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

22–31 March 2011

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ICES
International Council for the Exploration of the Sea

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Executive Summary

Working Group on North Atlantic Salmon [WGNAS], ICES HQ, 22–31 March 2011.

Chair: Gérald Chaput (Canada).

Number of participants: 24 representing fourteen nations from North America and the Northeast Atlantic. Information was provided by correspondence from Greenland and Spain, for use by the Working Group.

WGNAS met to consider questions posed to ICES by the North Atlantic Salmon Conservation Organization (NASCO) and by ICES Science Committee and the Chair of the Advisory Committee. 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.

Relative to the questions posed by NASCO:

- In the North Atlantic, exploitation remains low and nominal catch of wild Atlantic salmon in 2010 was 1589 t, the third lowest in the time-series beginning in 1960.
- Northern Northeast Atlantic Commission stock complexes (1SW and MSW) are at full reproductive capacity prior to the commencement of distant water fisheries.
- Southern Northeast Atlantic Commission stock complexes (1SW and MSW) are at full reproductive capacity prior to the commencement of distant water fisheries.
- Prior to any distant water fisheries, the 1SW age group in the Northern NEAC and both age groups in the Southern NEAC stock complexes are at risk of suffering reduced reproductive capacity for 2011 to 2014. The MSW age group from the Northern NEAC complex is at full reproductive capacity for 2011 and 2012 and at risk of suffering reduced reproductive capacity in 2013 and 2014.
- Marine survival indices in the North Atlantic have declined and remain low. Factors other than marine fisheries, acting in freshwater and in the ocean in both NAC and NEAC (marine mortality, fish passage, water quality), are contributing to continued low abundance of wild Atlantic salmon.
- The Working Group has provided a work example of the catch advice framework for the Faroes Fishery. Further, a proposed Framework of Indicator framework for the Faroes fishery is provided.

Relative to the question posed by ICES:

- Elements from WGNAS specific to population abundance and status relative to safe biological limits for Atlantic salmon are contained in WGNAS reports and could be considered by MSFDG in delivery of their tasks. As well, information reviewed by WGNAS regularly and contained in numerous study group and workshop initiatives could be used by Strategic Initiative on Area Based Science and Management (SIASM) to develop advice on marine area based management and spatial planning.

1 Introduction

1.1 Main tasks

At its 2010 Statutory Meeting, ICES resolved (C. Res. 2010/2/ACOM09) that the **Working Group on North Atlantic Salmon** [WGNAS] (chaired by: Gérald Chaput, Canada) will meet at ICES HQ, 22–31 March 2011 to consider questions posed to ICES by the North Atlantic Salmon Conservation Organization (NASCO). In March 2011, NASCO also asked ICES to provide a more detailed evaluation of the choice of appropriate management units to be used in a risk based framework for the provision of catch advice for the Faroese salmon fishery, taking into account relevant biological and management considerations and including, if possible, worked examples of catch advice.

In a communication dated March 10, 2011, the Chair of the ICES Science Committee and the Chair of the Advisory Committee requested assistance from ICES expert groups to two groups created jointly by ACOM and SCICOM, the Marine Strategy Directive Framework Steering Group (MSDFSG) and the Strategic Initiative on Area Based Science and Management (SIASM).

The terms of reference were met and the sections of the report which provide the answers 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, including unreported catches by country and catch and release, and production of farmed and ranched Atlantic salmon in 2010[1]	2.1 and 2.2
	ii)	report on significant new or emerging threats to, or opportunities for, salmon conservation and management[2];	2.3
	iii)	Report on significant advances in our understanding of associations between changes in biological characteristics of all life stages of Atlantic salmon and ecosystem changes with a view to better understanding the dynamics of salmon populations[3]	2.4
	iv)	Further develop approaches to forecast pre-fishery abundance for North American and European stocks with measures of uncertainty;	2.5
	v)	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;[4]	2.6
	vi)	Provide a compilation of tag releases by country in 2010 and advise on the utility of maintaining this compilation;	2.7
	vii)	identify relevant data deficiencies, monitoring needs and research requirements[4].	Annex 8

b)	With respect to Atlantic salmon in the Northeast Atlantic Commission area:	Section 3
	1) Describe the key events of the 2010 fisheries;	3.8
	2) Review and report on the development of age-specific stock conservation limits;	3.3
	3) Describe the status of the stocks and provide annual catch options or alternative management advice for 2012–2014, with an assessment of risks relative to the objective of exceeding stock conservation limits and advise on the implications of these options for stock rebuilding;	3.1, 3.2, 3.4, 3.5, 3.6, 3.7, 3.8.9 to 3.8.15,
	▪ supplementary request from NASCO received March 9 2011: "Provide a more detailed evaluation of the choice of appropriate management units to be used in a risk based framework for the provision of catch advice for the Faroese salmon fishery, taking into account relevant biological and management considerations and including, if possible, worked examples of catch advice."	3.10
	4) Further investigate opportunities to develop a framework of indicators or alternative methods that could be used to identify any significant change in previously provided multi-annual management advice.	3.9

c)	With respect to Atlantic salmon in the North American Commission area:	Section 4
	1) Describe the key events of the 2010 fisheries (including the fishery at St Pierre and Miquelon)[5];	4.4
	2) Update age-specific stock conservation limits based on new information as available;	4.3
	3) Describe the status of the stocks;	4.1, 4.5, 4.6
•	*In the event that NASCO informs ICES that the framework of indicators (FWI) indicates that reassessment is required[8]:*	
	4) Provide annual catch options or alternative management advice for 2011–2014 with an assessment of risks relative to the objective of exceeding stock conservation limits and advise on the implications of these options for stock rebuilding[6].	

d)	With respect to Atlantic salmon in the West Greenland Commission area:	Section 5
	1) Describe the key events of the 2010 fisheries[5];	5.1
	2) Describe the status of the stocks;	5.2
•	*In the event that NASCO informs ICES that the framework of indicators (FWI) indicates that reassessment is required[8]:*	

	3) Provide annual catch options or alternative management advice for 2011–2013 with an assessment of risk relative to the objective of exceeding stock conservation limits and advise on the implications of these options for stock rebuilding[6].	
e)	ICES Science Committee and the Chair of the Advisory Committee requested assistance from ICES expert groups to two groups created jointly by ACOM and SCICOM, the Marine Strategy Directive Framework Steering Group (MSDFSG) and the Strategic Initiative on Area Based Science and Management (SIASM). 1) ICES requested all its Expert Groups (EG) to identify and describe the work streams of relevance to the Descriptors in Annex I of Directive 2008/56/EC regarding criteria for good environmental status of marine waters. EGs are asked to provide views on what good environmental status might be for those descriptors, including methods that could be used to determine status. 2) From SIASM, the following term of reference were added to all EGs for 2011: i. take note of and comment on the Report of the Workshop on the Science for area-based management: Coastal and Marine Spatial Planning in Practice (WKCMSP) ii. provide information that could be used in setting pressure indicators that would complement biodiversity indicators currently being developed by the Strategic Initiative on Biodiversity Advice and Science (SIBAS). Particular consideration should be given to assessing the impacts of very large renewable energy plans with a view to identifying/predicting potentially catastrophic outcomes. iii. identify spatially resolved data, for e.g. spawning grounds, fishery activity, habitats, etc.	Section 6

Notes:

1. With regard to question a.1, for the estimates of unreported catch the information provided should, where possible, indicate the location of the unreported catch in the following categories: in-river; estuarine; and coastal.

2. With regard to question a.2, ICES is requested to include information on any new research into the migration and distribution of salmon at sea and on the potential impacts of the development of alternative/renewable energy on Atlantic salmon.

3. With regard to question a.3, there is particular interest in determining if declines in salmon abundance coincide with changes in the biological characteristics of juveniles in freshwater or are modifying characteristics of adult fish (size at age, age at maturity, condition, sex ratio, growth rates, etc.) and with environmental changes including climate change

4. With regard to question a.5, ICES is requested to include information on best solutions for fish passage and associated mitigation efforts with examples of practices in member countries.

5. In the responses to questions b.1, c.1 and d.1, ICES is asked to provide details of catch, gear, effort, composition and origin of the catch and rates of exploitation. For home-water fisheries, the information provided should indicate the location of the catch in the

following categories: in-river; estuarine; and coastal. Any new information on non-catch fishing mortality, of the salmon gear used, and on the bycatch of other species in salmon gear, and on the bycatch of salmon in any existing and new fisheries for other species is also requested.

6. In response to questions b.3, c.4 and d.3, provide a detailed explanation and critical examination of any changes to the models used to provide catch advice

7. In response to question d.2, ICES is requested to provide a brief summary of the status of North American and Northeast Atlantic salmon stocks. The detailed information on the status of these stocks should be provided in response to questions b.3 and c.3.

8 The aim should be for NASCO to inform ICES by 31 January of the outcome of utilizing the FWI

At the 2009 Annual Meeting of NASCO, conditional multi-annual regulatory measures were agreed to in the West Greenland Commission (2009–2011) and for the Faroe Islands (2009–2011) in the Northeast Atlantic Commission. The measures were conditional on a Framework of Indicators (FWI) being provided by ICES, and the acceptance of the FWI by the various parties of each commission. At the 2009 annual meeting of NASCO, Denmark (in respect of the Faroe Islands) opted out of the multi-annual regulatory measures as a FWI was not provided by ICES for the fishery in the Faroes (ICES, 2010b). In January 2011, NASCO indicated that no change to the management advice previously provided by ICES was required for the fishery at West Greenland.

In response to the remaining terms of reference, the Working Group considered 33 Working Documents submitted by participants (Annex 1); other references cited in the Report are given in Annex 2. A full address list for the 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		
Chaput, G. (Chair)	Canada		
Degerman, E.	Sweden		
Douglas, S.	Canada		
Ensing, D.	UK (N. Ireland)		
Erkinaro, J.	Finland		
Euzenat, G.	France		
Fey, D.	Germany		
Fiske, P.	Norway		
Gjøsæter, H.	NorwayGudbergsson, G.		Iceland
MacLean, J. C.	UK (Scotland)		
Meerburg, D.	Canada		
Ó Maoiléidigh, N.	Ireland		
Potter, T.	UK (England and Wales)		
Prusov, S.	Russia		
Russell, I.	UK (England and Wales)		
Sheehan, T.	USA		
Smith, G. W.	UK (Scotland)		
Tretyakov, I.	Russia		
Trial, J.	USA		
Ustyuzhinskiy, G.	Russia		
Wennevik, V.	Norway		

White, J.	Ireland

1.3 Management framework for salmon in the North Atlantic

The advice generated by ICES is in response to terms of reference posed by the North Atlantic Salmon Conservation Organization (NASCO), pursuant to its role in international management of salmon. NASCO was set up in 1984 by international convention (the Convention for the Conservation of Salmon in the North Atlantic Ocean), with a responsibility for the conservation, restoration, enhancement, and rational management of wild salmon in the North Atlantic. While sovereign states retain their role in the regulation of salmon fisheries for salmon originating from their own rivers, distant water salmon fisheries, such as those at Greenland and Faroes, which take salmon originating from 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 organization 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 NASCOs 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 by ICES 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. 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 maximum sustainable yield (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.

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 95% 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 suffer reduced reproductive capacity.

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.

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% (ICES, 2003) as part of an agreed management plan. ICES applies the same level of risk aversion for catch advice for homewater fisheries on the North American stock complex.

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 1960–2010 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 categories, wild and ranched, reflecting the fact that Iceland has been the only North Atlantic country where large-scale ranching has been undertaken with the specific intention of harvesting all returns at the release site. The release of smolts for commercial ranching purposes ceased in Iceland in 1998, but ranching for rod fisheries in two Icelandic rivers continued into 2010 (Table 2.1.1.1). 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 and Wales), UK (Northern Ireland), France and Spain); 'North America' (Canada, USA and St Pierre et Miquelon (France)); and 'Greenland and Faroes'.

The provisional total nominal catch for 2010 was 1589 tonnes, 276 t above the updated catch for 2009 (1313 t). The 2010 catch was 164 t below the average of the last five years (1753 t), and over 600 t below the average of the last ten years (2201 t). Catches were below the previous five- and ten-year averages in the majority of Southern NEAC countries except UK (England and Wales) and UK (Scotland) where catches in 2010 were above the previous five-year averages. Catches were below the previous ten-year averages and above the previous five-year averages in the majority of Northern NEAC countries.

Nominal catches in homewater fisheries split, where available, by sea age or size category are presented in Table 2.1.1.2 (weight only). The data for 2010 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 at 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 recognizes 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 in the distribution of the catch among individual countries. In most countries the majority of the catch is now taken in freshwater; the coastal catch has declined markedly.

Coastal, estuarine and riverine catch data aggregated by region are presented in Figure 2.1.1.3. In northern Europe catches in coastal fisheries have been in decline since 2001 and freshwater catches have been relatively constant. About half the catch has typically been taken in rivers and half in coastal waters (although there are no coastal fisheries in Iceland and Finland), with estuarine catches representing a negligible component of the catch in this area. There has been a reduction in the proportion of the catch taken in coastal waters over the last five years and it now represents only one third of the total. In southern Europe, catches in all fishery areas have declined dramatically over the period. While coastal fisheries have historically made up the largest component of the catch, these fisheries have declined the most, reflecting widespread measures to reduce exploitation in a number of countries. In the last four years, the majority of the catch in this area has been taken in freshwater, though there was a slight increase in the proportion of the catch taken in coastal waters in 2010.

In North America, the total catch over the period 2000 to 2010 has been relatively constant. 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 (13 t or less), but has increased as a proportion of the total catch over the period.

2.1.2 Catch and release

The practice of catch and release in rod fisheries has become increasingly common as a salmon management/conservation measure in light of the widespread decline in salmon abundance in the North Atlantic. In some areas of Canada and USA, catch and release has been practiced since 1984, and in more recent years 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 2010 for countries that have records. Catch and release may also be practiced in other countries while not being formally recorded. There are large differences in the percentage of the total rod catch that is released: in 2010 this ranged from 12% in Norway (this is a minimum figure) to 70% in UK (Scotland) reflecting varying management practices and angler attitudes among these countries. Catch and release rates have typically been highest in Russia (average of 84% in the five years 2004 to 2008) and are believed to have remained at this level. However, there were no obligations to report caught-and-released fish in Russia in 2009 and records for 2010 are incomplete. Within countries, the percentage of fish released has tended to increase over time. There is also evidence from some countries that larger MSW fish are released in larger proportions than smaller fish. Overall, over 222 000 salmon were reported to have been released around the North Atlantic in 2010, the highest in the time-series.

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

2.1.3 Unreported catches

Unreported catches by year (1987 to 2010) 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. Estimates for Canada since 2009 are considered incomplete (information available for three of the four jurisdictions). There are also no estimates of unreported catch for Spain and St Pierre and Miquelon (NAC), where total catches are typically small. It has not been possible to separate the unreported catch into that taken in coastal, estuarine and riverine areas.

In general, the derivation methods used by each country have remained relatively unchanged and thus comparisons over time may be appropriate. 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 2010 was estimated to be 382 t. The unreported catch in the Northeast Atlantic Commission Area in 2010 was estimated at 357 t, and that for the West Greenland and North American Commission Areas at 10 t and 15 t, respectively. The 2010 unreported catch by country is provided in Table 2.1.3.2. Information on unreported catches was not provided to enable these to be partitioned into coastal, estuarine and riverine areas.

In the past, salmon fishing by non-contracting parties is known to have taken place in international waters to the north of the Faroe Islands. Typically, a number of surveillance flights have taken place over this area in recent years and no sightings of vessels were reported, although there have been extended periods over the winter period when no flights took place. This is the period when salmon fishing has previously been reported. In 2010, there were no flights over the area by the Icelandic coastguard. Some flights are thought to have been completed by the Norwegian coastguard, but there is no information available on these.

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

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 2010 is 1177 kt, the second year in which production in this area has been in excess of one million tonnes. The 2010 total represents a 5% increase on 2009 and a 26% increase on the previous 5-year mean (Table 2.2.1.1 and Figure 2.2.1.1) due to increased production in the majority of countries where farming occurs. Norway and

UK (Scotland) continue to produce the majority of the farmed salmon in the North Atlantic (78% and 13% respectively).

Worldwide production of farmed Atlantic salmon has been over one million tonnes since 2002. It is difficult to source reliable production figures for all countries outside the North Atlantic area and it has been necessary to use 2009 estimates for some countries in deriving a worldwide estimate for 2010. Noting this caveat, total production in 2010 is provisionally estimated at around 1369 kt (Table 2.2.1.1 and Figure 2.2.1.1), a 4% decrease on 2009, continuing the small decrease in production first noted in 2009 and reflecting a fall in production outside the North Atlantic in 2010. Production in this area is estimated to have accounted for 14% of the total in 2010 (down from 22% in 2009 and 34% in 2008). Production outside the North Atlantic is still dominated by Chile despite a further decrease in farmed salmon production in this country compared with 2009 (60%) due to an outbreak of infectious salmon anaemia (ISA) virus. The ISA outbreak is reported to have had a catastrophic impact on the Chilean salmon industry.

The worldwide production of farmed Atlantic salmon in 2010 was over 850 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 practiced in two Icelandic rivers since 1990 and these data have now been included in the ranched catch (Table 2.1.1.1). The total harvest of ranched Atlantic salmon in countries bordering the North Atlantic in 2010 was 39 t, the majority of which (36 t) was taken by the Icelandic ranched rod fisheries (Figure 2.2.2.1). Small catches of ranched fish from experimental projects were also recorded in Ireland; these data include catches in net, trap and rod fisheries. No estimate of ranched salmon production was made in Norway in 2010 where such catches have been very low in recent years (<1 t) and UK (N. Ireland) where the proportion of ranched fish was not assessed between 2008 and 2010 due to a lack of microtag returns.

It was noted that a large proportion of the fish caught in Sweden in recent years (15 t, 70% of the total catch in 2010) originate from hatchery-reared smolts released under programmes to mitigate for hydropower development schemes. However, these fish do not fall within the agreed definition of ranched fish and are not included in Figure 2.2.2.1.

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 Update on Workshop on Age Determination of Salmon (WKADS)

The Working Group noted that a Workshop on Age Determination of Salmon (WKADS) had recently taken 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 had primarily focused on digital scale reading to measure age and growth, with a view to standardization.

Recommendations from the Workshop included standardizing digital scale reading, compilation of a digital image reference collection, detailing of characteristics and reference points, itemising scale marks and issues in their separation. Approaches to future sample and data collection to address questions of changing life histories and proposals for future data analyses were also made.

The Workshop began with presentations detailing reasons for scale reading and the procedures used by different laboratories, a theoretical review and practical demonstrations. Notable variations were found in the approaches taken by different laboratories. The most prevalent issues were presented and discussed in working sessions to reach consensus on how they should be addressed and the necessary steps to provide further information about them.

The previous report "No. 188 Atlantic Salmon Scale Reading Guidelines" (ICES 1992) was confirmed as the primary reference for practitioners. As such its definitions are still appropriate and so were adopted, though technology has moved forward enabling greater detailing in measurements and image storage. Groups in the working sessions detailed:

- The procedure of digital scale reading being adopted by the Celtic Sea Trout Project (Poole, 2010) was considered appropriate to reading salmon scales and should be adopted.
- A digital image reference collection was compiled to include recognized scale features and age groups.
- Scale spawning marks and erosion marks, commonly acknowledged as being difficult to recognize, were detailed.
- Scales from farm escapees were noted as being recently more complex to distinguish from those of wild salmon than in the past. The other common distinguishing marks were listed and should include morphology.
- Important reference points on scales were listed for accurate calculation of growth periods with digital apparatus.
- Approaches to data analyses being used on the more detailed datasets being collated from digital scale reading were presented and discussed.
- Approaches for determining changes in growth and life histories from scales were discussed and recommendations were made for the necessary data collection.
- In Northern Europe (Finland and Norway) collecting scale samples from an alternative position below the adipose fin was found to provide more information; this location is further back on the fish than recommended in the earlier scale reading guidelines (ICES 1992). A recommendation for future collection from this alternative position requires further consideration, owing to the long history of using the 'recognized' sampling location. Switching could undermine the continuity of the time-series.

On the basis of the draft Workshop output, the Working Group recommended that:

- further work be undertaken to address the issues raised at the Workshop regarding protocols, inter-laboratory calibration and quality control as they relate to the interpretation of age and calculation of growth and other features from scales;
- a second Workshop should be convened to facilitate the work and reporting.

2.3.2 Overview of the potential impacts of the development of alternative/renewable energy on Atlantic salmon

Globally, there has been increasing interest in recent years in the development of renewable energy sources. Renewable (naturally replenished) energy is that which comes from sources such as sunlight, wind, water, geothermal heat and biofuels. The growth of clean renewable energy has been seen as an important part of addressing climate change concerns. Together with high oil prices and an increasing awareness of the need for energy security, these concerns have led to increased levels of government support, renewable energy legislation, incentives and commercialization. Thus, governments have been keen to support the development of renewable energy technologies and to see the establishment of new renewable energy schemes.

Where such technologies rely on water power (river flow, tidal currents) or are located in aquatic environments, they have the potential to affect Atlantic salmon and other resident fish species. There are several forms of hydropower. Hydroelectric energy is a term usually associated with large-scale hydroelectric dams, but there are also many hydro systems which operate at a smaller, local scale. These might also rely on a head of water created by a dam or estuarine barrage to generate power, but hydroelectricity systems can also derive kinetic energy from rivers and oceans without using a dam. Tides, currents and waves can all be harnessed to produce power. For example, systems to harvest electrical power from ocean waves have recently been gaining momentum as a viable technology.

The development of renewable energy is expected to assist in the effort to reduce carbon emissions worldwide. However, this development raises particular concerns given that the impacts of past hydroelectric power developments on the natural environment and biodiversity have frequently not been adequately addressed or mitigated. Further, many new developments have not been properly evaluated, in part because many of the devices have yet to be deployed and tested (Boehlert and Gill, 2010).

The potential impacts of in-river and estuarine structures on Atlantic salmon are relatively well known given the long history of hydropower development and barrage construction in rivers supporting salmonid and other migratory fish species. Key concerns associated with such schemes are:

- The loss of juvenile habitat due to impoundment of the best spawning and rearing areas. The impounded areas created are commonly also colonized by species that favour those conditions, which result in additional pressures through predation and competition.
- The creation of barriers to migration prevents fish from reaching spawning areas and completing downstream migrations. This can be mitigated where sufficient water flows over a weir, or through an adjacent fish pass, providing appropriate conditions for fish. The position of fish passes in relation to the location of a hydropower scheme, as well as the fish pass type and flow conditions are critically important to the effectiveness of the pass. Fish passage options are discussed in more detail in the next section.
- Barriers also delay movements of migratory fish, reducing or removing the environmental cues that fish rely on during their migration. This can result in unnatural aggregations of fish in the vicinity of obstructions, with associated increased risks of predation, disease or exploitation.

- Where schemes rely on water being abstracted above a barrier or impoundment and discharged below it, the area of river between these points becomes depleted. This, in turn, can affect the channel morphology of the stretch with consequences for both migratory and resident species.
- The presence of side streams or mill leats that take water away from the main river channel disorientate migratory fish. Unless efficient fish passes are provided, this results in fish failing to complete their migration (up or down) and therefore being lost to the stock.
- The turbines (used to generate power) represent a very serious threat to migratory fish. Even with the most fish-friendly designs, fish mortalities occur when fish pass through the turbines. Such impacts can be partially mitigated by screening and provision of by-pass facilities. Screens and by-passes must be properly designed, positioned, operated and maintained.
- Key concerns relating to the impact of hydropower schemes on migratory fish are the construction of high dams in the lower sections of rivers and estuaries and the potential cumulative impact where a number of schemes are created in the same catchment. In such circumstances, it is critical that fish are able to enter the river and migrate successfully past successive barriers. The expansion of hydropower schemes needs to be considered at the catchment scale and not just the local scale.

The Working Group noted reports from several countries of an increase in the number of hydropower schemes in recent years, and that this was anticipated to increase further in coming years in response to government targets on renewable energy and the introduction of financial incentives to support this growth. For example, France has scheduled a power increase of 3000 MW by 31 December 2020 and a production increase of 3 million MWh per year, from hydropower developments. These targets represent an increase of 38% of the power and 21% of the production currently being generated in the salmon-producing areas in France. Regional planning and development of renewables is required in France and it is anticipated that hydropower developments will require revisions of river classification, possibly downward. French law on energy has ruled that all environmental measures (e.g. restoration projects or mitigation measures) have to be preceded by a socio-economic study of the impact on hydroelectric potential.

The Working Group noted apparent contradictions between the objectives of different EU Directives: Renewable Energy Directive (2009/28) seeks to promote the development of hydroelectric schemes, while the Council Directive on the Conservation of Natural Habitats and Wild Fauna and Flora (1992/43) and the Water Framework Directive (2000/60) seek to protect the functionality and resiliency of rivers and require habitats to achieve good ecological status.

The Working Group further noted that some countries, for example UK (England and Wales), are taking action to define standards (e.g. good practice guides) that must be adopted by developers at each proposed hydropower scheme to ensure appropriate environmental protection. It was also recognized that catchment management strategies are required for multiple schemes within catchments to reduce cumulative impacts on salmon populations. However, it was noted that reaching agreement on such standards was challenging because the requirements identified by fishery interests were commonly seen as major obstacles to the economics of proposed schemes by developers. The Working Group considered that the difficulties posed by current salmon restoration programmes highlighted the importance of establishing robust standards at the outset and not relying on inadequate mitigation/compensation provisions.

The Working Group also acknowledged the recent marked increase in offshore wind farms. Wind turbines are particularly effective in areas where winds are stronger and more constant and, because offshore areas experience mean windspeeds far in excess of that on land, there is particular interest in establishing wind farms in coastal areas. Wind farms and other offshore renewable energy developments can impact on the environment during construction, operation and decommissioning (Gill, 2005). Commonly, construction and decommissioning are likely to cause some physical disturbance (e.g. noise and sediment load) with potential implications for local biological communities, the significance of which will likely depend on the extent of the disturbance and the resilience of the communities (Gill, 2005). However, once operational, underwater noise and the emission of electromagnetic fields from such developments may represent longer term and more serious threats for coastal and migratory species. The likelihood of any such impacts on Atlantic salmon will depend on interactions between the migratory routes of salmon, the behaviour of the fish in the proximity of the development, the location and distribution of proposed offshore developments, and the technologies deployed.

In recognition of the potential impact of wind and tidal offshore developments on migratory species, scientists in UK (Scotland) have recently reviewed the available information on the migratory routes and behaviour of Atlantic salmon (and other diadromous species) in Scotland's coastal environment (Malcolm *et al.*, 2010). The Scottish Government has set targets to generate 80% of national power capacity from renewable sources by 2020. However, it is recognized that the development of marine renewables will need to incorporate processes to assess, manage and minimize environmental impacts through appropriate planning and licensing processes for such schemes (Malcolm *et al.*, 2010). This study identified broad scale migration patterns for adult salmon, but recognized these were unlikely to be sufficient to inform site-specific risk assessments. Information on juvenile migratory routes was even less well developed and absent for important east coast rivers. The report concluded that significant knowledge gaps remain and that these should be considered as part of an overall assessment of research needs in relation to offshore renewable developments and diadromous fish.

Detailed studies on the species composition, distribution and relative abundance of the fish community are needed for any proposed offshore development to understand the effects the proposed action will have on the fish community within the deployment area. Additional behavioural studies are also required on key species in relation to changed hydrokinetics. Within the USA, proposals for tidal energy have increased in recent years. The estimated environmental risks involved with tidal energy depend mainly on design, size, and deployment method. One of the risks involved with tidal energy is the damage associated with physical encounter with the turbines; this raises particular concerns in relation to the rotation speed of the turbine blades. Vertebrates (e.g. fish and seals) could be struck by blades and suffer injury or death (Wilson *et al.*, 2007). For this reason, observations of what animals may be found within the assumed strike range of the turbine blades need to be made. Studies using hydroacoustics and midwater trawlnetting have been initiated in support of a proposed hydrokinetic tidal power project to record the vertical distribution of fish at proposed turbine deployment sites and control sites on seasonal, daily, and tidal time-scales. These data are essential to understanding the ecosystem effects that new alternative/renewable energy projects may have on the fish community.

The Working Group concluded that great care must be taken to minimize the impact of renewable energy schemes on salmon (and other species) through careful development, device design and site selection. The Working Group highlighted that the pressures to expand renewable energy raised additional concerns, particularly given unresolved difficulties in establishing and maintaining appropriate safeguards for aquatic biodiversity in previous hydropower developments, and the risks posed by individual and cumulative developments within a catchment.

2.3.3 Overview of best solutions for fish passage with examples of practices in member countries

NASCO asked ICES to provide information on best solutions for fish passage and associated mitigation efforts with examples of practices in member countries.

The Working Group noted that river connectivity was vital in maintaining biodiversity and that maximizing the production of juvenile salmon in freshwater was particularly important at a time when the levels of salmon survival at sea were low. It is thus essential that all potential nursery habitat can be reached by salmon, and that smolts can freely reach the sea. Restricted fish passage can have significant ecological impacts. For example, salmon may be excluded from important nursery habitats, increasing levels of predation (by fish, birds and anglers), or disease/parasite incidence, can occur where salmon aggregate at obstacles and move through impoundments, and smolts and kelts can be injured or killed on spillways, sills or in turbines, as they migrate downstream. The Working Group recognized that in the face of increasing pressures on freshwater ecosystems, for example as a result of the growing threat from small-scale hydropower plants as identified in the previous section, effective fish passage solutions were essential.

The Working Group noted that there are several national and international manuals and comprehensive guides on both upstream (e.g. Evans and Johnston, 1980; Powers *et al*., 1985; Struthers, 1993; Clay, 1995; Larinier, 2002; FAO/DVWK, 2002; Kroes *et al*., 2006; Jungwirth *et al*., 1998; NMFS, 2008; Degerman, 2008; Grande, 2010; Environment Agency, 2010) and downstream fish passage (e.g. Poe *et al*., 1993, Washington Department of Fish and Wildlife, 2000; Larinier and Travade, 2002; Deutsche Vereinigung für Wasserwirtschaft, 2005; NMFS, 2008).

Fish passage considerations include both upstream and downstream passage. Upstream passage can be achieved in a number of different ways. Removal of the obstacle (often dams) is the best solution. Opening of a dam or sluice gates can be used in some situations, but this is rarely applicable and a simple fish pass may be still required if water velocity or the head of water is too high for fish to swim upstream. Other options are to construct fishways; these can be 'natural' or 'technical'. 'Natural' fish passes include rocky ramps or the creation of channels either within or outside the watercourse. Technical fishways come in many types; these include: (a) pool and weir fishways (traditional fish ladders); (b) vertical slot fishways; and (c) Denil and Larinier fishways (roughened channels). Other, less frequently used options include: fish elevators, fish locks, fish pumps and the trapping and transport of ascending spawners.

The technology available for upstream fish passage is more advanced than that available for downstream passage. There are particular concerns with downstream passage in relation to hydropower generation (Section 2.3.2). The key requirement to achieving effective downstream passage past obstructions is to lead the fish to a spillway or by-pass. Fish tend to go with the flow, which can present a particular problem when most of the water is led through turbines. Ensuring suitable bypass flows and adequate attraction flows (relative to generating flow) are considered critical variables regulating the effectiveness of downstream fish passage (Rivinoja, 2005).

Examples of practices in member countries

River Rhine, Germany

The stocks of Atlantic salmon in the River Rhine were lost at the end of the 1950s, and a reintroduction programme started in 1978 with the aim of re-establishing self-sustaining runs. One of the main obstacles that needs to be addressed is the upstream and downstream passage of fish. There are particular concerns about the movement of fish into and through the Rhine delta, with the Haringvliet Sluice in the Netherlands considered a major obstacle. However, free passage of fish is also a problem in most of the Rhine tributaries, both with regard to fish reaching their spawning grounds and in relation to losses of smolts at hydropower plants.

River Ätran, Sweden

The River Ätran is the most important salmon river on the Swedish west coast. In 1903 a power plant was established close to the mouth and salmon and sea trout had great difficulties passing this and a previous fish ladder. In 1946, the dam was equipped with a Denil fishway and this immediately improved upstream access for salmon. The salmon population in the River Ätran is currently assessed as of good status; 3000–5000 Atlantic salmon and sea trout have been counted passing the power plant annually over the period 2000 to 2010. However, upstream migration remains a problem for weaker swimmers such as eel and sea lamprey and further changes to the dam are proposed. Downstream passage of fish in the river has been an ongoing problem.

River Monnow, UK (England and Wales)

In 2009, a fish pass was installed on Osbaston Weir on the River Monnow, one of the largest tributaries of the River Wye in Wales. The rock ramp by-pass channel opened up 200 km of the river to a wide range of species, and salmon have since been seen spawning upstream of the weir, with juvenile salmon found in subsequent fishery surveys.

River Taff, UK (England and Wales)

The River Taff is a recovering river in south Wales. Three fish passes have recently been installed (2003, 2005 and 2009) on the river to help with the re-establishment of salmon. Prior to the installation of the passes, there were no salmon upstream. However, there has been progressive recolonization of the newly accessible areas since this time, with over 70% of the sites surveyed for juvenile salmon containing salmon fry in 2010.

River Himleån, Sweden

The River Himleån is a small catchment in Sweden. In the 1980s, salmon were absent from the river due to migration barriers, acidification in the upper parts, eutrophication in the lower parts and canalisation for drainage of agricultural areas. Today, 38 km of the river is accessible to salmon after removal of three dams and other habitat improvement measures. There has been a steady improvement in the densities of salmon parr in the river and the stock is currently assessed as being above conservation limits, i.e. from a lost salmon population to a healthy river in 23 years.

Summary

The Working Group noted that there was extensive information available on fish pass design and that improving fish passage had contributed to sustaining and recovering wild salmon populations. In addition, the technology available for upstream fish passage is often more advanced than that available for downstream passage. However, scientific evaluation was often absent or inadequate. It was recognized that fishways are never 100% effective, so a proportion of the migrating population is typically lost at each such structure. In rivers with multiple passes/barriers this can have substantial negative cumulative effects resulting in few spawners reaching the nursery areas and/or few smolts reaching the sea.

The Working Group recognized that careful design, adequate water supply and proper maintenance were crucial to well functioning fishways. Where this was possible, the removal of dams had provided some positive examples of restoration, and complete removal of obstructions offered the best solutions for upstream and downstream movements of aquatic species without delays or mortality. However, there were many more examples of poorly designed and inefficient technical fishways where problems persisted with insufficient studies on the effectiveness of such structures.

2.3.4 Recent results from acoustic tracking investigations in Canada

The Working Group reviewed the results of ongoing projects, led by the Atlantic Salmon Federation (ASF) to assess estuarine and marine survival of tagged Atlantic salmon released in rivers of the Gulf of St Lawrence.

In all 249 smolts and 52 kelts were sonically tagged in four rivers between April and June 2010. The proportion of smolts detected (apparent survival) in 2010 from freshwater release points to the head of tide, and from the head of tide to estuary exits, were similar for each of the rivers to those that have been observed in previous years (Figure 2.3.4.1). By contrast, there was an improvement in the proportion of fish detected across the Gulf of St Lawrence to the Strait of Belle Isle (Figure 2.3.4.1). This was especially true of the Cascapedia River, where most few of the fish that successfully exited from the Baie des Chaleurs into the Gulf of St Lawrence were later be detected in the Strait of Belle Isle.

For the first time in four years of study, a smolt from the St Jean River (Quebec North Shore) was detected crossing the Strait of Belle Isle in 2010. This fish passed through the Strait in the same time frame as fish from the Miramichi, Restigouche and Cascapedia Rivers.

Although kelts arrived at the Strait of Belle Isle slightly in advance of smolts, there was an overlap of smolt and kelt movements past the array. Synchronized movements past the array was more pronounced for smolts from the four river systems (Figure 2.3.4.1).

There was a partial detector array functioning in the Cabot Strait (37 km northward from Cape Breton Island) exit of the Gulf of St Lawrence in 2010, but no tagged smolts were detected. A kelt from the St Jean River (Quebec North Shore) that had been tagged migrating upstream in 2009 and left the river in spring 2010 was detected at this array. One of two kelts tagged leaving the Margaree River in 2010 also crossed the Cabot Strait, the other was recorded at the Strait of Belle Isle array.

Six satellite-linked passive drifters were released in 2010 to determine surface water currents in the Gulf of St Lawrence at the time of the smolt migration. The rate of movement of these drifters was slow and half or less of the calculated speeds of the migrating smolt. The timing and direction of the prevailing surface currents did not match the directions taken by the smolt from these areas.

2.3.5 Assessing the impact of common assessment procedures on smolt physiology, behaviour and adult return rates

Marine survival estimates for various Atlantic salmon stocks are reported annually to ICES as part of the Working Group's assessment activities. It has previously been noted, however, that the assessment methodologies used in deriving these estimates may have a negative effect on fish behaviour and survival (Hansen, 1988; Hansen and Jonsson, 1988; Moffett *et al.*, 1997; Crozier and Kennedy, 2002; Riley *et al.,* 2007). Indeed, Crozier and Kennedy (2002) reported that over a 13-year period wild salmon smolts tagged with Coded Wire Tags (CWT) on the River Bush, Northern Ireland had return rates 56% lower than untagged fish.

The Working Group noted recent investigations conducted in UK (England and Wales) to assess the impact of trapping, handling, anaesthesia and tagging (CWT) of Atlantic salmon on smolt physiology, smolt migratory behaviour and subsequent adult return rates.

Physiology of wild migrating smolts–River Frome

Cortisol levels determined from blood plasma of actively migrating smolts caught on the River Frome indicated a highly significant ($p<0.01$) increase in plasma cortisol concentrations following capture, consistent with an acute ('fight or flight') stress response.

Physiology of hatchery-reared smolts – laboratory study

Hatchery-reared smolts were randomly assigned to one of five experimental treatments ($n=6$ per treatment): control; handled/ no anaesthetic; anaesthetized/ handled; anaesthetized/ adipose fin clip only; anaesthetized/ adipose fin clip and CWT. Water samples were then drawn from each tank during an initial acclimation period and at regular intervals post-treatment after the fish had been returned to the tank. This continued for four days in freshwater and for a further three days following an *in situ* transfer to seawater; the water samples were analysed to determine the cortisol release rate.

Cortisol release rates remained at around $4ng^{-1}g^{-1}h^{-1}$ in the control fish throughout the experiment. However, all fish subjected to a handling or tagging procedure responded with an acute stress response with an increase in cortisol release rates for three to twelve hours after the procedure. After this time period, cortisol release rates rapidly returned to baseline levels indicating that there was no chronic stress response in any of the groups.

There were a small number of mortalities after fish were transferred to salt water, although the small sample size makes it difficult to draw robust conclusions about the influence of handling and tagging. Nevertheless, all those fish that died in salt water had undergone a handling or tagging procedure and all released cortisol at a consistently higher rate throughout the experimental period than those fish that survived. Variation in the cortisol response to stress is an individual trait that has been demonstrated to be stable over time with a degree of heritability. It may be that the fish that died after transfer to salt water exhibited a natural 'high-response' to stress and that this meant they were less able to cope with the additional stressors of handling/tagging as well as the subsequent saltwater transfer.

