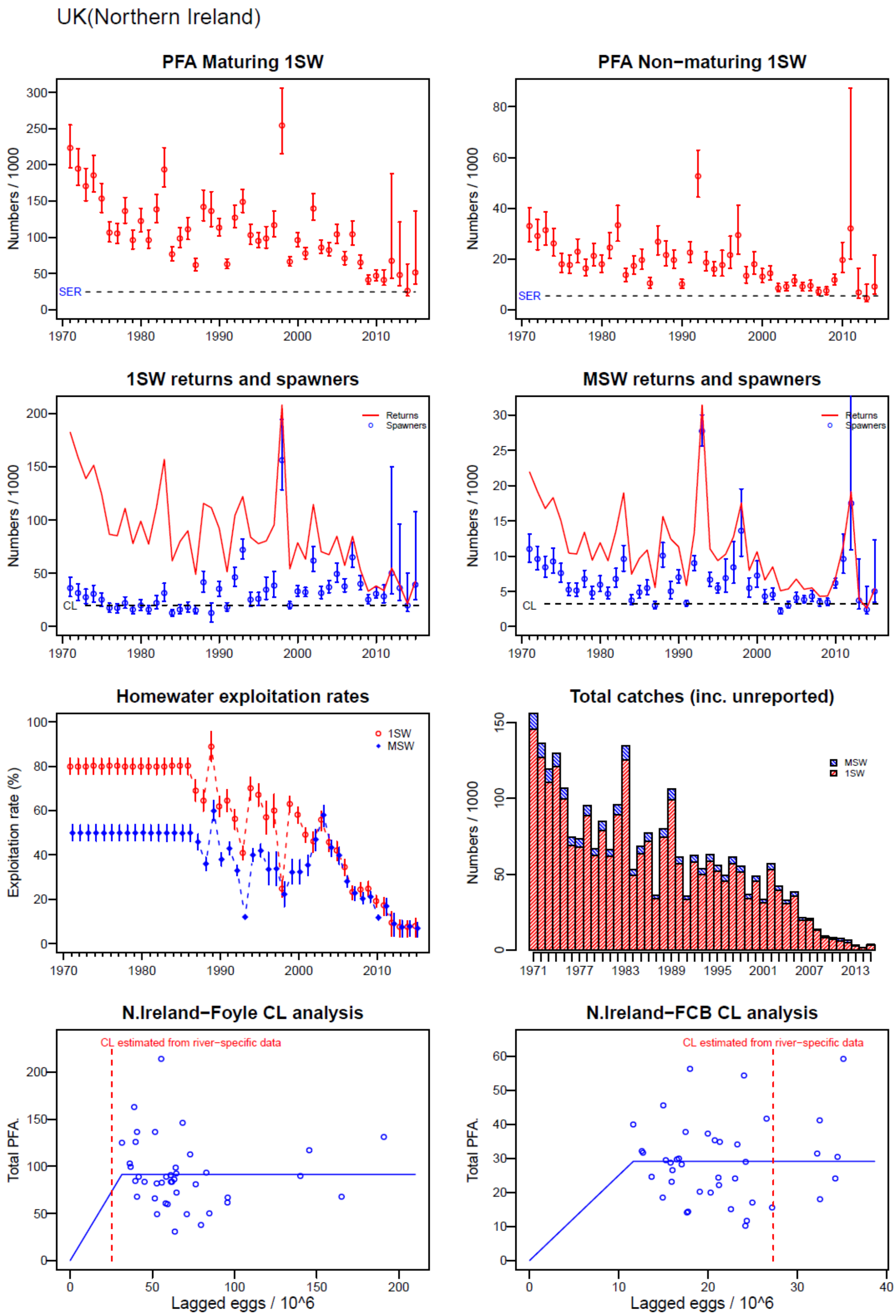


Figure 3.3.4.1i. Summary of fisheries and stock description, UK (Northern Ireland). The river-specific CLs, which are used for assessment purposes, are included on the regional CL analysis plots (for comparison, the CLs estimated from the regional S–R relationships are at the inflection points).

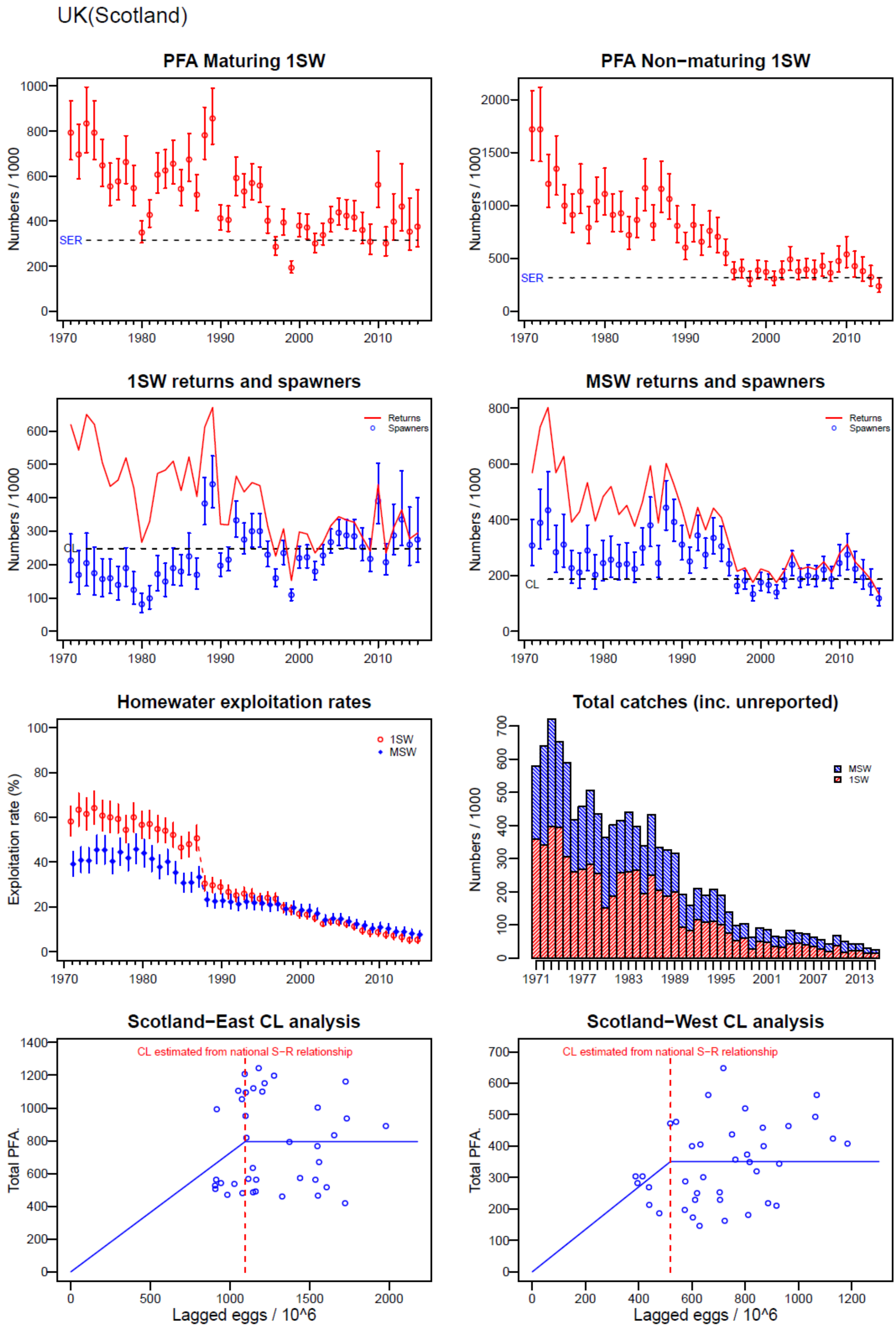


Figure 3.3.4.1j. Summary of fisheries and stock description, UK (Scotland).

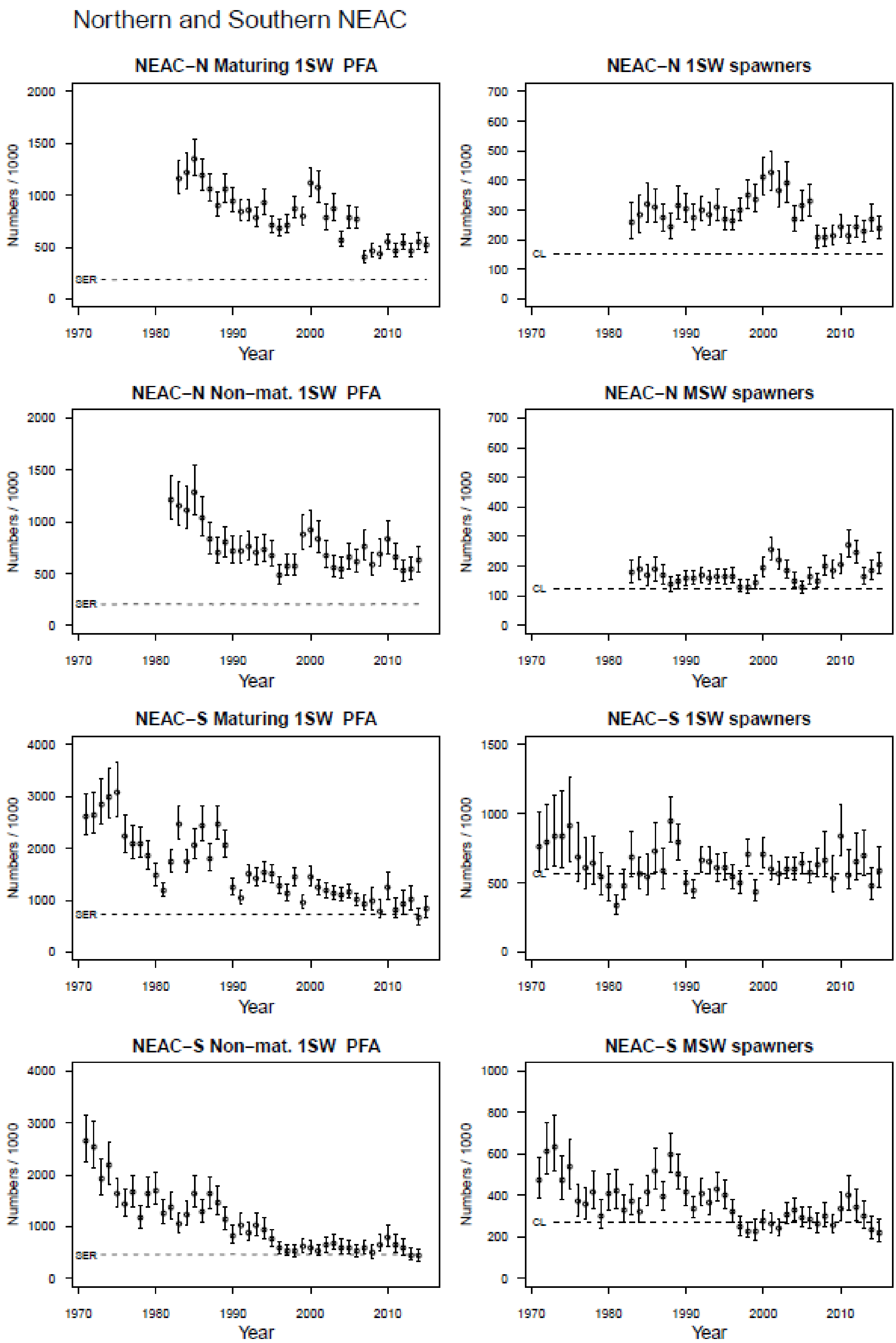


Figure 3.3.4.2. Estimated PFA (left panels) and spawning escapement (right panels) with 90% confidence limits, for maturing 1SW (1SW spawners) and non-maturing 1SW (MSW spawners) salmon in northern (NEAC – N) and southern (NEAC – S) NEAC stock complexes.

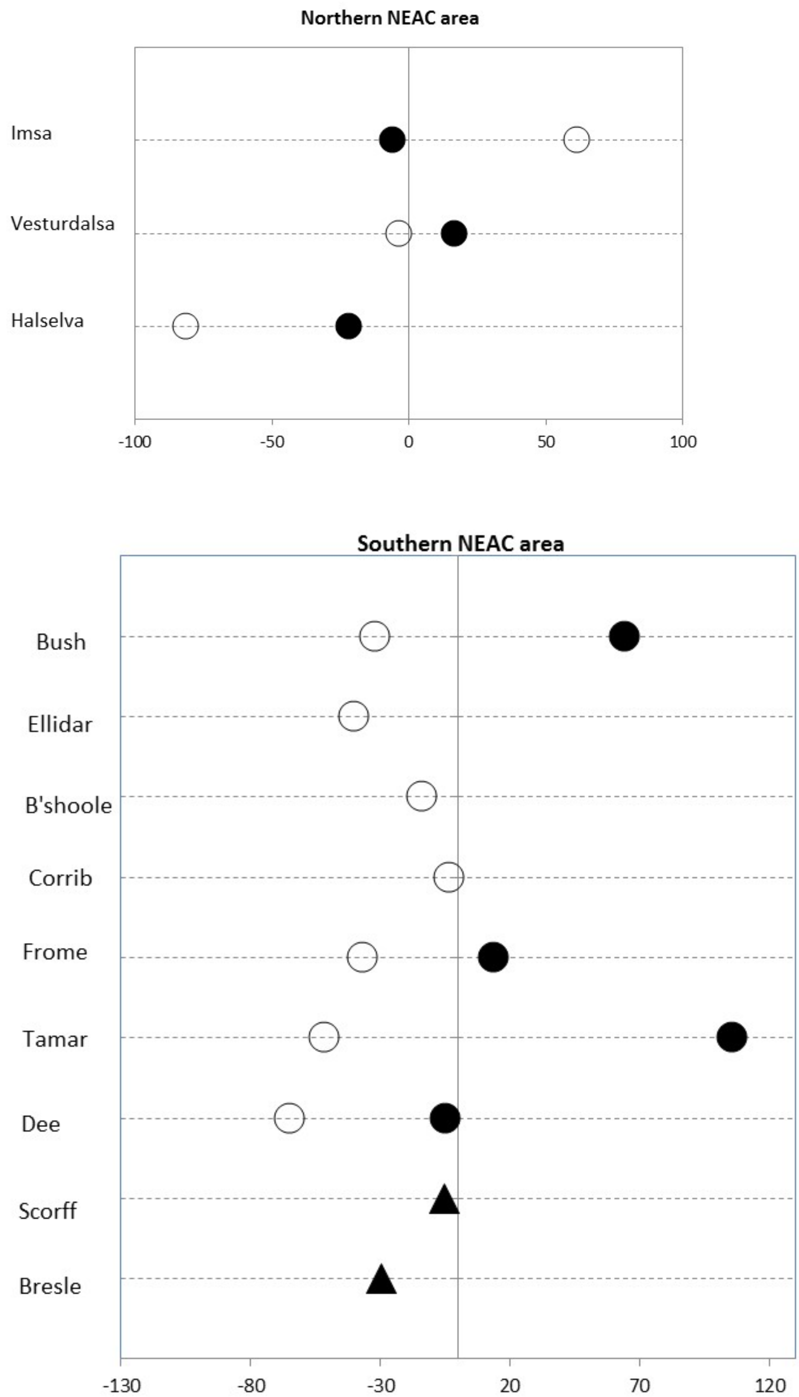


Figure 3.3.6.1. Comparison of the percent change in the five-year mean return rates for 1SW and 2SW wild salmon smolts to rivers of northern (upper panel) and southern NEAC (lower panel) areas for the 2005 to 2009 and 2010 to 2014 smolt years (2004 to 2008 and 2009 to 2013 for 2SW salmon). Open circles are for 1SW and filled circles are for 2SW dataseries. Triangles indicate all ages without separation into 1SW and 2SW smolts. Populations with at least three datapoints in each of the two time periods are included in the analysis. The scale of change in some rivers is influenced by low return numbers, where a few fish more or less returning may have a significant impact on the percentage change.

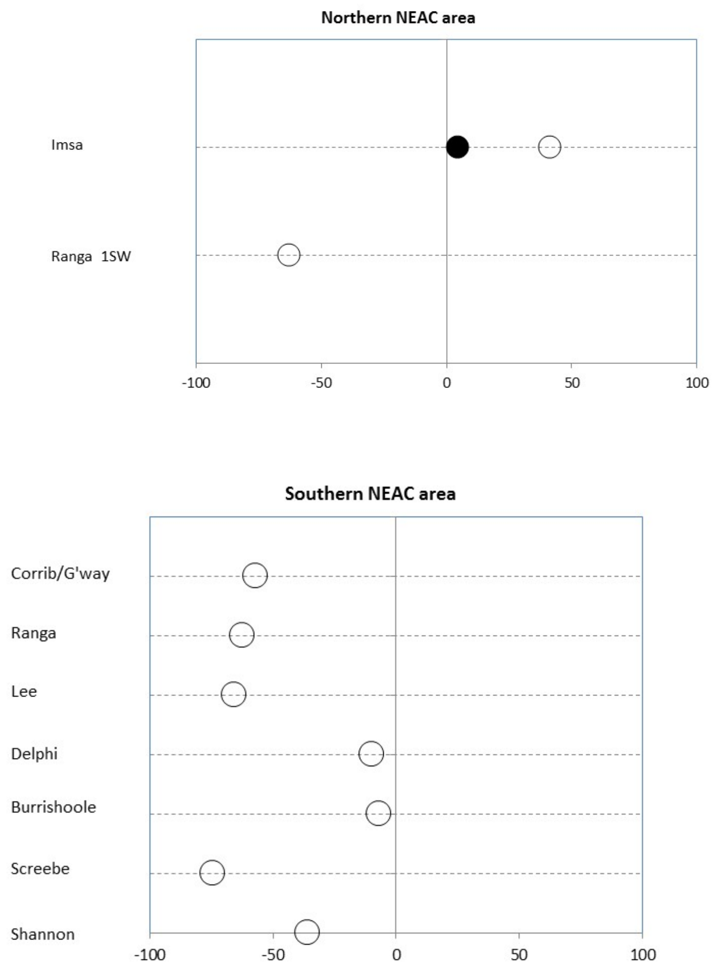


Figure 3.3.6.2. Comparison of the percent change in the five-year mean return rates for 1SW and 2SW hatchery salmon smolts to rivers of northern (upper panel) and southern NEAC (lower panel) areas for the 2005 to 2009 and 2010 to 2014 smolt years (2004 to 2008 and 2009 to 2013 for 2SW salmon). Open circles are for 1SW and filled circles are for 2SW dataseries. Populations with at least three datapoints in each of the two time periods are included in the analysis. The scale of change in some rivers is influenced by low return numbers, where a few fish more or less returning may have a significant impact on the percentage change.

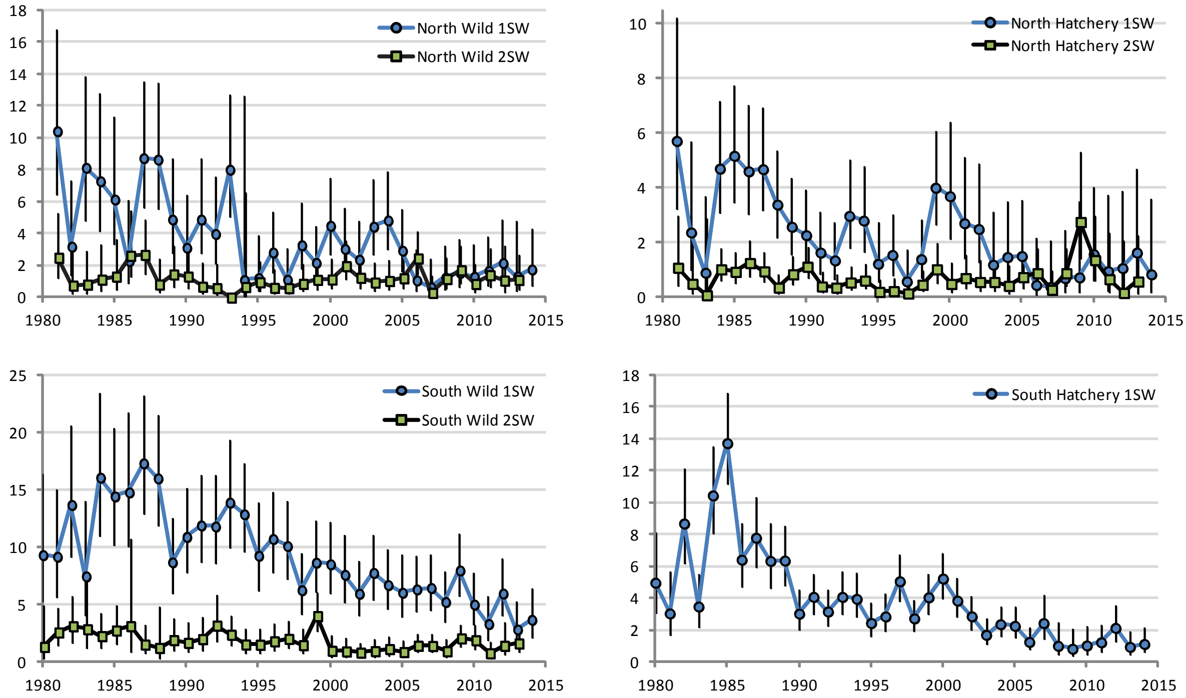


Figure 3.3.6.3. Least squared (marginal mean) average annual survival indices (%) of wild (left hand panels) and hatchery origin smolts (right hand panels) to 1SW and 2SW salmon to northern (top panels) and southern areas (bottom panels). Annual means derived from a general linear model analysis of rivers in a region with a quasi-Poisson distribution (log-link function). Error values are 95% CLs. Note y-scale differences among panels. Following details in Tables 3.3.6.1 and 3.3.6.2 the analyses included estimated survival (%) to 1SW and 2SW returns by smolt year with: Wild returns to: northern rivers (Vesturdalsa, Halselva and Imsa) and southern rivers (Ellidaar, Corrib, Burrishoole, North Esk, Bush, Dee, Tamar and Frome). Hatchery returns to: northern rivers (Halselva, Imsa, Drammen and Lagan) and southern rivers (Ranga, Shannon, Screebe, Burrishoole, Delphi-Burrishoole, Delphi, Bunowen, Lee, Corrib-Cong, Corrib-Galway, Erne, Bush 1+ smolts and Bush 2+ smolts).

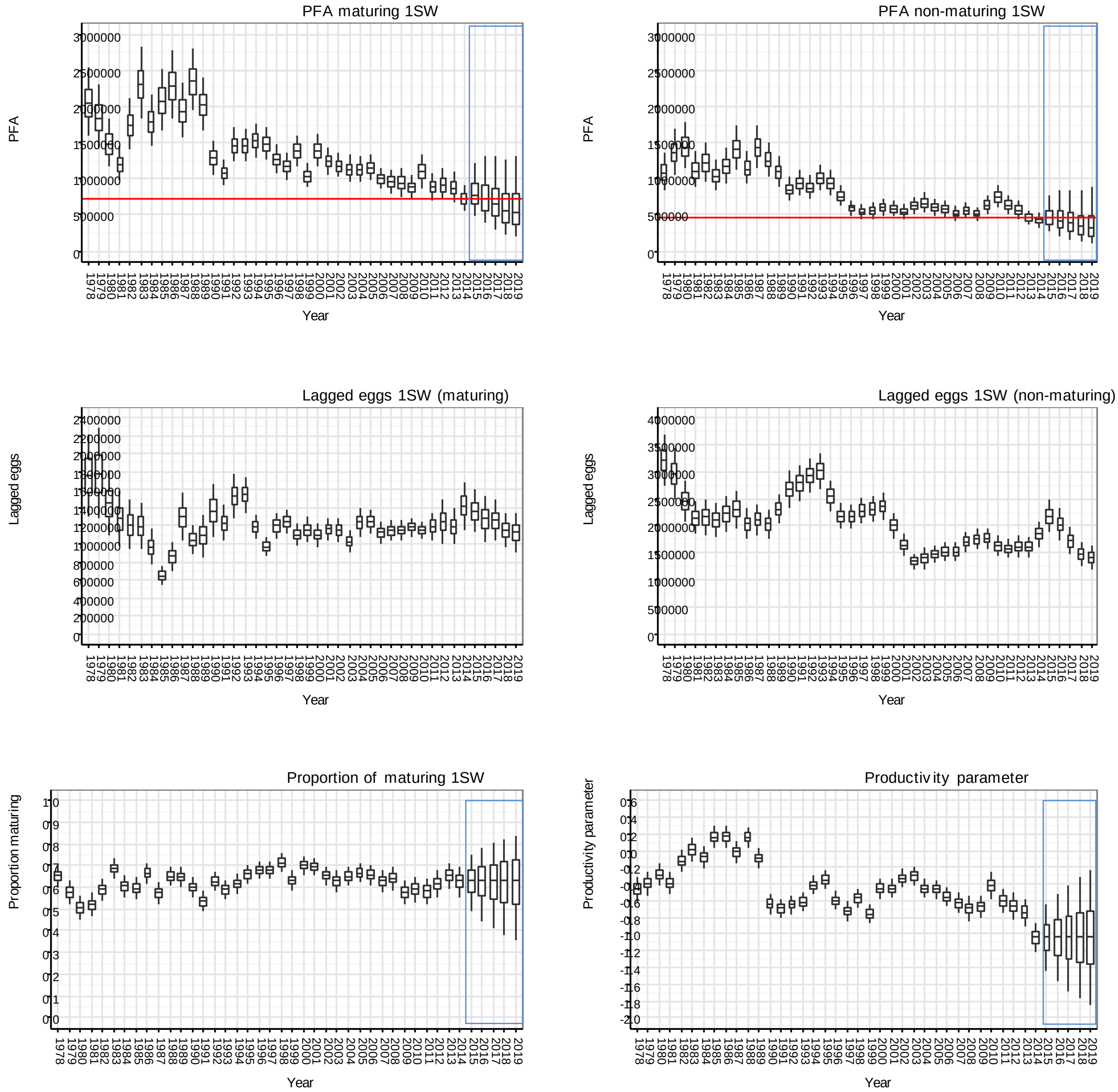


Figure 3.5.2.1. Southern NEAC PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th Bayesian credible intervals (BCIs).

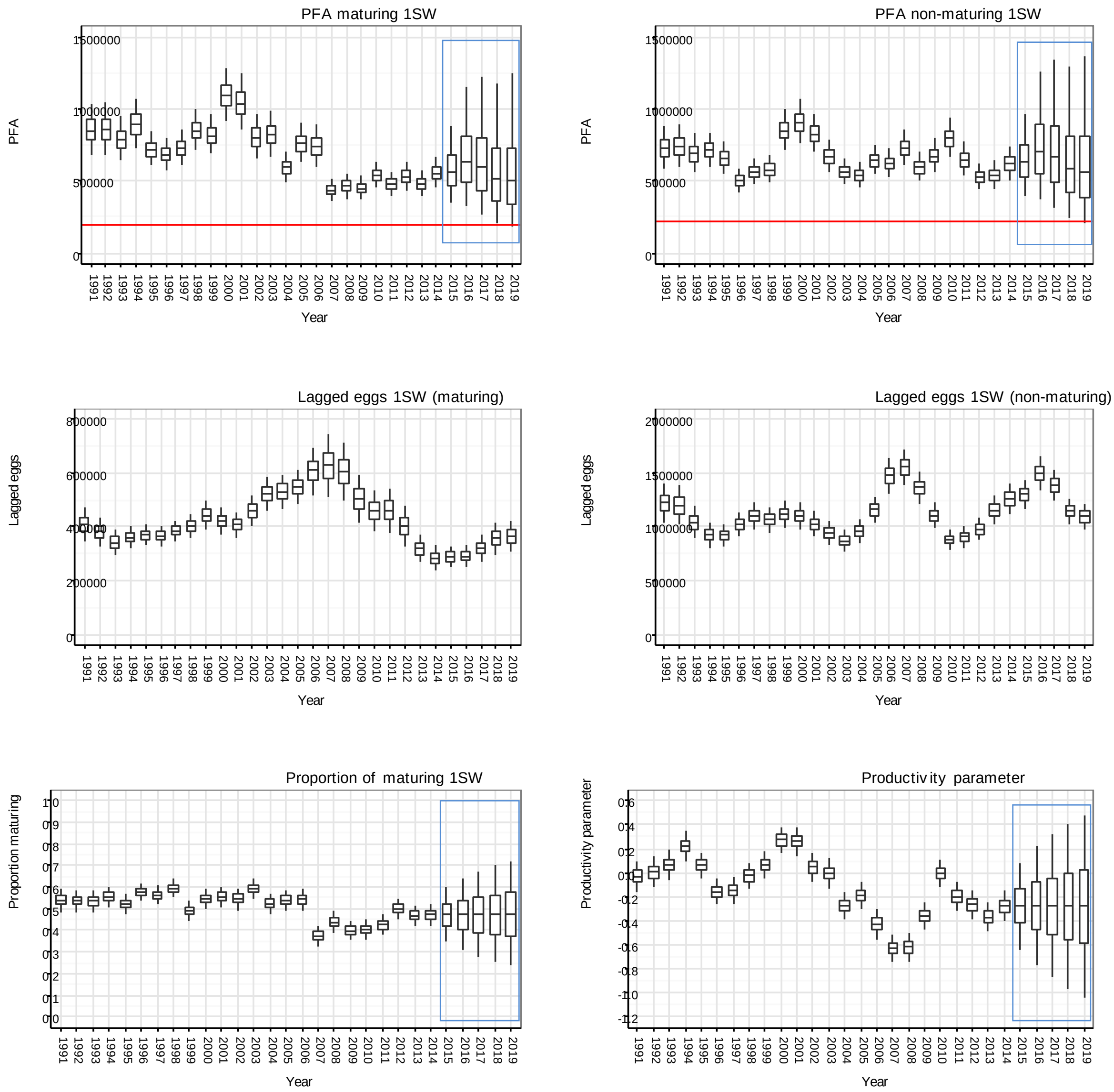


Figure 3.5.2.2. Northern NEAC PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1991 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th Bayesian credible intervals (BCIs).

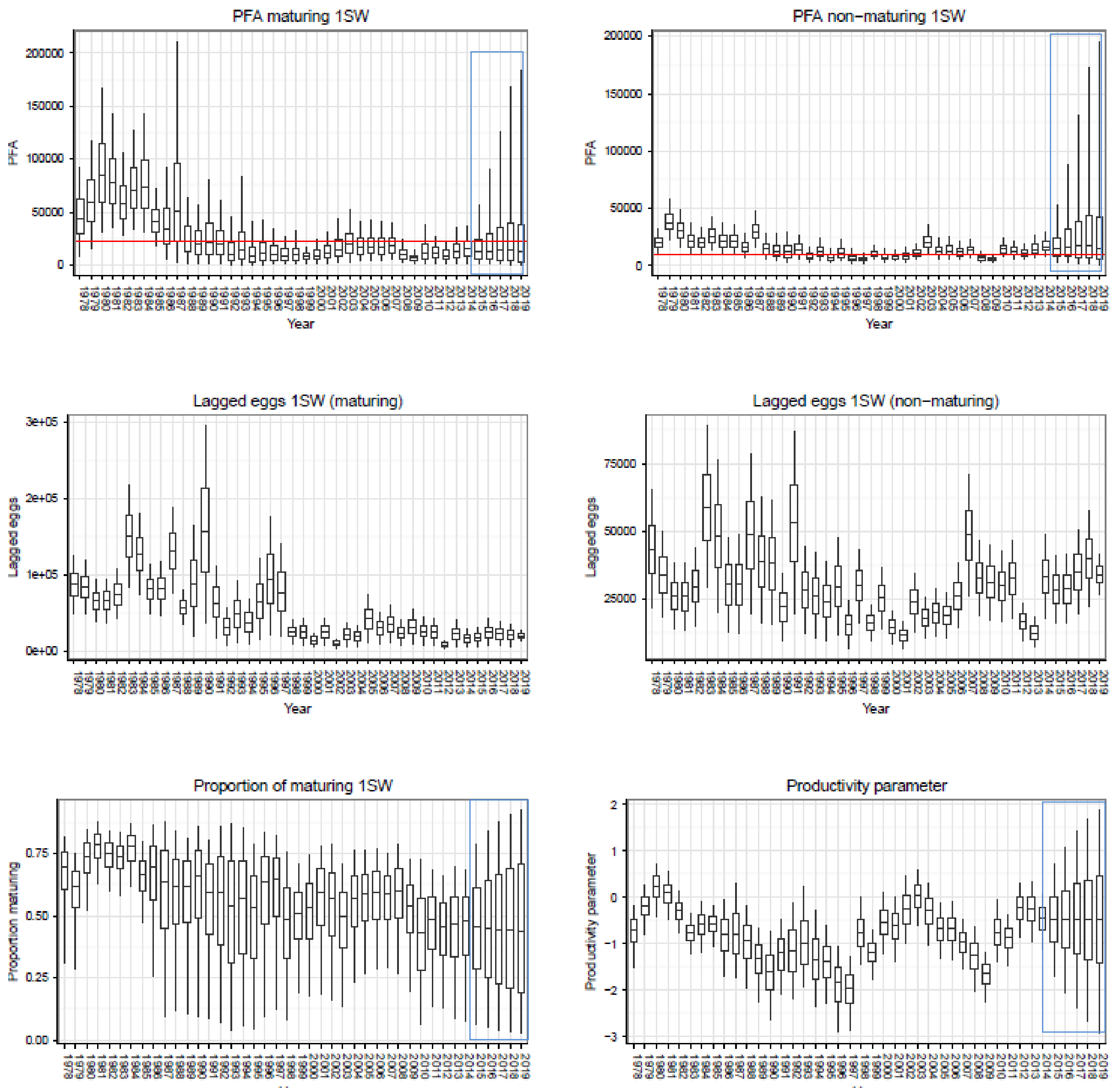


Figure 3.5.3.1. France: PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

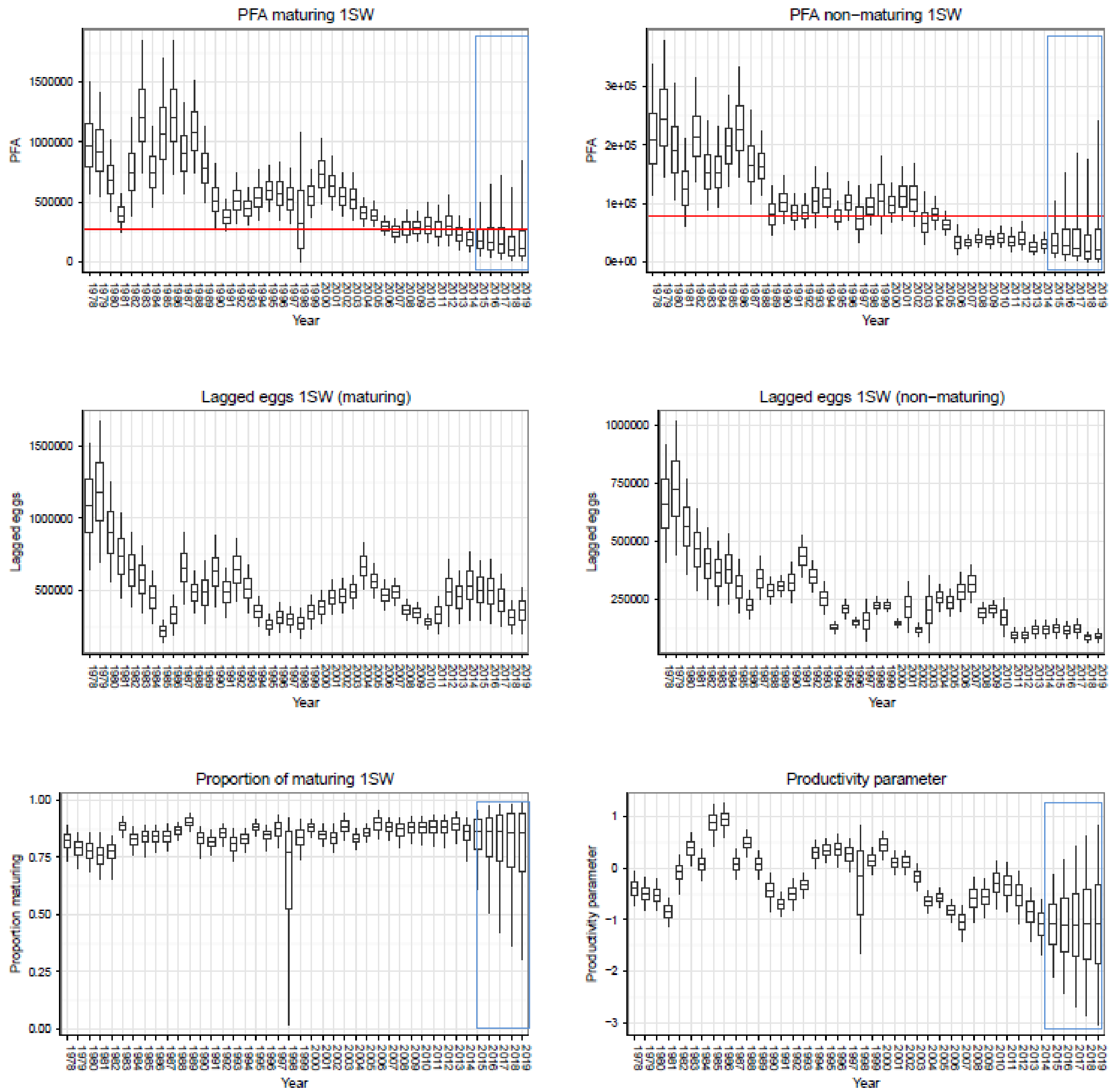


Figure 3.5.3.2. Ireland: PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

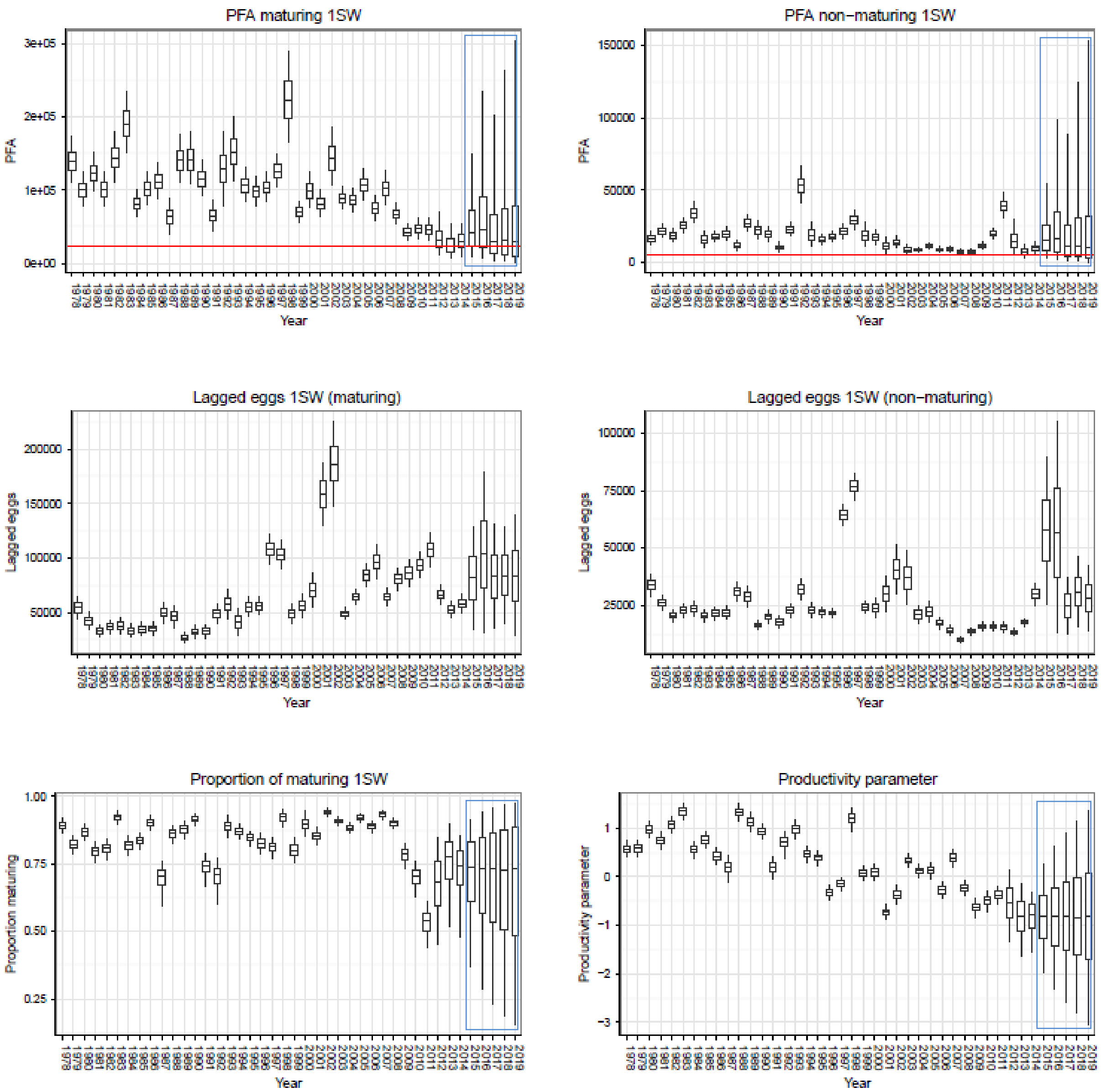


Figure 3.5.3.3. UK (Northern Ireland): PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

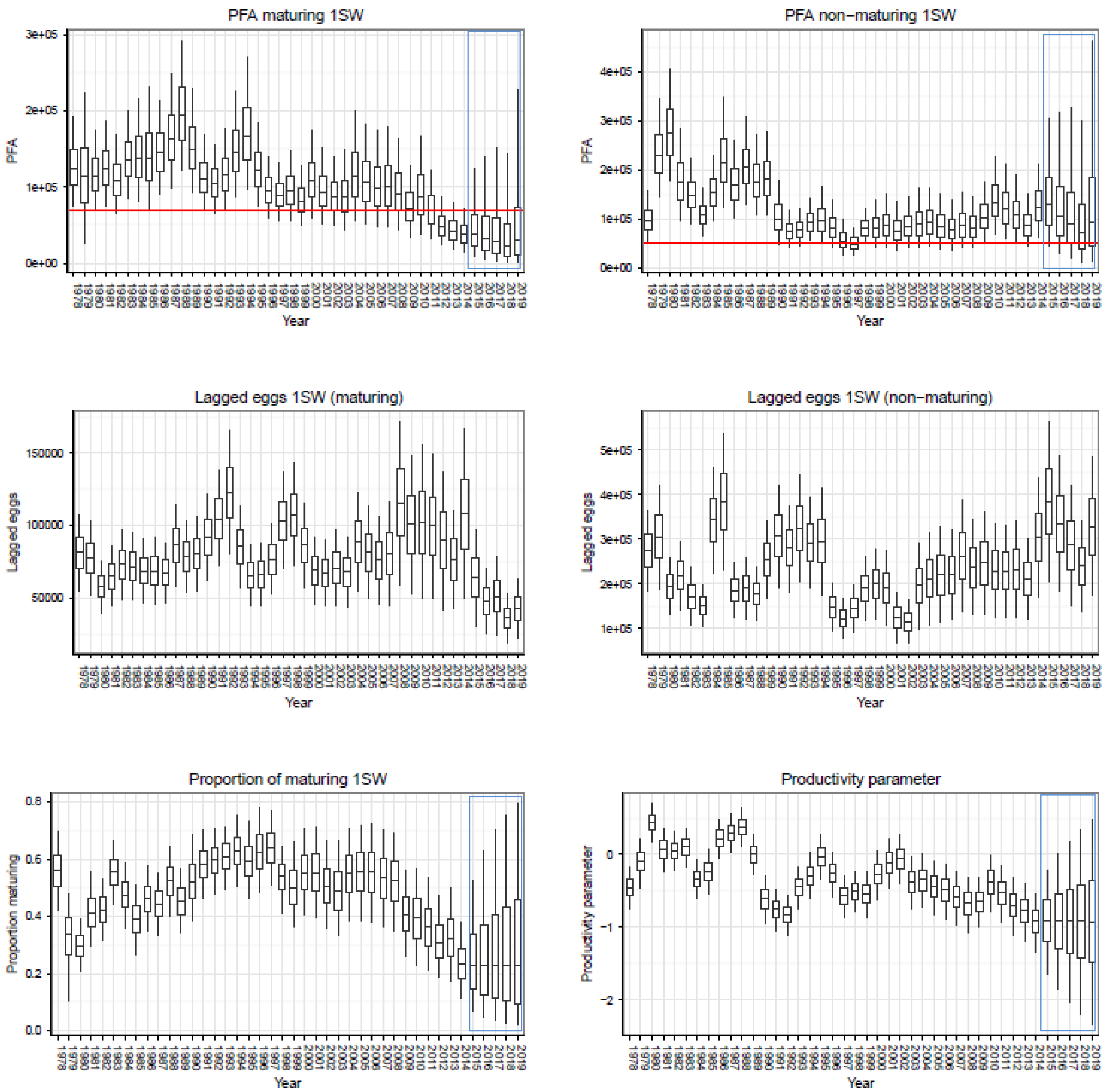


Figure 3.5.3.4. UK (England & Wales): PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

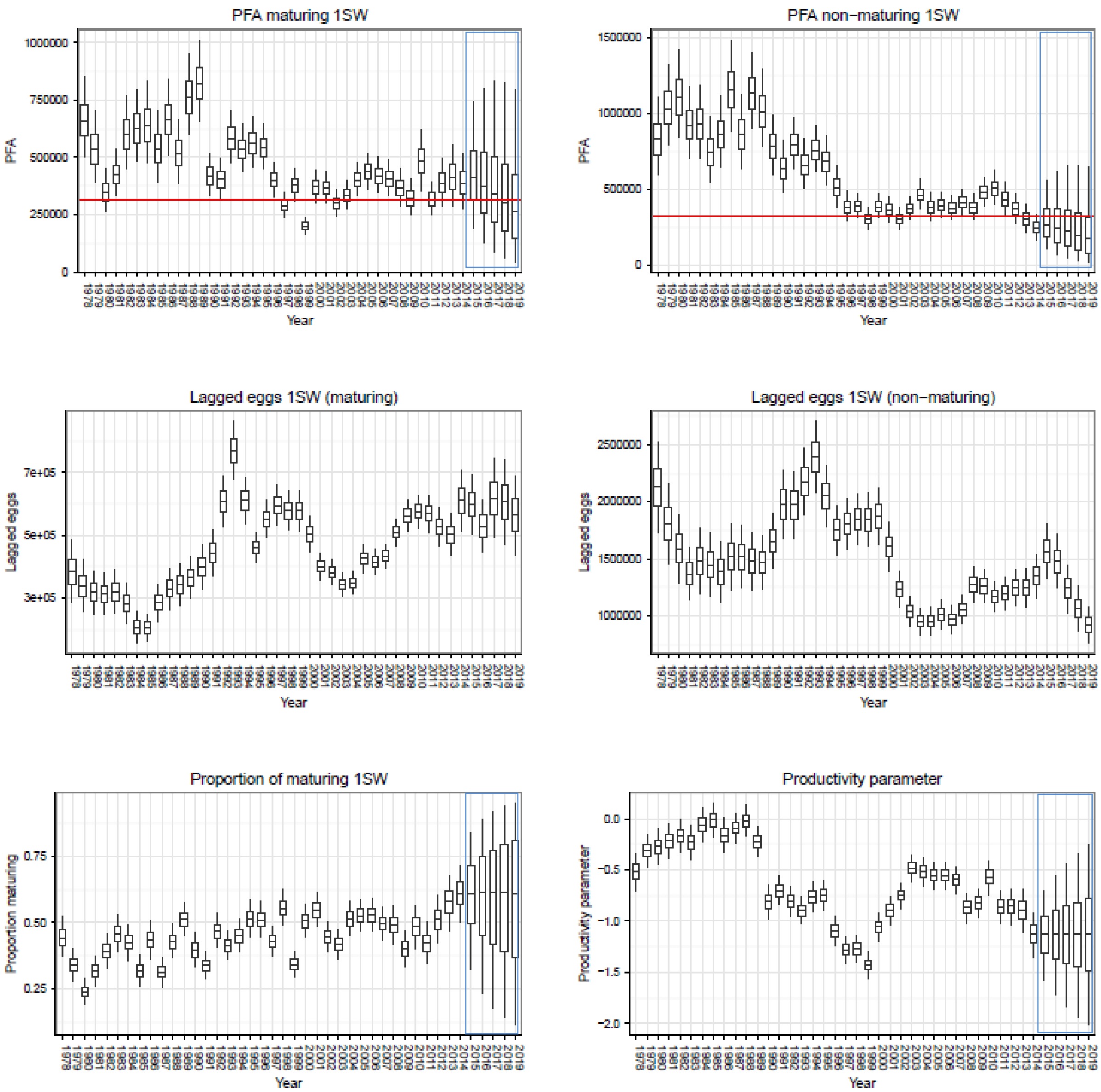


Figure 3.5.3.5. UK (Scotland): PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

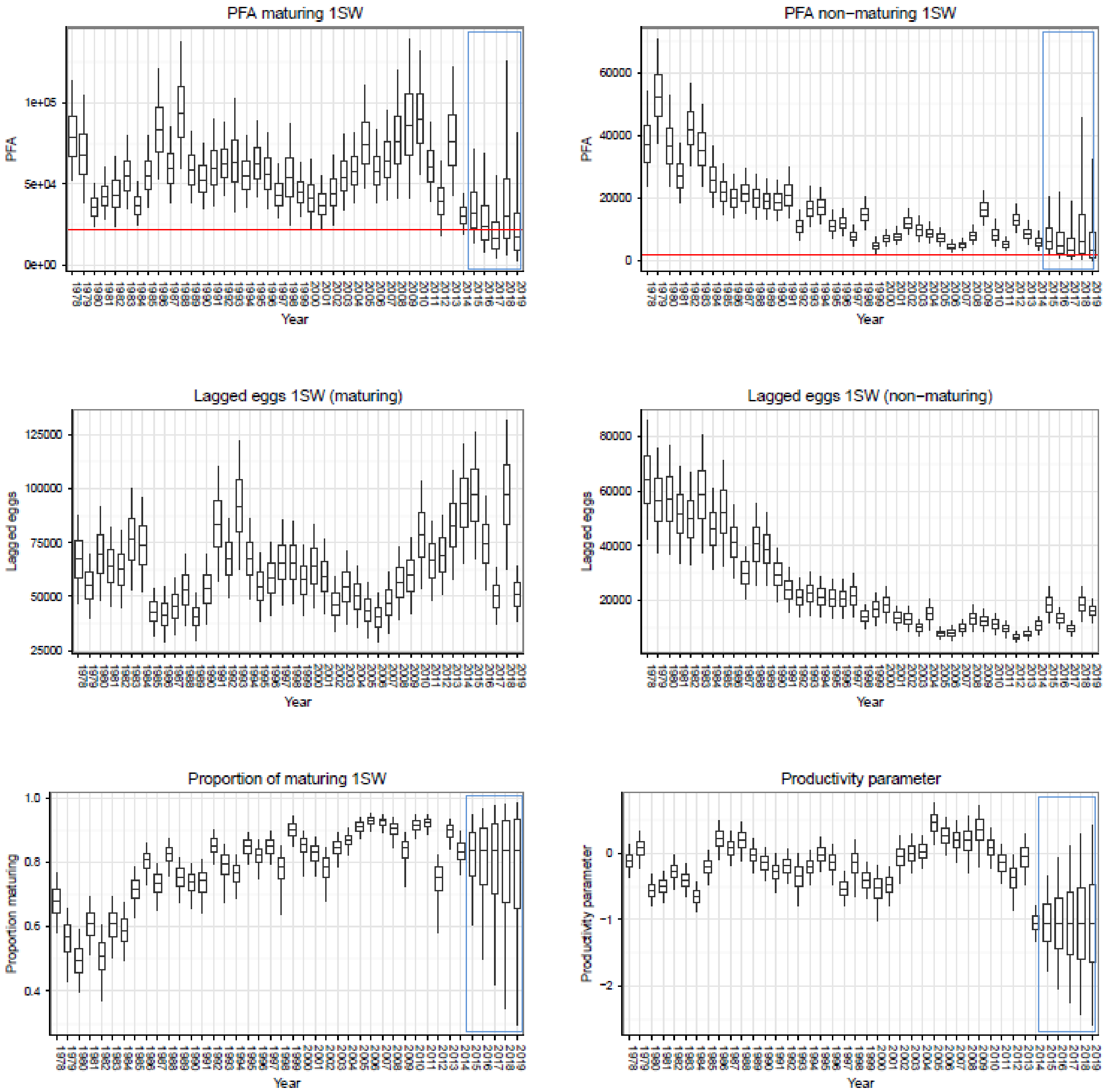


Figure 3.5.3.6. Iceland (south/west regions): PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

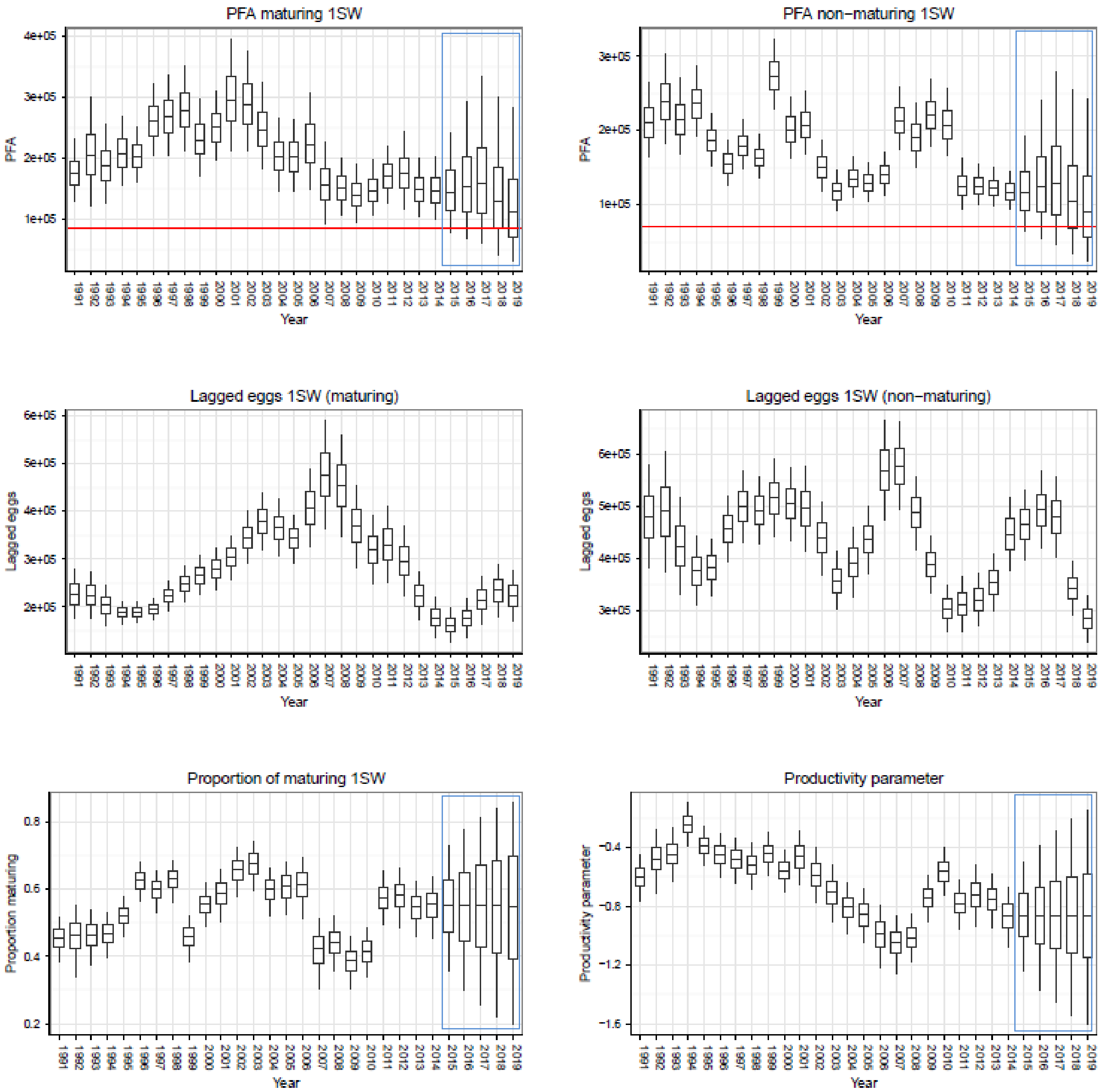


Figure 3.5.3.7. Russia: PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1991 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

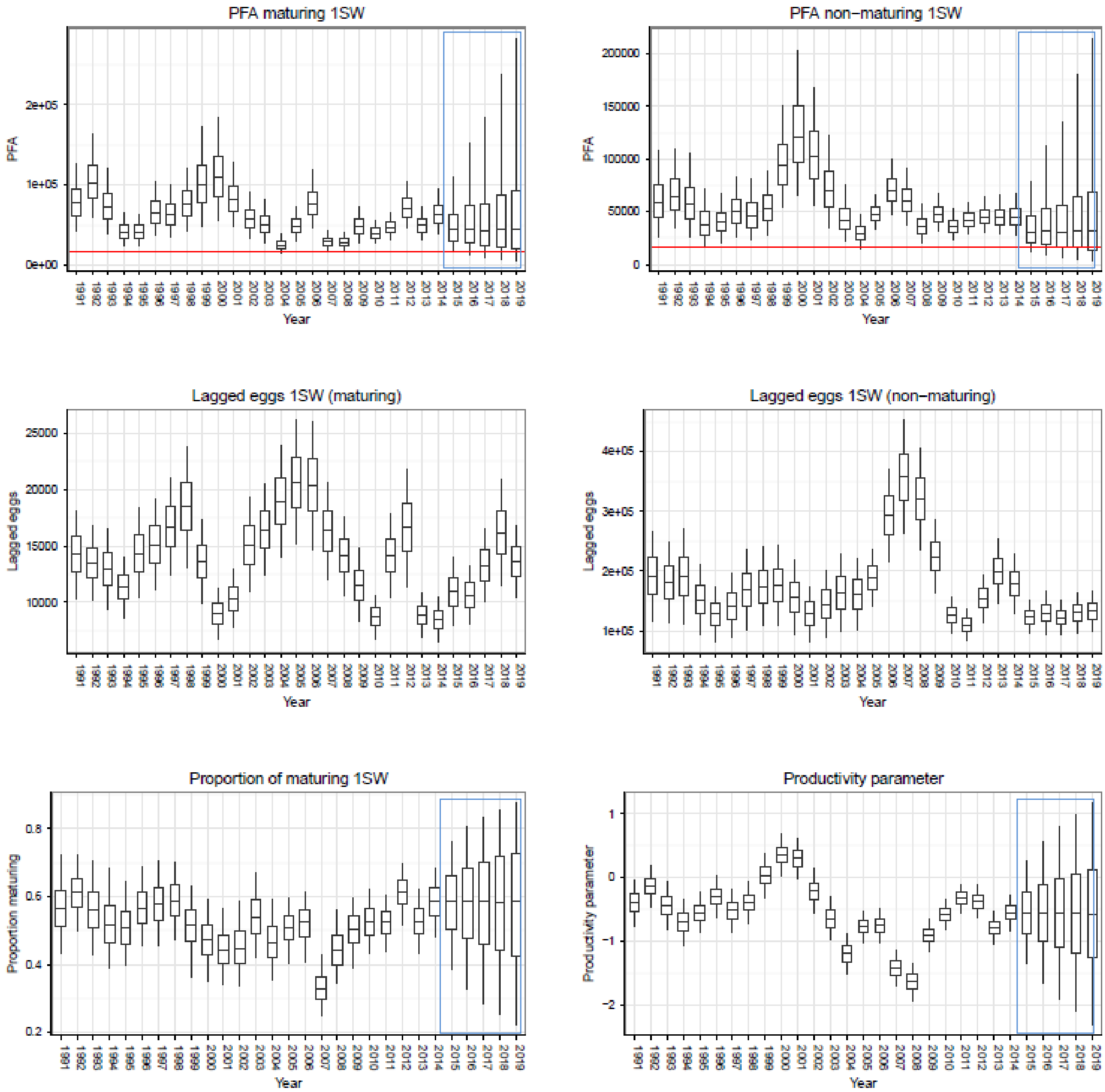


Figure 3.5.3.8. Finland: PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1991 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

