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

17–26 March

Moncton, Canada

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

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H. C. Andersens Boulevard 44–46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

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Executive summary

Working Group on North Atlantic Salmon [WGNAS], Moncton, Canada, 17–26 March 2015.

Chair: Ian Russell (UK).

Number of meeting participants: 24 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) and France. Information was also provided by correspondence or by WebEx link from Greenland, Sweden, Russia, 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 ahead of the meeting as well as the development of documents and text for the report during the meeting. The report is structured by sections specific to the terms of reference of the WGNAS.

- In the North Atlantic, exploitation rates have declined and the nominal catch of wild Atlantic salmon in 2014 was 1106 t, the lowest in the time-series beginning in 1960.
- The Working Group reported on a range of new opportunities for salmon assessment and management (e.g. developments in setting conservation limits, fish tracking technologies, genetic investigations) and potential threats (e.g. parasites).
- The two Northern NEAC stock complexes were considered to be at full reproductive capacity prior to the commencement of distant water fisheries in the latest available PFA year. However, the Southern NEAC non-maturing 1SW stock complex was considered to be at risk of suffering reduced reproductive capacity, while the Southern NEAC maturing 1SW stock complex was suffering reduced reproductive capacity. At a country level, stocks from several jurisdictions were below CLs.
- Catch advice for the Faroes fishery was developed for the 2015/2016 to 2017/2018 fishing seasons. For the Northern NEAC stock complex, both maturing and non-maturing 1SW salmon have a high probability (>95%) of achieving their SERs for TACs at Faroes of up to ~40 t in the 2015/2016 season and up to ~20 t in 2016/2017, but only the non-maturing 1SW fish will exceed the SER in 2017/2018 with a TAC of <20 t. However, the Southern NEAC stock complexes both have less than 95% probability of achieving their SERs in each season with any TAC option. There are therefore no catch options that ensure a greater than 95% probability of each stock complex achieving its SER, and none that gives a greater than 60% probability of simultaneous attainment of SERs in all four stock complexes.

- At the individual country level, the probabilities of the non-maturing 1SW stocks (the main contributor to the catch) achieving their SERs in 2015/2016 varies between 15% and 100% with a zero TAC; these probabilities decrease for increasing TAC options at Faroes and for subsequent seasons. The probability of simultaneous attainment of SERs in all of the ten maturing 1SW national stock complexes is less than 2.2% in every year regardless of any harvest at Faroes, and for the ten non-maturing 1SW stock complexes it is less than 1.8% in every year.
- The Working Group developed options for incorporating North American origin stocks into the current Faroes risk framework and catch advice procedures and advised on additional data that would enhance the development of catch advice for the Faroes fishery.
- North American 2SW spawner estimates were below their CLs in four of the six regions. Within each of the geographic areas, there are also varying numbers of individual river stocks which are failing to meet CLs, particularly in the southern areas of Scotia-Fundy and the USA.
- In the absence of any fishing, there is less than 75% probability in 2015 to 2018 that the forecast numbers of 2SW salmon returning to North America will be above the six regional management objectives (conservation limits for the four northern areas, rebuilding objectives for the two southern areas) simultaneously. Therefore, in line with the objectives agreed by NASCO, there are no mixed-stock fishery options on 1SW non-maturing salmon and 2SW salmon in North America in 2015 to 2018.
- There was a nominal catch of 58 t in the fishery at Greenland in 2014. The overall abundance of salmon contributing to the West Greenland fishery remains low relative to historical levels and five of the seven stock complexes exploited in the fishery are below their CLs.
- There are no mixed-stock fishery options at West Greenland in 2015, 2016 and 2017 that would be consistent with a 75% probability or greater of simultaneously meeting the management objectives for the seven stock complexes.
- The two Indicator Frameworks previously developed by the Working Group to be used to check on the status of NAC and NEAC stocks in the interim years of a multi-annual catch advice cycle were updated and are available for use in any new multiyear agreements for the Greenland and Faroes fisheries, respectively.
- Based on the results from recent genetic investigations, the Working Group provided new information on the regional contribution of different stocks to the catches in the mixed-stock fisheries operating at Greenland, Labrador and in Saint Pierre & Miquelon, and the fishery operating at Faroes in the 1990s.
- Marine survival indices for individual index stocks in the North Atlantic in recent years are somewhat variable. However, the overall declining trend has persisted and survival indices remain low. 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.

1 Introduction

1.1 Main tasks

At its 2014 Statutory Meeting, ICES resolved (C. Res. 2014/2/ACOM10) that the **Working Group on North Atlantic Salmon** [WGNAS] (chaired by: Ian Russell, UK) will meet in Moncton, Canada, 17–26 March 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:

a) With respect to Atlantic Salmon in the North Atlantic area:	Section 2
i) 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 2014[1];	2.1, 2.2 and Annex 4
ii) report on significant new or emerging threats to, or opportunities for, salmon conservation and management[2];	2.3 and 2.5
iii) 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];	2.4
iv) provide a compilation of tag releases by country in 2014; and	2.6
v) identify relevant data deficiencies, monitoring needs and research requirements.	2.7 and Annex 7
b) With respect to Atlantic salmon in the Northeast Atlantic Commission area:	Section 3
i) describe the key events of the 2014 fisheries[4];	3.1
ii) review and report on the development of age-specific stock conservation limits;	3.2
iii) describe the status of the stocks;	3.3
iv) provide catch options or alternative management advice for 2015/16-2017/18 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[5];	3.4 and 3.5
v) advise on options for taking into account the recent genetic analysis that suggests there was a significant contribution of North American origin stocks to historic mixed-stock fisheries in Faroese waters for the provision of catch advice[6];	3.6
vi) update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice; and	3.7
vii) advise on what data would enhance the development of the catch options.	3.8
c) With respect to Atlantic salmon in the North American Commission area:	Section 4
i) describe the key events of the 2014 fisheries (including the fishery at St Pierre and Miquelon)[4];	4.1

ii) update age-specific stock conservation limits based on new information as available;	4.2
iii) describe the status of the stocks;	4.3
iv) provide catch options or alternative management advice for 2015-2018 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[5];	4.4 to 4.8
v) update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice;	5.8
vi) considering the available contemporary data on stock origin of salmon in the Labrador fisheries, estimate the catches by stock origin and describe their spatial and temporal distribution; and	4.9
vii) considering the available contemporary data on stock origin of salmon in the Saint-Pierre et Miquelon fishery, estimate the catches by stock origin and describe their spatial and temporal distribution.	4.9

d) With respect to Atlantic salmon in the West Greenland Commission area:	Section 5
i) describe the key events of the 2014 fisheries[4];	5.1
ii) describe the status of the stocks[7];	5.2
iii) provide catch options or alternative management advice for 2015–2017 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 rebuilding[5];	5.3 to 5.7
iv) update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice; and	5.8
v) considering the available contemporary data on stock origin of salmon in the West Greenland fishery, estimate the catches by stock origin and describe their spatial and temporal distribution.	5.9

1. With regard to question a) i, 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 a) ii, 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 a) iii, 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 the responses to questions b) i, c) i and d) i, 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.

5. In response to questions b) iv, c) iv and d) iii, provide a detailed explanation and critical examination of any changes to the models used to provide catch advice and report on any developments in relation to incorporating environmental variables in these models.

6. In response to question b) v, this should include consideration of the implications of the new genetic results with regard to the factors previously identified by ICES as requiring management decisions for the finalisation of the risk framework for the provision of catch advice for the Faroes fishery (i.e. annual or seasonal catch advice, sharing agreement, choice of management units to consider and specified management objectives).

7. In response to question d) ii, 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 b) iii and c) iii.

In response to the Terms of Reference, the Working Group considered 35 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 WebEx 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

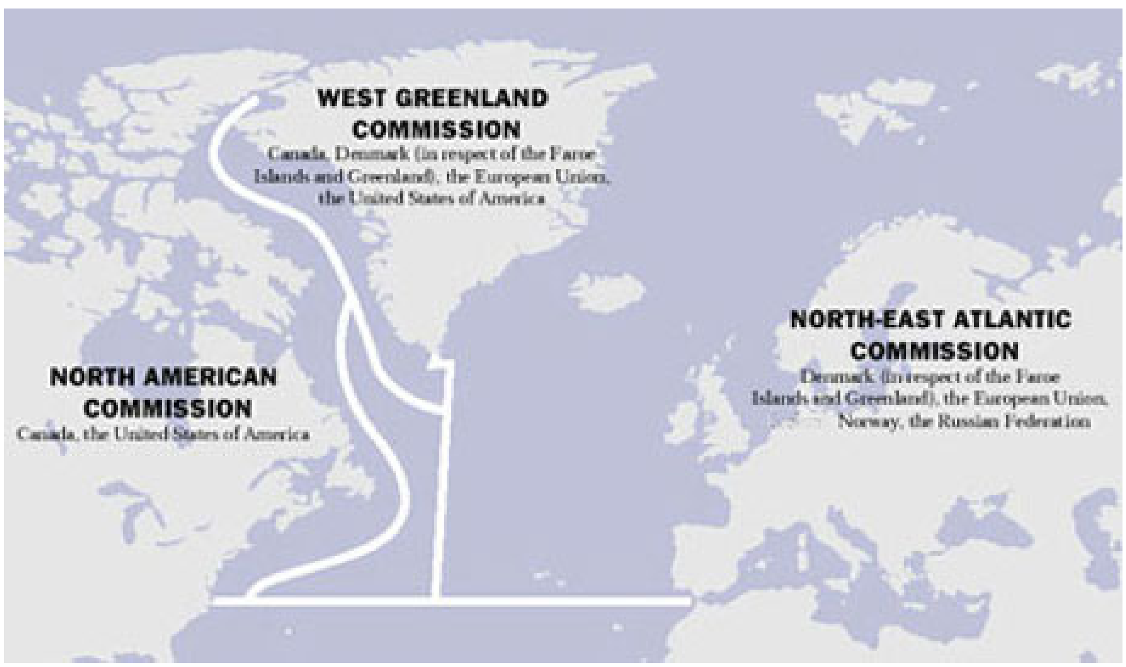
Member	Country
Bradbury, I.	Canada
Breau, C.	Canada
Carr, J.	Canada
Chaput, G.	Canada
Douglas, S.	Canada
Ensing, D.	UK (Northern Ireland)
Erkinaro, J.	Finland
Fairchild, W.	Canada
Fiske, P.	Norway
Gjøsæter, H.	Norway
Gudbergsson, G.	Iceland
Jones, R.	Canada
Levy, A.	Canada
Meerburg, D.	Canada
Millar, C.	UK (Scotland)
Nygaard, R.	Greenland (by WebEx)
Ó Maoiléidigh, N.	Ireland
Potter, T.	UK (England & Wales)
Rivot, E.	France
Robertson, M.	Canada
Russell, I. (Chair)	UK (England & Wales)
Sheehan, T.	USA
Smith, G. W.	UK (Scotland)

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.

Recent genetic investigations have indicated that North American fish contributed a larger proportion of the catch in the historic mixed-stock fishery at Faroes than previously thought. In light of these findings, The Working Group has been asked to advise on management options taking into account the North American fish; further details are provided in Section 3.6 of this report.

Full details of the assessment approaches used by the Working Group are provided in the Stock Annex, and this includes a general introduction at Section 1. Readers new to this report would be advised to read the Stock Annex in the first instance. The stock annex for Atlantic salmon is at sal-nea_SA

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 1960–2014 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 2014 (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 and so are considered as ranched. 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 & Miquelon (France)); and 'Greenland and Faroes'.

The provisional total nominal catch for 2014 was 1106 t, 176 t below the updated catch for 2013 (1282 t). The 2014 catch was the lowest in the time-series and followed on the previous lowest of the time-series in 2013. Catches were at or below the previous five and ten-year averages in the majority of countries, except Sweden, Finland, 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 2014 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 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 of 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 the majority of the catch is now taken in rivers and estuaries, except in UK (England & Wales), UK (Scotland), Norway and Russia where roughly half of the total catch is still taken in coastal waters.

Coastal, estuarine and riverine catch data for the period 2003 to 2014 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 reduced from 518 t in 2004 to 246 t in 2014. Freshwater catches have been fluctuating between 481 t (2014) and 763 t over the same period. At the beginning of the time-series about half the catch was taken in coastal waters and half in rivers. The proportion of the catch taken in coastal waters over the last six years 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 471 t and 136 t in 2004 to 79 t and 52 t in 2014, respectively. This reflects 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. In the last seven years a quarter of the catch in this area has been taken in coastal waters and half in rivers.

In North America, the total catch has been fluctuating around 140 t over the period 2004 to 2014. 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 (15 t).

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 fishing 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 1990's 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 2014 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 2014 this ranged from 19% in Norway (this is a minimum figure) to 82% in UK (Scotland) reflecting varying management practices and angler attitudes among these countries. Within countries, the percentage of fish released has tended to increase over time, although numbers were lower in many countries in 2014 due to reduced catch levels. There is also evidence from some countries that larger MSW fish are released in larger proportions than smaller fish. Overall, over 135 000 salmon were reported to have been released around the North Atlantic in 2014, below the average of the last five years (181 600).

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

2.1.3 Unreported catches

Unreported catches by year (1987 to 2014) 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 2014 was estimated to be 287 t. The unreported catch in the Northeast Atlantic Commission Area in 2014 was estimated at 256 t, and that for the West Greenland and North American Commission Areas at 10 t and 21 t, respectively. The 2014 unreported catch by country is provided in Table 2.1.3.2. Information on unreported catches was not fully provided to enable these to be partitioned 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, 2010b); details are also summarised in the Stock Annex.

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 2014 is 1555 kt, 65.4 kt above the updated production for 2013 (1490 kt). The production of farmed Atlantic salmon in this area has been over one million tonnes since 2009. The

2014 total represents a 4% increase on 2013 and a 16% 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 (79% and 10% respectively). With the exception of Ireland, farmed salmon production in 2014 was above the previous five-year average in all countries. Data for UK (Northern Ireland) since 2001 and data for east coast USA since 2011 are not publicly available.

Worldwide production of farmed Atlantic salmon has been over one million tonnes since 2002 and has been over two million tonnes since 2012. The total production in 2014 is provisionally estimated at around 2171 kt (Table 2.2.1.1 and Figure 2.2.1.1), a 3% increase on 2013. Production of farmed Atlantic salmon outside the North Atlantic is estimated to have accounted for 22% of the total in 2014. 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) which impacted the industry in that country from 2007.

The worldwide production of farmed Atlantic salmon in 2014 was over 1900 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 have now been included in a separate 'ranched' column in Table 2.1.1.1. A similar approach has now been adopted, over the available time-series, for one river in Sweden (Lagan). These fish originate in 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.

The total harvest of ranched Atlantic salmon in countries bordering the North Atlantic in 2014 was 21 t and taken in Iceland, Ireland and Sweden (Table 2.2.2.1; Figure 2.2.2.1). No estimate of ranched salmon production was made in Norway in 2014 where such catches have been very low in recent years (<1 t) and UK (Northern Ireland) where the proportion of ranched fish was not assessed between 2008 and 2014 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 Interactions between farmed and wild salmon–UK (Northern Ireland)

In UK (Northern Ireland) a study was finished in 2014 using genetic methods to detect the presence of farm escaped fish in samples taken from the commercial fishery in 2006 and 2007. The study used genetic assignment techniques to assign a sample of 1100 individuals taken along the Northern Irish coast between Downhill and Cushendun to a genetic baseline consisting of 1100 juveniles from ten regional rivers, as well as a sample (350 individuals) from two commonly used Norwegian origin aquaculture strains. All samples were genotyped for a suite of 17 microsatellite loci and a panel of 90 Single Nucleotide Polymorphism (SNP) markers. Assignments were performed using various genetic assignment software packages utilising Bayesian, frequency based and maximum likelihood methods to assign samples to baseline populations. There were two assignment groups: 'wild' and 'farmed'.

The percentage of samples assigned to the 'farmed' assignment group ranged from 0.7% to 2.9% for the microsatellites, and 1.2% to 1.7% for SNPs across the various methods. These figures are slightly lower than those reported by Walker *et al.* (2006) that reported an average of 4.2% of farmed escapes in commercial samples from the Northern Irish coast between 1992 and 2004.

2.3.2 Tracking and acoustic tagging studies in Canada

There is growing interest in the development of techniques to help investigate salmon mortality at sea and to better partition mortality between different periods of the marine phase of the life cycle. To this end, NASCO's International Atlantic Salmon Research Board (IASRB) adopted a resolution in 2014 to further support the development of telemetry programmes in the ocean.

The Working Group reviewed the results of ongoing projects led by the Atlantic Salmon Federation (ASF) in collaboration with the Ocean Tracking Network, Miramichi Salmon Association (MSA), Restigouche River Watershed Management Committee, Department of Fisheries and Oceans (DFO) and others, to assess estuarine and marine survival of tagged Atlantic salmon released in rivers of the Gulf of St Lawrence (GoSL), Canada. More than 2300 smolts from four rivers (Cascapedia, Restigouche, Southwest and Northwest branches of the Miramichi) were tagged with acoustic transmitters and released over a period of twelve years, 2003 to 2014. Acoustic arrays to detect tagged fish were positioned at the head of tide of each river, at the exit from the bays to the GoSL and at the Strait of Belle Isle (SoBI) leading to the Labrador Sea, more than 800 km from the point of release.

A Bayesian state–space model variant of the Cormac-Jolly-Seber model was used to better distinguish the imperfect detection of tagged smolts on the sonic arrays from apparent survival during their out migration. The model reduced uncertainty in expected values of the annual and river-specific detection probabilities at the head of tide and bay exit arrays. However, it was not possible to distinguish the probabilities of detection from the probabilities of survival at the last array (SoBI). The head of tide and outer bay arrays were in place in all years. The SoBI array was deployed since 2007 so the probabilities of detection at the bay exits were estimated using the years 2007 to 2013 when the SoBI array was operational. The predicted posterior probability distributions for the bay arrays were used as probability distributions of detection in the years when the SoBI array was not in place (2003 to 2006). The probabilities of detection and survival to SoBI can only be estimated with a prior assumption at this array. The prior was derived using sentinel tags (fixed tags adjacent to SoBI receivers) placed at three distances near two receivers.

There was generally a high probability of detection through freshwater with the greatest interannual variation in Restigouche due to losses of receivers, particularly in 2011. For the bay arrays, there was a higher probability of detection at Miramichi Bay (median range 0.74 to 0.84) than the Chaleur Bay (0.53 to 0.67). The probability of detection through the GoSL was derived from the informative prior using the sentinel tag information, and the posterior distribution was dominated by the prior assumption (mean was 0.44).

The probability of smolt survival through freshwater (Figure 2.3.2.1) was high for Cascapedia (median range 0.94 to 0.95) and highly variable in SW Miramichi (0.71 to 0.89) and Restigouche (0.72 to 0.91). The survival rate through freshwater was negatively associated with migration duration. The survival rates from release to the outer bays leading to the GoSL (Figure 2.3.2.2) varied annually, ranging between 0.50 and 0.80, except for the NW Miramichi where estimated survival decreased below 0.30 over the last two years. The inferred survival rates through the GoSL to the Labrador Sea were highly variable (Figure 2.3.2.3).

The SoBI receiver array (between Labrador and Newfoundland) appears to be the primary route for smolts and kelts exiting the GoSL. The only other possible exit is through the Cabot Strait, and this array has been in place since 2012. Only two smolt tags were detected on the Cabot array (originating in Miramichi in 2012 and Cascapedia in 2013).

Salmon kelts have been acoustically tagged since 2008 (272 from Miramichi and 42 from Restigouche). In the Miramichi, 32 kelts have also been tagged with satellite archival pop-up tags (2012 to 2014). Detections through the freshwater and bays were high in most years (> 0.80), with the exception of 2014 (Restigouche = 0.60, Miramichi = 0.76). There was a high mortality of kelts in the GoSL and pop-up tags provided data on where the salmon were dying (Figure 2.3.2.4).

Predator–prey studies are ongoing in the Miramichi and Chaleur Bay. Information has been collected in 2014 on cormorant diet (pellets), smolt abundance and size, cormorant colony size, and cormorant movements in the Restigouche area and Chaleur Bay. These data will be used in a bioenergetics model. The ASF, MSA and DFO have collaborated on a study of striped bass and Atlantic salmon smolt interactions on the Miramichi River. The partners have documented the spatial and temporal overlap of the two species (using acoustic tags), and the contribution of smolts to the diet of striped bass is being examined. Significant losses of acoustically tagged Miramichi smolts have been estimated in areas where striped bass were known to be spawning. The field component of these projects will continue in 2015.

The Working Group encourages the continuation of this tracking programme as information from it is expected to be useful in the assessment of marine mortality on North American salmon stocks. The Working Group also notes that these techniques are being proposed for other areas in line with the NASCO IASRB resolution.

2.3.3 Diseases and parasites

2.3.3.1 Update on Red Vent Syndrome (Anasakiasis)

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, 2014a). The condition, known as red vent syndrome (RVS or Anasakiasis), has been noted since 2005, 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. In 2014, in UK (England & Wales), three rivers were monitored for the presence of RVS (Tyne, Dee and Lune). While there was monitoring of RVS levels on the Tamar and Caldew rivers in previous years, this was not continued in 2014. In the Tyne and the Dee levels were 8% and 25% respectively, both near the top end of the ranges recorded for these rivers; for the Lune, levels dropped significantly to 10%, however the sample size was small.

In 2014 in France, the level of infestation continued to be monitored on the Bresle and Scorff rivers; some level of infestation was found on two-thirds of the adult fish in both rivers, and this is less than previously. In the River Bresle, less than 10% of the fish were "moderately" affected compared to 25% in this category, on average, for previous years. On the River Scorff, 29% were "moderately" affected in 2014, compared with an average of 22% in previous years.

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, 2014a).

2.3.3.2 Update on sea lice investigations in Norway

The surveillance programme for sea lice infection on wild salmon smolts and sea trout at specific localities along the Norwegian coast continued in 2014 (Nilsen *et al.*, 2014), and for most areas sea lice infestation rates were low to moderate in the salmon smolt migration period as a result of coordinated efforts among fish farms to reduce infestation levels in this period. In two areas, Romsdalsfjord and Vikna, salmon smolts were probably exposed to elevated levels of sea lice, especially late migrating smolts may have been affected.

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.*, 2014). The use of chemicals to keep lice levels in 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 more of the most commonly used chemical agents. Multi-resistant sea lice are now present in all areas except Finnmark County in northernmost Norway (Aaen *et al.*, 2015; www.fhi.no). A recently published study demonstrated how the resistance to the most commonly used pesticide, emamectin benzoate, spread rapidly through the panmictic North Atlantic sea lice population from 1999, and that this was associated with reduced variation (selective sweeps) in genome regions that have been shown to be linked with susceptibility to emamectin benzoate (Besnier *et al.*, 2014).

Norway has a regime of "National salmon fjords" that restrict salmon farming and other activities close to "National salmon rivers". A recent study has evaluated the effect of such protected areas on the effects of sea lice from fish farms on salmon and sea trout (Serra-Llinares *et al.*, 2014). When the size and shape of a protected area are such that fish farms are kept at a minimum distance (in the study calculated to at least 30 km), wild fish seem unaffected by the direct lice infection pressure imposed by fish farms (Serra-Llinares *et al.*, 2014). However, this distance is considered likely to be site-dependent.

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 (2014a). 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. The first classification of populations based on both dimensions (conservation limit and harvest potential, and genetic integrity) is planned for 2015.

2.3.5 Changing biological characteristics of salmon

The Working Group have previously reported changes in the biological characteristics of salmon, including the size of returning 1SW fish (ICES, 2010a; 2013). For example, decreasing mean fork lengths have been observed in returning adult 1SW fish in the Rivers Bush and Bann in UK (Northern Ireland) since 1973 (ICES, 2013).

In 2014, very small 1SW salmon were reported anecdotally by anglers from various areas in NAC and this was noted by the Working Group. However, available evidence from traps and counting facilities did not indicate below average return size on monitored rivers in 2014 (e.g. Miramichi, Nashwaak, La Have, Sandhill). Stocks will continue to be monitored in 2015.

2.3.6 Determining sex ratios in Atlantic salmon populations

The sex ratio of Atlantic salmon spawners is a key parameter for estimating egg deposition rates and assessing the status of salmon populations. Accurate sexing of out-migrating smolts requires lethal sampling. Many Canadian salmon populations are assessed using counting facilities where fish are sampled as they migrate into river systems during summer. Accurate sexing of adult salmon during the summer spawning migration also requires lethal sampling although alternate methods such as external examination of male kype formation is possible for fish sampled in autumn. Given that lethal sampling is never desirable and not even possible in small and threatened populations, a simple non-lethal method to determine salmon sex is preferred. Recent work has identified sex determining genomic regions in Atlantic salmon (Yano *et al.*, 2012; 2013; Eisbrenner *et al.*, 2014). Use of the sdY locus (Yano *et al.*, 2013) has allowed accurate sexing of Atlantic salmon in Newfoundland and Labrador populations. As expected, comparison with visual external sexing during the summer migration revealed significant discrepancies (males mis-sexed as female).

Genetic based sex identification provides a new tool for refining sex ratios and production estimates in Atlantic salmon populations, particularly for populations in which abundance of salmon is very low and sacrificing individual fish for the purpose of obtaining this biological characteristic (sex) is not justifiable.

2.3.7 Update on EU project ECOKNOWS; embedding Atlantic salmon stock assessment at a broad ocean scale within an integrated Bayesian life cycle modelling framework

Within the Atlantic salmon case study of the EU-FP7 ECOKNOWS project (http://www.ecoknows.eu/), a Hierarchical Bayesian life cycle model was developed that captures the joint dynamics of the five regional stock units considered by the Working Group for stock assessment in the Southern European stock complex: France, UK (England & Wales), Ireland and UK (Northern Ireland), Southwest Iceland and UK (Scotland) (see details of the model in Massiot-Granier *et al.,* 2014). The new modelling approach provides improvement to models currently used by the Working Group, and paves the way toward harmonizing the stock assessment models used in the Atlantic (WGNAS) and the Baltic (WGBAST).

- The existing biological knowledge of Atlantic salmon demography is first integrated into an age and stage-based life cycle model, which explicitly incorporates the variability of life histories (river and sea ages) and accounts for natural and fishing mortality due to the sequential fisheries along the migration routes. This body of prior knowledge forms the prior about the population dynamic, which is then updated after assimilation of the available data.
- The model is built in a full Bayesian probabilistic rationale. All sources of uncertainties are accounted for in both estimations and forecasting.
- The model provides a framework for harmonizing the structure and parameterization between different stock units, while maintaining the specificities and associated levels of detail in data assimilation.
- The hierarchical structure provides a tool for separating out signals in the variability of demographic traits at different spatial scales: (1) a common trend shared by the five stock units of the southern European stock complex and, (2) fluctuations specific to each stock unit. Results highlight that both post-smolt survival during the first months at sea (smolts □ PFA stages) and the of salmon maturing after two winters at sea exhibit common decreasing trends among the five stock units. Results then support the hypothesis of a response of salmon populations to broad scale ecosystem changes. However, changes specific to each of the five stock units still represent a significant part of the total variability (~40%), suggesting an additional influence of drivers acting at a more regional scale.

The life cycle model is expandable and provides a framework for structuring further research and data collection:

- It offers possibilities for extending the model by incorporating additional sources of data: (1) time-series of egg-to-smolt data available from a set of monitored rivers to provide information on density-dependent egg-to-smolt survival rates and on smolt age compositions (a database has been consolidated during the project); (2) smolt tagging and recapture data available for several monitored rivers to improve the estimates of return rates.
- It would enable trends in survival and proportion maturing to be correlated with environmental factors likely to influence populations at various spatial scales (global vs. local influence).
- It could be used to assess how management and environmental scenarios can affect population dynamics at the scale of all stock complexes in the North Atlantic Ocean.

It has not been possible for the Working Group to utilise the model as yet. Ongoing issues include: (1) improving the computational tractability of the model (running time is still too long), and (2) assessing the possibility of transferring the methodology to the stock assessment model for North America. Continued efforts are being made to address these issues.

2.3.8 New opportunities for sampling salmon at sea

Knowledge of the salmon's marine life cycle, including migration routes and feeding areas for salmon from different parts of the distribution range is still limited, although recent projects such as the EU-funded SALSEA-Merge project have provided much valuable information. To advance our understanding of salmon at sea, and the factors influencing marine growth and survival, further sampling at sea is needed. With the low density of salmon in the ocean, obtaining samples of salmon at sea is costly. Thus, opportunities to obtain samples opportunistically from research cruises targeting other species provides a potential cost-effective alternative to targeted studies.

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 such an opportunity. The area surveyed (2.45 million km^2 in 2014) 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. 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. The Working Group has been in contact with the coordinator of the IESSNS surveys, who is keen to facilitate collaboration. Preliminary discussions have taken place to clarify sampling protocols and to identify appropriate individuals to carry out subsequent analysis of any salmon samples. These 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.

2.3.9 New opportunities for collecting information on salmon bycatch in pelagic fisheries

The Working Group received information from the Institute of Marine Research (IMR), Bergen, Norway, related to a new tagging initiative and wide-scale tag screening programme in the Northeast Atlantic. The tagging programme is directed at pelagic species (herring and mackerel) using glass-encapsulated passive integrated transponder (PIT) tags / RFID tags (Radio Frequency Identity tags). Tag detection relies on the installation of antenna-reader systems at ports of landing. To date, such detectors have been installed at eight factories processing herring and mackerel; these are located in Norway (1), Iceland (1, with 2 more planned), Faroes (1) and Scotland (5, with 1 more planned). Further detectors are also planned in Ireland (3) and Denmark (1). By 2015, there may as many as 22 RFID detector systems screening herring and mackerel catches around Europe.

PIT / RFID tags are also widely used in juvenile salmon, and to some extent also in adult salmon. The Working Group received reports of a total number of 29 895 salmon being tagged with PIT/RFID tags in 2014 (4951 adults, 21 814 smolts, 3130 parr). The tag detectors will thus be able to detect such tags in post-smolts or adult salmon taken as bycatch in the mackerel and herring fisheries. The Working Group has contacted the programme coordinators at IMR and has been advised that all tag detections will be registered and stored on an IMR database, and that information on any salmon caught will be available. The Working Group will therefore provide IMR with details of the tag number series used in salmon tagging investigations, and relevant contact details, so that tag–recapture details (date, location, etc.) can be reported back to appropriate researchers.

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) had its second meeting from the 12th to the 16th of May 2014 at ICES HQ in Copenhagen.

WGERAAS decided to focus on the evaluation of case studies and use the river-specific database; 'Database on Effectiveness of Recovery Actions for Atlantic salmon' (DBERAAS) to support the case studies by providing an overview of the impact of a list of stressors and the effect of recovery actions across the species range.

At the meeting in Copenhagen an interim report was drafted (ICES, 2014b) presenting eight case studies and an analysis of a partially completed database using data from rivers that were the focus of peer-reviewed or grey literature studies of recovery or rebuilding actions. The results from the analysis showed the potential of a complete DBERAAS for analysis of population stressors, and recovery and rebuilding actions, in relation to conservation status, and the effects of recovery and rebuilding actions across varying spatial scales.

For 2015, WGERAAS aims to collect more case studies, specifically on populations impacted by stressors such as invasive species and diseases, as well as populating DBERAAS. Analysis of both DBERAAS and case studies will indicate under what conditions recovery actions are successful and when unsuccessful. Recommendations on future recovery and restoration actions for Atlantic salmon will be based on this analysis.

WGERAAS plans to meet in November 2015 and report to ICES in 2016.

2.5 Reports from expert group reports relevant to North Atlantic salmon

2.5.1 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 2014, during the NASCO Annual Meeting in St Malo, France. Discussions were held on the requirements for Expert Groups to address new and ongoing issues related to diadromous species, including issues arising from the NASCO Annual Meeting. The annual meeting of WGRECORDS was held in September 2014, during the ICES Annual Science Conference in Á Coruna, Spain. 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 the ongoing, recently held, or proposed expert groups which WGRECORDS has proposed to ICES:

- Ongoing: The Working Group on Effectiveness of Recovery Actions for Atlantic Salmon (WGERAAS), next meeting autumn 2015. An update is provided in Section 2.4;
- Recent: The Workshop on Lampreys and Shads (WKLS) held in October 2014;
- The Working Group on Data Poor Diadromous Fish (WGDAM) to be held in October 2015;
- Proposed: Workshop of a Planning Group on the Monitoring of Eel Quality "Development of standardized and harmonized protocols for the estimation of eel quality";
- Proposed: Joint Workshop of the Working Group on Eel and the Working Group on Biological Effects of Contaminants "Are contaminants in eels contributing to their decline?"

Theme sessions and symposia may be developed and proposed by WGRECORDS. In 2014, a Theme Session proposed by WGRECORDS was held at the ICES ASC entitled: "Analytical approaches to using telemetry data to assess marine survival of Diadromous and other migratory fish species".

This Theme Session focused particularly on approaches for estimating mortality of fish using electronic tags. In particular, the theme session highlighted the benefits of cooperation between research groups in North America including: Ocean Tracking Network (OTN), Atlantic Cooperative Telemetry network (ACT) and Florida Atlantic Coast Telemetry network (FACT) and the opportunities for researchers in Europe to start applying these techniques. The international salmon telemetry programme, which is being supported by NASCO and developed by member states, was outlined at the session as this aims to describe the migration pathways of Atlantic salmon in the sea and help in partitioning the marine mortality of salmon populations from different regions in space and time.

Of particular relevance to NASCO is the Theme Session developed by WGRECORDS for the ICES Annual Science Conference in September 2015, entitled: "Practical application of Genetic Stock Identification for the conservation, management and restoration of Diadromous fish species".

A Theme Session has also been proposed for the ICES ASC in 2016, entitled: "Planning the future for diadromous and other migratory fish - what can be done to respond to climate change and other processes potentially affecting natural mortality over broad geographic scales."

2.6 NASCO has asked ICES to provide a compilation of tag releases by country in 2014

Data on releases of tagged, finclipped and otherwise marked salmon in 2014 were provided to the Working Group and are compiled as a separate report (ICES, 2015). In summary (Table 2.6.1), about 4.2 million salmon were marked in 2014, an increase from the 3.56 million fish marked in 2013. The adipose clip was the most commonly used primary mark (3.53 million), with coded wire microtags (0.516 million) the next most common primary mark and 124 196 fish were marked with external tags. Most marks were applied to hatchery-origin juveniles (4.1 million), while 65 943 wild juveniles and 6115 adults were also marked. In 2014, 19 392 PIT tagged salmon, Data Storage Tags (DSTs), radio and/or sonic transmitting tags (pingers) were also used (Table 2.6.1).

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 in the southwest of France.

2.7 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. Reported total nominal catch of salmon by country (in tonnes round fresh weight), 1960–2014. (2014 figures include provisional data).

	NAC Area			NEAC (N. Area)								NEAC (S. Area)						Faroes & Greenland				Total	Unreported catches	
						Iceland		Sweden					UK	UK	UK				East	West		Reported		
Year	Canada	USA	St. P&M	Norway	Russia	Wild	Ranch (4)	Wild	Ranch (15)	Denmark	Finland	Ireland	(E & W)	(N.Irl.)	(Scotl.)	France	Spain	Faroes	Grld.	Grld.	Other	Nominal	NASCO	International
	(1)			(2)	(3)							(5,6)		(6,7)		(8)	(9)	(10)		(11)	(12)	Catch	Areas (13)	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.

	NAC Area			NEAC (N. Area)								NEAC (S. Area)						Faroes & Greenland				Total	Unreported catches	
													UK	UK	UK				East	West		Reported		
Year	Canada	USA	St. P&M	Norway	Russia	Iceland		Sweden		Denmark	Finland	Ireland	(E & W)	(N.Irl.)	(Scotl.)	France	Spain	Faroes	Grld.	Grld.	Other	Nominal	NASCO	International
	(1)			(2)	(3)	Wild	Ranch (4)	Wild	Ranch (15)			(5,6)		(6,7)		(8)	(9)	(10)		(11)	(12)	Catch	Areas (13)	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	-	2,156	700	-
2006	137	0	3	932	91	93	17	8	6	2	67	326	80	29	192	13	11	0	0	22	-	2,029	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	17	121	4	2	0	0	26	-	1,318	343	-
2010	153	0	3	642	88	147	42	9	13	13	49	99	109	12	180	10	2	0	0	40	-	1,610	393	-
2011	179	0	4	696	89	98	30	20	19	13	44	87	136	10	159	11	7	0	0	28	-	1,629	421	-
2012	126	0	3	696	82	50	20	21	9	12	64	88	58	9	124	10	8	0	0	33	-	1,412	403	-
2013	137	0	5	475	78	125	29	10	4	11	46	87	84	6	123	11	4	0	0	47	-	1,282	306	-
2014	106	0	4	490	81	47	13	24	6	9	58	52	52	5	83	12	7	0	0	58	-	1,106	287	-
Average																								
2009-2013	144	0	4	621	82	109	33	14	11	11	48	86	88	11	141	9	4	0	0	35	-	1,450	373	-
2004-2013	143	0	3	728	80	110	33	11	9	8	52	184	86	23	169	11	7	0	0	28	-	1,686	484	-

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. Reported total nominal catch of salmon in home waters by country (in tonnes round fresh weight), 1960–2014. (2014 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)										
								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
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.

Year	NAC Area: Canada (1) Lg	Canada (1) Sm	Canada (1) T	USA T	NEAC (N. Area): Norway (2) S	Norway (2) G	Norway (2) T	Russia (3) T	Iceland Wild T	Iceland Ranch T	Sweden Wild T	Sweden Ranch T	Denmark T	Finland S	Finland G	Finland T	NEAC (S. Area): Ireland (4,5) S	Ireland (4,5) G	Ireland (4,5) T	UK (E&W) T	UK(N.I.) (4,6) T	UK(Scotland) S	UK(Scotland) G	UK(Scotland) T	France T	Spain T	Total 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	21	15	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	-	-	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	-	-	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	-	-	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	-	-	46	-	-	87	83	4	74	45	119	11	4	1,216
2014	41	65	106	0	319	171	490	81	47	13	24	6	9	-	-	58	-	-	52	52	5	58	26	83	12	7	1,043
Average																											
2009-2013	58	86	144	0	473	148	621	82	102	32	14	11	11	-	-	48	-	-	86	88	10	96	45	141	9	4	1393
2004-2013	58	85	143	0	546	182	728	80	107	32	11	9	8	-	-	53	-	-	184	86	23	109	60	169	11	7	1642

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, 1991–2014. Figures for 2014 are provisional.

Year	Canada [4]		USA		Iceland		Russia [1]		UK (E&W)		UK (Scotland)		Ireland		UK (N Ireland) [2]		Denmark		Norway [3]	
	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch
1991	22,167	28	239	50			3,211	51												
1992	37,803	29	407	67			10,120	73												
1993	44,803	36	507	77			11,246	82	1,448	10										
1994	52,887	43	249	95			12,056	83	3,227	13	6,595	8								
1995	46,029	46	370	100			11,904	84	3,189	20	12,151	14								
1996	52,166	41	542	100	669	2	10,745	73	3,428	20	10,413	15								
1997	50,009	50	333	100	1,558	5	14,823	87	3,132	24	10,965	18								
1998	56,289	53	273	100	2,826	7	12,776	81	4,378	30	13,464	18								
1999	48,720	50	211	100	3,055	10	11,450	77	4,382	42	14,846	28								
2000	64,482	56	0	-	2,918	11	12,914	74	7,470	42	21,072	32								
2001	59,387	55	0	-	3,611	12	16,945	76	6,143	43	27,724	38								
2002	50,924	52	0	-	5,985	18	25,248	80	7,658	50	24,058	42								
2003	53,645	55	0	-	5,361	16	33,862	81	6,425	56	29,170	55								
2004	62,316	57	0	-	7,362	16	24,679	76	13,211	48	46,279	50					255	19		
2005	63,005	62	0	-	9,224	17	23,592	87	11,983	56	46,165	55	2,553	12			606	27		
2006	60,486	62	1	100	8,735	19	33,380	82	10,959	56	47,669	55	5,409	22	302	18	794	65		
2007	41,192	58	3	100	9,691	18	44,341	90	10,917	55	55,660	61	13,125	40	470	16	959	57		
2008	54,887	53	61	100	17,178	20	41,881	86	13,035	55	53,347	62	13,312	37	648	20	2,033	71	5,512	5
2009	52,151	59	0	-	17,514	24			9,096	58	48,418	67	10,265	37	847	21	1,709	53	6,696	6
2010	55,895	53	0	-	21,476	29	14,585	56	15,012	60	78,357	70	15,136	40	823	25	2,512	60	15,041	12
2011	71,358	57	0	-	18,593	32			14,406	62	64,813	73	12,753	39	1,197	36	2,153	55	14,303	12
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
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
2014	39,534	59	0	-	14,017	44	8,479	52	7,368	77	37,139	82	5,400	35	1,065	50	1,918	61	20,281	19
5-yr mean 2009-2013	54,664	57			18,094	29	7,687	46	12,185	63	61,792	73	12,145	38	1,878	41	2,092	56	14,121	12
% change on 5-year mean	-28	3			-23	51	10	13	-40	22	-40	13	-56	-7	-43	22	-8	9	44	63

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).

[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, 1987–2014.

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
Mean 2009-2013	338	25	10	373

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, 2014.

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	40
NEAC	Finland	6	0.4	9
NEAC	Iceland	2	0.1	3
NEAC	Ireland	6	0.4	10
NEAC	Norway	210	15.1	30
NEAC	Sweden	3	0.2	9
NEAC	France	3	0.2	20
NEAC	UK (E & W)	10	0.7	16
NEAC	UK (N.Ireland)	0	0.0	6
NEAC	UK (Scotland)	10	0.7	11
NAC	USA	0	0.0	0
NAC	Canada	21	1.5	17
WGC	West Greenland	10	0.7	15
	Total Unreported Catch *	287	20.6	
	Total Reported Catch of North Atlantic salmon	1,107		

* No unreported catch estimate available for Russia in 2014.
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), 1980–2014.

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	45,396	43,612	15,691	11,127	1,068	-	4,500	1,215,133	123,233	8,408	70,831	31,807	0	234,279	1,449,412
2011	1,065,974	158,018	60,500	41,448	12,196	-	1,083	-	8,500	1,347,719	264,349	7,467	83,144	36,662	0	391,622	1,739,341
2012	1,232,095	162,223	76,595	52,951	12,440	-	2,923	-	8,754	1,547,981	399,678	8,696	79,981	43,982	0	532,337	2,080,318
2013	1,168,324	163,234	75,852	47,550	9,125	-	3,018	-	22,500	1,489,603	492,329	6,834	74,673	42,776	0	616,612	2,106,215
2014	1,220,333	162,374	86,490	47,316	12,000	-	3,965	-	22,500	1,554,978	492,329	6,368	74,673	42,776	0	616,146	2,171,124
5-yr mean 2009-2013	1,053,775	156,377	61,969	45,732	12,332		1,767		9,276	1,344,660	302,579	7,865	75,458	37,024	0	422,927	1,767,587
% change on 5-year mean	+16	+4	+40	+3	-3		+124		+143	+16	+63	-19	-1	+16		+46	+23

Notes:
Data for 2014 are provisional for many countries.
Where production figures were not available for 2014, values as in 2013 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 2011 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), 1980–2014.

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	12.5	2.8	-	6.2	-	21
5-yr mean 2009-2013	33.5	2.8		11.0		47.4
% change on 5-year mean	-63	-1		-44		-55

1 From 1990, catch includes fish ranched for both commercial and angling purposes.
2 Total yield in homewater fisheries and rivers.
3 The proportion of ranched fish was not assessed between 2008 and 2014 due to a lack of microtag returns.

Table 2.7.1. Summary of Atlantic salmon tagged and marked in 2014.

		Primary Tag or Mark				
Country	Origin	Microtag	External mark[2]	Adipose clip	Other Internal[1]	Total
Canada	Hatchery Adult	0	2,559	288	1,350	**4,197**
	Hatchery Juvenile	0	17	328,318	65	**328,400**
	Wild Adult	0	2,294	0	170	**2,464**
	Wild Juvenile	0	8,906	17,971	372	**27,249**
	Total	**0**	**13,776**	**346,577**	**1,957**	**362,310**
Denmark	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	102,450	0	328,000	10,000	440,450
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	0	0
	Total	**102,450**	**0**	**328,000**	**10,000**	**440,450**
France	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile[3]	0	0	469,738	0	469,738
	Wild Adult[3]	620	0	0	0	620
	Wild Juvenile	3,101	3,000	0	0	6,101
	Total	**3,721**	**3,000**	**469,738**	**0**	**476,459**
Iceland	Hatchery Adult	0	72	0	0	72
	Hatchery Juvenile	24,755	0	0	0	24,755
	Wild Adult	0	34	0	0	34
	Wild Juvenile	5,357	0	0	0	5,357
	Total	**30,112**	**106**	**0**	**0**	**30,218**
Ireland	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	194,102	0	0	0	194,102
	Wild Adult	0	0	0	0	0
	Wild Juvenile	5,164	0	0	0	5,164
	Total	**199,266**	**0**	**0**	**0**	**199,266**
Norway	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	84,634	3,798	0	0	88,432
	Wild Adult	179		0	0	179
	Wild Juvenile	768	3,204	0	0	3,972
	Total	**85,581**	**7,002**	**0**	**0**	**92,583**
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	77,333	0	202,564		**279,897**
	Wild Adult	0	0	0	0	**0**
	Wild Juvenile	0	0	0	0	**0**
	Total	**77,333**	**0**	**202,564**	**0**	**279,897**
Sweden	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile[4]	0	4000	167,665	0	171,665
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	0	0
	Total	**0**	**4,000**	**167,665**	**0**	**171,665**
UK (England & Wales)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile			64,121		64,121
	Wild Adult		630		48	678
	Wild Juvenile	1,981		9,052	58	11,091
	Total	**1,981**	**630**	**73,173**	**106**	**75,890**
UK (N. Ireland)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	11,664	0	39,606	0	51,270
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	0	0
	Total	**11,664**	**0**	**39,606**	**0**	**51,270**
UK (Scotland)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	0	202,373	257	202,630
	Wild Adult	0	282	0	107	389
	Wild Juvenile	3,832	0	281	2,346	6,459
	Total	**3,832**	**282**	**202,654**	**2,710**	**209,478**
USA	Hatchery Adult	0	616	0	2,542	3,158
	Hatchery Juvenile	0	92,354	164,815	2,027	259,196
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	50	50
	Total	**0**	**92,970**	**164,815**	**4,619**	**262,404**
All Countries	Hatchery Adult	0	3,247	288	3,892	7,427
	Hatchery Juvenile	494,938	100,169	3,500,171	12,349	4,107,627
	Wild Adult	799	4,991	0	325	6,115
	Wild Juvenile	20,203	15,110	27,304	2,826	65,443
	Total	**515,940**	**123,517**	**3,527,763**	**19,392**	**4,186,612**

[1] Includes other internal tags (PIT, ultrasonic, radio, DST, etc.)

[2] Includes Carlin, spaghetti, streamers, VIE etc.

[3] Includes external dye mark.

[4] The 4000 external tagged hatchery juveniles also adipose finclipped

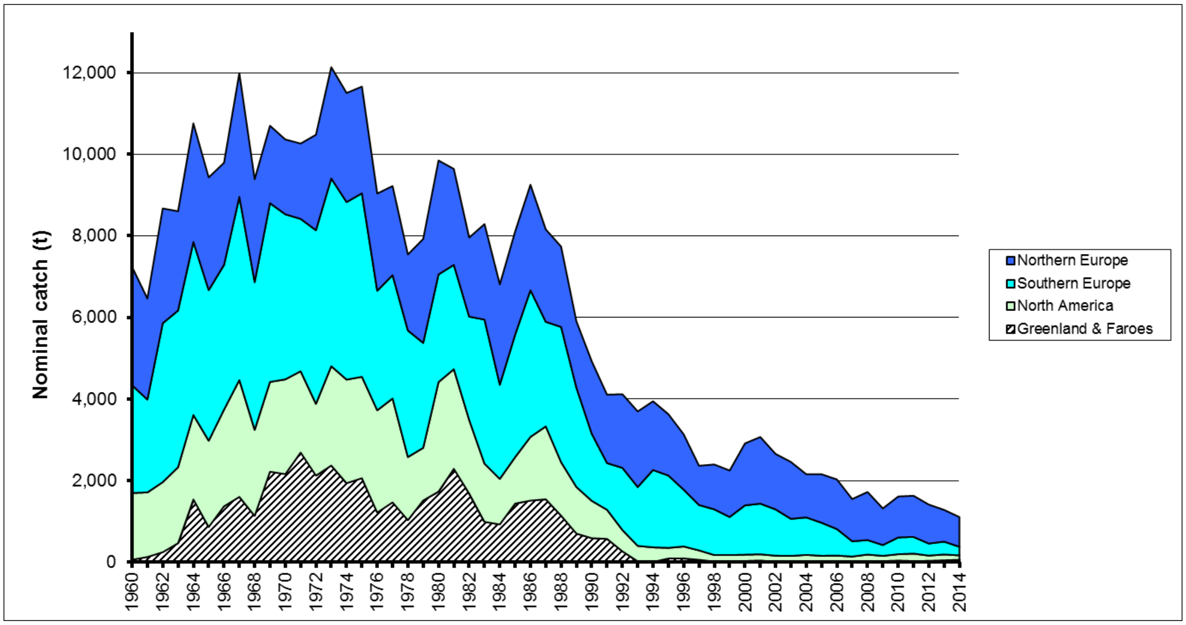


Figure 2.1.1.1. Total reported nominal catch of salmon (tonnes round fresh weight) in four North Atlantic regions, 1960–2014.

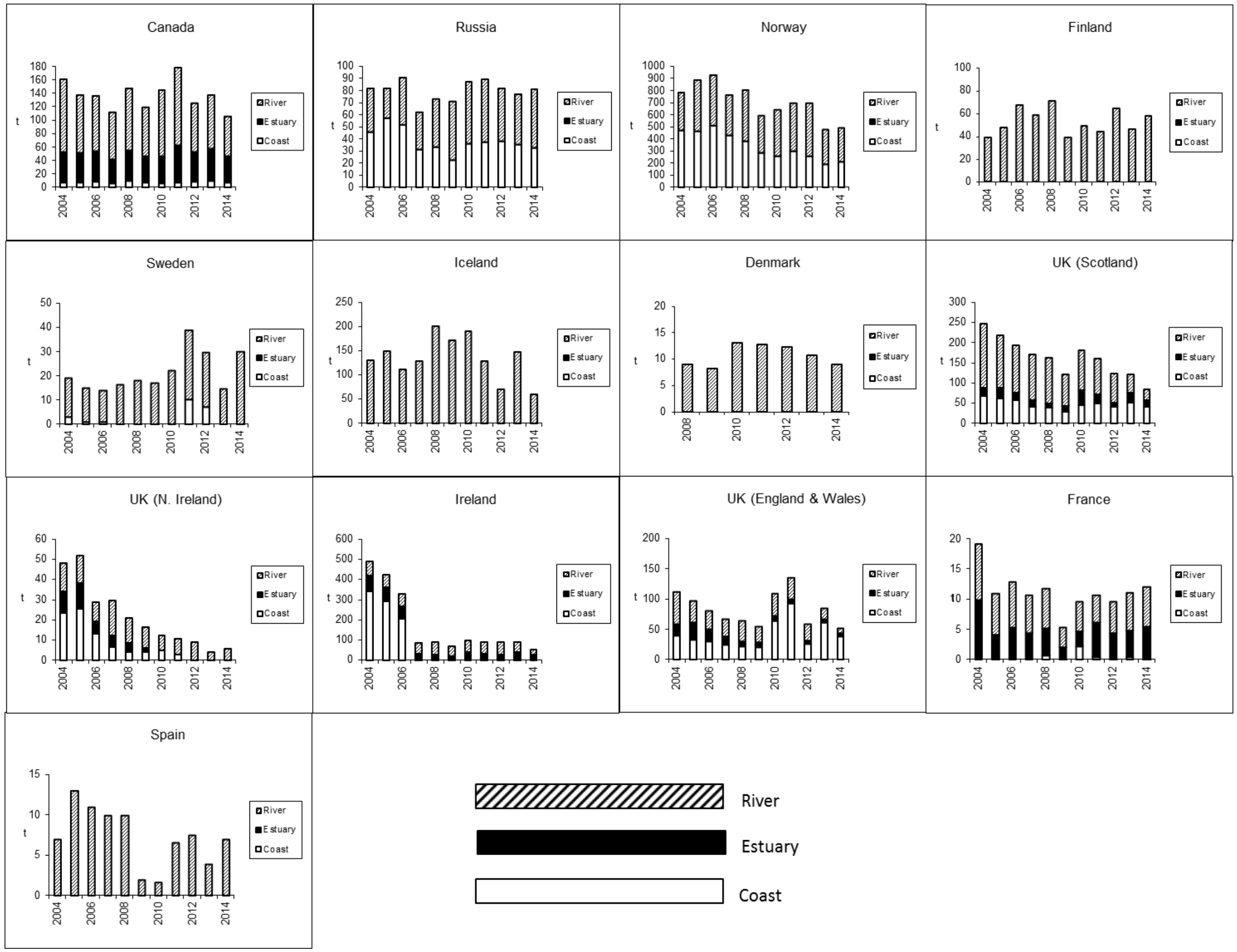


Figure 2.1.1.2. Nominal catch (tonnes) taken in coastal, estuarine and riverine fisheries by country, 2004–2014. The way in which the nominal catch is partitioned among categories varies between countries, particularly for estuarine and coastal fisheries, see text for details. Note also that the y-axes scales vary.

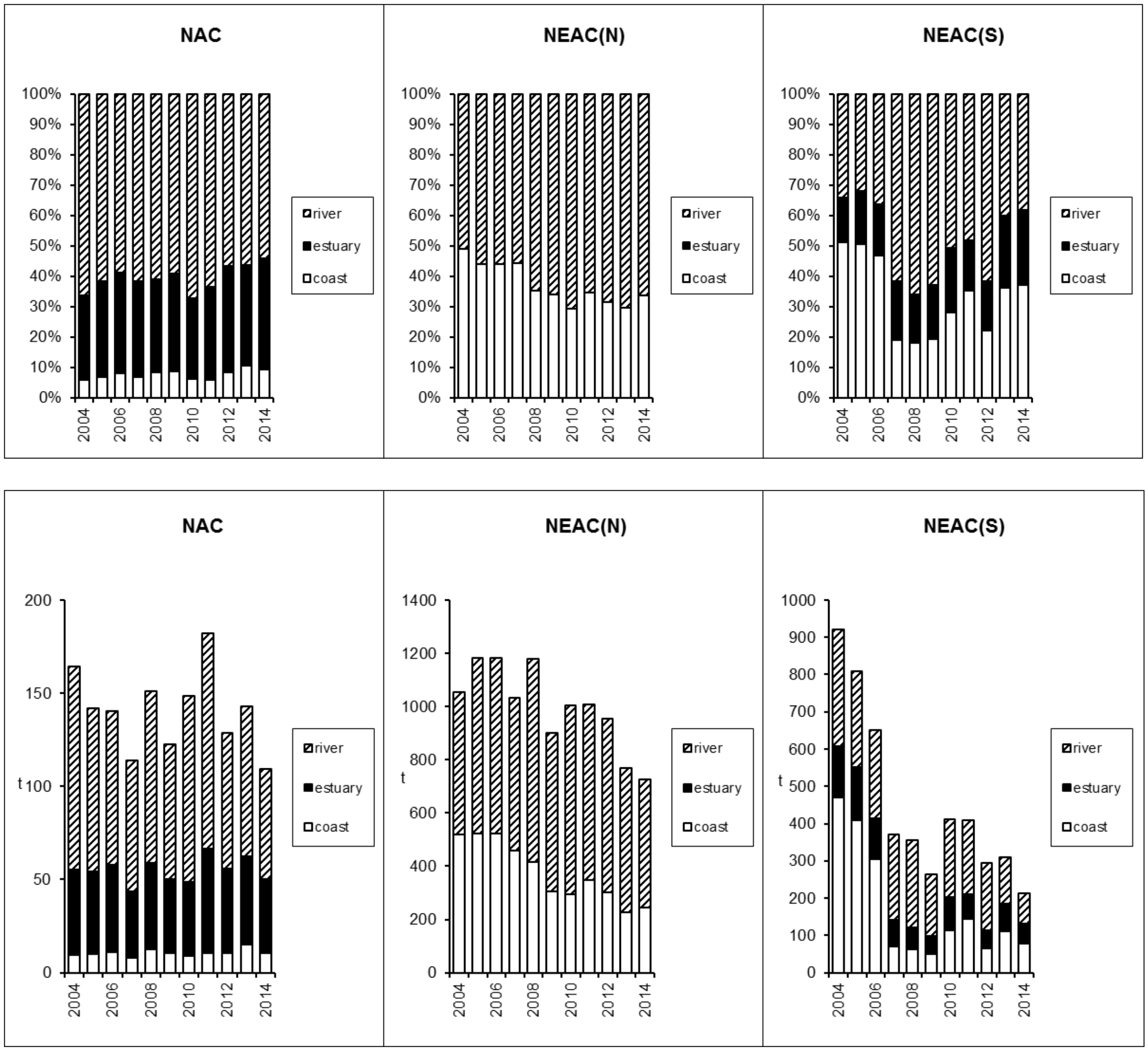


Figure 2.1.1.3. Nominal catch taken in coastal, estuarine and riverine fisheries for the NAC and NEAC Northern and Southern areas, 2004–2014. The way in which the nominal catch is partitioned among categories varies between countries, particularly for estuarine and coastal fisheries; see text for details. Top Panel - Percentages of nominal catch taken in coastal, estuarine and riverine fisheries. Bottom panel - Nominal catches (tonnes) taken in coastal, estuarine and riverine fisheries. Note that the y-axes scales vary for the bottom panel.

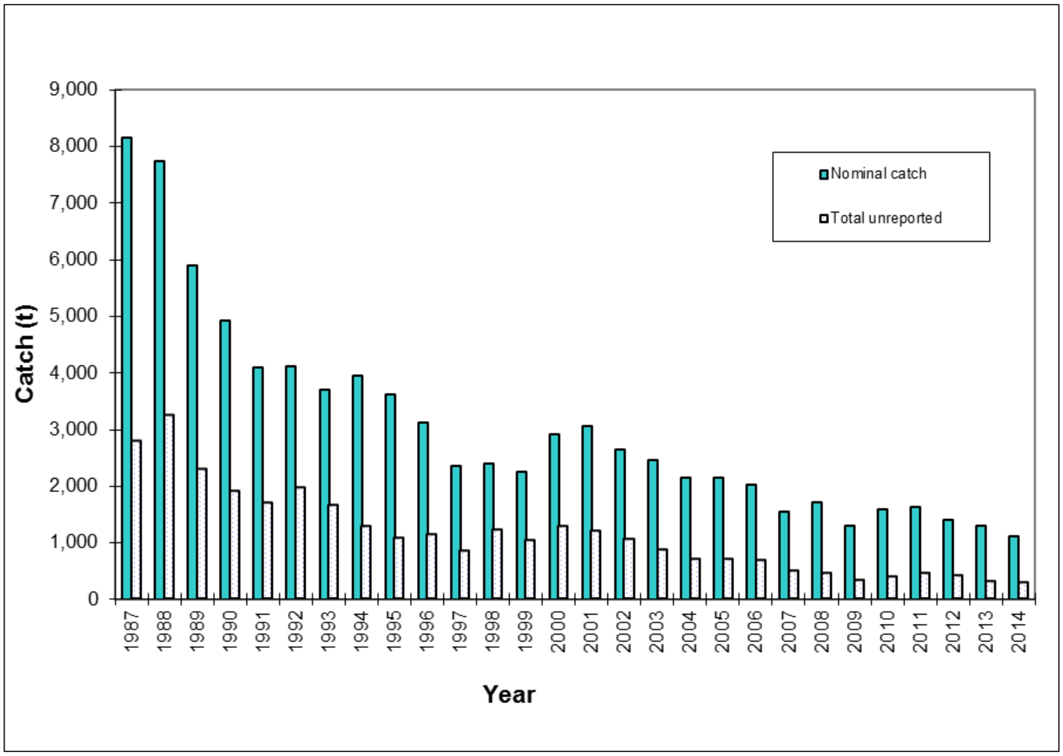


Figure 2.1.3.1. Nominal North Atlantic salmon catch and unreported catch in NASCO Areas, 1987–2014.

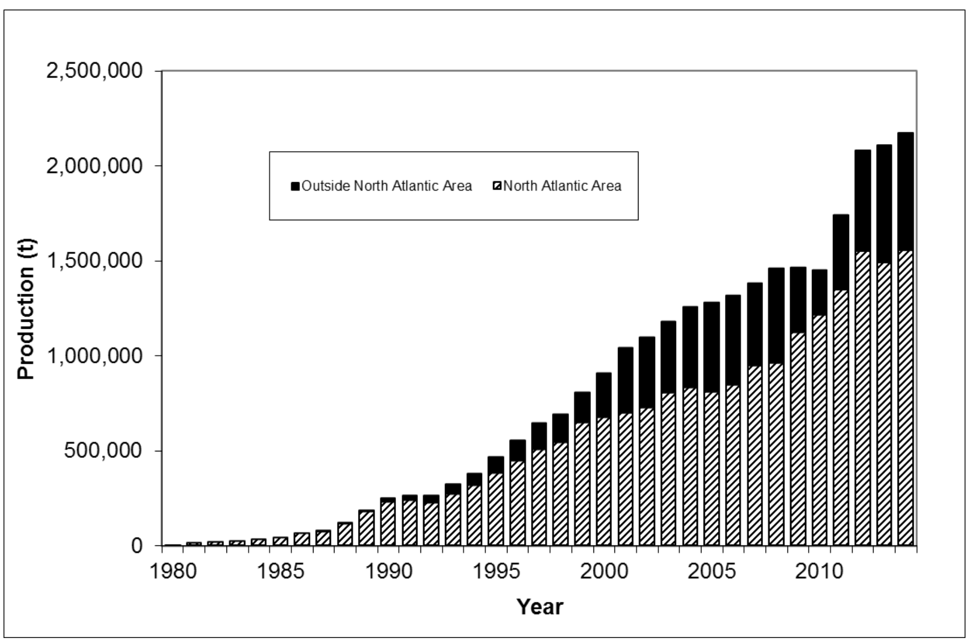


Figure 2.2.1.1. Worldwide farmed Atlantic salmon production, 1980–2014.

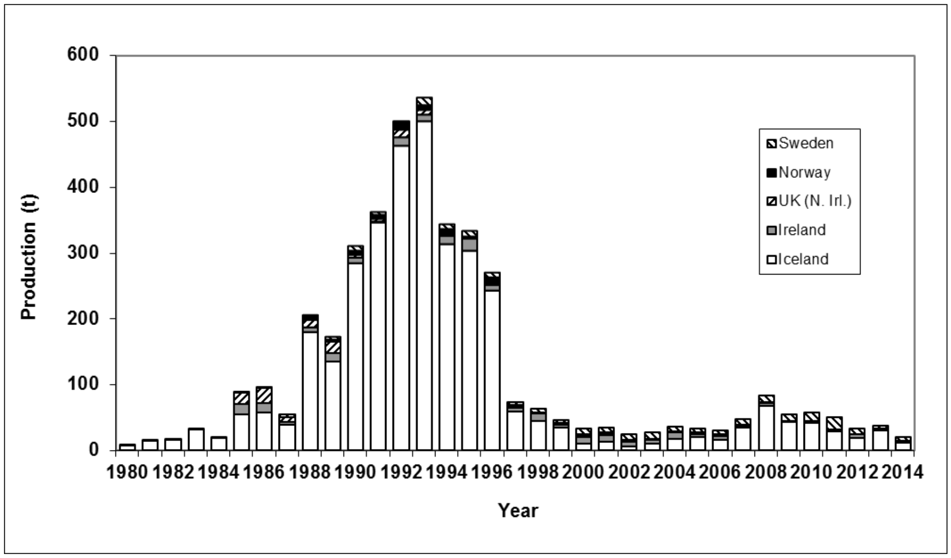


Figure 2.2.2.1. Production of ranched salmon (tonnes round fresh weight) in the North Atlantic, 1980–2014.

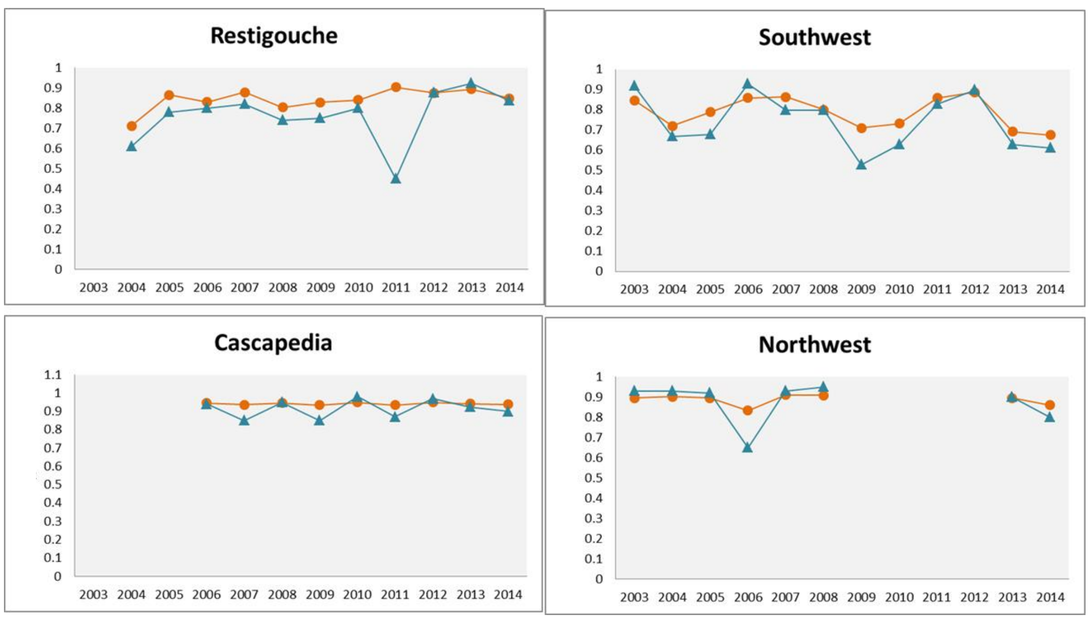


Figure 2.3.2.1. The proportion of tags detected (blue triangle) vs. the estimated probability of survival (corrected for incomplete detections, orange circle) for acoustic tagged Atlantic salmon smolts from their release site to head of tide.

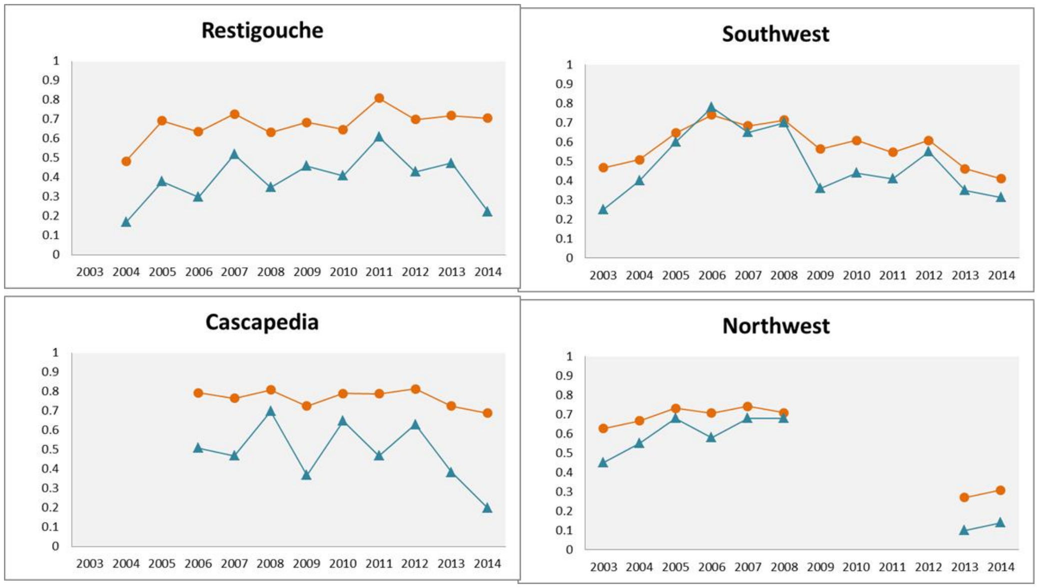


Figure 2.3.2.2. The proportion of tags detected (blue triangle) vs. the estimated probability of survival (corrected for incomplete detections, orange circle) for acoustic tagged Atlantic salmon smolts from their release site to exit into the Gulf of St Lawrence.

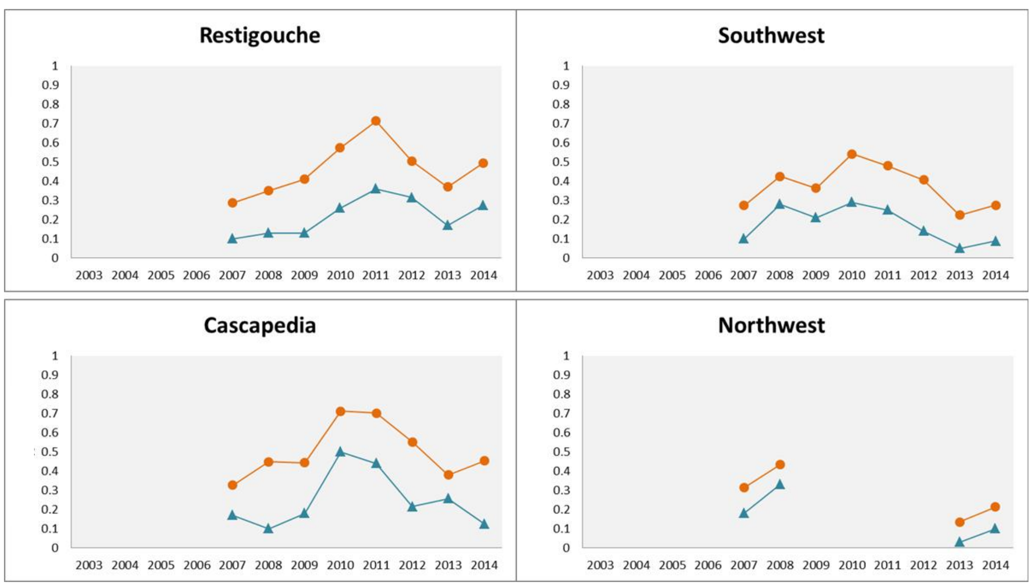


Figure 2.3.2.3. The proportion of tags detected (blue triangle) vs. the estimated probability of survival (corrected for incomplete detections, orange circle) for acoustic tagged Atlantic salmon smolts from their release site to the Strait of Belle Isle (exit of the Gulf of St Lawrence to the Labrador Sea).

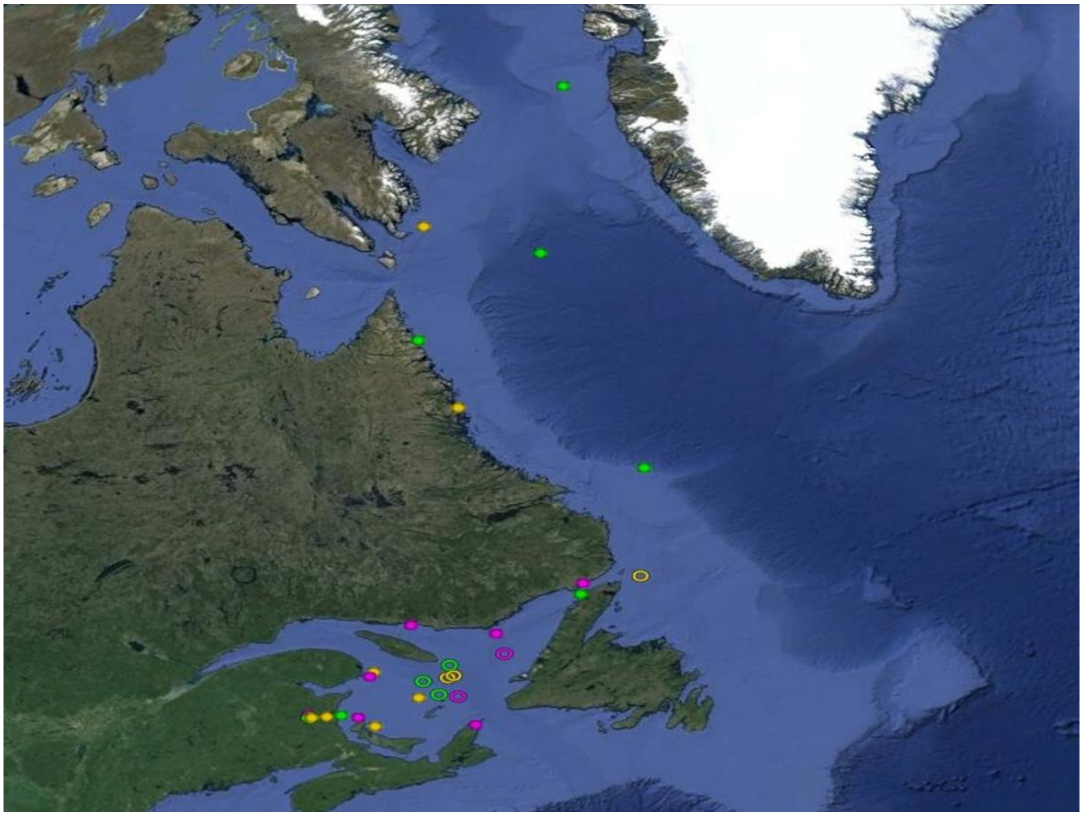


Figure 2.3.2.4. Locations of archival pop-off tags in 2012 (pink), 2013 (yellow), and 2014 (green) from Atlantic salmon kelts tagged in the Miramichi River. Open circles represent tags that never transmitted nor were recovered, but whose last position is inferred from detections at acoustic arrays into the Gulf of St Lawrence or into the Labrador Sea (these locations are indicative since precise recovery locations are unknown). Solid circles represent tags that transmitted data.

3 Northeast Atlantic Commission area

3.1 NASCO has requested ICES to describe the key events of the 2014 fisheries

- There were no significant changes in fishing methods used in 2014.
- 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 2014 (938 t) was 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 2014

In Norway, because of low catches in rivers, the start of the sea fishery was postponed 14 days in two areas (Nordmøre and Trondheimsfjord). Catch and release of large female salmon was imposed in the rivers in the same areas in July and August for the same reason.

In UK (England & Wales) flows were well below the long-term average in early spring and again for much of summer and early autumn (July to October inclusive) and were particularly low in July and September. Summer and early autumn represents an important period for most rod fisheries, and relatively 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. The number of days fished by anglers in UK (England & Wales) in 2014 was 33% below the average of the previous five years. This is likely to have contributed to the in-river catch being the lowest on record in 2014.

In UK (Northern Ireland) low flows also affected angling opportunities negatively in the index River Bush, reflected by the low cpue of 0.03 per rod per hour and lowest ever recorded rod catch of 130 fish for 2014. In Ireland, despite periods of low flow, low catches, counts and returns are believed to reflect a very poor returning stock.

3.1.3 Gear and effort

No significant changes in gear type used were reported in 2014, 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 bend nets in Norway has decreased for the past 15–20 years and in 2014, was the lowest in the time-series. In Russia, the number of fishing days in the catch and release fishery in the Kola Peninsula increased for the period when data are available (1991–2006). The number of gear units in the coastal fishery in the Archangelsk region decreased to half of the number of gear units in the previous year. 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 engines and net and cobles fished was the lowest in the time-series. For UK (Northern Ireland) driftnet, draft net, bag nets and boxes decreased throughout the time-series and there was no fishing for the past two 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 for the past three years. 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 over the last ten years, but showed a slight increase for the past four years.

3.1.4 Catches

NEAC area catches are presented in Table 3.1.4.1. The provisional nominal catch in the NEAC area in 2014 was the lowest in the time-series (938 t), 143 t below the updated catch for 2013 (1081 t) and 26% and 38% below the previous 5-year and 10-year averages respectively. It should be noted that changes in nominal catch may reflect changes in stock sizes, exploitation rates and the extent of catch and release in rivers, and thus cannot be regarded as a direct measure of development in stock sizes over time.

The provisional total nominal catch in Northern NEAC in 2014 was the lowest in the time-series (727 t), 43 t below the updated catch for 2013 (770 t) and 22% and 30% below the previous five-year and ten-year averages respectively. Catches in 2014 were close to or below long-term averages in most Northern NEAC countries. Although the catch in Norway in 2014 (490 t) increased slightly compared to 2013 (475 t), this catch represents the second lowest catch in the time-series. The greatest reduction in catches in 2014 compared to the previous year was observed for both wild and ranched salmon at Iceland with 60% and 59% reductions respectively.

In the Southern NEAC area the provisional total nominal catch for 2014 (211 t) was the lowest in the time-series, 99 t below the updated catch for 2013 (310 t) and was 38% and 56% below the previous 5-year and 10-year averages respectively. Catches in 2014 were below long-term averages in most Southern NEAC countries except France where the catch in 2014 (12 t) was above both the 5- and 10-year average (9 t and 11 t respectively). Catches in Spain in 2014 (7 t) were also above the 5-year average (4 t). The greatest reduction in catches in Southern NEAC in 2014 was observed in Ireland, UK (England & Wales), UK (Scotland), UK (Northern Ireland), with 39%, 39%, 35% and 30% reductions compared to the previous year.

Figure 3.1.4.1 shows the trends in nominal catches of salmon in the Southern and Northern NEAC areas from 1971 until 2014. 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 was between 211 to 411 t over the last five 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 is now below 1000 t. 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, perceived likelihood of success and experience. 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 changes in one or more factors occur, 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. Cpue may be affected by increasing rates of catch and release in rod fisheries.

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) (Figure 3.1.5.1). The cpue for the net and coble fishery in UK (Scotland) show a general decline over the time-series while the fixed engine fishery showed a slight increase for the last four years (Table 3.1.5.5). The cpue values for rod fisheries in UK (England &Wales) showed an increasing trend with the last two years slightly under the 5-year mean (Table 3.1.5.4). In UK (Northern Ireland), the River Bush rod fishery cpue showed a decrease from 2013 with the cpue in 2014 close to the 5-year average (Table 3.1.5.1). The rod fishery cpue in France showed an increase from 2014 and were among the highest in the time-series.

In the Northern NEAC area the cpue for the commercial costal 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). A slight decreasing trend was noted for rod fisheries in Finland (River Teno and River Naatamo) although both rivers showed an increase from 2013 and to the 5-year mean (Table 3.1.5.1). An increasing trend was observed for the Norwegian net fisheries cpue. The cpue values for salmon <3 kg were higher than the previous year and the other year classes were close to the 5-year mean (Figure 3.1.5.1 and Table 3.1.5.6).

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. The overall percentage of 1SW fish in the Northern NEAC area catch remained reasonably consistent at 66% in the period 1987 to 1999 (range 47% to 72%), but has fallen in more recent years to 59% (range 44% to 84%), when greater variability among countries has also been evident.

On average, 1SW fish comprise a higher percentage of the catch in Iceland, Finland and Russia than in the other Northern NEAC countries, with the percentage of 1SW fish in Norway and Sweden remaining the lowest among the Northern NEAC countries (Figure 3.1.6.1).

In the Southern NEAC area, the percentage of 1SW fish in the catch in 1987–1999 averaged 59% (range 46% to 71%), and averaged 57% in 2000–2014 (range 27% to 71%). The percentage of 1SW salmon in the Southern NEAC area remained reasonably consistent over the time-series, although with considerable variability among individual countries (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 2000–2014.

3.1.7 Farmed and ranched salmon in catches

The contribution of farmed and ranched salmon to national catches in the NEAC area in 2014 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 2014 was in the lower ranges (5%) in the time-series, whereas the proportion in samples taken from Norwegian rivers in autumn was the lowest in the time-series (10%, a preliminary number based on 44 rivers).

The number of farmed salmon that escaped from Norwegian farms in 2014 is reported to be 283 000 fish (provisional figure), up from the previous year (198 000). An assessment of the likely effect of these fish on the estimates of PFA has been reported previously (ICES, 2001).

Following severe weather conditions in the south of Ireland in early 2014, cages containing approximately 250 000 salmon were damaged. The fate of all these fish is unknown but a large proportion may have died due to crushing in the net and therefore the number of fish at liberty cannot be assessed. However, subsequent scanning of catches and broodstock in some southern areas of Ireland during the following summer and autumn did not identify farmed fish.

The release of smolts for commercial ranching purposes ceased in Iceland in 1998, but ranching for rod fisheries in two Icelandic rivers continued in 2014. Icelandic catches have traditionally been split into two separate categories, wild and ranched. In 2014, 12.5 t were reported as ranched salmon in contrast to 46.5 t harvested as wild. Similarly, Swedish catches have been split into two separate categories, wild and ranched (Table 2.1.1.1). In 2014, 19.3 t were reported as ranched salmon in contrast to 10.6 t harvested as wild. Ranching occurs on a much smaller scale in other countries. Some of these operations are experimental and at 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 (e.g. ICES, 2013). Through tagging studies and a pilot genetic study (Svenning *et al.,* 2011) in Finnmark, Norway's northernmost county, this coastal fishery has been demonstrated to intercept and exploit Russian salmon returning to Russian rivers. The fishing effort in coastal areas of Norway have decreased in later years due to reductions in the fishing season, and the number of fishers operating. In Finnmark County the number of registered fishing localities declined over the last twenty years (from 2733 to 1119). However, there are still significant salmon fisheries operating in Finnmark and neighbouring counties exploiting Atlantic salmon of Russian origin.

Further studies into the composition of this mixed-stock fishery in Finnmark, Troms and Nordland counties were conducted under the Joint Russian-Norwegian Scientific Research Programme on Living Marine Resources (Appendix 10 of the 42nd Joint Russian-Norwegian Fishery Commission) and under the Kolarctic Salmon project (Kolarctic ENPI CBC programme). The Kolarctic Salmon project developed a genetic baseline for over 180 rivers in northern Norway and Russia and analysed over 20 000 samples from coastal fisheries which operated between May and August (extending beyond normal fishing season) in 2008, 2009, 2011 and 2012. The samples from the coastal fisheries were assigned to rivers and regions in the study area, and estimates of exploitation of salmon of different origin in time and space were reported in 2014 (Svenning *et al*., 2014).

Salmon originating in Russian rivers comprised more than 20% of the recorded catches. Still, the incidence of Russian salmon in the catches varied strongly within season and among fishing regions, being less than 9% in the coastal catches from Nordland, Troms and Finnmark counties, while nearly 50% of all salmon captured in the Varangerfjord, close to the border, were of Russian origin. The catch of Russian salmon decreased by time within season, e.g. in Varangerfjord the incidence of Russian salmon decreased from ca. 70% in May to ca. 20% in August. Thus, catches of Russian salmon were much higher before the start of formal fishing season in Eastern Finnmark (early June), but, still a fairly high amount of the recorded catch in this area consisted of salmon stocks originating in Russian rivers.

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

3.1.9 Exploitation indices for NEAC stocks

Exploitation rates have been plotted for 1SW and MSW salmon from the Northern NEAC (1983 to 2014) and Southern NEAC (1971 to 2014) areas and are displayed in Figure 3.1.9.1. National exploitation rates are an output of the NEAC PFA Run Reconstruction Model. These were combined as appropriate by weighting each individual country's exploitation rate to the reconstructed returns. 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 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 weighted exploitation rate on 1SW salmon in the Northern NEAC area was 39% in 2014 representing a slight decline from the previous 5-year (41%) and 10-year (42%) averages. Exploitation on 1SW fish in the Southern NEAC complex was 9% in 2014 indicating a decrease from both the previous 5-year (13%) and the 10-year (18%) 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 in 2008. Exploitation on MSW salmon in the Northern NEAC area was 42% in 2014, showing a slight decline from the previous 5-year (44%) and 10-year averages (50%). Exploitation on MSW fish in Southern NEAC was 11% in 2014, a slight decrease from 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 while 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 both 1SW and MSW fish was in UK (Scotland), and for MSW fish in UK (England & Wales), whereas 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.

3.2 Management objectives and reference points

Conservation limits (CLs) have been defined by ICES as the numbers of fish that will achieve long-term average maximum sustainable yield (MSY) and this definition has also been adopted by NASCO (NASCO, 1998). In the absence of specific management objectives, the status of NEAC stocks at both the country and stock complex scales (Section 3.3.4) are considered with respect to general ICES guidance (Stock Annex).

The assessment of stock status evaluates the risk of failing to meet or exceed the objectives for the stock. Managers can choose the risk level which they consider appropriate. Where such choices have yet to be made, ICES considers that, to be consistent with the precautionary approach and given that the CLs are considered to be limit reference points to be avoided with a high probability, then managers should choose a risk level that results in a low chance of failing to meet the CLs. ICES recommends that the risk of failing to meet or exceed CLs for individual stocks should be less than 5% (ICES, 2012b).

The following terminology is used to characterize stock status:

- ICES considers that if the lower bound of the 90% confidence interval of the current spawner estimate is above the CL, then the stock is 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.
- When the midpoint is below the CL, ICES considers the stock to be suffering reduced reproductive capacity.

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 provided in the Stock Annex.

3.2.1 Setting conservation limits

River-specific CLs have been derived for salmon stocks in some countries in the NEAC area (France, Ireland, UK (England & Wales), UK (Northern Ireland) and Norway). An interim approach has been developed for estimating national CLs for countries that cannot provide one based upon river-specific estimates. This approach is based on the establishment of pseudo-stock–recruitment relationships for national salmon stocks; further details are provided in the Stock Annex.

3.2.2 National conservation limits

CL estimates for individual countries are summed to provide estimates for Northern and Southern NEAC stock complexes (Table 3.2.2.1). 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 3.2.2.1). 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.

3.2.3 Progress with setting river-specific conservation limits

One of the river-specific CLs in UK (England & Wales) was revised in 2014 as a result of an increase in the available wetted area in the catchment. On the River Conwy, the area above Conwy Falls is now accessible to salmon. As a result of the increase in the accessible wetted area for spawning and juvenile rearing, the CL for the Conwy has now been increased from 0.63 to 1.17 million eggs.

In UK (Northern Ireland), the river-specific CL for the River Bush is derived from a whole river stock/recruitment relationship, based on estimates of ova deposition and subsequent smolt counts. Conservation limits have been determined for a number of other important salmon rivers in the DCAL area of UK (Northern Ireland) by transporting optimal productivity metrics determined from the River Bush stock recruitment study to measured habitat parameters for each recipient river. A habitat survey was completed on the Glenarm River in 2014 allowing the determination of a CL for this catchment. CLs, management targets and compliance monitoring have also been established for a number of rivers within the Foyle catchment, including the Finn, Mourne, Roe and Faughan. The cessation of commercial fishing and restrictions in recreational fishing effort and associated returns has reduced the datasets available for stock assessment purposes. In particular low return rates from mandatory catch and release angling limit the potential for fishery dependant assessment of some stocks in UK (Northern Ireland). With the availability and reliability of these fishery dependant datasets currently under review other potential stock assessment processes based on other locally derived datasets are being considered. In 2014, a UK (Northern Ireland) Biological Reference Point (BRP) from locally derived data has been developed to provide a more robust benchmark for the assessment of BRP compliance and prevent reliance on a derived CL from stock assessment models. In 2015, the Working Group undertook the national assessments for UK (Northern Ireland) with respect to river-specific CLs for the first time.

Progress has been made in setting conservation limits for Icelandic salmon rivers. Estimates of salmon production range from 2.1 to 57.7 fish 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 CL between rivers of similar origin and productivity.

Previously, spawning targets had been set for six Norwegian tributaries in the Teno system, and a spawning stock evaluation undertaken for five of these tributaries: Máskejohka, Lákšjohka, Válljohka, Árášjohka and Iešjohka (Anon, 2012). Defining these reference points followed the procedures previously described for Norwegian salmon rivers (Hindar *et al.*, 2007; Forseth *et al.*, 2013). Spawning targets have recently been set for practically 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).

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 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 Tana/Teno, and the Norwegian catches from the River Tana/Teno 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, and input data for the current year are provided in Appendix 3 of the Stock Annex. In addition to adding new data for 2014, the following changes were made to the national/regional input data for the model:

France: mid-dates of returns to homewaters have been changed to month 8.5 for both 1SW and MSW fish.

Iceland: mid-dates of returns to homewaters have been changed to month 6 for MSW fish in N&E Iceland and to month 7 for 1SW fish in S&W Iceland. Unreported catches for years from 1995 have been reduced to 4% based on new information indicating that a smaller percentage than previously thought of the salmon were caught as bycatch in pelagic fisheries.

Sweden: The mid-date of return of MSW salmon has been changed from month 6 to month 6.5.

Norway: the national egg deposition CLs was split into regional values.

UK (England & Wales): minor changes in the CLs used in the model are described in Section 3.2.3.

UK (Northern Ireland): Preliminary river-specific CLs have been used in the assessment rather than the values derived from the pseudo S–R relationship. The preliminary CL for the Foyle area is 25 300 000 eggs, which is close to the value derived from the national model. The preliminary CL for the DCAL area is 27 300 000 eggs, which is about double the value from the pseudo S–R relationship and indicates this management unit is not above CL as previously estimated.

UK (Scotland): mid-dates of return for salmon to Scotland-East have been changed to month 8 for 1SW fish and month 5 for MSW fish; mid-dates of return for salmon to Scotland-West have been changed to month 8 for 1SW fish and month 7 for MSW fish.

3.3.3 New estimates of the composition of the Faroes catch

Genetic analysis of scale samples collected at Faroes has provided new information on the stock composition of salmon catches in the area. DNA was extracted from 656 scale samples (87 1SW and 487 MSW non-farm origin fish and 82 farmed escapees) collected during the 1993/1994 and 1994/1995 research fisheries and analysed against the genetic baseline of European salmon developed during the EU SALSEA-Merge project (Anon, 2011).