Wild smolt migratory behaviour–River Ceiriog

Each September, in the years 2004 to 2006, wild salmon parr were captured, PIT tagged and released back into the River Ceiriog, a tributary of the Welsh Dee in North Wales, at their site of capture. In total, 5709 parr were tagged over the period. A proportion of these tagged salmon were subsequently monitored as they migrated downstream using a PIT tag detection system installed in the water intake of a trout farm. In April and early May 2006 to 2007, a proportion of the PIT-tagged smolts migrating downstream were intercepted using a rotary screw trap (RST), 1.1 km upstream from the water intake. All PIT-tagged smolts caught were anaesthetized and tagged with a CWT, before being returned to the river immediately downstream of the RST. The previously PIT-tagged smolts that migrated past the RST without being caught and that were subsequently detected at the water intake were used as the control group.

In both 2006 and 2007, the downstream migration timing of the control group of smolts was significantly correlated with the time of sunset. However, the downstream migration timing of the smolts intercepted and tagged with CWTs was statistically random with respect to sunset (Riley *et al.*, 2007).

Adult return rates–River Frome

Each September, in the years 2005 to 2008, around 10 000 wild salmon parr have been captured, PIT tagged and released back into the River Frome in Dorset, at their site of capture. In total, about 43 000 salmon parr were PIT tagged over the period. During the following springs (2006–2009), 1779 PIT tagged salmon smolts were intercepted, using a RST in the lower reaches of the Frome. All PIT-tagged smolts caught were anaesthetized, tagged with a CWT, and returned to the river immediately downstream of the RST within 45 minutes of capture. The 3295 PIT-tagged smolts that successfully migrated past the RST during spring without being caught, but that were detected using PIT antenna systems deployed in the lower Frome, were used as the control group. Differences in the survival between the CWT tagged fish and the control population were determined based on the adult return detection rate of the two groups recorded by a cross-river PIT antenna array (Ibbotson *et al.*, 2004) located 4.1 km upstream of the tidal influence.

Adult return rates have varied year on year. In two years, there was no difference between the return rates of the control and tagged groups, while in the other two years the return rate of the tagged group was lower. To date (November 2010), there has been a 34.5% reduction ($p < 0.05$) in returns from RST intercepted/ CWT smolts compared with the control group. However, the results are strongly influenced by the returns of one smolt cohort (2007) and data are required from more years. The smolt run in 2007 was atypical, with >72% of the smolts caught and released during the daylight, possibly making them more vulnerable to visual predators, although environmental variation and run timing are also likely to play a key role in smolt survival. The River Frome study is planned to continue until 2014 and based on current adult salmon return rates it is anticipated that this will enable a more robust assessment of the effects of handling/tagging on adult return rates.

Summary

Ongoing concerns about trends in the marine mortality of salmon, together with reliance on marine survival data as inputs for stock assessment and modelling, emphasize the vital importance of obtaining accurate marine survival data. The results of this and earlier studies suggest that the additional mortality associated with the handling and tagging of wild smolts should be taken into account when assessing marine survival. However, further work is needed to assess the extent to which such handling and tagging effects might vary year on year in response to factors such as environmental effects and smolt run timing.

2.3.6 Red vent syndrome

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. The condition, known as red vent syndrome (RVS), has been noted since 2005, and has been linked to the presence of a nematode worm, *Anisakis simplex* (Beck *et al*., 2008). 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. However, their presence in the muscle and connective tissue surrounding the vents of Atlantic salmon is unusual. The reason for their occurrence in the vents of migrating wild salmon, and whether this might be linked to possible environmental factors, or changes in the numbers of prey species (intermediate hosts) or marine mammals (final hosts) remains unclear.

A number of regions within the NEAC stock complex observed a notable increase in the incidence of salmon with RVS during 2007 (ICES 2008a), but levels have been lower in some NEAC countries since 2008 (ICES 2009a; ICES 2010b). However, levels of RVS on monitored rivers in UK (England and Wales) and in France have typically remained high (20–60%) and have changed relatively little over recent years. During a fishery survey by Inland Fisheries Ireland in summer 2010, a sample of 392 salmon was examined for the prevalence of *Anisakis* symptoms. Of these 6% demonstrated no symptoms, 20% revealed slight reddening of the vent/ no swelling, 33% displayed severe reddening / no swelling, 25% displayed severe reddening /slight swelling, while 15% demonstrated severe reddening /severe swelling. The presence of *Anisakis* was confirmed in a number of samples, while others have been sent for a full parasitological examination. Trapping records for rivers in UK (England and Wales) for the last six years indicate that RVS has generally been less prevalent in early and late running fish than mid-season fish. Early running fish comprise mainly MSW salmon whereas late running fish are predominantly 1SW fish. Within the NAC stock complex, RVS has previously been detected in the Scotia-Fundy (2008 and 2009) and Quebec regions.

There is no clear indication that RVS affects either the survival of the fish or their spawning success. Affected fish have been taken for use as broodstock in a number of countries, successfully stripped of their eggs, and these have developed normally in hatcheries. Recent results have also demonstrated that affected vents demonstrated signs of progressive healing in freshwater, suggesting that the time when a fish is examined for RVS, relative to its period of in-river residence, is likely to influence perceptions about the prevalence of the condition.

2.3.7 Reduced sensitivity and development of resistance towards treatment in the salmon louse (*Lepeophtheirus salmonis*)

In the two previous reports, the Working Group highlighted concerns arising from Norway regarding the development of reduced sensitivity of the salmon louse (*Lepeophtheirus salmonis*) to oral treatment (ICES 2009a; ICES 2010b). Though both the aquaculture industry and management authorities are taking actions, this problem still remains a potential threat to wild salmon populations. The monthly reports of lice numbers on aquaculture salmon, reported by fish farmers, demonstrate that the average number of adult lice on salmon in January and February 2011 for Norway as a whole, was at the same high level as seen in the previous year (www.lusedata.no). Throughout 2010, levels were on average higher than the previous year in the periods January to March and August to November. Coordinated delousing efforts carried out in early spring managed to reduce lice numbers over the period of the smolt migration to approximately the same levels recorded in the two previous years (Anon., 2010a). The relatively low infestation levels on farmed salmon achieved in the main smolt migration period may have allowed most wild smolts to complete their migration from rivers to the open ocean without heavy lice infestation. However, smolts migrating later from cold rivers in the fjords may not have had time to reach the coast before lice levels started increasing at the beginning of June (Anon., 2010).

Investigations of lice infestation rates on wild salmonids (salmon and trout) also indicate that lice infestation was low in May, and increased from the beginning of June. In some areas, infestation levels on sea trout reached very high levels during summer, and sea trout populations in these areas are severely affected (Bjørn *et al.*, 2010).

Due to the reduced sensitivity, and in some cases resistance, to the commonly used oral treatment against salmon lice, alternative chemicals and treatment methods have been applied in several areas. Resistance towards treatment continues to be a growing problem in some regions, giving cause for concern for future years.

2.3.8 Atlantic salmon genetics–new initiatives in relation to management of mixed-stock coastal fisheries in northern Norway

SALSEA-Merge and other current and previous projects have contributed to the establishment of a comprehensive genetic baseline for salmon populations in northern Europe. Work continues to further develop this baseline for the salmon populations of northernmost Europe into a practical and useful tool for management of mixed-stock coastal fisheries in Norway and Russia. Last year, the Working Group reported (ICES 2010b) on a pilot project that expanded the baseline for a number of Russian rivers, and ongoing genetic analysis and assignment of samples from salmon caught in coastal fisheries in Norway. Power analysis of the genetic baseline developed indicate that with the present coverage, and number of genetic markers used, around 50% of the samples from coastal fisheries can be reliably (probability >90%) assigned to river. However, it was recognized that the spatial coverage of the baseline should be expanded, and additional sampling should be conducted in a number of rivers to improve the precision of the assignment of individuals.

A further initiative to achieve this has been taken by Norway, Russia and Finland. In 2011 a new EU project "Trilateral cooperation on our common resource; the Atlantic salmon in the Barents region" (Kolarctic Salmon) was started. The project funding consists of both EU-funding (Kolarctic ENPI CBC) and national funding from Norway, Russian Federation and Finland.

Through the activities outlined in the project plan, a model for coastal migration of returning spawners to these northern salmon rivers will be developed. Up to 100 northern rivers will be added to the genetic baseline, and up to 18 000 samples from coastal fisheries in Norway and Russia will be analysed. Through the activities in this project, a foundation will be established on which a river-specific management regime for coastal and riverine fisheries for these northern populations can be implemented.

2.3.9 SALSEA West Greenland

The marine survey aspect of the SALSEA program was developed to concentrate marine sampling upon areas where stocks from many rivers co-occur, because declines in marine survival are affecting stocks over broad geographic areas. Considering that both southern European and North American stocks co-occur at West Greenland as 1SW fish, an additional land-based survey was developed for West Greenland (SALSEA West Greenland). SALSEA West Greenland is designed to enhance the current Baseline Sampling Program (Section 5.1.2) and integrate it with the previous coordinated marine surveys in other oceanic areas (SALSEA North America and SALSEA-Merge). Collectively, these data and data from subsequent in-river sampling programmes in home waters will be used to investigate hypotheses on the causal mechanisms driving stock-specific performance in the ocean (i.e. marine survival).

As in 2009, the 2010 Baseline Sampling Program was delivered by seven samplers from Canada, Greenland, UK (England and Wales), UK (Scotland), and USA (2) stationed in three different communities representing three different NAFO Divisions during 11 of the 14 weeks of the fishery. The SALSEA West Greenland Enhanced Sampling Program was successfully integrated into this program and a total of 358 fresh whole salmon were purchased directly from individual fishermen for detailed sampling. Fresh whole fish are needed, as the protocols for many of the samples require the collection of fresh internal tissues. The following is a list of the samples collected in 2010 and their purpose:

- adipose tissue samples preserved in RNALater for origin determination;
- scales samples for age and growth studies;
- stomach samples preserved in formalin for diet studies;
- sea lice collections preserved in both RNALater and EtOH for Slice® resistance and population genetics studies;
- muscle fillet sections frozen for lipid analysis;
- otolith and water samples for oxygen isotope analysis;
- heart and kidney samples preserved in both RNALater and formalin for parasite (*Ichthyophonus*) investigations;
- pyloric caeca, gill arch, liver, spleen, kidney, and heart samples preserved in formalin for miscellaneous parasite investigations;
- intestines preserved in formalin for parasite analysis;
- kidney samples preserved in RNALater and frozen for ISAv analysis;
- adipose and caudal fin clip, dorsal muscle and liver frozen samples and scale samples for stable isotopes analysis;

- gillrakers, pyloric caeca, spleen, and kidney frozen samples for miscellaneous disease investigations.

All carcasses, post sampling, were returned to the communities where the sampling took place. Sample auditing and processing are currently underway. The Working Group recommends that SALSEA West Greenland be conducted in 2011 for a third year and that efforts continue to integrate the results from this sampling programme with results obtained from both SALSEA-Merge and SALSEA North America.

2.3.10 Salmon bycatch in the Icelandic mackerel fishery

Only limited information exists on the distribution of salmon in Icelandic waters as ocean fisheries for salmon have been banned for more than 70 years. In 2010, the Icelandic Directorate of Fisheries launched a programme to investigate the incidence of salmon bycatch in a new mackerel fishery, which started in late May of that year. The programme was limited to 1000–3000 tonne multi-gear vessels, which fished with a midwater trawl and landed their catch in processing factories and freezing plants all over Iceland. The monitoring of these landings for salmon bycatch was primarily carried out in land-based sorting facilities prior to processing and freezing of the mackerel catch. The sampling rate was 40 kg per 100 t of landed catch. However, a few salmon were also recovered in factory trawlers. For each salmon, information was recorded on the date and place (coordinates) of capture, along with the length, weight and sex of the fish and details of any tags recovered. The salmon´s head was also retained.

Most of the bycatch of salmon occurred in areas off eastern and northeastern Iceland during the early summer. The total bycatch recorded during the 2010 sampling was 170 adult salmon, most of which were 1SW fish less than 60 cm in fork length. No post-smolts were detected. Four of the salmon were tagged, three with CWTs and one with a Carlin tag. Three of the tags originated in Norway and one from Ireland.

The Working Group welcomed this opportunistic assessment of the incidence of salmon bycatch in this pelagic fishery and also the opportunity to collect samples from the salmon caught, as this provided new information on the temporal and spatial distribution of salmon in this area, as well as the biology of the fish. It was recognized that systematic screening and sampling of the bycatch needed to be done by skilled personnel in order to provide reliable information. Further work is planned to utilize the sampled fish, including DNA analysis against the genetic baseline developed as part of the SALSEA programme. This might provide further opportunities to trace the salmon back to country of origin or even to specific areas or rivers. The results of this sampling will be reported as a part of the SALSEA project; further sampling is planned for the 2011 mackerel fishery season.

2.3.11 Reintroduction of salmon–developments on the River Rhine

The programme of reintroducing Atlantic salmon to the River Rhine started 20 years ago. It is part of a wider ecological rehabilitation programme involving all countries bordering the river and coordinated by the International Commission for the Protection of the River Rhine (ICPR). This 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.

Stocking of juvenile salmon started in 1988 and the first adult salmon was recorded in the River Sieg, a tributary of the Rhine, in 1990, more than 30 years after the extirpation of salmon from the Rhine catchment. Naturally produced juvenile salmon were first observed in 1994 and since the start of the programme more than 6200 adult salmon, mainly from stocking, have been recorded in the Rhine and its tributaries. The actual number of returned salmon is probably somewhat higher than 6200, because some tributaries are not equipped with detection facilities and in other rivers salmon can also by-pass these facilities. In some tributaries, for example the River Moselle and River Wupper, further monitoring stations are planned. Stocking of juveniles is planned to continue in the coming years with more than one million individuals released each year. Access to suitable juvenile salmon habitat in the upper part of the Rhine and most of its tributaries is still restricted by dams and weirs, and smolts migrating downstream have to pass hydropower plants. However, future improvements in both fish passage and water quality are expected as a result of the implementation of the Water Framework Directive, and this should facilitate the restoration of the salmon population in the River Rhine.

After a successful pilot project in 2006, the downstream migration of Atlantic salmon smolts has been monitored in the River Rhine since 2007 using the NEDAP Trail system (Breukelaar *et al.*, 1998). The study aims to investigate the success of downstream migration through Germany and the Netherlands and to assess the migration routes in relation to the obstructions within the partly dammed Rhine Delta, particularly the Haringvliet sluices. Tagged smolts have been released each year since 2007 in two tributaries of the River Rhine about 330 km from the sea. The smolts (hatchery 2^+, weight >150 g) have been tagged with transponders (length 3.5 cm, weight 11.5 g) by implantation into the body cavity, and allowed to recover for ten days in the hatchery before release to the river. Within that period no post tagging mortality has been observed. The tagged fish were subsequently detected by fixed antenna arrays when leaving the tributary and during their migration through the Rhine Delta to the sea using the NEDAP trail system (ICES 2008a, 2009a, 2010b).

The number of fish reaching the sea after passage through the delta has typically been relatively low; the highest percentage (46%) occurred in 2007 and may reflect higher discharge in that year. The study was repeated in 2010 and results suggest a slight preference for night-time migration (52% of all detections) in common with 2009 (Spierts *et al*., 2009), but in contrast to investigations in 2007 and 2008 when the smolts had a slight preference for daytime migration (Vriese and Breukelaar, 2007; Spierts *et al*., 2008). In 2010, the fastest smolts entered the sea after ten days, for smolts released in River Wupper and River Dhünn, and after 19 days for smolts released in the River Sieg. In common with previous years, the most important migration route from all rivers to the sea was the passage through the Haringvliet sluices in the Netherlands. The study is planned to continue in 2011 and is aimed specifically at improving conditions for migratory fish species during their passage from freshwater to the sea and *vice versa*.

The Working Group noted that proposed changes to the way in which the Haringvliet sluices will be operated had potential implications for the success of the programme. Previously, in 2004, the Dutch government had agreed to the implementation of progressive measures to partially open the sluices. Aside from establishing a brackish water biotope, decreasing sludge deposition and improving water quality, this was expected to facilitate the passage of migratory fish species. However, following a change in the Dutch government in 2010 these measures were dropped and ecologically meaningful alternatives are to be examined. This has raised serious concerns among the different organizations involved in the migratory fish programmes on the River Rhine, because this will affect the main migration route for these fish.

2.4 NASCO has asked ICES to report on significant advances in our understanding of associations between changes in biological characteristics of all life stages of Atlantic salmon and ecosystem changes with a view to better understanding the dynamics of salmon populations

The Working Group had considered a preliminary report from the second meeting of the Study Group on the Identification of Biological Characteristics for Use as Predictors of Salmon Abundance [SGBICEPS] at its last meeting (ICES 2010b) and noted that the final study group report had since been published (ICES 2010c). No other new information was presented to the Working Group at the 2011 meeting.

2.5 NASCO has asked ICES to further develop approaches to forecast pre-fishery abundance for North American and European stocks with measures of uncertainty

The Study Group on Salmon Stock Assessment and Forecasting (SGSAFE) was established to further develop Atlantic salmon stock assessment and forecast models and to assist the Working Group in their tasks to provide catch advice to NASCO for management of the North Atlantic high seas salmon fisheries. There were four terms of reference for the study group:

a) Update and further develop stock and/or catch forecast models for salmon stocks in the NASCO North American (NAC) and Northeast Atlantic Commission (NEAC) areas;

b) Evaluate options for developing forecast models which include all sea age classes;

c) Evaluate methods for incorporating uncertainty in the assessments;

d) Develop risk analyses for the provision of salmon catch advice.

The first meeting of the study group in March 24–26, 2009 was attended by nine participants from Europe and North America. During this first meeting, new forecast models for the NAC and for the NEAC areas were developed and presented at the ICES Working Group meeting in 2009 (ICES 2009a). For the NAC, the input data used in the run-reconstruction were updated, and some of the regional spawner and return inputs were revised. A regional disaggregated model for the single 1SW non-maturing component was developed using a first order random walk production parameter. The inference portion of the model included uncertainties in the lagged spawner values (as priors) and in the 2SW returns to regions as pseudo-observations. Uncertainties in catches and biological characteristics of the West Greenland fishery were included in the forecast and the full risk analysis for West Greenland was provided. The inference and forecast portions of the model were run in a Bayesian hierarchical framework. Details of the work completed during the first study group are provided in the previous Working Group report (ICES 2009a).

For the NEAC area, efforts were made to translate the run reconstruction of returns and spawners from Oracle CrystalBall© to R software (R Development Core Team 2007) to facilitate the development of the assessment and forecast model in a Bayesian hierarchical framework. Models for the southern NEAC and northern NEAC stock complexes, which combined maturing and non-maturing 1SW return streams from common lagged eggs, were developed. The forecast portion of the model was developed for the stock complex level and included a risk assessment of the probability of meeting or exceeding stock complex conservation limits in the absence of any fisheries. The models for NEAC were presented in 2009 and were accepted and used in 2009 and 2010 for the provision of catch advice (ICES (2009a; ICES 2010b). Details of the NEAC model are presented in ICES (2009a). The work of the study group was incomplete in 2009 and the group agreed to continue working on the model development in subsequent years.

Further to the work reported by the Working Group in 2009, the ACOM review of the Working Group report was critical of some aspects of the models and, as a result, an additional term of reference was given to the study group:

e) Explore the possibility of incorporating physical and biological variables into the models that may explain variation in salmon survival.

The second meeting of the study group was held on March 1–4, 2011 in Moncton (NB), Canada. There were thirteen participants, six from Europe and seven from Canada. As in the first study group, experts in Bayesian modelling and Atlantic salmon assessments from France, who were not Working Group members, participated.

Progress of the study group relative to the terms of reference are described.

a) Update and further develop stock and/or catch forecast models for salmon stocks in the NASCO North American and Northeast Atlantic Commission areas.

The model for NAC originally developed during the first study group meeting of 2009 was refined to account for covariance in the productivity parameters among the regions. Pre-Fishery Abundance (PFA) of 1SW non-maturing salmon is modelled for each region proportionally to lagged spawners using a first order autocorrelated function. The inter-regional variance in the productivity parameter was modelled as a multinormal distribution which ascribes correlation in productivity between regions among years. The justification for using the inter-region covariance matrix for the productivity parameter is that the fish share a common marine environment during part of their life cycle but there can be regional specificities in the evolution of the freshwater and or the marine coastal environment and subsequent variation in productivities.

There were unresolved issues with the NEAC model developed in 2009 which were resolved in the 2011 meeting. These included: the incorporation of the uncertainty in the regional returns for the Bayesian formulation which had not been completed during the previous meeting, an interest in exploring further alternate productivity functions such as the shifting level dynamic, consideration for the disaggregation of the returns and spawners at a sub-complex scale and the development of the full catch advice framework.

The revised NEAC model developed by the study group is a combined sea age-group model with uncertainty in the returns and lagged eggs structured in a hierarchical Bayesian framework. The differences from the 2009 model structure include: a single productivity parameter is estimated for the lagged eggs to PFA association and the proportion maturing is uncoupled from the productivity parameter estimation. The productivity parameter remains a first order autocorrelated function and in addition the proportion maturing is modelled as a first order autocorrelated function. The revised model is discussed further in Section 3.6 and is applied to develop catch advice for the NEAC south and NEAC north stock complexes.

b) Evaluate options for developing forecast models which include all sea age classes.

The combined sea age class models have been developed for the NEAC stocks but not for the NAC stock. At present, the spawning-stock variable for NEAC is lagged eggs from both sea age groups and both maturing and non-maturing recruitments are modelled simultaneously with a common productivity parameter. For NAC, only 2SW spawners are used and the Working Group has only considered the recruitment of the non-maturing 1SW salmon which is the sea age group exploited at West Greenland; the maturing 1SW salmon are not exploited in that fishery.

Some points of discussion were raised regarding the assumptions on heritability of age-at-maturity in the two differing assumptions for NAC and NEAC. For the NEAC model, the assumption is that an egg is an egg regardless of its sea age origin. However, there is an interest in conserving the sea age structure of the spawning-stock which is why the conservation limits are defined by sea age group. A preliminary examination of this assumption could be done by comparing the variation in the proportion maturing parameter with the corresponding proportions of the lagged eggs contributed by one of the sea age groups of the spawners. For the NAC model, the assumption is that there is perfect heritability in that 2SW salmon spawners are the only contributor to 1SW non-maturing salmon and that no other sea age groups (including 1SW, 3SW and repeat spawning MSW salmon) produce recruitment of 1SW non-maturing salmon. The study group did not have time to consider a combined sea age-group model for NAC but the model structure similar to that developed for NEAC could be considered.

c) Evaluate methods for incorporating uncertainty in the assessments.

From the very first study group meeting, the development of inference and forecast models in a hierarchical Bayesian framework was considered the most appropriate approach to use. Both the NAC and NEAC models incorporate the uncertainty in the input data (or pseudo-observations) to the models. Further developments which would consider physical or biological variables to characterize the functional relationship between spawners and recruitment must also consider how to incorporate the uncertainty in those variables and in the forecasts.

d) Develop risk analyses for the provision of salmon catch advice.

The development of the catch advice in a risk analysis framework within the Bayesian structure is complete for the NAC model. A similar approach for NEAC was proposed by the Working Group in 2010, further developed at the study group and is being completed by the Working Group (see Section 3.10).

e) Explore the possibility of incorporating physical and biological variables into the models that may explain variation in salmon survival.

A very good scientific literature review of biotic and abiotic factors associated with biological characteristics and survival of Atlantic salmon is available in the SGBICEPS report (ICES 2010c). The factors vary between NAC and NEAC and even within areas of NEAC. Progress on this term of reference would require the development of models at scales below the stock complex level. No specific work (exploration of forecast models and environmental variables) on this term of reference was done during the study group.

Next steps

The study group report is to be finalized by July 2011. The models developed by the study group have been presented to the Working Group and are being used to develop catch advice for both NAC and NEAC. The study group tasks are considered complete and no further meetings are planned. Further work on the question of incorporating environmental variables in assessment and forecast models is expected by collaborators in a new EU funded project, Effective Use of Ecosystem and Biological Knowledge in Fisheries (ECOKNOWS), and one of their deliverables is reporting to ICES.

2.6 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 noted that a study group had been established by ICES to address this question. The Study Group on Effectiveness of Recovery Actions for Atlantic Salmon [SGERAAS] was set up and had intended to work by correspondence to make progress on this issue. The Study Group has not been able to address this question and there was no progress to report. The Working Group recognized that the issue of the restoration and rehabilitation of salmon stocks remained a concern, but that the issue could not be appropriately addressed by the Working Group during its annual meeting. The Working Group remains of the view that a study group is the best way to provide this review.

2.7 NASCO has asked ICES to provide a compilation of tag releases by country in 2010 and advise on the utility of maintaining this compilation

2.7.1 Compilation of tag releases and fin clip data by ICES Member Countries in 2010

Data on releases of tagged, finclipped and otherwise marked salmon in 2010 were provided to the Working Group and are compiled as a separate report (ICES, 2011). In summary (Table 2.7.1.1), about 4.89 million salmon were marked in 2010, an increase from the 3.45 million fish marked in 2009 (ICES, 2010a). The adipose clip was the most commonly used primary mark (4.1 million), with coded wire microtags (0.52 million) the next most common primary mark and 253 073 fish were marked with external tags. Most marks were applied to hatchery-origin juveniles (4.6 million), while 269 325 wild juveniles and 21 147 adults were also marked. The use of PIT (Passive Integrated Transponder) and other implanted tags for marking Atlantic salmon has increased in recent years and these are listed in a separate column in Table 2.7.1.1. In 2010, 14 423 PIT tags, Data Storage Tags (DSTs), radio and/or sonic transmitting tags (pingers) were also used.

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. At this time, two jurisdictions (USA and Iceland) require that some or all of the sea cage farmed fish reared in their area be marked. In

USA, the broodstock have 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. In Iceland, CWTs are being applied to about 10% of sea cage farm production. As in previous years, the CWT tagged farmed fish are included in the compilation.

2.7.2 Utility of maintaining the tag compilation

In addition to providing a compilation of tag releases by country in 2010, NASCO asked ICES for advice on the utility of maintaining this compilation. The initial idea for the tag compilation database was to simplify detection and return of tag recoveries and information from ocean and offshore fisheries where salmon stocks from many countries could be harvested. Valuable information have been collected from historical tagging datasets on the spatial and temporal distribution of salmon at sea as recently reported by ICES Workshops: WKDHUSTI, WKSHINI and WKLUSTRE (ICES 2007a; ICES 2008b; ICES 2009b).

Following the closure or reduction of most of the oceanic mixed-stock fisheries, there is a reduced need for this multi-country tag compilation. However, in 2010 close to 4.9 million fish were either marked or tagged, of which around 280 000 were of wild origin. Tagged salmon are still recovered in different fisheries, including from research vessel surveys and in bycatch screening programmes for salmon. Further, various fishery boards, private companies, and official institutions carry out salmon tagging programmes. In many countries, compilation of a national database is linked to the preparation of the ICES annual tag compilation. Without the deadline set by the annual meeting, the Working Group considered that continuation of national tagging records was likely to be compromised.

In summary, the Working Group still sees value in maintaining the tag compilation, while such large numbers of salmon are being tagged annually and while the return of tags can add to the knowledge of salmon at sea. With the preparation and assistance from the ICES Secretariat the tag compilation can be completed during the annual meeting of the Working Group. The Working Group therefore recommends continuing with the annual compilation of salmon tags and encourages further use of the scientific information gathered from tagging programmes.

Table 2.1.1.1. Reported total nominal catch of salmon by country (in tonnes round fresh weight), 1960–2010. (2010 figures include provisional data).

	NAC Area			NEAC (N. Area)							NEAC (S. Area)						Faroes & Greenland				Total	Unreported catches	
Year	Canada (1)	USA	St. P&M	Norway (2)	Russia (3)	Iceland Wild	Iceland Ranch (4)	Sweden (West)	Denmark	Finland	Ireland (5,6)	UK (E & W)	UK (N.Irl.) (6,7)	UK (Scotl.)	France (8)	Spain (9)	Faroes (10)	East Grld.	West Grld. (11)	Other (12)	Reported Nominal Catch	NASCO Areas (13)	International waters (14)
1960	1,636	1	-	1,659	1,100	100	-	40	-	-	743	283	139	1,443	-	33	-	-	60	-	7,237	-	-
1961	1,583	1	-	1,533	790	127	-	27	-	-	707	232	132	1,185	-	20	-	-	127	-	6,464	-	-
1962	1,719	1	-	1,935	710	125	-	45	-	-	1,459	318	356	1,738	-	23	-	-	244	-	8,673	-	-
1963	1,861	1	-	1,786	480	145	-	23	-	-	1,458	325	306	1,725	-	28	-	-	466	-	8,604	-	-
1964	2,069	1	-	2,147	590	135	-	36	-	-	1,617	307	377	1,907	-	34	-	-	1,539	-	10,759	-	-
1965	2,116	1	-	2,000	590	133	-	40	-	-	1,457	320	281	1,593	-	42	-	-	861	-	9,434	-	-
1966	2,369	1	-	1,791	570	104	2	36	-	-	1,238	387	287	1,595	-	42	-	-	1,370	-	9,792	-	-
1967	2,863	1	-	1,980	883	144	2	25	-	-	1,463	420	449	2,117	-	43	-	-	1,601	-	11,991	-	-
1968	2,111	1	-	1,514	827	161	1	20	-	-	1,413	282	312	1,578	-	38	5	-	1,127	403	9,793	-	-
1969	2,202	1	-	1,383	360	131	2	22	-	-	1,730	377	267	1,955	-	54	7	-	2,210	893	11,594	-	-
1970	2,323	1	-	1,171	448	182	13	20	-	-	1,787	527	297	1,392	-	45	12	-	2,146	922	11,286	-	-
1971	1,992	1	-	1,207	417	196	8	18	-	-	1,639	426	234	1,421	-	16	-	-	2,689	471	10,735	-	-
1972	1,759	1	-	1,578	462	245	5	18	-	32	1,804	442	210	1,727	34	40	9	-	2,113	486	10,965	-	-
1973	2,434	3	-	1,726	772	148	8	23	-	50	1,930	450	182	2,006	12	24	28	-	2,341	533	12,670	-	-
1974	2,539	1	-	1,633	709	215	10	32	-	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	-	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	-	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	10	-	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	-	37	1,230	349	148	1,323	20	32	37	8	984	138	7,682	-	-
1979	1,287	3	-	1,831	455	219	6	12	-	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	17	-	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	26	-	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	25	-	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	28	-	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	40	-	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	45	-	49	1,595	361	98	913	22	13	566	7	864	-	8,108	-	-
1986	1,559	2	3	1,598	608	232	59	54	-	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	47	-	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	40	-	36	1,874	395	114	882	32	18	243	4	893	-	7,737	3,248	-
1989	1,139	2	2	905	364	141	136	29	-	52	1,079	296	142	895	14	7	364	-	337	-	5,904	2,277	-
1990	911	2	2	930	313	141	285	33	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	
								Sweden				UK	UK	UK				East	West		Reported		
Year	Canada	USA	St. P&M	Norway	Russia	Iceland		(West)	Denmark	Finland	Ireland	(E & W)	(N.Irl.)	(Scotl.)	France	Spain	Faroes	Grld.	Grld.	Other	Nominal	NASCO	International
	(1)			(2)	(3)	Wild	Ranch (4)				(5,6)		(6,7)		(8)	(9)	(10)		(11)	(12)	Catch	Areas (13)	waters (14)
1991	711	1	1	876	215	129	346	38	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	49	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	56	9	70	541	248	83	547	16	8	23	-	-	-	3,696	1,644	25-100
1994	355	0	3	996	141	136	313	44	6	49	804	324	91	649	18	10	6	-	-	-	3,945	1,276	25-100
1995	260	0	1	839	128	146	303	37	3	48	790	295	83	588	10	9	5	2	83	-	3,629	1,060	-
1996	292	0	2	787	131	118	243	33	2	44	685	183	77	427	13	7	-	0	92	-	3,136	1,123	-
1997	229	0	2	630	111	97	59	19	1	45	570	142	93	296	8	4	-	1	58	-	2,364	827	-
1998	157	0	2	740	131	119	46	15	1	48	624	123	78	283	8	4	6	0	11	-	2,395	1,210	-
1999	152	0	2	811	103	111	35	16	1	62	515	150	53	199	11	6	0	0	19	-	2,247	1,032	-
2000	153	0	2	1,176	124	73	11	33	5	95	621	219	78	274	11	7	8	0	21	-	2,912	1,269	-
2001	148	0	2	1,267	114	74	14	33	6	126	730	184	53	251	11	13	0	0	43	-	3,069	1,180	-
2002	148	0	2	1,019	118	90	7	28	5	93	682	161	81	191	11	9	0	0	9	-	2,654	1,039	-
2003	141	0	3	1,071	107	99	11	25	4	78	551	89	56	192	13	9	0	0	9	-	2,457	847	-
2004	161	0	3	784	82	111	18	20	4	39	489	111	48	245	19	7	0	0	15	-	2,157	686	-
2005	139	0	3	888	82	129	21	15	8	47	422	97	52	215	11	13	0	0	15	-	2,156	700	-
2006	137	0	3	932	91	93	17	14	2	67	326	80	29	192	13	11	0	0	22	-	2,029	670	-
2007	112	0	2	767	63	93	36	16	3	58	85	67	30	169	11	9	0	0	25	-	1,546	475	-
2008	158	0	4	807	73	132	69	18	9	71	89	64	21	160	12	9	0	0	26	-	1,720	443	-
2009	126	0	3	595	71	122	44	17	8	36	68	54	17	120	4	2	0	1	26	-	1,313	343	-
2010	146	0	3	642	88	124	36	22	13	49	99	113	16	189	10	2	0	2	38	-	1,589	382	-
Average																							
2005-2009	134	0	3	798	76	114	37	16	6	56	198	72	30	171	10	9	0	0	23	-	1,753	526	-
2000-2009	142	0	3	931	92	102	25	22	5	71	406	113	46	201	12	9	1	0	21	-	2,201	765	-

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 for Canada in 2007 and 2008 and incomplete reports for 2009 and 2010. No unreported catch estimates for Russia since 2008.
14. Estimates refer to season ending in given year.

Table 2.1.1.2. Reported total nominal catch of salmon in homewaters by country (in tonnes round fresh weight), 1960–2010. (2010 figures include provisional data). S = Salmon (2SW or MSW fish). G = Grilse (1SW fish). Sm = small. Lg = large; T = S + G or Lg + Sm.

Year	NAC Area				NEAC (N. Area)											NEAC (S. Area)										Total
	Canada (1)			USA	Norway (2)			Russia (3)	Iceland Wild	Iceland Ranch	Sweden (West)	Denmark	Finland			Ireland (4,5)			UK (E&W)	UK(N.I.) (4,6)	UK(Scotland)			France	Spain	
	Lg	Sm	T	T	S	G	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	-	-	-	-	-	-	743	283	139	971	472	1,443	-	33	7,177
1961	-	-	1,583	1	-	-	1,533	790	127	-	27	-	-	-	-	-	-	707	232	132	811	374	1,185	-	20	6,337
1962	-	-	1,719	1	-	-	1,935	710	125	-	45	-	-	-	-	-	-	1,459	318	356	1,014	724	1,738	-	23	8,429
1963	-	-	1,861	1	-	-	1,786	480	145	-	23	-	-	-	-	-	-	1,458	325	306	1,308	417	1,725	-	28	8,138
1964	-	-	2,069	1	-	-	2,147	590	135	-	36	-	-	-	-	-	-	1,617	307	377	1,210	697	1,907	-	34	9,220
1965	-	-	2,116	1	-	-	2,000	590	133	-	40	-	-	-	-	-	-	1,457	320	281	1,043	550	1,593	-	42	8,573
1966	-	-	2,369	1	-	-	1,791	570	104	2	36	-	-	-	-	-	-	1,238	387	287	1,049	546	1,595	-	42	8,422
1967	-	-	2,863	1	-	-	1,980	883	144	2	25	-	-	-	-	-	-	1,463	420	449	1,233	884	2,117	-	43	10,390
1968	-	-	2,111	1	-	-	1,514	827	161	1	20	-	-	-	-	-	-	1,413	282	312	1,021	557	1,578	-	38	8,258
1969	-	-	2,202	1	801	582	1,383	360	131	2	22	-	-	-	-	-	-	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	-	-	-	-	-	-	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	18	-	-	-	-	-	-	1,639	426	234	719	702	1,421	-	16	7,575
1972	1,201	558	1,759	1	1,064	514	1,578	462	245	5	18	-	-	-	32	200	1,604	1,804	442	210	1,013	714	1,727	34	40	8,357
1973	1,651	783	2,434	3	1,220	506	1,726	772	148	8	23	-	-	-	50	244	1,686	1,930	450	182	1,158	848	2,006	12	24	9,768
1974	1,589	950	2,539	1	1,149	484	1,633	709	215	10	32	-	-	-	76	170	1,958	2,128	383	184	912	716	1,628	13	16	9,567
1975	1,573	912	2,485	2	1,038	499	1,537	811	145	21	26	-	-	-	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	-	-	-	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	10	-	-	-	59	145	1,227	1,372	345	110	639	521	1,160	19	19	7,756
1978	1,225	320	1,545	4	668	382	1,050	476	285	6	10	-	-	-	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	12	-	-	-	26	105	922	1,027	261	99	598	478	1,076	10	29	6,341
1980	1,763	917	2,680	6	1,352	478	1,830	664	241	8	17	-	-	-	34	202	745	947	360	122	851	283	1,134	30	47	8,120
1981	1,619	818	2,437	6	1,189	467	1,656	463	147	16	26	-	-	-	44	164	521	685	493	101	844	389	1,233	20	25	7,352
1982	1,082	716	1,798	6	985	363	1,348	364	130	17	25	-	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	28	-	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	40	-	37	9	46	101	728	829	345	78	504	509	1,013	25	18	5,883
1985	540	593	1,133	2	923	638	1,561	659	162	55	45	-	38	11	49	100	1,495	1,595	361	98	514	399	913	22	13	6,668
1986	779	780	1,559	2	1,042	556	1,598	608	232	59	54	-	25	12	37	136	1,594	1,730	430	109	745	526	1,271	28	27	7,744
1987	951	833	1,784	1	894	491	1,385	564	181	40	47	-	34	15	49	127	1,112	1,239	302	56	503	419	922	27	18	6,615
1988	633	677	1,310	1	656	420	1,076	420	217	180	40	-	27	9	36	141	1,733	1,874	395	114	501	381	882	32	18	6,595
1989	590	549	1,139	2	469	436	905	364	141	136	29	-	33	19	52	132	947	1,079	296	142	464	431	895	14	7	5,201
1990	486	425	911	2	545	385	930	313	146	280	33	13	41	19	60	-	-	567	338	94	423	201	624	15	7	4,333
1991	370	341	711	1	535	342	876	215	129	346	38	3	53	17	70	-	-	404	200	55	285	177	462	13	11	3,534
1992	323	199	522	1	566	301	867	167	174	462	49	10	49	28	77	-	-	630	171	91	361	238	599	20	11	3,851
1993	214	159	373	1	611	312	923	139	157	499	56	9	53	17	70	-	-	541	248	83	320	227	547	16	8	3,670
1994	216	139	355	0	581	415	996	141	136	313	44	6	38	11	49	-	-	804	324	91	400	248	648	18	10	3,934
1995	153	107	260	0	590	249	839	128	146	303	37	3	37	11	48	-	-	790	295	83	364	224	588	10	9	3,538
1996	154	138	292	0	571	215	787	131	118	243	33	2	24	20	44	-	-	685	183	77	267	160	427	13	7	3,042
1997	126	103	229	0	389	241	630	111	97	59	19	1	30	15	45	-	-	570	142	93	182	114	296	8	3	2,303
1998	70	87	157	0	445	296	740	131	119	46	15	1	29	19	48	-	-	624	123	78	162	121	283	8	4	2,376
1999	64	88	152	0	493	318	811	103	111	35	16	1	29	33	62	-	-	515	150	53	142	57	199	11	6	2,225
2000	58	95	153	0	673	504	1,176	124	73	11	33	5	56	39	95	-	-	621	219	78	161	114	275	11	7	2,882
2001	61	86	148	0	850	417	1,267	114	74	14	33	6	105	21	126	-	-	730	184	53	150	101	251	11	13	3,024
2002	49	99	148	0	770	249	1,019	118	90	7	28	5	81	12	93	-	-	682	161	81	118	73	191	11	9	2,643
2003	60	81	141	0	708	363	1,071	107	99	11	25	4	63	15	78	-	-	551	89	56	122	71	193	13	7	2,444
2004	68	94	161	0	577	207	784	82	111	18	19	4	32	7	39	-	-	489	111	48	159	88	247	19	7	2,140
2005	56	83	139	0	581	307	888	82	129	21	15	8	31	16	47	-	-	422	97	52	126	90	216	11	13	2,138
2006	55	82	137	0	671	261	932	91	93	17	14	2	38	29	67	-	-	326	80	29	118	75	193	13	11	2,005
2007	49	63	112	0	627	140	767	63	93	36	16	3	52	6	58	-	-	85	67	30	99	70	169	11	9	1,519
2008	58	100	158	0	637	170	807	73	132	69	18	9	65	6	71	-	-	89	64	21	110	50	160	12	9	1,691
2009	52	67	119	0	460	135	595	71	122	44	17	8	21	15	36	-	-	68	54	17	83	37	120	4	2	1,277
2010	53	93	146	0	458	184	642	88	124	36	22	13	-	-	49	-	-	99	113	16	116	73	189	10	2	1,547
Average																										
2005-2009	54	79	133	0	595	203	798	76	114	37	16	6	41	14	56	-	-	198	72	30	107	64	172	10	9	1726
2000-2009	57	85	142	0	655	275	931	92	102	25	22	5	54	17	71	-	-	406	113	47	125	77	202	12	9	2176

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, 1991–2010. Figures for 2010 are provisional.