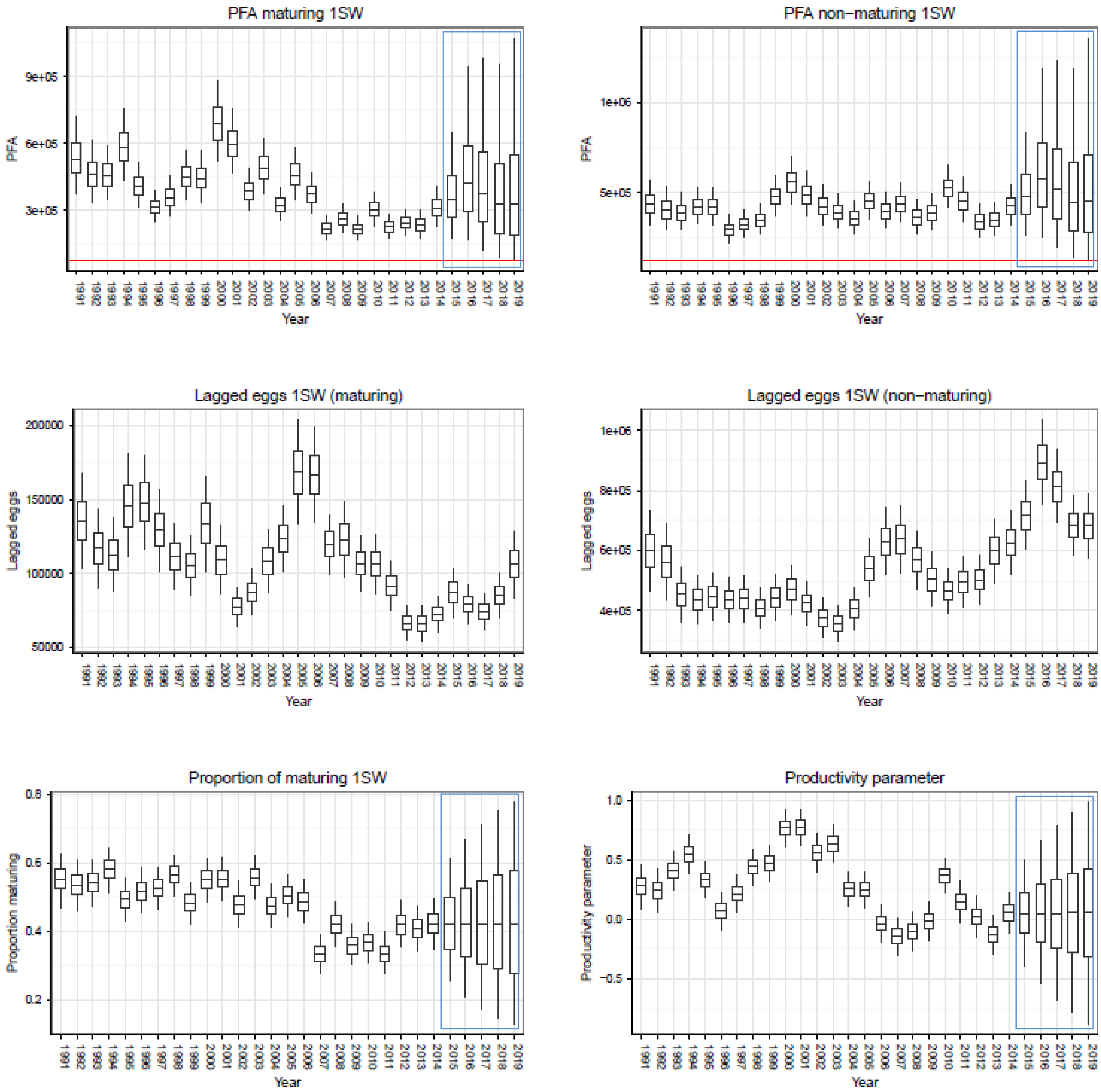


Figure 3.5.3.9. Norway: PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1991 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

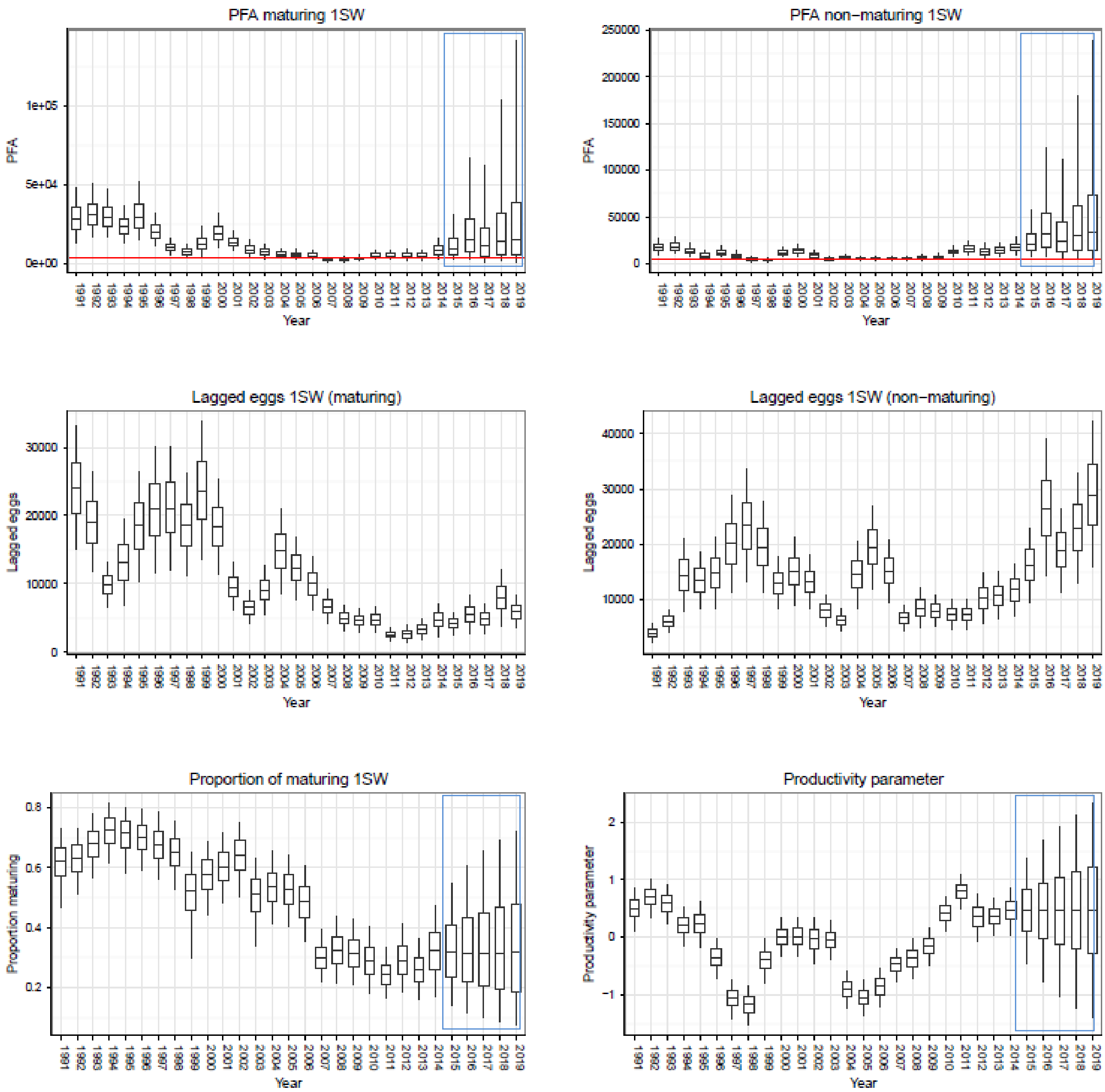


Figure 3.5.3.10. Sweden: PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1991 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

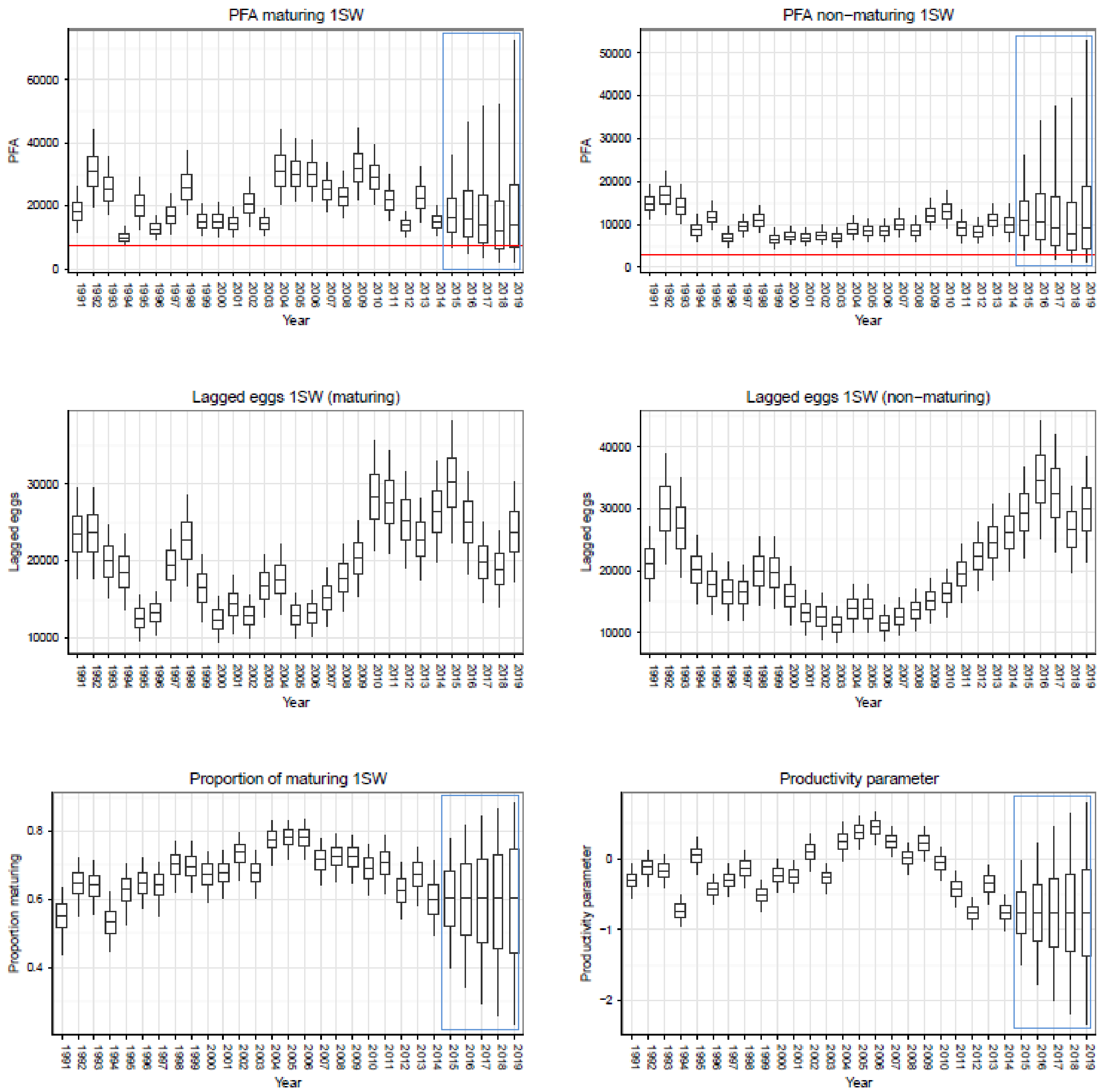
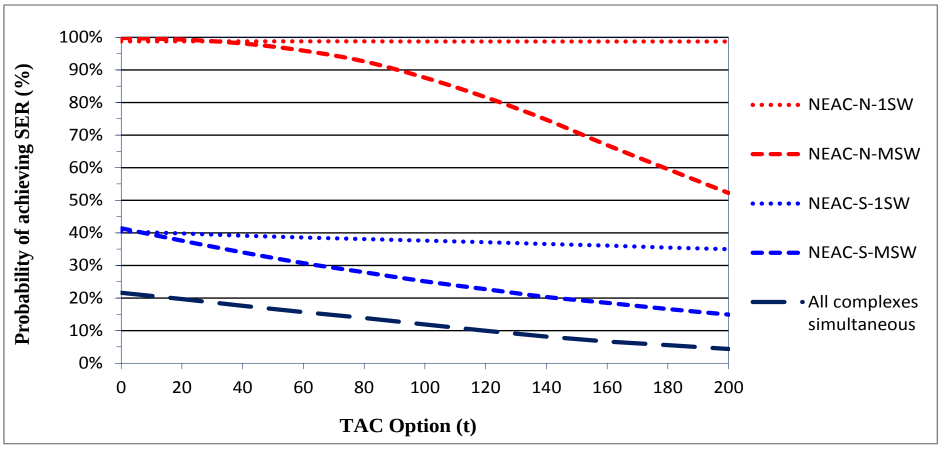
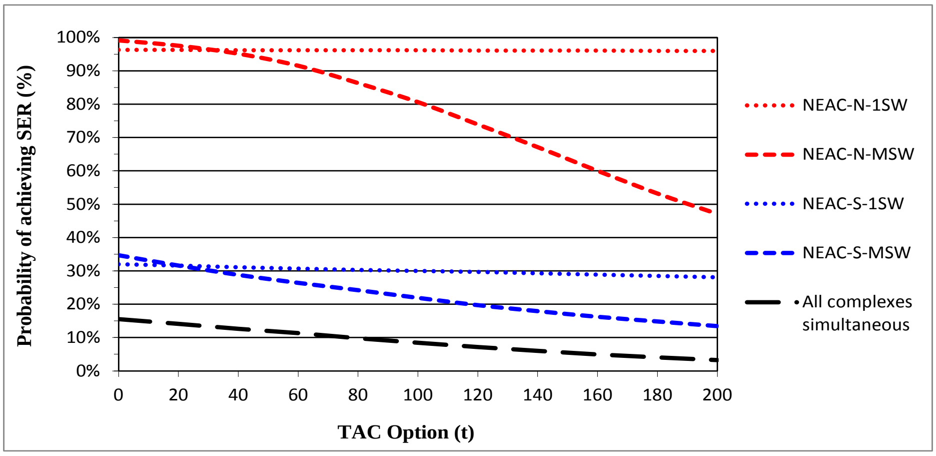


Figure 3.5.3.11. Iceland (north/east regions): PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1991 to 2019. For PFAs, proportion maturing and productivity parameter for the last five years (2015 to 2019) are forecasts (as indicated by rectangles). The horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

Catch options for 2016/17 season:



Catch options for 2017/18 season:



Catch options for 2018/19 season:

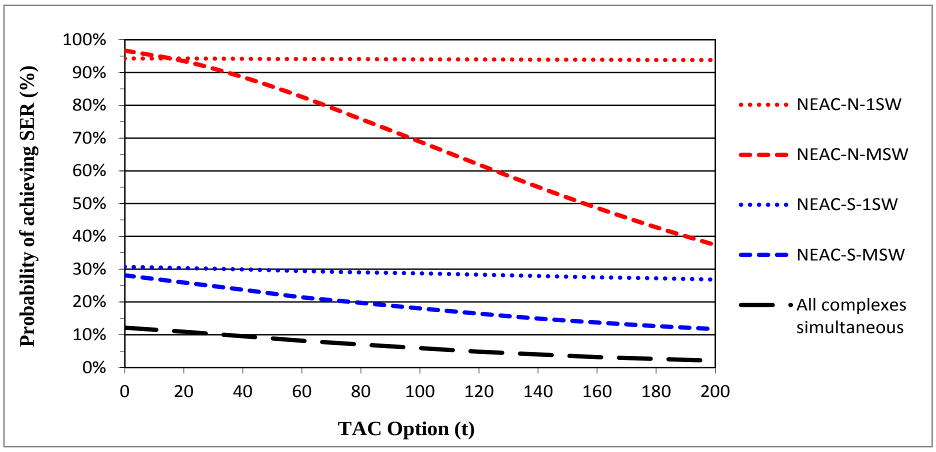


Figure 3.6.1.1. Probability of northern and southern NEAC - 1SW and MSW stock complexes, and all stock complexes simultaneously, achieving their SERs for different catch options for the Faroes fishery in the 2016/2017 to 2018/2019 fishing seasons.

FWI NEAC 2017 Indicators suggest: **PFA forecast OK or overestimated**

Indicators for Northern NEAC 1SW PFA

		Insert data from 2016 here	N reg	Slope	Intercept	r^2	Median PFA in 2016	12.5%ile	87.5%ile	Reassess in year 2017? Outside 75% conf.lim. below	above	Outside 75% confidence limits below	above
1	Returns all 1SW NO PFA est	255260	32	0.574829	-88479.71	0.95	630816	230948.47	317314.48	-1	-1	NO	NO
2	Survivals W 1SW NO Imsa	2.9	32	0.000012	-3.75	0.46	630816	-0.32	8.01	0	-1	Uninformative	NO
3	Survivals H 1SW NO Imsa	1.5	33	0.000006	-1.12	0.30	630816	-0.16	5.55	0	-1	Uninformative	NO
4	Counts all NO Øyensåa (1SW)	3215	17	0.002353	574.91	0.27	630816	1004.81	3114.11	-1	1	NO	YES
5	Counts all NO Nausta (1SW)	1744	18	0.002012	-34.97	0.28	630816	333.48	2134.62	-1	-1	NO	NO
6	Catch rT&N 1SW FI	8255	17	0.0139136	1689.7437	0.39	630816	1851.30	19081.99	-1	-1	NO	NO
									Sum of scores	-4	-4	Indicators do not suggest that the PFA forecast is an overestimation.	Indicators do not suggest that the PFA forecast is an underestimation.

Indicators for Northern NEAC MSW PFA

		Insert data from 2016 here	N reg	Slope	Intercept	r^2	Median PFA in 2016	12.5%ile	87.5%ile	Reassess in year 2017? Outside 75% conf.lim. below	above	Outside 75% conf.lim. below	above
1	PFA-MSW-CoastNorway	211073	32	0.358088	-14199.06	0.87	631049	176983.63	246560.65	-1	-1	NO	NO
2	Orkla counts	6131	17	0.013501	-3554.83	0.57	631049	3071.09	6859.07	-1	-1	NO	NO
3	Counts all NO Nausta	1744	18	0.003915	-1315.88	0.34	631049	294.82	2014.50	-1	-1	NO	NO
4	Returns all 2SW NO PFA est	166963	22	0.2436223	1221.1683	0.49	631049	88946.43	220971.12	-1	-1	NO	NO
5	Catch W rT&N 2SW FI	3562	17	0.0068946	-1388.331	0.32	631049	103.49	5821.54	-1	-1	NO	NO
									Sum of scores	-5	-5	Indicators do not suggest that the PFA forecast is an overestimation.	Indicators do not suggest that the PFA forecast is an underestimation.

Indicators for Southern NEAC 1SW PFA

		Insert data from 2016 here	N reg	Slope	Intercept	r^2	Median PFA in 2016	12.5%ile	87.5%ile	Reassess in year 2017? Outside 75% conf.lim. below	above	Outside 75% conf.lim. below	above
1	Ret. W 1SW UK(E&W) Itchen M	359	28	0.000283	8.58	0.23	724326	-37.02	464.44	0	-1	Uninformative	NO
2	Ret. W 1SW UK(E&W) Frome M	156	43	0.000540	-25.75	0.37	724326	-172.41	902.87	0	-1	Uninformative	NO
3	Ret. W 1SW UK(Sc.) North Esk M	8211	35	0.006730	4017.16	0.61	724326	5683.84	12100.57	-1	-1	NO	NO
4	Surv. W 1SW UK(NI) Bush M	10.8	27	2.153E-05	-10.18085	0.56	724326	-4.24	15.07	0	-1	Uninformative	NO
5	Ret. Freshw 1SW UK(NI) Bush	1387	41	0.000684	450.65	0.26	724326	165.10	1726.39	-1	-1	NO	NO
6	Ret. W 1SW UK(E&W) Dee M	5000	24	0.0035444	-418.4296	0.31	724326	425.69	3871.99	-1	1	NO	YES
									Sum of scores	-3	-4	Indicators do not suggest that the PFA forecast is an overestimation.	Indicators do not suggest that the PFA forecast is an underestimation.

Indicators for Southern NEAC MSW PFA

		Insert data from 2016 here	N reg	Slope	Intercept	r^2	Median PFA in 2016	12.5%ile	87.5%ile	Reassess in year 2017? Outside 75% conf.lim. below	above	Outside 75% conf.lim. below	above
1	Ret. W 2SW UK(Sc.) Baddoch NM	25	28	0.000034	3.21	0.47	459472	5.81	31.69	-1	-1	NO	NO
2	Ret. W 2SW UK(Sc.) Girnoch NM	60	44	0.000037	8.50	0.43	459472	-3.68	54.37	0	1	Uninformative	YES
3	Ret. W 1SW UK(Sc.) North Esk NM	8211	35	0.007469	6670.32	0.46	459472	6378.71	13825.63	-1	-1	NO	NO
4	Ret. W MSW UK(E&W) Itchen NM	120	28	0.000095	51.90	0.09	459472	-15.53	206.87	0	-1	Uninformative	NO
5	Ret. W 1SW UK(E&W) Itchen NM	524	28	0.000353	89.89	0.21	459472	1.38	502.49	-1	1	NO	YES
6	Ret. W MSW UK(E&W) Frome NM	104	43	0.000779	32.17	0.48	459472	-116.34	896.88	0	-1	Uninformative	NO
7	Ret. W 1SW UK(E&W) Frome NM	156	43	0.000666	113.77	0.39	459472	-107.23	946.97	0	-1	Uninformative	NO
8	Catch W MSW Ice Ellidaar NM	17	44	0.000094	-26.25	0.57	459472	-39.19	73.07	0	-1	Uninformative	NO
9	Ret. Freshw 2SW UK(NI) Bush	257	40	0.000144	58.98	0.23	459472	-9.86	259.70	0	-1	Uninformative	NO
10	Ret. W 2SW UK(Sc.) North Esk NM	99	35	0.0036431	4586.9979	0.21	459472	3042.31	9479.53	1	-1	YES	NO
									Sum of scores	-2	-6	Indicators do not suggest that the PFA forecast is an overestimation.	Indicators do not suggest that the PFA forecast is an underestimation.

Figure 3.7.2.1. Updated framework of indicators spreadsheet for the Faroes fishery. For illustrative purposes, indicator variable values for the 27 retained indicators are entered in the input (grey shaded) cells.

FWI NEAC **2017** Indicators suggest: **PFA forecast OK or overestimated**

Indicators for Northern NEAC 1SW PFA

		Insert data from 2016 here	N reg	Slope	Intercept	r^2	Median PFA in 2016	12.5%ile	87.5%ile	Reassess in year 2017? Outside 75% conf.lim. below	Outside 75% conf.lim. above	Outside 75% confidence limits below	Outside 75% confidence limits above
1	Returns all 1SW NO PFA est	255260	32	0.574829	-88479.71	0.95	630816	230948.47	317314.48	-1	-1	NO	NO
2	Survivals W 1SW NO Imsa	2.9	32	0.000012	-3.75	0.46	630816	-0.32	8.01	0	-1	Uninformative	NO
3	Survivals H 1SW NO Imsa	1.5	33	0.000006	-1.12	0.30	630816	-0.16	5.55	0	-1	Uninformative	NO
4	Counts all NO Øyensåa (1SW)	3215	17	0.002353	574.91	0.27	630816	1004.81	3114.11	-1	1	NO	YES
5	Counts all NO Nausta (1SW)	1744	18	0.002012	-34.97	0.28	630816	333.48	2134.62	-1	-1	NO	NO
6	Catch rT&N 1SW FI	8255	17	0.0139136	1689.7437	0.39	630816	1851.30	19081.99	-1	-1	NO	NO
								Sum of scores		-4	-4		
												Indicators do not suggest that the PFA forecast is an overestimation.	**Indicators do not suggest that the PFA forecast is an underestimation.**

Indicators for Northern NEAC MSW PFA

		Insert data from 2016 here	N reg	Slope	Intercept	r^2	Median PFA in 2016	12.5%ile	87.5%ile	Reassess in year 2017? Outside 75% conf.lim. below	Outside 75% conf.lim. above	Outside 75% conf.lim. below	Outside 75% conf.lim. above
1	PFA-MSW-CoastNorway	211073	32	0.358088	-14199.06	0.87	631049	176983.63	246560.65	-1	-1	NO	NO
2	Orkla counts	6131	17	0.013501	-3554.83	0.57	631049	3071.09	6859.07	-1	-1	NO	NO
3	Counts all NO Nausta	1744	18	0.003915	-1315.88	0.34	631049	294.82	2014.50	-1	-1	NO	NO
4	Returns all 2SW NO PFA est	166963	22	0.2436223	1221.1683	0.49	631049	88946.43	220971.12	-1	-1	NO	NO
5	Catch W rT&N 2SW FI	3562	17	0.0068946	-1388.331	0.32	631049	103.49	5821.54	-1	-1	NO	NO
								Sum of scores		-5	-5		
												Indicators do not suggest that the PFA forecast is an overestimation.	**Indicators do not suggest that the PFA forecast is an underestimation.**

Indicators for Southern NEAC 1SW PFA

		Insert data from 2016 here	N reg	Slope	Intercept	r^2	Median PFA in 2016	12.5%ile	87.5%ile	Reassess in year 2017? Outside 75% conf.lim. below	Outside 75% conf.lim. above	Outside 75% conf.lim. below	Outside 75% conf.lim. above
1	Ret. W 1SW UK(E&W) Itchen M	359	28	0.000283	8.58	0.23	724326	-37.02	464.44	0	-1	Uninformative	NO
2	Ret. W 1SW UK(E&W) Frome M	156	43	0.000540	-25.75	0.37	724326	-172.41	902.87	0	-1	Uninformative	NO
3	Ret. W 1SW UK(Sc.) North Esk M	8211	35	0.006730	4017.16	0.61	724326	5683.84	12100.57	-1	-1	NO	NO
4	Surv. W 1SW UK(NI) Bush M	10.8	27	2.153E-05	-10.18085	0.56	724326	-4.24	15.07	0	-1	Uninformative	NO
5	Ret. Freshw 1SW UK(NI) Bush	1387	41	0.000684	450.65	0.26	724326	165.10	1726.39	-1	-1	NO	NO
6	Ret. W 1SW UK(E&W) Dee M	5000	24	0.0035444	-418.4296	0.31	724326	425.69	3871.99	-1	1	NO	YES
								Sum of scores		-3	-4		
												Indicators do not suggest that the PFA forecast is an overestimation.	**Indicators do not suggest that the PFA forecast is an underestimation.**

Indicators for Southern NEAC MSW PFA

		Insert data from 2016 here	N reg	Slope	Intercept	r^2	Median PFA in 2016	12.5%ile	87.5%ile	Reassess in year 2017? Outside 75% conf.lim. below	Outside 75% conf.lim. above	Outside 75% conf.lim. below	Outside 75% conf.lim. above
1	Ret. W 2SW UK(Sc.) Baddoch NM	25	28	0.000034	3.21	0.47	459472	5.81	31.69	-1	-1	NO	NO
2	Ret. W 2SW UK(Sc.) Girnoch NM	60	44	0.000037	8.50	0.43	459472	-3.68	54.37	0	1	Uninformative	YES
3	Ret. W 1SW UK(Sc.) North Esk NM	8211	35	0.007469	6670.32	0.46	459472	6378.71	13825.63	-1	-1	NO	NO
4	Ret. W MSW UK(E&W) Itchen NM	120	28	0.000095	51.90	0.09	459472	-15.53	206.87	0	-1	Uninformative	NO
5	Ret. W 1SW UK(E&W) Itchen NM	524	28	0.000353	89.89	0.21	459472	1.38	502.49	-1	1	NO	YES
6	Ret. W MSW UK(E&W) Frome NM	104	43	0.000779	32.17	0.48	459472	-116.34	896.88	0	-1	Uninformative	NO
7	Ret. W 1SW UK(E&W) Frome NM	156	43	0.000666	113.77	0.39	459472	-107.23	946.97	0	-1	Uninformative	NO
8	Catch W MSW Ice Ellidaar NM	17	44	0.000094	-26.25	0.57	459472	-39.19	73.07	0	-1	Uninformative	NO
9	Ret. Freshw 2SW UK(NI) Bush	257	40	0.000144	58.98	0.23	459472	-9.86	259.70	0	-1	Uninformative	NO
10	Ret. W 2SW UK(Sc.) North Esk NM	99	35	0.0036431	4586.9979	0.21	459472	3042.31	9479.53	1	-1	YES	NO
								Sum of scores		-2	-6		
												Indicators do not suggest that the PFA forecast is an overestimation.	**Indicators do not suggest that the PFA forecast is an underestimation.**

Figure 3.7.2.2. Framework of indicators spreadsheet for the Faroes fishery. In this alternative indicator spreadsheet only the two southern NEAC stock complexes are determining the outcome of the FWI. The northern NEAC stock complexes are still retained in the spreadsheet because they may influence the advice in future. For illustrative purposes, indicator variable values for the 27 retained indicators are entered in the input (green shaded) cells.

4 North American commission

4.1 NASCO has requested ICES to describe the key events of the 2015 fisheries

The previous advice provided by ICES (2015) indicated that there were no mixed-stock fishery catch options on the 1SW non-maturing salmon component for the 2015 to 2017 PFA years. The NASCO Framework of Indicators of North American stocks for 2015 did not indicate the need for a revised analysis of catch options and no new management advice for 2016 is provided. The assessment was updated to 2015 and the stock status is consistent with the previous years' assessments and catch advice.

4.1.1 Key events of the 2015 fisheries

- Mandatory catch and release of small salmon was implemented in the 2015 recreational fishery for the Gulf region, and mandatory release of large salmon continued.
- The majority of harvest fisheries were directed toward small salmon.
- The 2015 provisional harvest in Canada was 133.6 t, comprised of 45 092 small salmon and 11 039 large salmon, 2% more small salmon and 26% more large salmon compared to 2014.
- Overall, catches remain very low relative to pre-1990 values.

4.1.2 Gear and effort

Canada

The 23 areas for which the Department of Fisheries and Oceans (DFO) manages the salmon fisheries are called Salmon Fishing Areas (SFAs); for Québec, the management is delegated to the province of Québec (Ministère des Forêts, de la Faune, et des Parcs) and the fishing areas are designated by Q1 through Q11 (Figure 4.1.2.1). Harvests (fish which were retained) and catches (including harvests and fish caught–and–released in recreational fisheries) are categorized in two size groups: small and large. Small salmon, generally 1SW, in the recreational fisheries refer to salmon less than 63 cm fork length, whereas in commercial fisheries, it refers to salmon less than 2.7 kg whole weight. Large salmon, generally MSW, in recreational fisheries are greater than or equal to 63 cm fork length and in commercial fisheries refer to salmon greater than or equal to 2.7 kg whole weight.

Three groups exploited salmon in Canada in 2015: Aboriginal peoples; residents fishing for food in Labrador; and recreational fishers. There were no commercial fisheries in Canada in 2015. There is no legal bycatch of salmon in commercial fisheries directing for other species and there are no estimates of the extent of the bycatch and the associated mortality of salmon from these fisheries, although previous analyses by ICES indicated the extent of the mortality was low (ICES, 2004).

In 2015, four subsistence fisheries harvested salmon in Labrador: 1) Nunatsiavut Government (NG) members fishing in northern Labrador communities (Rigolet, Makkovik, Hopedale, Postville, and Nain) and Lake Melville; 2) Innu Nation members fishing in northern Labrador community of Natuashish and Lake Melville community of Sheshatshiu; 3) NunatuKavut Community Council (NCC) members fishing in southern Labrador and Lake Melville and, 4) Labrador residents fishing in Lake Melville and various coastal communities. The NG, Innu, and NCC fisheries were monitored by Aboriginal Fishery Guardians jointly administered by the Aboriginal groups and DFO. The fishing gear is multifilament gillnets of 15 fathoms (27.4 m) in length of a stretched mesh size ranging from 3 to 4 inches (7.6 to 10.2 cm). Although nets are mainly set in estuarine waters some nets are also set in coastal areas usually within bays. Catch statistics are based on logbook reports.

Most catches (94% in 2015, Figure 2.1.1.2) in Canada now take place in rivers or in estuaries. Fisheries are principally managed on a river-by-river basis; areas are closely controlled where retention of large salmon in recreational fisheries are allowed. In other areas, fisheries are managed on larger management units that encompass a collection of geographically neighbouring stocks. The commercial fisheries are now closed and the remaining coastal food fisheries in Labrador are mainly located in bays generally inside the headlands. Sampling of this fishery occurred again in 2015 for biological characteristics and genetic markers to identify the origin of harvested salmon.

The following management measures were in effect in 2015.

Aboriginal peoples' food, social, and ceremonial (FSC) fisheries

In Québec, Aboriginal peoples' fisheries took place subject to agreements, conventions or through permits issued to the communities. There are approximately ten communities with subsistence fisheries in addition to the fishing activities of the Inuit in Ungava (Q11), who fished in estuaries or within rivers. The permits generally stipulate gear, season, and catch limits. Catches with permits have to be reported collectively by each Aboriginal user group. However, catches under a convention, such as for Inuit in Ungava, do not have to be reported. When reports are not available, the catches are estimated based on the most reliable information available. In the Maritimes (SFAs 15 to 23), FSC agreements were signed with several Aboriginal peoples' groups (mostly First Nations) in 2015. The signed agreements often included allocations of small and large salmon and the area of fishing was usually in-river or estuaries. Harvests that occurred both within and outside agreements were obtained directly from the Aboriginal peoples. In Labrador (SFAs 1 and 2), fishery arrangements with the NG, Innu, and NCC, resulted in fisheries in estuaries and coastal areas. By agreement with First Nations, there were no FSC fisheries for salmon on the island of Newfoundland in 2015. Harvest by Aboriginal peoples with recreational licences is reported under the recreational harvest categories.

Resident food fisheries in Labrador

The DFO is responsible for regulating the Resident Fishery. In 2015, a licensed subsistence trout and charr fishery for local residents took place, using gillnets, in Lake Melville (SFA 1) and in estuary and coastal areas of Labrador (SFA 1 and 2). Residents who requested a licence were permitted to retain a seasonal bycatch of three salmon of any size while fishing for trout and charr; three salmon tags accompanied each licence. When the bycatch of three salmon was caught the resident fishers were required to remove their net from the water. If bycatch during a single gillnet set exceeded three salmon, resident fishers were required to discard the excess fish. All licensees were requested to complete logbooks.

Recreational fisheries

Licences are required for all persons fishing recreationally for Atlantic salmon. Gear is restricted to fly fishing and there are daily and seasonal bag limits. Recreational fisheries management in 2015 varied by area and large portions of the southern areas remained closed to all directed salmon fisheries (Figure 4.1.2.2). Except for 37 rivers in Québec, only small salmon could be retained in the recreational fisheries. Following the low returns to rivers in Québec in 2014, fishing regulations changed prior to the 2015 season to limit the retention of large salmon on 16 additional rivers. Of the 114 salmon rivers, fishing was not authorized on 32 rivers, harvest of small salmon only authorized on 45 rivers while harvest of large salmon was allowed during half of the season on five rivers and for the entire season on 32 rivers. Following the very low returns to many Gulf rivers in 2014, changes to small salmon retention was implemented in Gulf region in 2015. The annual small salmon retention was reduced from four to zero in Gulf rivers of New Brunswick and from two to zero in Gulf rivers of Nova Scotia thereby mandating hook-and-release only on those rivers where salmon angling was allowed to continue in Nova Scotia and New Brunswick.

Until 2011, recreational salmon anglers on PEI had to first obtain a general angling licence, and then purchase a salmon licence. Beginning in 2012, separate salmon licences were no longer issued, and the provincial angling licence confers recreational fishing access to Atlantic salmon (catch and release fishing only, no retention).

In all areas of eastern Canada, there is no estimate of salmon released as bycatch in non-salmon directed recreational fisheries.

USA

There were no recreational or commercial fisheries for anadromous Atlantic salmon in the USA in 2015.

France (Islands of Saint Pierre & Miquelon)

Nine professional and 71 recreational gillnet licences were issued in 2015 (Table 4.1.2.1). Professional licences have a maximum authorization of three nets of 360 metres maximum length whereas the recreational licence is restricted to one net of 180 metres.

4.1.3 Catches in 2015

Canada

The provisional harvest of salmon in 2015 by all users was 133.6 t, about 13% higher than the 2014 harvest of 118.0 t (Tables 2.1.1.1, 2.1.1.2; Figure 4.1.3.1). This is the fifth lowest catch in the time-series since 1960. The 2015 harvest was 45 152 small salmon (79.8 t) and 11 433 large salmon (53.8 t), 2% more small salmon and 31% more large salmon by number compared to 2014. There has been a dramatic decline in harvested tonnage since 1988, in a large part this is the result of: the reductions in commercial fisheries effort; the closure of the insular Newfoundland commercial fishery in 1992; the closure of the Labrador commercial fishery in 1998; and the closure of the Québec commercial fishery in 2000.

Aboriginal peoples' FSC fisheries

The provisional harvest by Aboriginal peoples in 2015 was 62.3 t (Table 4.1.3.1). Harvest (by weight) increased by 10 t (18%) from 2014 and proportion large by number (46%) increased by 5%. The increase from 2014 occurred in Labrador where the reported catch of 40.4 t was the highest value in the time-series beginning in 2000.

In Labrador, catch statistics for the aboriginal and resident food fisheries were derived from logbooks issued to each fisher. Total catches were estimated by adjusting the logbook catches proportionately to the number of fishers reporting out of the total licensed/designated. For Québec, catches from the aboriginal fisheries have to be reported collectively by each aboriginal community. However, most reports are not available and the catches are estimated on the basis of the most reliable information available. The reliability of the catch estimates varies among the user groups. As in Québec, aboriginal groups with fishing agreements in the DFO Gulf and Maritimes regions are expected to report their catches. Reports in most years are incomplete. The 2015 values will be updated when the reports become available.

Complete and timely reporting of Aboriginal peoples' catch statistics is required in all areas of Eastern Canada.

Residents fishing for food in Labrador

The estimated catch for the fishery in 2015 was 2.0 t, an increase of 0.4 t from 2014. This represents approximately 764 fish, 38% of which were large (Table 4.1.3.2).

Recreational fisheries

Harvest in recreational fisheries in 2015 totalled 35 965 small and large salmon (69.2 t). This harvest increased 3.7% from the 2014 harvest level and decreased 12.4% from the previous five-year average, and remains at low levels and similar to the previous decade (Table 4.1.3.3; Figure 4.1.3.2). The small salmon harvest of 34 012 fish was 2% higher than the 2014 harvest. The large salmon harvest of 1953 fish was 45.4% higher than the 2014 harvest and occurred only in Québec in both years. The small salmon size group has contributed 89% on average of the total recreational harvests since the imposition of catch-and-release recreational fisheries in the Maritimes and insular Newfoundland (SFA 3 to 14B, 15 to 23) in 1984. In 2015, 64 159 salmon (39 902 small and 24 257 large) were caught and released (Table 4.1.3.4; Figure 4.1.3.3), representing about 64% of the total number caught (including retained fish), the highest value of the time-series that has consistently been above 50% since 1997.

Recreational catch statistics for Atlantic salmon are not collected regularly in all areas of Canada and there is no enforceable mechanism in place that requires anglers to report their catch statistics, except in Québec where reporting of harvested salmon is a legal requirement. The last recreational angler survey for New Brunswick was conducted in 1997 and the catch rates for the Miramichi from that survey have been used to estimate catches (both harvest and catch-and-release) for all subsequent years; no estimates of release of salmon kelts 2011–2015 are provided.

Complete and timely reporting of recreational catch statistics is required in all areas of Eastern Canada.

Commercial fisheries

All commercial fisheries for Atlantic salmon remained closed in Canada in 2015 and the catch therefore was zero.

Unreported catches

The unreported catch estimate for Canada is incomplete and totalled 17.1 t in 2015. The majority of this unreported catch is illegal fisheries directed at salmon (Tables 2.1.3.1, 2.1.3.2). Of the unreported catch which could be attributed to a geographic location (0.7 t), 0.5 t was considered to have occurred in inland waters and 0.2 t in marine waters.

USA

There are no commercial or recreational fisheries for anadromous Atlantic salmon in the USA and the catch therefore was zero. Unreported catches in the USA were estimated to be 0 t.

France (Islands of Saint Pierre & Miquelon)

A total harvest of 3.5 t was reported in the professional and recreational fisheries in 2015, a decrease of 8% from the 2014 reported harvest of 3.8 t (Tables 2.1.1.1, 4.1.2.1).

There are no unreported catch estimates.

4.1.4 Harvest of North American salmon, expressed as 2SW salmon equivalents

Harvest histories (1972 to 2015) of salmon, expressed as 2SW salmon equivalents are provided in Table 4.1.4.1. The Newfoundland-Labrador commercial fishery historically was a mixed-stock fishery and harvested both maturing and non-maturing 1SW salmon as well as 2SW maturing salmon. The harvest in these fisheries of repeat spawners and older sea ages was not considered in the run-reconstructions.

Harvests of 1SW non-maturing salmon in Newfoundland-Labrador commercial fisheries have been adjusted by natural mortalities of 3% per month for 13 months, and 2SW harvests in these same fisheries have been adjusted by one month to express all harvests as 2SW equivalents in the year and time they would reach rivers of origin. The Labrador commercial fishery has been closed since 1998. Harvests from the Aboriginal Peoples' fisheries in Labrador (since 1998) and the residents' food fishery in Labrador (since 2000) are both included. Mortalities in mixed-stock fisheries and losses in terminal locations (including harvests, losses from catch and release mortality and other removals including broodstock) in Canada were summed with those of the USA to estimate total 2SW equivalent losses in North America. The terminal fisheries included coastal, estuarine and river catches of all areas, except Newfoundland and Labrador where only river catches were included, and excluding Saint Pierre & Miquelon. Harvest equivalents within North America peaked at about 363 000 in 1976 and have remained below 12 000 2SW salmon equivalents for most years between 1999 and 2014 (Table 4.1.4.1).

Data inputs were updated to 2015 and an adjustment for harvests in aboriginal fisheries for Québec which had been omitted in previous years (1984 to 2014) were added (see Section 4.3.2). The previously omitted aboriginal fishery harvest data ranged from 723 (in 1995) to 10 705 (in 1988) large salmon (including 2SW and other multi-sea-winter salmon). The value in 2015 was 2765 large salmon. These adjustments to input data, in particular the inclusion of the complete time-series of harvests in aboriginal fisheries, resulted in an increase in the 2SW equivalent harvest in homewaters, in the total North American harvests, and in the proportions of the total harvests, from values in previous reports.

In the most recent year (2015), the losses of the cohort destined to be 2SW salmon in terminal areas of North America was estimated at 4590 fish, 44% of the total North American catch of 2SW salmon. The percentages of harvests occurring in terminal fisheries ranged from 17 to 33% during 1972 to 1991 and 44 to 87% during 1992 to

2015 (Table 4.1.4.1). Percentages increased significantly since 1992 with the reduction and closures of the Newfoundland and Labrador commercial mixed-stock fisheries. With the increased catch at West Greenland and the decreased catches in North America in recent years, the proportion of 2SW salmon harvested in North American fisheries in 2015 is 48%, the fourth lowest of the time-series (Table 4.1.4.1).

4.1.5 Origin and composition of catches

In the past, salmon from both Canada and the USA were taken in the commercial fisheries of eastern Canada. Sampling programs of current marine fisheries (Labrador subsistence and Saint Pierre & Miquelon) are used to monitor salmon interceptions from other areas of North America.

Results of sampling programme for Labrador Aboriginal fisheries

The NCC and NG sampling programme of Labrador Aboriginal fisheries continued in 2015. Landed fish were sampled opportunistically for length, weight, sex, scales (age analysis) and tissue (genetic analysis). Fish were also examined for the presence of external tags or marks.

In 2015, a total of 880 samples (5.8% of harvest by number) were collected from the Labrador Aboriginal fisheries, 212 from northern Labrador (SFA 1A), 204 from Lake Melville (SFA 1B), and 464 samples from southern Labrador (SFA 2) (Figure 4.1.2.1). Based on the interpretation of the scale samples, 77% were 1SW salmon, 19% were 2SW, one sample was a 3SW salmon (<1%), and 4% were previously spawned salmon. The majority of salmon sampled were river ages 3 to 5 years (98%) (modal age 4). There were no river age 1 and few river age 2 (0.5%) salmon sampled, suggesting, as in previous years (2006 to 2014), that very few salmon from the most southern stocks of North America (USA, Scotia-Fundy) were exploited in these fisheries. Details on stock composition and estimates of catches originating in regions of North America for previous years were reported in ICES (2015). Genetic analyses of tissue samples are planned and will be reported accordingly to ICES when completed.

PERCENTAGE OF SAMPLES BY RIVER AGE WITHIN THE THREE SAMPLED AREAS IN 2015

Area	Number of Samples	River Age						
		1	2	3	4	5	6	7
Northern Labrador (SFA 1A)	212	0.0	0.0	17.5	59.9	20.8	0.9	0.9
Lake Melville (SFA 1B)	204	0.0	1.0	30.4	53.9	14.7	0.0	0.0
Southern Labrador (SFA 2)	464	0.0	0.4	14.4	55.2	27.6	2.4	0.0
All areas	880	0.0	0.5	18.9	56.0	23.0	1.5	0.2

Sampling programme for Saint Pierre & Miquelon

In 2015, 109 tissue samples (106 corresponding scale samples) were obtained from the fishery covering the period 26 May to 30 June, 2015. Salmon sampled in 2015 were predominantly river age 2 (32%) and 3 (52%) with the majority of fish sampled being one-sea-winter maiden salmon (73%). Details on stock composition and estimates of catches originating in regions of North America for previous years were reported in ICES (2015). Genetic analyses of tissue samples are planned and will be reported accordingly to ICES when completed.

Sea age	River age				
	2	3	4	5	Total
1SW	22	39	13	3	77
2SW	11	16	1	0	28
Previous spawners	1	0	0	0	1
Total	34	55	14	3	106

Recommendations for future activities

The Working Group noted that the sampling intensity was low for the Labrador Aboriginal (samples represented approximately 6% of the provisional harvest in 2015) and for the Saint Pierre & Miquelon (samples represented approximately 7% of reported harvest in 2015) fisheries. The Working Group recommends that sampling and supporting descriptions of the Labrador and Saint Pierre & Miquelon mixed-stock fisheries be continued and expanded (i.e. sample size, geographic coverage, tissue samples, seasonal distribution of the samples) in future years to improve the information on biological characteristics and stock origin of salmon harvested in these mixed-stock fisheries.

4.1.6 Exploitation rates

Canada

Provisional exploitation rates in the 2015 recreational fishery for retained small salmon was 9% for Newfoundland (range: 5% Terra Nova River to 16% Exploits River) and 3% for Labrador (Sand Hill River), which were similar to the previous five year means of 10% and 3%, respectively. Retention of small and large salmon in the recreational fisheries of Nova Scotia, New Brunswick and Prince Edward Island was not permitted in 2015.

USA

There was no exploitation of anadromous salmon in homewaters.

Exploitation trends for North American salmon fisheries

Annual exploitation rates of small salmon (mostly 1SW) and large salmon (mostly MSW) in North America for the 1971 to 2015 time period were calculated by dividing annual removals (harvests, estimated mortality from catch and release, broodstock) in all North American fisheries by annual estimates of the returns to North America prior to any homewater fisheries. The fisheries included coastal, estuarine and river fisheries in all areas, as well as the commercial fisheries of Newfoundland and Labrador which harvested salmon from all regions in North America.

Exploitation rates of both small and large salmon fluctuated annually but remained relatively steady until 1984 when exploitation of large salmon declined sharply with the introduction of the non-retention of large salmon in angling fisheries and reductions in commercial fisheries (Figure 4.1.6.1). Exploitation of small salmon declined steeply in North America with the closure of the Newfoundland commercial fishery in 1992. Declines continued in the 1990s with continuing management controls in all fisheries to reduce exploitation. In the last few years, exploitation rates on small salmon and large salmon have remained at the lowest in the time-series, averaging

11% for large salmon and 14% for small salmon over the past ten years. However, exploitation rates across regions within North America are highly variable.

4.2 Management objectives and reference points

Management objectives are described in Section 1.4.

There were no changes to the 2SW salmon Conservation Limits (CLs) and Management Objectives from those identified previously (ICES, 2015). CLs for 2SW salmon for Canada total 123 349 and for the USA, 29 199, for a combined total of 152 548.

Country and Comission Area	Stock Area	2SW spawner requirement	2SW Management Objective
	Labrador	34 746	
	Newfoundland	4022	
	Gulf of St Lawrence	30 430	
	Québec	29 446	
	Scotia-Fundy	24 705	10 976
Canada Total		123 349	
USA		29 199	4549
North American Total		152 548	

4.3 Status of stocks

To date, 1082 Atlantic salmon rivers have been identified in eastern Canada and 21 rivers in eastern USA, where salmon are or were present within the last half century. Conservation requirements have been defined for 503 (46%) of these rivers in eastern Canada and all rivers in USA. Assessments of adult spawners and egg depositions relative to conservation requirements were reported for 64 of these rivers in eastern North America in 2015.

4.3.1 Smolt abundance

Canada

Wild smolt production was estimated in eleven rivers in 2015 (Table 4.3.1.1). The relative smolt production, scaled to the size of the river using the conservation egg requirements, was highest in Kedgwick River (Gulf), and lowest in the LaHave River (Scotia-Fundy) (Figure 4.3.1.1). Trends in smolt production over the time-series declined ($p < 0.05$) in Conne River (Newfoundland, 1987–2015), the Nashwaak River (Scotia-Fundy, 1998–2015) and the two monitored rivers of Québec, St Jean (1989–2015) and de la Trinite (1984–2015), whereas production significantly increased ($p < 0.05$) in Western Arm Brook (Newfoundland; 1971–2015). No other rivers showed any long-term trend (Figure 4.3.1.1).

USA

Wild salmon smolt production has been estimated on the Narraguagus River from 1997 to 2015 (Figure 4.3.1.1). The trend in wild smolt production over the time-series has declined ($p < 0.05$).

4.3.2 Estimates of total adult abundance

Returns of small (1SW), large, and 2SW salmon (a subset of large) to each region were originally estimated by the methods and variables developed by Rago *et al*. (1993) and reported by ICES (1993). Further details are provided in the Stock Annex. The returns for individual river systems and management areas for both sea age groups were derived from a variety of methods. These methods included counts of salmon at monitoring facilities, population estimates from mark–recapture studies, and applying angling and commercial catch statistics, angling exploitation rates, and measurements of freshwater habitat. The 2SW component of the large returns was determined using the sea age composition of one or more indicator stocks.

Returns are the number of salmon that returned to the geographic region, including fish caught by homewater commercial fisheries, except in the case of the Newfoundland and Labrador regions where returns do not include landings in commercial and food fisheries. This avoided double counting fish because commercial catches in Newfoundland and Labrador and food fisheries in Labrador were added to the sum of regional returns to create the PFA of North American salmon.

Total returns of salmon to USA rivers are the sum of trap catches and redd based estimates.

Data from previous years were updated and corrections were made to data inputs when required. In 2015, revised inputs for the minimum and maximum ranges of returns of small salmon to rivers in Labrador for the years 2009, 2010, 2013 and 2014 were provided; the revised values were lower than the values in the previous year's assessment. Similarly for large salmon, revised values for the ranges of returns to rivers in Labrador were provided for 2010, 2013 and 2014; the values were higher for 2010 and lower for 2013 and 2014 from the previous year's input values.

The other change to the inputs was the correction for the omission of some of the harvest estimates in aboriginal fisheries from the Québec region. The data had been provided but omitted from the reconstruction equation time-series for 1984 to 2014. The increase in estimated returns of large salmon and 2SW salmon from the 2014 estimates are in the range of 4 to 17% over the 1984 to 2014 time period for Québec.

Finally, a revised value for 2013 for the large salmon spawners for the USA was provided. The value for 2013 was corrected from 525 to 5200 owing to a transcription error.

Since 2002, Labrador regional estimates are generated from data collected at four counting facilities, one in SFA 1 and three in SFA 2 (Figure 4.1.2.1, Figure 4.3.2.1). The production area (km^2) in SFA 1 is approximately equal to the production area in SFA 2. The current method to estimate Labrador returns assumes that the total returns to the northern area are represented by returns at the single monitoring facility in SFA 1 and returns in the southerly areas (SFA 2 and 14b) are represented by returns at the three monitoring facilities in SFA 2. The uncertainty in the estimates of returns and spawners has been relatively high compared with other regions in recent years (coefficient of variation approximately 20% in the recent three years).

The Working Group recommends that additional monitoring 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. Aboriginal and recreational catches and effort) to describe stock status in Labrador.

Estimates of small, large and 2SW salmon returns to the six geographic areas and overall for NAC are reported in Tables 4.3.2.1 to 4.3.2.3 and are shown in Figures 4.3.2.2 to 4.3.2.4.

Small salmon returns

- The total estimate of small salmon returns to North America in 2015 was the highest on record (641 110), and represents a 27% increase from estimated returns in 2014 (504 350), and was 5% higher than the second highest value (613 300) estimated in 2011;
- Small salmon returns increased in 2015 from the previous year in five (Newfoundland, Québec, Gulf, Scotia-Fundy and USA) of the six geographical regions, and decreased in the Labrador region;
- Small salmon returns to Labrador (256 800) and Newfoundland (300 750) in 2015 were the second highest on record, small salmon returns to Québec (35 670) were the tenth highest on record. Whereas, small salmon returns to Scotia-Fundy (4207) were the fourth lowest on record;
- Small salmon returns to Labrador (256 800) and Newfoundland (300 750) combined represent 87% of the 2015 total small salmon returns to North America (641 100).

Large salmon returns

- The total estimate of large salmon returns to North America in 2015 (200 200) was 52% higher than the estimate for 2014 (132 100), and the 2015 estimate ranks 11th (descending) out of the 46 year time-series;
- Large salmon returns increased from the previous year in five (Labrador, Newfoundland, Québec, Gulf, and USA) of the six geographical regions in 2015, and decreased slightly in Scotia-Fundy;
- Large salmon returns to Labrador (89 080) in 2015 were the highest on record, and large salmon returns to Newfoundland (38 560) were the second highest on record, whereas large salmon returns to Scotia-Fundy (736) were the lowest on record, and large salmon returns to the USA (771) were the sixth lowest on record;
- Large salmon returns to Labrador (89 080) and Newfoundland (38 560) combined represent 64% of the total large salmon returns to North America (200 200) in 2015.

2SW salmon returns

- The total estimate of 2SW salmon returns to North America in 2015 (116 000) was 50% higher than the estimate for 2014 (77 565), and the 2015 estimate ranks 20th (descending) out of the 46 year time-series;
- 2SW salmon returns increased from the previous year in five (Labrador, Newfoundland, Québec, Gulf, and USA) of the six geographical regions in 2015, and decreased slightly in Scotia-Fundy;
- 2SW salmon returns in 2015 were the highest on record for Labrador (57 880) and the tenth highest on record for Newfoundland (5170), whereas 2SW salmon returns to Scotia-Fundy (678) in 2015 were the lowest on record, and 2SW salmon returns to the USA (761) were the sixth lowest on record;

- 2SW salmon returns from Labrador (57 880), Québec (27 200), and Gulf (24 280) regions combined represent 94% of 2SW salmon returns to North America. There are few 2SW salmon returns to Newfoundland (5170), as the majority of the large salmon returns to that region are comprised of previous spawning 1SW salmon.

4.3.3 Estimates of spawning escapements

Updated estimates for small, large and 2SW spawners (1971 to 2015) were derived for the six geographic regions (Tables 4.3.3.1 to 4.3.3.3). A comparison between the numbers of returns and spawners for small and large salmon is presented in Figures 4.3.2.2 and 4.3.2.3. A comparison between the numbers of 2SW returns, spawners, CLs, and management objectives (Scotia-Fundy and USA) is presented in Figure 4.3.2.4.

Small salmon spawners

- The total estimate of small salmon spawners in 2015 for North America (600 650) was the highest on record, and represents a 30% increase from 2014 (463 500), and a 10% increase from the second highest value (547 200) estimated in 2011;
- Estimates of small salmon spawners increased in five (Newfoundland, Québec, Gulf, Scotia-Fundy and USA) of the six geographical regions in 2015, and decreased in Labrador;
- Small salmon spawners in 2015 were the second highest values on record for Labrador (255 300) and Newfoundland (273 200), and the ninth highest on record for Québec (27 050), whereas small salmon spawners were the fifth lowest on record for Scotia-Fundy (4183).

Large salmon spawners

- The total estimate of large salmon spawners in North America for 2015 (194 200) increased by 54% from 2014 (126 500), and the 2015 estimate is the second highest value out of the 46 year time-series;
- Estimates of large salmon spawners increased in five (Labrador, Newfoundland, Québec, Gulf, and USA) of the six geographical regions in 2015, and decreased slightly in Scotia-Fundy;
- Large salmon spawners in 2015 were the highest on record for Labrador (88 975), and the second highest on record for Newfoundland (38 080), whereas large salmon spawners were the lowest on record for Scotia-Fundy (727) in 2015.

2SW salmon spawners

- The total estimate of 2SW salmon spawners in North America for 2015 (112 100) increased by 52% from 2014 (73 920), and did not meet the total 2SW CL for NAC (152 548). The 2015 estimate of 2SW salmon spawners ranks 6th (descending) out of the 46 year time-series;
- Estimates of 2SW salmon spawners in 2015 increased in five of the six geographical regions (Labrador, Newfoundland, Québec, Gulf and USA), and remained the same as 2014 in Scotia-Fundy;

- Estimates of 2SW salmon spawners in 2015 were the highest on record for Labrador (57 810), the ninth highest in the time-series for Newfoundland (5092), whereas they were the lowest on record for Scotia-Fundy (671);
- Estimates (median) of 2SW salmon spawners exceeded region specific 2SW CLs for two (Labrador and Newfoundland) of the six geographical regions in 2015; however, 2SW CLs were not met for Québec, Gulf, Scotia-Fundy, or the USA with values ranging from 3% (Scotia-Fundy) to 79% (Québec) in 2015;
- Labrador has met or exceeded the regional 2SW CL four times (2011, 2013, 2014, and 2015) during the 46 year time-series. The 2SW CL for Newfoundland has been met or exceeded in six of the previous ten years, the 2SW CL for Gulf has been met or exceeded in one of the previous ten years, and 2SW CLs have not been met for Québec, Scotia-Fundy or USA in the previous ten years;
- The 2SW management objectives for Scotia-Fundy (10 976) and USA (4549) were also not met in 2015, and have not been met since 1991 (Scotia-Fundy), and 1990 (USA). For USA, 2SW returns are assessed relative to the management objective as adult stocking programs for restoration efforts contribute to the number of spawners.

4.3.4 Egg depositions in 2015

The time-series of attained CLs for assessed rivers is summarized in Section 2.5 (Figure 2.5.1). The time-series in Section 2.5 includes all assessed small rivers on Prince Edward Island individually (DFO, 2016), whereas these rivers are collectively considered as one grouping in this section.

Egg depositions by all sea ages combined in 2015 exceeded or equalled the river-specific CLs in 41 of the 64 assessed rivers (64%) and were less than 50% of CLs in ten rivers (16%; Figure 4.3.4.1). This is an improvement to 2014 when CLs were attained in 18 of the 66 assessed rivers (27%), and were less than 50% of CLs in 31 rivers (47%). The number of rivers assessed annually varies due to operational considerations and environmental conditions.

- CLs were exceeded in three of four (75%) of assessed rivers in Labrador, eight of 13 rivers (62%) in Newfoundland, 27 of 35 rivers (77%) in Québec, and three of five rivers (60%) in Gulf.
- None of the seven assessed rivers in Scotia-Fundy met CLs and all were below 50% of CLs except for the North River. Large deficiencies in egg depositions were noted in the Southern Upland and Outer Bay of Fundy regions of Scotia-Fundy where assessed rivers were less than 8% of CLs. With the exception of three rivers where catch and release fishing only was permitted, salmon fisheries were closed on all these rivers.
- Large deficiencies in egg depositions were noted in the USA. All seven assessed rivers were below 10% of their CLs and all fisheries are closed on these stocks.

4.3.5 Marine survival (return rates)

In 2015, return rate estimates were available from ten wild and two hatchery populations from rivers distributed among Newfoundland, Québec, Scotia-Fundy, and USA (Tables 4.3.5.1 to 4.3.5.4). Return rates for wild small salmon declined for monitored rivers in Québec ($p < 0.05$) over the time period, whereas there was no statistically significant trend for populations in Newfoundland and Scotia-Fundy (Figure 4.3.5.1). Although significant declines were not evident in the analysis for Scotia-Fundy, small salmon return rates have been below long-term averages in recent years. The trend in return rates for wild 2SW salmon declined in Québec ($p < 0.05$). Although the analysis does not show a statistically significant decline for Scotia-Fundy, the wild 2SW return rates have been lower since 2010 compared to previous years (Figure 4.3.5.1).

In 2015, return rate of small salmon of hatchery origin to the Penobscot River (USA) was similar to 2014 and the third lowest value of the time-series. Return rate to the Saint John River (Scotia-Fundy) increased from 2014 but was the fifth lowest value of the time-series (Figure 4.3.5.2). Hatchery origin 2SW return rates in 2015 were within the range of observed values for the Saint John (Scotia-Fundy) and the Merrimack (USA) but increased for the Penobscot (USA) (Figure 4.3.5.2).

Regional least squared (or marginal mean) average annual return rates were calculated to balance for variation in the annual number of contributing experimental groups through application of a GLM (generalised linear model) with survival related to smolt year and river with a quasi-Poisson distribution (log-link function) (Figures 4.3.5.1 and 4.3.5.2).