A total of 105 fish (five 1SW and 100 MSW non-farm origin fish) were identified as probably being of North American origin, 61 using unique alleles at the SsaD486 microsatellite locus (and confirmed by exclusion analysis) and 44 by exclusion analysis alone (Vasemägi *et al.*, 2001). These results were confirmed by cluster analysis (Pritchard *et al.*, 2000; Jombart and Ahmed, 2011) and conformation analysis. North American fish therefore accounted for 5.7% of the 1SW non-farmed origin fish overall, but were only identified in February 1994, in which month they accounted for 11.9% of the non-farmed origin 1SW fish in the samples. However, in most months the samples of 1SW fish were very small and so the results provide no clear evidence of any seasonal trend in the proportion of North American fish in the catches. MSW North American fish accounted for 20.5% of all MSW non-farmed origin fish in the samples, with the percentages varying between 11.1% in March 1994 and 29.9% in February 1995 (Figure 3.3.3.1). This partly reflected a difference in the proportions between the two fishing seasons, with 14.5% of the samples being identified as North American in the 1993/94 season compared to 25.6% in the 1994/1995 season. There was no consistent seasonal trend in the estimated proportion of North American fish in the catches at Faroes and so the overall percentages for 1SW (5.7%) and MSW (20.5%) salmon have been used in subsequent analyses.

After the putative North American fish were removed from the analysis, the composition of the European component was investigated using the remaining 551 fish (82 1SW and 387 MSW non-farmed origin and 82 farmed). Individual genetic assignments of the EU fish were performed using the Bayesian assignment method implemented in the GENECLASS2 software package (Rannala and Mountain, 1997; Piry *et al*., 2004), and Mixed-Stock Analysis was undertaken using the conditional maximum likelihood method as implemented in the ONCOR software package (Millar, 1987; Kalinowski *et al*., 2007). These methods were both used to assign fish to four hierarchical levels of regional assignment units (RAUs). At the broad geographical scale (Level 1), there were three RAUs, namely, Iceland, Northern Europe and Southern Europe, while at the finest supportable scale (Level 4), 17 RAUs could be distinguished (Gilbey *et al*., submitted).

At Level 1, 89.3% of the 1SW wild European fish (n=82) were assigned to Southern Europe, 9.5% to Northern Europe and 1.2% to Iceland using the ONCOR analysis. The number of 1SW fish in each monthly sample was ≤7 except in February 1994 (n=31) and December 1994 (n=37); in these months 94% and 89% of the samples were assigned to Southern Europe respectively (by GENECLASS2). The data therefore provide no evidence of any change in the proportion of Northern and Southern European fish through the season.

The Level 1 ONCOR assignment of the MSW non-farmed origin European salmon showed a decreasing trend in the proportion of Southern European fish and an increasing trend in the proportion of Northern European fish over the course of both the 1993/1994 and 1994/1995 seasons (Figure 3.3.3.2). For the two seasons combined the mean estimate of the proportion of Southern European fish declined from 55.8% in November to 15.4% in March, while the proportion of Northern European fish increased from 43.3% in November to 84.6% in March and there was a clear trend in the stock composition during the course of the fishing season. Icelandic MSW fish were only identified (by GENECLASS2 analysis) in November (1%) and December (3%) samples. In view of this, the overall monthly results for the two seasons combined were used in the subsequent analysis.

The geographic areas covered by the Level 3 and Level 4 RAUs (Figure 3.3.3.3) do not align closely with the national/regional areas used by ICES for the assessment of pre-fishery abundance (PFA) and the provision of catch advice (ICES, 2014a) and in some areas the RAUs overlap geographically (e.g. in UK and Ireland). In addition, the sample sizes for some groups in the genetic analysis were very small (e.g. 1SW fish from Northern Europe). It is therefore not possible to use the genetic results to estimate the composition of the Faroes catch based on the PFA assessment areas. However, an approximate comparison suggests that the genetic assignment proportions broadly match the relative estimates of PFA within the assessment areas.

The scale samples analysed in this study were collected in November, December, February and March. This did not reflect the full seasonal extent of the Faroes commercial fishery, which generally operated from November until at least April. The fishery followed a similar pattern each year, with catches increasing from November to December and then again from January to February, before declining towards the end of the fishing season. The genetic assignments provide no evidence that the proportion of the Faroes 1SW catch originating in Southern Europe, Northern Europe and Iceland changed over the course of the season and so the proportions derived from the ONCOR analysis were combined with the proportion from North America to give an overall 1SW stock composition of 84.2% Southern European, 9.0% Northern Europe, 1.2% Icelandic and 5.7% North American (Table 3.3.3.1).

As there was a temporal trend in the genetic assignment proportions to Northern and Southern Europe for the samples from non-farmed origin MSW salmon (Figure 3.3.3.2), the monthly proportions (for the 1993/1994 and 1994/1995 seasons combined) therefore have to be applied to the average seasonal breakdown of the MSW catch for the 1983/1984 to 1990/1991 commercial fishery seasons to estimate the overall composition for the MSW catch. The genetic assignments for November and December samples have been applied to the commercial catches for the same months, the February samples to the catches in January and February, and the March samples to the catches between March and the end of the fishing season. This provides an estimate of the overall composition of the MSW catch of 20.9% Southern European, 58.0% Northern Europe, 0.6% Icelandic and 20.5% North American (Table 3.3.3.2).

As indicated above, it is not possible to use the genetic assignments at Levels 3 and 4 to estimate the composition of the catches to country/regional level, but they suggest that the composition within the stock complexes is broadly similar to the relative proportions of the PFA estimates and so the breakdown of catches at this level can be made by applying the relative proportions of PFA. Further details of the way that the new genetic results have been incorporated into the NEAC PFA Run-reconstruction and Catch Option models are provided in Section 3.6.

Uncertainty in the estimates

While the new genetic results are thought to provide the best available data on the contribution of North American salmon to the Faroes fishery, it is important to note the following uncertainties:

1) The samples were collected more than 20 years ago. Since that time there has been a substantial change in the proportions of North American and European fish in the catches at West Greenland, with the proportion from North America increasing from around 60% in the early 1990s to over 80% in recent years. There may have been similar changes, in either direction, in the proportions migrating to the Northeast Atlantic.

2) A significant proportion of the fish sampled from the Faroes fishery are thought to have been fish-farm escapees, based on scale reading using the method of Hansen *et al.* (1999). It might have been expected that the genetic analysis would assign these fish to Norwegian regions, the area from which many farmed stocks originated, but while none of these fish was identified as being of North American origin, 25% were assigned to Southern Europe. This may be because there were no farmed fish samples in the baseline used in the genetic analysis, but it could also indicate errors in the identification of farm escapees.

3) The samples were collected from a research fishery. The vessels that were fishing had previously operated in the commercial fishery and there should not have been any differences in the fishing methods used, but this cannot be discounted entirely.

4) Scales have only been analysed from two seasons in the 1990s. Between 11% and 30% of the samples from eight months were identified as North American, but it is possible that these were not representative years.

5) The new results suggest that the overall exploitation rate on the North American stock may have been similar to that on the Northern European stock complex and considerably higher than that on the Southern European stock complex. This is a surprising finding which requires further validation.

There has been some independent confirmation of the genetic identification of North American fish; four of the fish tagged in the fishery and recaptured in North America were included in the genetic analysis and were identified as North American. The DNA samples identified as being North American have been sent to a Canadian laboratory to be run against a North American baseline, but this work has not yet been completed.

3.3.4 Changes to the NEAC-PFA run-reconstruction model

The split of the MSW catch between Southern and Northern NEAC has previously been based on about 100 recaptures of fish tagged in the fishery area (Hansen and Jacobsen, 2003) and a 50:50 split was assumed for the 1SW fish. The breakdown to countries within the stock complexes for each age group was based on the relative level of PFA, and further division between regions, where this is used in the assessments, was based on estimated proportions provided by the national representatives.

While there are uncertainties in the new results from the genetic analysis of salmon, the Working Group considered they are likely to provide better estimates of the stock composition of the catches because they are based upon considerably more samples. However, both the tagging data and the new genetic data are from a very limited time period in the early 1990s. The new data were therefore incorporated into the NEAC PFA and risk framework model for developing the catch advice (Section 3.5).

Estimating new catch proportions

A new approach was used to estimate the proportions for the maturing and non-maturing 1SW components of the catch originating in each country/region and generate confidence intervals around them, as follows:

1) Remove the North American fish, treating this as a fixed proportion;

2) Apportion the remaining catch to the Northern NEAC, Southern NEAC and Icelandic stock complexes, according to mixing proportions estimated from genetic (ONCOR) analysis (with 95% confidence intervals); and

3) Within each stock complex, the catch was split based on contribution to total PFA over the years 2001 to 2013 in which the Faroes fishery has not been operating.

Errors in the catch proportions were estimated by simulation. Confidence intervals in the proportions of the fish originating in Northern Europe, Southern Europe and Iceland were obtained from the genetic analysis (ONCOR) and were incorporated in the risk framework using a triangular distribution based on the estimated mean proportions and their 95% confidence intervals. A triangular distribution was used because the confidence intervals from the genetic analysis were not symmetrical. Specifically, the proportion for complex i was simulated using:

$\square_i^* \sim \text{Triangle}(\text{lower-CI}_i, \text{Mean}_i, \text{upper-CI}_i)$

The proportions are then given by:

$\pi_i^* = \exp(\square_i^*) / \Sigma_k \exp(\square_k^*)$

The * indicates a simulated value. For 1SW fish, there was one set of genetic proportions for the full fishing season, whereas for the MSW fish there were four sets of proportions for the time periods: November, December, January–February and March–April by complex for MSW fish. Proportions were simulated for each time period and then combined based on the average catch of MSW fish by season taken over the 1981/1982 to 1990/1991 fishing seasons.

To split the catch within the stock complexes, the mean proportional contributions by region to the total PFA over the period 2001 to 2013 were used. This year range was chosen since the Faroese fishery did not operate in these years and so the PFA estimates for these years are not affected by changing the split in the Faroes catch. The simulated PFA values from the run-reconstruction model, P_{yj}^*, for year, y, and region, j, are used to simulate proportional contributions:

$\pi_{yj}^* = PFA_{yj}^* / \Sigma_k PFA_{yk}^*$

by year for each region. They are then averaged over years to get the proportional contribution by region:

$\pi_j^* = 1/n\ \Sigma_y\ \pi_{yj}^*$

where: n = 13 years. The overall proportion by region, p_j, of the Faroes catch originating in Europe is then a combination of the proportion by stock complex, π_i, multiplied by the proportion by region, π_j, within complex:

$p_j^* = \pi_i^*\ \pi_j^*$

Re-simulating catch proportions

In order to use these values in the PFA run-reconstruction model simulations, it is assumed that the variation in p_j^* can be explained by:

$\square_j \sim N(\mu_j, \square_j)$ where: $p_i = \exp(\square_j) / \Sigma_k \exp(\square_k)$

The parameters of this distribution are estimated from the simulations above: μ_j is given by the mean of the log p_j^* and the variability $\square_j$ is the standard deviation of log p_j^*. Simulating new values for the proportions is achieved by first simulating $\square_j^*$ from a normal distribution with the region-specific means and standard deviations, followed by the transformation given above.

The initial procedure to simulate the catch proportions for each region was incorporated at the end of the NEAC PFA run-reconstruction model and run once after the national input data had been updated. The resulting proportions (means and standard errors) were then provided as input data in the models and the re-simulation procedure used to generate the catch proportions to be applied to the years when the Faroes fishery operated. The same procedure was incorporated into the risk framework model to estimate the composition of any potential TAC option.

3.3.5 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 3.3.5.1(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).

Tables 3.3.5.1–3.3.5.6 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 3.3.5.2.

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 3.3.5.1–3.3.5.2) 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 suffering reduced reproductive capacity prior to the commencement of distant water fisheries in the latest available PFA year. The non-maturing 1SW stock Southern NEAC 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. It should be noted, however, that for non-maturing 1SW salmon the PFA was only slightly above the SER.

The abundances of both maturing 1SW and of non-maturing 1SW recruits (PFA) for Northern NEAC (Figure 3.3.5.2) 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 remaining at full reproductive capacity, have spent limited periods at risk of suffering reduced reproductive capacity.

The abundances of both maturing 1SW and of non-maturing 1SW recruits (PFA) for Southern NEAC (Figure 3.3.5.2) 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, and has been at risk of suffering reduced reproductive capacity or suffering reduced reproductive capacity in half of the years since then.

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 1997. After this point, however the stock has generally been at risk of reduced reproductive capacity or suffering reduced reproductive capacity.

Individual Country Stocks

Table 3.3.5.7 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 3.3.5.1(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, 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 3.3.5.7). In Southern NEAC, the maturing 1SW stocks for all 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) and France were at full reproductive capacity before the commencement of distant-water fisheries, and only UK (Northern Ireland) was at full reproductive capacity for spawners (Table 3.3.5.7).

3.3.6 Compliance with river-specific Conservation Limits (CLs)

The status of individual rivers with regard to attainment of national CLs after homewater fisheries is shown in Table 3.3.6.1. 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 and data for the individual rivers for Russia and Norway relate to 2013. Of the four jurisdictions in Northern NEAC where stocks are being assessed for compliance, many individual rivers are failing to meet CL. The Tana/Teno (Finland/Norway) river is failing to meet CL. The percentage of rivers failing to meet CL in the other three jurisdictions ranges from 36% to 85%. In Southern NEAC, four of the five jurisdictions assess compliance with CL for individual rivers. In three of these jurisdictions, less than half of the rivers being assessed are meeting CL.

At a country or jurisdiction level, spawner compliance with CLs varies, but generally indicates that many jurisdictions are failing to meet CLs. In the case of three jurisdictions in Northern NEAC, there was less than 95% probability that the national spawner estimate exceeded the 1SW CL and there were two jurisdictions where this probability was not exceeded for MSW spawners. The situation in Southern NEAC was more severe, with no jurisdiction's national 1SW spawning estimates meeting the CL with 95% or greater probability. Only one jurisdiction showed a high probability of meeting MSW CL in 2014 (UK (Northern Ireland)).

3.3.7 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 3.3.7.1 and 3.3.7.2. The figures provide the percent change in return rates between five-year averages for the smolt years 2004 to 2008 and 2009 to 2013 for 1SW salmon, and 2003 to 2007 and 2008 to 2012 for 2SW salmon. The annual return rates for different rivers and experimental facilities are presented in Tables 3.3.7.1 and 3.3.7.2. 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 their marine survival. The overall trend for Northern NEAC hatchery smolts show a more varied picture with two out of three dataseries showing an increase in marine survival. It has to be noted, 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 apparent for the Northern NEAC areas. However, for the Southern NEAC areas data are more variable with some rivers showing an increase in survival while other rivers show a decrease. The increase in survival in the Southern NEAC area is especially notable in the 2SW data. The percentage change between the averages of the five year periods varied from a 68% decline (River Halseva 1SW) to a 126% increase (River Bresle) (Figure 3.3.7.1). 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 displayed a mixed picture with some rivers above and some below the previous five and ten-year averages (Tables 3.3.7.1 and 3.3.7.2). The return of 1SW wild salmon to the River Bush in UK (Northern Ireland) was below the five-year and ten-year averages, the 2SW salmon showing an increase on the previous five and ten-year averages on the same river. A decrease in survival for hatchery-reared fish was detected in Norway for 2SW salmon on the Imsa River, and on the Ranga River in Iceland for 1SW fish. 1SW hatchery reared fish on the Imsa River were similar to the previous five and ten-year averages (Table 3.3.7.2).

Comparison of return rates for the 2012 and 2013 smolt years show a decrease for 2013 compared to 2012 for wild 1SW smolts in Norway and Iceland (Northern NEAC) (Table 3.3.7.1). For Southern NEAC, 1SW return rates showed a general decrease in 2013 compared to 2012 with the exception of the River Corrib in Ireland. Decreased survival for wild 2SW returns from the 2012 smolt year compared to 2011 was noted in the single river that reported MSW survival in Northern NEAC. For Southern NEAC, the River Bush in UK (Northern Ireland) and the River Frome in UK (England & Wales) both reported increased marine survival for wild 2SW fish from the 2012 smolt year relative to the previous year.

The two remaining return rates for 1SW hatchery smolts in the Northern NEAC area for the 2013 smolt year showed an increase relative to 2012 for the River Imsa, and a decrease on the River Ranga (Table 3.3.7.2). In the Southern NEAC area return rates for hatchery smolts generally decreased in the same period, except for the River Burrishoole in Ireland, for which the survival index was similar in 2013 compared to 2012. The only available MSW survival index for the 2012 smolt cohort, for the River Imsa in Norway (Northern NEAC), showed decreased survival relative to the previous year.

Return rates for monitored rivers have been standardised to provide indices of survival for Northern and Southern 1SW and 2SW returning adult wild and hatchery salmon in the NEAC area (Figure 3.3.7.3). Standardisation was undertaken through application of a GLM (generalised linear model) with survival related to smolt year and river, each as factors. Each of the hatchery and wild, 1SW and 2SW, Northern and Southern area river survival indices were run independently, as presented in Tables 3.3.7.1 and 3.3.7.2. Only return rates given in separate 1SW and 2SW age classes were used. The results are:

- 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 2012. 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 2012) has been at the lowest level (average of 1.3%). The return rate for the last point in the time-series (for the 2013 smolt cohort) of 0.8% is down on the 2012 return rate of 2.1%, and is the second lowest in the time-series. The general declining trend is not evident for the 2SW wild component (comprising three river indices), the most recent return rate (for 2012 smolts) is the eighth lowest in the time-series.
- 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 between 1988 and 1989 was followed by a decline from around 10% to around 6% during the period 2000 to 2008. An increase in 2009 was followed by three years of declining survival, this improved slightly for the 2012 smolt cohort to 5.8% but has fallen for the 2013 cohort to 3.2%, the 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 (2012) was 1.4%, 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 has been noted in recent years, though the last three are still 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 cohort has not been maintained, and the most recent return rate (the 2012 smolt cohort) is down on the preceding three years.
- 1SW return rates of hatchery smolts to the Southern NEAC area (13 river indices) although varying annually, have decreased since 1980 ($p<0.05$). Although there was a slight improvement in returns of the 2012 smolt year cohort, returns of the 2013 cohort are the second lowest in the time-series (1.0%), and 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 information on estimated returns and spawners as derived from the PFA model (Section 3.3.5), and suggest that returns are strongly influenced by factors in the marine environment.

3.4 PFA forecasts

In 2015, 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.

3.4.1 Description of the forecast model

The complex and country scale models follow the same basic structure, with differences relating to the handling of parallel data streams and analyses where countries comprising each of the complexes are modelled. The Southern complex country model included France, southwest Iceland, Ireland, UK (England & Wales), UK (Northern Ireland) and UK (Scotland). The Northern complex country model included Finland, northeast Iceland, Norway, Russia and Sweden.

In brief, the *PFA* is modelled using the summation of lagged eggs from 1SW and MSW fish (*LE*) for each year (*t*) and 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 at the scale of the stock complex or country in the case of the country models. The uncertainties in the maturing and non-maturing PFA returns are derived in the Bayesian forecast models.

Catches of salmon at sea 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 (1978 to 2014). For Northern NEAC, data were available for a 24-year time-series, 1991 to 2014. The models were fitted and forecasts were derived in a consistent Bayesian framework.

For both Southern and Northern NEAC complexes, forecasts for maturing and non-maturing stocks were derived for five years, from 2014 to 2018. Risks were defined each year as the posterior probability that the PFA would be above the age and stock complex specific SER levels. 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 Spawner Escapement Reserves (SERs) under the scenario of no exploitation, for both the northern and southern complexes. These were calculated for each of the five forecast years, 2014 to 2018.

The country disaggregated version of the Bayesian NEAC inference and forecast model was run at country level, for both Southern and Northern NEAC. This incorporated country specific catch proportions at Faroes, lagged eggs and returns of maturing and non-maturing components. Models were run at the north and south complex levels, 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. Linkage between countries in the model is 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 evolution of the productivity parameter is independent between countries with the exception of its associated variance. Evolution of the proportion maturing (*p.PFAm*) is also independent for each country, as is its variance.

3.4.2 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 3.3.5). From these the productivity parameters (*a*) the proportions maturing (*p.PFAm*) are developed and forecast for the time period 2014 to 2018.

Forecasts of maturing PFA in the Southern NEAC stock complex (Figure 3.4.2.1) show an initial increase into 2015 before declining from 2016 to 2018, with the lower 25th Bayesian credibility interval (BCI) dropping below the spawner escapement reserve (SER) for the first time in 2017. The median non-maturing PFA stock component is estimated to have fallen from 2010 to levels similar to the SER in 2013. It is forecast to rise slightly into 2014 and 2015 before declining, with the forecast median PFA below the SER for the first time in 2018. These PFA ranges are mirrored in the probabilities of their maturing and non-maturing components exceeding the SERs (Table 3.4.2.1), with probability of the non-maturing SER being achieved in 2018 of 0.47.

Lagged egg estimates of maturing 1SW fish in the Southern NEAC stock complex show a slight decline into the forecast period, stabilising within the range of values seen between 1995 and 2010. Lagged eggs from the non-maturing stock complex increased in 2014 and 2015 and then rapidly declined through to 2018 to around the level seen in 2006. The proportion maturing, following a period of three low years (2009 to 2011) at around 0.6, increased in 2012 to 0.67 in 2013. Forecasts of the proportion maturing for 2014 to 2018 extend from the 2013 point with increasing variability.

The Northern stock complex forecasts (Figure 3.4.2.2) show both the maturing and non-maturing PFAs above the SERs with high probabilities (Table 3.4.2.1) with only the bottom 95^{th} BCI falling below the SER for the last forecast year (2018) for both maturing and non-maturing PFAs. Forecast maturing PFAs are in line with levels seen between 2007 and 2013 but below those seen before 2007, while non-maturing PFAs are within the range of values observed over the full time-series.

Maturing lagged egg forecasts for 2014 to 2018 show a slight increase, though are predicted to still be below the 2012 level, while non-maturing lagged eggs are predicted to continue increasing to 2016, to levels seen in 2006 and 2007, before the trend turns and values decline in 2017 and 2018.

The proportion maturing in the Northern NEAC stock complex appears to be in a lower phase, being below 0.5, while prior to 2007 the proportion was generally between 0.5 and 0.6. The productivity parameter has shown a decline from 2010 to 2013. The apparent cyclical trends in maturing and non-maturing PFAs and lagged eggs are mirrored in the progression of the productivity parameter and may be indicative of cyclical success of strong cohorts of the stocks incorporated in the complex.

3.4.3 Results of the NEAC country level Bayesian forecast models and Probabilities of PFAs attaining SERs

Figures 3.4.3.1 to 3.4.3.11 show country level maturing and non-maturing PFA forecasts, with the probabilities of PFAs exceeding the SERs detailed in Table 3.4.3.1 (Southern NEAC countries) and Table 3.4.3.2 (Northern NEAC countries).

Of note in the forecasts of Southern NEAC countries:

- **France**: the forecast (2014 to 2018) median maturing PFA is below the SER, while the non-maturing PFA forecast estimates are within the lower 25th BCI.
- **Ireland**: the median maturing PFA is on or around the SER for 2014 to 2016, falling below it in 2017 and 2018. Median and 75th BCIs of the non-maturing

PFAs are well below the SER, with only the upper 95th BCIs predicted to exceed it. The proportion maturing remains high, at above 0.95.

- **UK (Northern Ireland)**: the maturing SER is in the lower 25th BCI of the PFA forecasts, while non-maturing PFAs are above the SER with probabilities falling from 0.98 to 0.87 (Table 3.4.3.1). The proportion maturing has fallen from around 0.8 prior to 2010 to around 0.6.
- **UK (England & Wales)**: the forecast median maturing PFA is on or around the SER for 2014 and 2015, and then decreases in 2016, 2017 and 2018. The median non-maturing PFA shows a similar trend though is above the SER, with probabilities of attainment falling from 0.85 in 2014 to 0.56 in 2018.
- **UK (Scotland)**: Maturing PFAs are predicted to be above the SER with a probability of 0.85 in 2014, declining to 0.62 in 2018. Predicted non-maturing PFAs are at or about the SER for 2014 to 2018, with probabilities of 0.57 to 0.47. The proportion maturing in 2013 is the highest seen in the time-series at around 0.59.
- **Iceland (south/west regions)**: maturing and non-maturing PFAs remain generally above the SERs with probabilities above 0.8 in all forecast years. Proportion maturing is high compared to levels seen in the early 1980s.

Of note in the forecasts of Northern NEAC countries:

- **Russia**: PFA forecasts are generally above the SER though remain among the lowest of the time-series.
- **Finland**: the probabilities of maturing PFAs attaining the SER fall from approximately 0.89 in 2014 to 0.61 in 2018, with a similar trend for the non-maturing PFA, declining from 0.81 in 2014 to 0.57 in 2018.
- **Norway**: PFAs for Norway are predicated to remain above the SERs with high probabilities, with only the forecast 5th BCI in 2018 falling below the SERs.
- **Sweden**: PFAs are forecast to remain above the SERs with high probabilities.
- **Iceland (north/east regions)**: PFAs are predicted to remain above the SERs with high probabilities, with the 5th BCIs falling below the SERs in only the last two years.

3.5 NASCO has asked ICES to provide catch options or alternative management advice for 2015/2016–2017/2018 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

3.5.1 Catch advice for Faroes

The Faroes risk framework (ICES 2013) has been used to evaluate catch options for the Faroes fishery in the 2015/2016, 2016/2017 and 2017/2018 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 revised estimates of the composition of the catches in the Faroes fishery based on new genetic results (Section 3.3.3). The new procedure for estimating the stock composition is described in Section 3.3.4. This procedure provided the only new input data for the model, other than the new stock forecasts; 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 each NEAC country (i.e. 20 management units). 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 SERs under 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 –	199 279
Northern NEAC non-maturing 1SW –	219 540
Southern NEAC maturing 1SW –	723 008
Southern NEAC non-maturing 1SW –	465 646

Catch Advice based on Stock Complexes

The probability of the Northern and Southern NEAC stock complexes achieving their SERs for different catch options are shown in Table 3.5.1.1 and Figure 3.5.1.1. The probabilities with a zero TAC are the same as the values generated directly by the forecast model (Section 3.4). The catch option table indicates that the Northern NEAC management units have a high probability (>95%) of achieving their SERs for TACs at Faroes of <40 t in the 2015/2016 and 2016/2017 seasons, but only the non-maturing 1SW fish will exceed the SER in 2017/2018 with a TAC of <20 t. However, the Southern NEAC stock complexes both have less than 95% probability of achieving their SERs in each year with any TAC option. There are therefore no catch options that ensure a greater than 95% probability of each stock complex achieving its SER, and none that gives a greater than 59% probability of simultaneous attainment of SERs in all four stock complexes.

The slope of the curves in the catch option figures (Figure 3.5.1.1) is chiefly a function of the uncertainty in the estimates and the level of exploitation on the stocks resulting from a particular TAC in the Faroes fishery (Table 3.5.1.2). The flatness of some of the risk curves, particularly for the 1SW stocks, indicates that the risk to these management units is affected very little by any harvest at Faroes, principally because the exploitation rate on these stock components in the fishery is very low (Table 3.5.1.2).

In 2015, model forecasts of Southern NEAC maturing and non-maturing PFAs show a slight increase from 2013, before declining from 2015 onwards. This is a result of the decline in lagged eggs resulting from the run reconstruction, and predicts that the stocks will be at risk of suffering reduced reproductive capacity (2014 to 2018), the PFA of non-maturing 1SW fish is at risk of suffering reduced reproductive capacity (2014 to 2017) and suffering reduced reproductive capacity in 2018.

Maturing and non-maturing 1SW PFAs of the Northern NEAC stock complex were forecast to follow similar trends to those of the Southern NEAC complex, though generally above the SERs. They have been forecast to be at full reproductive capacity in the years 2014 to 2017 and at risk of suffering reduced reproductive capacity in 2018.

Catch Advice based on Countries

The catch options for the country level (national) management units are shown in Tables 3.5.1.3 and 3.5.1.4 for maturing 1SW and non-maturing 1SW salmon respectively from each NEAC country. The probabilities of the maturing 1SW national management units achieving their SERs in 2015/2016 vary between 41% and 99% for the different countries with no TAC at Faroes, and these probabilities are hardly affected by any of the TAC options, reflecting the low exploitation rate on 1SW stocks (Table 3.1.5.2). The probabilities of achieving SERs decrease for the two subsequent seasons. The probabilities of the non-maturing 1SW national management units achieving their SERs in 2015/2016 vary between 11% and 100% for different countries and show decreasing probabilities for increasing TAC options at Faroes. The probability of simultaneous attainment of SERs in all of the 10 maturing 1SW national management units is less than 2.2%, and for the non-maturing 1SW management units is less than 1.9%, in every year with no catch at Faroes. These probabilities decrease with increasing TAC options. The probability of simultaneous attainment of SERs in all of the 20 country management units is negligible.

River-specific assessments

ICES (2012) 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 data are available to the Working Group to assess performance of individual stocks in all countries or jurisdictions in the NEAC area. 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 3.5.1.5 for 2014 (except Russia and Norway where the data relate to 2013). 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 80% and 86% of the monitored rivers met their river-specific CLs before any homewater exploitation, whereas only 39% of assessed rivers met their CLs in one country in Southern NEAC (Table 3.5.1.5). 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 had a 95% or greater probability of meeting both 1SW and MSW CLs. The situation for southern NEAC was more severe with most returns of adult salmon having less than 95% probability of meeting 1SW and MSW CLs. MSW returns in only two jurisdictions, UK (Northern Ireland) and France, had a high probability of meeting MSW CL.

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 2015/2016 to 2017/2018. 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.

3.5.2 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 general management advice at the level of the stock complexes.

New data have been presented indicating that a larger number of North American fish than previously thought may have been caught in the Faroes fishery in the past. 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. Further details are provided in Section 3.6.

3.6 NASCO has asked ICES to advise on options for taking into account the recent genetic analysis that suggests there was a significant contribution of North American origin stocks to historic mixed-stock fisheries in Faroese waters for the provision of catch advice

In the context of this question NASCO has asked ICES to consider the implications of the new genetic results with regard to the factors previously identified by ICES as requiring management decisions for the finalisation of the risk framework for the provision of catch advice for the Faroes fishery (i.e. annual or seasonal catch advice, sharing arrangement, choice of management units to consider and specified management objectives).

3.6.1 Identification of North American salmon in Faroes catches

A number of studies have indicated that some North American salmon migrate to the Northeast Atlantic and that North American fish were caught in the Faroes fishery when it operated in the 1970s and 1980s. ICES (2007a) has reported the recapture in the Faroes fishery of about six salmon tagged as smolts in Canada in the 1970s and 1980s. It is difficult to use these results to estimate the proportion of North American fish in the total Faroes catch because of differences in tagging programmes in different countries, but they suggested that few North American fish were caught at Faroes at that time. Based on the recapture of 87 salmon tagged in the Faroes fishery area between November 1992 and March 1995, Hansen and Jacobsen (2003) estimated that 6.9% (95% cl 1.6% to 13.6%) of all the tagged fish originated from Canada. Tucker *et al.* (1999) measured the ^{137}Cs concentrations in adult salmon that had returned to the St Marguerite River, Canada, and found that 43% of the samples had concentrations characteristic of the Faroe, Norwegian, North, and Irish Seas. However these results do not provide a clear basis for estimating the contribution of North American fish to the Faroes catches.

Recent genetic studies of salmon caught in the Faroes longline fishery in the 1990s have indicated that the proportion of North American fish may be greater than previously thought. Scale samples taken from salmon caught in the 1993/1994 and 1994/1995 research fisheries were analysed and 5.7% of the 1SW salmon and 20.5% of the MSW salmon were identified as North American origin [see Section 3.3.3]. While the continent of origin of these samples requires further confirmation, the Working Group agreed that the result provided the best available estimate of the proportion of North American fish that might be caught in a fishery at Faroes. The remainder of this section is based on the assumption that significant numbers of North American fish may be vulnerable to a fishery at Faroes. If the Faroes fishery reopens, it is important that new samples should be collected and genetically analysed against both European and North American baselines (Section 3.8).

3.6.2 Options and implications of using the new genetic results

In the context of the ICES advice to NASCO, the presence of North American fish in the Faroes catches has implications for the assessment of PFA of both NEAC and NAC stocks and the provision of catch advice for the Faroes fishery.

PFA assessment for NEAC

ICES (2012a) has previously estimated that none of the 1SW salmon but 2.5% of the MSW salmon caught in the Faroes fishery originated from North America, and since 2012, 2.5% has been removed from the MSW catch figures before estimating the PFA of European stocks and developing catch advice for the Faroes fishery. Based on the results of the new genetic studies (see Section 3.3.3) these proportions have been increased to 5.7% and 20.5% for 1SW and MSW salmon respectively. This has reduced the estimated catch of European stocks in the fishery, and has consequently reduced the estimated PFA of non-maturing 1SW salmon in the NEAC area by up to about 2% in the early 1980s when the Faroes fishery was at its height. As the fishery has not operated since 2001, PFA estimates for the years since then will not have been affected.

PFA assessment for NAC

The Working Group does not currently take account of the catch of North American fish in the Faroes fishery when estimating the PFA of North American stocks. If 5.7% of the 1SW fish and 20.5% of the MSW fish caught at Faroes were North American, it would mean that an average of 270 1SW and 23 700 MSW North American fish were caught each season between 1983/1984 and 1990/1991. Including these data in the stock assessment would increase the estimated PFA of maturing 1SW North American salmon by an average of about 330 fish per year between 1984 and 1995, and the estimated PFA of non-maturing 1SW North American salmon by an average of 28 800 fish per year between 1983 and 1994. As the Faroes fishery has not operated since 2001, the PFA estimates since that time would not have been affected.

3.6.3 NEAC Catch Options

ICES has previously proposed a framework for the provision of catch advice for the Faroes fishery and used this to provide advice in 2013; the Working Group has applied the same approach in this report. ICES (2011; 2012a; 2013; 2014a) has also noted that NASCO would need to agree upon the following issues before the risk framework could be formally adopted:

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

NASCO has asked ICES to comment on the implications of the new genetic results with regard to these factors.

Choice of management units

The stock complexes previously used for the provision of NEAC catch advice (southern NEAC and northern NEAC) are significantly larger than each of the six management units used for North American salmon (2SW only) in the catch advice for the West Greenland fishery, and ICES (2010b) has advised that the NEAC catch advice should ideally be based on smaller management units. ICES (2012a) proposed a method to estimate the stock composition of the Faroes catch at a national level based on tag returns and the PFA estimates, and was thereby able to run the risk framework using management units based on countries as well stock complexes. The new genetics results are thought to provide improved estimates of the composition of European stocks in the Faroes catches and also indicate that the contribution of North American fish may be greater than for many European countries. The options for taking this new information into account are:

a) Continue using only NEAC MUs in the risk framework:

In this case, the estimated catch of North American salmon would be removed from each TAC option, and the estimated catches of salmon from European stock complexes or countries would be reduced overall because of the increased North American component.

There have also been some changes in the relative proportions among the European management units (complexes or countries) such that the estimated catches from individual management units may go up or down. Thus while the overall estimated impact of a Faroes TAC on European stocks may be expected to decrease as a result of the new genetic results, the effects on individual management units (complexes or countries) may increase or decrease.

If North American salmon were not included in the risk framework, the status of North American stocks could still be taken into account as independent information influencing the overall catch advice.

b) Add North America as a single 'region' in the risk framework:

North America could be added to the NEAC risk framework as a single region with one (MSW only) or two (1SW and MSW) additional management units. Only MSW salmon (non-maturing 1SW PFA) are considered in the West Greenland risk framework, and this may also be appropriate to NEAC, where the catch of 1SW North American fish appears to be very small. PFA forecasts for North America could be included in the risk assessment in the same way as for the NEAC management units, and the advice could be provided in the same format with an additional column for North America (see Table 3.5.1.1).

c) Adding six North American 'regions' in the risk framework:

This option is similar to option 'b', but the North American stocks would be split into the six management units currently used for the West Greenland catch advice. This would result in six additional management units if only MSW stocks were included and twelve additional management units if both 1SW and MSW stocks were included, although not all regions would have to be included if it was found that North American salmon from some regions do not migrate to the Faroes area. The West Greenland catch advice is based only on the MSW management units, and as the catches of 1SW at Faroes appear to be very small, the same may be appropriate to the Faroes catch advice. The average size of these management units would be similar to the size of the Icelandic management units and larger than the management units for France, Sweden and UK (Northern Ireland), although some North American management units are very small (e.g. USA).

The Working Group have previously advised that it is desirable to go down to country/region level. However, at the present there is very limited information on the proportions of the North American fish caught at Faroes originating in the different management units, and it would not be appropriate to adopt this option before more information is obtained on the North American fish found in the Faroes area. It is hoped that the planned genetic analysis of the Faroes samples against a North American genetic baseline will begin to provide such information. The Working Group therefore considers option (b) may be the most appropriate at the current time.

Specification of management objectives

The management objectives provide the basis for determining the risks to stocks in each management unit associated with different TAC options in the Faroes fishery. ICES currently provides catch option tables showing the probabilities of each management unit meeting or exceeding its SER individually and the probability of simultaneous attainment of this management objective within all of the management units (ICES, 2013), but has recommended that management decisions should be based principally on a 95% probability of attainment of SERs in each management unit (stock complex or country) individually. If North American management units were added to the Faroes risk framework, the same management objective could be applied to each management unit. If North American stocks were included as a single-stock complex, this could be based on the sum of the CLs for the four northern regions and the rebuilding requirements for USA and Scotia-Fundy, or using an alternative approach.

Share allocation for the Faroes fishery

The Faroes 'sharing allocation' establishes the proportion of any harvestable surplus within the NEAC area that could be made available to the Faroes fishery through the TAC. Thus, for any TAC option being evaluated for the Faroes, the risk assessment is based on the total harvest (Faroes plus homewater fisheries) combined being equal to the TAC divided by the Faroes share. This approach assumes that home water countries then have the option to manage exploitation of individual river stocks on the basis of their status. The share allocation has to be determined before the catch advice is developed so that the current risk framework can be run.

ICES (2013) has proposed that the share allocation could be derived using the same approach as for West Greenland, where the allocation is based on the proportion of the total harvest of North American fish that was taken at West Greenland between 1986 and 1990 (0.4). There is no biological basis for this choice, and European stocks/fisheries were not taken into account in setting this share agreement, although the status of European stocks is taken into account in the catch advice.

ICES (2010b) proposed using the same approach and baseline period to establish the share allocation for the Faroes fishery. This gave a potential share allocation of 0.075 to Faroes, being the proportion of the total harvest of European fish that was taken at Faroes between 1986 and 1990. Following discussion within NASCO, one Party proposed an alternative baseline period of 1984–1988, which would give a share allocation of 0.084 to Faroes, and in the absence of further advice from NASCO, ICES has used this value (ICES, 2012a; 2013). The calculation of the share agreement on this basis (i.e. excluding North American fish) would not be affected by the new genetic results.

If one or more North American management units was included in the NEAC risk framework, the share agreement could continue to be based only on NEAC stocks (in a similar way to West Greenland) or it could be calculated based on the share of the total catch of salmon from all management units that was taken at Faroes during a reference period. Alternatively, two share allocations could be agreed, with the 'expected' total harvest of North American and European fish under any TAC calculated separately before the risk analysis was conducted, or another approach might be used. The Working Group considers that if North American fish are included in the risk framework it would be appropriate to update the share allocation based on the share of the total catch of salmon from all European and North American management units that was taken at Faroes during the previously agreed reference period (i.e. 1984-88).

Season to which any TAC should apply

The Faroes fishery has historically operated between October/November and May/June, but the historical TACs applied to a calendar year. This means that two different cohorts of salmon of each age class were exploited under each TAC. ICES (2011) recommended that NASCO manage any fishery on the basis of fishing seasons (i.e. October to June) and catch advice should be provided on this basis. The new genetic results have no implications for this decision.

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 to check the robustness 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 from that projected by the forecast model, a new assessment and new catch advice is triggered in intermediate years. 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 data points;
- 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; and
- regression significant at the 0.05 probability level;
- 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 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 is provided by the Working Group.

3.7.2 Progress in 2015

The Working Group updated the FWI and explored a number of new indicator series, in addition to those used previously (where still available), to assess which time-series might be informative and used in the FWI. For Northern NEAC, three new dataseries were tested for the 1SW stock complex, and one new series for the MSW stock complex. For Southern NEAC, six new dataseries were tested for the 1SW stock complex, and five new series for the MSW stock complex. A number of time-series had been discontinued since the FWI was first developed, and these were removed.

In evaluating all the time-series, it was apparent for some of the regression relationships that the lower 12.5% CL, which is used to determine which indicator values are outside the 75% CI on the lower side, were negative for predicted PFA values in 2015 and 2016. This implies that indicator values, which can never be negative, will not indicate that predicted PFA values are overestimates regardless of how small they are. This is not an issue when the Faroes fishery is closed, as at present. However, in the event of an open fishery, an additional criterion would be required for including time-series in the FWI as informative indicators. This would require that the lower 12.5% confidence limit for an indicator time-series should be positive for any values of PFA included in 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 2015 (to be applied in January 2016) and 2016. During the three previous years, five and four indicator datasets were found to be informative. None of the four new datasets fulfilled all the inclusion criteria, but one appeared promising since it had an R^2 above 0.2, but was not statistically significant due to too few observations. For the Southern NEAC stock complex, seven indicator datasets for the 1SW component and ten for the MSW component have been retained in the framework for 2015 and 2016. During the three previous years, six and 13 indicator datasets were found to be informative. In the event of an open fishery, some of the indicators would need to be removed from the FWI for the reason outlined above.

It is anticipated that the majority of datasets included in the proposed new 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.

3.7.3 Next steps

Assuming a new multi-annual agreement is confirmed, the updated FWI will be made available to NASCO to enable them to facilitate intermediate assessments in 2016 and 2017 in order to determine whether new catch advice might be required. The FWI will then need to be updated and a new three-year-cycle started in 2018.

3.8 NASCO has asked ICES to advise on what data would enhance the development of the catch options

3.8.1 Modelling approach for the catch options risk framework

The model for assessing catch options for the Faroes fishery is outlined in the Stock Annex. Catch advice for the 2015/2016 to 2017/2018 fisheries is given in Section 3.5.1. Central to this process is an assessment of the biological characteristics of a catch that would occur at the Faroes consequent on the allocation of a given TAC.

The TAC option (tonnes) is converted to numbers of fish using the mean weights of salmon caught in the Faroes fishery and converted to numbers of wild fish using an estimate of the proportion of fish-farm escapees in the catch. Numbers by sea age class (1SW and MSW) are estimated according to the proportion of each age group observed in historical catch sampling programmes at Faroes. In the past, there has also been a requirement to discard any fish less than 60 cm total length caught in the Faroes fishery. The proportion of the 1SW catch subsequently discarded is derived from historical surveys and, as 80% of these fish were estimated to die (ICES, 1986), these mortalities are included as fishery losses. Finally, the 1SW fishery losses are reduced to take account of the proportion that will not mature as 1SW fish (Youngson and Webb, 1993). The survivors from this group are accounted for in the MSW fish taken in the following year.

This derived catch, by sea age group, is allocated to management units (currently individual countries or country aggregations) based on genetic analysis of historic scale samples of the Faroes fishery and relative PFA (Section 3.3.3). For each management unit, the catch is raised by the Faroes share allocation to give the total potential harvest of fish. Harvests are adjusted for natural mortality and subtracted from the stock forecasts which are then compared with the Spawner Escapement Reserves to evaluate attainment of the management objective.

3.8.2 Derivation of parameters currently used to characterise the Faroes fishery

The data used to determine the biological characteristics of the Faroes fishery are largely taken from sampling programmes conducted in commercial and research fisheries in Faroese waters in the 1980s and 1990s (Table 3.8.2.1). Improvements to these data may be possible by subjecting existing samples to techniques not available when the samples were originally analysed. Thus, for example, as genetic analyses are being used to provide more reliable estimates of the stock composition of the catch, it may also be also possible to use such techniques to estimate the proportion of fish-farm escapees in the catch.

Improvements to parameter estimates could also be achieved by collecting contemporary data to reliably characterise a possible future fishery. In addition, the value of such a programme would be to test the extent to which contemporary samples fall within the range already seen in the historic data. Such a sampling programme should be designed to adequately cover the spatial and temporal range likely to be found in a commercial fishery. Fishing methods, including vessel and gear specifications, should also be consistent with the methods used in a commercial fishery.

3.8.3 Derivation of parameters currently used to assess the status of stocks

The allocation of a TAC depends upon the management objectives being met for relevant management units. The Stock Annex describes the run-reconstruction and forecast models used to estimate stock abundance in the NEAC area. In general, reported catch is raised by estimates of unreported catch and exploitation rate to provide estimates of the numbers of fish returning to home waters and subsequently escaping to spawn. Estimates of lagged eggs, derived from estimates of sex ratio, fecundity and smolt ages, provide PFA forecasts used in the catch advice.

In this regard, improvements to the estimation of these data inputs and parameters would enhance the advice which ICES is able to provide. Similarly, improvements might be expected from developments in the modelling process which would reduce the dependence on reported catch data by allowing the integration of more reliable abundance indicators, such as counter and trap data, where available.

With respect to biological reference points, increasing the numbers of countries able to provide river-specific CLs and thus reducing the reliance on the 'pseudo stock–recruitment' relationships currently used (Stock Annex) would increase the reliability of the advice provided by ICES.

3.8.4 Estimates of natural marine mortality

Estimates of natural marine mortality (M) are used to raise estimates of home water returns to PFA in both the run-reconstruction and forecast models (Stock Annex). Currently, a constant marine mortality rate (0.03 per month) is used both throughout the time-series and throughout the period after the first sea winter. Estimates of marine mortality which more accurately characterise variation over the time-series or partition mortality through the migration would also enhance the advice which ICES is able to provide.

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	31368	204	55	0	0	0	700	436	-	0
Mean 2009-2013	51	37	116	67	34 903	205	68	5	3	2	808	507		0
% change [3]	-5,5	-8,6	-5,9	-2,4	-10,1	-0,8	-19,4	-100,0	-100,0	-100,0	-13,4	-14,1		0,0
Mean 2004-2013	53	48	132	66	34 254	264	79	36	20	2	1 058	586		0
% change [3]	-9,4	-28,9	-17,3	-1,5	-8,4	-22,9	-30,4	-100,0	-100,0	-100,0	-33,8	-25,6		0,0

[1] Number of gear units expressed as trap months.

[2] Number of gear units expressed as crew months.

[3] (2012/mean - 1) * 100

[3] (2012/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	n/a	82	53
2008	0	160	0	20061	31143	8111	756	694	2401	12	56	n/a	66	62
2009	0	146	38	18314	29641	7676	761	656	2421	12	37	n/a	79	72
2010	0	166	40	17983	30646	7814	756	615	2200	12	33	n/a	55	66
2011	0	154	91	19899	31269	7915	776	727	2540	12	29	n/a	78	52
2012	0	149	86	19588	32614	7930	785	681	2799	12	25	n/a	72	53
2013	0	181	94	19109	33148	8074	785	558	3010	12	25	n/a	110	71
2014	0	181	94	19109	32852	7791	746	396	2878	12	29	n/a	57	74
Mean 2009-2013	0	159	70	18 979	31 464	7 882	773	647	2 594	12	30		79	63
% change [6]	0,0	13,7	34,7	0,7	4,4	-1,2	-3,4	-38,8	10,9	0,0	-2,7		-27,7	17,8
Mean 2004-2013	346	318	97	23 453	31 059	8 254	787	665	2 362	13	48	14 802	70	64
% change [6]	-100,0	-43,1	-3,1	-18,5	5,8	-5,6	-5,2	-40,4	21,8	-10,4	-39,2		-19,0	15,8

[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] (2012/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) (2014 figures are provisional).

	Southern	Northern		Other catches	Total	Unreported catches	
	countries	countries	Faroes	in international	Reported	NEAC	International
Year		(1)	(2)	waters	Catch	Area (3)	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	211	727	0	-	938	256	-
Average							
2009-2013	338	927	0	-	1266	338	-
2004-2013	480	1031	0	-	1511	437	-

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 seaso	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	3.8	0.8	1.4	0.3	0.73		0.150
Mean 2009-13	2.8	0.7	1.1	0.2	0.64	#	0.18

[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
Mean	0.20	0.06
2009-13	0.15	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)				
Year	North East 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	0.23	0.07	0.63
1998	5.92	3.81	1.25	0.24	0.08	0.46
1999	8.06	4.88	0.79	0.31	0.02	0.52
2000	13.06	8.11	1.01	0.33	0.18	1.05
2001	10.34	6.83	0.71	0.33	0.16	0.71
2002	8.55	5.59	1.03	0.53	0.23	0.90
2003	7.13	4.82	1.24	0.60	0.11	0.62
2004	8.17	5.88	1.17	0.36	0.11	0.69
2005	7.23	4.13	0.60	0.60	0.09	1.28
2006	5.60	3.20	0.66	0.51	0.09	0.82
2007	7.24	4.17	0.33	0.51	0.05	0.75
2008	5.41	3.59	0.63	0.64	0.06	0.34
2009	4.76	3.08	0.53	0.64	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	n/a	0.21	0.31
2013	11.06	8.22	0.54	n/a	0.08	0.39
2014	10.30	6.12	0.43	n/a	0.07	0.31
Mean 2009-13	11.78	7.03	0.68	0.34	0.10	0.40

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

Year	Region							England &
	NE	Thames	Southern	SW	Midlands	NW	NRW Wales	Wales
1997	5.0	0.6	3.1	5.2	1.7	2.6	5.3	4.0
1998	6.5	0.0	5.9	7.5	1.3	3.9	8.6	6.0
1999	7.4	0.3	3.1	6.3	2.1	3.5	7.4	5.5
2000	9.2	0.0	5.2	8.8	4.9	4.4	11.7	7.9
2001	11.3	0.0	11.0	6.6	5.4	5.5	15.4	8.7
2002	9.4	0.0	18.3	6.0	3.5	3.6	10.0	6.8
2003	9.7	0.0	8.8	4.7	5.2	2.9	8.3	5.7
2004	14.7	0.0	18.8	9.6	5.5	6.6	17.4	11.4
2005	12.4	0.0	12.7	6.2	6.6	4.5	13.9	9.0
2006	14.2	0.0	15.6	8.7	6.6	5.9	13.3	10.1
2007	11.7	0.0	18.0	8.7	5.7	6.0	14.2	9.6
2008	12.7	0.0	21.8	10.9	5.8	7.3	15.3	10.5
2009	9.5	0.0	13.7	5.7	3.6	3.6	9.3	6.6
2010	16.7	2.8	17.1	9.9	4.3	6.5	14.1	10.2
2011	17.5	0.0	14.5	9.4	6.5	6.0	11.4	10.9
2012	15.4	0.0	17.3	9.2	6.3	6.5	9.1	10.6
2013	16.7	0.0	10.0	5.9	7.9	5.7	7.7	8.9
2014	13.0	0.0	14.8	5.6	5.5	4.8	7.3	7.8
Mean (2009-2013)	15.1	0.6	14.5	8.0	5.7	5.7	10.3	9.5

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
Mean		
2009-2013	59.3	101.9

[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
Mean							
2009-13	1.06	1.28	0.35		0.65	1.03	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 (1)	Spain (2)	**Southern countries**
1987		66	61	71	46	**63**	61	68	77		**63**
1988		63	64	53	55	**62**	57	69	29		**60**
1989	69	66	73	73	50	**72**	63	65	33		**63**
1990	66	64	68	73	48	**69**	48	52	45		**49**
1991	71	59	65	70	48	**66**	53	71	39		**58**
1992	72	70	62	72	46	**65**	55	77	48		**59**
1993	76	58	61	61	50	**63**	57	81	74	64	**64**
1994	63	55	68	69	49	**67**	54	77	55	69	**61**
1995	71	59	58	70	45	**62**	53	72	60	26	**59**
1996	73	79	53	80	40	**61**	53	65	51	34	**56**
1997	73	69	64	82	44	**68**	54	73	51	28	**60**
1998	82	75	66	82	45	**70**	58	82	71	54	**65**
1999	70	83	65	78	46	**68**	45	68	27	14	**54**
2000	82	71	67	75	47	**69**	54	79	58	74	**65**
2001	78	48	58	74	44	**60**	55	75	51	40	**62**
2002	83	34	49	70	41	**54**	54	76	69	38	**64**
2003	75	51	61	67	48	**62**	52	66	51	16	**55**
2004	86	47	52	68	43	**58**	51	81	40	67	**59**
2005	87	72	67	66	50	**69**	58	76	41	15	**61**
2006	84	73	54	77	41	**60**	57	78	50	15	**61**
2007	91	30	42	69	38	**50**	57	78	45	26	**61**
2008	90	34	46	58	44	**54**	48	76	42	11	**55**
2009	91	62	49	63	44	**59**	49	72	42	30	**54**
2010	82	50	56	58	49	**61**	55	78	67	32	**63**
2011	85	61	41	58	42	**50**	36	57	35	2	**45**
2012	86	76	47	70	40	**55**	49	50	38	18	**49**
2013	93	59	52	65	45	**64**	55	58	47	13	**55**
2014	80	65	59		46	**61**	49	58	40	4	**50**
Means											
1987-1999	71	67	64	72	47	66	55	71	51	41	59
2000-2014	85	56	53	67	44	59	52	71	48	27	57

1. No data provided for France for 2009. Data from 2008 used.
2. Based on catches in Asturias (~90 % of the Spanish catch).

Table 3.2.2.1. 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	18,755	13,819			18,755	13,819	22,819	23,788
Iceland (north & east)	6,032	1,620			6,032	1,620	7,450	2,788
Norway			63,939	72,198	63,939	72,198	81,397	120,589
Russia	67,710	38,913			67,710	38,913	86,086	70,285
Sweden	1,181	1,196			1,181	1,196	1,527	2,090
			Stock Complex		**157,617**	**127,745**	**199,279**	**219,540**

	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	22,488	9,467
Iceland (south & west)	17,751	1,158			17,751	1,158	21,926	1,994
Ireland			211,471	46,943	211,471	46,943	269,210	78,407
UK (E&W)			54,812	30,203	54,812	30,203	69,778	51,993
UK (NI)			21,649	2,437	21,649	2,437	26,553	4,100
UK (Sco)	245,912	187,518			245,912	187,518	313,054	319,685
			Stock complex		**568,995**	**273,360**	**723,008**	**465,646**

Table 3.3.3.1. Estimation of the overall Level 1 composition of 1SW catch at Faroes.

Geographic Region		Estimated proportion by continent	Genetic assignments within Europe	Overall genetic assignments
Southern NEAC	)		89.3%	84.2%
Northern NEAC	)	94.3%	9.5%	9.0%
Iceland	)		1.2%	1.2%
North America		5.7%		5.7%

Table 3.3.3.2. Estimation of the overall Level 1 composition of MSW catch at Faroes.

Catch/ assignments	Region	Months				Total season	
		Nov	Dec	Jan-Feb	Mar-June		
Mean MSW catch	Fishery	7,671	27,809	28,865	51,466	115,812	
Proprtion NA	N America	-	-	-	-	20.5%	
Genetic assignment proportions	Southern NEAC	55.8%	37.6%	27.0%	15.4%		
	Northern NEAC	43.3%	59.5%	73.0%	84.6%		
	Iceland	1.0%	3.0%	0.0%	0.0%		
Overall composition of landed catch	Southern NEAC	3,403	8,313	6,196	6,301	24,213	**20.9%**
	Northern NEAC	2,641	13,155	16,752	34,615	67,162	**58.0%**
	Iceland	61	663	0.00	0.00	724	**0.6%**
	North America	1,573	5,701	5,917	10,551	23,741	**20.5%**

Table 3.3.5.1. Estimated number of returning 1SW salmon 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	25,976	9,391		154,066	17,250				49,654	62,615	1,057,362	82,531	181,654	620,370	1,837,087	**2,065,982**	2,350,396			
1972	101,042	8,662		117,099	13,658				99,312	50,755	1,122,961	79,224	158,858	543,835	1,833,189	**2,069,756**	2,384,054			
1973	46,963	10,318		173,127	16,940				60,481	54,431	1,222,958	94,040	138,765	650,155	1,972,306	**2,236,754**	2,572,163			
1974	65,074	10,285		172,851	24,493				28,234	38,793	1,394,790	117,350	151,645	618,935	2,072,044	**2,361,633**	2,728,428			
1975	77,714	12,558		263,668	26,433				56,646	60,030	1,535,827	120,173	124,413	505,784	2,109,202	**2,411,875**	2,838,354			
1976	70,874	12,629		184,377	14,976				51,868	47,490	1,048,387	80,269	86,543	435,302	1,542,375	**1,759,251**	2,042,511			
1977	39,814	17,561		117,243	6,776				39,738	48,503	905,317	91,780	85,240	452,698	1,440,776	**1,631,955**	1,876,417			
1978	38,132	17,814		118,731	8,039				40,841	63,591	792,931	104,411	111,232	519,290	1,466,010	**1,641,601**	1,865,379			
1979	34,214	17,143		164,448	8,303				47,382	58,875	727,533	99,247	78,073	428,383	1,288,647	**1,449,737**	1,649,655			
1980	26,944	2,588		116,635	10,577				97,920	26,796	553,296	93,665	98,688	266,982	1,022,635	**1,148,029**	1,304,687			
1981	24,194	13,358		96,474	19,321				77,712	34,499	291,569	98,124	77,328	328,821	840,806	**918,274**	1,004,968			
1982	14,407	6,144		84,690	17,072				48,175	35,459	603,419	83,165	111,868	472,749	1,242,064	**1,364,262**	1,505,309			
1983	35,083	9,062	699,128	141,892	22,620	817,756	**910,842**	1,023,621	51,430	44,585	1,064,464	121,688	156,924	482,650	1,742,304	**1,930,160**	2,165,322	2,631,461	**2,847,510**	3,100,623
1984	38,402	3,279	729,148	152,766	32,034	859,416	**958,724**	1,077,640	84,853	27,548	559,565	107,039	61,730	509,941	1,239,199	**1,361,420**	1,500,568	2,163,017	**2,323,068**	2,501,278
1985	50,982	22,704	743,243	209,387	38,184	964,181	**1,068,675**	1,185,865	31,616	44,517	926,345	106,868	79,921	421,542	1,452,921	**1,620,089**	1,822,587	2,492,326	**2,693,272**	2,919,544
1986	40,061	28,237	646,162	179,345	39,560	849,569	**936,484**	1,035,696	48,143	73,452	1,041,466	123,718	90,221	522,965	1,723,144	**1,919,925**	2,152,927	2,643,175	**2,858,652**	3,108,627
1987	48,437	16,590	543,615	190,731	31,667	761,228	**834,593**	917,732	86,594	45,486	671,600	128,280	49,129	403,527	1,251,819	**1,409,116**	1,600,223	2,068,942	**2,246,264**	2,454,899
1988	28,490	24,030	497,711	132,245	26,447	648,908	**710,605**	782,983	29,778	81,613	907,003	176,210	115,915	611,475	1,748,867	**1,934,462**	2,169,304	2,451,537	**2,649,878**	2,891,163
1989	62,118	12,910	549,339	196,903	7,721	753,790	**830,809**	921,568	15,920	45,597	652,528	118,426	111,282	669,523	1,477,583	**1,624,172**	1,791,411	2,289,735	**2,457,994**	2,644,370
1990	62,182	9,696	491,699	163,402	17,881	681,803	**747,333**	827,027	26,927	42,090	407,558	84,788	92,306	321,145	894,295	**984,968**	1,091,485	1,619,221	**1,735,661**	1,863,213
1991	61,248	14,110	430,049	138,548	22,514	607,564	**669,256**	738,980	19,713	46,310	291,047	83,922	51,504	318,579	749,219	**819,156**	899,883	1,393,722	**1,490,301**	1,594,197
1992	86,184	26,626	361,595	171,102	24,988	618,534	**674,866**	738,275	35,324	53,044	422,012	87,806	104,428	464,236	1,077,761	**1,181,548**	1,303,640	1,736,412	**1,856,800**	1,992,452
1993	58,097	21,826	362,846	146,745	25,016	568,020	**618,790**	672,990	51,873	51,960	343,715	122,647	122,236	417,944	1,029,364	**1,126,908**	1,243,990	1,635,669	**1,746,887**	1,874,732
1994	32,358	6,968	492,409	173,579	19,287	656,932	**727,568**	809,085	39,646	42,641	438,596	135,645	83,906	444,891	1,093,336	**1,202,573**	1,326,717	1,801,396	**1,932,812**	2,078,492
1995	32,386	18,338	321,100	155,916	28,090	512,484	**558,923**	611,727	13,338	52,991	490,848	103,464	77,774	436,933	1,079,477	**1,182,985**	1,303,815	1,629,282	**1,743,152**	1,872,603
1996	54,648	9,739	244,442	211,716	16,758	495,864	**541,144**	591,277	16,414	45,658	456,400	76,995	80,452	314,199	904,966	**997,059**	1,108,404	1,434,375	**1,540,827**	1,659,832
1997	49,854	13,295	282,423	208,505	7,612	516,957	**565,229**	617,707	8,466	33,270	457,670	68,949	95,319	225,639	807,486	**894,696**	1,001,067	1,360,251	**1,461,676**	1,578,838
1998	62,263	22,815	368,182	227,933	6,129	632,462	**691,351**	758,889	16,497	45,620	479,088	75,864	208,167	307,618	1,039,789	**1,142,446**	1,262,954	1,712,491	**1,836,072**	1,973,508
1999	83,590	11,562	342,128	176,844	9,656	573,999	**626,582**	684,343	5,535	36,877	446,017	60,033	54,206	152,400	677,865	**759,727**	861,550	1,289,305	**1,387,953**	1,502,555
2000	90,601	12,179	563,892	193,098	17,887	804,598	**880,736**	969,751	14,410	32,899	621,269	91,679	78,629	297,574	1,026,893	**1,143,645**	1,287,822	1,883,822	**2,029,114**	2,190,957
2001	65,596	11,044	487,040	259,788	11,061	751,845	**841,225**	949,890	12,364	29,528	492,976	79,678	62,195	290,848	896,184	**975,639**	1,070,639	1,695,867	**1,821,628**	1,960,352
2002	44,555	19,137	297,701	237,279	10,692	544,829	**613,727**	703,371	27,982	36,798	431,390	74,894	123,118	234,951	866,343	**941,809**	1,025,200	1,451,616	**1,559,550**	1,678,818
2003	43,870	10,128	412,361	211,918	5,754	614,305	**689,514**	776,532	18,398	44,058	421,305	58,600	80,393	266,769	827,427	**901,156**	985,875	1,483,827	**1,592,206**	1,711,600
2004	18,776	27,205	249,820	147,878	4,840	407,063	**451,704**	508,633	22,090	44,189	309,866	105,424	71,864	316,788	808,766	**884,295**	976,979	1,247,311	**1,338,676**	1,445,707
2005	41,049	24,381	370,427	168,940	4,745	553,621	**614,103**	686,875	14,414	64,863	309,762	85,812	91,575	343,375	849,386	**921,708**	1,005,429	1,440,812	**1,539,210**	1,644,147
2006	71,967	25,757	299,079	204,551	5,297	549,228	**610,592**	688,120	20,160	45,920	237,295	84,144	58,501	333,230	723,065	**792,870**	876,138	1,308,403	**1,408,138**	1,517,097
2007	21,007	19,036	168,009	110,433	1,640	289,101	**321,858**	362,748	15,882	52,542	270,154	79,871	94,727	326,393	751,106	**861,829**	1,062,304	1,068,091	**1,185,896**	1,389,762
2008	22,603	17,382	210,196	114,587	2,545	332,721	**370,048**	415,637	15,667	63,884	266,176	78,858	56,291	281,583	672,822	**786,246**	986,226	1,036,058	**1,159,760**	1,360,783
2009	40,273	28,107	168,684	108,771	2,711	316,758	**350,565**	391,008	4,444	72,000	221,332	49,437	43,091	240,450	558,334	**650,130**	808,946	901,371	**1,003,247**	1,167,159
2010	32,253	22,390	249,424	123,469	4,603	391,947	**435,411**	483,490	15,197	73,694	280,102	97,215	39,551	440,975	830,908	**983,921**	1,214,786	1,261,819	**1,420,747**	1,654,635
2011	36,686	18,556	175,822	132,423	3,926	332,266	**369,580**	411,680	10,260	51,946	247,570	57,091	34,253	233,769	554,339	**655,431**	847,444	914,231	**1,027,490**	1,222,065
2012	63,631	9,670	195,417	152,221	5,548	387,753	**430,223**	483,813	11,200	29,536	250,206	34,984	51,689	311,986	594,301	**729,318**	933,069	1,019,402	**1,162,892**	1,371,070
2013	36,668	22,975	184,112	118,084	3,221	330,378	**369,276**	416,196	15,743	87,625	228,406	45,665	30,473	364,489	670,915	**813,435**	1,009,326	1,036,239	**1,185,185**	1,385,584
2014	51,929	9,742	251,394	111,390	8,975	390,833	**438,860**	495,856	13,848	23,698	151,331	25,230	36,807	276,586	459,184	**557,367**	690,397	883,752	**998,789**	1,139,958
10yr Av.	41,806	19,800	227,257	134,487	4,321	387,461	**431,052**	483,542	13,681	56,571	246,233	63,831	53,696	315,284	666,436	**775,225**	943,407	1,087,018	**1,209,135**	1,385,226

Table 3.3.5.2. Estimated number of returning MSW salmon 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	23,845	9,663		132,553	641				10,906	24,452	157,395	90,976	21,911	567,966	781,540	**880,197**	994,238			
1972	25,019	15,062		134,685	507				21,560	37,458	168,986	150,053	19,145	732,216	1,008,611	**1,138,698**	1,290,583			
1973	40,402	14,102		222,546	2,253				13,228	33,774	182,584	114,140	16,759	804,022	1,033,662	**1,173,530**	1,340,843			
1974	68,492	13,384		209,597	1,413				6,134	29,203	206,998	84,158	18,296	568,701	814,992	**920,868**	1,047,405			
1975	88,324	14,776		224,725	404				12,287	31,040	231,686	114,583	14,995	626,593	918,354	**1,042,486**	1,188,148			
1976	68,843	12,179		195,189	1,211				8,993	26,827	161,117	60,391	10,446	391,768	586,643	**666,677**	754,184			
1977	47,728	16,940		134,364	519				6,911	26,086	139,442	76,826	10,254	427,819	614,143	**694,730**	788,978			
1978	24,294	21,837		116,169	641				7,133	33,815	120,757	64,741	13,386	531,897	686,462	**777,119**	890,334			
1979	24,250	14,459		101,625	1,670				8,137	21,638	108,815	31,867	9,398	394,076	506,275	**578,555**	666,640			
1980	23,776	20,074		168,797	3,260				16,986	30,324	119,888	103,505	11,914	483,934	688,124	**774,375**	877,050			
1981	28,003	7,034		96,580	715				11,571	20,255	88,314	145,779	9,334	518,827	711,579	**803,072**	908,696			
1982	37,453	8,071		85,350	3,469				7,242	14,345	51,519	56,258	13,523	418,868	502,276	**565,224**	645,572			
1983	41,403	6,164	427,934	124,147	2,278	547,622	**604,392**	670,730	7,712	23,909	106,157	64,089	18,921	450,707	607,410	**676,410**	760,651	1,189,967	**1,283,524**	1,387,805
1984	34,794	7,928	439,396	123,915	3,200	554,266	**611,181**	673,906	12,612	20,266	76,456	51,611	7,453	376,441	491,266	**548,203**	616,961	1,078,694	**1,161,149**	1,253,751
1985	33,669	5,111	405,953	135,653	1,188	530,118	**583,301**	644,340	9,572	14,686	83,735	76,461	9,638	463,423	591,646	**661,146**	742,824	1,155,678	**1,246,752**	1,346,416
1986	27,437	13,958	485,040	133,866	609	600,162	**663,339**	737,729	9,664	12,296	94,690	103,661	10,839	593,082	738,223	**830,240**	945,379	1,380,276	**1,495,449**	1,627,039
1987	36,311	14,444	367,036	99,465	2,741	474,662	**522,778**	577,802	5,179	10,926	117,733	82,753	5,542	387,706	548,439	**614,636**	691,708	1,054,511	**1,139,549**	1,232,264
1988	25,584	9,320	306,568	99,883	2,918	406,878	**445,884**	490,396	14,153	12,419	84,771	107,747	15,618	601,839	750,547	**841,738**	949,834	1,188,116	**1,289,067**	1,403,268
1989	25,232	7,890	219,268	97,155	10,194	332,231	**361,166**	395,456	6,572	11,091	77,460	87,033	12,424	525,759	647,583	**724,807**	814,217	1,004,147	**1,087,415**	1,182,477
1990	27,683	8,334	260,510	124,791	5,307	392,741	**428,111**	469,093	6,671	11,015	37,202	106,318	11,320	437,419	548,947	**615,189**	694,679	967,602	**1,044,487**	1,132,417
1991	37,132	5,775	220,139	122,213	7,192	363,128	**394,188**	428,919	6,084	10,945	55,990	46,972	5,819	333,243	413,198	**461,624**	518,572	798,178	**857,279**	922,147
1992	36,041	8,596	239,304	116,316	9,954	378,847	**412,014**	448,244	7,647	12,381	43,035	35,942	13,327	443,172	498,250	**557,488**	633,151	901,524	**970,424**	1,052,875
1993	37,661	9,729	229,374	137,711	11,245	398,339	**427,496**	460,289	3,584	6,061	41,956	39,541	31,395	364,023	438,210	**492,088**	559,213	857,552	**920,657**	993,873
1994	35,388	8,247	224,504	121,964	8,584	370,158	**400,998**	434,073	7,604	9,819	67,690	55,348	11,049	440,191	534,286	**595,145**	671,868	928,566	**996,865**	1,080,285
1995	23,375	5,227	240,527	138,633	4,265	382,628	**413,611**	448,641	3,644	10,101	65,290	55,991	9,350	408,820	496,779	**557,083**	630,030	902,627	**972,491**	1,052,111
1996	24,093	6,856	241,610	104,611	6,919	356,135	**386,229**	419,287	6,483	6,478	43,563	57,424	10,224	312,081	391,662	**441,062**	499,295	768,524	**828,095**	893,283
1997	28,973	3,865	159,442	85,264	5,009	261,980	**284,356**	308,937	3,323	7,304	56,513	35,959	12,796	215,464	296,317	**337,844**	385,503	574,935	**622,581**	675,127
1998	27,571	5,627	191,180	105,549	2,787	309,067	**334,446**	362,446	2,817	4,529	32,878	23,187	17,463	228,184	278,503	**312,090**	351,756	603,840	**647,506**	694,725
1999	29,489	6,445	204,425	93,018	1,978	307,963	**336,520**	368,662	6,128	8,821	51,111	46,280	7,972	175,559	260,875	**306,096**	364,004	589,553	**643,782**	707,636
2000	56,332	3,779	283,138	162,222	7,093	476,873	**515,212**	557,265	4,269	2,402	64,231	48,281	10,653	224,851	319,555	**360,150**	409,103	818,661	**876,890**	939,429
2001	75,395	4,344	333,246	114,946	8,416	494,997	**539,021**	587,790	4,965	4,209	56,985	51,824	7,818	214,174	304,114	**346,698**	399,978	823,444	**886,878**	958,015
2002	65,791	4,105	288,633	125,096	5,787	452,059	**491,381**	537,475	4,609	4,568	65,631	46,540	9,294	175,208	274,135	**312,407**	357,634	748,972	**805,700**	868,827
2003	47,273	4,296	255,547	87,089	1,379	365,234	**397,889**	433,698	6,607	7,287	69,089	60,715	6,037	218,081	326,346	**375,759**	433,315	713,072	**774,671**	841,543
2004	21,589	4,246	231,439	67,176	4,244	301,389	**329,755**	363,512	12,370	5,854	38,018	51,589	5,397	281,520	351,525	**402,354**	461,086	673,979	**733,641**	799,971
2005	17,886	5,261	213,002	80,564	2,859	294,502	**320,221**	349,804	7,721	5,190	49,343	55,838	6,866	222,626	309,490	**353,166**	407,860	622,875	**674,670**	735,152
2006	28,159	5,044	270,483	77,338	2,982	353,834	**385,095**	420,812	7,677	4,307	35,707	50,108	4,392	231,001	297,016	**341,593**	397,471	671,114	**727,287**	792,826
2007	40,724	4,843	230,347	80,524	2,791	333,269	**359,972**	390,792	7,309	2,650	15,887	48,102	6,031	221,333	265,982	**307,765**	359,553	617,628	**668,467**	727,316
2008	40,995	6,247	265,136	126,073	3,901	406,418	**445,249**	490,939	8,045	3,032	23,968	53,222	3,649	249,515	298,977	**348,924**	409,857	730,681	**795,890**	870,475
2009	17,557	5,032	207,513	107,191	3,451	312,131	**342,255**	378,113	3,717	4,686	26,818	41,108	4,780	211,103	255,628	**298,256**	351,037	588,192	**642,107**	704,294
2010	28,291	7,102	228,879	132,476	4,026	366,862	**402,871**	444,504	3,066	9,717	17,452	60,672	4,380	278,719	324,186	**382,863**	458,850	716,186	**787,132**	871,412
2011	21,765	7,960	319,372	131,704	7,551	444,000	**490,366**	544,253	8,662	4,920	20,093	88,493	11,439	313,665	386,131	**459,880**	553,165	863,153	**951,172**	1,056,932
2012	26,359	4,496	279,131	65,005	10,708	350,791	**387,044**	430,913	6,823	2,812	21,489	72,911	17,191	247,798	318,961	**382,926**	463,291	695,736	**771,308**	862,165
2013	25,381	5,153	197,159	74,274	4,528	279,568	**307,918**	340,033	7,088	7,795	24,311	67,611	3,061	218,766	280,842	**338,737**	413,356	581,685	**647,941**	728,797
2014	27,504	6,263	202,518	73,727	9,167	289,630	**320,681**	358,232	8,732	8,242	10,850	42,161	10,342	183,914	227,132	**273,587**	334,540	537,162	**596,320**	664,791
10yr Av.	27,462	5,740	241,354	94,888	5,196	343,101	**376,167**	414,839	6,884	5,335	24,592	58,023	7,213	237,844	296,434	**348,770**	414,898	662,441	**726,229**	801,416

Table 3.3.5.3. 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 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	31,652	11,638	NA	NA	22,299	NA	NA	NA	64,096	77,317	1,348,824	105,451	222,245	791,412	2,276,610	**2,625,740**	3,042,324	NA	NA	NA
1972	122,874	10,772	NA	150,632	17,641	NA	NA	NA	128,536	62,928	1,432,496	101,726	195,132	695,926	2,283,804	**2,635,834**	3,094,725	NA	NA	NA
1973	57,309	12,823	NA	223,024	21,838	NA	NA	NA	78,574	67,396	1,563,156	120,574	170,503	831,336	2,460,176	**2,850,292**	3,336,676	NA	NA	NA
1974	79,370	12,787	NA	221,410	31,598	NA	NA	NA	36,738	48,093	1,781,134	149,741	185,661	791,061	2,568,724	**3,002,632**	3,533,938	NA	NA	NA
1975	94,545	15,616	NA	339,084	34,171	NA	NA	NA	73,387	74,514	1,960,570	153,587	153,055	647,947	2,620,951	**3,079,023**	3,674,334	NA	NA	NA
1976	86,358	15,662	NA	237,211	19,350	NA	NA	NA	67,335	58,787	1,339,275	102,855	106,366	556,278	1,921,248	**2,243,320**	2,650,600	NA	NA	NA
1977	48,698	21,726	NA	150,820	8,724	NA	NA	NA	51,357	60,084	1,153,046	116,986	104,542	577,178	1,789,402	**2,076,753**	2,439,606	NA	NA	NA
1978	46,395	22,101	NA	152,948	10,363	NA	NA	NA	52,794	78,823	1,011,549	133,125	136,170	662,090	1,817,377	**2,089,162**	2,417,774	NA	NA	NA
1979	41,609	21,132	NA	211,455	10,714	NA	NA	NA	61,415	72,707	927,538	126,928	95,559	546,903	1,600,472	**1,841,847**	2,144,222	NA	NA	NA
1980	33,044	3,343	NA	150,875	13,684	NA	NA	NA	127,245	33,473	711,889	120,852	121,879	347,236	1,287,808	**1,479,743**	1,711,977	NA	NA	NA
1981	29,772	16,722	NA	125,285	24,961	NA	NA	NA	101,236	43,191	383,100	127,691	96,945	431,555	1,065,328	**1,196,494**	1,341,331	NA	NA	NA
1982	17,784	7,745	NA	109,706	22,058	NA	NA	NA	62,714	44,257	775,520	108,023	138,212	610,702	1,552,419	**1,749,651**	1,982,248	NA	NA	NA
1983	42,910	11,347	890,812	182,574	29,193	1,015,712	**1,159,925**	1,334,188	66,972	55,520	1,361,461	156,599	193,253	621,588	2,173,577	**2,467,842**	2,827,513	3,259,924	**3,633,959**	4,072,890
1984	46,825	4,138	928,147	196,065	41,351	1,065,036	**1,220,567**	1,402,227	109,868	34,229	716,079	136,954	76,319	652,701	1,544,736	**1,738,760**	1,966,018	2,675,814	**2,965,621**	3,290,593
1985	62,178	28,126	944,642	269,356	49,160	1,196,914	**1,359,190**	1,548,051	41,080	55,128	1,183,842	136,889	98,429	540,610	1,807,966	**2,063,890**	2,376,460	3,081,251	**3,429,990**	3,829,618
1986	48,818	35,010	822,320	230,646	51,033	1,051,154	**1,192,881**	1,352,998	62,468	91,094	1,330,392	158,484	111,284	672,358	2,145,426	**2,449,148**	2,819,929	3,269,642	**3,646,047**	4,087,481
1987	59,091	20,570	691,260	245,014	40,828	944,653	**1,061,651**	1,200,945	112,611	56,360	857,109	164,396	60,977	517,876	1,564,800	**1,801,022**	2,087,230	2,565,920	**2,866,433**	3,221,798
1988	34,735	29,731	634,187	169,617	34,151	802,322	**904,514**	1,021,897	38,782	100,903	1,157,393	225,109	142,292	782,572	2,168,013	**2,466,765**	2,824,988	3,019,860	**3,376,465**	3,784,842
1989	75,574	15,993	699,054	251,528	9,983	931,356	**1,054,882**	1,199,685	20,771	56,459	830,740	151,208	136,115	855,115	1,829,856	**2,064,618**	2,341,173	2,819,750	**3,122,675**	3,474,052
1990	75,765	12,007	626,479	208,460	23,128	839,881	**949,637**	1,075,702	34,935	52,069	520,028	108,387	112,849	410,158	1,106,568	**1,253,016**	1,424,399	1,993,315	**2,206,564**	2,444,701
1991	74,577	17,412	547,224	177,755	29,098	750,028	**849,348**	962,058	25,359	57,218	371,097	107,091	63,199	406,399	927,055	**1,042,866**	1,175,603	1,712,825	**1,893,526**	2,091,674
1992	104,864	32,960	460,531	218,754	32,282	762,324	**852,927**	959,908	45,421	65,561	536,933	112,139	127,485	591,849	1,328,264	**1,498,775**	1,699,368	2,130,477	**2,355,285**	2,610,466
1993	70,858	26,955	462,096	188,032	32,362	700,151	**784,102**	878,278	67,125	64,405	437,466	156,197	149,200	532,337	1,269,439	**1,427,484**	1,617,172	2,003,889	**2,214,884**	2,447,652
1994	39,435	8,604	626,236	223,003	24,892	814,089	**925,084**	1,059,520	51,336	52,776	558,110	172,495	102,417	567,024	1,350,920	**1,526,666**	1,730,492	2,214,838	**2,454,132**	2,733,742
1995	39,366	22,664	408,394	200,216	36,331	631,907	**710,563**	798,428	17,264	65,463	623,656	131,749	95,129	556,556	1,330,703	**1,501,062**	1,697,810	1,994,859	**2,212,284**	2,456,031
1996	66,487	12,056	311,013	272,071	21,664	611,570	**687,274**	773,569	21,301	56,466	580,719	98,230	98,472	400,932	1,115,018	**1,265,973**	1,438,998	1,759,335	**1,956,529**	2,173,768
1997	60,686	16,438	359,228	267,283	9,860	638,657	**717,013**	809,559	10,943	41,147	581,965	87,754	116,345	286,739	995,405	**1,133,036**	1,295,779	1,665,296	**1,852,131**	2,064,769
1998	75,774	28,157	468,285	293,181	7,942	781,564	**877,978**	992,358	21,304	56,360	608,808	96,543	254,200	391,417	1,278,007	**1,441,348**	1,634,936	2,100,003	**2,321,093**	2,574,768
1999	101,536	14,246	435,130	226,397	12,499	706,662	**793,144**	890,351	7,129	45,597	567,111	76,435	66,130	193,872	837,204	**962,518**	1,119,021	1,580,154	**1,757,588**	1,963,728
2000	110,021	15,057	716,139	247,560	23,102	992,005	**1,117,123**	1,264,184	18,699	40,645	788,825	116,807	95,927	378,598	1,269,608	**1,450,034**	1,668,702	2,313,929	**2,572,565**	2,868,736
2001	79,743	13,639	618,912	333,631	14,295	930,506	**1,069,678**	1,233,851	15,962	36,458	626,620	101,109	75,893	370,498	1,101,210	**1,237,298**	1,395,930	2,079,356	**2,310,117**	2,567,525
2002	54,243	23,608	378,431	304,303	13,836	674,294	**780,916**	914,676	36,154	45,437	549,589	95,140	150,017	299,543	1,062,742	**1,189,752**	1,335,092	1,777,374	**1,974,401**	2,193,195
2003	53,443	12,514	524,827	271,089	7,460	761,360	**876,300**	1,010,294	23,803	54,402	537,035	74,458	98,258	339,387	1,015,480	**1,142,789**	1,288,288	1,819,086	**2,021,376**	2,241,273
2004	22,822	33,577	317,689	189,267	6,247	502,909	**573,560**	662,529	28,611	54,536	395,435	134,026	87,893	402,911	994,238	**1,120,344**	1,268,140	1,529,849	**1,697,343**	1,890,413
2005	49,975	30,060	470,255	216,327	6,126	683,368	**779,108**	893,572	18,584	80,097	394,587	108,899	111,537	436,639	1,040,043	**1,165,929**	1,306,351	1,759,921	**1,946,154**	2,155,578
2006	87,609	31,800	380,070	261,443	6,826	677,347	**773,927**	889,249	26,124	56,766	301,793	106,945	71,251	424,407	890,521	**1,003,806**	1,139,016	1,604,070	**1,780,315**	1,979,485
2007	25,507	23,512	213,431	140,843	2,121	356,543	**408,782**	469,926	20,518	64,848	344,839	101,451	115,683	415,942	929,612	**1,092,566**	1,359,221	1,317,255	**1,506,646**	1,786,606
2008	27,502	21,484	267,139	146,451	3,291	411,320	**470,081**	541,241	20,288	78,829	339,330	100,769	68,797	358,914	835,859	**999,470**	1,265,364	1,279,101	**1,475,957**	1,757,241
2009	48,950	34,683	214,568	137,343	3,511	389,748	**441,575**	504,309	5,710	88,916	282,321	62,985	52,566	306,381	690,589	**826,082**	1,038,500	1,107,991	**1,272,449**	1,498,782
2010	39,311	27,669	316,948	156,410	5,957	483,833	**550,149**	626,352	19,623	90,990	357,151	123,712	48,335	561,782	1,035,292	**1,248,078**	1,559,238	1,559,099	**1,801,928**	2,131,347
2011	44,676	22,917	223,682	167,515	5,075	408,884	**467,182**	534,017	13,282	64,257	316,572	72,721	41,964	298,084	690,707	**832,570**	1,081,536	1,131,303	**1,305,561**	1,566,882
2012	77,243	11,968	248,237	194,300	7,133	476,894	**545,252**	626,904	14,457	36,474	318,220	44,433	62,640	397,635	741,934	**923,935**	1,195,763	1,261,619	**1,474,207**	1,758,529
2013	44,528	28,361	234,430	151,503	4,173	408,260	**468,516**	540,328	20,420	108,307	290,504	58,161	37,120	466,073	837,666	**1,029,560**	1,295,054	1,284,464	**1,501,072**	1,780,881
2014	63,290	12,022	320,097	143,197	11,593	483,473	**555,740**	643,014	17,931	29,309	193,409	32,143	44,976	352,294	572,933	**707,536**	883,766	1,095,755	**1,266,473**	1,474,375
10yr Av.	50,859	24,448	288,886	171,533	5,581	477,967	**546,031**	626,891	17,694	69,879	313,873	81,222	65,487	401,815	826,516	**982,953**	1,212,381	1,340,058	**1,533,076**	1,788,971

Table 3.3.5.4. 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				5.0%	**50.0%**	95.0%		S&W					5.0%	**50.0%**	95.0%	5.0%	50.0%	95.0%
1971	51,855	27,002	NA	267,072	4,515				61,981	65,602	399,724	379,083	32,888	1,761,413	2,300,383	**2,711,682**	3,225,217			
1972	79,368	25,364	NA	430,324	6,934				39,211	59,241	383,058	279,757	29,012	1,712,932	2,104,351	**2,514,132**	3,022,985			
1973	125,210	23,906	NA	397,182	4,835				23,887	51,134	413,574	214,778	31,320	1,263,741	1,687,660	**2,007,109**	2,399,136			
1974	160,852	26,424	NA	430,059	3,196				34,193	54,309	446,632	261,680	25,970	1,333,978	1,816,308	**2,165,735**	2,616,159			
1975	124,323	21,684	NA	367,922	4,407				30,205	46,857	340,152	179,318	18,026	985,981	1,365,652	**1,607,599**	1,907,930			
1976	86,459	29,727	NA	254,367	2,437				21,478	45,438	279,670	180,100	17,635	931,642	1,242,257	**1,484,326**	1,777,431			
1977	45,040	38,099	NA	218,655	2,329				20,278	58,587	239,573	150,510	22,788	1,071,040	1,304,188	**1,570,924**	1,897,475			
1978	47,186	25,505	NA	199,648	4,328				21,006	37,827	212,953	88,144	16,271	809,336	986,054	**1,193,878**	1,440,994			
1979	54,252	36,020	NA	345,338	8,583				40,072	53,525	244,966	227,842	21,335	1,025,242	1,357,014	**1,619,856**	1,941,963			
1980	69,855	14,343	NA	240,990	5,524				30,882	37,082	194,679	307,007	17,943	1,110,696	1,429,133	**1,708,836**	2,050,717			
1981	84,751	15,920	NA	215,225	9,950				21,371	26,687	125,507	144,591	24,786	906,317	1,052,316	**1,254,215**	1,508,423			
1982	86,910	12,207	832,997	270,239	7,027	1,015,976	**1,213,381**	1,448,909	20,784	42,633	209,712	150,143	33,337	925,370	1,163,350	**1,387,368**	1,660,836	2,214,301	**2,602,034**	3,066,203
1983	69,999	14,652	806,505	252,085	7,400	965,040	**1,153,014**	1,381,231	26,659	35,852	143,082	108,718	13,532	722,773	873,872	**1,056,230**	1,272,468	1,869,258	**2,211,554**	2,624,424
1984	68,804	9,871	755,151	276,835	3,974	935,334	**1,116,274**	1,340,438	20,714	26,328	153,200	149,231	17,301	860,754	1,018,393	**1,231,895**	1,495,380	1,984,970	**2,351,183**	2,796,702
1985	60,281	25,352	907,409	281,409	3,679	1,069,670	**1,281,919**	1,537,587	24,505	22,425	190,944	217,286	19,495	1,165,747	1,365,680	**1,648,161**	1,987,787	2,475,071	**2,931,405**	3,467,673
1986	74,667	26,096	704,635	216,426	7,151	862,098	**1,030,245**	1,234,561	15,300	19,977	224,846	176,472	10,545	798,584	1,048,410	**1,250,256**	1,502,130	1,939,706	**2,283,679**	2,705,764
1987	50,172	16,708	559,512	198,102	6,551	696,166	**833,579**	996,913	31,627	21,981	168,698	215,811	26,733	1,153,170	1,347,372	**1,625,363**	1,963,525	2,071,087	**2,460,417**	2,929,109
1988	50,856	14,356	426,275	197,992	19,505	597,915	**710,375**	848,218	18,814	19,840	163,421	188,246	21,551	1,055,740	1,228,323	**1,472,804**	1,771,309	1,849,057	**2,184,313**	2,591,654
1989	53,364	14,935	477,283	242,166	10,446	668,906	**800,009**	959,235	14,971	19,553	75,005	198,713	19,508	806,612	942,215	**1,141,698**	1,388,516	1,632,310	**1,943,944**	2,317,304
1990	67,496	10,330	394,094	231,678	13,268	597,599	**719,925**	858,931	12,642	19,277	99,757	89,182	10,141	600,700	689,341	**835,949**	1,011,738	1,306,299	**1,559,381**	1,845,646
1991	63,852	15,003	413,600	213,903	17,970	605,899	**726,667**	869,210	16,571	21,464	84,053	75,032	22,460	811,368	852,722	**1,034,965**	1,256,236	1,480,582	**1,763,490**	2,095,161
1992	66,597	16,929	395,380	253,429	20,130	631,123	**754,853**	903,619	8,229	10,600	78,340	77,198	52,647	657,301	732,902	**892,209**	1,087,760	1,385,831	**1,648,160**	1,963,747
1993	62,995	14,336	386,204	226,182	15,304	590,646	**708,074**	848,697	14,403	17,075	113,806	97,596	18,645	756,686	836,532	**1,022,680**	1,254,063	1,447,127	**1,732,430**	2,070,245
1994	42,374	9,198	416,767	258,097	7,787	612,866	**736,323**	882,905	7,081	17,569	110,000	99,041	15,862	700,670	779,439	**954,606**	1,172,233	1,414,657	**1,693,049**	2,025,371
1995	43,040	11,941	414,627	194,569	12,430	567,420	**678,497**	813,801	12,725	11,300	76,009	102,867	17,401	545,234	630,424	**771,479**	946,247	1,216,569	**1,451,994**	1,734,540
1996	50,077	6,663	266,703	154,591	8,842	407,376	**489,317**	586,501	6,584	12,582	96,218	64,208	21,518	374,572	474,408	**585,404**	718,676	895,737	**1,075,977**	1,285,863
1997	47,587	9,696	319,436	192,323	4,900	479,552	**576,931**	690,831	5,421	7,794	55,683	40,931	29,513	392,245	437,126	**535,304**	657,978	933,965	**1,113,610**	1,327,442
1998	50,890	11,107	340,116	168,957	3,476	477,911	**576,152**	694,735	11,457	15,165	85,582	80,480	13,365	299,103	413,796	**521,064**	658,973	911,725	**1,098,466**	1,325,807
1999	97,150	6,522	471,785	295,601	12,454	740,061	**885,882**	1,064,716	7,989	4,145	107,295	83,493	17,864	383,287	499,617	**611,842**	754,157	1,258,882	**1,498,879**	1,793,648
2000	129,778	7,475	556,604	207,765	14,803	762,705	**919,077**	1,104,917	9,664	7,242	97,718	91,792	13,090	373,260	487,638	**600,828**	747,102	1,275,577	**1,521,289**	1,821,135
2001	113,436	7,068	481,326	225,684	10,165	697,033	**840,958**	1,010,568	8,793	7,843	111,133	81,434	15,516	302,651	436,185	**536,896**	663,428	1,155,301	**1,377,901**	1,645,085
2002	81,389	7,421	425,393	157,997	2,437	563,773	**675,857**	817,059	12,580	12,521	116,819	106,104	10,157	376,671	519,679	**646,089**	804,346	1,104,366	**1,325,586**	1,588,893
2003	37,229	7,330	386,256	121,857	7,453	465,154	**561,445**	677,868	23,115	10,120	64,155	89,475	9,122	483,035	556,832	**689,018**	859,610	1,044,829	**1,254,022**	1,508,168
2004	30,808	9,079	354,292	146,271	5,011	454,367	**546,235**	657,944	14,464	8,931	82,807	97,012	11,505	381,839	486,954	**604,376**	753,689	958,388	**1,153,923**	1,388,996
2005	48,601	8,687	450,095	139,734	5,214	543,780	**653,291**	786,339	14,348	7,404	60,029	87,125	7,359	394,390	467,517	**582,864**	728,943	1,035,140	**1,236,961**	1,487,121
2006	69,972	8,337	383,257	145,466	4,872	513,048	**612,544**	735,828	13,611	4,554	27,257	83,559	10,075	379,139	422,165	**526,666**	660,724	953,474	**1,142,709**	1,371,886
2007	70,622	10,732	442,147	229,035	6,830	631,020	**762,603**	922,150	15,066	5,211	40,645	92,412	6,139	427,236	474,697	**596,930**	751,766	1,132,575	**1,359,321**	1,640,591
2008	30,330	8,695	346,477	194,384	6,035	485,977	**587,152**	712,181	6,994	8,079	45,502	71,466	8,018	362,898	407,498	**511,134**	645,892	915,253	**1,102,306**	1,326,955
2009	48,760	12,268	380,743	240,162	7,048	572,514	**692,037**	836,547	5,723	16,717	29,305	104,622	7,367	475,242	512,604	**652,027**	834,508	1,113,813	**1,344,489**	1,634,317
2010	37,623	13,787	531,418	240,248	13,277	690,116	**838,591**	1,017,287	16,198	8,484	34,301	154,649	19,282	538,657	616,004	**787,235**	1,009,879	1,338,148	**1,631,444**	1,974,211
2011	45,458	7,723	465,779	117,365	18,791	542,738	**657,208**	795,415	12,748	4,847	36,263	126,328	28,967	423,863	509,077	**653,386**	841,531	1,080,197	**1,312,578**	1,598,644
2012	43,720	8,901	327,648	134,278	7,941	433,920	**525,014**	635,258	13,206	13,413	41,285	117,208	5,111	374,321	448,178	**579,141**	750,939	906,436	**1,107,571**	1,353,509
2013	47,459	10,764	337,764	133,592	16,021	450,658	**547,803**	667,844	16,393	14,195	18,771	73,455	17,298	316,193	362,538	**468,188**	610,317	836,373	**1,021,449**	1,244,471
10yr Av.	47335.18	9897.158	401962.1	172053.5	9103.956	531813.87	**642,248**	776679.31	12875.12	9183.299	41616.45	100783.8	12112.17	407378.01	470723.2	**596194.758**	758818.76	1026980	**1241275.06**	1502070