Year	Canada		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	28,497	33	239	50			3,211	51												
1992	46,450	34	407	67			10,120	73												
1993	53,849	41	507	77			11,246	82	1,448	10										
1994	61,830	39	249	95			12,056	83	3,227	13	6,595	8								
1995	47,679	36	370	100			11,904	84	3,189	20	12,151	14								
1996	52,166	33	542	100	669	2	10,745	73	3,428	20	10,413	15								
1997	57,252	49	333	100	1,558	5	14,823	87	3,132	24	10,965	18								
1998	62,895	53	273	100	2,826	7	12,776	81	5,365	31	13,464	18								
1999	55,331	50	211	100	3,055	10	11,450	77	5,447	44	14,846	28								
2000	64,482	55	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	55	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	44,423	60	3	100	9,691	18	44,341	90	10,917	55	55,660	61	13,125	40	470	16	959	57		
2008	58,004	54	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	55,178	60	0	-	17,514	24	-	-	9,096	58	48,371	67	10,265	37	847	21	1,709	53	6,696	6
2010	58,297	57	0	-	20,345	28	14,585	56	14,103	59	81,497	70	15,136	40	1024	21	2,512	60	15,041	12
5-yr mean 2005-2009	56,219	60			12,468	20			11,198	56	50,242	60	9,967	31			1,220	55		
% change on 5-year mean	+4	-+4			+63	+43			+26	+5	+62	+18	+52	+28			+106	+10		

Key:

[1] No data were provided by the authorities for 2009 and data for 2010 were incomplete, however catch-and-release is understood to have remained at similar high levels.

[2] Data for 2006-2009 is for the DCAL area only; the figure for 2010 is a total for N.Ireland.

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

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, 1987–2010.

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	15	10	382
Mean 2005-2009	485		10	526

* 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.

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, 2010.

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	4	0.2	25
NEAC	Finland	8	0.4	14
NEAC	Iceland	12	0.6	7
NEAC	Ireland	10	0.5	9
NEAC	Norway	275	14.0	30
NEAC	Sweden	2	0.1	8
NEAC	France	1	0.0	5
NEAC	UK (E & W)	20	1.0	15
NEAC	UK (N.Ireland)	0	0.0	0
NEAC	UK (Scotland)	25	1.3	12
NAC	USA	0	0.0	0
NAC	Canada	15	0.8	9
WGC	West Greenland	10	0.5	20
	Total Unreported Catch *	382	19.4	
	Total Reported Catch of North Atlantic salmon	1,589		

* No unreported catch estimate available for Russia in 2010. Data for Canada is incomplete in 2010.
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), 1980–2010.

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	Other	Total	Total
1980	4,153	598	0	11	21	0	0	0	0	4,783	0	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	0	9,611
1982	10,266	2,152	70	38	100	0	0	0	0	12,626	0	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	0	19,972
1984	22,300	3,912	120	227	385	0	0	0	0	26,944	0	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	0	37,196
1986	45,675	10,337	1,370	672	1,215	0	123	0	0	59,392	0	0	0	20	0	0	0	59,392
1987	47,417	12,721	3,530	1,334	2,232	365	490	0	0	68,089	3	0	0	50	0	0	53	68,142
1988	80,371	17,951	3,300	3,542	4,700	455	1,053	0	0	111,372	174	0	0	250	0	0	424	111,796
1989	124,000	28,553	8,000	5,865	5,063	905	1,480	0	0	173,866	1,864	1,100	1,000	400	0	700	5,064	178,930
1990	165,000	32,351	13,000	7,810	5,983	2,086	2,800	<100	5	229,035	9,500	700	1,700	1,700	0	800	14,400	243,435
1991	155,000	40,593	15,000	9,395	9,483	4,560	2,680	100	0	236,811	14,991	2,000	3,500	2,700	0	1,400	24,591	261,402
1992	140,000	36,101	17,000	10,380	9,231	5,850	2,100	200	0	220,862	23,769	4,900	6,600	2,500	0	400	38,169	259,031
1993	170,000	48,691	16,000	11,115	12,366	6,755	2,348	<100	0	267,275	29,248	4,200	12,000	4,500	1,000	400	51,348	318,623
1994	204,686	64,066	14,789	12,441	11,616	6,130	2,588	<100	0	316,316	34,077	5,000	16,100	5,000	1,000	800	61,977	378,293
1995	261,522	70,060	9,000	12,550	11,811	10,020	2,880	259	0	378,102	41,093	5,000	16,000	6,000	1,000	0	69,093	447,195
1996	297,557	83,121	18,600	17,715	14,025	10,010	2,772	338	0	444,138	69,960	5,200	17,000	7,500	1,000	600	101,260	545,398
1997	332,581	99,197	22,205	19,354	14,025	13,222	2,554	225	0	503,363	87,700	6,000	28,751	9,000	1,000	900	133,351	636,714
1998	361,879	110,784	20,362	16,418	14,860	13,222	2,686	114	0	540,325	125,000	3,000	33,100	7,068	1,000	400	169,568	709,893
1999	425,154	126,686	37,000	23,370	18,000	12,246	2,900	234	0	645,590	150,000	5,000	38,800	9,195	0	500	203,495	849,085
2000	440,861	128,959	32,000	33,195	17,648	16,461	2,600	250	0	671,974	176,000	5,670	49,000	12,003	0	500	243,173	915,147
2001	436,103	138,519	46,014	37,606	23,312	13,202	2,645	250	0	697,651	200,000	5,443	68,000	13,815	0	500	287,758	985,409
2002	462,495	145,609	45,150	42,121	22,294	6,798	1,471	250	0	726,188	273,000	5,948	84,200	14,699	0	1,000	378,847	1,105,035
2003	509,544	176,596	52,526	34,550	16,347	6,007	3,710	250	298	799,828	261,000	10,329	65,411	13,324	0	1,000	351,064	1,150,892
2004	563,914	158,099	40,492	35,000	14,067	8,515	6,620	250	203	827,160	261,000	6,659	55,646	14,317	0	1,000	338,622	1,165,782
2005	586,512	129,588	18,962	35,000	13,764	5,263	6,300	250	179	795,818	385,000	6,123	63,369	16,827	0	1,000	472,319	1,268,137
2006	629,888	131,847	11,905	47,880	11,000	4,674	5,745	250	229	843,418	370,000	5,823	70,181	22,417	0	1,000	469,421	1,312,839
2007	744,220	129,930	22,305	36,511	9,923	2,715	1,158	250	280	947,292	371,809	6,261	70,998	23,982	0	1,000	474,050	1,421,342
2008	737,694	128,606	36,000	39,810	11,000	9,014	330	250	380	963,084	393,000	6,261	73,265	26,173	0	1,000	499,699	1,462,783
2009	862,908	144,247	51,500	40,550	13,000	6,028	742	250	55	1,119,280	200,000	7,930	68,670	32,819	0	1,000	310,419	1,429,699
2010	916,434	150,004	45,396	38,957	13,000	11,127	1,068	250	1,400	1,177,636	81,000	7,930	71,000	30,264	0	1,000	191,194	1,368,830
5-yr mean 2005-2009	712,244	132,844	28,134	39,950	11,737	5,539	2,855	250	225	933,778	343,962	6,480	69,297	24,444	0	1,000	445,182	1,378,960
% change on 5-year mean	+29	+13	+61	-2	+11	+101	-63	0	+523	+26	-76	+22	+2	+24		0	-57	-1

Notes: Data for 2010 are provisional for many countries.
Where production figures were not available for 2010, values as in 2009 were assumed.
West Coast USA = Washington State.
West Coast Canada = British Columbia.
Australia = Tasmania. This is mostly Atlantic salmon, but includes a small component of trout
Source of production figures for non-Atlantic areas: miscellaneous fishing publications & Government reports
'Other' includes South Korea & China.

Table 2.7.1.1. Summary of Atlantic salmon tagged and marked in 2010; 'Hatchery' and 'Wild' refer to smolts and parr; 'Adults' relates to both wild and hatchery-origin fish.

Country	Origin	Microtag	External mark	Adipose clip	Other Internal[1]	Total
Canada	Hatchery Adult	0	0	21	301	322
	Hatchery Juvenile	0	3,877	716,904	0	720,781
	Wild Adult[2]	0	4,847	2,020	874	7,741
	Wild Juvenile[2]	0	18,512	35,615	266	54,393
	Total	0	27,236	754,560	1,441	783,237
Denmark	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	77,000	0	240,995	0	317,995
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	0	0
	Total	77,000	0	240,995	0	317,995
France	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile[3]	0	178,200	266,174	0	444,374
	Wild Adult[3]	0	241	0	0	241
	Wild Juvenile	2,394	2,582	0	0	4,976
	Total	2,394	181,023	266,174	0	449,591
Germany	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	18,694	0	30,950	0	49,644
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	0	0
	Total	18,694	0	30,950	0	49,644
Iceland	Hatchery Adult	0	6	0	0	6
	Hatchery Juvenile	44,064	0	0	0	44,064
	Wild Adult	0	188	0	0	188
	Wild Juvenile	3,503	0	0	0	3,503
	Total	47,567	194	0	0	47,761
Ireland	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	197,852	0	368,950	0	566,802
	Wild Adult	0	0	0	0	0
	Wild Juvenile	5,020	0	5,020	0	10,040
	Total	202,872	0	373,970	0	576,842
Norway	Hatchery Adult	0	6,000	0	0	6,000
	Hatchery Juvenile	72,491	24,626	0	0	97,117
	Wild Adult	0	1,087	0	6,877	7,964
	Wild Juvenile	3,072	2,781	0	0	5,853
	Total	75,563	34,494	0	6,877	116,934
Russia	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	0	1,344,059	0	1,344,059
	Wild Adult	0	2,861	0	0	2,861
	Wild Juvenile	0	0	0	0	0
	Total	0	2,861	1,344,059	0	1,346,920
Sweden	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	3000	174,017	0	177,017
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	500	0	0	500
	Total	0	3,500	174,017	0	177,517
UK (England & Wales)	Hatchery Adult	0	1,224	0	0	1,224
	Hatchery Juvenile	13,800	0	109,610	0	123,410
	Wild Adult	0	0	0	0	0
	Wild Juvenile	9,963	0	11,405	0	21,368
	Total	23,763	1,224	121,015	0	146,002
UK (N. Ireland)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	21,091	0	53,499	0	74,590
	Wild Adult	0	0	0	0	0
	Wild Juvenile	1315	0	0	0	1,315
	Total	22,406	0	53,499	0	75,905
UK (Scotland)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	0	0	3,020	3,020
	Wild Adult	0	1,361	0	3	1,364
	Wild Juvenile	1919	0	0	3,082	5,001
	Total	1,919	1,361	0	6,105	9,385
USA	Hatchery Adult	1,771	1,180	227	0	3,178
	Hatchery Juvenile	40,558	0	592,274	0	632,832
	Wild Adult	788	0	0	0	788
	Wild Juvenile	252	0	162,124	0	162,376
	Total	43,369	1,180	754,625	0	799,174
All Countries	Hatchery Adult	1,771	8,410	248	301	10,730
	Hatchery Juvenile	485,550	209,703	3,897,432	3,020	4,595,705
	Wild Adult	788	10,585	2,020	7,754	21,147
	Wild Juvenile	27,438	24,375	214,164	3,348	269,325
	Total	515,547	253,073	4,113,864	14,423	4,896,907

[1] Includes other internal tags (PIT, ultrasonic, radio, DST, etc.)
[2] May include hatchery fish.
[3] Includes external dye mark.

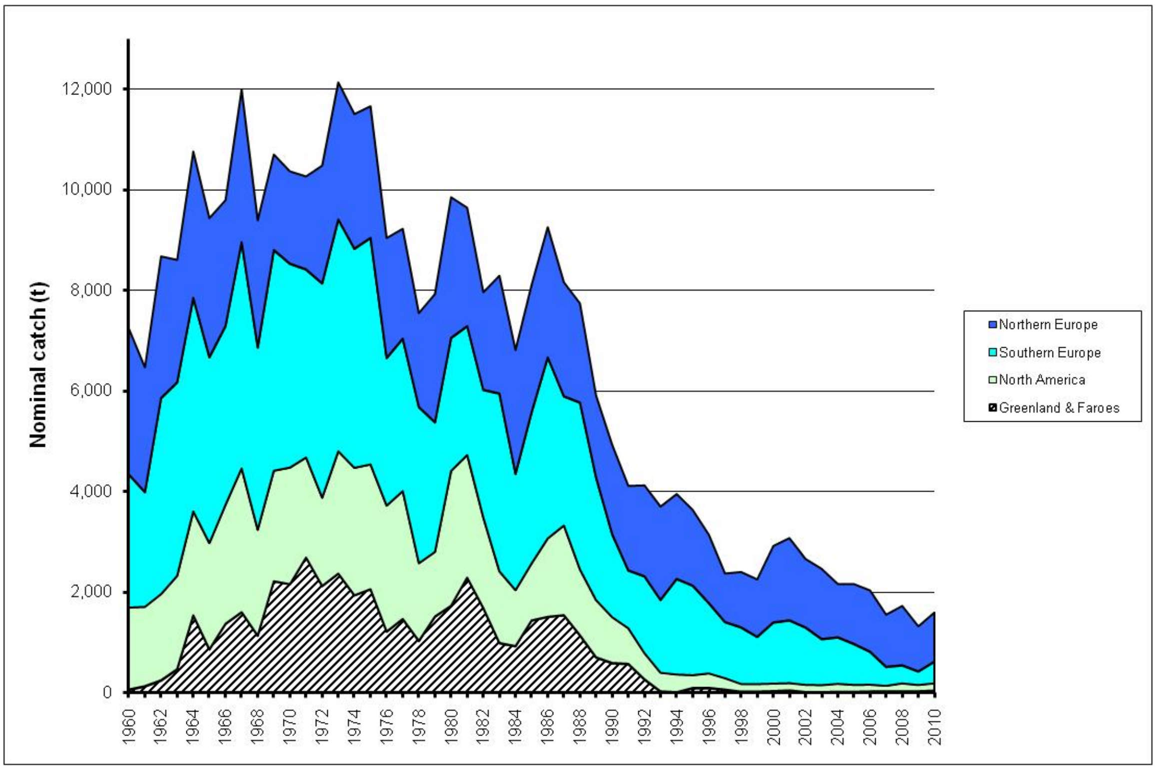

Figure 2.1.1.1. Reported total nominal catch of salmon (tonnes round fresh weight) in four North Atlantic regions, 1960–2010.

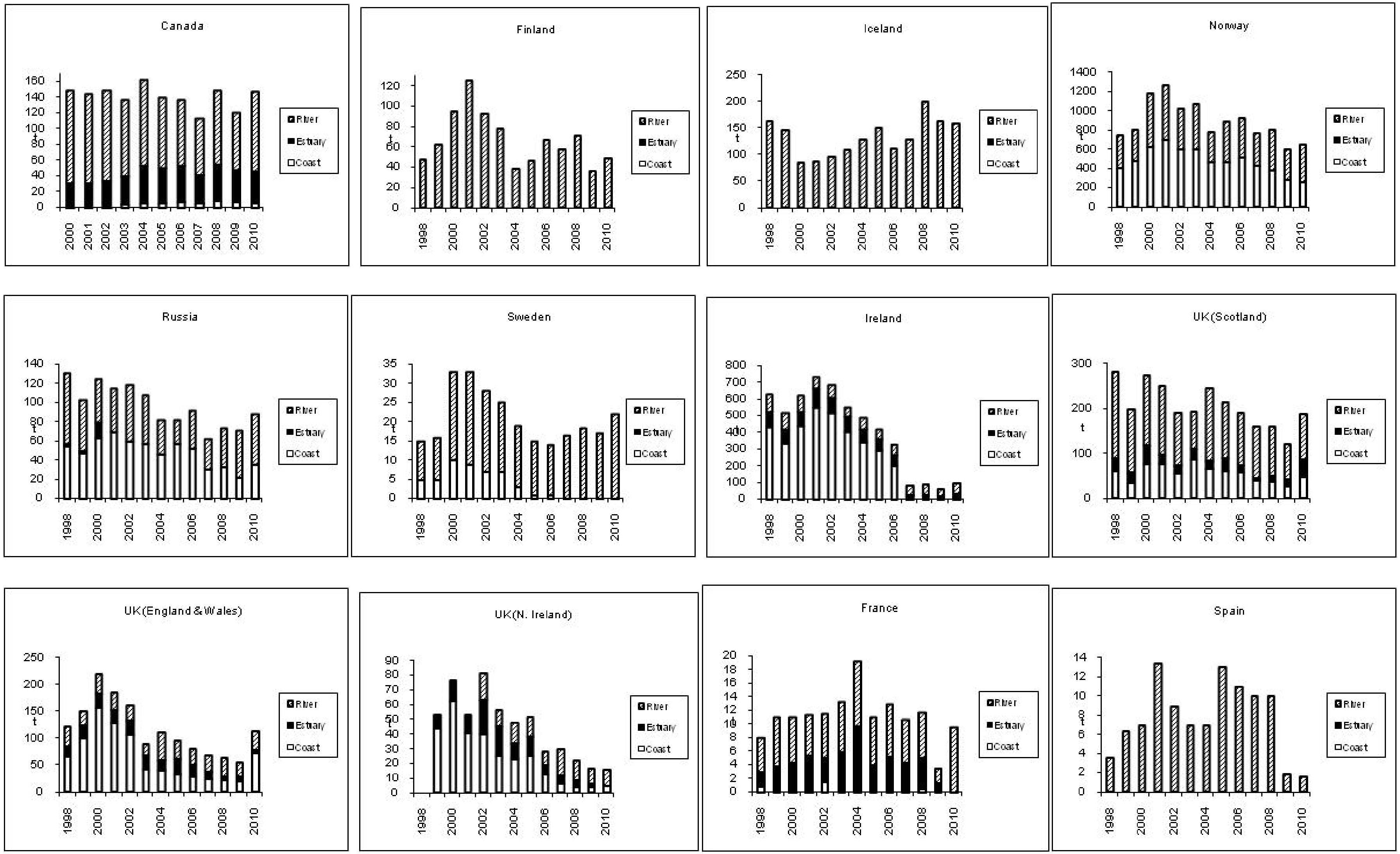

Figure 2.1.1.2. Nominal catch (tonnes) taken in coastal, estuarine and riverine fisheries by country. The way in which the nominal catch is partitioned among categories varies between countries, particularly for estuarine and coastal fisheries – see text for details. Note also that the time-series and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

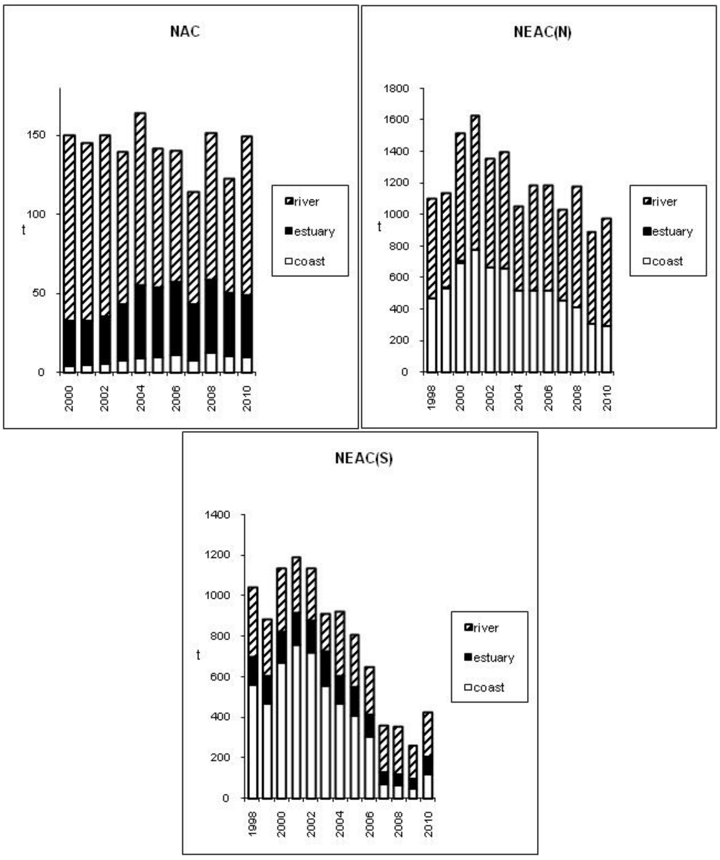

Figure 2.1.1.3. Nominal catch taken in coastal, estuarine and riverine fisheries for the NAC area, and for the NEAC northern and southern areas. The way in which the nominal catch is partitioned among categories varies between countries, particularly for estuarine and coastal fisheries – see text for details. Note also that the time-series and y-axes vary.

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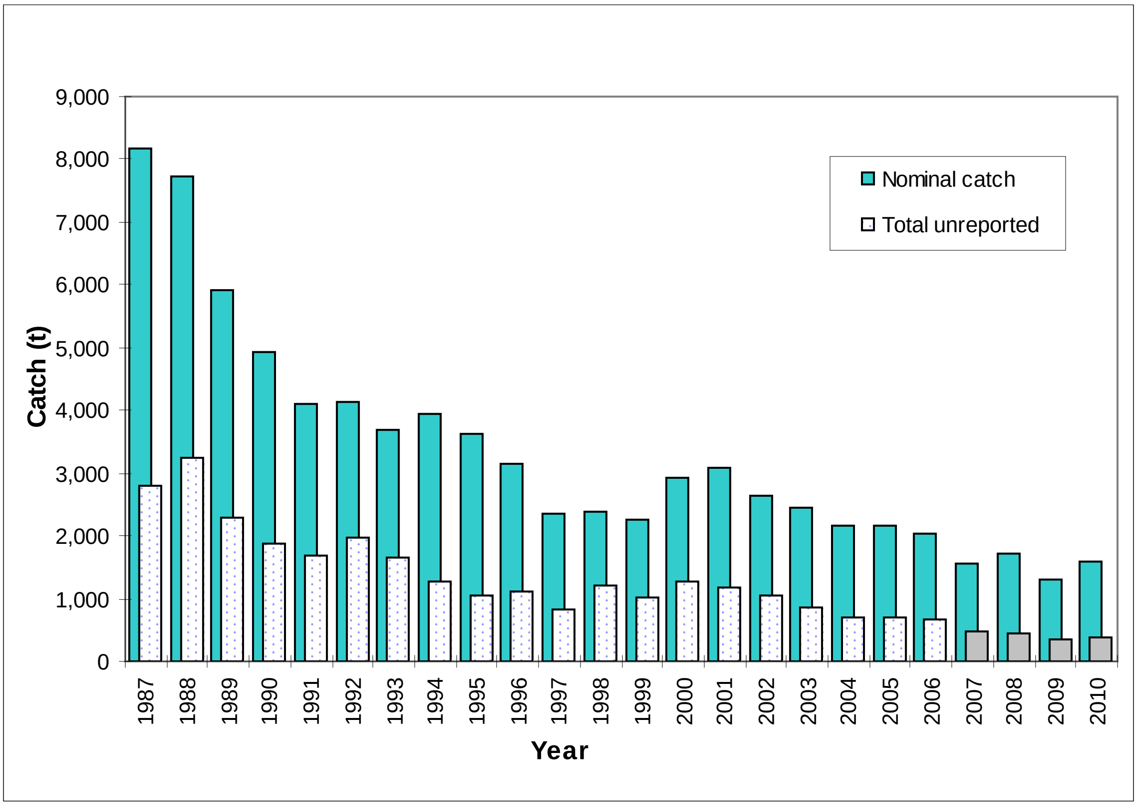


Figure 2.1.3.1. Nominal North Atlantic salmon catch and unreported catch in NASCO areas, 1987–2010. Unreported catch estimates for 2007 to 2010 are incomplete.

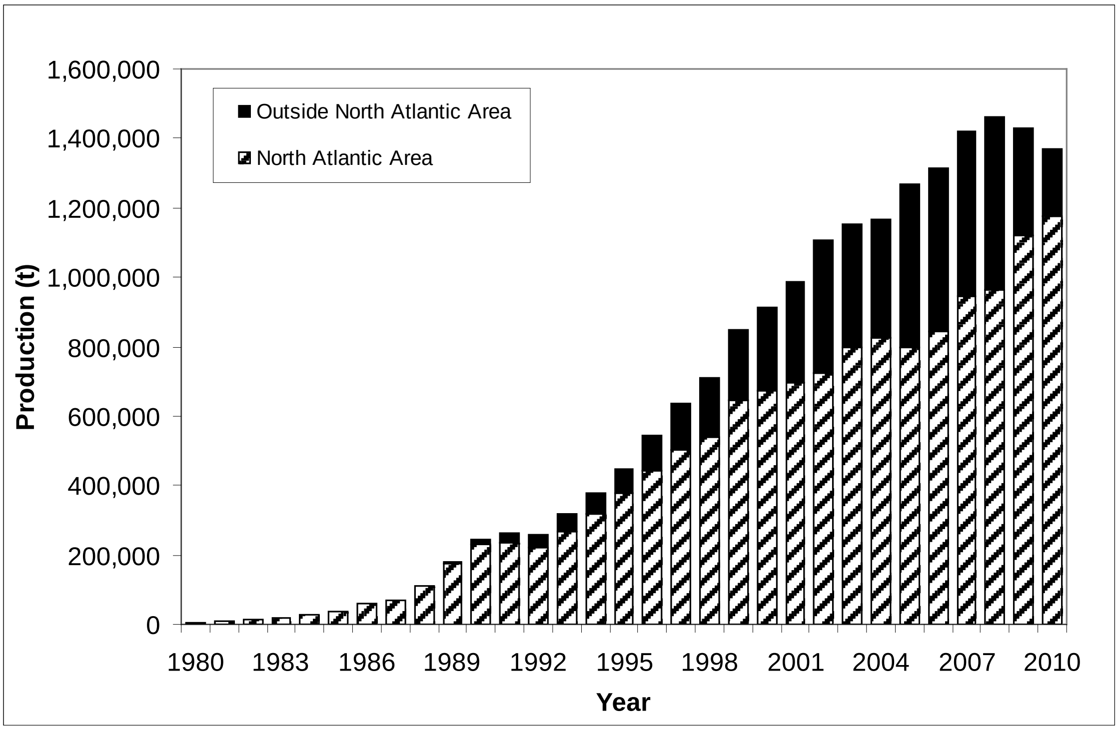


Figure 2.2.1.1. Worldwide production of farmed Atlantic salmon, 1980–2010.

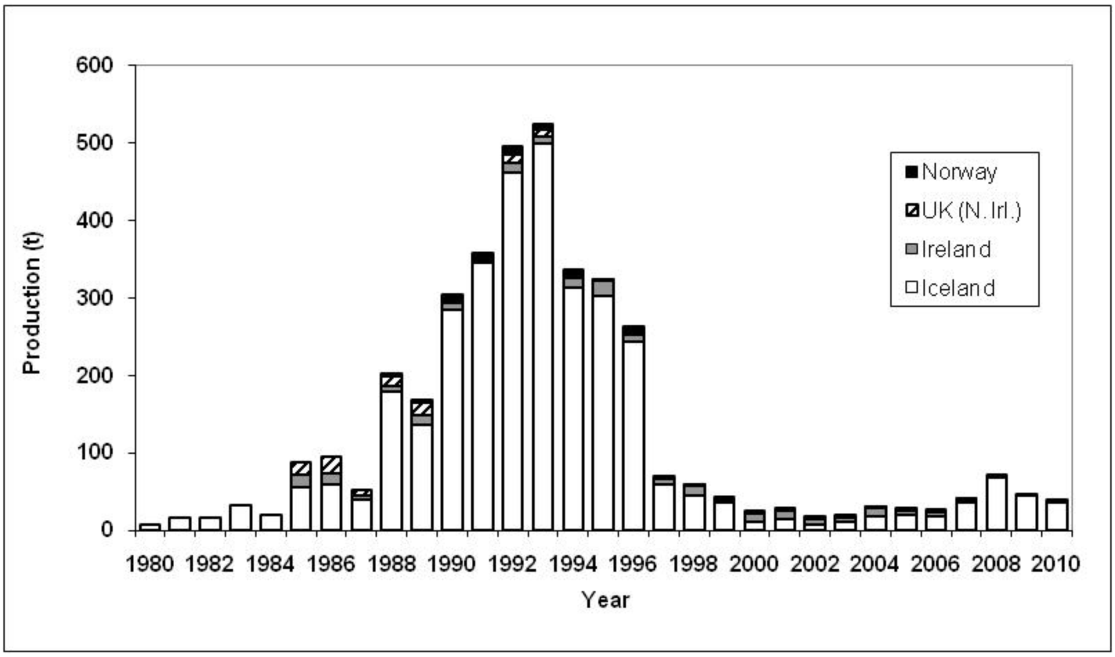
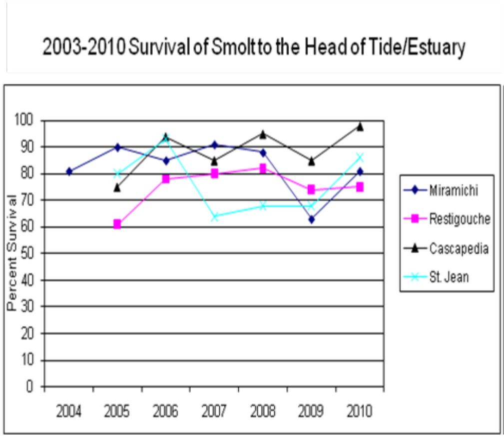
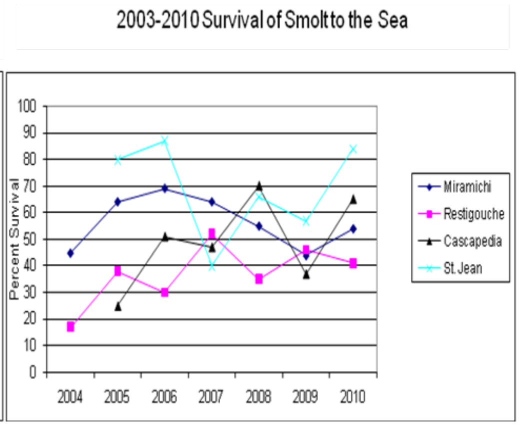


Figure 2.2.2.1. Production of ranched Atlantic salmon (tonnes round fresh weight) in the North Atlantic, 1980–2010.

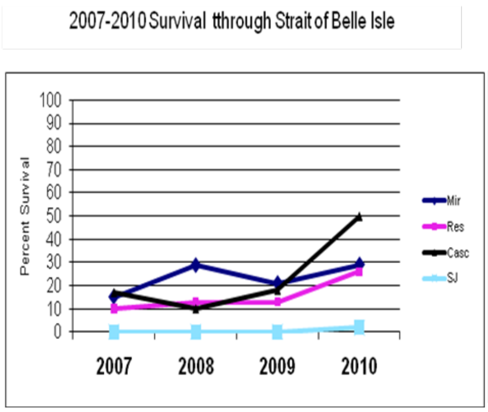
a)



b)



c)



d)

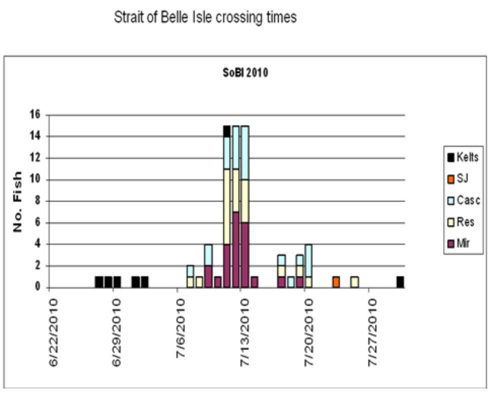


Figure 2.3.4.1. Survivals of smolts from freshwater release points to (a) the head of tide, (b) from the head of tide to estuary exits and (c) to the Strait of Belle Isle; and the dates at which kelts and smolts passed the Strait of Belle Isle (d).

3 Northeast Atlantic Commission

3.1 Status of stocks/exploitation

The current status of stocks is considered with respect to the following guidance from ICES.

The conservation limits (CLs) have been defined by ICES as the level of stock that will achieve long-term average maximum sustainable yield (MSY). NASCO has adopted this definition of CLs (NASCO, 1998). The CL is a limit reference point; having populations fall below these limits should be avoided with high probability. Homewater stocks in the NEAC area have been interpreted to be at full reproductive capacity only if the lower bound of the 95% confidence interval of the most recent spawner estimate is above the CL. In a similar manner, the status of stocks prior to the commencement of distant water fisheries has been interpreted to be at full reproductive capacity only if the lower bound of the 95% confidence interval of the most recent pre fishery abundance (PFA) estimate is above the Spawner Escapement Reserve (SER).

National outputs of the NEAC PFA model are currently combined in the following groups to provide NASCO with catch advice or alternative management advice for the distant water fisheries at West Greenland and Faroes.

Southern NEAC countries:	Northern NEAC countries:
Ireland	Finland
France	Norway
UK (England & Wales)	Russia
UK (Northern Ireland)	Sweden
UK (Scotland)	Iceland (north/east regions)1
Iceland (south/west regions)[1]	

Justification for these groupings is provided in Section 3.5.1.

The status of these stock complexes, based on the NEAC run reconstruction model 1971 to 2010, prior to the commencement of distant water fisheries with respect to the SER requirements is:

- Northern NEAC 1SW stock complex is considered to be at full reproductive capacity.
- Northern NEAC MSW stock complex is considered to be at full reproductive capacity.
- Southern NEAC 1SW stock complex is considered to be at full reproductive capacity.
- Southern NEAC MSW stock complex is considered to be at full reproductive capacity.

The status of stocks is shown in Figure 3.1.1.

[1] The Iceland stock complex was split into two separate complexes for stock assessment purposes in 2005. Prior to 2005, all regions of Iceland were considered to contribute to the Northern NEAC stock complex.

Estimated exploitation rates have generally been decreasing over the time period for both 1SW and MSW stocks in Northern and Southern NEAC areas (Figures 3.8.14.1 and 3.8.14.2). Exploitation on Northern 1SW stocks is higher than on Southern 1SW and considerably higher for MSW stocks. The current estimates for both stock complexes are among the lowest in the time-series.

3.2 Management objectives

Management objectives are outlined in Section 1.4.

3.3 Reference points

Section 1.5 describes the derivation of reference points for these stocks and stock complexes.

3.3.1 Description of the national conservation limits model

River-specific CLs have been developed for salmon stocks in some countries in the NEAC area. 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 establishing pseudo-stock–recruitment relationships for national salmon stocks in the NEAC area (Potter *et al.*, 2004).

As described in 2002 (ICES 2002), the model provides a means for relating estimates of the numbers of recruits and spawners derived from the PFA model. This is achieved by converting the numbers of 1SW and MSW spawners into numbers of eggs deposited, using the proportion of female fish in each age class and the average number of eggs produced per female. The egg deposition in year 'n' is assumed to contribute to the recruitment in years "n+3" to "n+8" in proportion to the numbers of smolts produced of ages 1 to 6 years. These proportions are then used to estimate the 'lagged egg deposition' contributing to the recruitment of maturing and non-maturing 1SW fish in the appropriate years. The plots of lagged eggs (stock) against the 1SW adults in the sea (recruits) have been presented as 'pseudo-stock–recruitment' relationships for each homewater country except for countries with river-specific CLs.