Analyses of time-series of regional return rates of wild smolts to small salmon and 2SW adults by area for the period of 1970 to 2015 (Tables 4.3.5.1 to 4.3.5.4; Figures 4.3.5.1 and 4.3.5.2) indicate:

- Return rates of wild populations exceed those of hatchery populations;
- Small salmon return rates (uncorrected for marine exploitation) of wild smolts to Newfoundland vary annually and without trend over the period 1970 to 2015;
- Small salmon return rates for Newfoundland populations in 2015 were greater than those for other populations in eastern North America;
- Small salmon and 2SW return rates of wild smolts to Québec vary annually and have declined over the period 1983/1984 to 2015;
- Small salmon and 2SW return rates of wild smolts to the Scotia-Fundy and USA vary annually and without a statistically significant trend over the period (mid-1990s to 2015);
- In Scotia-Fundy and USA, hatchery smolt return rates to 2SW salmon have decreased over the period 1970 to 2015. 1SW return rates for Scotia-Fundy hatchery stocks have also declined for the period, while stable for USA.

4.3.6 Pre-fisheries abundance

4.3.6.1 North American run-reconstruction model

The run-reconstruction model developed by Rago *et al*. (1993) and described in previous Working Group reports (ICES, 2008; 2009) and in the primary literature (Chaput *et al*., 2005) was used to estimate returns and spawners by size (small salmon, large salmon) and sea age group (2SW salmon) to the six geographic regions of NAC. The input data were similar in structure to the data used previously by the Working Group (ICES, 2012a; Stock Annex). Estimates of returns and spawners to regions were provided for the time-series to 2015. The full set of data inputs are included in the Stock Annex and the summary output tables of returns and spawners by sea age or size group are provided in Tables 4.3.2.1 to 4.3.2.3 and 4.3.3.1 to 4.3.3.2.

4.3.6.2 Non-maturing 1SW salmon

The non-maturing component of 1SW salmon, destined to be 2SW returns (excluding 3SW and previous spawners) is represented by the pre-fishery abundance estimator for year i designated as PFANAC1SW. This annual pre-fishery abundance is the estimated number of salmon in the North Atlantic on August 1st of the second summer at sea. As the pre-fishery abundance estimates for potential 2SW salmon requires estimates of returns to rivers, the most recent year for which an estimate of PFA is available is 2014. This is because pre-fishery abundance estimates for 2015 require 2SW returns to rivers in North America in 2016.

The PFA estimates accounting for returns to rivers, fisheries at sea in North America, fisheries at West Greenland, and corrected for natural mortality are shown in Figure 4.3.6.1 and Table 4.3.6.1. The median of the estimates of non-maturing 1SW salmon in 2014 was 184 700 salmon (90% C.I. range 149 500 to 223 500). This value is 46% higher than the previous year (126 600) and 28% higher than the previous five year average (144 140). The estimated non-maturing 1SW salmon in 2014 ranks 25th (descending) out of the 44 year time-series.

4.3.6.3 Maturing 1SW salmon

Maturing 1SW salmon are in some areas (particularly Newfoundland) a major component of salmon stocks, and their abundance when combined with that of the 2SW age group provides an index of the majority of an entire smolt cohort.

The reconstructed distribution of the PFA of the 1SW maturing cohort of North American origin is shown in Figure 4.3.6.1 and Table 4.3.6.1. The estimated PFA of the maturing component in 2015 was 670 950 fish, 27% higher than the previous year and 28% higher than the previous five year mean (525 200). Maximum abundance of the maturing cohort was estimated at over 912 000 fish in 1981 and the recent estimate ranks 10th (descending) out of the 45 year time-series.

4.3.6.4 Total 1SW recruits (maturing and non-maturing)

The pre-fishery abundance of 1SW maturing salmon and 1SW non-maturing salmon from North America from 1971–2014 (2015 PFA requires 2SW returns in 2016) were summed to give total recruits of 1SW salmon (Figure 4.3.6.1; Table 4.3.6.1). The PFA of the 1SW cohort, estimated for 2014, was 713 900 fish, 33% higher than the 2013 PFA estimate (537 100), and 11% higher than the previous five year mean (643 180). The 2014 PFA estimate ranks 26th (descending) of the 44 year time-series. The abundance of the 1SW cohort has declined by 58% over the time-series from a peak of 1 705 000 fish in 1975.

4.3.7 Summary on status of stocks

In 2015, the midpoints of the spawner abundance estimates were below the CLs for 2SW salmon for all regions of NAC with the exceptions of Labrador and Newfoundland (Figure 4.3.2.4). The proportion of the 2SW CL attained from 2SW spawners in the other northern areas were 79% and 78% for Québec and Gulf, respectively. From returns to rivers of 2SW salmon, prior to in-river exploitation, these percentages of CL would have been 92% and 80%, respectively. For the two southern areas of NAC, Scotia-Fundy and USA, the 2SW CL attained from 2SW spawners in 2015 were 3% and 5%, respectively. Salmon abundance to these southern areas represents 6% and 17%, of the management objectives for the Scotia-Fundy (10 976) and USA (4549), respectively.

The rank of the estimated returns in the 1971 to 2015 time-series and the proportions of the 2SW CLs achieved in 2015 for six regions in North America are shown below:

Region	Rank of 2015 returns in 1971 to 2015, (45=lowest)		Rank of 2015 returns in 2006 to 2015 (10=lowest)		Median estimate of 2015 2SW spawners as percentage of Conservation Limit (% of management objective)
	1SW	2SW	1SW	2SW	(%)
Labrador	2	1	2	1	166
Newfoundland	2	10	1	2	127
Québec	10	32	2	4	79
Gulf	33	34	5	4	78
Scotia-Fundy	42	45	7	10	3 (6)
USA	36	40	7	8	5 (17)

Estimates of PFA suggest continued low abundance of North American adult salmon. The total population of 1SW and 2SW Atlantic salmon in the Northwest Atlantic has oscillated around a generally declining trend since the 1970s with a period of persistent low abundance since the early 1990s. During 1993 to 2014, the total population of 1SW and 2SW Atlantic salmon was about 600 000 fish, about half of the average abundance during 1971 to 1992. The maturing 1SW salmon in 2015 increased by 27% relative to 2014 and was the highest value since 1988; however, 87% of 1SW salmon returns to NAC are from two (Labrador and Newfoundland) of six regions (Figure 4.3.6.1). The non-maturing 1SW PFA for 2014 increased by 46% from 2013, and was higher than estimates since 2010; 94% of 2SW salmon returns to NAC are from three (Labrador, Québec and Gulf) regions.

The abundances of 1SW salmon returns in 2015 increased from 2014 in all areas (range 36% to 198%) with the exception of Labrador, which declined by 4%. 1SW salmon returns in 2015 were generally the highest returns since 2011 (Labrador and Newfoundland were the second highest in the time-series), although 1SW salmon returns in 2015 still remain among the lowest values in the Gulf, Scotia-Fundy and USA region time-series. Returns of 1SW salmon have generally increased over the time-series for the NAC, mainly as a result of the commercial fishery closures in Canada and increased returns over time to Labrador and Newfoundland; however, important variations in annual abundances continue to be noted, such as the low returns of 2009 and 2013, and the high returns of 2011 and 2015 (Figure 4.3.2.2).

The abundances of large salmon (multi-sea-winter salmon including maiden and repeat spawners) returns in 2015 increased from 2014 in all areas (range 42% to 127%) with the exception of Scotia-Fundy, which declined by 3%. The returns of 2SW salmon in 2015 also increased from 2014 in all geographic areas (range 42% to 128%) with the exception of Scotia-Fundy, which decreased by 1%. The returns of 2SW salmon to Labrador in 2015 were the highest in the time-series for that region, whereas the returns of 2SW salmon to Scotia-Fundy were the lowest in the time-series for that region. 2SW salmon returns in 2015 also remain among the lowest in the time-series for the Québec, Gulf, and USA regions.

Egg depositions by all sea ages combined in 2015 exceeded or equalled the river-specific CLs in 41 of the 64 assessed rivers (64%) and were less than 50% of CLs in ten rivers (16%) (Figure 4.3.4.1). Large deficiencies in egg depositions (<10% CLs) were noted in areas of Scotia-Fundy and USA.

Despite major changes in fisheries, returns to southern regions (Scotia-Fundy and USA) have been at or near historical lows and many populations are currently at risk of extirpation. All salmon stocks within the USA and the Scotia-Fundy regions have been or are being considered for listing under country specific species at risk legislation. Recovery Potential Assessments for the three Designatable Units of salmon in Scotia-Fundy as well as for one Designatable Unit in Québec and one in Newfoundland occurred in 2012 and 2013 to inform the requirements under the Species at Risk Act listing process in Canada (ICES, 2014).

Spatially, there is a divergence of salmon returns to NAC; salmon returns in the more northern regions (Labrador and Newfoundland) were generally at greater abundance in 2015 relative to the time-series of returns to those regions, whereas salmon returns in 2015 were generally among the lowest values in the time-series for the more southern regions (Gulf, Scotia-Fundy and USA). With the exception of 2SW returns to Labrador, this spatial trend of increasing abundance for the northern regions (Labrador and Newfoundland) vs. the decreasing trend in abundance for the southern regions (Gulf, Scotia-Fundy and USA) generally applies across the time-series. Note however, that salmon returns to Labrador are predominately a reflection of the counts of salmon for the single monitoring site on English River in northern Labrador (SFA 1, Figure 4.3.2.1). Regional return estimates in 2015 are reflected in the overall 2015 return estimates for NAC, as Labrador and Newfoundland collectively comprise 87% of the small salmon returns and 64% of the large salmon returns to NAC, respectively, and Labrador, Québec, and Gulf collectively comprise 94% of the 2SW salmon returns to NAC.

The estimated PFA of 1SW non-maturing salmon ranked 25th (descending) of the 44-year time-series and the estimated PFA of 1SW maturing salmon ranked 10th (descending) of the 45-year time-series. The continued low abundance of salmon stocks across North America, despite significant fishery reductions, and generally sustained smolt production (from the limited number of monitored rivers) strengthens the conclusions that factors acting on survival in the first and second years at sea are constraining abundance of Atlantic salmon.

Table 4.1.2.1. The number of professional and recreational gillnet licences issued at Saint Pierre & Miquelon and reported landings.

	Number of licences		Reported Landings (t)		
Year	Professional	Recreational	Professional	Recreational	Total
1990			1.146	0.734	1.880
1991			0.632	0.530	1.162
1992			1.295	1.024	2.319
1993			1.902	1.041	2.943
1994			2.633	0.790	3.423
1995	12	42	0.392	0.445	0.837
1996	12	42	0.951	0.617	1.568
1997	6	36	0.762	0.729	1.491
1998	9	42	1.039	1.268	2.307
1999	7	40	1.182	1.140	2.322
2000	8	35	1.134	1.133	2.267
2001	10	42	1.544	0.611	2.155
2002	12	42	1.223	0.729	1.952
2003	12	42	1.620	1.272	2.892
2004	13	42	1.499	1.285	2.784
2005	14	52	2.243	1.044	3.287
2006	14	48	1.730	1.825	3.555
2007	13	53	0.970	0.977	1.947
2008	9	55	Na	Na	3.54
2009	8	50	1.87	1.59	3.46
2010	9	57	1.00	1.78	2.78
2011	9	56	1.76	1.99	3.75
2012	9	60	1.05	1.75	2.80
2013	9	64	2.29	3.01	5.30
2014	12	70	2.25	1.56	3.81
2015	9	71	1.21	2.30	3.51

Table 4.1.3.1. Harvests (by weight), and the percent large by weight and number in the Aboriginal Peoples' Food, Social, and Ceremonial (FSC) fisheries in Canada.

Aboriginal Peoples' FSC fisheries			
Year	Harvest (t)	% large	
		by weight	by number
1990	31.9	78	
1991	29.1	87	
1992	34.2	83	
1993	42.6	83	
1994	41.7	83	58
1995	32.8	82	56
1996	47.9	87	65
1997	39.4	91	74
1998	47.9	83	63
1999	45.9	73	49
2000	45.7	68	41
2001	42.1	72	47
2002	46.3	68	43
2003	44.3	72	49
2004	60.8	66	44
2005	56.7	57	34
2006	61.4	60	39
2007	48.0	62	40
2008	62.4	66	44
2009	51.1	65	45
2010	59.3	59	38
2011	70.4	63	41
2012	59.6	62	40
2013	64.0	70	51
2014	52.9	61	41
2015	62.3	67	46

Table 4.1.3.2. Harvests (by weight), and the percent large by weight and number in the Resident Food Fishery in Labrador, Canada.

Labrador resident food fishery			
Year	Harvest (t)	% large	
		by weight	by number
2000	3.5	30	18
2001	4.6	33	23
2002	6.1	27	15
2003	6.7	32	21
2004	2.2	40	26
2005	2.7	32	20
2006	2.6	39	27
2007	1.7	23	13
2008	2.3	46	25
2009	2.9	42	28
2010	2.3	38	26
2011	2.1	51	37
2012	1.7	47	32
2013	2.1	65	51
2014	1.6	46	31
2015	2.0	54	38

Table 4.1.3.3. Harvests of small and large salmon, and the percent large by number, in the recreational fisheries of Canada. The values for 2015 are provisional.

Y	Small	Large	Both Size Groups	% Large
1974	53 887	31 720	85 607	37%
1975	50 463	22 714	73 177	31%
1976	66 478	27 686	94 164	29%
1977	61 727	45 495	107 222	42%
1978	45 240	28 138	73 378	38%
1979	60 105	13 826	73 931	19%
1980	67 314	36 943	104 257	35%
1981	84 177	24 204	108 381	22%
1982	72 893	24 640	97 533	25%
1983	53 385	15 950	69 335	23%
1984	66 676	9 982	76 658	13%
1985	72 389	10 084	82 473	12%
1986	94 046	11 797	105 843	11%
1987	66 475	10 069	76 544	13%
1988	91 897	13 295	105 192	13%
1989	65 466	11 196	76 662	15%
1990	74 541	12 788	87 329	15%
1991	46 410	11 219	57 629	19%
1992	77 577	12 826	90 403	14%
1993	68 282	9 919	78 201	13%
1994	60 118	11 198	71 316	16%
1995	46 273	8 295	54 568	15%
1996	66 104	9 513	75 617	13%
1997	42 891	6 756	49 647	14%
1998	45 810	4 717	50 527	9%
1999	43 667	4 811	48 478	10%
2000	45 811	4 627	50 438	9%
2001	43 353	5 571	48 924	11%
2002	43 904	2 627	46 531	6%
2003	38 367	4 694	43 061	11%
2004	43 124	4 578	47 702	10%
2005	33 922	4 132	38 054	11%
2006	33 668	3 014	36 682	8%
2007	26 279	3 499	29 778	12%
2008	46 458	2 839	49 297	6%
2009	32 944	3 373	36 317	9%
2010	45 407	3 209	48 616	7%
2011	49 931	4 141	54 072	8%
2012	30 453	2 680	33 133	8%
2013	31 404	3 472	34 876	10%
2014	33 339	1 343	34 682	4%
2015	34 012	1 953	35 965	5%

Table 4.1.3.4. Numbers of salmon hooked and-released in Eastern Canadian salmon angling fisheries. Blank cells indicate no data. Released fish in the kelt fishery of New Brunswick are not included in the totals for New Brunswick nor Canada. Totals for all years prior to 1997 are incomplete and are considered minimal estimates. Estimates for 2015 are preliminary; both preliminary and final figures are shown for 2014.

	Newfoundland			Nova Scotia			New Brunswick					Prince Edward Island			Quebec			CANADA		
Year	Small	Large	Total	Small	Large	Total	Small Kelt	Small Bright	Large Kelt	Large Bright	Total	Small	Large	Total	Small	Large	Total	SMALL	LARGE	TOTAL
1984				939	1,655	2,594	661	851	1,020	14,479	15,330							**1,790**	**16,134**	**17,924**
1985		315	315	1,323	6,346	7,669	1,098	3,963	3,809	17,815	21,778			67				**5,286**	**24,476**	**29,762**
1986		798	798	1,463	10,750	12,213	5,217	9,333	6,941	25,316	34,649							**10,796**	**36,864**	**47,660**
1987		410	410	1,311	6,339	7,650	7,269	10,597	5,723	20,295	30,892							**11,908**	**27,044**	**38,952**
1988		600	600	1,146	6,795	7,941	6,703	10,503	7,182	19,442	29,945	767	256	1,023				**12,416**	**27,093**	**39,509**
1989		183	183	1,562	6,960	8,522	9,566	8,518	7,756	22,127	30,645							**10,080**	**29,270**	**39,350**
1990		503	503	1,782	5,504	7,286	4,435	7,346	6,067	16,231	23,577			1,066				**9,128**	**22,238**	**31,366**
1991		336	336	908	5,482	6,390	3,161	3,501	3,169	10,650	14,151	1,103	187	1,290				**5,512**	**16,655**	**22,167**
1992	5,893	1,423	7,316	737	5,093	5,830	2,966	8,349	5,681	16,308	24,657			1,250				**14,979**	**22,824**	**37,803**
1993	18,196	1,731	19,927	1,076	3,998	5,074	4,422	7,276	4,624	12,526	19,802							**26,548**	**18,255**	**44,803**
1994	24,442	5,032	29,474	796	2,894	3,690	4,153	7,443	4,790	11,556	18,999	577	147	724				**33,258**	**19,629**	**52,887**
1995	26,273	5,166	31,439	979	2,861	3,840	770	4,260	880	5,220	9,480	209	139	348		922	922	**31,721**	**14,308**	**46,029**
1996	34,342	6,209	40,551	3,526	5,661	9,187						472	238	710		1,718	1,718	**38,340**	**13,826**	**52,166**
1997	25,316	4,720	30,036	713	3,363	4,076	3,457	4,870	3,786	8,874	13,744	210	118	328	182	1,643	1,825	**31,291**	**18,718**	**50,009**
1998	31,368	4,375	35,743	688	2,476	3,164	3,154	5,760	3,452	8,298	14,058	233	114	347	297	2,680	2,977	**38,346**	**17,943**	**56,289**
1999	24,567	4,153	28,720	562	2,186	2,748	3,155	5,631	3,456	8,281	13,912	192	157	349	298	2,693	2,991	**31,250**	**17,470**	**48,720**
2000	29,705	6,479	36,184	407	1,303	1,710	3,154	6,689	3,455	8,690	15,379	101	46	147	445	4,008	4,453	**37,347**	**20,526**	**64,482**
2001	22,348	5,184	27,532	527	1,199	1,726	3,094	6,166	3,829	11,252	17,418	202	103	305	809	4,674	5,483	**30,052**	**22,412**	**59,387**
2002	23,071	3,992	27,063	829	1,100	1,929	1,034	7,351	2,190	5,349	12,700	207	31	238	852	4,918	5,770	**32,310**	**15,390**	**50,924**
2003	21,379	4,965	26,344	626	2,106	2,732	1,555	5,375	1,042	7,981	13,356	240	123	363	1,238	7,015	8,253	**28,858**	**22,190**	**53,645**
2004	23,430	5,168	28,598	828	2,339	3,167	1,050	7,517	4,935	8,100	15,617	135	68	203	1,291	7,455	8,746	**33,201**	**23,130**	**62,316**
2005	33,129	6,598	39,727	933	2,617	3,550	1,520	2,695	2,202	5,584	8,279	83	83	166	1,116	6,445	7,561	**37,956**	**21,327**	**63,005**
2006	30,491	5,694	36,185	1,014	2,408	3,422	1,071	4,186	2,638	5,538	9,724	128	42	170	1,091	6,185	7,276	**36,910**	**19,867**	**60,486**
2007	17,719	4,607	22,326	896	1,520	2,416	1,164	2,963	2,067	7,040	10,003	63	41	104	951	5,392	6,343	**22,592**	**18,600**	**41,192**
2008	25,226	5,007	30,233	1,016	2,061	3,077	1,146	6,361	1,971	6,130	12,491	3	9	12	1,361	7,713	9,074	**33,967**	**20,920**	**54,887**
2009	26,681	4,272	30,953	670	2,665	3,335	1,338	2,387	1,689	8,174	10,561	6	25	31	1,091	6,180	7,271	**30,835**	**21,316**	**52,151**
2010	27,256	5,458	32,714	717	1,966	2,683	463	5,730	1,920	5,660	11,390	42	27	69	1,356	7,683	9,039	**35,101**	**20,794**	**55,895**
2011	26,240	8,119	34,359	1,157	4,320	5,477		6,537		12,466	19,003	46	46	92	3,100	9,327	12,427	**37,080**	**34,278**	**71,358**
2012	20,940	4,089	25,029	339	1,693	2,032		2,504		5,330	7,834	46	46	92	2,126	6,174	8,300	**25,955**	**17,332**	**43,287**
2013	19,962	6,770	26,732	480	2,657	3,137		2,646		8,049	10,695	12	23	35	2,238	7,793	10,031	**25,338**	**25,292**	**50,630**
2014 (prelim)	18,393	4,327	22,720	189	1,287	1,476		2,806		5,884	8,690	68	68	136	1,580	4,932	6,512	**23,036**	**16,498**	**39,534**
2014 (final)	20,553	4,410	24,963	185	1,127	1,312		2,806		5,884	8,690	68	68	136	1,580	4,932	6,512	**25,192**	**16,421**	**41,613**
2015 (prelim)	24,637	5,580	30,217	653	1,656	2,309		11,478		7,443	18,921	68	68	136	3,066	9,510	12,576	**39,902**	**24,257**	**64,159**

Table 4.1.4.1. Reported harvests and losses expressed as 2SW salmon equivalents in North American salmon fisheries. Only midpoints of the Monte Carlo simulated values are shown.

	MIXED STOCK					CANADA											
						LOSSES FROM ALL SOURCES (TERMINAL FISHERIES, CATCH AND RELEASE MORTALITY, BYCATCH MORTALITY) IN Year i											
Year (i)	NF-LAB Comm / Food 1SW (Year i-1) (a)	% 1SW of total 2SW equivalents (Year i)	NF-LAB Comm / Food 2SW (Year i) (a)	NF-Lab Comm / Food total (Year i)	Saint-Pierre and Miquelon (Year i)	Labrador	Newfoundland	Quebec	Gulf	Scotia - Fundy	Canadian total	USA	North American Total	Terminal losses as a % of NA Total	Greenland Total	NW Atlantic Total	Harvest in homewaters as % of total NW Atlantic
1972	20054	0.12	153913	173967	0	425	586	27390	20110	5630	54141	345	228453	24	197560	426013	54
1973	17387	0.07	219321	236708	0	1010	782	32750	15610	6222	56374	327	293409	19	148170	441579	66
1974	23643	0.09	236109	259752	0	805	500	47550	18040	13050	79945	247	339944	24	186489	526433	65
1975	23382	0.09	237759	261141	0	325	470	41085	14210	12540	68630	389	330160	21	154533	484693	68
1976	34943	0.12	256780	291723	323	830	369	42250	16200	11170	70819	191	363056	20	194325	557381	65
1977	26656	0.10	241350	268006	0	1290	779	42200	29340	13350	86959	1355	356320	25	112871	469191	76
1978	26903	0.15	157406	184309	0	765	536	37155	20350	9371	68177	894	253380	27	142563	395943	64
1979	13457	0.13	92124	105581	0	610	131	25185	6243	3822	35991	433	142005	26	103669	245674	58
1980	20542	0.09	217380	237922	0	890	638	53570	25335	17415	97848	1533	337303	29	141916	479218	70
1981	33643	0.14	201464	235107	0	520	416	44670	14659	12890	73155	1267	309529	24	121067	430596	72
1982	33501	0.20	134504	168005	0	620	406	35295	20990	8958	66269	1413	235687	29	161111	396797	59
1983	25173	0.18	111601	136774	323	428	421	34400	17290	12307	64846	386	202329	32	145870	348199	58
1984	19005	0.19	82876	101881	323	510	170	19420	3580	3970	27650	675	130529	22	26859	157388	83
1985	14299	0.15	78820	93119	323	294	17	22265	750	4995	28321	645	122408	24	32452	154860	79
1986	19523	0.16	105002	124525	269	466	35	27250	2005	2990	32746	606	158146	21	99140	257286	61
1987	24713	0.16	132369	157081	215	630	15	27360	2085	1470	31560	300	189157	17	123655	312812	60
1988	31483	0.28	81197	112680	215	710	19	27660	1380	1480	31249	248	144393	22	123799	268191	54
1989	21822	0.21	81420	103242	215	462	10	23780	1310	300	25862	397	129716	20	85121	214837	60
1990	19222	0.25	57402	76623	205	357	21	23000	930	620	24928	695	102451	25	43635	146086	70
1991	11808	0.23	40468	52275	129	92	0	23570	1120	1380	26162	231	78798	33	52165	130963	60
1992	9811	0.28	25135	34945	247	782	18	24240	1270	1180	27490	167	62850	44	79657	142506	44
1993	3098	0.19	13285	16384	312	388	41	18590	685	1151	20855	166	37717	56	29799	67516	56
1994	2070	0.15	11946	14016	366	490	147	19350	760	782	21529	2	35913	60	1889	37801	95
1995	1180	0.12	8685	9866	86	455	148	17950	530	384	19467	0	29419	66	1884	31303	94
1996	1030	0.15	5651	6681	172	385	159	17200	910	850	19504	0	26356	74	19159	45516	58
1997	940	0.15	5396	6335	161	210	113	14150	840	611	15924	0	22421	71	19339	41760	54
1998	1127	0.39	1763	2891	247	206	88	7960	530	330	9114	0	12252	74	13048	25301	48
1999	175	0.17	842	1017	250	270	84	6610	790	460	8214	0	9481	87	4323	13804	69
2000	150	0.13	1051	1201	244	265	163	6330	660	202	7620	0	9065	84	6439	15504	58
2001	284	0.18	1337	1621	232	325	73	7110	900	261	8669	0	10522	82	5934	16456	64
2002	261	0.19	1079	1340	211	200	66	4170	530	184	5150	0	6701	77	8606	15306	44
2003	309	0.15	1691	2000	312	235	63	6070	750	206	7324	0	9635	76	3224	12859	75
2004	351	0.11	2873	3224	300	270	86	5960	815	113	7244	0	10768	67	3474	14242	76
2005	464	0.17	2189	2653	354	270	72	5340	920	109	6711	0	9718	69	4339	14058	69
2006	559	0.19	2401	2960	382	220	110	4870	800	149	6149	0	9491	65	4181	13672	69
2007	558	0.21	2061	2620	210	245	64	4730	900	111	6050	0	8879	68	4932	13811	64
2008	495	0.14	3037	3532	381	230	123	4470	900	99	5822	0	9735	60	6618	16353	60
2009	540	0.17	2599	3139	373	220	42	4650	900	120	5932	0	9443	63	7549	16992	56
2010	440	0.13	2895	3335	299	200	103	4260	820	131	5514	0	9148	60	6671	15819	58
2011	539	0.13	3459	3998	405	145	0	5780	1530	78	7533	0	11936	63	8756	20692	58
2012	612	0.16	3286	3897	156	70	28	4505	730	52	5385	0	9439	57	6871	16310	58
2013	550	0.10	5035	5585	571	165	89	4870	850	32	6006	0	12161	49	7076	19237	63
2014	430	0.12	3103	3533	361	90	41	3470	430	13	4044	0	7938	51	9598	17536	45
2015	496	0.09	4777	5273	485	70	78	3890	545	7	4590	0	10348	44	11424	21771	48
2016	516														11718		

Variations in numbers from previous assessments is due updates to data inputs and to stochastic variation from Monte Carlo simulation

NF-Lab Comm / Food 1SW (Year i-1) = Catch of 1SW non-maturing * 0.677057 (M of 0.03 per month for 13 months to July for Canadian terminal fisheries)

NF-Lab Comm / Food 2SW (Year i) = catch of 2SW salmon * 0.970446 (M of 0.03 per month for 1 month to July of Canadian terminal fisheries)

Canada - Losses from all sources = 2SW returns - 2SW spawners (includes losses from harvests, from catch and release mortality, and other inriver losses such as bycatch mortality but excludes the fisheries at St-Pierre and Miquelon and NF-Lab Comm / Food fisheries)

a - starting in 1998, there was no commercial fishery in Labrador; numbers reflect harvests of the aboriginal and residential subsistence fisheries

Table 4.3.1.1. Estimated smolt production by smolt migration year in monitored rivers of eastern North America.

Smolt Migration Year	USA	Scotia–Fundy				Gulf				
	Narraguagus	Nashwaak	LaHave	St. Mary's (West Br.)	Middle	Margaree	Northwest Miramichi	Southwest Miramichi	Restigouche	Kedgwick
1991										
1992										
1993										
1994										
1995										
1996			20 511							
1997	2898		16 550							
1998	2866	22 750	15 600							
1999	4346	28 500	10 420				390 500			
2000	2094	15 800	16 300				162 000			
2001	2621	11 000	15 700				220 000	306 300		
2002	1800	15 000	11 860			63 200	241 000	711 400		
2003	1368	9000	17 845			83 100	286 000	48 500	379 000	91 800
2004	1344	13 600	20 613			105 800	368 000	1 167 000	449 000	131 500
2005	1298	5 200	5270	7350		94 200	151 200		630 000	67 000
2006	2612	25 400	22 971	25 100		113 700	435 000	1 330 000	500 000	129 000
2007	1240	21 550	24 430	16 110		112 400		1 344 000	1 087 000	116 600
2008	1029	7 300	14 450	15 217		128 800		901 500	486 800	110 100
2009	1180	15 900	8644	14 820		96 800		1 035 000	491 000	126 800
2010	2170	12 500	16 215					2 165 000	636 600	108 600
2011	1404	8750					768 000		792 000	275 178
2012	969	11 060							842 000	155 012
2013	1386	10 120	7159		11 103				842 000	104 081
2014	1590	11 100	29 175		11 907				230 743	59 792
2015	1590	7900	6664		24 110				490 000	252 000

Table 4.3.1.1. Continued. Estimated smolt production by smolt migration year in monitored rivers of eastern North America.

Smolt Migration Year	Québec		Newfoundland				
	St. Jean	De la Trinite	Conne	Rocky	NE Trepassey	Campbellton	Western Arm Brook
1991	113 927	40 863	74 645	7732	1911		13 453
1992	154 980	50 869	68 208	7813	1674		15 405
1993	142 972	86 226	55 765	5115	1849	31 577	13 435
1994	74 285	55 913	60 762	9781	944	41 663	9283
1995	60 227	71 899	62 749	7577	792	39 715	15 144
1996	104 973	61 092	94 088	14 261	1749	58 369	14 502
1997		31 892	100 983	16 900	1829	62 050	23 845
1998	95 843	28 962	69 841	12 163	1727	50 441	17 139
1999	114 255	56 557	63 658	8 625	1419	47 256	13 500
2000	50 993	39 744	60 777	7616	1740	35 596	12 706
2001	109 845	70 318	86 899	9392	916	37 170	16 013
2002	71 839	44 264	81 806	10 144	2074	32 573	14 999
2003	60 259	53 030	71 479	4440	1064	35 089	12 086
2004	54 821	27 051	79 667	13 047	1571	32 780	17 323
2005	96 002	34 867	66 196	15 847	1384	30 123	8607
2006	102 939		35 487	13 200	1385	33 302	20 826
2007	135 360	42 923	63 738	12 355	1777	35 742	16 621
2008	45 978	35 036	68 242	18 338	1868	40 390	17 444
2009	37 297	32 680	71 085	14 041	1600	36 722	18 492
2010	47 187	37 500	54 392	15 098	1012	41 069	19 044
2011	45 050	44 400	50 701	9311	800	37 033	20 544
2012	40 787	45 108	51 220	5673	1557	44 193	13 573
2013	36 849	42 378	66 261	6989	520	40 355	19 710
2014	56 298	30 583	56 224	9901		45 630	19 771
2015		47 414	32 557	6454		32 759	14 278

Table 4.3.2.1. Estimated small salmon returns (medians, 5th percentile, 95th percentile) to the six geographic areas and overall for NAC. Returns for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23.

	Median estimates of returns of small salmon						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	49075	135800	23725	62975	26550	NA	299000
1971	64280	118900	18735	49820	18850	32	271400
1972	48550	110700	15620	62800	17000	18	255600
1973	14035	159800	20720	63250	24470	23	282600
1974	54210	120600	20980	98270	43640	55	338900
1975	102700	150900	22640	88280	33870	84	399600
1976	74350	158600	24870	129000	52900	186	441200
1977	65285	159800	22840	46200	46210	75	341700
1978	32780	139300	21220	41130	15810	155	251300
1979	42435	151700	27125	72320	48920	250	343900
1980	96400	172400	37330	63330	70670	818	441800
1981	105400	225400	52230	106000	59450	1130	552400
1982	73175	200600	29680	121300	36050	334	463100
1983	45970	156800	22540	37100	22635	295	286400
1984	24030	206600	25230	54150	42710	598	354300
1985	43260	195600	26730	86000	47460	392	400900
1986	66215	199850	38290	161400	49360	758	518400
1987	82260	135400	43790	122400	51340	1128	437800
1988	75170	217700	50350	173250	51950	992	571500
1989	52165	107500	39840	102900	54595	1258	359900
1990	30210	152300	45260	117300	55170	687	402000
1991	24290	105800	35260	85050	28280	310	279600
1992	34480	228900	39820	192700	34030	1194	532600
1993	45590	265600	34340	136300	25650	466	509800
1994	33765	161000	32850	67370	10440	436	306800
1995	47580	203900	26380	60750	19990	213	360300
1996	90050	313200	35210	55360	31690	651	528600
1997	94785	176800	26610	30510	9394	365	339500
1998	151700	183600	28260	39280	20370	403	423200
1999	147050	201100	29930	35610	10590	419	425100
2000	180700	228900	27570	51100	12350	270	501100
2001	144200	156300	18950	42070	5418	266	367300
2002	102950	155600	30240	68825	9853	450	368200
2003	84880	242500	25200	40520	5835	237	399300
2004	95155	210200	34040	75910	8397	319	423700
2005	220100	221400	23000	46000	7488	319	518700
2006	212200	212800	28090	56235	10270	450	520750
2007	195300	183600	21390	42030	7732	297	450300
2008	202500	247500	35540	60795	15370	814	563100
2009	102300	222800	20830	25330	4246	241	376200
2010	121900	267800	26590	73990	14870	525	505600
2011	247100	243700	36420	75260	9462	1080	613300
2012	173100	270100	23670	17895	609	26	485500
2013	153900	187800	19210	25080	2106	78	388550
2014	267300	195000	23900	16160	1414	110	504350
2015	256800	300750	35670	43440	4207	150	641100

	5th percentile of estimates of returns						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	34120	120100	19350	53940	22810	NA	272900
1971	44830	105595	15360	42700	16060	32	244400
1972	33740	97650	12800	53640	14090	18	231600
1973	9499	141900	17010	54120	20740	23	260695
1974	37510	106700	17190	83700	37140	54	309000
1975	71510	133300	18520	75420	30560	83	358600
1976	51310	139200	20440	110900	46630	184	401800
1977	45770	139800	18660	39980	40250	74	309600
1978	22920	121700	17390	36190	14470	154	228500
1979	29260	133500	22200	62370	42180	248	315300
1980	66320	151900	30520	54530	62680	811	399100
1981	72380	198300	42670	85360	51050	1120	497900
1982	50560	177200	24260	96100	31320	331	417800
1983	31880	137595	18460	29640	19830	292	259100
1984	16850	180000	22960	44720	36470	593	323400
1985	29940	168200	24260	68190	40110	388	362300
1986	45070	174900	35270	126900	41670	751	465100
1987	56460	118495	40060	96840	43350	1118	393095
1988	51689	190100	46320	137000	43960	983	515300
1989	35830	94850	36690	81320	46570	1247	324900
1990	20850	138300	41920	92750	46380	681	369000
1991	16580	96410	32700	67200	24510	307	255995
1992	24160	199700	36830	164300	29270	1183	487500
1993	33200	234700	31840	89420	21920	462	449800
1994	25080	138600	30500	57270	9359	432	279800
1995	35890	173900	24510	51890	17480	211	325100
1996	67540	270095	32820	47230	27490	645	476600
1997	73620	159300	24500	24670	8260	362	309595
1998	103100	171300	25780	33520	18760	399	372100
1999	101000	185600	27460	31170	9827	415	375700
2000	123200	216900	24490	44880	11320	268	441800
2001	98809	148300	17230	37000	5004	264	321500
2002	66440	143400	27970	59640	8993	446	328100
2003	52049	233000	23160	35050	5343	235	364300
2004	72280	192100	30630	65250	7642	316	391500
2005	166300	175795	20890	38540	6796	316	445700
2006	141100	194000	25920	46650	9287	446	445500
2007	138200	159100	19350	33670	6977	294	385795
2008	148795	222200	32540	48630	13890	807	500895
2009	60260	194700	18970	20080	3841	239	323200
2010	82989	256100	24180	64830	13430	520	463395
2011	148795	217000	33540	61690	8509	1070	509500
2012	112000	250400	21520	14350	550	26	421200
2013	90828	172400	17400	19390	1906	77	322600
2014	184500	177500	21680	12900	1270	109	419100
2015	183100	265800	32480	37480	3809	149	558000

	95th percentile of estimates of returns						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	72380	150700	27900	72010	30310	NA	328600
1971	94980	132205	22100	56970	21640	32	305300
1972	71720	123600	18390	72040	19840	18	283800
1973	19890	178000	24440	72110	28080	23	303800
1974	79520	134100	24770	112800	50030	55	371600
1975	153300	168900	26680	101200	37230	85	454100
1976	109100	178005	29450	146600	59250	188	484300
1977	96420	179500	26850	52690	52110	76	378700
1978	47920	156700	25030	46010	17130	156	274900
1979	63020	170500	31990	82120	55490	252	374000
1980	143400	192500	43950	72050	78620	825	493905
1981	158000	253405	61450	127400	67790	1140	614100
1982	109005	223405	34950	146500	40770	337	511505
1983	68010	175700	26550	44680	25440	298	316300
1984	35530	234200	27520	63720	48790	603	385900
1985	64411	223100	29210	104100	54710	396	440800
1986	97900	226105	41240	195700	56890	765	571305
1987	123000	152000	47640	147400	59130	1138	489400
1988	113000	244500	54390	208900	59670	1001	629810
1989	77150	120400	43010	124600	62800	1269	395900
1990	45260	166100	48530	141600	64030	693	435300
1991	36480	114800	37850	102700	31940	313	303400
1992	51131	258600	42800	221200	38670	1205	577800
1993	66890	296000	36810	183200	29450	470	569500
1994	48190	183300	35180	77430	11570	440	334600
1995	67051	235005	28250	69450	22510	215	396700
1996	127300	357900	37650	63260	36040	657	585100
1997	130700	194700	28690	36380	10510	368	379700
1998	199600	196200	30800	44950	22020	407	474005
1999	194500	217000	32420	40020	11350	423	475505
2000	239700	240800	30630	57380	13380	272	561900
2001	191800	164500	20640	47250	5831	268	415500
2002	138605	168000	32430	77990	10700	454	406900
2003	118805	252100	27260	45960	6346	239	435300
2004	117700	227900	37570	86330	9135	322	455700
2005	275105	266800	25170	53510	8187	322	592105
2006	286600	231300	30270	65920	11250	454	597700
2007	251300	208900	23350	50140	8483	300	512900
2008	258500	273300	38540	72910	16870	821	627600
2009	144200	250900	22690	30640	4643	243	427605
2010	160900	279300	28900	83210	16350	530	547900
2011	345800	270100	39270	88950	10390	1090	716500
2012	234400	290305	25800	21370	667	26	550000
2013	220400	203500	20970	30730	2303	79	456600
2014	350500	212800	26070	19470	1556	111	589100
2015	331200	335500	38870	49500	4609	151	724605

Table 4.3.2.2. Estimated large salmon returns (medians, 5th percentile, 95th percentile) to the six geographic areas and overall for NAC. Returns for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23.

	Median estimates of returns of large salmon						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	10110	14870	103500	69550	20260	NA	218650
1971	14350	12580	59330	40040	15870	653	143200
1972	12320	12660	77235	57040	19000	1383	180000
1973	17350	17340	85150	53350	14770	1427	190000
1974	16855	14280	114300	77810	28520	1394	253500
1975	16045	18390	97105	50310	30660	2331	215400
1976	18390	16620	96730	48740	28820	1317	211100
1977	16270	14600	113900	87750	38100	1998	273000
1978	12890	11340	102200	43790	22290	4208	197200
1979	7270	7191	56435	17890	12800	1942	103700
1980	17260	12060	134400	62470	43740	5797	276200
1981	15715	28860	105900	39240	28230	5601	224000
1982	11550	11600	93445	54140	23640	6056	201000
1983	8399	12450	76720	40850	20600	2155	161200
1984	5906	12390	63700	32720	24500	3222	142600
1985	4762	10900	65940	44330	34170	5530	165900
1986	8108	12300	78000	68595	28285	6176	201700
1987	10970	8416	73480	46640	17700	3081	160600
1988	6926	12960	81010	53670	16455	3286	174550
1989	6556	6918	73700	42800	18500	3197	151900
1990	3832	10270	72450	56620	16020	5051	164300
1991	1872	7564	65290	57600	15660	2647	150600
1992	7488	31470	65570	60340	14290	2460	182000
1993	9446	17080	50450	64275	10070	2231	154000
1994	12920	17350	50980	41475	6308	1346	130800
1995	25395	19040	59210	48420	7482	1748	161700
1996	18870	28900	53600	41550	10890	2407	156800
1997	16080	27990	44210	36200	5574	1611	132200
1998	13340	35150	33940	30350	3854	1526	118200
1999	16170	32170	36970	27870	4940	1168	119200
2000	21840	27045	35390	30565	2875	533	118200
2001	23060	17880	37230	40435	4656	797	124000
2002	16775	16830	26450	23945	1586	526	86140
2003	14235	24460	42120	40300	3528	1199	125800
2004	17050	22160	36330	40590	3090	1316	120500
2005	21080	28460	35380	37960	2023	994	125800
2006	21110	35820	32780	37620	2987	1030	131200
2007	21810	29560	30040	35540	1596	958	119600
2008	26185	28910	35960	28680	3272	1799	124700
2009	39425	34280	35060	36570	3145	2095	150400
2010	18640	35320	37820	33390	2514	1098	128900
2011	57410	43390	48150	66270	4794	3088	223300
2012	33890	28850	34570	27030	1304	913	126600
2013	64270	37720	39030	35440	3178	533	180100
2014	61970	23020	22210	23750	757	340	132100
2015	89080	38560	37270	33610	736	771	200200

	5th percentile of estimates of returns						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	4937	11860	84830	67130	17970	NA	198400
1971	7079	10020	48500	37600	14130	647	128495
1972	6067	10130	63320	49040	17150	1371	161700
1973	8576	13810	69890	45660	13410	1414	169200
1974	8324	12710	93800	66010	26270	1381	226995
1975	7861	16130	79650	43020	28020	2310	193400
1976	8895	14590	79150	41430	25980	1305	188200
1977	7986	12950	93570	75220	34640	1980	246000
1978	6296	10350	84020	38770	20560	4170	176100
1979	3558	6293	46280	15670	11590	1925	92100
1980	8513	11120	110300	54640	39610	5744	247500
1981	7679	25320	86640	33030	25460	5551	200300
1982	5681	10070	76750	42890	21500	6001	178200
1983	4091	11270	62970	33830	18400	2136	144500
1984	2943	9101	60710	23390	21160	3193	130900
1985	2320	7706	62070	31880	29320	5479	151100
1986	3995	9436	73950	49260	23740	6120	180400
1987	5390	6449	69960	34250	15040	3053	145600
1988	3399	9855	76530	39590	13740	3257	158300
1989	3238	5380	70040	31620	15610	3168	138700
1990	1877	8373	68140	39780	13500	5006	146400
1991	920	6147	61690	40250	13440	2623	132595
1992	3985	22130	61720	51570	12300	2437	167800
1993	5900	13720	48640	34890	8881	2211	123700
1994	8448	13800	49200	33259	5651	1334	119900
1995	18030	14650	57260	41420	6573	1732	149500
1996	13500	23830	51410	33278	9572	2385	144600
1997	11570	22950	42390	28580	4993	1596	121300
1998	7976	27450	32130	24820	3536	1512	106900
1999	9608	24920	34800	23450	4592	1157	108195
2000	13050	22980	32510	25860	2611	528	106900
2001	13810	15110	34250	35370	4265	790	112500
2002	9844	13730	24170	20000	1443	521	76860
2003	7446	19510	38810	33980	3186	1188	114600
2004	11570	16970	33780	33150	2821	1304	109400
2005	12190	20520	33150	31180	1835	985	111700
2006	13280	30080	30600	30940	2686	1021	119000
2007	12870	23360	27950	29900	1456	949	106700
2008	15920	22500	32800	22960	2917	1783	110700
2009	20890	23800	32670	30840	2845	2076	128000
2010	11560	28730	35260	27980	2283	1088	117300
2011	32760	31510	45150	52770	4315	3059	191800
2012	20490	23280	32130	22170	1168	905	110900
2013	39790	26080	36570	28000	2802	528	151400
2014	38720	18640	20860	18650	678	337	107800
2015	53400	30120	34610	27220	662	764	162600

	95th percentile of estimates of returns						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	16970	17910	122000	71980	22600	NA	239200
1971	24180	15050	69800	42480	17650	659	158400
1972	20830	15260	91210	64950	20840	1396	198500
1973	29000	20840	100600	61220	16090	1440	211100
1974	28910	15850	134800	89440	30810	1407	280100
1975	26920	20770	114500	57790	33210	2352	237800
1976	30850	18640	113800	56130	31630	1329	234300
1977	27380	16250	134200	100300	41480	2016	300400
1978	21470	12340	120705	48810	23960	4246	218400
1979	12270	8110	66620	20020	14020	1959	115500
1980	29360	13010	158400	70330	47860	5848	305200
1981	26490	32410	124500	45690	30950	5652	247405
1982	19510	13110	110400	65430	25850	6110	223500
1983	14130	13630	90680	47640	22790	2174	178700
1984	10070	15620	66670	42020	27840	3251	154600
1985	7994	14220	69860	57150	38960	5579	181000
1986	13630	15170	82010	87911	32720	6232	223200
1987	18500	10410	76930	59210	20330	3108	176200
1988	11640	16080	85610	67680	19180	3316	190900
1989	11110	8441	77320	54020	21440	3225	164900
1990	6462	12180	76920	73350	18500	5096	182300
1991	3151	9008	68950	75260	17840	2671	169000
1992	12730	40810	69480	69120	16240	2481	196300
1993	15120	20390	52290	93410	11220	2251	183600
1994	20240	20880	52720	49571	6977	1358	142200
1995	37480	23390	61090	55370	8430	1764	176000
1996	27610	33990	55790	49680	12200	2429	169600
1997	23620	33020	45980	43880	6174	1625	143800
1998	18900	42960	35740	35940	4166	1540	129700
1999	22620	39310	39120	32330	5291	1179	130105
2000	30780	31020	38280	35320	3131	538	129500
2001	32610	20530	40150	45540	5052	804	135900
2002	24010	19970	28750	27830	1724	531	95370
2003	20920	29440	45430	46760	3862	1210	137000
2004	22510	27420	38840	47950	3367	1328	131500
2005	29720	36340	37640	44910	2214	1003	140100
2006	28980	41400	34900	44170	3291	1039	143700
2007	30930	35780	32140	41090	1739	967	132400
2008	36540	35220	39160	34610	3621	1815	138900
2009	58080	45010	37460	42280	3439	2114	173400
2010	25970	42080	40340	38820	2747	1108	140700
2011	82310	55390	51190	79990	5274	3115	255000
2012	47160	34380	37000	31860	1446	921	142200
2013	88720	49540	41520	42690	3550	538	208600
2014	85220	27470	23570	28790	835	343	156500
2015	124100	46840	39860	40060	811	778	236500

Table 4.3.2.3. Estimated 2SW salmon returns (medians, 5th percentile, 95th percentile) to the six geographic areas and overall for NAC. Returns for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23.

	Median estimates of returns of 2SW salmon						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	10110	4131	75565	59615	17115	NA	166800
1971	14350	3592	43310	34830	13490	653	110600
1972	12320	3718	56380	49470	16010	1383	139600
1973	17350	4629	62160	47750	12920	1427	146700
1974	16855	3643	83410	67280	27130	1394	200200
1975	16045	5190	70885	43090	28900	2331	166900
1976	18390	4350	70610	40260	26660	1317	162200
1977	16270	3550	83150	80810	32220	1998	218500
1978	12890	3584	74615	36300	18780	4208	150900
1979	7270	1744	41200	12025	10500	1942	74920
1980	17260	3898	98120	56900	38720	5797	221100
1981	15715	7004	77300	24380	23250	5601	153600
1982	11550	3169	68215	42070	16760	6056	148300
1983	8399	3697	56010	31170	16490	2155	118200
1984	5906	3355	46500	29540	21460	3222	110200
1985	4762	2746	48140	36050	29695	5530	127100
1986	8108	3263	56940	57065	21420	6176	153300
1987	10970	2346	53640	36045	13660	3081	120200
1988	6926	3431	59140	42740	11820	3286	127500
1989	6556	1688	53800	28280	14610	3197	108300
1990	3832	2685	52890	36930	11640	5051	113200
1991	1872	2049	47660	36090	13030	2647	103400
1992	7488	8154	47870	38130	11980	2460	116300
1993	9446	4355	36830	43170	8092	2231	104700
1994	12920	4040	37210	30410	5177	1346	91550
1995	25395	3848	43220	39720	6837	1748	121200
1996	18870	5662	39130	29880	9219	2407	105600
1997	16080	5994	32270	24440	4579	1611	85400
1998	8712	6434	24770	16470	2604	1526	60510
1999	10560	6280	26990	16150	4192	1168	65320
2000	14240	6364	25840	17380	2380	533	66710
2001	15080	2506	27180	27400	4270	788	77215
2002	10990	2432	19310	14380	970	504	48610
2003	9316	3366	30750	26330	3328	1192	74355
2004	11130	3321	26520	26115	2689	1283	71050
2005	13775	4412	25830	26500	1698	984	73240
2006	13810	5389	23930	22640	2542	1023	69290
2007	14275	4162	21930	22940	1390	954	65660
2008	17090	3893	26250	18890	3054	1764	70940
2009	25590	4614	25590	24370	2666	2069	84920
2010	12090	4663	27610	20590	2017	1078	68040
2011	37340	3636	35150	53350	4640	3046	136900
2012	22010	2288	25240	19280	1081	879	70810
2013	41750	4830	28490	25530	2945	525	104100
2014	40230	3104	16210	17060	686	334	77565
2015	57880	5170	27200	24280	678	761	116000

	5th percentile of estimates of returns						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	4937	3088	61930	57550	15020	NA	151200
1971	7079	2604	35410	32620	11860	647	98350
1972	6067	2722	46220	42470	14290	1371	124400
1973	8576	3482	51020	40690	11690	1414	129400
1974	8324	2859	68480	56990	24870	1381	178600
1975	7861	3870	58150	36660	26260	2310	149000
1976	8895	3328	57780	34240	23830	1305	143300
1977	7986	2873	68300	68969	28920	1980	195300
1978	6296	2918	61330	32090	17190	4170	134200
1979	3558	1337	33790	10580	9402	1925	65770
1980	8513	3191	80520	49910	34760	5744	198100
1981	7679	5455	63250	20350	20740	5551	135400
1982	5681	2512	56030	32850	14870	6001	130400
1983	4091	3023	45970	25670	14510	2136	104700
1984	2943	2448	44320	20830	18330	3193	99560
1985	2320	1914	45310	25320	25450	5479	114500
1986	3995	2367	53990	40620	18120	6120	135300
1987	5390	1656	51070	25880	11630	3053	107100
1988	3399	2447	55870	31420	9902	3257	114500
1989	3238	1240	51130	20650	12380	3168	98860
1990	1877	2019	49740	26120	9910	5006	101500
1991	920	1564	45030	24900	11150	2623	91570
1992	3985	5438	45060	32090	10260	2437	107700
1993	5900	3229	35510	23110	7188	2211	83790
1994	8448	2893	35920	24110	4651	1334	83040
1995	18030	2563	41800	33760	6008	1732	110795
1996	13500	4078	37530	23420	8132	2385	96220
1997	11570	4243	30950	18560	4129	1596	76910
1998	5211	4517	23460	12860	2391	1512	54790
1999	6282	4364	25400	13180	3913	1157	59460
2000	8495	4540	23730	14310	2159	528	59370
2001	8998	1699	25000	23580	3916	781	69380
2002	6430	1604	17640	11770	895	500	42830
2003	4863	2231	28330	21640	3008	1181	67020
2004	7540	2091	24660	20820	2463	1271	64180
2005	7956	2551	24200	21430	1541	975	64820
2006	8648	3548	22330	18180	2292	1014	61960
2007	8377	2635	20400	19030	1272	945	58060
2008	10410	2479	23940	14460	2730	1748	62190
2009	13540	2759	23850	20260	2424	2050	71830
2010	7488	3135	25740	16570	1837	1068	61030
2011	21300	2384	32960	41840	4188	3018	117100
2012	13360	1600	23450	15820	970	871	61000
2013	25850	3082	26690	20220	2600	520	86900
2014	25050	2150	15230	13320	614	331	61950
2015	34659	3412	25260	19460	611	754	92240

	95th percentile of estimates of returns						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	16970	5196	89050	61670	19220	NA	182600
1971	24180	4547	50950	37030	15150	659	123505
1972	20830	4737	66580	56460	17690	1396	154800
1973	29000	5750	73460	54730	14120	1440	164500
1974	28910	4434	98440	77360	29350	1407	222700
1975	26920	6500	83600	49360	31470	2352	185300
1976	30850	5414	83110	46230	29410	1329	181300
1977	27380	4233	98000	92350	35670	2016	241000
1978	21470	4252	88150	40490	20360	4246	167500
1979	12270	2142	48630	13440	11630	1959	84220
1980	29360	4609	115600	64050	42600	5848	244200
1981	26490	8547	90870	28370	25680	5652	172100
1982	19510	3807	80600	51100	18620	6110	166200
1983	14130	4387	66190	36790	18490	2174	131600
1984	10070	4266	48670	38290	24610	3251	120800
1985	7994	3589	51000	46670	34020	5579	139400
1986	13630	4165	59870	73480	24610	6232	171100
1987	18500	3034	56160	45880	15700	3108	132800
1988	11640	4397	62490	54110	13620	3316	140800
1989	11110	2123	56440	35810	16870	3225	117700
1990	6462	3367	56150	47570	13420	5096	124900
1991	3151	2537	50330	47170	14910	2671	115200
1992	12730	10840	50720	44020	13650	2481	125200
1993	15120	5490	38170	63361	8998	2251	125400
1994	20240	5180	38490	36680	5685	1358	100800
1995	37480	5117	44600	45660	7644	1764	134400
1996	27610	7282	40730	36310	10300	2429	116300
1997	23620	7776	33570	30250	5034	1625	94770
1998	12500	8361	26090	20060	2814	1540	66490
1999	14960	8219	28560	19110	4474	1179	71340
2000	20370	8240	27940	20430	2595	538	74420
2001	21610	3302	29310	31100	4629	795	85240
2002	15930	3264	20990	16990	1041	508	54540
2003	13830	4536	33160	31090	3650	1203	81480
2004	14950	4550	28360	31530	2911	1295	78050
2005	19690	6294	27480	31680	1848	993	81511
2006	19170	7205	25470	27070	2795	1032	76880
2007	20480	5690	23460	26710	1509	963	73330
2008	24190	5299	28590	23110	3381	1780	79860
2009	38020	6458	27340	28490	2908	2088	98250
2010	17070	6182	29450	24620	2194	1088	75170
2011	53930	4926	37370	64650	5099	3072	158005
2012	31000	2970	27010	22740	1194	887	80620
2013	58150	6557	30310	31080	3297	530	121800
2014	55970	4062	17210	20820	761	337	93830
2015	81580	6961	29100	29130	746	768	140100

Table 4.3.3.1. Estimated small salmon spawners (medians, 5th percentile, 95th percentile) to the six geographic areas and overall for NAC. Returns for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23.

	Median estimates of spawners of small salmon						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	45065	105300	13780	39175	18450	NA	NA
1971	60345	92070	11660	32650	12130	29	210000
1972	45600	86120	10290	40160	10845	17	194100
1973	6542	124450	13750	45520	18290	13	208800
1974	51705	94160	12570	76180	33120	40	269100
1975	98700	117600	14460	67230	26200	67	325600
1976	68620	124100	16270	90410	40650	151	341300
1977	60690	125300	15000	24740	32225	54	259400
1978	30090	110800	14300	22810	9013	127	188000
1979	38315	120700	19800	49680	36540	247	266200
1980	92600	136600	26045	43490	49550	722	350200
1981	100200	178600	38690	70155	40350	1009	430900
1982	69075	158900	21080	89775	24415	290	365400
1983	41600	124100	15035	23890	14810	255	220800
1984	21100	166850	20380	21810	32770	540	264250
1985	40160	158500	20120	59925	36130	363	317200
1986	62755	162800	27730	122200	39440	660	417300
1987	76900	110800	32760	89630	41130	1087	354200
1988	69645	177700	36350	127550	42140	923	456200
1989	47475	89050	30700	69710	43510	1080	283100
1990	26900	122450	32760	84555	44150	617	312400
1991	21970	85055	25260	66225	22260	235	221900
1992	31720	205150	27370	159900	26290	1124	452600
1993	42900	239200	22000	112700	20490	444	440000
1994	30845	129900	20720	45025	9137	427	237100
1995	44750	171000	17710	47975	17900	213	301200
1996	87110	275000	23170	34160	28170	651	450600
1997	92200	151900	18000	19160	8356	365	291100
1998	149200	158200	21180	25130	19930	403	374400
1999	144500	176300	23730	21410	10200	419	377000
2000	177400	204900	21080	31360	12000	270	447200
2001	141700	133600	13670	25920	5093	266	320400
2002	100400	133100	21350	44000	9554	450	309000
2003	82280	219700	19330	25040	5594	237	352200
2004	92750	188300	26310	48885	8141	319	364500
2005	217400	197400	18310	28670	7298	319	469400
2006	210000	190700	21620	36580	10030	450	469300
2007	193100	167700	16690	27120	7521	297	411900
2008	200000	217200	26700	39120	15130	814	499000
2009	100600	197100	16230	15540	4081	241	333300
2010	120000	235200	20490	47740	14770	525	438800
2011	244900	214100	27820	49170	9345	1080	547200
2012	171400	246600	18260	10880	590	26	447600
2013	152100	163600	14970	15460	2080	78	348700
2014	265500	167500	18750	10420	1404	110	463500
2015	255300	273200	27050	41180	4183	150	600650

	5th percentile of estimates of spawners						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	30100	89789	11320	30340	14670	NA	NA
1971	40900	78900	9585	25590	9333	29	183100
1972	30790	73260	8420	30970	7936	17	169900
1973	2007	106700	11250	36660	14640	13	187400
1974	35010	80490	10350	61540	26710	40	239495
1975	67530	99720	11890	54470	22760	66	284400
1976	45590	104595	13310	72240	34440	150	301995
1977	41180	105795	12310	18720	26310	54	227900
1978	20230	93300	11730	18070	7710	126	165500
1979	25140	101895	16260	40140	29990	245	238500
1980	62520	116500	21380	35040	41640	716	308895
1981	67190	151400	31710	49530	31830	1000	378395
1982	46450	135800	17300	64380	19600	287	320195
1983	27500	105100	12320	16190	12040	253	194000
1984	13920	140000	18090	12290	26590	535	233200
1985	26840	132195	17680	42170	28900	360	278500
1986	41600	137200	24720	88050	31890	654	365695
1987	51090	93960	29100	65160	33180	1077	309500
1988	46160	150100	32290	92120	34390	915	400800
1989	31150	76190	27550	47959	35510	1070	248500
1990	17540	108100	29420	60370	35250	612	279100
1991	14260	75800	22670	48940	18500	233	198700
1992	21400	176700	24360	131800	21630	1114	409400
1993	30510	209000	19500	65199	16710	440	377595
1994	22160	107300	18370	35200	8040	423	209800
1995	33060	140700	15830	39370	15370	211	265800
1996	64600	230800	20720	28380	23970	645	397500
1997	71040	134200	15930	14720	7242	362	261200
1998	100600	146000	18720	20690	18280	399	323300
1999	98499	160600	21270	18010	9429	415	326600
2000	119900	192800	18000	26510	10960	268	387900
2001	96290	125400	12130	22040	4684	264	274400
2002	63869	120700	19140	36820	8694	446	269200
2003	49448	210000	17280	21040	5103	235	317300
2004	69880	170695	22790	40420	7392	316	333595
2005	163595	152100	16130	23370	6609	316	397200
2006	138895	172000	19420	29410	9059	446	394795
2007	136000	142795	14730	21180	6779	294	349400
2008	146200	191800	23710	29660	13650	807	437395
2009	58570	168800	14360	11620	3694	239	281100
2010	81040	223700	18100	40850	13310	520	397100
2011	146600	187100	24950	39180	8411	1070	443295
2012	110300	227000	16130	8055	531	26	383395
2013	89028	147900	13210	11250	1881	77	282600
2014	182800	149700	16570	7910	1261	109	379000
2015	181600	238000	23850	35260	3787	149	518600

	95th percentile of estimates of spawners						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	68370	120400	16270	48380	22130	NA	NA
1971	91040	105305	13770	39750	14950	29	243200
1972	68780	98990	12110	49400	13710	17	222005
1973	12390	142000	16200	54480	21950	13	230200
1974	77020	107700	14840	90610	39560	40	301200
1975	149305	135300	17110	80090	29600	68	379900
1976	103400	143600	19140	107800	47080	152	384700
1977	91820	145000	17700	30890	38050	54	296100
1978	45230	128400	16850	27620	10320	128	211905
1979	58900	139600	23400	59360	43050	249	295900
1980	139600	156700	30730	51880	57550	728	401100
1981	152800	206405	45620	90680	48630	1018	493900
1982	104905	182300	24880	114500	29120	293	414000
1983	63640	143500	17730	31270	17600	257	251400
1984	32600	193500	22670	31350	38920	545	295205
1985	61311	185900	22540	77920	43480	366	356400
1986	94440	188200	30680	156200	47080	666	470900
1987	117600	127800	36550	114800	48990	1097	404400
1988	107400	204600	40420	162505	50010	931	516700
1989	72460	101900	33840	91310	51760	1090	318600
1990	41950	136600	36120	108505	52860	622	346100
1991	34150	94310	27800	83830	25960	237	245305
1992	48371	234300	30390	187800	30940	1134	496405
1993	64210	269400	24490	160005	24280	448	499600
1994	45270	152100	23080	54630	10240	431	265000
1995	64231	202700	19570	56750	20410	215	338800
1996	124400	319600	25590	40250	32490	657	506100
1997	128200	170200	20080	23510	9474	368	330900
1998	197100	170700	23650	29490	21570	407	423900
1999	192000	192000	26210	24780	10970	423	427600
2000	236500	216700	24170	36290	13040	272	507005
2001	189300	141600	15220	29860	5496	268	368405
2002	136100	145300	23600	51270	10400	454	347505
2003	116205	229300	21360	29010	6091	239	388500
2004	115300	206300	29740	57170	8888	322	395900
2005	272405	241800	20480	34140	7984	322	541200
2006	284300	209100	23800	43780	10990	454	546405
2007	249100	192500	18680	33110	8267	300	475600
2008	255905	242600	29620	48490	16620	821	563100
2009	142505	225900	18110	19600	4462	243	386500
2010	158900	246700	22890	54760	16230	530	480200
2011	343700	241005	30670	59290	10280	1090	649300
2012	232700	266700	20390	13600	648	26	512500
2013	218600	179000	16780	19670	2276	79	416700
2014	348800	185600	20920	12930	1547	111	548605
2015	329700	307800	30300	46950	4578	151	685105

Table 4.3.3.2. Estimated large salmon spawners (medians, 5th percentile, 95th percentile) to the six geographic areas and overall for NAC. Returns for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23.