Table 3.3.5.5. Estimated number of 1SW spawners 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	12,980	4,683	NA	NA	8,139	NA	**NA**	NA	47,914	31,369	398,629	35,102	36,295	212,973	581,156	**771,024**	1,016,307	NA	**NA**	NA
1972	50,386	4,350	NA	71,646	6,426	NA	**NA**	NA	95,832	25,427	419,174	38,415	31,845	169,038	596,122	**792,771**	1,069,300	NA	**NA**	NA
1973	23,397	5,151	NA	78,406	8,016	NA	**NA**	NA	58,351	27,244	456,589	46,480	27,765	203,274	617,505	**832,495**	1,125,344	NA	**NA**	NA
1974	32,600	5,133	NA	93,942	11,567	NA	**NA**	NA	27,244	19,422	522,162	58,296	30,471	172,813	604,167	**839,387**	1,160,547	NA	**NA**	NA
1975	38,647	6,281	NA	111,918	12,431	NA	**NA**	NA	54,666	29,998	575,347	60,096	24,902	154,903	658,063	**909,050**	1,267,180	NA	**NA**	NA
1976	35,350	6,316	NA	109,473	7,111	NA	**NA**	NA	50,048	23,754	392,367	39,732	17,346	160,685	512,965	**691,775**	939,476	NA	**NA**	NA
1977	19,840	8,791	NA	74,436	3,187	NA	**NA**	NA	38,338	24,197	337,509	45,368	17,049	139,407	454,644	**610,148**	824,825	NA	**NA**	NA
1978	19,080	8,904	NA	58,857	3,788	NA	**NA**	NA	39,406	31,732	297,050	52,528	22,304	187,890	495,470	**640,386**	832,786	NA	**NA**	NA
1979	17,126	8,602	NA	74,963	3,921	NA	**NA**	NA	45,737	29,516	271,693	51,588	15,627	125,202	416,453	**549,190**	722,361	NA	**NA**	NA
1980	13,451	1,293	NA	73,355	4,985	NA	**NA**	NA	94,490	13,471	206,382	48,705	19,751	82,361	367,858	**477,493**	615,879	NA	**NA**	NA
1981	12,120	6,699	NA	53,467	9,101	NA	**NA**	NA	74,992	17,263	70,584	51,541	15,462	98,493	271,208	**338,843**	414,040	NA	**NA**	NA
1982	7,204	3,075	NA	49,598	8,067	NA	**NA**	NA	46,495	17,780	168,686	43,555	22,441	170,499	379,164	**480,232**	596,209	NA	**NA**	NA
1983	17,495	4,534	161,709	64,655	10,591	205,639	**261,105**	324,959	49,630	22,190	360,764	64,127	31,333	150,270	538,411	**688,387**	875,692	789,541	**952,547**	1,147,170
1984	19,217	1,634	164,696	80,777	15,111	223,374	**283,275**	349,699	81,893	13,780	197,250	56,344	12,374	188,864	458,565	**562,684**	680,545	725,806	**846,663**	981,426
1985	25,511	11,337	171,587	92,825	17,986	262,280	**321,248**	391,324	30,516	22,229	235,072	55,825	15,991	178,098	417,952	**545,264**	706,072	724,659	**871,841**	1,044,239
1986	19,999	14,117	152,017	102,356	18,514	256,987	**309,276**	371,528	44,743	36,821	326,209	65,213	18,033	224,021	576,177	**737,543**	928,801	876,454	**1,049,373**	1,246,573
1987	24,186	8,285	127,559	95,710	14,905	227,891	**272,555**	322,983	80,581	22,723	202,628	68,576	15,270	168,177	454,089	**584,613**	753,192	720,001	**858,168**	1,032,359
1988	14,213	12,003	116,810	86,775	12,464	205,646	**244,442**	290,291	27,715	40,753	342,159	95,441	41,288	383,514	798,887	**946,966**	1,132,720	1,039,195	**1,194,283**	1,381,815
1989	24,822	6,431	184,659	96,432	3,602	268,005	**317,217**	379,548	14,796	22,759	221,298	64,518	12,202	439,648	668,987	**789,665**	930,364	975,978	**1,110,433**	1,259,553
1990	24,840	4,847	165,671	97,195	9,736	259,780	**304,225**	357,816	25,041	21,093	159,575	46,401	35,183	198,011	421,772	**496,144**	583,620	712,091	**803,178**	904,412
1991	24,495	7,063	144,246	83,248	12,345	232,459	**273,402**	321,024	18,351	23,135	117,056	46,890	18,295	214,702	387,347	**448,117**	517,881	646,807	**722,938**	804,417
1992	34,243	13,376	121,927	115,914	13,657	263,448	**301,991**	345,388	32,834	26,537	159,624	49,408	46,058	332,221	572,240	**661,590**	768,396	865,914	**965,390**	1,079,521
1993	23,142	10,924	121,030	113,786	13,748	247,593	**285,115**	325,163	48,292	25,957	141,357	72,961	72,171	275,252	566,705	**652,268**	761,543	843,184	**939,584**	1,053,744
1994	12,902	3,483	166,448	115,950	10,560	262,798	**311,234**	369,748	36,836	21,218	124,348	80,660	25,289	297,407	508,735	**605,495**	712,715	808,689	**918,351**	1,039,995
1995	12,923	9,196	107,876	121,350	17,488	236,205	**271,144**	310,196	11,669	26,558	178,956	64,443	25,697	298,588	527,020	**615,005**	714,252	791,624	**887,941**	993,290
1996	27,251	4,863	80,583	138,151	10,435	231,767	**263,947**	297,963	14,351	22,827	182,528	49,434	34,740	228,593	462,559	**540,729**	632,965	719,762	**805,416**	903,180
1997	24,978	6,629	105,296	158,519	4,755	265,442	**302,018**	341,414	7,406	16,600	228,273	45,924	38,242	158,529	428,423	**501,570**	589,911	720,390	**803,823**	900,879
1998	31,142	11,456	138,202	163,249	3,814	306,243	**350,387**	398,486	14,432	22,790	220,991	52,257	156,470	233,592	622,654	**710,965**	813,343	962,790	**1,063,142**	1,174,003
1999	33,468	6,011	127,517	162,565	6,020	295,358	**338,259**	386,556	4,845	18,700	232,536	42,282	20,059	107,863	364,253	**431,957**	516,995	689,076	**771,785**	867,608
2000	36,146	6,351	213,664	141,746	11,180	352,503	**410,974**	480,284	12,618	16,752	352,765	64,498	33,016	219,025	606,638	**707,283**	828,575	1,002,288	**1,121,896**	1,256,810
2001	26,171	5,864	186,364	198,568	6,894	364,529	**427,565**	498,498	10,820	15,338	256,424	57,487	31,138	220,481	521,012	**599,740**	694,077	925,209	**1,030,008**	1,145,459
2002	22,226	10,350	111,849	210,636	6,686	307,749	**364,742**	430,061	24,521	19,153	216,398	53,935	70,192	179,721	502,130	**576,636**	659,830	845,263	**942,822**	1,047,059
2003	21,819	5,461	156,574	199,088	3,592	328,225	**390,341**	461,197	16,099	22,933	246,935	46,020	41,178	228,270	539,531	**613,017**	697,343	906,507	**1,004,913**	1,113,656
2004	9,416	14,894	93,866	146,005	3,014	228,882	**269,156**	316,406	19,333	23,017	155,978	82,142	41,061	267,311	527,993	**603,203**	694,775	787,088	**874,462**	975,234
2005	20,525	13,642	140,024	133,175	2,966	265,985	**312,531**	365,538	12,612	33,662	172,061	67,168	55,901	293,482	574,914	**646,724**	729,982	872,843	**961,386**	1,055,717
2006	35,977	14,227	110,694	162,963	3,298	279,313	**329,420**	384,302	17,627	23,884	126,995	67,777	38,681	287,224	506,618	**576,091**	658,469	819,226	**907,156**	1,004,001
2007	10,524	10,658	61,851	123,669	1,022	176,513	**209,200**	248,950	13,892	27,836	249,447	65,454	75,133	285,111	628,670	**739,100**	939,544	832,385	**951,137**	1,152,557
2008	11,252	10,065	87,795	93,414	1,836	175,683	**206,096**	239,605	13,690	33,897	243,758	64,898	43,352	251,325	561,869	**675,231**	875,045	763,044	**882,523**	1,082,909
2009	20,167	16,877	71,686	100,854	1,961	183,123	**213,645**	249,743	3,873	37,448	204,915	40,852	34,843	217,289	466,836	**558,582**	717,293	673,854	**773,971**	936,859
2010	16,101	13,407	115,779	92,155	3,334	208,410	**243,452**	282,232	13,286	38,975	258,157	80,086	32,214	392,281	698,548	**852,014**	1,082,554	940,116	**1,095,942**	1,328,345
2011	18,349	11,508	80,327	102,663	2,157	186,956	**216,809**	249,702	8,947	27,534	227,365	45,103	28,449	206,162	463,020	**564,165**	756,084	674,894	**781,890**	974,633
2012	31,776	5,820	89,771	109,910	4,008	210,639	**243,355**	280,717	9,790	15,685	228,230	29,097	46,587	287,525	522,219	**656,857**	860,016	761,818	**901,584**	1,108,145
2013	18,293	14,243	90,875	100,074	2,253	194,924	**228,385**	265,651	13,751	46,302	211,290	37,742	27,561	334,457	569,796	**712,505**	908,756	795,229	**942,387**	1,139,894
2014	25,846	6,019	137,744	90,644	6,273	228,515	**269,357**	317,408	12,110	12,559	141,642	21,230	33,592	258,391	411,517	**509,474**	642,307	670,005	**780,284**	919,932
10yr Av.	20,881	11,646	98,655	110,952	2,911	211,006	**247,225**	288,385	11,958	29,778	206,386	51,941	41,631	281,325	540,401	**649,074**	817,005	780,342	**897,826**	1,070,299

Table 3.3.5.6. Estimated number of MSW spawners 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%		**N&E**					5.0%	**50.0%**	95.0%	5.0%	50.0%	95.0%
1971	10,680	2,905	NA	NA	271	NA	NA	NA	6,846	7,351	82,303	52,184	10,962	307,345	386,363	**475,048**	576,519	NA	NA	NA
1972	11,233	4,509	NA	58,690	214	NA	NA	NA	13,440	11,193	88,778	93,168	9,589	389,684	500,214	**616,172**	750,571	NA	NA	NA
1973	18,206	4,234	NA	66,062	953	NA	NA	NA	8,258	10,097	95,493	71,423	8,389	435,640	515,176	**640,209**	788,975	NA	NA	NA
1974	30,592	4,020	NA	98,618	596	NA	NA	NA	3,824	8,768	108,857	52,624	9,151	283,737	380,649	**475,275**	589,689	NA	NA	NA
1975	39,798	4,440	NA	86,450	170	NA	NA	NA	7,667	9,344	121,744	72,215	7,498	310,666	430,862	**541,556**	671,750	NA	NA	NA
1976	31,085	3,657	NA	86,083	509	NA	NA	NA	5,613	8,073	84,825	37,803	5,228	225,866	301,553	**374,937**	454,299	NA	NA	NA
1977	21,428	5,071	NA	71,744	219	NA	NA	NA	4,311	7,809	72,882	48,084	5,133	209,153	284,298	**354,852**	438,576	NA	NA	NA
1978	10,893	6,533	NA	50,531	272	NA	NA	NA	4,468	10,167	62,839	41,353	6,708	286,313	338,844	**418,503**	518,775	NA	NA	NA
1979	13,339	4,355	NA	44,528	704	NA	NA	NA	5,082	6,501	57,105	20,611	4,700	201,581	237,743	**300,659**	378,365	NA	NA	NA
1980	13,085	6,009	NA	47,912	1,387	NA	NA	NA	10,616	9,040	62,743	66,895	5,964	243,305	326,970	**407,520**	503,409	NA	NA	NA
1981	15,327	2,109	NA	65,880	301	NA	NA	NA	7,491	6,055	46,291	94,349	4,679	255,584	339,498	**424,885**	524,243	NA	NA	NA
1982	20,546	2,421	NA	40,664	1,451	NA	NA	NA	4,722	4,318	32,462	36,520	6,775	238,104	269,182	**326,917**	402,862	NA	NA	NA
1983	22,686	1,853	101,095	49,297	955	142,932	**177,911**	218,382	5,012	7,145	63,636	41,878	9,456	242,504	310,331	**373,825**	453,350	477,873	**554,590**	642,108
1984	19,171	2,365	103,991	62,151	1,355	155,249	**190,943**	229,895	8,172	6,058	43,110	33,494	3,725	223,482	269,038	**321,778**	386,727	448,458	**514,302**	589,014
1985	18,587	1,529	95,966	51,340	501	137,332	**169,542**	205,794	6,242	4,386	53,549	50,000	4,829	296,369	353,715	**418,449**	496,060	514,800	**590,068**	673,746
1986	15,009	4,191	114,391	52,514	258	150,326	**188,174**	233,886	6,264	3,699	51,050	67,960	5,423	379,042	433,858	**520,224**	629,089	613,845	**710,275**	825,544
1987	20,013	4,330	89,283	53,323	1,151	138,305	**170,888**	207,477	3,373	3,301	79,728	54,656	2,995	244,338	331,340	**393,876**	465,526	494,463	**565,829**	645,662
1988	14,101	2,809	73,169	44,900	1,236	112,007	**137,671**	166,064	9,189	3,717	52,855	71,401	9,987	443,312	508,638	**596,659**	700,299	643,252	**734,984**	840,710
1989	11,417	2,367	77,481	51,010	4,318	126,371	**147,720**	172,280	4,290	3,327	40,691	57,957	4,982	390,703	432,014	**506,928**	594,687	577,306	**655,974**	746,001
1990	12,398	2,505	91,535	48,181	2,650	133,976	**158,501**	187,405	4,339	3,318	14,862	70,835	7,019	309,376	350,561	**415,221**	492,779	505,006	**574,983**	657,498
1991	16,751	1,731	76,489	60,542	3,604	137,552	**160,608**	186,596	3,959	3,271	41,113	31,847	3,320	251,076	290,193	**337,246**	392,646	445,794	**498,992**	559,362
1992	16,196	2,572	84,549	58,425	4,994	143,612	**168,224**	195,174	4,976	3,725	20,890	24,533	8,926	344,016	351,010	**409,370**	483,762	513,683	**578,667**	656,169
1993	16,937	2,917	78,327	55,843	5,601	138,068	**161,010**	186,283	2,330	1,820	24,291	27,866	27,621	274,739	311,135	**364,104**	429,642	466,911	**526,138**	595,592
1994	15,895	2,479	76,690	65,263	4,272	142,353	**166,307**	191,573	5,314	2,948	40,245	38,968	6,627	333,150	371,681	**431,147**	506,884	532,468	**598,277**	676,832
1995	10,501	1,568	83,374	64,379	2,454	139,314	**163,835**	191,071	2,549	3,037	37,972	40,837	5,427	306,475	341,121	**400,042**	472,110	499,842	**565,022**	641,805
1996	13,260	2,056	83,274	63,262	3,937	142,370	**167,267**	193,866	4,540	1,934	19,606	42,595	6,794	240,867	272,718	**321,114**	378,302	433,162	**489,118**	551,363
1997	15,888	1,160	57,881	52,897	2,852	112,369	**132,333**	154,351	2,322	2,190	39,149	27,392	8,503	164,569	209,692	**250,585**	298,023	337,507	**383,288**	434,774
1998	15,113	1,685	69,485	41,934	1,596	110,394	**131,489**	154,292	1,971	1,367	12,540	17,980	13,564	181,617	198,958	**231,919**	271,203	323,625	**364,328**	408,388
1999	14,687	2,247	72,016	54,685	1,133	122,671	**145,423**	170,312	4,297	2,822	33,629	37,908	5,402	133,350	183,209	**227,823**	285,224	323,610	**373,837**	435,837
2000	28,125	1,360	102,903	58,780	4,068	168,007	**196,970**	229,242	2,992	819	44,371	41,044	7,211	175,848	237,928	**277,838**	325,874	424,993	**475,658**	531,636
2001	37,820	1,649	122,794	89,469	4,813	220,787	**257,885**	299,355	3,476	1,390	37,039	44,440	5,476	167,510	223,884	**266,183**	318,831	466,698	**525,397**	591,237
2002	32,902	1,640	106,651	74,541	3,335	188,280	**221,124**	257,001	3,216	1,602	47,545	39,939	5,311	139,022	205,062	**243,168**	288,325	414,535	**464,910**	522,979
2003	23,501	2,008	95,728	63,409	793	159,776	**187,121**	217,203	4,616	2,335	54,204	54,276	3,087	184,459	262,100	**311,135**	368,392	441,370	**499,211**	562,846
2004	10,822	1,915	87,369	48,111	2,429	128,233	**152,081**	180,155	8,644	1,912	24,708	46,132	3,079	238,017	279,820	**330,229**	388,523	426,113	**483,142**	547,911
2005	8,936	2,424	78,989	36,496	1,643	109,302	**129,300**	152,528	5,420	1,814	37,735	49,941	4,181	188,360	249,655	**293,174**	347,659	375,361	**423,035**	481,391
2006	14,115	2,774	101,373	46,617	1,711	141,443	**167,543**	196,377	5,360	1,509	25,193	45,488	2,901	198,694	243,143	**287,463**	343,160	403,019	**455,492**	518,194
2007	20,334	3,102	83,943	39,849	1,605	127,225	**149,969**	174,815	5,112	901	14,192	44,040	4,780	192,879	226,865	**268,422**	319,748	370,344	**418,608**	474,534
2008	20,437	3,443	125,787	47,458	2,622	170,261	**201,042**	238,220	5,624	1,303	21,208	48,893	2,779	219,153	256,634	**306,430**	367,253	448,430	**508,917**	578,892
2009	8,790	3,226	99,771	70,144	2,325	157,726	**186,468**	219,774	2,596	1,727	23,281	37,759	3,863	188,159	221,037	**263,544**	316,211	398,773	**451,270**	511,627
2010	14,109	4,394	122,870	60,963	2,716	176,158	**206,270**	240,810	2,143	3,404	15,134	55,843	3,566	245,013	275,435	**333,911**	409,491	474,990	**541,185**	622,771
2011	10,880	5,260	179,159	72,617	3,786	230,735	**273,339**	321,503	6,066	1,863	17,336	79,451	9,502	274,096	327,309	**400,965**	493,733	588,190	**675,041**	778,513
2012	13,198	3,017	156,263	63,983	7,236	209,625	**245,802**	287,600	4,757	1,322	18,412	66,963	15,494	223,087	280,241	**344,052**	424,364	516,295	**591,172**	681,130
2013	12,698	3,563	111,661	33,591	2,939	140,253	**165,598**	194,174	4,964	3,520	20,954	61,890	2,770	194,679	240,958	**298,863**	373,320	401,231	**465,566**	545,159
2014	13,735	4,578	124,246	36,717	5,958	157,664	**186,577**	221,720	6,115	3,711	9,440	38,736	9,438	165,605	196,085	**242,359**	303,437	373,844	**430,882**	498,379
10yr Av.	13,723	3,578	118,406	50,843	3,254	162,039	**191,191**	224,752	4,816	2,107	20,288	52,900	5,927	208,973	251,736	**303,918**	369,838	435,048	**496,117**	569,059

Table 3.3.5.7. 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 & Wales)	Suffering	Suffering	At risk	At risk
UK (Northern Ireland)	At risk	At risk	Full	Full
UK (Scotland)	At risk	At risk	At risk	Suffering
Ireland	Suffering	Suffering	Suffering	Suffering
France	Suffering	Suffering	Full	At risk
Northern NEAC				
Russia	Full	Full	Full	Suffering
Finland	Full	At risk	Full	Suffering
Norway	Full	Full	Full	Full
Sweden	Full	Full	Full	Full
Iceland	Full	Suffering	Full	Full

Key: Full = At full reproductive capacity.

At risk = At risk of suffering reduced reproductive capacity.

Suffering = Suffering reduced reproductive capacity.

Table 3.3.6.1. Status of spawner escapement by jurisdiction in the NEAC area in 2014 and compliance (i.e. meeting or exceeding CL or other stock indicator) with river-specific conservation limits or other stock indicator for individual river stocks after homewater fisheries (except Russia and Norway where data are for 2013).

Country or jurisdiction	95% or higher probability of spawners meeting CL 1SW	95% or higher probability of spawners meeting CL MSW	No. rivers	No. with CL	No. assessed for compliance	No. attaining CL	% attaining CL
Northern NEAC	1SW	MSW					
Russia	No	No	112	80	7	6	86
Finland/Norway (Tana/Teno)	No	No	1	1	1	0	0
Norway	Yes	Yes	439	439	191	95	50
Sweden	Yes	Yes	23	22	22	8	36
Iceland	No	Yes	100	0	0	NA	NA
Southern NEAC							
UK (Scotland)	No	No	398	0	0	NA	NA
UK (Northern Ireland)	No	Yes	15	10	9	4	44
UK (England/Wales)	No	No	64	64	64	12	19
Ireland	No	No	141	141	141	55	39
France (1SW)	No		42	33	30	27	90
France (MSW)		No	42	33	30	22	73

Table 3.3.7.1. 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	Bresle
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	All ages
1975	20.8																							
1980								17.9	1.1	3.1				0.6										
1981						17.3	4.0	9.2	3.8	5.4	8.2	3.8		0.9										
1982						5.3	1.2	20.9	3.3	5.8	11.2	5.0												
1983						13.5	1.3	10.0	1.8	3.4				1.7										
1984						12.1	1.8	26.2	2.0	7.8	6.0	4.0		1.4										
1985	9.4					10.2	2.1	18.9	1.8	7.9	13.6	5.4		1.9										
1986						3.8	4.2			8.7			31.3	1.9										
1987				2.0	0.3	17.3	5.6	16.6	0.7	12.0	10.4	3.9	35.1	0.4										
1988	12.7			5.8	0.7	13.3	1.1	14.6	0.7	10.1			36.2	0.9										
1989	8.1			2.1	1.0	8.7	2.2	6.7	0.7	3.5	6.6	4.2	25.0	1.4										
1990	5.4			3.9	1.6	3.0	1.3	5.0	0.6	9.2	6.0	3.1	34.7	1.8										
1991	8.8			2.1	0.3	8.7	1.2	7.3	1.3	9.5	7.6	3.1	27.8	2.2										
1992	9.6			2.1	0.4	6.7	0.9	7.3		7.6	10.9	6.5	29.0	2.0							7.1		5.3	3.1
1993	9.8			2.1	0.0	15.6		10.8	0.1	9.5	14.5	6.1		2.0	6.3	2.5					4.7		17.0	5.1
1994	9.0			0.6	0.4			9.8	1.4	9.4	10.9	3.6	27.1	0.8	1.3	1.2					1.3		3.5	4.7
1995	9.4		1.5	0.9	0.0	1.8	1.5	8.4	0.1	6.8	8.4	3.8		2.5	2.7	0.4					2.3	11.8	5.0	
1996	4.6	2.5	0.4	2.8	0.6	3.5	0.9	6.3	1.2	9.2	5.9	2.7	31.0	2.1	4.8	2.1					2.5	15.1	4.8	2.2
1997	5.3	1.0	1.5	0.8	0.0	1.7	0.3	12.7	0.8	8.2	7.2	4.2	19.8	0.7	6.2	3.4					2.3	5.8	14.0	4.6
1998	5.3	1.5	1.0	1.5	0.6	7.2	1.0	5.5	1.1	5.3	2.6	1.4	13.4	0.5	2.3	3.7					2.6	6.7	6.6	2.2
1999	7.7	1.3	1.2	1.3	0.0	4.2	2.2	6.4	0.9	8.1	6.8	3.8	16.5	0.8	5.0	12.4					2.7	15.9		
2000	6.3	1.1	0.7	0.4	1.1	12.5	1.7	9.4		9.0	6.0	2.8	10.1	0.2	2.0	0.9					3.5	10.6	2.4	
2001	5.1	3.4	1.3	2.5	2.5	3.6	2.2	7.2	1.1	7.6	4.7	2.9	12.4	0.3	4.3						0.4	6.2	3.7	
2002	4.4	1.1	2.3	0.8	0.6	5.5	0.9	6.0	0.5	6.5	2.2	2.0	11.3	0.2	2.9	0.7	3.6	1.4	5.6	1.7	0.8	22.6	3.1	
2003	9.1	5.5	0.6	4.9	1.6	3.5	0.7	8.3	2.1	8.3			6.8	0.3	2.6	0.4	6.1	1.8	4.8	0.9	1.4	12.0	5.7	3.4
2004	7.7	5.7	0.6	3.5	1.2	5.9	1.4	6.3	0.8	5.8			6.8	0.4	4.5	1.0	6.0	1.5	5.3	2.9	1.3	6.5	4.0	4.4
2005	6.4	2.5	0.9	3.0	1.0	3.7	1.8			5.3	6.7	2.8	5.9	0.6	5.1	0.5	6.4	1.2			1.0	8.5	6.6	2.8
2006	7.1	1.8	1.0	0.8	0.8	0.8	5.8	1.2	0.9	13.0	3.3	3.4	14.0	0.8	4.3	1.5	3.5	2.4	5.1	2.2	2.9	7.4	5.3	3.2
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	0.9	3.5	3.4	5.7	1.3	2.6	4.4	4.0	3.7
2008	14.9	2.6	1.1	0.2	0.2	1.1	2.3	1.7	1.0	8.2	6.4		4.0	0.7	2.5	1.3	1.7	0.9	3.1	1.6	3.6	3.0		1.9
2009	14.2	1.3	1.6	1.1	0.6	2.4	3.1	6	1.0	8.9	9	8.7	5.9	1.0	4.8	1.1	8.2	1.9	7.7	2.6	1.9	6.9		17.0
2010	8.6	2.0	1.1	0.4	0.4	1.7	1.1	2.9	1.3	7.5			4.0	1.3	1.9	0.7	3.4	5.0	8.6	2.4	1.3	4.4		6.2
2011	6.1	1.3	0.6	0		4.4	2.5	2.4	0	10.8			2.7	0.5	0.0	0.3	1.1	1.9[9]	1.5	1.8[9]		5.2		3.3
2012	10.9	2.1				3.3	1.3	1.5	0	9.4			11.7	1.8	4.8[9]		2.5[9]		3.2[9]	2.1		7.4		2.5
2013	4.3					1.4		2		4.5			4.6		2.0				1.5			6.0		
Mean																								
(5-year)	8.8	1.7	1.1	0.5	0.5	2.6	2.1	3.0	0.7	8.2	9.0	8.7	5.8	1.1	2.2	0.7	4.2	2.6	4.8	2.2	1.6	6.0		7.3
(10-year)	9.9	2.2	0.9	1.2	0.6	2.6	2.1	2.8	0.9	8.2	6.1	4.7	6.8	0.8	2.9	0.9	4.2	2.3	4.8	2.0	2.1	6.0	5.0	5.0

[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 3.3.7.2. 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				1.6	0.5				
2013	0.3				1.9					
Mean										
(5-year)	0.7		1.0	0.2	1.8	1.6				
(10-year)	1.1		0.5	0.1	1.9	1.4	0.2	0.5		

[1] Microtagged.

[2] Carlin-tagged, not corrected for tagging mortality.

[3] since 1999 only 1 year old smolts included

Table 3.3.7.2. (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	0.4	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	0.8	1.4	0.9			0.5
2011	0.4		5.2		1.3		0.1	1.3	0.4	0.5	0.8	1.9	0.9
2012	0.5		3.2		1.8		0.2	3.9		1.9	2.2	3.5	0.9
2013	0.2	0.1	3.2		1.7		0.1	1.3	0.9	0.7	1.3	1.2	0.3
Mean													
(5-year)	0.3	0.1	3.4		1.6		0.1	1.8	1.0	1.0	1.4	2.2	0.7
(10-year)	0.4	1.0	4.4	7.4	1.9	0.9	0.4	1.5	2.1	1.2	1.5	2.3	1.1

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. 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 2014 to 2018 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)	**723 008**	**465 646**	**199 279**	**219 540**
PFA Year	**Probability of PFA meeting or Exceeding SER**			
2014	0.936	0.692	0.998	0.999
2015	0.912	0.708	0.985	0.989
2016	0.838	0.626	0.979	0.984
2017	0.745	0.541	0.957	0.966
2018	0.657	0.473	0.913	0.925

Table 3.4.3.1. 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 2014 to 2018 for the Southern NEAC countries.

Maturing	France	Iceland–SW	Ireland	UK (England & Wales)	UK (N. Ireland)	UK (Scotland)
Spawner Escapement Reserve (SER)	**17 400**	**17 751**	**211 471**	**54 812**	**21 649**	**245 912**
PFA Year	**Probability of PFA meeting or Exceeding SER**					
2014	0.383	0.996	0.526	0.500	0.586	0.845
2015	0.355	0.990	0.491	0.515	0.693	0.814
2016	0.398	0.957	0.479	0.442	0.693	0.738
2017	0.416	0.869	0.459	0.397	0.563	0.668
2018	0.387	0.941	0.346	0.322	0.601	0.617

Non-Maturing	**France**	**Iceland-SW**	**Ireland**	**UK (England & Wales)**	**UK (N. Ireland)**	**UK (Scotland)**
Spawner Escapement Reserve (SER)	**5100**	**1158**	**46 943**	**30 203**	**2437**	**187 518**
PFA Year	**Probability of PFA meeting or Exceeding SER**					
2014	0.807	0.995	0.065	0.852	0.981	0.571
2015	0.714	0.980	0.113	0.811	0.965	0.598
2016	0.710	0.934	0.151	0.723	0.941	0.541
2017	0.700	0.854	0.170	0.652	0.868	0.497
2018	0.648	0.911	0.141	0.557	0.868	0.466

Table 3.4.3.2. 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 2014 to 2018 for Northern NEAC countries.

Maturing	Finland	Iceland–NE	Norway	Russia	Sweden
Spawner Escapement Reserve (SER)	**22 819**	**7450**	**81 397**	**86 086**	**1527**
PFA Year	**Probability of PFA meeting or Exceeding SER**				
2014	0.858	0.993	0.994	0.947	0.937
2015	0.642	0.979	0.981	0.897	0.920
2016	0.627	0.954	0.973	0.882	0.937
2017	0.598	0.908	0.947	0.862	0.877
2018	0.608	0.859	0.905	0.769	0.886

Non-Maturing	Finland	Iceland-NE	Norway	Russia	Sweden
Spawner Escapement Reserve (SER)	**23 788**	**2788**	**120 589**	**70 285**	**2090**
PFA Year	**Probability of PFA meeting or Exceeding SER**				
2014	0.809	0.993	0.997	0.963	0.999
2015	0.583	0.975	0.990	0.907	0.996
2016	0.582	0.949	0.985	0.885	0.996
2017	0.556	0.906	0.965	0.862	0.982
2018	0.569	0.858	0.927	0.771	0.980

Table 3.5.1.1. 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 2015/2016 to 2017/2018 fishing seasons.

Catch options for 2015/16	TAC option (t)	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW	All complexes simultaneous
	0	98%	99%	83%	70%	59%
	20	98%	97%	83%	67%	56%
	40	98%	94%	82%	64%	51%
	60	98%	89%	82%	61%	46%
	80	98%	81%	82%	57%	40%
	100	98%	73%	81%	54%	34%
	120	98%	63%	81%	51%	28%
	140	98%	54%	81%	48%	23%
	160	98%	46%	80%	45%	18%
	180	98%	38%	80%	43%	14%
	200	98%	31%	80%	40%	11%

Catch options for 2016/17	TAC option (t)	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW	All complexes simultaneous
	0	96%	98%	74%	62%	47%
	20	96%	97%	74%	59%	44%
	40	96%	94%	73%	56%	41%
	60	96%	89%	73%	53%	37%
	80	96%	84%	72%	51%	33%
	100	96%	77%	72%	48%	29%
	120	95%	70%	72%	45%	25%
	140	95%	63%	71%	43%	21%
	160	95%	56%	71%	40%	18%
	180	95%	49%	70%	38%	15%
	200	95%	43%	70%	36%	12%

Catch options for 2017/18	TAC option (t)	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW	All complexes simultaneous
	0	91%	97%	65%	54%	35%
	20	91%	94%	64%	51%	32%
	40	91%	89%	64%	48%	30%
	60	91%	84%	64%	46%	26%
	80	91%	78%	63%	44%	23%
	100	91%	71%	63%	41%	20%
	120	91%	64%	62%	39%	17%
	140	91%	57%	62%	37%	15%
	160	91%	51%	62%	35%	12%
	180	91%	45%	61%	33%	11%
	200	91%	39%	61%	31%	9%

Table 3.5.1.2 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 2015/16 to 17/18 fishing seasons.

Catch options for 2015/16 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%	0.0%	0.3%
	40	0.0%	1.4%	0.1%	0.5%
	60	0.0%	2.1%	0.1%	0.8%
	80	0.0%	2.8%	0.1%	1.1%
	100	0.0%	3.4%	0.2%	1.4%
	120	0.1%	4.1%	0.2%	1.6%
	140	0.1%	4.8%	0.2%	1.9%
	160	0.1%	5.5%	0.2%	2.2%
	180	0.1%	6.2%	0.3%	2.4%
	200	0.1%	6.9%	0.3%	2.7%

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%	0.0%	0.3%
	40	0.0%	1.2%	0.1%	0.6%
	60	0.0%	1.8%	0.1%	0.9%
	80	0.0%	2.5%	0.1%	1.2%
	100	0.0%	3.1%	0.2%	1.5%
	120	0.1%	3.7%	0.2%	1.7%
	140	0.1%	4.3%	0.2%	2.0%
	160	0.1%	4.9%	0.3%	2.3%
	180	0.1%	5.5%	0.3%	2.6%
	200	0.1%	6.2%	0.3%	2.9%

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%	0.7%	0.0%	0.3%
	40	0.0%	1.3%	0.1%	0.6%
	60	0.0%	2.0%	0.1%	1.0%
	80	0.0%	2.6%	0.2%	1.3%
	100	0.1%	3.3%	0.2%	1.6%
	120	0.1%	3.9%	0.2%	1.9%
	140	0.1%	4.6%	0.3%	2.3%
	160	0.1%	5.2%	0.3%	2.6%
	180	0.1%	5.9%	0.3%	2.9%
	200	0.1%	6.5%	0.4%	3.2%

Table 3.5.1.3 Probability (%) of National NEAC - 1SW stock complexes achieving their SERs individually and simultaneously for different catch options for the Faroes fishery in the 2015/2016 to 2017/2018 fishing seasons.

Catch options for	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All 1SW MUs simultaneous
2015/16	0	88%	63%	97%	94%	99%	74%	70%	48%	44%	41%	2.2%
season:	20	88%	63%	97%	94%	99%	74%	70%	48%	44%	41%	2.1%
	40	88%	63%	97%	94%	99%	74%	69%	47%	44%	41%	2.1%
	60	88%	63%	97%	94%	99%	73%	69%	47%	44%	40%	2.1%
	80	88%	62%	97%	94%	99%	73%	69%	47%	43%	40%	2.0%
	100	88%	62%	97%	93%	99%	73%	68%	47%	43%	40%	2.0%
	120	87%	62%	97%	93%	99%	73%	68%	46%	43%	40%	1.9%
	140	87%	62%	97%	93%	99%	72%	68%	46%	43%	40%	1.8%
	160	87%	62%	97%	93%	99%	72%	67%	46%	43%	40%	1.8%
	180	87%	62%	97%	93%	99%	72%	67%	46%	42%	40%	1.8%
	200	87%	62%	97%	93%	99%	71%	67%	45%	42%	40%	1.7%

Catch options for	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All 1SW MUs simultaneous
2016/17	0	86%	60%	95%	88%	96%	67%	57%	46%	40%	43%	1.3%
season:	20	86%	60%	95%	88%	96%	67%	56%	46%	40%	42%	1.3%
	40	86%	60%	95%	88%	96%	67%	56%	45%	39%	42%	1.2%
	60	86%	60%	95%	87%	96%	66%	56%	45%	39%	42%	1.2%
	80	86%	60%	94%	87%	96%	66%	55%	45%	39%	42%	1.2%
	100	86%	60%	94%	87%	96%	66%	55%	45%	39%	42%	1.2%
	120	85%	59%	94%	87%	96%	65%	55%	44%	39%	42%	1.1%
	140	85%	59%	94%	87%	96%	65%	54%	44%	38%	42%	1.1%
	160	85%	59%	94%	87%	96%	65%	54%	44%	38%	42%	1.1%
	180	85%	59%	94%	87%	96%	65%	54%	44%	38%	41%	1.1%
	200	85%	59%	94%	87%	96%	65%	54%	44%	38%	41%	1.0%

Catch options for	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All 1SW MUs simultaneous
2017/18	0	77%	61%	90%	89%	98%	62%	61%	34%	32%	39%	0.6%
season:	20	76%	61%	90%	89%	98%	62%	60%	34%	32%	39%	0.6%
	40	76%	61%	90%	88%	98%	61%	60%	34%	32%	39%	0.6%
	60	76%	61%	90%	88%	98%	61%	60%	34%	32%	39%	0.5%
	80	76%	61%	90%	88%	98%	61%	59%	34%	32%	39%	0.5%
	100	76%	61%	90%	88%	98%	61%	59%	33%	31%	39%	0.5%
	120	76%	60%	90%	88%	98%	60%	59%	33%	31%	39%	0.5%
	140	76%	60%	90%	88%	98%	60%	59%	33%	31%	39%	0.5%
	160	76%	60%	90%	88%	98%	60%	58%	33%	31%	39%	0.4%
	180	76%	60%	90%	88%	98%	60%	58%	33%	31%	39%	0.4%
	200	76%	60%	90%	88%	98%	59%	58%	33%	30%	38%	0.4%

Table 3.5.1.4 Probability (%) of National NEAC - MSW stock complexes achieving their SERs individually and simultaneously for different catch options for the Faroes fishery in the 2015/2016 to 2017/2018 fishing seasons.

Catch options for 2015/16 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All MSW MUs simultaneous
	0	91%	58%	99%	100%	100%	60%	97%	11%	81%	71%	1.9%
	20	85%	50%	97%	99%	100%	58%	96%	11%	80%	70%	1.3%
	40	77%	43%	95%	99%	100%	56%	95%	10%	78%	69%	0.9%
	60	68%	37%	91%	98%	99%	53%	95%	10%	76%	67%	0.6%
	80	60%	32%	86%	97%	99%	51%	94%	10%	74%	66%	0.3%
	100	51%	28%	80%	96%	98%	49%	93%	9%	72%	64%	0.2%
	120	43%	24%	74%	94%	98%	47%	93%	9%	70%	63%	0.1%
	140	36%	21%	67%	93%	97%	45%	92%	9%	69%	62%	0.1%
	160	29%	19%	60%	91%	96%	43%	91%	9%	67%	60%	0.0%
	180	24%	16%	54%	89%	95%	41%	90%	8%	65%	59%	0.0%
	200	19%	14%	48%	87%	94%	39%	89%	8%	63%	58%	0.0%

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%	58%	99%	100%	99%	54%	94%	15%	73%	71%	1.8%
	20	83%	52%	97%	99%	99%	52%	93%	15%	70%	70%	1.4%
	40	77%	46%	95%	99%	98%	50%	93%	14%	68%	68%	1.0%
	60	70%	41%	92%	98%	97%	48%	92%	14%	66%	67%	0.7%
	80	63%	37%	88%	97%	97%	46%	91%	13%	65%	66%	0.4%
	100	55%	33%	84%	97%	95%	44%	90%	13%	63%	65%	0.3%
	120	49%	29%	80%	96%	94%	42%	90%	13%	61%	64%	0.2%
	140	43%	26%	75%	95%	93%	41%	89%	12%	59%	63%	0.1%
	160	37%	24%	70%	93%	92%	39%	88%	12%	57%	62%	0.1%
	180	32%	21%	65%	92%	90%	38%	87%	12%	55%	61%	0.1%
	200	27%	20%	61%	91%	89%	36%	86%	12%	54%	60%	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	87%	56%	97%	98%	97%	50%	87%	17%	66%	70%	1.5%
	20	81%	50%	94%	97%	96%	48%	86%	17%	63%	69%	1.0%
	40	75%	45%	90%	96%	95%	46%	84%	16%	61%	68%	0.7%
	60	68%	40%	86%	94%	93%	44%	83%	16%	59%	66%	0.5%
	80	62%	37%	82%	93%	91%	42%	82%	16%	58%	65%	0.4%
	100	56%	33%	77%	92%	90%	41%	80%	15%	56%	65%	0.3%
	120	50%	30%	72%	90%	88%	39%	79%	15%	54%	64%	0.2%
	140	45%	27%	67%	88%	86%	38%	78%	14%	52%	63%	0.1%
	160	40%	25%	62%	86%	84%	36%	77%	14%	51%	62%	0.1%
	180	35%	23%	58%	85%	82%	35%	76%	14%	49%	61%	0.1%
	200	31%	21%	53%	83%	80%	33%	75%	14%	47%	60%	0.0%

Table 3.5.1.5. Compliance with river-specific conservation limits for individual river stocks, before homewater fisheries, within each jurisdiction in the NEAC area in 2014 (except Russia and Norway where data are for 2013). NA = not available.

Country or jurisdiction	95% or higher probability of returns meeting CL 1SW	95% or higher probability of returns meeting CL MSW	No. rivers	No. with CL	No. assessed for compliance	No. attaining CL	% attaining CL
Northern NEAC							
Russia	Yes	Yes	112	80	7	6	86
Finland/Norway (Tana/Teno)	Yes	Yes	1	1	0	NA	NA
Norway	Yes	Yes	439	439	191	152	80
Sweden	Yes	Yes	23	22	0	NA	NA
Iceland	Yes	Yes	100	0	0	NA	NA
Southern NEAC							
UK (Scotland)	No	No	398	0	0	NA	NA
UK (Northern Ireland)	No	Yes	15	10	0	NA	NA
UK (England/Wales)	No	No	64	64	0	NA	NA
Ireland	No	No	141	141	141	55	39
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	0.94	significant at p 0.05	yes	
Survivals W 1SW NO Imsa	32	0.45	significant at p 0.05	yes	
Counts all NO Nausta	17	0.31	significant at p 0.05	yes	
Counts all NO Øyensåa	16	0.37	significant at p 0.05	yes	
Survivals H 1SW NO Imsa	31	0.30	significant at p 0.05	yes	
Catch rT&N 1SW FI	16	0.38	significant at p 0.05	yes	
Counts 1SW RU Tuloma	27	0.03	not significant at p 0.05	no	
Tot catch 1SW TanaTeno	32	0.11	not significant at p 0.05	no	
Counts 1 SW Utsjoki	13	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	New 2015!
Counts 1SW Akujoki	12	0.25	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	0.50	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	17	0.36	significant at p 0.05	yes	
Counts all NO Målselv	24	0.10	not significant at p 0.05	no	
Counts MSW RU Tuloma	26	0.12	not significant at p 0.05	no	
Catch W rT&N 2SW FI	16	0.34	significant at p 0.05	yes	
Tot catch MSW TanaTeno	32	0.06	not significant at p 0.05	no	
Counts MSW M Utsjoki	13	0.0001	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	34	0.58	significant at p 0.05	yes	
Ret. W 1SW UK(E&W) Itchen M	27	0.28	significant at p 0.05	yes	
Ret. W 1SW UK(E&W) Frome M	42	0.36	significant at p 0.05	yes	
Ret. Freshw 1SW UK(NI) Bush	40	0.26	significant at p 0.05	yes	
Surv FW 1SW UK(NI) Bush	31	0.08	not significant at p 0.05	no	New 2015
Surv 1SW UK(NI) Bush M	26	0.54	significant at p 0.05	yes	
Surv coast 1SW UK(E&W) Dee M	20	0.20	significant at p 0.05	yes	
Ret. W 1SW UK(E&W) Test M	27	0.12	not significant at p 0.05	no	
Ret. W 1SW UK(E&W) Dee M	23	0.30	significant at p 0.05	yes	
Ret. W 1SW UK(E&W) Tamar M	21	0.15	not significant at p 0.05	no	
Ret. 1SW UK(E&W) Lune M	26	0.00	not significant at p 0.05	no	
Count 1SW UK(E&W) Fowey M	20	0.03	not significant at p 0.05	no	
Ret. Riv 1SW UK(Sc.) North Esk	34	0.01	not significant at p 0.05	no	New 2015
Ret. 1SW UK(E&W) Kent	22	0.03	not significant at p 0.05	no	New 2015
Ret. 1SW UK(E&W) Leven	12	0.03	not significant at p 0.05	no	New 2015
Ret. 1SW UK(E&W) H-Avon	9	0.07	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	New 2015

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	27	0.24	significant at p 0.05	yes	
Catch W MSW Ice Ellidaar NM	43	0.57	significant at p 0.05	yes	
Ret. W 2SW UK(Sc.) Baddoch NM	26	0.40	significant at p 0.05	yes	
Ret. W MSW UK(E&W) Frome NM	42	0.48	significant at p 0.05	yes	
Ret. W 1SW UK(E&W) Tamar NM	21	0.11	not significant at p 0.05	no	
Ret. W 1SW UK(E&W) Frome NM	42	0.38	significant at p 0.05	yes	
Ret. MSW UK(E&W) Lune NM	26	0.08	not significant at p 0.05	no	
Ret. W 1SW UK(Sc.) North Esk NM	34	0.44	significant at p 0.05	yes	
Ret. W 1SW UK(E&W) Itchen NM	27	0.25	significant at p 0.05	yes	
Ret. Freshw 2SW UK(NI) Bush	39	0.23	significant at p 0.05	yes	
Count MSW UK(E&W) Fowey NM	20	0.02	not significant at p 0.05	no	
Ret. W 2SW UK(Sc.) North Esk NM	34	0.22	significant at p 0.05	yes	
Ret. W 2SW UK(Sc.) Girnoch NM	43	0.46	significant at p 0.05	yes	
Ret. W MSW UK(E&W) Test NM	27	0.01	not significant at p 0.05	no	
Count 1SW UK(E&W) Fowey NM	20	0.01	not significant at p 0.05	no	
Ret. W 1SW UK(E&W) Dee NM	23	0.06	not significant at p 0.05	no	
Ret. W All UK(Sc.) West water NM	24	0.17	significant at p 0.05	no	
Ret. W 1SW UK(E&W) Test NM	27	0.13	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	24	0.01	not significant at p 0.05	no	
Ret. W MSW UK(E&W) Dee NM	23	0.02	not significant at p 0.05	no	
Ret. W MSW UK(E&W) Tamar NM	21	0.04	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	
Ret. Riv MSW UK(Sc.) North Esk	33	0.04	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	New 2015
Counts. MSW UK(E&W) Leven	12	0.05	not significant at p 0.05	no	New 2015
Ret. MSW UK(E&W) H-Avon	9	0.06	not significant at p 0.05	no	New 2015
Ret. MSW UK(E&W) Frome	10	0.06	not significant at p 0.05	no	New 2015

Table 3.8.2.1. Derivation of parameters currently used in the Faroes catch options analysis.

PARAMETER	DERIVATION
Mean weight of salmon in the fishery	Drawn randomly from the observed values of the 1985/1986 to 1990/1991 fishing seasons
Proportion by sea age	Estimated from scale samples collected in the fisheries between 1985/1986 and 1990/1991.
Discard rates	Estimated from the proportions of fish less than 60 cm in catch samples between the 1982/1983 and 1994/1995 seasons (ICES, 1996).
Mortality rates of discarded fish	Estimated from experimental fisheries conducted within the 1985/1986 to 1990/1991 fishing seasons.
Proportions of fish-farm escapees	Estimated from samples taken in the 1980/1981 to 1994/1995 fishing seasons (ICES 1996), corrected to take account of the reduction in the proportion of farm escapees in Norwegian coastal waters between 1989 and 2008 (ICES, 2013).
The proportion of the 1SW catch that will not mature as 1SW fish	Derived from samples taken from collected in the fisheries between 1985/1986 and 1990/1991.
Proportions of catches by management unit	Genetic analysis of scales collected in the fisheries between 1993 and 1995 are used to assign catch to stock complexes (Northern and Southern NEAC and NAC). Within NEAC stock complexes, relative PFA estimates between 2001 and 2013 are used to assign catch to countries.

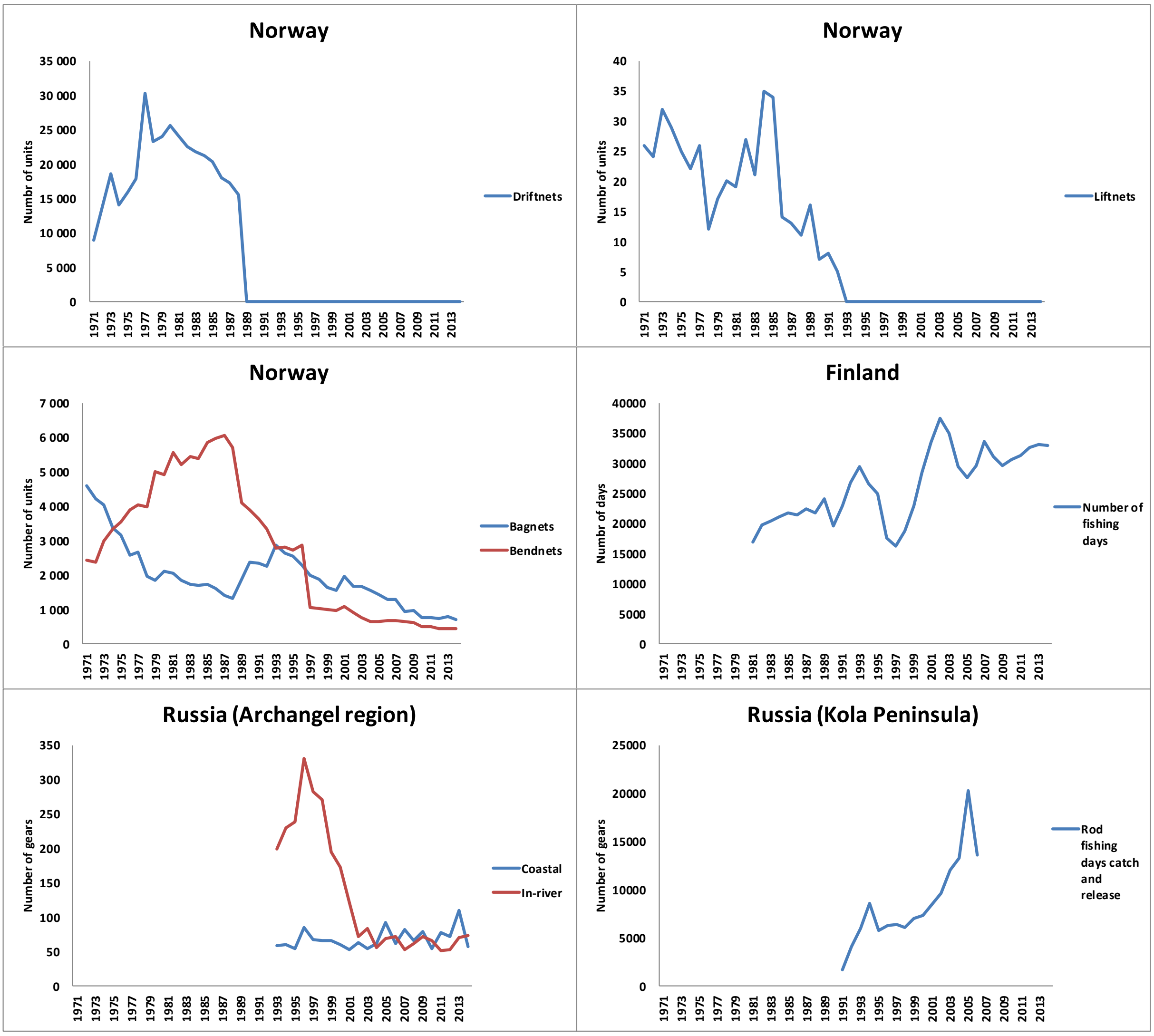


Figure 3.1.3.1. Overview of effort as reported for various fisheries and countries in the NEAC Northern area, 1971–2014.

Figure 3.1.3.2. Overview of effort as reported for various fisheries and countries in the NEAC Southern area, 1971–2014.

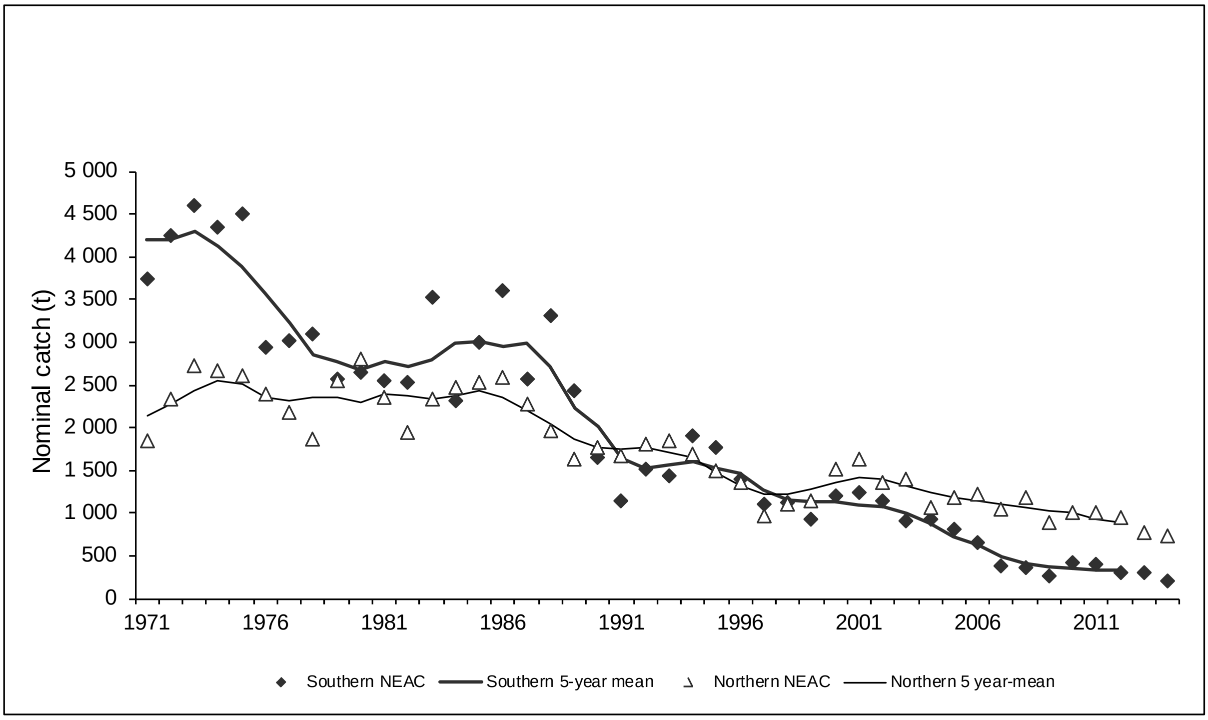


Figure 3.1.4.1. Nominal catches of salmon and 5-year running means in the Southern and Northern NEAC areas, 1971–2014.

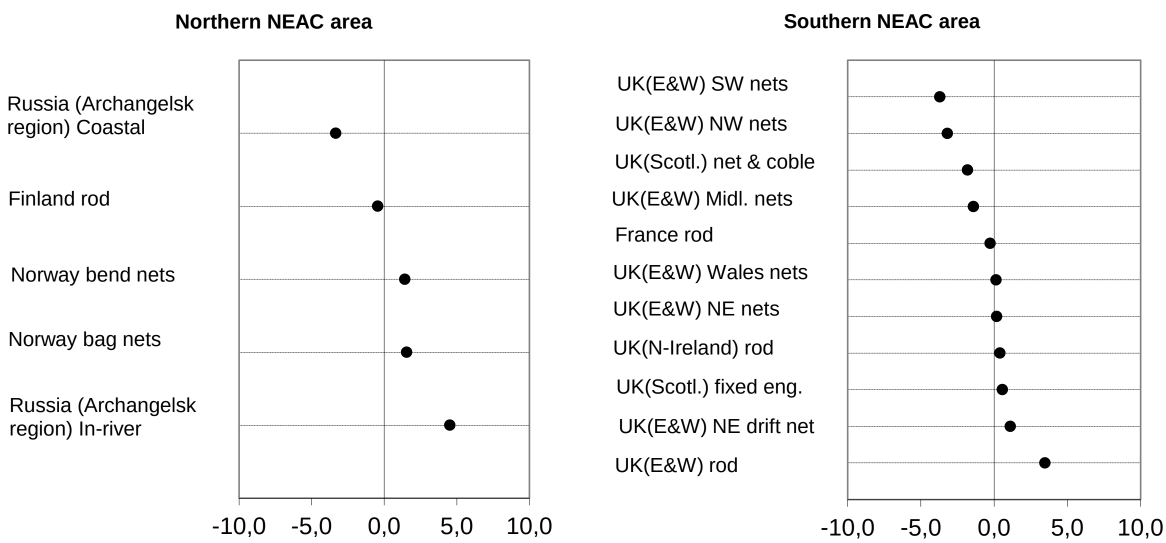


Figure 3.1.5.1. Percentage change (%) over years in cpue estimates in various rod and net fisheries in the Northern and Southern NEAC areas.

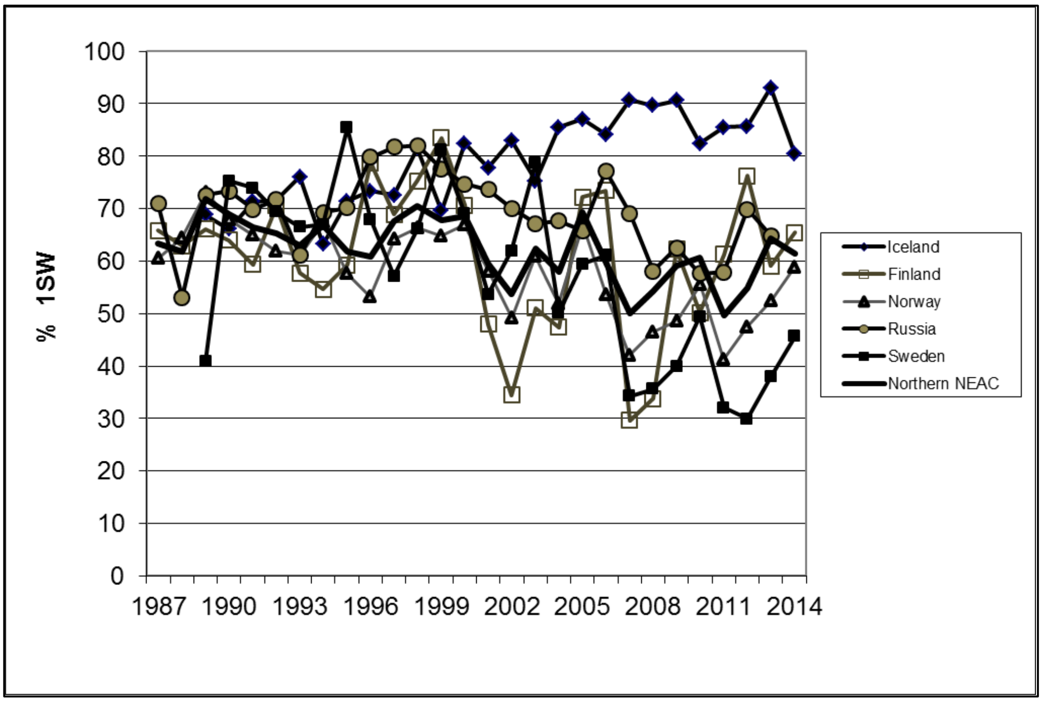


Figure 3.1.6.1. Percentage of 1SW salmon in the reported catch for Northern NEAC countries, 1987–2014.

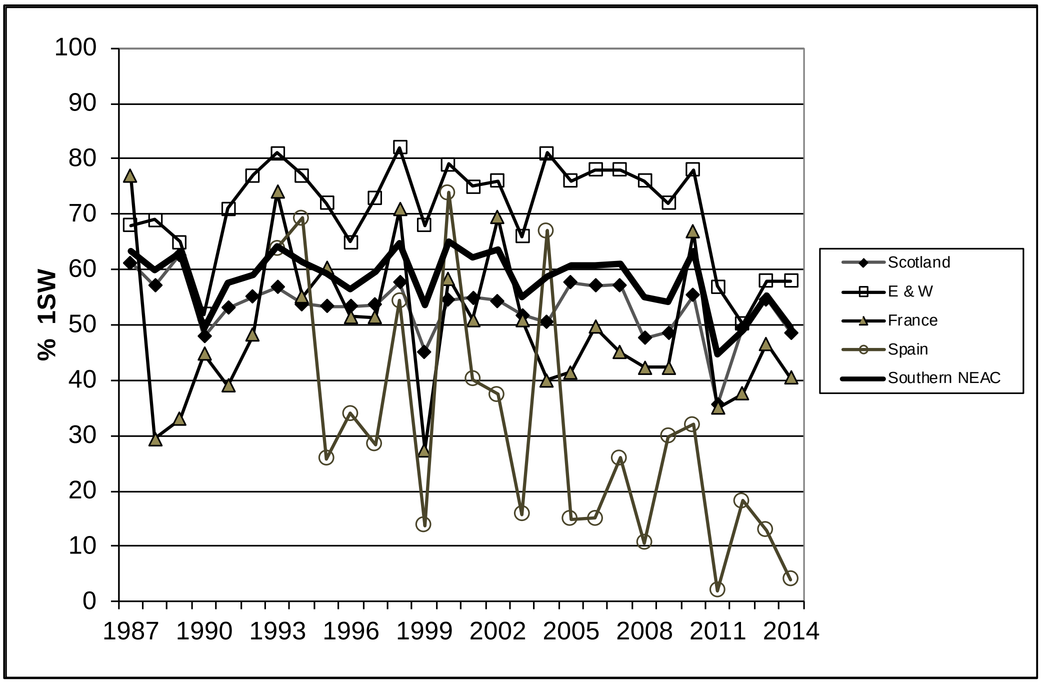
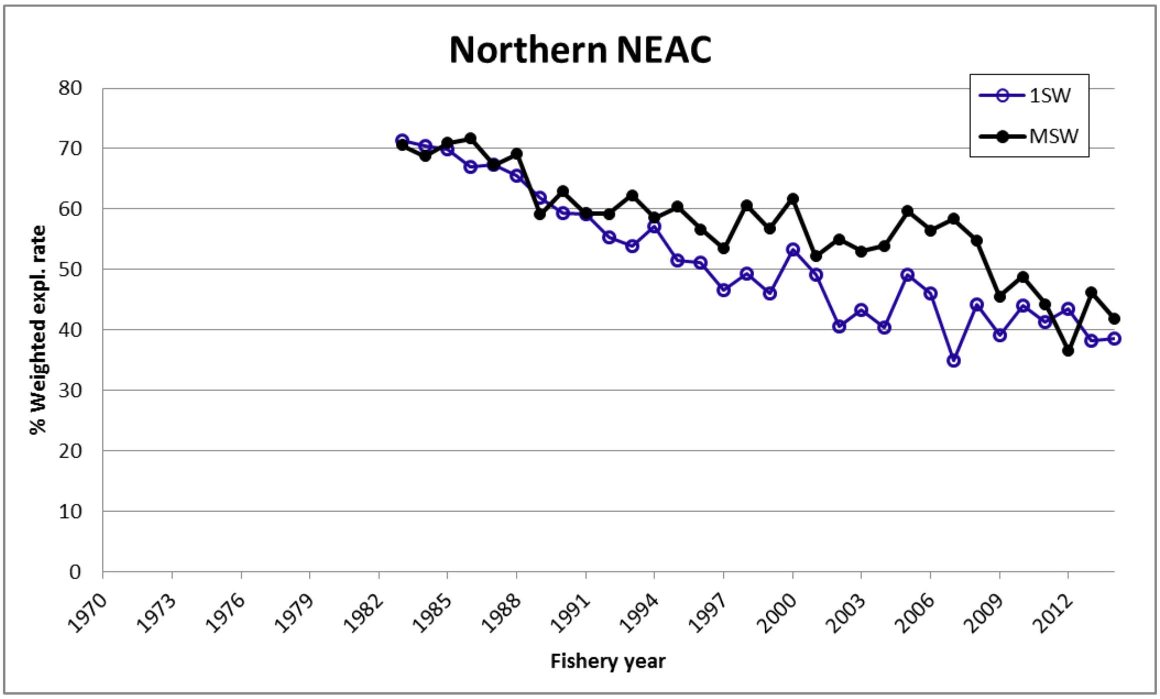


Figure 3.1.6.2. Percentage of 1SW salmon in the reported catch for Southern NEAC countries, 1987–2014.



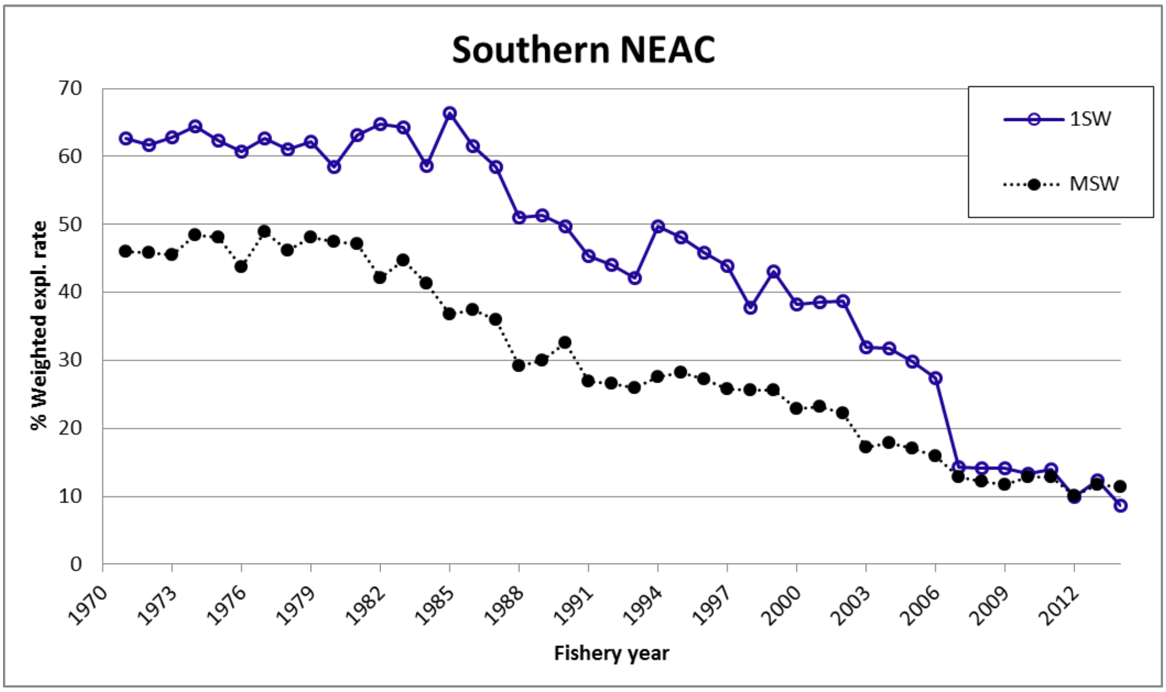


Figure 3.1.9.1. Mean annual exploitation rate of wild 1SW and MSW salmon by commercial and recreational fisheries in Northern (above) and Southern (bottom) NEAC countries, 1971–2014.

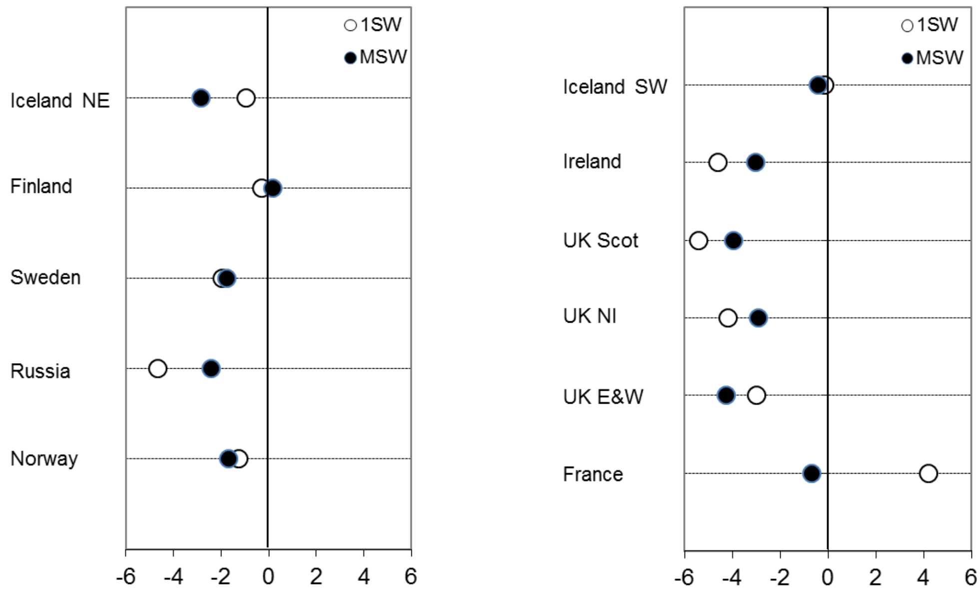


Figure 3.1.9.2. The rate of change of exploitation of 1SW and MSW salmon in Northern NEAC (left) and Southern NEAC (right) countries over the period 1971–2014, except for Norway (1983–2014).

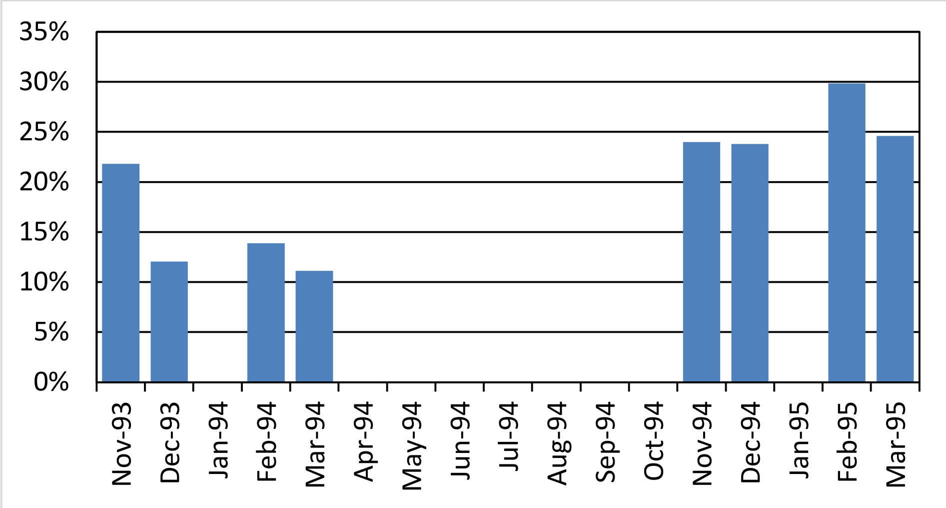


Figure 3.3.3.1. Percentage of North American fish in monthly samples of salmon scales collected from non-farmed origin MSW salmon caught in the Faroes research fishery between November 1993 and March 1995.

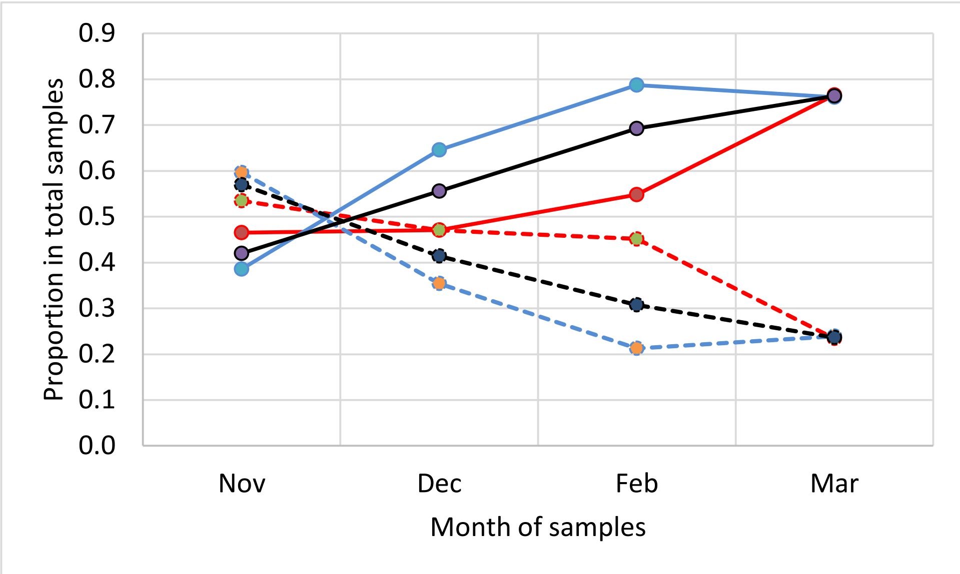


Figure 3.3.3.2. Proportions of Northern European (solid lines) and Southern European (dashed lines) salmon identified in monthly samples of scales collected from non-farmed origin MSW fish caught in the Faroes research fishery in the 1993/1994 (blue line) and 1994/1995 (red lines) seasons and for both seasons combined (black lines).

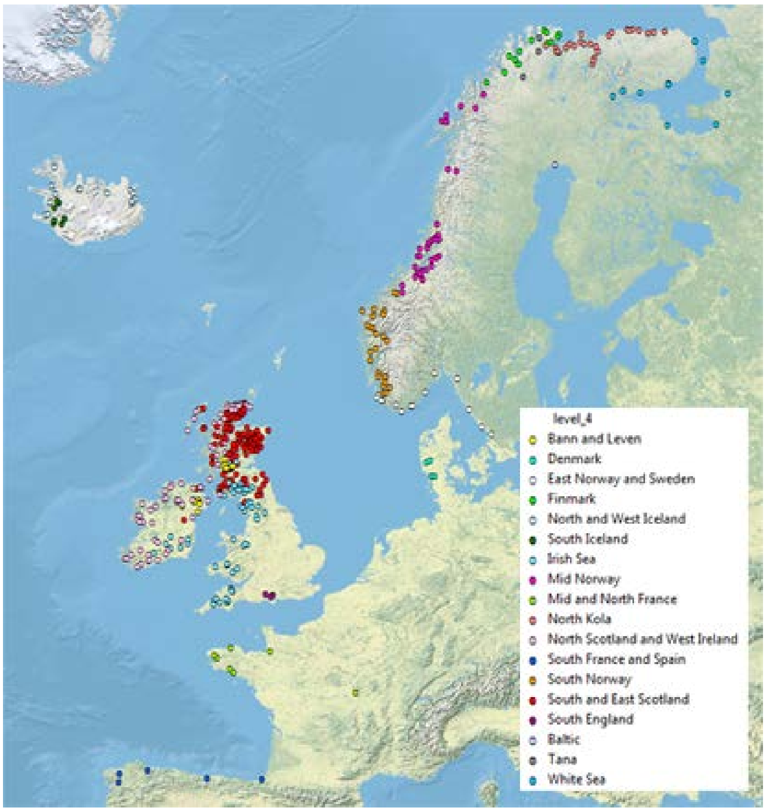


Figure 3.3.3.3 Salmon stocks in the genetic baseline assigned to the 17 Level 4 Regional Assessment Units (RAUs).

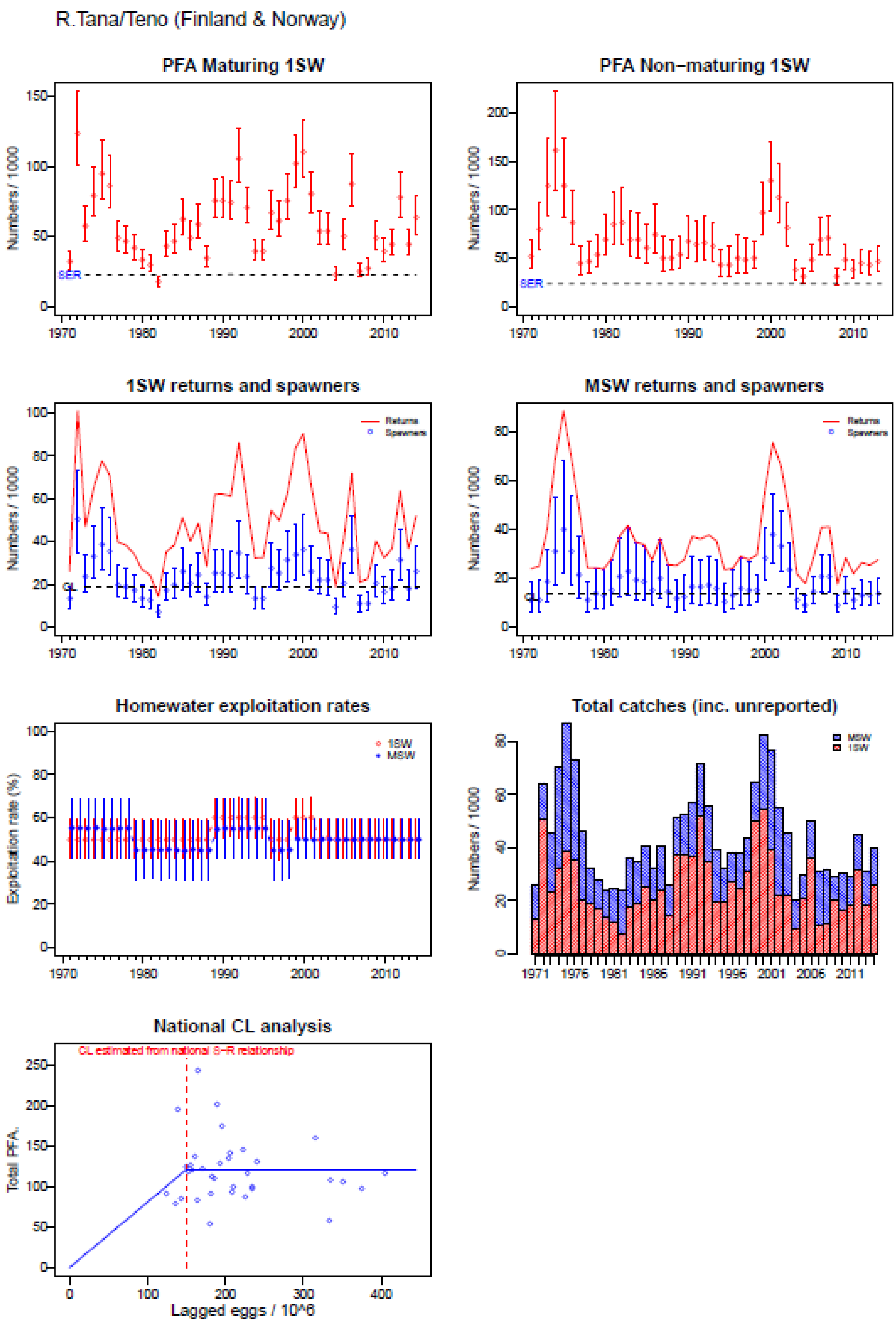


Figure 3.3.5.1a. Summary of fisheries and stock description, River Teno / Tana (Finland and Norway combined).

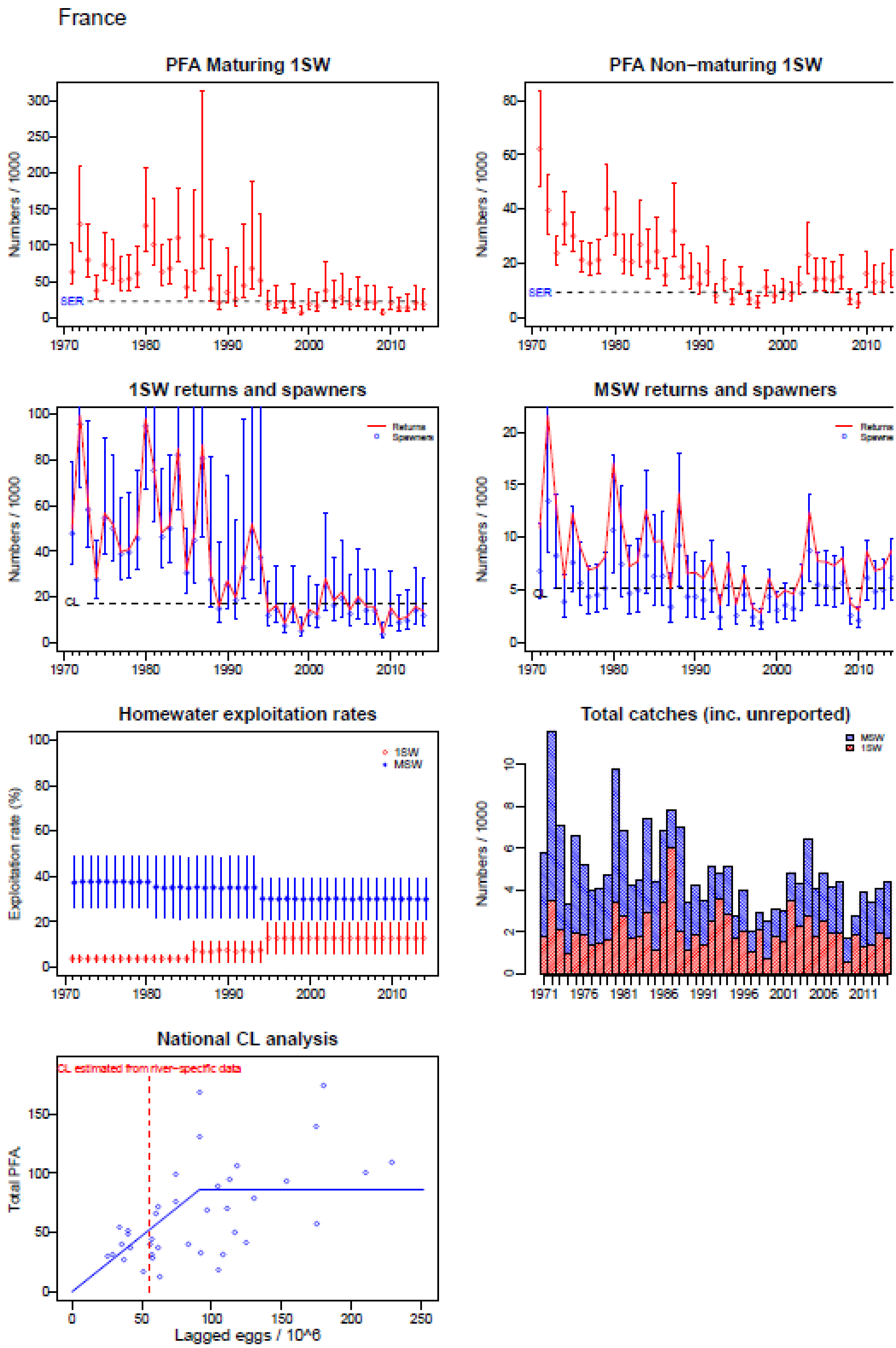


Figure 3.3.5.1b. Summary of fisheries and stock description, France. The river-specific CL, which is used for assessment purposes, is included on the national CL analysis plot (for comparison, the CL estimated from the national S-R relationship is at the inflection point).

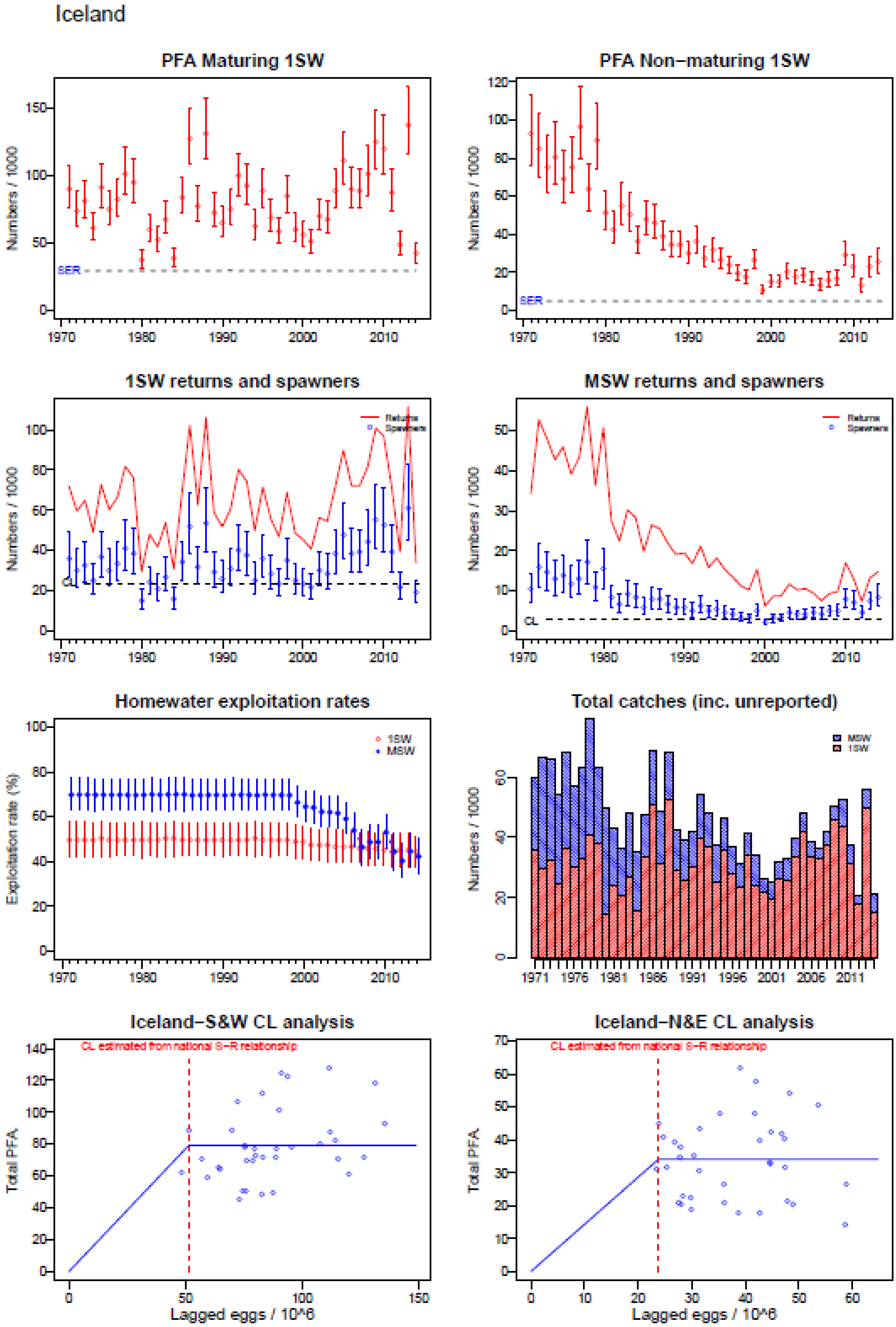


Figure 3.3.5.1c. Summary of fisheries and stock description, Iceland.