ICES currently define the CL for salmon as the stock size that will result in the maximum sustainable yield (MSY) in the long term. However, it is not straightforward to estimate this point on the national stock–recruitment relationships because the replacement line (i.e. the line on which 'stock' equals 'recruits') is not known for the pseudo-stock–recruitment relationships established by the national model. This is because the stock is expressed as eggs, while the recruits are expressed as adult salmon. In 2001 the Working Group adopted a method for setting biological reference points from the national pseudo-stock–recruitment datasets (ICES 2001). This model assumes that there is a critical spawning stock level below which recruitment decreases linearly towards zero, and above which recruitment is constant. The position of the critical stock level is determined by searching for the value that minimizes the residual sum of squares. This point is a proxy for S_{lim} and is therefore defined as the CL for salmon stocks. This approach was again applied to the 2010 national stock–recruitment relationship assessment for countries where no river-specific CLs have been determined.

3.3.2 National conservation limits

The national CL model has been run for all countries (see Section 3.8.11) and the CLs derived in this way are used for countries where the development of river-specific CLs has not been completed. Where river-specific estimates have been derived (i.e. France, Ireland, UK (England and Wales) and Norway) they are used to provide national estimates (Table 3.3.2.1). The Working Group has previously noted that outputs from the national model are only designed to provide a provisional guide to the status of stocks in the NEAC area. The estimated national CLs have been summed for Northern and Southern Europe and are given in Figure 3.1.1 for comparison with the estimated spawning escapement. The CLs have been calculated as:

- Northern NEAC 1SW spawners: 207 231
- Northern NEAC MSW spawners: 131 456
- Southern NEAC 1SW spawners: 624 504
- Southern NEAC MSW spawners: 258 720

The CLs have also been used to estimate the SERs (i.e. the CL increased to take account of natural mortality between the recruitment date (1st January) and return to homewaters) for maturing and non-maturing 1SW salmon from the Northern NEAC and Southern NEAC stock complexes. The SERs are shown in Figure 3.1.1 and Table 3.3.2.1. The Working Group also considers the current 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.

3.3.3 Progress with setting river-specific conservation limits

In Norway, CLs have been developed for 439 rivers since 2007. The CLs are based on stock–recruitment relationships in nine rivers. In 2010 attainment of CLs was evaluated for 211 Norwegian rivers based on data from 1993 to 2009, but advice on exploitation was not given in 2010. Work is now in progress to provide management advice for 211 rivers based on data from 1993–2010.

In Iceland, progress has been made in setting conservation limits for salmon rivers. Information on the production demonstrates a wide range in salmon catch from 2.1 to 57.7 adult fish per ha wetted area. This wide production range reveals that there will be large differences in the spawning requirements among rivers. There are only few rivers with available measurements of wetted area but an effort will be made to increase that number in the coming years. 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 characteristics. It is, however, noted that this might take a few years (5-10) before being fully adopted. The salmon run and catch has been high in most Icelandic rivers for the past few years and many rivers have demonstrated record high catches. This good situation and the economic recession have slowed the need and progress of setting river based conservation limits for Icelandic salmon rivers although the work continues.

In UK (Northern Ireland) conservation limits have been determined for a number of important salmon rivers in the Department of Culture Arts and Leisure (DCAL) area, through the transport of optimal productivity metrics determined from the River Bush stock recruitment study to measured habitat parameters for the other rivers. Habitat surveys were initiated on the Upper Bann and Moyola rivers in 2010 to facilitate the derivation of CLs for both these catchments. The Loughs Agency has established conservation limits and compliance monitoring for the two main rivers (Foyle and Roe) out of the total of five rivers in their jurisdiction.

3.4 Management advice

The Working Group considers that the following quantitative catch advice, based upon the PFA forecasts and estimated SERs shown in Figures 3.6.2.4 and 3.6.2.5, is appropriate to management advice at the stock complex level. Management at finer scales should take account of individual river stock status. Based on recent work on resolving the most appropriate stock groupings for management advice for the distant water fisheries (ICES, 2002; 2005) the Working Group agreed that:

- Advice for the Faroes fishery should be based upon all NEAC stocks.
- Advice for the West Greenland fishery should be based upon Southern NEAC non-maturing 1SW salmon stocks.

3.4.1 Northern NEAC maturing 1SW stock

- The Bayesian forecast model shows that the lower bounds of the forecasted PFA for 2011 to 2014 are below SER indicating that the stock is at risk of suffering reduced reproductive capacity prior to the commencement of distant water fisheries (Figure 3.6.2.5).
- In the absence of specific management objectives for this stock complex the precautionary approach is to fish only on maturing 1SW salmon from rivers where stocks have been revealed to be at full reproductive capacity. Furthermore, due to the different status of individual stocks within the stock complex, mixed-stock fisheries present particular threats to stock status.

3.4.2 Northern NEAC non-maturing 1SW stock

- The Bayesian forecast model shows that the medians and lower bounds of the forecasted PFA for 2011 and 2012 are above SER indicating that the stock is at full reproductive capacity prior to the commencement of distant water fisheries. For 2013 and 2014, the lower bounds of the forecasted PFA are below SER indicating that the stock is at risk of suffering reduced reproductive capacity prior to the commencement of distant water fisheries (Figure 3.6.2.5).
- In the absence of specific management objectives for this stock complex the precautionary approach is to fish only on non-maturing 1SW salmon from rivers where stocks have been revealed to be at full reproductive capacity. Furthermore, due to the different status of individual stocks within the stock complex, mixed-stock fisheries present particular threats to stock status.

3.4.3 Southern NEAC maturing 1SW stocks

- The Bayesian forecast model shows that the lower bounds of the forecasted PFA for 2011 to 2014 are below SER indicating that the stock is at risk of suffering reduced reproductive capacity prior to the commencement of distant water fisheries (Figure 3.6.2.4).
- In the absence of specific management objectives for this stock complex the precautionary approach is to fish only on maturing 1SW salmon from riv-

ers where stocks have been revealed to be at full reproductive capacity. Furthermore, due to the different status of individual stocks within the stock complex, mixed-stock fisheries present particular threats to stock status.

3.4.4 Southern NEAC non-maturing 1SW stocks

- The Bayesian forecast model shows that the lower bounds of the forecasted PFA for 2010 to 2014 are below SER indicating that the stock is at risk of suffering reduced reproductive capacity prior to the commencement of distant water fisheries (Figure 3.6.2.4). There are no catch options at West Greenland that would allow the management objectives to be met for this stock complex.
- In the absence of specific management objectives for this stock complex, with the exception of the West Greenland fishery, the precautionary approach is to fish only on non-maturing 1SW salmon from rivers where stocks have been revealed to be at full reproductive capacity. Furthermore, due to the different status of individual stocks within the stock complex, mixed-stock fisheries present particular threats to stock status.

3.5 Relevant factors to be considered in management

The management of a fishery should ideally be based upon the status of all 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 have been revealed to be at full reproductive capacity. Fisheries in estuaries and especially rivers are more likely to meet this requirement.

The Working Group also emphasized that the national stock CLs are not appropriate to the management of homewater fisheries. This is because of the relative imprecision of the national CLs which do not take account of differences in the status of different river stocks or sub-river populations, and because of the capacity of homewater fisheries to target specific 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.

As noted in previous years, the inclusion of farmed fish in the Norwegian catches could result in the stock status being overestimated (Potter and Hansen, 2001).

3.5.1 Grouping of national stocks

National stocks are combined into Southern NEAC and Northern NEAC groups (see Section 3.1) to provide NASCO with management advice for the distant water fisheries at West Greenland and Faroes.

The groups were deemed appropriate by the Working Group as they fulfilled an agreed set of criteria for defining stock groups for the provision of management advice that were considered in detail at the 2002 meeting (ICES, 2002) and re-evaluated at the 2005 meeting (ICES, 2005). Consideration of the level of exploitation of national stocks at both the distant water fisheries resulted in the proposal that advice for the Faroes fishery (both 1SW and MSW) should be based upon all NEAC area stocks, but that advice for the West Greenland fishery should be based upon Southern NEAC non-maturing 1SW stock only.

3.6 Pre-fishery abundance forecasts

The Working Group previously used a regression model to forecast PFA of non-maturing (potential MSW) salmon from the Southern NEAC stock group (ICES, 2002; 2003; 2009a). In 2009 this was superseded by a new forecast model developed in a Bayesian framework which produced forecasts for all four NEAC stock complexes. This model was used to produce forecasts in 2009 and 2010. In 2011 a revised version, including minor developments in the way in which PFA maturing and PFA non-maturing were calculated was used. The updated model was run in parallel with the previous model and forecasts were found to be comparable. Developments in the model are detailed in Section 3.7.2.

3.6.1 Description of the forecast model

In 2011 the Working Group ran forecast models for the Southern NEAC and Northern NEAC complexes. The model was run for each stock complex independently.

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 forecast one year at a time (a_{t+1}) in an auto correlated random walk, using the previous year's value (*a*) as the mean value in a normal distribution, with a common standard deviation of the time-series of *a*.

$$a_{t+1} = N(a_t, tau.a)$$

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

$$logit.p.PFAm_{t+1} \sim N(logit.p.PFAm_t, tau.logit.p.PFAm)$$
$$logit.p.PFAmt = logit\ (p.PFAmt)$$

Uncertainties in the lagged eggs were accounted for by assuming that the lagged eggs of 1SW and MSW fish were normally distributed with means and standard deviations derived from the Monte-Carlo run reconstruction at the scale of the stock complex. In the 2009 and 2010 assessments the reported uncertainties in the maturing and non-maturing PFA returns were those derived from the Monte-Carlo run reconstruction for years prior to 2010 and 2009 respectively. The uncertainties in these variables in the 2011 assessment 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) were introduced as co-variates and incorporated directly within the inference and forecast structure of the model. For Southern NEAC, the data were available for a 33-year time-series of lagged eggs and returns (1978 to 2010). For Northern NEAC, data were available for a 20-year time-series, 1991 to 2010. 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 2010 to 2014. Risks were defined each year as the posterior probability that the PFA would be below the age and stock complex specific SER levels. For illustrative purposes, risk analyses were derived based on the probability that the PFA abundance would be greater than or equal to the SER under the scenario of no exploitation.

3.6.2 Results of the NEAC Bayesian forecast models

The trends in the posterior estimates of PFA for both the Southern NEAC and Northern NEAC complexes closely match the PFA estimates derived from the run reconstruction model (Section 3.8.12).

For the Southern NEAC stock complex, the productivity parameters for the maturing and non-maturing components peaked in 1985 and 1986, and reached the lowest values in 1997 and 1999 (Figure 3.6.2.1). There was a sharp drop in the productivity parameter during 1989 to 1991 and the median values post-1991 are all lower than during the previous time period.

Over the entire time-series, the maturing proportions averaged about 0.6 with the smallest proportion in 1980 and the largest proportion in 1998 (Figure 3.6.2.2). There is an increasing trend in the proportion maturing (8 of 13 values below the average during 1978 to 1990 compared with 4 of 17 values between 1991 and 2007). The total PFA (maturing and non-maturing 1SW salmon at January 1st of the first winter at sea) for the Southern NEAC complex ranged from 3 to 4 million fish between 1978 and 1989, declined rapidly to just over 2 million fish in 1990, and fell to its lowest level of just over 1.5 million fish in 2008 (Figure 3.6.2.4).

For the Northern NEAC complex, peak PFA abundance was estimated at about 2 million fish in year 2000 with the lowest value of the series in 2008 at over 1 million fish (Figure 3.6.2.5). The proportion maturing has varied around 0.55 over the time-series but in 2007 there was an abrupt drop in the proportion maturing to below 0.37. This revealed some recovery in 2008 to around 0.43 however in 2009 was consistent with the previous two years, around 0.38, notably below the 1991 to 2006 level (Figure 3.6.2.2).

The productivity increased in 2009 in the Northern NEAC complex, though remained below pre-2004 values, while in the Southern complex 2009 was comparable with 2008 and continued the slow decline from 2003, though in the same range as post-1989 values (Figure 3.6.2.1).

Forecasts from these models into 2010 to 2014 for the non-maturing and maturing age group were developed within the Bayesian model framework. Variations in the median abundance over the forecasts are related to variations in lagged eggs (Figure 3.6.2.3) as the productivity parameter values are set at the level of the last year with available data (Figures 3.6.2.1). The variability in the productivity parameters increased sequentially over the forecasts.

For the Southern NEAC stock complex, the 25th percentiles of the posterior distributions of the forecasts are below the SER for the maturing age component, with the median points just above for years 2009 to 2014, with 2011 to 2014 being forecasts (Figures 3.6.2.4). For the non-maturing component the 25th percentile is just above the SER for the first forecast year (2010) and falls below it by the fifth forecast year (2014).

The abundances of the Northern NEAC age components have declined over the 1991 to 2009 time period (Figure 3.6.2.5). For the maturing component the lower limit of the confidence interval has fallen below the age-specific SERs for 2010 to 2014 and the 25 percentile has just remained above. For the non-maturing component of the stock, forecasts are generally above the SER but with the lower limit of the confidence interval of forecast abundances falling below the SER in 2013 and 2014.

3.6.3 Probability of attaining PFA above SER

Probabilities that the PFAs will be above or equal to SERs in 2010 to 2014 from the Bayesian model are given in the table below. Probabilities of meeting SERs are higher in the Northern complex than in the Southern complex.

Probability that PFAs will be greater than or equal to the complex and age specific SERs

Southern NEAC		Maturing	Non-maturing
	SER	793 900	437 525
Year		p	p
2010		0.508	0.810
2011		0.562	0.782
2012		0.543	0.734
2013		0.512	0.688
2014		0.589	0.732
Northern NEAC		Maturing	Non-maturing
	SER	261 359	222 225
Year		p	p
2010		0.862	0.999
2011		0.800	0.994
2012		0.761	0.982
2013		0.765	0.974
2014		0.760	0.965

3.6.4 Use of the NEAC Bayesian forecast models in catch advice

In the absence of specific management objectives for the Faroes fishery, ICES requires that the lower bound of the 95% confidence interval of the PFA estimate be above the SER for the stock to be considered at full reproductive capacity. The Working Group noted that for both the Northern NEAC and Southern NEAC stock complexes the Bayesian models predict that the lower limit of the 95% confidence interval as being below the SER for both age groups in all years, except for the non-maturing component in 2010 to 2012 in the Northern NEAC complex.

It is also noteworthy that for the Southern NEAC maturing complex the 25th percentiles, in all instances, fall below the respective SER and the medians are just above SER. For the non-maturing component, the lower limit of the confidence interval is well below and the 25th percentiles are just below SER for the forecast years 2010 and 2011 and are well below in 2011 to 2014.

For the West Greenland Commission area, the risk level has been set to 75% (ICES 2009a).

3.7 Comparison with previous assessment

3.7.1 Changes to the NEAC PFA model and national conservation limit model

Provisional catch data for 2009 were updated where appropriate and the assessment extended to include data for 2010. In addition,

- The time-series of national exploitation rates for UK (England and Wales) was revised for both 1SW and MSW salmon. These data have been estimated by deriving time-series of 'standard fishing units' employed in the salmon fisheries for the time-series as a whole, weighted by their relative catching power and adjusted relative to average age-specific exploitation estimates derived for the 1997 and 1998 seasons. The 'standard fishing units' for the latter part of the time-series (1998 on) were updated, based on the numbers of days fished by different net categories rather than licence numbers as used previously. Licence numbers continue to be used in respect of the rod fishery. In addition, further efforts have been made to refine the average age-specific exploitation rates applied to the time-series as a whole.
- The number of regions used in respect of the Norway assessment was expanded from three to four by splitting the South region into Southeast and Southwest regions. This was done to better reflect the different stock status in these two regions in the overall assessment and reflects domestic management arrangements.

3.7.2 Changes to the NEAC PFA Bayesian forecast model

Improvements in the stock complex Bayesian PFA forecast models

The Bayesian PFA forecast models were run at the Northern NEAC and Southern NEAC stock complex levels. These runs were made with models containing minor improvements in structure and calculation processes relative to the models used in previous years. Changes were made to the models to improve the calculation run times and incorporate uncertainty around all the variables and parameters from the Run Reconstruction model. The details of model changes and their reasons included:

- The uncertainty in lagged eggs and returns is accounted for through the approximation of normal distributions, using means and standard deviations which are specified in the dataset. As a consequence, the uncertainties around PFAm and PFAnm over past years are modelled and monitored.
- The productivity parameter is forecast in an auto correlated random walk, around a normal distribution. This ensures that forecasts are more congruous with the past values.
- In the previous version two productivity parameters were calculated, for the maturing and non-maturing components of the PFA, each of which were then calculated, and summed to calculate total PFA. In the updated version only one productivity parameter is calculated, and used to calculate total PFA, which is then split into maturing and non-maturing PFA based upon the proportion of maturing PFA.
- The proportion of maturing PFA is forecast in an auto correlated random walk, around a normal distribution, transformed on a logit scale. This ensures that forecast proportions of maturing and non-maturing PFA are more in line with the past values.

To verify that the changes to the models were relatively minor, the versions of the models run in 2009 and 2010 were run in parallel with the revised 2011 recommended version. Differences in results were minimal (Figure 3.7.2.1 to 3.7.2.5).

Comparison of results from the revised 2011 Bayesian forecast model and its predecessor

Only one productivity parameter (*a*) is estimated in the revised model, from which total PFA was estimated from Lagged Eggs. In the earlier version of the model two productivity parameters were calculated, non-maturing (*anm*) and maturing (*am*) (Figure 3.7.2.1). For both the Northern and Southern stock complex models these parameters tracked well over the time period. In the updated model the single productivity parameter is functionally a summation of the two productivity parameters of the previous version but uncorrected for the proportion maturing. The uncertainty is lower because the variance is estimated for only one parameter as opposed to the two (*anm* and *am*) in the previous version.

The consequences of the revised model structure on the estimates of proportion of maturing 1SW is clear (Figure 3.7.2.2) with estimates increasing in uncertainty as forecast year interval increases and due to the inclusion of uncertainty from the inference portion of the model for years prior to 2010. Also notable is the positioning of the forecast series in line with the recent year (2009) estimate.

Estimates of the maturing PFA are consistent with the previous year's forecasts for both models (Figure 3.7.2.3). Uncertainty is greater in the new version, with medians, inter quartile ranges and 2.5th percentiles being slightly lower.

For Northern NEAC, estimates of the non-maturing PFA from the revised model for the five forecast years are more consistent with the earlier time-series than from the previous model version (Figure 3.7.2.4), and consistent for Southern NEAC. Estimates tend to include greater uncertainty the further into the future the forecast is made.

The original and revised models were compared by plotting outputs and respective error values (Figure 3.7.2.5). Higher relative error values for all the variables of interest in the inference portion of the model are due to the inclusion of the uncertainty of the returns estimates in the new version, these uncertainties had not been incorporated in the early version. Inferences on PFA are similar for maturing and non maturing components between the two model versions, as is the inference of the proportion maturing for both stock complexes (medians are all distributed along the 1:1 line) (Figure 3.7.2.5).

The largest differences are in the forecast values for PFA and proportion maturing, and particularly for the Northern NEAC complex (Figure 3.7.2.5). The first order autocorrelation dynamic introduced in the new version of the model shifts the forecast of the proportion maturing to the most recent year value rather than to the mean of the series value as was the case for the first version of the model. The consequences are apparent in the shift of the forecast probability of maturing for the Northern NEAC complex being at about 0.40 which gives a higher forecast for the non-maturing PFA and a slightly lower forecast for the maturing PFA (Figure 3.7.2.5). When the large drop in proportion maturing was noted in the 2007 PFA of the Northern NEAC stock complex, it was thought to be anomalous but over the past three years of inference, the proportion maturing has remained lower than was inferred prior to 2007 (Figure 3.6.2.2).

3.7.3 Performance of the revised 2011 Bayesian forecast model

In 2010, a retrospective comparison of model forecasts was undertaken to investigate the NEAC Bayesian forecast model's ability to predict PFAs for maturing and non-maturing recruits in both Northern and Southern NEAC stock complexes (ICES 2010b). This exercise was repeated in 2011. Run-reconstructed PFAs for 2009 were compared with the model predictions. Data in the forecast model were successively truncated to allow forecasts to be run simulating the viewpoints for the years 2006 to 2010 (Figures 3.7.3.1 and 3.7.3.2). The year 2006 is the earliest for which lagged spawner estimates, derived from the run-reconstruction model, allow prediction of the 2009 PFA values. The 2010 forecast is necessary to predict PFAs for non-maturing stocks in 2009 as the MSW spawners for that cohort do not return until 2010 and abundance estimates are not available until 2011.

In all four stock complexes, the uncertainties associated with the forecasts generally decrease as the interval between reconstructed estimate and forecast year decreases. Median run-reconstructed PFA estimates generally lay within the interquartile range of model forecasts for that PFA cohort.

3.8 NASCO has requested ICES to describe the key events of the 2010 fisheries and the status of the stocks

3.8.1 Fishing at Faroes in 2009/2010

No fishery for salmon has been prosecuted since 2000.

3.8.2 Significant events in NEAC homewater fisheries in 2010

UK (Northern Ireland)

In 2010 exploitation in UK (Northern Ireland) was further reduced by the closure of all net fisheries in the Foyle area.

France

Reliable catch estimates, for both commercial and recreational net fisheries, on the Albâtre coast (northwest France) and Mont St Michel Bay (west France) areas continue to be unavailable. In addition, catches from a new coastal fishery in the southwest of the country, which began in 2009 and expanded in 2010, are also unreported. Catches from these three areas are estimated to be at least 500 fish which represents a fivefold increase in catch in coastal fisheries in 2010 compared with 2009. It was reported to the Working Group that the absence of catch statistics was a result of lack of enforcement of existing regulations.

Ireland

During 2001 to 2009, catch statistics were collected by seven designated Regional Fisheries Boards around the Republic of Ireland. Statistics were collected directly from mandatory logbook reports from the commercial and recreational sectors. In 2010, a new body, Inland Fisheries Ireland, replaced the seven regional fisheries boards and the Central Fisheries Board and is now responsible for the collection of catch statistics.

Norway

Although no further restrictions in coastal fisheries were applied in 2010, the number of licences in use for bag and bendnets in Norway continues to decline. The number of bag nets in use in the 2010 season was 760, compared with 978 the year before, while the number of bendnets in use declined from 631 in 2009 to 493. This decline is most likely due to low recruitment of new fishers as older fishers retire. Also, the reductions in the length of the fishing season in many areas during recent years may have reduced the motivation of fishers in some regions to participate in the fishery. In 2010, a number of rivers in the Rogaland, Hordaland and Nordland counties were closed on the basis of low spawner numbers in 2009.

3.8.3 Gear and effort

No significant changes in gear type used were reported in 2010, however, changes in effort were recorded. The number of gear units licensed or authorized in several of the NEAC area countries provides a partial measure of effort (Table 3.8.3.1), 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.

Trends in effort are shown in Figures 3.8.3.1 and 3.8.3.2 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 numbers of gear units licensed from UK (England and Wales) and reported in UK (Scotland) (Table 3.8.3.1) have decreased and were among the lowest reported in the time-series. In Norway the number of bag nets has decreased for the past 15–20 years and was the lowest reported in the time-series. The number of bendnets has also decreased for the same period and was the lowest in the time period and additional restrictions on the numbers of days fished were introduced from 2008. The number of driftnet, draftnet, bag nets and boxes for UK (Northern Ireland) for 2010 was the lowest reported for the time-series.

Rod effort trends, where available, have varied for different areas across the time-series (Table 3.8.3.1). In the Northern NEAC area the catch and release rod fishery in the Kola Peninsula in Russia has increased from 1711 fishing days in 1991 to 13 604 in 2006 (no data were available for 2007–2010). In Finland the number of fishing days has demonstrated an increase throughout the time period but it was close to the five year average in 2010. In the Southern NEAC area rod licences in 2010 decreased from the previous year in UK (England and Wales). In Ireland there was an apparent increase in the early 1990s in rod fishing licences due to the introduction of one day licences and then remained stable for over a decade, thereafter decreasing from 2002 due to fishery closures. In France the effort has been fairly stable over the last 10 years.

3.8.4 Catches

NEAC area catches are presented in Table 3.8.4.1. The provisional declared catch in the NEAC area in 2010 was 1401 tonnes, the second lowest in the time-series but representing an increase of around 21% on the 2009 catch (1158 t).

The provisional total nominal catch in Northern NEAC for 2010 (973 t) rose by 9% compared with 2009 but was 12% and 22% below the previous 5 and 10 year averages respectively. In the Southern NEAC area the provisional total nominal catch for 2010 (427 t) rose by 62% compared with 2009 (264 t) but was 13% and 46% below the previous 5 and 10 year averages respectively. Despite a noticeable increase in catches in 2010 over 2009 in the Southern NEAC area the catches are still below the long-term means in most countries which reflects significantly reduced fishing effort and possibly reduced stock abundance.

Figure 3.8.4.1 shows the trends in nominal catches of salmon in the Southern and Northern NEAC areas from 1971 until 2010. 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 250–650 t over last 5 years. The catch revealed marked declines in 1976 and in 1989 to 1991. The catch in the Northern area also indicated an overall decline 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 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 although it 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.

3.8.5 Catch per unit of effort (cpue)

The cpue is a measure that can be influenced by various factors, such as fishing conditions/experience. It is assumed that the cpue of net fisheries is a more stable indicator of the general status of salmon stocks than rod cpue; the latter may be more affected by varying local factors, e.g. weather conditions, management measures and angler experience. Both may also be affected by measures taken to reduce fishing effort, for example, changes in regulations affecting gear. If large changes occur for one or more factors a common pattern may not be evident over larger areas. It is, however, expected that for a relatively stable effort, cpue can reflect changes in the status of stocks and stock size. The cpue may be affected by increasing rates of catch and release in rod fisheries which are not included in all recreational rod fisheries.

The cpue data are presented in Tables 3.8.5.1–3.8.5.5. The cpue for rod fisheries have been collected by relating the catch to rod days or angler season, and that of net fisheries was calculated as catch per licence-day, trap month or crew month.

In the Southern NEAC area, cpue has generally decreased in UK (England and Wales) and UK (Scotland) net fisheries (Figure 3.8.5.1). The cpue for net fisheries in 2010 demonstrated mostly higher figures compared with 2009 and the previous 5-year averages (Table 3.8.5.3). In UK (Northern Ireland), the River Bush rod fishery cpue increased in 2010 but was less than the 5-year average (Table 3.8.5.1). In France, the cpue for rod fisheries is higher than both the 2009 figure and the 5-year average (Table 3.8.5.1).

In the Northern NEAC area, there has been an increasing trend in cpue for the Russian rod fisheries in both the Barents and White Sea rivers (Figure 3.8.5.1 and Table 3.8.5.2) and in the Norwegian net fisheries (Figure 3.8.5.1 and Table 3.8.5.5.). A decreasing trend was noted for rod fisheries in Finland (River Teno). Most 2010 cpue values increased compared with both 2009 and the previous 5-year means (Tables 3.8.5.1, 3.8.5.2, and 3.8.5.5).

3.8.6 Age composition of catches

The percentage of 1SW salmon in NEAC catches is presented in Table 3.8.6.1 and in Figures 3.8.6.1 (Northern NEAC) and 3.8.6.2 (Southern NEAC). The overall percentage of 1SW fish in the Northern NEAC area catch remained reasonably consistent in the period 1987 to 2000 (range 61 to 72%), but has fallen in more recent years (range 50 to 69%), when greater variability among countries has also been evident. In 2010, the percentage of 1SW fish in catches remained at the same level for Northern NEAC countries compared with 2009 (61% compared with 59% in 2009) and similar to the previous 5- and 10-year averages. On average, 1SW fish comprise a higher percentage of the catch in Iceland and Russia than in the other Northern NEAC countries (Figure 3.8.6.1). The percentage of 1SW fish in the catches in Iceland has been increasing for a number of years, but the estimate for 2010 is somewhat lower than the three previous years. The percentage of 1SW in Norway, Sweden and Finland has been lowest among the Northern NEAC countries, but has increased in recent years.

In the Southern NEAC area, the overall percentage of 1SW fish in the catch (60%) was equal to the previous 5- and 10-year means (59%) and has remained reasonably consistent over the time-series (range 49 to 65%), although there is considerable variability among individual countries (Figure 3.8.6.2). On average, 1SW fish comprise a larger proportion of the catch (70 to 80%) in UK (England and Wales) than in the other Southern NEAC countries that provide data.

3.8.7 Farmed and ranched salmon in catches

The contribution of farmed and ranched salmon to national catches in the NEAC area in 2010 was again generally low in most countries, with the exceptions of Norway, Iceland and Sweden, and is similar to the values that have been reported in previous years (ICES 2009a). The occurrence of such fish is usually ignored in assessments of the status of national stocks (Section 3.8.11).

However, in Norway farmed salmon continue to form a large proportion of the catch in those fisheries which have been sampled (29% in coastal fisheries, 36% in fjordic fisheries in 2009 and 8% in rod fisheries in 2010). The number of coastal and fjordic fisheries sampled was lower in 2009 than in previous years and incidence of farmed fish in these fisheries is thought to be an overestimate of the overall picture for 2009, and in 2010 the number of marine fisheries sampled was too low to provide an estimate. The number of farmed salmon that escaped from the Norwegian farms in 2010 is reported to be 255 000 fish (provisional figure). An assessment of the likely effect of these fish on the output data from the PFA model has been reported previously (ICES 2001).

The release of smolts for commercial ranching purposes ceased in Iceland in 1998, but ranching for rod fisheries in two Icelandic rivers continued into 2010. Icelandic catches have traditionally been split into two separate categories, wild and ranched, and in 2010, 36 t were reported as ranched salmon in contrast to 124 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. In 2010, in Ireland less than 1t was reported as ranched salmon and this has been included in the nominal catch.

3.8.8 National origin of catches

Catches of Russian salmon in Norway

Evidence of Russian origin salmon being caught in coastal mixed-stock fisheries in northernmost Norway have been reported in previous years (e.g. ICES 2009a). Norway has recently decreased fishing effort in coastal areas and available information reveals a decline in the number of fishing days and in the number of fishers operating in marine waters of Finnmark county. However, there are still salmon fisheries operating in this coastal area, which are very likely to exploit Russian salmon.

In 2009, a joint Russian and Norwegian project began, the aims of which included establishing a genetic baseline for characterization of salmon populations, which could be used for estimating the composition of mixed-stock fisheries in the area (see Section 2.3.8). Preliminary investigation of the composition of the mixed-stock fisheries indicate that the catches consist of a mix of salmon from a number of rivers in both countries, with the Russian component in Finnmark increasing from west to east. Also, the results demonstrate that bag nets located near the coast catch fish from a larger number of stocks than bag nets located in the fjords. This work will continue under the Joint Russian-Norwegian Scientific Research Program on Living Marine Resources in 2011 (Appendix 10 of the 39th Joint Russian-Norwegian Fishery Commission) and under the Kolarctic Salmon project (EU Kolarctic ENPI CBC programme) (see Section 2.3.8).

3.8.9 Developments to the NEAC-PFA and CL model

The Working Group has previously developed a model to estimate the pre-fishery abundance (PFA) of salmon from countries in the NEAC area. PFA in the NEAC area is defined as the number of 1SW recruits on January 1st in the first sea winter. The model estimates the PFA from the catch in numbers of 1SW and MSW salmon in each country. These are raised to take account of minimum and maximum estimates of non-reported catches and exploitation rates of these two sea-age groups. Finally these values are raised to take account of the natural mortality between January 1st in the first sea winter and the mid-point of the respective national fisheries. As reported in 2002 (ICES 2002), the Working Group has determined a natural mortality value of 0.03 (range 0.02 to 0.04) per month to be appropriate. A Monte Carlo simulation (10 000 trials) using 'Crystal Ball v7.2.1' in Excel (Decisioneering, 1996) is used to estimate confidence limits on the PFA values. Potter *et al.*, 2004 provide full details of the model. Further modifications, to improve the model were incorporated during the Working Group meeting in 2005 (ICES 2005).

The Working Group has developed an updated version of the model which runs in the 'R' software. The objective is to provide a more flexible platform for the further development of the model and to allow its integration with the Bayesian forecast model for the development of catch options. The new code has been run in parallel with the Excel/Crystal Ball model to validate the outputs, prior to making additional changes (ICES 2010b).

The transfer of the model to the R software has provided the opportunity to review the current model and consider changes. In addition to the minor corrections described in Section 3.7.1, various issues have been noted where the model (whether in Crystal Ball or R) might be improved and the outputs (figures and tables) modified in line with the provision of catch options.

3.8.10 National input to the NEAC-PFA model

To run the NEAC PFA model, most countries are required to input the following time-series information (beginning in 1971) for 1SW and MSW salmon:

- Catch in numbers,
- Unreported catch levels (min and max), and
- Exploitation levels (min and max).

The model input data are provided in Annex 5. For some countries, the data are provided in two or more regional blocks. In these instances, the model output is combined to provide one set of output variables per country. The model input data for Finland consists solely of catches from the River Tana/Teno. These comprise both Finnish and Norwegian net and rod catches. The Norwegian catches from the River Tana/Teno are not included in the Norway data. The model input data for UK (England and Wales) exclude the estimated catches of Scottish fish in the NE English coastal fishery; these are incorporated into the assessment for UK (Scotland).

Descriptions of how the model inputs have been derived were presented in detail at the Working Group meeting in 2002 (ICES 2002). Modifications are reported in the year in which they are first implemented and significant modifications undertaken in 2010 are indicated in Section 3.7.1.

3.8.11 Description of national stocks as derived from the PFA model

The Working Group has previously noted that the NEAC PFA model provides our best interpretation of available information on national salmon stocks. However, there remains considerable uncertainty around the derived estimates, and national representatives are continuing to improve the data inputs each year on the basis of new data, improved sampling and further analysis.

The National CLs model has been designed as a means to provide a preliminary CL reference point for countries where river-specific reference points have not been developed. A limitation with a single national status of stocks analysis is that it does not capture variations in status in different fishery areas or stock complexes. This has been addressed, at least in part, by the area splits in some countries.

The model output for each country has been displayed as a summary sheet (Figures 3.8.11.1(a–j)) comprising the following:

- Estimated pre-fishery abundance (PFA) and SERs of maturing 1SW and non-maturing 1SW salmon.
- Estimated total returns and spawners (95% confidence limits) and CLs for 1SW and MSW salmon.
- Total exploitation rate of 1SW and MSW salmon estimated from the total returns and total catches derived from the model.
- Estimated total catch (including non-reported) of 1SW and MSW salmon.
- National pseudo stock–recruitment relationship (PFA against lagged egg deposition), with CL fitted by the method presented in ICES (2001) for those countries where CLs are not estimated using river-specific CLs.

3.8.12 Trends in the PFA for NEAC stocks

Tables 3.8.12.1–3.8.12.6 demonstrate combined results from the PFA assessment for 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 groups are shown in Figure 3.1.1.

The 95% confidence limits of the estimates (Figure 3.1.1) indicate the uncertainty in this assessment procedure. The Working Group recognized that the model provides an index of the current and historical status of stocks based upon simple catch and fisheries parameters (i.e. catch and exploitation rate). Errors or inconsistencies in the output largely reflect uncertainties in our best estimates of these parameters.

Recruitment patterns of maturing 1SW salmon and of non-maturing 1SW recruits for Northern NEAC (Figure 3.1.1) demonstrate broadly similar patterns. The general decline over the time period is interrupted by a short period of increased recruitment from 1998 to 2003. Both stock complexes have been at full reproductive capacity prior to the commencement of distant water fisheries throughout the time-series.

Trends in spawner numbers for the Northern stock complexes for both 1SW and MSW are similar. Throughout most of the time-series, both 1SW and MSW spawners have been either at full reproductive capacity or at risk of reduced reproductive capacity. In 2010, both the 1SW and 2SW spawner estimates indicated that the stock complex was at full reproductive capacity.

Recruitment patterns of maturing 1SW salmon and of non-maturing 1SW recruits for Southern NEAC (Figure 3.1.1) demonstrate broadly similar declining trends over the time period. The maturing 1SW stock complex has been at full reproductive capacity over most of the time period with the exception of 2009, when it was at risk of suffering reduced reproductive capacity prior to the commencement of distant water fisheries. The non-maturing 1SW stock has been at full reproductive capacity over most of the time period but has been at risk of suffering reduced reproductive capacity before any fisheries took place in two (2006 and 2008) of the last four PFA years.

Declining trends in spawner numbers are evident in the Southern NEAC stock complexes for both 1SW and MSW. The 1SW stock has been at risk of reduced reproductive capacity or suffering reduced reproductive capacity for most of the time-series. In contrast, the MSW stock has been at full reproductive capacity for most of the time-series until 1997. Thereafter the stock was either at risk of reduced reproductive capacity or suffering reduced reproductive capacity with the exception of 2004 and 2010 when the stock was at full reproductive capacity.

The trends in recruitment described above are broadly consistent with the general pattern of decline in marine survival of 1SW and 2SW returns in most monitored stocks in the area (Section 3.8.13).

3.8.13 Survival indices 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 Figure 3.8.13.1. The survival indices are the percent change in return rate between five year averages for the periods 2000 to 2004 and 2005 to 2009 for 1SW salmon, and 1999 to 2003 and 2004 to 2008 for 2SW salmon. The annual survival indices for different rivers and experimental facilities are presented in Tables 3.8.13.1 and 3.8.13.2. Return rates of hatchery released fish, however, may not always be a reliable indicator of marine survival of wild fish.

The overall trend for hatchery smolts in Northern and Southern NEAC areas is indicative of a decline in marine survival. For the wild smolts this decline is also apparent for the Northern NEAC areas; however for the Southern NEAC areas data are more variable with some rivers revealing an increase in survival whilst other rivers reveal a decrease. The percentage change between the means of the five year periods varied from a 97% decline to a 226% increase in one river (Figure 3.8.13.1). 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. Most of the survival indices for wild and reared smolts were below the previous 5 and 10-year averages (Tables 3.8.13.1 and 3.8.13.2). The return of wild 1SW salmon to Ellidaar River in Iceland was higher than both the 5-year and 10-year averages, though slightly lower than the return in 2008. Also the returns of both 1SW and 2SW wild salmon to North Esk were above the 5-year and 10-year averages. An increase in survival (226%) was also detected in Iceland for hatchery reared grilse on the Ranga River (Table 3.8.13.2).

Comparison of survival indices for the 2008 and 2009 smolt years demonstrate a general increase for 2009 compared with 2008 for wild smolts in Northern and Southern NEAC areas, with the exception of the rivers Ellidaar and Vesturdalsa in Iceland. Return rates of wild smolts to the river Bresle of 1SW fish were exceptionally high in 2010 (Table 3.8.13.1). In the Irish river Corrib survival indices were unchanged. Survival indices for hatchery smolts in the Northern NEAC area for the 2009 smolt year demonstrated a decrease relative to 2008. In the Southern NEAC area survival indices for hatchery smolts increased in the same period, except for the Irish rivers Lee and Shannon, for which the survival indices remained unchanged.

Results from these analyses are consistent with the information on estimated returns and spawners as derived from the PFA model (Section 3.8.12), and suggest that returns are strongly influenced by factors in the marine environment.

3.8.14 Exploitation indices for NEAC stocks

Exploitation estimates have been plotted for 1SW and MSW salmon from the Northern NEAC (1983 to 2010) and Southern NEAC (1971 to 2010) areas and are displayed in Figures 3.8.14.1 and 3.8.14.2.