	Median estimates of spawners of large salmon						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	9545	12730	39050	11930	7877	NA	NA
1971	13860	10950	20310	11830	8228	490	65815
1972	11895	11280	39710	33290	12000	1038	109500
1973	16340	15390	40290	35480	7613	1100	116600
1974	16050	13050	49120	55935	15210	1147	151000
1975	15720	17170	40820	33620	17800	1942	127500
1976	17560	15610	38850	29150	16950	1126	119600
1977	14980	11820	56100	55660	21570	643	161000
1978	12125	9775	51320	19390	10860	3314	107200
1979	6660	6630	21940	8826	7936	1509	53710
1980	16370	10130	61030	34470	23950	4264	150600
1981	15195	27520	44700	16055	12760	4334	120900
1982	10930	10350	45100	27050	10380	4643	109000
1983	7971	11070	29610	18070	5693	1769	74510
1984	5396	11820	37090	28610	20020	2547	105700
1985	4468	10910	35450	43135	28570	4885	127400
1986	7642	12210	40670	66375	24970	5570	157800
1987	10340	8400	36000	43780	16070	2781	117800
1988	6216	12910	43130	52100	14780	3038	132500
1989	6094	6881	41130	40520	18090	2800	115800
1990	3475	10240	40940	54815	15250	4356	129000
1991	1780	7534	33000	56440	14130	2416	115400
1992	6706	31360	32380	58185	12980	2293	144200
1993	9058	16940	24980	62330	8789	2065	124800
1994	12430	16870	24460	40430	5432	1344	101500
1995	24940	18640	34620	47620	7077	1748	135100
1996	18485	28410	30040	40270	9966	2407	130200
1997	15870	27590	24820	34890	4907	1611	110300
1998	13020	34900	23030	29495	3472	1526	105500
1999	15760	31830	27920	26350	4448	1168	107400
2000	21430	26470	26720	29450	2644	1587	108400
2001	22570	17500	27490	39010	4355	1491	112500
2002	16470	16510	20740	23040	1374	511	78720
2003	13880	24130	33810	39080	3293	1192	115400
2004	16640	21870	28160	39130	2963	1283	110100
2005	20660	27890	28070	36600	1897	1088	116300
2006	20770	35220	26110	36210	2815	1419	122500
2007	21455	29250	23570	34110	1468	1189	111100
2008	25840	28290	29830	27340	3162	2231	116700
2009	39090	34080	28680	35190	3007	2318	142400
2010	18340	34910	31990	31900	2363	1502	121100
2011	57190	42830	40240	64480	4715	3915	213650
2012	33790	28600	28400	26040	1246	2054	120200
2013	64030	37490	32360	33880	3129	5252	175900
2014	61830	22730	17460	23130	742	572	126500
2015	88975	38080	31930	32895	727	1519	194200

	5th percentile of estimates of spawners						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	4375	9707	32030	9650	5573	NA	NA
1971	6593	8389	16590	9398	6436	486	56050
1972	5643	8708	32490	25500	10100	1029	95770
1973	7567	11750	33110	27840	6281	1090	101200
1974	7521	11460	40280	44580	12940	1137	132600
1975	7534	14840	33470	26350	15250	1925	112200
1976	8065	13550	31810	22160	14120	1116	104600
1977	6700	10180	45790	43230	18100	637	141200
1978	5529	8785	42080	14690	9175	3284	93670
1979	2949	5737	17990	6715	6707	1495	47140
1980	7624	9179	50040	26870	19750	4224	132800
1981	7159	23910	36690	9844	9968	4295	105900
1982	5060	8855	37150	15780	8241	4601	92310
1983	3663	9903	24320	11190	3542	1753	63580
1984	2433	8616	34170	19230	16650	2524	93739
1985	2026	7619	31550	30420	23640	4840	112400
1986	3528	9380	36640	47308	20480	5520	136600
1987	4757	6446	32520	31540	13360	2756	102900
1988	2689	9835	38580	37910	12070	3011	116300
1989	2777	5346	37490	29570	15260	2775	103000
1990	1520	8338	36540	38000	12720	4317	111200
1991	827	6148	29330	38740	11910	2394	97120
1992	3203	21990	28510	49510	10960	2271	130100
1993	5512	13680	23160	33850	7619	2046	95080
1994	7958	13330	22680	32280	4780	1332	90630
1995	17570	14270	32690	40630	6178	1732	123100
1996	13110	23200	27820	32200	8679	2385	118000
1997	11360	22600	23000	27390	4318	1596	99238
1998	7663	27170	21250	23970	3161	1512	93970
1999	9195	24650	25770	21970	4095	1157	96110
2000	12640	22430	23800	24710	2389	1573	96790
2001	13320	14770	24880	34000	3964	1478	101100
2002	9539	13420	18410	19230	1236	506	69610
2003	7091	19080	30500	32810	2956	1181	104200
2004	11150	16640	25590	31850	2692	1271	99130
2005	11770	19830	25780	29780	1714	1078	102000
2006	12940	29480	23940	29660	2512	1406	110400
2007	12510	23230	21450	28470	1330	1178	98370
2008	15570	21970	26640	21550	2812	2211	102700
2009	20550	23530	26280	29470	2714	2297	119400
2010	11260	28170	29490	26560	2136	1488	109200
2011	32530	30560	37190	51380	4231	3879	181700
2012	20380	23030	26040	21310	1112	2035	104400
2013	39550	25420	29870	26590	2764	5204	147200
2014	38590	18280	16130	18130	662	567	102400
2015	53300	29820	29300	26510	654	1505	157200

	95th percentile of estimates of spawners						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	16410	15800	46200	14160	10180	NA	NA
1971	23690	13540	23900	14240	9957	494	77150
1972	20410	13830	46750	41260	13820	1047	123800
1973	27990	18940	47540	43110	8948	1110	132900
1974	28100	14630	57910	67250	17460	1157	170005
1975	26590	19440	48140	40870	20480	1960	143000
1976	30020	17620	45730	36240	19790	1136	136500
1977	26090	13460	65890	67930	25000	649	181200
1978	20700	10800	60410	24220	12580	3344	120700
1979	11660	7544	25850	10920	9162	1523	60460
1980	28470	11070	71990	41980	28100	4301	169500
1981	25970	31020	52780	22320	15480	4373	136400
1982	18890	11830	53500	38380	12520	4685	125600
1983	13700	12240	34990	24980	7958	1785	85290
1984	9560	15130	40100	37700	23360	2570	117500
1985	7700	14130	39280	55721	33350	4928	142700
1986	13160	15090	44670	85830	29360	5620	178800
1987	17870	10400	39510	56460	18710	2806	133200
1988	10930	15970	47770	66330	17520	3066	148700
1989	10650	8424	44840	51890	21000	2825	129100
1990	6105	12190	45290	71780	17750	4395	147200
1991	3058	8963	36710	73890	16320	2438	133700
1992	11950	40750	36260	67011	14900	2313	158800
1993	14730	20270	26760	92240	9933	2084	154800
1994	19750	20400	26250	48510	6068	1356	112800
1995	37020	22950	36540	54710	7994	1764	149300
1996	27230	33520	32250	48440	11240	2429	142800
1997	23400	32680	26590	42500	5490	1625	121900
1998	18580	42580	24810	34820	3777	1540	116800
1999	22210	39060	30070	30550	4794	1179	118500
2000	30380	30510	29590	34090	2902	1601	119600
2001	32130	20200	30110	44130	4755	1504	124100
2002	23700	19570	23030	26830	1510	516	87800
2003	20570	29260	37090	45500	3626	1203	126700
2004	22090	27060	30660	46410	3233	1295	120900
2005	29300	35910	30380	43370	2082	1098	130200
2006	28640	41080	28220	42770	3112	1432	134800
2007	30570	35580	25670	39620	1606	1200	123900
2008	36200	34800	32980	33010	3506	2251	130900
2009	57740	44510	31160	40910	3296	2339	165200
2010	25660	41430	34610	37350	2593	1515	132900
2011	82080	55220	43270	77620	5184	3949	245300
2012	47060	34110	30760	30810	1385	2072	135900
2013	88480	49120	34850	41270	3512	5298	204600
2014	85080	27100	18790	28160	820	577	150600
2015	124000	46380	34550	39210	801	1533	231100

Table 4.3.3.3. Estimated 2SW salmon spawners (medians, 5th percentile, 95th percentile) to the six geographic areas and overall for NAC. Returns for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23.

	Median estimates of spawners of 2SW salmon						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	9545	3243	28510	9958	6498	NA	NA
1971	13860	2989	14830	10460	7045	490	49770
1972	11895	3132	28990	29360	10380	1038	85030
1973	16340	3847	29410	32140	6698	1100	89980
1974	16050	3143	35860	49240	14080	1147	119900
1975	15720	4720	29800	28880	16360	1942	97600
1976	17560	3981	28360	24060	15490	1126	90790
1977	14980	2771	40950	51470	18870	643	129900
1978	12125	3048	37460	15950	9409	3314	81500
1979	6660	1613	16015	5782	6678	1509	38390
1980	16370	3260	44550	31565	21305	4264	121700
1981	15195	6588	32630	9721	10360	4334	79090
1982	10930	2763	32920	21080	7802	4643	80690
1983	7971	3276	21610	13880	4183	1769	52880
1984	5396	3185	27080	25960	17490	2547	81930
1985	4468	2729	25875	35300	24700	4885	98015
1986	7642	3228	29690	55060	18430	5570	120000
1987	10340	2331	26280	33960	12190	2781	88270
1988	6216	3412	31480	41360	10340	3038	96105
1989	6094	1678	30020	26970	14310	2800	82080
1990	3475	2664	29890	36000	11020	4356	87480
1991	1780	2050	24090	34970	11650	2416	77030
1992	6706	8136	23630	36860	10800	2293	88720
1993	9058	4314	18240	42485	6941	2065	83545
1994	12430	3893	17860	29650	4395	1344	70020
1995	24940	3700	25270	39190	6453	1748	101600
1996	18485	5503	21930	28970	8369	2407	86120
1997	15870	5881	18120	23600	3968	1611	69430
1998	8506	6346	16810	15940	2274	1526	51440
1999	10290	6196	20380	15360	3732	1168	57140
2000	13975	6201	19510	16720	2178	1587	60200
2001	14755	2433	20070	26500	4009	1491	69310
2002	10790	2366	15140	13850	786	511	43430
2003	9081	3303	24680	25580	3122	1192	66910
2004	10860	3235	20560	25300	2576	1283	63840
2005	13505	4340	20490	25580	1589	1088	66570
2006	13590	5279	19060	21840	2393	1419	63610
2007	14030	4098	17200	22040	1279	1189	59850
2008	16860	3770	21780	17990	2955	2809	66230
2009	25370	4572	20940	23470	2546	2292	79095
2010	11890	4560	23350	19770	1886	1482	62980
2011	37195	3637	29370	51820	4562	3873	130400
2012	21940	2260	20735	18550	1029	2020	66515
2013	41585	4741	23620	24680	2913	5244	102800
2014	40140	3063	12740	16630	673	566	73920
2015	57810	5092	23310	23735	671	1509	112100

	5th percentile of estimates of spawners						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	4375	2307	23380	8162	4721	NA	NA
1971	6593	2098	12110	8287	5608	486	41090
1972	5643	2213	23710	22400	8699	1029	73110
1973	7567	2784	24170	25350	5536	1090	76450
1974	7521	2436	29400	39020	11950	1137	103800
1975	7534	3453	24430	22540	13860	1925	84540
1976	8065	2983	23220	18260	12890	1116	77460
1977	6700	2181	33430	40170	15710	637	113000
1978	5529	2473	30720	12090	7939	3284	70340
1979	2949	1232	13130	4399	5646	1495	32950
1980	7624	2646	36530	24580	17640	4224	106400
1981	7159	5091	26790	5807	8278	4295	67230
1982	5060	2170	27120	12100	6200	4601	66880
1983	3663	2647	17750	8434	2652	1753	44150
1984	2433	2294	24940	17340	14560	2524	71470
1985	2026	1889	23030	24340	20500	4840	85340
1986	3528	2346	26750	38970	15230	5520	102200
1987	4757	1641	23740	23980	10220	2756	75670
1988	2689	2407	28160	29990	8520	3011	83010
1989	2777	1238	27370	19540	12090	2775	72950
1990	1520	1991	26680	25280	9266	4317	75610
1991	827	1561	21410	23990	9840	2394	65460
1992	3203	5391	20810	30950	9160	2271	80099
1993	5512	3183	16910	22500	6045	2046	62650
1994	7958	2780	16550	23490	3899	1332	61529
1995	17570	2469	23860	33150	5634	1732	91210
1996	13110	3898	20310	22600	7306	2385	76790
1997	11360	4136	16790	17810	3535	1596	61260
1998	5012	4389	15520	12370	2073	1512	45760
1999	6016	4312	18810	12420	3459	1157	51260
2000	8226	4377	17380	13710	1968	1573	52830
2001	8683	1644	18160	22730	3654	1478	61490
2002	6230	1557	13440	11260	719	506	37770
2003	4635	2163	22270	20760	2807	1181	59640
2004	7270	2037	18680	20030	2355	1271	56760
2005	7678	2485	18820	20580	1441	1078	58130
2006	8427	3474	17470	17410	2146	1406	56300
2007	8146	2584	15660	18320	1163	1178	52330
2008	10180	2386	19450	13830	2634	2784	57619
2009	13320	2752	19190	19430	2311	2271	65999
2010	7293	3045	21530	15720	1708	1469	56220
2011	21150	2353	27150	40660	4105	3837	110000
2012	13290	1611	19010	15100	916	2002	56750
2013	25690	2997	21800	19290	2556	5196	85480
2014	24960	2080	11770	12930	600	561	58109
2015	34588	3348	21390	18890	604	1495	88170

	95th percentile of estimates of spawners						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	16410	4167	33720	11800	8292	NA	NA
1971	23690	3887	17440	12550	8529	494	60330
1972	20410	4076	34120	36200	12050	1047	97700
1973	27990	4897	34710	39110	7850	1110	104700
1974	28100	3848	42280	59110	16180	1157	137300
1975	26590	5970	35140	35070	18860	1960	111800
1976	30020	4979	33380	29880	18120	1136	106000
1977	26090	3353	48100	62760	21960	649	147800
1978	20700	3640	44100	19800	10880	3344	93390
1979	11660	1997	18870	7144	7728	1523	44391
1980	28470	3889	52560	38480	24930	4301	138400
1981	25970	8064	38530	13600	12490	4373	92370
1982	18890	3365	39050	30380	9445	4685	94580
1983	13700	3908	25540	19460	5748	1785	62371
1984	9560	4087	29270	34690	20470	2570	92370
1985	7700	3561	28680	45730	28730	4928	110000
1986	13160	4119	32610	71700	21610	5620	138000
1987	17870	3031	28840	44000	14190	2806	101200
1988	10930	4399	34870	52700	12120	3066	109105
1989	10650	2119	32730	34590	16500	2825	91630
1990	6105	3354	33060	46430	12770	4395	99030
1991	3058	2543	26800	46240	13460	2438	88840
1992	11950	10830	26470	42810	12440	2313	97630
1993	14730	5428	19530	62771	7809	2084	104600
1994	19750	5002	19170	35920	4883	1356	79470
1995	37020	4945	26670	45100	7288	1764	115300
1996	27230	7081	23540	35450	9445	2429	96610
1997	23400	7618	19410	29490	4414	1625	79090
1998	12290	8276	18110	19540	2475	1540	57300
1999	14680	8094	21950	18280	4006	1179	63100
2000	20100	8059	21600	19820	2388	1601	67720
2001	21280	3239	21980	30190	4364	1504	77290
2002	15720	3192	16820	16420	852	516	49380
2003	13590	4455	27080	30190	3434	1203	74050
2004	14680	4441	22380	30620	2796	1295	70900
2005	19410	6176	22170	30590	1736	1098	74920
2006	18940	7105	20600	26260	2639	1432	71160
2007	20240	5610	18740	25810	1395	1200	67610
2008	23950	5164	24070	22260	3278	2834	75020
2009	37800	6381	22740	27570	2783	2313	92750
2010	16870	6061	25270	23750	2058	1495	69910
2011	53780	4918	31590	62760	5010	3907	151000
2012	30930	2947	22450	22040	1142	2038	76330
2013	57980	6469	25440	30021	3263	5290	120200
2014	55880	4018	13720	20330	745	571	89940
2015	81520	6837	25220	28550	736	1523	136300

Table 4.3.5.1. Return rates (%), by year of smolt migration, of wild Atlantic salmon to 1SW (or small) salmon to North American rivers. The year 1991 was selected for illustration as it is the first year of the commercial fishery moratorium for the island of Newfoundland.

SMOLT YEAR	USA	SCOTIA-FUNDY				GULF				QUÉBEC					NFLD				
	Narraguagus	**Nashwaak**	**LaHave**	**St.Mary's**	**Middle**	**Margaree**	**NWMiramichi**	**SWMiramichi**	**Miramichi**	**à la barbe**	**Saint Jean**	**Bec scie**	**de la Trinite**	**Highlands**	**Conne**	**Rocky**	**NE Trepassey**	**Campbellton**	**WAB**
1991										0.6	0.5	1.2	1.6		3.4	3.1	2.6		3.6
1992										0.5	0.4	1.3	0.8		4.0	3.7	4.7		6.1
1993										0.4	0.3	0.9	0.7	1.5	2.7	3.1	5.4	9.0	7.1
1994											0.3	1.2	0.6	1.6	5.8	3.9	8.5	7.3	8.9
1995											0.6	1.4	0.9	1.6	7.2	4.7	9.2	8.1	8.1
1996			1.5								0.3		0.6	3.2	3.4	3.1	2.9	3.4	3.5
1997	0.04		4.3										1.7	1.4	2.9	2.5	5.0	5.3	7.2
1998	0.22	2.9	2.0								0.3		1.4	2.5	3.4	2.7	4.9	6.1	6.1
1999	0.30	1.8	4.8				3.0				0.3		0.4	0.6	8.1	3.2	5.9	3.8	11.1
2000	0.25	1.5	1.2				4.9				0.5		0.3	0.6	2.5	3.1	3.2	6.0	4.4
2001	0.16	3.1	2.7				6.6	8.6	7.9		0.5		0.6		3.0	2.9	7.1	5.3	9.2
2002	0.00	1.9	2.0			1.5	2.4	3.0	3.0		0.6		0.9		2.4	4.0	5.5	6.8	9.4
2003	0.08	6.4	1.8			1.6	4.1	6.8	5.9		0.6		0.6		5.3	3.8	6.6	7.8	9.5
2004	0.08	5.1	1.1			0.9	2.6	1.8	2.0		0.7		1.0		2.5	3.3	4.4	11.4	5.9
2005	0.24	12.7	8.0	3.0		1.1	3.6				0.4		1.5		4.0	2.2	5.5	9.2	15.1
2006	0.09	1.8	1.5	0.7		0.7	1.4	1.5	1.5		0.3				3.3	1.3	2.7	5.6	3.8
2007	0.33	5.6	2.3	2.2		1.3		1.6			0.4		1.5		4.4	5.6	5.5	11.2	11.6
2008	0.21	3.9	1.2	0.6		0.3		1.0			0.6		0.7		2.4	2.7	2.6	8.8	6.1
2009	0.26	12.4	3.5			1.0		3.3			0.8		1.9		2.5	6.8	4.9	9.5	9.6
2010	0.95	7.9	1.8					1.5			0.7		2.5		2.7	5.1	5.6	11.0	7.1
2011	0.25	0.3									0.4		0.6		3.9	4.6	3.0	9.7	5.7
2012	0.00	1.6									0.4		0.4		5.3	3.7	4.0	9.3	5.2
2013	0.26	1.6	0.6		0.19						0.9		0.6		1.9	5.3		10	7.2
2014	0.32	2.9	0.6		0.33						0.9		1.9		4.1	1.0		8.8	8.2

Table 4.3.5.2. Return rates (%), by year of smolt migration, of wild Atlantic salmon to 2SW salmon to North American rivers. The year 1991 was selected for illustration as it is the first year of the commercial fishery moratorium for the island of Newfoundland.

	USA		Scotia–Fundy				Gulf			Québec				Nfld
Smolt year	Narraguagus	Nashwaak	LaHave	St.Mary's	Middle	Margaree	NWMiramichi	SW Miramcihi	Miramichi	à la barbe	Saint Jean	Bec scie	de la Trinite	Highlands
1991										0.6	0.9	0.4	0.6	
1992										0.5	0.7	0.4	0.5	
1993										0.4	0.8	0.9	0.7	1.2
1994											0.9	1.5	0.7	1.4
1995											0.9	0.4	0.5	1.3
1996			0.2								0.4		0.5	0.9
1997	0.84		0.4										1.1	1.2
1998	0.29	0.7	0.3								0.4		0.7	1.1
1999	0.50	0.8	0.9				1.2				0.7		0.2	0.7
2000	0.15	0.3	0.1				0.5				1.2		0.1	0.7
2001	0.83	0.9	0.6				0.6	3.3	2.3		0.9		0.3	
2002	0.60	1.3	0.5			6.2	0.7	1.4	1.3		0.9		0.5	
2003	1.00	1.6	0.2			3.9	0.9	2.0	1.6		1.4		0.2	
2004	0.94	1.3	0.3			3.0	0.5	0.8	0.7		1.1		0.7	
2005	0.71	1.5	0.5	0.3		2.3	1.1				0.6		0.5	
2006	0.74	0.6	0.4	0.1		3.0	0.2	0.5	0.4		0.5			
2007	1.99	1.3	0.2	0.1		2.1		0.8			0.5		0.3	
2008	0.63	2.1	0.3			2.4		0.7			1.8		0.5	
2009	1.71	3.3	0.9			5.7		2.2			1.9		0.8	
2010	0.20	0.4	0.2								1.0		0.6	
2011	0.6	1.0									1.7		0.3	
2012	0.94	0.3									0.6		0.1	
2013	1.9	0.5	0.2		1.36						1.9		0.3	

Table 4.3.5.3. Return rates (%), by year of smolt migration, of hatchery Atlantic salmon to 1SW salmon to North American rivers. The year 1991 was selected for illustration as it is the first year of the commercial fishery moratorium for the island of Newfoundland.

		USA				Scotia Fundy				Gulf		Québec
Smolt year	Connecticut	Penobscot	Merrimack	Saint John	LaHave	East Sheet	Liscomb	Morell	Mill	West	Valley-field	auxRochers
1991	0.003	0.14	0.01	0.69	4.51	0.15	0.50	3.16			0.48	0.43
1992		0.04	0.00	0.41	1.26	0.21	0.42	1.43	0.44	2.16	0.70	0.07
1993	0.003	0.05	0.00	0.39	0.62	0.32	0.56	0.14	0.37		0.02	0.10
1994	0.003	0.03	0.00	0.66	1.44	0.36	0.35	5.20	0.11		0.08	0.02
1995		0.09	0.02	1.14	2.26	0.37	0.64					0.07
1996		0.04	0.02	0.56	0.47	0.07	0.17					0.31
1997		0.04	0.02	0.75	0.87	0.03	0.15					0.46
1998		0.04	0.09	0.47	0.34	0.05	0.10					1.04
1999		0.03	0.05	0.46	0.79	0.23						0.32
2000	0.003	0.03	0.01	0.27	0.43	0.03						1.15
2001		0.07	0.06	0.45	0.87							0.02
2002		0.04	0.02	0.34	0.63							0.07
2003		0.05	0.03	0.32	0.72							
2004		0.05	0.02	0.39	0.53							
2005	0.015	0.06	0.02	0.56								
2006	0.000	0.04	0.02	0.24								
2007	0.010	0.13	0.01	0.83								
2008	0.000	0.03	0.00	0.13								
2009		0.07	0.03	1.44								
2010	0.005	0.12	0.18	0.12								
2011	0.000	0.00	0.00	0.02								
2012		0.01	0.00	0.67								
2013		0.02	0.01	0.11								
2014		0.02		0.18								

Table 4.3.5.4. Return rates (%), by year of smolt migration, of hatchery Atlantic salmon to 2SW salmon to North American rivers. The year 1991 was selected for illustration as it is the first year of the commercial fishery moratorium for the island of Newfoundland.

	USA			Scotia Fundy				Gulf			Québec	
Smolt year	Connecticut	Penobscot	Merrimack	Saint John	LaHave	East Sheet	Liscomb	Morell	Mill	West	Valley-field	auxRochers
1991	0.039	0.19	0.02	0.15	0.48	0.00	0.05	0.04			0.00	0.13
1992	0.084	0.08	0.00	0.22	0.24	0.01	0.03	0.07	0.00	0.05	0.06	0.06
1993	0.041	0.19	0.03	0.19	0.21	0.02	0.03	0.31	0.91		0.01	0.19
1994	0.038	0.21	0.05	0.27	0.23	0.06	0.02					0.05
1995		0.16	0.06	0.19	0.23	0.00	0.03					0.04
1996		0.14	0.09	0.08	0.13	0.01						0.07
1997		0.10	0.11	0.20	0.17	0.01						0.08
1998		0.05	0.06	0.06	0.11	0.00						0.09
1999		0.08	0.13	0.16	0.21	0.00						0.02
2000	0.006	0.06	0.03	0.05	0.07							0.01
2001		0.16	0.26	0.15	0.13							0.02
2002		0.17	0.18	0.11	0.17							
2003	0.004	0.12	0.05	0.06	0.09							
2004	0.034	0.12	0.13	0.09	0.11							
2005		0.10	0.10	0.12								
2006		0.23	0.15	0.06								
2007		0.30	0.08	0.17								
2008	0.010	0.15	0.05	0.16								
2009	0.035	0.39	0.17	0.13								
2010	0.002	0.09	0.11	0.07								
2011	0.011	0.05	0.02	0.02								
2012		0.03	0.08	0.10								
2013		0.10	0.02	0.02								

Table 4.3.6.1. Estimates (medians, 5th percentiles, 95th percentiles) of Prefishery Abundance (PFA) for 1SW maturing salmon, 1SW non-maturing salmon, and the total cohort of 1SW salmon by year (August 1 of the second summer at sea) for NAC for the years of Prefishery Abundance.

	Median		
Year of PFA	1SW cohort	1SW non-maturing	1SW maturing
1971	1234000	712700	520500
1972	1262000	740900	520900
1973	1568000	901150	667000
1974	1512000	811900	699500
1975	1705000	904200	797800
1976	1635000	834800	799100
1977	1304000	667200	636100
1978	807100	396400	410700
1979	1427000	837600	589500
1980	1545000	711400	832500
1981	1579000	666500	912000
1982	1326000	559700	765800
1983	845900	334300	511300
1984	892000	352700	538900
1985	1184000	525700	657000
1986	1394000	559700	834200
1987	1308000	509400	798800
1988	1262000	414700	847500
1989	920600	326600	593600
1990	850300	290000	559900
1991	736100	322200	413700
1992	786100	210100	575800
1993	694200	150100	543600
1994	513100	185200	327100
1995	563600	183100	380200
1996	708250	154700	553100
1997	467200	106700	360100
1998	538700	98500	440100
1999	545500	103600	441500
2000	640800	118000	522100
2001	465850	81710	383800
2002	496600	110900	385600
2003	527600	108400	418700
2004	558000	111900	445900
2005	653400	106700	546000
2006	649900	102100	547900
2007	587400	113200	473800
2008	724900	133200	591300
2009	505300	108800	396800
2010	741200	208900	531700
2011	758000	113500	644100
2012	674300	162900	510600
2013	537100	126600	409800
2014	713900	184700	529800
2015	NA	NA	670950

	5th percentile		
Year of PFA	1SW cohort	1SW non-maturing	1SW maturing
1971	1166000	651200	484400
1972	1204000	685400	492000
1973	1487000	821000	636900
1974	1445000	752100	662300
1975	1626000	839795	747300
1976	1556000	765900	752300
1977	1236000	606800	594700
1978	770795	368100	382695
1979	1356000	772300	557200
1980	1476000	655195	781400
1981	1505950	621400	848700
1982	1267000	523700	715100
1983	805000	304600	479700
1984	846600	321900	505395
1985	1125000	483995	615195
1986	1322000	512800	776795
1987	1249000	472295	747000
1988	1197000	382900	787900
1989	874795	298600	556300
1990	807100	265600	524900
1991	701795	300200	388800
1992	728600	178300	528895
1993	628695	132900	481500
1994	476600	163800	299100
1995	521600	164900	343900
1996	651195	138900	499795
1997	433100	96130	328900
1998	483995	87280	387400
1999	491500	91030	390300
2000	576200	104100	460800
2001	416600	71960	336600
2002	452200	97770	344000
2003	487495	95810	382600
2004	520895	97570	412600
2005	575095	93770	470100
2006	570900	88810	470200
2007	518300	98480	407100
2008	656500	112600	526900
2009	448895	96309	342095
2010	683900	176800	487800
2011	649400	97700	537000
2012	600200	136000	444295
2013	463100	103200	342100
2014	618295	149500	441995
2015	NA	NA	585500

	95th percentile		
Year of PFA	1SW cohort	1SW non-maturing	1SW maturing
1971	1305000	778305	559800
1972	1325000	801300	553700
1973	1653000	984100	698500
1974	1583000	876600	738900
1975	1789000	973800	860300
1976	1718000	909500	849900
1977	1374000	728400	682000
1978	845705	426500	439100
1979	1503000	908400	623505
1980	1623050	772200	893305
1981	1658000	716005	980200
1982	1389000	599700	819400
1983	889500	365600	545300
1984	939405	386105	573500
1985	1244000	571100	700200
1986	1465000	609000	891700
1987	1373000	548000	857100
1988	1331000	449100	910005
1989	968300	356600	633600
1990	895200	316500	595600
1991	771405	346205	439500
1992	845900	245000	622800
1993	759705	169300	605500
1994	551305	210700	356000
1995	607505	203900	418005
1996	770200	172800	611600
1997	510400	118600	401100
1998	594100	111100	492800
1999	600100	118100	493800
2000	706605	133605	584900
2001	517705	92510	434000
2002	540300	125500	425700
2003	568800	122600	456300
2004	595900	127700	479100
2005	729300	121200	621300
2006	731300	116400	627400
2007	653705	129500	538400
2008	795600	156005	658105
2009	562000	123000	449800
2010	799005	244000	575600
2011	866200	131200	750800
2012	748500	192600	577600
2013	613100	152900	480005
2014	811910	223500	617500
2015	NA	NA	756900

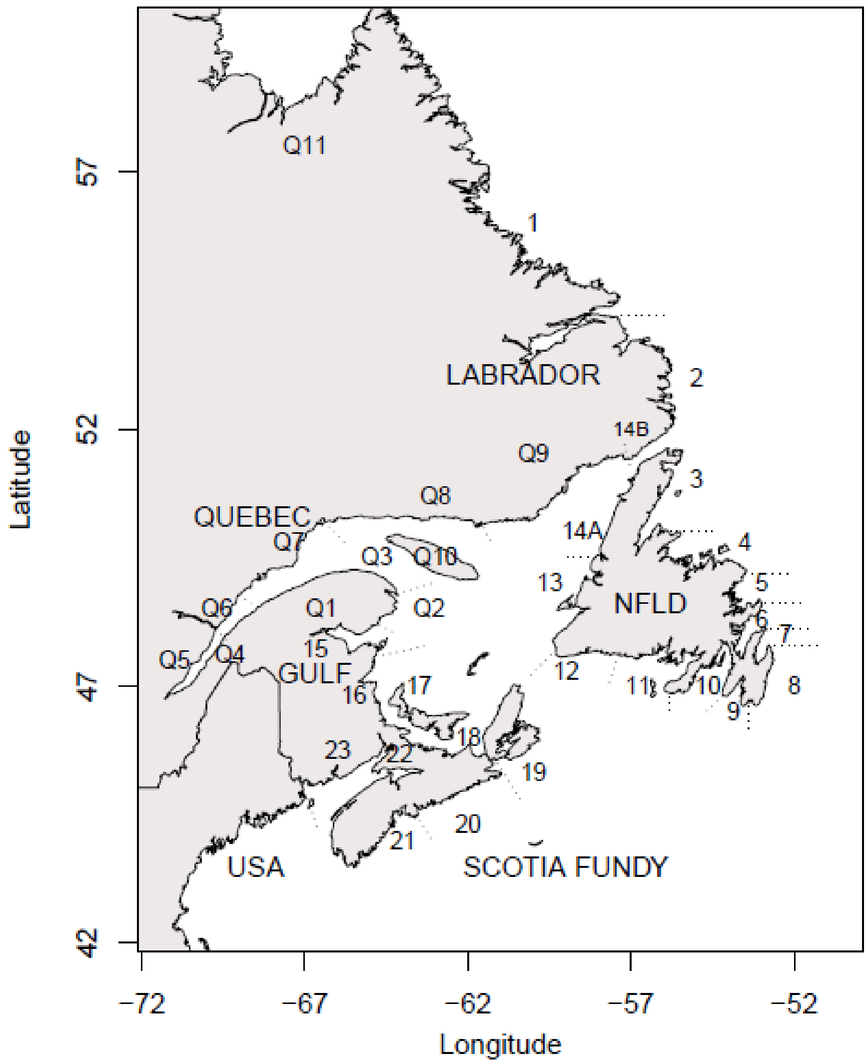


Figure 4.1.2.1. Map of Salmon Fishing Areas (SFAs) and Québec Management Zones (Qs) in Canada.

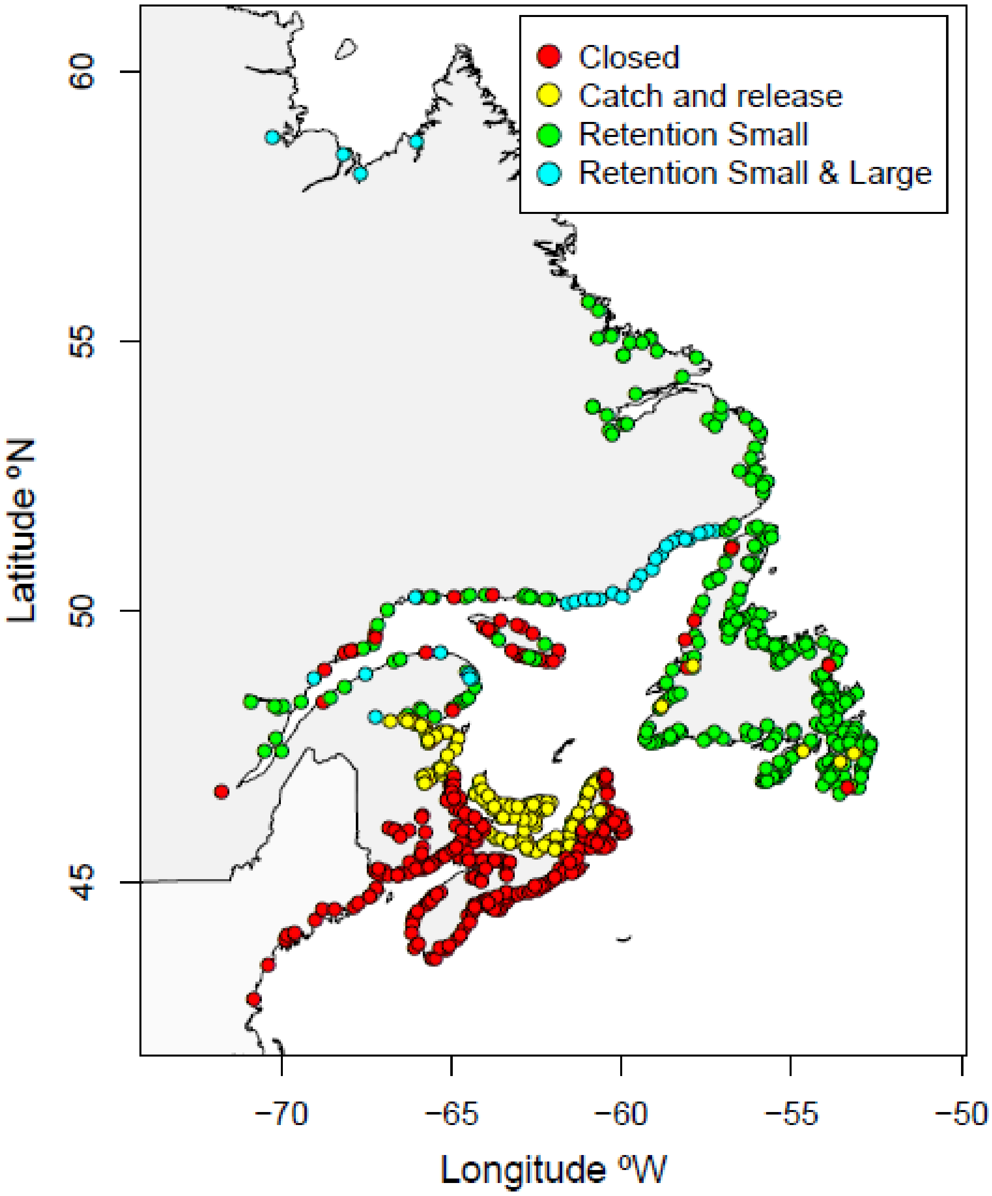


Figure 4.1.2.2. Summary of recreational fisheries management measures in Canada in 2015.

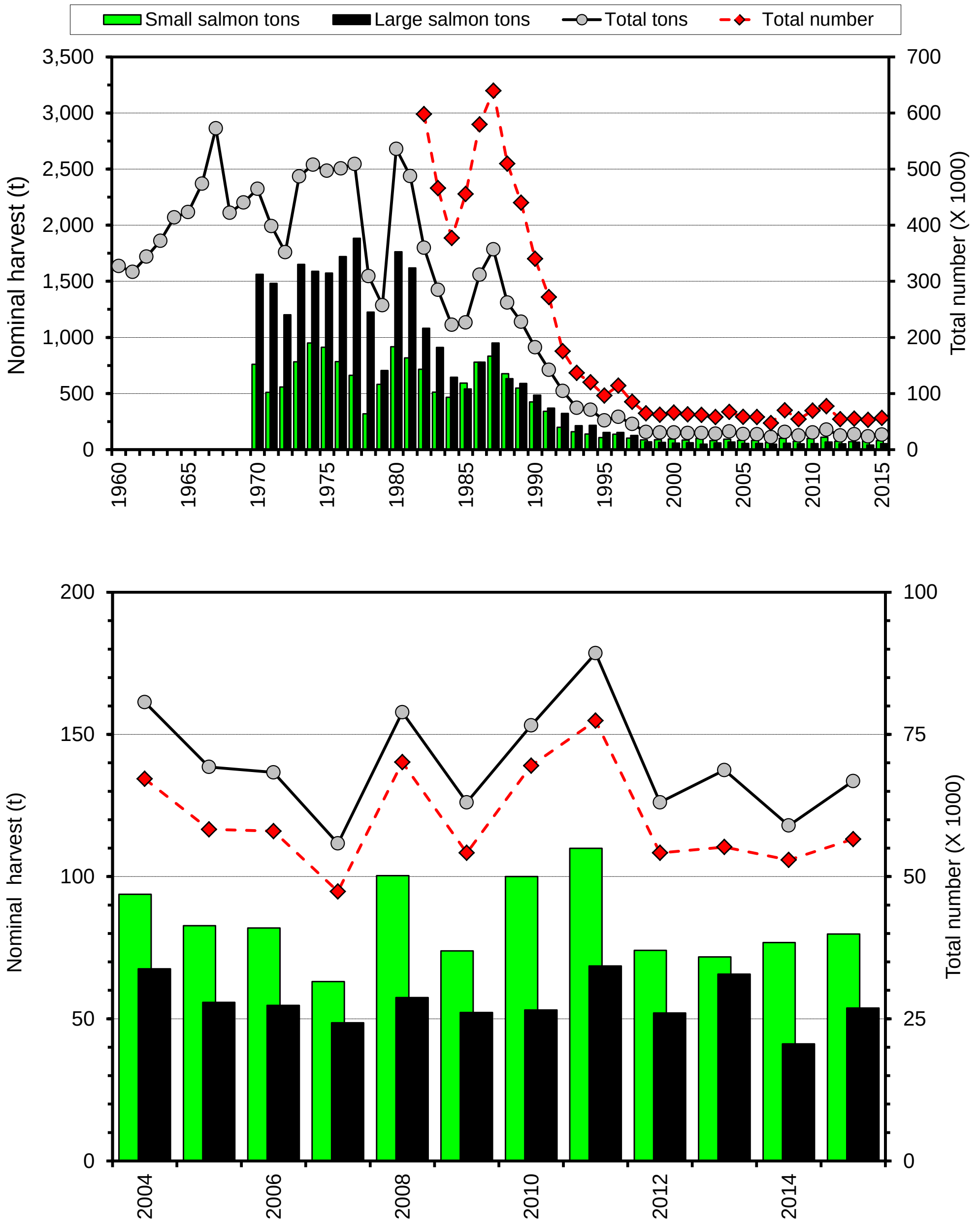


Figure 4.1.3.1. Harvest (t) of small salmon, large salmon and both sizes combined (weight & numbers) for Canada, 1960 to 2015 (top panel) and 2004 to 2015 (bottom panel) by all users.

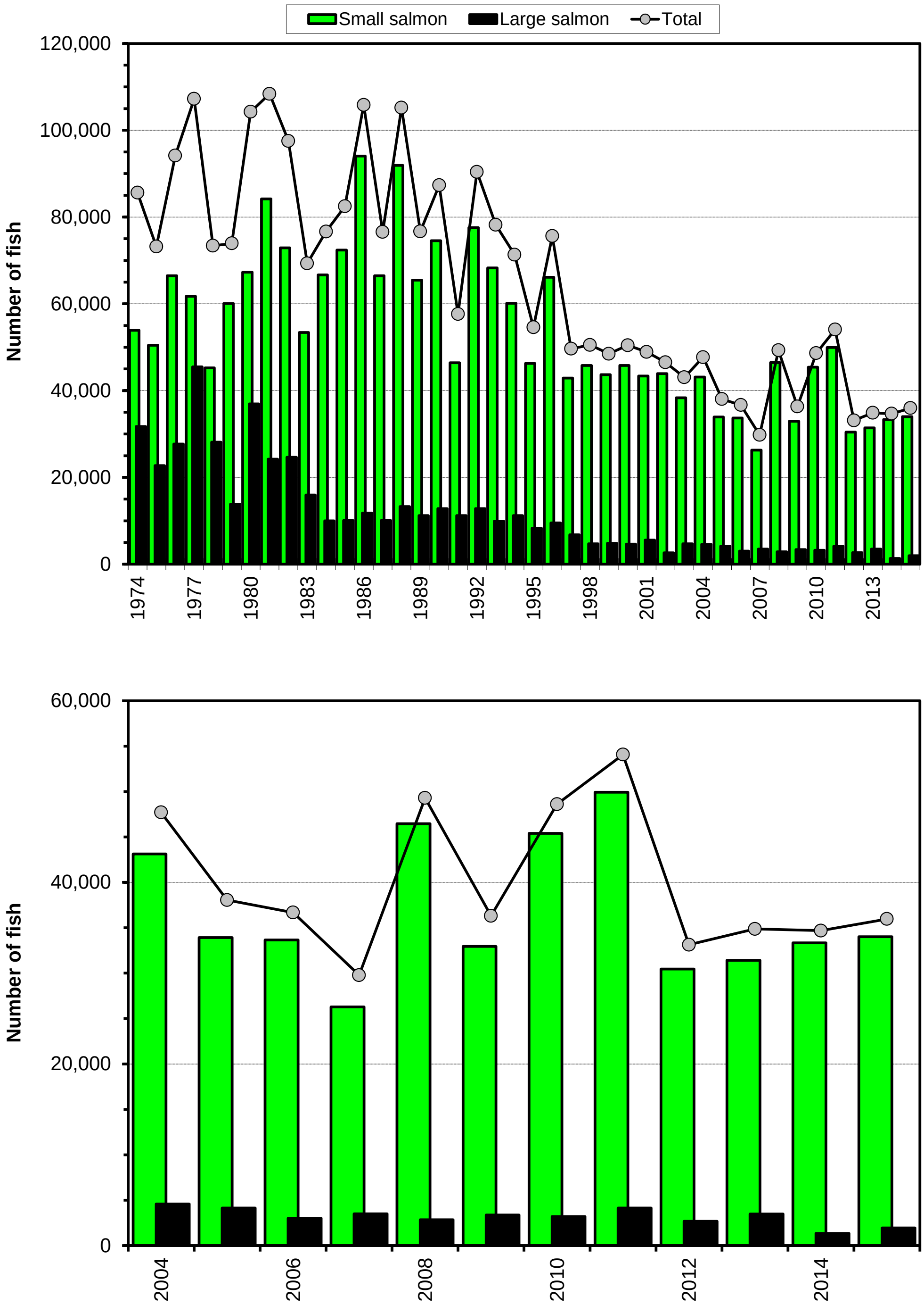


Figure 4.1.3.2. Harvest (number) of small salmon, large salmon and both sizes combined in the recreational fisheries of Canada, 1974 to 2015 (top panel) and 2004 to 2015 (bottom panel).

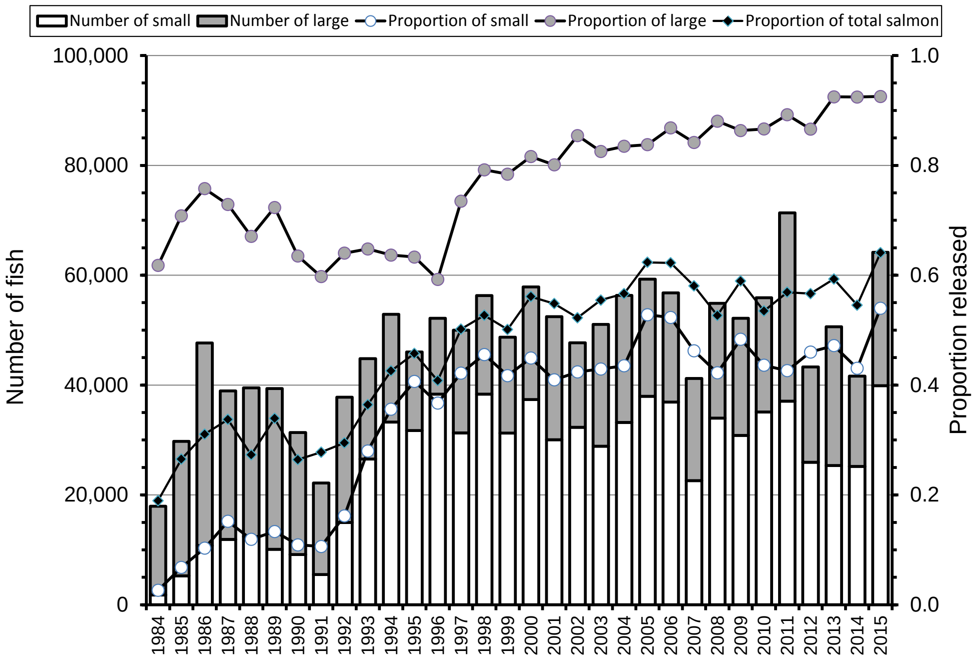


Figure 4.1.3.3. The number (bars) of caught and released small and large salmon in the recreational fisheries of Canada, 1984 to 2015. Black lines represent the proportion released of the total catch (released and retained); small salmon (open circle), large salmon (grey circle), and both sizes combined (black diamond).

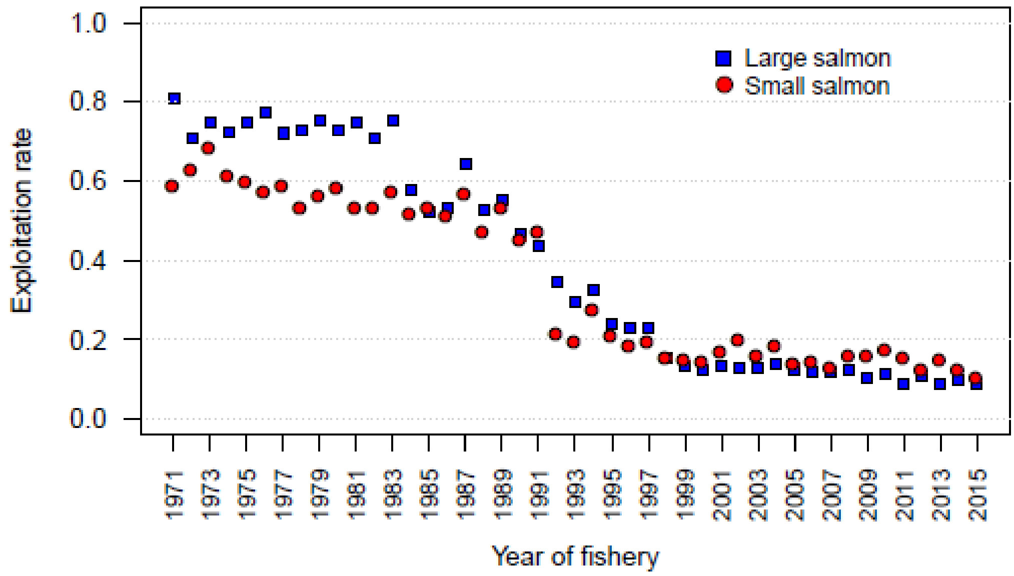


Figure 4.1.6.1. Exploitation rates in North America on the North American stock complex of small and large salmon, 1971 to 2015.

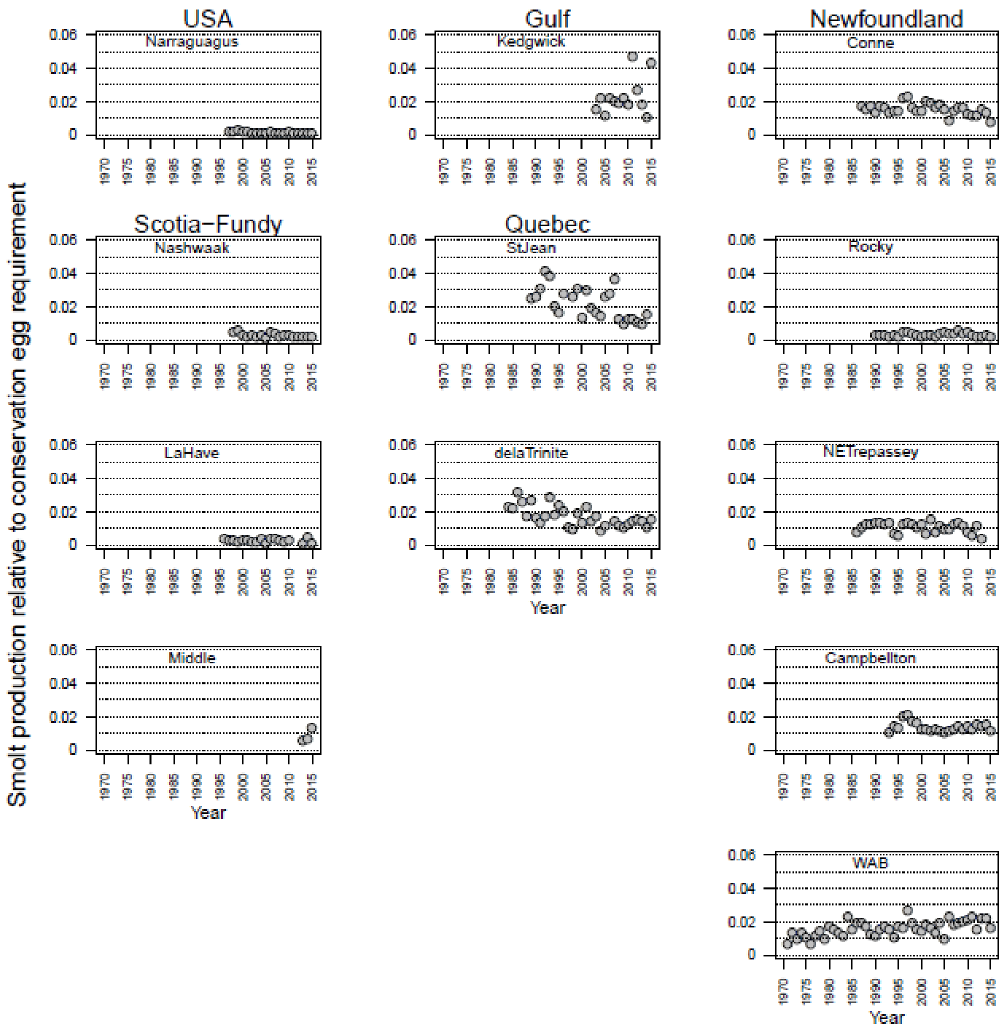


Figure 4.3.1.1 Time-series of wild smolt production from eleven monitored rivers in eastern Canada and one river in eastern USA, 1970 to 2015. Smolt production is expressed as a proportion of the conservation egg requirements for the river. The Unama'ki Institute of Natural Resources began monitoring smolts on Middle River (Scotia-Fundy) in 2011, and smolt population estimates are available for 2013–2015.

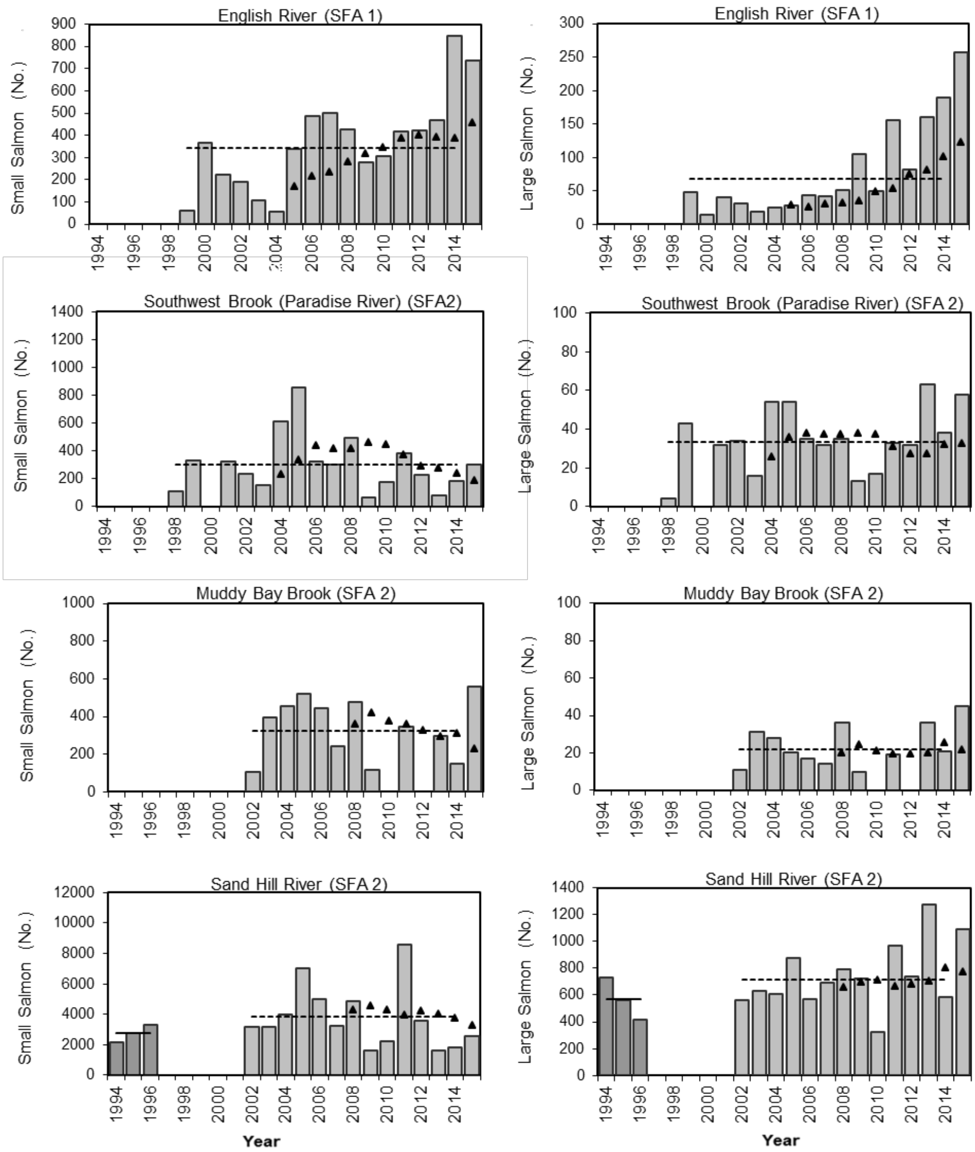


Figure 4.3.2.1. Total returns of small salmon (left column) and large salmon (right column) to English River (SFA 1), Southwest Brook (Paradise River) (SFA 2), Muddy Bay Brook (SFA 2) and Sand Hill River (SFA 2), Labrador, 1994–2015. The solid horizontal line represents the pre-moratorium (commercial salmon fishery in Newfoundland and Labrador) mean, the dashed line the moratorium mean, and the triangles the previous six-year mean.

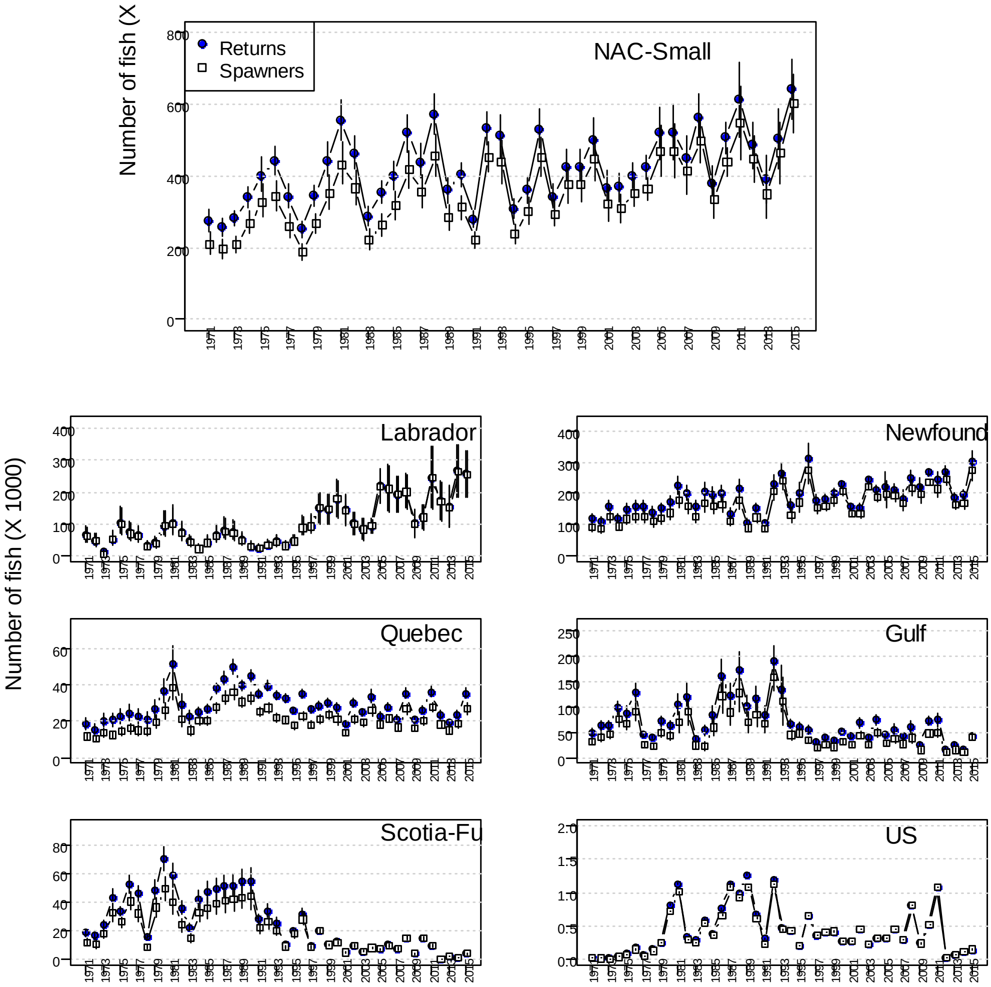


Figure 4.3.2.2. Estimated (median, 5th to 95th percentile range) returns (shaded circles) and spawners (open square) of small salmon for NAC and to each of the six regions 1971 to 2015. Returns and spawners for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23.