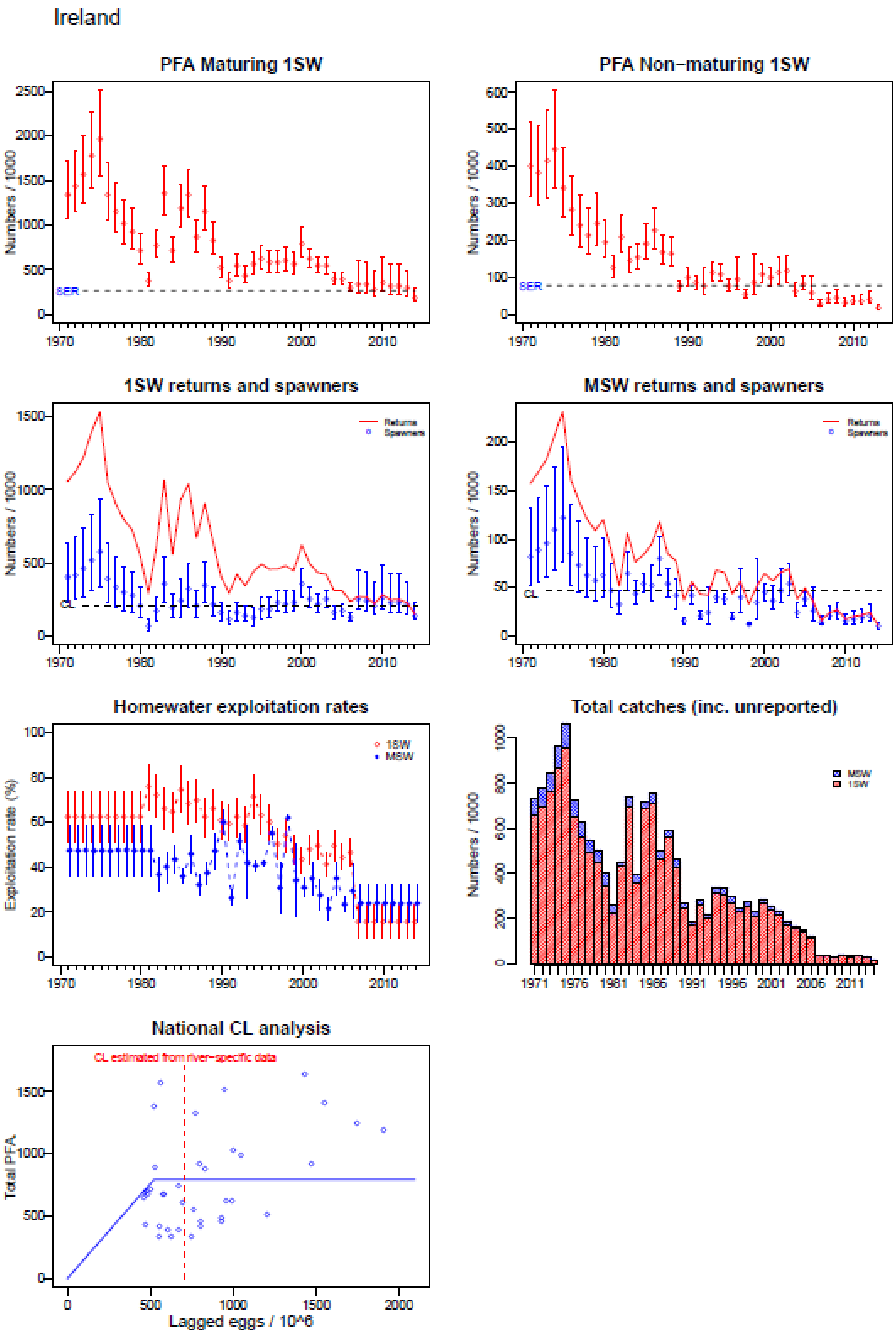


Figure 3.3.5.1d. Summary of fisheries and stock description, Ireland. The river-specific CL, which is used for assessment purposes, is included on the national CL analysis plot (for comparison, the CL estimated from the national S-R relationship is at the inflection point).

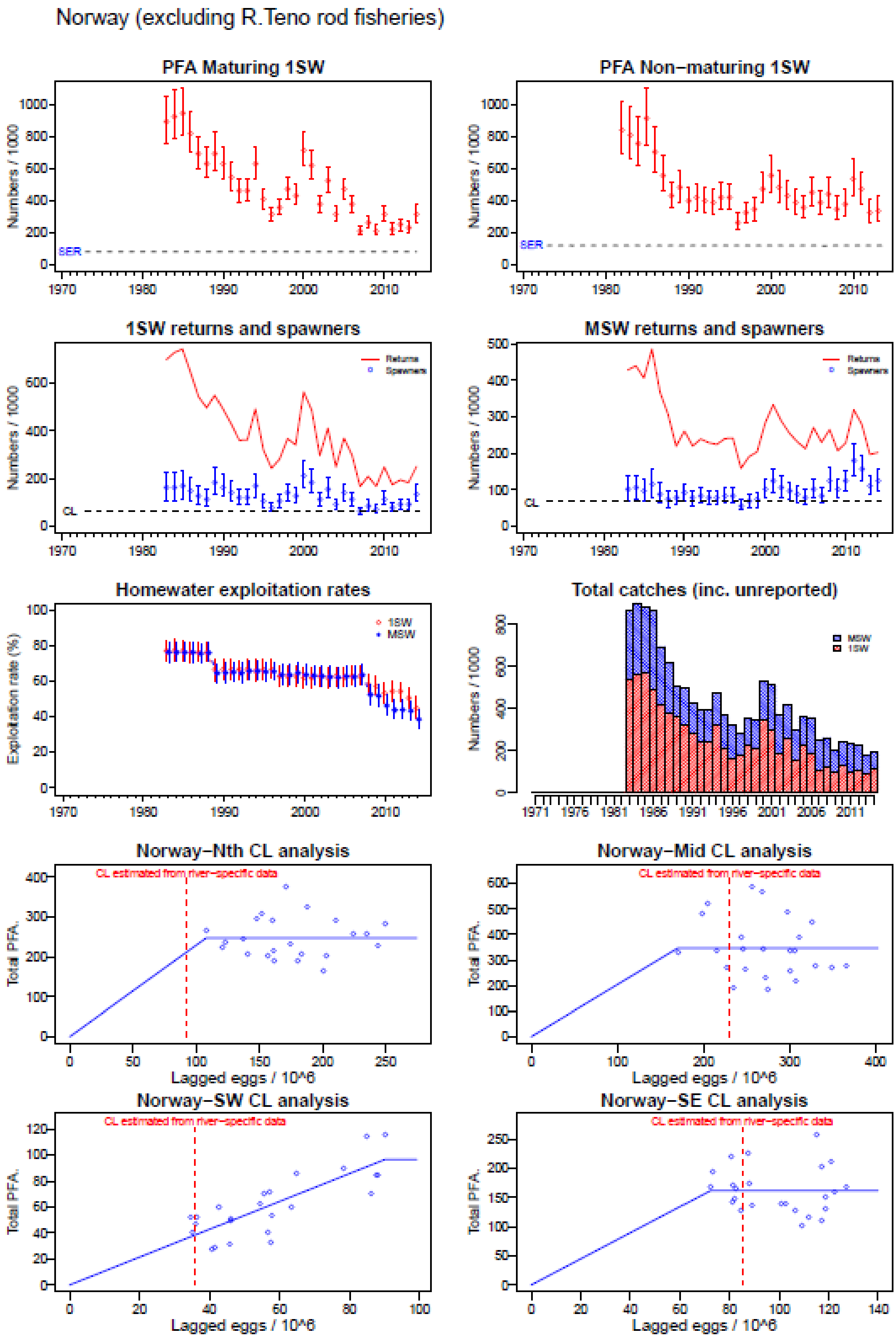


Figure 3.3.5.1e. Summary of fisheries and stock description, Norway (minus Norwegian catches from the R. Teno / Tana). The river-specific CLs, which are used for assessment purposes, are included on the regional CL analysis plots (for comparison, the CLs estimated from the regional S-R relationships are at the inflection points).

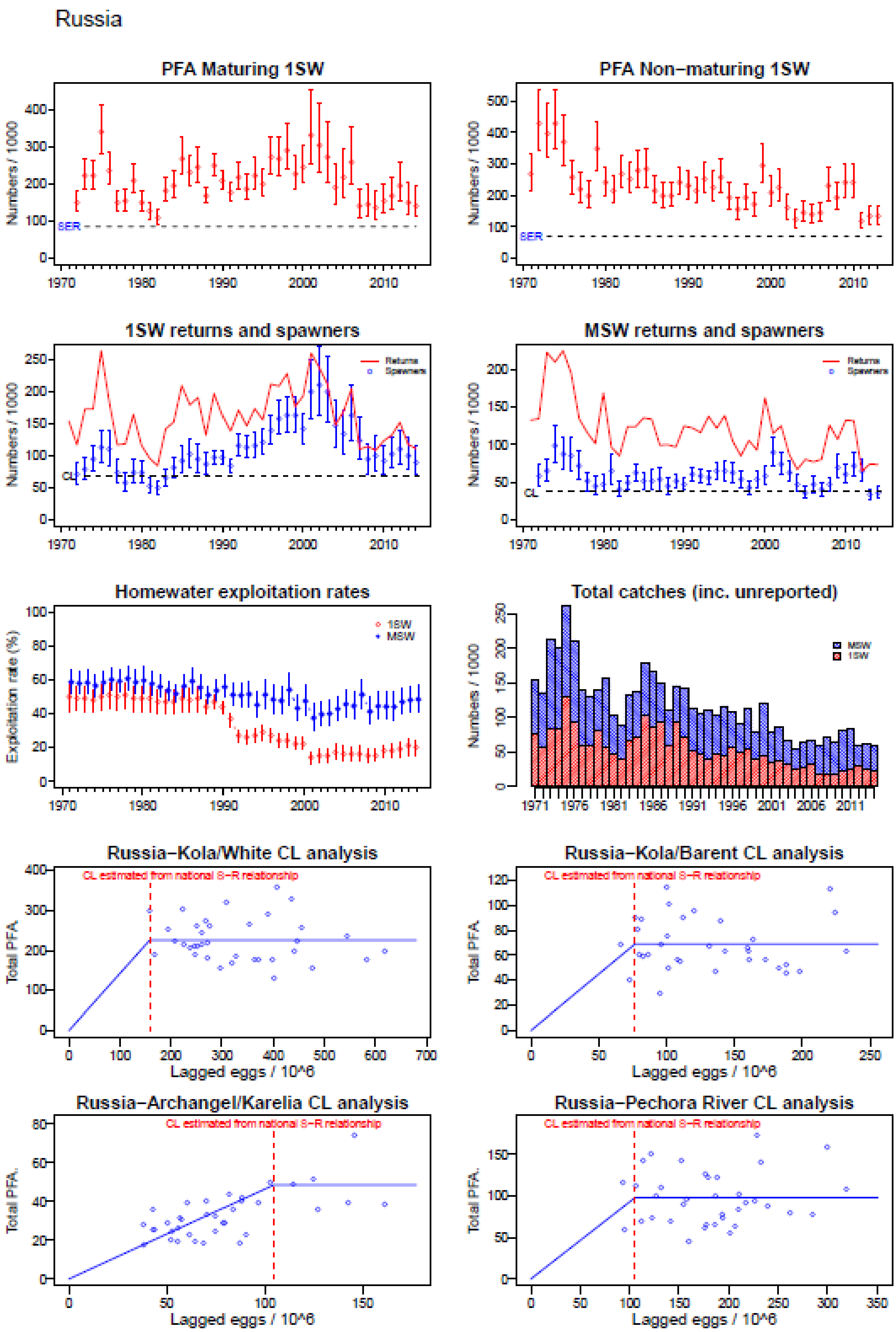


Figure 3.3.5.1f. Summary of fisheries and stock description, Russia.

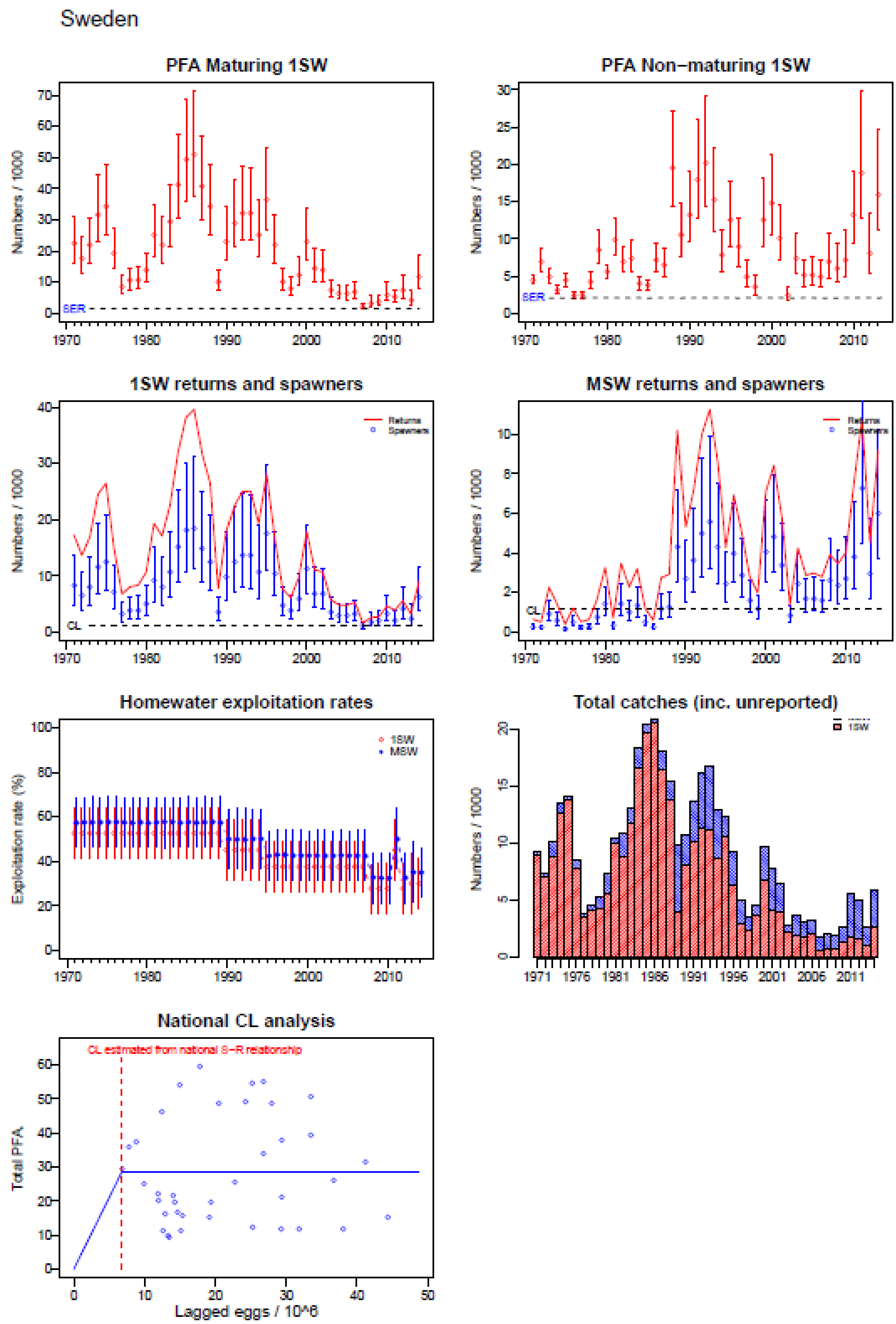


Figure 3.3.5.1g. Summary of fisheries and stock description, Sweden.

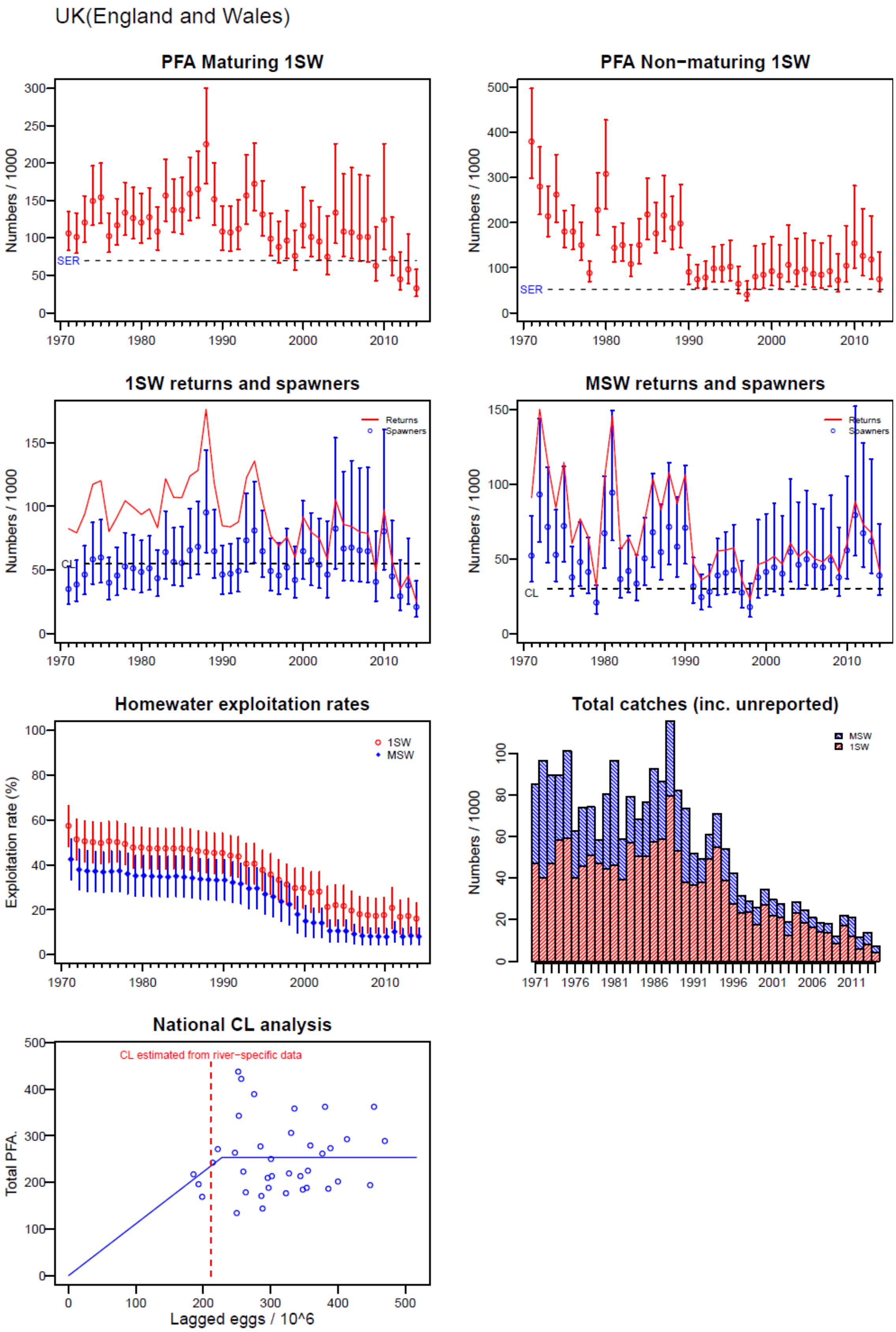


Figure 3.3.5.1h. Summary of fisheries and stock description, UK (England & Wales). The river-specific CL, which is used for assessment purposes, is included on the national CL analysis plot (for comparison, the CL estimated from the national S-R relationship is at the inflection point).

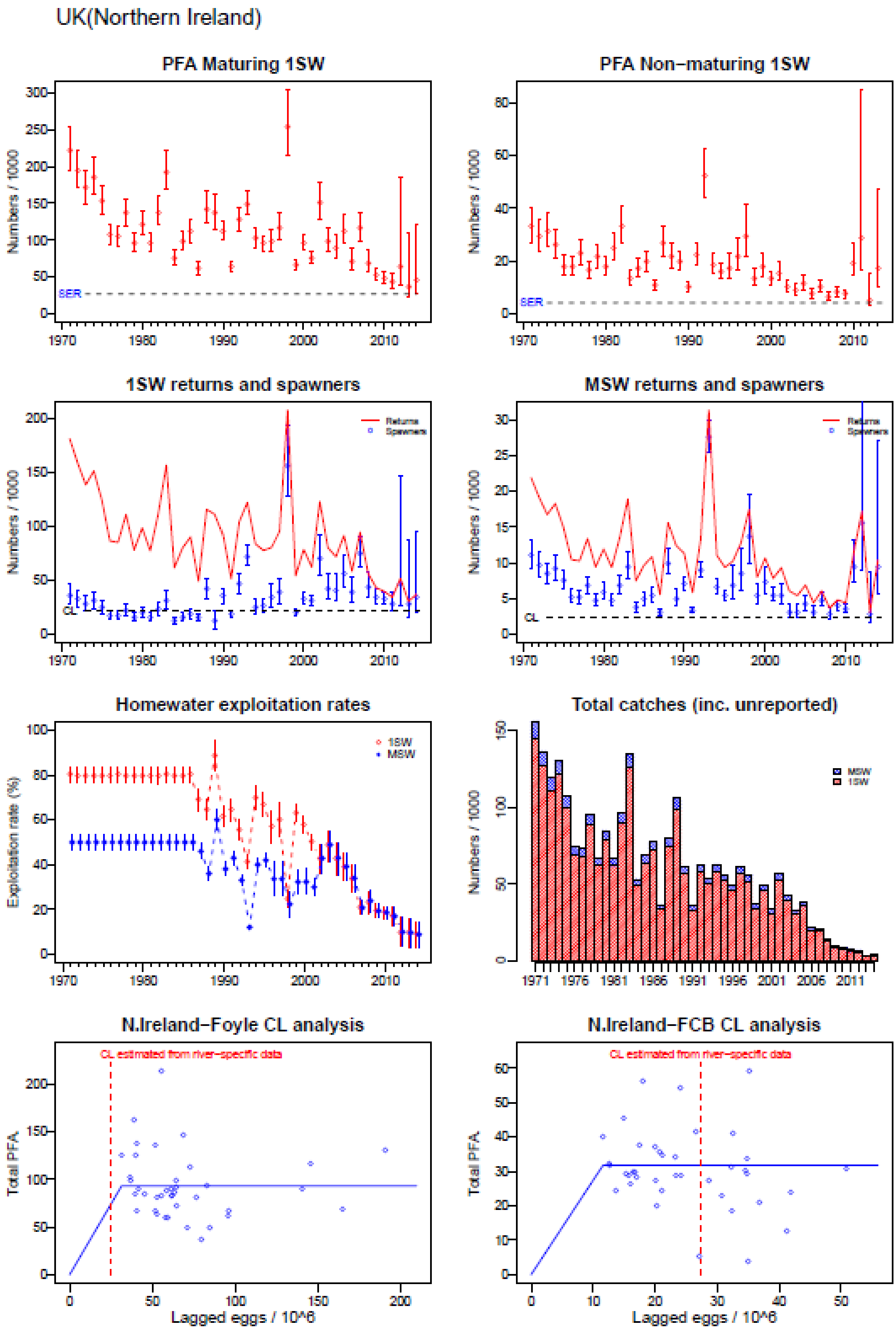


Figure 3.3.5.1i. Summary of fisheries and stock description, UK (Northern Ireland). The river-specific CLs, which are used for assessment purposes, are included on the regional CL analysis plots (for comparison, the CLs estimated from the regional S-R relationships are at the inflection points).

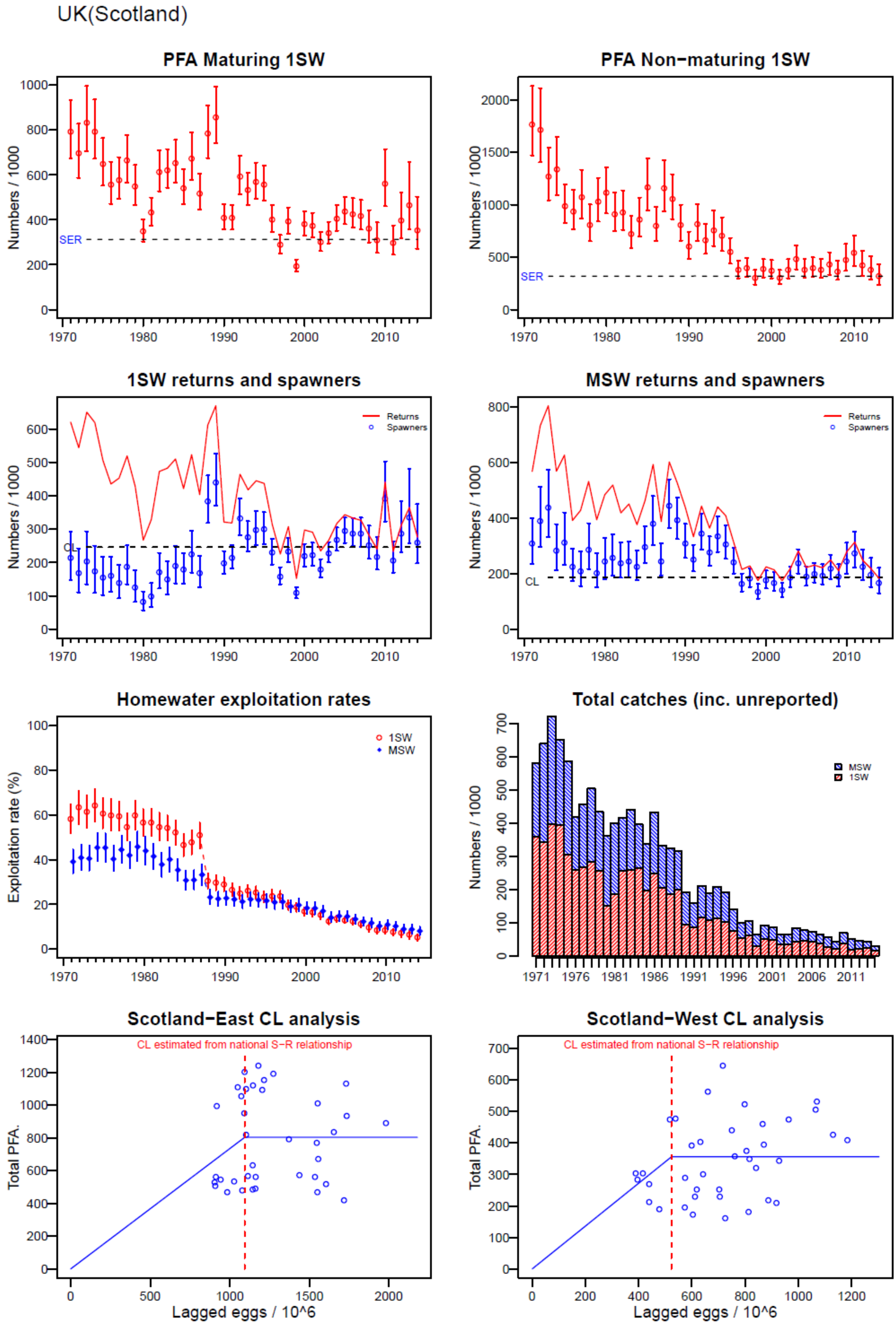


Figure 3.3.5.1j. Summary of fisheries and stock description, UK (Scotland).

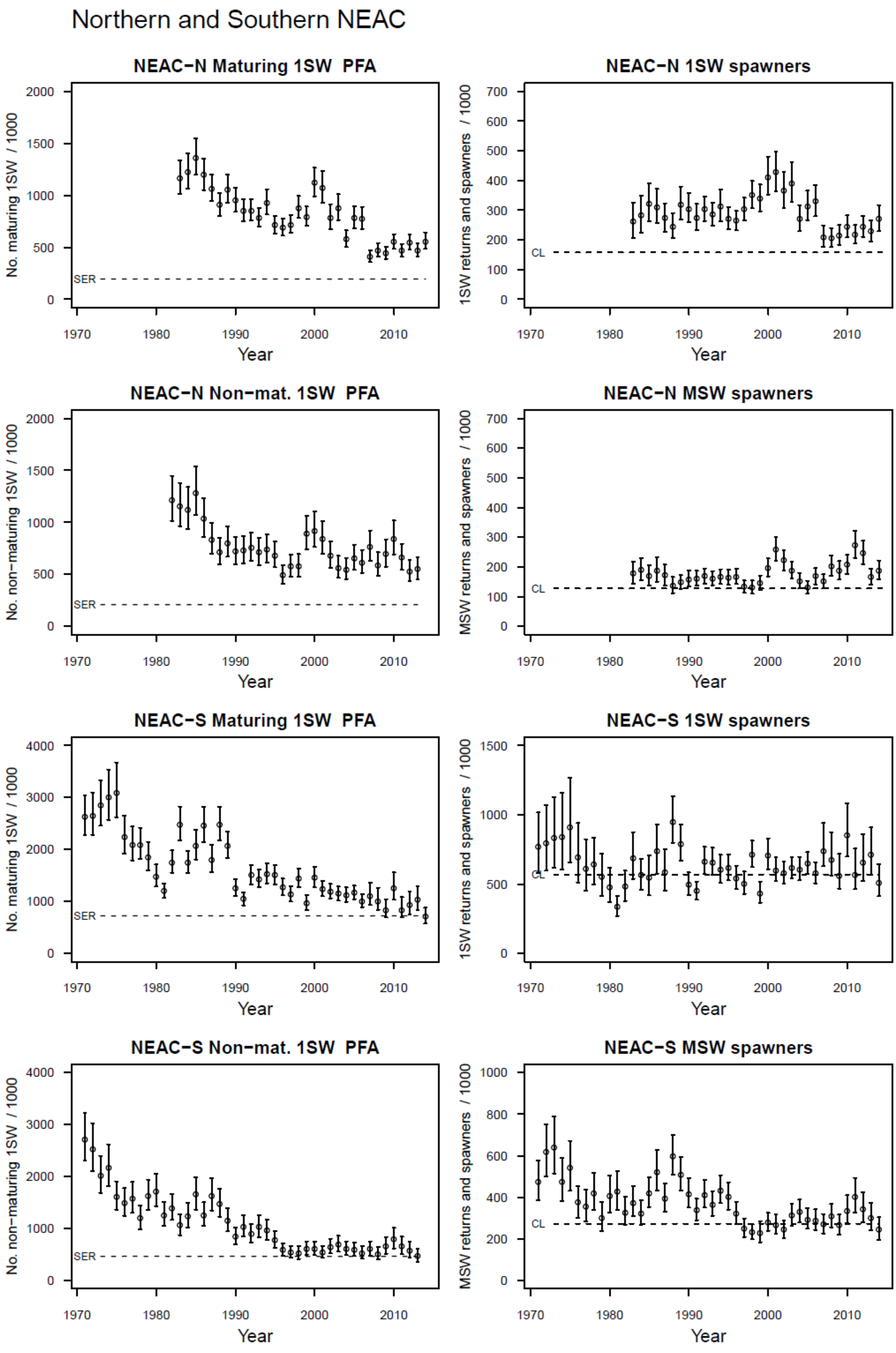


Figure 3.3.5.2. Estimated PFA (left panels) and spawning escapement (right panels) with 90% confidence limits, for maturing 1SW (1SW spawners) and non-maturing 1SW (MSW spawners) salmon in Northern (NEAC – N) and Southern (NEAC – S) NEAC stock complexes.

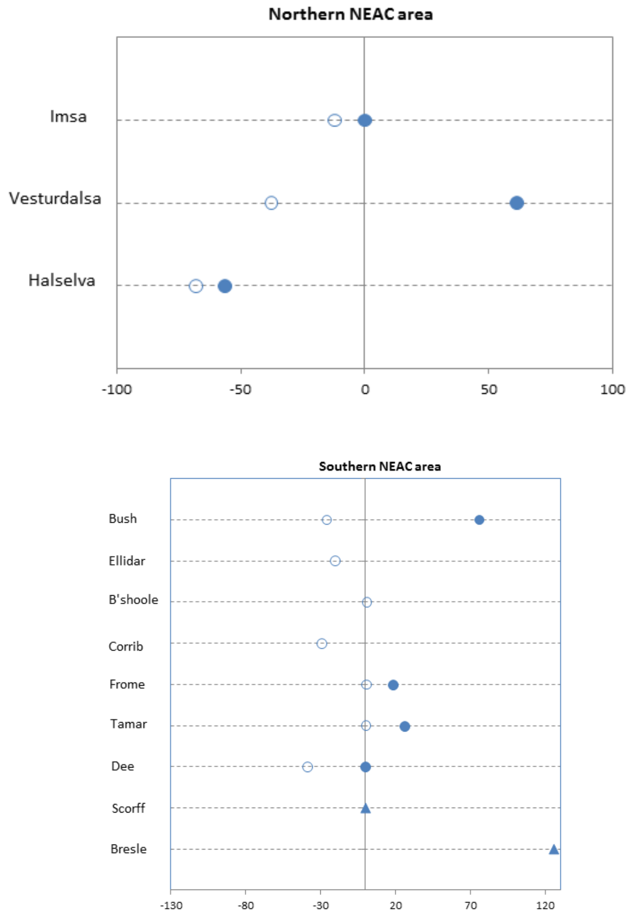
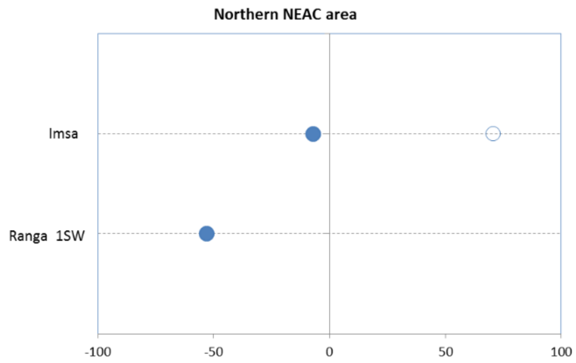


Figure 3.3.7.1. Comparison of the percent change in the five-year mean return rates for 1SW and 2SW wild salmon smolts to rivers of Northern (left) and Southern NEAC (right) areas for the 2004 to 2008 and 2009 to 2013 smolt years (2003 to 2007 and 2008 to 2012 for 2SW salmon). Filled circles are for 1SW and open circles are for 2SW dataseries. Triangles indicate all ages without separation into 1SW and 2SW smolts. Populations with at least three data points 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.



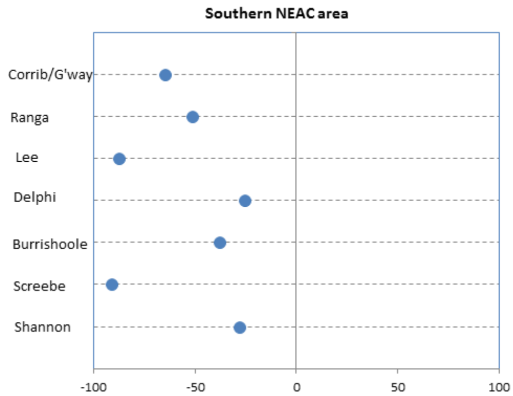


Figure 3.3.7.2. Comparison of the percent change in the five-year mean return rates for 1SW and 2SW hatchery salmon smolts to rivers of northern (upper) and southern NEAC (lower) areas for the 2004 to 2008 and 2009 to 2013 smolt years (2003 to 2007 and 2008 to 2012 for 2SW salmon). Filled circles are for 1SW and open circles are for 2SW dataseries. Triangles indicate all ages without separation into 1SW and 2SW smolts. Populations with at least three data points 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.

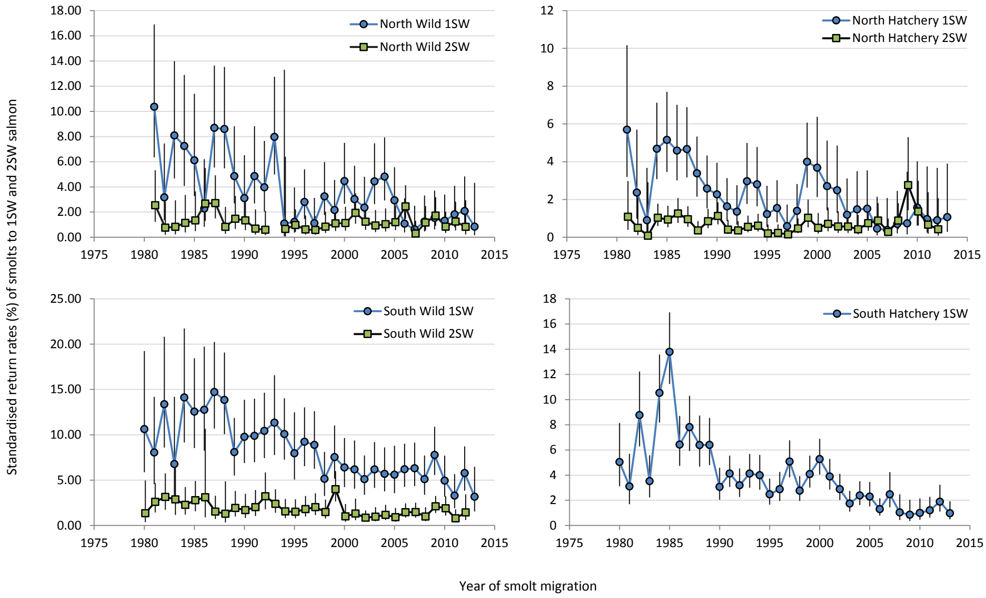


Figure 3.3.7.3. Standardised mean annual survival indices (%) of wild (left hand panels) and hatchery origin (right hand panels) smolts to 1SW and 2SW salmon to Northern (top panels) and Southern areas (bottom panels). The standardised values are annual means derived from a general linear model analysis of rivers in a region with a quasi-Poisson distribution, hence a log-link function. Error values are 95% CLs. Note y-scale differences among panels. Following details in Tables 3.3.7.1 and 3.3.7.2 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).

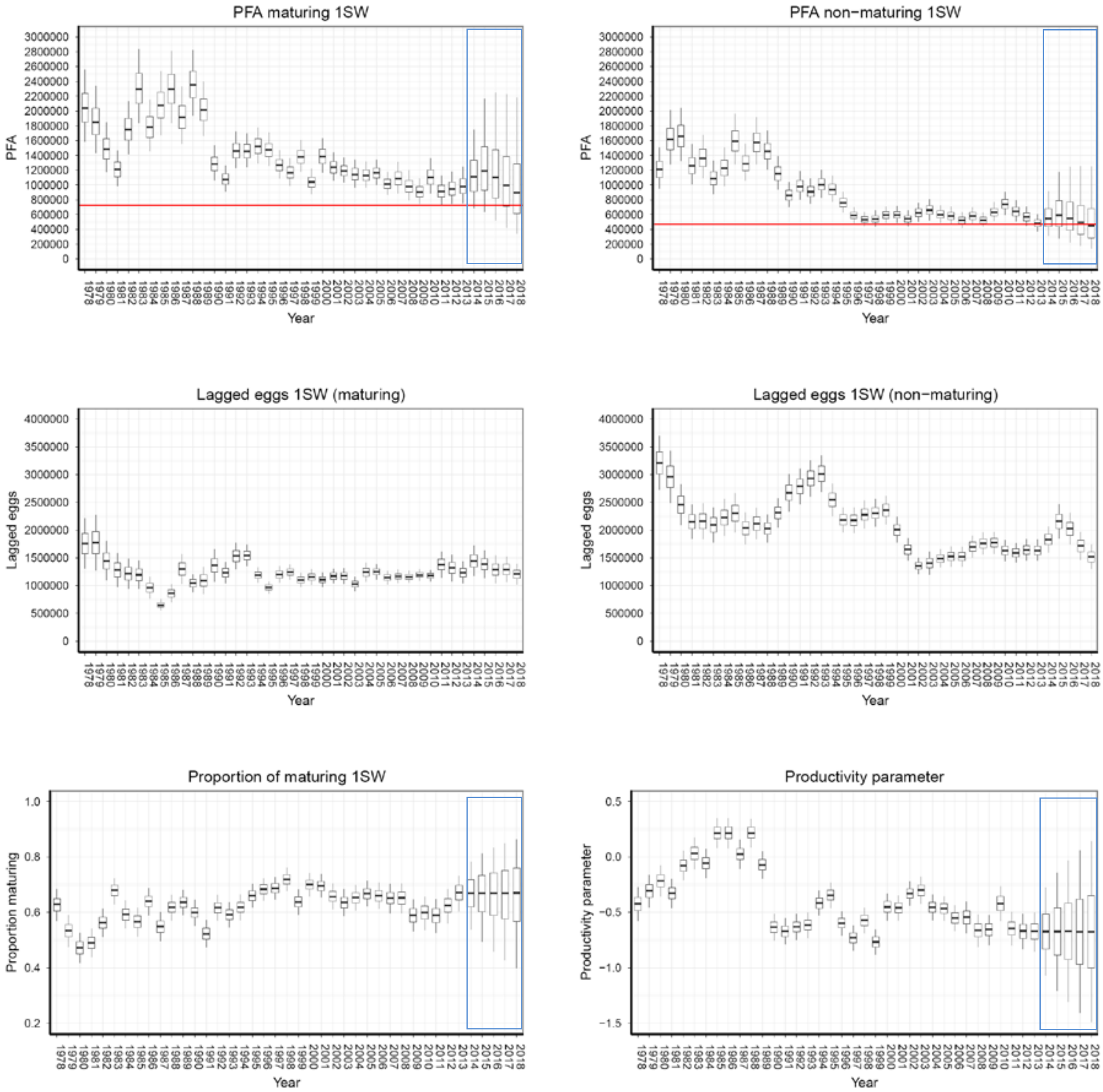


Figure 3.4.2.1. Southern NEAC PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th Bayesian credibility intervals (BCIs).

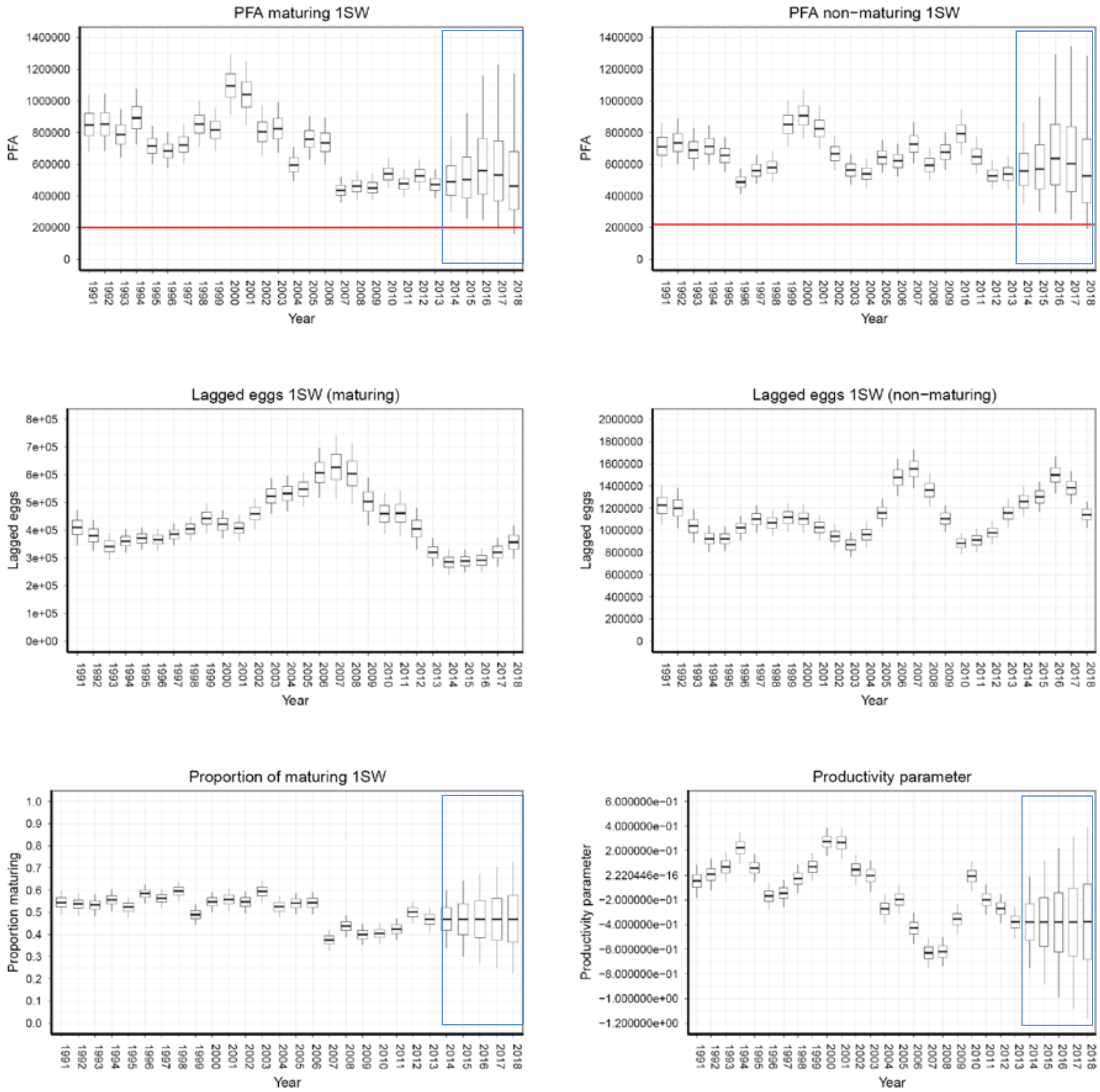


Figure 3.4.2.2. Northern NEAC PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1991 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th Bayesian credibility intervals (BCIs).

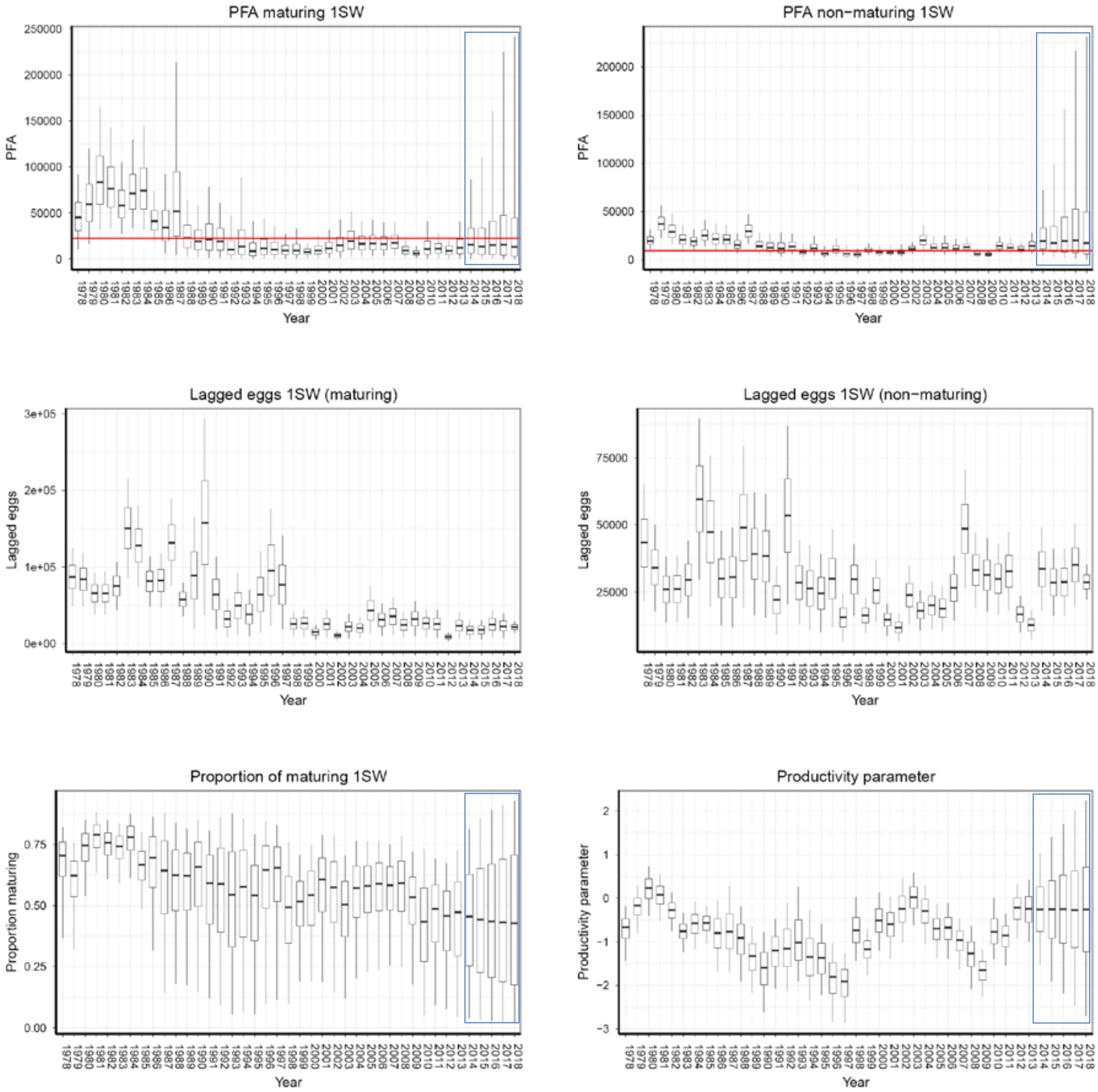


Figure 3.4.3.1. France: PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

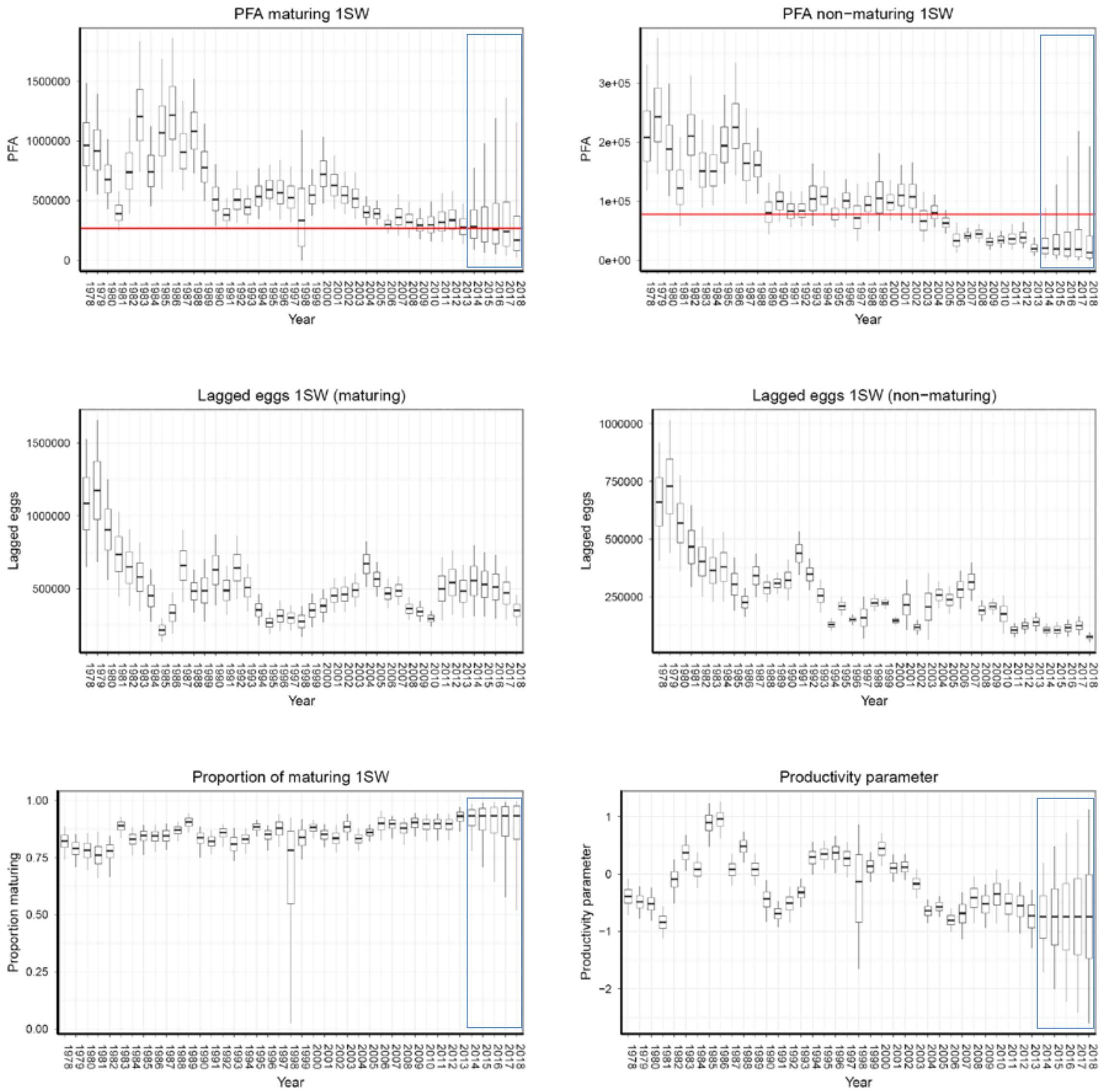


Figure 3.4.3.2. Ireland: PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

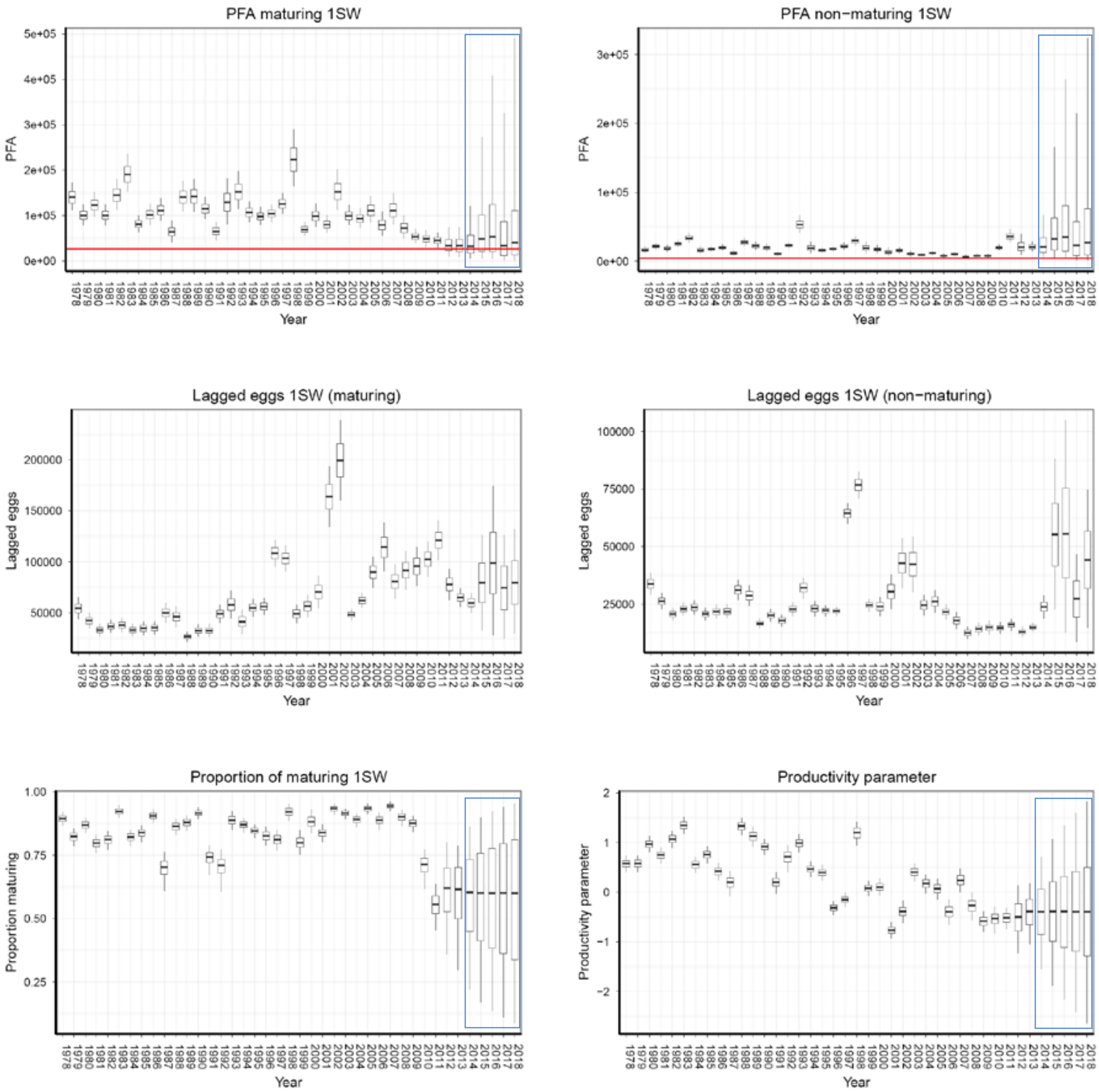


Figure 3.4.3.3. UK (Northern Ireland): PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

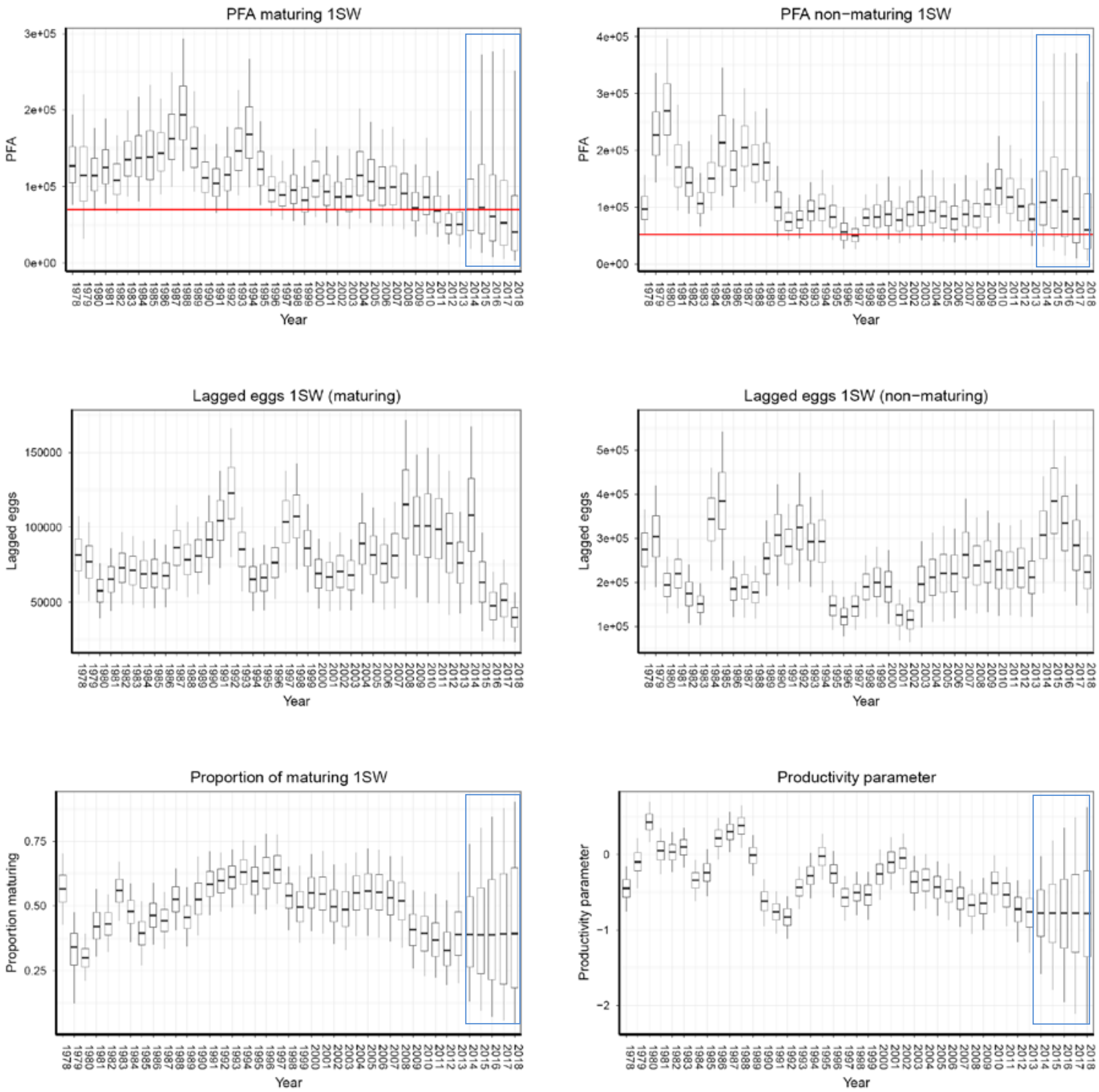


Figure 3.4.3.4. UK (England & Wales): PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

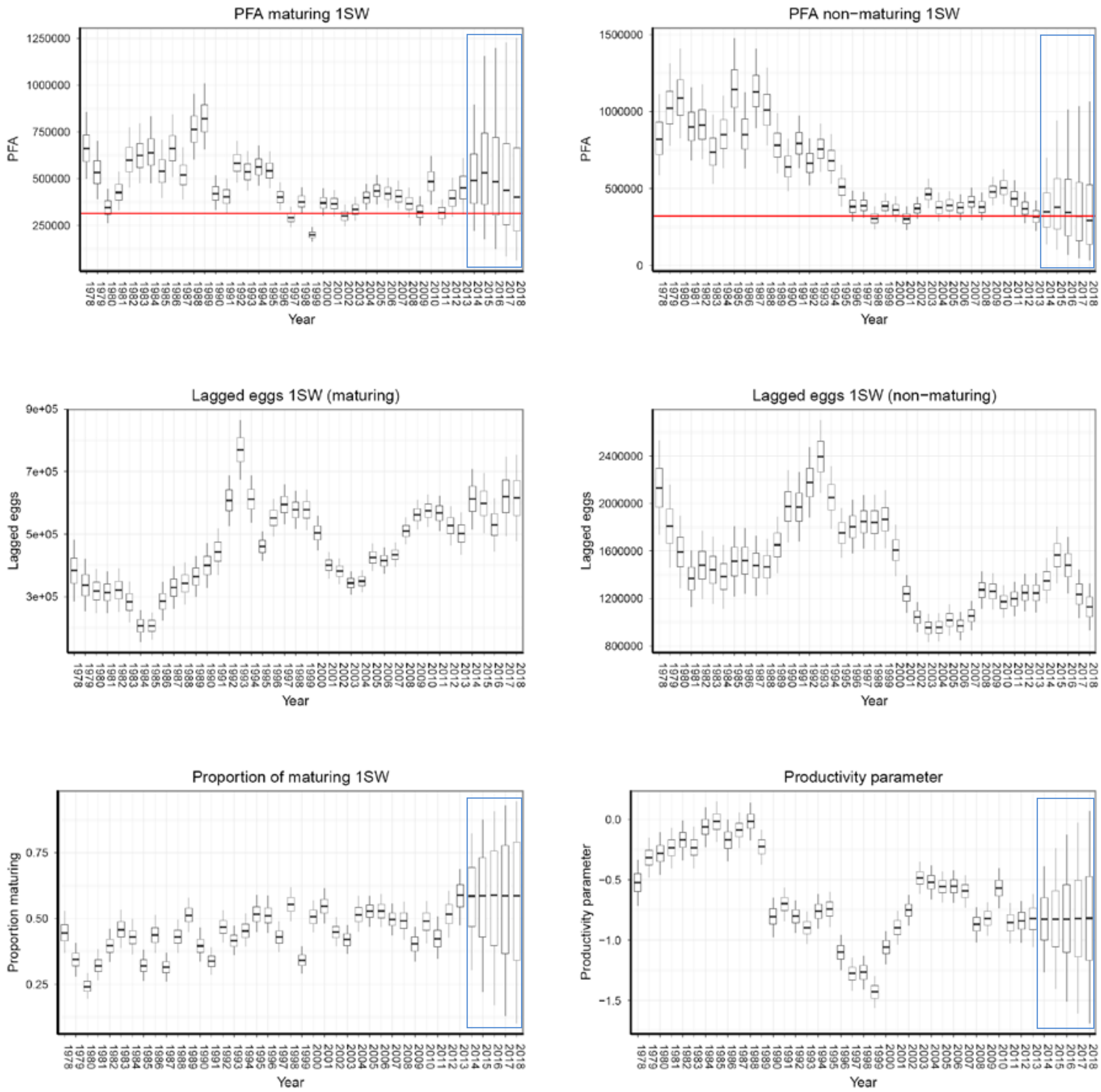


Figure 3.4.3.5. UK (Scotland): PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

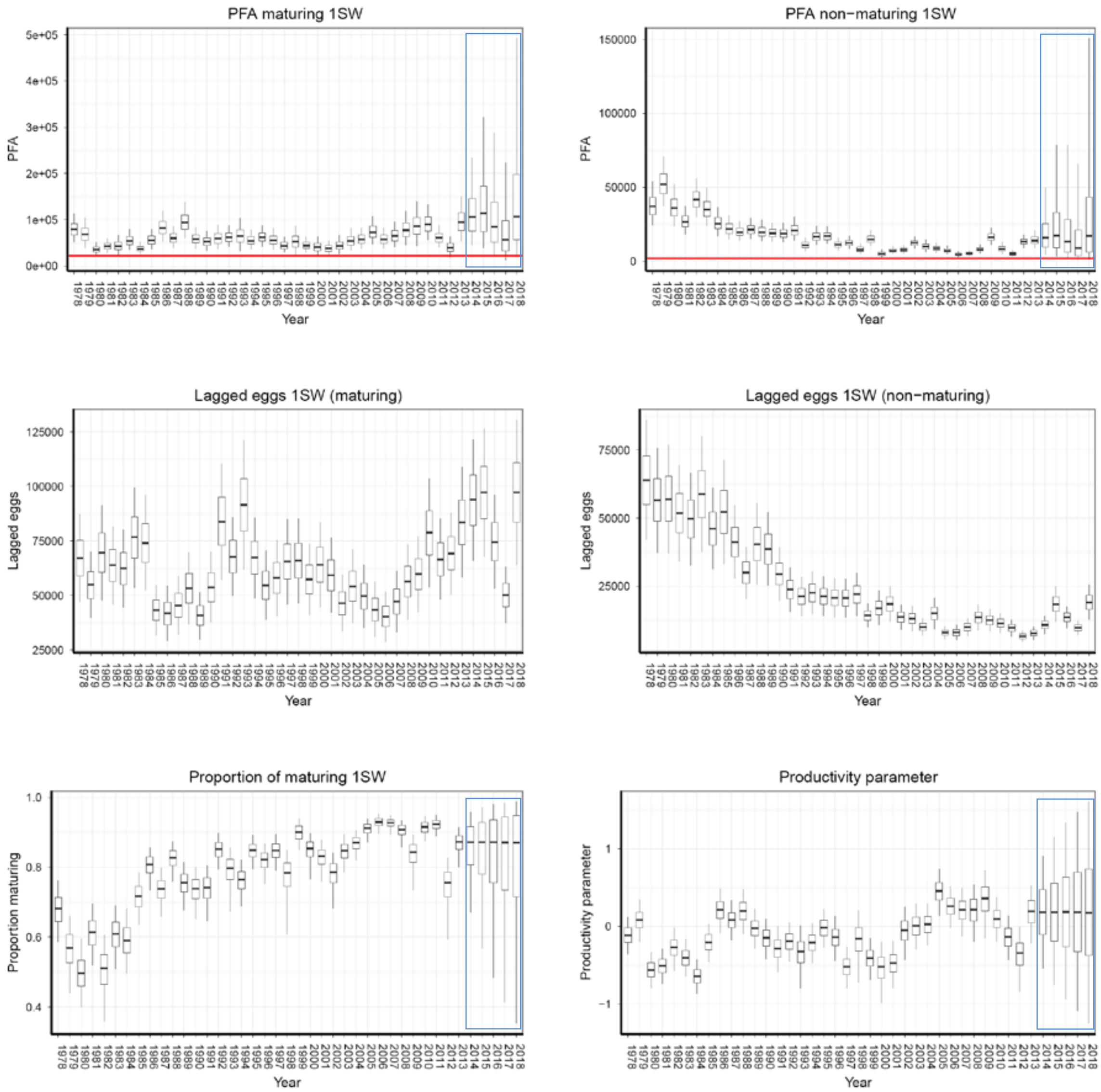


Figure 3.4.3.6. Iceland (south/west regions): PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1978 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

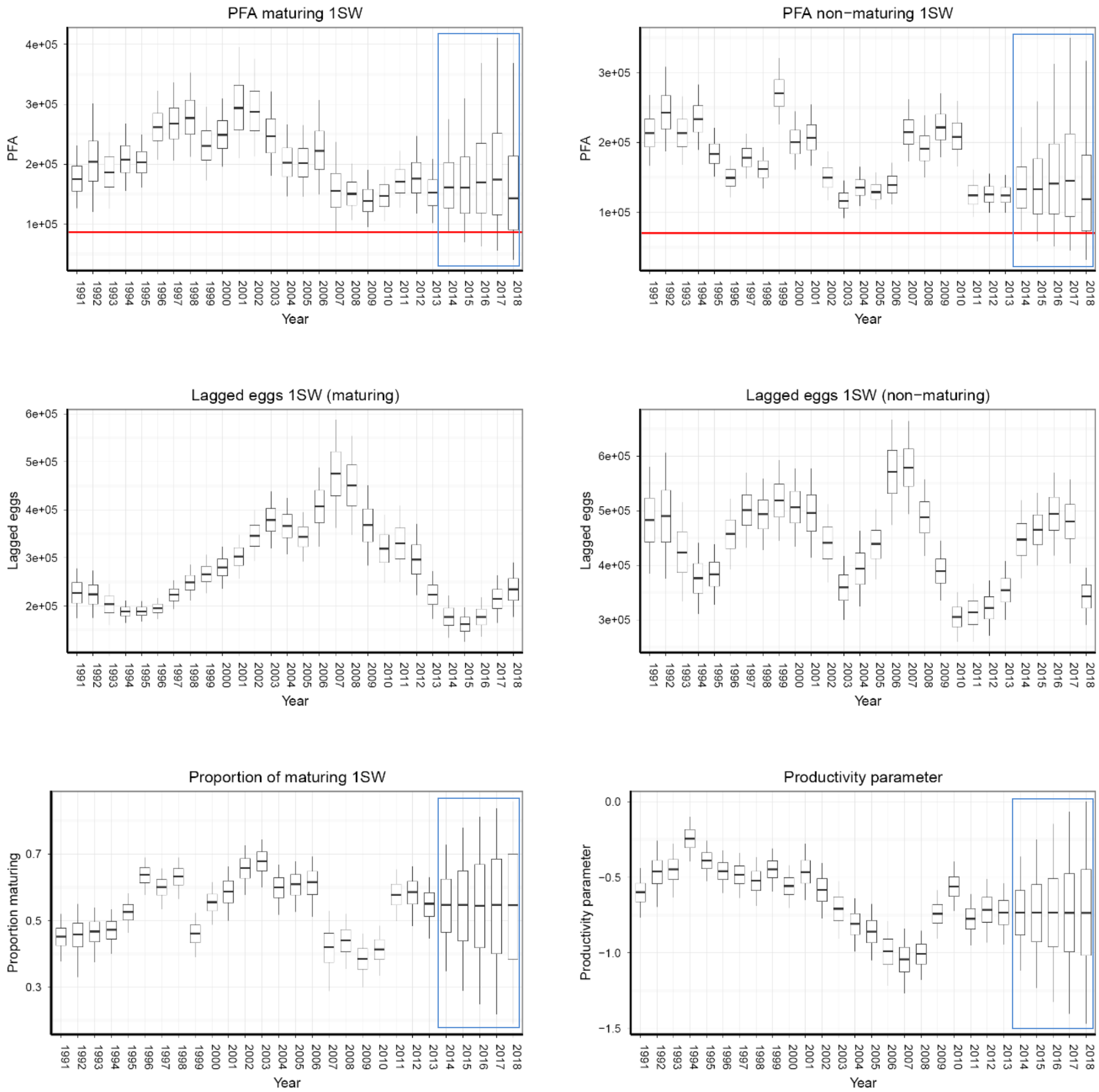


Figure 3.4.3.7. Russia: PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1991 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

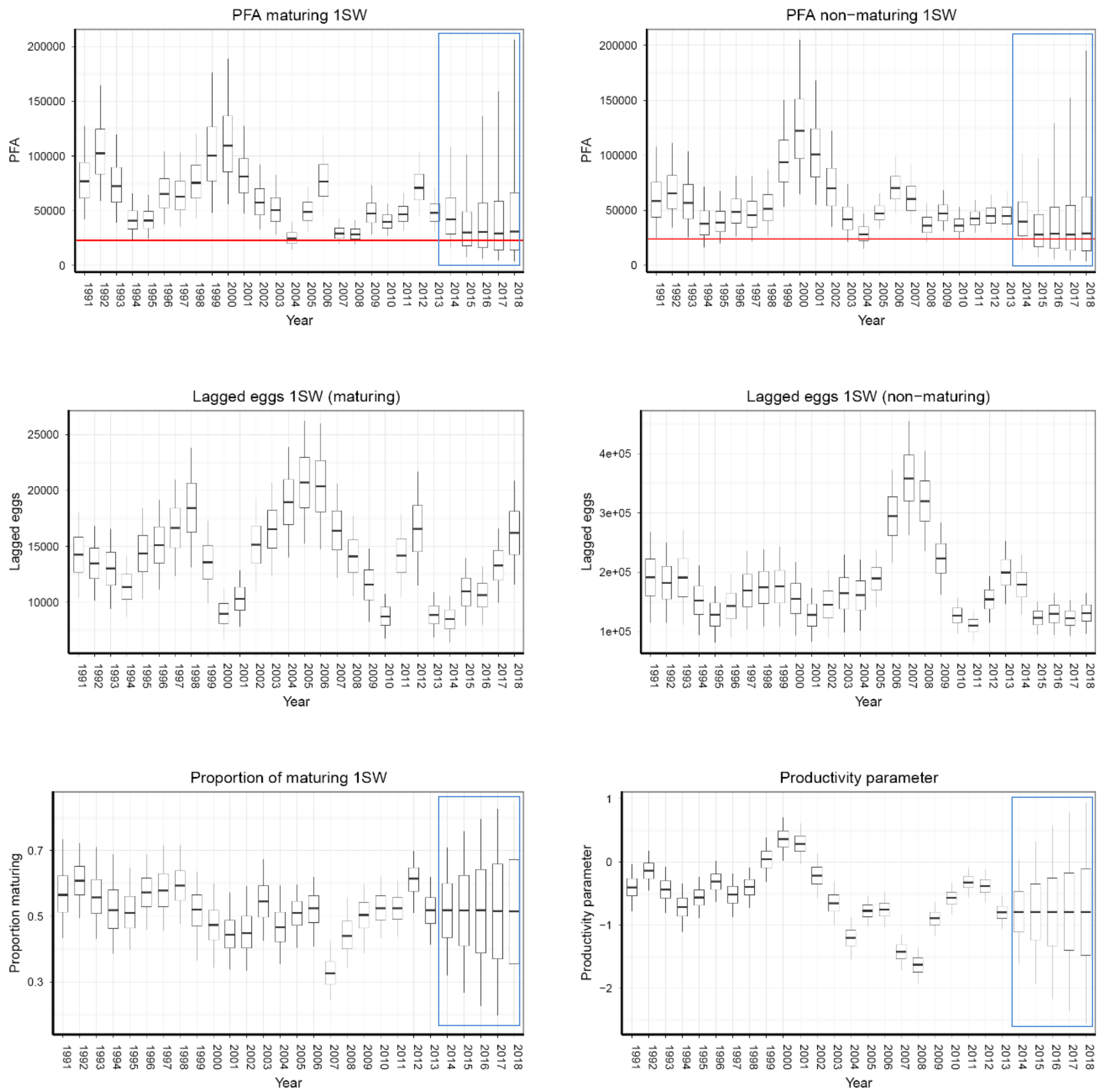


Figure 3.4.3.8. Finland: PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1991 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

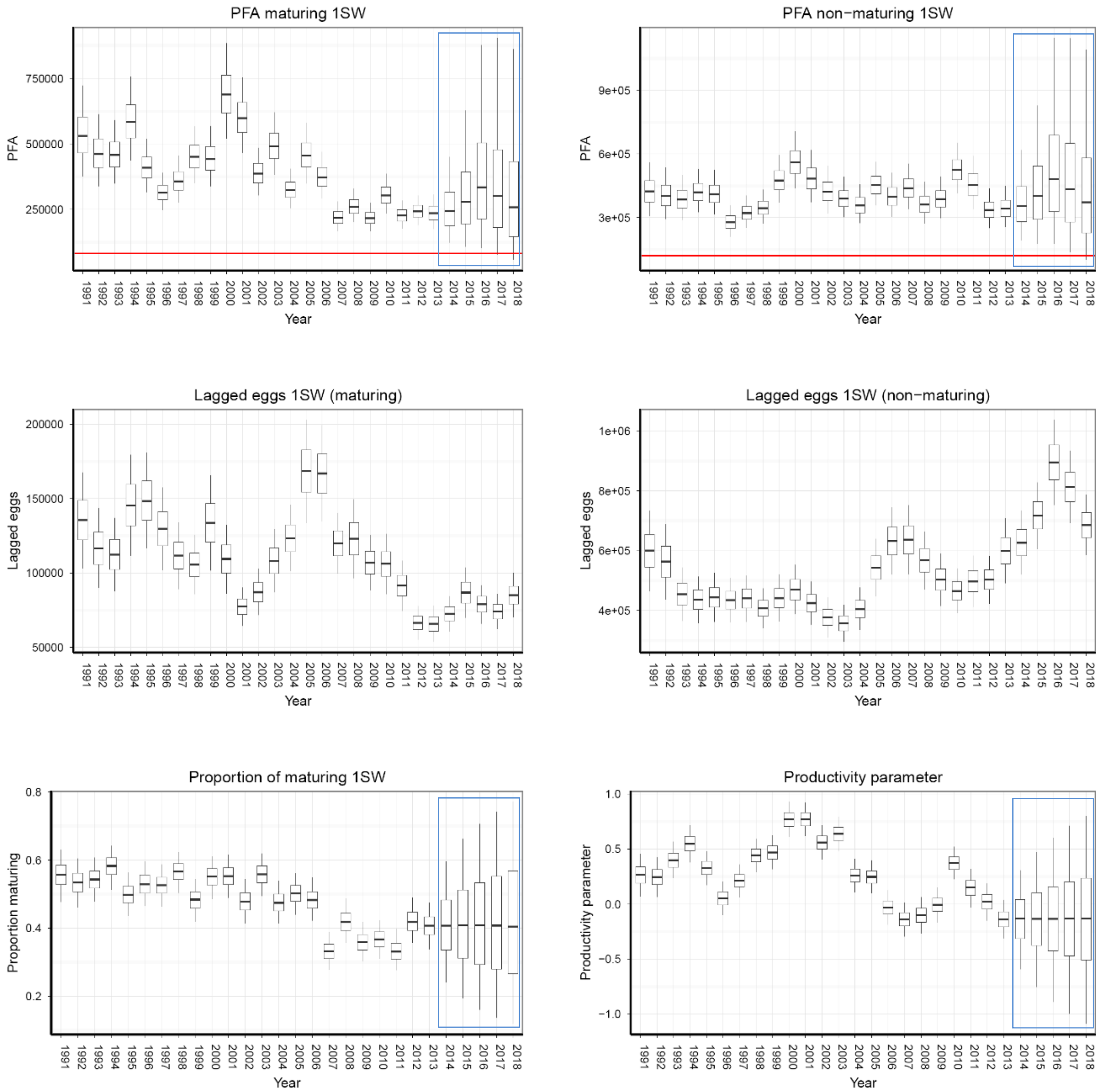


Figure 3.4.3.9. Norway: PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1991 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

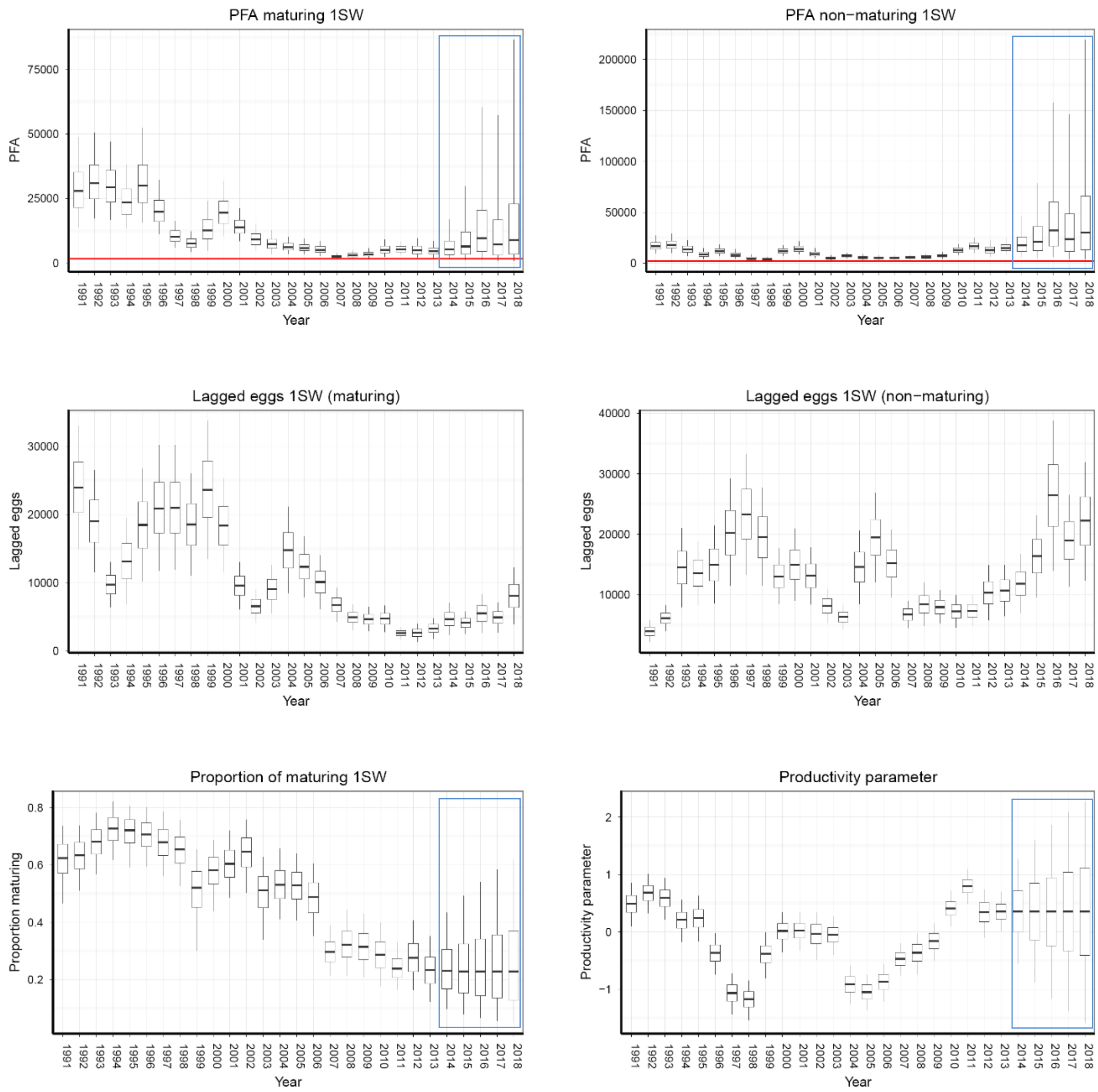


Figure 3.4.3.10. Sweden: PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1991 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed horizontal lines in the upper panels are the age-specific SER values. Box and whiskers show the 5th, 25th, 50th, 75th and 95th BCIs.

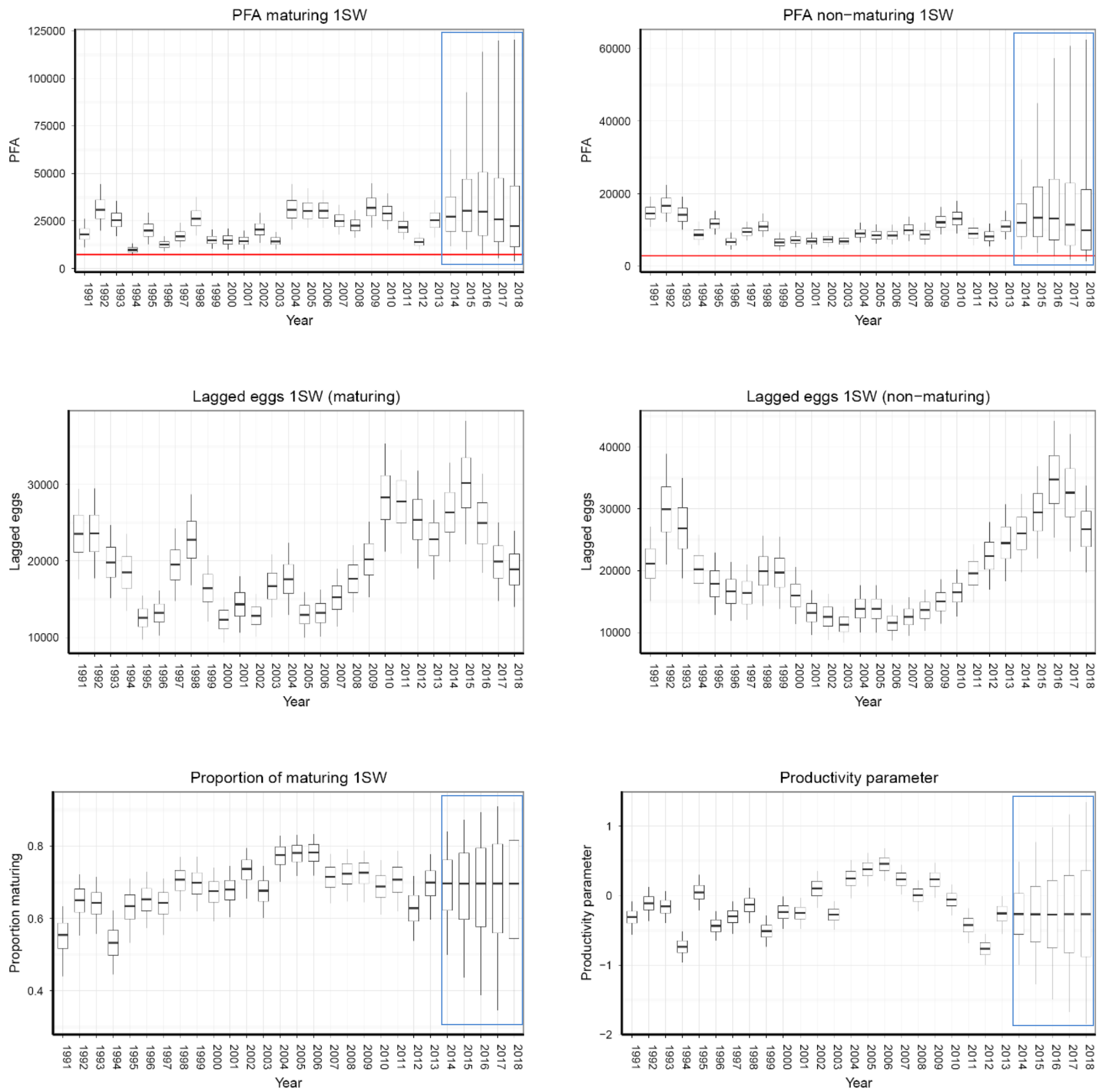
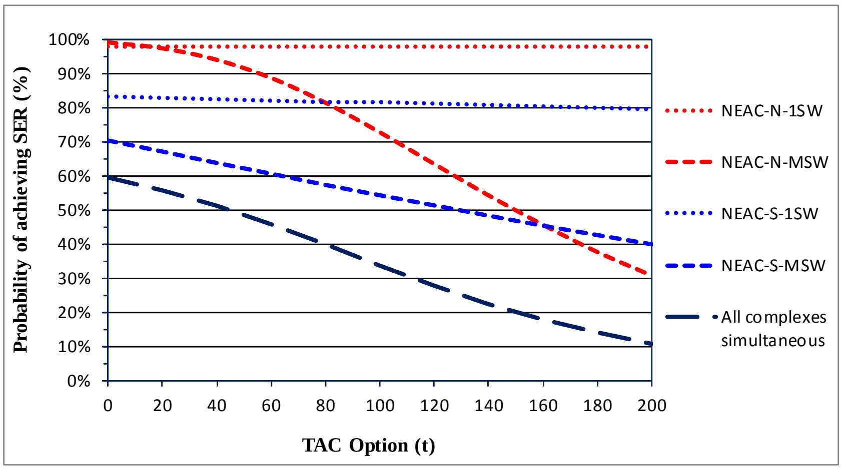
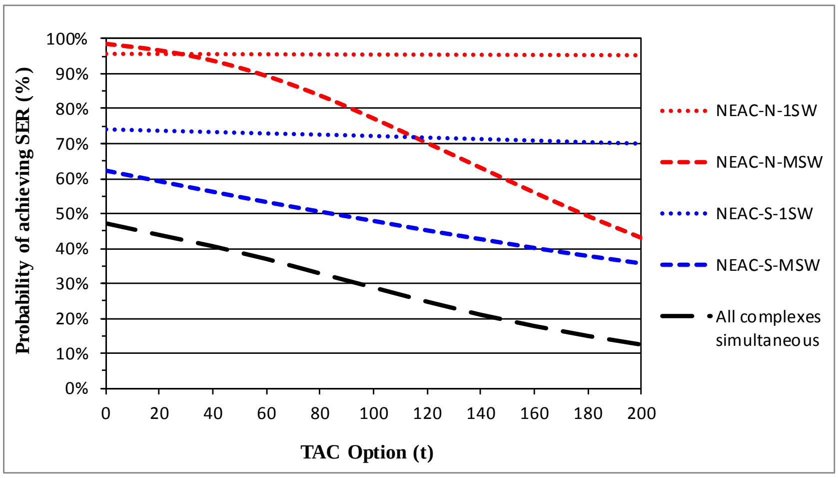


Figure 3.4.3.11. Iceland (north/east regions): PFA maturing and non-maturing, lagged eggs from 1SW and MSW, proportion 1SW maturing, and the productivity parameter values for PFA years 1991 to 2018. For PFAs, proportion maturing and productivity parameter for the last five years (2014 to 2018) are forecasts (as indicated by rectangles). The dashed 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 2015/16 season:



Catch options for 2016/17 season:



Catch options for 2017/18 season:

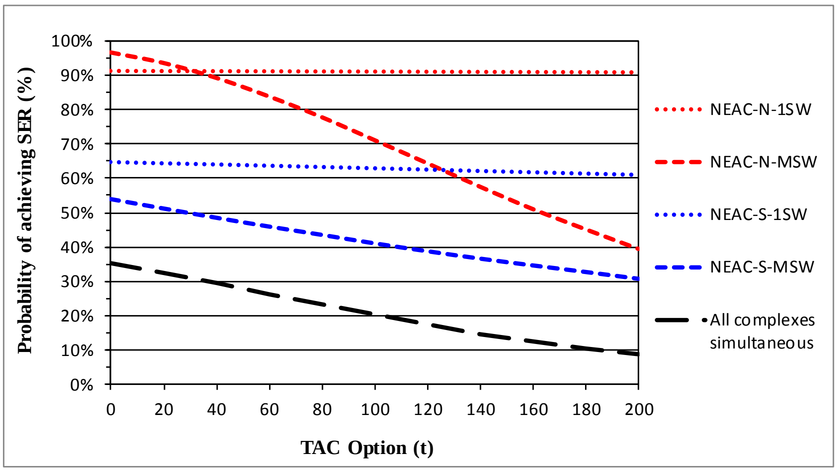


Figure 3.5.1.1 Probability of Northern and Southern NEAC - 1SW and MSW stock complexes, and all stock complexes simultaneously, achieving their SERs for different catch options for the Faroes fishery in the 2015/2016 to 2017/2018 fishing seasons.