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. Previously (e.g. ICES 2010b) the stock complex exploitation rates presented were not weighted by national stock abundance.

Data gathered prior to the 1980s represent estimates of national exploitation rates whilst 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 overall rate of change of exploitation within the different countries in the NEAC area has been presented as a plot of the change (% change per year) in exploitation rate over the time-series. This was derived from of the slope of the linear regression between time and natural logarithm transformed exploitation rate (Figures 3.8.14.3 and 3.8.14.4).

The exploitation of 1SW salmon in both Northern NEAC and Southern NEAC areas has demonstrated a general decline over the time-series (Figure 3.8.14.1 and 3.8.14.2), with 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 40% in 2010 representing a decline from the previous 5-year (44%) and 10-year (45%) averages. Exploitation on 1SW fish in the Southern NEAC complex was 14% in 2010 indicating a decrease from both the previous 5-year (21%) and the 10-year (27%) averages.

The exploitation rate of MSW fish also exhibited an overall decline over the time-series in both Northern NEAC and Southern NEAC areas (Figures 3.8.14.1 and 3.8.14.2), with a notable sharp decline in 2008 as a result of significant changes in the Norwegian fisheries in the Northern NEAC area. Exploitation on MSW salmon in the Northern NEAC area was 45% in 2010, representing a decrease from the previous 5-year (54%) and 10-year averages (55%). Exploitation on MSW fish in Southern NEAC was 13% in 2010, a decrease from both the previous 5-year (15%) and 10-year (18%) averages.

The relative rate of change of exploitation over the entire time-series is plotted for the Northern NEAC stock complex in Figure 3.8.14.3. This indicates an overall reduction of exploitation in most countries for 1SW and MSW salmon. Exploitation of 1SW fish in Finland has been relatively stable over the time period whilst the largest rate of reduction has been for 1SW salmon in Russia. The Southern NEAC countries have also demonstrated a general decrease in exploitation rate (Figure 3.8.14.4) on both 1SW and MSW components. The greatest rate of decrease displayed for both 1SW and MSW fish was in UK (Scotland) whilst France and Iceland SW demonstrated relative stability in exploitation rates for both 1SW and MSW salmon during the time-series.

3.9 NASCO has asked ICES to further investigate opportunities to develop a framework of indicators or alternative methods that could be used to identify any significant change in previously provided multi-annual management advice

In 2006, ICES provided multi-annual management advice for all three NASCO Commission Areas and presented a preliminary framework (Framework of Indicators - FWI) which would indicate if any significant change in the status of stocks used to inform the previously provided multi-annual management advice had occurred. This FWI was subsequently developed further at the Study Group on Establishing a Framework of Indicators of Salmon Stock Abundance [SGEFISSA] in November 2006 (ICES 2007b).

The Working Group (ICES 2007c) developed a FWI for the Greenland fishery based on the seven contributing regions/stock complex with direct links to the three management objectives established by NASCO for that fishery. However, SGEFISSA was unable to develop a FWI for the Faroese fishery for a number of different reasons. Among these were the lack of quantitative catch advice, the absence of specific management objectives and a sharing agreement for this fishery and the fact that none of the available indicator datasets met the criteria for inclusion in the FWI. The Working Group (ICES 2007c) endorsed the SGEFISSA report of applying the FWI in respect of the West Greenland and North American Commissions. However, in the absence of a FWI for the Faroese fishery, it was recommended that annual assessments be conducted to update the multiyear catch advice.

In 2009 (ICES 2009a) the Working Group updated the NEAC datasets previously examined in the FWI. However, these still did not satisfy the criteria for inclusion in the FWI as being informative of a significant change, because over the time-series the PFA estimates have predominately remained above the SER. The Working Group decided that these datasets would need to be re-evaluated for use in future, should PFA estimates decline to levels consistently below the limit reference points for each stock complex. Alternatively, different approaches to that applied in respect of the Greenland fishery should be explored.

In 2010 the Working Group concluded that, as NEAC stocks remained close to their respective SERs, none of the available indicator datasets would meet the criteria for inclusion in the FWI and, additionally, as no alternative approaches had been proposed, the only indication of a change in the status of stocks would be provided by a full assessment of the NEAC stock complexes (ICES 2010b).

In 2011 the Working Group re-evaluated the approach for developing a FWI for the Faroese fishery. Because over the time-series the PFA estimates for the NEAC stock complexes have predominately remained above the SER, the working group suggested a different set of decision rules for this FWI. It was suggested that the status of stocks should be re-evaluated if the FWI suggests that the PFA estimates are deviating substantially from the median values from the forecast. Several criteria for when the PFA deviate substantially from the forecast were explored. It was suggested that the 95% confidence interval range of the indicator prediction relative to the median forecast value be used to compute those thresholds. The limits should be computed at the median values of the PFA forecasts in each of the years in a multiyear advice. In the event of a closed fishery, the indicators should be compared with the upper 95% confidence limit, and in the event of an open fishery they should be compared with both the upper and lower 95% confidence limits (see Figure 3.9.1 for an example).

To be included in the FWIs an indicator must fulfil two criteria: it must be a reliable predictor of the relevant PFA (r^2 from the regression larger than 0.20), and the value of the indicator (or a preliminary value) must be available for the inclusion in the FWI evaluation by mid-January. Of the possible 38 indicators that were evaluated during the 2011 meeting, 28 (74%) were assessed to be relevant predictors of PFA, and 10 (26%) were rejected. Of the retained indicators eight were from Northern NEAC and 20 from Southern NEAC (Table 3.9.1).

A spreadsheet for FWIs for each of the stock complexes was developed and tested.

Until alternative management units are agreed it is recommended that the indicators be regressed against the stock complexes to which they belong. For example MSW indicators from Norway should be regressed against PFA MSW for Northern NEAC. It is recommended that this procedure should be developed further and that new possible indicators should be brought forward to the Working Group before the next assessment in 2012. Depending on the success of the new suite of indicators to predict relevant PFAs, and that they can be made available at a relevant time (before 15th of January), a FWI could be suggested to NASCO in next year's working group report.

For a fishery to be opened or to remain open there should be a high probability that all four stock complexes would meet their CLs, and any indication that there has been a change in PFA from the forecast median value would trigger an assessment. If very few indicators are available to run the FWI by the agreed time, this would automatically trigger an assessment for the coming year.

3.10 NASCO has asked ICES to provide a more detailed evaluation of the choice of appropriate management units to be used in a risk based framework for the provision of catch advice for the Faroese salmon fishery, taking into account relevant biological and management considerations and including, if possible, worked examples of catch advice.

3.10.1 Background

For a number of years, NASCO has asked ICES to provide catch options or alternative management advice 'with an assessment of risks relative to the objective of exceeding stock conservation limits' for salmon in the NEAC area. In 2010, ICES (2010b) outlined a risk framework that could be used to provide and evaluate catch options for the Faroes fishery based on the method currently used to provide catch advice for the West Greenland fishery. The risk framework for the West Greenland fishery involves estimating the uncertainty in meeting defined management objectives at different catch levels (TAC options).

ICES (2010b) described the procedure for conducting such an assessment and noted that the following three issues would require decisions by managers before full catch advice could be provided:

- the choice of management units for NEAC stocks;
- the specification of management objectives;
- the share arrangement for the Faroes fishery.

The approach would then involve estimating the probability of stocks achieving the management objective in each of the NEAC area Management Units. The catch advice would display the probability of the stock in each Management Unit achieving its management objective for different Total Allowable Catch (TAC) options in the Faroes fishery and could be presented in tabular and graphic form.

The NEA Commission discussed the above questions at its 2010 annual meeting and during intersessional discussions but has not reached any conclusion. NASCO therefore submitted the following additional question to ICES in February 2011: 'Provide a more detailed evaluation of the choice of appropriate management units to be used in a risk based framework for the provision of catch advice for the Faroese salmon fishery, taking into account relevant biological and management considerations and including, if possible, worked examples of catch advice.' In this section, the proposed risk framework is explored in more detail, a number of issues including the choice of management units are discussed, and a worked example of catch advice is provided in Section 3.10.8.

3.10.2 Faroes fishing season

The Working Group noted that the first issue to be resolved is the period to which any TAC for the Faroes fishery would 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 (e.g. two cohorts of 1SW salmon, etc) were exploited under each TAC. While ICES could continue to provide catch advice on the basis of calendar year TAC options, allocating each stock forecast between two fishing periods would add another level of uncertainty to the advice. The Working Group therefore recommends that NASCO should manage any fishery on the basis of fishing seasons operating from October to June, and catch advice should be provided on this basis. This approach has been assumed in the examples provided in this report, although it should be noted that the advice would take exactly the same form if it was provided on a calendar year basis.

3.10.3 Choice of management units

ICES (2010b) noted that the stock complexes currently 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. Basing an assessment of stock status on these large units greatly increases the risks to individual NEAC river stocks or groups of stocks that are already in a more depleted state than the average. However, having management units of a similar size (in numbers of fish) to those used for North America would require more than 50 units which would make the provision and determination of catch options unwieldy and impractical. ICES (2010b) therefore noted that it would be necessary to find a compromise between the number of management units and their size and distribution.

The choice of management units may be influenced by both biological and political considerations as well as by practical issues such as the availability of data. Management which requires meeting CLs for individual stocks would require basing the management of a mixed-stock fishery on the status of each individual river stock (or population) that it exploits, possibly split by sea age group. Applying such an approach to the management of the Faroes fishery would result in >3000 management units in the NEAC area (i.e. at least two age groups in each of ~1500 rivers). Larger management units might be defined on biological grounds, such as commonalities in migratory patterns of stocks or other biological characteristics, but insufficient data are available to determine such groupings at present.

From a jurisdictional perspective, there is likely to be a strong preference for splitting the management units to at least the national level because of the different management regimes adopted by jurisdictions.

The development of catch advice is also constrained by the availability of data. The run-reconstruction (RR) model, which is used to estimate PFA and national CLs was initially broken down to the national level. This reflected the different ways that data are collected on stocks and fisheries in different countries and the ease with which parameter values for the model could therefore be derived. The assessment for some countries has since been broken down further where there are thought to be marked differences in parameter values (e.g. exploitation rates) between the regions. The RR model can, in theory, be run for individual rivers, but estimates of exploitation rates and unreported catches required for the model are not normally available at this level and there is no benefit in sub-dividing the assessment between areas for which the same parameter values would be used.

The assessment of TAC options also requires data on the size and age composition and origin of the catch. Some data are available from historical sampling in the Faroes fishery when it operated in the 1980s to 1990s, but data on the origin of the catch are limited. The Working Group currently uses proportions derived from historical smolt and adult tagging studies to divide the Faroese catch between countries of origin in the RR model (Table 3.10.3.1). While the overall pattern appears reasonable, the results are relatively imprecise and some gaps (which arise from lack of tags) appear inconsistent with our general understanding of the stocks (e.g. zero proportion for Finnish MSW stock). The approximate nature of these estimates is not critical in the RR analysis, particularly since there has been little or no catch at Faroes for more than a decade, but it has a much more significant impact on the evaluation of catch options going forward. More precise estimates of stock composition could be obtained using genetic stock identification techniques on either historical (e.g. scales) or future samples collected in the fishery.

There therefore appears to be a conflict between the desire to define the NEAC management units at the jurisdiction level or below and the restrictions of the data which probably limit us to defining management units between the levels of jurisdictions and the currently used stock complexes. These management units would also be split into age groups (1SW and MSW).

The main problem with allocating catch to management units relates to the difficulty of estimating the contribution of the management units for which there are limited tag recoveries (e.g. UK (Northern Ireland), France, Finland). A compromise that would partly resolve this problem could be to amalgamate geographically neighbouring units.

3.10.4 Management objectives

The management objectives provide the basis for determining the risks to stocks in each management unit associated with different catch options. However, NASCO has not provided management objectives for the Faroes fishery. The NASCO agreement on the adoption of a Precautionary Approach (NASCO, 1998) indicates that salmon fisheries should be managed by means of CLs and management targets and also calls for the 'formulation of pre-agreed management actions in the form of procedures to be applied over a range of stock conditions'. This suggests that the management objectives (e.g. the required probability of exceeding the CL) should be agreed in advance of specific management proposals being considered. Nevertheless, the proposed presentation of the catch options would permit managers to review the risk that different TAC options would pose to individual management units and choose a risk level that they consider appropriate.

The Working Group also considered the implications of basing the risk framework on overall abundance objectives for management units comprising large numbers of river stocks. Even setting management units at the jurisdiction level would mean that (at least) four management units (i.e. Ireland, Norway, Russia and (UK Scotland)) would each comprise over one hundred river stocks. Thus it would still be possible for large numbers of river stocks to be below CL while the management unit as a whole was meeting its management objective. If the management unit is set at the stock complex level, the problem would be greater, and it would be possible, for example, for the status of river stocks in a jurisdiction with many salmon rivers to completely mask the status of the stocks in a jurisdiction with fewer rivers.

The Working Group therefore proposed that an additional management objective should be applied to all management units based on the status of individual stocks. For example, this objective might state that for each of the management units an agreed percentage of the assessed river stocks must be meeting specified management objectives before a TAC is allocated to the mixed-stock fishery at Faroes. The criteria for judging satisfactory compliance with these requirements would need to be agreed by managers.

3.10.5 Sharing agreement

The 'sharing agreement' will establish the proportion of any harvestable surplus within the NEAC area that could be made available to the Faroes fishery through the TAC. In effect this means that for any TAC option being evaluated for the Faroes, it is assumed that the total harvest would be the TAC divided by the Faroes share.

The management framework for the West Greenland fishery provides a precedent for setting a share allocation based upon the historical split of declared catches at West Greenland and in North America using a baseline period of 1986–1990 (catches in West Greenland are lagged one year back). ICES (2010b) indicated that same method could be used to establish the share arrangement for the Faroes fishery, and because some stocks are exploited at both Faroes and West Greenland, suggested that it might be appropriate to use the same baseline period. On this basis, the share allocations would be 7.5% to Faroes, 7.1% to West Greenland and 85.4% to all NEAC homewater fisheries (Table 3.10.5.1 and Figure 3.10.5.1).

NASCO has not provided a share allocation, but one Party had proposed an alternative baseline period of 1984–1988. The share allocations based on this period would be 8.4% Faroes, 5.2% West Greenland and 86.4% all NEAC homewater fisheries (Table 3.10.5.1 and Figure 3.10.5.1). In the absence of an agreed share allocation, a value of 8% for the Faroes fishery has been used in this example.

The Faroes and West Greenland share allocations do not have to be based on the same baseline period, but any variance would have to be accommodated in an adjustment to the homewater share. Any share allocation established between West Greenland and NEAC stocks could be based on MSW stocks alone.

3.10.6 Evaluation of catch options

The process for assessing each catch option within the risk framework would be as follows. Parameters marked with an '*' in the equations have uncertainty around them (see Section 3.10.7) and so contribute to the estimation of the probability density function around the potential total harvest arising from each TAC option.

The TAC option (T) is first divided by the mean weight (W) of salmon caught in the Faroes fishery to give the number of fish (N) that would be caught; thus:

$$N = T / W^*$$

This value is converted to numbers of wild fish (Nw) by multiplying by one minus the proportion of farm escapees in the Faroes catch (pE) observed in historical sampling programmes:

$$Nw = N \times (1 - pE^*)$$

This value is split into numbers by sea age classes (1SW and MSW) according to the proportion of each age group (pAi) observed in historical catch sampling programmes at Faroes, and the discards that die (i.e. 80% of fish less than 60 cm TL) are added to the 1SW catch. Thus:

$$Nw1SW = Nwtotal \times pA1SW^* + (Nwtotal \times pD^* \times 0.8)$$

and

$$NwMSW = Nwtotal \times pAMSW^*$$

where 'pD' is the proportion of the total catch that is discarded (i.e. <60 cm TL).

Further corrections are made to the 1SW and MSW numbers to reduce the 1SW total to take account of the proportion that will not mature as grilse and to add the survivors from this group to the MSW fish in the following year. For the first catch advice year the number added to the MSW total is adjusted to the TAC applying in the current year (i.e. zero in 2011). Thus

$$Nw1SW = Nw1SW \times pM^*$$

and

$$NwMSW = NwMSW + Nw1SW \times (1-pM^*) \times e^{-12m}$$

where 'pM' is the proportion of 1SW salmon that are expected to mature in the same year (0.78) and 'm' is the instantaneous monthly rate of mortality.

The numbers in each age group are then divided among the management units by multiplying by the appropriate proportions (pUj), where 'i' denotes the age groups and 'j' denotes the management units:

Nwij = Nwi x pUj

Finally, each of these values is raised by the Faroes share allocation (S) to give the total potential harvest (Hij) of fish from each management unit and sea age group.

Hij = Nwij / S

These harvests are then subtracted from the stock forecasts (PFAij) for the management units and sea age groups and compared with the Spawner Escapement Reserves (SER) to evaluate attainment of the management objective. In practice the attainment of the management objective is assessed by determining the probability that PFAij – Hij – SERij is greater than zero.

The SER is the number of fish that need to be alive at the time of the Faroes fishery to meet the CL when the fish return to homewaters; this equals the CL raised by the mortality over the intervening time. CLs and SERs are currently estimated without uncertainty.

3.10.7 Input data for the risk framework

NASCO has asked ICES to provide worked examples of catch advice. On the basis of the above evaluation, the Working Group decided to provide an example of the risk framework based on the stock complexes previously used for the provision of catch advice. The assessment requires input data as described in Section 3.10.6. Some of these parameters (e.g. mean ages and weights, discard rates, etc.) apply to the catch that might occur at the Faroes if a TAC was allocated. In most cases the only data available to estimate these parameters comes from sampling programmes conducted in commercial and research fisheries in Faroese waters in the 1980s and 1990s.

<u>Mean weights:</u> Mean weights of salmon caught in the commercial and research fisheries operating in Faroese waters between 1983/84 and 1995/96 varied between 3.06 and 5.23 kg (Table 3.10.7.1 and Figure 3.10.7.1) (ICES 1997). However, high values were observed at the beginning of the time-series when part of the catch was taken to the north of the Faroes EEZ, and the values for the latter part of the series are based on relatively small catches in a research fishery which may not be as representative of a full commercial fishery. As a result, mean weights have been drawn randomly from the observed values of the 1985/1986 to 1990/1991 fishing seasons.

<u>Proportion by sea age:</u> The age composition of catches in the Faroes fishery has been estimated from samples collected in the 1983/1984 to 1994/1995 fishing seasons (Table 3.10.7.2 and Figure 3.10.7.2) (ICES, 1996b). The samples taken between 1991/1992 and 1994/1995 were from the research fishery and included potential discards but excluded farm escapees. As a result, values have been drawn from the observations between 1985/1986 and 1990/1991 to provide a probability distribution for this parameter. However, the age composition of the catches may be expected to be related to the mean weight (Figure 3.10.7.3). To take account of this relationship, the values of mean weight and age composition used in each sample run have been drawn from the same years.

<u>Discard rates:</u> In the past, there has been a requirement to discard any fish less than 60 cm total length caught in the Faroes fishery and discard rates have been estimated from the proportions of fish less than 60 cm in catch samples between the 1982/1983 and 1994/1995 seasons (ICES, 1996b) (Table 3.10.7.3); 80% of these fish were expected to die (ICES, 1986). A probability distribution for the discard rate has been estimated by sampling at random from the annual values seen over for the same period as for the other parameters above.

Proportions of fish-farm escapees: The proportion of fish-farm escapees in the catches at Faroes has also been estimated from samples taken in the 1980/1981 to 1994/1995 fishing season (ICES, 1996b). However, the Working Group is aware that there have been substantial changes in the production of farmed fish and in the incidence of escape events. Data were also available to the Working Group on the proportion of farm escapees in Norwegian coastal waters between 1989 and 2008; the proportion in recent years (2002–2008) was 63% of the proportion during the period 1989/1990 to 1994/1995 when the sample time-series overlap (Table 3.10.7.4). The probability distributions of proportion of farm escapees used in the risk framework has therefore been generated by multiplying the rates observed in the Faroes fishery between 1988/1989 to 1994/1995 by 0.63 and then drawing sample values at random.

Proportions of catches by management unit: The origin of the stocks exploited at Faroes has been estimated from smolt and adult tagging studies and an approximate split between jurisdictions has been employed in the NEAC RR model (e.g. ICES, 2010b). These same proportions have been used to develop the risk framework, but because of the uncertainties described in Section 3.10.3, they have been grouped at the stock complex level. Thus 1SW salmon are assigned 50% to Northern NEAC and 50% to Southern NEAC area. MSW salmon are assigned 60.5% to Northern NEAC and 27.5% to Southern NEAC; the remaining 12% of MSW salmon were estimated to derive from other jurisdictions not currently included in the assessment (e.g. including Spanish and North American stocks).

Other input parameters are displayed in Table 3.10.7.5.

3.10.8 Worked example of the risk framework

The methods and data described above have been used to provide an example of the risk framework for the Northern and Southern NEAC stock complexes using the PFA forecasts derived from the Bayesian model described in Section 3.6. The results are presented as an example of how future catch advice might be provided, and do not constitute formal catch advice at this stage. The assessment was run using 10 000 sample draws when generating probability distributions for the input parameters. Probability distributions for the PFA forecasts were derived from the mean and sd of the forecast model outputs using a lognormal distribution.

In the example, the probability of the stock complexes in Northern and Southern NEAC areas achieving their SERs (the overall abundance objective) for different catch options in the Faroes fishery (from 0 to 500 t) in 2012 to 2014 are indicated in Table 3.10.8.1 and Figure 3.10.8 .1. This assumes that the same TAC is applied and is taken in each of the three years. This indicates that there are no TAC options that will permit all stock complexes to have a greater than 75% probability of achieving their SERs in any year from 2012–2014. The flatness of the curves in the catch options figures is a function of the uncertainty in the estimates and the level of exploitation on the stocks in the Faroes fishery (Table 3.10.8.2 and Figure 3.10.8.2); more uncertain data and lower exploitation rates generate flatter curves.

Section 3.10.4 above discusses the problem of basing this form of risk analysis on management units comprising large numbers of river stocks and proposes that an additional management objective should also be applied at a smaller geographical scale if the management units are defined at the jurisdiction or stock complex level. This objective might state that an agreed percentage of the assessed river stocks within each of the smaller geographic units must be meeting specified management objectives before a TAC is allocated to the mixed-stock fishery at Faroes. Table

3.10.8.3 provides examples of the type of data that might be used in such an assessment, but the Working Group noted that stock status indicators should be based on the attainment of CLs before exploitation.

The Working Group recommends that further work be undertaken to check the appropriateness of the various data inputs, including seeking original datasets from the sampling programmes in the Faroes, and to define the management objectives based on individual river stocks.

Table 3.3.2.1. Conservation limits for NEAC stock groups estimated from national lagged egg deposition model and from river-specific values (where available).

	National Model CLs		River Specific CLs		Conservation limit used	
	1SW	MSW	1SW	MSW	1SW	MSW
Northern NEAC						
Finland	11,908	15,769			11,908	15,769
Iceland (north & east)	6,639	1,568			6,639	1,568
Norway			77,198	69,634	77,198	69,634
Russia	110,077	43,224			110,077	43,224
Sweden	1,409	1,261			1,409	1,261
			Conservation limit		207,231	131,456
			Spawner Escapement Reserve		261,359	222,225

	National Model CLs		River Specific CLs		Conservation limit used	
	1SW	MSW	1SW	MSW	1SW	MSW
Southern NEAC						
France			17,400	5,100	17,400	5,100
Iceland (south & west)	20,258	1,235			20,258	1,235
Ireland			236,044	15,334	236,044	15,334
UK (E&W)			54,491	29,605	54,491	29,605
UK (NI)	19,441	1,639			19,441	1,639
UK (Sco)	276,871	205,807			276,871	205,807
			Conservation limit		624,504	258,720
			Spawner Escapement Reserve		793,900	437,525

Table 3.8.3.1. Number of gear units licensed or authorized by country and gear type (- indicates no information available).

Year	UK (England and 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	-	3,080.0	800.0	142	305	18	4,608	2,421	26	8,976
1972	308	224	315	76	-	3,455.0	813.0	130	307	18	4,215	2,367	24	13,448
1973	291	230	335	70	-	3,256.0	891.0	130	303	20	4,047	2,996	32	18,616
1974	280	240	329	69	-	3,188.0	782.0	129	307	18	3,382	3,342	29	14,078
1975	269	243	341	69	-	2,985.0	773.0	127	314	20	3,150	3,549	25	15,968
1976	275	247	355	70	-	2,862.0	760.0	126	287	18	2,569	3,890	22	17,794
1977	273	251	365	71	-	2,754.0	684.0	126	293	19	2,680	4,047	26	30,201
1978	249	244	376	70	-	2,587.0	692.0	126	284	18	1,980	3,976	12	23,301
1979	241	225	322	68	-	2,708.0	754.0	126	274	20	1,835	5,001	17	23,989
1980	233	238	339	69	-	2,901.0	675.0	125	258	20	2,118	4,922	20	25,652
1981	232	219	336	72	-	2,802.5	655.0	123	239	19	2,060	5,546	19	24,081
1982	232	221	319	72	-	2,396.0	647.0	123	221	18	1,843	5,217	27	22,520
1983	232	209	333	74	-	2,522.5	667.5	120	207	17	1,735	5,428	21	21,813
1984	226	223	354	74	-	2,459.5	637.5	121	192	19	1,697	5,386	35	21,210
1985	223	230	375	69	-	2,010.0	528.5	122	168	19	1,726	5,848	34	20,329
1986	220	221	368	64	-	1,954.5	591.0	121	148	18	1,630	5,979	14	17,945
1987	213	206	352	68	-	1,679.0	564.0	120	119	18	1,422	6,060	13	17,234
1988	210	212	284	70	-	1,534.0	384.5	115	113	18	1,322	5,702	11	15,532
1989	201	199	282	75	-	1,233.0	352.5	117	108	19	1,888	4,100	16	0
1990	200	204	292	69	-	1,281.5	339.5	114	106	17	2,375	3,890	7	0
1991	199	187	264	66	-	1,136.5	295.0	118	102	18	2,343	3,628	8	0
1992	203	158	267	65	-	851.0	292.0	121	91	19	2,268	3,342	5	0
1993	187	151	259	55	-	902.5	263.5	120	73	18	2,869	2,783	-	0
1994	177	158	257	53	37,278	748.5	245.5	119	68	18	2,630	2,825	-	0
1995	163	156	249	47	34,941	728.5	221.5	122	68	16	2,542	2,715	-	0
1996	151	132	232	42	35,281	643.0	200.5	117	66	12	2,280	2,860	-	0
1997	139	131	231	35	32,781	679.5	194.0	116	63	12	2,002	1,075	-	0
1998	130	129	196	35	32,525	541.5	150.5	117	70	12	1,865	1,027	-	0
1999	120	109	178	30	29,132	406.0	131.5	113	52	11	1,649	989	-	0
2000	110	103	158	32	30,139	381.0	123.0	109	57	10	1,557	982	-	0
2001	113	99	143	33	24,350	387.0	94.5	107	50	6	1,976	1,081	-	0
2002	113	94	147	32	29,407	425.5	101.5	106	47	4	1,666	917	-	0
2003	58	96	160	57	29,936	362.5	108.5	105	52	2	1,664	766	-	0
2004	57	75	157	65	32,766	449.5	117.5	90	54	2	1,546	659	-	0
2005	59	73	148	65	34,040	381.0	100.5	93	57	2	1,453	661	-	0
2006	52	57	147	65	31,606	363.5	85.5	107	49	2	1,283	685	-	0
2007	53	45	157	66	32,181	238.0	69.0	20	12	2	1,302	669	-	0
2008	55	42	130	66	33,900	181.0	76.5	20	12	2	957	653	-	0
2009	50	42	118	66	36,461	161.5	63.5	20	12	2	978	631	-	0
2010	51	40	118	66	37,728	188.7	65.2	2	1	2	760	493	-	0
Mean 2005-2009	54	52	140	66	33,638	265	79	52	28	2	1,195	660		0
% change [3]	-7.1	-22.8	-15.7	0.6	12.2	-28.8	-17.5	-96.2	-96.5	0.0	-36.4	-25.3		
Mean 2000-2009	72	73	147	55	31,479	333	94	78	40	3	1,438	770		0
% change [3]	-30.6	-44.9	-19.5	20.7	19.9	-43.3	-30.6	-97.4	-97.5	-41.2	-47.2	-36.0		

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

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

[3] (2010/mean - 1) * 100

[4] Dash means "no data"

Table 3.8.3.1. Cont'd. Number of gear units licensed or authorized by country and gear type (- indicates no information available).

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 Tourist anglers 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	Commercial, number of gears In-river
1971	916	697	213	10,566	-	-	-	-	-	-	-	-	-	-
1972	1,156	678	197	9,612	-	-	-	-	-	-	-	-	-	-
1973	1,112	713	224	11,660	-	-	-	-	-	-	-	-	-	-
1974	1,048	681	211	12,845	-	-	-	-	-	-	-	-	-	-
1975	1,046	672	212	13,142	-	-	-	-	-	-	-	-	-	-
1976	1,047	677	225	14,139	-	-	-	-	-	-	-	-	-	-
1977	997	650	211	11,721	-	-	-	-	-	-	-	-	-	-
1978	1,007	608	209	13,327	-	-	-	-	-	-	-	-	-	-
1979	924	657	240	12,726	-	-	-	-	-	-	-	-	-	-
1980	959	601	195	15,864	-	-	-	-	-	-	-	-	-	-
1981	878	601	195	15,519	16,859	5,742	677	467	-	-	-	-	-	-
1982	830	560	192	15,697	19,690	7,002	693	484	4,145	55	82	-	-	-
1983	801	526	190	16,737	20,363	7,053	740	587	3,856	49	82	-	-	-
1984	819	515	194	14,878	21,149	7,665	737	677	3,911	42	82	-	-	-
1985	827	526	190	15,929	21,742	7,575	740	866	4,443	40	82	-	-	-
1986	768	507	183	17,977	21,482	7,404	702	691	5,919	58 [3]	86	-	-	-
1987	768	507	183	17,977	22,487	7,759	754	689	5,724 [4]	87 [4]	80	-	-	-
1988	836	507	183	11,539	21,708	7,755	741	538	4,346	101	76	-	-	-
1989	801	507	183	16,484	24,118	8,681	742	696	3,789	83	78	-	-	-
1990	756	525	189	15,395	19,596	7,677	728	614	2,944	71	76	-	-	-
1991	707	504	182	15,178	22,922	8,286	734	718	2,737	78	71	1,711	-	-
1992	691	535	183	20,263	26,748	9,058	749	875	2,136	57	71	4,088	-	-
1993	673	457	161	23,875	29,461	10,198	755	705	2,104	53	55	6,026	59	199
1994	732	494	176	24,988	26,517	8,985	751	671	1,672	14	59	8,619	60	230
1995	768	512	164	27,056	24,951	8,141	687	716	1,878	17	59	5,822	55	239
1996	778	523	170	29,759	17,625	5,743	672	814	1,798	21	69	6,326	85	330
1997	852	531	172	31,873	16,255	5,036	616	588	2,953	10	59	6,355	68	282
1998	874	513	174	31,565	18,700	5,759	621	673	2,352	16	63	6,034	66	270
1999	874	499	162	32,493	22,935	6,857	616	850	2,225	15	61	7,023	66	194
2000	871	490	158	33,527	28,385	8,275	633	624	2,037 [5]	16	35	7,336	60	173
2001	881	540	155	32,814	33,501	9,367	863	590	2,080	18	42	8,468	53	121
2002	833	544	159	35,024	37,491	10,560	853	660	2,082	18	43	9,624	63	72
2003	877	549	159	31,809	34,979	10,032	832	644	2,048	18	38	11,994	55	84
2004	831	473	136	30,807	29,494	8,771	801	657	2,158	15	38	13,300	62	56
2005	877	518	158	28,738	27,627	7,776	785	705	2,356	16	37	20,309	93	69
2006	875	533	162	27,341	29,516	7,749	836	552	2,269	12	37	13,604	62	72
2007	0	335	100	19,986	33,664	8,763	780	716	2,431	13	37	n/a	82	53
2008	0	160	0	20,061	31,143	8,111	756	694	2,401	12	32	n/a	66	62
2009	0	146	38	18,314	29,641	7,676	761	656	2,421	12	30	n/a	79	72
2010	0	166	40	17,983	30,646	7,814	756	615	2,200	12	36	n/a	55	66
Mean 2005-2009	175	338	92	22,888	30,318	8,015	784	665	2,376	13	35	16,957	76	66
% change [6]	-100.0	-50.9	-56.3	-21.4	1.1	-2.5	-3.5	-7.5	-7.4	-7.7	4.0		-28.0	0.6
Mean 2000-2009	517	429	123	27,842	31,544	8,708	790	650	2,228	15	37	12,091	68	83
% change [6]	-100.0	-61.3	-67.3	-35.4	-2.8	-10.3	-4.3	-5.4	-1.3	-20.0	-2.4		-18.5	-20.9

[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] (2010/mean - 1) * 100
[7] Dash means "no data"

Table 3.8.4.1. Nominal catch of salmon in NEAC Area (in tonnes round fresh weight), 1960 to 2010 (2010 figures are provisional).

Year	Southern countries	Northern countries	Faroes (1)	Other catches in international waters	Total Reported Catch	Unreported catches NEAC Area (3)	Unreported catches International waters (2)
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	-	2,495	946	-
2003	908	1,394	0	-	2,302	719	-
2004	919	1,058	0	-	1,977	575	-
2005	810	1,189	0	-	1,999	605	-
2006	651	1,217	0	-	1,868	604	-
2007	372	1,036	0	-	1,407	465	-
2008	354	1,179	0	-	1,533	433	-
2009	264	893	0	-	1,158	317	-
2010	427	973	0	-	1,401	357	-
Means							
2005-2010	490	1103	0	-	1593	485	-
2000-2009	786	1248	1	-	2035	689	-

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

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Table 3.8.5.1. The cpue for salmon rod catches in Finland (Teno and Naatamo), France and UK (N. Ireland; River Bush).

	Finland (R. Teno)		Finland (R. Naatamo)		France	UK(N.Ire.)(R.Bush)
	Catch per angler season	Catch per angler day	Catch per angler season	Catch per angler day	Catch per angler season	Catch per rod day
Year	kg	kg	kg	kg	Number	Number
1974		2.8				
1975		2.7				
1976		-				
1977		1.4				
1978		1.1				
1979		0.9				
1980		1.1				
1981	3.2	1.2				
1982	3.4	1.1				
1983	3.4	1.2				0.248
1984	2.2	0.8	0.5	0.2		0.083
1985	2.7	0.9	n/a	n/a		0.283
1986	2.1	0.7	n/a	n/a		0.274
1987	2.3	0.8	n/a	n/a	0.39	0.194
1988	1.9	0.7	0.5	0.2	0.73	0.165
1989	2.2	0.8	1.0	0.4	0.55	0.135
1990	2.8	1.1	0.7	0.3	0.71	0.247
1991	3.4	1.2	1.3	0.5	0.60	0.396
1992	4.5	1.5	1.4	0.3	0.94	0.258
1993	3.9	1.3	0.4	0.2	0.88	0.341
1994	2.4	0.8	0.6	0.2	2.32	0.205
1995	2.7	0.9	0.5	0.1	1.15	0.206
1996	3.0	1.0	0.7	0.2	1.57	0.267
1997	3.4	1.0	1.1	0.2	0.44 [1]	0.338
1998	3.0	0.9	1.3	0.3	0.67	0.569
1999	3.7	1.1	0.8	0.2	0.76	0.273
2000	5.0	1.5	0.9	0.2	1.06	0.259
2001	5.9	1.7	1.2	0.3	0.97	0.444
2002	3.1	0.9	0.7	0.2	0.84	0.184
2003	2.6	0.7	0.8	0.2	0.76	0.238
2004	1.4	0.4	0.9	0.2	1.25	0.252
2005	2.7	0.8	1.3	0.2	0.74	0.323
2006	3.4	1.0	1.9	0.4	0.89	0.457
2007	2.9	0.8	1.0	0.2	0.74	0.601
2008	4.2	1.1	0.9	0.2	0.77	0.457
2009	2.3	0.6	0.7	0.1	0.50	0.136
2010	3.0	0.8	1.3	0.2	0.87	0.226
Mean 2005-09	3.1	0.9	1.2	0.2	0.7	0.4

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

Table 3.8.5.2. The cpue for salmon rod catches in the Barents Sea and White Sea basin in Russia.

	Barents Sea Basin, catch per angler day					White Sea Basin, catch per angler day			
Year	Rynda	Kharlovka	E. Litsa	Varzina	Iokanga	Ponoy	Varzuga	Kitsa	Umba
1991						2.79	1.87		1.33
1992	2.37	1.45	2.95	1.07	0.14	4.50	2.26	1.21	1.37
1993	1.18	1.46	1.59	0.49	0.65	3.57	1.28	1.43	2.72
1994	0.71	0.85	0.79	0.55	0.33	3.30	1.60	1.59	1.44
1995	0.49	0.78	0.94	1.22	0.72	3.77	2.52	1.78	1.20
1996	0.70	0.85	1.31	1.50	1.40	3.78	1.44	1.76	0.93
1997	1.20	0.71	1.09	0.61	1.41	6.09	2.36	2.48	1.46
1998	1.01	0.55	0.75	0.44	0.87	4.52	2.28	2.78	0.98
1999	0.95	0.77	0.93	0.43	1.19	3.30	1.71	1.66	0.76
2000	1.35	0.77	0.89	0.57	2.28	3.55	1.53	3.02	1.25
2001	1.48	0.92	1.00	0.89	0.73	4.35	1.86	1.81	1.04
2002	2.39	0.99	0.89	0.80	2.82	7.28	1.44	2.11	0.36
2003	1.61	1.14	1.04	0.79	2.01	8.39	1.17	1.61	0.36
2004	1.07	0.98	1.31	0.65	1.00	5.80	1.14	1.10	0.36
2005	1.09	0.82	1.45	0.46	0.88	4.42	0.57	0.89	0.28
2006	0.98	1.49	1.49	1.45		6.28	2.23		0.73
2007	0.92	0.78	1.43	1.16		5.96			
2008						5.73			
2009						5.72			
2010						4.78			
Mean 2005-09	1.00	1.03	1.46	1.02	0.88	5.62	1.40	0.89	0.51

Table 3.8.5.3. The cpue data for net and fixed engine fisheries by Region in UK (England and Wales). Data expressed as catch per licence-tide, except for the Northeast, for which the data are expressed as catch per licence-day.