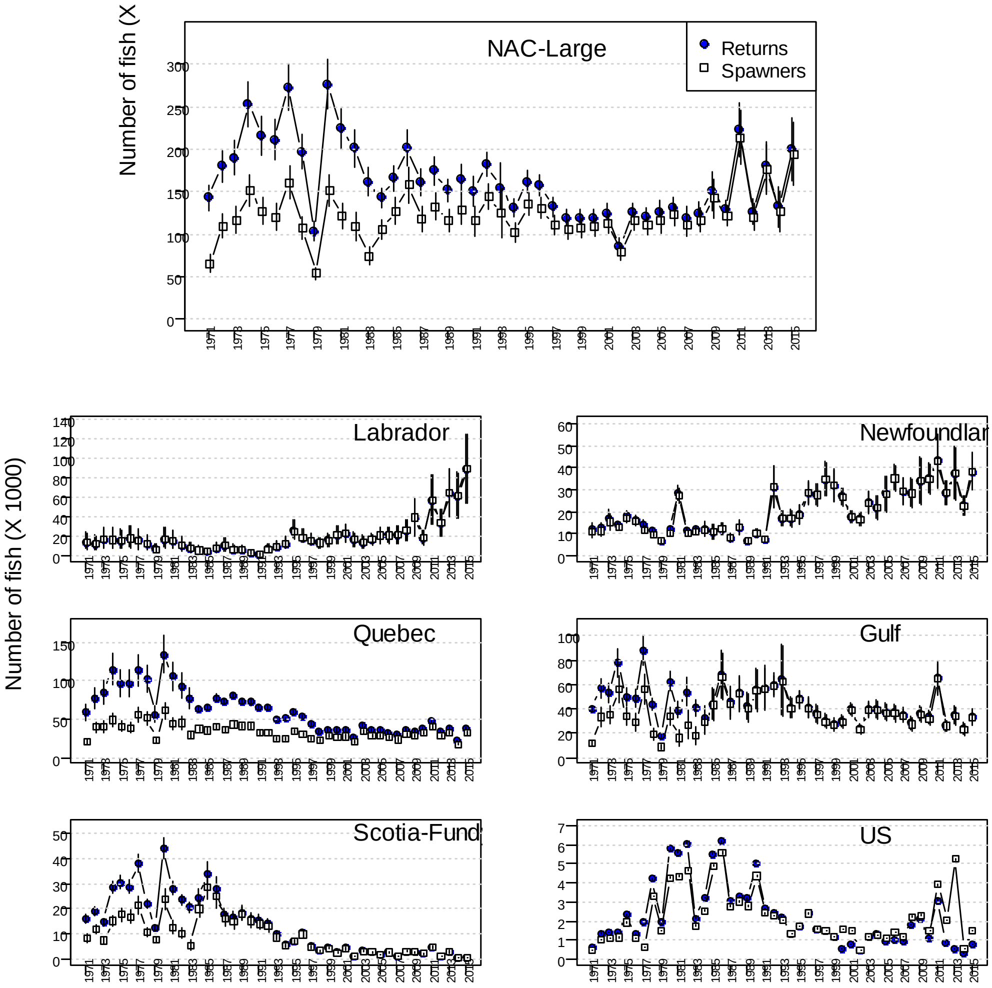


Figure 4.3.2.3. Estimated (median, 5th to 95th percentile range) returns (shaded circles) and spawners (open square) of large salmon for NAC and to each of the six regions 1971 to 2015. Returns and spawners for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23. For USA estimated spawners exceed the estimated returns due to adult stocking restoration efforts.

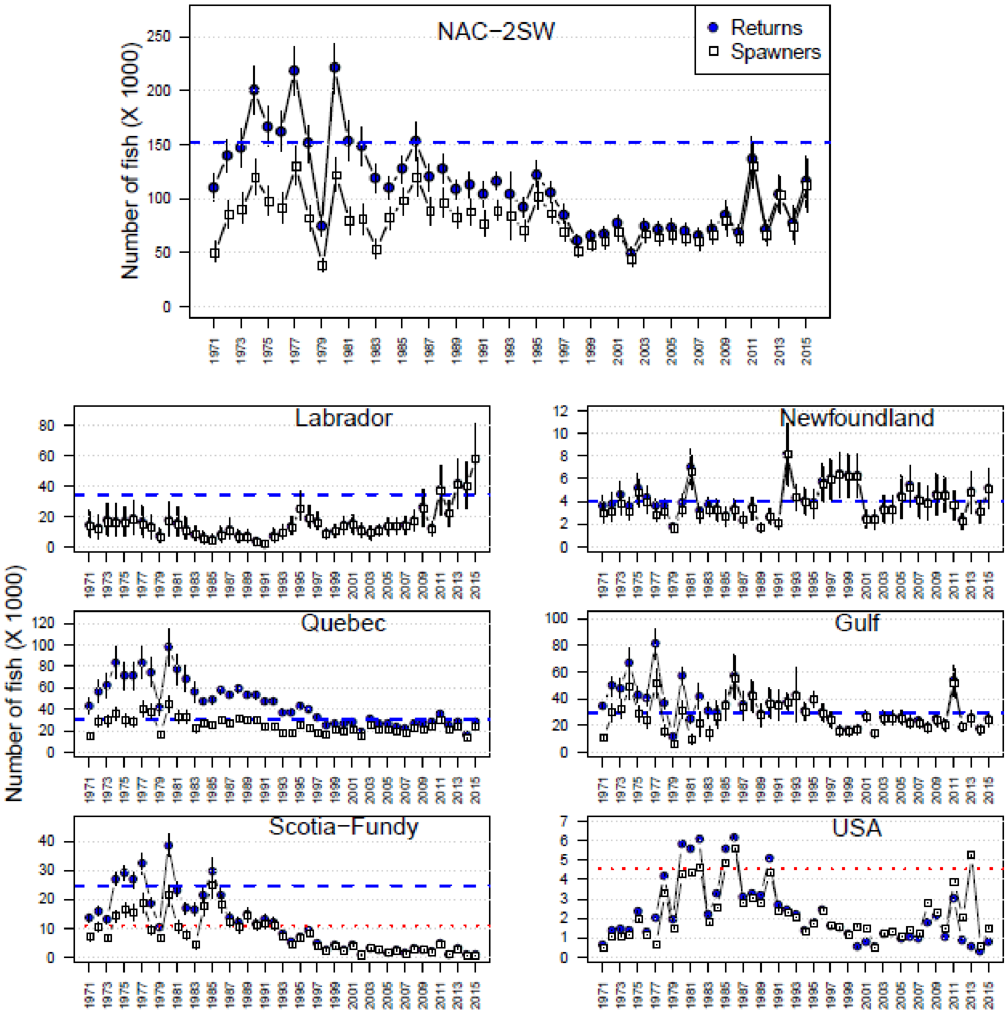


Figure 4.3.2.4. Estimated (median, 5th to 95th percentile range) returns (shaded circles) and spawners (open square) of 2SW salmon for NAC and to each of the six regions 1971 to 2015. The dashed line is the corresponding 2SW Conservation Limit for NAC overall and for each region; the 2SW CL for US (29 990 fish) is off scale in the plot for US. The dotted line in the Scotia-Fundy and US panels are the region specific management objectives. Returns and spawners for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23. For USA estimated spawners exceed the estimated returns due to adult stocking restoration efforts; therefore, 2SW returns are assessed relative to the management objective for USA.

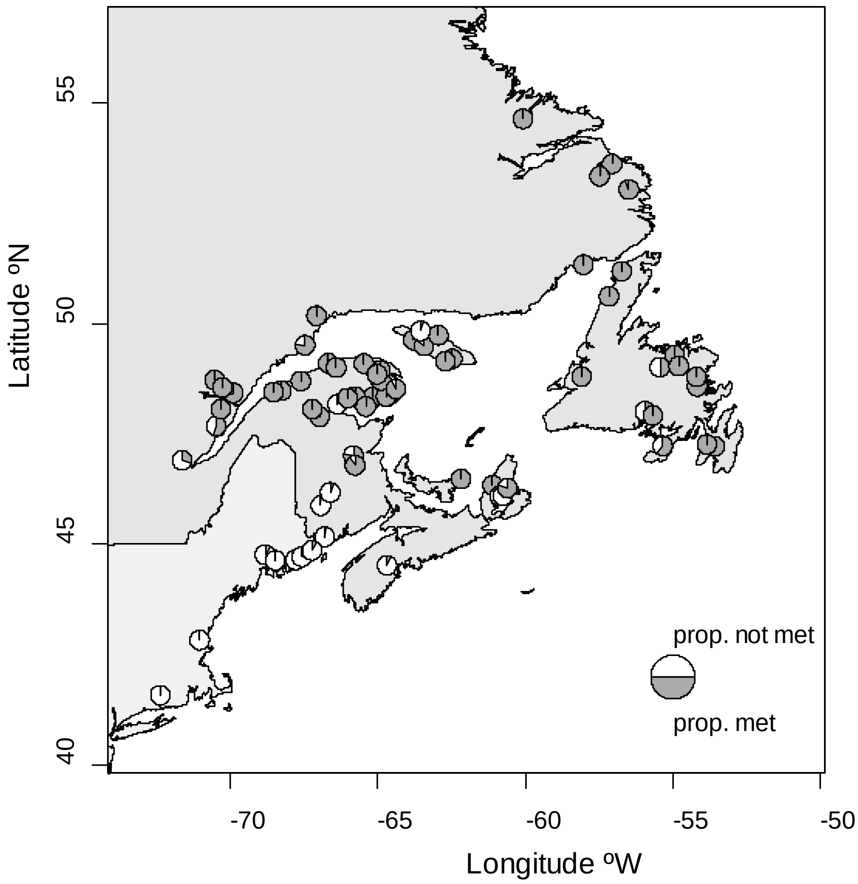


Figure 4.3.4.1. Proportion of the conservation requirement attained in the 64 assessed rivers of the North American Commission area in 2015.

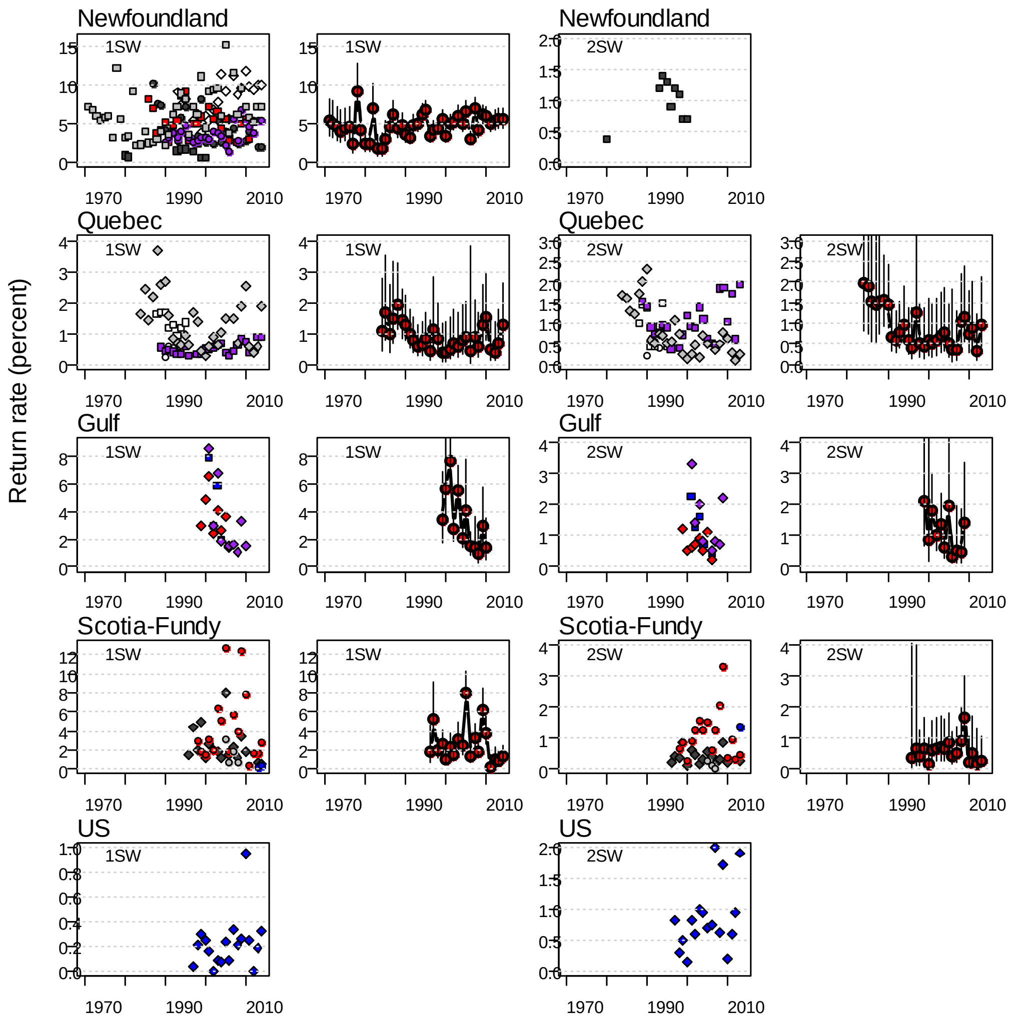


Figure 4.3.5.1. Estimated annual return rates (left and third column of panels; individual rivers are shown with different symbols and colours) and least squared (or marginal mean) average annual return rates, (with one standard error bars) (second and right column of panels) of wild origin smolts to 1SW and 2SW salmon to the geographic areas of North America. The standardized values are annual means derived from a general linear model analysis of rivers in a region. Note y-scale differences among panels. Standardized rates are not shown for regions with a single population.

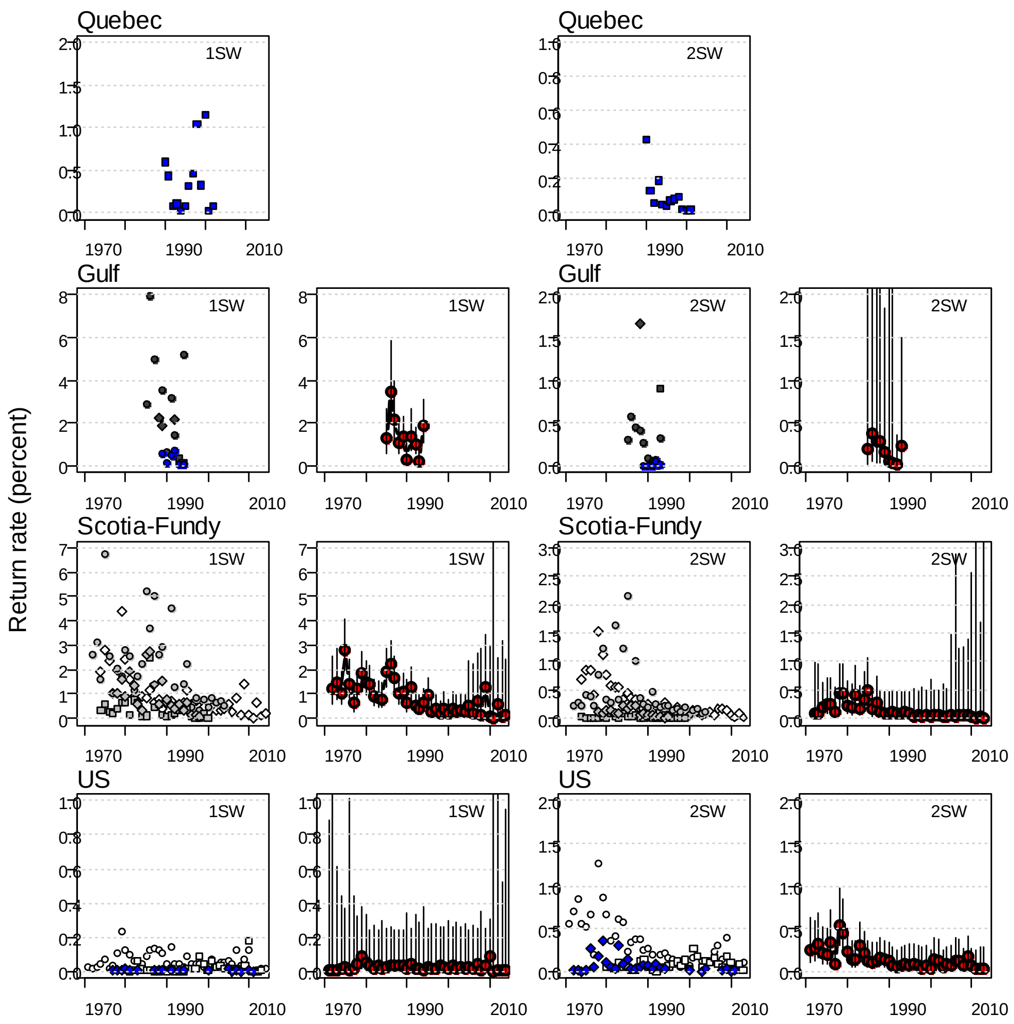


Figure 4.3.5.2. Estimated annual return rates (left and third column of panels; individual rivers are shown with different symbols and colours) and least squared (or marginal mean) average annual return rates (with one standard error bars) of hatchery origin smolts to 1SW and 2SW salmon to the geographic areas of North America. The standardized values are annual means derived from a general linear model analysis of rivers in a region. Note y-scale differences among panels. Standardized rates are not shown for regions with a single population.

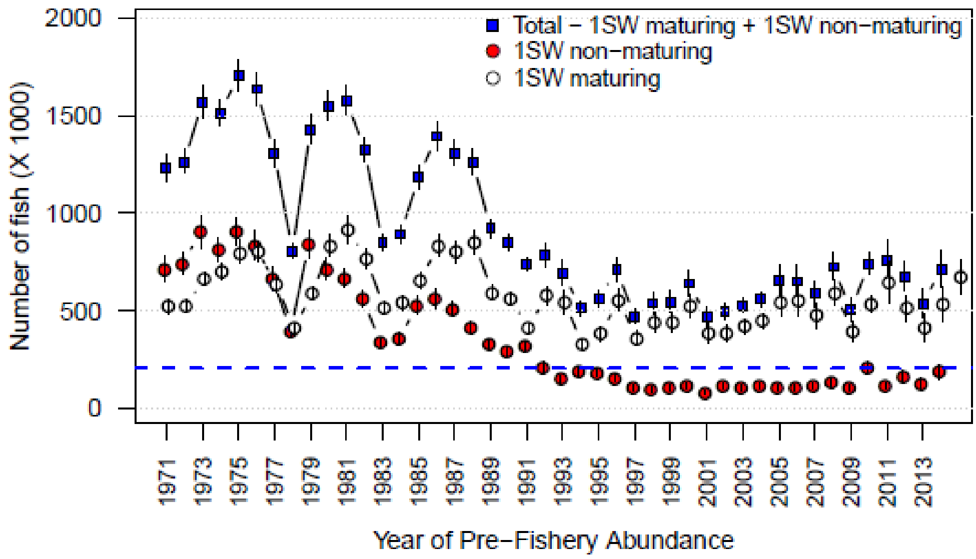


Figure 4.3.6.1. Estimated (median, 5th to 95th percentile range) Prefishery Abundance (PFA) for 1SW maturing, 1SW non-maturing, and total cohort of 1SW salmon for NAC, PFA years 1971 to 2014. The dashed blue horizontal line is the corresponding sum of the 2SW conservation limits for NAC, corrected for 11 months of natural mortality (1SW non-maturing are assessed relative to the CL).

5 Atlantic salmon in the West Greenland Commission

The previous advice provided by ICES (2015) indicated that there were no catch options for the West Greenland fishery for the years 2015–2017. The NASCO Framework of Indicators for the West Greenland Commission did not indicate the need for a revised analysis of catch options and therefore no new management advice for 2016 is provided. This year's assessment of the contributing stock complexes confirms that advice.

5.1 NASCO has requested ICES to describe the events of the 2015 fishery and status of the stock

The Atlantic salmon fishery is regulated according to the Government of Greenland Executive Order No 12 of August 1, 2012. Since 1998, with the exception of 2001, the export of Atlantic salmon has been banned. From 2002–2011 there have been two landing categories reported for the fishery: commercial landings where licensed fishers can sell salmon to hotels, institutions and local markets and private landings where both licensed and unlicensed fishers fish for private consumption. From 2012–2014 (for the first time since 2001), licensed fishers were additionally allowed to land to factories and a 35 t factory quota was set by the Greenland authorities. This quota was reduced to 30 t in 2014. The quota did not apply to the commercial or private landings, only factory landings, and the export ban persisted as the landed salmon could only be sold within Greenland. In 2015, the Government of Greenland unilaterally set a quota for all components of the fishery (private, commercial, and factory landings) to 45 t as a quota could not be agreed to by all parties of the West Greenland Commission of NASCO (NASCO, 2015, see WGC(15)21). The export ban persists as the landed salmon could only be sold within Greenland.

Only hook, fixed gillnets and driftnets are allowed to target salmon directly and the minimum mesh size has been 140 mm (stretched mesh) since 1985. Fishing seasons have varied from year to year, but in general the season has started in August and continued until the quota has been met or until a specified date later in the season. From 2005-2014, the fishing season has been from 1 August to 31 October. In 2015, the Government of Greenland delayed the opening of the fishery until 15 August with a closing date of 31 October. Factory landings were only allowed from 9 October to the end of the season on 31 October.

5.1.1 Catch and effort in 2015

Catch data were collated from fisher and factory reports. The reports were screened for errors and missing values. Catches were assigned to NAFO/ICES area based on the reporting community. Reports which contained only the total number of salmon caught or the total catch weight without the number of salmon, were corrected using an average of 3.25 kg gutted weight per salmon. Since 2005 it has been mandatory to report gutted weights, and these have been converted to whole weight using a conversion multiplier of 1.11.

In 2015, catches were distributed among the six NAFO Divisions on the west coast of Greenland and in ICES Division XIV (East Greenland) (Table 5.1.1.1; Figure 5.1.1.1). A total catch of 56.8 t of salmon was reported for the 2015 fishery compared to 57.9 t of salmon in the 2014 fishery. A harvest of 1 t was reported from East Greenland, accounting for 1.6% of the total reported catch. Harvest reported for East Greenland is not included in assessments of the contributing stock complexes, owing to a lack of information on the stock composition of that fishery. Catches of Atlantic salmon decreased until the closure of the export commercial fishery in 1998, but the internal use only fishery has been increasing in recent years (Table 5.1.1.2; Figure 5.1.1.2).

Of the total catch (56.8 t), 33.8 t was reported as being commercial, 19.2 t for private consumption and 3.8 t as factory landings (Table 5.1.1.3). Commercial and private landings both substantially increased over the 2014 reported values (11.6 and 11.2 t respectively). Compared to 2014, commercial landings increased by 2.9 times and private landings increased by 1.7 times whereas factory landings were 11.0% of the reported value.

A total of 89.4% (50.8 t) of the reported landings came from licensed fishers and 10.6% (6 t) came from unlicensed fishers (Table 5.1.1.3). For Private landings, 35% (5.9 t) came from unlicensed fishers and 69.5% (13.3 t) came from licensed fishers. Although not allowed to sell their catch, 0.4% (147 kg, approximately 50 fish) of the commercial landings were reported as coming from unlicensed fishers. All factory landings came from licensed fishers.

Reported landings to factories in 2015 occurred in five communities (three communities in NAFO Division 1C (Atammik, Kangaamiut and Manitsoq) and two communities in 1D (Nuuk and Qeqertarsuatsiaat, Figure 5.1.1.1). Since 2012, factory landings were allowed at the beginning of the fishery, but in 2015 factory landings weren't allowed until October 9th. The factory in Qeqertarsuatsiaat registered a total of 2.1 t and all other factories registered less than 0.7 t each.

Reported factory landings are considered to be accurate given the reporting structure in place between the factories receiving salmon and the Greenland Fisheries Licence Control Authority (GFLK). Therefore, uncertainty in the catch statistics is likely caused by unreported catch in the commercial fishery, outside the factory landings, and the private fishery.

Numerous newspaper, radio, and TV public service announcements were made throughout the fishing season to remind fishery participants that catch reporting was mandatory and to encourage adherence to this requirement. Additionally, on three occasions (4 September, 23 September, and 8 October) the GFLK announced progress towards reaching the quota while also reminding participants to promptly report all catches. As of 8 October, GLFK estimated that only 22 t of landed salmon had been reported. On 9 October, the Naalakkersuisut (Fisheries Minister) announced that factory landings would be allowed.

Despite these efforts, the 2015 quota was exceeded by 26% (11.8 t) due to a number of different factors. In some instances, reports were received by GLFK after the fishing season, despite the daily reporting requirement and frequent reminders. In other instances, some fishers reported their landings as required, but they reported them to a local government municipality office with the expectation that the municipality would coordinate the reporting of all received reports. This was done to remove the burden of daily reporting for fishers in smaller municipalities who don't have easy means to contact GLFK. There appears to have been a misunderstanding as some of these municipalities did not report until the end of the fishing season. At the end of the 2015 season reported landings were below the 45 t quota. However, when all the reports were received, the quota was been exceed by 11.8 t.

There is currently no quantitative approach for estimating the unreported catch for the private fishery, but the 2015 value is likely to have been at the same level proposed in recent years (10 t), as reported by the Greenlandic authorities. An adjustment for some unreported catch (Adjusted landings (sample)), primarily for commercial landings, has been done since 2002 by comparing the weight of salmon seen by the sampling teams and the corresponding community-specific reported landings (commercial and private landings combined, see Section 5.1.2). However, sampling only occurs during a portion of the fishing season and therefore these adjustments are considered to be minimum adjustments for unreported catch.

The seasonal distribution of catches has previously been reported to the Working Group (ICES, 2002). However since 2002, this has not been possible. Although fishers are required to record daily catches, previous comparisons of summed reported catch and number of returned catch reports reveal that a large number of fishers report their total catch in only one report for the entire season, without detailed daily catch statistics. The Working Group is aware of the updated reporting requirement initiated for the 2015 fishery, but they have not received the detailed returns and therefore no further evaluation of the seasonal distribution of the fishery was conducted. The seasonal distribution for factory landings however is assumed to be accurate given the reporting structure in place between the factories and the GFLK. Factory landings in 2015 were restricted to the final three weeks of the season (9–31 October).

Greenland Authorities issued 310 licences (Table 5.1.1.4) and received 938 reports from 189 fishers in 2015 compared to 669 reports from 114 fishers out of 321 licences in 2014 and 553 reports from 95 fishers out of 228 licences in 2013. The number of licences issued decreased from 2014 but the number of fishers who reported increased. These levels remain well below the 400 to 600 people reporting landings in the commercial export fishery from 1987 to 1991. The total number of fishers reporting catches from all areas has increased from a low of 41 in 2002 to its current level. In 2015, 61% of licensed fishers provided a total of 189 reports. On average over the past ten years (2005–2014), 52% of licensed fishers have reported landings (Figure 5.1.1.3). The number of individual reports made by individual fishers who reported increased from 2010–2013, but has remained at this level since 2013.

The Working Group previously reported on the procedures for reporting salmon harvest in Greenland (ICES, 2014) and modifications to these procedures were made in 2015. In summary, private, and commercial landings are required to be reported to GFLK by e-mail, phone, fax, or return logbook on a daily basis. Factory landings are submitted to GFLK either on a daily or weekly basis, depending on the likelihood of exceeding a quota. However, both the 2014 factory only quota and the 2015 total quota were exceeded (Figure 5.1.1.2) due to reporting issues.

Similar information is requested for factory, commercial, and private fisher landings. Requested data includes fishing date, location, and information on catch and effort required for the calculation of catch per unit of effort statistics. These types of data allow for a more accurate characterization and assessment of the nature and extent of the fishery than is currently available. The Working Group did not receive any detailed statistics beyond reported landings and licence related information by community and NAFO Divisions for any of the landing types, except for factory landings (see below), and therefore could not further characterize and assess the fishery beyond what is currently presented. The Working Group has previously been informed that this level of detail is often lacking from commercial and private landing reports. The variations in the numbers of people reporting catches, variation in reported landings in each of the NAFO Divisions and documentation of underreporting of landings (ICES, 2015) suggest that there are inconsistencies in the catch data and highlights the need for better data. **The Working Group recommends that efforts to**

improve the reporting system continue and that detailed statistics related to catch and effort should be made available to the Working Group for analysis.

The Working Group reviewed results from a phone survey conducted by GFLK to gain further information on the 2015 fishery. The survey focused only on licensed fishes who did not report catches. Non-licensed fishers were not contacted as it is not feasible to target potential fishers from this category as the potential pool of participants is quite large, potentially including all residents of Greenland. A total of 310 professional fishermen obtained a licence in 2015. A total of 114 fishers reported catches and 196 did not. Of these 105 were contacted by phone and interviewed. Considering that the phone interviews and preliminary results involved translating between Danish, Greenlandic, and English, care should be used when interpreting the results as the meaning of some questions and answers may be unclear due to translation.

A total of 2941 kg of unreported catch were identified from the 105 fishers interviewed in 2015. As only 54% of the licensed fishers who did not report catches were contacted and interviewed, a division-specific weighted pro-ration scheme was developed to account for different non-reporting rates and weights. This resulted in an estimated total of 5001 kg of non-reported harvest from licensed fishers in 2015.

A similar phone survey was also conducted in 2014. Attempts were made to contact all licensed fishers, both those who reported and those who did not report catches in 2014 (ICES, 2015). A total of 321 professional fishermen obtained a licence in 2014. A total of 98 fishers reported catches and 223 did not. Of these, 196 (88%) were contacted by phone and interviewed. An additional eleven non-licensed fishers who had reported catches were also contacted for a total of 207. Preliminary analysis of the 2014 results suggests that there was no systematic bias which would indicate a tendency of over- or underreporting of reported catches. A total of 12.2 t of non-reported harvest was recorded during the 2014 survey, but a division-specific weighted proration scheme was not developed and therefore a total estimated non-reported harvest is not available. The 12.2 t identified in 2014 is considered a minimum estimate.

The Working Group acknowledges the valuable information gained on catch in this fishery through the post-season telephone surveys. The 'adjusted landings (survey)' of 5 t in 2015 and 12.2 t in 2014 have been added to the 'adjusted landings (sampling)' as described in Section 5.1.2, and 'reported landings' for use in future stock assessments ('landings for assessment'). A summary of the reported landings, adjusted landings (survey), and the adjusted landings (sampling) is presented in Table 5.1.1.5. Adjusted landings do not replace the official reported statistics.

The utility of the survey would be enhanced if all people fishing for salmon could be identified and surveyed. The Working Group recommends further analysis of the resulting data and continuation of the phone survey programme. Information gained on the level of total catches for this fishery will provide for a more accurate assessment of the status of stocks and assessment of risk with varying levels of harvest.

The Working Group was also informed about the increased monitoring and control efforts undertaken by GLFK during 2015. A number of gillnets were confiscated by officers due to inadequate contact information in NAFO Division 1B (4) and 1D (15). In other instances, officers worked with local fishers to ensure that gillnets were labelled and fished properly. Officers identified that no gillnets were deployed in traditional fishing areas in 1B two days after the season had ended, but approximately 35 gillnets were removed and destroyed from 1D as they were still deployed on November 1, one day after the fishing season ended. In addition, officers in Nuuk visited the fish market daily to monitor and collected landings records. Unfortunately this resulted in duplicate reporting of landings when reports were filed both by the fisher and the officer. Auditing procedures were developed to identify and remove duplicates.

5.1.1.1 Exploitation

An extant exploitation rate for NAC and southern NEAC non-maturing 1SW fish at West Greenland can be calculated by dividing the recorded harvest of 1SW salmon at West Greenland by the PFA estimate for the corresponding year for each complex. Exploitation rates are available for the 1971 to 2014 PFA years (Figure 5.1.1.4). The most recent estimate of exploitation available is for the 2014 fishery as the 2015 exploitation rate estimates are dependent on the 2015 PFA estimates, which depends on 2016 2SW returns. NAC PFA estimates (Table 4.3.6.1) are provided for August of the PFA year and Southern NEAC PFA estimates (Table 3.3.4.4) are provided for January of the PFA year, the latter adjusted by eight months (January to August) of natural mortality at 0.03 per month. The 2014 NAC exploitation rate was 9.4%, which is lower than the 2013 estimate (11.1%), the previous five-year mean (8.3%, 2009–2013), and is the second highest since 2001. The 2013 NAC exploitation rate was updated from 9.5% (ICES, 2015) to 11.1% primarily due to the addition of 12.2 t of adjusted landings (survey) incorporated during this assessment (Table 5.1.1.5). NAC exploitation rate peaked in 1971 at 40.8%, but this estimate is slightly variable and dependent on the output from the run-reconstruction model which may vary slightly from assessment to assessment (see Section 4.3.2). The 1971 NAC exploitation rate reported in 2014 was 38.6% (ICES, 2014). The 2014 southern NEAC exploitation rate was 2.0% and is an increase from the previous year’s estimate (0.9%) and the previous five-year mean (0.4%, 2009–2013), but remains among the lowest in the time-series. Southern NEAC exploitation rate at Greenland peaked in 1975 at 28.5%. No changes in southern NEAC exploitation rates compared to previous estimates were noted.

5.1.2 International sampling programme

The international sampling programme for the fishery at West Greenland agreed by the parties at NASCO continued in 2015 (NASCO, 2015; see WGC(15)22). The sampling was undertaken by participants from Canada, Ireland, UK(Scotland), UK(England&Wales), UK(Northern Ireland), and USA. Additionally, staff from the Greenland Institute of Natural Resources assisted with coordination of the programme. Sampling began in September and continued through October.

Samplers were stationed in four different communities (Figure 5.1.1.1) representing four different NAFO Divisions: Sisimiut (NAFO division 1B), Maniitsoq (1C), Paamiut (1E) and Qaqortoq (1F). As in previous years no sampling occurred in the fishery in East Greenland. Tissue and biological samples were collected from all sampled fish.

Arrangements were also made to collect biological characteristics data and samples from three of the five factories registered to receive Atlantic salmon. The factories were located in the communities of Kangaamiut (NAFO division 1C), Atammik (1C), and Qeqertarsuatsiaat (1D). Sampling instructions and supplies for sampling 300 salmon were provided to Greenland Institute of Natural Resources and these packages were forwarded to the individual factories prior to the beginning of the fishery. The expectation was for factory staff to collect a maximum of 25 samples per day to spread the sample collection over the fishing season. Unfortunately, due to a combination of the opening of factory landings being delayed until 9 October, a small tonnage (3.5 t) of factory landings spread across five factories, and miscommunication, no factory samples were collected in 2015.

A total of 1964 salmon were observed by the sampling teams, approximately 12% by weight of the reported landings. Of this total, 1708 were sampled for biological characteristics, 163 fish were only checked for an adipose clip, and 93 were documented as being landed, but were not sampled or examined further. Approximately 1708 fork lengths and weights (Table 5.1.2.1), 1704 scale samples for age determination, and 1674 useable tissue samples for DNA analysis and continent of origin assignment were collected.

A total of 30 adipose finclipped fish were recovered, but none of these carried tags. A total of six tags were returned by a fisher or consumer to a sampler or the Nature Institute. Some tags were recovered during the 2015 fishing season and others during past seasons. Efforts continue to identify the origin of all recovered tags.

Starting in 2002, non-reporting of harvest was evident based on a comparison of reported landings to the sample data. In at least one of the NAFO Divisions where international samplers were present, the sampling team observed more fish than were reported as being landed. When there is this type of discrepancy, the reported landings are adjusted according to the total weight of the fish identified as being landed (Adjusted landings (sample)) during the sampling effort and these adjusted landings are carried forward for all future assessments. Adjusted landings do not replace the official reported statistics (Tables 5.1.1.1 and 5.1.1.2).

The time-series of reported landings and subsequent adjusted landings (sampling) for 2002–2015 are presented in Table 5.1.2.2. In 2015, as in 2006 and 2011, no discrepancies were identified. It should be noted that samplers were only stationed within select communities for 2–5 weeks per year whereas the fishing season ran for twelve weeks. It is not possible to correct for misreporting for an entire fishing season or area given the discrepancy in sampling coverage vs. fishing season without more accurate daily/weekly catch statistics. Landings for assessment are presented in Table 5.1.1.5.

As reported previously (ICES, 2012a), access to fish in support of the sampling programme in Nuuk had been compromised. It was unclear if a solution to this issue had been reached prior to the 2015 sampling season and consequently no sampling was planned within Nuuk. Unless assurances can be provided that access to fish will be allowed, there may continue to be no sampling in Nuuk for the foreseeable future. Landings in Nuuk averaged 15% of the total reported landings over the past ten years (2006–2015) and were 17% in 2015. Although the potential for bias exists when describing the biological characteristics of the harvest, stock assessment results, and catch advice, this potential bias is expected to be small given that sampling occurred both to the north (NAFO Division 1C) and to the south (NAFO Division 1E) of Nuuk. Regardless, the need to obtain samples from fish landed in Nuuk is reiterated.

5.1.2.1 Biological characteristics of the catches

The mean length and whole weight of North American 1SW salmon was 65.6 cm and 3.36 kg weight and the means for European 1SW salmon were 64.4 cm and 3.13 kg (Table 5.1.2.3). The North American 1SW whole weight was slightly higher than the 2014 value (3.25 kg) and the previous ten year average (3.22 kg, 2005–2014). The European 1SW whole weight was higher than both the 2014 value (3.02 kg) and previous ten year average (3.19 kg, 2005–2014).

North American salmon sampled from the fishery at West Greenland were predominantly river age two (31.6%), three (40.6%) and four (21.6%) year old fish (Table 5.1.2.4). European salmon were predominantly river age two (54.9%) and three (28.8%) year old fish (Table 5.1.2.5). As expected, the 1SW age group dominated the 2015 sample collection for both the North American (97.0%) and European (98.2%) origin fish (Table 5.1.2.6).

5.1.2.2 Continent of origin of catches at West Greenland

A total of 1674 samples were analysed from salmon from four communities representing four NAFO Divisions: Sisimiut in 1B (n=497), Maniitsoq in 1C (n=890), Paamiut in 1E (n=169) and Qaqortoq in 1F (n=118). DNA isolation and the subsequent microsatellite analysis as described by King *et al.* (2001) was performed. As in previous years, a database of approximately 5000 Atlantic salmon genotypes of known origin was used as a baseline to assign these individuals to continent of origin. Overall, 79.9% of the salmon sampled were determined to be of North American origin and 20.1% were determined to be of European origin. The NAFO division-specific continent of origin assignments are presented in Table 5.1.2.7.

These data show the large proportion of North American origin individuals contributing to the fishery over the recent past (Table 5.1.2.7; Figure 5.1.2.1). The variability of the continental representation among divisions underscores the need to sample multiple NAFO Divisions to achieve the most accurate estimate of the contribution of fish from each continent to the mixed-stock fishery.

The estimated weighted proportions of North American and European salmon since 1982 and the weighted numbers of North American and European Atlantic salmon caught at West Greenland (excluding the unreported catch and reported harvest from ICES Area XIV) are provided in Table 5.1.2.8 and Figure 5.1.2.2. Approximately 13 500 (~44.6 t) North American origin fish and approximately 3900 (~11.2 t) European origin fish were harvested in 2015. The 2015 total number of fish harvested (17 400) is lower than in 2014 (18 200), the second highest total since 1997 (21 300), the 16th highest total in the 32 year time-series (1982–2015 with no harvest estimates in 1993 and 1994), but only 5.2% of the maximum estimate of 336 000 fish harvested in 1982. The 2015 total number of North American fish harvested (13 500) is higher than in 2014 (12 800), the second highest total since 1997 (18 000), the 15th highest total in the 32 year time-series (1982–2015 with no harvest estimates in 1993 and 1994), but only 7.0% of the maximum estimate of 192 200 fish harvested in 1982. The 2015 total number of European fish harvested (3900) is lower than in 2014 (5400), the third highest total since 1996 (9700), the 16th highest total in the 32 year time-series (1982–2015 with no harvest estimates in 1993 and 1994), but only 2.3% of the maximum estimate of 168 800 fish harvested in 1982. The **Working Group recommends a continuation and potential expansion of the broad geographic sampling programme (multiple NAFO divisions including factory and non-factory landings) to more accurately estimate continent and region of origin and biological characteristics of the mixed-stock fishery.**

5.1.3 Time-series analysis of length and weight

Biological characteristics, including length and weight have been collected from fish harvested at Greenland since 1969. Over the period of sampling (1969 to 2015) the mean weight of these fish appeared to decline from high values in the 1970s to the lowest mean weights of the time-series in 1990 to 1995, before generally increasing to present day (Figure 5.1.3.1). These mean weight trends were unadjusted for the period of sampling and it is known that salmon grow quickly during the period of feeding and while in the fishery at West Greenland. Preliminary analysis of data from 2002–2010 indicated that there was annual variation in weight, corrected for length and period of sampling, but no trend over time for 1SW non-maturing salmon at West Greenland over the time period (ICES, 2011). Increasing weights from the samples were attributed to both increasing length and variations in the sampling period. It was recommended that the longer time-series of sampling data from West Greenland should be analysed in a similar way to assess the extent of the variations in condition over the time period corresponding to the large variations in productivity as identified by the NAC and NEAC assessment and forecast models (ICES, 2011).

In 2015, the Working Group evaluated if changes in length–weight relationships of maiden 1SW salmon sampled at West Greenland over the years 1978 to 2014 had occurred (ICES, 2015) (records prior to 1978 did not always contain associated date, weight, length or continent of origin information and were therefore excluded from the analysis).

The data evaluated consisted of 45 749 observations of maiden 1SW Salmon. The following covariates were considered:

- Year (1978 to 2014);
- Day of year (214 to 305) corresponding to dates 02 August to 28 October;
- Continent of origin (North America or Europe).

Whole weight over time, having corrected for time of year and length, showed an increase of around 0.2 kg beginning in 1995, peaking in 2001/2002 and declining thereafter to pre-1995 levels. The trends were similar for North American and European fish. The change in weight during the season showed a steady increase from around 2.3 kg to around 3.4 kg, approximately a 50% increase over the fishing season.

Multiple modelling approaches were investigated which all showed the same increase in mean weight in the early 2000s, supporting the conclusion that the weights-at-length of the sampled fish did increase at this time. Further analysis could be enlightening if covariates were available, examples include annually varying climatological or run-time data. Preliminary interpretation suggests that there is not a simple relationship between condition of salmon at West Greenland and abundance. Further work should be conducted with these data and additional marine ecological datasets to explore ecological principles of salmon dynamics at sea and how they might be related to abundance and other ecological processes. The Working Group is aware of several ongoing efforts addressing this (see Sections 2.2.7 and 2.6.1).

5.2 NASCO has requested ICES to describe the status of the stocks

Five out of the seven stock complexes exploited at West Greenland are below CLs. A more detailed overview of status of stocks in the NEAC and NAC areas is presented in the relevant commission sections (Sections 3 and 4).

5.2.1 North American stock complex

The total estimate of 2SW salmon spawners in North America for 2015 increased by 52% from 2014, but was below the total 2SW CL for NAC area. For the six geographical regions, 2SW spawner estimates were below their CLs for four regions (Figure 4.3.2.3). Labrador and Newfoundland both exceeded and Québec, Gulf, Scotia-Fundy and the USA were below their 2SW CLs with values ranging from 3% (USA) to 79% (Québec) of region specific 2SW CLs. Only 6% and 17% of the 2SW management objectives for Scotia-Fundy and USA were respectively met in 2015. Within each of the geographic areas there are individual river stocks which are failing to meet CLs, particularly in the southern areas of Scotia-Fundy and the USA. In these regions there are numerous populations in danger of extinction and receiving special protections under federal legislation. The estimated exploitation rate of North American origin salmon in North American fisheries has declined (Figure 4.1.6.1) from peaks of 81% in 1971 for 2SW salmon to recent 10-yr mean exploitation rates of 11% for large salmon. Increasingly restrictive fishing regulations are associated with populations and regions that failed to meet their CLs (Figures 4.1.2.2 and 4.3.4.1).

5.2.2 MSW Southern European stock complex

The southern NEAC non-maturing 1SW stock complex was considered to be suffering reduced reproductive capacity (Figure 3.3.4.2) prior to the commencement of distant water fisheries. Spawners for non-maturing 1SW stocks from three out of five countries in southern NEAC were assessed to be either at risk of suffering or suffering reduced reproductive capacity. In addition, rivers in the south and west of Iceland are included in the assessment of the southern NEAC stock complex. In Iceland, spawners for non-maturing 1SW stock were assessed to at full reduced reproductive capacity (Table 3.3.4.7). Within individual jurisdictions there are large numbers of rivers not meeting CLs after homewater fisheries (Table 3.3.5.1). Homewater exploitation rates on the MSW southern NEAC stock complex are shown in Figure 3.1.9.1. Exploitation on MSW fish in southern NEAC was 12% in 2015, being roughly at the same level as both the previous five year (12%) and ten year (13%) averages.

5.3 NASCO has requested ICES to compare contemporary indices of abundance of salmon in the West Greenland fishery to historical estimates and suggest options for improving future estimates

At its 2001 meeting, NASCO implemented an Ad Hoc management programme that provided for in-season adjustments to allocated quota based on real-time observation of catch per unit of effort (cpue) in the fishery at West Greenland (NASCO, 2001). In 2002 (ICES, 2002), the Working Group examined an apparent relationship between annual catch per unit of effort estimates for the West Greenland fishery and prefishery abundance (PFA) estimates for the North American stock complex for a series of years from 1987 to 1992 and 1997 to 2001. Despite the limitations of using cpue data described by the Working Group at the time (ICES, 2002), these data have been updated to include more recent data from 2012 to 2015 to allow for the estimation of contemporary relative abundance of fish at West Greenland from these effort data.

Although cpue aggregated on an annual basis is available from 1987 to 1992, 1995 to 2001 and 2012 to 2015, cpue data on a daily trip basis were only available from 1997 to 2001 and 2012 to 2015. These data included date, port landed, NAFO Division, and landed weight of salmon caught. Trip information was only available for commercial trips that landed and reported salmon to factories. Information on commercial trips that targeted, but did not land or report landing salmon is not available.

Between 1997 and 2015, the number of trips reporting commercial landings of Atlantic salmon ranged from 712 trips (1997) to 56 trips (2015; Tables 5.3.1 and 5.3.2). Distribution of trips across NAFO Divisions and weeks has been variable through time, and number of trips landing within given weeks is often very low, as observed during the 1998 and 1999 fisheries. In 2000, the fishery opened on the 14th August and closed four days later as the quota of 20 t was reached. In 2015, landings to factories occurred very late in the season (Weeks 41 to 43).

Effort within the Greenland fishery was not constant among weeks (Table 5.3.3) or NAFO Divisions (Figure 5.3.1) over the period 1997 to 2001 or 2012 to 2015. Variable fishing effort across area and time may introduce biases in cpue estimates. In other fisheries, effort standardization procedures (e.g. General Linear Modelling approaches) have been applied to standardize effort relative to week, area, vessel size, etc., but the small number of trips within cells and lack of detailed information about trips, vessels and gear precludes the application of many standardization approaches to existing data.

Available commercial cpue corresponds to the North American 1SW non-maturing PFA estimates, with the exception of a large outlier in the 2000 (2015 data are not included in the regressions analysis as 2015 PFA estimates are dependent on 2016 2SW returns; Figure 5.3.2). There also appears to be a significant relationship between commercial cpue and the southern European 1SW non-maturing PFA with exception of the same outlying point in 2000 (again, 2015 cpue data are not included in the regression analysis; Figure 5.3.2).

The previous conclusion (ICES, 2002) that cpue during the harvest period accurately reflects the overall PFA level appears to remain valid when updated with data for 2012 to 2015. The recent cpue values are low compared to historic estimates and supports the previous conclusions from ICES (2015) that stock abundance is low at West Greenland. Anecdotal reports of high abundance of salmon at Greenland may be the result of localized concentrations of abundance, localized catch success, or shifting baselines of perception.

Given issues of variability of effort and cpue levels among weeks and NAFO Divisions, unstandardized catch per unit of effort data should only be used as a tentative measure of abundance. The relationship between cpue and PFA is relatively steep, if the 2000 outlying point is excluded, meaning that relatively small changes in cpue levels are associated with large changes in PFA. Other information that could be used to characterize fishing effort were not available for the entire period including vessel size, gear type, amount of gear deployed, soak time and other trip information.

Despite concerns about the use of cpue data to inform stock abundance, the Working Group endorses the general principal of using these fishery-dependant indices to infer stock abundance over time. Comprehensive reporting of data characterizing fishing effort (e.g. vessel size, gear type, amount of gear deployed, soak time, documentation of zero landings trips and private sales trips) would allow for a more detailed analyses of cpue data to characterize availability of Atlantic salmon in West Greenland. Development of alternative in-season measures of abundance (e.g. relationships between 1SW returns to rivers from the same cohort) should also be explored.

Similarly, there is scope to explore alternative fishery-independent methods to estimate stock abundance at Greenland, such as:

- Hydroacoustic surveys at West Greenland;
- Standardised gillnet surveys or Test Fishing as conducted for Pacific salmon on the West Coast of the USA;
- Open trawl surveys.

5.4 NASCO has requested ICES to estimate the effects of modifying the timing of the West Greenland salmon fishery, including altering the start date, with regard to harvest and exploitation of contributing stocks

Atlantic salmon feeding at West Greenland grow rapidly over the period of August to November. ICES (2015; see Section 5.1.3) reported on an analysis of the change in whole weight of European origin and North American origin salmon at West Greenland for which there was a 50% increase on average, from 2.3 kg to around 3.4 kg over the fishing season (August 1 to October 30). There was no discernible difference in weight over the season between NAC and NEAC 1SW non-maturing salmon.

It had been previously reported that the mean weight of 1SW salmon of NAC origin sampled at West Greenland increased by 78% between Greenland and returns to homewater in the subsequent year (Reddin, 1980a). The consequence on the stock abundance escaping the fisheries, that takes account of the gain in weight that is realized over summer and autumn for a given Total Allowable Catch, had been considered previously (Reddin, 1980b). Linear regressions of weight by date using data from the 1973–1973 time period indicated that 28% less salmon were caught per tonne in a fishery with a mean date of 13 October compared to a mean date of the 30 July (Reddin, 1980b).

The increase in weight of individual fish over the fishing season at West Greenland prompted managers to ask whether increased returns to homewaters could be realized by fishing later in the season for a comparable total allowable catch option established in weight of fish harvested. The following analysis examines the relative consequence on predicted returns to homewaters of a fixed total allowable catch according to variations in opening and duration of the fishing season at West Greenland (Table 5.4.1). The consequence on returns to homewaters was examined by moving fish at the pre-fishery abundance stage through the fishery, adjusting their size (in weight) over time, removing fish based on weekly catches (set at a proportion of the total allowable catch for the year), and correcting for natural mortality (at 0.03 per month) as the fish mature from the PFA stage, through the fishery, and to return to homewaters.

The relative change in returns to homewaters from a base condition was examined. The base condition for the fishery was an opening date of July 30 (week 31) with a fishing season that extended to 11 November (week 44). As the relative change in returns to homewaters is the metric of interest, the total allowable catch and the pre-fishery abundance are simply scaling factors but for illustrative purposes, the characteristics of the fish in the fishery and the prefishery abundance values as reported by ICES (2015) were used. Specifically:

- A total allowable catch option of 100 t was used;
- Prefishery abundance of NAC 1SW non-maturing salmon from the 2014 PFA year was used: 149 100 (5th to 95th percentile range 74 300 to 326 700);
- Pre-fishery abundance of southern NEAC 1SW non-maturing salmon from the 2014 PFA year was used: 380 000 (5th to 95th percentile range 300 000 to 500 000);
- Proportion of West Greenland harvests which were of NAC origin for 2010 to 2014 (range of 0.72 to 0.93);
- The proportion of NAC catches comprised of 1SW non maturing salmon for 2010 to 2014 (range of 0.913 to 0.982);

- The proportion of NEAC catches comprised of 1SW non maturing salmon for 2010 to 2014 (range of 0.831 to 0.980).

The weight of salmon in the fishery at West Greenland was estimated by standard week based on samples collected from the fishery during 2002 to 2015, all years, continent and origin, sea ages, and areas combined. When whole weight was available, this value was used. When only gutted weight was available, whole weight was derived from gutted weight using a conversion factor of 1.11. A total of 18 605 samples with information on standard week and whole weight were available for analysis.

The whole weight (kg) distributions by standard week (31 to 44) for the years 2002 to 2015 are shown in Figures 5.4.1 and 5.4.2. Weight of salmon generally increases by standard week in individual years (Figure 5.4.2) but with a large amount of variation associated with differences in length, sea age, and condition of individual fish. The linear regression of whole weight (on the log scale) on standard week using all the data explained 14% of the total variance (residual standard error = 0.2096) but the slope (0.036; std. error 0.001) and intercept (-0.171; std. error 0.024) were statistically significant from zero (Figure 5.4.3). Uncertainties in the PFA values, and fishery characteristics were simulated by 5000 independent Monte Carlo draws.

- Pre-fishery abundances of NAC and southern NEAC 1SW non-maturing salmon were drawn from a normal distribution defined by parameters described above.
- Proportion of West Greenland harvests which were NAC origin by uniform distribution between 0.72 and 0.93.
- The proportion of NAC catches comprised of 1SW non maturing salmon by uniform distribution between 0.913 and 0.982.
- The proportion of NEAC catches comprised of 1SW non maturing salmon by uniform distribution between 0.831 and 0.980.

The fishery catches by weight were assumed to be taken uniformly by week over the duration of the fishery ($Catch_{wk}$ (t) = TAC(t) / duration of the fishery (weeks).

The number of fish landed per week (N_{wk}) was estimated as $Catch_{wk}$ (t) * 1000 divided by the predicted geometric mean weight of a salmon for the corresponding week.

- N_{wk} = Catchwk * 1000 / exp(0.036 * week - 0.171), for week = 31 to 44.

The number of salmon of NAC origin was estimated from individual attribution of continent of origin of the fish in the harvests each week as:

- $N.NAC_{wk} = \Sigma(N_{i,wk} * (Unif(0,1) < Unif(min.NAC, max.NAC)))$

The number of salmon of NEAC origin was estimated as:

- $N.NEAC_{wk} = N_{wk} - N.NAC_{wk}$

The number of 1SW non-maturing salmon of NAC origin was estimated as:

- $N.NAC.1SW_{wk} = \Sigma(N.NAC_{i,wk} * (Unif(0,1) < Unif(min.NAC1SW, max.NAC1SW)))$

The number of 1SW non-maturing salmon of NEAC origin was estimated similarly as:

- $N.NEAC.1SW_{wk} = \Sigma(N.NEAC_{i,wk} * (Unif(0,1) < Unif(min.NEAC1SW, max.NEAC1SW)))$

Salmon progress through the fishery in weekly intervals. PFA (NAC and NEAC) available per week is discounted for natural mortality ($exp^{(-0.03*7/30)}$) and realized harvests of 1SW non-maturing salmon in the previous week.

- $PFA.NAC_{wk+1} = PFA.NAC_{wk} * e^{(-0.03 * 7/30)} – N.NAC.1SW_{wk}$
- $PFA.NEAC_{wk+1} = PFA.NEAC_{wk} * e^{(-0.03 * 7/30)} – N.NEAC.1SW_{wk}$

Finally, salmon surviving to the end of the potential fishery season (week 44) are returned to homewaters assuming seven months of natural mortality at M = 0.03 per month.

The base fishery scenario (Sc_{base}) is a 14 week season, beginning in week 31 and ending in week 44. Alternate fisheries scenarios (Sc_i) examined included (Table 5.4.1):

- delaying the start of the season by one week increments but all closing after week 44 (scenario A1 to A5);
- shifting an eight week season beginning at week 31, with sequential two week delays, all ending after week 44 (scenario B1 to B4); and
- a six week season beginning in week 39 and ending after week 44 (scenario C1).

The relative difference (($Sc_i – Sc_{base}$) / Sc_{base}) in the catches of 1SW non-maturing salmon of NAC and NEAC, in the estimated PFA abundance post fishery week 44, and the returns as 2SW salmon to NAC and NEAC for the fishery scenarios are shown in Table 5.4.2.

The number of non-maturing 1SW salmon harvested decreases as the opening of the season is delayed, the highest catches in numbers of fish are realized for a short fishery season that opens early (scenario B1) and the lowest catches are realized from the fishery that opens the latest and is of shortest duration (scenario C1; Table 5.4.2). As predicted, the number of salmon harvested decreases for a fixed TAC as the opening of the fishery is delayed. The relative gain in returns to homewaters as 2SW salmon is reduced by the consequences of natural mortality acting on the fish over the migration period. Under the conditions examined (M = 0.03 per month), the largest relative increase in abundance of returns for NAC salmon is 2.5% for the shortest and latest opening of the fishery season (scenario C1; Table 5.4.2). There is no discernible difference in the relative gain of 2SW NEAC salmon returns to homewaters, for the reason that the fishery effect at West Greenland is small (harvests of 5000 fish from a PFA estimate of almost 400 000 fish).

This analysis indicates that the relative gain in returns to homewaters associated with a delay of the fishery season for a fixed TAC option is dependent upon the exploitation rate on the stock being exploited. The more heavily exploited component benefits the most from a delay in the opening of the season. The realized gains are also dependent upon the growth rates in weight of the fish during the fishery season, and the assumed natural mortality rate. If growth rates are lower or natural mortality higher, the relative gains to escapement would be reduced from those provided here.

If growth rates are higher or natural mortality lower, the relative gains would be more important.

Based on characteristics of the fish in the fishery, the estimated changes in weights over the period of sampling (weeks 31 to 44), and the assumed natural mortality rate of salmon, there would be some small gains in escapement (2.5% for NAC) which could be realized from delaying the opening of the fishery season to at least mid-September (week 38). However, the number of fish killed would be reduced by almost 15% from the base scenario, which would result in a lower exploitation rate on the stock overall, and could favour protection of weaker stocks assuming equal availability to the fishery.

Scenarios for season closures after week 44 were not examined. There are no contemporary samples from the fishery after week 44 (4–11 November) with which to assess if salmon continue to increase in weight into the early winter. The limited sampling available in week 44 (N = 50) from 2008 and 2010 suggest that weight of salmon in the fishery catches at that time was not higher than fish sampled in prior weeks (41; Figure 5.4.2).

5.5 NASCO has requested ICES to advise on changes to temporal and/or spatial fishery patterns that may provide increased protection for weaker stocks

ICES previously provided information on estimated catches at West Greenland by stock origin and described their spatial and temporal distribution based on available contemporary data (ICES, 2015). ICES summarized available data on continent of origin by standard week and by NAFO Division (2005–2016), and division-specific subcontinental (regional) contributions for both European (2002, 2004–2012) and North American (2011–2014) fish. Finally, ICES also estimated the annual number of North American (2011–2014) and European (2002, 2004–2012) fish harvested at these same regional levels. Collectively, these summaries represent the most robust estimates available that describe the composition of the West Greenland harvest at the subcontinental level and they could be used to evaluate options for temporal and/or spatial focused management options aimed at protecting weaker stocks at West Greenland.

One option for investigating if temporal and/or spatial fishery patterns exist would be to evaluate the individual regional assignments for the samples previously reported on by ICES (2015). Unfortunately the individual assignment results were not available to the Working Group.

In the absence of individual assignment data, the mixture analysis results reported for the European component of the stock complex by ICES (2015) and the North American component of the stock, which has been updated by Bradbury *et al.* (accepted), can provide insights to temporal and spatial patterning of the contributing stocks to the West Greenland fishery. Three regional groupings (North Scotland, North and West Ireland, Irish Sea, and south and east Scotland) contributed approximately 90% to the European harvest and three regional groupings (Central Labrador, Gaspe, and Southern Gulf of St Lawrence) contributed approximately 75% of the North American fish harvested. Weaker performing stocks originating in the more southerly regions of North America (Nova Scotia, Inner Bay of Fundy, and USA) and Europe (North and West France and South France and Spain) generally contributed less than 2% of the harvest.