FWI NEAC	2016	Indicators suggest:	REASSESS

Indicators for Northern NEAC 1SW PFA

Reassess in year 2016?

		Insert data from 2015 here	N reg	Slope	Intercept	r^2	Median PFA in 2015	12.5%ile	87.5%ile	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	250000	32	0.571387	-85680.77	0.94	503435	157724.51	246226.71	-1	1	NO	YES
2	Survivals W 1SW NO Imsa	1.8	31	0.000012	-3.86	0.45	503435	-2.07	6.58	0	-1	Uninformative	NO
3	Survivals H 1SW NO Imsa	4	32	0.000006	-1.22	0.30	503435	-1.07	4.82	0	-1	Uninformative	NO
4	Counts all NO Øyensåa (1SW)	400	16	0.002723	226.18	0.37	503435	593.26	2600.42	1	-1	YES	NO
5	Counts all NO Nausta (1SW)	2000	17	0.002156	-175.84	0.31	503435	-7.27	1826.80	0	1	Uninformative	YES
6	Catch rT&N 1SW FI	10000	16	0.013758	1835.8849	0.38	503435	-364.43	17888.70	0	-1	Uninformative	NO
								Sum of scores		0	-2	Indicators 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

Reassess in year 2016?

		Insert data from 2015 here	N reg	Slope	Intercept	r^2	Median PFA in 2015	12.5%ile	87.5%ile	Outside 75% conf.lim. below	Outside 75% conf.lim. above	Outside 75% conf.lim. below	Outside 75% conf.lim. above
1	PFA-MSW-CoastNorway	187000	32	0.358598	-14470.47	0.87	570739	155054.05	225337.02	-1	-1	NO	NO
2	Orkla counts	4000	17	0.013428	-3504.23	0.57	570739	2229.37	6089.41	-1	-1	NO	NO
3	Counts all NO Nausta	926	17	0.003994	-1403.18	0.36	570739	-7.07	1760.04	0	-1	Uninformative	NO
4	Returns all 2SW NO PFA est	250000	22	0.2427393	1727.8195	0.5	570739	73902.39	206634.70	-1	1	NO	YES
5	Catch W rT&N 2SW FI	5000	16	0.0070016	-1497.989	0.34	570739	-509.42	5505.66	0	-1	Uninformative	NO
								Sum of scores		-3	-3	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

Reassess in year 2016?

		Insert data from 2015 here	N reg	Slope	Intercept	r^2	Median PFA in 2015	12.5%ile	87.5%ile	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	500	27	0.000327	-59.92	0.28	1187678	91.48	565.54	-1	-1	NO	NO
2	Ret. W 1SW UK(E&W) Frome M	156	42	0.000544	-37.92	0.36	1187678	70.40	1147.01	-1	-1	NO	NO
3	Ret. W 1SW UK(Sc.) North Esk M	6000	34	0.006595	4194.17	0.58	1187678	8808.98	15244.17	1	-1	YES	NO
4	Surv. W 1SW UK(NI) Bush M	10.8	26	2.147E-05	-10.20677	0.54	1187678	5.74	24.86	-1	-1	NO	NO
5	Ret. Freshw 1SW UK(NI) Bush	1387	40	0.000699	425.50	0.26	1187678	484.52	2027.31	-1	-1	NO	NO
6	Surv coast 1SW UK(E&W) Dee M	2	20	3.187E-06	-0.063259	0.2	1187678	1.94	5.50	-1	-1	NO	NO
7	Ret. W 1SW UK(E&W) Dee M	5000	23	0.0034888	-330.6473	0.3	1187678	2246.87	5378.99	-1	-1	NO	NO
								Sum of scores		-5	-7	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

Reassess in year 2016?

		Insert data from 2015 here	N reg	Slope	Intercept	r^2	Median PFA in 2015	12.5%ile	87.5%ile	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	26	0.000027	2.44	0.40	587010	6.28	30.20	-1	-1	NO	NO
2	Ret. W 2SW UK(Sc.) Girnoch NM	60	43	0.000036	4.60	0.46	587010	-1.25	52.88	0	1	Uninformative	YES
3	Ret. W 1SW UK(Sc.) North Esk NM	8211	34	0.007316	6863.97	0.44	587010	7433.97	14883.21	-1	-1	NO	NO
4	Ret. W MSW UK(E&W) Itchen NM	120	27	0.000137	9.62	0.24	587010	3.61	176.65	-1	-1	NO	NO
5	Ret. W 1SW UK(E&W) Itchen NM	359	27	0.000394	48.36	0.25	587010	36.08	523.01	-1	-1	NO	NO
6	Ret. W MSW UK(E&W) Frome NM	104	42	0.000782	29.27	0.48	587010	-22.62	999.20	0	-1	Uninformative	NO
7	Ret. W 1SW UK(E&W) Frome NM	156	42	0.000669	110.42	0.38	587010	-28.38	1034.66	0	-1	Uninformative	NO
8	Catch W MSW Ice Ellidaar NM	17	43	0.000094	-26.07	0.57	587010	-27.50	85.39	0	-1	Uninformative	NO
9	Ret. Freshw 2SW UK(NI) Bush	257	39	0.000148	53.95	0.23	587010	5.17	276.47	-1	-1	NO	NO
10	Ret. W 2SW UK(Sc.) North Esk NM	99	34	0.0038291	4371.011	0.22	587010	3382.39	9855.06	1	-1	YES	NO
								Sum of scores		-4	-8	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. Framework of indicators spreadsheet for the Faroes fishery. For illustrative purposes, the 2014 annual indicator variable values for the 28 retained indicators are entered in the input (grey shaded) cells.

4 North American commission

4.1 NASCO has requested ICES to describe the key events of the 2014 fisheries

4.1.1 Key events of the 2014 fisheries

- There were no new significant events reported for 2014 in the NAC area.
- The majority of harvest fisheries were directed to small salmon.
- The 2014 provisional harvest in Canada was 105.6 t, comprised of 36 619 small salmon and 8709 large salmon, 11% less small salmon and 37% less large salmon compared to 2013.
- 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 2014; Aboriginal peoples, residents fishing for food in Labrador, and recreational fishers. There were no commercial fisheries in Canada in 2014. 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 2014, 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 (93% in 2014, 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 and in areas where retention of large salmon in recreational fisheries is allowed are closely controlled. 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 2014 for biological characteristics and genetic markers to identify the origin of harvested salmon.

The following management measures were in effect in 2014.

Aboriginal people's 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 2014. 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 2014. 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 2014, 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 2014 varied by area and large portions of the southern areas remained closed to all directed salmon fisheries (Figure 4.1.2.2). Except for 49 rivers in Québec, only small salmon could be retained in the recreational fisheries. In 2014, a regulatory change was mandated due to the generally low returns that required fishermen to release large salmon after August 1st in all Québec salmon rivers, excluding those in Ungava region. Changes to small salmon retention was implemented in Gulf rivers in 2014. The annual small salmon retention was reduced from eight to four in rivers in New Brunswick and from four to two in Nova Scotia.

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 2014.

France (Islands of Saint Pierre & Miquelon)

Nine professional and 64 recreational gillnet licences were issued in 2014 (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 2014

Canada

The provisional harvest of salmon in 2014 by all users was 105.6 t, about 23% lower than the 2013 harvest of 137.4 t (Tables 2.1.1.1 and 2.1.1.2; Figure 4.1.3.1). This is the lowest catch in the time-series since 1960. The 2014 harvest was 36 619 small salmon (65 t) and 8709 large salmon (41 t), 11% less small salmon and 37% less large salmon by number compared to 2013. There has been a dramatic decline in harvested tonnage since 1988, in large part 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 2014 was 53.0 t (Table 4.1.3.1). Harvest (by weight) decreased by 17% from 2013 and proportion large by number (41%) decreased by 20%.

Residents fishing for food in Labrador

The estimated catch for the fishery in 2014 was 1.6 t, a decrease of 0.4 t from 2013. This represents approximately 659 fish, 31% of which were large (Table 4.1.3.2).

Recreational fisheries

Harvest in recreational fisheries in 2014 totalled 27 124 small and large salmon (51.0 t), declined 22.2% from the 2013 harvest level and decreased 34.5% 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 25 781 fish was 18% lower than the 2013 harvest. The large salmon harvest of 1343 fish was 61.3% lower than the 2013 harvest and occurred only in Québec. 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 2014, 39 534 salmon (23 036 small and 16 498 large) were caught and released (Table 4.1.3.4; Figure 4.1.3.3, representing about 59% of the total number caught (including retained fish).

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 2011–2014 are provided. The reliability of recreational catch statistics could be improved in all areas of Canada.

Commercial fisheries

All commercial fisheries for Atlantic salmon remained closed in Canada in 2014 and the catch therefore was zero.

Unreported catches

The unreported catch estimate for Canada is complete and totalled 21.0 t in 2014. 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 (9.0 t), 5.8 t was considered to have occurred in inland waters and 3.2 t in tidal waters.

USA

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

France (Islands of Saint-Pierre et Miquelon)

A total harvest of 3.8 t was reported in the professional and recreational fisheries in 2014, a decrease of 28% from the 2013 reported harvest of 5.3 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 2014) 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 10 000 2SW salmon equivalents between 1999 and 2014 (Table 4.1.4.1).

In the most recent year, the losses of the cohort destined to be 2SW salmon in terminal areas of North America was estimated at 1688 fish, 30% of the total North American catch of 2SW salmon. The percentages of harvests occurring in terminal fisheries ranged from 15 to 32% during 1972 to 1990 and 38 to 81% during 1993 to 2014 (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 declined in 2014 to 37%, the second 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 2014. 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 2014, a total of 208 samples were collected from the Labrador Aboriginal fisheries; 92 from northern Labrador (SFA 1A), 42 from Lake Melville (SFA 1B), and 74 samples from southern Labrador (SFA 2) (Figure 4.1.2.1). Based on the interpretation of the scale samples (203 of 208), 81% of all the samples taken were 1SW salmon, 12% were 2SW, and 7% were previously spawned salmon. The majority of salmon sampled were river ages three to six years (98%) (modal age 4). There were no river age 1 and few river age 2 (2%) salmon sampled, suggesting, as in previous years (2006 to 2013), that very few salmon from the most southern stocks of North America (USA, Scotia-Fundy) were exploited in these fisheries.

PERCENTAGE OF SAMPLES BY RIVER AGE WITHIN THE THREE SAMPLED AREAS IN 2014

Area	Number of Samples	River Age					
		1	2	3	4	5	6
Northern Labrador (SFA 1A)	89	0.0	2.2	38.2	43.8	14.6	1.1
Lake Melville (SFA 1B)	40	0.0	0.0	55.0	32.5	12.5	0.0
Southern Labrador (SFA 2)	74	0.0	2.7	14.9	58.1	23.0	1.4
All areas	203	0.0	2.0	33.0	46.8	17.2	1.0

Details on stock composition and estimates of catches originating in regions of North America are provided in Section 4.9.

The Working Group noted that this sampling programme provides biological characteristics of the harvest and the origin of the fish in the fishery which are important parameters in the Run Reconstruction Model for North America and in development of catch advice.

Sampling programme for Saint-Pierre & Miquelon

In 2014, 71 samples were obtained from the fishery covering the period 26 May to 26 June, 2014. Salmon sampled in 2014 were predominantly river age 2 (27%) and 3 (48%) and both one-sea-winter (42%) and two-sea-winter (52%) maiden salmon. Details on stock composition and estimates of catches originating in regions of North America are provided in Section 4.9.

Recommendations for future activities

The Working Group noted that the sampling intensity of Labrador Aboriginal fisheries was low (in 2014 samples represented 2% of the provisional harvest) and in Saint Pierre & Miquelon fisheries samples represented 4% of reported harvest. 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 2014 recreational fishery for retained small salmon was 11% for Newfoundland (range: 6% Terra Nova River to 20% Conne River) and 2% for Labrador (Sand Hill River), which were similar to the previous five year means of 10% and 3%, respectively.

In Québec, the 2014 total fishing exploitation rate was about 18%, which is similar to the rate observed for the last five years. Native peoples' fishing exploitation rate was 8% of the total return. Recreational fishing exploitation rate was 10% on the total run, 15% for the small and 5% for the large salmon, lower than the previous five year average of 16% for small salmon and 8% for large salmon.

USA

There was no exploitation of anadromous USA 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 2014 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 9% 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, 2014a). CLs for 2SW salmon for Canada total 123 349 and for the USA, 29 199, for a combined total of 152 548.

Country and Commission 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 NASCO has requested ICES to describe the 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 485 (45%) of these rivers and assessments of adult spawners and egg depositions relative to conservation requirements were reported for 68 of these rivers in 2014.

4.3.1 Smolt abundance

Canada

Wild smolt production was estimated in eleven rivers in 2014 (Table 4.3.1.1). The relative smolt production, scaled to the size of the river using the conservation egg requirements, was highest in Western Arm Brook, Newfoundland, and lowest in the Nashwaak River, Scotia-Fundy (Figure 4.3.1.1). Trends in smolt production over the time-series declined ($p < 0.05$) in the two monitored rivers of Québec, St Jean (1989–2014) and de la Trinite (1984–2014), whereas production increased in Western Arm Brook (Newfoundland; 1971–2014) ($p < 0.05$). All other rivers showed no long-term trend (Figure 4.3.1.1). The Unama'ki Institute of Natural Resources conducted a smolt population assessment on Middle River (SFA 19; Scotia-Fundy) in 2013 and 2014. The smolt abundance estimate for 2014 was 11 522 (95% C.I. 2386–20 658). The large variation resulted from low recapture rate of marked fish.

USA

Wild salmon smolt production has been estimated on the Narraguagus River from 1997 to 2014 (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 by geographic area

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. Previously for Labrador, minimum and maximum values were mistakenly used for 2011 to 2013 to characterise the uncertainty of return and spawner estimates. This was corrected and the 5th and 95th percentiles are reported to characterize uncertainty of these estimates.

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). 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 (SFA2 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 25% in the recent three years).

Further work is needed to utilise available data (Aboriginal and recreational catches and effort) in describing stock status. The Working Group recommends that additional monitoring be considered in Labrador to better estimate salmon returns in that region.

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 4.3.2.1 to 4.3.2.3.

Small Salmon Returns

- The total estimate of small salmon returns to North America in 2014 was the highest on record (639 000), and represents a 50% increase from estimated returns in 2013 (425 300), and was 5% higher than the second highest value (610 900) estimated in 2011;

- Small salmon returns increased in 2014 from the previous year in four (Labrador, Newfoundland, Québec, and USA) of the six geographical regions, and decreased in the Gulf and Scotia-Fundy regions;
- Small salmon returns to Labrador (349 200) and Newfoundland (249 200) combined represent 94% of the 2014 total small salmon returns to North America (639 000);
- Small salmon returns to Labrador (349 200) in 2014 were the highest on record and small salmon returns to Newfoundland (249 200) were the fifth highest on record, whereas, small salmon returns to the Gulf (16 290) and Scotia-Fundy (1414) regions were the lowest and second lowest estimates on record, respectively. Small salmon returns to the USA (110) were among the lowest of the time-series;
- The large increase in the estimated small salmon returns and spawners for Labrador in 2014 (Figure 4.3.2.1) are a reflection of the high counts of small salmon noted in the single monitoring site in northern Labrador (SFA 1) (Figure 4.3.2.4).

Large Salmon Returns

- The total estimate of large salmon returns to North America in 2014 (152 300) was 15% lower than the estimate for 2013 (179 000);
- Large salmon returns declined from the previous year in five (Newfoundland, Québec, Gulf, Scotia-Fundy and USA) of the six geographical regions in 2014, and increased from 2013 in Labrador;
- Large salmon returns to Labrador (77 540) and Newfoundland (30 820) combined represent 71% of the total large salmon returns to North America (152 300) in 2014;
- Large salmon returns in 2014 were the lowest on record for Québec (19 320), Scotia-Fundy (759), and USA (340), the second lowest on record for Gulf (23 580), and the highest on record for Labrador (77 540), and among the highest on record for Newfoundland (30 820);
- The increase in the estimated returns and spawners of large salmon (Figure 4.3.2.2) for Labrador in 2014 are a reflection of the high counts of large salmon noted in the single monitoring site in northern Labrador (SFA 1) (Figure 4.3.2.4).

2SW Salmon Returns

- The total estimate of 2SW salmon returns to North America in 2014 (87 510) was 15% lower than the estimate for 2013 (103 000);
- 2SW salmon returns declined from the previous year in four (Québec, Gulf, Scotia-Fundy and USA) of the six geographical regions in 2014, and increased in Labrador and Newfoundland;
- 93% of the total 2SW salmon returns to North America (87 510) in 2014 were from Labrador (50 310), Gulf (16 970) and Québec (14 100) regions combined. There are few numbers of 2SW salmon in Newfoundland (5100), as the majority of the large salmon returns to that region are comprised of previous spawning 1SW salmon;

- 2SW salmon returns in 2014 were the lowest on record for Québec (14 100), Scotia-Fundy (689), and USA (334), and the fifth lowest on record for Gulf (16 970). 2SW returns were the highest on record for Labrador (50 310) and among the highest on record for Newfoundland (5100);
- The increase in the estimated returns and spawners of 2SW salmon (Figure 4.3.2.3) for Labrador in 2014 are a reflection of the high counts of large salmon noted in the single monitoring site in northern Labrador (SFA 1) (Figure 4.3.2.4).

4.3.3 Estimates of spawning escapements

Updated estimates for small, large and 2SW spawners (1971 to 2014) 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 4.3.2.1 and 4.3.2.2. A comparison between the numbers of 2SW returns, spawners, CLs, and management objectives (Scotia-Fundy and USA) is presented in Figure 4.3.2.3.

Small Salmon Spawners

- The total estimate of small salmon spawners in 2014 for North America (607 700) was the highest on record, and represents a 57% increase from 2013 (386 500), and a 11% increase from the second highest value (546 200) estimated in 2011;
- Estimates of small salmon spawners increased in four (Labrador, Newfoundland, Québec and USA) of the six geographical regions in 2014, and decreased in the Gulf and Scotia-Fundy regions;
- Small salmon spawners in 2014 were the highest on record for Labrador (347 600) and the fifth highest on record for Newfoundland (229 100); however, they were the lowest on record for Gulf (10 500), the second lowest on record for Scotia-Fundy (1403), and among the lowest for the USA (110);

Large Salmon Spawners

- The total estimate of large salmon spawners in North America for 2014 (150 100) decreased by 14% from 2013 (173 600);
- Estimates of large salmon spawners decreased in four (Newfoundland, Québec, Gulf, and Scotia-Fundy) of the six geographical regions in 2014, and increased in Labrador and the USA;
- Large salmon spawners in 2014 were the highest on record for Labrador (77 380) and among the highest on record for Newfoundland (30 530); however, they were the lowest on record for Québec (17 770) and Scotia-Fundy (742), and among the lowest for Gulf (22 990) and the USA (572).

2SW Salmon Spawners

- The total estimate of 2SW salmon spawners in North America for 2014 (86 040) decreased by 13% from 2013 (99 330), and did not meet the total 2SW CL for NAC (152 548);
- Estimates of 2SW salmon spawners decreased from 2013 in three (Québec, Gulf, and Scotia-Fundy) of the six geographical regions in 2014, and increased in the other three regions (Labrador, Newfoundland, and USA);

- Estimates of 2SW salmon spawners in 2014 were the highest on record for Labrador (50 210), and among the highest for Newfoundland (5048); however, they were the lowest on record for Québec (12 970) and Scotia-Fundy (673), and among the lowest values on record for Gulf (16 580) and the USA (566);
- Estimates (median) of 2SW salmon spawners exceeded 2SW CLs for two (Labrador and Newfoundland) of the six geographical regions in 2014; however, 2SW CLs were not met for Québec, Gulf, Scotia-Fundy or the USA with values ranging from 2% (USA) to 56% (Gulf) of region specific 2SW CLs in 2014;
- Labrador has met or exceeded the regional 2SW CL three times (2011, 2013, and 2014) during the 45 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 2014, and have not been met since 1991 (Scotia-Fundy), and 1986 (USA).

4.3.4 Egg depositions in 2014

Egg depositions by all sea ages combined in 2014 exceeded or equalled the river-specific CLs in 18 of the 66 assessed rivers (27%) and were less than 50% of CLs in 31 rivers (47%; Figure 4.3.4.1). The number of rivers assessed annually varies due to operational considerations and environmental conditions.

- CLs were exceeded in 25% (one of four) of assessed rivers in Labrador, 50% (five of ten rivers) in Newfoundland, and 27% (ten of 37 rivers) in Québec.
- None of the seven assessed rivers in Scotia-Fundy met CLs and all were below 50% of CLs. With the exception of three rivers where catch and release fishing only was permitted, fisheries were closed on all these rivers.
- Large deficiencies in egg depositions were noted in the USA. All seven assessed rivers were below 5% of their CLs and all fisheries are closed on these stocks.

4.3.5 Marine survival (return rates)

In 2014, return rate data were available from nine wild and three 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 over the time period except for populations in Newfoundland (Figure 4.3.5.1). The trend in return rates for wild 2SW salmon also declined in Québec ($p < 0.05$) but not for Gulf and Scotia-Fundy although wild 2SW return rates declined for Scotia-Fundy since 2010 compared to previous years (Figure 4.3.5.1).

For hatchery origin small salmon, the third lowest value for Penobscot River (USA) and second lowest value for the Saint John River (Scotia-Fundy) were recorded in 2014 (Figure 4.3.5.2). Hatchery origin 2SW return rates in 2014 were within the range of observed values for the Saint John (Scotia-Fundy) but the lowest on record for the Penobscot (USA) (Figure 4.3.5.2).

Analyses of time-series of standardized return rates of wild smolts to small salmon and 2SW adults by area for the period of 1970 to 2014 (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 2014;
- Small salmon return rates for Newfoundland populations in 2014 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 2014;
- Small salmon and 2SW return rates of wild smolts to the Scotia-Fundy and USA vary annually and without trend over the period (mid 1990s to 2014);
- In Scotia-Fundy and USA, hatchery smolt return rates to 2SW salmon have decreased over the period 1970 to 2014. 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 2014. 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 2013. This is because pre-fishery abundance estimates for 2014 require 2SW returns to rivers in North America in 2015.

The medians derived from Monte Carlo simulations for 2SW salmon returns by region and for NAC overall are shown in Figure 4.3.2.3. The estimated abundance of 2SW returns to rivers for NAC in 2014 was 87 510 salmon (90% C.I. range 68 090 to 107 600) (Table 4.3.2.3; Figure 4.3.2.3). The median estimate for 2014 is 15% lower than the previous year and 3% lower than the previous five year average (90 350). The 2014 estimate ranks 28th (descending) out of the 45 year time-series.

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

2013 was 140 400 salmon (90% C.I. range 111 700 to 172 000). This value is 13% lower than the previous year (161 500) and 1% lower than the previous five year average (141 920). The estimated non-maturing 1SW salmon in 2013 ranks 29th (descending) out of the 43 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 medians of the region-specific estimates of returns of the 1SW maturing component to rivers of NAC are summarized in Figure 4.3.2.1. Estimated abundance of 1SW returns in 2014 (639 000) was 50% higher than 2013 (425 300) and 36% higher than the previous five year mean (471 400). With the exception of Labrador (+120%) and Newfoundland (+5%), returns of 1SW maturing salmon in 2014 were below the previous five year means (-8% to -77%). Returns of maturing 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 very low returns of 2009, the very high returns of 2011, and the large increase in 2014 returns relative to 2013 (Figure 4.3.2.1).

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 2014 was 668 600 fish, 49% higher than the previous year and 35% higher than the previous five year mean (496 260). Maximum abundance of the maturing cohort was estimated at over 911 000 fish in 1981 and the recent estimate ranks 10th (descending) out of the 44 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 1971–2013 (2014 PFA requires 2SW returns in 2015) 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 2013, was 588 500 fish, 12% lower than the 2012 PFA value (671 900), and 12% lower than the previous five year mean (667 160). The 2013 PFA estimate ranks 32nd (descending) of the 43 year time-series. The abundance of the 1SW cohort has declined by 65% over the time-series from a peak of 1 705 000 fish in 1975.

4.3.7 Summary of status of stocks

In 2014, 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 4.3.2.3). The proportion of the 2SW CL attained from 2SW spawners in the other northern areas were 44% and 54% for Québec and Gulf, respectively. From returns to rivers of 2SW salmon, prior to in-river exploitation, these percentages of CL would have been 48% and 56%. For the two southern areas of NAC, Scotia-Fundy and USA, the 2SW CL attained from 2SW spawners in 2014 were 3% and 2%, respectively. Returns of 2SW salmon to these southern areas were 6% and 7% of the management objectives for the Scotia-Fundy (10 976) and USA (4549), respectively.

The rank of the estimated returns in the 1971 to 2014 time-series and the proportions of the 2SW CLs achieved in 2014 for six regions in North America are shown below:

Region	Rank of 2014 returns in 1971 to 2014, (44=lowest)		Rank of 2014 returns in 2005 to 2014 (10=lowest)		Median estimate of 2SW spawners as percentage of Conservation Limit (% of management objective)
	1SW	2SW	1SW	2SW	(%)
Labrador	1	1	1	1	144
Newfoundland	5	10	3	2	125
Québec	31	44	5	10	44
Gulf	44	40	10	10	54
Scotia-Fundy	43	44	9	10	3 (6)
USA	36	44	8	10	2 (7)

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 2008, the total population of 1SW and 2SW Atlantic salmon was about 600 000 fish, about half of the average abundance during 1972 to 1990. The maturing 1SW salmon in 2014 increased by 49% relative to 2013 and was the highest value since 1988 (Figure 4.3.6.1). The non-maturing 1SW PFA for 2013 declined by 13% from 2012.

The abundances of 1SW maturing salmon in 2014 increased from 2013 in all areas (range 10% to 84%) with the exceptions of Gulf and Scotia-Fundy that declined 34% and 33%, respectively. The abundances of large salmon (multi-sea-winter salmon including maiden and repeat spawners) declined in all areas with the exception of Labrador for which returns were the highest of the time-series. The returns of 2SW fish in 2014 decreased from 2013 in all geographic areas with the exceptions of Labrador and Newfoundland. Québec, Scotia-Fundy and the USA had the lowest values in the time-series. Returns of 2SW fish in 2014 increased from 2013 in Labrador and Newfoundland 17% and 6%, respectively. Labrador had the highest value of the time-series.

Egg depositions by all sea ages combined in 2014 exceeded or equalled the river-specific CLs in 18 of the 66 assessed rivers (27%) and were less than 50% of CLs in 31 rivers (47%) (Figure 4.3.4.1).

Despite major changes in fisheries, returns to southern regions (Scotia-Fundy and USA) have remained 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 DU in Québec and one in Newfoundland were completed in 2012 and 2013 to inform the requirements under the Species at Risk Act listing process in Canada (ICES, 2014a).

With the exception of two northern areas (Labrador and Newfoundland), 2014 abundances of 1SW salmon remained at comparably low levels to those of 2013, whereas 2SW and large salmon declined. In 2014 1SW and 2SW returns and spawners were the highest in the time-series for Labrador. The estimated PFA of 1SW non-maturing salmon ranked 29th (descending) of the 43-year time-series and the estimated PFA of 1SW maturing salmon ranked 10th (descending) of the 44-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.

4.4 NASCO has asked ICES to provide catch options or alternative management advice for 2015–2018 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

As the predicted number of 2SW salmon returning to North America in 2015 is substantially lower than the 2SW CL there are no catch options for the composite stock in the North American fisheries. Where river-specific spawning requirements are being achieved, there are no biological reasons to restrict the harvest.

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

Advice regarding management of this stock complex in the fishery at West Greenland is provided in Section 5.

4.5 Relevant factors to be considered in management

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

The salmon caught in the Labrador and Saint Pierre & Miquelon mixed-stock fisheries originate in all areas of North America. All sea age groups, including previous spawners, contribute to the fisheries in varying proportions.

4.6 Updated forecast of 2SW maturing fish for 2015

Catch options are only provided for the non-maturing 1SW and maturing 2SW components as the maturing 1SW component is not fished outside homewaters, and in the absence of significant marine interceptory fisheries, is managed in homewaters.

It is possible to provide catch options for the North American Commission area for four years. The updated forecast for 2015 for 2SW maturing fish is based on an updated forecast of the 2014 pre-fishery abundance and accounting for fish which were already removed from the cohort by fisheries in Greenland and Labrador as 1SW non-maturing fish in 2014. The updated forecast of the 2014 pre-fishery abundance has a PFA mid-point of 149 100 fish, 30% below the forecast PFA value provided in the 2012 assessment (213 600) (ICES 2012a). The surviving 2SW salmon from the 2014 pre-fishery abundance of non-maturing 1SW will be available in 2015.

4.6.1 Catch options for 2015 fisheries on 2SW maturing salmon

As the 5th percentiles of the predicted numbers of 2SW salmon returning to North America in 2015 are lower than the 2SW management objectives for all areas and overall for North America, there are no catch options on 2SW salmon in mixed-stock fisheries in North America in 2015 that would allow the attainment of region-specific management objectives (Table 4.6.1.1). A limited catch option may be available on individual rivers where spawning requirements are being achieved; in these circumstances, there are no biological reasons to further restrict the harvest.

4.7 Pre-fishery abundance of 2SW salmon for 2015–2017

4.7.1 Forecast models for pre-fishery abundance of 2SW salmon

ICES (2009; 2012a) developed estimates of the pre-fishery abundance for the non-maturing 1SW salmon (PFA) using a Bayesian framework that incorporates the estimates of lagged spawners and works through the fisheries at sea to determine the corresponding returns of 2SW salmon, conditioned by fisheries removals and natural mortality at sea. This model considered regionally-disaggregated lagged spawners and returns of 2SW salmon for the six regions of North America. Dataseries were finalized for 2014 and updated for past years in some regions.

Lagged spawners overall for NAC have generally been less than half the 2SW conservation limit for NAC (Figure 4.7.1.1). The lowest lagged spawner values were estimated during the 2003 to 2013 PFA years, with a slight improvement in abundance for the 2015 to 2017 PFA years resulting from the higher 2SW spawner values in Gulf and Québec in the 2011 spawning year. The improvements in 2SW spawners in Labrador over the past four years have not yet been accounted in the lagged spawners, due to the older smolt ages in Labrador; improved lagged spawners for Labrador will occur for PFA years 2018 onward.

North American and region-specific PFA and productivity value inferences are provided by the model (Figures 4.7.1.2 to 4.7.1.6).

The productivity coefficient (log of PFA to LS) was highest in most regions prior to 1990 (PFA year) and decreased in all regions to reach the lowest values during and after the 1990s (Figure 4.7.1.2). Productivity coefficient values near zero or negative (negative value means the PFA estimate was less than the lagged spawners) were estimated for Labrador and Newfoundland in the early 2000s, for Gulf during 1998 to 2000, and for Scotia-Fundy and the USA during the 1990s and again since the 2010 PFA year. The most recent year values (2013 PFA year) are positive for Labrador and Newfoundland, just above zero for Québec and Gulf, and negative for Scotia-Fundy and the USA (Figures 4.7.1.2, 4.7.1.3). The productivity coefficient for NAC overall was negative in 2001 and improved from that point onward, but at values less than half those estimated between 1978 and 1988 PFA years; it returned to near zero values in 2013 (Figures 4.7.1.3, 4.7.1.4).

The regional contributions to the overall NAC PFA were relatively stable over the period 1980 to 2008 with over 70% of total PFA contributed by Québec and Gulf regions, followed by Labrador with over 20% of the overall PFA (Figure 4.7.1.5, 4.7.1.6). The Scotia-Fundy region contributed as much as 20% of the PFA for the 1984 PFA year but through the 2000s, has represented less than 5% of the total PFA and the USA has never represented more than a few percentage of the total (Figure 4.7.1.6). For the PFA years 2011 to 2013, the proportions of the estimated PFA originating in Labrador, Québec, and Gulf has been approximately 34% to 54%, 20% to 33%, and 23% to 29%, respectively (Figure 4.7.1.6). Genetic stock identification results of samples from the fishery at West Greenland in 2011 to 2014 showed just under 25% Labrador origin salmon, about 40% Québec origin salmon, and just under 30% Gulf origin salmon (see Section 5.9).

The productivity estimate in the most recent year, 2013, decreased to near zero and substantially below the levels observed in the late 1990s to early 2000s (Figure 4.7.1.3). By region, the most recent year value for the productivity was among the highest values since 1997 for Labrador, higher than the early 2000s for Newfoundland but less than the values of the recent two decades of the series, and among the lowest values of the time-series for Québec, Gulf, Scotia-Fundy and USA (Figure 4.7.1.3). The productivity parameters for Scotia-Fundy and USA are negative (on the log scale) indicating that the PFA is less than the Lagged Spawner abundance that produced them and the salmon in these regions are expected to decline further from current levels of very low abundance.

For 2015 to 2017 PFA years, the 5th and 25th percentiles of the posterior distributions of the regional PFAs are all less than the management objective reserves, with the exception of Labrador for 2015 and 2017 for which the 25th percentile of the predicted PFA is just above the 2SW CL reserve (Figure 4.7.1.5; Table 4.7.1.1).

For NAC overall, the predicted values (5th and 25th percentiles) for 2015 to 2017 are all substantially below the 2SW CL reserve (Table 4.7.1.1).

The forecasts have very high uncertainty and the uncertainties increase as the forecasts move farther forward in time.

4.7.2 Catch options for non-maturing 1SW salmon

Catch options on non-maturing 1SW salmon in North America in 2015 to 2017 and on surviving 2SW salmon in 2016 to 2018 are presented relative to the probability that the region specific PFA estimates will meet or exceed the 2SW management objectives for the regions, in the absence of any mixed-stock fisheries exploitation at sea. The probabilities that the returns of 2SW salmon to the six regions of NAC will meet or exceed the 2SW objectives for the six regions in NAC, and simultaneously for all regions, in the absence of any fishing on the age group for the 2SW salmon return years 2015 to 2018 are provided in Table 4.7.1.1. The management objectives, corrected to the PFA time period for eleven months of natural mortality of 0.03 per month, are provided in Table 4.7.1.2, together with the 5^{th} and 25^{th} percentile and median values of the predicted PFA abundances by region. The 5^{th} percentiles are below the management objectives for all six regions of North America for all years 2015 to 2017.

There are, therefore, no mixed-stock fishery options on 1SW non-maturing salmon in 2015 to 2017 or on 2SW salmon in 2016 to 2018 which would provide a greater than 95% chance of meeting the individual management objectives; the probability of simultaneous attainment in any year is zero.

4.8 Comparison with previous assessment and advice

In 2012, the ICES Working Group provided forecasts of the regional productivity parameters and the regional specific PFAs based on the regional lagged spawners. The productivity parameter used in the forecast is the value derived from the last year in the model, with increasing uncertainty for each year of the forecast. In the 2012 assessment, the productivity parameter for the 2010 PFA had increased from previous years in the regions and overall, as a result of the greatly improved returns of 2SW salmon to all regions in 2011 (ICES 2012a). The returns of 2SW salmon in 2012 to 2014 were lower than those of 2012 in four of the six regions whereas returns in 2013 and 2014 in Labrador and Newfoundland were higher than those of 2011 (Figure 4.3.2.3). As a result, the forecast value of the productivity parameter was lower than realized in 2011 to 2013 for the Labrador region, resulting in a realized regional PFA value for those three years which were higher than forecast. In all other regions, the forecasted productivity parameter was much higher than the realized values with the result that the forecast regional PFA values were all higher than the realized values for PFA years 2011 to 2013. Due to the large uncertainty associated with the forecast values, the estimated PFA values for 2011 to 2013 were within the 95% confidence intervals of the forecast values.

The previous advice provided by ICES (2012a) indicated that there were no mixed-stock fishery catch options on the 1SW non-maturing salmon component for the 2012 to 2014 PFA years and this year's assessment confirms that advice.

4.9 Origin and composition of mixed-stock fishery catches based on contemporary genetic stock identification data

The Working Group was asked to consider the available contemporary data on stock origin of salmon, to estimate the catches by stock origin, and to describe their spatial and temporal distribution of salmon from the Labrador subsistence fisheries and for the fishery in Saint Pierre & Miquelon.

The stock composition and variation in composition of salmon harvested in these mixed-stock fisheries was determined based on a recently developed North American baseline for Atlantic salmon which allows assignment to regional reporting groups (Bradbury *et al*., 2014a; Moore *et al*., 2014). These reporting groups largely approximate regional clusters identified in landscape analyses of population structure (Dionne *et al.*, 2008; Bradbury *et al*., 2014b). In total, twelve regional groups in eastern North America can be reliably identified using 15 microsatellite loci (Figure 4.9.1).

The regional groups do not correspond directly to the six regions used by the Working Group to characterize stock status and to provide catch advice. The overlap between the regional groups and the ICES areas in North America are shown in Table 4.9.1.

The twelve reporting groups were used for mixture analysis using the Bayesian mixture model from Pella and Masuda (2001) as implemented in cBAYES (Neaves *et al.*, 2005). The accuracy of assignment in the mixture analyses was very high, 94.5%. The power of the baseline to resolve rare contributions was examined using simulations; accurate estimation of the rare stock contributions was possible when they represented from 0.5–1.0% and above.

The numbers of salmon from each regional group in the Labrador subsistence fisheries during 2012 to 2014 and for the fishery at Saint Pierre & Miquelon in 2004 to 2014 were estimated using the mixture analysis regional contributions. A multinomial distribution was used to model the mixture proportions and these were raised to the total catch (number of salmon) in the fisheries. A total of 1000 simulations were conducted. In each simulation, the proportion contribution of each regional group was modelled with a beta distribution parameterized by the mean and standard errors from the mixture analysis outputs.

4.9.1 Labrador fishery origin and composition of the catches

Tissue samples from salmon sampled from the Labrador subsistence fisheries during 2006 to 2014 were genetically typed to the twelve regional groups. The estimated proportional contributions of the twelve groups (and associated standard errors) based on combined samples for 2006 to 2011 and combined samples for 2012 to 2014 are shown in Table 4.9.1.1. The uncertainties in the estimated contributions are lowest (coefficient of variation, CV, of 1%) for the largest contributing group (Labrador Central) with CVs exceeding 50% for almost all the other groups (Table 4.9.1.1).

The Labrador Central (LAB) regional group represents the majority (almost 92 to 96%) of the salmon in the Labrador subsistence fishery with minor contributions from all the other regional groups (Table 4.9.1.1; Bradbury *et al.*, 2014a). Raised to estimated catches of salmon in 2012 to 2014, the Central Labrador regional group represented 96% of the catch, followed by Ungava/Northern Labrador (UNG), Québec/Labrador South (QLS) and Newfoundland (NFL) at about 1% each (Table 4.9.1.2). No USA origin salmon were identified in the mixed-stock analysis of samples from 2012 to 2014 and raised catches for those years are essentially zero (Table 4.9.1.2). However Bradbury *et al*. (2014a) previously reported the presence of USA origin salmon in the samples from the fisheries in 2006 to 2011 with raised harvest estimates of 30 to 40 fish per year. These annual values differ somewhat if annual sampling results are used, but because of the smaller annual sample sizes, the estimates of raised catches are more uncertain.

4.9.2 Saint Pierre & Miquelon fishery origin and composition of the catches

Sampling of the salmon catches was conducted in 2004, 2011, 2013 and 2014. The number of tissue samples collected for those years are 138, 73, 71, and 71, respectively, for a total of 353 individual samples over the four years.

Genetic mixed-stock analysis was used to examine 353 individuals collected from the Saint Pierre & Miquelon fishery (2004, 2011, 2013, 2014). Estimates of stock composition showed consistent dominance of three regions, Gulf of St Lawrence, Gaspe Peninsula, and Newfoundland (Figure 4.9.2.1).

Raised to estimated catches of salmon in 2004 to 2014, the origin of the catches at Saint Pierre & Miquelon are dominated by three regional groups: Gulf of St Lawrence (GUL) at 38%, Québec (GAS, QUE) at 32% and Newfoundland (NFL) at 24% (Table 4.9.2.1). The Scotia-Fundy area of Canada has comprised on average about 3% of the catch whereas salmon of US origin have not occurred in the fishery (Table 4.9.2.1). The annual values differ somewhat if annual sampling results are used because of the smaller annual sample sizes and the estimates of raised catches are more uncertain.

Continued analysis of additional years will be informative of the characteristics of the salmon, age and size structure and origin of the fish and the variation in the stock-specific characteristics of the catches.

The Working Group welcomed the analysis for genetic origin of samples of the catches at Saint Pierre & Miquelon. The ongoing collaboration between French and Canadian researchers was encouraged to ensure that adequate samples are collected and that the North American genetic baseline is used in the analysis of these samples. This initiative addressed gaps identified in the previous sampling activities (ICES, 2011; 2012a).

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 (tonnes)		
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	9	64	2.25	1.56	3.81

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	53.0	61	41

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

Table 4.1.3.3. Harvests of small and large salmon, and the percent large by number, in the recreational fisheries of Canada, 1974 to 2014. The values for 2014 are provisional.

Year	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	9982	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	9919	78 201	13%
1994	60 118	11 198	71 316	16%
1995	46 273	8295	54 568	15%
1996	66 104	9513	75 617	13%
1997	42 891	6756	49 647	14%
1998	45 810	4717	50 527	9%
1999	43 667	4811	48 478	10%
2000	45 811	4627	50 438	9%
2001	43 353	5571	48 924	11%
2002	43 904	2627	46 531	6%
2003	38 367	4694	43 061	11%
2004	43 124	4578	47 702	10%
2005	33 922	4132	38 054	11%
2006	33 668	3014	36 682	8%
2007	26 279	3499	29 778	12%
2008	46 458	2839	49 297	6%
2009	32 944	3373	36 317	9%
2010	45 407	3209	48 616	7%
2011	49 931	4141	54 072	8%
2012	30 453	2680	33 133	8%
2013	31 404	3472	34 876	10%
2014	25 781	1343	27 124	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.

	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	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**

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.

Year (i)	MIXED STOCK: NF-LAB Comm / Food 1SW (Year i-1) (a)	MIXED STOCK: % 1SW of total 2SW equivalents (Year i)	MIXED STOCK: NF-LAB Comm / Food 2SW (Year i) (a)	MIXED STOCK: NF-Lab Comm / Food total (Year i)	MIXED STOCK: Saint-Pierre and Miquelon (Year i)	CANADA – LOSSES FROM ALL SOURCES (TERMINAL FISHERIES, CATCH AND RELEASE MORTALITY, BYCATCH MORTALITY) IN 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	Estimated abundance in North America (2SW)	Exploitation rates in North America on 2SW equivalents
1972	20109	0.12	153816	173924	0	420	590	27510	20230	5600	54350	345	228619	24	197920	426539	54	302500	0.76
1973	17434	0.07	219127	236561	0	1010	776	32700	15480	6213	56179	327	293067	19	148170	441237	66	377000	0.78
1974	23711	0.09	235915	259626	0	810	501	47730	18240	13030	80311	247	340184	24	186489	526673	65	449600	0.76
1975	23453	0.09	237565	261018	0	330	496	41160	14080	12520	68586	389	329993	21	154569	484562	68	416500	0.79
1976	35024	0.12	256586	291610	323	830	379	42170	16150	11130	70659	191	362783	20	194469	557252	65	431600	0.84
1977	26744	0.10	241253	267997	0	1280	782	42220	29220	13460	86962	1355	356314	25	113015	469328	76	473500	0.75
1978	26974	0.15	157309	184283	0	760	529	37450	20330	9364	68433	894	253610	27	142634	396245	64	317400	0.80
1979	13494	0.13	92056	105550	0	609	126	25240	6253	3842	36070	433	142053	26	103813	245866	58	172100	0.83
1980	20603	0.09	217186	237789	0	890	636	53570	25330	17340	97766	1533	337088	29	141844	478931	70	451600	0.75
1981	33717	0.14	201367	235085	0	520	425	44330	14582	12850	72707	1267	309059	24	120923	429982	72	365400	0.85
1982	33575	0.20	134407	167982	0	620	399	35150	20650	8919	65738	1413	235133	29	161183	396316	59	291100	0.81
1983	25241	0.18	111601	136842	323	428	418	34450	17320	12281	64897	386	202448	32	145870	348317	58	237200	0.85
1984	19039	0.19	82798	101837	323	510	185	16110	3510	3960	24275	675	127110	20	26837	153948	83	195900	0.65
1985	14333	0.15	78761	93095	323	294	11	19600	990	5070	25965	645	120028	22	32445	152473	79	209600	0.57
1986	19574	0.16	104905	124479	269	467	33	23990	1780	2960	29230	606	154584	19	99068	253652	61	262900	0.59
1987	24780	0.16	132175	156955	215	630	21	24050	1950	1430	28081	300	185551	15	123439	308990	60	256700	0.72
1988	31564	0.28	81129	112694	215	710	22	24170	1360	1450	27712	248	140869	20	123799	264668	53	211600	0.67
1989	21889	0.21	81352	103242	215	461	5	21650	1250	340	23706	397	127560	19	84977	212537	60	193600	0.66
1990	19276	0.25	57353	76629	205	357	22	20940	1170	640	23129	695	100658	24	43624	144282	70	173900	0.58
1991	11835	0.23	40429	52264	129	93	9	20380	960	1380	22822	231	75446	31	52215	127661	59	145100	0.52
1992	9838	0.28	25105	34943	248	782	53	20930	1170	1170	24105	167	59463	41	79585	139047	43	142600	0.42
1993	3108	0.19	13276	16383	312	387	48	15690	610	1162	17897	166	34759	52	29814	64572	54	118900	0.29
1994	2076	0.15	11936	14012	366	490	155	16060	680	777	18162	2	32542	56	1888	34430	95	103600	0.31
1995	1183	0.12	8676	9859	86	460	149	13430	550	358	14947	0	24892	60	1886	26778	93	129400	0.19
1996	1033	0.15	5645	6678	172	380	168	12750	820	819	14937	0	21787	69	19181	40968	53	110100	0.20
1997	942	0.15	5390	6332	161	210	130	10590	820	608	12358	0	18852	66	19332	38184	49	90160	0.21
1998	1130	0.39	1761	2891	248	203	88	4390	490	331	5502	0	8641	64	13048	21689	40	60920	0.14
1999	175	0.17	841	1016	250	270	83	3920	810	461	5544	0	6810	81	4321	11131	61	65750	0.10
2000	150	0.12	1050	1200	244	270	157	3540	590	199	4756	0	6200	77	6442	12642	49	67290	0.09
2001	284	0.18	1336	1620	232	310	70	4480	930	266	6056	0	7908	77	5931	13839	57	78490	0.10
2002	260	0.19	1078	1339	210	200	53	1870	530	183	2836	0	4384	65	8606	12990	34	49090	0.09
2003	309	0.15	1689	1997	311	234	74	3480	830	211	4829	0	7138	68	3224	10361	69	76030	0.09
2004	351	0.11	2870	3220	300	270	74	3370	850	116	4680	0	8200	57	3474	11674	70	73680	0.11
2005	463	0.17	2186	2649	354	270	85	3100	950	106	4511	0	7514	60	4339	11853	63	75760	0.10
2006	558	0.19	2399	2957	383	220	95	2320	820	151	3606	0	6946	52	4180	11125	62	72040	0.10
2007	558	0.21	2058	2616	210	240	65	2580	880	110	3875	0	6701	58	4934	11635	58	67680	0.10
2008	494	0.14	3035	3529	381	220	108	2320	850	96	3594	0	7504	48	6617	14121	53	74540	0.10
2009	539	0.17	2596	3135	372	230	65	2630	890	120	3935	0	7442	53	7549	14991	50	88220	0.08
2010	439	0.13	2892	3331	299	198	106	2490	840	133	3767	0	7398	51	6671	14068	53	68220	0.11
2011	539	0.13	3456	3994	405	140	32	3430	1440	81	5123	0	9522	54	8764	18286	52	142700	0.07
2012	610	0.16	3282	3892	156	60	24	2240	690	52	3066	0	7115	43	6871	13985	51	74110	0.10
2013	549	0.10	4949	5499	571	160	71	2360	1080	34	3705	0	9774	38	7079	16853	58	111800	0.09
2014	428	0.12	3107	3535	361	100	52	1130	390	16	1688	0	5584	30	9598	15182	37	93750	0.06
2015	496														9684				

Variations in numbers from previous assessments is due 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, 1991 to 2014.

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			20 510							
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	14 034			83 100	286 000	48 500	379 000	91 800
2004	1344	13 600	21 613			105 800	368 000	1 167 000	449 000	131 500
2005	1298	5200	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	7310	14 450	15 217		128 800		901 500	486 800	110 100
2009	1180	15 900	8643	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		10 943				842 000	104 081
2014	1590	11 100	29 175		11 522				230 743	59 792

Table 4.3.1.1 (continued). Estimated smolt production by smolt migration year in monitored rivers of eastern North America, 1991 to 2014.

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	9 283
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	8625	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	8 607
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	56 456	30 741	56 224	9901		45 630	19 771

Table 4.3.2.1. Estimated small salmon returns (medians, 5th percentile, 95th percentile) to the six geographic areas and overall for NAC, 1971 to 2014. 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	49230	135600	23630	62960	26540		
1971	64360	118800	18700	49760	18860	32	271400
1972	48440	110600	15580	62860	16980	18	255400
1973	13940	159800	20740	63160	24420	23	282300
1974	53970	120600	20970	98370	43640	55	338800
1975	103100	151000	22590	88340	33870	84	400100
1976	73850	158500	24940	128600	52890	186	440600
1977	65540	159700	22770	46300	46150	75	341800
1978	32850	139500	21200	41100	15810	155	251500
1979	42310	152000	27100	72370	48820	250	344100
1980	96000	172500	37220	63190	70610	818	441700
1981	105400	225400	52150	106600	59380	1130	552200
1982	73320	200700	29660	121400	36080	334	463400
1983	45880	156600	22500	37230	22610	295	286200
1984	24140	206400	24880	54310	42760	598	353800
1985	43130	195600	26460	86110	47420	392	400600
1986	65470	200400	37900	161500	49240	758	517300
1987	82040	135500	43450	122300	51280	1128	437800
1988	75540	217200	50020	172500	51890	992	570600
1989	51800	107600	39600	102800	54630	1258	359300
1990	30240	152300	45120	117100	55250	687	401900
1991	24240	105600	34990	85000	28240	310	279300
1992	34360	228900	39680	192900	33990	1194	532400
1993	45760	265700	34340	136300	25700	466	510000
1994	33810	161100	32680	67400	10470	436	306900
1995	47730	203900	26050	60680	19990	213	360000
1996	90050	313200	35140	55300	31780	651	528800
1997	95240	176900	26580	30560	9377	365	340200
1998	151700	183800	28240	38950	20390	403	423500
1999	147400	201300	29200	35430	10600	419	424300
2000	181800	228800	26770	50790	12360	270	500900
2001	145100	156300	18160	41890	5420	266	367300
2002	102500	155600	28570	68500	9851	450	365600
2003	85550	242500	24230	40420	5842	237	398800
2004	95090	210200	32980	74860	8397	319	421800
2005	220900	221600	22110	45480	7489	319	517800
2006	212900	212800	27000	56260	10280	450	519700
2007	194900	183600	20520	42310	7735	297	449300
2008	204000	247700	34380	61190	15360	814	563300
2009	89550	222700	19700	25390	4241	241	361900
2010	91830	267800	25480	73520	14890	525	473900
2011	247100	243500	35190	74480	9449	1080	610900
2012	173700	270400	22480	17750	609	26	485000
2013	189900	187800	20650	24700	2105	78	425300
2014	349200	249200	22620	16290	1414	110	639000

	5th percentile of estimates of returns						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	34160	120400	19370	53890	22810		
1971	44770	105500	15340	42650	16050	32	244300
1972	33710	97690	12780	53680	14080	18	231400
1973	9448	142000	16990	54170	20770	23	260800
1974	37570	106900	17210	83760	37190	55	309200
1975	71430	133000	18520	75540	30460	83	358300
1976	51220	138900	20460	110900	46600	184	401800
1977	45590	140100	18640	39950	40270	74	310000
1978	22890	121700	17390	36170	14480	154	228700
1979	29270	133100	22220	62540	42250	248	315800
1980	66350	152400	30540	54530	62710	811	400400
1981	72380	197700	42730	85490	51010	1120	498100
1982	50530	177100	24310	96300	31340	331	417500
1983	31810	137700	18430	29650	19830	292	259100
1984	16760	179500	22570	44710	36550	593	322800
1985	29820	168300	24010	68160	40150	389	362300
1986	45110	174700	34960	127300	41670	751	465200
1987	56440	118600	39710	97340	43300	1118	393000
1988	51830	190100	45980	136600	44100	983	514500
1989	35710	94780	36440	81000	46480	1247	325100
1990	20870	138200	41770	92900	46430	681	368800
1991	16560	96320	32430	67380	24500	307	255800
1992	24180	199800	36660	164500	29340	1183	488100
1993	33250	235200	31850	88960	21910	462	449800
1994	25170	138700	30330	57260	9358	432	279700
1995	35930	173400	24170	51890	17460	211	324600
1996	67880	269500	32720	47270	27500	645	475600
1997	73660	159200	24500	24720	8260	362	309400
1998	102900	171300	25750	33310	18740	399	372700
1999	100300	185600	26740	31030	9824	415	373900
2000	123700	216800	23700	44570	11330	268	441000
2001	98920	148100	16440	36800	5007	264	320300
2002	66290	143300	26340	59450	8997	446	325900
2003	51970	232900	22190	35050	5341	235	363200
2004	72310	192100	29470	64320	7638	316	389800
2005	166100	176200	19940	38100	6791	316	444200
2006	140400	194100	24820	46490	9297	446	444100
2007	138200	158700	18530	33270	6978	294	385500
2008	149100	222300	31410	48620	13880	807	500300
2009	43160	194500	17830	20100	3843	239	305200
2010	59470	256100	23120	64280	13410	520	437700
2011	148500	216500	32360	60260	8515	1070	507200
2012	112300	250400	20330	14200	550	26	419900
2013	112400	172400	18590	19120	1907	77	346100
2014	230700	218200	20440	13030	1271	109	516200

	95th percentile of estimates of returns						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	72950	150800	27880	72040	30300		
1971	95150	132000	22080	56950	21660	32	305400
1972	71640	123400	18390	72010	19850	18	283200
1973	19800	177600	24460	72170	28050	23	303900
1974	79460	134300	24770	112900	50030	55	371700
1975	153300	168900	26650	101100	37290	85	454700
1976	109100	178100	29440	146700	59190	188	484800
1977	96930	179200	26840	52610	52060	76	379200
1978	47970	157000	25040	46030	17140	156	275000
1979	62850	170900	31980	82190	55450	252	373900
1980	143100	192500	43940	71910	78540	825	493600
1981	157600	253300	61480	127400	67790	1140	615100
1982	109400	224100	34950	146400	40820	337	512700
1983	68200	175600	26530	44760	25410	298	316100
1984	35580	233200	27170	63830	48940	603	385000
1985	64410	222700	28920	104100	54790	396	440000
1986	97510	225900	40890	195500	56820	765	571100
1987	122600	152500	47220	147400	59250	1138	488100
1988	113300	244400	54050	208300	59610	1001	629300
1989	77130	120500	42770	124600	62740	1269	396100
1990	45160	166500	48440	141400	64070	693	435100
1991	36370	114900	37570	102700	31950	313	303000
1992	51120	257900	42710	221300	38650	1205	577000
1993	66700	295900	36830	183500	29510	470	570400
1994	48280	183500	35020	77460	11570	440	334700
1995	66940	234600	27910	69420	22520	215	396500
1996	127200	357100	37580	63350	36080	657	584600
1997	131000	194800	28660	36360	10500	368	379800
1998	199800	196200	30730	44610	22020	407	473600
1999	194700	216900	31690	39850	11360	423	474700
2000	240200	240800	29850	57050	13390	272	560600
2001	192000	164500	19880	47020	5832	268	414900
2002	138900	168100	30800	77550	10710	454	405300
2003	119100	252100	26280	45800	6347	239	434400
2004	117700	228100	36460	85390	9155	322	453600
2005	275300	267000	24270	52920	8191	322	591100
2006	286400	231200	29170	65980	11250	454	596100
2007	251100	208500	22510	51330	8489	300	512600
2008	258600	273100	37360	73720	16850	821	626400
2009	135800	251000	21570	30640	4640	243	418000
2010	124000	279300	27850	82730	16360	530	510000
2011	345900	270600	38020	88770	10390	1090	714200
2012	235100	290400	24650	21310	667	26	550000
2013	268200	203200	22720	30350	2304	79	505100
2014	467600	280500	24800	19590	1557	111	760700

Table 4.3.2.2. Estimated large salmon returns (medians, 5th percentile, 95th percentile) to the six geographic areas and overall for NAC, 1971 to 2014. 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	10130	14870	103400	69560	20290		
1971	14410	12570	59220	40050	15890	653	143200
1972	12390	12660	77340	56990	18990	1383	180100
1973	17350	17330	85180	53360	14750	1427	189900
1974	17100	14260	114400	77580	28560	1394	253800
1975	15920	18400	97120	50440	30610	2331	215400
1976	18290	16650	96550	48750	28800	1317	211000
1977	16290	14590	113700	87800	38070	1998	273000
1978	12750	11350	102500	43840	22260	4208	197300
1979	7265	7200	56510	17850	12810	1942	103800
1980	17380	12050	134300	62450	43730	5796	276200
1981	15680	28870	105500	39350	28210	5601	223700
1982	11560	11600	93510	54110	23660	6056	200900
1983	8354	12450	76870	40680	20610	2155	161300
1984	5988	12380	59150	32660	24530	3222	138100
1985	4737	10960	62300	44500	34170	5529	162400
1986	8174	12300	73510	68700	28240	6176	197400
1987	10980	8441	68990	46780	17690	3081	156300
1988	6901	12980	76260	53880	16440	3286	169900
1989	6639	6916	70800	42690	18510	3197	149000
1990	3827	10280	69630	56730	16030	5051	161600
1991	1870	7570	61010	57660	15650	2647	146500
1992	7544	31580	61040	60240	14280	2459	177400
1993	9440	17110	46450	64250	10060	2231	150000
1994	12930	17370	46460	41480	6318	1346	126400
1995	25520	19040	53010	48360	7500	1748	155700
1996	18830	28930	47510	41540	10870	2407	150600
1997	16190	27990	39320	36240	5579	1611	127400
1998	13460	35270	29040	30560	3847	1526	113700
1999	16130	32070	33290	27930	4942	1168	115500
2000	21960	27010	31570	30500	2872	533	114400
2001	23200	17850	33630	40360	4661	797	120500
2002	16920	16820	23290	23960	1584	526	83140
2003	14150	24460	38540	40630	3526	1199	122500
2004	17070	22150	32770	40200	3095	1316	116600
2005	21000	28410	32340	38000	2023	994	122700
2006	21120	35680	29240	38200	2987	1030	128300
2007	21870	29610	27100	35400	1594	958	116500
2008	26230	28840	33010	28960	3272	1799	122100
2009	39230	34440	32310	36430	3143	2095	147700
2010	13790	35330	35450	33080	2514	1098	121300
2011	57660	43470	44950	66210	4794	3087	220100
2012	33790	28840	31540	27080	1308	913	123500
2013	66460	37810	34790	36320	3174	525	179000
2014	77540	30820	19320	23580	759	340	152300

	5th percentile of estimates of returns						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	4970	11820	84780	67140	17980		
1971	7084	10010	48560	37600	14120	647	128400
1972	6096	10090	63300	48940	17120	1371	161500
1973	8491	13770	69880	45550	13420	1414	168800
1974	8384	12680	93710	65880	26300	1381	227000
1975	7837	16110	79600	43030	28000	2310	193000
1976	8983	14640	79180	41440	25970	1305	188100
1977	7996	12940	93250	75170	34610	1980	245800
1978	6245	10350	84020	38800	20570	4170	176100
1979	3577	6300	46350	15690	11590	1925	92130
1980	8508	11110	110100	54590	39580	5744	247800
1981	7672	25310	86530	32950	25460	5551	200300
1982	5665	10100	76720	42810	21510	6002	178200
1983	4093	11280	63030	33760	18390	2136	144300
1984	2958	9130	56160	23440	21160	3193	126400
1985	2322	7689	58430	31910	29340	5479	147400
1986	3997	9468	69490	49210	23830	6120	176000
1987	5408	6465	65520	34320	15020	3053	141100
1988	3386	9882	71640	39740	13720	3256	153700
1989	3264	5379	67110	31570	15630	3168	136000
1990	1877	8357	65270	39860	13500	5006	143600
1991	918	6150	57330	40010	13450	2623	128100
1992	3987	22190	57160	51480	12310	2437	163100
1993	5896	13800	44640	34930	8901	2211	119900
1994	8470	13800	44710	33290	5657	1334	115600
1995	18100	14680	51080	41300	6587	1732	143500
1996	13380	23720	45280	33220	9583	2385	138500
1997	11590	22950	37520	28550	4996	1596	116400
1998	7983	27400	27250	25080	3533	1512	102300
1999	9550	24960	31120	23550	4596	1157	104400
2000	13010	22960	28700	25870	2614	528	103000
2001	13800	15150	30670	35270	4262	790	108900
2002	9870	13710	20990	20120	1444	521	73970
2003	7423	19410	35280	34190	3188	1188	111200
2004	11580	16960	30240	32960	2823	1304	105700
2005	12150	20500	30060	31260	1835	985	108700
2006	13280	29950	27100	31430	2684	1021	116000
2007	12900	23430	24990	29890	1453	949	103800
2008	15880	22510	29850	23200	2920	1783	108000
2009	20720	23840	29880	30800	2847	2076	124800
2010	8145	28710	32900	27680	2283	1088	110500
2011	32890	31280	41910	52590	4316	3059	188400
2012	20560	23280	29160	22140	1170	905	107800
2013	40860	25940	32580	28460	2800	520	149100
2014	48590	24020	17970	18450	679	337	122100

	95th percentile of estimates of returns						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	17000	17900	122000	71970	22600		
1971	24280	15120	69820	42510	17650	659	158400
1972	20850	15220	91120	65060	20850	1395	198700
1973	29220	20890	100500	61180	16090	1440	211500
1974	28810	15840	134900	89370	30830	1407	280900
1975	26780	20700	114500	57790	33230	2352	237700
1976	30790	18640	113900	56090	31620	1329	234100
1977	27400	16270	134300	100400	41520	2016	300300
1978	21400	12340	120800	48870	23960	4246	218300
1979	12230	8100	66660	20030	14030	1959	115600
1980	29300	12990	158500	70330	47890	5848	304900
1981	26270	32450	124600	45730	30970	5651	247100
1982	19520	13110	110400	65410	25810	6110	223700
1983	14110	13620	90660	47590	22820	2174	178500
1984	10110	15620	62110	41990	27860	3251	149900
1985	7945	14200	66170	57200	39030	5579	177400
1986	13710	15150	77530	88080	32670	6232	218800
1987	18540	10430	72480	59270	20360	3109	171700
1988	11600	16080	80850	67850	19160	3316	186000
1989	11170	8449	74460	53860	21400	3226	162000
1990	6443	12200	73980	73570	18530	5096	179700
1991	3150	8985	64690	75360	17870	2671	164900
1992	12700	40960	64930	68970	16240	2481	191800
1993	15090	20400	48280	93190	11220	2251	179500
1994	20300	20920	48210	49670	6968	1358	137700
1995	37310	23410	54930	55450	8420	1764	169900
1996	27790	34100	49720	49830	12170	2429	163600
1997	23780	33030	41130	43840	6167	1625	138900
1998	18870	43080	30850	36000	4161	1540	125000
1999	22600	39230	35450	32310	5288	1179	126600
2000	30860	31010	34430	35140	3131	538	125900
2001	32630	20550	36580	45470	5054	804	132200
2002	23990	19930	25580	27830	1724	531	92230
2003	20930	29520	41810	46980	3863	1210	133800
2004	22490	27400	35290	47430	3367	1328	127500
2005	29800	36330	34610	44750	2211	1003	136900
2006	28900	41430	31410	44980	3288	1039	140500
2007	30920	35810	29220	40870	1737	967	129300
2008	36530	35190	36160	34690	3623	1815	136200
2009	57990	44920	34730	42020	3439	2114	170700
2010	19460	42020	38010	38490	2744	1108	132100
2011	82360	55610	47980	79850	5273	3115	251800
2012	47060	34410	33910	32060	1444	921	139200
2013	92110	49630	37010	44100	3548	530	209100
2014	106400	37590	20650	28690	837	343	182500

Table 4.3.2.3. Estimated 2SW salmon returns (medians, 5th percentile, 95th percentile) to the six geographic areas and overall for NAC, 1971 to 2014. 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	10130	4137	75490	59590	17130		
1971	14410	3580	43230	34820	13510	653	110500
1972	12390	3733	56460	49460	15980	1383	139700
1973	17350	4616	62180	47680	12910	1427	146700
1974	17100	3639	83530	67190	27110	1394	200400
1975	15920	5202	70900	42990	28860	2331	166600
1976	18290	4357	70480	40250	26630	1317	161900
1977	16290	3549	82970	80560	32300	1998	218100
1978	12750	3584	74820	36280	18770	4208	150800
1979	7265	1741	41250	12020	10520	1942	74960
1980	17380	3903	98020	56820	38660	5796	221200
1981	15680	7019	77010	24350	23210	5601	153400
1982	11560	3166	68260	41900	16730	6056	148100
1983	8354	3700	56110	31270	16490	2155	118300
1984	5988	3362	43180	29540	21470	3222	107000
1985	4737	2739	45480	35970	29700	5529	124300
1986	8174	3260	53660	57110	21390	6176	150000
1987	10980	2353	50360	35940	13650	3081	116700
1988	6901	3432	55670	42770	11780	3286	124100
1989	6639	1684	51680	28250	14640	3197	106300
1990	3827	2691	50830	37030	11650	5051	111200
1991	1870	2056	44530	36030	13030	2647	100200
1992	7544	8163	44560	38070	11990	2459	113000
1993	9440	4361	33910	43390	8091	2231	101800
1994	12930	4037	33920	30400	5167	1346	88250
1995	25520	3852	38700	39720	6827	1748	116800
1996	18830	5668	34680	29800	9202	2407	101000
1997	16190	6011	28710	24390	4579	1611	81940
1998	8788	6451	21200	16530	2604	1526	57120
1999	10540	6284	24300	16240	4193	1168	62710
2000	14350	6377	23040	17340	2377	533	64010
2001	15160	2503	24550	27340	4273	788	74610
2002	11060	2429	17000	14380	969	504	46350
2003	9252	3380	28140	26500	3330	1192	71790
2004	11160	3321	23920	25970	2690	1283	68340
2005	13720	4417	23610	26560	1694	984	70970
2006	13800	5378	21350	23020	2546	1023	67140
2007	14300	4167	19790	22830	1389	954	63420
2008	17130	3882	24100	19000	3057	1764	68920
2009	25460	4618	23590	24220	2666	2069	82640
2010	8944	4671	25880	20420	2016	1078	63010
2011	37360	3659	32820	53070	4638	3045	134600
2012	21930	2288	23030	19280	1082	879	68500
2013	43120	4812	25400	26210	2945	525	103000
2014	50310	5100	14100	16970	688.6	334	87510

	5th percentile of estimates of returns						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	4970	3086	61890	57550	15010		
1971	7084	2602	35450	32640	11890	647	98270
1972	6096	2715	46210	42440	14270	1371	124500
1973	8491	3461	51010	40650	11690	1414	129200
1974	8384	2861	68410	56950	24870	1381	178500
1975	7837	3867	58110	36640	26280	2310	148500
1976	8983	3320	57800	34230	23830	1305	143200
1977	7996	2862	68070	68940	28930	1980	195700
1978	6245	2922	61330	32170	17180	4170	134200
1979	3577	1341	33830	10590	9420	1925	65820
1980	8508	3187	80390	49740	34710	5744	198400
1981	7672	5481	63170	20360	20780	5551	135200
1982	5665	2521	56010	32760	14840	6002	130300
1983	4093	3022	46010	25750	14510	2136	105000
1984	2958	2445	40990	20820	18330	3193	96360
1985	2322	1917	42650	25260	25380	5479	111800
1986	3997	2380	50730	40670	18150	6120	132000
1987	5408	1659	47830	25920	11610	3053	104100
1988	3386	2445	52300	31250	9927	3256	111000
1989	3264	1246	48990	20690	12400	3168	96890
1990	1877	2009	47640	26340	9887	5006	99500
1991	918	1568	41850	24890	11150	2623	88450
1992	3987	5448	41720	32120	10270	2437	104600
1993	5896	3230	32590	23250	7191	2211	80860
1994	8470	2906	32640	24130	4651	1334	79620
1995	18100	2577	37290	33760	5999	1732	106200
1996	13380	4060	33060	23340	8116	2385	91620
1997	11590	4259	27390	18540	4122	1596	73490
1998	5217	4504	19890	12980	2393	1512	51410
1999	6241	4362	22720	13270	3913	1157	56790
2000	8502	4527	20950	14290	2160	528	56640
2001	9018	1697	22390	23560	3913	781	66860
2002	6450	1597	15320	11770	896	500	40570
2003	4857	2218	25750	21740	3010	1181	64600
2004	7537	2083	22070	20680	2464	1271	61420
2005	7939	2546	21940	21500	1542	975	62680
2006	8666	3553	19780	18490	2294	1014	59650
2007	8427	2641	18240	19060	1271	945	55960
2008	10370	2448	21790	14730	2730	1748	60240
2009	13440	2795	21810	20180	2423	2050	69570
2010	5277	3136	24020	16370	1838	1068	56850
2011	21360	2372	30590	41560	4183	3018	114200
2012	13350	1601	21290	15700	969	871	58820
2013	26500	3066	23780	20410	2592	520	85020
2014	31510	3026	13120	13200	615.3	331	68090

	95th percentile of estimates of returns						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	17000	5181	89050	61640	19250		
1971	24280	4572	50970	37010	15140	659	123600
1972	20850	4755	66520	56420	17700	1395	155100
1973	29220	5765	73360	54710	14130	1440	164700
1974	28810	4416	98490	77380	29380	1407	222500
1975	26780	6531	83580	49280	31460	2352	185000
1976	30790	5396	83140	46300	29430	1329	181100
1977	27400	4234	98020	92200	35660	2016	241000
1978	21400	4246	88190	40420	20390	4246	167600
1979	12230	2141	48660	13440	11610	1959	84270
1980	29300	4611	115700	63950	42590	5848	244400
1981	26270	8568	90920	28360	25650	5651	171800
1982	19520	3809	80580	50990	18620	6110	166000
1983	14110	4380	66180	36770	18480	2174	131800
1984	10110	4281	45340	38300	24610	3251	117700
1985	7945	3575	48300	46730	34020	5579	136800
1986	13710	4142	56590	73610	24620	6232	168000
1987	18540	3046	52910	46010	15690	3109	129600
1988	11600	4417	59020	54250	13620	3316	137100
1989	11170	2125	54360	35830	16890	3226	115800
1990	6443	3376	54010	47680	13420	5096	122900
1991	3150	2547	47230	47120	14920	2671	112000
1992	12700	10880	47400	43980	13680	2481	121900
1993	15090	5485	35250	63420	8985	2251	122600
1994	20300	5186	35200	36690	5684	1358	97740
1995	37310	5121	40100	45660	7658	1764	129900
1996	27790	7280	36290	36320	10290	2429	111900
1997	23780	7780	30020	30280	5033	1625	91420
1998	12490	8382	22520	20090	2816	1540	62850
1999	14970	8209	25880	19220	4472	1179	68750
2000	20430	8225	25140	20350	2596	538	71530
2001	21600	3308	26710	31140	4633	795	82620
2002	15870	3255	18670	17000	1042	509	52260
2003	13830	4527	30520	31230	3647	1203	79050
2004	14940	4551	25760	31220	2916	1295	75260
2005	19710	6274	25260	31630	1848	993	79410
2006	19160	7184	22930	27530	2799	1032	74660
2007	20450	5689	21330	26580	1509	963	71110
2008	24180	5316	26400	23210	3381	1780	77790
2009	37940	6447	25350	28270	2911	2088	96140
2010	12750	6197	27740	24470	2195	1088	69250
2011	53990	4951	35030	64610	5095	3072	155600
2012	30850	2968	24750	22840	1194	887	78420
2013	60410	6559	27020	32000	3298	530	121600
2014	69910	7158	15080	20800	761	337	107600

Table 4.3.3.1. Estimated small salmon spawners (medians, 5th percentile, 95th percentile) to the six geographic areas and overall for NAC, 1971 to 2014. 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	45220	105200	13810	39300	18400		
1971	60430	92070	11670	32610	12170	29	209800
1972	45490	86220	10270	40200	10800	17	193900
1973	6443	124400	13740	45630	18330	13	208700
1974	51470	93990	12580	76210	33120	40	268600
1975	99170	117600	14490	67260	26150	67	326000
1976	68120	124100	16220	90040	40730	151	340900
1977	60940	125300	15010	24770	32140	54	259500
1978	30160	110800	14310	22750	9023	127	188100
1979	38200	120700	19820	49720	36510	247	266400
1980	92200	136500	26010	43510	49550	722	349900
1981	100200	178900	38720	69980	40260	1009	431300
1982	69210	158700	21100	89220	24420	290	365000
1983	41500	124300	15040	23780	14830	255	220800
1984	21200	167000	20380	21810	32740	540	264500
1985	40030	158900	20100	60010	36210	363	317100
1986	62000	162700	27710	122200	39500	660	416900
1987	76670	111000	32780	89950	41090	1087	354600
1988	70010	177400	36380	127400	42180	923	456700
1989	47110	89130	30700	69520	43550	1080	282700
1990	26930	122300	32800	84350	44080	617	312300
1991	21910	85080	25230	66490	22280	235	222000
1992	31600	205400	27380	159900	26290	1124	453000
1993	43080	239200	22010	112700	20490	444	439900
1994	30890	129900	20730	44960	9133	427	237100
1995	44910	171300	17710	48110	17880	213	301500
1996	87100	275000	23170	34220	28240	651	450800
1997	92650	151900	17970	19120	8352	365	291500
1998	149200	158300	21200	24890	19930	403	373900
1999	144900	176400	23750	21320	10200	419	377000
2000	178600	204800	21060	31230	11990	270	448100
2001	142600	133600	13660	25830	5088	266	321100
2002	99940	132900	21350	43800	9548	450	307900
2003	82940	219600	19320	24930	5597	237	352600
2004	92690	188500	26300	48220	8136	319	364100
2005	218200	196800	18290	28360	7297	319	469400
2006	210700	191000	21610	36590	10030	450	470300
2007	192700	167700	16720	27430	7535	297	412300
2008	201400	217500	26690	39450	15130	814	501000
2009	87850	197200	16230	15530	4083	241	321300
2010	89880	235200	20490	47420	14780	525	408300
2011	244900	214200	27830	48630	9364	1080	546200
2012	172000	246800	18390	10750	590	26	448500
2013	188100	163300	17700	15150	2079	78	386500
2014	347600	229100	18890	10500	1403	110	607700

	5th percentile of estimates of spawners						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	30140	89920	11320	30300	14640		
1971	40840	78830	9566	25510	9342	29	182900
1972	30760	73330	8419	31040	7939	17	170200
1973	1956	106500	11260	36690	14660	13	187400
1974	35060	80340	10320	61620	26710	40	239300
1975	67450	99610	11900	54500	22750	66	284100
1976	45490	104400	13300	72190	34470	150	301800
1977	40990	105700	12300	18640	26250	54	227900
1978	20200	93210	11730	17960	7694	126	165800
1979	25150	101900	16260	40110	29920	245	238600
1980	62550	116400	21330	35050	41640	716	309200
1981	67190	151000	31720	49240	31870	1000	377300
1982	46430	135400	17300	64190	19660	287	319700
1983	27440	105200	12330	16220	12030	253	193600
1984	13820	140200	18080	12330	26610	535	233700
1985	26720	131600	17640	42280	28910	360	278700
1986	41640	137400	24750	88190	31940	654	365200
1987	51070	93980	29060	65130	33160	1077	309700
1988	46300	150300	32310	91940	34390	915	400900
1989	31030	76300	27530	47770	35470	1070	248400
1990	17560	108200	29480	60390	35230	612	279400
1991	14230	75790	22660	48900	18570	233	198800
1992	21420	176600	24360	131600	21660	1114	408900
1993	30560	208900	19520	65510	16700	440	379500
1994	22250	107500	18380	35230	8043	423	210000
1995	33110	140600	15830	39420	15350	211	265900
1996	64940	230600	20750	28270	23940	645	397700
1997	71070	134000	15900	14690	7227	362	260800
1998	100400	145900	18710	20530	18300	399	323400
1999	97810	160700	21250	17890	9432	415	326800
2000	120400	192800	18000	26330	10970	268	388300
2001	96400	125300	12120	21920	4686	264	274200
2002	63710	120600	19130	36650	8702	446	268800
2003	49360	210000	17280	21010	5097	235	317300
2004	69910	170400	22790	40000	7398	316	332900
2005	163400	152000	16120	23000	6610	316	395900
2006	138100	172300	19420	29170	9063	446	394900
2007	135900	142700	14730	20930	6787	294	349000
2008	146500	192200	23740	29730	13650	807	438700
2009	41460	168800	14360	11520	3692	239	264800
2010	57520	223700	18130	40430	13320	520	372700
2011	146300	187200	24980	38060	8429	1070	443100
2012	110600	226800	16220	7950	532	26	383300
2013	110600	147800	15630	10950	1881	77	307500
2014	229100	198100	16700	7926	1261	109	485300

	95th percentile of estimates of spawners						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	68930	120500	16300	48350	22120		
1971	91220	105400	13780	39730	14970	29	243800
1972	68690	99040	12110	49400	13700	17	221900
1973	12310	142100	16210	54560	21960	13	230100
1974	76960	107700	14840	90720	39520	40	301200
1975	149300	135500	17120	80140	29560	68	380100
1976	103400	143800	19150	107900	47040	152	384600
1977	92340	144800	17700	30890	38040	54	296600
1978	45280	128500	16880	27590	10350	128	211600
1979	58730	139600	23390	59260	43090	249	296100
1980	139300	156500	30700	51980	57540	729	401700
1981	152400	206700	45660	90690	48660	1018	493600
1982	105300	182000	24890	114200	29150	293	414000
1983	63830	143100	17750	31290	17630	257	250500
1984	32650	193800	22670	31350	38920	545	295400
1985	61310	186200	22550	77850	43530	366	356500
1986	94050	188200	30680	156100	47080	666	470500
1987	117200	128000	36540	114700	49060	1097	404900
1988	107800	204700	40420	162800	49910	931	515200
1989	72440	102000	33870	91170	51670	1090	319100
1990	41850	136500	36110	108500	52860	623	345500
1991	34050	94300	27790	84000	26020	237	245800
1992	48360	234500	30390	188000	30960	1134	497400
1993	64020	269300	24490	160100	24260	448	500200
1994	45360	152000	23070	54690	10220	431	264600
1995	64110	201900	19590	56770	20400	215	337900
1996	124200	319100	25590	40150	32530	657	506900
1997	128400	169600	20050	23570	9464	368	330600
1998	197300	170800	23680	29270	21570	407	424000
1999	192200	192100	26220	24760	10970	423	427300
2000	236900	216800	24130	36120	13020	272	507500
2001	189500	141700	15210	29730	5498	268	368500
2002	136300	145300	23580	50990	10400	454	347300
2003	116500	229200	21350	28870	6093	239	387900
2004	115300	206400	29780	56470	8887	322	395200
2005	272600	242100	20440	33740	7985	322	542600
2006	284200	209500	23780	43950	11000	454	546400
2007	248900	192600	18710	33900	8274	300	474800
2008	256100	242800	29670	49120	16600	821	563100
2009	134100	225600	18090	19570	4470	243	377300
2010	122100	246800	22870	54360	16250	530	443800
2011	343700	241200	30640	59190	10300	1090	649000
2012	233400	266900	20540	13590	649	26	513500
2013	266400	178700	19760	19350	2278	79	466300
2014	466000	260600	21070	13060	1546	111	730100

Table 4.3.3.2. Estimated large salmon spawners (medians, 5th percentile, 95th percentile) to the six geographic areas and overall for NAC, 1971 to 2014. 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	9568	12720	39160	11900	7870		
1971	13930	10970	20240	11830	8197	490	65800
1972	11970	11290	39650	33290	11990	1038	109600
1973	16340	15420	40380	35360	7609	1100	116600
1974	16290	13050	49050	55720	15220	1147	151000
1975	15590	17160	40740	33740	17860	1942	127400
1976	17460	15600	38790	29170	16970	1126	119500
1977	15010	11840	55820	55550	21550	643	161000
1978	11990	9779	51190	19410	10870	3314	106900
1979	6656	6637	21930	8786	7935	1509	53620
1980	16490	10130	60890	34430	23930	4263	150600
1981	15160	27500	44770	16030	12730	4334	120900
1982	10940	10350	45360	27050	10400	4643	109100
1983	7926	11070	29670	18070	5727	1769	74500
1984	5478	11880	37090	28480	20020	2547	105700
1985	4443	10910	35450	43260	28530	4884	127700
1986	7707	12230	40650	66450	24900	5570	157800
1987	10350	8395	36040	44150	16050	2781	118100
1988	6191	12920	43160	52100	14780	3038	132400
1989	6178	6899	41140	40760	18120	2800	116100
1990	3470	10230	40940	54890	15250	4356	129300
1991	1777	7531	33080	56390	14120	2416	115300
1992	6762	31380	32370	58360	12980	2292	144500
1993	9053	16950	24960	63070	8768	2065	125400
1994	12440	16900	24470	40460	5427	1344	101500
1995	25060	18590	34610	47660	7101	1748	135300
1996	18450	28350	30050	40340	9952	2407	130000
1997	15980	27570	24830	34920	4904	1611	110300
1998	13140	34900	23020	29620	3474	1526	105700
1999	15720	31800	27920	26460	4445	1168	107500
2000	21550	26500	26710	29440	2650	1587	108400
2001	22710	17500	27490	38940	4363	1491	112500
2002	16610	16510	20720	23050	1373	511	78810
2003	13790	24120	33780	39340	3292	1192	115600
2004	16660	21810	28160	38830	2962	1283	109700
2005	20580	27900	28090	36570	1900	1088	116100
2006	20780	35250	26070	36840	2811	1419	123200
2007	21510	29270	23570	34030	1468	1189	111100
2008	25880	28340	29830	27630	3159	2231	117100
2009	38890	34180	28720	35000	3005	2318	142100
2010	13490	34800	32030	31650	2365	1502	115800
2011	57440	42780	40260	64370	4704	3914	213500
2012	33680	28530	28490	26070	1249	2054	120100
2013	66210	37330	31570	34830	3137	525	173600
2014	77380	30530	17770	22990	742	572	150100

	5th percentile of estimates of spawners						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	4408	9691	32100	9630	5564		
1971	6598	8430	16600	9424	6433	486	56120
1972	5672	8717	32550	25490	10100	1029	96020
1973	7482	11850	33100	27810	6277	1090	101200
1974	7581	11470	40250	44340	12940	1137	132500
1975	7510	14870	33430	26410	15240	1925	112500
1976	8153	13580	31820	22140	14150	1116	104300
1977	6710	10190	45780	43310	18120	637	141200
1978	5478	8780	41960	14630	9167	3284	93410
1979	2968	5730	17980	6676	6719	1495	47090
1980	7619	9188	49970	26850	19770	4225	132700
1981	7152	23920	36690	9794	9994	4295	106100
1982	5044	8852	37190	15760	8260	4601	92420
1983	3665	9896	24320	11210	3510	1753	63650
1984	2448	8641	34130	19170	16670	2524	93930
1985	2028	7652	31570	30710	23710	4840	112700
1986	3530	9379	36620	47190	20450	5520	136500
1987	4775	6423	32560	31650	13390	2756	102900
1988	2676	9833	38600	38020	12080	3011	116300
1989	2803	5364	37470	29640	15220	2775	103100
1990	1520	8310	36540	38050	12740	4317	111200
1991	825	6108	29380	38630	11910	2394	96920
1992	3205	22060	28480	49700	11010	2271	130200
1993	5509	13640	23150	33930	7608	2046	95380
1994	7980	13370	22700	32260	4783	1332	90720
1995	17640	14230	32700	40630	6184	1732	123100
1996	12990	23180	27830	32140	8664	2385	118000
1997	11370	22490	23020	27400	4320	1596	99510
1998	7671	27030	21240	24240	3163	1512	94390
1999	9137	24630	25760	22110	4098	1157	96330
2000	12610	22470	23830	24860	2391	1573	97050
2001	13310	14780	24860	33860	3969	1478	101000
2002	9565	13410	18420	19210	1236	506	69690
2003	7068	19030	30520	32990	2957	1181	104300
2004	11170	16630	25630	31660	2692	1271	98800
2005	11730	19950	25820	29890	1714	1078	101900
2006	12940	29490	23920	30170	2514	1406	110900
2007	12540	23060	21470	28590	1329	1178	98430
2008	15530	21950	26660	21960	2810	2211	103000
2009	20390	23570	26290	29470	2713	2297	119300
2010	7840	28160	29480	26310	2135	1488	105100
2011	32660	30690	37230	50740	4228	3879	181700
2012	20450	22990	26110	21150	1111	2035	104400
2013	40620	25460	29340	27080	2763	520	143800
2014	48440	23780	16430	17860	663	567	119800

	95th percentile of estimates of spawners						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	16440	15770	46160	14160	10180		
1971	23800	13530	23880	14230	9960	494	77140
1972	20430	13840	46800	41120	13850	1047	123600
1973	28210	18990	47610	42940	8947	1110	133000
1974	28000	14620	57900	67210	17480	1157	170000
1975	26450	19470	48110	40980	20460	1959	143100
1976	29960	17610	45760	36210	19800	1136	135900
1977	26120	13500	65870	67850	25030	649	180900
1978	20640	10780	60400	24190	12570	3344	120700
1979	11630	7540	25880	10890	9153	1523	60550
1980	28410	11070	71910	42010	28070	4301	169200
1981	25750	31080	52810	22260	15490	4373	136400
1982	18900	11860	53540	38300	12530	4685	126000
1983	13680	12250	34980	24930	7944	1785	85490
1984	9602	15100	40050	37770	23360	2570	117500
1985	7651	14190	39330	56010	33380	4928	142700
1986	13240	15070	44650	85770	29330	5620	179000
1987	17910	10370	39530	56520	18720	2806	133300
1988	10890	16020	47760	66160	17520	3065	148600
1989	10710	8435	44810	51810	21010	2825	129100
1990	6086	12140	45290	71740	17770	4395	147300
1991	3057	8954	36750	74030	16340	2438	133700
1992	11920	40750	36240	67020	14950	2313	158800
1993	14700	20280	26760	92220	9923	2084	155100
1994	19810	20460	26220	48640	6076	1356	112900
1995	36850	22970	36550	54660	8014	1764	149500
1996	27410	33510	32260	48540	11240	2429	142900
1997	23570	32600	26620	42460	5491	1625	121700
1998	18560	42760	24840	35000	3785	1540	117000
1999	22190	38940	30090	30810	4791	1179	118600
2000	30460	30530	29580	34020	2907	1601	119900
2001	32150	20180	30110	43990	4756	1504	124100
2002	23680	19630	23010	26890	1510	516	87940
2003	20570	29170	37060	45680	3628	1203	126800
2004	22080	27020	30660	45940	3230	1295	120600
2005	29380	35800	30370	43300	2085	1098	130300
2006	28560	40990	28240	43490	3113	1432	135300
2007	30560	35450	25700	39460	1606	1200	123700
2008	36180	34650	32970	33290	3510	2251	131100
2009	57650	44640	31140	40530	3299	2339	165200
2010	19160	41420	34600	36970	2595	1515	126600
2011	82140	54990	43280	77910	5181	3949	245000
2012	46960	34110	30870	31000	1385	2072	135800
2013	91870	49160	33780	42550	3512	530	203500
2014	106300	37300	19110	28090	820	577	180100

Table 4.3.3.3. Estimated 2SW salmon spawners (medians, 5th percentile, 95th percentile) to the six geographic areas and overall for NAC, 1971 to 2014. 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	9568	3237	28590	9977	6497		
1971	13930	2978	14780	10430	7066	490	49740
1972	11970	3143	28950	29230	10380	1038	85010
1973	16340	3840	29480	32200	6697	1100	89940
1974	16290	3138	35800	48950	14080	1147	119800
1975	15590	4706	29740	28910	16340	1942	97550
1976	17460	3978	28310	24100	15500	1126	90770
1977	15010	2767	40750	51340	18840	643	129800
1978	11990	3055	37370	15950	9406	3314	81400
1979	6656	1615	16010	5767	6678	1509	38360
1980	16490	3267	44450	31490	21320	4263	121700
1981	15160	6594	32680	9768	10360	4334	79100
1982	10940	2767	33110	21250	7811	4643	80860
1983	7926	3282	21660	13950	4209	1769	53030
1984	5478	3177	27070	26030	17510	2547	82020
1985	4443	2728	25880	34980	24630	4884	97710
1986	7707	3227	29670	55330	18430	5570	120200
1987	10350	2332	26310	33990	12220	2781	88330
1988	6191	3410	31500	41410	10330	3038	96130
1989	6178	1679	30030	27000	14300	2800	82200
1990	3470	2669	29890	35860	11010	4356	87370
1991	1777	2047	24150	35070	11650	2416	77210
1992	6762	8110	23630	36900	10820	2292	88790
1993	9053	4313	18220	42780	6929	2065	83760
1994	12440	3882	17860	29720	4390	1344	70070
1995	25060	3703	25270	39170	6469	1748	101800
1996	18450	5500	21930	28980	8383	2407	86080
1997	15980	5881	18120	23570	3971	1611	69570
1998	8585	6363	16810	16040	2273	1526	51610
1999	10270	6201	20380	15430	3732	1168	57210
2000	14080	6220	19500	16750	2178	1587	60290
2001	14850	2433	20070	26410	4007	1491	69280
2002	10860	2376	15130	13850	786.6	511	43510
2003	9018	3306	24660	25670	3119	1192	67000
2004	10890	3247	20550	25120	2574	1283	63650
2005	13450	4332	20510	25610	1588	1088	66580
2006	13580	5283	19030	22200	2395	1419	63920
2007	14060	4102	17210	21950	1279	1189	59790
2008	16910	3774	21780	18150	2961	2809	66380
2009	25230	4553	20960	23330	2546	2292	78880
2010	8746	4565	23390	19580	1883	1482	59660
2011	37220	3627	29390	51630	4557	3872	130300
2012	21870	2264	20790	18590	1030	2020	66560
2013	42960	4741	23040	25130	2911	525	99330
2014	50210	5048	12970	16580	672.6	566	86040

	5th percentile of estimates of spawners						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	4408	2300	23430	8169	4694		
1971	6598	2084	12120	8273	5600	486	41030
1972	5672	2211	23760	22360	8729	1029	73110
1973	7482	2788	24160	25360	5534	1090	76490
1974	7581	2429	29380	38940	11930	1137	103700
1975	7510	3448	24410	22650	13860	1925	84540
1976	8153	2991	23230	18310	12910	1116	77400
1977	6710	2183	33420	39930	15710	637	112200
1978	5478	2471	30630	12050	7930	3284	70180
1979	2968	1235	13130	4386	5647	1495	32910
1980	7619	2640	36480	24540	17710	4225	106200
1981	7152	5103	26790	5842	8250	4295	67210
1982	5044	2166	27150	12110	6198	4601	67220
1983	3665	2653	17750	8500	2658	1753	44090
1984	2448	2276	24920	17310	14540	2524	71470
1985	2028	1902	23050	24250	20540	4840	85230
1986	3530	2348	26730	38900	15300	5520	102200
1987	4775	1641	23770	24000	10220	2756	75670
1988	2676	2422	28180	30020	8522	3011	83200
1989	2803	1239	27360	19470	12060	2775	72840
1990	1520	1989	26680	25170	9262	4317	75660
1991	825	1560	21450	24050	9828	2394	65510
1992	3205	5416	20790	31020	9156	2271	80280
1993	5509	3183	16900	22610	6048	2046	62780
1994	7980	2775	16570	23440	3901	1332	61500
1995	17640	2460	23870	33250	5647	1732	91280
1996	12990	3906	20320	22580	7316	2385	76700
1997	11370	4127	16800	17780	3534	1596	61150
1998	5012	4428	15500	12530	2073	1512	45910
1999	5971	4274	18800	12480	3458	1157	51240
2000	8238	4383	17400	13740	1966	1573	52990
2001	8701	1650	18150	22650	3657	1478	61550
2002	6252	1558	13450	11250	719	506	37730
2003	4626	2174	22280	21000	2803	1181	59810
2004	7274	2025	18710	19900	2353	1271	56830
2005	7664	2479	18850	20620	1440	1078	58310
2006	8446	3485	17460	17730	2148	1406	56490
2007	8194	2583	15670	18210	1165	1178	52340
2008	10140	2370	19460	13980	2635	2784	57720
2009	13220	2742	19190	19290	2311	2271	65910
2010	5081	3061	21520	15570	1708	1469	53510
2011	21210	2351	27180	40210	4102	3837	109800
2012	13280	1587	19060	15030	917	2002	56890
2013	26340	3020	21420	19400	2558	520	81320
2014	31410	2969	12000	12810	599	561	66660

	95th percentile of estimates of spawners						
Year	1-LAB	2-NFLD	3-QC	4-GF	5-SF	6-USA	7-NAC
1970	16440	4166	33690	11790	8295		
1971	23800	3875	17430	12570	8522	494	60390
1972	20430	4071	34160	36080	12020	1047	97370
1973	28210	4901	34750	39090	7859	1110	104800
1974	28000	3846	42270	58970	16220	1157	136900
1975	26450	5964	35120	35140	18840	1959	111700
1976	29960	4963	33400	29890	18110	1136	105700
1977	26120	3356	48080	62750	21970	649	147800
1978	20640	3639	44090	19850	10890	3344	93270
1979	11630	1998	18890	7149	7709	1523	44430
1980	28410	3888	52490	38380	24900	4301	138200
1981	25750	8073	38550	13660	12490	4373	92320
1982	18900	3370	39090	30310	9437	4685	94810
1983	13680	3909	25540	19420	5745	1785	62230
1984	9602	4064	29240	34750	20470	2570	92590
1985	7651	3557	28710	45740	28750	4928	110100
1986	13240	4106	32590	71770	21590	5620	138200
1987	17910	3026	28860	43970	14200	2806	101300
1988	10890	4392	34870	52810	12140	3065	109100
1989	10710	2119	32710	34530	16530	2825	91650
1990	6086	3349	33060	46460	12750	4395	99020
1991	3057	2534	26830	46250	13490	2438	88940
1992	11920	10820	26450	42770	12470	2313	97520
1993	14700	5439	19540	62810	7813	2084	104500
1994	19810	5004	19140	36000	4880	1356	79540
1995	36850	4958	26680	45100	7286	1764	114900
1996	27410	7078	23550	35380	9448	2429	96910
1997	23570	7624	19440	29360	4412	1625	79040
1998	12280	8279	18130	19550	2474	1540	57360
1999	14690	8122	21970	18380	4007	1179	63160
2000	20160	8044	21590	19730	2392	1601	67770
2001	21270	3224	21980	30150	4359	1504	77120
2002	15670	3197	16790	16440	853	516	49400
2003	13590	4450	27050	30390	3435	1203	74250
2004	14660	4467	22380	30320	2794	1295	70550
2005	19430	6179	22170	30600	1736	1098	74920
2006	18930	7095	20610	26680	2640	1432	71450
2007	20210	5617	18760	25690	1394	1200	67440
2008	23950	5187	24070	22320	3283	2834	75190
2009	37720	6368	22730	27340	2783	2313	92490
2010	12550	6081	25260	23560	2058	1495	65830
2011	53840	4898	31600	62990	5011	3907	151200
2012	30780	2949	22530	22130	1143	2038	76520
2013	60250	6473	24660	30830	3264	530	117900
2014	69810	7100	13950	20330	746	571	106200

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, 1991 to 2013. 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	SF			Gulf				Québec				Nfld					
	Narraguagus	Nashwaak	LaHave	St.Mary's	Margaree	NWMiramichi	SWMiramcihi	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	3.1	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	1.7	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	0.19	1.6	0.6							0.9		0.6		1.9	5.3		10	7.2

Table 4.3.5.2. Return rates (%), by year of smolt migration, of wild Atlantic salmon to 2SW salmon to North American rivers, 1991 to 2012. 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	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			0.3							0.4		0.5	0.9
1997	0.84		0.5									1.1	1.2
1998	0.29	0.7	0.4							0.4		0.7	1.1
1999	0.50	0.8	1.0			1.2				0.7		0.2	0.7
2000	0.15	0.3	0.2			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	0.6		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			3.0	0.5	0.8	0.7		1.1		0.7	
2005	0.71	1.5	0.7	0.2	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	0.0	2.1		0.8			0.5		0.3	
2008	0.63	2.1	0.4		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	

Table 4.3.5.3. Return rates (%), by year of smolt migration, of hatchery Atlantic salmon to 1SW salmon to North American rivers, 1991 to 2013. The year 1991 was selected for illustration as it is the first year of the commercial fishery moratorium for the island of Newfoundland.