		Region (aggregated data, various methods)				
Year	North East drift nets	North East	South West [1]	Midlands	Wales [1]	North West
1988		5.49				-
1989		4.39				0.82
1990		5.53				0.63
1991		3.20				0.51
1992		3.83				0.40
1993	8.23	6.43				0.63
1994	9.02	7.53				0.71
1995	11.18	7.84				0.79
1996	4.93	3.74				0.59
1997	6.48	4.40	0.70	0.48	0.07	0.63
1998	5.92	3.81	1.25	0.42	0.08	0.46
1999	8.06	4.88	0.79	0.72	0.02	0.52
2000	13.06	8.11	1.01	0.66	0.18	1.05
2001	10.34	6.83	0.71	0.79	0.16	0.71
2002	8.55	5.59	1.03	1.39	0.23	0.90
2003	7.13	4.82	1.24	1.13	0.11	0.62
2004	8.17	5.88	1.17	0.46	0.11	0.69
2005	7.23	4.13	0.60	0.97	0.09	1.28
2006	5.60	3.20	0.66	0.97	0.09	0.82
2007	7.24	4.17	0.33	1.26	0.05	0.75
2008	5.41	3.59	0.63	1.33	0.06	0.34
2009	4.76	3.09	0.53	1.67	0.04	0.51
2010	17.03	9.56	0.99	0.26	0.09	0.47
Mean 2005-09	6.05	3.64	0.55	1.24	0.07	0.74

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Table 3.8.5.4. The cpue data for UK (Scotland) net fisheries. 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	190.0
Mean 2005-09	47.5	74.3

[1] Excludes catch and effort for Solway Region

Table 3.8.5.5. The cpue for the marine fishery in Norway. The cpue is expressed as numbers of salmon caught per net day in bag nets and bendnets partitioned by salmon weight.

Year	Bagnet			Bendnet		
	< 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
Mean 2005-09	0.88	1.02	0.32	0.60	0.86	0.37

Table 3.8.6.1. Percentage of 1SW salmon in catches from countries in the Northeast Atlantic, 1987 to 2010.

Year	Iceland	Finland	Norway	Russia	Sweden	**Northern countries**	UK (Scot)	UK (E&W)	France (1)	Spain (2)	**Southern countries**
1987		66	61	71		**63**	61	68	77		**63**
1988		63	64	53		**62**	57	69	29		**60**
1989	69	66	73	73	41	**72**	63	65	33		**63**
1990	66	64	68	73	70	**69**	48	52	45		**49**
1991	71	59	65	70	71	**66**	53	71	39		**58**
1992	72	70	62	72	68	**65**	55	77	48		**59**
1993	76	58	61	61	62	**63**	57	81	74	64	**64**
1994	63	55	68	69	64	**67**	54	77	55	69	**61**
1995	71	59	58	70	78	**62**	53	72	60	26	**59**
1996	73	79	53	80	63	**61**	53	65	51	34	**56**
1997	73	69	64	82	54	**68**	54	73	51	28	**60**
1998	82	75	66	82	59	**70**	58	83	71	54	**65**
1999	70	83	65	78	71	**68**	45	68	27	14	**54**
2000	82	71	67	75	69	**69**	54	79	58	74	**65**
2001	78	48	58	74	55	**60**	55	76	51	40	**63**
2002	83	34	49	70	63	**54**	54	76	69	38	**64**
2003	75	51	61	67	47	**62**	52	67	51	16	**55**
2004	86	47	52	68	52	**58**	51	81	40	67	**59**
2005	87	72	67	66	55	**69**	58	75	41	15	**61**
2006	84	73	54	77	56	**60**	57	77	50	15	**61**
2007	91	30	42	69	33	**50**	57	78	45	26	**61**
2008	90	34	46	58	30	**54**	48	75	42	11	**55**
2009	91	57	49	63	34	**59**	49	70	42	30	**54**
2010	86	45	56	58	41	**61**	56	73	66	32	**60**
Means											
2005-2009	88	53	51	67	42	58	54	75	44	19	58
2000-2009	85	52	54	69	49	59	53	75	49	33	60

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

Table 3.8.12.1. Estimated number (median values) of returning maturing 1SW salmon by NEAC country or region and year.

Year	Northern NEAC								Southern NEAC									NEAC Area		
	Finland	Iceland	Norway	Russia	Sweden	Total			France	Iceland	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total			Total		
		N&E				2.5%	median	97.5%		S&W					2.5%	median	97.5%	2.5%	median	97.5%
1971	25,991	9,417		154,307	17,506				49,822	62,547	1,055,765	99,432	181,632	616,271	1,816,909	**2,075,590**	2,413,471			
1972	40,601	8,603		117,273	13,849				99,486	50,589	1,125,289	86,189	158,796	539,184	1,799,057	**2,076,983**	2,433,031			
1973	36,903	10,355		173,030	17,159				60,923	54,485	1,223,860	100,342	138,686	645,980	1,941,971	**2,240,732**	2,627,494			
1974	73,170	10,291		172,443	24,718				28,348	38,692	1,396,098	124,321	151,668	613,759	2,033,698	**2,361,234**	2,795,944			
1975	50,967	12,554		264,286	26,559				56,619	60,050	1,539,220	125,827	124,471	500,215	2,069,535	**2,418,438**	2,896,780			
1976	34,887	12,627		184,108	14,980				51,978	47,441	1,046,984	84,157	86,564	433,051	1,515,622	**1,758,555**	2,086,603			
1977	17,918	17,564		117,390	7,069				39,998	48,627	905,378	94,286	85,271	448,817	1,415,008	**1,630,124**	1,918,546			
1978	24,419	17,843		118,564	8,080				41,190	63,700	792,790	105,963	111,143	514,713	1,437,345	**1,637,118**	1,892,752			
1979	28,512	17,052		164,511	8,522				47,014	58,702	727,717	100,004	78,005	424,038	1,263,359	**1,444,417**	1,678,579			
1980	12,782	2,586		116,891	10,812				97,913	26,664	552,519	92,669	98,719	263,351	1,001,557	**1,144,856**	1,327,503			
1981	19,738	13,290		96,744	19,605				77,901	34,385	291,557	96,496	77,303	324,414	821,906	**912,020**	1,014,024			
1982	5,772	6,135		85,066	17,208				47,933	35,360	603,305	82,013	111,939	468,486	1,216,125	**1,358,157**	1,526,731			
1983	28,521	9,044	698,622	141,824	22,903	800,817	**908,387**	1,036,758	51,421	44,685	1,065,285	118,293	157,065	475,494	1,705,012	**1,922,400**	2,190,410	2,584,527	**2,834,139**	3,126,779
1984	31,875	3,288	729,363	152,987	32,248	839,761	**955,039**	1,094,745	84,452	27,508	559,405	103,068	61,705	504,142	1,209,554	**1,352,348**	1,515,910	2,121,278	**2,311,338**	2,521,054
1985	48,145	22,697	742,001	209,344	38,334	950,429	**1,067,801**	1,207,284	31,358	44,556	927,207	103,181	80,038	417,475	1,422,425	**1,611,722**	1,847,307	2,451,149	**2,683,918**	2,951,835
1986	43,771	28,184	646,279	178,920	40,444	846,354	**944,720**	1,060,132	48,573	73,157	1,038,391	117,356	89,912	518,788	1,680,244	**1,904,803**	2,183,494	2,601,345	**2,853,369**	3,150,291
1987	55,946	16,605	543,675	190,753	32,771	762,754	**847,326**	946,670	85,873	45,467	668,950	122,145	49,128	400,380	1,217,349	**1,395,173**	1,627,230	2,044,353	**2,245,923**	2,497,227
1988	26,773	24,058	498,720	131,946	27,466	648,508	**714,657**	795,341	29,570	81,783	908,007	166,776	115,849	607,514	1,706,741	**1,923,187**	2,188,532	2,408,465	**2,639,467**	2,914,026
1989	62,503	12,959	549,204	196,771	8,779	748,265	**833,946**	942,760	16,017	45,725	651,653	109,720	111,406	667,440	1,441,934	**1,613,326**	1,814,445	2,254,572	**2,451,196**	2,673,247
1990	59,341	9,696	491,754	163,256	19,533	673,923	**748,057**	841,194	26,967	42,002	408,018	79,321	92,182	317,898	873,328	**975,717**	1,102,584	1,593,973	**1,727,153**	1,878,919
1991	72,252	14,078	429,626	138,470	23,667	611,668	**682,338**	766,612	19,490	46,338	291,353	77,229	51,510	316,962	729,204	**810,457**	906,670	1,384,070	**1,495,038**	1,619,722
1992	95,585	26,519	361,804	171,352	25,869	620,438	**686,316**	761,208	35,600	53,067	422,177	79,594	104,358	463,787	1,050,669	**1,171,846**	1,314,806	1,720,591	**1,859,762**	2,018,082
1993	67,175	21,812	363,117	147,043	27,659	573,194	**632,012**	698,568	50,992	51,993	343,271	109,497	122,173	414,907	999,089	**1,109,250**	1,247,866	1,615,319	**1,742,747**	1,895,964
1994	26,734	6,968	491,534	173,278	21,092	645,747	**725,799**	823,333	40,128	42,828	439,927	120,996	83,827	442,498	1,063,082	**1,185,239**	1,331,025	1,762,161	**1,914,203**	2,085,712
1995	26,230	20,064	320,546	156,137	30,689	504,872	**559,007**	620,264	13,304	58,003	491,004	92,821	77,843	434,453	1,056,624	**1,175,359**	1,317,058	1,601,810	**1,735,743**	1,889,034
1996	60,944	10,705	244,768	212,476	18,964	499,014	**551,639**	612,288	16,558	50,111	457,062	67,140	80,456	313,041	884,104	**990,907**	1,120,152	1,422,629	**1,544,053**	1,685,046
1997	52,073	14,646	282,533	208,688	8,673	512,640	**569,071**	633,705	8,513	36,597	457,458	61,062	95,458	224,923	789,851	**888,848**	1,012,309	1,340,594	**1,459,573**	1,596,683
1998	59,945	24,943	368,483	227,921	7,623	623,180	**692,944**	772,879	16,485	50,092	478,978	68,667	207,811	307,006	1,021,496	**1,138,962**	1,277,504	1,692,726	**1,833,285**	1,989,819
1999	86,106	12,689	342,099	176,589	11,260	571,057	**631,747**	700,326	5,508	40,720	445,660	55,957	54,208	151,609	665,621	**758,260**	875,915	1,277,172	**1,391,630**	1,525,707
2000	90,421	13,330	563,157	193,119	22,366	795,938	**886,723**	992,327	14,336	36,180	620,116	84,059	78,648	295,216	1,001,852	**1,136,268**	1,303,254	1,857,775	**2,025,220**	2,219,505
2001	40,955	12,116	486,276	261,151	14,653	719,674	**820,390**	948,548	12,417	32,392	493,574	75,535	62,202	290,199	883,407	**973,913**	1,078,153	1,655,012	**1,797,851**	1,960,922
2002	28,747	20,950	297,164	236,862	14,934	525,813	**602,887**	709,063	17,464	40,338	430,997	69,917	123,272	233,492	841,956	**924,314**	1,017,772	1,410,140	**1,531,802**	1,670,882
2003	33,876	11,124	412,777	211,009	9,094	596,578	**682,607**	787,967	11,462	48,254	421,782	50,237	80,368	266,267	807,438	**886,921**	976,657	1,448,705	**1,572,117**	1,710,029
2004	13,114	30,069	249,967	148,213	7,857	400,207	**452,091**	518,293	13,847	48,440	310,789	84,117	71,700	316,079	778,154	**854,373**	940,770	1,211,281	**1,308,684**	1,415,837
2005	33,351	26,777	370,770	168,543	6,678	541,201	**610,204**	695,893	9,016	71,433	309,410	69,196	91,401	343,334	826,007	**902,463**	987,042	1,407,171	**1,514,303**	1,633,733
2006	63,444	28,179	300,008	204,429	8,161	536,001	**607,653**	698,549	12,711	50,433	237,159	64,870	58,258	332,354	694,439	**765,035**	844,125	1,270,513	**1,375,012**	1,493,605
2007	11,763	20,907	167,891	110,073	3,865	278,573	**316,601**	365,033	9,901	57,724	270,172	62,235	94,686	326,310	722,292	**836,311**	1,064,718	1,030,234	**1,155,951**	1,387,055
2008	12,131	19,082	210,241	114,573	4,994	319,231	**363,174**	417,492	9,838	69,900	266,283	59,545	56,410	281,287	643,177	**761,087**	990,667	997,378	**1,128,185**	1,361,230
2009	24,761	30,847	168,476	109,001	5,305	300,423	**339,692**	386,864	3,515	79,129	222,496	37,775	43,021	240,405	541,664	**640,957**	825,919	870,512	**983,331**	1,171,337
2010	23,074	25,255	249,446	141,460	8,817	394,533	**449,874**	514,990	11,968	72,792	287,001	67,877	39,506	463,325	805,976	**971,210**	1,241,220	1,244,151	**1,422,743**	1,698,395
10yr Av.	28,522	22,531	291,301	170,531	8,436	461,223	524,517	604,269	11,214	57,083	324,966	64,130	72,082	309,305	754,451	**851,658**	996,704	1,254,510	**1,378,998**	1,550,302

Table 3.8.12.2. Estimated number (median values) of returning non-maturing 1SW salmon by NEAC country or region and year.

	Northern NEAC								Southern NEAC									NEAC Area		
Year	**Finland**	**Iceland**	**Norway**	**Russia**	**Sweden**	**Total**			**France**	**Iceland**	**Ireland**	**UK(EW)**	**UK(NI)**	**UK(Scot)**	**Total**			**Total**		
		N&E				2.5%	median	97.5%		**S&W**					2.5%	median	97.5%	2.5%	median	97.5%
1971	23,911	9,656		132,470	1,057				10,823	24,411	157,527	109,109	21,927	564,152	778,492	**896,648**	1,038,053			
1972	37,517	15,063		134,671	745				21,755	37,498	169,348	162,623	19,144	726,859	994,397	**1,147,000**	1,330,450			
1973	44,690	14,101		222,500	2,583				13,235	33,800	182,696	122,165	16,740	798,075	1,015,255	**1,175,419**	1,377,285			
1974	66,380	13,379		210,039	1,663				6,154	29,186	206,177	88,888	18,299	566,507	798,790	**924,209**	1,074,707			
1975	74,052	14,759		225,077	403				12,330	30,964	231,110	120,547	15,020	624,408	902,365	**1,044,663**	1,220,581			
1976	60,815	12,179		195,003	1,209				9,005	26,806	160,172	63,147	10,440	390,818	576,410	**667,003**	773,440			
1977	37,053	16,959		134,397	907				6,933	26,128	139,412	78,955	10,278	425,317	601,631	**693,887**	806,041			
1978	23,696	21,864		116,110	694				7,118	33,795	120,882	65,123	13,393	530,836	671,397	**778,034**	908,866			
1979	25,294	14,444		101,465	2,015				8,146	21,658	108,713	31,627	9,400	394,006	496,882	**578,784**	682,188			
1980	26,483	20,113		169,154	3,530				16,957	30,431	120,000	102,427	11,903	480,021	671,570	**770,707**	889,426			
1981	29,165	7,039		96,524	1,026				11,653	20,298	88,358	142,932	9,331	513,636	692,167	**795,243**	920,681			
1982	38,137	8,074		85,321	3,686				7,215	14,323	51,636	55,261	13,507	417,151	490,360	**562,478**	654,011			
1983	41,406	6,167	428,112	124,035	2,529	545,070	**608,153**	684,524	7,690	23,977	151,964	61,631	18,933	448,318	611,046	**730,755**	965,516			
1984	39,378	7,944	438,989	123,716	3,556	556,007	**618,874**	693,260	12,685	20,305	76,461	49,783	7,450	375,156	479,781	**544,614**	624,464	1,069,698	**1,165,512**	1,272,939
1985	30,643	5,117	405,213	135,393	1,487	523,945	**583,173**	651,655	9,503	14,714	83,651	73,127	9,655	461,600	577,646	**655,535**	751,911	1,137,797	**1,240,816**	1,357,276
1986	26,790	13,956	485,701	133,901	1,437	598,063	**667,668**	751,281	9,725	12,285	94,863	97,828	10,857	590,353	716,533	**820,460**	951,557	1,360,814	**1,491,242**	1,643,552
1987	33,504	14,458	366,775	99,458	4,280	472,293	**524,137**	586,401	5,165	10,915	117,430	78,177	5,547	386,273	533,856	**607,798**	696,476	1,038,679	**1,133,857**	1,241,240
1988	21,503	9,305	306,539	99,782	4,158	405,735	**445,777**	493,268	14,198	12,429	84,770	101,133	15,612	600,246	728,184	**833,461**	960,982	1,164,888	**1,280,725**	1,415,515
1989	24,291	7,893	219,257	97,146	11,633	328,937	**360,948**	399,120	6,514	11,090	77,586	79,811	12,429	523,640	630,160	**715,495**	819,425	984,703	**1,077,589**	1,186,799
1990	30,499	8,320	259,974	124,718	7,411	392,896	**431,369**	478,734	6,664	11,000	37,176	98,906	11,325	435,906	532,315	**605,758**	693,747	953,043	**1,038,579**	1,137,997
1991	36,714	5,779	220,215	122,244	8,547	359,487	**394,457**	435,485	6,056	10,958	55,989	42,527	5,815	331,852	402,373	**456,238**	521,607	784,989	**851,568**	928,663
1992	39,191	8,596	239,281	116,343	10,988	378,290	**415,450**	458,919	7,618	12,347	43,019	32,160	13,328	444,145	486,400	**553,819**	638,668	890,190	**970,891**	1,065,282
1993	45,459	9,729	229,629	137,645	15,060	404,145	**439,132**	479,303	3,577	6,059	42,035	35,173	31,428	364,151	425,811	**487,192**	562,210	854,114	**927,400**	1,011,727
1994	37,707	8,246	224,450	121,775	11,023	370,120	**404,960**	445,158	7,644	9,821	67,568	49,324	11,049	440,732	518,760	**589,113**	676,010	914,913	**995,496**	1,090,776
1995	23,350	5,732	240,614	138,699	7,683	382,403	**417,122**	458,181	3,645	11,064	65,211	49,839	9,343	406,944	483,975	**549,581**	633,686	890,561	**968,374**	1,061,069
1996	20,636	7,525	241,334	104,543	9,852	351,238	**385,436**	424,404	6,475	7,131	43,663	49,841	10,217	311,877	380,149	**433,148**	498,610	754,042	**819,776**	895,766
1997	29,961	4,237	159,311	85,194	6,421	260,997	**286,790**	316,320	3,340	8,020	56,497	31,578	12,756	215,000	287,460	**333,264**	388,173	566,347	**620,570**	682,601
1998	25,214	6,179	191,307	105,514	4,732	305,121	**334,295**	367,190	2,822	4,964	32,831	19,716	17,553	227,859	271,087	**307,587**	352,642	593,732	**642,869**	697,932
1999	23,630	7,088	204,223	93,014	4,055	300,959	**333,521**	371,437	6,099	9,679	51,015	45,061	7,964	175,191	255,365	**304,953**	372,951	577,662	**639,587**	716,464
2000	52,642	4,152	282,757	162,234	8,890	468,425	**512,720**	563,332	4,257	2,632	64,043	47,785	10,633	224,234	313,219	**359,379**	418,065	805,814	**873,379**	948,466
2001	75,695	4,767	333,334	114,787	10,716	490,265	**541,118**	599,262	4,965	4,615	56,957	50,045	7,812	212,934	296,350	**344,250**	405,578	813,145	**886,833**	969,395
2002	60,579	4,505	289,127	125,321	7,845	442,833	**489,107**	542,617	3,659	5,000	65,539	46,406	9,277	174,884	268,365	**311,437**	365,906	735,630	**802,025**	876,498
2003	43,060	4,739	255,473	87,196	8,965	364,175	**401,399**	443,950	5,339	7,998	69,304	54,046	6,036	217,874	314,245	**367,274**	434,415	702,601	**769,699**	848,190
2004	20,650	4,654	231,712	67,280	6,494	298,451	**331,606**	370,950	9,981	6,458	38,076	43,901	5,403	282,176	336,944	**391,853**	459,284	657,762	**724,557**	801,234
2005	15,944	5,775	213,219	80,513	4,927	291,077	**321,214**	355,695	6,112	5,703	49,307	50,993	6,887	222,299	300,179	**347,547**	408,243	611,214	**669,494**	738,714
2006	27,934	5,528	270,479	77,272	4,922	350,693	**386,786**	428,141	6,148	4,726	35,605	43,731	4,390	231,072	283,254	**334,476**	396,616	657,048	**721,926**	795,950
2007	39,784	5,316	230,028	80,509	6,804	331,594	**363,363**	399,433	5,836	2,910	15,972	40,111	6,040	221,612	252,692	**297,827**	355,118	604,620	**661,903**	728,688
2008	37,838	6,848	265,215	125,931	9,712	401,243	**445,955**	499,249	6,449	3,330	24,029	44,915	3,651	248,759	284,866	**337,456**	406,465	712,056	**785,178**	870,829
2009	17,624	5,513	207,560	107,060	8,793	311,820	**346,765**	389,221	3,366	4,992	26,977	32,724	4,791	208,055	240,101	**286,036**	343,136	572,910	**634,084**	704,552
2010	27,872	8,749	228,971	136,585	10,813	369,099	**410,849**	459,028	2,835	6,409	18,464	57,331	4,381	286,804	317,772	**385,130**	473,855	713,870	**797,830**	897,372
10yr Av.	36,698	5,639	252,512	100,245	7,999	365,125	**403,816**	448,755	5,469	5,214	40,023	46,420	5,867	230,647	289,477	**340,328**	404,862	678,085	**745,353**	823,142

Table 3.8.12.3. Estimated pre fishery abundance (median values) of maturing 1SW salmon (potential 1SW returns) by NEAC country or region and year.

Year	Northern NEAC								Southern NEAC									NEAC Area		
	Finland	Iceland N&E	Norway	Russia	Sweden	Total			France	Iceland S&W	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total			Total		
						2.5%	median	97.5%							2.5%	median	97.5%	2.5%	median	97.5%
1971	33,568	11,990		199,595	22,699				63,833	79,633	1,344,339	127,406	231,501	777,447	2,240,138	**2,639,297**	3,148,796			
1972	52,207	10,960		151,360	18,109				127,173	64,444	1,433,859	110,606	202,472	680,614	2,224,101	**2,639,313**	3,169,791			
1973	47,523	13,171		223,076	22,366				78,114	69,303	1,558,964	128,794	177,052	814,766	2,399,179	**2,845,967**	3,423,107			
1974	93,523	13,106		221,434	31,784				36,458	49,276	1,776,290	158,909	193,498	774,199	2,513,192	**3,001,129**	3,643,616			
1975	65,334	15,985		340,405	34,273				72,551	76,465	1,959,189	161,101	158,846	631,892	2,555,423	**3,076,889**	3,775,086			
1976	44,746	16,071		237,283	19,355				66,452	60,377	1,332,796	107,769	110,492	547,187	1,869,738	**2,236,679**	2,715,715			
1977	23,031	22,362		151,204	9,224				51,198	61,911	1,152,663	120,357	108,754	566,364	1,745,416	**2,071,851**	2,499,186			
1978	31,278	22,709		152,607	10,451				52,547	81,073	1,010,460	135,365	141,544	648,862	1,768,030	**2,079,506**	2,470,075			
1979	36,623	21,707		212,003	11,138				60,158	74,726	926,499	127,773	99,572	534,709	1,555,787	**1,835,530**	2,188,289			
1980	17,112	3,293		151,635	14,587				125,412	33,947	704,939	119,530	126,453	334,652	1,240,976	**1,462,635**	1,740,335			
1981	26,471	16,923		127,019	26,262				100,473	43,786	373,259	125,422	99,747	413,511	1,020,920	**1,168,286**	1,339,711			
1982	8,614	7,814		111,513	23,120				62,344	45,035	769,902	106,911	143,759	594,458	1,503,108	**1,734,105**	2,006,309			
1983	37,710	11,508	897,350	184,644	30,503	1,002,679	**1,170,966**	1,373,397	66,858	56,860	1,356,966	153,394	201,378	604,539	2,107,459	**2,453,350**	2,878,939			
1984	41,230	4,187	931,549	197,034	41,645	1,043,917	**1,222,316**	1,440,943	108,123	35,022	712,159	132,480	79,273	637,642	1,493,652	**1,720,485**	1,990,353	2,609,960	**2,946,155**	3,332,671
1985	61,803	28,882	947,216	270,247	49,202	1,178,743	**1,366,475**	1,591,819	40,418	56,698	1,179,505	132,188	102,399	527,582	1,750,738	**2,049,822**	2,414,921	3,011,983	**3,421,135**	3,893,889
1986	56,405	35,873	826,380	231,029	52,042	1,048,172	**1,210,224**	1,400,892	62,481	93,115	1,320,942	150,570	115,147	655,263	2,070,988	**2,422,680**	2,858,495	3,198,159	**3,639,142**	4,152,583
1987	71,795	21,157	694,835	246,463	42,202	945,389	**1,085,202**	1,251,353	109,849	57,931	850,497	156,498	63,111	506,309	1,506,505	**1,775,495**	2,122,440	2,515,957	**2,865,877**	3,287,225
1988	34,697	30,622	638,336	170,029	35,486	801,734	**916,682**	1,055,232	38,205	104,095	1,154,609	213,200	147,956	768,014	2,104,454	**2,444,158**	2,862,351	2,961,192	**3,363,662**	3,842,438
1989	79,945	16,482	701,514	251,252	11,566	923,930	**1,067,271**	1,239,437	20,803	58,155	828,190	140,437	142,187	842,276	1,772,795	**2,047,503**	2,374,446	2,762,468	**3,118,260**	3,526,013
1990	75,892	12,346	627,849	208,711	25,170	831,198	**955,201**	1,106,571	34,658	53,478	518,651	101,523	117,614	401,893	1,074,899	**1,240,666**	1,442,422	1,954,930	**2,199,225**	2,484,217
1991	92,012	17,935	547,492	177,729	30,235	755,972	**871,076**	1,008,831	25,001	59,032	370,073	98,508	65,695	400,367	895,499	**1,029,655**	1,189,741	1,693,578	**1,902,914**	2,142,179
1992	121,726	33,749	460,576	218,958	33,027	763,768	**874,122**	1,002,346	45,375	67,535	536,231	101,365	132,835	584,913	1,290,615	**1,485,983**	1,718,803	2,101,737	**2,363,095**	2,659,812
1993	85,543	27,792	462,449	188,065	35,254	705,228	**805,436**	921,363	65,058	66,248	436,571	139,509	155,532	523,080	1,226,165	**1,407,357**	1,628,164	1,972,757	**2,214,882**	2,496,026
1994	34,119	8,870	625,549	222,573	26,928	796,783	**926,532**	1,081,371	51,223	54,519	559,089	154,197	106,732	557,687	1,303,725	**1,502,456**	1,740,259	2,154,406	**2,431,805**	2,747,084
1995	33,479	25,538	408,487	199,867	39,171	622,585	**713,118**	819,560	17,036	73,828	623,820	118,382	99,147	547,368	1,296,024	**1,489,803**	1,724,228	1,958,406	**2,205,316**	2,491,976
1996	77,626	13,620	311,743	272,063	24,199	614,488	**704,009**	810,194	21,145	63,760	580,743	85,590	102,519	394,508	1,086,097	**1,256,659**	1,462,976	1,740,243	**1,963,454**	2,222,804
1997	66,324	18,642	359,308	267,501	11,031	631,191	**725,802**	836,868	10,817	46,581	580,993	77,620	121,569	283,425	969,215	**1,127,563**	1,323,574	1,640,332	**1,855,490**	2,105,311
1998	76,291	31,754	468,759	293,381	9,720	769,087	**884,079**	1,021,287	20,979	63,770	608,340	87,466	264,468	386,403	1,254,846	**1,443,778**	1,670,346	2,070,961	**2,330,473**	2,628,994
1999	109,507	16,148	434,962	225,837	14,317	702,384	**804,265**	923,766	7,008	51,821	565,825	71,161	68,943	190,817	819,639	**962,348**	1,142,440	1,562,956	**1,769,578**	2,011,153
2000	115,172	16,962	716,685	247,696	28,494	980,839	**1,130,186**	1,305,769	18,242	46,039	787,822	106,987	100,049	371,755	1,233,565	**1,440,355**	1,700,029	2,276,086	**2,575,079**	2,923,944
2001	52,066	15,425	618,530	334,925	18,631	888,614	**1,046,625**	1,244,453	15,797	41,239	627,614	96,027	79,131	364,957	1,078,911	**1,234,783**	1,416,534	2,023,240	**2,285,301**	2,589,323
2002	36,558	26,687	378,126	304,119	18,989	650,427	**770,858**	932,532	22,202	51,390	548,221	88,992	156,725	293,848	1,028,958	**1,172,181**	1,340,861	1,722,969	**1,946,422**	2,209,233
2003	43,064	14,154	524,914	269,744	11,564	738,186	**869,709**	1,032,727	14,588	61,401	536,393	63,881	102,406	335,434	986,794	**1,124,848**	1,286,680	1,772,199	**1,997,307**	2,256,811
2004	16,698	38,266	318,010	189,594	9,988	493,684	**576,612**	680,897	17,612	61,653	395,489	107,016	91,392	398,459	952,048	**1,082,342**	1,233,828	1,479,635	**1,660,943**	1,867,852
2005	42,469	34,053	471,657	216,182	8,502	667,376	**777,963**	913,852	11,472	90,826	393,908	87,982	116,307	432,710	1,009,475	**1,143,276**	1,297,047	1,716,958	**1,923,461**	2,158,454
2006	80,628	35,875	381,436	261,357	10,371	661,923	**774,766**	917,218	16,167	64,197	301,595	82,532	74,097	418,997	849,530	**968,800**	1,105,458	1,551,104	**1,745,817**	1,968,679
2007	14,977	26,605	213,532	140,615	4,926	344,220	**403,646**	478,653	12,602	73,443	344,066	79,166	120,452	411,375	889,437	**1,063,690**	1,373,950	1,265,449	**1,473,697**	1,799,822
2008	15,429	24,293	267,519	146,470	6,354	394,393	**462,835**	547,829	12,507	88,972	339,032	75,813	71,763	354,498	794,722	**967,620**	1,277,818	1,226,338	**1,437,466**	1,766,794
2009	31,489	39,270	214,284	137,802	6,747	370,302	**431,399**	504,804	4,467	100,745	283,065	48,025	54,670	302,944	666,561	**813,528**	1,064,376	1,069,031	**1,249,930**	1,521,078
2010	29,356	32,155	317,456	178,614	11,222	487,079	**570,981**	670,867	15,232	92,655	365,327	86,359	50,325	583,483	996,637	**1,229,576**	1,596,214	1,530,372	**1,805,369**	2,197,053
10yr Av.	36,274	28,678	370,547	217,942	10,729	569,620	**668,539**	792,383	14,265	72,652	413,471	81,579	91,727	389,671	925,307	**1,080,064**	1,299,277	1,535,729	**1,752,571**	2,033,510

Table 3.8.12.4. Estimated pre fishery abundance (median values) of non-maturing 1SW salmon (potential MSW returns) by NEAC country or region and year.

Year	Northern NEAC								Southern NEAC									NEAC Area		
	Finland	Iceland N&E	Norway	Russia	Sweden	Total 2.5%	Total median	Total 97.5%	France	Iceland S&W	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total 2.5%	Total median	Total 97.5%	Total 2.5%	Total median	Total 97.5%
1971	63,447	26,037		270,747	7,389				56,394	63,499	401,682	394,450	31,956	1,737,264	2,238,000	**2,697,076**	3,278,712			
1972	75,289	24,377		430,928	10,289				36,185	57,263	392,656	292,373	27,945	1,720,197	2,074,687	**2,537,468**	3,129,722			
1973	111,305	22,953		398,134	7,024				20,431	49,367	407,073	212,105	30,530	1,223,221	1,597,801	**1,955,357**	2,408,376			
1974	124,416	25,382		432,411	5,851				31,557	52,473	455,991	272,140	25,087	1,347,815	1,792,981	**2,197,213**	2,717,409			
1975	102,073	20,942		368,072	6,076				27,989	45,390	344,259	182,660	17,431	989,912	1,343,482	**1,614,414**	1,951,649			
1976	62,266	28,703		254,136	4,228				19,426	44,013	280,445	180,878	17,170	920,180	1,202,108	**1,470,711**	1,808,046			
1977	39,993	36,873		217,594	3,462				20,145	56,812	250,528	158,909	22,386	1,104,584	1,321,546	**1,621,549**	2,007,060			
1978	42,514	24,532		201,287	6,357				18,623	36,579	214,993	84,500	15,697	804,645	956,389	**1,183,229**	1,473,940			
1979	44,613	34,566		351,769	13,067				35,824	51,805	256,921	223,718	19,874	1,043,026	1,345,801	**1,641,382**	2,014,102			
1980	49,010	13,261		255,209	12,978				26,310	35,413	210,785	294,099	15,568	1,120,329	1,402,163	**1,713,882**	2,104,575			
1981	63,906	14,837		228,299	16,367				17,792	25,267	140,994	136,191	22,516	921,661	1,041,062	**1,268,735**	1,554,930			
1982	69,411	11,350		280,314	12,209				17,515	41,082	297,856	139,504	31,592	931,262	1,177,728	**1,499,560**	2,001,072			
1983	65,888	13,949	819,634	258,462	11,019	961,670	**1,173,892**	1,435,324	23,380	34,605	150,913	102,392	12,430	725,766	854,352	**1,052,587**	1,300,186	1,852,501	**2,227,111**	2,681,342
1984	51,404	9,281	770,430	282,836	8,025	923,376	**1,123,813**	1,371,091	17,633	25,327	161,658	140,662	16,106	864,131	994,111	**1,228,681**	1,527,864	1,954,062	**2,356,010**	2,842,832
1985	45,047	24,182	916,753	284,288	8,843	1,050,147	**1,282,834**	1,570,128	21,661	21,389	201,943	203,971	18,110	1,175,117	1,337,677	**1,647,698**	2,047,058	2,437,365	**2,934,412**	3,543,522
1986	56,333	24,963	714,321	221,398	13,277	853,195	**1,036,102**	1,257,318	13,481	19,050	235,533	167,032	9,260	814,668	1,035,809	**1,263,337**	1,550,632	1,922,113	**2,301,197**	2,758,477
1987	36,090	16,038	568,426	202,550	10,423	689,488	**837,972**	1,019,179	28,258	21,263	172,835	201,843	26,060	1,145,106	1,295,518	**1,602,263**	1,987,717	2,018,206	**2,441,807**	2,962,013
1988	40,867	13,819	440,349	205,194	23,914	598,043	**721,085**	872,122	16,529	19,166	169,757	172,491	20,765	1,051,805	1,188,221	**1,454,780**	1,788,531	1,810,915	**2,177,409**	2,622,184
1989	51,140	14,462	505,427	253,321	16,639	691,075	**836,565**	1,014,942	12,973	18,940	81,865	184,474	18,887	813,673	916,305	**1,136,047**	1,413,802	1,635,174	**1,974,891**	2,385,648
1990	61,425	9,875	396,712	229,510	16,011	582,571	**709,642**	866,146	11,070	18,520	102,130	79,885	9,705	595,943	659,527	**820,521**	1,026,010	1,265,907	**1,530,647**	1,854,763
1991	65,555	14,505	413,816	210,460	19,298	590,169	**719,506**	879,265	14,949	20,778	85,460	68,204	22,226	808,269	821,547	**1,020,837**	1,278,176	1,437,625	**1,741,908**	2,117,635
1992	76,037	16,357	396,204	248,301	26,006	625,138	**757,768**	920,378	7,380	10,227	79,476	68,962	52,437	654,345	703,756	**879,165**	1,101,549	1,353,048	**1,638,351**	1,984,324
1993	63,065	13,879	388,222	223,091	19,190	577,165	**703,688**	859,160	12,833	16,510	114,750	86,115	18,418	752,150	800,967	**1,005,218**	1,267,692	1,404,924	**1,711,432**	2,087,870
1994	39,082	9,694	417,203	253,350	13,743	596,514	**726,396**	885,257	6,155	18,605	111,235	87,133	15,597	697,970	747,970	**941,856**	1,190,880	1,370,766	**1,669,531**	2,037,655
1995	34,537	12,680	417,311	192,771	17,330	549,841	**670,675**	818,606	11,272	12,022	77,207	89,265	17,105	545,225	602,478	**756,800**	953,711	1,175,699	**1,429,094**	1,737,052
1996	50,170	7,086	266,762	151,783	10,805	395,754	**483,867**	593,710	5,953	13,406	96,491	56,493	21,361	372,426	453,397	**573,887**	728,343	868,925	**1,058,516**	1,295,364
1997	42,196	10,325	320,487	187,736	7,969	461,929	**563,737**	689,457	4,891	8,297	55,640	34,983	29,366	389,174	418,783	**524,666**	661,513	899,161	**1,089,284**	1,322,934
1998	39,468	11,855	341,166	166,102	6,786	456,922	**562,598**	695,406	10,260	16,181	85,640	78,027	13,311	297,953	396,163	**517,113**	680,050	877,246	**1,082,289**	1,337,155
1999	87,916	6,949	473,482	289,171	14,913	707,283	**865,633**	1,056,320	7,160	4,406	107,059	82,735	17,774	380,048	480,581	**607,701**	772,504	1,214,699	**1,474,241**	1,789,584
2000	126,433	7,967	556,908	204,234	17,920	740,548	**910,342**	1,119,821	8,439	7,711	95,995	87,069	13,060	363,648	458,399	**584,594**	751,166	1,229,196	**1,497,470**	1,824,682
2001	101,296	7,538	483,326	222,969	13,143	670,161	**824,885**	1,015,620	6,319	8,360	110,681	81,070	15,512	299,839	419,029	**531,821**	678,757	1,114,241	**1,358,440**	1,655,711
2002	71,877	7,921	427,028	155,807	14,985	550,711	**676,114**	830,048	9,013	13,349	116,198	93,541	10,145	369,366	485,399	**622,286**	799,444	1,062,093	**1,300,022**	1,592,159
2003	34,476	7,793	387,090	120,194	10,859	452,206	**558,426**	691,341	16,729	10,791	64,038	75,908	9,073	478,161	519,681	**663,030**	848,011	997,063	**1,223,113**	1,502,530
2004	26,655	9,657	356,320	144,014	8,239	441,256	**541,469**	667,795	10,296	9,527	82,737	88,501	11,514	377,096	463,246	**588,150**	753,760	926,420	**1,131,615**	1,389,071
2005	46,693	9,264	451,774	137,669	8,235	530,529	**649,881**	799,222	10,336	7,908	59,937	75,766	7,345	392,072	439,575	**565,187**	730,821	996,516	**1,216,600**	1,491,198
2006	66,447	8,910	384,673	142,612	11,380	499,332	**610,195**	745,369	9,856	4,867	27,374	69,734	10,089	377,021	392,415	**505,593**	654,948	914,377	**1,117,142**	1,365,634
2007	63,200	11,472	443,385	225,283	16,225	609,498	**752,882**	932,070	10,825	5,573	40,666	77,539	6,115	422,474	441,004	**573,062**	747,179	1,081,739	**1,327,677**	1,633,110
2008	29,441	9,235	346,929	190,698	14,691	473,237	**584,885**	725,085	5,680	8,339	45,512	56,693	7,982	352,762	373,212	**484,500**	631,205	871,942	**1,070,784**	1,319,194
2009	46,597	14,616	382,467	243,537	18,074	562,345	**694,437**	859,538	4,775	10,715	31,084	99,018	7,335	486,579	492,763	**651,522**	867,649	1,087,326	**1,349,104**	1,676,653
10yr Av.	61,311	9,437	421,990	178,702	13,375	552,982	**680,351**	838,591	9,227	8,714	67,422	80,484	9,817	391,902	448,472	**576,975**	746,294	1,028,091	**1,259,197**	1,544,994

Table 3.8.12.5. Estimated number (median values) of 1SW spawners by NEAC country or region and year.