Historic tag return data suggest that salmon originating in the USA were more prominent in southern portions of the fishery than were Canadian salmon (Reddin *et al*., 2012). Bradbury *et al*. (accepted) explicitly tested for differences in spatial distribution of salmon from different regions and detected no significant spatial structuring. Cluster analysis indicated no structuring and none of the variance in catch composition was attributable to location or year, further supporting the suggestion that the contributing stocks are mixed off the coast of West Greenland. These results agree with earlier investigations by Gauthier-Ouellet *et al.* (2009). However, salmon from the US and other more southerly populations are relatively rare in the harvest and the power to detect spatial or temporal patterning may be influenced by sample size. Bradbury *et al.* (accepted) did detect a tendency for salmon from southern regions to arrive slightly earlier in the season, but this relationship was not significant. Further analyses on regional contributions of the European component of the stock complex, beyond that presented by ICES (2015), were not undertaken, but there is no evidence to suggest that the dynamics deviate from the North American patterning.

Given that the temporal estimates of stock composition at West Greenland (ICES, 2015; Bradbury *et al.*, accepted) and the modelled estimates of MSW stock abundance (ICES, 2015) are highly correlated, the genetic estimates appear to be accurately resolving stock composition in the harvest. It is difficult to ascertain if there are spatial or temporal patterns to the harvest of the weaker performing stocks considering their low representation, but it is unlikely considering the lack of patterning for the larger contributors. As such, there does not appear to be any obvious temporal and/or spatial patterns to the regional contributions to the harvest that would allow for management options to provide increased protection for weaker stocks.

The Working Group also investigated if there were spatial or temporal trends in fishery contribution by continent of origin or river age, as river age is considered a proxy for latitude of origin. Approximately 11 000 samples (Tables 5.5.1 to 5.5.4) were available for analysis from the 2006–2015 fisheries. Data analysed included origin (North American or European), river age (1–6), NAFO Division (1A–1F), and standard weeks (31–44) for individuals sampled. Standard week 31 refers to 30 July–05 August in every year and sequentially increases by one every seven days.

There appears to be slight increase in the contribution of European origin salmon as the fishing season progresses (Figure 5.5.1), with low contributions in the early part of the fishery (~6% in weeks 31 and 32) and higher contributions later in the fishing season (28 and 44% in weeks 42 and 44 respectively; Table 5.5.1). Care should be taken when interpreting these results as the sample sizes for these four weeks represent less than 5% of the available samples. Low sample size is a result of low sampling effort and low harvest rates early and late in the fishing season. The majority of these early and late samples came from only two years.

There was no clear pattern of continental-specific contributions across NAFO Divisions (Figure 5.5.2) with the North American contribution generally following the approximate 80/20 split that has occurred since the mid-1990s (Figure 5.1.2.3). It should be noted that the two divisions with the highest European contribution also had the lowest sample sizes (Division 1A and 1E; Table 5.5.2).

There was no clear pattern of river age contributions across standard week for either North American or European fish (Figure 5.5.3). The contribution of river age one North American fish ranged from 1–2% across all standard weeks with the exception of 5% contribution in week 31 (Table 5.5.3), which consisted of only three fish, all sampled in a single year/community/day. River age two contributions across standard weeks ranged from 21–31% with no apparent pattern of increasing or decreasing contributions as the fishing season progressed. As noted previously, the North American contribution to the fishery is dominated by river age 2–4 fish (Table 5.1.2.4). Although there appears to be an increasing contribution of river age one European fish as the fishery progressed (Figure 5.5.3), there were no samples collected in standard week 43 and the low sample size collected in week 42 only contained a single river age one fish (Table 5.5.3). As above, the six European age one fish collected in week 44 all came from a single year/community/day. As noted previously, the European contribution to the fishery is dominated by river age 1–2 fish (Table 5.1.2.5). This approach is less useful for identifying weaker stocks originating in Europe as a significant number of productive southern European stocks produces large numbers of river age one fish that may be exploited at Greenland.

There is no evidence of a clear patterning of North American or European river age contributions across NAFO Division (Figure 5.5.4). North American river age one contributions were approximately 1% across all divisions and river age two contributions ranged from 25–29% with only a 14% difference between minimum and maximum contributions for river age three and a 12% for river age four (Table 5.5.4). European river age one fish had a larger contribution in NAFO Division 1A (44%), but sample size was low and the remaining divisions ranged from 0–11% with no clear patterning. European river age two fish were lowest in NAFO Division 1A but approximately equal across all other divisions (45–66%) and river age three ranged from 1–7%. Although there potentially appears to be a weak association between European river age one fish contribution in larger proportions in the more northern areas (NAFO Division 1A), overall there appears to be similar contributions across all other NAFO Divisions.

Neither the results presented here, by ICES (2015), nor Bradbury *et al*. (accepted) provide clear evidence that there are temporal and/or spatial management options for the fishery at West Greenland that would provide increased protection for weaker stocks. Although samples sizes may not be optimal, the best available information suggests that the contributing North American and European stocks sufficiently mix along the coast of West Greenland and across the fishing season. The contributions to the harvest by the regional stock groupings closely mirrors the modelled estimates of MSW stock abundance, which further supports the suggestion that the stocks are well mixed within the fished complex. Although some weak relationships were identified (e.g. higher contribution of North American river age one fish in week 31, greater European river age one fish in the north), these relationships remain preliminary and further analysis of these data, increased genetic sampling of the fishery, and further refinement in the genetic baselines used for regional assignments may be needed to investigate these patterns further.

Table 5.1.1.1. Distribution of nominal catches (t) by Greenland vessels since 1960. NAFO Division is represented by 1A–1F. Since 2005, gutted weights have been reported and converted to total weight by a factor of 1.11.

Year	1A	1B	1C	1D	1E	1F	Unk.	West Greenland	East Greenland	Total
1960							60	60		60
1961							127	127		127
1962							244	244		244
1963	1	172	180	68	45			466		466
1964	21	326	564	182	339	107		1539		1539
1965	19	234	274	86	202	10	36	861		861
1966	17	223	321	207	353	130	87	1338		1338
1967	2	205	382	228	336	125	236	1514		1514
1968	1	90	241	125	70	34	272	833		833
1969	41	396	245	234	370		867	2153		2153
1970	58	239	122	123	496	207	862	2107		2107
1971	144	355	724	302	410	159	560	2654		2654
1972	117	136	190	374	385	118	703	2023		2023
1973	220	271	262	440	619	329	200	2341		2341
1974	44	175	272	298	395	88	645	1917		1917
1975	147	468	212	224	352	185	442	2030		2030
1976	166	302	262	225	182	38		1175		1175
1977	201	393	336	207	237	46	-	1 420	6	1426
1978	81	349	245	186	113	10	-	984	8	992
1979	120	343	524	213	164	31	-	1 395	+	1395
1980	52	275	404	231	158	74	-	1 194	+	1194
1981	105	403	348	203	153	32	20	1 264	+	1264
1982	111	330	239	136	167	76	18	1 077	+	1077
1983	14	77	93	41	55	30	-	310	+	310
1984	33	116	64	4	43	32	5	297	+	297
1985	85	124	198	207	147	103	-	864	7	871
1986	46	73	128	203	233	277	-	960	19	979
1987	48	114	229	205	261	109	-	966	+	966
1988	24	100	213	191	198	167	-	893	4	897
1989	9	28	81	73	75	71	-	337	-	337
1990	4	20	132	54	16	48	-	274	-	274
1991	12	36	120	38	108	158	-	472	4	476
1992	-	4	23	5	75	130	-	237	5	242
1993 [1]	-	-	-	-	-	-	-	-	-	-
1994 [1]	-	-	-	-	-	-	-	-	-	-
1995	+	10	28	17	22	5	-	83	2	85
1996	+	+	50	8	23	10	-	92	+	92
1997	1	5	15	4	16	17	-	58	1	59
1998	1	2	2	4	1	2	-	11	-	11
1999	+	2	3	9	2	2	-	19	+	19
2000	+	+	1	7	+	13	-	21	-	21

Year	1A	1B	1C	1D	1E	1F	Unk.	West Greenland	East Greenland	Total
2001	+	1	4	5	3	28	-	43	-	43
2002	+	+	2	4	1	2	-	9	-	9
2003	1	+	2	1	1	5	-	9	-	9
2004	3	1	4	2	3	2	-	15	-	15
2005	1	3	2	1	3	5	-	15	-	15
2006	6	2	3	4	2	4	-	22	-	22
2007	2	5	6	4	5	2	-	25	-	25
2008	4.9	2.2	10.0	1.6	2.5	5.0	0	26.2	0	26.2
2009	0.2	6.2	7.1	3.0	4.3	4.8	0	25.6	0.8	26.3
2010	17.3	4.6	2.4	2.7	6.8	4.3	0	38.1	1.7	39.6
2011	1.8	3.7	5.3	8.0	4.0	4.6	0	27.4	0.1	27.5
2012	5.4	0.8	15.0	4.6	4.0	3.0	0	32.6	0.5	33.1
2013	3.1	2.4	17.9	13.4	6.4	3.8	0	47.0	0.0	47.0
2014	3.6	2.8	13.8	19.1	15.0	3.4	0	57.8	0.1	57.9
2015	0.8	8.8	10.0	18.0	4.2	14.1	0	55.9	1.0	56.8

[1] The fishery was suspended.

+ Small catches <5 t.

- No catch.

Table 5.1.1.2. Nominal catches of salmon at West Greenland since 1960 (t round fresh weight) by participating nations. For Greenlandic vessels specifically, all catches up to 1968 were taken with set gillnets only and catches after 1968 were taken with set gillnets and driftnets. All non-Greenlandic vessel catches from 1969–1975 were taken with driftnets. The quota figures applied to Greenlandic vessels only and parenthetical entries identify when quotas did not apply to all sectors of the fishery.

Year	Norway	Faroes	Sweden	Denmark	Greenland	Total	Quota	Comments
1960	-	-	-	-	60	60		
1961	-	-	-	-	127	127		
1962	-	-	-	-	244	244		
1963	-	-	-	-	466	466		
1964	-	-	-	-	1539	1539		
1965	-	36	-	-	825	858		Norwegian harvest figures not avaialble, but known to be less than Faroese catch
1966	32	87	-	-	1251	1370		
1967	78	155	-	85	1283	1601		
1968	138	134	4	272	579	1127		
1969	250	215	30	355	1360	2210		
1970	270	259	8	358	1244	2139		Greenlandic total includes 7 t caught by longlines in the Labrador Sea
1971	340	255	-	645	1449	2689	-	
1972	158	144	-	401	1410	2113	1100	
1973	200	171	-	385	1585	2341	1100	
1974	140	110	-	505	1162	1917	1191	
1975	217	260	-	382	1171	2030	1191	
1976	-	-	-	-	1175	1175	1191	
1977	-	-	-	-	1420	1420	1191	
1978	-	-	-	-	984	984	1191	
1979	-	-	-	-	1395	1395	1191	
1980	-	-	-	-	1194	1194	1191	

Year	Norway	Faroes	Sweden	Denmark	Greenland	Total	Quota	Comments
1981	-	-	-	-	1264	1264	1265	Quota set to a specific opening date for the fishery
1982	-	-	-	-	1077	1077	1253	Quota set to a specific opening date for the fishery
1983	-	-	-	-	310	310	1191	
1984	-	-	-	-	297	297	870	
1985	-	-	-	-	864	864	852	
1986	-	-	-	-	960	960	909	
1987	-	-	-	-	966	966	935	
1988	-	-	-	-	893	893	840	Quota for 1988–1990 was 2520 t with an opening date of August 1. Annual catches were not to exceed an annual average (840 t) by more than 10%. Quota adjusted to 900 t in 1989 and 924 t in 1990 for later opening dates.
1989	-	-	-	-	337	337	900	
1990	-	-	-	-	274	274	924	
1991	-	-	-	-	472	472	840	
1992	-	-	-	-	237	237	258	Quota set by Greenland authorities
1993	-	-	-	-			89	The fishery was suspended. NASCO adopt a new quota allocation model.
1994	-	-	-	-			137	The fishery was suspended and the quotas were bought out.
1995	-	-	-	-	83	83	77	Quota advised by NASCO
1996	-	-	-	-	92	92	174	Quota set by Greenland authorities
1997	-	-	-	-	58	58	57	Private (non-commercial) catches to be reported after 1997
1998	-	-	-	-	11	11	20	Fishery restricted to catches used for internal consumption in Greenland
1999	-	-	-	-	19	19	20	
2000	-	-	-	-	21	21	20	
2001	-	-	-	-	43	43	114	Final quota calculated according to the ad hoc management system
2002	-	-	-	-	9	9	55	Quota bought out, quota represented the maximum allowable catch (no factory landing allowed), and higher catch figures based on sampling programme information are used for the assessments
2003	-	-	-	-	9	9		Quota set to nil (no factory landing allowed), fishery restricted to catches used

Year	Norway	Faroes	Sweden	Denmark	Greenland	Total	Quota	Comments
								for internal consumption in Greenland, and higher catch figures based on sampling programme information are used for the assessments
2004	-	-	-	-	15	15		same as previous year
2005	-	-	-	-	15	15		same as previous year
2006	-	-	-	-	22	22		Quota set to nil (no factory landing allowed) and fishery restricted to catches used for internal consumption in Greenland
2007	-	-	-	-	25	25		Quota set to nil (no factory landing allowed), fishery restricted to catches used for internal consumption in Greenland, and higher catch figures based on sampling programme information are used for the assessments
2008	-	-	-	-	26	26		same as previous year
2009	-	-	-	-	26	26		same as previous year
2010	-	-	-	-	40	40		No factory landing allowed and fishery restricted to catches used for internal consumption in Greenland
2011	-	-	-	-	28	28		same as previous
2012	-	-	-	-	33	33	(35)	Unilateral decision made by Greenland to allow factory landing with a 35 t quota for factory landings only, fishery restricted to catches used for internal consumption in Greenland, and higher catch figures based on sampling programme information are used for the assessments
2013	-	-	-	-	47	47	(35)	same as previous year
2014	-	-	-	-	58	58	(30)	Unilateral decision made by Greenland to allow factory landing with a 30 t quota for factory landings only, fishery restricted to catches used for internal consumption in Greenland, and higher catch figures based on sampling programme information and phone surveys are used for the assessments
2015	-	-	-	-	57	57	45	Unilateral decision made by Greenland to set a 45 t quota for all sectors of the fishery, fishery restricted to catches used for internal consumption in Greenland, and higher catch figures based on sampling programme information and phone surveys are used for the assessments

Table 5.1.1.3. Reported landings (t) by landing category, the number of fishers reporting and the total number of landing reports received for licensed and unlicensed fishers in 2012–2015. Empty cells identify categories with no reported landings and 0.0 entries represents reported values of <0.5.

NAFO/ICES	Licensed	No. of Fishers	No. of Reports	Comm.	Private	Factory	Total	Licensed	No. of Fishers	No. of Reports	Comm.	Private	Factory	Total
2015								2014						
1A	NO	5	6		0.1		0.1	NO	1.0	1.0		0.1		0.1
1A	YES	13	29	0.1	0.6		0.7	YES	20.0	87.0	3.0	0.5		3.5
1A	TOTAL	18	35	0.1	0.7		0.8	TOTAL	21.0	88.0	3.0	0.6		3.6
1B	NO	3	5		0.1		0.1	NO						
1B	YES	15	96	7.3	1.5		8.7	YES	8.0	28.0	2.1	0.7		2.8
1B	TOTAL	18	101	7.3	1.5		8.8	TOTAL	8.0	28.0	2.1	0.7		2.8
1C	NO	16	58	0.1	1.7		1.8	NO	5.0	18.0	0.6			0.6
1C	YES	42	181	2.9	3.9	1.5	8.2	YES	35.0	212.0	1.5	2.1	9.7	13.2
1C	TOTAL	58	239	3.0	5.6	1.5	10.1	TOTAL	40.0	230.0	2.1	2.1	9.7	13.8
1D	NO	20	35		0.8		0.8	NO	6.0	10.0	0.2	0.3		0.5
1D	YES	11	161	14.3	0.5	2.4	17.1	YES	14.0	115.0	0.4	5.5	12.8	18.6
1D	TOTAL	31	196	14.3	1.3	2.4	18.0	TOTAL	20.0	135.0	0.6	5.7	12.8	19.1
1E	NO	3	5	0.1	0.2		0.2	NO	1.0	1.0	0.2			0.2
1E	YES	11	71	2.0	1.9		3.9	YES	9.0	102.0	1.4	0.8	12.6	14.8
1E	TOTAL	14	76	2.1	2.1		4.2	TOTAL	10.0	103.0	1.6	0.8	12.6	15.0
1F	NO	20	69		2.4		2.4	NO	3.0	3.0	0.1	0.1		0.2
1F	YES	21	173	7.1	4.6		11.7	YES	11.0	80.0	2.0	1.2		3.2
1F	TOTAL	41	242	7.1	7.0		14.1	TOTAL	14.0	83.0	2.1	1.3		3.4
XIV	NO	8	32		0.6		0.6	NO						0.0
XIV	YES	1	17	0.0	0.4		0.4	YES	1.0	12.0	0.1	0.0		0.1
XIV	TOTAL	9	49	0.0	0.9		1.0	TOTAL	1.0	12.0	0.1	0.0		0.1
ALL	NO	75	210	0.1	5.9		6.0	NO	16.0	33.0	1.2	0.4		1.6
ALL	YES	114	728	33.7	13.3	3.8	50.8	YES	98.0	636.0	10.5	10.7	35.0	56.2
ALL	TOTAL	189	938	33.8	19.2	3.8	56.8	TOTAL	114.0	669.0	11.6	11.2	35.0	57.8

NAFO/ICES	Licensed	No. of Fishers	No. of Reports	Comm.	Private	Factory	Total	Licensed	No. of Fishers	No. of Reports	Comm.	Private	Factory	Total
2013								2012						
1A	NO	10	32	0.3	0.0		0.3	NO	8.0	25.0		0.6		0.6
1A	YES	18	94	1.2	1.6		2.8	YES	27.0	142.0	1.3	3.5		4.8
1A	TOTAL	28	126	1.5	1.6		3.1	TOTAL	35.0	167.0	1.3	4.1		5.4
1B	NO	2	5	0.2			0.2	NO	3.0	3.0		0.2		0.2
1B	YES	6	14	1.3	0.9		2.2	YES	6.0	19.0	0.1	0.5		0.5
1B	TOTAL	8	19	1.4	0.9		2.4	TOTAL	9.0	22.0	0.1	0.7		0.8
1C	NO							NO	2.0	6.0		0.3		0.3
1C	YES	21	205	2.2	3.5	12.3	18.0	YES	30.0	172.0	1.8	0.8	12.1	14.7
1C	TOTAL	21	205	2.2	3.5	12.3	18.0	TOTAL	32.0	178.0	1.8	1.2	12.1	15.0
1D	NO	10	23	0.4	0.0		0.5	NO	5.0	15.0	0.0	0.4		0.4
1D	YES	9	112	0.1	4.8	8.0	12.9	YES	3.0	23.0	1.4	1.2	1.6	4.2
1D	TOTAL	19	135	0.5	4.9	8.0	13.4	TOTAL	8.0	38.0	1.4	1.6	1.6	4.6
1E	NO	1	1	0.1			0.1	NO	13.0	22.0		1.3		1.3
1E	YES	6	41	0.8	0.2	5.3	6.4	YES	3.0	45.0	0.8	1.9		2.7
1E	TOTAL	7	42	0.9	0.2	5.3	6.4	TOTAL	16.0	67.0	0.8	3.2		4.0
1F	NO	5	10	0.3			0.3	NO	6.0	17.0		0.7		0.7
1F	YES	6	15	1.0	2.4		3.4	YES	10.0	40.0	0.1	2.2		2.3
1F	TOTAL	11	25	1.4	2.4		3.8	TOTAL	16.0	57.0	0.1	2.8		3.0
XIV	NO	1	1	0.0			0.0	NO	6.0	24.0		0.5		0.5
XIV	YES							YES	0.0	0.0				
XIV	TOTAL	1	1	0.0			0.0	TOTAL	6.0	24.0		0.5		0.5
ALL	NO	29	72	1.3	0.1		1.4	NO	43.0	112.0	0.0	4.1		4.1
ALL	YES	66	481	6.6	13.4	25.6	45.6	YES	79.0	441.0	5.5	9.9	13.7	29.1
ALL	TOTAL	95	553	7.9	13.4	25.6	47.0	TOTAL	122.0	553.0	5.5	14.1	13.7	33.2

Table 5.1.1.4. Total number of licences issued by NAFO (1A-1F)/ICES Divisions and the number of people (licensed and unlicensed) reporting catches of Atlantic salmon in the Greenland fishery. Reports received by fish plants prior to 1997 and to the Licence Office from 1998 to present. Blanks cells indicate that the date were not reported or available.

Year	Licences	1A	1B	1C	1D	1E	1F	ICES	Unk.	Number of fishers reporting	Number of reports received
1987		78	67	74		99	233		0	579	
1988		63	46	43	53	78	227		0	516	
1989		30	41	98	46	46	131		0	393	
1990		32	15	46	52	54	155		0	362	
1991		53	39	100	41	54	123		0	410	
1992		3	9	73	9	36	82		0	212	
1993											
1994											
1995		0	17	52	21	24	31		0	145	
1996		1	8	74	15	23	42		0	163	
1997		0	16	50	7	2	6		0	80	
1998		16	5	8	7	3	30		0	69	
1999		3	8	24	18	21	29		0	102	
2000		1	1	5	12	2	25		0	43	
2001	452	2	7	13	15	6	37		0	76	
2002	479	1	1	9	13	9	8		0	41	
2003	150	11	1	4	4	12	10		0	42	
2004	155	20	2	8	4	20	12		0	66	
2005	185	11	7	17	5	17	18		0	75	
2006	159	43	14	17	20	17	30		0	141	
2007	260	29	12	26	10	33	22		0	132	
2008	260	44	8	41	10	16	24		0	143	
2009	294	19	11	35	15	25	31	9	0	145	
2010	309	86	17	19	16	30	27	13	0	208	389
2011	234	25	9	20	15	20	23	5	0	117	394
2012	279	35	9	32	8	16	16	6	0	122	553
2013	228	28	8	21	19	7	11	1	0	95	553
2014	321	21	8	40	20	10	14	1	0	114	669
2015	310	18	18	58	31	14	41	9	0	189	938

Table 5.1.1.5. Adjusted landings estimated from comparing the weight of salmon seen by the sampling teams and the corresponding community-specific reported landings (Adjusted landings (sampling) and from phone surveys (Adjusted landings (survey). Dashes '-' indicate that no adjustment was necessary and no phone surveys were conducted from 2002–2013. Adjusted landings (sampling and surveys) are added to the reported landings and estimated unreported catch for assessment purposes.

Year	Reported Landings (West Greenland Only)	Adjusted Landings (Sampling)	Adjusted Landings (Survey)	Landings for Assessment
2002	9.0	0.7		9.8
2003	8.7	3.6		12.3
2004	14.7	2.5		17.2
2005	15.3	2.0		17.3
2006	23.0	-		23.0
2007	24.6	0.2		24.8
2008	26.1	2.5		28.6
2009	25.5	2.5		28.0
2010	37.9	5.1		43.1
2011	27.4	-		27.4
2012	32.6	2.0		34.6
2013	46.9	0.7		47.7
2014	57.7	0.6	12.2	70.5
2015	55.9	-	5.0	60.9

Table 5.1.2.1. Size of biological samples and percentage (by number) of North American and European salmon in research vessel catches at West Greenland (1969 to 1982), from commercial samples (1978 to 1992, 1995 to 1997, and 2001) and from local consumption samples (1998 to 2000, and 2002 to present).

		Sample Size			Continent of Origin (%)			
Source		Length	Scales	Genetics	N. American	(95% CI)1	European	(95% CI)1
Research	1969	212	212		51	(57, 44)	49	(56, 43)
	1970	127	127		35	(43, 26)	65	(75, 57)
	1971	247	247		34	(40, 28)	66	(72, 50)
	1972	3488	3488		36	(37, 34)	64	(66, 63)
	1973	102	102		49	(59, 39)	51	(61, 41)
	1974	834	834		43	(46, 39)	57	(61, 54)
	1975	528	528		44	(48, 40)	56	(60, 52)
	1976	420	420		43	(48, 38)	57	(62, 52)
	19782	606	606		38	(41, 38)	62	(66, 59)
	19783	49	49		55	(69, 41)	45	(59, 31)
	1979	328	328		47	(52, 41)	53	(59, 48)
	1980	617	617		58	(62, 54)	42	(46, 38)
	1982	443	443		47	(52, 43)	53	(58, 48)
Commercial	1978	392	392		52	(57, 47)	48	(53, 43)
	1979	1653	1653		50	(52, 48)	50	(52, 48)
	1980	978	978		48	(51, 45)	52	(55, 49)
	1981	4570	1930		59	(61, 58)	41	(42, 39)
	1982	1949	414		62	(64, 60)	38	(40, 36)
	1983	4896	1815		40	(41, 38)	60	(62, 59)
	1984	7282	2720		50	(53, 47)	50	(53, 47)
	1985	13 272	2917		50	(53, 46)	50	(52, 34)
	1986	20 394	3509		57	(66, 48)	43	(52, 34)
	1987	13 425	2960		59	(63, 54)	41	(46, 37)
	1988	11 047	2562		43	(49, 38)	57	(62, 51)
	1989	9366	2227		56	(60, 52)	44	(48, 40)
	1990	4897	1208		75	(79, 70)	25	(30, 21)
	1991	5005	1347		65	(69, 61)	35	(39, 31)
	1992	6348	1648		54	(57, 50)	46	(50, 43)
	1995	2045	2045		68	(75, 65)	32	(35, 28)
	1996	3341	1397		73	(76, 71)	27	(29, 24)
	1997	794	282		80	(84, 75)	20	(25, 16)
	2001	4721	2655		69	(71, 67)	31	(33, 29)
Local Consumption	1998	540	406		79	(84, 73)	21	(27, 16)
	1999	532	532		90	(97, 84)	10	(16, 3)
	2000	491	491		70		30	
	2002	501	501	501	68		32	

		Sample Size			Continent of Origin (%)			
Source		Length	Scales	Genetics	N. American	(95% CI)1	European	(95% CI)1
	2003	1743	1743	1779	68		32	
	2004	1639	1639	1688	73		27	
Local Consumption	2005	767	767	767	76		24	
	2006	1209	1209	1193	72		28	
	2007	1116	1110	1123	82		18	
	2008	1854	1866	1853	86		14	
	2009	1662	1683	1671	91		9	
	2010	1261	1265	1240	80		20	
	2011	967	965	964	92		8	
	2012	1372	1371	1373	82		18	
	2013	1155	1156	1149	82		18	
	2014	892	775	920	72		28	
	2015	1708	1704	1674	80		20	

[1] CI - confidence interval calculated by method of Pella and Robertson (1979) for 1984–1986 and binomial distribution for the others.

[2] During 1978 Fishery

[3] Research samples after 1978 fishery closed.

Table 5.1.2.2. Reported landings (kg) for the West Greenland Atlantic salmon fishery from 2002 by NAFO Division and the division-specific adjusted landings (sampling) where the sampling teams observed more fish landed than were reported. Adjusted landings (sampling) were not calculated for 2006, 2011, and 2015 as the sampling teams did not observe more fish than were reported. Shaded cells indicate that sampling took place in that year and division.

Year		1A	1B	1C	1D	1E	1F	Total
2002	Reported	14	78	2100	3752	1417	1661	9022
	Adjusted						2408	9769
2003	Reported	619	17	1621	648	1274	4516	8694
	Adjusted			1782	2709		5912	12 312
2004	Reported	3476	611	3516	2433	2609	2068	14 712
	Adjusted				4929			17 209
2005	Reported	1294	3120	2240	756	2937	4956	15 303
	Adjusted				2730			17 276
2006	Reported	5427	2611	3424	4731	2636	4192	23 021
	Adjusted							
2007	Reported	2019	5089	6148	4470	4828	2093	24 647
	Adjusted						2252	24 806
2008	Reported	4882	2210	10024	1595	2457	4979	26 147
	Adjusted				3577		5478	28 627
2009	Reported	195	6151	7090	2988	4296	4777	25 496
	Adjusted				5466			27 975
2010	Reported	17 263	4558	2363	2747	6766	4252	37 949
	Adjusted		4824		6566		5274	43 056
2011	Reported	1858	3662	5274	7977	4021	4613	27 407
	Adjusted							
2012	Reported	5353	784	14 991	4564	3993	2951	32 636
	Adjusted		2001				3694	34 596
2013	Reported	3052	2358	17 950	13 356	6442	3774	46 933
	Adjusted		2461				4408	47 669
2014	Reported	3625	2756	13 762	19 123	14 979	3416	57 662
	Adjusted						4036	58 282
2015	Reported	751	8801	10 055	17 966	4170	14 134	55 877
	Adjusted							

Table 5.1.2.3. Annual mean whole weights (kg) and fork lengths (cm) by sea age and continent of origin of Atlantic salmon caught at West Greenland 1969 to 1992 and 1995 to present (NA = North America and E = Europe).

	Whole weight (kg)									Fork Length (cm)					
	1SW		2SW		PS		All sea ages		Total	1SW		2SW		PS	
	NA	E	NA	E	NA	E	NA	E		NA	E	NA	E	NA	E
1969	3.12	3.76	5.48	5.80	-	5.13	3.25	3.86	3.58	65.0	68.7	77.0	80.3	-	75.3
1970	2.85	3.46	5.65	5.50	4.85	3.80	3.06	3.53	3.28	64.7	68.6	81.5	82.0	78.0	75.0
1971	2.65	3.38	4.30	-	-	-	2.68	3.38	3.14	62.8	67.7	72.0	-	-	-
1972	2.96	3.46	5.85	6.13	2.65	4.00	3.25	3.55	3.44	64.2	67.9	80.7	82.4	61.5	69.0
1973	3.28	4.54	9.47	10.00	-	-	3.83	4.66	4.18	64.5	70.4	88.0	96.0	61.5	-
1974	3.12	3.81	7.06	8.06	3.42	-	3.22	3.86	3.58	64.1	68.1	82.8	87.4	66.0	-
1975	2.58	3.42	6.12	6.23	2.60	4.80	2.65	3.48	3.12	61.7	67.5	80.6	82.2	66.0	75.0
1976	2.55	3.21	6.16	7.20	3.55	3.57	2.75	3.24	3.04	61.3	65.9	80.7	87.5	72.0	70.7
1978	2.96	3.50	7.00	7.90	2.45	6.60	3.04	3.53	3.35	63.7	67.3	83.6	-	60.8	85.0
1979	2.98	3.50	7.06	7.60	3.92	6.33	3.12	3.56	3.34	63.4	66.7	81.6	85.3	61.9	82.0
1980	2.98	3.33	6.82	6.73	3.55	3.90	3.07	3.38	3.22	64.0	66.3	82.9	83.0	67.0	70.9
1981	2.77	3.48	6.93	7.42	4.12	3.65	2.89	3.58	3.17	62.3	66.7	82.8	84.5	72.5	-
1982	2.79	3.21	5.59	5.59	3.96	5.66	2.92	3.43	3.11	62.7	66.2	78.4	77.8	71.4	80.9
1983	2.54	3.01	5.79	5.86	3.37	3.55	3.02	3.14	3.10	61.5	65.4	81.1	81.5	68.2	70.5
1984	2.64	2.84	5.84	5.77	3.62	5.78	3.20	3.03	3.11	62.3	63.9	80.7	80.0	69.8	79.5
1985	2.50	2.89	5.42	5.45	5.20	4.97	2.72	3.01	2.87	61.2	64.3	78.9	78.6	79.1	77.0
1986	2.75	3.13	6.44	6.08	3.32	4.37	2.89	3.19	3.03	62.8	65.1	80.7	79.8	66.5	73.4
1987	3.00	3.20	6.36	5.96	4.69	4.70	3.10	3.26	3.16	64.2	65.6	81.2	79.6	74.8	74.8
1988	2.83	3.36	6.77	6.78	4.75	4.64	2.93	3.41	3.18	63.0	66.6	82.1	82.4	74.7	73.8
1989	2.56	2.86	5.87	5.77	4.23	5.83	2.77	2.99	2.87	62.3	64.5	80.8	81.0	73.8	82.2
1990	2.53	2.61	6.47	5.78	3.90	5.09	2.67	2.72	2.69	62.3	62.7	83.4	81.1	72.6	78.6
1991	2.42	2.54	5.82	6.23	5.15	5.09	2.57	2.79	2.65	61.6	62.7	80.6	82.2	81.7	80.0
1992	2.54	2.66	6.49	6.01	4.09	5.28	2.86	2.74	2.81	62.3	63.2	83.4	81.1	77.4	82.7
1995	2.37	2.67	6.09	5.88	3.71	4.98	2.45	2.75	2.56	61.0	63.2	81.3	81.0	70.9	81.3
1996	2.63	2.86	6.50	6.30	4.98	5.44	2.83	2.90	2.88	62.8	64.0	81.4	81.1	77.1	79.4
1997	2.57	2.82	7.95	6.11	4.82	6.9	2.63	2.84	2.71	62.3	63.6	85.7	84.0	79.4	87.0
1998	2.72	2.83	6.44	-	3.28	4.77	2.76	2.84	2.78	62.0	62.7	84.0	-	66.3	76.0
1999	3.02	3.03	7.59	-	4.20	-	3.09	3.03	3.08	63.8	63.5	86.6	-	70.9	-
2000	2.47	2.81	-	-	2.58	-	2.47	2.81	2.57	60.7	63.2	-	-	64.7	-
2001	2.89	3.03	6.76	5.96	4.41	4.06	2.95	3.09	3.00	63.1	63.7	81.7	79.1	75.3	72.1
2002	2.84	2.92	7.12	-	5.00	-	2.89	2.92	2.90	62.6	62.1	83.0	-	75.8	-
2003	2.94	3.08	8.82	5.58	4.04	-	3.02	3.10	3.04	63	64.4	86.1	78.3	71.4	-
2004	3.11	2.95	7.33	5.22	4.71	6.48	3.17	3.22	3.18	64.7	65.0	86.2	76.4	77.6	88.0
2005	3.19	3.33	7.05	4.19	4.31	2.89	3.31	3.33	3.31	65.9	66.4	83.3	75.5	73.7	62.3
2006	3.10	3.25	9.72		5.05	3.67	3.25	3.26	3.24	65.3	65.3	90.0		76.8	69.5
2007	2.89	2.87	6.19	6.47	4.94	3.57	2.98	2.99	2.98	63.5	63.3	80.9	80.6	76.7	71.3
2008	3.04	3.03	6.35	7.47	3.82	3.39	3.08	3.07	3.08	64.6	63.9	80.1	85.5	71.1	73.0
2009	3.28	3.40	7.59	6.54	5.25	4.28	3.48	3.67	3.50	64.9	65.5	84.6	81.7	75.9	73.5
2010	3.44	3.24	6.40	5.45	4.17	3.92	3.47	3.28	3.42	66.7	65.2	80.0	75.0	72.4	70.0

	Whole weight (kg)									Fork Length (cm)					
	1SW		2SW		PS		All sea ages		Total	1SW		2SW		PS	
	NA	E	NA	E	NA	E	NA	E		NA	E	NA	E	NA	E
2011	3.30	3.18	5.69	4.94	4.46	5.11	3.39	3.49	3.40	65.8	64.7	78.6	75.0	73.7	76.3
2012	3.34	3.38	6.00	4.51	4.65	3.65	3.44	3.40	3.44	65.4	64.9	75.9	70.4	72.8	68.9
2013	3.33	3.16	6.43	4.51	3.64	5.38	3.39	3.20	3.35	66.2	64.6	81.0	72.8	69.9	73.6
2014	3.25	3.02	7.60	6.00	4.47	5.42	3.39	3.13	3.32	65.6	64.7	86.0	78.7	73.6	83.5
2015	3.36	3.13	7.52	7.1	4.53	3.81	3.42	3.18	3.37	65.6	64.4	84.1	82.5	74.2	67.2
Prev. 10-yr mean	3.22	3.19	6.90	5.56	4.48	4.13	3.32	3.28	3.30	65.4	64.7	82.0	77.2	73.7	72.2
Overall mean	2.89	3.16	6.65	6.21	4.11	4.72	3.03	3.25	3.14	63.5	65.2	82.0	80.9	71.8	75.8

Table 5.1.2.4. River age distribution (%) and mean river age for all North American origin salmon caught at West Greenland 1968 to 1992 and 1995 to present. Continent of origin assignments were based on scale characteristics until 1995, scale characteristics and DNA based assignments until 2001 and DNA based assignments only from 2002 on.

YEAR	1	2	3	4	5	6	7	8
1968	0.3	19.6	40.4	21.3	16.2	2.2	0	0
1969	0	27.1	45.8	19.6	6.5	0.9	0	0
1970	0	58.1	25.6	11.6	2.3	2.3	0	0
1971	1.2	32.9	36.5	16.5	9.4	3.5	0	0
1972	0.8	31.9	51.4	10.6	3.9	1.2	0.4	0
1973	2.0	40.8	34.7	18.4	2.0	2.0	0	0
1974	0.9	36	36.6	12.0	11.7	2.6	0.3	0
1975	0.4	17.3	47.6	24.4	6.2	4.0	0	0
1976	0.7	42.6	30.6	14.6	10.9	0.4	0.4	0
1977	-	-	-	-	-	-	-	-
1978	2.7	31.9	43.0	13.6	6.0	2.0	0.9	0
1979	4.2	39.9	40.6	11.3	2.8	1.1	0.1	0
1980	5.9	36.3	32.9	16.3	7.9	0.7	0.1	0
1981	3.5	31.6	37.5	19.0	6.6	1.6	0.2	0
1982	1.4	37.7	38.3	15.9	5.8	0.7	0	0.2
1983	3.1	47.0	32.6	12.7	3.7	0.8	0.1	0
1984	4.8	51.7	28.9	9.0	4.6	0.9	0.2	0
1985	5.1	41.0	35.7	12.1	4.9	1.1	0.1	0
1986	2.0	39.9	33.4	20.0	4.0	0.7	0	0
1987	3.9	41.4	31.8	16.7	5.8	0.4	0	0
1988	5.2	31.3	30.8	20.9	10.7	1.0	0.1	0
1989	7.9	39.0	30.1	15.9	5.9	1.3	0	0
1990	8.8	45.3	30.7	12.1	2.4	0.5	0.1	0
1991	5.2	33.6	43.5	12.8	3.9	0.8	0.3	0
1992	6.7	36.7	34.1	19.1	3.2	0.3	0	0
1993	-	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-	-
1995	2.4	19.0	45.4	22.6	8.8	1.8	0.1	0
1996	1.7	18.7	46.0	23.8	8.8	0.8	0.1	0
1997	1.3	16.4	48.4	17.6	15.1	1.3	0	0
1998	4.0	35.1	37.0	16.5	6.1	1.1	0.1	0
1999	2.7	23.5	50.6	20.3	2.9	0.0	0	0
2000	3.2	26.6	38.6	23.4	7.6	0.6	0	0
2001	1.9	15.2	39.4	32.0	10.8	0.7	0	0
2002	1.5	27.4	46.5	14.2	9.5	0.9	0	0
2003	2.6	28.8	38.9	21.0	7.6	1.1	0	0
2004	1.9	19.1	51.9	22.9	3.7	0.5	0	0
2005	2.7	21.4	36.3	30.5	8.5	0.5	0	0
2006	0.6	13.9	44.6	27.6	12.3	1.0	0	0
2007	1.6	27.7	34.5	26.2	9.2	0.9	0	0

YEAR	1	2	3	4	5	6	7	8
2008	0.9	25.1	51.9	16.8	4.7	0.6	0	0
2009	2.6	30.7	47.3	15.4	3.7	0.4	0	0
2010	1.6	21.7	47.9	21.7	6.3	0.8	0	0
2011	1.0	35.9	45.9	14.4	2.8	0	0	0
2012	0.3	29.8	39.4	23.3	6.5	0.7	0	0
2013	0.1	32.6	37.3	20.8	8.6	0.6	0	0
2014	0.4	26.0	44.5	21.9	6.9	0.4	0	0
2015	0.1	31.6	40.6	21.6	6.0	0.2	0	0
Prev. 10-yr mean	0.9	27.5	43.4	21.0	6.7	0.6	0	0
Overall Mean	2.5	31.5	39.7	18.4	6.7	1.1	0.1	0

Table 5.1.2.5. River age distribution (%) and mean river age for all European origin salmon caught at West Greenland 1968 to 1992 and 1995 to present. Continent of origin assignments were based on scale characteristics until 1995, scale characteristics and DNA based assignments until 2001 and DNA based assignments only from 2002 on.

YEAR	1	2	3	4	5	6	7	8
1968	21.6	60.3	15.2	2.7	0.3	0	0	0
1969	0	83.8	16.2	0	0	0	0	0
1970	0	90.4	9.6	0	0	0	0	0
1971	9.3	66.5	19.9	3.1	1.2	0	0	0
1972	11.0	71.2	16.7	1.0	0.1	0	0	0
1973	26.0	58.0	14.0	2.0	0	0	0	0
1974	22.9	68.2	8.5	0.4	0	0	0	0
1975	26.0	53.4	18.2	2.5	0	0	0	0
1976	23.5	67.2	8.4	0.6	0.3	0	0	0
1977	-	-	-	-	-	-	-	-
1978	26.2	65.4	8.2	0.2	0	0	0	0
1979	23.6	64.8	11.0	0.6	0	0	0	0
1980	25.8	56.9	14.7	2.5	0.2	0	0	0
1981	15.4	67.3	15.7	1.6	0	0	0	0
1982	15.6	56.1	23.5	4.2	0.7	0	0	0
1983	34.7	50.2	12.3	2.4	0.3	0.1	0.1	0
1984	22.7	56.9	15.2	4.2	0.9	0.2	0	0
1985	20.2	61.6	14.9	2.7	0.6	0	0	0
1986	19.5	62.5	15.1	2.7	0.2	0	0	0
1987	19.2	62.5	14.8	3.3	0.3	0	0	0
1988	18.4	61.6	17.3	2.3	0.5	0	0	0
1989	18.0	61.7	17.4	2.7	0.3	0	0	0
1990	15.9	56.3	23.0	4.4	0.2	0.2	0	0
1991	20.9	47.4	26.3	4.2	1.2	0	0	0
1992	11.8	38.2	42.8	6.5	0.6	0	0	0
1993	-	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-	-
1995	14.8	67.3	17.2	0.6	0	0	0	0
1996	15.8	71.1	12.2	0.9	0	0	0	0
1997	4.1	58.1	37.8	0.0	0	0	0	0
1998	28.6	60.0	7.6	2.9	0.0	1.0	0	0
1999	27.7	65.1	7.2	0	0	0	0	0
2000	36.5	46.7	13.1	2.9	0.7	0	0	0
2001	16.0	51.2	27.3	4.9	0.7	0	0	0
2002	9.4	62.9	20.1	7.6	0	0	0	0
2003	16.2	58.0	22.1	3.0	0.8	0	0	0
2004	18.3	57.7	20.5	3.2	0.2	0	0	0
2005	19.2	60.5	15.0	5.4	0	0	0	0
2006	17.7	54.0	23.6	3.7	0.9	0	0	0
2007	7.0	48.5	33.0	10.5	1.0	0	0	0

YEAR	1	2	3	4	5	6	7	8
2008	7.0	72.8	19.3	0.8	0.0	0	0	0
2009	14.3	59.5	23.8	2.4	0.0	0	0	0
2010	11.3	57.1	27.3	3.4	0.8	0	0	0
2011	19.0	51.7	27.6	1.7	0	0	0	0
2012	9.3	63.0	24.0	3.7	0	0	0	0
2013	4.5	68.2	24.4	2.5	0	0	0	0
2014	4.5	60.7	30.8	4.0	0	0	0	0
2015	9.2	54.9	28.8	5.8	1.2	0	0	0
Prev. 10-yr mean	10.4	59.0	26.3	3.8	0.4	0	0	0
Overall Mean	16.9	60.8	19.1	2.8	0.3	0	0	0

Table 5.1.2.6. Sea age composition (%) of samples from fishery landings at West Greenland from 1985 by continent of origin.

	North American			European		
Year	1SW	2SW	Previous Spawners	1SW	2SW	Previous Spawners
1985	92.5	7.2	0.3	95.0	4.7	0.4
1986	95.1	3.9	1.0	97.5	1.9	0.6
1987	96.3	2.3	1.4	98.0	1.7	0.3
1988	96.7	2.0	1.2	98.1	1.3	0.5
1989	92.3	5.2	2.4	95.5	3.8	0.6
1990	95.7	3.4	0.9	96.3	3.0	0.7
1991	95.6	4.1	0.4	93.4	6.5	0.2
1992	91.9	8.0	0.1	97.5	2.1	0.4
1993	-	-	-	-	-	-
1994	-	-	-	-	-	-
1995	96.8	1.5	1.7	97.3	2.2	0.5
1996	94.1	3.8	2.1	96.1	2.7	1.2
1997	98.2	0.6	1.2	99.3	0.4	0.4
1998	96.8	0.5	2.7	99.4	0.0	0.6
1999	96.8	1.2	2.0	100.0	0.0	0.0
2000	97.4	0.0	2.6	100.0	0.0	0.0
2001	98.2	2.6	0.5	97.8	2.0	0.3
2002	97.3	0.9	1.8	100.0	0.0	0.0
2003	96.7	1.0	2.3	98.9	1.1	0.0
2004	97.0	0.5	2.5	97.0	2.8	0.2
2005	92.4	1.2	6.4	96.7	1.1	2.2
2006	93.0	0.8	5.6	98.8	0.0	1.2
2007	96.5	1.0	2.5	95.6	2.5	1.5
2008	97.4	0.5	2.2	98.8	0.8	0.4
2009	93.4	2.8	3.8	89.4	7.6	3.0
2010	98.2	0.4	1.4	97.5	1.7	0.8
2011	93.8	1.5	4.7	82.8	12.1	5.2
2012	93.2	0.7	6.0	98.0	1.6	0.4
2013	94.9	1.4	3.7	96.6	2.4	1.0
2014	91.3	1.1	7.6	96.1	2.4	1.5
2015	97.0	0.7	2.3	98.2	1.2	0.6

Table 5.1.2.7. The number of samples and continent of origin of Atlantic salmon by NAFO Division sampled at West Greenland in 2015. NA = North America, E = Europe.

		Numbers			Percentages	
NAFO Div	Sample dates	NA	E	Totals	NA	E
1B	September 14–October 11	410	87	497	82.5	17.5
1C	September 07–September 28	754	136	890	84.7	15.3
1E	September 02–October 01	83	86	169	49.1	50.9
1F	September 04–September 17	90	28	118	76.3	23.7
Total		1337	337	1674	79.9	20.1

Table 5.1.2.8. The numbers of North American (NA) and European (E) Atlantic salmon caught at West Greenland 1971 to 1992 and 1995 to present and the percentage by continent of origin, based on NAFO Division continent of origin weighted by catch (weight) in each division. Numbers are rounded to the nearest hundred fish. Unreported catch is not included in this assessment.

	Percentageby continent weighted by catch in number		Numbers of salmon by continent	
Year	NA	E	NA	E
1982	57	43	192 200	143 800
1983	40	60	39 500	60 500
1984	54	46	48 800	41 200
1985	47	53	143 500	161 500
1986	59	41	188 300	131 900
1987	59	41	171 900	126 400
1988	43	57	125 500	168 800
1989	55	45	65 000	52 700
1990	74	26	62 400	21 700
1991	63	37	111 700	65 400
1992	45	55	46 900	38 500
1995	67	33	21 400	10 700
1996	70	30	22 400	9700
1997	85	15	18 000	3300
1998	79	21	3100	900
1999	91	9	5700	600
2000	65	35	5100	2700
2001	67	33	9400	4700
2002	69	31	2300	1000
2003	64	36	2600	1400
2004	72	28	3900	1500
2005	74	26	3500	1200
2006	69	31	4000	1800
2007	76	24	6100	1900
2008	86	14	8000	1300
2009	89	11	7000	800
2010	80	20	10 000	2600
2011	93	7	6800	600
2012	79	21	7800	2100
2013	82	18	11 500	2700
2014	72	28	12 800	5400
2015	79	21	13 500	3900

Table 5.3.1. Distribution of commercial fishing effort (excluding private landings) by standard week (week 31 corresponds to July 31st–August 5th) and NAFO statistical area from 1987 to 2001. Fishing effort from 2000 is not available by standard week.

Year	Week	1A	1B	1C	1D	1E	1F	Total
	33		24	78	10	68	81	261
	34	2	20	56	8	48	42	177
	35	2	5	19		11	17	57
	36		4	20		7	20	60
1997	37	1	9	50	6	10	15	106
	38			30	4	10	4	51
	Total	5	62	253	28	153	179	712
	33	6	1	3	1		8	19
	34	2		4	1		4	11
	35	3		2			3	8
	36	2				1	1	4
1998	37	1		2			3	6
	38		1	1			1	3
	39 or later	1	2	5	2		5	15
	Total	15	4	17	4	1	25	66
	33			1	1		6	8
	34		1	13	5			19
	35		1	8			1	12
	36			9	2	1	7	19
1999	37	1		4	2	2		9
	38			10	2		1	13
	39 or later	2	18	35	29	1	3	88
	Total	3	20	80	41	4	18	168
2000	33	1	1	6	16	2	32	58
	33			0	22		64	86
	34			5	14		37	56
	35		1	15	11		25	52
	36		6	7	1		24	38
2001	37		1	10			15	26
	38			7			5	12
	39 or later			6	1		2	9
	Total		8	50	49		172	280

Table 5.3.2. Distribution of commercial fishing effort (excluding private landings) by standard week (week 31 corresponds to July 31st–August 5th) and NAFO statistical area from 2012 to 2015.

Year	Week	1A	1B	1C	1D	1E	1F	Total
	32			2				2
	33			4	1			5
	34			11				11
	35			17				17
	36			14				14
2012	37			16				16
	38			16				16
	39			32	1			33
	40			15				15
	41			1				1
	Total			128	2			130
	31				3			
	32				11			11
	33			2	8			10
	34			10	14			24
	35			8	7			15
2013	36			25	5			30
	37			42	5			47
	38			38	3			41
	39			36	6	3		45
	40					21		21
	Total			161	59	24		244
	31				0	0		
	32				4	0		4
	33			2	6	0		8
	34			19	8	21		48
2014	35			31	10	32		73
	36			20	22	23		65
	37			27	16			43
	38			15	5			20
	Total			114	71	76		261
	41			14	6			20
2015	42			17	7			24
	43			9	3			12
	Total			40	16			56

Table 5.3.3. Commercial (excluding private landings) catch per unit of effort [live weight (kg) / laning] by standard week from 1997 to 2001 and 2012 to 2015.

	Week No.												
		31	32	33	34	35	36	37	38	39	40	41		Total
1997	Effort Units			261	177	57	60	106	51					712
	cpue			89	75	63	59	74	67					77
1998	Effort Units			19	11	8	4	6	3	15				66
	cpue			57	44	48	54	59	87	190				85
1999	Effort Units			8	19	12	19		9	13	88			168
	cpue			82	184	61	171		140	57	62			93
2000	Effort Units			58										58
	cpue			343										343
2001	Effort Units			86	56		52	38	26	12	9			280
	cpue			115	118		96	161	192	90	91			123
2012	Effort Units		2	5	11	17	14	16	16	33	15	1		130
	cpue		13	29	77	69	63	56	86	93	162	234		85
2013	Effort Units	3	11	10	24	15	30	47	41	45	21			247
	cpue	130	95	143	130	50	60	71	62	99	187			92
2014	Effort Units		4	8	48	73	65	43	20					261
	cpue		166	111	106	111	153	94	135					121
2015	Effort Units										20	24	12	56
	cpue										44	72	56	59

Table 5.4.1. Fishery season scenarios examined (shaded cross hatched cells) and predicted geometric mean weight of salmon in the fishery at West Greenland by standard week of the fishery.

<table>
<tr><th>STANDARD WEEK</th><th>31</th><th>32</th><th>33</th><th>34</th><th>35</th><th>36</th><th>37</th><th>38</th><th>39</th><th>40</th><th>41</th><th>42</th><th>43</th><th>44</th></tr>
<tr><td>Pred. weight (kg)</td><td>2.59</td><td>2.68</td><td>2.78</td><td>2.88</td><td>2.99</td><td>3.10</td><td>3.21</td><td>3.33</td><td>3.45</td><td>3.58</td><td>3.71</td><td>3.85</td><td>3.99</td><td>4.14</td></tr>
<tr><td>Base</td><td colspan="14" bgcolor="#bfbfbf"></td></tr>
<tr><td>A1</td><td></td><td colspan="13" bgcolor="#bfbfbf"></td></tr>
<tr><td>A2</td><td colspan="2"></td><td colspan="12" bgcolor="#bfbfbf"></td></tr>
<tr><td>A3</td><td colspan="3"></td><td colspan="11" bgcolor="#bfbfbf"></td></tr>
<tr><td>A4</td><td colspan="4"></td><td colspan="10" bgcolor="#bfbfbf"></td></tr>
<tr><td>A5</td><td colspan="5"></td><td colspan="9" bgcolor="#bfbfbf"></td></tr>
<tr><td>B1</td><td colspan="8" bgcolor="#bfbfbf"></td><td colspan="6"></td></tr>
<tr><td>B2</td><td colspan="2"></td><td colspan="8" bgcolor="#bfbfbf"></td><td colspan="4"></td></tr>
<tr><td>B3</td><td colspan="4"></td><td colspan="8" bgcolor="#bfbfbf"></td><td colspan="2"></td></tr>
<tr><td>B4</td><td colspan="6"></td><td colspan="8" bgcolor="#bfbfbf"></td></tr>
<tr><td>C1</td><td colspan="8"></td><td colspan="6" bgcolor="#bfbfbf"></td></tr>
</table>

Table 5.4.2. Estimated tonnes harvested, and relative changes from the base fishing scenario of catches of 1SW non-maturing salmon from NAC and southern NEAC (N.NAC.1SWnmat; N.NEAC.1SWnmat), of surviving abundance post week 44 of NAC and southern NEAC 1SW non-maturing salmon (PFA.NAC45, PFA.NEAC45), and returns as 2SW salmon to homewaters (NAC.Ret.2SW, NEAC.Ret.2SW). The values shown for the base period are the mean values of the corresponding components. The relative changes shown are the means of 5000 Monte Carlo draws.

		Relative change from base fishery season					
Fishing season scenario	Tonnes harvested	N.NAC.1SWnmat	N.NEAC.1SWnmat	PFA.NAC45	PFA.NEAC45	NAC.Ret.2SW	NAC.Ret.2SW
Base	102.5	24 230	4911	112 200	339 800	90 980	275 500
A1	102.5	-1.90%	-1.90%	-0.10%	0.10%	-0.10%	0.00%
A2	102.1	-4.20%	-4.20%	0.60%	-0.10%	0.60%	-0.10%
A3	101.7	-6.40%	-6.40%	1.00%	0.10%	0.90%	0.10%
A4	101.9	-8.00%	-8.00%	1.10%	0.10%	1.00%	0.10%
A5	102.4	-9.40%	-9.30%	1.20%	0.20%	1.20%	0.20%
B1	102.2	10.30%	10.30%	-1.70%	-0.10%	-1.70%	-0.10%
B2	102.2	2.60%	2.60%	0.00%	-0.10%	-0.10%	-0.10%
B3	102.2	-4.50%	-4.50%	0.70%	0.10%	0.60%	0.10%
B4	102.0	-11.30%	-11.20%	1.70%	0.00%	1.70%	0.00%
C1	102.2	-14.50%	-14.50%	2.60%	0.20%	2.50%	0.10%

Table 5.5.1. Sample size by standard week for North American origin and European origin salmon sampled during the West Greenland fishery, 2006–2015.

Standard week	North American	European	Total
31	65	4	69
32	215	14	229
33	531	99	630
34	755	182	937
35	1350	256	1606
36	1954	344	2298
37	1104	195	1299
38	1063	201	1264
39	1262	294	1556
40	943	262	1205
41	121	53	174
42	52	20	72
43	-	-	0
44	22	28	50
Total	9437	1952	11 389

Table 5.5.2. Sample size by NAFO Division for North American origin and European origin salmon sampled during the West Greenland fishery, 2006–2015.

NAFO Division	North American	European	Total
1A	91	33	124
1B	2940	387	3327
1C	1208	396	1604
1D	2930	472	3402
1E	290	171	461
1F	2031	524	2555
Total	9490	1983	11 473

Table 5.5.3. Sample size by river age (1–6) and standard week (31–44) for North American origin and European origin salmon sampled during the West Greenland fishery, 2006–2015. No samples were collected during standard week 43.

NORTH AMERICAN							
Standard week	1	2	3	4	5	6	Total
31	3	13	33	11	1	2	63
32	1	60	82	56	12	0	211
33	4	137	233	104	30	2	510
34	5	148	334	163	64	7	721
35	20	344	556	237	87	7	1251
36	23	508	856	355	95	7	1844
37	5	327	446	218	57	5	1058
38	13	260	446	201	71	8	999
39	18	333	525	262	93	6	1237
40	6	277	394	192	49	6	924
41	1	29	46	16	15	0	107
42	0	14	29	6	2	1	52
43	-	-	-	-	-	-	0
44	1	7	12	2	0	0	22
Total	100	2457	3992	1823	576	51	8999
EUROPEAN							
31	0	4	0	0	0	0	4
32	0	8	4	1	0	0	13
33	3	47	37	7	2	0	96
34	11	96	51	12	0	0	170
35	38	123	55	5	1	0	222
36	21	189	75	10	0	0	295
37	12	126	46	3	1	0	188
38	17	118	52	6	2	0	195
39	34	168	74	9	0	0	285
40	30	155	58	12	1	0	256
41	14	20	13	1	0	0	48
42	0	17	3	0	0	0	20
43	-	-	-	-	-	-	0
44	6	19	1	0	0	0	26
Total	186	1090	469	66	7	0	1818

Table 5.5.4. Sample size by river age, NAFO Division (1A–1F) for North American origin and European origin salmon sampled during the West Greenland fishery, 2006–2015.

NORTH AMERICAN							
River age	1A	1B	1C	1D	1E	1F	Total
1	1	41	4	33	2	17	100
2	24	888	418	707	46	471	2467
3	45	1314	577	1305	83	768	4021
4	12	555	309	608	57	334	1832
5	5	148	85	205	22	102	578
6	0	15	7	14	4	9	52
Total	87	2849	1151	2872	184	1907	9050
EUROPEAN							
1	14	41	33	62	8	42	187
2	10	232	233	267	73	256	1113
3	6	96	93	108	57	106	472
4	2	8	24	14	12	15	69
5	0	4	2	2	2	1	8
6	0	0	0	0	0	0	0
Total	32	370	380	453	116	498	1849

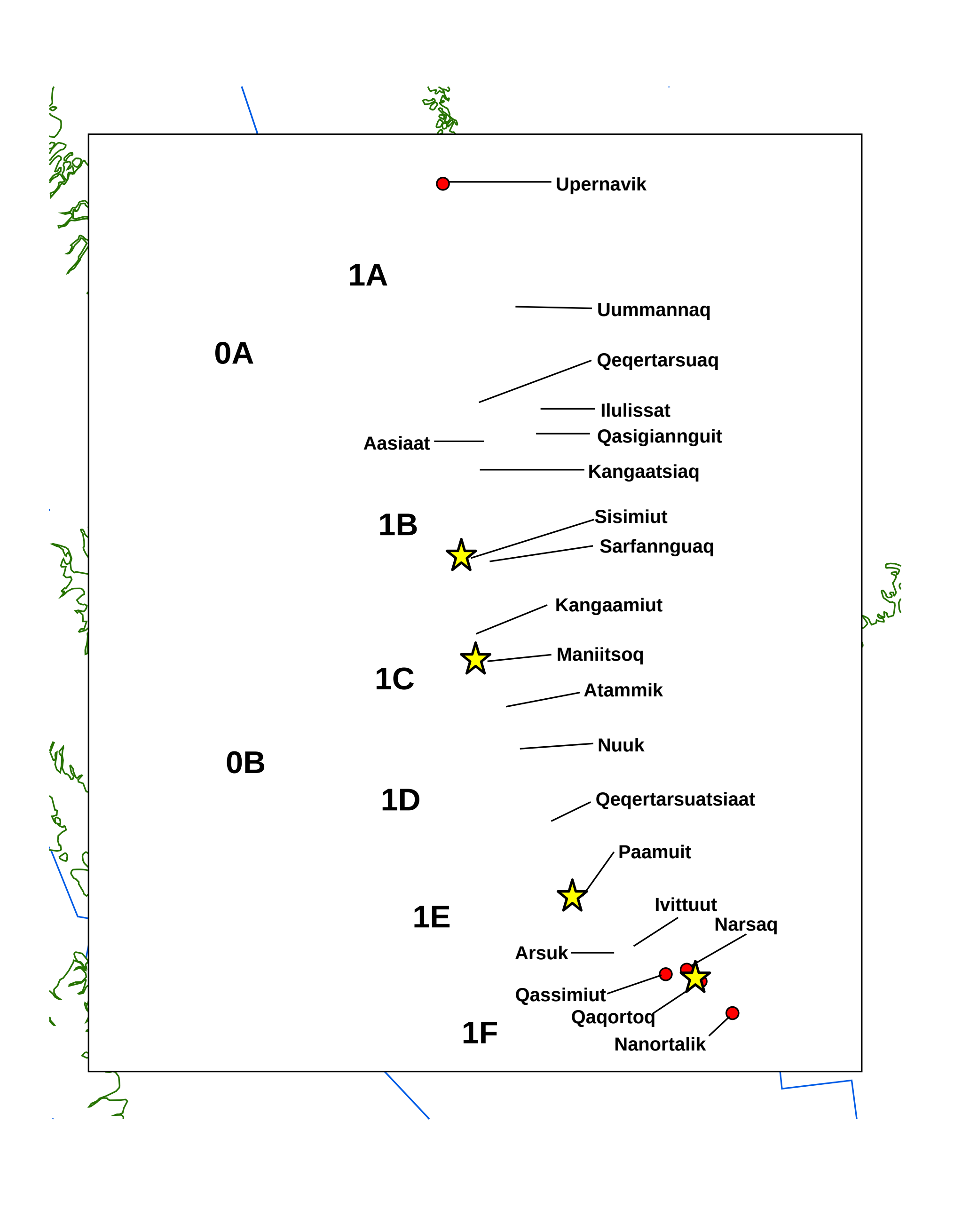


Figure 5.1.1.1. Location of NAFO divisions along the coast of West Greenland. Yellow stars identify the communities where sampling occurred within a community in 2015.