	USA			SF				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								

Table 4.3.5.4. Return rates (%), by year of smolt migration, of hatchery Atlantic salmon to 2SW salmon to North American rivers, 1991 to 2012. 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			SF				GULF				QUÉBEC
	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								

Table 4.3.6.1. Estimates (medians, 5th percentiles, 95th percentiles) of Pre-fishery 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 Pre-fishery Abundance 1971 to 2014.

	Median			5th percentile			95th percentile		
Year of PFA	1SW maturing	1SW non-maturing	1SW cohort	1SW maturing	1SW non-maturing	1SW cohort	1SW maturing	1SW non-maturing	1SW cohort
1971	520000	713700	1235000	484800	650200	1165000	560600	778900	1306000
1972	520800	740500	1262000	491200	685000	1204000	553700	801900	1326000
1973	666900	901800	1569000	635900	821100	1488000	698300	985500	1654000
1974	699200	811900	1512000	662100	751100	1446000	739500	877500	1583000
1975	798500	904900	1705000	746300	839500	1627000	861500	974800	1790000
1976	798600	835500	1635000	751700	766200	1556000	849800	911100	1720000
1977	636500	667300	1304000	595100	606600	1236000	682100	730100	1375000
1978	410800	396800	807800	383000	368200	770800	439600	427000	846300
1979	589700	837300	1427000	557500	772200	1356000	623600	908900	1504000
1980	832700	711400	1545000	781800	655500	1476000	892800	771600	1621000
1981	911400	666700	1579000	849400	621200	1507000	981800	715700	1659000
1982	766100	560500	1327000	715000	523700	1267000	820900	599800	1391000
1983	511200	329800	841600	479900	300500	801300	545400	361700	884700
1984	538500	349200	888000	504800	318400	842800	572500	382900	934500
1985	657000	521600	1179000	615500	479300	1121000	699900	567600	1240000
1986	833300	555000	1389000	777000	508200	1318000	891700	604400	1462000
1987	798600	504500	1304000	747400	468000	1245000	855400	543400	1367000
1988	846600	411900	1259000	786500	379800	1192000	909100	446100	1328000
1989	593200	323900	917300	555400	295900	872000	633600	354100	965500
1990	560100	285800	846100	524700	261500	803000	595500	312500	890600
1991	413300	317800	731100	388000	296000	697600	438700	341300	766000
1992	575500	206500	782100	529500	174500	724600	621800	240800	841400
1993	543800	145600	689800	481600	128900	624100	606400	164600	756000
1994	327400	179300	507200	299200	158200	470200	356200	203900	545500
1995	379900	177000	557200	343200	158700	515200	417700	197800	601000
1996	553400	150000	703800	498400	134600	645800	611200	167900	764900
1997	360600	102000	463100	328600	91620	428300	401600	113600	505400
1998	440300	95010	535500	387900	83940	481100	492200	107300	589700
1999	440800	99950	541000	388600	87350	486300	492800	114000	595600
2000	522000	114500	636800	460200	100700	572500	583800	130100	701600
2001	384000	78560	462800	335400	68950	412500	433200	89250	513700
2002	383000	107500	490600	342000	94510	446600	424100	121900	535200
2003	418300	104700	523200	381400	92210	482900	455200	118500	563900
2004	444000	108900	553100	410900	94780	516100	477000	124600	590500
2005	544900	103800	649000	468800	90790	571200	620400	118100	726300
2006	546900	99000	646100	468900	86260	566500	625900	113200	727200
2007	472600	110500	583300	406800	95940	515000	538000	126600	651500
2008	591400	130300	722100	526200	109700	652300	656500	153200	792300
2009	382100	101900	484300	323600	90560	424400	439900	114600	543700
2010	499100	205500	705000	461500	173300	652900	536600	241100	758900
2011	641900	110400	752500	534800	94700	643400	748600	127800	861500
2012	510300	161500	671900	442900	133800	597200	577400	192100	747900
2013	447900	140400	588500	366100	111700	499200	530200	172000	678800
2014	668600			542000			794200		

Table 4.6.1.1. Updated forecasts, expressed as the 5th and 25th percentile of the posterior distributions, for returns of 2SW salmon to regions and overall in North America in 2015, relative to the management objectives for the regions. For NAC, the objective shown is the sum of 2SW conservation limits for all regions.

Region	5th percentile	25th percentile	Management objective
Labrador	16 440	30 340	34 746
Newfoundland	1 702	2 988	4022
Québec	8 920	12 780	29 446
Gulf	7 494	12 560	30 430
Scotia-Fundy	236	479	10 976
USA	183	358	4549
North America	46 240	68 890	152 548

Table 4.7.1.1. Probabilities that the returns of 2SW salmon to the six regions of NAC will meet or exceed the 2SW objectives for the six regions in NAC and simultaneously for all regions in the absence of any fishing on the age group for the 2SW salmon return years 2015 to 2018.

Region	2SW Objective to NAC	Probability of meeting 2SW objectives in the absence of fisheries (2SW return year)			
		2015	2016	2017	2018
Labrador	34 746	0.820	0.845	0.743	0.852
Newfoundland	4 022	0.639	0.639	0.547	0.408
Québec	29 446	0.074	0.181	0.304	0.292
Gulf	30 430	0.186	0.487	0.563	0.315
Scotia-Fundy	10 976	0.000	0.008	0.009	0.013
USA	4 549	0.002	0.010	0.003	0.002
Simultaneous to North America		0.000	0.000	0.001	0.001

Table 4.7.1.2. Predicted abundance (5th percentile upper table, 25th percentile middle table; median value lower table) of the 1SW non-maturing salmon at the PFA stage by region of North America for the 2015 to 2017 PFA years relative to the management objectives for the regions. The management objectives are adjusted for natural mortality for the eleven months between the PFA stage and returns to homewaters in North America. For North America, the objective shown is the sum of the 2SW conservation limits to all six regions (corrected for M).

Region	Objective (corrected for M)	5th percentile of regional PFA		
		2015	2016	2017
Labrador	47 955	30 080	20 590	26 560
Newfoundland	5594	2 408	1 674	1 109
Québec	40 958	12 830	12 470	10 410
Gulf	42 327	14 400	13 300	7 063
Scotia-Fundy	15 267	455	250	175
USA	6328	185	58	24
North America	212 189	89 960	78 850	74 140

Region	Objective (corrected for M)	25th percentile of regional PFA		
		2015	2016	2017
Labrador	47 955	62 000	47 370	68 950
Newfoundland	5594	4 545	3 622	2 596
Québec	40 958	20 030	21 630	19 320
Gulf	42 327	26 970	28 830	15 660
Scotia-Fundy	15 267	1 079	685	555
USA	6328	439	164	77
North America	212 189	141 600	132 400	137 700

Region	Objective (corrected for M)	median of regional PFA		
		2015	2016	2017
Labrador	47 955	101 000	83 550	128 000
Newfoundland	5 594	7 111	6 134	4 520
Québec	40 958	27 160	30 950	29 310
Gulf	42 327	41 430	47 610	27 970
Scotia-Fundy	15 267	1 922	1 335	1 195
USA	6328	793	339	173
North America	212 189	195 100	193 600	213 000

Table 4.9.1. Correspondence between ICES areas used for the assessment of status of North American salmon stocks and the regional groups (Figure 4.9.1) defined from the North American genetic baseline.

ICES region	Regional group	Group acronym
Québec	Ungava / Northern Labrador	UNG
Labrador	Labrador Central	LAB
	Québec / Labrador South	QLS
Québec	Québec	QUE
	Anticosti	ANT
	Gaspe	GAS
Gulf	Gulf of St Lawrence	GUL
Scotia-Fundy	Nova Scotia	NOS
	Inner Bay of Fundy	FUN
USA	USA	US
Newfoundland	Newfoundland	NFL
	Avalon	AVA

Table 4.9.1.1. Contributions of regional groups (percentages, mean and standard error) to the Labrador subsistence fisheries catches based on mixture analysis of samples in 2006 to 2011 (Bradbury *et al.*, 2014) and 2012 to 2014.

Region-code	Region-name	2006 to 2011	2012 to 2014
UNG	Ungava-Northern Labrador	0.480 (0.268)	2.665 (0.706)
LAB	Central Labrador	96.028 (0.715)	95.309 (0.928)
QLS	Lower North Shore-Southern Labrador	1.340 (0.488)	0.024 (0.097)
NFL	Newfoundland	0.858 (0.358)	1.054 (0.441)
AVA	Avalon-East Newfoundland	0.002 (0.042)	0.001 (0.052)
QUE	Higher North Shore Québec	0.298 (0.274)	0.043 (0.111)
GAS	Gaspe	0.347 (0.336)	0.229 (0.271)
ANT	Anticosti	0.001 (0.046)	0.000 (0.029)
GUL	Southern Gulf of St Lawrence	0.357 (0.214)	0.658 (0.366)
NOS	Nova Scotia	0.006 (0.048)	0.004 (0.058)
FUN	Inner Bay of Fundy	0.005 (0.049)	0.002 (0.044)
USA	USA	0.278 (0.161)	0.011 (0.056)

Table 4.9.1.2. Estimated annual catches (median, 10th to 90th percentiles) by regional group of North American origin salmon in the Labrador subsistence fisheries (aboriginal and resident), 2012 to 2014, based on genetic stock identification of combined samples (2012–2014). Regional groups are shown in Figure 4.9.1.

Acronym	2012	2013	2014	Average (prop.)
Catch (number)	14 204	13 538	12 968	13 570
UNG	365 (256 - 501)	352 (246 - 487)	338 (233 - 473)	351 (0.026)
LAB	13543 (13363 - 13704)	12904 (12741 - 13060)	12368 (12208 - 12509)	12938 (0.957)
QLS	0 (0 - 9)	0 (0 - 6)	0 (0 - 4)	0 (0)
NFL	145 (77 - 243)	139 (74 - 228)	128 (69 - 209)	137 (0.010)
AVA	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0)
QUE	0 (0 - 21)	0 (0 - 18)	0 (0 - 17)	0 (0)
GAS	20 (2 - 81)	18 (1 - 80)	16 (1 - 79)	18 (0.001)
ANT	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0)
GUL	86 (34 - 169)	78 (29 - 163)	80 (32 - 150)	81 (0.006)
NOS	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0)
FUN	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0)
USA	0 (0 - 1)	0 (0 - 2)	0 (0 - 1)	0 (0)

Table 4.9.2.1. Estimated annual catches (median, 10th to 90th percentiles) by regional group of North American origin salmon in the Saint Pierre & Miquelon salmon fishery, 2004 to 2014, based on genetic stock identification of combined samples (2004, 2011, 2013, 2014). Regional groups are shown in Figure 4.9.1.

Acronym	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average (prop.)
Samples						335						
Catch (number)	1235	1458	1577	863	1570	1535	1233	1666	643	2351	1690	1438
UNG	0 (0 - 2)	0 (0 - 2)	0 (0 - 2)	0 (0 - 1)	0 (0 - 2)	0 (0 - 2)	0 (0 - 2)	0 (0 - 2)	0 (0 - 1)	0 (0 - 3)	0 (0 - 2)	0 (0)
LAB	16 (4 - 36.1)	18 (5 - 41)	19 (6 - 46)	11 (3 - 26)	20 (6 - 46)	18 (5 - 42)	15 (4 - 34)	22 (5 - 46)	8 (2 - 18)	29 (9 - 67)	20 (6 - 48)	17 (0.013)
QLS	15 (3 - 41)	18 (3 - 52)	19 (3 - 52)	11 (2 - 30)	19 (3 - 53)	17 (4 - 50)	16 (3 - 42)	20 (4 - 62)	7 (1 - 23)	28 (6 - 79)	20 (3 - 58)	17 (0.012)
NFL	292 (246 - 339)	340 (288 - 396)	371 (310 - 433)	204 (169- 239)	371 (313 - 429)	360 (305- 414)	289 (245 - 336)	392 (332 - 452)	151 (127 - 179)	550 (471 - 632)	400 (339 - 458)	338 (0.239)
AVA	12 (4 - 25)	14 (4 - 32)	15 (5 - 33)	8 (2 - 18)	15 (5 - 34)	16 (4 - 33)	12 (4 - 27)	16 (5 - 35)	6 (1 - 14)	23 (7 - 48)	16 (5 - 35)	13 (0.010)
QUE	54 (33 - 82)	65 (39 - 97)	71 (41 - 108)	38 (23 - 59)	71 (43 - 105)	70 (42 - 105)	56 (34 - 83)	76 (48 - 114)	28 (17 - 44)	107 (65 - 159)	75 (46 - 115)	64 (0.046)

Table 4.9.2.1. (Continued). Estimated annual catches (median, 10th to 90th percentiles) by regional group of North American origin salmon in the Saint Pierre & Miquelon salmon fishery, 2004 to 2014, based on genetic stock identification of combined samples (2004, 2011, 2013, 2014). Regional groups are shown in Figure 4.9.1.

Acronym	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average (prop.)
GAS	326 (276 - 377)	385 (332 - 442)	417 (358 - 480)	229 (196- 268)	418 (357 - 479)	408 (345- 467)	327 (278 - 377)	441 (377 - 509)	170 (144 - 198)	627 (537 - 720)	449 (384 - 513)	381 (0.270)
ANT	1 (0 - 8)	1 (0 - 10)	1 (0 - 9)	1 (0 - 6)	1 (0 - 11)	1 (0 - 10)	1 (0 - 8)	1 (0 - 11)	0 (0 - 5)	2 (0 - 14)	2 (0 - 10)	1 (0.001)
GUL	467 (418 - 523)	550 (490 - 620)	597 (531 - 661)	324 (289- 361)	591 (529 - 656)	581 (520- 643)	464 (415 - 517)	630 (561 - 695)	242 (213 - 272)	887 (796 - 980)	641 (573 - 704)	543 (0.384)
NOS	32 (15 - 58)	38 (18 - 70)	42 (20 - 74)	23 (10 - 42)	41 (20 - 75)	41 (20 - 75)	33 (15 - 58)	43 (20 - 78)	18 (8 - 32)	63 (31 - 111)	44 (21 - 79)	38 (0.027)
FUN	0 (0 - 6)	0 (0 - 6)	0 (0 - 7)	0 (0 - 4)	0 (0 - 7)	0 (0 - 6)	0 (0 - 6)	0 (0 - 7)	0 (0 - 2)	0 (0 - 9)	0 (0 - 6)	0 (0)
USA	0 (0 - 2)	0 (0 - 2)	0 (0 - 2)	0 (0 - 1)	0 (0 - 2)	0 (0 - 2)	0 (0 - 2)	0 (0 - 2)	0 (0 - 1)	0 (0 - 3)	0 (0 - 2)	0 (0)

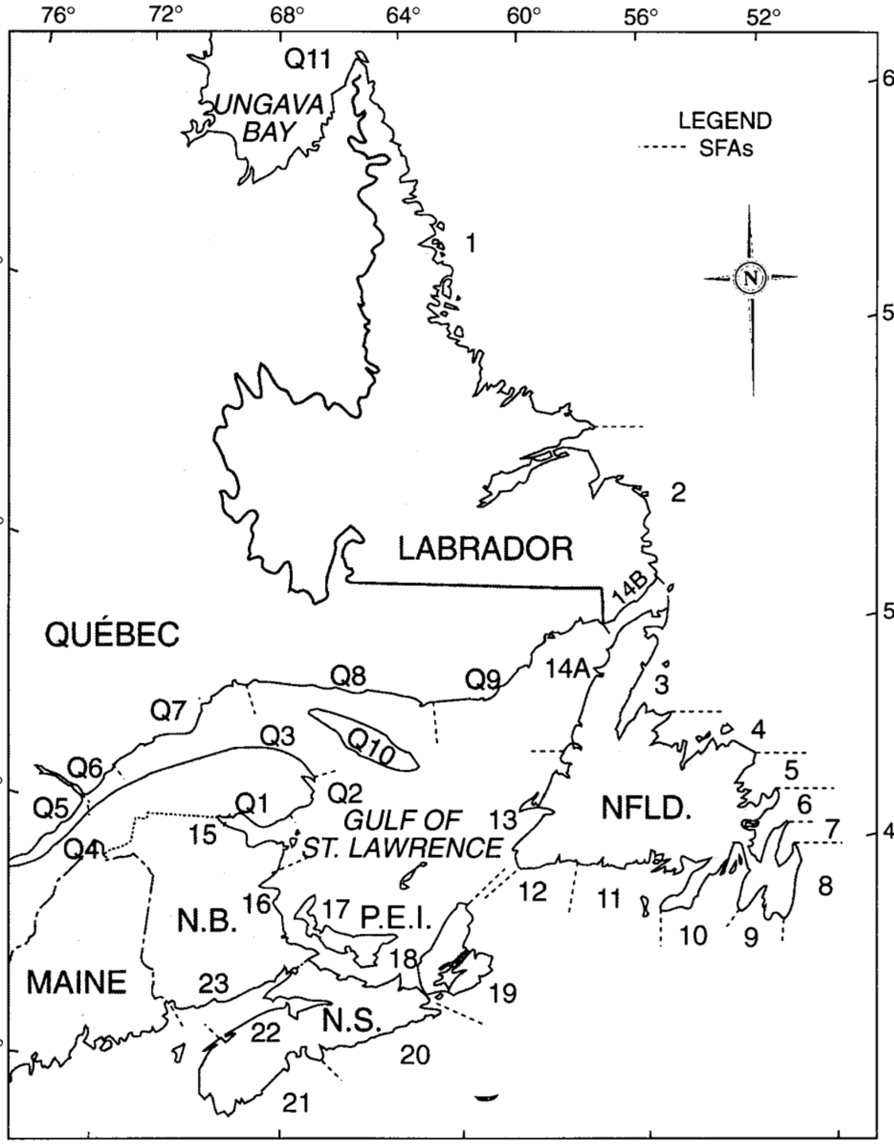


Figure 4.1.2.1. Map of Salmon Fishing Areas (SFAs) and Québec Management Zones (Qs) in Canada.

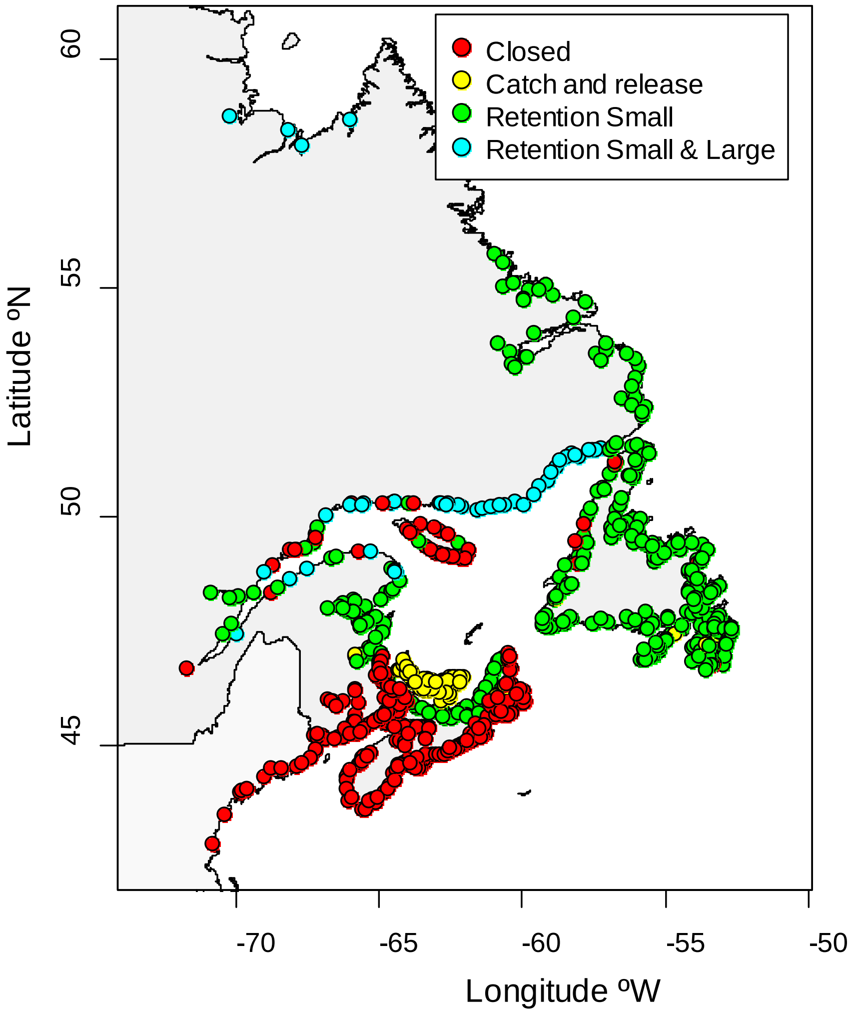


Figure 4.1.2.2. Summary of recreational fisheries management measures in Canada in 2014.

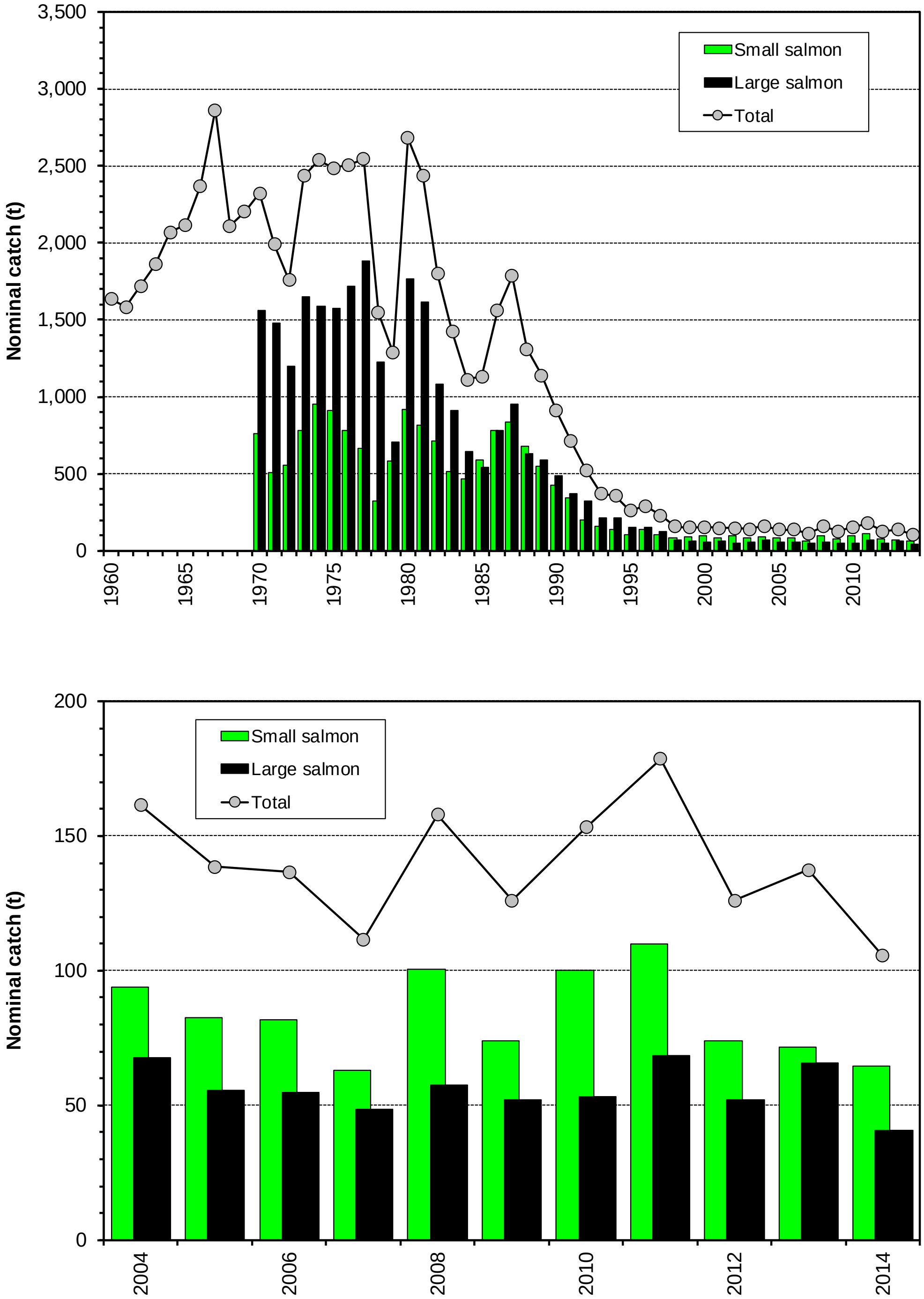


Figure 4.1.3.1. Harvest (t) of small salmon, large salmon and both sizes combined for Canada, 1960 to 2014 (top panel) and 2004 to 2014 (bottom panel) by all users.

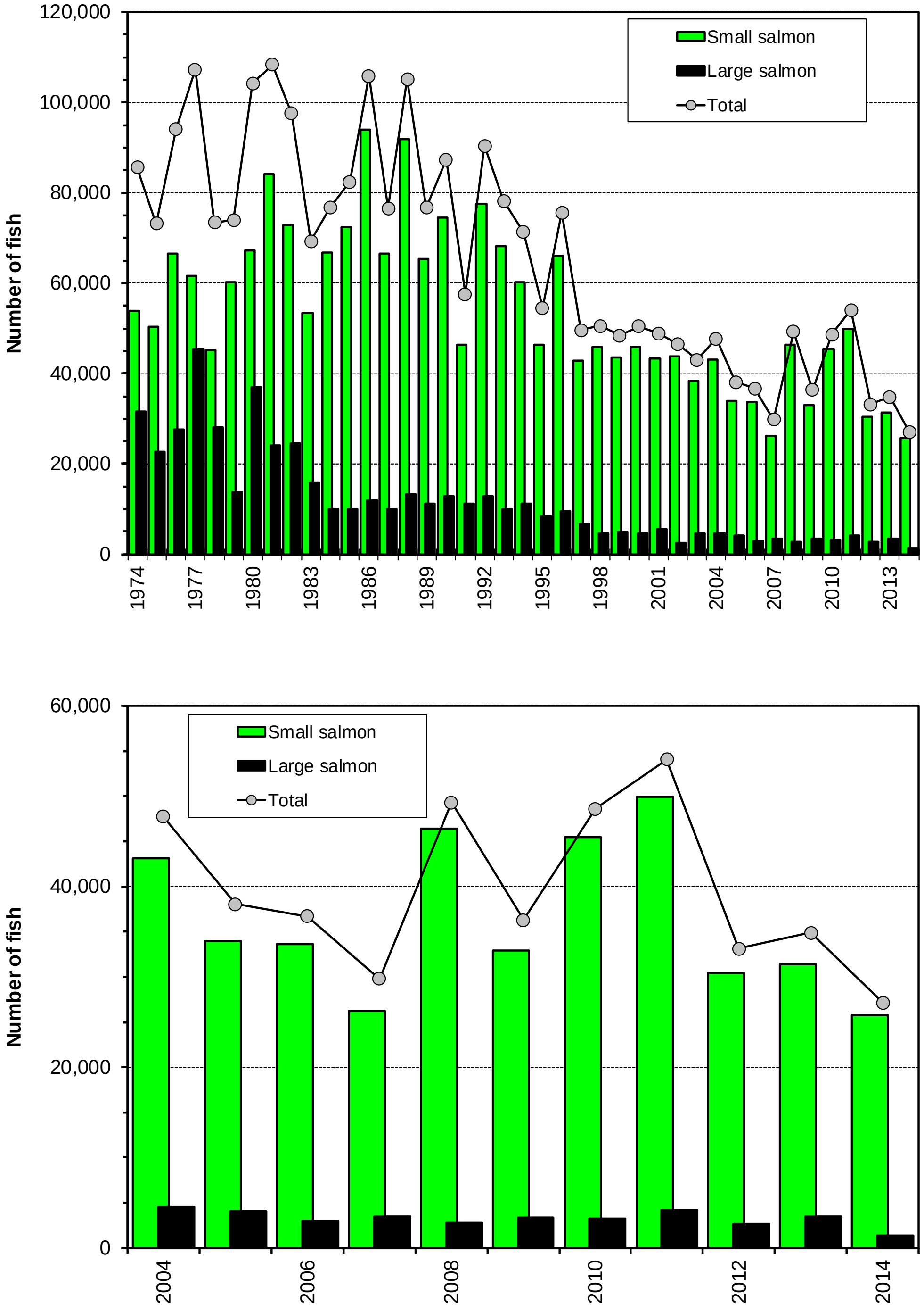


Figure 4.1.3.2. Harvest (number) of small salmon, large salmon and both sizes combined in the recreational fisheries of Canada, 1974 to 2014 (top panel) and 2004 to 2014 (bottom panel).

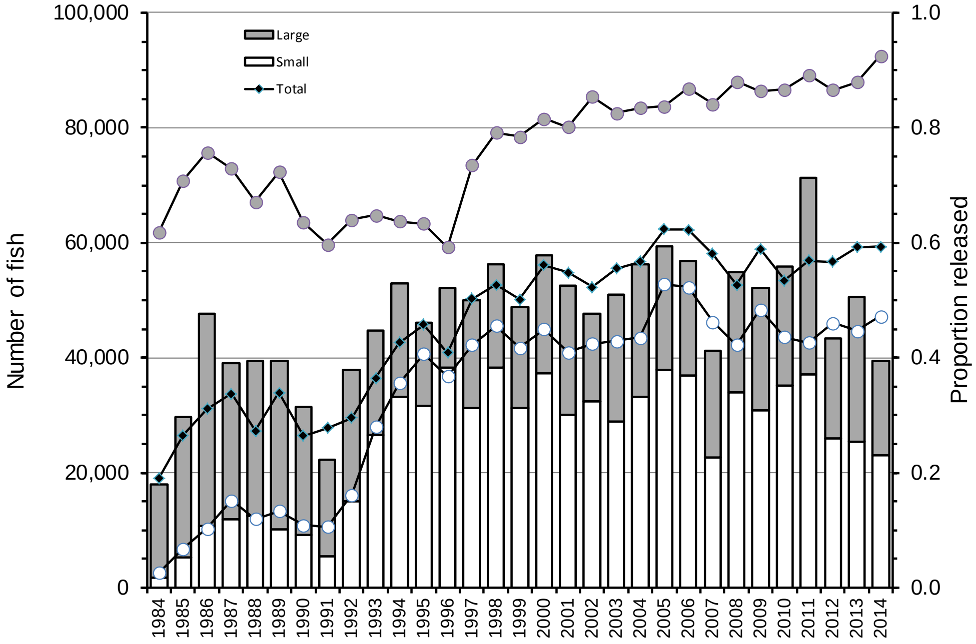


Figure 4.1.3.3. The number of caught and released small and large salmon in the recreational fisheries of Canada, 1984 to 2014. Black lines represent the proportion released of the total catch (released and retained); small salmon (open circle), large salmon (grey circle), and both sizes combined (black diamond).

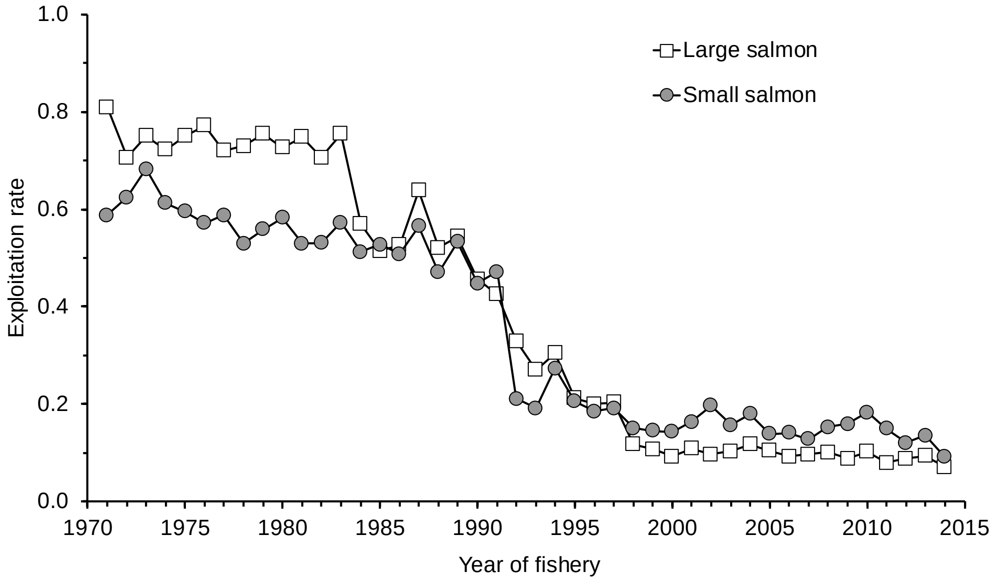


Figure 4.1.6.1. Exploitation rates in North America on the North American stock complex of small and large salmon, 1971 to 2014.

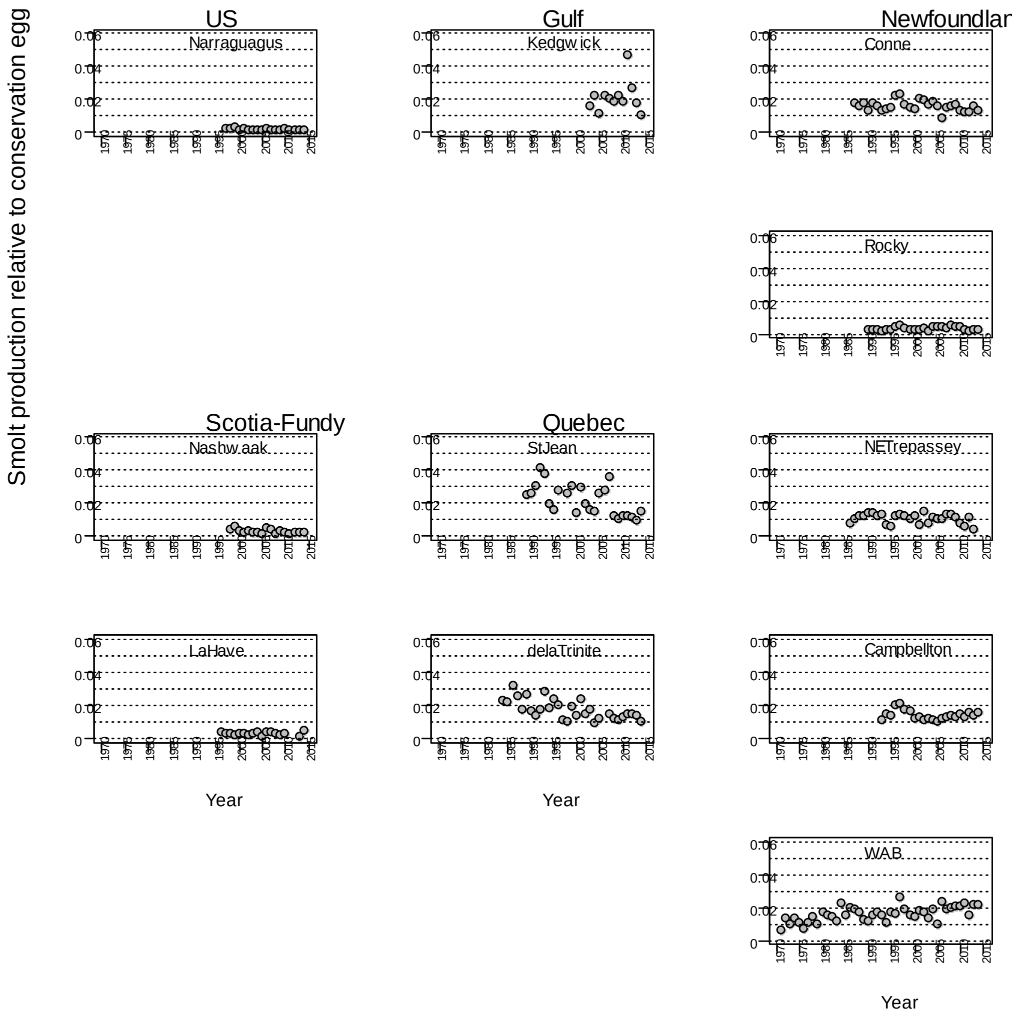


Figure 4.3.1.1 Time-series of wild smolt production from ten monitored rivers in eastern Canada and one river in eastern USA, 1970 to 2014. Smolt production is expressed as a proportion of the conservation egg requirements for the river.

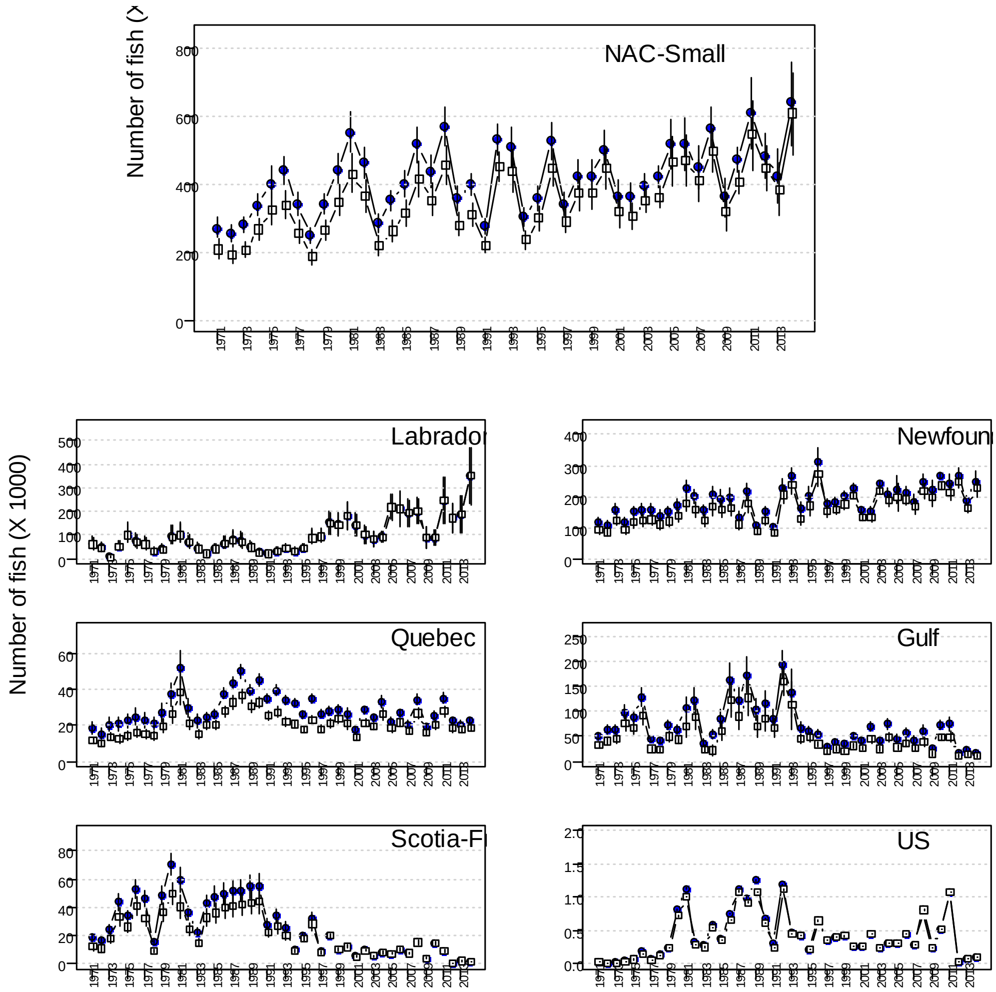


Figure 4.3.2.1. Estimated (median, 5th to 95th percentile range) returns (shaded circles) and spawners (open square) of small salmon for NAC and to each of the six regions 1971 to 2014. Returns and spawners for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23.

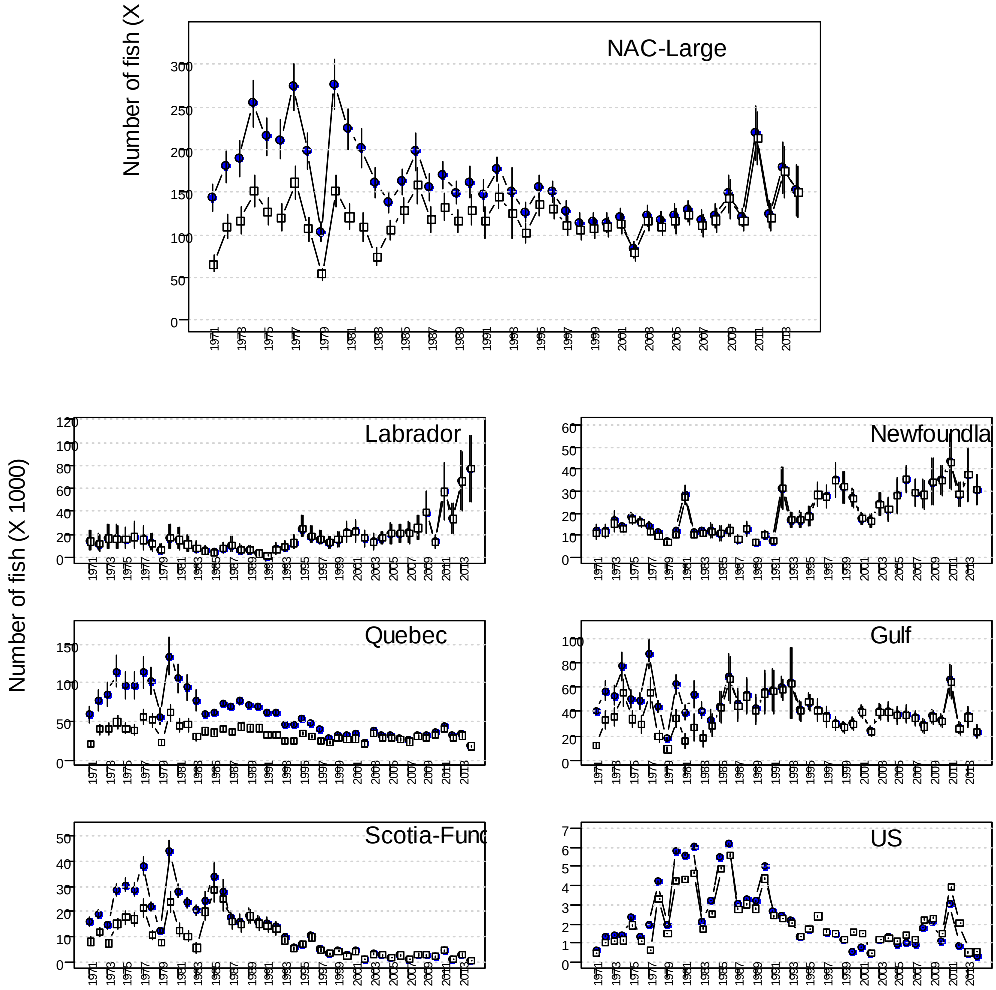


Figure 4.3.2.2. Estimated (median, 5th to 95th percentile range) returns (shaded circles) and spawners (open square) of large salmon for NAC and to each of the six regions 1971 to 2014. Returns and spawners for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23. For USA estimated spawners exceed the estimated returns due to adult stocking restoration efforts.

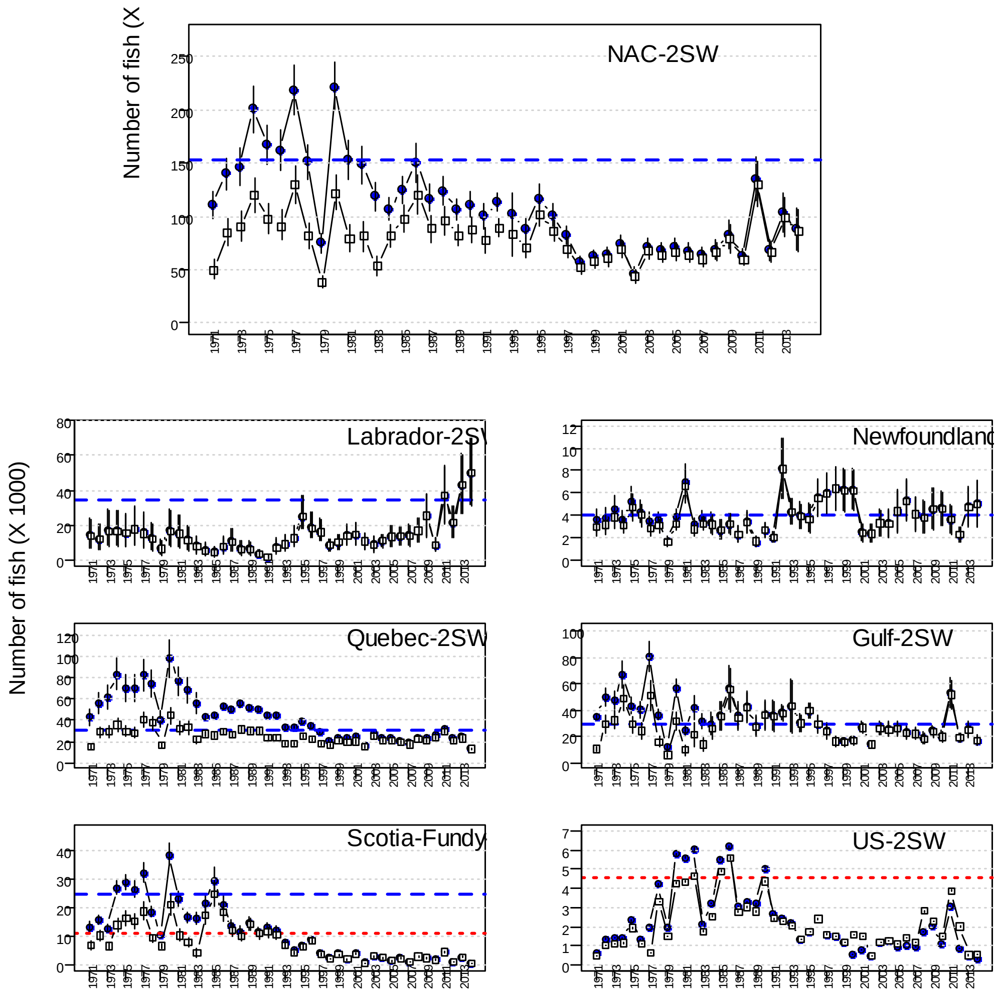


Figure 4.3.2.3. Estimated (median, 5th to 95th percentile range) returns (shaded circles) and spawners (open square) of 2SW salmon for NAC and to each of the six regions 1971 to 2014. The dashed line is the corresponding 2SW Conservation Limit for NAC overall and for each region; the 2SW CL for US (29 199 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.

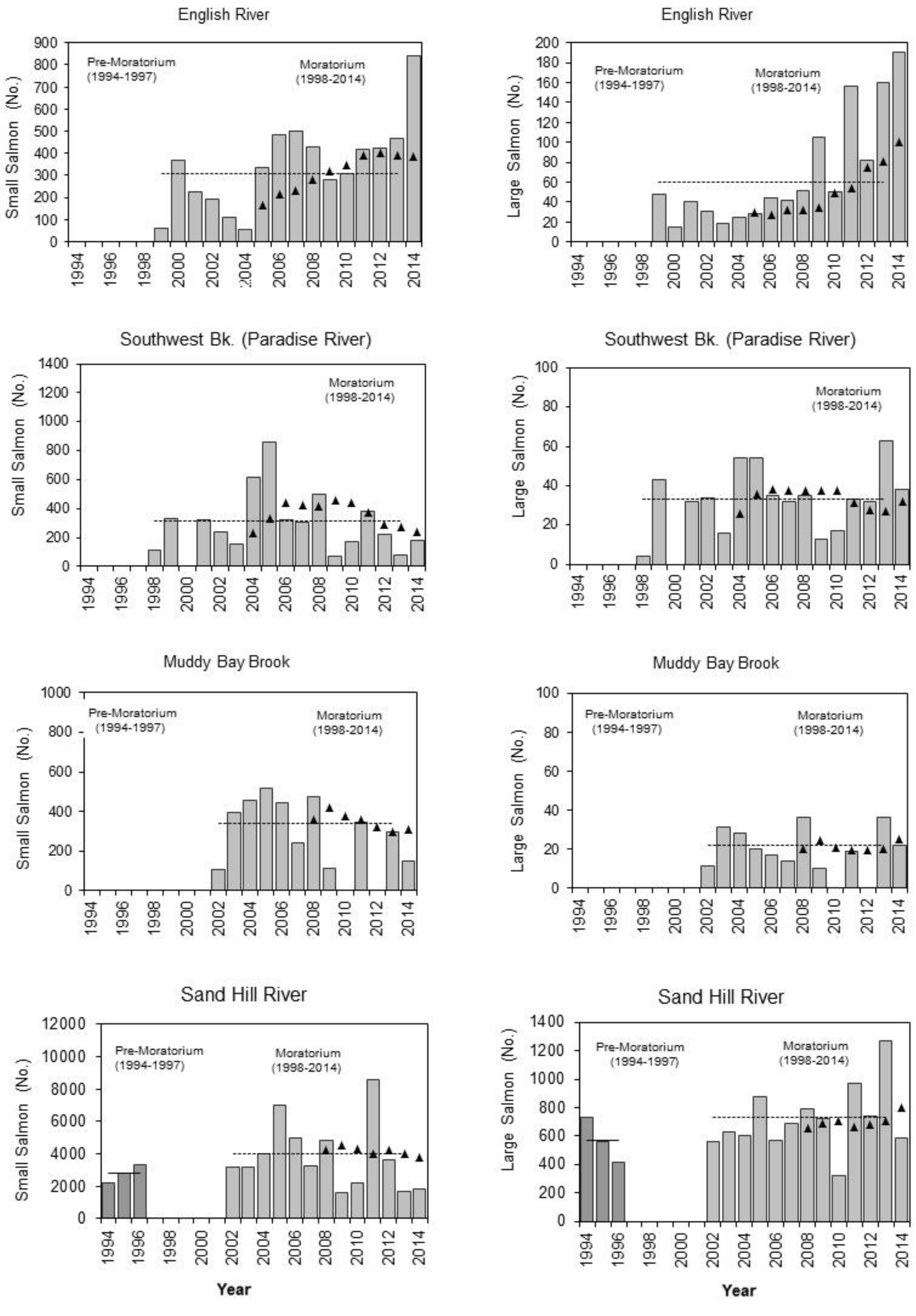


Figure 4.3.2.4. Total returns of small salmon (left column) and large salmon (right column) to English River (SFA 1), Southwest Brook (Paradise River) (SFA 2), Muddy Bay Brook (SFA 2) and Sand Hill River (SFA 2), Labrador, 1994–2014. The solid horizontal line represents the pre-moratorium (commercial salmon fishery in Newfoundland and Labrador) mean, the dashed line the moratorium mean, and the triangles the previous 6-year mean.

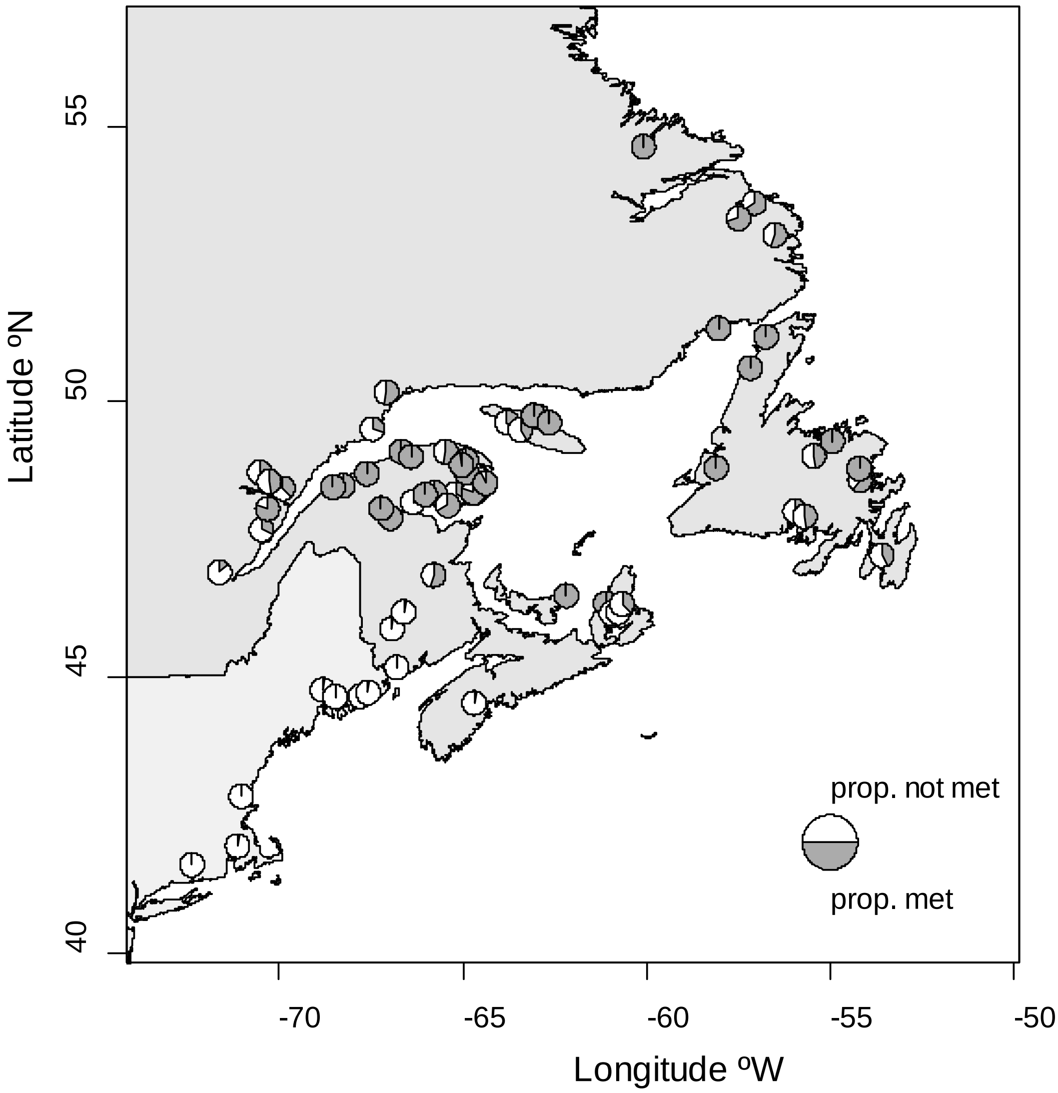


Figure 4.3.4.1. Proportion of the conservation requirement attained in the 66 assessed rivers of the North American Commission area in 2014.

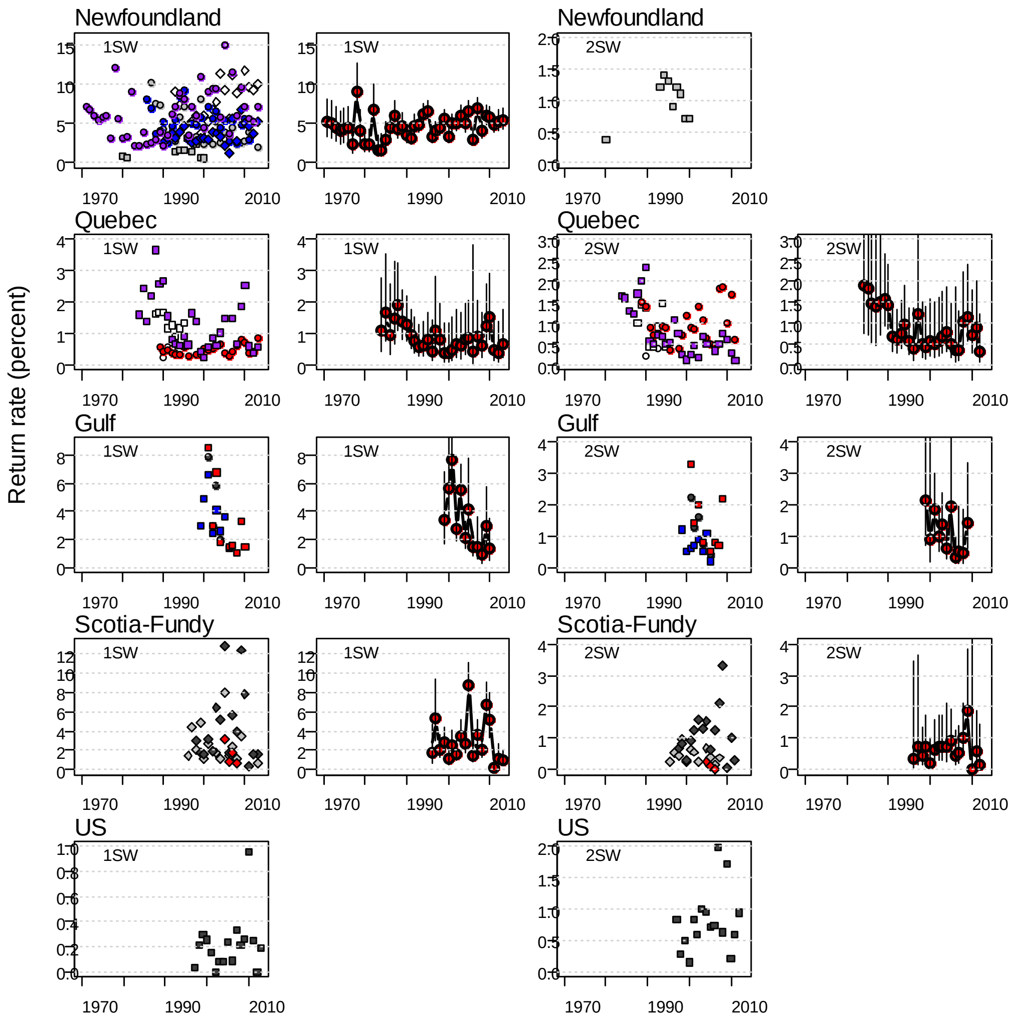


Figure 4.3.5.1. Estimated annual return rates (left and third column of panels) and standardized mean (one standard error bars) annual return rates (second and right column of panels) of wild origin smolts to 1SW and 2SW salmon to the geographic areas of North America. The standardized values are annual 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.

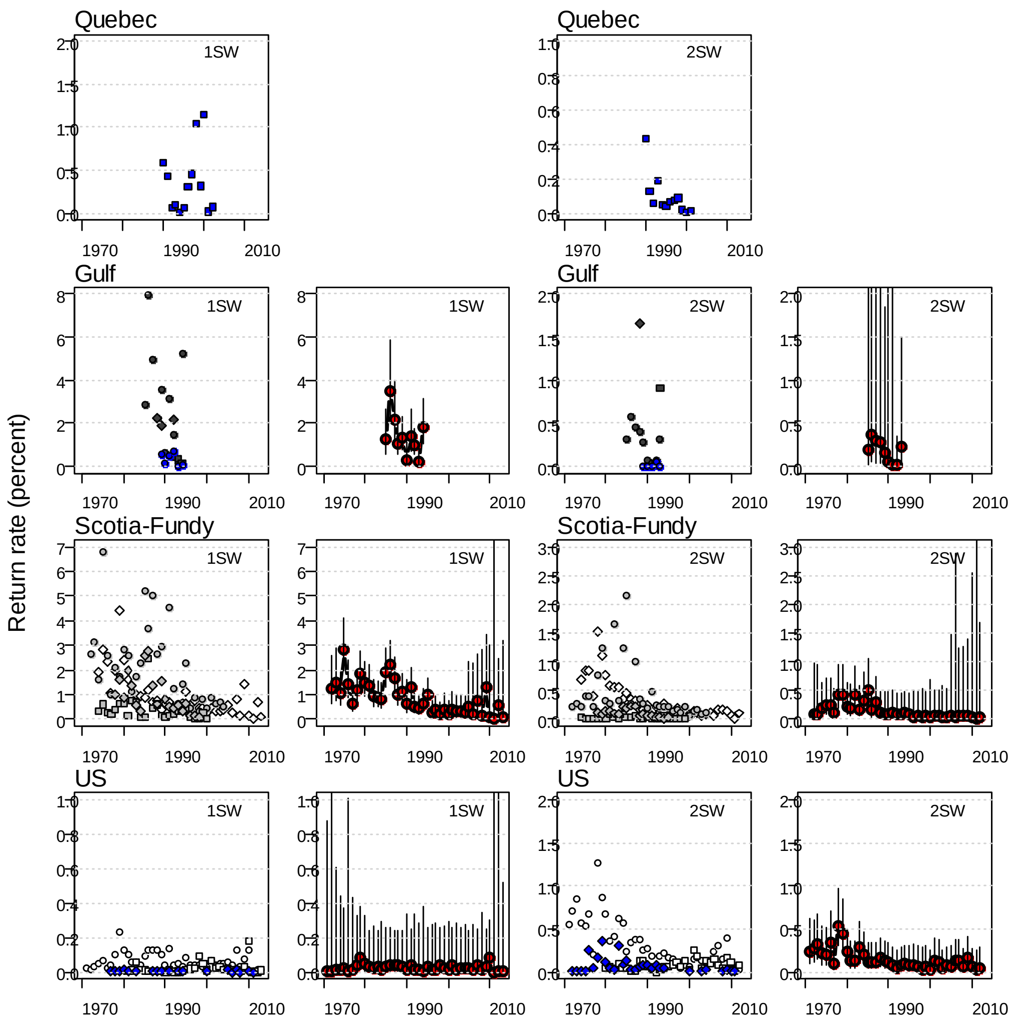


Figure 4.3.5.2. Estimated annual return rates (left and third column of panels) and standardized mean (one standard error bars) annual return rates (second and right column of panels) of hatchery origin smolts to 1SW and 2SW salmon to the geographic areas of North America. The standardized values are 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.

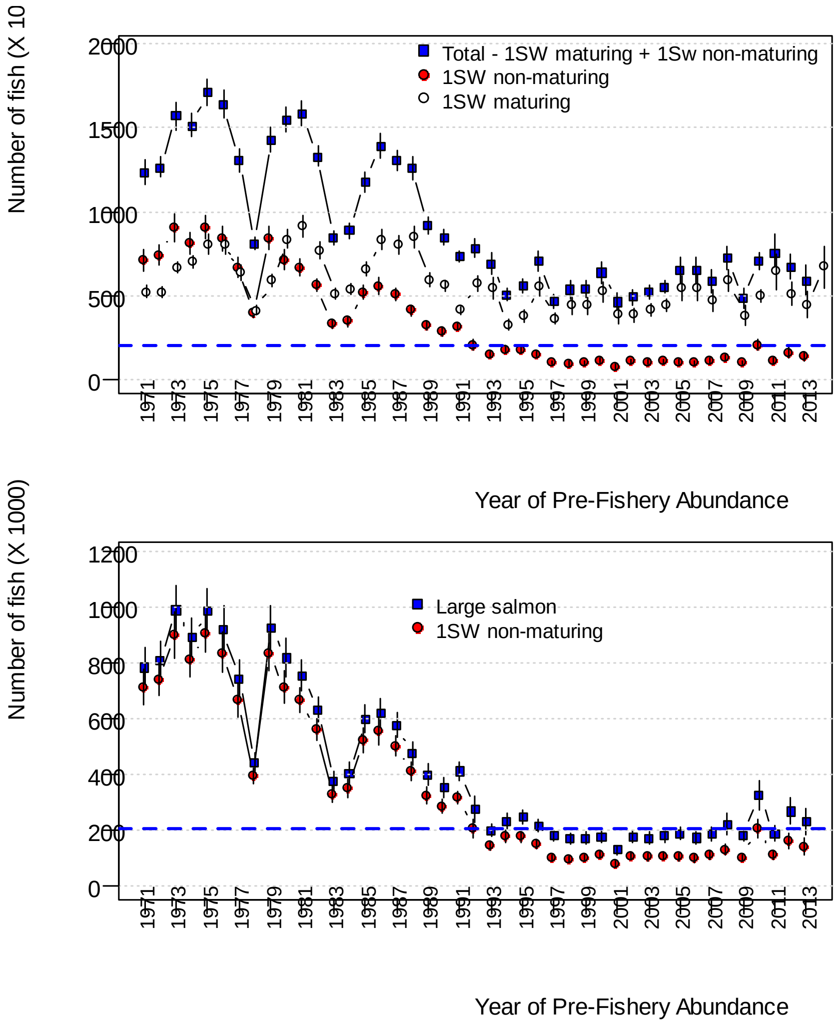


Figure 4.3.6.1. Estimated (median, 5th to 95th percentile range) Pre-fishery Abundance (PFA) for 1SW maturing, 1SW non-maturing, and total cohort of 1SW salmon (upper panel) and comparison of large salmon PFA and 1SW non-maturing PFA (lower panel) for NAC, PFA years 1971 to 2013. The dashed blue horizontal line is the corresponding sum of the 2SW conservation limits for NAC, corrected for eleven months of natural mortality.

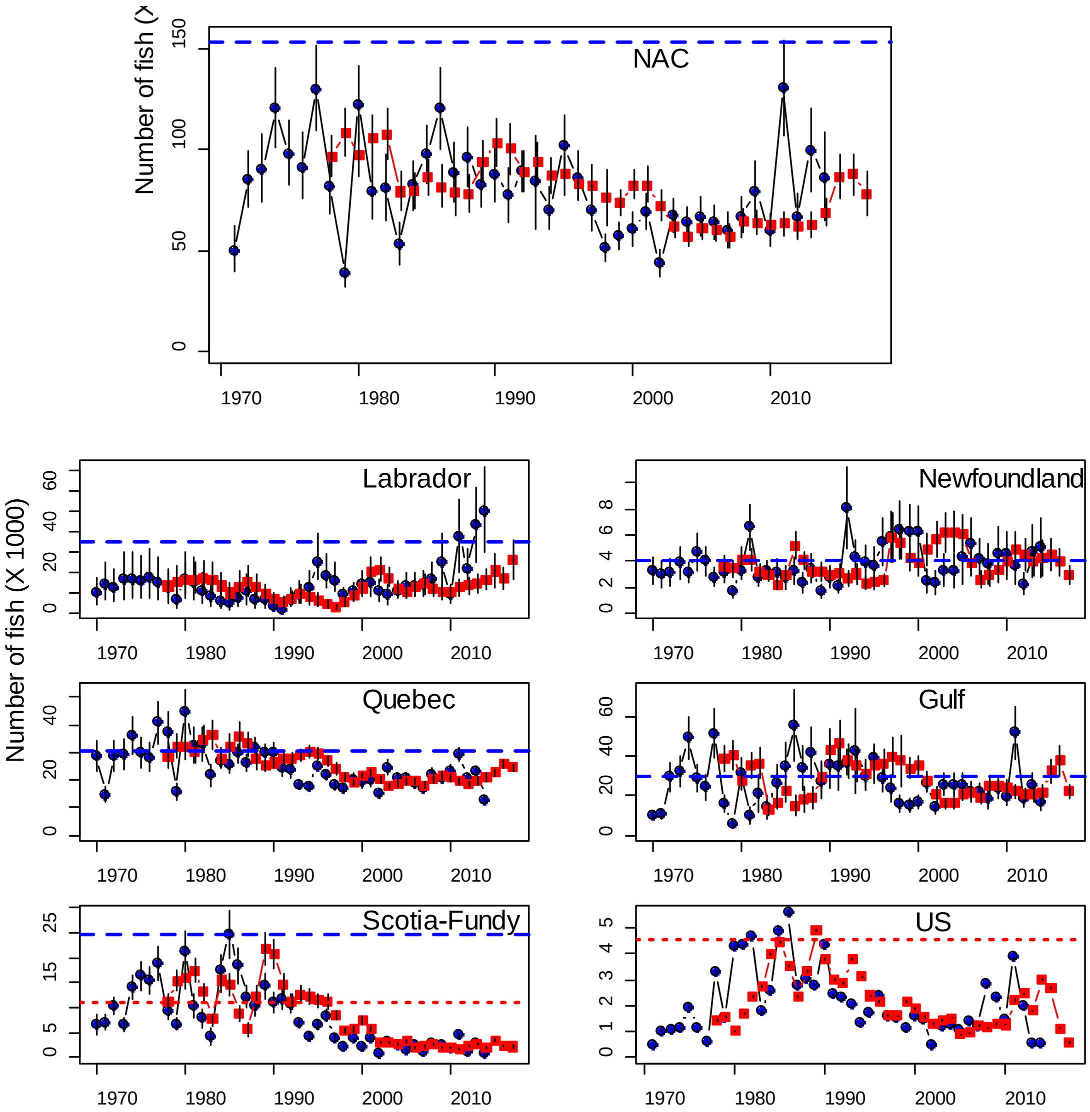


Figure 4.7.1.1. Median (5th to 95th percentile range) of spawners (circles) and lagged spawners (squares) of 2SW salmon to NAC overall and for each of the six regions. For spawners, year corresponds to the year of spawning. For lagged spawners, year corresponds to the year of PFA. The dashed blue line is the corresponding 2SW Conservation Limit for NAC overall and for each region; the 2SW CL for the US (29 199 fish) is off scale in the plot. The dotted red line in Scotia-Fundy and US panels are the region specific management objectives.

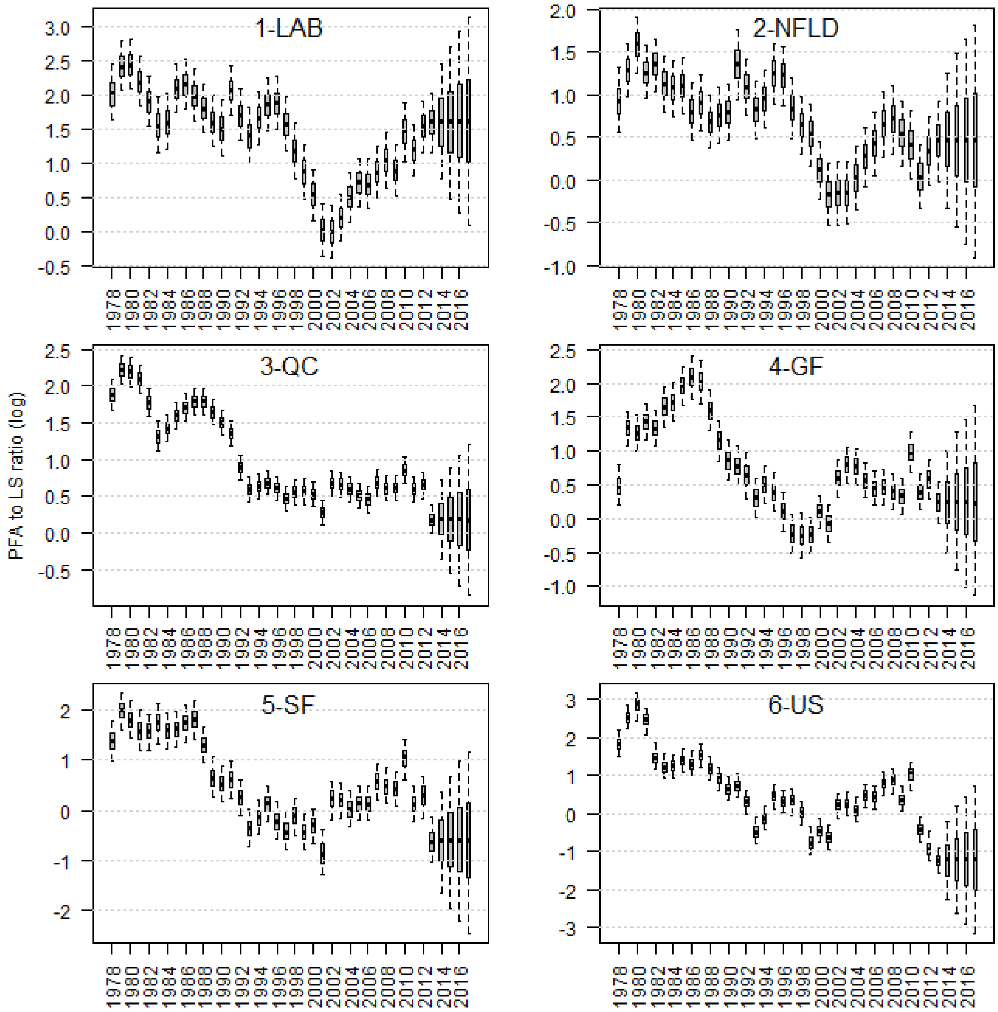


Figure 4.7.1.2. Region specific PFA to LS ratio (log) for PFA years 1978 to 2017. The values for 2014 to 2017 are predicted values from the model. Boxplots are interpreted as follows: the dashed line is the median, the shaded rectangle is the inter-quartile range and the dashed vertical line is the 5th to 95th percentile range.

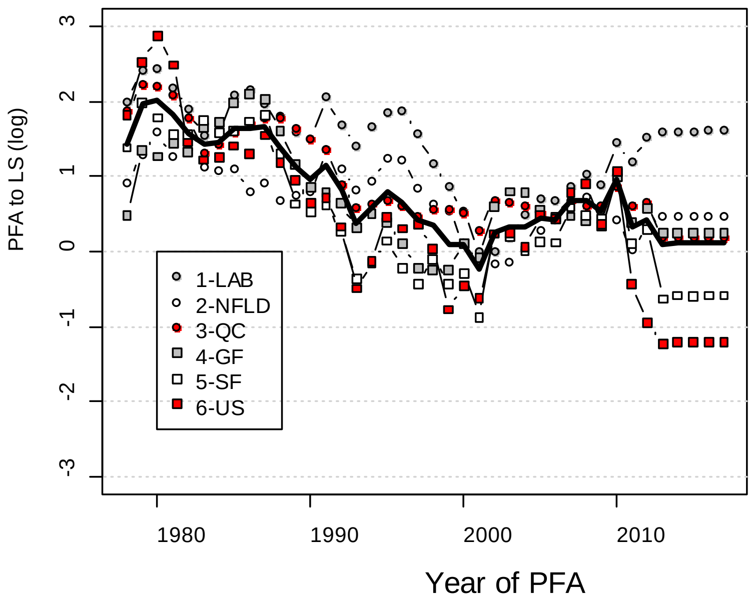


Figure 4.7.1.3. Region specific PFA to LS ratio for PFA years 1978 to 2017. The values for 2014 to 2017 are forecast values.

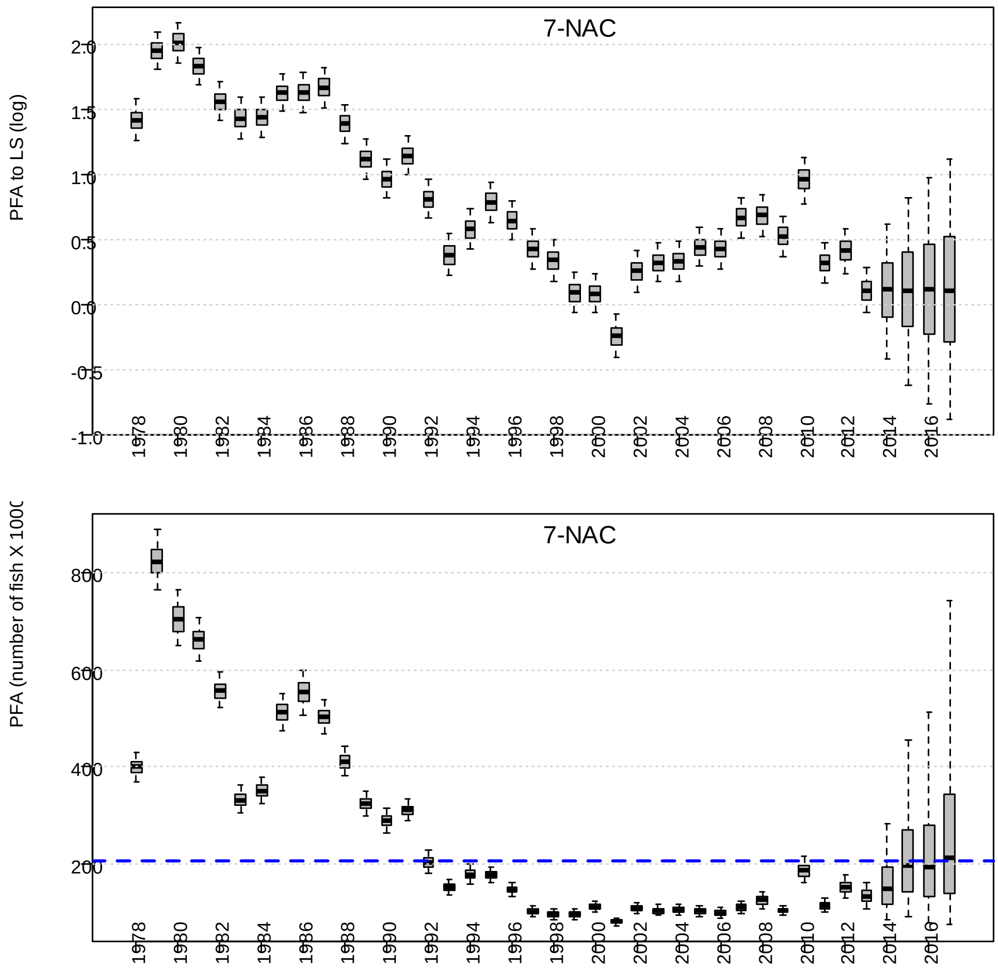


Figure 4.7.1.4. PFA to LS ratio (log scale; upper panel) and total PFA (number of fish X 1000; bottom panel) for NAC prior to exploitation. The dashed blue line in the bottom panel is the corresponding sum of the 2SW conservation limits for NAC, corrected for eleven months of natural mortality. Boxplots are interpreted as in Figure 4.7.1.2.

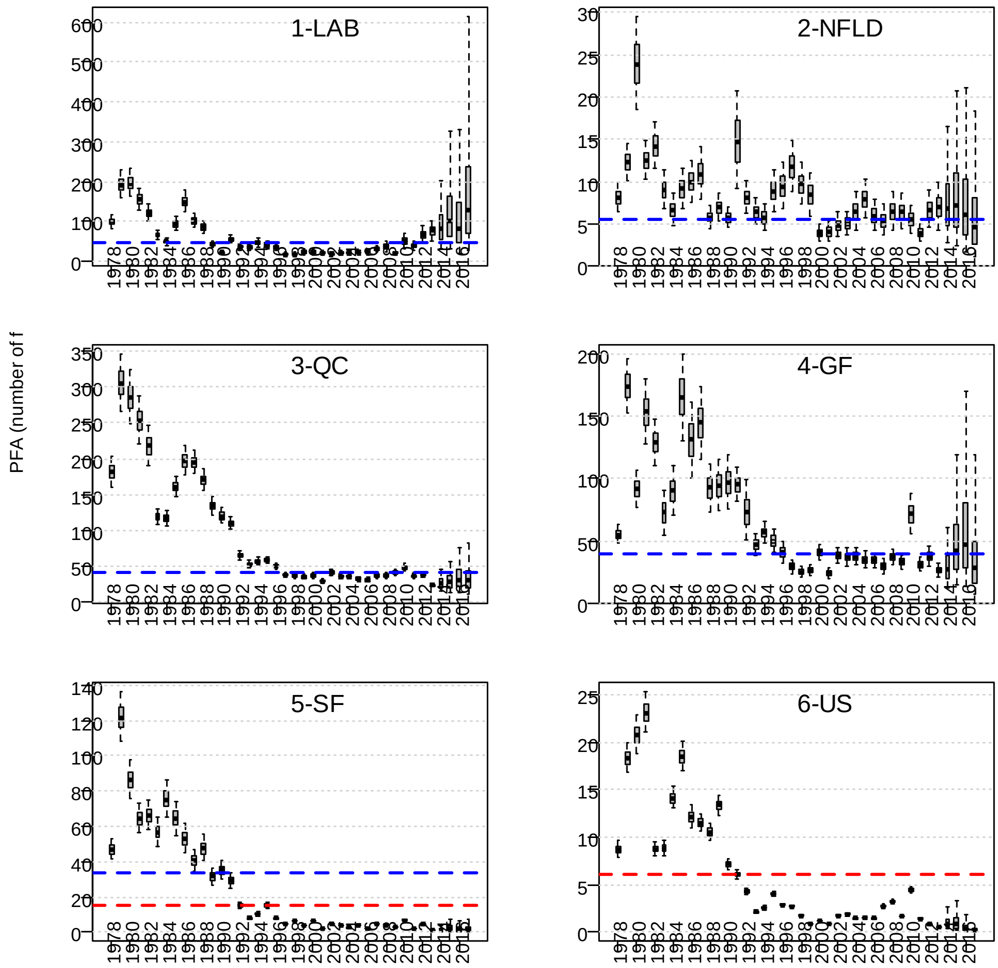


Figure 4.7.1.5. Region specific PFA values for PFA years 1978 to 2017. The values for 2014 to 2017 are predicted based on Lagged Spawners and forecasts of the PFA to LS ratio. The dashed blue line is the corresponding 2SW conservation limit reserve for each region. For Scotia-Fundy and US the dotted red line corresponds to the 2SW management objectives (adjusted for eleven months of natural mortality). Boxplots are interpreted as in Figure 4.7.1.2.

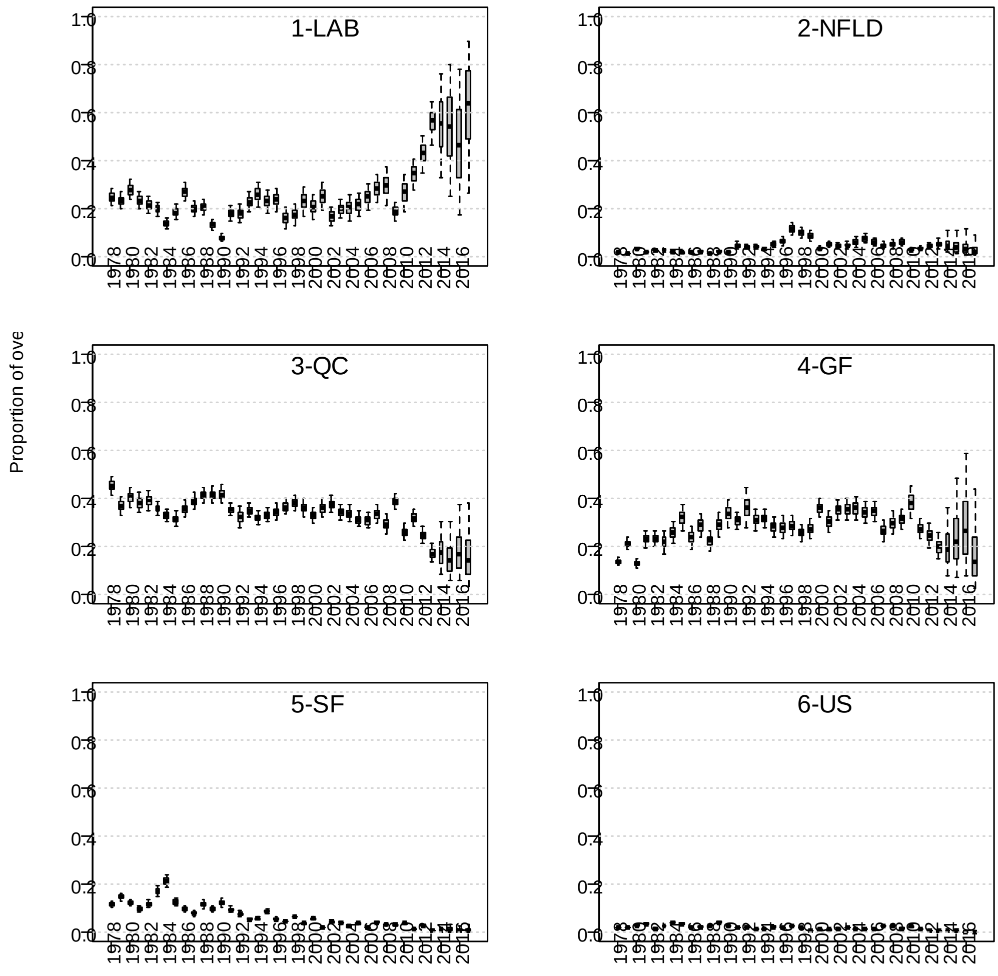


Figure 4.7.1.6. Proportion of PFA in each region relative to overall PFA for NAC.