Year	Northern NEAC								Southern NEAC									NEAC Area		
	Finland	**Iceland N&E**	**Norway**	**Russia**	**Sweden**	**Total**			**France**	**Iceland S&W**	**Ireland**	**UK(EW)**	**UK(NI)**	**UK(Scot)**	**Total**			**Total**		
						2.5%	median	97.5%							2.5%	median	97.5%	2.5%	median	97.5%
1971	13,002	4,713		77,688	8,264				48,082	31,304	395,689	51,836	36,423	213,839	575,014	**785,807**	1,073,592			
1972	20,299	4,295		59,440	6,525				96,006	25,257	421,405	45,212	31,796	168,324	577,361	**804,648**	1,107,155			
1973	18,437	5,190		88,846	8,079				58,793	27,308	457,898	52,671	27,800	204,071	601,008	**842,663**	1,175,563			
1974	36,559	5,142		89,621	11,665				27,358	19,333	522,176	65,438	30,404	172,975	584,179	**846,681**	1,213,903			
1975	25,464	6,276		133,743	12,525				54,639	30,020	576,159	65,906	24,948	154,517	637,324	**916,984**	1,320,898			
1976	17,417	6,321		90,540	7,051				50,158	23,747	390,890	43,343	17,339	160,205	497,184	**693,216**	972,154			
1977	8,949	8,794		58,559	3,333				38,598	24,348	338,624	47,999	17,109	140,083	439,522	**613,415**	857,546			
1978	12,223	8,924		58,315	3,819				39,755	31,859	297,579	54,366	22,240	187,886	476,849	**640,179**	860,323			
1979	14,249	8,521		84,306	4,009				45,369	29,333	271,957	52,145	15,642	124,779	400,403	**548,659**	748,641			
1980	6,384	1,292		60,043	5,087				94,483	13,320	206,455	47,782	19,753	82,143	354,470	**477,406**	637,204			
1981	9,875	6,628		49,741	9,251				75,181	17,149	70,666	49,768	15,493	98,617	259,583	**336,936**	425,354			
1982	2,883	3,068		45,215	8,095				46,253	17,681	169,016	42,292	22,419	170,652	363,287	**478,462**	614,483			
1983	14,247	4,517	160,750	75,100	10,795	199,994	**261,584**	336,680	49,621	22,319	360,573	60,714	31,462	149,924	517,551	**684,884**	896,205	764,056	**948,551**	1,173,707
1984	15,917	1,644	163,878	80,952	15,168	215,882	**282,293**	362,677	81,492	13,756	197,349	52,232	12,356	189,026	439,409	**558,997**	697,235	702,238	**843,728**	1,001,577
1985	24,017	11,354	171,881	107,388	18,060	256,647	**324,784**	405,590	30,258	22,290	234,435	52,096	16,046	178,523	397,841	**541,883**	724,507	702,826	**870,100**	1,069,115
1986	21,879	14,075	152,385	92,541	19,061	255,080	**316,386**	387,514	45,173	36,534	324,086	59,550	18,022	224,259	548,114	**728,564**	955,293	851,638	**1,047,231**	1,282,420
1987	27,976	8,294	127,502	97,858	15,431	228,762	**281,527**	342,055	79,860	22,710	200,818	62,275	15,278	168,474	430,525	**574,231**	782,544	700,255	**857,560**	1,072,456
1988	13,388	12,046	117,370	73,648	12,936	206,149	**249,938**	301,665	27,507	40,948	343,378	85,562	41,170	384,024	767,113	**938,539**	1,148,620	1,010,195	**1,189,573**	1,404,564
1989	24,965	6,490	184,680	103,813	4,139	265,103	**320,924**	394,196	14,893	22,900	222,431	55,852	12,294	440,594	641,385	**782,023**	945,054	949,947	**1,105,096**	1,282,174
1990	23,706	4,847	165,208	91,871	10,719	257,154	**306,739**	369,749	25,081	20,994	159,636	40,552	35,062	197,643	405,145	**489,958**	594,147	695,556	**799,036**	918,648
1991	28,905	7,037	143,999	87,860	12,998	232,778	**280,099**	337,404	18,128	23,163	117,871	39,986	18,308	214,738	371,090	**440,641**	522,539	635,084	**722,485**	819,862
1992	38,224	13,257	121,734	125,392	14,213	262,180	**307,668**	359,845	33,110	26,528	159,610	41,088	45,946	332,963	550,254	**653,506**	776,344	848,189	**962,386**	1,094,631
1993	26,830	10,904	120,900	108,526	15,176	248,024	**292,030**	341,080	47,411	25,991	141,551	60,192	72,110	275,013	540,620	**638,817**	767,109	822,810	**931,811**	1,067,907
1994	10,689	3,484	165,952	126,621	11,590	258,068	**312,536**	381,100	37,318	21,414	125,204	66,056	25,193	298,130	483,879	**590,010**	715,511	780,727	**904,893**	1,046,171
1995	10,467	10,029	107,408	111,082	19,126	232,334	**272,939**	318,973	11,635	28,993	178,336	53,812	25,755	298,858	507,435	**607,143**	724,164	771,447	**880,919**	1,006,260
1996	30,480	5,352	80,921	155,084	11,850	232,547	**270,187**	311,528	14,495	25,055	182,890	39,617	34,736	227,998	444,298	**532,632**	638,949	706,339	**803,551**	916,944
1997	26,050	7,321	105,263	158,446	5,416	260,595	**304,247**	351,790	7,453	18,294	227,716	37,931	38,294	158,625	412,262	**493,712**	596,237	702,982	**799,198**	911,427
1998	29,912	12,473	138,500	172,661	4,750	299,585	**351,154**	409,210	14,420	25,049	220,819	44,552	155,965	233,550	604,481	**704,966**	823,558	942,322	**1,057,504**	1,187,482
1999	34,405	6,596	127,677	137,324	7,023	290,319	**340,491**	396,864	4,818	20,762	232,321	38,232	20,092	107,831	354,071	**428,958**	526,523	676,663	**771,401**	883,013
2000	36,149	6,930	213,213	149,562	13,964	346,130	**414,735**	495,354	12,544	18,447	350,842	56,825	33,051	218,803	587,227	**699,490**	841,070	979,440	**1,116,706**	1,278,384
2001	16,415	6,423	185,983	225,631	9,164	348,067	**419,878**	503,648	10,873	16,847	256,953	53,121	31,152	221,277	508,640	**597,930**	701,150	900,007	**1,019,567**	1,151,633
2002	14,377	11,295	111,652	200,401	9,327	295,212	**359,847**	438,246	13,960	20,944	216,034	49,091	70,362	179,893	478,071	**559,285**	651,395	812,181	**920,792**	1,041,116
2003	16,919	6,005	156,933	179,677	5,675	315,371	**387,523**	471,780	9,162	25,088	247,403	37,532	41,161	227,986	518,215	**596,824**	685,638	875,014	**986,251**	1,109,528
2004	6,556	16,551	93,859	122,298	4,903	222,646	**269,423**	325,402	11,066	25,210	156,951	60,923	40,900	266,951	496,029	**571,715**	656,908	749,929	**842,574**	943,757
2005	16,659	15,005	140,194	140,882	4,166	257,677	**311,084**	372,456	7,203	37,175	171,625	50,717	55,729	293,771	549,398	**625,017**	709,012	842,307	**937,175**	1,040,065
2006	31,688	15,499	111,137	171,794	5,094	270,649	**327,998**	395,301	10,153	26,221	126,890	48,694	38,439	286,702	476,719	**546,626**	624,724	782,680	**875,829**	978,116
2007	5,880	11,709	61,925	91,747	2,413	168,614	**206,763**	254,343	7,910	30,586	250,361	47,823	75,092	285,333	598,770	**712,423**	940,680	796,997	**922,014**	1,153,357
2008	6,061	11,055	87,872	96,833	3,616	167,941	**202,880**	243,112	7,861	36,997	244,942	45,819	43,471	251,157	530,737	**648,081**	877,698	727,983	**853,116**	1,084,861
2009	12,396	18,522	71,614	92,056	3,853	173,160	**208,834**	251,572	2,812	41,188	206,952	29,180	34,771	217,250	447,603	**546,697**	731,539	647,488	**757,760**	945,583
2010	11,548	15,390	115,876	119,534	6,395	214,237	**260,543**	316,343	9,575	38,537	265,252	52,172	32,172	413,375	675,341	**839,972**	1,109,911	927,932	**1,102,010**	1,375,731
10yr Av.	13,850	12,745	113,704	144,085	5,460	243,357	**295,477**	357,220	9,057	29,879	214,336	47,507	46,325	264,370	527,952	**624,457**	768,866	806,252	**921,709**	1,082,375

Table 3.8.12.6. Estimated number (median values) of MSW spawners by NEAC country or region and year.

Year	Northern NEAC								Southern NEAC									NEAC Area		
	Finland	Iceland	Norway	Russia	Sweden	Total			France	Iceland	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total			Total		
		N&E				2.5%	median	97.5%		N&E					2.5%	median	97.5%	2.5%	median	97.5%
1971	10,745	2,897		54,760	445				6,763	7,324	82,563	70,271	10,977	307,526	389,413	**494,526**	621,316			
1972	16,959	4,515		56,612	316				13,635	11,241	88,924	105,538	9,588	389,028	493,060	**628,923**	792,287			
1973	20,053	4,232		92,744	1,088				8,265	10,144	95,583	79,160	8,380	434,488	505,027	**645,582**	825,611			
1974	29,802	4,017		91,379	700				3,844	8,762	107,922	57,651	9,158	284,324	370,732	**481,876**	616,425			
1975	33,270	4,413		93,514	170				7,710	9,258	121,012	78,042	7,519	311,294	420,026	**546,724**	703,233			
1976	27,280	3,659		77,664	509				5,625	8,054	83,820	40,501	5,228	225,603	294,407	**375,798**	472,169			
1977	16,661	5,089		54,750	382				4,333	7,841	73,137	50,223	5,148	209,781	275,601	**357,598**	457,536			
1978	10,665	6,566		45,555	292				4,453	10,149	63,373	41,672	6,704	287,449	328,316	**421,385**	536,637			
1979	13,886	4,346		41,952	849				5,091	6,516	56,912	20,413	4,708	202,606	230,423	**302,049**	392,402			
1980	14,530	6,045		68,584	1,489				10,587	9,146	62,790	65,803	5,952	242,285	315,105	**406,416**	516,541			
1981	16,041	2,113		40,821	433				7,573	6,093	46,255	91,710	4,668	255,409	326,479	**421,363**	537,860			
1982	21,002	2,420		37,590	1,559				4,695	4,294	32,674	35,479	6,754	238,691	260,576	**326,380**	411,339			
1983	22,702	1,857	101,115	57,458	1,061	143,231	**182,506**	229,267	4,990	7,221	109,277	39,385	9,473	242,369	316,279	**430,874**	662,132	489,700	**615,427**	850,708
1984	21,644	2,386	103,920	59,529	1,501	157,397	**197,483**	244,030	8,245	6,098	43,126	31,655	3,729	224,301	260,713	**319,884**	394,396	443,424	**518,788**	606,149
1985	16,829	1,535	95,703	58,943	626	135,373	**171,316**	212,334	6,173	4,414	53,495	46,494	4,834	296,697	343,081	**415,451**	505,456	504,321	**588,163**	686,284
1986	14,736	4,191	114,522	54,638	607	150,575	**193,140**	243,476	6,325	3,689	51,162	62,463	5,432	379,856	417,658	**513,854**	636,765	600,275	**708,693**	841,335
1987	18,439	4,346	89,373	44,211	1,805	137,720	**173,978**	215,618	3,359	3,281	79,494	49,992	2,999	244,161	319,710	**388,105**	471,112	482,985	**563,216**	655,540
1988	11,831	2,793	72,923	48,952	1,757	112,960	**139,575**	170,182	9,234	3,731	52,977	64,639	10,001	443,608	490,285	**589,613**	710,720	625,119	**729,727**	853,731
1989	10,928	2,368	77,561	44,953	4,900	123,868	**147,513**	175,149	4,232	3,327	40,853	50,695	4,978	390,611	416,997	**499,320**	599,778	560,768	**647,820**	751,610
1990	13,716	2,493	91,173	55,080	3,694	133,013	**160,111**	193,359	4,332	3,297	14,898	63,069	7,026	310,739	337,442	**408,097**	493,563	491,555	**569,174**	660,525
1991	16,465	1,732	76,502	59,595	4,258	134,160	**160,667**	191,156	3,931	3,285	41,124	27,306	3,314	250,451	280,430	**332,514**	396,261	433,649	**493,943**	564,049
1992	17,571	2,572	84,375	57,223	5,470	141,628	**169,871**	202,311	4,947	3,694	20,896	20,635	8,928	345,414	340,432	**405,648**	488,810	502,734	**576,760**	665,908
1993	20,412	2,920	78,394	66,782	7,512	138,592	**166,648**	198,005	2,323	1,819	24,310	23,587	27,659	275,274	299,921	**359,896**	433,145	459,334	**527,344**	606,373
1994	16,988	2,474	76,850	66,550	5,509	140,630	**168,278**	198,619	5,354	2,947	40,194	32,926	6,631	334,739	357,648	**425,623**	510,491	519,537	**594,574**	684,607
1995	10,491	1,718	83,534	67,851	4,408	137,962	**165,651**	197,604	2,550	3,316	37,948	34,685	5,421	305,685	329,566	**392,942**	474,871	487,602	**559,698**	647,717
1996	11,336	2,264	82,956	53,930	5,651	138,667	**166,704**	197,702	4,532	2,146	19,629	34,993	6,775	241,050	261,589	**312,930**	377,042	419,615	**480,591**	552,058
1997	16,499	1,271	57,717	44,578	3,690	110,210	**133,407**	159,393	2,339	2,405	39,156	23,033	8,445	164,333	200,483	**245,937**	300,159	327,782	**379,798**	439,873
1998	13,862	1,854	69,654	48,468	2,717	107,742	**131,268**	157,756	1,976	1,489	12,527	14,788	13,658	181,700	192,029	**227,892**	272,284	314,702	**359,808**	411,379
1999	11,810	2,483	72,132	52,764	2,328	118,139	**144,059**	173,489	4,268	3,101	33,570	36,713	5,393	133,454	177,315	**226,453**	294,177	313,751	**371,309**	444,437
2000	26,323	1,495	102,864	85,071	5,104	162,451	**195,750**	233,323	2,980	895	44,180	40,542	7,201	175,740	231,803	**277,371**	335,638	414,535	**474,008**	541,792
2001	37,816	1,808	122,678	71,684	6,155	216,017	**259,350**	308,081	3,476	1,520	37,028	42,982	5,475	167,075	216,989	**264,558**	325,547	457,452	**524,938**	600,954
2002	30,197	1,799	107,102	75,479	4,488	182,254	**220,081**	263,118	2,278	1,747	47,474	39,847	5,297	139,342	199,776	**242,587**	296,819	404,093	**463,682**	532,001
2003	21,565	2,229	95,701	52,112	5,156	158,097	**189,607**	225,616	3,344	2,561	54,423	47,788	3,087	184,541	249,710	**302,511**	369,324	429,505	**493,174**	568,476
2004	10,331	2,095	87,531	38,427	3,734	125,689	**153,169**	185,416	6,244	2,132	24,773	38,456	3,085	238,843	265,067	**319,461**	386,357	410,182	**473,586**	546,887
2005	7,963	2,659	79,146	43,688	2,825	106,684	**129,739**	156,416	3,812	1,998	37,714	44,849	4,201	188,116	239,989	**286,927**	347,267	363,259	**417,235**	482,811
2006	13,947	3,036	101,057	42,781	2,820	138,812	**168,288**	202,118	3,832	1,651	25,082	38,908	2,898	198,771	229,103	**279,926**	341,643	387,978	**448,803**	518,896
2007	19,919	3,406	83,822	39,181	3,913	125,600	**151,878**	181,359	3,654	991	14,361	36,040	4,789	193,193	213,462	**258,403**	315,338	357,081	**411,005**	474,431
2008	18,931	3,772	125,764	73,579	6,556	165,610	**201,148**	244,072	4,032	1,434	21,389	40,336	2,780	218,403	242,530	**294,784**	363,638	430,437	**497,466**	577,622
2009	8,807	3,531	99,984	59,291	5,933	156,007	**188,724**	228,359	2,101	1,749	23,589	29,387	3,873	185,368	205,462	**251,244**	308,053	381,639	**441,191**	510,129
2010	13,930	5,773	122,851	77,798	7,293	176,344	**211,741**	253,021	1,771	2,436	16,012	51,514	3,567	251,493	268,640	**335,724**	424,219	469,262	**548,991**	645,236
10yr Av.	18,341	3,011	102,564	57,402	4,887	155,111	**187,372**	224,758	3,454	1,822	30,185	41,011	3,905	196,515	233,073	**283,612**	347,821	409,089	**472,007**	545,744

Table 3.8.13.1. Estimated survival of wild smolts (%) to return to homewaters (prior to coastal fisheries) for various monitored rivers in the NE Atlantic Area.

Smolt year	Iceland[1]			Norway[2]				Ireland		UK (Scotland)[2]		UK (NI)[7]	UK (E & W)		France			
	Ellidaar	R.Vesturdalsa[4]		R. Halselva		R. Imsa		R. Corrib		North Esk		R. Bush	R. Dee		Nivelle[5]	Scorff	Oir	Bresle
	1SW	1SW	2SW	1SW	2SW	1SW	2SW	1SW	2SW	1SW	MSW	1SW[3]	1SW	MSW	All ages	All ages	All ages	All ages
1975	20.8																	
1980								17.9	1.1									
1981						17.3	4.0	9.2	3.8	8.2	3.8							
1982						5.3	1.2	20.9	3.3	11.2	5.0							
1983						13.5	1.3	10.0	1.8									
1984						12.1	1.8	26.2	2.0	6.0	4.0							
1985	9.4					10.2	2.1	18.9	1.8	13.6	5.4							
1986						3.8	4.2					31.3			15.1			
1987				2	0.3	17.3	5.6	16.6	0.7	10.4	3.9	35.1			2.6			
1988	12.7			5.8	0.7	13.3	1.1	14.6	0.7			36.2			2.4			
1989	8.1			2.1	1	8.7	2.2	6.7	0.7	6.6	4.2	25.0			3.5			
1990	5.4			3.9	1.6	3.0	1.3	5.0	0.6	6.0	3.1	34.7			1.8			
1991	8.8			2.1	0.3	8.7	1.2	7.3	1.3	7.6	3.1	27.8			9.2			
1992	9.6			2.1	0.4	6.7	0.9	7.3		10.9	6.5	29.0			8.3		5.3	
1993	9.8			2.1	0	15.6		10.8	0.1	14.5	6.1		6.3	2.5	7.2 [6]		17.0	5.8
1994	9.0			0.6	0.4			9.8	1.4	10.9	3.6	27.1	1.3	1.2	2.3 [6]		3.5	3.6
1995	9.4		1.5	0.9	0	1.8	1.5	8.4	0.1	8.4	3.8		2.7	0.4	4.4	11.7	5.0	
1996	4.6	2.5	0.4	2.3	0.6	3.5	0.9	6.5	1.2	5.9	2.7	31.0	4.8	2.1	3.4	15.1	4.8	
1997	5.3	1.0	1.5	0.3	0	1.7	0.3	12.7	0.8	7.2	4.2	19.8	6.2	3.4	2.7	5.8	14.0	4.7
1998	5.3	1.5	1.0	1.5	0.6	7.2	1.0	5.5	1.1	2.6	1.4	13.4	2.3	3.7	2.9	6.7	6.6	2.4
1999	7.7	1.3	1.2	1.3	0	4.2	2.2	6.4	0.9	6.8	3.8	16.5	5.0	12.4	2.8	15.9		
2000	6.3	1.1	0.7	0.4	1.1	12.5	1.7	9.4	0.0	6.0	2.8	10.1	2.0	0.9	3.4	10.9	2.4	
2001	5.1	3.4	1.3	2.5	2.5	3.6	2.2	7.2	1.1	4.7	2.9	12.4	4.3	0	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	2.2	2.0	11.3	2.9	0.7	0.9	21.6	3.1	
2003	9.1	5.5	0.6	4.9	1.6	3.5	0.7	8.3	2.1			6.8	2.6	0.4	1.2	11.8	5.7	4.2
2004	7.7	5.7	0.6	3.5	1.2	5.9	1.4	6.3	0.8			6.8	4.5	1.0	1.2	6.3	4.0	3.5
2005	6.4	2.5	0.9	3	1	3.7	1.8		0.0	6.7	2.8	5.9	5.1	0.5	1.0	8.5	6.6	3.4
2006	7.1	1.8	1.0	0.8	0.8	0.8	5.8	1.2	0.9	3.3	3.4	14.0	4.3	1.5	1.8	7.4	5.3	3.5
2007	19.3	0.9	0.3	0.3	0	0.9	1.2	0.9	0.0	5.0	4.0		1.3	0.7		4.4	4	3.5
2008	14.9	2.6	1.1	0.2	0.2	1.1	2.3	0.7		6.4	5.4		2.5	1.3		3		1.9
2009	14.2	1.3		1.1		2.1		0.7		9			4.8			5.4		15.8
Mean																		
2004-2008	11.1	2.7	0.8	1.6	0.6	2.5	2.5	2.3	0.4	5.3	3.9	8.9	3.5	1.0	1.3	5.9	5.0	3.2
1999-2008	8.8	2.6	1.0	1.8	0.9	4.2	2.0	5.2	0.7	5.1	3.4	10.5	3.5	1.9	1.6	9.6	4.3	3.3

[1] Microtags.
[2] Carlin tags, not corrected for tagging mortality.
[3] Microtags, corrected for tagging mortality.
[4] Assumes 50% exploitation in rod fishery.
[5] From 0+ stage in autumn.
[6] Incomplete returns.
[7] Assumes 30% exploitation in trap fishery.

Table 3.8.13.2. 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		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	2.0	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	0.4	0.7		
2006	1.0		0.2	0.1	1.0	1.8	0.1	0.7		
2007	1.9		0.3	0.0	0.5	0.7	0.2	0.1		
2008	2.4		0.1	0	1.8	2.1	0.1	0.3		
2009			0		1.5		0			
Mean										
2004-2008	1.4		0.4	0.1	1.9	1.3	0.2	0.4		
1999-2008	0.9	0.1	0.9	0.2	4.1	1.0	0.8	0.7	2.1	

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

Table 3.8.13.2. Cont'd. Estimated survival of hatchery smolts (%) to return to 1SW adult return to homewaters (prior to coastal fisheries) for monitored rivers and experimental facilities in Ireland and UK (N. Ireland).

Smolt year	Ireland									UK (N. Ireland)[3]	
	R. Shannon	R. Screebe	R. Burrishoole[1]	R. Delphi	R. Bunowen	R. Lee	R. Corrib Cong.[2]	R. Corrib Galway[2]	R. Erne	R. Bush 1+ smolts	R. Bush 2+ smolts
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	0.4			
1983	3.9		4.6				2.8	0.0		1.9	8.1
1984	5.0	10.4	27.1			2.3	5.2	0.0	9.4	13.3	
1985	17.8	12.3	31.1			15.7	1.4	0.0	8.2	15.4	17.5
1986	2.1	0.4	9.4			16.4		0.0	10.8	2.0	9.7
1987	4.7	8.4	14.1			8.8		0.0	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	0.0	1.2	8.1	23.2
1990	1.3		11.4			2.5	0.2	16.1	2.6	5.6	5.6
1991	4.2	0.3	13.6	10.8		0.8	4.9	4.1	1.3	5.4	8.8
1992	4.4	1.3	7.4	10.0	4.2		0.9	13.2		6.0	7.8
1993	2.9	3.4	12.0	14.3	5.4		1.0			1.1	5.8
1994	5.2	1.9	14.3	3.9	10.8			7.7		1.6	
1995	3.6	4.1	6.6	3.4	3.5		2.4			3.1	2.4
1996	2.9	1.8	5.3	10.6	3.4					2.0	2.3
1997	6.0	0.4	13.3	17.3	5.3	7.0			7.7	-	4.1
1998	3.1	1.3	4.9	7.2	2.9	4.9	3.3	2.3	2.6	2.3	4.5
1999	1.0	2.8	8.2	19.9	2.0			4.0	3.3	2.7	5.8
2000	1.2	3.8	11.8	19.5	5.4	3.6	6.7		4.0	2.8	4.4
2001	2.0	2.5	9.7	17.2	3.2	2.0	3.4		6.0	1.1	2.2
2002	1.0	4.1	9.2	12.6	2.0	1.9		5.3	1.9	0.7	3.1
2003	1.2		6.0	3.7	1.6	4.3			1.0	2.5	1.9
2004	0.4	1.8	9.4	7.6	1.8	2.2			3.1	0.7	1.9
2005	0.6	3.4	4.9	11.0	1.0	1.0			0.9	1.8	1.7
2006	0.3	1.3	5.2	3.7	0.0	0.2	0.4	2.9	0.9	2.0	3.8
2007	0.5	0.8	7.1	0.0		0.0	0.0	3.6	0.7		
2008	0.1	0.2	1.3	0.0		0.1	0.0	0.0	0.0		
2009	0.1	0.3	2.2	0.0		0.1		1.7	1.1		
Mean											
2004-2008	0.4	1.5	5.6	4.5	0.9	0.7	0.1	2.2	1.1	1.5	2.4
1999-2008	0.8	2.3	7.3	9.5	2.1	1.7	2.1	3.2	2.2	1.8	3.1

[1] Return rates to rod fishery with constant effort.

[2] Different release sites

[3] Microtagged.

Table 3.9.1. Performance of the various candidate indicators that were explored.

Summary Southern NEAC stock complex indicators			
1SW			
Candidate indicator dataset	N	R2	Retained?
Ret to coast 1SW UK(NI) Bush M	18	0.64	Yes
Catch MSW Ice Ellidaar M	39	0.63	Yes
Ret. W 1SW UK(E&W) Itchen M	21	0.48	Yes
Ret. W MSW UK(E&W) Itchen M	23	0.46	Yes
Ret. W 1SW UK(Sc) North Esk M	30	0.45	Yes
Ret. MSW UK(E&W) Frome M	38	0.37	Yes
Ret. W 2SW UK(Scot.) Baddoch M	23	0.32	Yes
Ret. 1SW UK(E&W) Frome M	36	0.29	Yes
Ret. W 2SW UK(Scot.) Girnock M	39	0.24	Yes
Ret. W 1SW UK(E&W) Test M	21	0.21	Yes
Ret. W MSW UK(E&W) Test M	23	0.08	No
Ret. W 2SW UK(Sc) North Esk M	30	0.02	No
Ret. 1SW UK(E&W) Dee M	17	0.01	No
Ret. MSW UK(E&W) Dee M	19	0.01	No
MSW			
Candidate indicator dataset	N	R2	Retained?
Ret W MSW UK(E&W) Itchen NM	23	0.73	Yes
Ret to coast 1SW UK(N.Irl) Bush NM	18	0.69	Yes
Ret W 2SW UK(Scot) Baddoch NM	23	0.47	Yes
Catch MSW Iceland Ellidaar NM	39	0.55	Yes
Ret 1SW UK(Sc) North Esk NM	30	0.35	Yes
Ret MSW UK(E&W) Frome NM	38	0.45	Yes
Ret 1SW UK(E&W) Frome NM	36	0.37	Yes
Ret W 2SW UK(Sc) North Esk NM	30	0.30	Yes
Ret W 2SW UK(Scot) Girnock NM	39	0.22	Yes
Ret W 1SW UK(E&W) Itchen NM	21	0.28	Yes
Ret W 1SW UK(E&W) Test NM	21	0.15	No
Ret W MSW UK(E&W) Test NM	23	0.11	No
Ret 1SW UK(E&W) Dee NM	17	0.08	No
Ret MSW (UK(E&W) Dee NM	19	0.02	No
Summary Northern NEAC Stock complex indicators			
1SW			
Candidate indicator dataset	N	R2	Retained?
Ret all 1SW Nor PFA est	22	0.91	Yes
Surv W 1SW Nor Imsa	28	0.40	Yes
Surv H 1SW Nor Imsa	27	0.26	Yes
Catch All 1SW Fin	28	0.12	No
MSW			
Candidate indicator dataset	N	R2	Retained?
PFA-MSW-CoastNorway	22	0.70	Yes
Orkla counts	16	0.62	Yes
Surv H 2SW Nor Drammen	25	0.59	Yes
Ret all 2SW Nor PFA est	18	0.54	Yes
Målselv counts	20	0.24	Yes
Catch W 2SW Fin	25	0.04	No

Table 3.10.3.1. Estimated proportions of 1SW and MSW salmon caught at Faroes originating from different countries as derived from smolt and adult tagging studies.

Jurisdiction	prop.1SW	prop.MSW
Finland	0.050	0.000
Norway	0.300	0.396
Russia	0.100	0.183
Sweden	0.050	0.023
Iceland-S&W	0.000	0.003
	0.500	0.605
France	0.050	0.000
Ireland	0.100	0.057
UK(England and Wales)	0.100	0.023
UK(Northern Ireland)	0.050	0.000
UK(Scotland)	0.200	0.192
Iceland-N&E	0.000	0.003
	0.500	0.275

Table 3.10.5.1. Historical sharing of catches of NAC (2SW) and NEAC (all ages) salmon between West Greenland, Faroes and homewater fisheries. Proportions are estimated from means of catches in the previous five years.

	West Greenland catch (t)	WG prop. NAC	WG catch of NAC salmon (t)	WG catch of NEAC salmon (t)	Canada catch - large salmon (t)	Faroes catch (t)	NEAC Hm'water catch (t)	Proportions of catch of NAC 2SW salmon taken in: WG	NAC (yr +1)	Proportions of catch of Southern NEAC salmon taken in: NEAC-home	Faroes	WG
1971	2,689	0.34	914	1,775	1,482	0	-	-	-	-	-	-
1972	2,113	0.36	761	1,352	1,201	9	6,558	-	-	-	-	-
1973	2,341	0.49	1147	1,194	1,651	28	7,311	-	-	-	-	-
1974	1,917	0.43	824	1,093	1,589	20	7,004	-	-	-	-	-
1975	2,030	0.44	893	1,137	1,573	28	7,070	37.0	63.0			
1976	1,175	0.43	505	670	1,721	40	5,296	32.9	67.1	83.3	0.3	16.4
1977	1,420	0.45	639	781	1,883	40	5,183	33.4	66.6	85.0	0.4	14.5
1978	984	0.43	423	561	1,225	37	4,939	31.6	68.4	85.4	0.5	14.1
1979	1,395	0.50	698	698	705	119	5,035	30.2	69.8	85.9	0.8	13.2
1980	1,194	0.52	621	573	1,763	536	5,396	28.6	71.4	84.8	2.5	12.6
1981	1,264	0.59	746	518	1,619	1,025	4,873	32.8	67.2	83.5	5.8	10.8
1982	1,077	0.57	614	463	1,082	606	4,434	33.8	66.2	81.9	7.7	10.4
1983	310	0.40	124	186	911	678	5,825	31.8	68.2	81.6	9.5	9.0
1984	297	0.54	160	137	645	628	4,724	32.1	67.9	81.0	11.1	7.8
1985	864	0.47	406	458	540	566	5,456	34.1	65.9	82.5	11.4	6.1
1986	960	0.59	566	394	779	530	6,096	32.8	67.2	84.8	9.6	5.6
1987	966	0.59	570	396	951	576	4,763	34.0	66.0	85.3	9.5	5.2
1988	893	0.43	384	509	633	243	5,072	37.4	62.6	86.4	8.4	5.2
1989	337	0.55	185	152	590	364	3,910	38.0	62.0	85.8	7.7	6.4
1990	274	0.74	203	71	486	315	3,112	38.6	61.4	85.4	7.5	7.1
1991	472	0.63	297	175	370	95	2,460	40.6	59.4	86.1	7.1	6.8
1992	237	0.45	107	130	323	23	2,836	37.2	62.8	88.1	5.3	6.6
1993	-	-	0	0	214	23	2,772	33.0	67.0	89.0	4.8	6.1
1994	-	-	0	0	216	6	3,243	32.2	67.8	93.6	3.0	3.4
1995	83	0.67	56	27	153	5	2,963	30.2	69.8	96.4	1.0	2.5
1996	92	0.70	64	28	154	0	2,492	20.8	79.2	97.4	0.4	2.3
1997	58	0.85	49	9	126	0	2,006	19.1	80.9	98.4	0.2	1.4
1998	11	0.79	9	2	70	6	2,165	23.9	76.1	99.4	0.1	0.5
1999	19	0.91	17	2	64	0	2,026	29.3	70.7	99.3	0.1	0.6
2000	21	0.65	14	7	58	8	2,700	28.8	71.2	99.3	0.1	0.6
2001	43	0.67	29	14	61	0	2,845	28.1	71.9	99.5	0.1	0.4
2002	9	0.72	6	3	49	0	2,472	20.4	79.6	99.6	0.1	0.3
2003	9	0.65	6	3	60	0	2,275	19.6	80.4	99.7	0.1	0.2
2004	15	0.72	11	4	68	0	1,936	18.3	81.7	99.7	0.1	0.2
2005	15	0.76	11	4	56	0	1,959	18.1	81.9	99.7	0.0	0.3
2006	22	0.69	15	7	55	0	1,838	14.8	85.2	99.7	0.0	0.3
2007	25	0.76	19	6	48	0	1,359	21.6	78.4	99.8	0.0	0.2

Table 3.10.7.1. Catch in weight (t) and numbers, mean weight and mean age on catch in the 1983/1984 to 1995/1996 fishing seasons.

	Season	Catch (t)	Catch (No)	Mean wt (kg)	Mean sea age
Commercial fishery	**1983/84**	651	124,509	5.23	2.07
	1984/85	598	135,777	4.40	2.07
	1985/86	545	154,554	3.53	2.02
	1986/87	539	140,304	3.84	2.05
	1987/88	208	65,011	3.20	1.96
	1988/89	309	93,496	3.30	2.04
	1989/90	364	111,515	3.26	2.04
	1990/91	202	57,441	3.52	2.07
Research fishery	**1991/92**	31	8,464	3.66	2.09
	1992/93	22	5,415	4.06	2.14
	1993/94	7	2,072	3.38	2.03
	1994/95	6	1,963	3.06	1.98
	1995/96	1	282	3.55	

Table 3.10.7.2. catch in numbers and percentages by sea age and mean age in the Faroes salmon fishery in the 1983/1984 to 1994/1995 fishing seasons.

Fishery	Season	1SW	2SW	3SW	MSW	%1SW	%2SW	%3SW	Mean Age
Comm'	1983/84	5,142	135,718	16,401	152,178	3.3%	86.3%	10.4%	2.07
	1984/85	381	138,375	11,358	149,733	0.3%	92.2%	7.6%	2.07
	1985/86	2,021	169,461	5,671	175,219	1.1%	95.7%	3.2%	2.02
	1986/87	71	124,628	6,621	131,324	0.1%	94.9%	5.0%	2.05
	1987/88	5,833	55,726	3,450	59,176	9.0%	85.7%	5.3%	1.96
	1988/89	1,351	110,717	5,728	116,445	1.1%	94.0%	4.9%	2.04
	1989/90	2,155	102,800	6,473	109,273	1.9%	92.3%	5.8%	2.04
	1990/91	632	52,419	4,390	56,809	1.1%	91.3%	7.6%	2.07
Research	1991/92	248	4,686	743	5,429	4.4%	82.5%	13.1%	2.09
	1992/93	521	2,646	1,120	3,766	12.2%	61.7%	26.1%	2.14
	1993/94	320	1,288	376	1,664	16.1%	64.9%	19.0%	2.03
	1994/95	206	1,585	166	1,751	10.5%	81.0%	8.5%	1.98
	Totals	18,881	900,049	62,497	962,767	1.9%	91.7%	6.4%	2.04

1991/92 to 1994/95 include discards and exclude reared fish.

Table 3.10.7.3. Estimation of discard rates in the 1982/1983 to 1994/1995 fishing seasons.

	Season	No samples	No. Sampled	No <60 cm TL	Discard rate (%)	Range %
Commercial fishery	**1982/83**	7	6820	472	6.9%	0.0% - 10.4%
	1983/84	5	4467	176	3.9%	-
	1984/85	12	9546	1289	13.5%	3.0% - 32.0%
	1985/86	7	14654	286	2.0%	0.6% - 13.8%
	1986/87	13	39758	2849	7.2%	0.0% - 71.3%
	1987/88	2	1499	235	15.7%	-
	1988/89	9	17235	1804	10.5%	0.4% - 31.9%
	1989/90	5	16375	1533	9.4%	3.6% - 18.5%
	1990/91	3	4615	681	14.8%	9.9% - 17.5%
Research fishery	**1991/92**	6	9350	825	8.8%	2.4% - 15.9%
	1992/93	3	9099	853	9.4%	5.1% - 32.3%
	1993/94	4	3035	436	14.4%	1.5% - 48.6%
	1994/95	5	4187	634	15.1%	5.0% - 39.7%

* Proprtion wild has been assessed for catches by calendar year.

Table 3.10.7.4. Percentages of farm escapees observed in catch samples taken in the Faroes fishery (1981/1982 to 1995/1996) and the Norwegian coastal fisheries (1989 to 2008).

Year	Norway coastal fisheries	Season	Faroes fishery (ICES, 1996)
1981		1981/82	2
1982		1982/83	2
1983		1983/84	1
1984		1984/85	4
1985		1985/86	7
1986		1986/87	4
1987		1987/88	1
1988		1988/89	8
1989	45	1989/90	17
1990	48	1990/91	43
1991	49	1991/92	42
1992	44	1992/93	37
1993	47	1993/94	27
1994	34	1995/95	17
1995	42	1995/96	19
1996	54		
1997	47		
1998	45		
1999	35		
2000	31		
2001	27		
2002	33		
2003	21		
2004	27		
2005	23		
2006	33		
2007	32		
2008	26		

Table 3.10.7.5. Additional parameter values used in the example catch advice for the Faroes fishery.