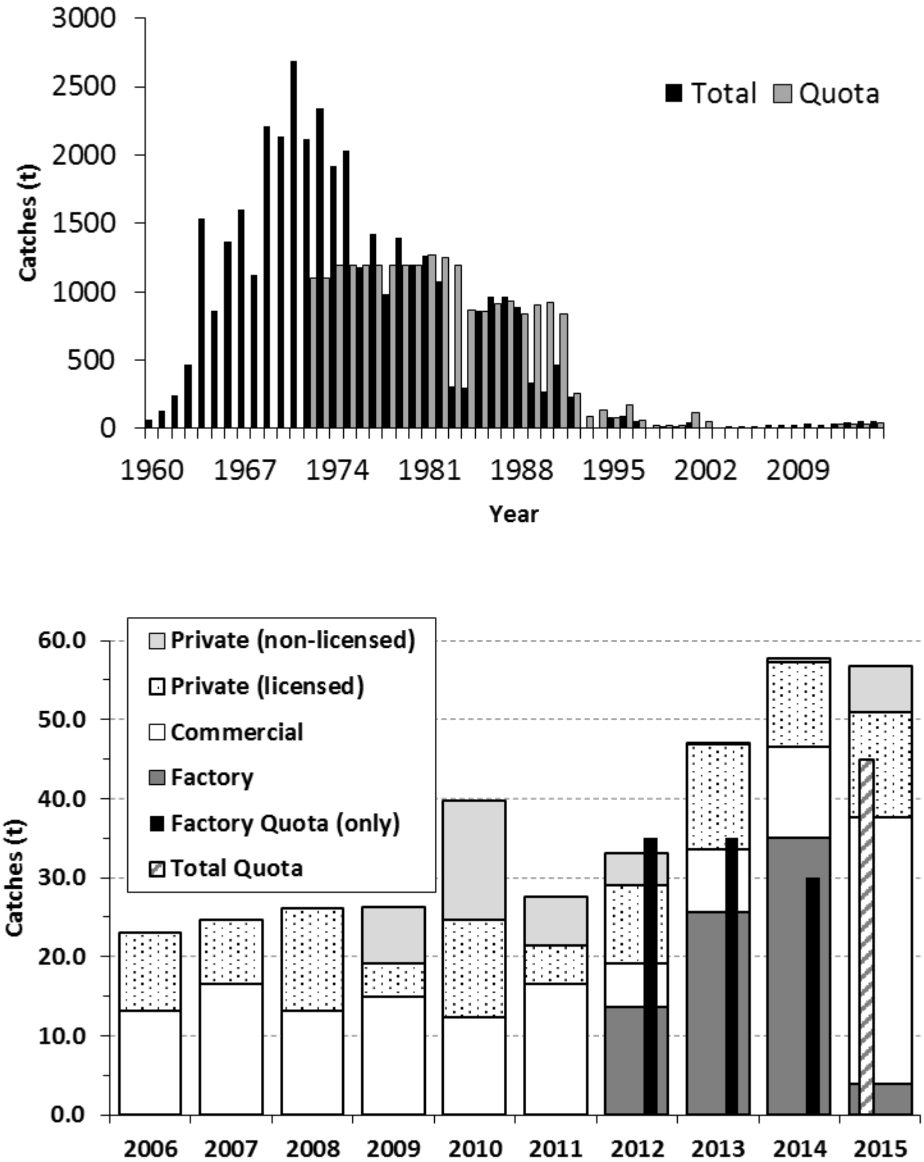


Figure 5.1.1.2. Nominal catches and commercial quotas (t, round fresh weight) of salmon at West Greenland for 1960–2015 (top panel) and 2006–2015 (bottom panel). Total reported landings from 2006–2015 are displayed by landings type. No quotas were set from 2003–2011, a factory only quota was set from 2012–2014, and a single quota of 45 t for all components of the fishery was applied in 2015.

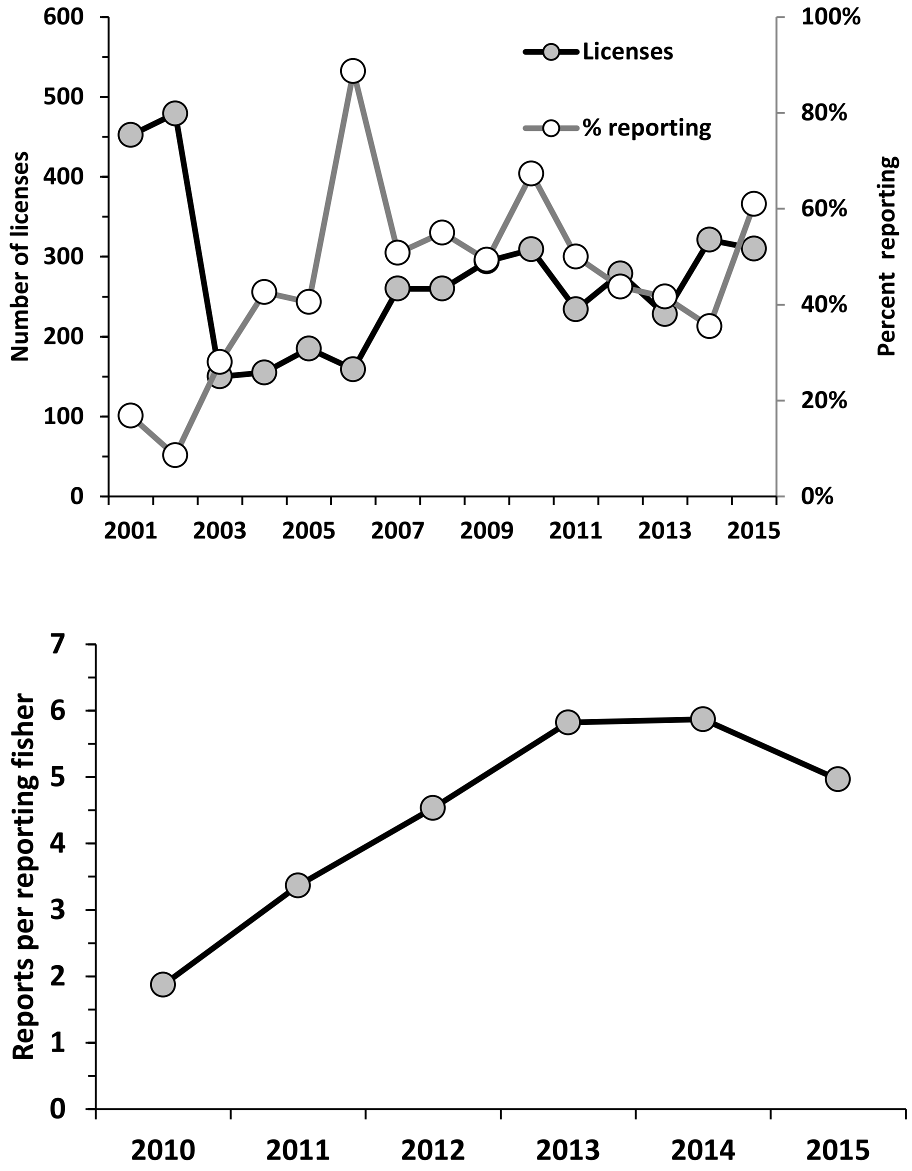


Figure 5.1.1.3. Number of licences issued and percentage of licensed fishers who submitted reports from 2001–present (top panel). The mean number of reports received from licensed and non-licensed fishers (combined) who reported landings from 2010-present (bottom panel).

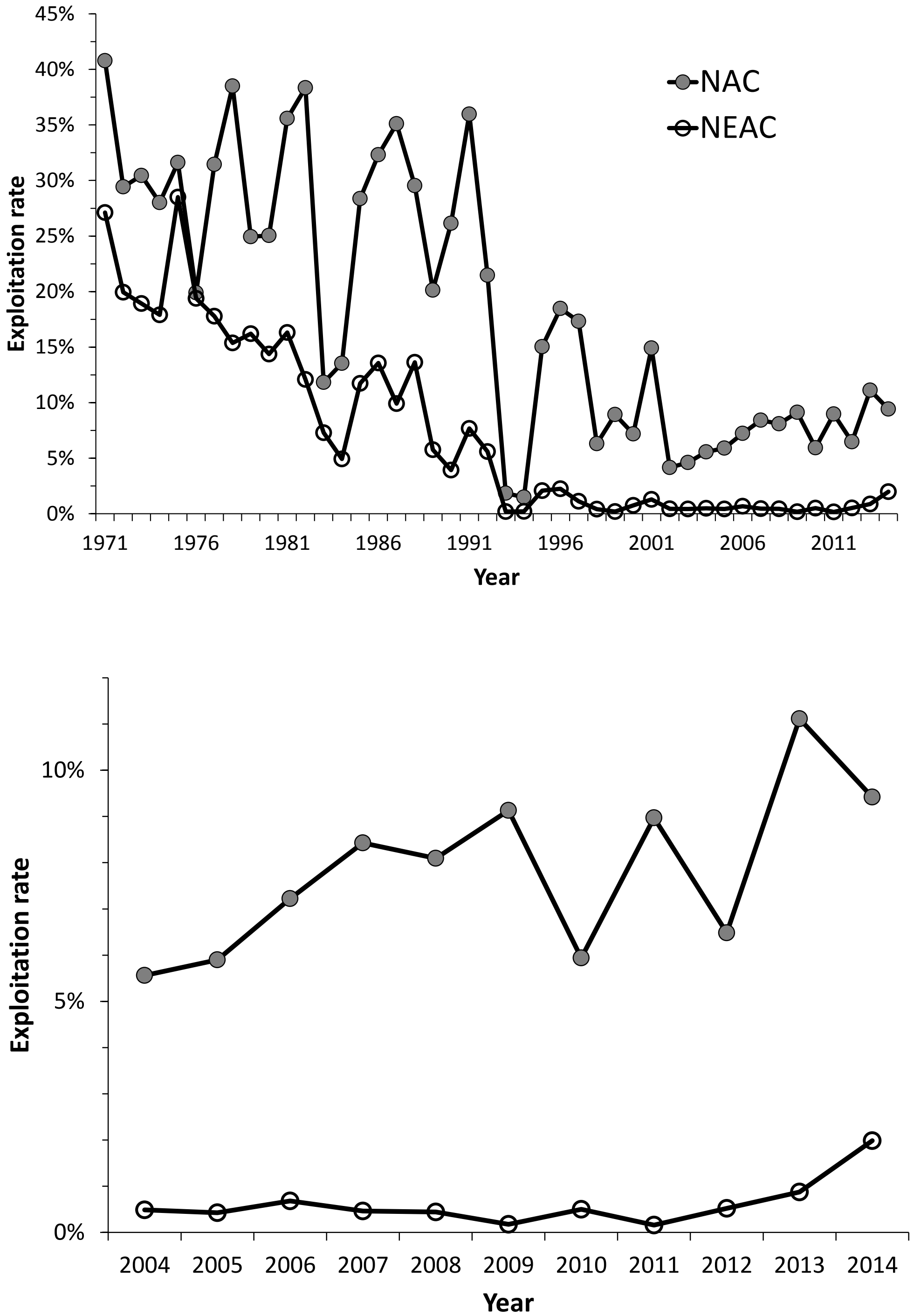


Figure 5.1.1.4. Exploitation rate (%) for NAC 1SW non-maturing and southern NEAC non-maturing Atlantic salmon at West Greenland, 1971–2014 (top) and 2005–2014 (bottom). Exploitation rate estimates are only available to 2014, as 2015 exploitation rates are dependent on 2016 returns.

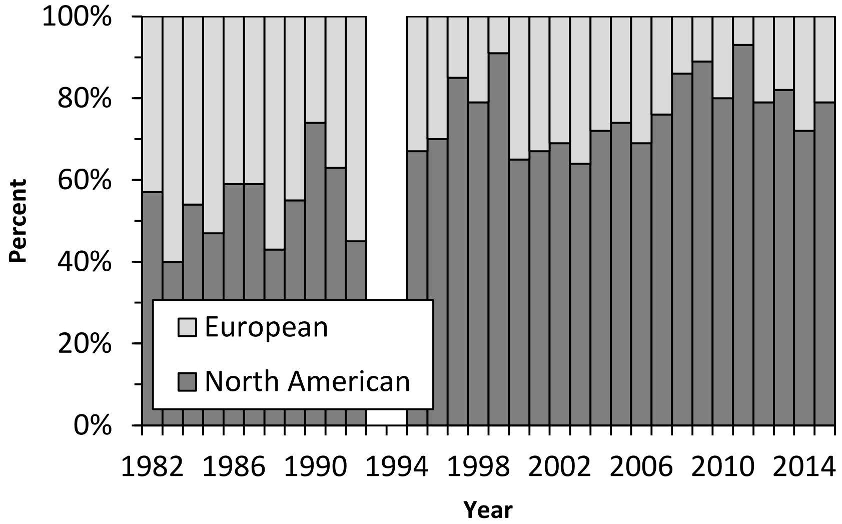


Figure 5.1.2.1. Percent of the sampled catch by continent of origin for the 1982 to 2015 Atlantic salmon West Greenland fishery.

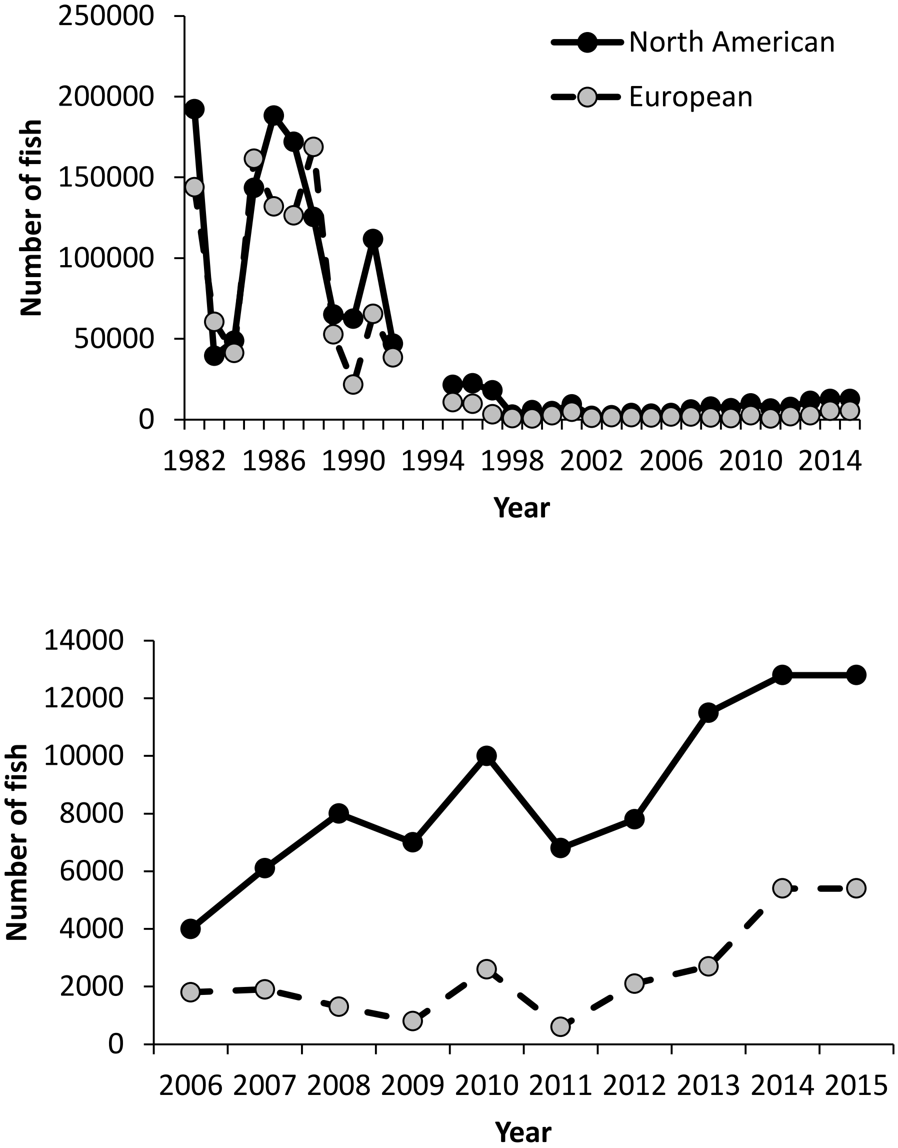


Figure 5.1.2.2. Number of North American and European Atlantic salmon caught at West Greenland from 1982 to 2015 (upper panel) and 2006 to 2015 (lower panel). Estimates are based on continent of origin by NAFO division, weighted by catch (weight) in each division. Numbers are rounded to the nearest hundred fish. Unreported catch is not included in this assessment.

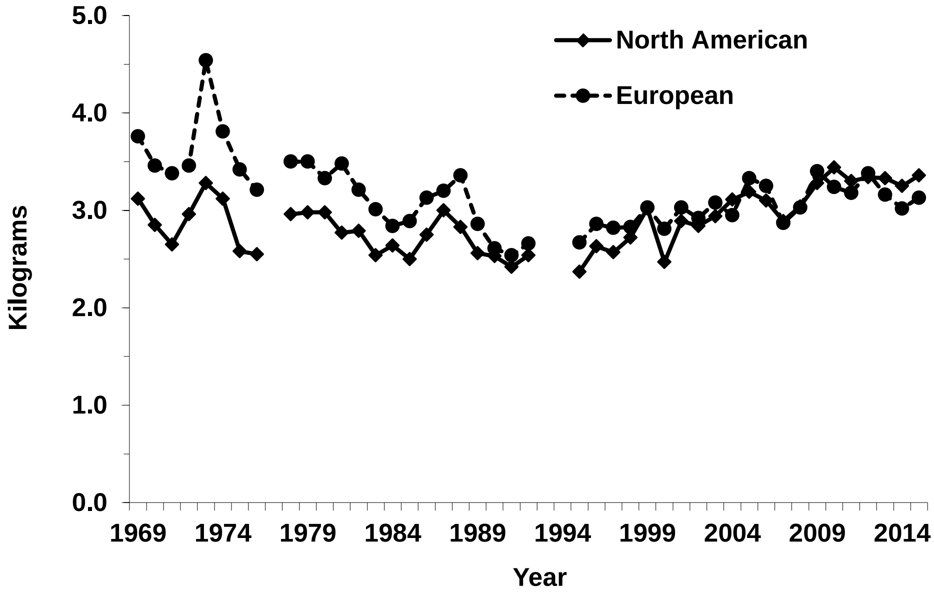


Figure 5.1.3.1. Mean uncorrected whole weight (kg) of European and North American 1SW Atlantic salmon sampled in West Greenland from 1969–2015.

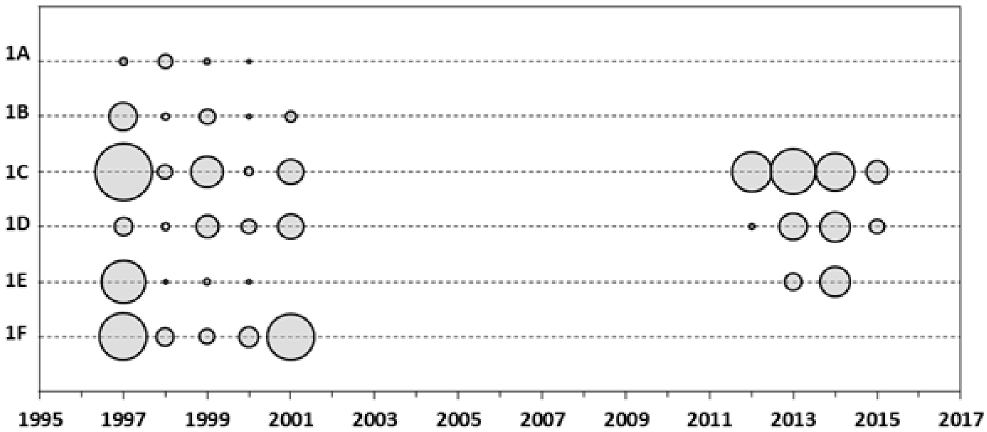


Figure 5.3.1. Distribution of commercial effort (number of trips reporting salmon landings) by NAFO area in the fisheries at West (regions 1A to 1F) 1997 to 2001 and 2012 to 2015. The size of circles indicates the number of commercial trips reported in each year and area.

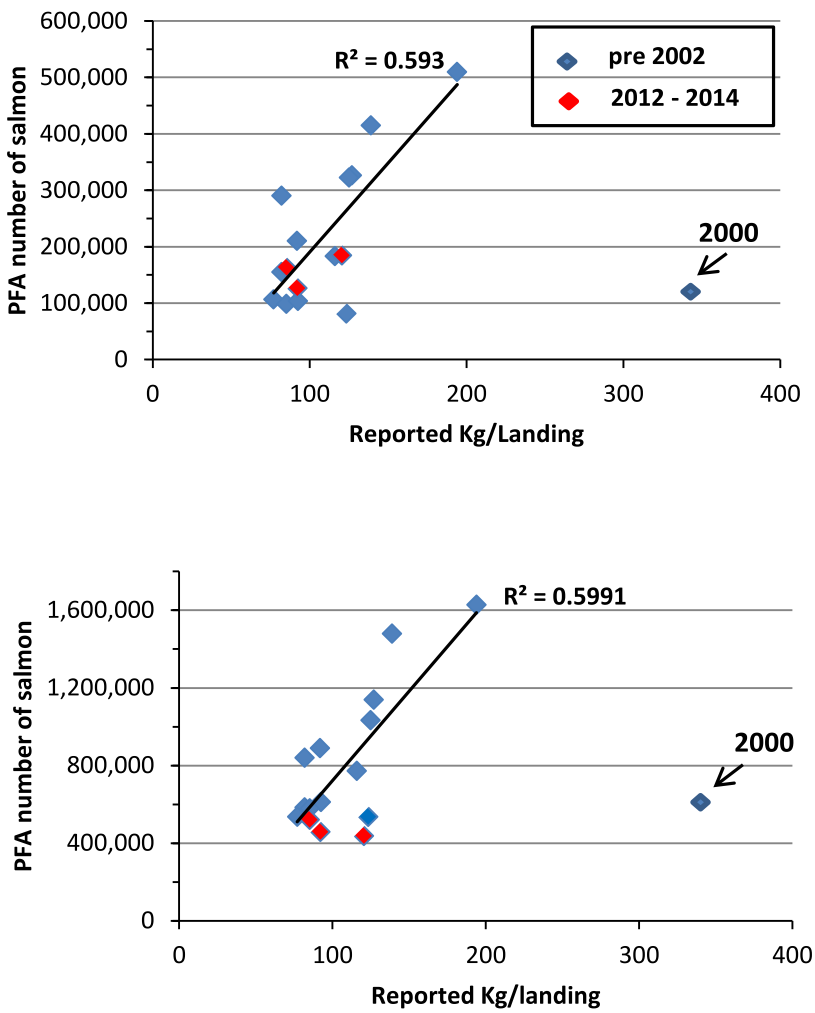


Figure 5.3.2. Relationship between cpue and pre-fishery abundance estimates for the non-maturing 1SW component of the North American (top panel) and southern European stock complexes (middle panel). Input data have been updated with revised PFA values and cpue data are slightly different from those previously reported by ICES. Regression relationships exclude the outlying point for 2000. Red points indicate available contemporary data (2012–2014).

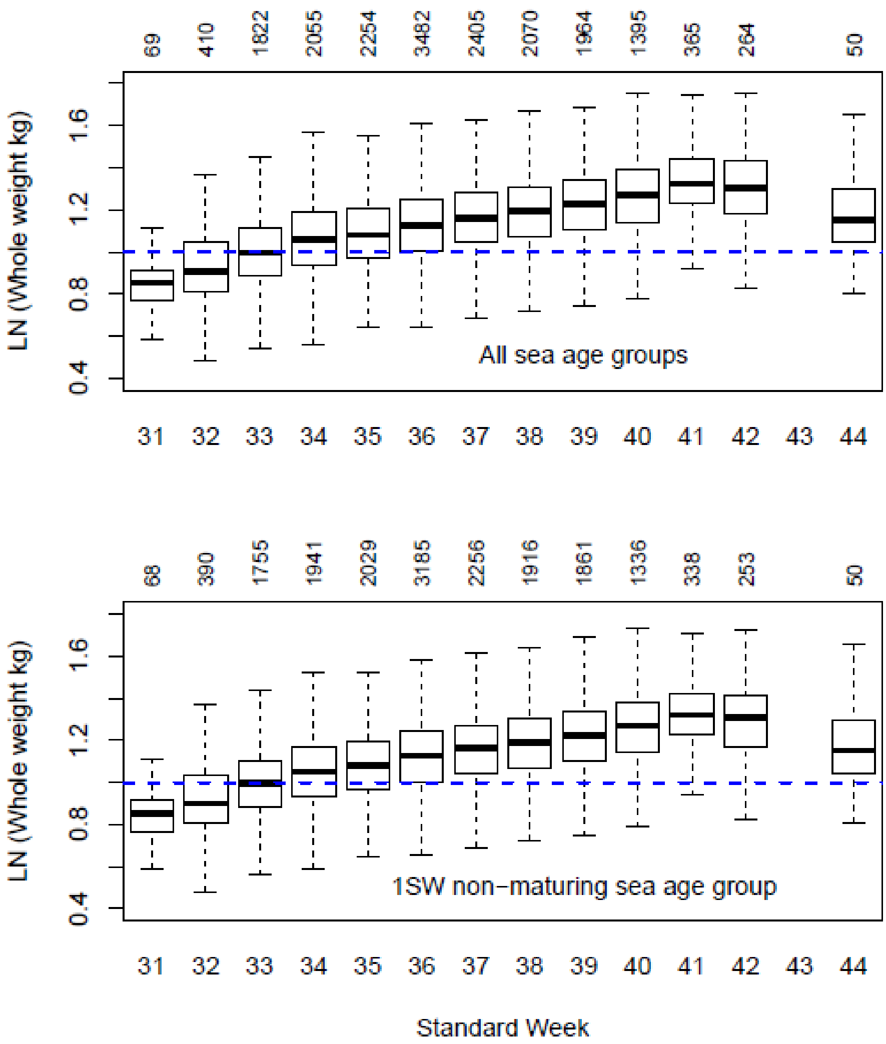


Figure 5.4.1. Boxplots of whole weight distributions (kg; LN(WW) by standard week for all sea age groups combined (upper panel) and for 1SW non-maturing salmon only (lower panel) for salmon sampled from the West Greenland fishery by standard week, all samples combined for 2002 to 2015. The samples are dominated by 1SW non-maturing sea age component. Boxplots are interpreted as: the horizontal line is the median, the rectangle is the inter-quartile range, and the vertical lines are +/- 1.5 the interquartile range. Sample sizes are indicated on the top of the plot.

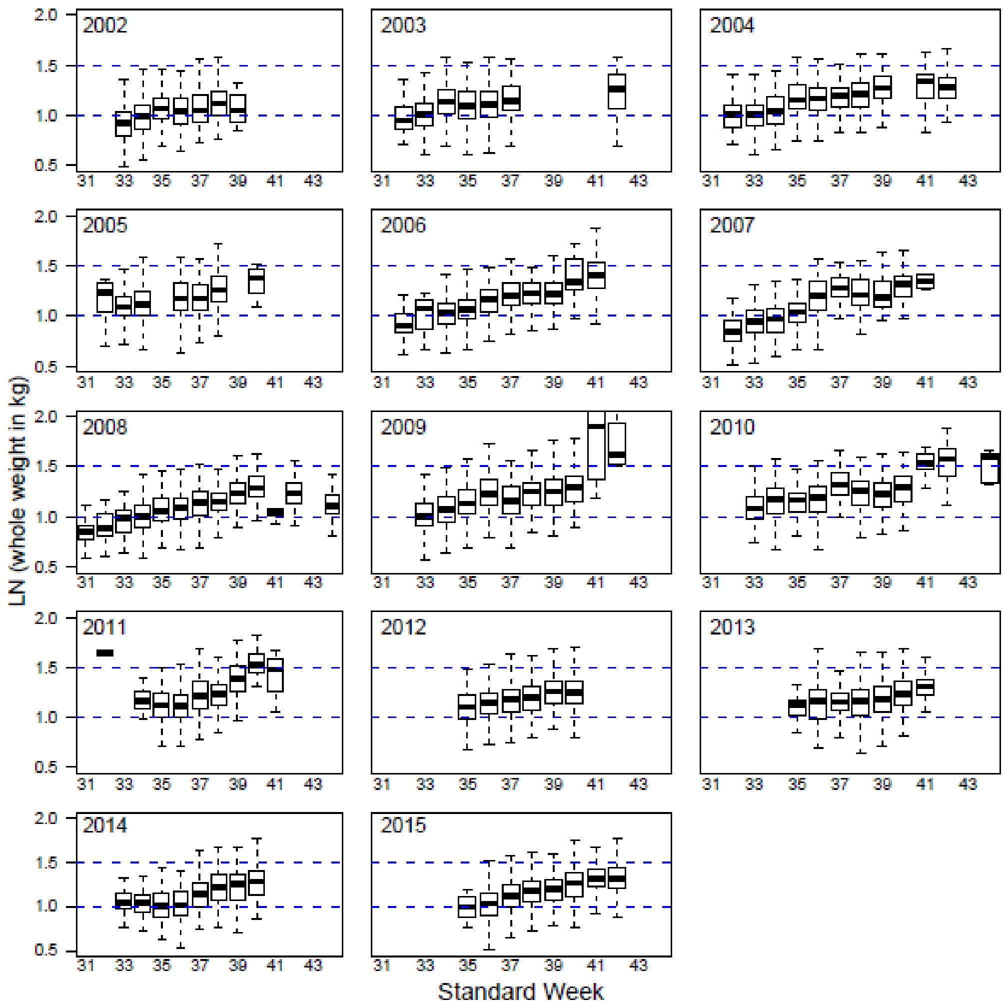


Figure 5.4.2. Boxplots of whole weight distributions (kg; LN(WW) by standard week and year for sea age groups combined for salmon sampled from the West Greenland fishery, 2002 to 2015. The samples are dominated by 1SW non-maturing sea age component. Boxplots are interpreted as in Figure 5.4.1.

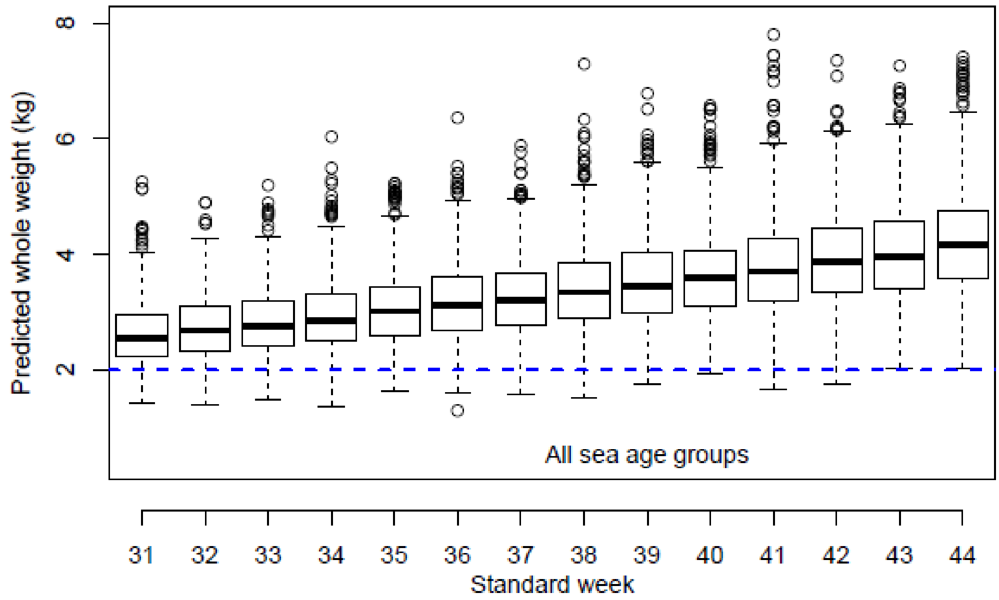


Figure 5.4.3. Predicted whole weight of salmon (all ages and continent of origin combined) at West Greenland by standard week. Boxplots are interpreted as in Figure 5.4.1. The circle symbols are values which are greater than +/- 1.5 the interquartile range.

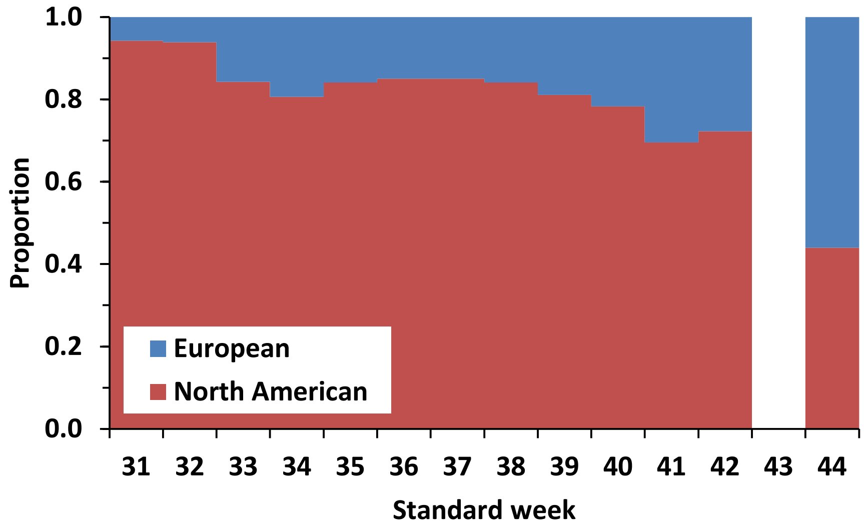


Figure 5.5.1. Continent of origin of sampled salmon from the West Greenland fishery by standard week, 2006–2015. Standard week 31 corresponds from 30 July to 5 August in every year. No samples were collected during week 43.

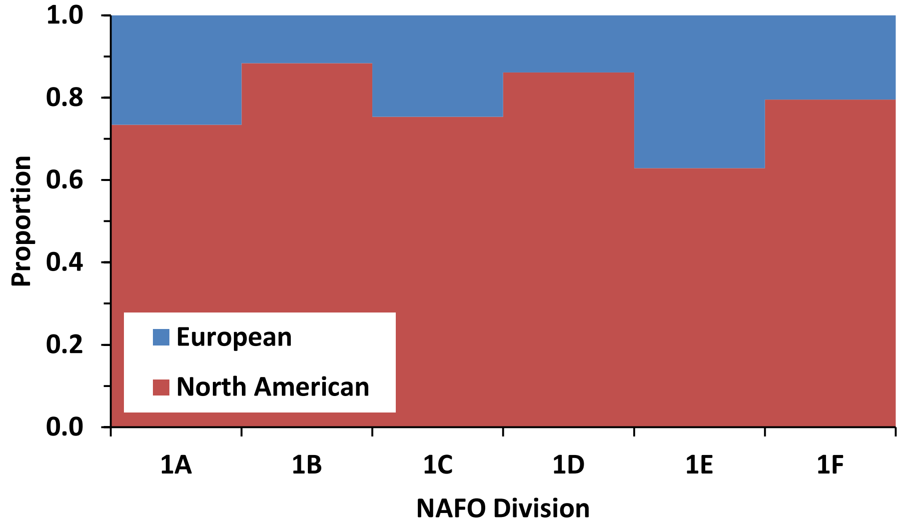
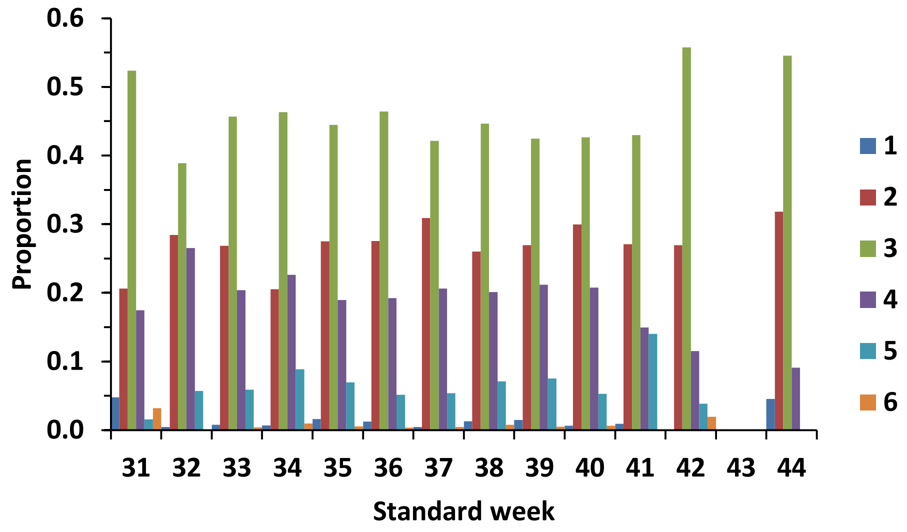


Figure 5.5.2. Continent of origin of sampled salmon from the West Greenland fishery by NAFO Division, 2006–2015.



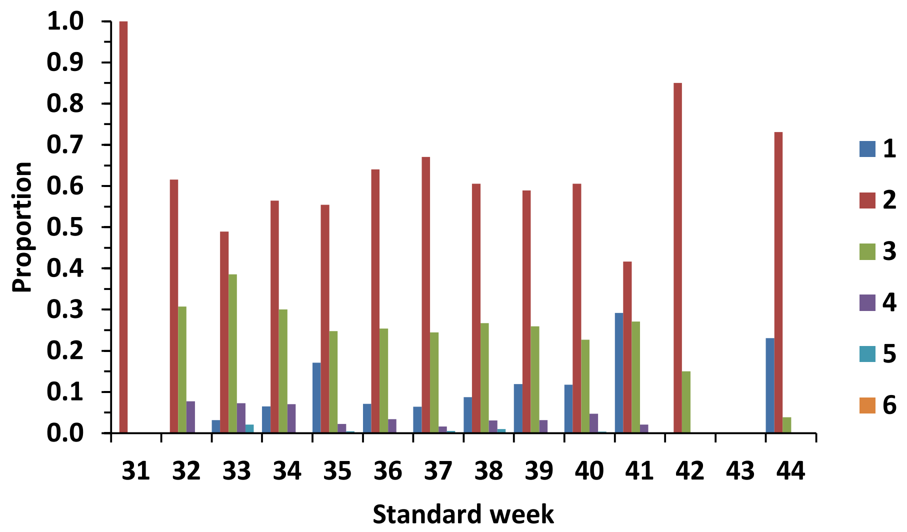


Figure 5.5.3. River age of North American origin (top) and European origin (bottom) sampled salmon from the West Greenland fishery by standard week, 2006–2015. Standard week 31 corresponds from 30 July to 5 August in every year. No samples were collected during week 43.

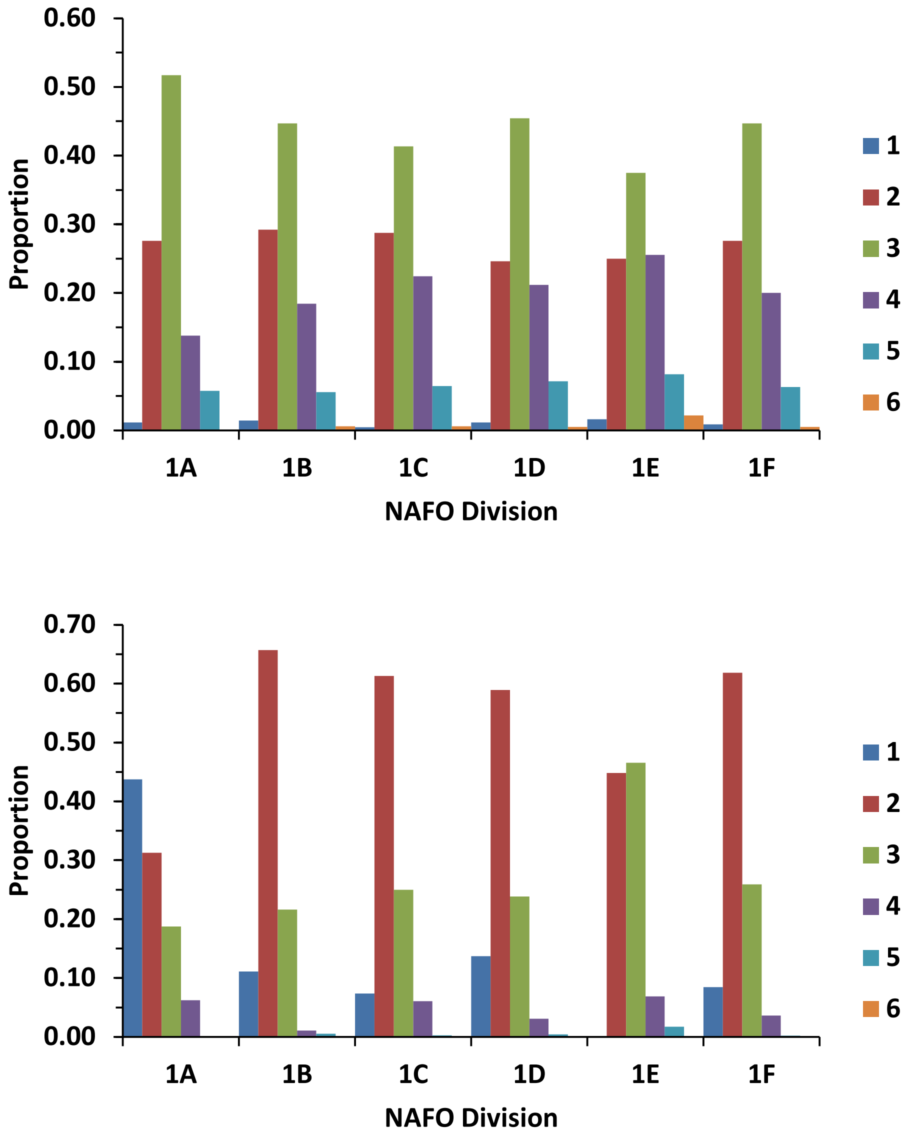


Figure 5.5.4. River age of North American origin (top) and European origin (bottom) sampled salmon from the West Greenland fishery by NAFO Division, 2006–2015.

Annex 1: List of Working Papers submitted to WGNAS 2016

WP No.	Authors	Title
1	Chaput, G., Kærgaard, K., Ó Maoiléidigh, N., and Saunders, R.	NASCO - WEST GREENLAND COMMISSION - REPORT OF THE FRAMEWORK OF INDICATORS WORKING GROUP 2016
2	Chaput, G., Breau, C., Cairns, D., Biron, M., Douglas, S., Guérard, M., Jones, R., Levy, A., Poole, R., Robertson, M., and Veinott, G.	Catch Statistics and Aquaculture Production Values for Canada: preliminary 2015, final 2014
3	Olmos, M. and Rivot, E.	First life cycle modelling framework for North America
4	Pénil, C.	French national report
5	Breau, C., Chaput, G., Biron, M., Cairns, D., and Douglas, S.	Status of Atlantic salmon in Canada's Gulf Region (Salmon Fishing Area 15 to 18)
6	Millan, M., Maoiléidigh, N. Ó., Gargan, P., White, J., O'Higgins, K., Dillane, M., McGrory, T., Bond, N., McLaughlin, D., Rogan, G., Cotter, D. and Poole, R.	NATIONAL REPORT FOR IRELAND - The 2015 Salmon Season
7	Levy, A.L., R.A. Jones, S.G. Heaslip and A.J.F. Gibson	Status of Atlantic Salmon in Canada's Maritimes Region (Salmon Fishing Areas 19 to 21, and 23)
8	Veinott, G.	Stock status of ethnic salmon Newfoundland region - Canada
9	Bailey, M., Sweka, J., Kocik, J., Atkinson, E. and Sheehan, T.	National report - USA
10	Sheehan, T.F., Davison, P., Deschamps, D., Drumm, A., Millane, M., Morgan, T., Music, P., Niven, A., Nygaard, R., King, T.L., Robertson, M. J. and Ó Maoiléidigh, N.	2015 Greenland sampling programme
11	Smith, G. W., Glover, R. and Middlemas, S.	National report for UK(Scotland): 2015 season
12	Middlemas S. and Smith, G.W.	Assessing Scottish salmon stocks with reference to Conservation Limits
13	Cefas, Environment Agency and Natural Resources Wales	Salmon stocks and fisheries in UK (England and Wales), 2015 - Preliminary assessment prepared for ICES, March 2016.
14	Russell, I.C., Fiske, P., Samokhvalov, I. and Hansen, J.	NASCO North East Atlantic Commission - Report of the Framework of Indicators Working Group, 2016.
15	ICES, 2016	Draft report of the Workshop on possible effects of salmonid aquaculture on wild Atlantic salmon populations in the North Atlantic (WKCULEF), 1–3 March, Copenhagen.
16	Ensing, D., Kennedy, R., Crozier, W. W., and Boylan, P.	National report for UK (Northern Ireland)
17	Ensing, D.	WGERAAS - an update
18	Gudbergsson, G. Antonsson, Th., Jonsson, I.R. and Sturlaugsson, J.	National report from Iceland. The 2015 salmon season.
19	Gudjonsson, S., Einarsson, S.M., Jonsson, I.R., and Gudbrandsson, J.	Marine feeding areas of Atlantic salmon from recoveries of ext tags

WP No.	Authors	Title
20	Prusov, S.	National report for Russia
21	Degerman, E.	National report for Sweden
22	Fiske, P., Wennevik, V., Jensen, A. J., Gjøsæter, H. and Bolstad, G.	National report - Norway
23	Nygaard, R.	National report - Greenland
24	Erkinaro, J., Orell, P., Länsman, Falkegård, M., Kuusela, J., Kylmäaho, M., Johansen, N., Ollila, J., Haantie, J. and Niemelä, E.	National report - Finland
25	de la Hoz, J.	National report - Spain
26	Rasmussen, G.	National report - Denmark
27	Potter, T.	WKTRUTTA2
28	Renkawitz, M.D., Sheehan, T.F., Dixon, H.J., and Nygaard, R.	Changing trophic structure and energy dynamics in the Northwest Atlantic: implications for Atlantic salmon feeding at West Greenland
29	Nygaard, R.	Salmon fishery at Greenland
30	Nygaard, R.	West Greenland phone survey
31	Potter, T	Documentation for NEAC Catch Options Model in R - 2016 (stock complex and country versions)
32	Guérard, M., and April, J.	Status of Atlantic salmon stocks in Québec in 2015
33	Chaput, G.	Smolt-to-Adult Supplementation
34	Ó Maoiléidigh, N.	WGRECORDS_highlights_for_WGNAS_2016
35	Chaput, G.	Development of PA reference points for Atlantic Salmon
36	Wennevik, V., Degerman, E. and Fiske, P.	Framework of indicators (FWI) for NEAC
37	Ó Maoiléidigh, N. and Sheehan, T.F.	Estimation of indices of abundance from historical and contemporary cpue data in the West Greenland fishery options for improving future estimates.

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Annex 4: Reported catch of salmon by sea age class 2015

Reported catch of salmon in numbers and weight (tonnes round fresh weight) by sea age class. Catches reported for 2015 may be provisional. Methods used for estimating age composition given in footnote.

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Greenland	1982	315532	-	17810	-	-	-	-	-	-	-	-	-	2688	-	336030	1077
	1983	90500	-	8100	-	-	-	-	-	-	-	-	-	1400	-	100000	310
	1984	78942	-	10442	-	-	-	-	-	-	-	-	-	630	-	90014	297
	1985	292181	-	18378	-	-	-	-	-	-	-	-	-	934	-	311493	864
	1986	307800	-	9700	-	-	-	-	-	-	-	-	-	2600	-	320100	960
	1987	297128	-	6287	-	-	-	-	-	-	-	-	-	2898	-	306313	966
	1988	281356	-	4602	-	-	-	-	-	-	-	-	-	2296	-	288254	893
	1989	110359	-	5379	-	-	-	-	-	-	-	-	-	1875	-	117613	337
	1990	97271	-	3346	-	-	-	-	-	-	-	-	-	860	-	101477	274
	1991	167551	415	8809	53	-	-	-	-	-	-	-	-	743	4	177103	472
	1992	82354	217	2822	18	-	-	-	-	-	-	-	-	364	2	85540	237
	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1995	31241	-	558	-	-	-	-	-	-	-	-	-	478	-	32277	83
	1996	30613	-	884	-	-	-	-	-	-	-	-	-	568	-	32065	92
	1997	20980	-	134	-	-	-	-	-	-	-	-	-	124	-	21238	58
	1998	3901	-	17	-	-	-	-	-	-	-	-	-	88	-	4006	11
	1999	6124	18	50	0	-	-	-	-	-	-	-	-	84	1	6258	19
	2000	7715	21	0	0	-	-	-	-	-	-	-	-	140	0	7855	21
	2001	14795	40	324	2	-	-	-	-	-	-	-	-	293	1	15412	43
	2002	3344	10	34	0	-	-	-	-	-	-	-	-	27	0	3405	10
	2003	3933	12	38	0	-	-	-	-	-	-	-	-	73	0	4044	12
	2004	4488	14	51	0	-	-	-	-	-	-	-	-	88	0	4627	15
	2005	3120	13	40	0	-	-	-	-	-	-	-	-	180	1	3340	14
	2006	5746	20	183	1	-	-	-	-	-	-	-	-	224	1	6153	22
	2007	6037	24	82	0	6	0	-	-	-	-	-	-	144	1	6263	25
	2008	9311	26	47	0	0	0	-	-	-	-	-	-	177	1	9535	26
	2009	7442	27	268	1	0	0	-	-	-	-	-	-	328	1	8038	29
	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11747	40
	2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8396	28
	2012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9689	33
	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12920	47
	2014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18200	58
	2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17845	57

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Canada	1982	358000	716	-	-	-	-	-	-	-	-	240000	1082	-	-	598000	1798
	1983	265000	513	-	-	-	-	-	-	-	-	201000	911	-	-	466000	1424
	1984	234000	467	-	-	-	-	-	-	-	-	143000	645	-	-	377000	1112
	1985	333084	593	-	-	-	-	-	-	-	-	122621	540	-	-	455705	1133
	1986	417269	780	-	-	-	-	-	-	-	-	162305	779	-	-	579574	1559
	1987	435799	833	-	-	-	-	-	-	-	-	203731	951	-	-	639530	1784
	1988	372178	677	-	-	-	-	-	-	-	-	137637	633	-	-	509815	1310
	1989	304620	549	-	-	-	-	-	-	-	-	135484	590	-	-	440104	1139
	1990	233690	425	-	-	-	-	-	-	-	-	106379	486	-	-	340069	911
	1991	189324	341	-	-	-	-	-	-	-	-	82532	370	-	-	271856	711
	1992	108901	199	-	-	-	-	-	-	-	-	66357	323	-	-	175258	522
	1993	91239	159	-	-	-	-	-	-	-	-	45416	214	-	-	136655	373
	1994	76973	139	-	-	-	-	-	-	-	-	42946	216	-	-	119919	355
	1995	61940	107	-	-	-	-	-	-	-	-	34263	153	-	-	96203	260
	1996	82490	138	-	-	-	-	-	-	-	-	31590	154	-	-	114080	292
	1997	58988	103	-	-	-	-	-	-	-	-	26270	126	-	-	85258	229
	1998	51251	87	-	-	-	-	-	-	-	-	13274	70	-	-	64525	157
	1999	50901	88	-	-	-	-	-	-	-	-	11368	64	-	-	62269	152
	2000	55263	95	-	-	-	-	-	-	-	-	10571	58	-	-	65834	153
	2001	51225	86	-	-	-	-	-	-	-	-	11575	61	-	-	62800	147
	2002	53464	99	-	-	-	-	-	-	-	-	8439	49	-	-	61903	148
	2003	46768	81	-	-	-	-	-	-	-	-	11218	60	-	-	57986	141
	2004	54253	94	-	-	-	-	-	-	-	-	12933	68	-	-	67186	162
	2005	47368	83	-	-	-	-	-	-	-	-	10937	56	-	-	58305	139
	2006	46747	82	-	-	-	-	-	-	-	-	11248	55	-	-	57995	137
	2007	37075	63	-	-	-	-	-	-	-	-	10311	49	-	-	47386	112
	2008	58386	100	-	-	-	-	-	-	-	-	11736	57	-	-	70122	158
	2009	42943	74	-	-	-	-	-	-	-	-	11226	52	-	-	54169	126
	2010	58531	100	-	-	-	-	-	-	-	-	10972	53	-	-	69503	153
	2011	63756	110	-	-	-	-	-	-	-	-	13668	69	-	-	77424	179
	2012	43192	74	-	-	-	-	-	-	-	-	10980	52	-	-	54172	126
	2013	41311	72	-	-	-	-	-	-	-	-	13887	66	-	-	55198	138
	2014	44171	77	-	-	-	-	-	-	-	-	8756	41	-	-	45328	106
	2015	45152	80	-	-	-	-	-	-	-	-	11433	54	-	-	56585	134

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
USA	1982	33	-	1206	-	5	-	-	-	-	-	-	-	21	-	1265	6
	1983	26	-	314	1	2	-	-	-	-	-	-	-	6	-	348	1
	1984	50	-	545	2	2	-	-	-	-	-	-	-	12	-	609	2
	1985	23	-	528	2	2	-	-	-	-	-	-	-	13	-	566	2
	1986	76	-	482	2	2	-	-	-	-	-	-	-	3	-	563	2
	1987	33	-	229	1	10	-	-	-	-	-	-	-	10	-	282	1
	1988	49	-	203	1	3	-	-	-	-	-	-	-	4	-	259	1
	1989	157	0	325	1	2	-	-	-	-	-	-	-	3	-	487	2
	1990	52	0	562	2	12	-	-	-	-	-	-	-	16	-	642	2
	1991	48	0	185	1	1	-	-	-	-	-	-	-	4	-	238	1
	1992	54	0	138	1	1	-	-	-	-	-	-	-	-	-	193	1
	1993	17	-	133	1	0	0	-	-	-	-	-	-	2	-	152	1
	1994	12	-	0	0	0	0	-	-	-	-	-	-	-	-	12	0
	1995	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	1996	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	1997	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	1998	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	1999	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2000	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2001	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2002	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2003	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2004	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2005	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2006	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2007	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2008	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2009	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2010	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2011	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2012	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2013	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2014	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0
	2015	0	0	0	0	0	0	-	-	-	-	-	-	-	-	0	0

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Faroe Islands	1982/83	9086	-	101227	-	21663	-	448	-	29	-	-	-	-	-	132453	625
	1983/84	4791	-	107199	-	12469	-	49	-	-	-	-	-	-	-	124508	651
	1984/85	324	-	123510	-	9690	-	-	-	-	-	-	-	1653	-	135177	598
	1985/86	1672	-	141740	-	4779	-	76	-	-	-	-	-	6287	-	154554	545
	1986/87	76	-	133078	-	7070	-	80	-	-	-	-	-	-	-	140304	539
	1987/88	5833	-	55728	-	3450	-	0	-	-	-	-	-	-	-	65011	208
	1988/89	1351	-	86417	-	5728	-	0	-	-	-	-	-	-	-	93496	309
	1989/90	1560	-	103407	-	6463	-	6	-	-	-	-	-	-	-	111436	364
	1990/91	631	-	52420	-	4390	-	8	-	-	-	-	-	-	-	57449	202
	1991/92	16	-	7611	-	837	-	-	-	-	-	-	-	-	-	8464	31
	1992/93	-	-	4212	-	1203	-	-	-	-	-	-	-	-	-	5415	22
	1993/94	-	-	1866	-	206	-	-	-	-	-	-	-	-	-	2072	7
	1994/95	-	-	1807	-	156	-	-	-	-	-	-	-	-	-	1963	6
	1995/96	-	-	268	-	14	-	-	-	-	-	-	-	-	-	282	1
	1996/97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
	1997/98	339	-	1315	-	109	-	-	-	-	-	-	-	-	-	1763	6
	1998/99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
	1999/00	225	-	1560	-	205	-	-	-	-	-	-	-	-	-	1990	8
	2000/01	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2001/02	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2002/03	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2003/04	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2004/05	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2005/06	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2006/07	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2007/08	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2008/09	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2009/10	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2010/11	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2011/12	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2012/13	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2013/14	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2014/15	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0
	2015/16	0	-	0	-	0	-	-	-	-	-	-	-	-	-	0	0

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Finland	1982	2598	5	-	-	-	-	-	-	-	-	5408	49	-	-	8006	54
	1983	3916	7	-	-	-	-	-	-	-	-	6050	51	-	-	9966	58
	1984	4899	9	-	-	-	-	-	-	-	-	4726	37	-	-	9625	46
	1985	6201	11	-	-	-	-	-	-	-	-	4912	38	-	-	11113	49
	1986	6131	12	-	-	-	-	-	-	-	-	3244	25	-	-	9375	37
	1987	8696	15	-	-	-	-	-	-	-	-	4520	34	-	-	13216	49
	1988	5926	9	-	-	-	-	-	-	-	-	3495	27	-	-	9421	36
	1989	10395	19	-	-	-	-	-	-	-	-	5332	33	-	-	15727	52
	1990	10084	19	-	-	-	-	-	-	-	-	5600	41	-	-	15684	60
	1991	9213	17	-	-	-	-	-	-	-	-	6298	53	-	-	15511	70
	1992	15017	28	-	-	-	-	-	-	-	-	6284	49	-	-	21301	77
	1993	11157	17	-	-	-	-	-	-	-	-	8180	53	-	-	19337	70
	1994	7493	11	-	-	-	-	-	-	-	-	6230	38	-	-	13723	49
	1995	7786	11	-	-	-	-	-	-	-	-	5344	38	-	-	13130	49
	1996	12230	20	1275	5	1424	12	234	4	19	1	-	-	354	3	15536	44
	1997	10341	15	2419	10	1674	15	141	2	22	1	-	-	418	3	15015	45
	1998	11792	19	1608	7	1660	16	147	3	-	-	-	-	460	3	15667	48
	1999	17929	31	2055	8	1643	17	120	2	6	0	-	-	592	3	22345	63
	2000	20199	37	5247	25	2502	25	101	2	0	0	-	-	1090	7	29139	96
	2001	14979	25	6091	28	5451	59	101	2	0	0	-	-	2137	12	28759	126
	2002	8095	15	5550	20	3845	41	135	2	10	0	-	-	2466	15	20101	94
	2003	8375	15	2332	8	3551	33	145	2	5	0	-	-	2424	15	16832	75
	2004	4177	7	1480	6	1077	10	246	4	6	0	-	-	1430	11	8416	39
	2005	10412	19	1287	5	1420	14	56	1	40	1	-	-	804	7	14019	47
	2006	17359	30	4217	18	1350	13	62	1	0	0	-	-	764	5	23752	67
	2007	4861	7	5368	20	2287	22	17	0	6	0	-	-	1195	8	13734	59
	2008	5194	8	2518	8	4161	40	227	4	0	0	-	-	1928	11	14028	71
	2009	9960	13	1585	5	1252	11	223	3	0	0	-	-	899	5	13919	38
	2010	7260	13	3270	13	1244	11	282	4	5	0	-	-	996	8	13057	49
	2011	9043	15	1859	8	1434	13	173	3	10	0	-	-	789	5	13308	44
	2012	15904	30	2997	13	1234	11	197	3	5	0	-	-	967	7	21304	64
	2013	9408	14	3044	15	1186	11	63	1	7	0	-	-	806	5	14514	46
	2014	13031	26	3323	13	928	9	96	2	0	0	-	-	1284	7	18662	58
	2015	8255	13	3562	16	1069	9	79	1	0	0	-	-	903	6	13868	45