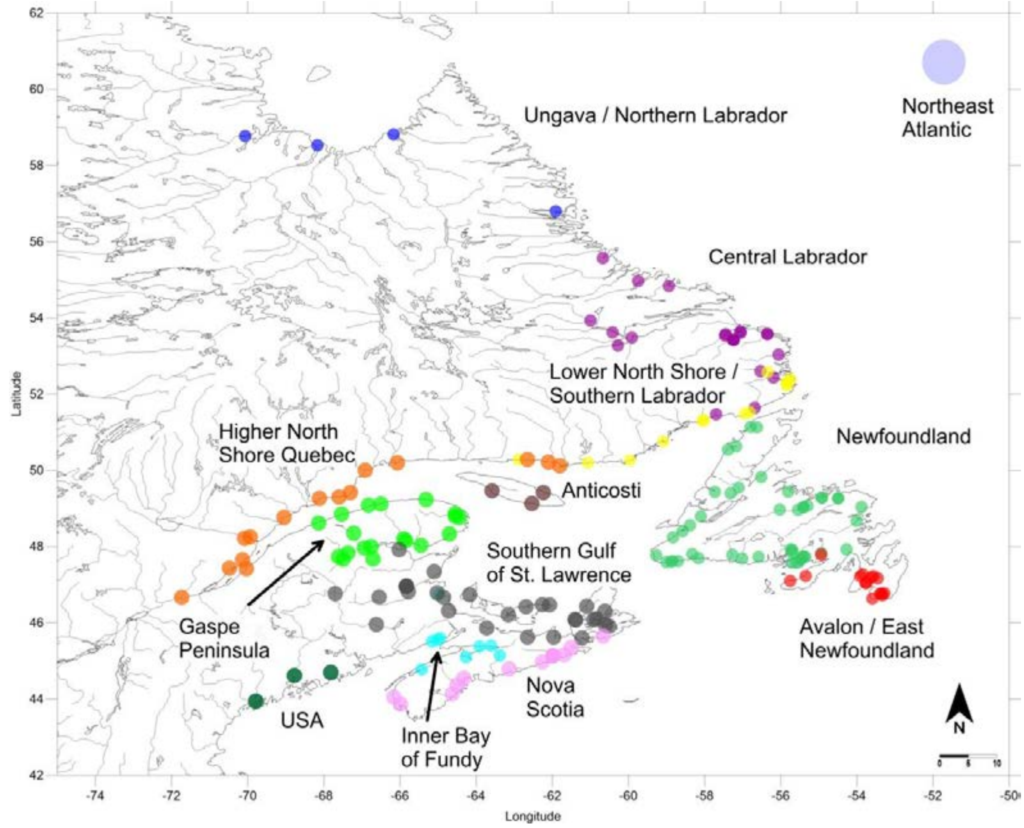


Figure 4.9.1. Regional groups for the North American origin salmon.

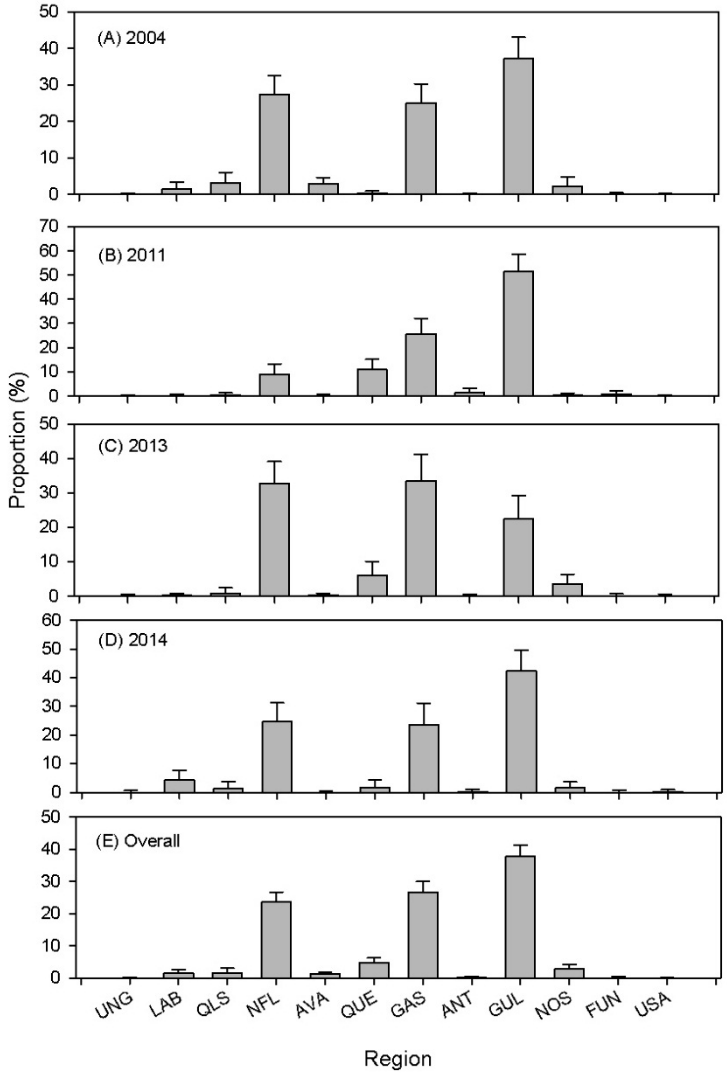


Figure 4.9.2.1. Genetic mixture estimates of composition of samples from the Saint Pierre & Miquelon Atlantic Salmon fishery by year (A) 2004, (B) 2011, (C) 2013, (D) 2014 and (E) overall. Error bars represent standard error of the estimates. Baseline locations refer to regional reporting groups shown in Figure 4.9.1 and Table 4.9.1.

5 Atlantic salmon in the West Greenland Commission

5.1 NASCO has requested ICES to describe the key events of the 2014 fishery

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. Since 2002 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. Since 2012 (for the first time since 2001), licensed fishers have additionally been 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 does not apply to the commercial or private landings and 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. As in recent years, the 2014 season was August 1 to October 31.

5.1.1 Catch and effort in 2014

Catch data were collated from fisher 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 2014, 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 57.8 t of salmon was reported for the 2014 fishery compared to 46.9 t of salmon in the 2013 fishery, an increase of 23%. A harvest of 0.1 t was reported from East Greenland, accounting for 0.2% of the total reported catch. Harvest reported for East Greenland is not included in assessments of the contributing stock complexes. 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, 11.6 t was reported as being commercial, 11.2 t for private consumption and 35.0 t as factory landings (Table 5.1.1.3). Commercial landings increased over the 2013 reported values (7.9 t) while private landings decreased slightly (13.4 t). In total, 97% of the landings (56.2 t) came from licensed fishers. Although not allowed to sell their catch, a total of 1.2 t of commercial landings were reported as coming from unlicensed fishers.

Reported landings to factories in 2014 occurred in six communities (three communities in NAFO Division 1C (Atammik, Kangaamiut and Maniitsoq), two communities in 1D (Nuuk and Qeqertarsuatsiaat) and one community in 1E (Arsuk), Figure 5.1.1.1) and amounted to 35.0 t, a 36.7% increase over the 2013 reported factory landings (25.6 t, Table 5.1.1.3). The 2014 factory quota (30 t) was reached on September 22 and factory landings were ordered to cease. However, a production facility that had not previously purchased fish and was unaware of the reporting regulations purchased five tonnes, which led to exceeding the factory quota by five tonnes.

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. However the distinction between these two sectors of the fishery are sometimes unclear as licensed fishermen can fish with the purpose of selling their catch (i.e. commercial landings) or for private consumption (i.e. private landings) and the reporting associated with these different intents is not always aligned.

An adjustment for some unreported catch 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 5.2.1.2). However, sampling only occurs during a portion of the fishing season and therefore these adjustments are considered to be minimum adjustments for unreported catch. There is currently no quantitative approach for estimating the unreported catch for the private fishery, but the 2014 value is likely to have been at the same level proposed in recent years (10 t), as reported by the Greenlandic authorities.

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, 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 seasonal distribution for factory landings is assumed to be accurate given the reporting structure in place between the factories and the GFLK.

Greenland Authorities issued 321 licences (Table 5.1.1.4) and received 669 reports from 114 fishers in 2014 compared to 553 reports from 95 fishers in 2013 (Table 5.1.1.3). Both the number of fishers and reports increased from 2013. The total number of fishers reporting catches from all areas has increased from a low of 41 in 2002 to its current level. These levels remain well below the 400 to 600 people reporting landings in the commercial export fishery from 1987 to 1991.

The Working Group has previously reported on the procedures for reporting salmon harvest in Greenland (ICES, 2014a). In summary, private and commercial landings are required to be reported to GFLK by e-mail, phone, fax or return logbook at the conclusion of the fishing season. Factory landings are submitted to GFLK weekly.

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 license related information by community and NAFO Divisions 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, 2013) 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 was provided preliminary results from a phone survey among the licensed fishermen conducted by GFLK to gain further information on the 2014 fishery. A total of 321 professional fishermen obtained a licence in 2014. A total of 207 fishers, including eleven non-professional (non-licensed) fishermen, were reached by phone and interviewed. No additional non-professional (non-licensed) fishers were contacted as the potential pool of fishers in this sector is so large, including all residents of Greenland. 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.

Numerous questions were asked of the interviewees related to fishing activity, intent and catches, bycatch of salmon in other fisheries, and observations and opinions on the status of the stock and management of the fishery. Preliminary summation of the responses was provided and a final summary is expected in 2016.

Of the 207 fishers interviewed, 119 licensed fishers reported that they had catches in 2014, but had not reported them to GFLK. Preliminary analysis suggested that approximately 66% of the harvest associated with these non-reports were attributed to eight fishers, as the majority of respondents had harvested minor amounts. Estimates of unreported catch for the contacted licensed fishers are considered preliminary and require further investigation.

Leaving aside the non-reported harvest identified by the interviews, analysis of the reported catch and the catches provided by the interviewees provided no evidence of any systematic bias in reporting (i.e. any tendency to over or under report catches).

Most fishers stated that they only use 1–2 gillnets. There appears to be some bycatch of salmon by other gear types (poundnets, sinking gillnets and sinking longlines) although for those who have experienced this, the levels appeared to be very low (1–2 salmon per year). A total of 109 licensed fishers reported that they only fished for private consumption in 2014 and approximately 80% of the fishers responded that they fish for salmon every year.

The interviewees were also given the opportunity to share their opinions on the status of the stock and management of the Atlantic salmon fishery. Many fishers believe that there were a lot of salmon off of the coast of West Greenland and there was a desire for an increased fishery. They suggested that consideration should be given to extending the fishery into November especially in the northern areas. There was a general wish for increased opportunity for factory landings and for the export of salmon to be allowed again. Some respondents noted the occurrence of untended and abandoned nets, especially in southern areas.

The Working Group acknowledges the valuable information gained on catch in this fishery through the post-season telephone survey and the possibility of using such a survey to obtain estimates of total catch from licensed fishers. 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 program. 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.

5.1.1.1 Exploitation

An extant exploitation rate for NAC and 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 2013 PFA years (Figure 5.1.1.3). The most recent estimate of exploitation available is for the 2013 fishery as the 2014 exploitation rate estimates are dependent on the 2015 returns of 2SW to NAC or MSW to Southern NEAC. NAC PFA estimates are provided for August of the PFA year and NEAC PFA estimates 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 2013 NAC exploitation rate was 9.5% which is an increase from the previous year's estimate (6.1%), the previous five-year mean (7.6%, 2008–2012) and the second highest since 1998. NAC exploitation rate peaked in 1971 at 38.6%. The 2013 NEAC exploitation rate was 0.9% and is an increase from the previous year's estimate (0.5%) and the previous five-year mean (0.4%, 2008–2012), but remains among the lowest in the time-series. NEAC exploitation rate peaked in 1975 at 28.5%.

5.1.2 International sampling programme

The international sampling programme for the fishery at West Greenland agreed by the parties at NASCO continued in 2014. The sampling was undertaken by participants from Canada, Ireland, UK (Scotland), UK (England & Wales), and USA. Additionally, staff from the Greenland Institute of Natural Resources assisted with coordination of the programme. Sampling began in August and continued through October.

Samplers were stationed in four different communities (Figure 5.1.1.1) representing four different NAFO Divisions: Sisimiut (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 with four of the factories registered to receive Atlantic salmon to collect biological characteristics data and samples. The factories were located in the communities of Kangaamiut (1C), Atammik (1C), Qeqertarsuisiat (1D) and Arsuk (1E). Sampling instructions and supplies for sampling 300 salmon were shipped to each factory. Unfortunately shipping time was longer than expected and two factories received the sampling package after the factory quota was reached and landings ceased. Samples were collected from Atammik (1C) and Arsuk (1E).

A total of 1013 salmon were observed by the sampling teams and an additional 276 salmon were sampled by the factory staff for a total of 1289 (representing ~8% by weight of the reported landings). Of this total, 925 were sampled for biological characteristics, 150 fish were only checked for an adipose clip, and 214 were documented as being landed but were not sampled or examined further. Approximately 890 fork lengths and weights (Table 5.1.2.1), 775 scale samples for age determination and 920 useable tissue samples for DNA analysis and continent of origin assignment were collected.

A total of eight adipose finclipped fish were recovered, but none of these carried tags. A single tag was recovered during the fishing season by the sampling programme. An additional 21 tags were returned directly to the Nature Institute. Two of these tags were recovered during the 2014 fishing season, one from the 2013 season and the remaining 17 tags were recovered during past fishing seasons as these tags were released by home countries during the 1970–2000 time period.

In all years since 2002, except for 2006 and 2011, 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 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 for 2002–2014 are presented in Table 5.1.2.2. The 2014 adjusted landings represented a 0.6 t increase over the reported landings. It should be noted that samplers are only stationed within select communities for 2–5 weeks per year whereas the fishing season runs 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.

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 2014 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 (2005–2014). 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.

In 2014 some minor problems in other communities (Maniitsoq and Qaqortoq) were encountered when samplers were not allowed access to fish although further communication from the Greenland Institute of Natural Resources helped rectify the situation.

5.1.2.1 Biological characteristics of the catches

An ANOVA was conducted to determine if the weight (lognormal gutted weight) of Atlantic salmon in 2014 differed among NAFO Divisions (1C and 1E), among standard weeks (34–40), between sample types (factory or non-factory) or between continent of origin (Europe or North America). NAFO Divisions 1C and 1E were selected as both divisions had factory and non-factory landings and standard weeks 34–40 were selected since this was the range of standard weeks that samples were available within each division. Differences in weight were detected based on the standard week of sampling ($F_{[5, 579]}=7.20$, $p<0.001$) and continent of origin ($F_{[1, 579]}=8.39$, $p=0.004$) whereas differences in weight were not noted among the NAFO Divisions ($F_{[1, 579]}=2.39$, $p=0.123$) or sample types ($F_{[1, 579]}=0.33$, $p=0.568$).

The lack of difference in weight based on sample type (Figure 5.1.2.1) or NAFO Division suggests that there are no differences in salmon characteristics for factory and non-factory landings. Differences in weights based on standard week and continent of origin were expected, given the rapid growth that salmon experience during summer off the coast of West Greenland and the apparent size difference between North American and European salmon stocks harvested within the fishery. The continent of origin estimates for the two sample types in NAFO Divisions 1C and 1F also appear to be similar (Figure 5.1.2.2). There appears to be no difference in origin or size between the two sample types and therefore they were combined for subsequent summation and reporting.

The mean length and whole weight of North American 1SW salmon was 65.6 cm and 3.25 kg weight and the means for European 1SW salmon were 63.6 cm and 3.02 kg (Table 5.1.2.3). The North American 1SW whole weight was approximately equal to the 2013 (3.33 kg) and previous ten year average (3.20 kg, 2004–2014). The European 1SW whole weight was lower than both the 2013 (3.16 kg) and previous ten year average (3.18 kg, 2005–2014).

North American salmon up to river age six were sampled from the fishery at West Greenland (Table 5.1.2.4), comprised predominantly of two year old (26.0%), three year old (44.5%) and four year old (21.9%) smolts. The river ages of European salmon ranged from one to four years (Table 5.1.2.5), comprised predominantly of two year old (60.7%) and three year old (30.8%) smolts.

As expected, the 1SW age group dominated the 2014 sample collection for both the North American (91.3%) and European (96.1%) origin fish (Table 5.1.2.6).

5.1.2.2 Continent of origin of catches at West Greenland

A total of 920 samples were analysed from salmon from six communities representing four NAFO Divisions: non-factory landings from Sisimiut in 1B (n=64), Maniitsoq in 1C (n=249), Paamiut in 1E (n=99) and Qaqortoq in 1F (n=234) and factory landings from Atammik in 1C (n=124) and Arsuk in 1E (n=150). 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, 71.7% of the salmon sampled were determined to be of North American origin and 28.3% 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 5.1.2.3). 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 5.1.2.4. Approximately 12 800 (~41.8 t) North American origin fish and approximately 5400 (~16.5 t) European origin fish were harvested in 2014. These are the highest estimates since 1997, the 15th highest total in the 31 year time-series (1982–2014 with no harvest estimates in 1993 and 1994), but only 5.4% of the maximum estimate of 336 000 fish harvested in 1982. The Working Group recommends a continuation and 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 2014) 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 increasing subsequently to 2010 (Figure 5.1.3.1). These mean weight trends are 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). The conclusion of increasing weights from the samples can be attributed to both increasing length and variations in the sampling period. It was previously 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).

Changes in length–weight relationships were used to investigate changes in condition of maiden 1SW salmon sampled at West Greenland over the years 1978 to 2014 (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 basis of the model relating fork length (L) and whole weight (W) was $W = aL^b$, which becomes a linear model when log-log transformed.

$$\log W = \alpha + \beta \log L$$

The data used consists 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).

The distribution of samples with respect to year and day of year is presented in Table 5.1.3.1. Between 1978 and 2001 the majority of observations were made in the first six weeks of the fishery (before September 15th), after 2001 the sampling programme expanded and observations were spread across a wider proportion of the fishing season.

Each covariate was allowed to influence both the slope β, and the intercept α. Due to the large quantity of data it was not possible to fit suitably complex models with the tools available at the Working Group, so an approximate two-stage approach was taken. The data were first separated into North American and European origin fish and all subsequent analysis conducted independently for each. The two stage modelling proceeded as follows:

1) Separate linear regressions between log weight and centred (around 65 cm) log length were done for each day of year and year combination. The estimates of the intercept and slope were recorded, along with their associated standard error. Log length was centred to reduce as much as possible the correlation between the estimates of intercept and slope.

2) A time-series model was fitted to the intercept and slope estimates, separately, using inverse variance weights derived from their standard errors. The model allows a smooth trend in between and within year with autocorrelated errors in both. Additionally the within year trend was allowed to vary across years, further detail is given below. The intercept and slope models were then combined to give estimates of weight for a given length.

The intercept was modelled using centred length data and therefore the model for length should be consistent for 65 cm fish.

In detail, the time-series model used for both the intercept and slope was:

s(year) + s(day-of-year) + s(year):day-of-year + ar1(year) + ar1(day-of-year)

whereas s denotes a smooth function and ar denotes a 1st order auto regressive process. This was intended to capture an underlying smooth trend both over and within years. Model predictions for a 65 cm fish (using only the intercept models) on the 20th of August are presented in Figure 5.1.3.1. These predictions present the trends in whole weight having removed any autocorrelation.

To get an impression of how well the model predicts fish weight, trends in weight for 2010 for an average fish are presented in Figure 5.1.3.2. Because fish increase in length throughout the year, weight is predicted using lengths that increase with day of year based on the model as estimated from the whole time-series of available data:

length ~ s(day-of-year):origin

where there is a different increase in length for each region.

Trends in whole weight (Figure 5.1.3.1) over time, having corrected for time of year and length, show an increase of around 0.2 kg beginning in 1995, peaking in 2001/2002 and declining thereafter to pre-1995 levels. The trends are similar for North American and European fish. The change in weight during the season (Figure 5.1.3.2) shows a steady increase from around 2.3 kg to around 3.4 kg, approximately a 50% increase over the fishing season.

Trends in PFA for North American and European origin salmon are show against trends in mean weight of maiden 1SW salmon for the time periods 1978–2014 (Figure 5.1.3.3). The dataseries were centred and scaled to have a unit variance for ease of comparison.

The model presented here is a pragmatic analysis of the data conducted at the Working Group. Even so, 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.

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. In European and North American areas, the overall abundance of stocks contributing to the West Greenland fishery has recently increased, but remains low relative to historical levels. 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 2014 decreased by 14% from 2013 and was below the total 2SW CL for NAC area. For the six geographical regions, 2SW spawner estimates were below their CLs for four of the six 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 2% (USA) to 56% (Gulf) of region specific 2SW CLs. The 2SW management objectives for Scotia-Fundy and USA were not met in 2014. 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 ten year mean exploitation rates of 9% 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 assessed to be at risk of suffering reduced reproductive capacity (Figure 3.3.4.2) prior to the commencement of distant water fisheries. Spawners for non-maturing 1SW stocks from five out of six countries in Southern NEAC were assessed to be either at risk of suffering or suffering reduced reproductive capacity (Table 3.3.5.7) and within 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 11% in 2014, a slight decrease from both the previous 5-year (12%) and 10-year (13%) averages.

5.3 NASCO has requested ICES to provide catch options or alternative management advice for 2015–2017 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 rebuilding

The management advice for the West Greenland fishery for 2015 to 2017 is based on the models used by the Working Group since 2003. The Working Group followed the process developed in previous years for providing management advice and catch options for West Greenland using the PFA and CLs or alternate management objectives of the NAC and NEAC areas (Table 5.3.1). The risks of the Greenland fishery to NAC and NEAC stock complexes are developed in parallel and combined into a single catch options table (Table 5.3.2).

5.3.1 Catch options for West Greenland

None of the stated management objectives would allow a mixed-stock fishery at West Greenland to take place in 2015, 2016, or 2017.

- In the absence of any marine fishing mortality at Greenland and North America, the lowest probabilities that the returns of 2SW salmon to North America will be sufficient to meet the conservation requirements of the four northern regions (Labrador, Newfoundland, Québec, and Gulf) were estimated to be 0.181, 0.304, and 0.292, all for the Québec region for the years 2015, 2016, and 2017, respectively (Table 5.3.2).

- In the absence of any marine fishing mortality at Greenland and North America, there is a low probability (from 0.008 to 0.013) that the returns in the southern region of Scotia-Fundy will be sufficient to meet the stock rebuilding objective during the period 2015 to 2017 (Table 5.3.2). The probability of meeting or exceeding the stock rebuilding objective of the USA region is estimated to 0.002 to 0.10 in all three years.
- In the absence of any marine fishing mortality at Greenland and in NEAC, there is less than 75% chance that the MSW conservation limit for southern NEAC will be met in 2015 to 2017 (Table 5.3.2).
- In the absence of any fishing mortality on these stocks, there is a zero probability of meeting or exceeding the seven management objectives simultaneously in 2015 to 2017 (Table 5.3.2).

5.4 Relevant factors to be considered in management

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

The salmon caught in the West Greenland fishery are mostly (>90%) non-maturing 1SW salmon, most of which are destined to return to homewaters in Europe or North America as 2SW fish. The primary European stocks contributing to the fishery in West Greenland are thought to originate in the southern MSW stock complex, although small numbers may also originate in northern Europe. Most MSW stocks in North America are thought to contribute to the fishery at West Greenland. Previous spawners, including salmon that spawned first as 1SW and 2SW salmon also contribute to the fishery, but in generally low (<5%) proportions (Table 5.1.2.6).

Salmon feeding at West Greenland grow rapidly over the August to October period. For a fixed catch option in terms of weight, a fishery prosecuted later in the season could result in fewer fish being harvested (in numbers of fish), which may result in a decreased exploitation rate (fish harvested in number divided by stock size in numbers). If stocks are equally available over the entire fishery season, then reduced exploitation rates would be of benefit to stocks which are at particularly low abundances as the probability of interception of these fish in the fishery is contingent upon the exploitation rate in the fishery (i.e. probability of capture). The benefits or risks to specific stocks of changes in fishing season will depend upon the relative distribution of the stocks in the fishery area during the fishing season, details which are currently not known for the large number of stocks contributing to the fishery at West Greenland.

5.5 Pre-fishery abundance forecasts 2015, 2016, 2017

PFA forecasts for each area (NEAC Section 3.4 and NAC Section 4.7) were developed using a Bayesian framework. A random walk productivity parameter linking lagged spawners or lagged eggs to PFA was developed and applied in the most recent assessments (2012 for NAC and 2013 for NEAC; ICES, 2012a, 2013). The PFA forecasts for the

West Greenland stock complex although improved from the lowest value estimated in 2001 remain among the lowest in the time-series (Figures 4.3.6.1, and 3.4.2.1).

5.5.1 North American stock complex

The PFA_{NA} forecasts for 2015 to 2017 fluctuate at median values of 193 600 to 213 000 fish, at low values relative to the earliest decade of the time-series (Figure 4.3.6.1; Table 4.3.6.1). The regional PFA forecasts indicate an increase during 2015 to 2017 for Labrador, similar abundance to recent years for Newfoundland, but generally decreased abundance for the other four regions (Figure 4.7.1.5).

5.5.2 Southern NEAC MSW stock complex

The Southern NEAC 1SW non-maturing (MSW) PFA forecasts for 2015 to 2017 fluctuate at median values of 587 800 to 491 800 fish, at low values relative to the earliest decade of the time-series (Figure 3.4.2.1). Since 1997, the spawning escapement of Southern NEAC MSW stocks has generally been at or below CLs with the exception of slight increases in estimated spawners from 2010–2012 (Figure 3.3.5.2). The PFA for the Southern NEAC MSW complex is expected to increase slightly in 2015, but decrease from 2016–2018 with the 2018 median estimate being below SER (Figure 3.4.2.1). There is only a 0.71-0.47 probability that the spawner escapement reserve (465 646 fish) will be met in 2015–2018 (Table 3.4.2.1).

5.6 Comparison with previous assessment and advice

In the 2012 assessment, the productivity parameter for the 2010 NAC PFA had increased from previous years in all the regions and overall, as a result of the greatly improved returns of 2SW salmon to all regions in 2011 (ICES, 2012a). The returns of 2SW salmon in 2012 to 2014 were lower than those of 2012 in four of the six regions whereas returns in 2013 and 2014 in Labrador and Newfoundland were higher than those of 2011 (Figure 4.3.2.3). As a result, the forecast value of the productivity parameter was lower than realized in 2011 to 2013 for the Labrador region, resulting in realized regional PFA values for those three years which were higher than forecast. In all other regions, the forecasted productivity parameter was much higher than the realized values with the result that the forecast regional PFA values were all higher than the realized values for PFA years 2011 to 2013. Due to the large uncertainty associated with the forecast values, the estimated PFA values for 2011 to 2013 were within the 95% confidence intervals of the forecast values.

The previous advice provided by ICES (2012a) indicated that there were no mixed-stock fishery catch options on the 1SW non-maturing salmon component for the 2012 to 2014 PFA years and this year's assessment confirms that advice.

5.7 Critical examination of changes to the models used to provide catch options

5.7.1 Run-reconstruction models

The run-reconstruction models to estimate pre-fishery abundance of 1SW non-maturing and maturing 2SW fish adjusted by natural mortality to the time prior to the West Greenland fishery follow the same structure as used since 2003 (ICES, 2003; 2004; 2005; 2006; 2012a) and incorporated the recommendations from ICES (2008) to improve the models. Additional details are provided in Sections 4.3 and 3.3.

5.7.2 Forecast models for pre-fishery abundance of 2SW salmon

The forecast models to estimate pre-fishery abundance of non-maturing 1SW salmon from the southern NEAC complex and for the NAC area have been used by ICES since 2009 and were used again in this assessment. The forecast models used to estimate pre-fishery abundance of non-maturing 1SW salmon (potential MSW) for North America and for the southern NEAC MSW salmon were the same as those used in the previous assessment in 2009 for NAC and 2011 for southern NEAC (ICES, 2009; 2011). For NAC, a regionally disaggregated model for 2SW salmon was developed whereas a combined 1SW cohort model was developed and used for the southern NEAC complex. Details of the model structures and the differences between these new models and those previously used by the Working Group are provided in the Stock Annex.

5.7.3 Development and risk assessment of catch options

The provision of catch options in a risk framework involves incorporating the uncertainty in the factors used to develop the catch options. The ranges in the uncertainties of all the factors will result in assessments of differing levels of precision. The analysis of risk involves four steps: 1) identifying the sources of uncertainty; 2) describing the precision or imprecision of the assessment; 3) defining a management strategy; and 4) evaluating the probability of an event (either desirable or undesirable) resulting from the fishery action. Atlantic salmon are managed with the objective of achieving spawning conservation limits. The undesirable event to be assessed is that the spawning escapement after fisheries will be below the conservation limit.

The risk assessments for the two stock complexes in the West Greenland fishery are developed in parallel and then combined at the end of the process into a single summary plot or catch options table (see Annex 6 for details; Figure 5.7.3.1).

5.7.4 Critical evaluation

Changes to the run-reconstruction and pre-fishery abundance forecast models have been critically examined in ICES (2009; 2011). There were no changes to the risk assessment of the catch options model. The Working Group used models that are fitted and forecasts derived in a single consistent Bayesian framework.

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

In 2007, ICES developed and presented to NASCO a framework (Framework of Indicators) to be used in interim years to determine if there is an expectation that the previously provided multiyear management advice for the Greenland fishery is likely to change in subsequent years (ICES, 2007a). A significant change in management advice would be an unforeseen increase in stock abundance to a level that would allow a fishery in the case where no catch had been previously advised or a decrease in stock abundance when catch options had been chosen. The finalized Framework of Indicators (FWI) was accepted by NASCO in June 2007 and applied to the 2008 fishery at West Greenland. The FWI was updated in 2009 (ICES, 2009) and again in 2012 (ICES, 2012a) in support of multi-annual regulatory measures for the West Greenland fishery during the time periods 2009–2011 and 2012–2014. An updated FWI has been requested by NASCO in support of the multiyear catch advice and the potential approval of multiyear regulatory measures for the 2015–2017 fisheries. A full description of the development of the FWI and instructions for the application of the framework indicator spreadsheet are detailed in the Stock Annex.

5.8.1 Update of the Framework of Indicators

The Working Group updated the FWI in support of the West Greenland fishery management. The update consisted of:

- Adding the values of the indicator variables for the most recent years;
- Running the objective function spreadsheet for each indicator variable and the variable of interest relative to the management objectives;
- Quantifying the threshold value for the indicator variables and the probabilities of a true high state and a true low state for those indicator variables retained for the framework;
- Revising/adding the indicator variables and the functions for evaluating the indicator score to the framework spreadsheet; and
- Providing the spreadsheet for doing the framework of indicators assessment.

The management objectives for the development of the catch options for the West Greenland fishery are provided in Table 5.3.1. Based on the results from the objective function spreadsheet and the criteria established by the Working Group, a total of 23 indicator variables, represented by 14 different rivers, were retained for the North American Commission area (Table 5.8.1.1). Of these, two were return or survival rate indicators of hatchery fish, while the remainder were of wild 2SW or large salmon (N=15)[1] or wild 1SW or small salmon (N = 6) returns to rivers or survival rate.

Origin	Wild	Wild	Wild	Wild	Hatchery	Hatchery	
Type of data	Return	Return	Survival	Survival	Survival	Survival	
Size/age group	Small/1SW	Large/2SW/ MSW	Small/1SW	Large/2SW	Small/1SW	Large/2SW	Total
Labrador							0
Newfoundland							0
Québec	2	8	1	1			12
Gulf	1	2					3
Scotia-Fundy	2	3			1	1	7
USA[1]		1[1]					1
Total	5	14	1	1	1	1	23

[1] for USA, returns include both wild and hatchery origin fish.

Summaries of the indicator variables retained for the potential 2015 to 2017 multiyear catch advice indicator framework are provided in Figure 5.8.1.1 and Table 5.8.1.1. No indicator variables were retained for the Labrador or Newfoundland areas. No indicator variables were explored for Southern NEAC 1SW non-maturing complex as they have yet to meet the qualifying criteria. All the retained indicator variables had a probability of identifying a true low state or a true high state of at least 80% (Figure 5.8.1.2).

5.9 NASCO has requested ICES to estimate catches by stock origin and describe their spatial and temporal distribution, considering the available contemporary data on stock origin of salmon in the West Greenland fishery

5.9.1 Continent of origin spatial and temporal distribution

Continent of origin contributions to the West Greenland fishery vary annually, but generally have increased for North America over the time-series (1982–2014, Figure 5.1.2.3). Mean North American contributions have increased from 52% in the 1980s, to 71% in the 1990s, to 74% in the 2000s and to 81% since 2010. Spatial trends are difficult to discern as data are not available for all NAFO Divisions in all years due to resource limitations of the sampling programme (Figure 5.9.1.1).

There appears to be a temporal pattern of increasing European contribution to the fishery as the fishing season progresses (Figure 5.9.1.2). According to the available sample data (2002–2014), the European contribution to the harvest is estimated to be approximately 18% for the first month of the fishery (August) and 34% during the last month of the fishery (October). However, the beginning and end of the fishing season are characterized by low sample size. Caution is advised in interpreting Figure 5.9.1.2 as the results may be biased by the number of samples, the NAFO Division where the samples were collected and the standard week when the samples were collected. Available samples are not uniformly distributed across all NAFO Divisions and standard weeks of the fishing season.

5.9.2 Region of origin spatial and temporal distribution

Recent genetic stock identification efforts provide an opportunity to identify the origin of North American and European Atlantic salmon sampled from the fishery at West Greenland. Genotyping of fishery samples follows the methods outlined in Bradbury *et al*. (2014a; 2014b) for North American origin salmon and Gilbey *et al.* (submitted) for European origin salmon. Twelve regional groups in eastern North America and 14 in Europe can be reliably identified (Figure 5.9.2.1). Tissue samples from salmon sampled from the West Greenland fishery were genetically typed to continent of origin and the 2011–2014 North American origin samples and the 2002 and 2004–2012 European origin samples were assessed against regional baselines.

For the North American samples, twelve reporting groups were used for mixture analysis using the Bayesian mixture model from Pella and Masuda (2001) as implemented in cBAYES (Neaves *et al*., 2005). The accuracy of assignment (94.5%) in the mixture analyses was very high. The power of the baseline to resolve rare contributions was examined using simulations; accurate estimation of the rare stock contributions was possible when they represented from 0.5–1.0% and above. For the European samples, regional assignments were made using the GENECLASS2 (Piry *et al*., 2004) individual assignment algorithm.

For the North American samples, the estimated proportional contributions of each of the twelve groups (and associated standard errors) for individual year samples (2011–2014) and overall (combined years) are shown in Table 5.9.2.1 and graphically displayed by NAFO Division and overall in Figure 5.9.2.2. The uncertainties in the estimated contributions are lowest (coefficient of variation, CV, of 5%) for the largest contributing stocks (LAB, GAS, GUL - samples combined overall years), with CVs of 33% for the US and 61% for the Scotia-Fundy region (NOS group) (Table 5.9.2.1).

The number of salmon from each regional group in the harvest of North American origin Atlantic salmon during 2011–2014 were estimated using the mixture analysis. A multinomial distribution was used to model the mixture proportions and these were raised to the total number of North American origin salmon in the fishery. A total of 1000 simulations were conducted. In each simulation, the proportion contribution of each regional group was modelled with a beta distribution parameterized by the mean and standard errors from the mixture analysis outputs (Table 5.9.2.1).

Three regional groups in NAC contribute the majority (over 90%) of the North American origin salmon in the West Greenland fishery: Québec (UNG, QUE, GAS, ANT) at 39%, Gulf of St Lawrence (GUL) at 29% and Labrador (LAB, QLS) at 26% (Table 5.9.2.2). Smaller contributions are from Newfoundland (NFL, AVA) at 5%, Scotia-Fundy (NOS, FUN) at 1% and USA at 1%.

Raised to estimated catches of North American salmon in 2011–2014, the median estimated catches from the southern regions of NAC ranged from three to 146 fish (individual year assignments) for Scotia-Fundy and 26 to 118 fish for the USA (Table 5.9.2.2). Using all samples combined to estimate the annual catches by regional group, the estimated harvest of Scotia-Fundy origin salmon was 55 to 105 fish annually and for USA, 72 to 101 salmon annually (Table 5.9.2.3). Salmon from Gulf region totalled just less than 2000 to almost 3800 fish annually whereas salmon from Québec totalled between 2700 to 5100 fish. Newfoundland origin salmon totalled 55 to 105 fish and Labrador salmon totalled 1600 to 3100 fish annually. These annual values differ somewhat if annual sampling results are used, but because of the smaller sample sizes annually, the estimates of raised catches are more uncertain (Tables 5.9.2.2 and 5.9.2.3). To estimate impacts to homewater returns, estimates of catch should be discounted by the natural mortality that would occur during the return migration.

For the European samples, the estimated proportional contributions of each of the 14 groups for all years combined are shown in Table 5.9.2.4 and graphically displayed by NAFO Division for each year and overall in Figures 5.9.2.3 and 5.9.2.4. Greater than 90% of the harvested European fish were assigned to three regions: N Scotland and N&W Ireland, Irish Sea, S&E Scotland. The S&E Scotland region, which includes some of the east coast of England, is considerably the largest contributor to the West Greenland fishery, representing almost 40% of the European fish caught. Substantial numbers of fish were also assigned to the Irish Sea (26.6%), which are principally fish originating in English (west coast), Welsh and Scottish (Solway) rivers and the large rivers of Ireland's east and south coast. The region delineated on the basis of the west and north coasts of Ireland and Scotland represents an additional 25.2% of the total. Overall, Scotland appears to be a major contributor to the fishery with almost 70% of the fish being assigned.

The number of salmon from each regional group in the harvest of European origin Atlantic salmon during 2002 and 2004–2012 fisheries were deterministically estimated by applying both year-specific and overall contribution estimates to the estimated number of European origin fish harvested. The primary contributor (S&E Scotland) contributed between 268–1231 fish annually (Table 5.9.2.5). When using the overall estimates this range decreased to 239–1036 (Table 5.9.2.6). Rivers in northern Europe contributed small numbers to the harvest annually (approximately 8%) while stocks from France and Spain contributed approximately 2% overall. While there is some annual variation, the contributions by regional group have not varied substantially between 2002 and 2012. As with the North American results, the annual estimates differ when using year-specific estimates vs. overall estimates. Due to the smaller sample sizes of the year-specific values, the estimates of raised catches are more uncertain. To estimate impacts to homewater returns, estimates of catch should be discounted by the natural mortality that would occur during the return migration.

North American estimated annual regional contributions were tallied by samples occurring before and after September 15th (Figure 5.9.2.5). Contributions appear consistent between the two time periods. Date of capture for the European origin samples were not available to the Working Group and therefore similar analyses were not possible.

Table 5.1.1.1. Distribution of nominal catches (metric tons) 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

[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 (metric tonnes 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. No quotas were set from 2003–2011, but since 2012 an annual quota has been set and applied to factory landings only.

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	

Year	Norway	Faroes	Sweden	Denmark	Greenland	Total	Quota	Comments
1977	-	-	-	-	1420	1420	1191	
1978	-	-	-	-	984	984	1191	
1979	-	-	-	-	1395	1395	1191	
1980	-	-	-	-	1194	1194	1191	
1981	-	-	-	-	1264	1264	1265	Quota set to a specific opening date for the fishery
1982	-	-	-	-	1077	1077	1253	Quota set to a specific opening date for the fishery
1983	-	-	-	-	310	310	1191	
1984	-	-	-	-	297	297	870	
1985	-	-	-	-	864	864	852	
1986	-	-	-	-	960	960	909	
1987	-	-	-	-	966	966	935	
1988	-	-	-	-	893	893	840	Quota for 1988–1990 was 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

Year	Norway	Faroes	Sweden	Denmark	Greenland	Total	Quota	Comments
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		Fishery restricted to catches used for internal consumption in Greenland; no factory landings permitted and no quota set by Greenland. 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		Fishery restricted to catches used for internal consumption in Greenland; no factory landings permitted and no quota set by Greenland.
2007	-	-	-	-	25	25		Fishery restricted to catches used for internal consumption in Greenland; no factory landings permitted and no quota set by Greenland. 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		same as previous year

Year	Norway	Faroes	Sweden	Denmark	Greenland	Total	Quota	Comments
2011	-	-	-	-	28	28		Fishery restricted to catches used for internal consumption in Greenland; no factory landings permitted and no quota set by Greenland.
2012	-	-	-	-	33	33	(35)	Fishery restricted to catches used for internal consumption in Greenland; factory landings permitted by Greenland with a 35 t quota applied to factory landings only. 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)	Fishery restricted to catches used for internal consumption in Greenland; factory landings permitted by Greenland with a 30 t quota applied to factory landings only. Higher catch figures based on sampling programme information are used for the assessments.

Table 5.1.1.3. Reported landings (metric tons) by landing category, the number of fishers reporting and the total number of landing reports received for licensed and unlicensed fishers in 2011–2014. Empty cells identify categories with no reported landings and 0.0 entries represents reported values of <0.05 t.

NAFO/ICES	Licensed	No. of Fishers	No. of Reports	Comm.	Private	Factory	Total	Licensed	No. of Fishers	No. of Reports	Comm.	Private	Factory	Total
2014								2013						
1A	NO	1	1		0.1		0.1	NO	10	32	0.3	0.0		0.3
1A	YES	20	87	3.0	0.5		3.5	YES	18	94	1.2	1.6		2.8
1A	TOTAL	21	88	3.0	0.6		3.6	TOTAL	28	126	1.5	1.6		3.1
1B	NO							NO	2	5	0.2			0.2
1B	YES	8	28	2.1	0.7		2.8	YES	6	14	1.3	0.9		2.2
1B	TOTAL	8	28	2.1	0.7		2.8	TOTAL	8	19	1.4	0.9		2.4
1C	NO	5	18	0.6			0.6	NO						
1C	YES	35	212	1.5	2.1	9.7	13.2	YES	21	205	2.2	3.5	12.3	18.0
1C	TOTAL	40	230	2.1	2.1	9.7	13.8	TOTAL	21	205	2.2	3.5	12.3	18.0
1D	NO	6	10	0.2	0.3		0.5	NO	10	23	0.4	0.0		0.5
1D	YES	14	115	0.4	5.5	12.8	18.6	YES	9	112	0.1	4.8	8.0	12.9
1D	TOTAL	20	135	0.6	5.7	12.8	19.1	TOTAL	19	135	0.5	4.9	8.0	13.4
1E	NO	1	1	0.2			0.2	NO	1	1	0.1			0.1
1E	YES	9	102	1.4	0.8	12.6	14.8	YES	6	41	0.8	0.2	5.3	6.4
1E	TOTAL	10	103	1.6	0.8	12.6	15.0	TOTAL	7	42	0.9	0.2	5.3	6.4
1F	NO	3	3	0.1	0.1		0.2	NO	5	10	0.3			0.3
1F	YES	11	80	2.0	1.2		3.2	YES	6	15	1.0	2.4		3.4
1F	TOTAL	14	83	2.1	1.3		3.4	TOTAL	11	25	1.4	2.4		3.8
XIV	NO						0.0	NO	1	1	0.0			0.0
XIV	YES	1	12	0.1	0.0		0.1	YES						
XIV	TOTAL	1	12	0.1	0.0		0.1	TOTAL	1	1	0.0			0.0
ALL	NO	16	33	1.2	0.4		1.6	NO	29	72	1.3	0.1		1.4
ALL	YES	98	636	10.5	10.7	35.0	56.2	YES	66	481	6.6	13.4	25.6	45.6
ALL	TOTAL	114	669	11.6	11.2	35.0	57.8	TOTAL	95	553	7.9	13.4	25.6	47.0

NAFO/ICES	Licensed	No. of Fishers	No. of Re-ports	Comm.	Private	Factory	Total	Licensed	No. of Fishers	No. of Re-ports	Comm.	Private	Factory	Total
2012								2011						
1A	NO	8	25		0.6		0.6	NO	4	4		0.2		0.2
1A	YES	27	142	1.3	3.5		4.8	YES	21	54	0.9	0.8		1.7
1A	TOTAL	35	167	1.3	4.1		5.4	TOTAL	25	58	0.9	1.0		1.9
1B	NO	3	3		0.2		0.2	NO	3	3		0.2		0.2
1B	YES	6	19	0.1	0.5		0.5	YES	6	27	2.8	0.6		3.5
1B	TOTAL	9	22	0.1	0.7		0.8	TOTAL	9	30	2.8	0.8		3.7
1C	NO	2	6		0.3		0.3	NO	6	6		0.7		0.7
1C	YES	30	172	1.8	0.8	12.1	14.7	YES	14	50	3.2	1.4		4.6
1C	TOTAL	32	178	1.8	1.2	12.1	15.0	TOTAL	20	56	3.2	2.1		5.3
1D	NO	5	15	0.0	0.4		0.4	NO	9	9		0.7		0.7
1D	YES	3	23	1.4	1.2	1.6	4.2	YES	6	86	7.1	0.2		7.3
1D	TOTAL	8	38	1.4	1.6	1.6	4.6	TOTAL	15	95	7.1	0.9		8.0
1E	NO	13	22		1.3		1.3	NO	16	29		1.8		1.8
1E	YES	3	45	0.8	1.9		2.7	YES	4	65	1.1	1.1		2.2
1E	TOTAL	16	67	0.8	3.2		4.0	TOTAL	20	94	1.1	2.9		4.0
1F	NO	6	17		0.7		0.7	NO	13	19		2.5		2.5
1F	YES	10	40	0.1	2.2		2.3	YES	10	31	1.5	0.7		2.1
1F	TOTAL	16	57	0.1	2.8		3.0	TOTAL	23	50	1.5	3.1		4.6
XIV	NO	6	24		0.5		0.5	NO	5	11		0.1		0.1
XIV	YES	0	0					YES	0	0				
XIV	TOTAL	6	24		0.5		0.5	TOTAL	5	11		0.1		0.1
ALL	NO	43	112	0.0	4.1		4.1	NO	56	81		6.1		6.1
ALL	YES	79	441	5.5	9.9	13.7	29.1	YES	61	313	16.5	4.9		21.4
ALL	TOTAL	122	553	5.5	14.1	13.7	33.2	TOTAL	117	394	16.5	11.0		27.5

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.

Year	Licences	1A	1B	1C	1D	1E	1F	ICES	Unk.	Total
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
2011	234	25	9	20	15	20	23	5	0	117
2012	279	35	9	32	8	16	16	6	0	122
2013	228	28	8	21	19	7	11	1	0	95
2014	321	21	8	40	20	10	14	1	0	114

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	NA	(95% CI)[1]	E	(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)
	1978[2]	606	606		38	(41, 38)	62	(66, 59)
	1978[3]	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)
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	
Commercial	2001	4721	2655		69	(71, 67)	31	(33, 29)

		Sample Size			Continent of Origin (%)			
Source		Length	Scales	Genetics	NA	(95% CI)[1]	E	(95% CI)[1]
Local Consumption	2002	501	501	501	68		32	
	2003	1743	1743	1779	68		32	
	2004	1639	1639	1688	73		27	
	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	

[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 where the sampling teams observed more fish landed than were reported. Adjusted landings were not calculated for 2006 and 2011 as the sampling teams did not observe more fish than were reported.

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

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

	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**
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
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	65.4	64.7	86.0	78.7	73.6	83.5
Prev. 10-yr mean	3.20	3.18	6.88	5.48	4.50	4.23	3.30	3.29	3.29	65.3	64.9	82.1	77.0	74.1	72.6
Overall mean	2.87	3.16	6.63	6.19	4.10	4.74	3.02	3.25	3.13	63.4	65.2	82.0	80.9	71.8	76.1

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
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
Prev. 10-yr mean	1.3	25.8	43.7	22.0	6.6	0.6	0	0
Overall Mean	2.5	31.5	39.7	18.4	6.8	1.1	.01	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
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
Prev. 10-yr mean	12.8	59.3	23.8	3.7	0.3	0	0	0
Overall Mean	17.0	61.0	18.9	2.7	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

Table 5.1.2.7. The number of samples and continent of origin of Atlantic salmon by NAFO Division sampled at West Greenland in 2014. NA = North America, E = Europe.

		Numbers			Percentages	
NAFO Div	Sample dates	NA	E	Totals	NA	E
1B	September 16–September 24	49	15	64	76.6	23.4
1C	August 27–October 07	288	85	373	77.2	22.8
1F	August 25–September 08	153	96	249	61.4	38.6
1E	August 14–October 06	170	64	234	72.6	27.4
Total		660	260	920	71.7	28.3

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 proportion 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.

	Proportion by continent weighted by catch in number		Numbers of salmon by continent	
	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

Table 5.1.3.1. The distribution of samples over year and standard week. Darker colours indicate more samples.

	31	32	33	34	35	36	37	38	39	40	41	42	43	44	
1978						182		191							373
1979		209	930	415											1554
1980		656		294											950
1981				285	386	1123									1794
1982					171	157									328
1983		75	372	785	165										1397
1984			465	914	537	209	2								2127
1985	402	868	825	294											2389
1986			1086	1659	275										3020
1987				319	1911	410									2640
1988			335	351	1052	455	194								2387
1989			202	922	614										1738
1990	90	399	609												1098
1991		154	566	495											1215
1992		235	225	467	285	59									1271
1993															0
1994															0
1995			659	1257	217										2133
1996			538	292	240			51							1121
1997				150	52	22									224
1998		7	158	185											350
1999				225	139	122		24	26						536
2000			481												481
2001			919	465	483	199	49	23	14						2152
2002			104	76	110	51	72	72	7						492
2003		110	497	282	255	316	151					37			1648
2004		47	345	125	98	386	255	174	43		22	30			1525
2005		6	66	237		111	187	85		10					702
2006		56	3	207	354	106	43	62	120	26	48				1025
2007		138	258	127	196	89	48	39	87	71	4				1057
2008	68	18	61	167	159	541	286	183	126	66	9	50			1734
2009			97	123	334	228	89	114	330	128	2				1445
2010			118	161	30	260	88	153	215	103	14	11			1153
2011				27	162	260	82	20	46	21	4				622
2012					72	292	167	133	172	427					1263
2013					28	101	208	283	245	144	73				1082
2014			45	45	67	90	95	99	108	121					670

Table 5.3.1. Management objectives and equivalent number of fish relevant to the development of catch options at West Greenland for the six geographic areas in NAC and the Southern NEAC non-maturing complex.

Area	Objective	Number of fish
US	2SW proportion of recovery criteria	4549
Scotia-Fundy	25% increase from 2SW returns during 1992 to 1997	10 976
Gulf	2SW conservation limit	30 430
Québec	2SW conservation limit	29 446
Newfoundland	2SW conservation limit	4022
Labrador	2SW conservation limit	34 746
Southern NEAC non-maturing complex	MSW conservation limit (Spawner escapement reserve to Jan. 1 of first winter at sea)	273 360 (465 646)

Table 5.3.2. Catch options tables for the mixed-stock fishery at West Greenland by year of PFA, 2015 to 2017. For the Simultaneous achievement, 0 refers to null attainment out of 10 000 draws.

2015 Catch option	Probability of meeting or exceeding region-specific management objectives							
	Labrador	Newfound-land	Québec	Gulf	Scotia-Fundy	US	Southern NEAC	Simultaneous
0	0.845	0.639	0.181	0.487	0.008	0.010	0.708	0.001
10	0.829	0.621	0.167	0.464	0.008	0.009	0.706	0.001
20	0.813	0.601	0.152	0.445	0.007	0.009	0.704	0.001
30	0.796	0.578	0.137	0.426	0.007	0.008	0.702	0.001
40	0.777	0.559	0.125	0.408	0.007	0.007	0.700	0.000
50	0.757	0.538	0.115	0.388	0.007	0.007	0.698	0.000
60	0.739	0.516	0.105	0.369	0.007	0.006	0.695	0.000
70	0.720	0.489	0.094	0.350	0.007	0.006	0.693	0.000
80	0.699	0.464	0.086	0.331	0.006	0.006	0.692	0.000
90	0.679	0.439	0.078	0.313	0.006	0.006	0.690	0.000
100	0.656	0.416	0.072	0.296	0.006	0.005	0.688	0.000

2016 Catch option	Probability of meeting or exceeding region-specific management objectives							
	Labrador	Newfound-land	Québec	Gulf	Scotia-Fundy	US	Southern NEAC	Simultaneous
0	0.743	0.547	0.304	0.563	0.009	0.003	0.630	0.000
10	0.728	0.531	0.285	0.545	0.008	0.003	0.629	0.000
20	0.708	0.511	0.267	0.524	0.008	0.003	0.627	0.000
30	0.689	0.490	0.251	0.506	0.007	0.003	0.625	0.000
40	0.672	0.469	0.235	0.486	0.007	0.002	0.623	0.000
50	0.654	0.448	0.220	0.470	0.007	0.002	0.622	0.000
60	0.637	0.428	0.205	0.453	0.007	0.002	0.620	0.000
70	0.617	0.408	0.192	0.433	0.006	0.002	0.618	0.000
80	0.599	0.389	0.178	0.419	0.006	0.002	0.616	0.000
90	0.577	0.370	0.165	0.402	0.005	0.002	0.614	0.000
100	0.558	0.354	0.154	0.385	0.005	0.002	0.612	0.000

2017 Catch option	Probability of meeting or exceeding region-specific management objectives							
	Labrador	Newfound-land	Québec	Gulf	Scotia-Fundy	US	Southern NEAC	Simultaneous
0	0.852	0.408	0.292	0.315	0.013	0.002	0.548	0.000
10	0.839	0.394	0.275	0.305	0.012	0.002	0.546	0.000
20	0.824	0.380	0.263	0.295	0.012	0.002	0.544	0.000
30	0.811	0.367	0.249	0.284	0.011	0.002	0.541	0.000
40	0.796	0.350	0.237	0.272	0.011	0.002	0.539	0.000
50	0.780	0.336	0.224	0.260	0.010	0.002	0.538	0.000
60	0.765	0.321	0.214	0.250	0.010	0.002	0.536	0.000
70	0.750	0.309	0.205	0.243	0.010	0.002	0.535	0.000
80	0.733	0.296	0.193	0.234	0.010	0.002	0.533	0.000
90	0.715	0.285	0.183	0.226	0.009	0.002	0.531	0.000
100	0.697	0.274	0.172	0.216	0.009	0.002	0.529	0.000

Table 5.8.1.1. Indicator variables retained from the North American geographic area. First year of PFA and end year of PFA refer to the start and end years of the indicator variable scaled to a common life stage (the PFA equals smolt year + 1). Number of years refers to the number of usable observations. All indicators with a true low or a true high ≥80% were incorporated into the framework.

Type	Origin	Age group	Area	River	Unit	PFA start year	PFA end year	Number of years	2014 value*	Threshold	Indicator low (true low)	Indocator high (true high)
Return	**W & H**	**2SW**	**USA**	**Penobscot**	**Number**	**1970**	**2013**	**44**	**174**	**2368**	**1**	**1**
Return	W	Large	SF	LaHave	Number	1972	2013	42	41	285	0.79	0.85
Return	W	Large	SF	North	Number	1983	2013	31	84	626	0.96	0.75
Return	W	Large	SF	Saint John	Number	1969	2013	45	46	3329	0.96	1
Return	W	1SW	SF	LaHave	Number	1979	2013	35	84	1679	0.95	0.67
Return	W	1SW	SF	Saint John	Number	1970	2013	44	112	2276	0.88	0.80
Survival	H	2SW	SF	Saint John	%	1975	2013	39	0.10	0.131	0.96	0.81
Survival	H	1SW	SF	Saint John	%	1975	2013	39	0.11	0.763	0.88	0.73
Return	W	2SW	Gulf	Miramichi	Number	1970	2013	44	6922	14695	1	0.82
Return	W	2SW	Gulf	Margaree	Number	1983	2013	31	1812	3471	0.86	0.56
Return	W	1SW	Gulf	Miramichi	Number	1971	2013	43	7475	41588	0.90	0.68
Return	W	Large	Québec	Bonaventure	Number	1983	2013	31	665	1493	0.81	0.73
Return	W	Large	Québec	Grande Rivière	Number	1983	2013	31	86	442	1	0.82
Return	W	Large	Québec	Saint-Jean	Number	1983	2013	31	278	1013	0.77	1
Return	W	Large	Québec	Dartmouth	Number	1983	2013	31	408	756	0.82	0.79

Type	Origin	Age group	Area	River	Unit	PFA start year	PFA end year	Number of years	2014 value*	Threshold	Indicator low (true low)	Indocator high (true high)
Return	**W & H**	**2SW**	**USA**	**Penobscot**	**Number**	**1970**	**2013**	**44**	**174**	**2368**	**1**	**1**
Return	W	Large	Québec	Madeleine	Number	1983	2013	31	308	693	0.93	0.81
Return	W	Large	Québec	Sainte-Anne	Number	1983	2013	31	519	584	0.88	0.80
Return	W	Large	Québec	Mitis	Number	1983	2013	31	290	369	0.89	0.59
Return	W	Large	Québec	de la Trinité	Number	1983	2013	31	65	385	0.84	0.92
Return	W	Small	Québec	Madeleine	Number	1984	2013	30	274	600	0.79	0.82
Return	W	Small	Québec	de la Trinité	Number	1979	2013	35	235	949	0.77	1
Survival	W	Large	Québec	de la Trinité	%	1985	2013	28	0.09	0.49	0.78	0.80
Survival	W	Small	Québec	de la Trinité	%	1985	2013	28	0.56	1.49	0.92	0.73

*** 2014 value: or if not available, the latest value of the time-series.**

Table 5.9.2.1. Contributions of North American origin regional groups (percentages, mean and standard error) from mixture analysis of genetic samples collected from the 2011 to 2014 West Greenland fisheries. Year-specific results and overall results for all years combined are shown. Contributions of italicised regions are indistinguishable from zero. Regional groups are shown in Figure 5.9.1.4.

Region-code	Region-name	2011	2012	2013	2014	Overall
UNG	Ungava-Northern Labrador	4.735 (0.515)	1.596 (0.582)	4.489 (1.099)	7.469 (1.31)	5.835 (1.188)
LAB	Central Labrador	19.91 (1.074)	17.046 (1.689)	21.234 (2.261)	21.255 (2.312)	21.76 (2.278)
QLS	Lower North Shore-Southern Labrador	4.212 (0.753)	1.45 (1.076)	4.564 (1.548)	4.948 (1.599)	5.776 (1.642)
NFL	Newfoundland	4.474 (0.737)	4.948 (1.362)	5.491 (1.705)	3.489 (1.455)	6.895 (1.719)
AVA	*Avalon-East Newfoundland*	*0.028 (0.051)*	*0.051 (0.109)*	*0.039 (0.088)*	*0.047 (0.111)*	*0.078 (0.185)*
QUE	Higher North Shore Québec	5.356 (0.813)	7.202 (1.536)	7.095 (1.692)	3.394 (1.435)	5.382 (1.678)
GAS	Gaspe	28.975 (1.41)	33.794 (2.504)	24.318 (2.79)	24.57 (2.767)	28.951 (2.895)
ANT	Anticosti	1.022 (0.285)	0.891 (0.444)	1.398 (0.636)	0.722 (0.502)	1.182 (0.651)
GUL	Southern Gulf of St Lawrence	29.327 (1.348)	30.466 (2.326)	28.281 (2.771)	33.495 (2.727)	22.863 (2.649)
NOS	Nova Scotia	0.847 (0.3)	0.846 (0.519)	1.93 (0.867)	0.176 (0.346)	0.171 (0.368)
FUN	*Inner Bay of Fundy*	*0.047 (0.086)*	*0.051 (0.115)*	*0.283 (0.486)*	*0.13 (0.27)*	*0.078 (0.193)*
USA	USA	1.067 (0.265)	1.66 (0.546)	0.877 (0.501)	0.305 (0.318)	1.03 (0.556)

Table 5.9.2.2. Estimated catches (median, 10th to 90th percentiles) by regional group of North American origin salmon at West Greenland in 2011 to 2014, based on genetic stock identification of annually specific sampling 2011 to 2014. Regional groups are shown in Figure 5.9.1.4.

Acronym	Region name	2011	2012	2013	2014	Average of medians (proportion of total)
North American origin estimated catch		6800	7800	11 500	12 800	9725
Number of NAC tissue samples		644	444	444	452	
UNG	Ungava-Northern Labrador	104 (59 to 161)	338 (244 to 463)	844 (682 to 1037)	732 (553 to 922)	504 (0.05)
LAB	Central Labrador	1156 (1021 to 1309)	1650 (1442 to 1886)	2448 (2131 to 2767)	2784 (2426 to 3149)	2009 (0.21)
QLS	Lower North Shore-Southern Labrador	84 (22 to 198)	353 (214 to 516)	558 (346 to 817)	727 (492 to 1015)	430 (0.05)
NFL	Newfoundland	335 (231 to 452)	422 (271 to 604)	381 (212 to 618)	870 (639 to 1182)	501 (0.05)
AVA	Avalon-East Newfoundland	0 (0 to 9)	0 (0 to 9)	0 (0 to 14)	1 (0 to 29)	0 (0.00)
QUE	Higher North Shore Québec	489 (363 to 625)	546 (404 to 720)	365 (192 to 609)	673 (439 to 962)	518 (0.05)
GAS	Gaspe	2293 (2105 to 2492)	1886 (1635 to 2147)	2823 (2483 to 3164)	3704 (3289 to 4078)	2676 (0.28)
ANT	Anticosti	56 (27 to 103)	103 (53 to 176)	72 (21 to 160)	138 (60 to 259)	92 (0.01)
GUL	Southern Gulf of St Lawrence	2064 (1890 to 2249)	2201 (1969 to 2446)	3855 (3492 to 4206)	2937 (2553 to 3318)	2764 (0.29)
NOS	Nova Scotia	49 (20 to 102)	140 (67 to 240)	4 (0 to 57)	3 (0 to 68)	48 (0.01)
FUN	Inner Bay of Fundy	0 (0 to 9)	6 (0 to 62)	2 (0 to 44)	0 (0 to 30)	2 (0.00)
USA	USA	108 (67 to 165)	61 (25 to 124)	26 (3 to 84)	118 (51 to 223)	78 (0.01)

Table 5.9.2.3. Estimated catches (median, 10th to 90th percentiles) of North American origin salmon at West Greenland in 2011 to 2014, based on genetic stock identification using all samples processed from the 2011 to 2014 sampling. Regional groups are shown in Figure 5.9.1.4.

Acronym	Region name	2011	2012	2013	2014	Average of medians (proportion of total)
Number of NAC tissue samples			1984			
North American origin estimated catch		6800	7800	11 500	12 800	9725
UNG	Ungava-Northern Labrador	320 (273 to 374)	369 (316 to 424)	541 (463 to 623)	609 (527 to 701)	459 (0.05)
LAB	Central Labrador	1350 (1260 to 1446)	1558 (1455 to 1669)	2291 (2136 to 2449)	2543 (2373 to 2711)	1935 (0.20)
QLS	Lower North Shore-Southern Labrador	286 (221 to 356)	327 (255 to 401)	476 (378 to 603)	538 (418 to 666)	406 (0.04)
NFL	Newfoundland	304 (240 to 371)	349 (270 to 429)	511 (410 to 618)	564 (456 to 690)	431 (0.04)
AVA	Avalon-East Newfoundland	0 (0 to 6)	0 (0 to 6)	1 (0 to 10)	1 (0 to 9)	0 (0.00)
QUE	Higher North Shore Québec	360 (297 to 439)	414 (334 to 505)	606 (504 to 742)	683 (558 to 820)	515 (0.05)
GAS	Gaspe	1973 (1853 to 2079)	2256 (2126 to 2390)	3324 (3132 to 3525)	3706 (3518 to 3933)	2814 (0.29)
ANT	Anticosti	68 (44 to 97)	77 (50 to 111)	113 (77 to 162.1)	125 (85 to 180)	95 (0.01)
GUL	Southern Gulf of St Lawrence	1993 (1879 to 2109)	2284 (2165 to 2406)	3382 (3189 to 3554)	3746 (3545 to 3961)	2851 (0.29)
NOS	Nova Scotia	54 (31 to 86)	62 (37 to 100)	93 (56 to 143)	104 (62 to 158)	78 (0.01)
FUN	Inner Bay of Fundy	1 (0 to 9)	1 (0 to 11)	1 (0 to 15)	1 (0 to 19)	1 (0.00)
USA	USA	72 (49 to 98)	81 (57 to 115)	120 (84 to 167)	134 (91 to 183)	101 (0.01)

Table 5.9.2.4. Overall contributions of European origin regional groups to samples collected during the 2002 and 2004–2012 fisheries. Regional groups are shown in Figure 5.9.1.4.

Acronym	Region name	Overall
NW Icld.	Iceland NW	0.2%
N Kola	N Kola	0.5%
Finnmark	Finnmark	0.0%
E Nor. & Swd.	E Norway & Sweden	0.8%
Mid Nor.	Mid Norway	1.5%
S Nor.	S Norway	0.6%
Den.	Denmark	0.2%
N Scot. & N&W Ire.	N Scotland & N&W Ireland	25.2%
BannLev	BannLev	2.2%
Irish Sea	Irish Sea	26.6%
S&E Scot.	S&E Scotland	39.9%
S. Eng.	South England	0.3%
N&W Fra.	N&W France	1.8%
S Fra. & Spn.	S France & Spain	0.1%

Table 5.9.2.5. Estimated catches by regional group of European origin salmon at West Greenland in 2002 and 2004–2012, based on genetic stock identification. Year-specific estimated contributions of regional groups were deterministically applied to the estimated harvest of European origin salmon. Regional groups are shown in Figure 5.9.2.1.

YEAR	2002	2004	2005	2006	2007	2008	2009	2010	2011	2012
estimated NEAC catch	1000	1500	1200	1800	1900	1300	800	2600	600	2100
NW Icld.	0	0	0	0	9	0	0	0	21	9
N Kola	7	0	0	5	9	20	0	32	0	9
Finnmark	0	4	0	0	0	0	0	0	0	0
E Nor. & Swd.	7	7	16	5	19	0	6	42	11	26
Mid Nor.	13	11	31	44	56	10	6	11	21	34
S Nor.	0	11	8	11	28	0	6	32	0	9
Den.	0	0	8	5	0	15	0	0	0	0
N Scot. & N&W Ire.	267	353	267	518	454	319	265	456	118	646
BannLev	13	44	24	49	74	10	6	32	11	51
Irish Sea	287	452	384	436	519	314	195	722	139	459
S&E Scot.	380	592	431	704	695	572	271	1231	268	799
S. Eng.	0	0	8	0	19	0	0	0	0	34
N&W Fra.	27	22	24	22	19	40	44	21	11	26
S Fra. & Spn.	0	4	0	0	0	0	0	21	0	0

Table 5.9.2.6. Estimated catches by regional group of European origin salmon at West Greenland in 2002 and 2004–2012, based on genetic stock identification. The overall estimated contributions of regional groups from the time period 2002 and 2004–2012 were deterministically applied to the estimated harvest of European origin salmon. Regional groups are shown in Figure 5.9.2.1.

YEAR	2002	2004	2005	2006	2007	2008	2009	2010	2011	2012
estimated NEAC catch	1000	1500	1200	1800	1900	1300	800	2600	600	2100
NW Icld.	2	3	2	3	3	2	1	5	1	4
N Kola	5	8	6	9	10	7	4	13	3	11
Finnmark	0	1	1	1	1	1	0	1	0	1
E Nor. & Swd.	8	12	9	14	15	10	6	20	5	16
Mid Nor.	15	23	18	27	29	20	12	39	9	32
S Nor.	6	10	8	12	12	8	5	17	4	13
Den.	2	3	3	4	4	3	2	6	1	5
N Scot. & N&W Ire.	252	378	302	454	479	328	202	655	151	529
BannLev	22	32	26	39	41	28	17	56	13	45
Irish Sea	266	399	319	479	505	346	213	691	160	558
S&E Scot.	399	598	478	717	757	518	319	1036	239	837
S. Eng.	3	5	4	6	6	4	3	8	2	7
N&W Fra.	18	28	22	33	35	24	15	48	11	39
S Fra. & Spn.	1	2	2	2	3	2	1	4	1	3

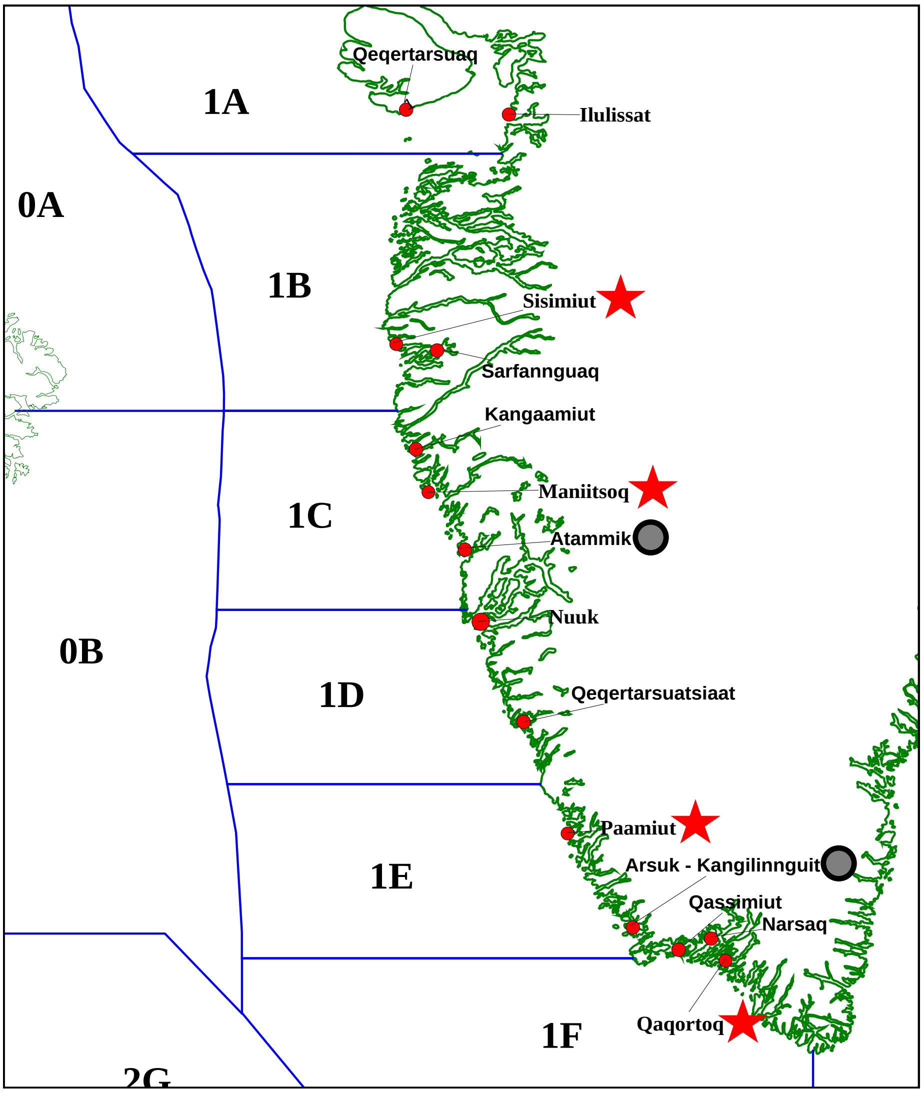


Figure 5.1.1.1. Location of NAFO divisions along the coast of West Greenland. Stars identify the communities where sampling occurred and circles identify the communities where factory landed salmon where sampled.

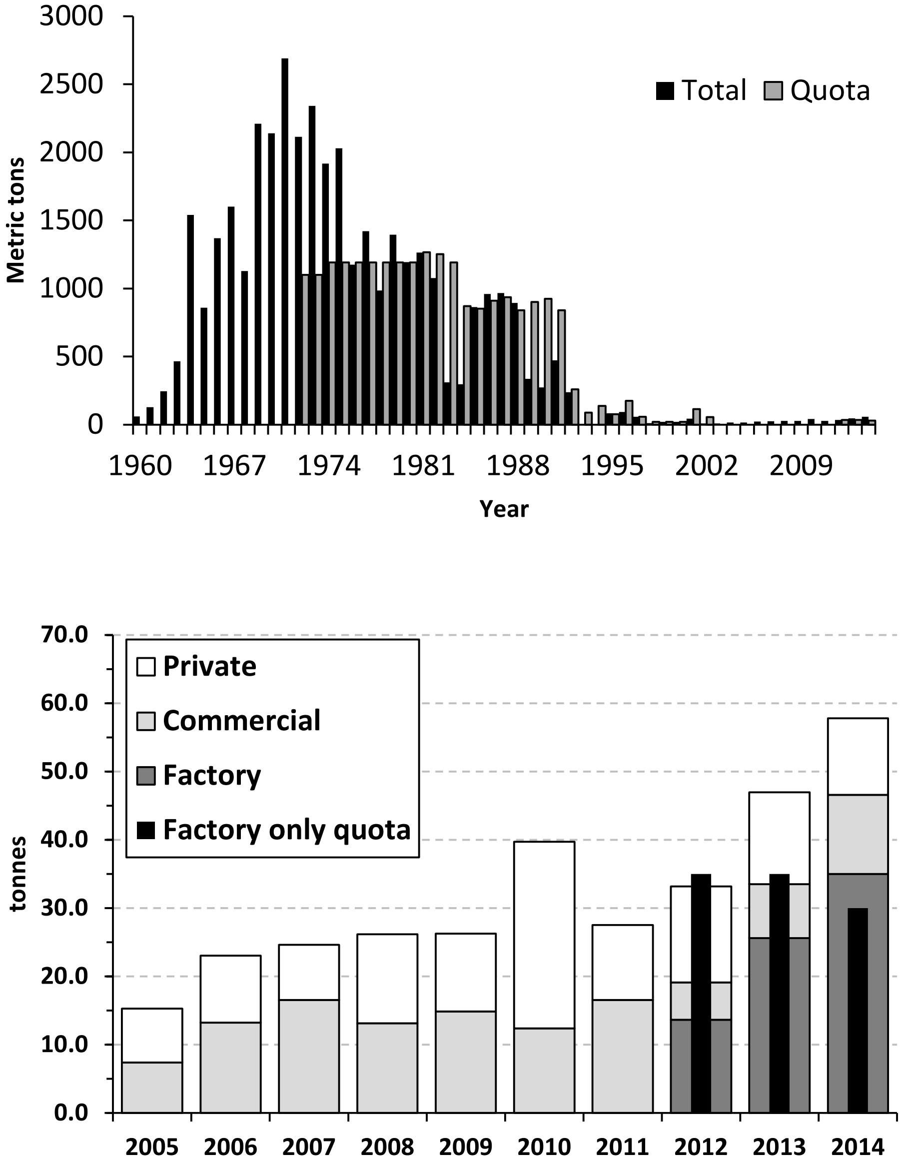
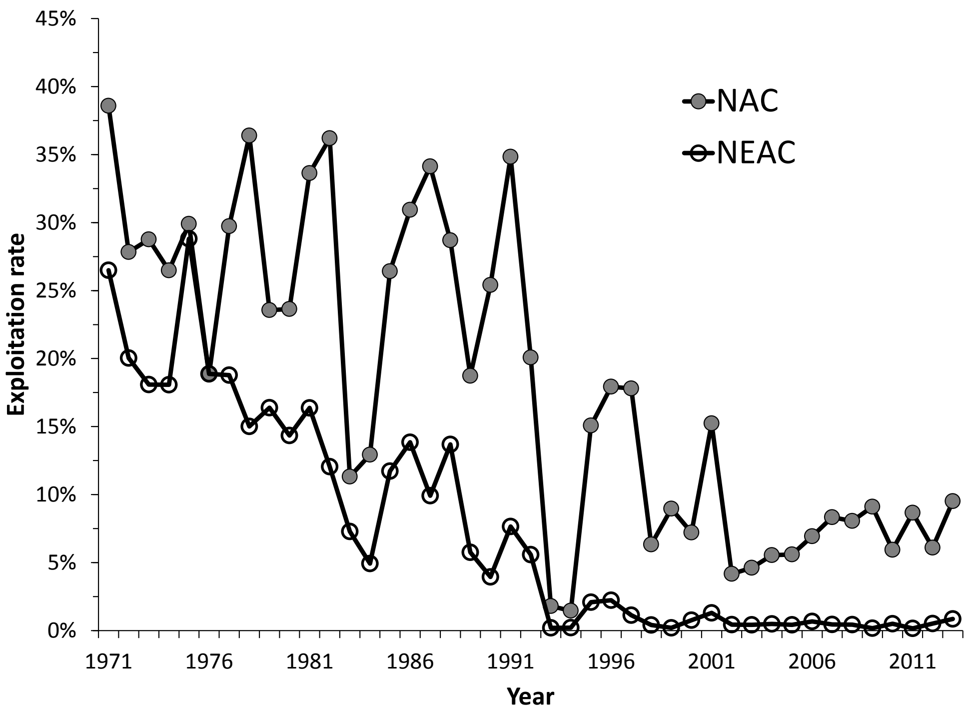


Figure 5.1.1.2. Nominal catches and commercial quotas (metric tonnes, round fresh weight) of salmon at West Greenland for 1960–2014 (top panel) and 2005–2014 (bottom panel). Total reported landings from 2005–2014 are displayed by landings **type. No quotas were set from 2003–2011, but since 2012 an annual quota has been set and applied to factory landings only.**



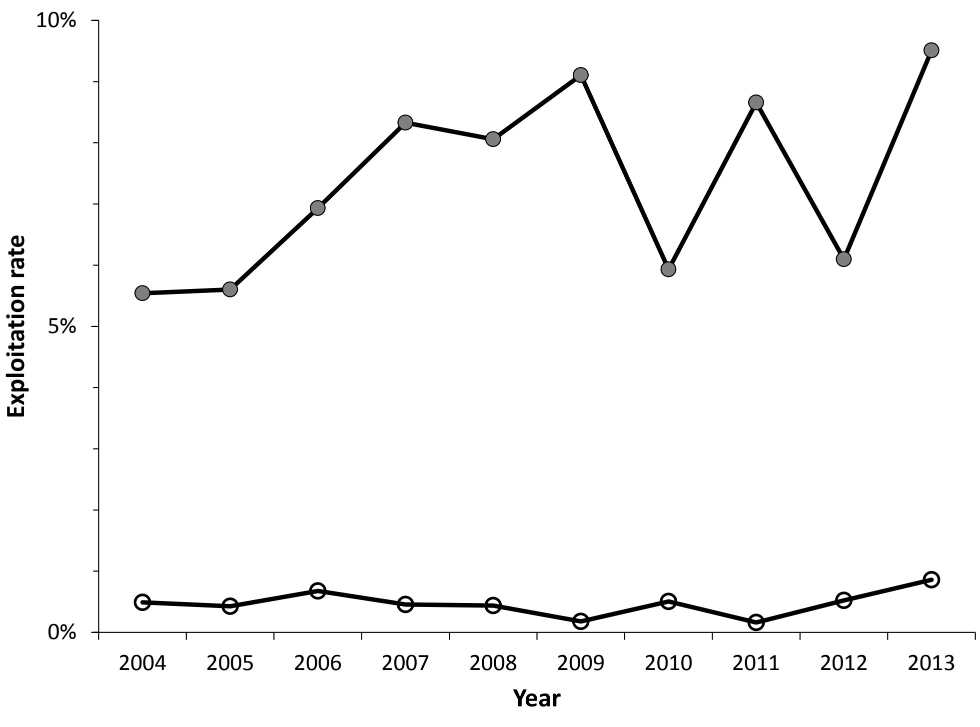
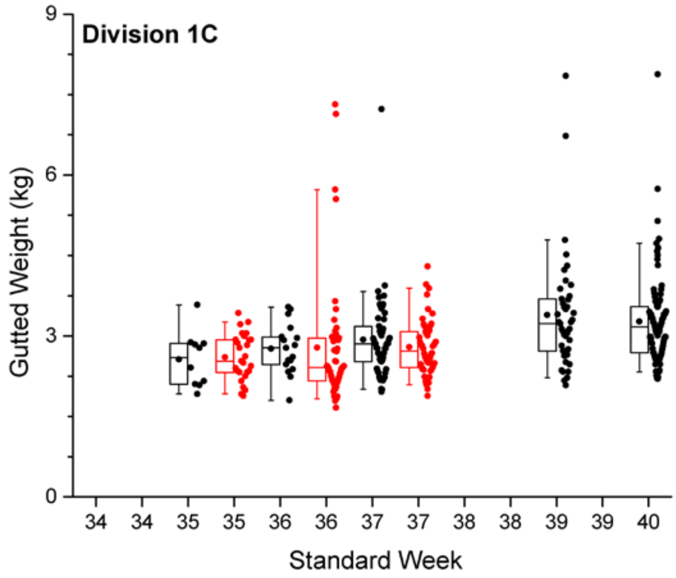


Figure 5.1.1.3. Exploitation rate (%) for NAC 1SW non-maturing and Southern NEAC non-maturing Atlantic salmon at West Greenland, 1971–2013 (top) and 2004–2013 (bottom). Exploitation rate estimates are only available to 2013, as 2014 exploitation rates are dependent on 2015 2SW NAC or MSW (NEAC) returns.



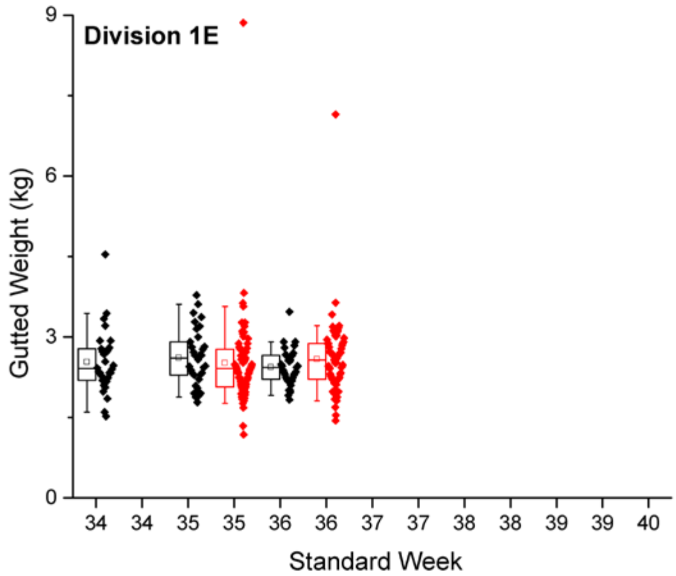


Figure 5.1.2.1. Box plots of gutted weight for non-factory (black) and factory (red) samples collected in 2014 from NAFO Divisions 1C (top) and 1E (bottom) across standard weeks 34–40. Data are represented by the mean (hollow square), median (horizontal line), 25th and 75th percentiles (box), 5th and 95th percentiles (whiskers) and the individual values.

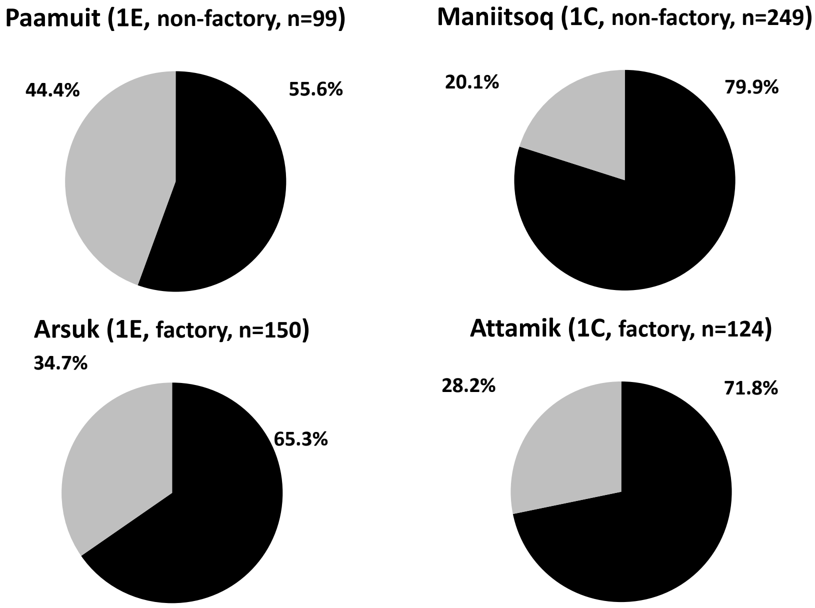


Figure 5.1.2.2. Continent of origin percentages for North American (black) and European (grey), and sample sizes, from factory and non-factory samples collected in NAFO Divisions 1C and 1E in 2014.

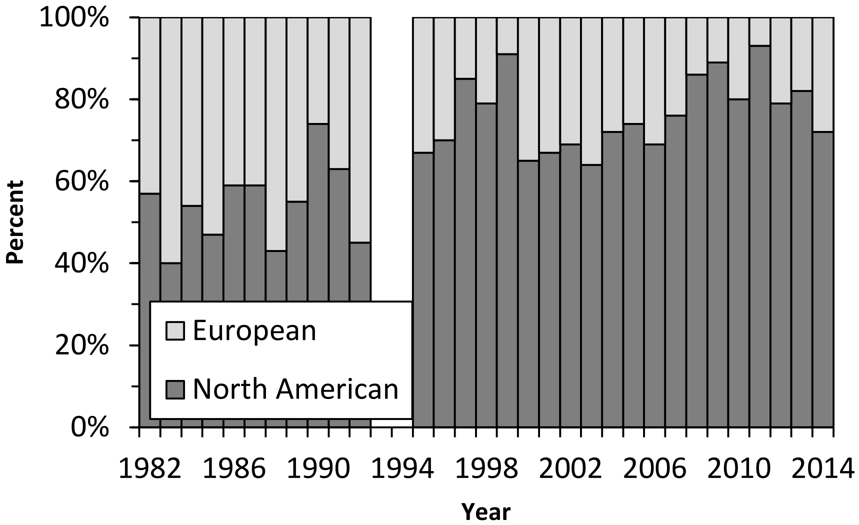
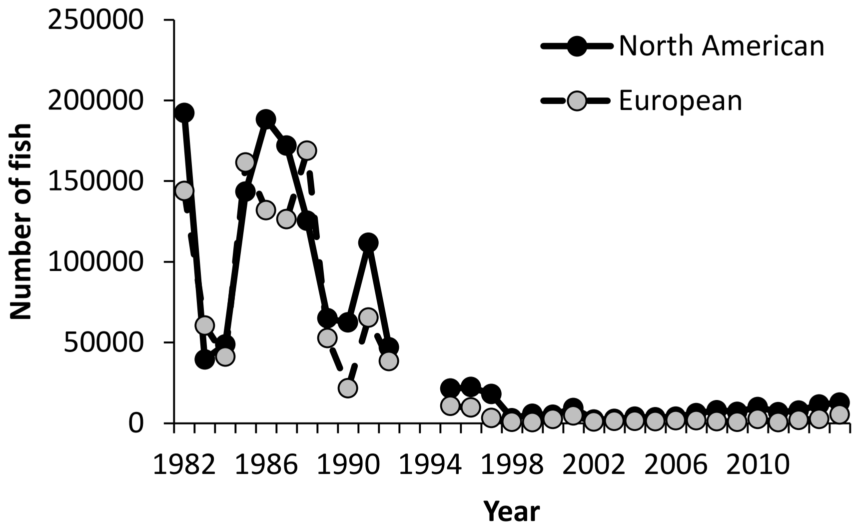


Figure 5.1.2.3. Percent of the sampled catch by continent of origin for the 1982 to 2014 Atlantic salmon West Greenland fishery.



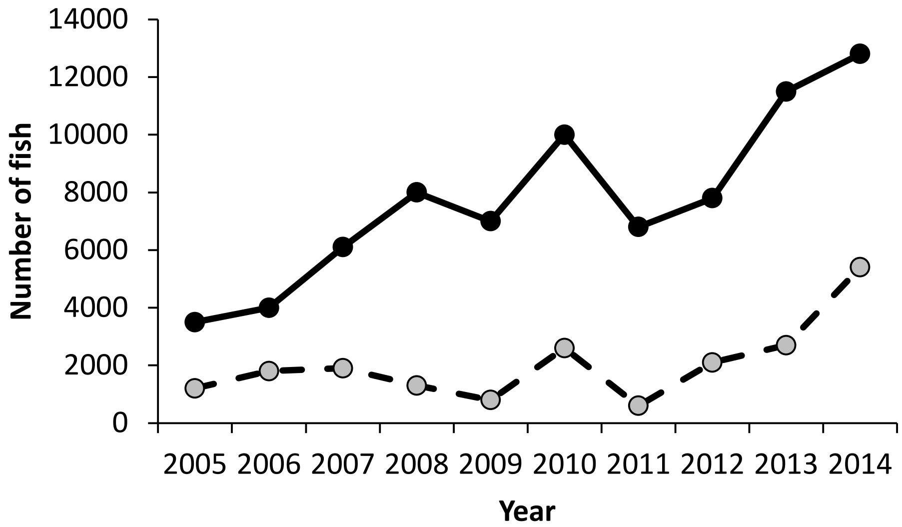


Figure 5.1.2.4. Number of North American and European Atlantic salmon caught at West Greenland from 1982 to 2014 (upper panel) and 2005 to 2014 (lower panel) based on NAFO Division continent of origin weighted by catch (weight) in each division. Numbers are rounded to the nearest hundred fish. Unreported catch is not included in this assessment.