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Iceland	1991	29601	-	11892	-	-	-	-	-	-	-	-	-	-	-	41493	130
	1992	38538	-	15312	-	-	-	-	-	-	-	-	-	-	-	53850	175
	1993	36640	-	11541	-	-	-	-	-	-	-	-	-	-	-	48181	160
	1994	24224	59	14088	76	-	-	-	-	-	-	-	-	-	-	38312	135
	1995	32767	90	13136	56	-	-	-	-	-	-	-	-	-	-	45903	145
	1996	26927	66	9785	52	-	-	-	-	-	-	-	-	-	-	36712	118
	1997	21684	56	8178	41	-	-	-	-	-	-	-	-	-	-	29862	97
	1998	32224	81	7272	37	-	-	-	-	-	-	-	-	-	-	39496	119
	1999	22620	59	9883	52	-	-	-	-	-	-	-	-	-	-	32503	111
	2000	20270	49	4319	24	-	-	-	-	-	-	-	-	-	-	24589	73
	2001	18538	46	5289	28	-	-	-	-	-	-	-	-	-	-	23827	74
	2002	25277	64	5194	26	-	-	-	-	-	-	-	-	-	-	30471	90
	2003	24738	61	8119	37	-	-	-	-	-	-	-	-	-	-	32857	99
	2004	32600	84	6128	28	-	-	-	-	-	-	-	-	-	-	38728	111
	2005	39980	101	5941	28	-	-	-	-	-	-	-	-	-	-	45921	129
	2006	29857	71	5635	23	-	-	-	-	-	-	-	-	-	-	35492	93
	2007	31899	74	3262	15	-	-	-	-	-	-	-	-	-	-	35161	89
	2008	44391	106	5129	26	-	-	-	-	-	-	-	-	-	-	49520	132
	2009	43981	103	4561	24	-	-	-	-	-	-	-	-	-	-	48542	126
	2010	43457	105	9251	43	-	-	-	-	-	-	-	-	-	-	52708	147
	2011	28550	74	4854	24	-	-	-	-	-	-	-	-	-	-	33404	98
	2012	17011	15	2848	14	-	-	-	-	-	-	-	-	-	-	19859	29
	2013	40412	97	4274	19	-	-	-	-	-	-	-	-	-	-	44686	116
	2014	13593	29	3317	17	-	-	-	-	-	-	-	-	-	-	16910	47
	2015	35835	84	3548	19	-	-	-	-	-	-	-	-	-	-	39383	103

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Sweden	1990	7430	18	-	-	-	-	-	-	-	-	3135	15	-	-	10565	33
	1991	8990	20	-	-	-	-	-	-	-	-	3620	18	-	-	12610	38
	1992	9850	23	-	-	-	-	-	-	-	-	4655	26	-	-	14505	49
	1993	10540	23	-	-	-	-	-	-	-	-	6370	33	-	-	16910	56
	1994	8035	18	-	-	-	-	-	-	-	-	4660	26	-	-	12695	44
	1995	9761	22	-	-	-	-	-	-	-	-	2770	14	-	-	12531	36
	1996	6008	14	-	-	-	-	-	-	-	-	3542	19	-	-	9550	33
	1997	2747	7	-	-	-	-	-	-	-	-	2307	12	-	-	5054	19
	1998	2421	6	-	-	`	-	-	-	-	-	1702	9	-	-	4123	15
	1999	3573	8	-	-	-	-	-	-	-	-	1460	8	-	-	5033	16
	2000	7103	18	-	-	-	-	-	-	-	-	3196	15	-	-	10299	33
	2001	4634	12	-	-	-	-	-	-	-	-	3853	21	-	-	8487	33
	2002	4733	12	-	-	-	-	-	-	-	-	2826	16	-	-	7559	28
	2003	2891	7	-	-	-	-	-	-	-	-	3214	18	-	-	6105	25
	2004	2494	6	-	-	-	-	-	-	-	-	2330	13	-	-	4824	19
	2005	2122	5	-	-	-	-	-	-	-	-	1770	10	-	-	3892	15
	2006	2585	4	-	-	-	-	-	-	-	-	1772	10	-	-	4357	14
	2007	1228	3	-	-	-	-	-	-	-	-	2442	13	-	-	3670	16
	2008	1197	3	-	-	-	-	-	-	-	-	2752	16	-	-	3949	18
	2009	1269	3	-	-	-	-	-	-	-	-	2495	14	-	-	3764	17
	2010	2109	5	-	-	-	-	-	-	-	-	3066	17	-	-	5175	22
	2011	2726	7	-	-	-	-	-	-	-	-	5759	32	-	-	8485	39
	2012	1900	5	-	-	-	-	-	-	-	-	4826	25	-	-	6726	30
	2013	1052	3	-	-	-	-	-	-	-	-	1996	12	-	-	3048	15
	2014	2887	8	-	-	-	-	-	-	-	-	3657	22	-	-	6544	30
	2015	1028	2	-	-	-	-	-	-	-	-	2569	15	-	-	3597	18

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Norway	1981	221566	467	-	-	-	-	-	-	-	-	213943	1189	-	-	435509	1656
	1982	163120	363	-	-	-	-	-	-	-	-	174229	985	-	-	337349	1348
	1983	278061	593	-	-	-	-	-	-	-	-	171361	957	-	-	449422	1550
	1984	294365	628	-	-	-	-	-	-	-	-	176716	995	-	-	471081	1623
	1985	299037	638	-	-	-	-	-	-	-	-	162403	923	-	-	461440	1561
	1986	264849	556	-	-	-	-	-	-	-	-	191524	1042	-	-	456373	1598
	1987	235703	491	-	-	-	-	-	-	-	-	153554	894	-	-	389257	1385
	1988	217617	420	-	-	-	-	-	-	-	-	120367	656	-	-	337984	1076
	1989	220170	436	-	-	-	-	-	-	-	-	80880	469	-	-	301050	905
	1990	192500	385	-	-	-	-	-	-	-	-	91437	545	-	-	283937	930
	1991	171041	342	-	-	-	-	-	-	-	-	92214	535	-	-	263255	877
	1992	151291	301	-	-	-	-	-	-	-	-	92717	566	-	-	244008	867
	1993	153407	312	62403	284	35147	327	-	-	-	-	-	-	-	-	250957	923
	1994	-	415	-	319	-	262	-	-	-	-	-	-	-	-	-	996
	1995	134341	249	71552	341	27104	249	-	-	-	-	-	-	-	-	232997	839
	1996	110085	215	69389	322	27627	249	-	-	-	-	-	-	-	-	207101	786
	1997	124387	241	52842	238	16448	151	-	-	-	-	-	-	-	-	193677	630
	1998	162185	296	66767	306	15568	139	-	-	-	-	-	-	-	-	244520	741
	1999	164905	318	70825	326	18669	167	-	-	-	-	-	-	-	-	254399	811
	2000	250468	504	99934	454	24319	219	-	-	-	-	-	-	-	-	374721	1177
	2001	207934	417	117759	554	33047	295	-	-	-	-	-	-	-	-	358740	1266
	2002	127039	249	98055	471	33013	299	-	-	-	-	-	-	-	-	258107	1019
	2003	185574	363	87993	410	31099	298	-	-	-	-	-	-	-	-	304666	1071
	2004	108645	207	77343	371	23173	206	-	-	-	-	-	-	-	-	209161	784
	2005	165900	307	69488	320	27507	261	-	-	-	-	-	-	-	-	262895	888
	2006	142218	261	99401	453	23529	218	-	-	-	-	-	-	-	-	265148	932
	2007	78165	140	79146	363	28896	264	-	-	-	-	-	-	-	-	186207	767
	2008	89228	170	69027	314	34124	322	-	-	-	-	-	-	-	-	192379	807
	2009	73045	135	53725	241	23663	219	-	-	-	-	-	-	-	-	150433	595
	2010	98490	184	56260	250	22310	208	-	-	-	-	-	-	-	-	177060	642
	2011	71597	140	81351	374	20270	183	-	-	-	-	-	-	-	-	173218	696
	2012	81638	162	63985	289	26689	245	-	-	-	-	-	-	-	-	172312	696
	2013	70059	117	49264	227	14367	131	-	-	-	-	-	-	-	-	133690	475
	2014	85419	171	47347	203	12415	116									145181	490
	2015	83196	153	64069	296	15407	134	-	-	-	-	-	-	-	-	162672	583

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Russia	1987	97242	-	27135	-	9539	-	556	-	18	-	-	-	2521	-	137011	564
	1988	53158	-	33395	-	10256	-	294	-	25	-	-	-	2937	-	100065	420
	1989	78023	-	23123	-	4118	-	26	-	0	-	-	-	2187	-	107477	364
	1990	70595	-	20633	-	2919	-	101	-	0	-	-	-	2010	-	96258	313
	1991	40603	-	12458	-	3060	-	650	-	0	-	-	-	1375	-	58146	215
	1992	34021	-	8880	-	3547	-	180	-	0	-	-	-	824	-	47452	167
	1993	28100	-	11780	-	4280	-	377	-	0	-	-	-	1470	-	46007	139
	1994	30877	-	10879	-	2183	-	51	-	0	-	-	-	555	-	44545	141
	1995	27775	62	9642	50	1803	15	6	0	0	0	-	-	385	2	39611	129
	1996	33878	79	7395	42	1084	9	40	1	0	0	-	-	41	1	42438	131
	1997	31857	72	5837	28	672	6	38	1	0	0	-	-	559	3	38963	110
	1998	34870	92	6815	33	181	2	28	0	0	0	-	-	638	3	42532	130
	1999	24016	66	5317	25	499	5	0	0	0	0	-	-	1131	6	30963	102
	2000	27702	75	7027	34	500	5	3	0	0	0	-	-	1853	9	37085	123
	2001	26472	61	7505	39	1036	10	30	0	0	0	-	-	922	5	35965	115
	2002	24588	60	8720	43	1284	12	3	0	0	0	-	-	480	3	35075	118
	2003	22014	50	8905	42	1206	12	20	0	0	0	-	-	634	4	32779	107
	2004	17105	39	6786	33	880	7	0	0	0	0	-	-	529	3	25300	82
	2005	16591	39	7179	33	989	8	1	0	0	0	-	-	439	3	25199	82
	2006	22412	54	5392	28	759	6	0	0	0	0	-	-	449	3	29012	91
	2007	12474	30	4377	23	929	7	0	0	0	0	-	-	277	2	18057	62
	2008	13404	28	8674	39	669	4	8	0	0	0	-	-	312	2	23067	73
	2009	13580	30	7215	35	720	5	36	0	0	0	-	-	173	1	21724	71
	2010	14834	33	9821	48	844	6	49	0	0	0	-	-	186	1	25734	88
	2011	13779	31	9030	44	747	5	51	0	0	0	-	-	171	1	23778	82
	2012	17484	42	6560	34	738	5	53	0	0	0	-	-	173	1	25008	83
	2013	14576	35	6938	36	857	6	27	0	0	0	-	-	93	1	22491	78
	2014	15129	35	7936	38	1015	7	34	0	0	0	-	-	106	1	24220	81
	2015	15011	38	7082	36	723	5	19	0	0	0			277	1	23112	80

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Ireland	1980	248333	745	-	-	-	-	-	-	-	-	39608	202	-	-	287941	947
	1981	173667	521	-	-	-	-	-	-	-	-	32159	164	-	-	205826	685
	1982	310000	930	-	-	-	-	-	-	-	-	12353	63	-	-	322353	993
	1983	502000	1506	-	-	-	-	-	-	-	-	29411	150	-	-	531411	1656
	1984	242666	728	-	-	-	-	-	-	-	-	19804	101	-	-	262470	829
	1985	498333	1495	-	-	-	-	-	-	-	-	19608	100	-	-	517941	1595
	1986	498125	1594	-	-	-	-	-	-	-	-	28335	136	-	-	526460	1730
	1987	358842	1112	-	-	-	-	-	-	-	-	27609	127	-	-	386451	1239
	1988	559297	1733	-	-	-	-	-	-	-	-	30599	141	-	-	589896	1874
	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	330558	1079
	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	188890	567
	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	135474	404
	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	235435	631
	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200120	541
	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	286266	804
	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	288225	790
	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	249623	685
	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	209214	570
	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	237663	624
	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	180477	515
	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	228220	621
	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	270963	730
	2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	256808	682
	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	204145	551
	2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	180953	489
	2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	156308	422
	2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120834	326
	2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30946	84
	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33200	89
	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25170	68
	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36508	99
	2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32308	87
	2012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32599	88
	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32300	87
	2014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19422	52
	2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23425	63

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
UK	1985	62815	-	-	-	-	-	-	-	-	-	32716	-	-	-	95531	361
(England & Wales)	1986	68759	-	-	-	-	-	-	-	-	-	42035	-	-	-	110794	430
	1987	56739	-	-	-	-	-	-	-	-	-	26700	-	-	-	83439	302
	1988	76012	-	-	-	-	-	-	-	-	-	34151	-	-	-	110163	395
	1989	54384	-	-	-	-	-	-	-	-	-	29284	-	-	-	83668	296
	1990	45072	-	-	-	-	-	-	-	-	-	41604	-	-	-	86676	338
	1991	36671	-	-	-	-	-	-	-	-	-	14978	-	-	-	51649	200
	1992	34331	-	-	-	-	-	-	-	-	-	10255	-	-	-	44586	171
	1993	56033	-	-	-	-	-	-	-	-	-	13144	-	-	-	69177	248
	1994	67853	-	-	-	-	-	-	-	-	-	20268	-	-	-	88121	324
	1995	57944	-	-	-	-	-	-	-	-	-	22534	-	-	-	80478	295
	1996	30352	-	-	-	-	-	-	-	-	-	16344	-	-	-	46696	183
	1997	30203	-	-	-	-	-	-	-	-	-	11171	-	-	-	41374	142
	1998	30272	-	-	-	-	-	-	-	-	-	6645	-	-	-	36917	123
	1999	27953	-	-	-	-	-	-	-	-	-	13154	-	-	-	41107	150
	2000	48153	-	-	-	-	-	-	-	-	-	12800	-	-	-	60953	219
	2001	38480	-	-	-	-	-	-	-	-	-	12827	-	-	-	51307	184
	2002	34708	-	-	-	-	-	-	-	-	-	10961	-	-	-	45669	161
	2003	14656	-	-	-	-	-	-	-	-	-	7550	-	-	-	22206	89
	2004	24753	-	-	-	-	-	-	-	-	-	5806	-	-	-	30559	111
	2005	19883	-	-	-	-	-	-	-	-	-	6279	-	-	-	26162	97
	2006	17204	-	-	-	-	-	-	-	-	-	4852	-	-	-	22056	80
	2007	15540	-	-	-	-	-	-	-	-	-	4383	-	-	-	19923	67
	2008	14467	-	-	-	-	-	-	-	-	-	4569	-	-	-	19036	64
	2009	10015	-	-	-	-	-	-	-	-	-	3895	-	-	-	13910	54
	2010	25502	-	-	-	-	-	-	-	-	-	7193	-	-	-	32695	109
	2011	19708	-	-	-	-	-	-	-	-	-	14867	-	-	-	34575	136
	2012	7493	-	-	-	-	-	-	-	-	-	7433	-	-	-	14926	58
	2013	13113	-	-	-	-	-	-	-	-	-	9495	-	-	-	22608	84
	2014	7678	-	-	-	-	-	-	-	-	-	6541	-	-	-	14219	52
	2015	9274	-	-	-	-	-	-	-	-	-	10458	-	-	-	19732	69

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
UK (Scotland)	1982	208061	496	-	-	-	-	-	-	-	-	128242	596	-	-	336303	1092
	1983	209617	549	-	-	-	-	-	-	-	-	145961	672	-	-	355578	1221
	1984	213079	509	-	-	-	-	-	-	-	-	107213	504	-	-	320292	1013
	1985	158012	399	-	-	-	-	-	-	-	-	114648	514	-	-	272660	913
	1986	202838	525	-	-	-	-	-	-	-	-	148197	744	-	-	351035	1269
	1987	164785	419	-	-	-	-	-	-	-	-	103994	503	-	-	268779	922
	1988	149098	381	-	-	-	-	-	-	-	-	112162	501	-	-	261260	882
	1989	174941	431	-	-	-	-	-	-	-	-	103886	464	-	-	278827	895
	1990	81094	201	-	-	-	-	-	-	-	-	87924	423	-	-	169018	624
	1991	73608	177	-	-	-	-	-	-	-	-	65193	285	-	-	138801	462
	1992	101676	238	-	-	-	-	-	-	-	-	82841	361	-	-	184517	600
	1993	94517	227	-	-	-	-	-	-	-	-	71726	320	-	-	166243	547
	1994	99479	248	-	-	-	-	-	-	-	-	85404	400	-	-	184883	648
	1995	89971	224	-	-	-	-	-	-	-	-	78511	364	-	-	168482	588
	1996	66465	160	-	-	-	-	-	-	-	-	57998	267	-	-	124463	427
	1997	46866	114	-	-	-	-	-	-	-	-	40459	182	-	-	87325	296
	1998	53503	121	-	-	-	-	-	-	-	-	39264	162	-	-	92767	283
	1999	25255	57	-	-	-	-	-	-	-	-	30694	143	-	-	55949	199
	2000	44033	114	-	-	-	-	-	-	-	-	36767	161	-	-	80800	275
	2001	42586	101	-	-	-	-	-	-	-	-	34926	150	-	-	77512	251
	2002	31385	73	-	-	-	-	-	-	-	-	26403	118	-	-	57788	191
	2003	29598	71	-	-	-	-	-	-	-	-	27588	122	-	-	57091	192
	2004	37631	88	-	-	-	-	-	-	-	-	36856	159	-	-	74033	245
	2005	39093	91	-	-	-	-	-	-	-	-	28666	126	-	-	67117	215
	2006	36668	75	-	-	-	-	-	-	-	-	27620	118	-	-	63848	192
	2007	32335	71	-	-	-	-	-	-	-	-	24098	100	-	-	56433	171
	2008	23431	51	-	-	-	-	-	-	-	-	25745	110	-	-	49176	161
	2009	18189	37	-	-	-	-	-	-	-	-	19185	83	-	-	37374	121
	2010	33426	69	-	-	-	-	-	-	-	-	26988	111	-	-	60414	180
	2011	15706	33	-	-	-	-	-	-	-	-	28496	126	-	-	44202	159
	2012	19371	40	-	-	-	-	-	-	-	-	19785	84	-	-	39156	124
	2013	20747	45	-	-	-	-	-	-	-	-	17223	74	-	-	37970	119
	2014	12579	26	-	-	-	-	-	-	-	-	13297	58	-	-	25876	83
	2015	13583	29	-	-	-	-	-	-	-	-	9041	39	-	-	22624	68

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
France	1987	6013	18	-	-	-	-	-	-	-	-	1806	9	-	-	7819	27
	1988	2063	7	-	-	-	-	-	-	-	-	4964	25	-	-	7027	32
	1989	1124	3	1971	9	311	2	-	-	-	-	-	-	-	-	3406	14
	1990	1886	5	2186	9	146	1	-	-	-	-	-	-	-	-	4218	15
	1991	1362	3	1935	9	190	1	-	-	-	-	-	-	-	-	3487	13
	1992	2490	7	2450	12	221	2	-	-	-	-	-	-	-	-	5161	21
	1993	3581	10	987	4	267	2	-	-	-	-	-	-	-	-	4835	16
	1994	2810	7	2250	10	40	1	-	-	-	-	-	-	-	-	5100	18
	1995	1669	4	1073	5	22	0	-	-	-	-	-	-	-	-	2764	10
	1996	2063	5	1891	9	52	0	-	-	-	-	-	-	-	-	4006	13
	1997	1060	3	964	5	37	0	-	-	-	-	-	-	-	-	2061	8
	1998	2065	5	824	4	22	0	-	-	-	-	-	-	-	-	2911	8
	1999	690	2	1799	9	32	0	-	-	-	-	-	-	-	-	2521	11
	2000	1792	4	1253	6	24	0	-	-	-	-	-	-	-	-	3069	11
	2001	1544	4	1489	7	25	0	-	-	-	-	-	-	-	-	3058	11
	2002	2423	6	1065	5	41	0	-	-	-	-	-	-	-	-	3529	11
	2003	1598	5	-	-	-	-	-	-	-	-	1540	8	-	-	3138	13
	2004	1927	5	-	-	-	-	-	-	-	-	2880	14	-	-	4807	19
	2005	1236	3	-	-	-	-	-	-	-	-	1771	8	-	-	3007	11
	2006	1763	3	-	-	-	-	-	-	-	-	1785	9	-	-	3548	13
	2007	1378	3	-	-	-	-	-	-	-	-	1685	9	-	-	3063	12
	2008	1471	3	-	-	-	-	-	-	-	-	1931	9	-	-	3402	12
	2009	487	1	-	-	-	-	-	-	-	-	975	4	-	-	1462	5
	2010	1658	4	-	-	-	-	-	-	-	-	821	4	-	-	2479	7
	2011	1145	3	-	-	-	-	-	-	-	-	2126	9	-	-	3271	11
	2012	1010	2	-	-	-	-	-	-	-	-	1669	7	-	-	2679	10
	2013	1457	3	-	-	-	-	-	-	-	-	1679	7	-	-	3136	11
	2014	1469	3	-	-	-	-	-	-	-	-	2159	9	-	-	3628	12
	2015	1239	-	-	-	-	-	-	-	-	-	2435	-	-	-	3674	12

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Spain (2)	1993	1589	-	827	-	75	-	-	-	-	-	-	-	-	-	2491	8
	1994	1658	5	-	-	-	-	-	-	-	-	735	4	-	-	2393	9
	1995	389	1	-	-	-	-	-	-	-	-	1118	6	-	-	1507	7
	1996	349	1	-	-	-	-	-	-	-	-	676	3	-	-	1025	4
	1997	169	0	-	-	-	-	-	-	-	-	425	2	-	-	594	3
	1998	481	1	-	-	-	-	-	-	-	-	403	2	-	-	884	3
	1999	157	0	-	-	-	-	-	-	-	-	986	5	-	-	1143	6
	2000	1227	3	-	-	-	-	-	-	-	-	433	3	-	-	1660	6
	2001	1129	3	-	-	-	-	-	-	-	-	1677	9	-	-	2806	12
	2002	651	2	-	-	-	-	-	-	-	-	1085	6	-	-	1736	8
	2003	210	1	-	-	-	-	-	-	-	-	1116	6	-	-	1326	6
	2004	1053	3	-	-	-	-	-	-	-	-	731	4	-	-	1784	6
	2005	412	1	-	-	-	-	-	-	-	-	2336	11	-	-	2748	12
	2006	350	1	-	-	-	-	-	-	-	-	1864	9	-	-	2214	10
	2007	481	1	-	-	-	-	-	-	-	-	1468	7	-	-	1949	8
	2008	162	0	-	-	-	-	-	-	-	-	1371	7	-	-	1533	7
	2009	106	0	-	-	-	-	-	-	-	-	250	1	-	-	356	1
	2010	81	0	-	-	-	-	-	-	-	-	166	1	-	-	247	1
	2011	18	0	-	-	-	-	-	-	-	-	1027	5	-	-	1045	5
	2012	237	1	-	-	-	-	-	-	-	-	1064	6	-	-	1301	6
	2013	111	0	-	-	-	-	-	-	-	-	725	4	-	-	836	4
	2014	48	0	-	-	-	-	-	-	-	-	1160	6	-	-	1208	6
	2014	43	0	-	-	-	-	-	-	-	-	1051	6	-	-	1094	6

1. MSW includes all sea ages >1, when this cannot be broken down.
   Different methods are used to separate 1SW and MSW salmon in different countries:
   - Scale reading: Faroe Islands, Finland (1996 onwards), France, Russia, USA and West Greenland.
   - Size (split weight/length): Canada (2.7 kg for nets; 63cm for rods), Finland up until 1995 (3 kg),
   Iceland (various splits used at different times and places), Norway (3 kg), UK Scotland (3 kg in some places and 3.7 kg in others),
   All countries except Scotland report no problems with using weight to catergorise catches into sea age classes; mis-classification may be very high in some years.
   In Norway, catches shown as 3SW refer to salmon of 3SW or greater.
2. Based on catches in Asturias (80-90% of total catch).

Annex 5: WGNAS responses to the generic ToRs for Regional and Species Working Groups

The Working Group was asked, where relevant, to consider the questions posed by ICES under their generic ToRs for regional and species Working Groups. Only brief responses are provided since the majority of questions are already addressed in response to the ToRs from NASCO (see main report) or in the WGNAS Stock Annex (see below).

	Generic ToR questions	WGNAS response
a)	Consider and comment on ecosystem overviews where available.	A brief ecosystem overview is provided in the WGNAS stock annex (see Annex 6 below) and environmental influences on the stock are incorporated in the annual advice to NASCO. The advice to NASCO is provided for three Commission areas – Northeast Atlantic, North America and West Greenland and may address a wide range of factors affecting salmon at different stages in their life cycle. Detailed consideration has been given to possible ecosystem drivers in both freshwater and the marine environment, but at present it is not possible to incorporate such drivers in the assessment process.
b)	For the fisheries considered by the Working Group consider and comment on: i) descriptions of ecosystem impacts of fisheries where available; ii) descriptions of developments and recent changes to the fisheries; iii) mixed fisheries overview; and iv) emerging issues of relevance for the management of the fisheries.	i) Salmon fisheries have no, or only minor, influence on the marine ecosystem. The exploitation of salmon in freshwater may affect the riverine ecosystem through changes in species composition. There is limited knowledge of the magnitude of these effects. ii) Any recent changes in fisheries are documented in response to the ToR from NASCO (see main report). iii) Salmon are not caught in mixed fisheries to any great extent. Most salmon are caught in targeted fisheries in homewaters, principally net and trap fisheries in estuaries and coastal waters, and rod-and-line fisheries in freshwater. There is very little bycatch of other species in these fisheries or in the inshore drift and gillnet fishery at West Greenland. There was some limited bycatch of other fish species (e.g. lumpsucker) in the Faroese longline fishery when this fishery operated. There is also some bycatch of salmon post-smolts and adults in pelagic fisheries operated in the Norwegian Sea and North Atlantic; further details were provided in Section 3.4 of the 2014 WGNAS report (ICES, 2014). Some fisheries targeted at other fish species in freshwater and coastal areas (e.g. aboriginal trout and charr fisheries in Canada) are licensed to land salmon caught as a bycatch. Numbers are typically small. Species interaction effects and ecosystem drivers are summarised in the stock annex (see below). iv) NASCO also routinely requests ICES to document emerging issues of relevance to the management of salmon fisheries. Details are provided in Section 2 of the report (above).

Generic ToR questions	**WGNAS response**
c) Conduct an assessment to update advice on the stock(s) using the method (analytical, forecast or trends indicators) as described in the stock annex and produce a brief report of the work carried out regarding the stock, summarising where the item is relevant: i. Input data (including information from the fishing industry and NGO that is pertinent to the assessments and projections); ii. Where misreporting of catches is significant, provide qualitative and where possible quantitative information and describe the methods used to obtain the information; iii. For relevant stocks estimate the percentage of the total catch that has been taken in the NEAFC regulatory area by year in the recent three years; iv. The developments in spawning–stock biomass, total-stock biomass, fishing mortality, catches (wanted and unwanted landings and discards) using the method described in the stock annex; v. The state of the stocks against relevant reference points; vi. Catch options for next year; vii. Historical performance of the assessment and catch options and brief description of quality issues with these.	The questions posed in this section of the generic ToR are addressed routinely in the WGNAS report when responding to the questions posed by NASCO. i. Details of all inputs used in the latest assessments for Atlantic salmon are provided in response to the ToRs from NASCO (see main report). ii. Estimates of unreported catch levels as used in the latest assessments for Atlantic salmon are provided in response to the ToRs from NASCO (see main report). The different components of the catch of Atlantic salmon are reported as fully as possible in the Working Group report in response to the specific questions posed by NASCO. Details of the data collection procedures for each country / region are also provided in the stock annex. Nominal catches are reported annually by country for all fisheries and estimates of unreported catch are also provided for most countries. These values are carried forward to the advice. Discards do not typically apply for salmon fisheries, although when the Faroese longline fishery was being prosecuted (the fishery has not operated since 2000) there was a legal requirement for salmon <63 cm in total length to be discarded. The catch options risk framework developed by WGNAS for the Faroes fishery makes allowance for these discards. iii. Not applicable to Atlantic salmon. iv. Not applicable to Atlantic salmon. v. The latest assessments of stock status for Atlantic salmon are provided in response to the ToRs from NASCO (see main report). vi. The latest catch options for Atlantic salmon are provided in response to the ToRs from NASCO (see main report). vii. Quality issues relating to the input data and models are described in the main report and stock annex.
d) Produce a first draft of the advice on the fish stocks and fisheries under considerations according to ACOM guidelines.	This task will be completed by the WG and WGNAS Chair in advance of the RG/ADG meeting in April.

GENERIC TOR QUESTIONS		WGNAS RESPONSE
e)	With reference to the Frequency of Assessment criteria agreed by ACOM (see section 5.1 of WGCHAIRS document 03): (1) Complete the calculation of the first set of criteria, by calculating Mohn's rho index for the final assessment year F; (2) Comment on the list of stocks initially identified as candidates for less frequent assessment from the first set of criteria (adding stocks to the list or removing them would require a sufficient rationale to be provided).	Following agreement with NASCO, WGNAS provides multiyear advice, with forecasts for three years into the future, accompanied by a Framework of Indicators (FWI) for the Greenland fishery and a FWI for Faroese fishery. The FWIs are designed to trigger re-assessment and recalculation of forecasts in the event of a certain proportion of stock status indicators showing a higher than expected performance against the forecast stock status. At the beginning of 2016 the FWI for the Faroese fishery triggered a re-assessment, while the Greenland FWI did not. In light of this WGNAS 2016 provided the appropriate re-assessment for the stocks contributing to the Faroese fishery (North European), and reset the FWI for a further two years. Currently the NAC FWI is due to run for a further year, with scheduled advice due in 2018. At which point (and in light of neither FWIs indicating re-assessment in intervening years) the WGNAS have recommended that both NAC and NEAC stocks are re-assessed, to realign the time frames of the respective FWIs.
f)	Consider and propose stocks to be benchmarked;	In 2016 the status of NAC and NEAC stocks were assessed using comparable tools to those applied in previous years. Work on developing life cycle forecast models is ongoing and their application is seen to be at least two years away. Upon the completion of these forecast models, completion a benchmarking exercise, prior to their implementation, is foreseen as being necessary.
g)	Review progress on benchmark processes of relevance to the expert group;	Not applicable.
h)	Propose specific actions to be taken to improve the quality and transmission of the data (including improvements in data collection)	There are significant uncertainties in some of the input data for the assessment models, particularly relating to unreported catches (used in the NEAC assessments). However, efforts are made to take account of these in the stock status and stock forecast models. Data deficiencies are recorded in the 'Quality Considerations' section of the annual advice document and specific concerns/ recommendations for improvement are included in WGNAS reports. Recommendations in relation to data collection needs for assessment of Atlantic salmon were recently provided in the report of the ICES Workshop on Eel and Salmon Data Collection Framework WKESDCF (ICES, 2012c); discussions have continued with the EU on the implementation of these recommendations.
i)	Prepare the data calls for the next year update assessment and for the planned data compilation workshops.	Not applicable to WGNAS.

Generic ToR questions	WGNAS response
j) Update, quality check and report relevant data for the stock: i) Load fisheries data on effort and catches into the InterCatch database by fisheries/fleet ii) Abundance survey results; iii) Environmental drivers.	i. Not applicable to WGNAS. The InterCatch database is not used for Atlantic salmon. All data inputs used in assessments are updated and reported in the WGNAS report. All data are subject to routine checking and QA by WGNAS members. ii. Not applicable to WGNAS. iii. Not applicable to WGNAS.
k) Produce an overview of the sampling activities on a national basis based on the InterCatch database or, where relevant, the regional database.	Not applicable to WGNAS. The InterCatch database is not used for Atlantic salmon.
l) Identify research needs of relevance for the Working Group.	This is addressed by WGNAS in response to the ToRs from NASCO (see main report).

Annex 6: WGNAS Stock Annex for Atlantic salmon

The table below provides an overview of the WGNAS Stock Annex. Stock Annexes for other stocks are available on the ICES website Library under the Publication Type "Stock Annexes". Use the search facility to find a particular Stock Annex, refining your search in the left-hand column to include the *year*, *ecoregion*, *species*, and *acronym* of the relevant ICES expert group.

Stock ID	Stock name	Last updated	Link
sal-nea	Atlantic Salmon	March 2016	*Salmo salar*

Annex 7: Glossary of acronyms used in this report

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 the 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 member country under the direction of an independent chair appointed by the Council.

AMO (*Atlantic Multidecadal Oscillation*). A mode of natural variability occurring in the North Atlantic Ocean and which has its principle expression in the sea surface temperature (SST) field.

BASIS (*Bering-Aleutian Salmon International Survey*). Project, commenced in 2001 in the North Pacific, designed to establish the biological responses of salmon to conditions resulting from climate change.

BC (*British Columbia*). Canadian province on the west (Pacific) coast.

BCI *(Bayesian Credibility Interval).* The Bayesian equivalent of a confidence interval. If the 90% BCI for a parameter α is 10 to 20, there is a 90% probability that α falls between 10 and 20.

BHSRA *(Bayesian Hierarchical Stock and Recruitment Approach).* Models for the analysis of a group of related stock–recruit datasets. Hierarchical modelling is a statistical technique that allows the modelling of the dependence among parameters that are related or connected through the use of a hierarchical model structure. Hierarchical models can be used to combine data from several independent sources.

BRP (*Biological Reference Point*). The spawning stock level that produces maximum sustainable yield (Conservation Limit).

C.I. *(Credible Interval).* A frequentist variability estimate usually derived from a statistical repeat sampling (e.g. Monty-Carlo) analysis or simulation. If the 90% C.I. for a parameter α is 10 to 20, there is a 90% probability that α falls between 10 and 20.

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).

CL, i.e. Slim *(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.

Cpue *(Catch per Unit of Effort).* A derived quantity obtained from the independent values of catch and effort.

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 programs 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.

ECOKNOWS *(Effective use of Ecosystems and biological Knowledge in fisheries).* The general aim of the ECOKNOWS project is to improve knowledge in fisheries science and management. The lack of appropriate calculus methods and fear of statistical over partitioning in calculations, because of the many biological and environmental influences on stocks, has limited reality in fisheries models. This reduces the biological credibility perceived by many stakeholders. ECOKNOWS will solve this technical estimation problem by using an up-to-date methodology that supports more effective use of data. The models will include important knowledge of biological processes.

ENPI CBC *(European Neighbourhood and Partnership Instrument Cross-Border Cooperation).* ENPI CBC is one of the financing instruments of the European Union. The ENPI programmes are being implemented on the external borders of the EU. It is designed to target sustainable development and approximation to EU policies and standards; supporting the agreed priorities in the European Neighbourhood Policy Action Plans, as well as the Strategic Partnership with Russia.

FAO (*Food and Aquaculture Organisation of the United Nations*). Agency of the United Nations dealing with global food and aquaculture production.

FSC (*Food, Social and Ceremonial fishery*). Aboriginal fishery in Canada for food, social or ceremonial purposes.

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

GFLK (*Greenland Fisheries Licence Control Authority*).

GLM (*Generalised Linear Model*). A conventional linear regression model for a continuous response variable given continuous and/or categorical predictors.

HBM (*Hierarchical Bayesian Modelling*). Statistical model written in multiple levels that estimates the parameters of the posterior distribution using the Bayesian method.

HELCOM (*Baltic Marine Environment Protection Commission*). HELCOM is the governing body of the Convention on the Protection of the Marine Environment of the Baltic Sea Area, known as the Helsinki Convention.

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

IBSFC (*International Baltic Sea Fishery Commission*). The IBSFC was established pursuant to Article V of the Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and the Belts (the Gdańsk Convention) which was signed on the 13th of September 1973. The Contracting Parties undertook to cooperate closely with a view to preserving and increasing the living resources of the Baltic Sea and the Belts and obtaining the optimum yield, and, in particular to expanding and coordinating studies towards these ends. The IBSFC was closed down in 2007.

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

ISAV (*Infectious Salmon Anaemia Virus*). ISAV is a highly infectious disease of Atlantic salmon caused by an enveloped virus.

IYS (*International Year of the Salmon*). A concept proposal from NPAFC for a multiyear (2016–2022) programme centred on an intensive burst of internationally coordinated, interdisciplinary, stimulating scientific research on salmon, and their relation to people.

JAGS (some stats term from 2.2.2.7)

LE (*Lagged Eggs*). The summation of lagged eggs from 1 and 2 sea-winter fish is used for the first calculation of PFA.

LRP (*Limit Reference Point*). When using the Precautionary Approach in resource management the LRP represents the stock status below which serious harm is occurring to the stock. At this stock status level, there may also be resultant impacts to the ecosystem, associated species and a long-term loss of fishing opportunities. Several approaches for calculating the LRP are in use and may be refined over time. The units describing stock status will vary depending on the nature of the resource (groundfish, shellfish, salmonids or marine mammals). The LRP is based on biological criteria and established by Science through a peer reviewed process.

MCMC (*Markov Chain Monte Carlo*). Re-sampling algorithm used in (Bayesian) statistics.

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 which has spent two or more winters at sea and may be a repeat spawner.

NAFO (*Northwest Atlantic Fisheries Organisation*). 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 Organisation*).

NCC (*NunatuKavut Community Council*). NCC is one of four subsistence fisheries harvesting salmonids in Labrador.

NOAA (*National Oceanic and Atmospheric Administration*).

NB (*New Brunswick*). Province on the east (Atlantic) coast of Canada.

NG *(Nunatsiavut Government).* NG is one of four subsistence fisheries harvesting salmonids in Labrador. NG members are fishing in the northern Labrador communities.

NPAFC (*North Pacific Anadromous Fish Commission*). An international intergovernmental 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.

OSPAR (*Convention for the Protection of the Marine Environment of the Northeast Atlantic*). OSPAR is the mechanism by which fifteen Governments of the west coasts and catchments of Europe, together with the European Community, cooperate to protect the marine environment of the Northeast Atlantic. It started in 1972 with the Oslo Convention against dumping. It was broadened to cover land-based sources and the offshore industry by the Paris Convention of 1974. These two conventions were unified, updated and extended by the 1992 OSPAR Convention. The new annex on biodiversity and ecosystems was adopted in 1998 to cover non-polluting human activities that can adversely affect the sea.

PA (*Precautionary Approach*). In resource management the PA is about being cautious when scientific information is uncertain, unreliable or inadequate and not using the absence of adequate scientific information as a reason to postpone or fail to take action to avoid serious harm to the resource.

PEI (*Prince Edward Island*). Canadian province on the east (Atlantic) coast.

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, and used to calculate total PFA, which is then split into PFAm and PFAnm based upon the *proportion of PFAm* (p.PFAm).

PICES (*North Pacific Marine Science Organization*). PICES, the North Pacific Marine Science Organization, is an intergovernmental scientific organization that was established and held its first meetings in 1992. Its present members are Canada, People's Republic of China, Japan, Republic of Korea, Russian Federation, and the United States of America. The purposes of the Organization are as follows: (1) Promote and coordinate marine research in the northern North Pacific and adjacent seas especially northward of 30 degrees North, (2) advance scientific knowledge of the ocean environment, global weather and climate change, living resources and their ecosystems, and the impacts of human activities, and (3) promote the collection and rapid exchange of scientific information on these issues.

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.

Q Areas. (*Québec Areas*). Areas for which the Ministère des Ressources naturelles et de la Faune manages the salmon fisheries.

RR model *(Run-Reconstruction model).* RR model is used to estimate PFA and national CLs.

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.

SAC (*Special Area of Conservation*). Strictly protected site designated under the European Committee Habitats Directive.

SALSEA-Merge (*Salmon at Sea Merge*). SALSEA-Merge is an international programme of cooperative research designed to improve understanding of the migration and distribution of salmon at sea in relation to feeding opportunities and predation. It differentiates between tasks which can be achieved through enhanced coordination of existing ongoing research, and those involving new research for which funding is required.

SAS (*smolt-to-adult supplementation*). Generally refers to intervention activities consisting of the capture of wild juvenile salmon (parr, fall presmolts, smolts) and rearing theses in captivity with the intention to release the mature captive reared adults to targeted rivers to spawn.

SER *(Spawning Escapement Reserve).* The CL increased to take account of natural mortality between the recruitment date (assumed to be 1st January) and the date of return to homewaters.

SFA *(Salmon Fishing Areas).* Areas for which the Department of Fisheries and Oceans (DFO) Canada manages the salmon fisheries.

SGERAAS (*Study Group on Effectiveness of Recovery Actions for Atlantic Salmon*). SGERAAS is the previous acronym for WGERAAS (*Working Group on Effectiveness of Recovery Actions for Atlantic Salmon*).

Slim, i.e. CL *(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 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.

SST (*Sea surface temperatures*). SST is the water temperatures close to the surface. In practical terms, the exact meaning of surface varies according to the measurement method used. A satellite infrared radiometer indirectly measures the temperature of a very thin layer of about 10 micrometres thick of the ocean which leads to the phrase skin temperature. A microwave instrument measures subskin temperature at about 1 mm. A thermometer attached to a moored or drifting buoy in the ocean would measure the temperature at a specific depth, (e.g. at one meter below the sea surface). The measurements routinely made from ships are often from the engine water intakes and may be at various depths in the upper 20 m of the ocean. In fact, this temperature is often called sea surface temperature, or foundation temperature.

TAC *(Total Allowable Catch).* TAC is the quantity of fish that can be taken from each stock each year.

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.

UK (*United Kingdom and Northern Ireland*). Country in Europe.

USR (*Upper Stock Reference Point*). When implementing the Precautionary Approach in resource management USR is the threshold point below which removals must be reduced to avoid serious harm.

WGAGFM (*Working Group on the Application of Genetics in Fisheries and Mariculture*).

WGAQUA (*Working Group on Aquaculture*).

WGDAM (*The Working Group on Data Poor Diadromous Fish*).

WGERAAS *(Working Group on Effectiveness of Recovery Actions for Atlantic Salmon)*. The task of the working group is to 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. The Working Group held its final meeting in Copenhagen in November 2015.

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.

WGPDMO (*ICES Working Group on Pathology and Diseases of Marine Organisms*).

WGRECORDS *(Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species)*. WGRECORDS was reconstituted as a Working Group from the Transition Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (TGRECORDS).

WKCULEF (*NASCO Request for Advice on Possible Effects of Salmonid Aquaculture on Wild Atlantic Salmon Populations*). Workshop on the possible effects of salmonid aquaculture on wild Atlantic salmon populations in the North Atlantic. Met in Copenhagen 1–3 of March 2016 and reported by the 11 March 2016 for the attention of the ICES Advisory Committee.

WKTRUTTA2 (*Workshop on sea trout*). A workshop was held in February 2016 to focus on the development of models to help address key management questions and to develop Biological Reference Points for use in the management of sea trout stocks and fisheries.

Annex 8: NASCO has requested ICES to identify relevant data deficiencies, monitoring needs and research requirements

The Working Group recommends that it should meet in 2017 (Chair: Jonathan White, Ireland) to address questions posed by ICES, including those posed by NASCO. The Working Group intends to convene in the headquarters of ICES in Copenhagen, Denmark. The meeting will be held from 28 March to 6 April 2017.

List of recommendations

1) The Working Group recommends that sampling and supporting descriptions of the Labrador and Saint Pierre & Miquelon mixed-stock fisheries be continued and expanded (i.e. sample size, geographic coverage, tissue samples, seasonal distribution of the samples) in future years to improve the information on biological characteristics and stock origin of salmon harvested in these mixed-stock fisheries.

6) The Working Group recommends that additional monitoring 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. Aboriginal and recreational catches and effort) to describe stock status in Labrador.

7) The Working Group recommends further analysis of the resulting data and continuation of the phone survey programme in the Greenland fishery. Information gained on the level of total catches 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) The Working Group recommends that efforts to improve the Greenland catch reporting system continue and that detailed statistics related to catch and effort should be made available to the Working Group for analysis.

9) Working Group recommends a continuation and potential expansion of the broad geographic sampling programme at West Greenland (multiple NAFO divisions including factory and non-factory landings) to more accurately estimate continent and region of origin and biological characteristics of the mixed-stock fishery.

Annex 9: Response of WGNAS 2016 to Technical Minutes of the Review Group (ICES, 2015)

As per the request of the ICES Review Group (RG), this section provides responses from the Working Group on North Atlantic Salmon (WGNAS) to the Technical Minutes of the RG provided in Annex 10 of ICES (2015) and elaborates on initial comments provided at the 2015 Review Group meeting. The points are addressed in the same order as they were listed in the Technical Minutes.

General comments on the report

A written review of the WGNAS 2015 report was provided by Marc Trudel and is included as Annex 10 of the 2015 WGNAS report (ICES, 2015). The review was discussed via teleconference during the RG meeting, which provided a good opportunity for feedback and exchange of ideas in both directions. After the teleconference, many of the minor and editorial comments were addressed and incorporated in the 2015 WGNAS report. Responses to the more specific comments are detailed below having been considered more widely by WGNAS participants at their 2016 meeting.

The RG indicated that WGNAS had produced a comprehensive and well written report on the status and trends of Atlantic salmon abundance and productivity in the Northern Europe, Southern Europe, and North America, that was substantiated with appropriate analyses.

Specific comments

RG COMMENT	WGNAS RESPONSE
NEAC	
1. A "hockey-stick" model was used to determine conservation limits for management units within NEAC (Figure 3.3.5.1 on p. 119–128). The position of these conservation limits appear to be highly subjective. For instance, in the Tana/Teno River in Finland and Norway, the conservation limit is set at the lowest lagged egg deposition (which presumably accounts for changes in body size over time) in the time-series at the presumed inflection point of the hockey-stick model (Figure 3.3.5.1a). In France, the conservation limit is set below the inflection point (Figure 3.3.5.1b). In Ireland, it is set above the inflection point (Figure 3.3.5.1d). In Norway (excluding the R. Teno rod fisheries), it is set both below and above the inflection point depending on the analysis (Figure 3.3.5.1e). A standardized approach across countries and management unit would be beneficial. As it is, it may be argued that there are missed fishery opportunities from some management unit (when the conservation limit is set above the "true" inflection point) or some populations may be at risk of overexploitation (when the conservation limit is set below the inflection point).	Hockey-stick Stock–Recruitment models were used to estimate country level biological reference points (conservation limits) for countries which have not calculated their own, river-specific conservation limits. The Hockey-stick model assumes linear, density-independent mortality for low S values and above a threshold it assumes that all habitat is utilised and density-dependent mortality limits any further increase in recruitment. This is a relatively simplistic approach, and is seen as appropriate in instances of limited information. It objectively deals with situations where specific details of stock structures are unknown. In these "national" instances, the individual river-specific details of the systems which contribute to national stocks are compiled into one national assessment and are not considered in individual stock S–R

	analyses. As such, the concept of a national stock needs to take into consideration stocks across numerous rivers with different levels of productivity. These national S–R relationships are considered as "National pseudo stock–recruitment relationships". It is a feature of Hockey-stick S–R analysis to take the lower end of the stock datapoints (lagged egg deposition) when there is no discernable linear trend, and define it as the CL. This is acknowledged. The WG encourage river level assessment of stock status and estimation of CLs, as being specific to biological stocks, they are viewed as being more accurate. These are now in place in most countries, and in such instances the applied national CL is the summation of the national river-specific CLs. The Hockey stick S–R curves have been included in figures Figure 3.3.5.1 a–j as point of reference and information. These were included following previous reviews and have been included in the report for 2016, again for information. National summed CLs, when applied, are the reference points drawn on these figures and this is cited in the figures, with updates detailed in Section 3.3.2. and 3.3.3. With regard to the noted figures, in the 2015 analysis the reference points applied for assessments were as follows: Tana/Teno River (Figure 3.3.5.1a.) Hockey stick: pseudo S–R relationship France (Figure 3.3.5.1b). National summation of river level S–R defined CLs Ireland (Figure 3.3.5.1d). National summation of river level S–R defined CLs Norway (Figure 3.3.5.1e). National summation of river level S–R defined CLs
2. Given that mixed-stocked fishery can lead to the extirpation of weak stocks (Ricker, 1958. J. Fish. Res. Board Can. 15: 991–1006), alternative management options that minimize fishery impacts on weak stocks should be evaluated. In particular, an examination of	This is a pertinent point and was raised in part as a question to ICES by NASCO and listed as a ToR for the WG, with regard to uncertainties and possible biases in the assessment of Faroese catch options . The

the spatio-temporal pattern of fish caught in the Faroes may help to determine periods and areas when fisheries could occur while avoiding weak stocks (Beacham *et al*., 2008. N. Am. J. Fish. Manag. 28: 849–855). I was particularly encouraged to see DNA analyses performed on archived scales from a test fishery that occurred in the mid-1990s. The results indicate that the proportion of northern NEAC increased from ~40% in November to ~80% in March for the MSW (Figure 3.3.3.2 on p. 117), suggesting that a fishery late in winter, early in spring may be possible with larger mesh as it would target primarily the northern NEAC stocks which are generally at full reproductive capacity, while avoiding the 1SW (assuming 1SW are smaller than MSW). Further evaluation of this strategy using contemporary DNA samples would help to evaluate this possibility. Given that the fishery in the Faroes has been closed for more than a decade, a test fishery conducted throughout the year would be highly desirable to further evaluate mixed-stock fishery options in the Faroes.	response may be found in Section 3.4. Conclusions of this work pertinent to the RG question include: New surveys may improve the trueness of the parameter values, but alternative methods are available to correct the values currently used in the assessment. Stock composition: undertake genetic analysis of all historic scale samples collected in the fishery area. Should any fishery be authorised at Faeroes in the future, it is, of course, important that there should be a comprehensive data collection and sampling programme.
3.	
There are a large number of tables and figures in all the sections. And sometime a quick visual display at the forefront of the report would help to highlight some of the key findings. One such example is provided in Table 3.3.5.7 on p. 96: this traffic light table clearly shows the risk of meeting conservation limits by countries within each regions of the NEAC. A similar table should be produced for NAC. Is there a way to embed this table early within the text of Chapter 3 and 4 or the executive summary?	The WG thank the RG for bringing this point to light. While there has been no great movement on highlighting more tables in this manner in the 2016 report it will be followed up with more vigour in 2017.
4.	
It was unclear to me whether or not the post-release mortality associated with catch and release was included as part of the estimated nominal catch in NEAC (this was done for NAC).	Post-release mortality is not considered with regard to Catch and Release fishing. Estimation of returns in the Run-Reconstruction (NAC and NEAC) is based only upon "nominal catch", defined as catch killed raised by exploitation rates. C&R fisheries are currently not incorporated in this. In the case of Ireland, annual C&R fish are added into estimates of spawners, as they are known to be in rivers. No estimates of mortality or repeat catch ability are made. With growing interest in this fishing activity the WG are considering more its impact on stocks and it's potential use as a data stream in estimating stock sizes.
WEST GREENLAND	
5.	
The results from the DNA analyses in the mixed-stock fishery are intriguing (Figure 5.9.2.5 on p. 278). These data suggest that most of these non-maturing 1SW (which would become 2SW in the terminal fishery the following year) were from the Gaspe region in Québec (40–50%), followed by Labrador (20–30%) and	The WG notes that the estimated stock proportions contributing to the Greenland fishery as identified by the reviewer from Figure 5.9.2.5 (p. 278) are not directly comparable to the estimated proportions of 2SW at the spawning ground calculated

then the Gulf of St Lawrence (10–20%). Yet, the proportion of 2SW at the spawning ground during the last five years was 40% for Labrador, 33% for the Gulf, and 27% for Québec (Table 4.3.3.3 on p. 175). This implies that 1) different stock complexes from NAC have different ocean distributions, 2) mortality rate beyond the first winter at sea differ among stock complexes, 3) abundance estimates are not directly comparable among different management units, or 4) the samples obtained for genetic analyses are biased. Each of these interpretations has different management implications. Hence, some effort is needed to understand these results.	from Table 4.3.3.3 (p. 175) due to the different stock groupings reported (see Figures 4.1.2.1 and 5.9.2.1). Estimated stock proportions in the Greenland fishery are reported for ten stock groups whereas estimated 2SW spawners are reported for six stocks groups. Differences noted by the reviewer are likely related to a mis-alignment of these two grouping schemes. Further information on this issue has been presented in the response to question No. 4.5 (NASCO has requested ICES to advise on changes to temporal and/or spatial fishery patterns that may provide increased protection for weaker stocks). The results presented by ICES (2015) have been superseded by a recent manuscript from Bradbury *et al*. (accepted) as outlined in Section 5.5. In summary, neither the new results presented in Section 5.5 or the results presented by ICES (2015) or Bradbury *et al*. (accepted) provide clear evidence that there are temporal and/or spatial management options for the fishery at West Greenland that would provide increased protection for weaker stocks. It is noted that samples sizes may not be optimal, but the best available information suggests that the contributing North American and European stocks sufficiently mix along the coast of West Greenland and across the fishing season. Further, the contributions to the harvest by the regional stock groupings closely mirrors the modeled estimates of MSW stock abundance, which further supports the suggestion that the stocks are well mixed within the fished complex (Bradbury *et al*., accepted). The WG will continue to review relevant information with the aim of providing any relevant updates.
Final comment	
One of the main conclusions of the report was "The continued low abundance of salmon stocks in many parts of the North Atlantic, despite significant fishery reductions, strengthens the view that factors acting on survival in the first and second years at sea are constraining the abundance of Atlantic salmon". Hence, I strongly recommend focusing research to understand why salmon survival has declined (or is currently low) in the North Atlantic. Failure to understand this will likely affect our ability to evaluate the effectiveness of any restoration and rehabilitation activities undertaken in freshwater to improve salmon habitat and returns.	The WG agree with this point of view. Research and analyses following the "SALSEA-Merge" project, which aimed to investigate mortality at sea are continuing and this is an area still very much in focus by the group.

Annex 10: Technical minutes from the Salmon Review Group

- RGSalmon
- 25–27 April 2016 in Copenhagen, Denmark
- Participants: Marc Trudel (Reviewer), and Henrik Sparholt and David Miller (ICES Secretariat)
- Working Group: WGNAS

General comments

The ICES Working Group on North Atlantic Salmon (WGNAS) produced a comprehensive report on the status and trends of Atlantic salmon abundance and productivity in the Northern Europe, Southern Europe, and North America. The WGNAS also evaluated different management options for 2016–2019 using Bayesian-based stock assessment models and region-specific reference points (i.e. conservation limits). The WGNAS also investigated biases that may occur in the assessment based on the use of historical that were obtained, in some cases, more than 20 years ago. The main conclusions of the report were:

- Overall, exploitation rates and catches of Atlantic salmon increased in 2015 relative to 2014, though they were still among the lowest in the time-series. The low returns and decline observed during the last two decades appear to be constrained by low marine survival.
- There was no mixed-stock fishery in the Faroes in 2015, which has been closed since 200. The nominal catch in the mixed-stock fishery in St-Pierre and Miquelon was 3.5 t and decreased by 8% in 2015 relative to 2014. For the west Greenland mixed-stock fishery, the Greenland authorities unilaterally set a quota to 45 t. This quota was exceeded at 57 t. Phone interviews also revealed an unreported catch of 5 t for a total of 61 t. This represents a decrease of nearly 10 t relative to 2014.
- The Framework of Indicator for the mixed-stock fishery in the Faroes triggered a revision of the assessment due to a potential underestimation of the abundance of the northern NEAC stock-complex. Simulations indicated that a Total Allowable Catch (TAC) of up to 60 t in 2016/2017, 2016/2017, and up to 40 t in 2017/2018 in the Faroes fishery had a 95% probability of meeting the SER in all northern NEAC stock complexes. There was less than 40% probability of meeting this management objective for the southern NEAC complex in the absence of any fishery. However, at the country level, the probability of meeting their SER was below 95% in some northern NEAC countries, and most southern NEAC countries. Hence, there was no catch option in the Faroes that would ensure a greater than 95% probability of each stock complex to achieve its SER.
- None of the potential biases that may been introduced by using historical data affected the conclusion that there was no catch option in the Faroes that would ensure a greater than 95% probability of each stock complex to achieve its SER. Instead of performing an intensive field survey to assess the validity of these assumptions, the WGNAS recommend either analysing additional historical scales for genetic stock identification to assess how the proportion of different stock complexes varied over time or to develop adjustment factors.

- North American 2SW spawner estimates were below their conservation limits in four of the six regions. This was particularly apparent for the southern areas of Scotia-Fundy and the United States. The abundance of Atlantic salmon is so low in the Northeast Atlantic that there hasn't been any commercial or recreational fishery since 1995. In contrast, returns to Labrador and Newfoundland were among the highest on record for 2015.
- Simulations indicated that no fishery options at West Greenland would achieve region-specific management objectives for the North American 2SW salmon at the 95% probability level.

Overall, the report was well written and was substantiated with appropriate analyses. The models used to evaluate different management options appeared reasonable and the Bayesian framework used in run reconstruction appeared to be robust. Below are some comments for further considerations by the WGNAS in future years.

Specific comments or questions

Atlantic salmon in the North Atlantic Area

1) p. 34. The variation in energy density observed in capelin among periods is interesting. Has a similar analysis been performed for other prey? The information presented in that section suggest that constant values were used for all the prey but capelin. Research performed in Alaska has showed that the energy density can vary among years within planktonic taxa (lower in warm compared to cool years). Hence, cautious must be exercised when the energy density of the food consumed by salmon is compared among periods until prey-specific and year-specific values are used.

10) p. 35. The potential for sea lice transmission form farmed to wild salmon is an ongoing issue wherever salmon farming occurs. In the second paragraph of Section 2.3.3.2, the WGNAS concluded that "the migrating salmon smolts were probably negatively affected by salmon lice infection in 2015" in some areas in Norway. While this may be the case, it is unclear from the information presentation in that section that this was the case or not. Hence, this statement need to be substantiated by appropriate documentation, otherwise the report will only fuel to the rhetoric of a polarized issue. It should be noted that Norway is one of the few countries to have reached their SER in recent years, yet it is also the country with the highest production of farmed salmon in the world. So either the treatments that they are using in their farms are effective, or the impacts of salmon farms on wild smolts may not be that important in some regions.

11) p. 40–42. The WGNAS considered the potential use of the smolt-to-adult supplementation (SAS) activity as a measure to circumvent the low smolt-to-adult return rates of Atlantic salmon. There is certainly concern that this approach may affect the genetic make-up of the populations where this strategy is employed, as well as their fitness. It should be noted that at this point, this is an untested assumption that deserve further testing. But it is clear that if nothing is done to reverse the trend of poor marine survival, that these populations may become extinct. For instance, the sockeye salmon population of the Snake River would likely have become extirpated if a conservation hatchery programme hadn't been started in the 1990s, when

there were often less than ten adults returning to spawn (one year with a single male) compared to the 5000–6000 adults that returned in the 1950s and 1960s.

12) p. 45. Given that poor marine survival has been identified throughout this report as the leading cause for the low return of Atlantic salmon in various regions of the NEAC and NAC, I find it odd that the analysis of DBERAAS 'Stressors" revealed that barriers to migration and freshwater habitat degradation as two of the three leading stressors having a high or very high impacts, and that all the 'Action' entries that were most often reported as having a high or very high benefit were actions conducted in freshwater. Certainly, having more healthy smolts would be beneficial for these populations, but more effort need to be directed to understand the cause of these poor marine survivals to determine what can be done, if anything, to improve their marine survival and subsequent returns.

13) p. 50, second paragraph. Peter Hutchinson from NASCO attended the second scoping meeting of the IYS.

NEAC

1) p. 74. Genetic stock identification analyses performed on Atlantic salmon caught in northern Norway indicate that between 20% and 70% of these fish originate in Russia. Is this information taken into consideration by the WGNAS in the PFA and SER assessment? Currently, the 1SW stocks in Norway have a high likelihood of achieving their SER, but not Russia (Table 3.6.1.3). Would that change if a fraction of the catch in Norway was allocated to Russia?

14) p. 84–90. The WGNAS did an excellent job at trying various scenarios to assess the potential effects of different biases introduced by using historical data on the catch advice for the Faroes. However, all these sensitivity analyses were performed by changing the value of one parameter at a time, which is the best they probably could achieve given the data they have. It is conceivable for instance, that changing the timing of the catch might not only affect the number of fish caught, but also the stocks that are being caught (this concept was investigated to some extant for the WGC). For this particular example, a detailed examination of the temporal changes in stock composition from archived scales collected when the fishery occurred may help to resolve this question.

15) p. 93, last paragraph of Section 3.6.1. I'm not sure I understand what the WGNAS is trying to say here.

NAC

1) I understand that the Bay of Ungava is in Quebec (region Q11), but for the purpose of examining trends in abundance, it probably make more sense to either pool this region with Labrador (because they are closer geographically) or leave it as a separate entity, since it is under a different jurisdiction.

16) p. 181. Some populations did not exhibit any significant trends in smolt survival. In some cases, this may be due to the short duration of the time-series. Perhaps one analysis that could be done in future years is to determine the minimum smolt survival (or adult return rates) that is needed to

sustain the populations in the absence of any fisheries or interventions. This might help to assess the recovery potential for some populations.

17) p. 183. Return of 1SW salmon have generally increased over the time-series in Labrador and Newfoundland. The WGNAS concludes that this was primarily due to the fishery closure in Canada (commercial fishery). If that is the case, we should see an increase in smolt output from these systems during the same period. Was that the case?

18) p. 214. I presume that the Scotia-Fundy correspond to Areas 19–23, and Gulf Region to Areas 15–18? It might be beneficial to the reader that is not familiar with the geography of Canada to make that statement clear in the figure caption.

West Greenland

1) p. 228, bottom of the page. Would hydroacoustics be able to detect these fish? That is are they sufficiently abundant to be detected? Any thoughts on what would be done with the carcasses collected as part of a test fishery (aside diet, DNA, and basic morphometrics, there is probably not much need to keep the whole carcass)?