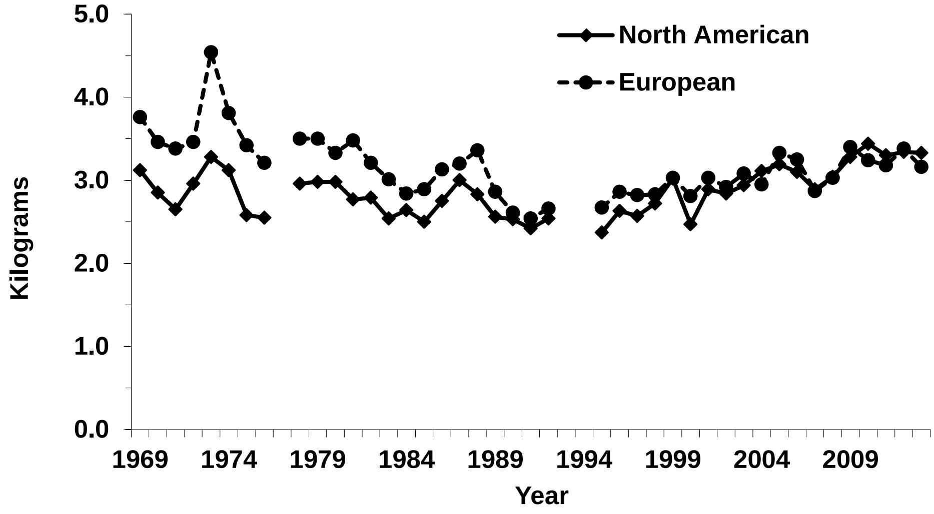


Figure 5.1.3.1. Mean uncorrected whole weight (kg) of European and North American 1SW Atlantic salmon sampled in West Greenland from 1969–2014.

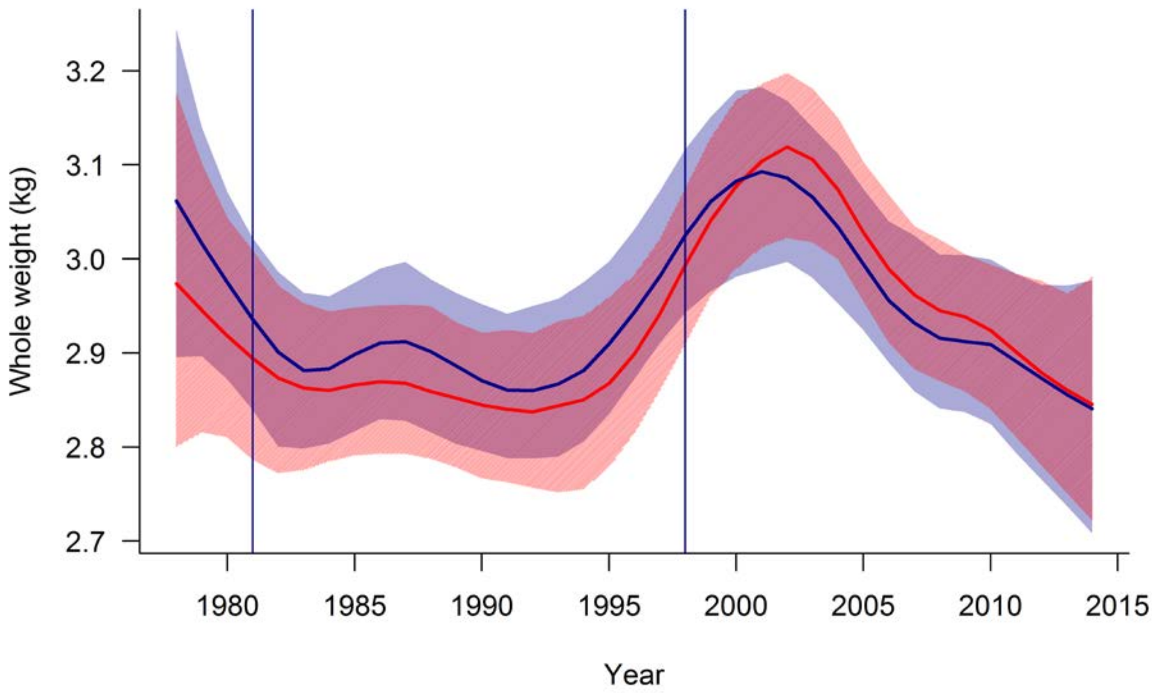


Figure 5.1.3.1 Trends in whole weight (kg) for maiden 1 SW fish of North American origin (red) and European origin (blue) over the sampling period (1978–2014). The plot above presents weights for a 65 cm fish on the 20th of August. Shaded areas represent 95% pointwise credibility intervals. Vertical bars represent major changes in the methods used to sample the harvest. Prior to 1982 samples were obtained randomly from research surveys, during 1983–1998 samples were collected from fish processing plants and sometimes were obtained from catch sorted by size and post 1999 samples were randomly obtained from open air markets.

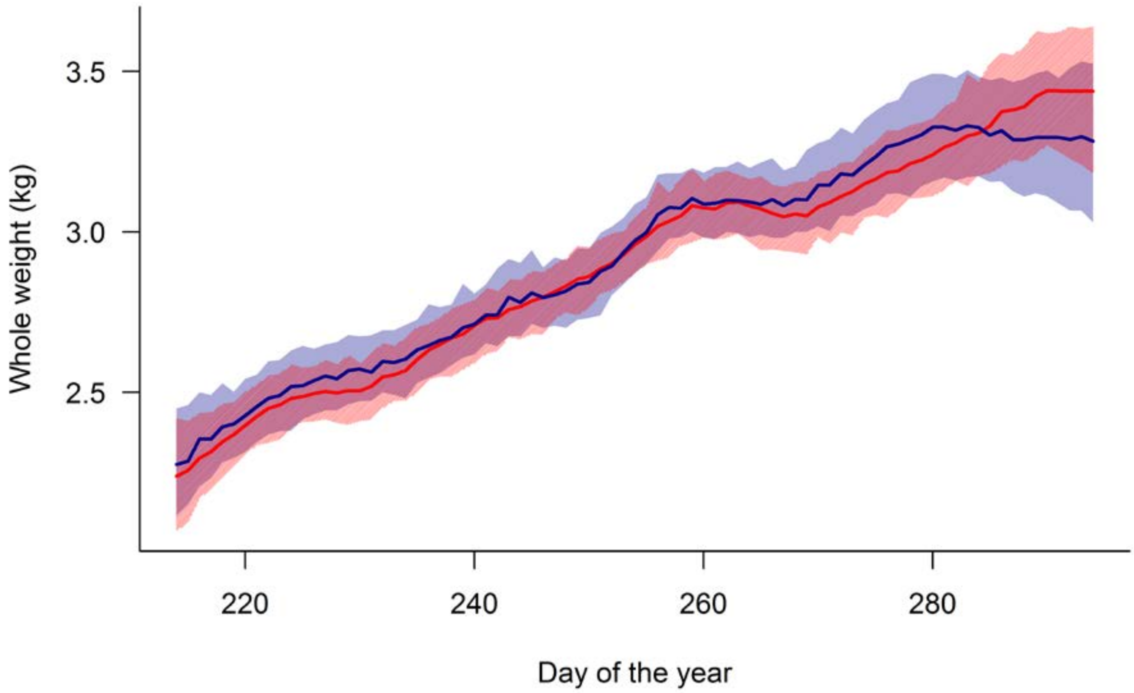


Figure 5.1.3.2. Trends in whole weight (kg) for maiden 1SW fish of North American origin (red) and European origin (blue) through the fishing season (1st August to 30th October). Presented is the weight increase for an average fish. Shaded areas represent 95% pointwise credibility intervals. Day 220 represents August 8th, 240 represents August 28th, 260 represents September 17th and 280 represents October 7th. The graph ends at day 294, October 21st.

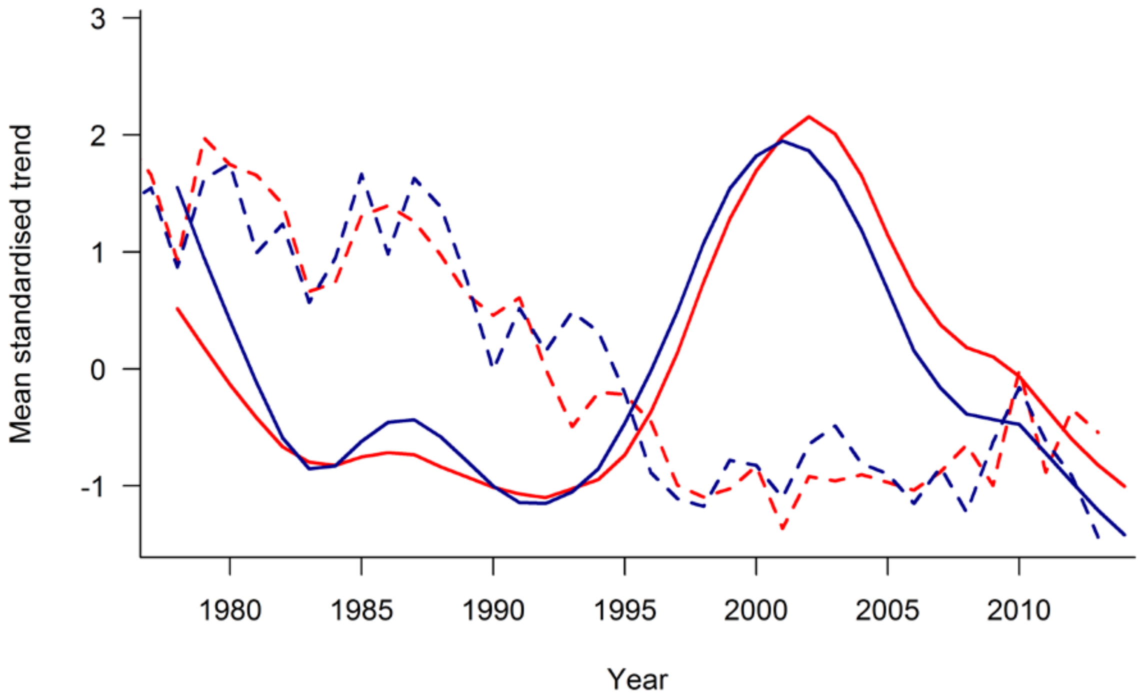


Figure 5.1.3.3. Trends in standardised logged PFA (dashed line) and fish weight (solid line) in the Greenland catch. Trends in weights for fish of North American origin and North American PFA are in red, while those for fish of European origin and European PFA are in blue. The time-series were centred to have zero mean and scaled to have unit variance over the years 1978 to 2013.

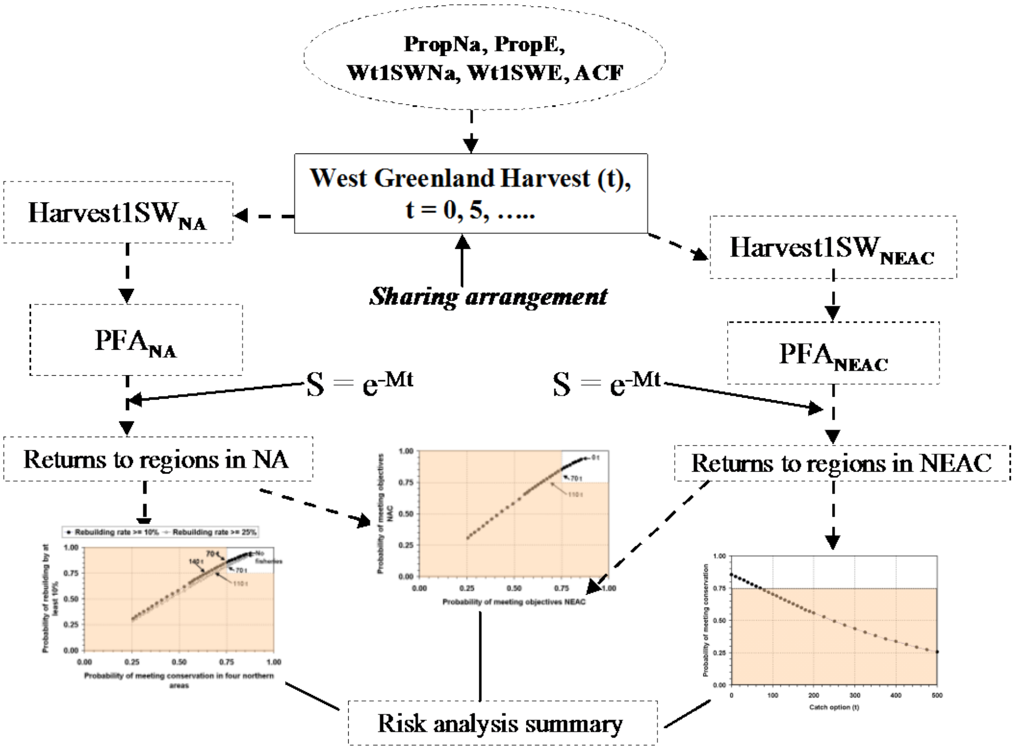


Figure 5.7.3.1. Flowchart, risk analysis for catch options at West Greenland using the PFA$_{NA}$ and the PFA$_{NEAC}$ predictions for the year of the fishery. Inputs with solid borders are considered known without error. Estimated inputs with observation error that is incorporated in the analysis have dashed borders. Solid arrows are functions that introduce or transfer without error whereas dashed arrows transfer errors through the components.

	Catch Advice	**Catch option > 0 (Yes = 1, No = 0)**			**0**				
	Overall Recommendation								
	No Significant Change Identified by Indicators								

Geographic Area	River/ Indicator	2014 Value	Ratio Value to Threshold	Threshold	True Low	True High	Indicator State	Probability of Correct Assignment	Indicator Score	Management Objective Met?
USA	Penobscot 2SW Returns	174	7%	2,368	100%	100%	-1	1	-1	
	possible range				*-1.00*	*1.00*				
	Average		7%						**-1.00**	**No**
Scotia-Fundy	Saint John Return Large	46	1%	3,329	96%	100%	-1	0.96	-0.96	
	Lahave Return Large	41	14%	285	79%	85%	-1	0.79	-0.79	
	North Return Large	84	13%	626	96%	96%	-1	0.96	-0.96	
	Saint John Survival 2SW (%)	0.10	76%	0.131	96%	81%	-1	0.96	-0.96	
	Saint John Survival 1SW (%)	0.11	14%	0.763	88%	73%	-1	0.88	-0.88	
	Saint John Return 1SW	112	5%	2,276	88%	80%	-1	0.88	-0.88	
	LaHave Return 1SW	84	5%	1,679	95%	67%	-1	0.95	-0.95	
	possible range				*-0.91*	*0.83*				
	Average		19%						**-0.91**	**No**
Gulf	Miramichi Return 2SW	6,922	47%	14,695	100%	82%	-1	1.00	-1.00	
	Miramichi Return 1SW	7,475	18%	41,588	90%	68%	-1	0.90	-0.90	
	Margaree Return Large	1,812	52%	3,471	86%	56%	-1	0.86	-0.86	
	possible range				*-0.92*	*0.69*				
	Average		39%						**-0.92**	**No**
Quebec	Bonaventure Return Large	665	45%	1,493	81%	73%	-1	0.81	-0.81	
	Grande Rivière Return Large	86	19%	442	100%	82%	-1	1.00	-1.00	
	Saint-Jean Return Large	278	27%	1013	77%	100%	-1	0.77	-0.77	
	Dartmouth Return Large	408	54%	756	82%	79%	-1	0.82	-0.82	
	Madeleine Return Large	308	44%	693	93%	81%	-1	0.93	-0.93	
	Sainte-Anne Return Large	519	89%	584	88%	80%	-1	0.88	-0.88	
	Mitis Return Large	290	79%	369	89%	59%	-1	0.89	-0.89	
	De la Trinité Return Large	65	17%	385	84%	92%	-1	0.84	-0.84	
	Madeleine Return Small	274	46%	600	79%	82%	-1	0.79	-0.79	
	De la Trinité Return Small	235	25%	949	77%	100%	-1	0.77	-0.77	
	De la Trinité 1SW Survival	0.56	38%	1.49	78%	80%	-1	0.78	-0.78	
	De la Trinité 2SW Survival	0.09	17%	0.54	92%	73%	-1	0.92	-0.92	
	possible range				*-0.85*	*0.82*				
	Average		42%						**-0.85**	**No**
Newfoundland										
	possible range									
	Average								**NA**	**Unknown**
Labrador										
	possible range									
	Average								**NA**	**Unknown**
Southern NEAC										
	possible range									
	Average								**NA**	**Unknown**

Figure 5.8.1.1. Framework of indicators spreadsheet for the West Greenland fishery. For illustrative purposes, the 2014 value of returns or survival rates for the 23 retained indicators is entered in the cells corresponding to the annual indicator variable values.

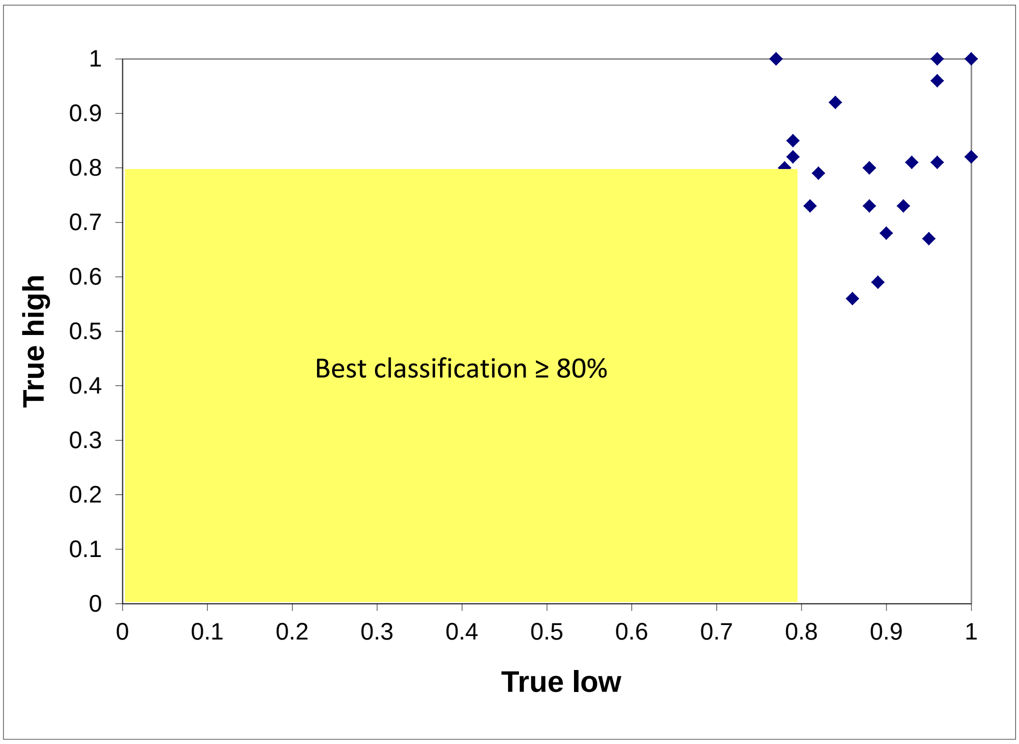


Figure 5.8.1.2. Comparative performance of the retained indicators (N = 23) at identifying a true low (i.e. management objective will not be met) and a true high (i.e. management objective will be met) for the West Greenland multiyear catch advice framework.

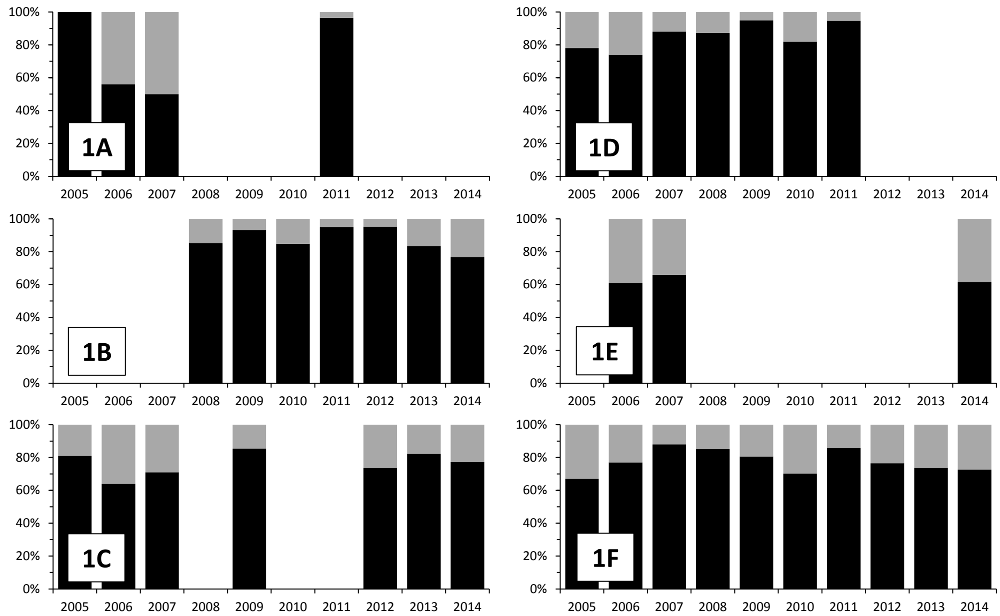


Figure 5.9.1.1. Year and division specific estimates of continent of origin contributions (%) to the 2005–2014 harvests at West Greenland fishery. Data represent year and division combinations where samples are available.

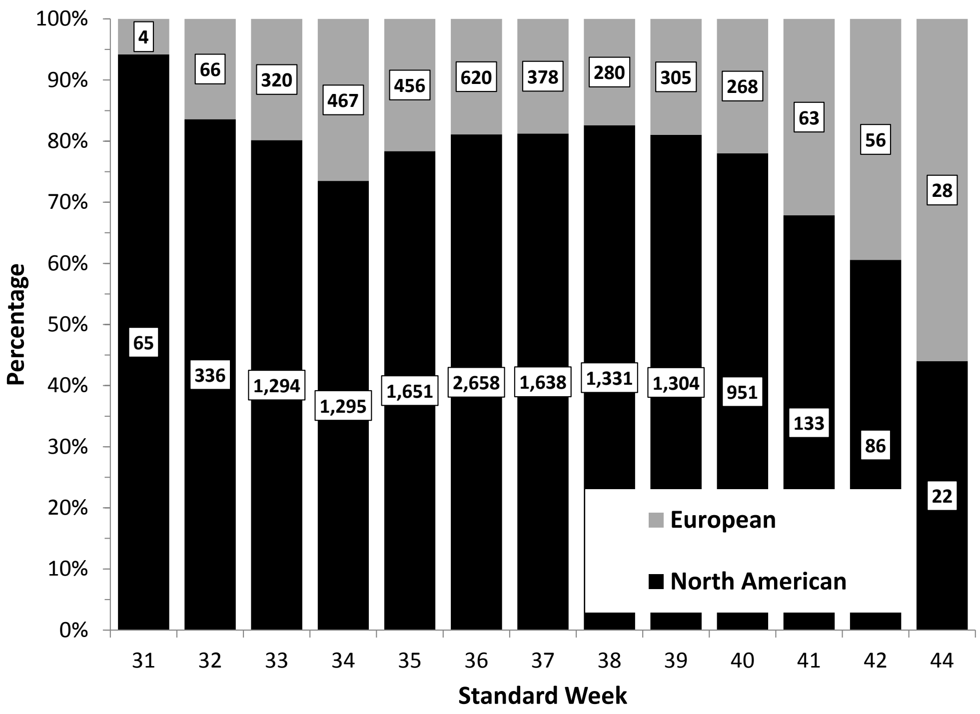


Figure 5.9.1.2. Continent of origin estimates by standard week for the 2005–2014 combined harvests at West Greenland. Sample sizes are provided in the text boxes.

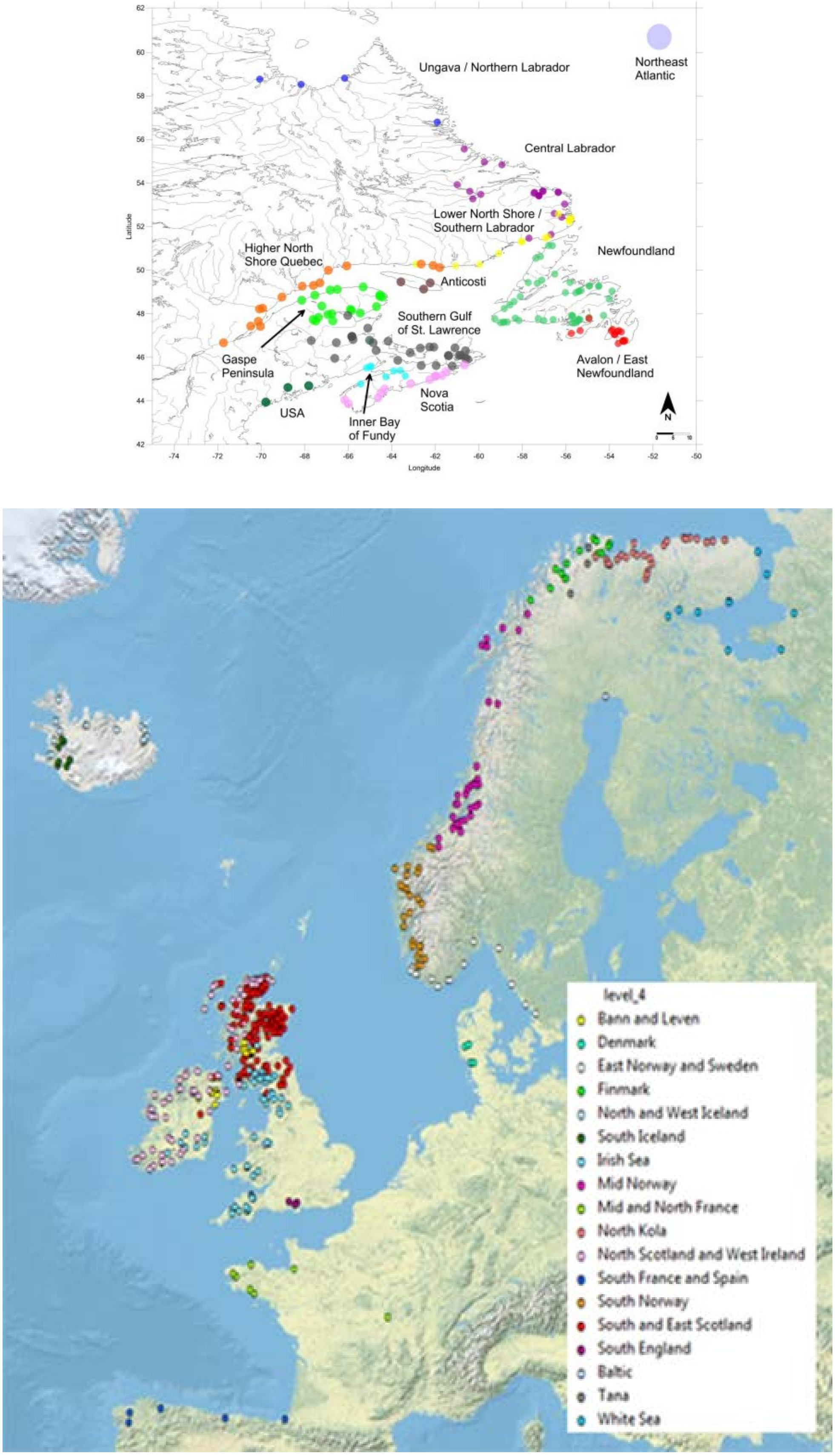


Figure 5.9.2.1. Regional groups for the North American (top) and European (bottom) origin salmon.

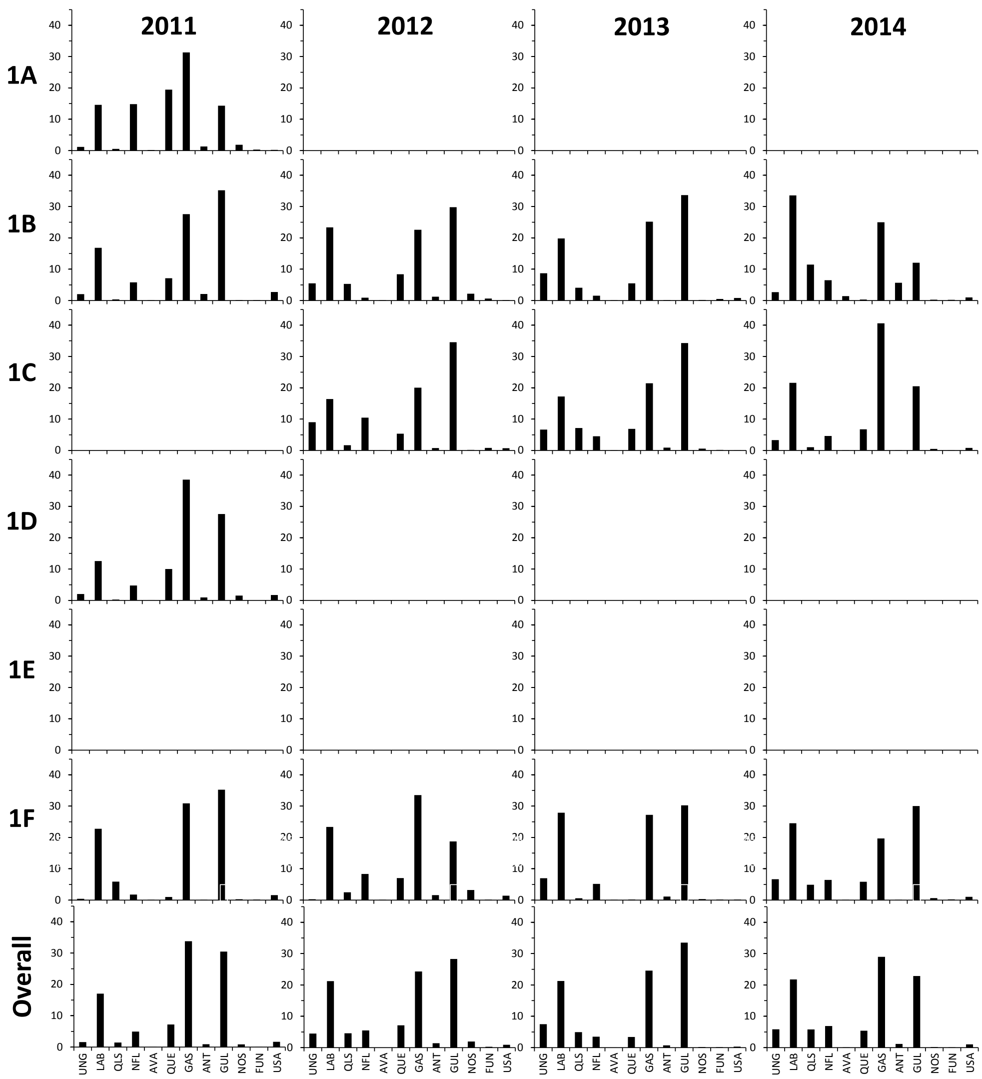


Figure 5.9.2.2. Regional contributions (%) to the North American harvest by NAFO Division for the 2011–2014 West Greenland harvests.

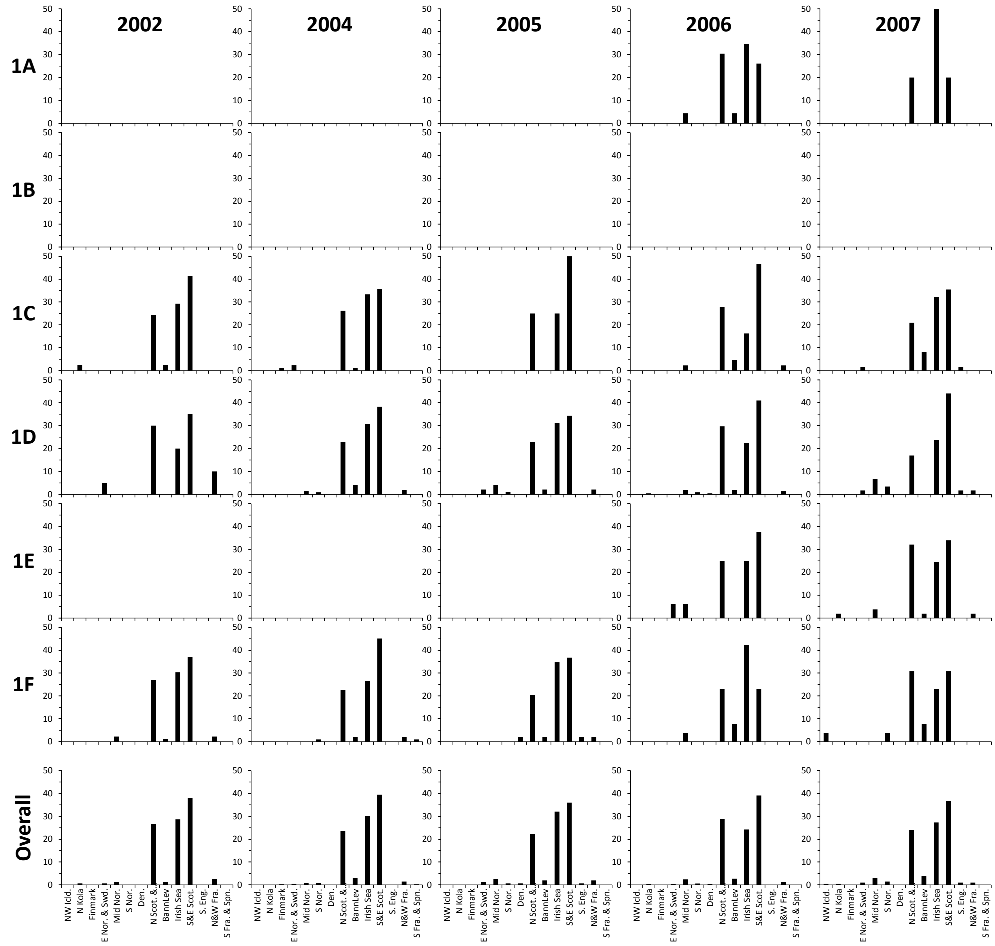


Figure 5.9.2.3. European regional contributions (%) by NAFO Division for the 2002 and 2004–2007 West Greenland harvests.

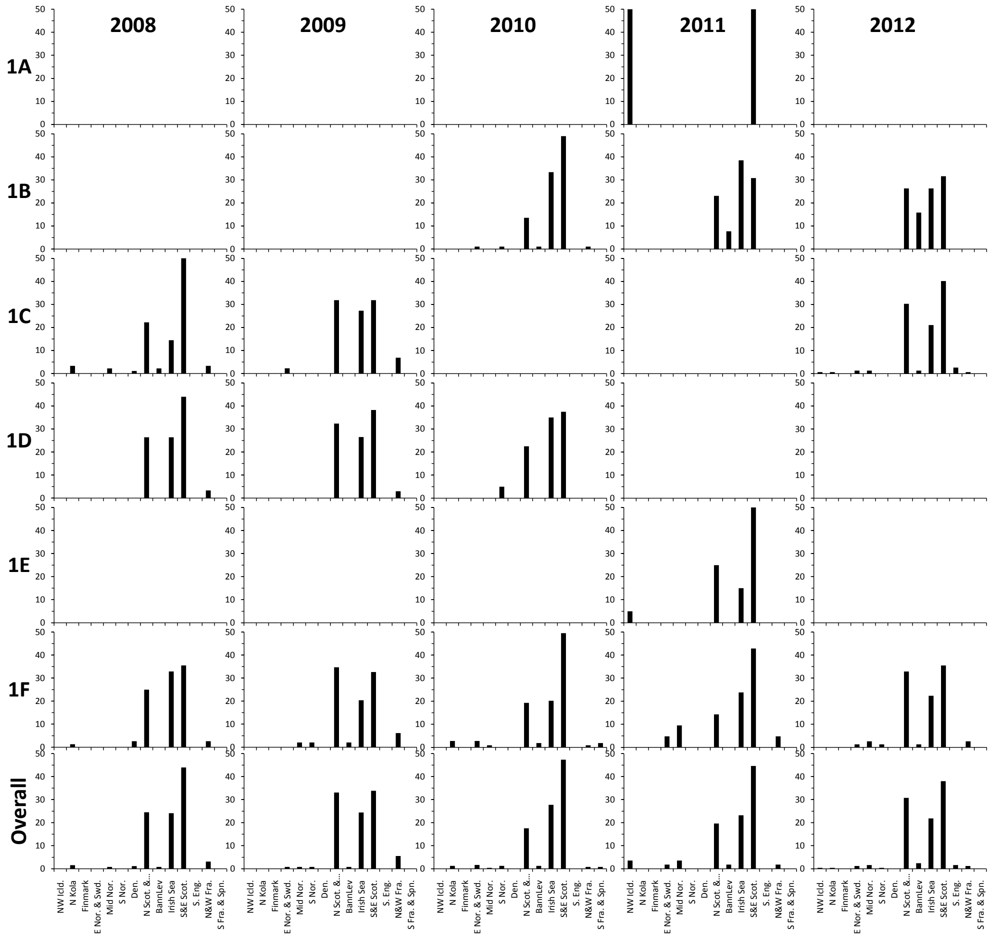


Figure 5.9.2.4. European regional contributions (%) by NAFO Division for the 2008–2012 West Greenland harvests.

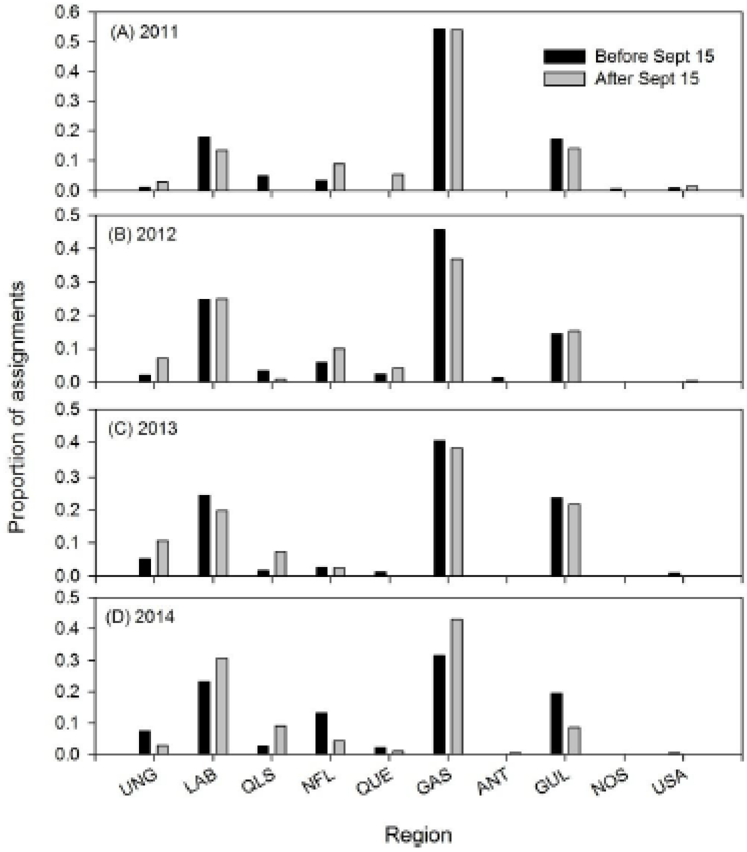


Figure 5.9.2.5. Comparison of individual assignments of samples from the West Greenland Atlantic Salmon fishery, all NAFO Divisions combined, from before and after September 15th 2011–2014. Regional groups are shown in Figure 5.9.2.1.

Annex 1: Working documents submitted to the Working Group on North Atlantic Salmon, 17–26 March, 2015

WP No.	Authors	Title
1	Dionne, M. and Cauchon, V.	Smolt production, freshwater and sea survival on two index rivers in Québec, the Saint-Jean and the Trinité.
2	Dionne, M. and Cauchon, V.	Status of Atlantic salmon stocks in Québec for 2014.
3	Degerman, E., Spjut, D. & Sers, B.	Fisheries, status and management of Atlantic salmon stocks in Sweden: National Report for 2014.
4	de la Hoz, J.	Salmon fisheries and status of stocks in Spain (Asturias-2014). Report for 2015 Meeting WGNAS.
5	Jacobsen, J.A.	Status of the fisheries for Atlantic salmon and production of farmed salmon in 2014 for the Faroe Islands.
6	Rasmussen, G.	National report for Denmark, 2014.
7	Bailey, M., Sweka, J., Kocik, J., Atkinson, E. and Sheehan, T.	National Report for the United States, 2014.
8	Sheehan, T.F., Belleni, L., Coghlan, B., Deschamps, D., Haas-Castro, R. Mee, D., Thomas, K., Nygaard, R., King, T., Robertson M. and Ó Maoiléidigh, N	The International Sampling Program: Continent of Origin and Biological Characteristics of Atlantic Salmon Collected at West Greenland in 2014.
9	Bradbury, I.R., Hamilton, L.C., Chaput, G., Sheehan, T.F., Robertson, M.J., Poole, R., Goraguer, H., and Dempson, J.B.	Genetic mixed-stock analysis of three Northwest Atlantic Salmon fisheries: Labrador, Saint Pierre and Miquelon, and West Greenland.
10	Carr J., Chaput, G. & Douglas, S.	Wild Atlantic salmon smolt and kelt tracking update from three rivers of Eastern Canada.
11	Levy, A. L., R. A. Jones, and A. J. F. Gibson	Status of Atlantic Salmon in Canada's Maritimes Region (Salmon Fishing Areas 19 to 21, and 23).
12	DFO (Douglas, S. et al.)	Update of stock status of Atlantic Salmon (*Salmo salar*) in DFO Gulf Region (New Brunswick Salmon Fishing Areas 15 and 16) for 2014. DFO Can. Sci. Advis. Sec. Sci. Resp. 2015/008.
13	Breau, C., D. Cairns, and G. Chaput	Indicators of Atlantic salmon stock status for Prince Edward Island (SFA 17) and Nova Scotia (SFA 18) in DFO Gulf Region for 2014.
14	Cefas, Environment Agency & Natural Resources Wales	Salmon Stocks and Fisheries in UK (England & Wales), 2014 - Preliminary assessment prepared for ICES, March 2015.
15	Veinott, G., Cochrane, N., Robertson, M., Dempson, B., Poole, R., Bradbury, I. and Grant, C.	Update on the Status of Atlantic Salmon (*Salmo salar*) Stocks in the Newfoundland and Labrador Region (2013-2014).
16	Veinott, G. and Reddin, D.G.	Return and Spawner estimates of Atlantic salmon for insular Newfoundland.
17	Fiske, P., Jensen, A.J., Sægrov, H., Wennevik, V., and Gjøsæter, H.	Atlantic salmon; National Report for Norway 2014.
18	Ensing, D., Kennedy, R., Crozier, W.W., & Boylan, P.	National report for UK (Northern Ireland).
19	Kennedy, R., Ensing, D., Crozier, W.W., Rosell, R. & Boylan, P.	Progress with setting river-specific CLs in UK (Northern Ireland).
20	Ensing, D. & Crozier, W.W.	Genetic identification of fish-farm escapees.

WP No.	Authors	Title
21	Erkinaro, J., Orell, P., Länsman, M., Falkegård, M., Kuusela, J., Kylmäaho, M., Johansen, N., Ollila, J., Haantie, J. & Niemelä, E.	Status of Atlantic salmon stocks in the rivers Teno/Tana and Näätämöjoki/Neidenelva.
22	Gudbergson, G. , Antonsson, Th, and Jonsson, I.R.	National report for Iceland. The 2014 salmon season.
23	Potter, T., Gilbey, J., Wennevik, V., Fiske, P., & Jacobsen, J.A.	Estimation of the composition of the Faroes salmon catch based on the genetic analysis of historic scales.
24	Potter, T.	Options for taking account of North American stocks in Faroese waters for the provision of catch advice.
25	Potter, T.	Updates to the NEAC Pre Fishery Abundance and National Conservation Limit Model and data inputs – 2015.
26	Potter, T.	Documentation for NEAC Pre-Fishery Abundance and National Conservation Limit Model in R – Updated 2015.
27	Ó Maoiléidigh, N., White, J., Dillane, M., Bond, N., McLaughlin, D., Rogan, G., Cotter, D., Poole, R., O'Higgins, K., Gargan, P. & McGrory, T.	National report for Ireland – The 2014 salmon season.
28	Smith, G. W., MacLean, J.C. and Glover, R.	National report for UK (Scotland): 2014 season
29	Chaput, G., Dionne, M., Breau, C., Cairns, D., Cameron, P., Douglas, S., Jones, R., Levy, A., Poole, R., Robertson, M., and Veinott, G.	Catch Statistics and Aquaculture Production Values for Canada: preliminary 2014, final 2013.
30	Bradbury, I., Goraguer, H., and Chaput, G.	Genetic mixed-stock analysis of Atlantic salmon harvested in the Saint-Pierre et Miquelon fishery, 2004, 2011, 2013 and 2014.
31	Chaput, G, and Prevost, E.	Atlantic salmon Pre-Fishery Abundance (PFA) and Catch Advice Model 1978-2017 (West Greenland fishery years).
32	Nygaard, R.	The Salmon Fishery in Greenland, 2014.
33	Prusov, S. & Ustyuzhinskiy, G.	Atlantic salmon fisheries and status of stocks in Russia. National Report for 2014.
34	Euzenat, G.	National report for France.
35	Nygaard, R.	Results of the phone interview survey of licensed Greenlandic salmon fishermen conducted in February 2015.

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Annex 3: Participants list

Name	Address	Phone/Fax	E-mail
Ian R. Bradbury	Fisheries and Oceans Canada Northwest Atlantic Fisheries Centre 80 East White Hills Road PO Box 5667 St. John's, Newfoundland Canada AIC-5XI	Phone +1 709 772 3869	Ian.bradbury@dfo-mpo.gc.ca
Cindy Breau	Fisheries and Oceans Canada DFO Moncton PO Box 5030 Moncton NB E1C 9B6 Canada	Phone +1 506 851 6238	Cindy.breau@dfo-mpo.ca
Jonathan Carr	Atlantic Salmon Federation PO 5200 St Andrew's NB E5B 3S8 Canada	Phone +1 506 529 1385	jcarr@asf.ca
Gérald Chaput	Fisheries and Oceans Canada DFO Moncton PO Box 5030 Moncton NB E1C 9B6 Canada	Phone +1 506 851 2022	Gerald.Chaput@dfo-mpo.gc.ca
Scott Douglas	Fisheries and Oceans Canada DFO Moncton PO Box 5030 Moncton NB E1C 9B6 Canada	Phone +1 506 851 3218	Scott.Douglas@dfo-mpo.gc.ca
Dennis Ensing	Agri-food and Biosciences Institute (AFBI) Fisheries & Aquatic Ecosystems Branch Newforge Lane BT9 5PX Belfast Northern Ireland United Kingdom	Phone +44 28 90 255 054 Fax +44 28 255 004	dennis.ensing@afbini.gov.uk

Name	Address	Phone/Fax	E-mail
Jaakko Erkinaro	Finnish Game and Natural Resources Institute Finland PO 413 90014 Oulu Finland	Phone +358 405435929	jaakko.erkinaro@luke.fi
Wayne Fairchild	Fisheries and Oceans Canada DFO Moncton PO Box 5030 Moncton NB E1C 9B6 Canada	Phone +1 506 851 2056	Wayne.fairchild@dfo-mpo.gc.ca
Peder Fiske	Norwegian Institute for Nature Research PO 5685 Sluppen 7485 Trondheim Norway	Phone +47 93466733	Peder.fiske@nina.no
Harald Gjøsæter	Institute of Marine Research PO Box 1870 Nordnes 5817 Bergen Norway	Mobile +47 414 79 177 Fax +47 55 238687	Harald.Gjoesaeter@imr.no /harald@imr.no
Gudni Gudbergsson	Institute of Freshwater Fisheries Arleyni 22 IS-112 Reykjavik Iceland	Phone +354 5806300	gudni.gudbergsson@veidimal.is
Ross Jones	Fisheries and Oceans Canada Bedford Institute of Oceanography PO Box 1006 Dartmouth NS B2Y 4A2 Canada	Cell +1 506 866 2673	Ross.Jones@dfo-mpo.gc.ca
Alex Levy	Fisheries and Oceans Canada Bedford Institute of Oceanography PO Box 1006 Dartmouth NS B2Y 4A2 Canada	Phone +1 902 478 7837	Alex.Levy@dfo-mpo.gc.ca
Dave Meerburg	Atlantic Salmon Federation PO Box 5200 St Andrews NB E5B 3S8 Canada	Phone +1 613 990 0286 Fax +1 613 954 0807	dmeerburg@asf.ca

Name	Address	Phone/Fax	E-mail
Colin Millar	Marine Scotland Science Freshwater Laboratory Faskally Pitlochry PH16 5LB United Kingdom	Phone +44 1224 294419	Colin.millar@scotland.gsi.gov.uk
Rasmus Nygaard By WebEx	Greenland Institute for Natural Resources PO Box 570 3900 Nuuk Greenland	Phone +299	rany@natur.gl
Niall Ó'Maoilédiegh	Marine Institute Fisheries Ecosystem Advisory Services Farran Laboratory Furnace Newport, Co. Mayo Ireland	Phone +353 9842300 Fax +353 9842340	niall.omaoileidigh@marine.ie
Ted Potter	Centre for Environment, Fisheries and Aquaculture Science (Cefas) Lowestoft Laboratory Pakefield Road NR33 0HT Lowestoft Suffolk United Kingdom	Phone +44 1502 524260 Fax +44 1502 513865	ted.potter@cefas.co.uk
Etienne Rivot	Agrocampus-Ouest UMR Ecologie et Samté des Ecosystèmes 35042 Rennes Cedex France	Phone +33 2 23 48 59 34	Etienne.rivot@agrocampus-ouest.fr
Martha Robertson	Fisheries and Oceans Canada Northwest Atlantic Fisheries Centre 80 East White Hills Road PO Box 5667 St. John's, Newfoundland Canada A1C-5X1		Martha.robertson@dfo-mpo.ca

Name	Address	Phone/Fax	E-mail
Ian Russell Chair	Centre for Environment, Fisheries and Aquaculture Science (Cefas) Lowestoft Laboratory Pakefield Road NR33 0HT Lowestoft Suffolk United Kingdom	Phone +44 1502 524330 Fax +44 1502 513865	ian.russell@cefas.co.uk
Tim Sheehan	NOAA Fisheries Service Northeast Fisheries Science Center 166 Water Street Woods Hole MA 02543 United States	Phone +1 508495-2215 Fax +1 508495-2393	tim.sheehan@noaa.gov
Gordon Smith	Marine Scotland Science Inchbraoch House South Quay Ferryden Montrose Angus DD10 9SL United Kingdom	Phone + 44 1674 677070 Fax + 44 1674 672604	Gordon.smith@scotland.gsi.gov.uk
Vidar Wennevik	Institute of Marine Research PO Box 1870 Nordnes 5817 Bergen Norway	Phone +47 90 66 23 94	Vidar.wennevik@imr.no
Jonathan White	Marine Institute Rinville Oranmore Co. Galway Ireland	Phone +353 91 387361 Fax +353 91387361	Jonathan.white@marine.ie

Annex 4: Reported catch of salmon by sea age class

Reported catch of salmon in numbers and weight (tonnes round fresh weight) by sea age class. Catches reported for 2013 may be provisional. Methods used for estimating age composition given in footnote.

West Greenland

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
West 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

Canada

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	36619	65	-	-	-	-	-	-	-	-	8709	41	-	-	45328	106

USA

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

Faroe Islands

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

Finland

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

Iceland

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	56945	97	4274	19	-	-	-	-	-	-	-	-	-	-	61219	116
	2014	13593	29	3317	17	-	-	-	-	-	-	-	-	-	-	16910	47

Sweden

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

Norway

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

Russia

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

Ireland

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

UK (England and Wales)

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	7291	-	-	-	-	-	-	-	-	-	6211	-	-	-	13502	52

UK (Scotland)

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	12572	26	-	-	-	-	-	-	-	-	13258	58	-	-	25830	83

France

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

Spain

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	-	-	-	-	-	-	-	-	726	4	-	-	837	4
	2014	161	0	-	-	-	-	-	-	-	-	1047	5	-	-	1208	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; 63 cm 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 categorise catches into sea age classes; misclassification 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). No data for 2008, previous year's data used to estimate split.

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.

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 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 2014a). 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. iv) NASCO also routinely requests ICES to document emerging issues of relevance to the management of salmon fisheries. Details are

GENERIC TOR QUESTIONS	WGNAS RESPONSE
	provided in Section 2 of the report (above).
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 WGNAS Chair in advance of the RG/ADG meeting in April.
e) 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.

GENERIC TOR QUESTIONS	WGNAS RESPONSE
	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.
f) Prepare the data calls for the next year update assessment and for the planned data compilation workshops.	Not applicable to WGNAS.
g) 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.
h) 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.
i) 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_SA	Atlantic salmon	March 2015	Atlantic salmon

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.

BCI *(Bayesian Credible Interval).* The Bayesian equivalent of a confidence interval. If the 90% BCI for a parameter A is 10 to 20, there is a 90% probability that A 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.

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.

COSEWIC *(Committee on the Status of Endangered Wildlife in Canada).* COSEWIC is the organization that assesses the status of wild species, subspecies, varieties, or other important units of biological diversity, considered to be at risk of extinction in Canada. COSEWIC uses scientific, Aboriginal traditional and community knowledge provided by experts from governments, academia and other organizations. Summaries of assessments on Atlantic salmon are currently available to the public on the COSEWIC website (www.cosewic.gc.ca)

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.

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.

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 multi-annual management advice has occurred.

GRAASP *(Genetically based Regional Assignment of Atlantic Salmon Protocol).* GRAASP was developed and validated by twelve European genetic research laboratories. Existing and new genetic data were calibrated and integrated in a purpose built electronic database to create the assignment baseline. The unique database created initially encompassed 32 002 individuals from 588 rivers. The baseline data, based on a suite of 14 microsatellite loci, were used to identify the natural evolutionary regional stock groupings for assignment.

ICPR *(The International Commission for the Protection of the River Rhine).* ICPR coordinates the ecological rehabilitation programme involving all countries bordering the river Rhine. This programme was initiated in response to catastrophic river pollution in Switzerland in 1986 which killed hundreds of thousands of fish. The programme aims to bring about significant ecological improvement of the Rhine and its tributaries enabling the re-establishment of migratory fish species such as salmon.

ISAV *(Infectious Salmon Anaemia Virus).* ISAV is a highly infectious disease of Atlantic salmon caused by an enveloped virus.

LE *(Lagged Eggs)*. The summation of lagged eggs from 1 and 2 sea winter fish is used for the first calculation of PFA.

LMN *(Labrador Métis Nation).* LMN is one of four subsistence fisheries harvesting salmonids in Labrador. LMN members are fishing in southern Labrador from Fish Cove Point to Cape St Charles.

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.

NG *(Nunatsiavut Government).* NG is one of four subsistence fisheries harvesting salmonids in Labrador. NG members are fishing in the northern Labrador communities.

NSERC *(Natural Sciences and Engineering Research Council of Canada)*. NSERC is a Canadian government agency that provides grants for research in the natural sciences and in engineering. Its mandate is to promote and assist research. Council supports a project to develop a standardized genetic database for North America.

OSPAR (*Convention for the Protection of the Marine Environment of the North-East 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.

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).

PGA *(The Probabilistic-based Genetic Assignment model).* An approach to partition the harvest of mixed-stock fisheries into their finer origin parts. PGA uses Monte Carlo sampling to partition the reported and unreported catch estimates to continent, country and within country levels.

PGCCDBS *The Planning Group on Commercial Catches, Discards and Biological Sampling.*

PGNAPES *(Planning Group on Northeast Atlantic Pelagic Ecosystem Surveys)*. PGNAPES coordinates international pelagic surveys in the Norwegian Sea and to the West of the British Isles, directed in particular towards Norwegian Spring-spawning Herring and Blue Whiting. In addition, these surveys collect environmental information. The work in the group has progressed as planned.

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 non-volatile memory.

PSAT (*Pop-up Satellite Archival Tags*). Used to track movements of large, migratory, marine animals. A PSAT is an archival tag (or data logger) that is equipped with a means to transmit the data via satellite.

PSU *(Practical Salinity Units).* PSU are used to describe salinity: a salinity of 35‰ equals 35 PSU.

Q Areas for which the Ministère des Ressources naturelles et de la Faune manages the salmon fisheries in Québec.

RFID Radio-frequency identification (RFID) is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags. Such tags are commonly used on fish including salmon.

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.

SALSEA (*Salmon at Sea*). SALSEA is an international programme of co-operative 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.

SARA *(Species At Risk Act).* SARA is a piece of Canadian federal legislation which became law in Canada on December 12, 2002. It is designed to meet one of Canada's key commitments under the International Convention on Biological Diversity. The goal of the Act is to protect endangered or threatened organisms and their habitats. It also manages species which are not yet threatened, but whose existence or habitat is in jeopardy. SARA defines a method to determine the steps that need to be taken in order to help protect existing relatively healthy environments, as well as recover threatened habitats. It identifies ways in which governments, organizations, and individuals can work together to preserve species at risk and establishes penalties for failure to obey the law.

SCICOM *(Science Committee)* of ICES. SCICOM is authorized to communicate to third-parties on behalf of the Council on science strategic matters and is free to institute structures and processes to ensure that inter alia science programmes, regional considerations, science disciplines, and publications are appropriately considered.

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.

SGBICEPS *(The Study Group on the Identification of Biological Characteristics For Use As Predictors Of Salmon Abundance).* The ICES study group established to complete a review of the available information on the life-history strategies of salmon and changes in the biological characteristics of the fish in relation to key environmental variables.

SGBYSAL *(Study Group on the Bycatch of Salmon in Pelagic Trawl Fisheries).* The ICES study group that was established in 2005 to study Atlantic salmon distribution at sea and fisheries for other species with a potential to intercept salmon.

SGEFISSA (*Study Group on Establishing a Framework of Indicators of Salmon Stock Abundance*). SGEFISSA is a study group established by ICES and met in November 2006.

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*).

SGSSAFE (*Study Group on Salmon Stock Assessment and Forecasting*). The study group established to work on the development of new and alternative models for forecasting Atlantic salmon abundance and for the provision of catch advice.

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.

SSGEF *(SCICOM Steering Group on Understanding Ecosystem Functioning).* SSGEF is one of five Steering Groups of SCICOM (Science Committee of ICES). Chair: Graham Pierce (UK); term of office: January 2012–December 2014.

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 sub-skin 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 in-takes 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.

SVC *(Spring Viraemia of Carp).* SVC is a contagious and potentially fatal viral disease affecting fish. As its name implies, SVC may be seen in carp in spring. However, SVC may also be seen in other seasons (especially in autumn) and in other fish species including goldfish and the European wells catfish. Until recently, SVC had only been reported in Europe and the Middle East. The first cases of SVC reported in the United States were in spring 2002 in cultivated ornamental common carp (Koi) and wild common carp. The number of North American fish species susceptible to SVC is not yet known.

TAC *(Total Allowable Catch).* TAC is the quantity of fish that can be taken from each stock each year.

WFD *(Water Framework Directive).* Directive 2000/60/EC (WFD) aims to protect and enhance the water environment, updates all existing relevant European legislation, and promotes a new approach to water management through river-based planning. The Directive requires the development of River Basin Management Plans (RBMP) and Programmes of Measures (PoM) with the aim of achieving Good Ecological Status or, for artificial or more modified waters, Good Ecological Potential.

WGBAST *(Assessment Working Group on Baltic Salmon and Trout*). The Assessment Working Group on Baltic Salmon and Trout assesses the status and trends of salmon and sea trout stocks in the Baltic Sea and provides annual catch advice on salmon.

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 first meeting in Belfast in February 2013 and is due to report to ICES in 2016.

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.

WGRECORDS *(Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species).* WGRECORS was reconstituted as a Working Group from the Transition Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (TGRECORDS).

WKADS *(Workshop on Age Determination of Salmon).* WKADS took place in Galway, Ireland, January 18th to 20th 2011, with the objectives of reviewing, assessing, documenting and making recommendations on current methods of ageing Atlantic salmon. The Workshop focused primarily on digital scale reading to measure age and growth with a view to standardization.

WKADS2 (*A second Workshop on Age Determination of Salmon*). Took place from September 4th to 6th, 2012 in Derry ~ Londonderry, Northern Ireland to addressed recommendations made at the previous WKADS meeting (2011) (ICES CM 2011/ACOM:44) to review, assess, document and make recommendations for ageing and growth estimations of Atlantic salmon using digital scale reading, with a view to standardization. Available tools for measurement, quality control and implementation of inter-laboratory QC were considered.

WKDUHSTI (*Workshop on the Development and Use of Historical Salmon Tagging Information from Oceanic Areas*). This workshop, established by ICES, was held in February 2007.

WKSHINI (*Workshop on Salmon historical information-new investigations from old tagging data*). This workshop met from 18–20 September 2008 in Halifax, Canada.

WKLUSTRE *(Workshop on Learning from Salmon Tagging Records).* This ICES Work-shop established to complete compilation of available data and analyses of the resulting distributions of salmon at sea.

This glossary has been extracted from various sources, but chiefly the EU SALMODEL report (Crozier *et al.*, 2003).

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 2016 (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 30 March to 8 April 2016.

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.

2) The Working Group recommends that additional monitoring be considered in Labrador to better estimate salmon returns in that region.

3) The Working Group recommends further analysis of the data collected in 2015 from fishers in the West Greenland fishery following a phone survey, and continuation of this survey programme in future years. 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.

4) 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.

5) The Working Group recommends a continuation and 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 2015 to Technical Minutes of the Review Group (ICES 2014a)

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 (2014a) and elaborates on initial comments provided at the 2014 Review Group meeting. The points are addressed in the same order as they were listed in the Technical Minutes.

General comments on the report

Two written reviews of the WGNAS 2014 report were provided by Carrie Holt and Marc Trudel, these are included at Annex 10 of the 2014 WGNAS report (ICES, 2014a). These reviews were discussed via WebEx during the RG meeting, and provided a good opportunity for exchanging feedback in both directions. After the WebEx, many of the minor and editorial comments were addressed and incorporated in the 2014 WGNAS report. Responses to the more specific comments are detailed below having been considered more widely by WGNAS participants at their 2015 meeting.

The RG indicated that WGNAS had provided a thorough and informative report on the status and trends of salmon in the Atlantic, that the report was well-written and that it addressed all the NASCO and ICES Terms of Reference. The RG also noted that the inclusion of the Stock Annex and model code are significant improvements over previous years' WGNAS reports, allowing for comparison of models and data inputs among regions. It was noted that the various comments from the reviewers might be considered by WGNAS in undertaking future assessments, but it was recognised that these were unlikely to change the advice to NASCO.

RG COMMENT	WGNAS RESPONSE
General comments.	
One theme that is mentioned throughout the document is the spatial scale of assessments and the possibility of matching to scales that are relevant to the biology and management of the species. The evolution from assessments at the level of the stock complex, to countries, to individual rivers reflect progress towards increased relevancy for biology (and to some extent management). Further work on identifying river-specific CLs and assessments for all countries is recommended. However, in the absence of such fine-scale assessments given current practical constraints, precautionary management (as is currently in place) is recommended.	WGNAS recognises the desirability of developing river-specific CLs for all stocks; this remains a long-term goal. WGNAS also recognises the need for precautionary management. In providing advice to NASCO, WGNAS seeks to use appropriate spatial scales; this is commonly at country/ regional scales, with larger stock complexes also appropriate in some instances.
Annex 6 (Section 1.1.2) refers to Crozier *et al*. (2003) to justify the application of relatively large stock groupings in assessments, given difficulties in collecting data across jurisdictions. Given changes in data availability over the past eleven years, might this be reconsidered?	The existing stock groupings are still to considered to be appropriate to providing management advice; recent genetic investigations have reinforced this view.
The report refers to the difficulty in simultaneously achieving river-specific CLs when fine spatial scales are considered. However, if more rivers are considered in assessment, it may be possible to relax objectives to a lower probability of achieving CLs on all rivers simultaneously (<75%), or include additional specifications for the number of rivers (e.g. 16 of 20 rivers) that must achieve their respective CLs with a given probability (e.g. 75%). In this way, the level of precaution can be adjusted according to additional fishery objectives.	Discussions on this issue occur regularly and are currently being debated within both WGNAS and NASCO. A number of possible mechanisms are available, for example: • The level of simultaneous attainment across all countries could be reduced. • A number of countries attaining CL could be set. Final agreement on the approaches to use require both scientific advice and a management decision at NASCO and would need to take account of acceptable levels of risk for individual river stocks.
The inclusion of the Stock Annex and model code are significant improvements over previous years' WGNAS reports. The Annex allows for comparison of models and data inputs among regions (especially NAC and NEAC). Further streamlining would be valuable, by, for example, using similar notation in model descriptions, and same levels of detail in model/data description among regions. Indeed, differences in assessment among regions may occur not only because of differences in biological status, but also differences models used or data inputted; this section should be able to highlight where and how those differences occur in a clear way.	The RG comments are noted. Given the demanding 2015 WGNAS ToRs (and loss of a meeting day due to snow travel disruptions), it was not possible to revise and standardise model notation. However, a number of updates were incorporated into the Stock Annex and further revisions are expected to be incorporated at future meetings.

RG COMMENT	WGNAS RESPONSE
Further, the Annex provides a thorough introduction and overview of the assessment approaches, and it may be useful for reviewers to read this document first, before the main report. I suggest referring to the Annex (especially Section 1 of the Annex) early in the text of the main report to help guide reviewers (and other non-specialist readers) through the complex information in the report. Also, would it be possible to shorten the text of the main document and/or provide summaries at the beginning of Sections to facilitate review? For example, many sections of the text describe Figures in detail (as in Section 3.1), often drowning out the main message (e.g. that recent exploitation rates and catches have remained low for most regions for that Section).	Reference to the Stock Annex was included in the introductory section of the 2014 WGNAS report and this will be continued. The comment about reducing the text and including summaries has been noted and changes incorportaed for 2015.

Section specific comments

Section 1. Introduction

Section 1.5 states that in many regions in North America, CLs are calculated as the number of spawners required to fully seed the wetted area of a river, which is not consistent with the MSY approaches used elsewhere. Given that ICES has requested that advice be provided according to MSY approaches by 2015 ("General Context of ICES Advice", June 2013), how will these differences be reconciled, if at all?	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. We expect to be able to report on these in 2016.
ICES considers a stock complex to be at full reproductive capacity when the lower confidence interval of the abundance estimate exceeds the Conservation Limit. However, the width of the confidence interval depends on which sources of uncertainty are included in the abundance estimates, and how they are included. Although details on those uncertainties are mentioned in various places in the Annex (Section 3), including a concise description of the sources of uncertainty considered when providing status advice would be beneficial. As the model evolves over years, and different uncertainties (or levels of uncertainties) are considered, the confidence intervals will change, and clear documentation of historical assumptions will be valuable.	The Stock Annex should include a section detailing the variables incorporated into each model and their associated variabilities / uncertainties in order to document sources and ranges of uncertainty that influence the variability of estimates. This may be best incorporated in a tabular format, with the possibility of documenting changes that occur between model application years. It was not possible to include this during the 2015 meeting, but WGNAS will aim to incorpoarte details in future iterations of the Stock Annex.

Section 2. Atlantic Salmon in the North Atlantic area

Section 2.1.1. What are the implications of the relatively large component of the catch in UK (England and Wales), UK (Scotland), Norway, and Russia being taken in coastal waters (instead of freshwater) for mixed-stock fisheries. Bycatches in Norway/Russia are noted in Section 3.4, but no information is provided for the UK.	The relatively high coastal contribution in some countries is recognised (and in part reflects much higher levels of catch-and-release in rod fisheries – these fish not recorded in nominal catch). Where mixed-stock fisheries exist in coastal areas, these are being phased out in some cases (UK (England & Wales)) or managed to safeguard the weakest contributing stocks.

RG COMMENT	WGNAS RESPONSE
	Where fish are intercepted returning to rivers in other countries this is accounted for in PFA assessment approaches.
Section 2.1.3 The authors indicate that there were no estimate of unreported catch for Spain and St-Pierre and Miquelon where catch is typically low. Are they authors implying that the unreported catch should also be low for these areas?	The fishery in SPM is small and only prosecuted by a few fishers. Unreported catch is likely to be low, but no information is available to enable inclusion of an 'estimate'.
Section 2.3.1. I agree that the quantification of uncertainty requires more attention than has been given so far. The NUSAP approach has the advantage of including the "spread" of the data (e.g. confidence intervals) as well as qualitative judgments about the data. Currently, these additional uncertainties are often captured in the text of the report (e.g. some regions may not be well represented by the single river for which there are data), but this information is not translated into concrete assessment advice. However, there may be additional ways of capturing those added dimensions of uncertainty (beyond NUSAP). For example, quantitative estimates of uncertainty on a variety of dimensions (data representativeness, data quality derived from survey methods, and confidence intervals from models) may be accounted for, by standardizing each to common scale (e.g. 1–5, low to high) and combining in a rule-based approach (like the rule-based approach for Norwegian Quality norm classification system in Figure 2.3.6.1). For Pacific salmon assessments in Canada, quantitative information on a variety of dimensions of uncertainties are included, and these are combined qualitatively by stock assessment experts to provide an overall stock assessment (categorized into healthy, cautious, and critical zones) that account for those uncertainties.	NUSAP was not considered further at the 2015 WGNAS meeting (the person who previously presented this approach did not attend). WGNAS acknowledges the suggestion of other similar approaches and recognises that these may provide useful mechanisms for capturing uncertainty and summarising the quality of assessments. This would require further consideration by the WG.
Section 2.3.4. One fish was diagnosed with ISAv. Although this fish was assigned to North America (based on DNA analysis), the strain of the virus originated from Scotland. The authors conclude that this fish may have been infected by another fish originating in Europe while they were feeding in the Labrador Sea or West Greenland. While this is certainly a possibility, it is also possible that this fish may have been incorrectly classified as a North American fish. It should be remembered that classification errors do occur. For Chinook Salmon, an independent evaluation of the genetic baseline with fish of known origin indicated that 96% of the fish were correctly classified to basin of origin. Another way of looking at this is that about 1 out of every 20 fish is misclassified. And it is not possible to tell which fish is actually misclassified. With 1284 fish, approximately 51 fish would be misclassified (for Chinook Salmon). This illustrates that we have to be careful when conclusions are based on only very few fish.	The comments about potential misclassification are noted by WGNAS.

RG COMMENT	WGNAS RESPONSE
Section 2.3.9. The EU ECOKNOWS model provides improved approaches for considering uncertainties when estimating PFA. Documentation on prior and posterior distributions of uncertain parameters used in the Bayesian integrated life cycle provides important information on uncertainties considered in the derivation of confidence (or credible) intervals that could used in assessments.	ECOKNOWS has currently produced a life cycle model for the southern NEAC stock complex. Equivalent northern NEAC and NAC models have not yet been formulated. Before implementation, a northern NEAC version is required as a minimum. While the ECOKNOWS project concluded at the end of 2014, WGNAS is hopeful that modelling developments will be continued.
Will this approach be considered in the near-term by WGNAS? If so, will both models be run simultaneously at first to assess differences in outputs?	Cross checking and validation of any new model development is standard practice within WGNAS. Implementation of the Bayesian life cycle approach was not possible in 2015 (and is likely to be a few years away). Before it is implemented a benchmarking exercise would be undertaken comparing the current approach with the new approach, both in terms of model structures and their forecasts. Details would be presented in the WG report.
Section 2.5.3. A comparison of NASCO River Database categories with other classification systems is provided. Table 2.5.3.1. suggests that NASCO's category, "Threatened with loss" is equivalent with IUCN categories "Critically endangered" through "near threatened". Table 2.5.3.2 suggests that the same NASCO category, "Threatened with loss", is equivalent to all ICES statuses less than the CL (and > "Lost"), which is not entirely consistent with interpretation from the previous table. Within Canada, the IUCN categories of threat are considered to be far below the threshold delineating critical and cautious zones for fisheries management. Most of the categories in Table 2.5.3.2. are tied to assessments for fisheries decisions which in many cases have thresholds that are far higher than those considered at biological risk of extinction (Table 2.5.3.1).	Table 2.5.3.1 was modified and updated before inclusion in the the 2014 report, better aligning categories. However, alignments remained somewhat subjective, as different classification systems are based on different metrics and direct comparisons are not always possible.

Section 3. Northeast Atlantic Commission area (NEAC)

RG COMMENT	WGNAS RESPONSE
Section 3.1.2. The authors indicate that the dam removal in Sweden is expected to have "large positive effects" on adult returns to this system. While this may be the case, is there any evidence that mortality associated with this dam was high? The authors need to back this statement with solid data, as others may be tempted to make this recommendation elsewhere to improve salmon returns. This may be a costly alternative if the problem of poor return lies elsewhere (i.e. in the marine environment).	The text was modified and updated before inclusion in the the 2014 report.

RG COMMENT	WGNAS RESPONSE
Section 3.3.4. describes the derivation of national Conservation Limits, CLs, using pseudo stock–recruitment relationships. In many cases, there is no (or only very weak) evidence of a relationship between eggs and PFA at low spawner abundances, so the CL is estimated to be the minimum (or near the minimum) egg abundance observed in the historical record (e.g. Sweden, UK (Northern Ireland), UK (Scotland)). This analysis assumes that if the stock is depleted to these levels, intrinsic stock productivity will be sufficient to keep the stock from further depletion (i.e. future conditions will be like the past). However, given large-scale declines in marine survival, this assumption of stationarity may not be valid. A caveat on the application of these CLs, and implied assumptions is warranted.	WGNAS recognises that the inflection point (which gives rise to the estimated CL) defaults to the lowest single or few points in the dataseries on the x (S) axis where the data do not suggest a clear S/R relationship. WGNAS has highlighted this previously (e.g. ICES 2001) and noted that this was consistent with the advice from ICES at the time that if there is no evidence that recruitment has declined over the range of stock levels previously observed, the stock reference point should be set at the lowest observed value. WGNAS recognises that if the stock has never fallen below CL, then the estimated CL will be too high, and if the lack of any evidence of declining recruitment is caused by the uncertainty in the data, the true CL may be underestimated. In the current report, WGNAS has shown the river-specific CLs for France, Ireland, Norway, UK(England and Wales) and UK(Northern Ireland) on the same plots as the hockey-stick model, and examples of both over and underestimation can be seen. WGNAS has repeatedly stressed the need for countries to depelop river-specific CLs.
How do national-level CLs derived from pseudo stock–recruitment models compare to sum of river-specific CLs for countries where river-specific CLs exist? (e.g. for Norway)	There is no formal comparison of the country (hockey-stick derived) and river-specific CLs in the WG report, although individual jurisdictions have explored this. For some countries, the two are in relatively close agreement, but this is not always the case. The CLs used in asessments, and their origins, are listed in Table 3.2.2.1. There is general agreement that those derived from river-specific S-R analysis based upon river population and wetted area data are more accurate than those derived at the country level.
Is it possible to compute uncertainties in CLs, statistically in terms of the estimate of the breakpoint and/or by incorporating uncertainties in estimates of lagged egg abundances and PFAs? If confidence limits on CLs can be estimated, these could be integrated with uncertainties in abundances estimates to derive a more complete probability distribution for stock assessments. Prager *et al*. (2003) and Prager and Shertzer (2010) suggest identifying RPs by integrating uncertainties in current assessment and reference points.	WGNAS has considered this in the past and appreciates the suggested reference material. WGNAS recognises that such uncertainty could be included in CLs and SERs but has noted that river-specific CLs are currently estimated in a number of different ways by different countries, and in the absence of river-specific values, the pseudo stock–recruitment relationship is used. As a result the estimation of uncertainty is unlikley to be consistent between countries. WGNAS therefore still considers that point estimate of CL values are most appropriate, with uncertainty in attainment coming from the variability of the estimates of PFA.

RG COMMENT	WGNAS RESPONSE
How are river-specific CLs for a subset of rivers extrapolated to all rivers within a nation, for example, for Norway, where only <200 (of the 465) rivers are assessed annually (Table 3.3.5.1)?	CLs have been determined for all rivers in Norway. While annual assesments only take place for about half of these, this accounts for the majority of the national productivity (in excess of 90%). No extrapolation is applied as these are primarily river-by-river assessments to inform local management decisions.
CLs for Scotland are very large (Table 3.2.2.1) compared with other nations, and dominate the NEAC totals, but these are described as unreliable in Section 3.2.3. What are the implications for the overall assessment for that stock complex (and fisheries advice for Faroes/West Greenland) of these large and unreliable CLs.	The CLs, as currently provided, are not described as unreliable, but WGNAS recognises that improvements will follow with the development of river-specific CLs. Scottish CLs and SERs are based upon nationally reported catches and estimated exploitation rates The catch data are considered reliable and the exploitation rates are informed by data from index rivers. Pending the develoment of river-specific CLs, these represent the best data available to the WG and are no different from the data supplied by other major salmon-producing countries such as Finland and Russia.
Figure 3.3.6.1. provides a comparison of return rates for 1SW and 2SW smolts. However, it might be more informative to show the natural log-transformed rates of change, as in Figure 3.1.9.2 for exploitation rates. In the current figure the very large increases and decreases in return rates occur for stocks with low average return rates. In the suggested revised analyses, the rates of change are independent of absolute value. Alternatively, the average return rates could be provided in parentheses for each stock so analysts could see that relationship.	WGNAS reviewed and implemented appropriate changes in the 2015 report.
Figure 3.3.6.3 shows survival rates time-series for northern and southern regions, with a steep decline in the northern region (wild) in ~1993, but a more gradual decline in southern region (wild) from late 1980s–late 1990s. Are there biological processes/hypotheses to support these divergent patterns? See also comment #2 from Section 4 below.	Survival indices for Northern NEAC wild salmon are based on adult returns of tagged smolts to three rivers (Vesturdalsa, Halselva and Imsa) and over the time-series not all three rivers have datapoints. In 1993, two entries are present, the Halselva (2.1%) and the Imsa (15.6%) giving an average return rate of 8.85%. In 1994 only the Halselva is reported, with a return rate of 0.6% The observed rapid drop in 1994 is therefore both an effect of the data points upon which it is based and an apparent decline in return rates. The Figure reflects this to some degree by the very large confidence interval around this point. Though no ecological influence is postulated as causing this decrease, it is in general in line with the decreases observed over the time-series. The dependence upon few rivers, and in this year one river, makes the analysis more sensitive to the influence of individual rivers.

RG COMMENT	WGNAS RESPONSE
Section 4. North American Commission area (NAC)	
Section 4.1.4.: In this assessment, the WGNAS excluded unreported catches in the run-reconstruction model. Previous assessment included unreported catches only in Québec. This was done for standardizing the run-reconstruction model across all management units. An alternative approach would have been to include unreported catches for all other management units. Is there a rationale for choosing one approach over the other?	Unreported catches for Canada are not reliably provided for each region. In the past, Québec had reported on what were considered unreported catches but no other regions had done so in the catch data for run reconstruction. To be consistent, it was decided to remove the unreported values for Québec.
The number of adult returns to Labrador has increased significantly in the last three years (Figures 4.3.2.1 and 4.3.2.2). However, there are no data on return rates of Labrador salmon to support those observations (and those to Newfoundland show no increase over recent years) (Figure 4.3.5.1). Several previous studies have highlighted large (ocean basin) scale declines in productivity across the North Atlantic (Peyronnet *et al*., 2008; Chaput, 2012; Section 1.3 of Annex 1), but the inconsistent trends in adult returns noted above suggest possible regional differences in return rates (and productivity) that merit further exploration. Long time-series of return rates may currently be biased towards more southerly, easily accessible populations that show stationary or declining return rates.	The limited extent of the monitoring possible in Labrador has long been recognised by WGNAS as a relative weakness in the assessments. The greater uncertainty of the estimates for Labrador is reflected in the wide confidence limits around the estimates of returns and spawners. Ideally, additional monitoring should be conducted on rivers in Labrador, and WGNAS has previously recommended that additional data be gathered in Labrador to better estimate salmon returns in that region. However, accessibility issues mean this is unlikely to be possible, in the short term at least.
Section 4.3.2. Newfoundland section: The results for the large salmon and 2SW seem conflicting. Whereas there is an increase in large salmon returns to Newfoundland since the 1990s, this pattern is not apparent for 2SW fish. Is there any explanation for this discrepancy?	Large salmon include repeat spanners which are not considered as part of the 2SW stock, hence the apparently greater increase in large salmon numbers.
Section 4.3.3. Gulf of St-Lawrence section: The five year mean is not a very useful metric here, as it is highly influenced by an extreme outlier.	Acknowledged, WGNAS will review and make appropriate changes in the 2015 report.
Scotia-Fundy section: The high percentages may be misleading and may give the impression that conditions are improving significantly. This is because some values were very low in 2012, such that the changes that occurred in 2013 appeared to be a large increase, although the conditions are not that great. I suggest removing the percentages in these cases to avoid giving the impression that the conditions are much better. Note that this is not unique to this section, but happens elsewhere in the document such as p. 149: marine survival have increased by 900%, though the change was from nearly 0% to 0.1%. In other words, the survival was still very low despite an apparent significant improvement (in that case, this was highlighted in the paragraph).	Acknowledged, WGNAS will review and make appropriate changes in the 2015 report.

RG COMMENT	WGNAS RESPONSE
Section 4.3.5. The text describes % changes in return rates with large fluctuations (as high as 900%). These calculations are sensitive to the absolute return rates (where small changes to populations with low return rates can result in large % changes over time). Alternatively, the % change can be calculated and plotted on a natural logarithm scale (as in Figure 3.1.9.2) so that % changes are independent of absolute return rates. See also comment #7 from Section 3 above.	Acknowledged, WGNAS will review and make appropriate changes in the 2015 report.
To what extent does information on marine survival contribute to assessments, if at all? The current risk assessment framework considers abundances relative to CLs only, and not trends in abundances or marine survival. Note, for Pacific salmon in Canada, assessment methods have recently been developed to capture the multidimensional nature of assessment data (e.g. abundances relative to reference points, trends in abundances, distribution, and uncertainties on those metrics). (See http://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2012/2012_106-eng.html)	Currently return/ marine survival indices are not directly incorporated into the stock assessments. This is partially a consequence of such data only being available for relatively few rivers, and the time-series' being inconsistent, and partially due to a lack of obvious ways to incorporate such time-series in an objective manner. WGNAS appreciates the additional reference and will consider adding some text in the 2015 report to evaluate trends in the estimated PFA against return rates.

Section 5. West Greenland Commission area (WGC)

Section 5.1.1. The authors indicate that the factory landings are considered precise given the reporting structure. Yet, the authors highlight a number of issues with the data indicating that they are far from being precise with known misrepresentation in some cases inconsistencies. They further argue that there is a need for better data. Hence, I would argue that the factory landings should not be considered precise.	Acknowledged, WGNAS will review and make appropriate changes in the 2015 report.
Section 5.1.2.2. The WGNAS recommends that "the longer time-series of sampling data from West Greenland should be analysed to further assess the extent of the variations in condition over the time period corresponding to the large variations in productivity identified by the NAC and NEAC assessment and forecast models." I'm not entirely sure I understand that the authors are trying to say here and why this is necessary either. This requires some clarification.	WGNAS plans to conduct some analysis of the available biological sampling data from West Greenland for inclusion in the 2015 report and will clarify text accordingly.

RG COMMENT	WGNAS RESPONSE
Section 5.1.3. Due to uncertainty in assessing the continent of origin of the catches of West Greenland, the WGNAS recommends improving these estimates by sampling more fish for DNA. While improving these estimates is certainly desirable, it is unclear to me that this will substantially change the assessment of this fishery given that a large fraction of the reported catch has been analysed. Moreover, it is unclear to me how these estimates are used for assessing the management advice to West Greenland. Presumably theses data are used to estimate the catch data for each continent in the run-reconstruction model? A sensitivity analysis may help to determine the effects of the uncertainty associated with DNA analyses on the outcome of the current assessment on Atlantic salmon.	These data are used to apportion the catch at West Greenland by continent of origin and, more recently, at finer spatial scales through comparison with genetic baselines in countries of origin.
The recommendation for increasing the number of fish sampled in landings in West Greenland (including Nuuk) to improve biological characterization of the fish (including country of origin) is supported to the extent that it will improve the characterization of stock-of-origin. For example, if there is a spatial pattern in the capture of fish of different stocks of origin, and specific areas are not well sampled within West Greenland, then those sampling deficiencies should be addressed. A more accurate description of country of origin may allow for possible selective fisheries on populations from stocks/stock complexes that are abundant while avoiding those of conservation concern (e.g. Scotia-Fundy and US stock complexes).	Further catch sampling at West Greenland is expected to improve our understanding of the variability of temporal and spatial patterns of exploitation and WGNAS recognises that this might lead to possible new management options. Indeed, in the 2015 ToRs for WGNAS, NASCO has asked for further information on the apportionment of catches in different mixed-stock fisheries (West Greenland and others). Details are provided in the 2015 report.
Additional comments on Stock Annex	
Section 1.3 describes ecosystem effects, and possible reasons for declines in abundances. Similar declines have been observed for Pacific salmon in Canada, resulting in the development of a "Cumulative Effects" research program to investigate the cumulative impacts of stressors on salmon throughout their life cycle (freshwater, estuarine, marine, and return to freshwater). Are similar "cumulative effects" research programs underway for Atlantic salmon? The EU-ECOKNOWS study might be one example.	Such a "Cumulative Effects" study appears to be a sensible approach to trying to understand all impacts upon salmon during their life cycle. Such a study is not currently being proposed for Atlantic salmon within the remit of WGNAS. Previously, a separate Study Group was set up that examined a number of these issues and results were reported in the reports of the ICES Study Group on Biological Characteristics as Predictors of Salmon Abundance (SGBICEPS). Further work on the distribtuion and survival of salmon at sea was completed as part of the SALSEA Merge project. In other instances, however, potential stressors are examined on an issue by issue basis. The work carried out under the ECOKNOWS project (and reported in recent WGNAS reports) in developing a life cycle model for Atlantic salmon, has provided a basic framework for scenario testing of impacts at different stages of the life cycle and could be developed to evaluate

RG COMMENT	WGNAS RESPONSE
	cumulative effects.
Section 3.1 of the annex describes a variety of ICES reference points. A figure would be helpful here to guide readers through this confusing nomenclature (especially the difference between MSY $B_{escapement}$ and B_{pa}).	This suggestion has been noted by WGNAS. It was not possible to include this during the 2015 meeting, but WGNAS will aim to incorpoarte details in future iterations of the Stock Annex.
Section 3.2 describes the run-reconstructions and the uncertain parameters included in those analyses. In particular, for the NEAC model (Section 3.2.1), a range of instantaneous mortalities from 0.02 to 0.04 are considered in Monte Carlo simulation. Is the distribution assumed to be uniform over that range? What is the justification for the distribution? The min/max values and the type of distribution considered for this uncertain parameter, and all other uncertain parameters have a direct influence on the resulting confidence intervals on abundances (and hence assessment outcomes according to the ICESs precautionary approach described in Section 3.1.1 of the Annex). These should be clearly documented and justified. Why was the instantaneous mortality set at a constant 0.03 for the NAC model (Section 3.2.2) instead of assuming a range as in the NEAC model?	For NEAC, a uniform distribution of mortality is included, ranging from 0.02 to 0.04. This sought to acknowledge a lack of specific detail about the instantaneous mortality rate beyond the belief that it lay within this range. In the NAC run reconstruction model, instantaneous mortality is modelled as a broad, minimally informative normal distribution, with a mean of 0.03 and standard deviation of 0.005 (giving 2.5th and 97.5th percentiles of: 0.020 and 0.039 respectively).
Further; In the run reconstruction, natural mortality is set to 0.03/month for all stocks and years. Given that marine survival (or return rates) has declined for most stocks (return rate/ survival indices in the main body of the report), is this a realistic assumption to make in the model?	A broadly similar question was asked by the RG in 2012 and 2013, and the detailed response from the WG can be found in Annex 9 of the 2013 and 2014 reports. In brief, WGNAS has reviewed the issue of 'M' on a number of occasions and does not believe it has suitable information to vary this parameter. The assumption is, therefore, that the mortality of adult fish after the first winter at sea has not changed and that all the variability of marine mortality has occurred at the post-smolt stage. Efforts are continuing to explore levels of mortality and to better partition this between different stages of the life cycle. Return rates are therefore not currently incorporated into the run reconstruction (or forecast) models.
Section 3.3.4 provides a useful comparison of NAC and NEAC forecast models. An additional section that lists assumptions (e.g. NAC's assumption of common variation in productivity among stocks, that is not included in the NEAC model) would be valuable within the table. Both forecast models include time-varying productivity (a parameter that varies over years), but not time-varying proportion of smolts at age. This assumption should also be clearly documented.	This suggestion has been noted by WGNAS. It is recognised that inclusion of a table to itemise assumptions and settings around modelled variables would be useful and would help to document changes/ updates asthey are introduced. It was not possible to include this during the 2015 meeting, but WGNAS will aim to incorpoarte details in future iterations of the Stock Annex.

Annex 10: Technical minutes from the North Atlantic Salmon Review Group

- Review of ICES WG on North Atlantic Salmon (WGNAS); Salmon Review Group (RG Salmon)
- ICES HQ, Copenhagen, Denmark 21–23 April, 2015.
- Reviewer: Marc Trudel

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 2015–2018 using Bayesian-based stock assessment models and region-specific reference points (i.e. conservation limits). The main conclusions of the report were:

- Overall, exploitation rates and catches of Atlantic salmon declined in 2014 and were often the lowest in the time-series that started in 1960. The low returns and decline observed during the last two decades appeared to be constrained by low marine survival.
- There was no mixed-stock fishery in the Faroes in 2014. The nominal catch in the mixed-stock fishery in St-Pierre and Miquelon decreased by 28% in 2014 to reach 3.8 t. The nominal catch in the mixed-stock fishery in West Greenland has been increasing from 33 t to 58 t since 2012 when the Greenland authorities set factory quota of 35 t, which was reduced to 30 t in 2014.
- The northern NEAC stock complexes were considered at full reproductive capacity, whereas the non-maturing 1SW stock complex from southern NEAC was at risk of suffering reduced reproductive capacity. It is important to note that stocks were often below the conservation limits at the country level.
- Probabilities of meeting age and complex-specific Spawner Escapement Reserves (SER) in 2015–2018 in the absence of fishing generally exceeded 95% for the northern NEAC complexes. These probabilities were below 50% and 75% for the maturing and non-maturing 1SW stock complex from southern NEAC, respectively.
- Simulations indicated that a Total Allowable Catch (TAC) of up to 40 t in 2015/2016, 2016/2017, and up to 20 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 80% 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.
- 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.
- 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, though I did not have the time to examine the models and computer code used to implement the models in any details. Below are some comments for further considerations by the WGNAS in future years.

Specific comments

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).

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 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.

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?

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).

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 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.

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 decline (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.