Minimum TAC option	0 t
Maximum TAC option	500 t
TAC steps	50 t
Faroes share allocation	0.08
TAC in current year	0 t
Proportion of 1SW salmon not maturing	0.22
Mortality of discards	0.8
Monthly rate of natural mortality	0.03

Table 3.10.8.1. Probability (%) of 1SW and MSW salmon in Northern and Southern NEAC areas achieving their SERs for different catch options (t) in Faroes for the years 2012 to 2014.

Catch options for 2012:	TAC option	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW
	0	81.2	96.6	39.3	81.8
	50	79.5	80.4	38.8	75.6
	100	78.2	56.1	38.2	69.1
	150	76.6	34.2	37.7	62.4
	200	75.2	19.7	37.1	55.7
	250	73.7	10.7	36.6	49.4
	300	72.2	5.7	36.1	43.3
	350	70.6	2.9	35.6	37.9
	400	69.1	1.5	35.1	33.0
	450	67.9	0.8	34.5	28.8
	500	66.7	0.4	33.9	25.0

Catch options for 2013:	TAC option	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW
	0	81.3	93.6	40.4	78.4
	50	80.4	77.0	40.0	72.6
	100	79.3	56.7	39.4	67.0
	150	78.2	38.9	39.0	61.4
	200	76.9	24.8	38.4	56.0
	250	75.9	15.8	38.1	50.7
	300	74.5	10.2	37.6	45.8
	350	73.3	6.7	37.3	41.3
	400	72.2	4.1	36.8	37.0
	450	71.0	2.7	36.4	33.2
	500	69.8	1.5	36.0	29.8

Catch options for 2014:	TAC option	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW
	0	81.7	93.1	50.8	74.4
	50	80.8	78.8	50.4	69.4
	100	80.0	61.8	49.9	64.6
	150	79.0	46.5	49.5	59.6
	200	78.1	33.9	49.0	54.7
	250	77.1	24.9	48.5	50.4
	300	76.1	17.7	48.1	45.8
	350	75.0	12.4	47.6	41.8
	400	74.1	8.9	47.2	38.4
	450	73.0	6.2	46.9	34.8
	500	71.9	4.5	46.5	31.3

Table 3.10.8.2. Forecast exploitation rate (%) of 1SW and MSW salmon from Northern and Southern NEAC areas in the Faroes fishery for different catch options in the years 2012 to 2014.

Catch options for 2012:	TAC option	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW
	0	0.0	0.0	0.0	0.0
	50	0.1	1.0	0.1	0.3
	100	0.2	2.1	0.1	0.6
	150	0.3	3.1	0.2	0.9
	200	0.4	4.2	0.3	1.2
	250	0.6	5.2	0.3	1.6
	300	0.7	6.3	0.4	1.9
	350	0.8	7.3	0.4	2.2
	400	0.9	8.3	0.5	2.5
	450	1.0	9.4	0.6	2.8
	500	1.1	10.4	0.6	3.1

Catch options for 2013:	TAC option	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW
	0	0.0	0.0	0.0	0.0
	50	0.1	0.9	0.1	0.3
	100	0.2	1.9	0.1	0.6
	150	0.3	2.8	0.2	0.9
	200	0.4	3.7	0.2	1.2
	250	0.5	4.7	0.3	1.5
	300	0.6	5.6	0.4	1.8
	350	0.7	6.6	0.4	2.1
	400	0.8	7.5	0.5	2.4
	450	0.9	8.4	0.5	2.7
	500	1.0	9.4	0.6	3.0

Catch options for 2014:	TAC option	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW
	0	0.0	0.0	0.0	0.0
	50	0.1	0.9	0.0	0.2
	100	0.2	1.7	0.1	0.5
	150	0.3	2.6	0.1	0.7
	200	0.4	3.4	0.2	1.0
	250	0.4	4.3	0.2	1.2
	300	0.5	5.1	0.3	1.5
	350	0.6	6.0	0.3	1.7
	400	0.7	6.8	0.4	2.0
	450	0.8	7.7	0.4	2.2
	500	0.9	8.5	0.5	2.5

Table 3.10.8.3. Information on the status of national stocks and individual river stocks within each jurisdiction in the NEAC area.

Country	Meeting National CL	Meeting National CL	No. rivers	No. with CL Total	No. asessed for compliance	No. meeting CL Total	%meeting CL Total
	1SW	MSW					
Iceland	Yes	Yes	100	0		NA	NA
Russia	Yes	Yes	112	80	8	7	87.5
Norway	Yes	Yes	450	439	211	74	35
Sweden	No	No	23	17	0	NA	NA
Finland/Norway (Tana/Teno)	No	No	1	1	1	0	0
UK Scotland	Yes	Yes	383	0	0	NA	NA
UK England/Wales	No	Yes	68	68	64	38	59.0
UK N. Ireland	Yes	Yes	15	7	7	2	28.6
Ireland	Yes	No	141	141	141	60	42.6
France	No	No	25	25	17	3	17.6
Germany	Not assessed						
Spain	Not assessed						
Portugal	Not assessed						

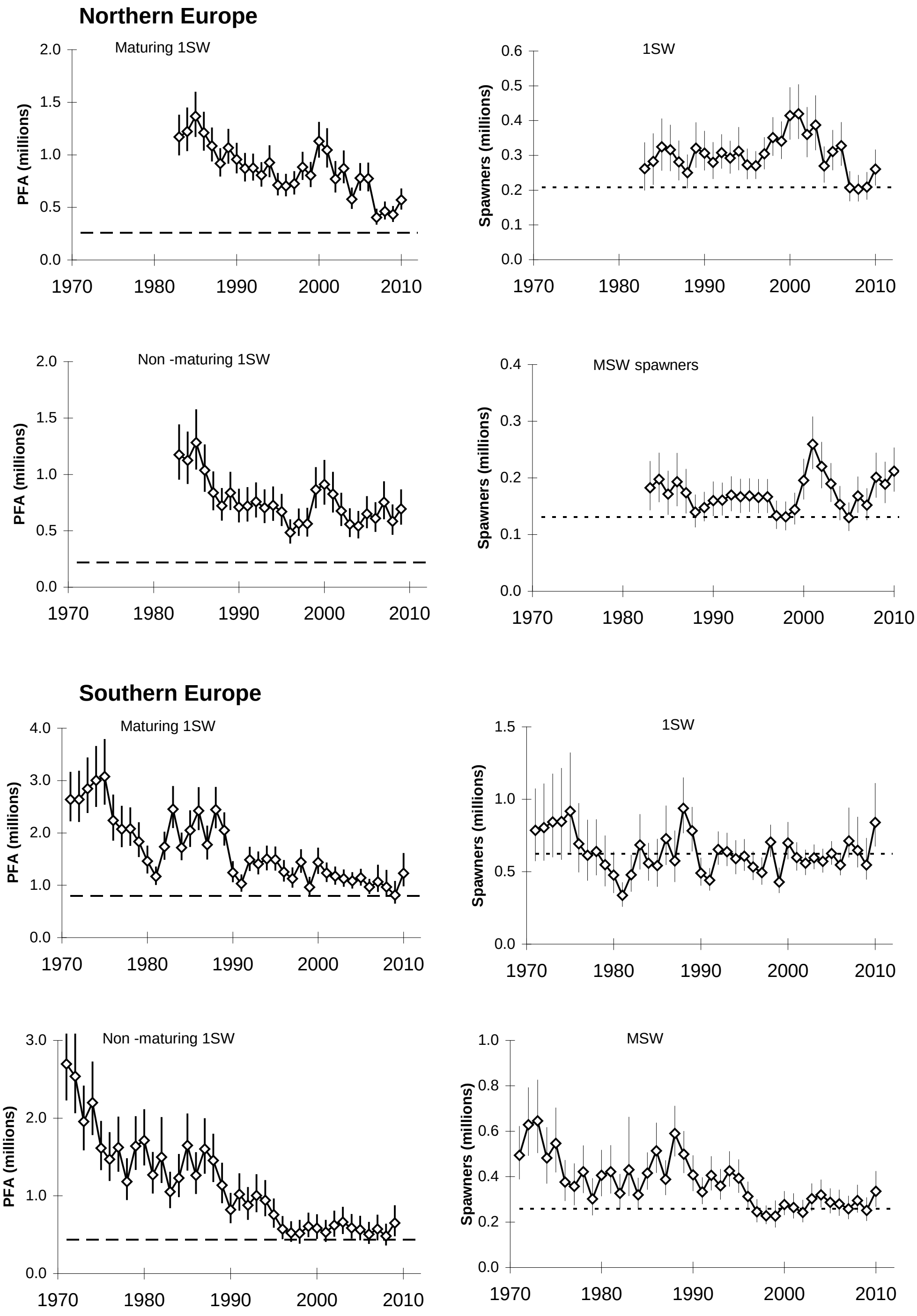


Figure 3.1.1. Estimated PFA (recruits) (left panels) and spawning escapement (right panels), with 95% confidence limits, for maturing 1SW and non-maturing 1SW salmon in Northern Europe (NEAC) and Southern Europe (NEAC).

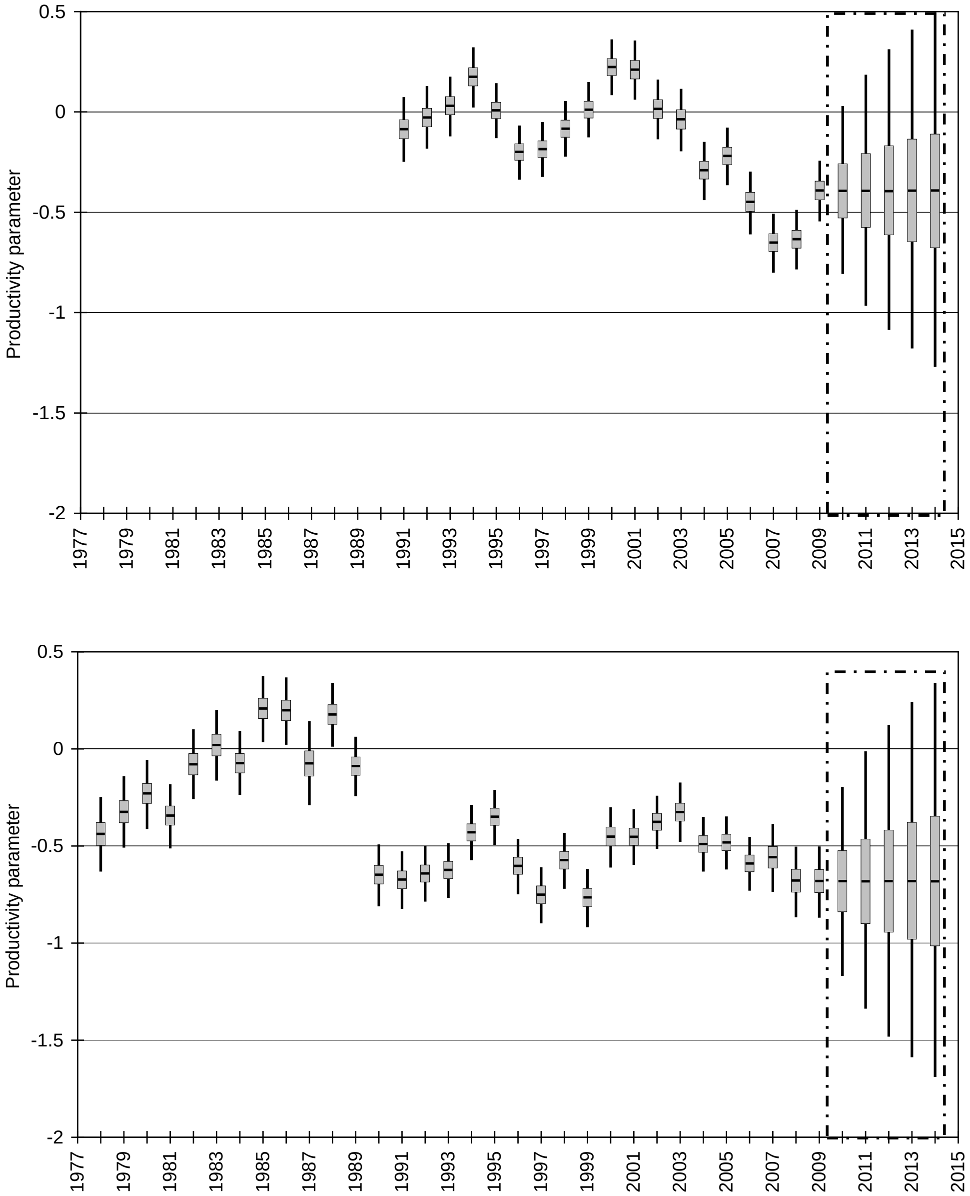
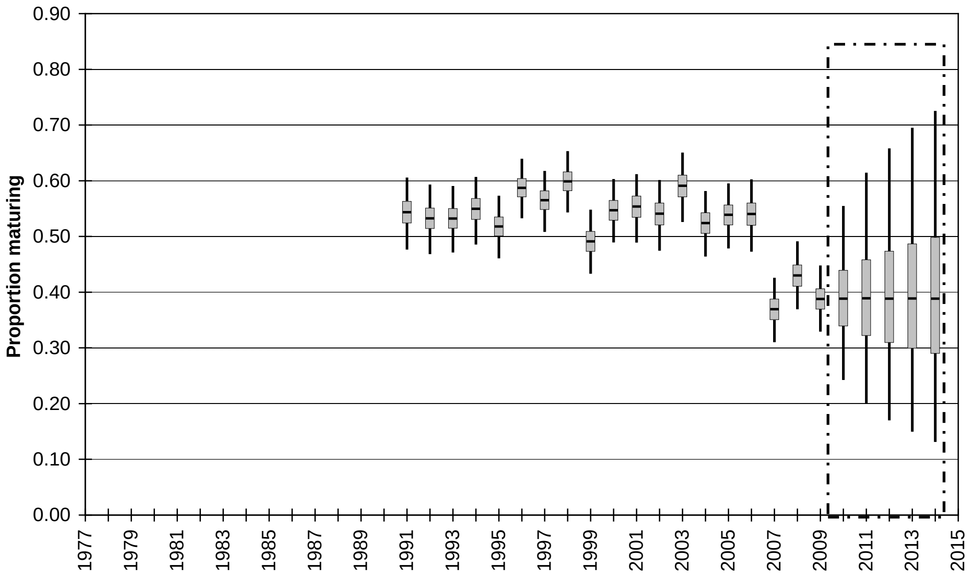


Figure 3.6.2.1. Estimated and forecast productivity parameters for the Northern (top) and Southern (bottom) NEAC complexes. The model forecast years are enclosed within the dashed boxed areas. Upper and lower bounds represent 2.5th and 97.5th Bayesian Credibility Interval (B.C.I.) ranges and boxes 25th, 75th BCI. The horizontal dash in each rectangle is the median.



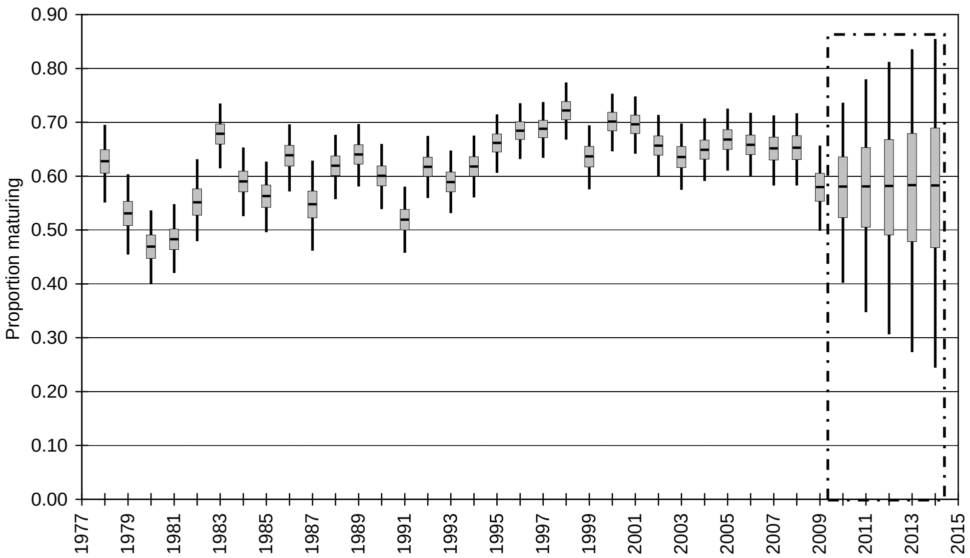


Figure 3.6.2.2. Estimated and forecast proportion maturing by year for the Northern (top) and Southern (bottom) NEAC complexes. The model forecast years are enclosed within the boxed areas. Box plots are interpreted as in Figure 3.6.2.1.

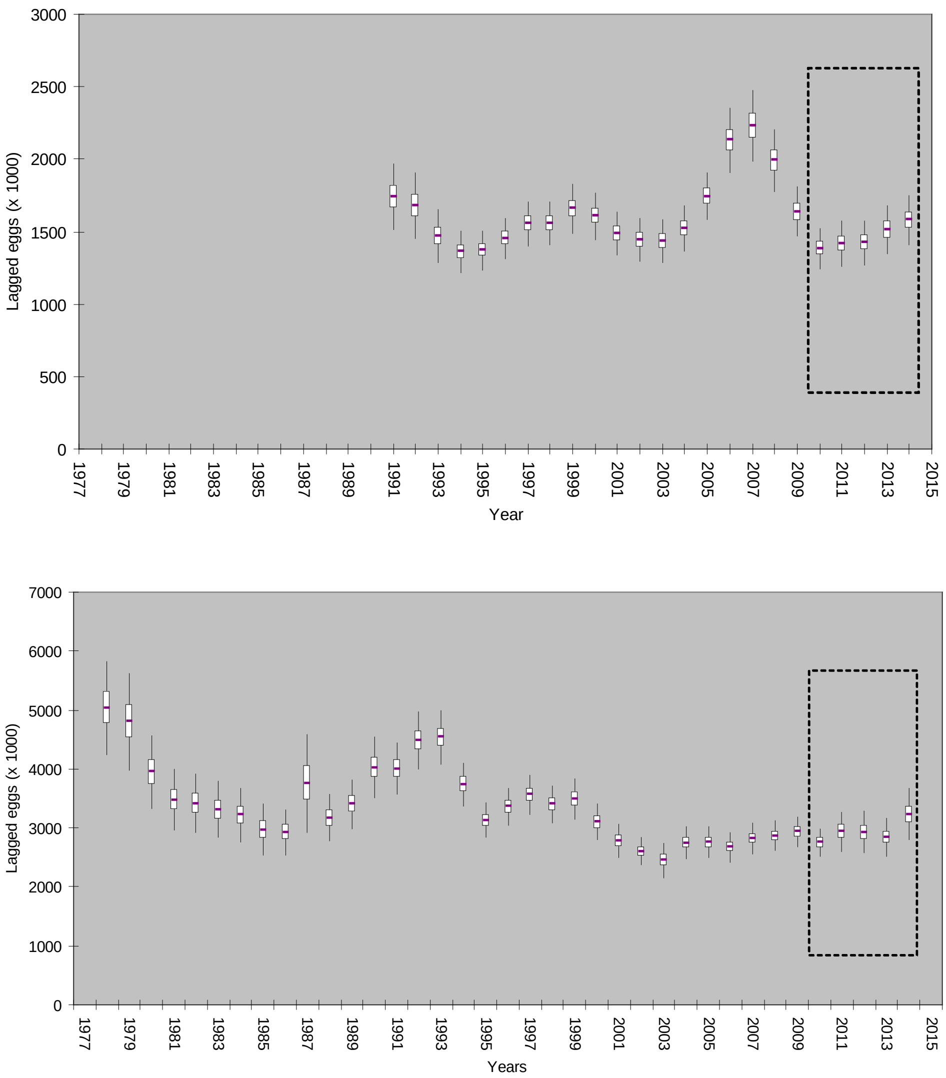
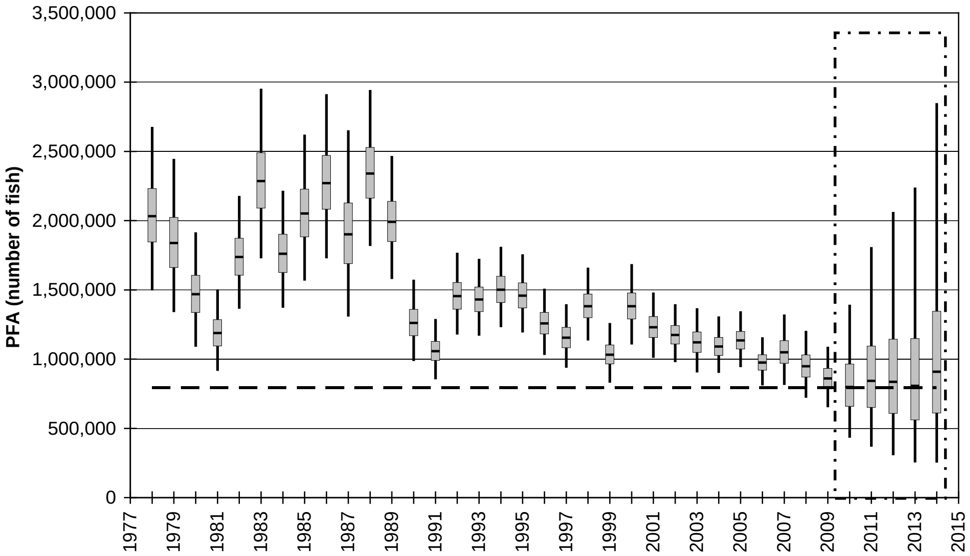


Figure 3.6.2.3. Estimates of the lagged egg deposition used in the PFA forecast model for the Northern NEAC (top) and Southern NEAC (bottom) areas. The model forecast years are enclosed within the boxed areas. Box plots are interpreted as in Figure 3.6.2.1.



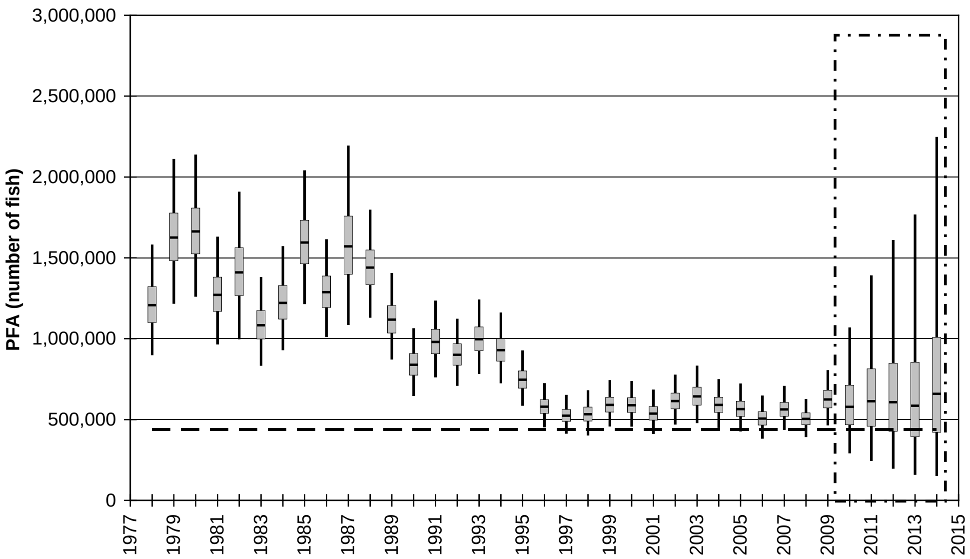


Figure 3.6.2.4. Estimated and forecast maturing PFA (upper panel) and non-maturing PFA (lower panel) for the Southern NEAC stock complex. The model forecast years are enclosed within the dashed boxed areas. The SER is indicated by the dashed horizontal line. Box plots are interpreted as in Figure 3.6.2.1.

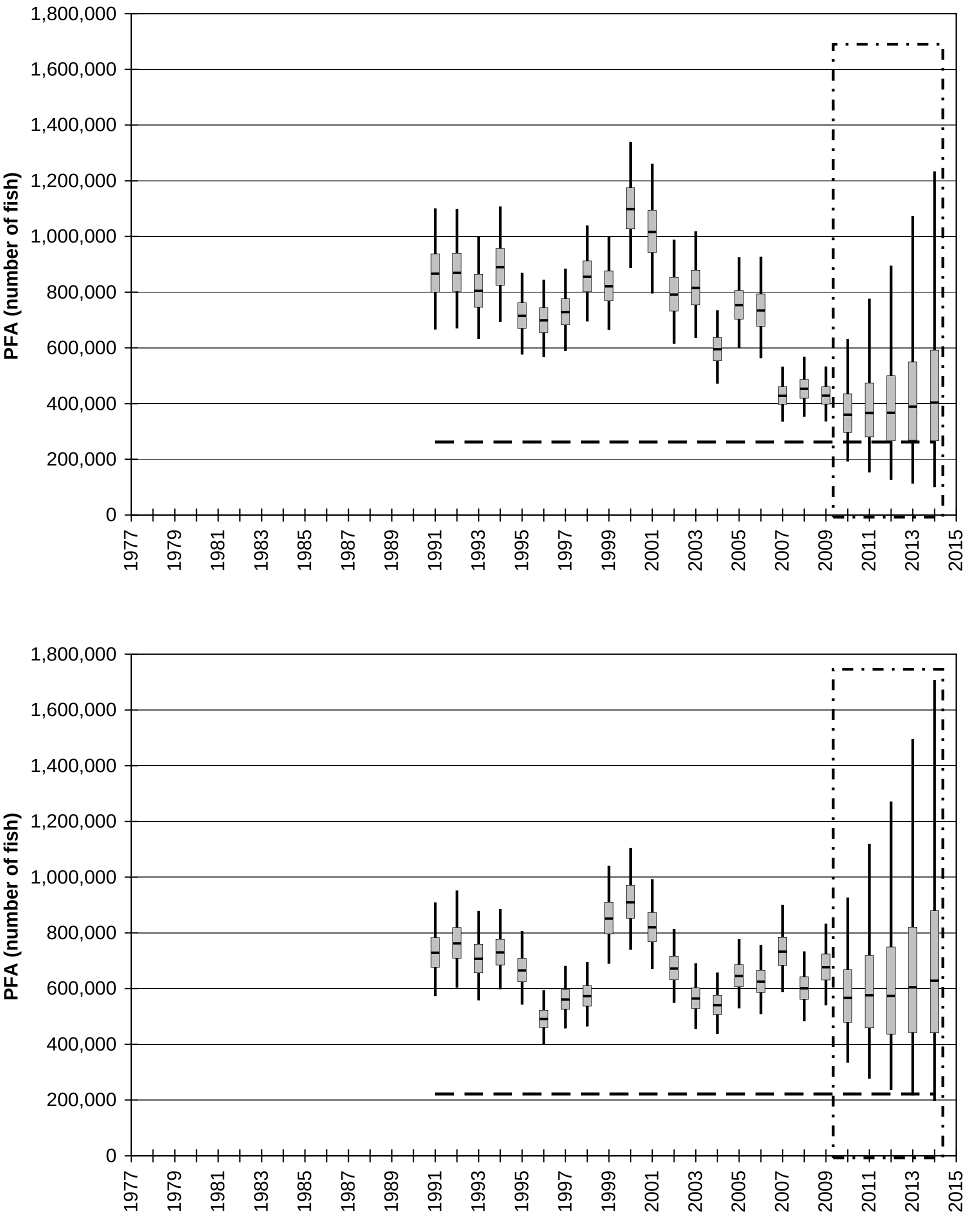


Figure 3.6.2.5. Estimated and forecast maturing PFA (upper panel) and non-maturing PFA (lower panel) for the northern NEAC stock complex. The model forecast years are enclosed within the dashed boxed areas. The SER is indicated by the dashed horizontal line. Box plots are interpreted as in Figure 3.6.2.1.

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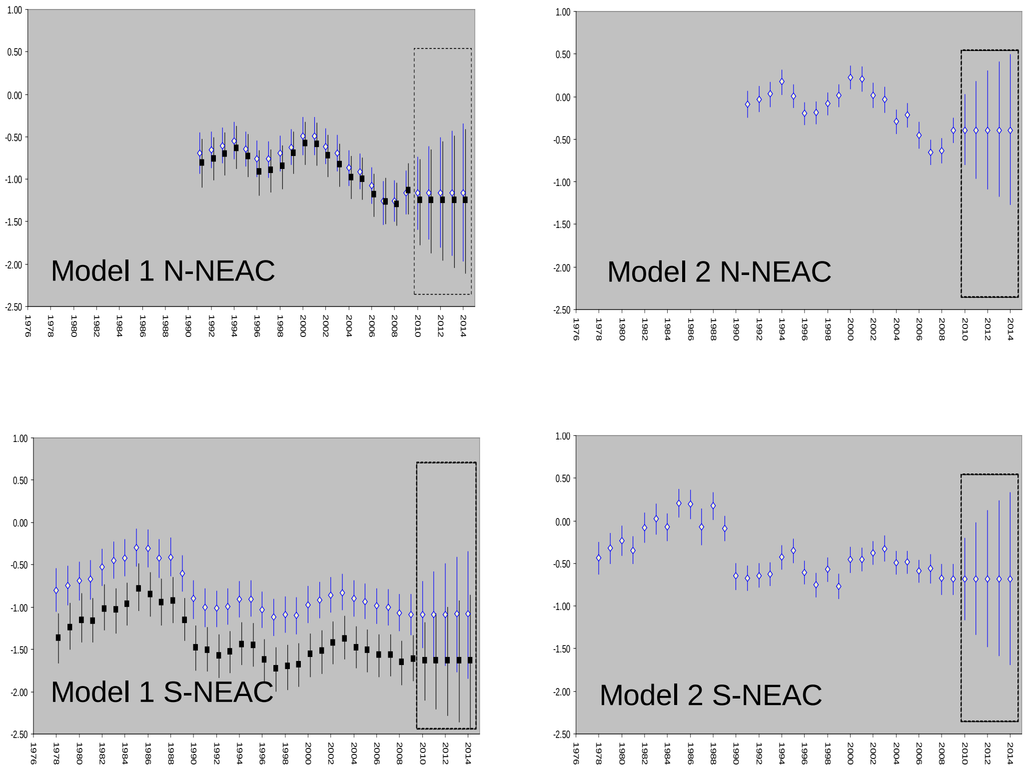


Figure 3.7.2.1. Estimates of the Productivity parameter for the Southern NEAC and Northern NEAC complexes produced by the Bayesian forecast model (Model 1) used in 2009 and 2010, and its update (Model 2) used in 2011. (For Model 1 open diamonds and closed boxes represent the maturing and non-maturing productivity parameters respectively. For Model 2 open diamonds represent the single productivity parameter. Forecast years are highlighted in the dashed boxes. Boxplots are interpreted as in Figure 3.6.2.1.

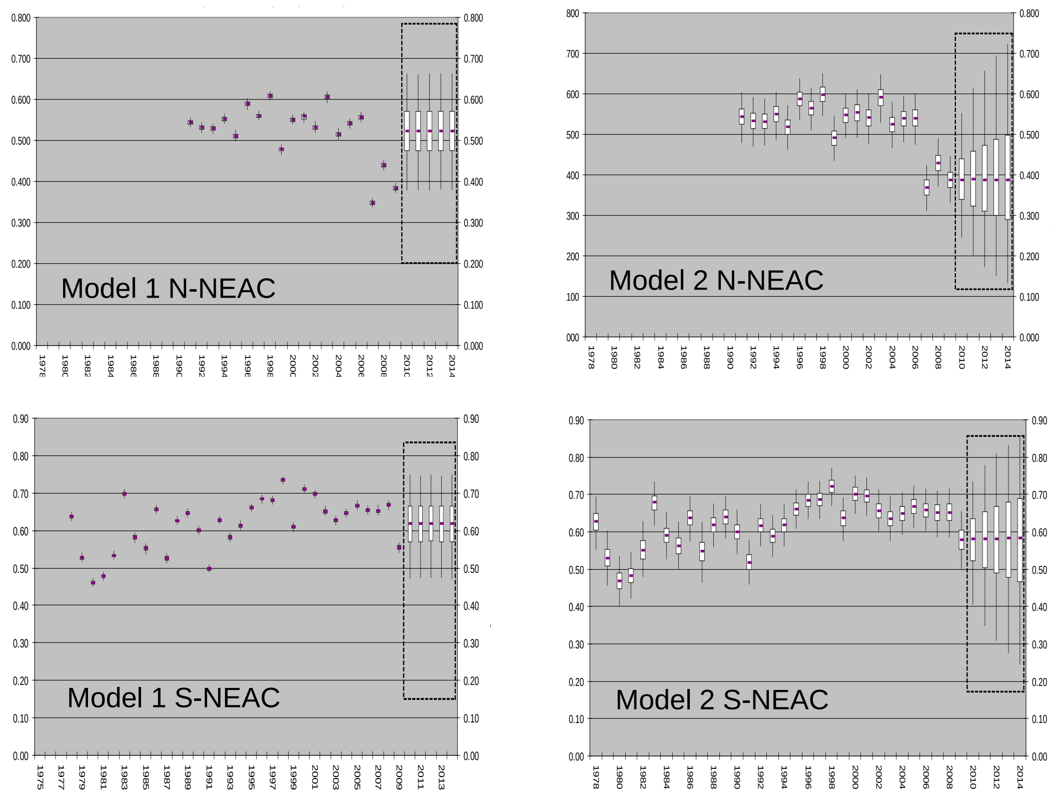


Figure 3.7.2.2. Estimates of the proportion of maturing 1SW for the Southern NEAC and Northern NEAC complexes produced by the Bayesian forecast model (Model 1) used in 2009 and 2010, and its update (Model 2) used in 2011. Forecast years are highlighted in the dashed boxes. Boxplots are interpreted as in Figure 3.6.2.1.

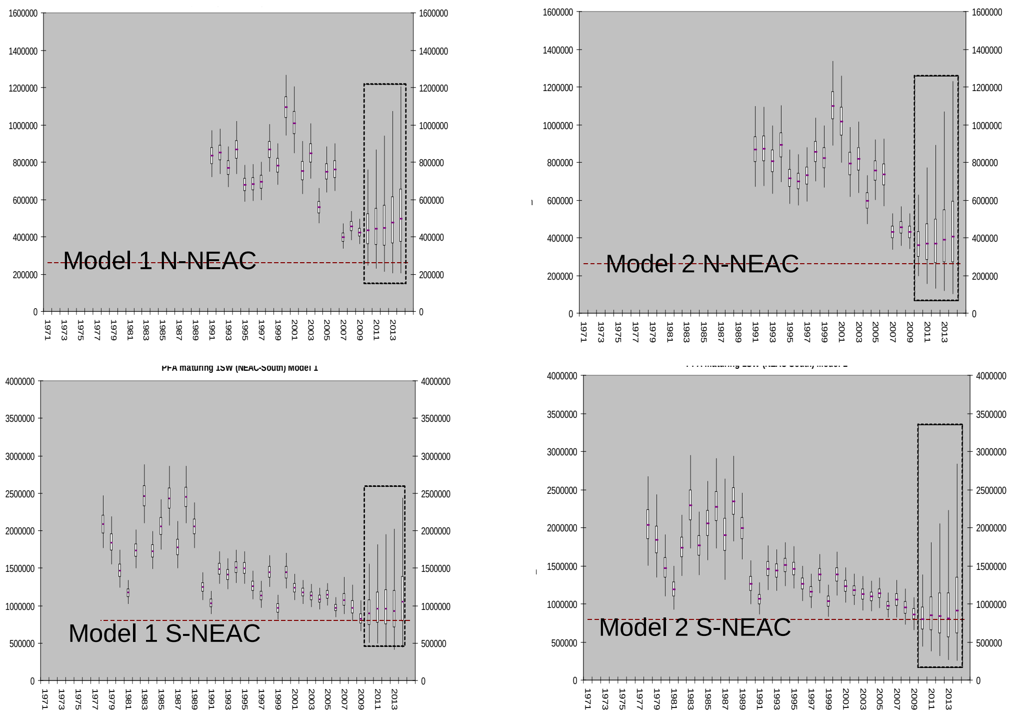


Figure 3.7.2.3. Estimates of the maturing PFA 1SW for the Southern NEAC and Northern NEAC complexes produced by the Bayesian forecast model (Model 1) used in 2009 and 2010, and its update (Model 2) used in 2011. Forecast years are highlighted in the dashed boxes. Boxplots are interpreted as in Figure 3.6.2.1.

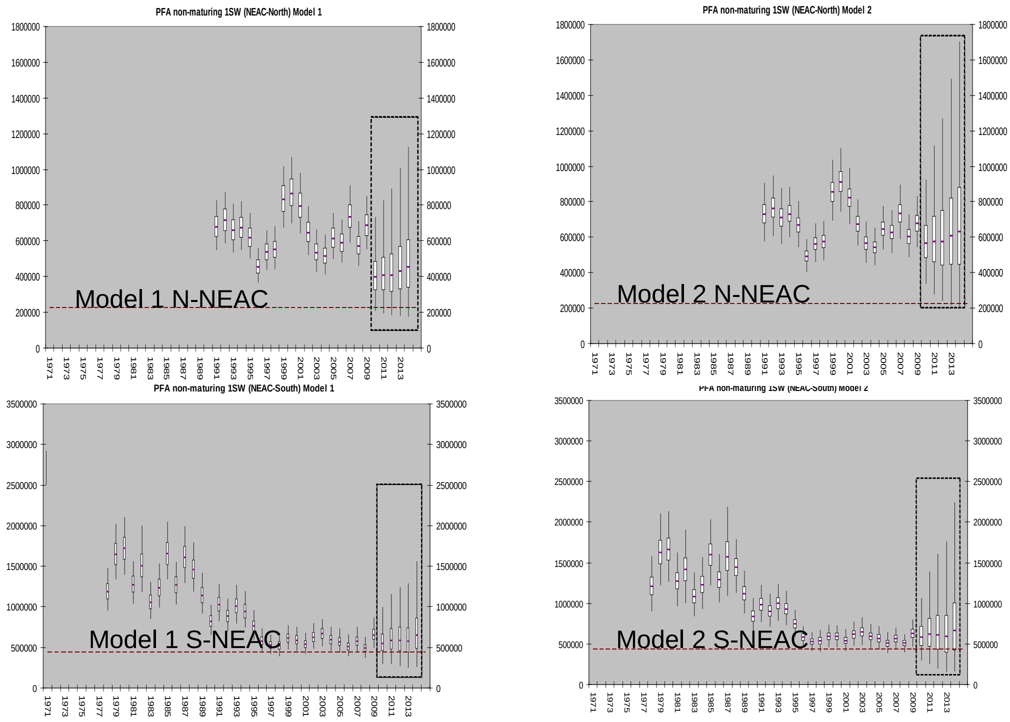


Figure 3.7.2.4. Estimates of the non-maturing PFA 1SW for the Southern NEAC and Northern NEAC complexes produced by the Bayesian forecast model (Model 1) used in 2009 and 2010, and its update (Model 2) used in 2011. Forecast years are highlighted in the dashed boxes. Boxplots are interpreted as in Figure 3.6.2.1.

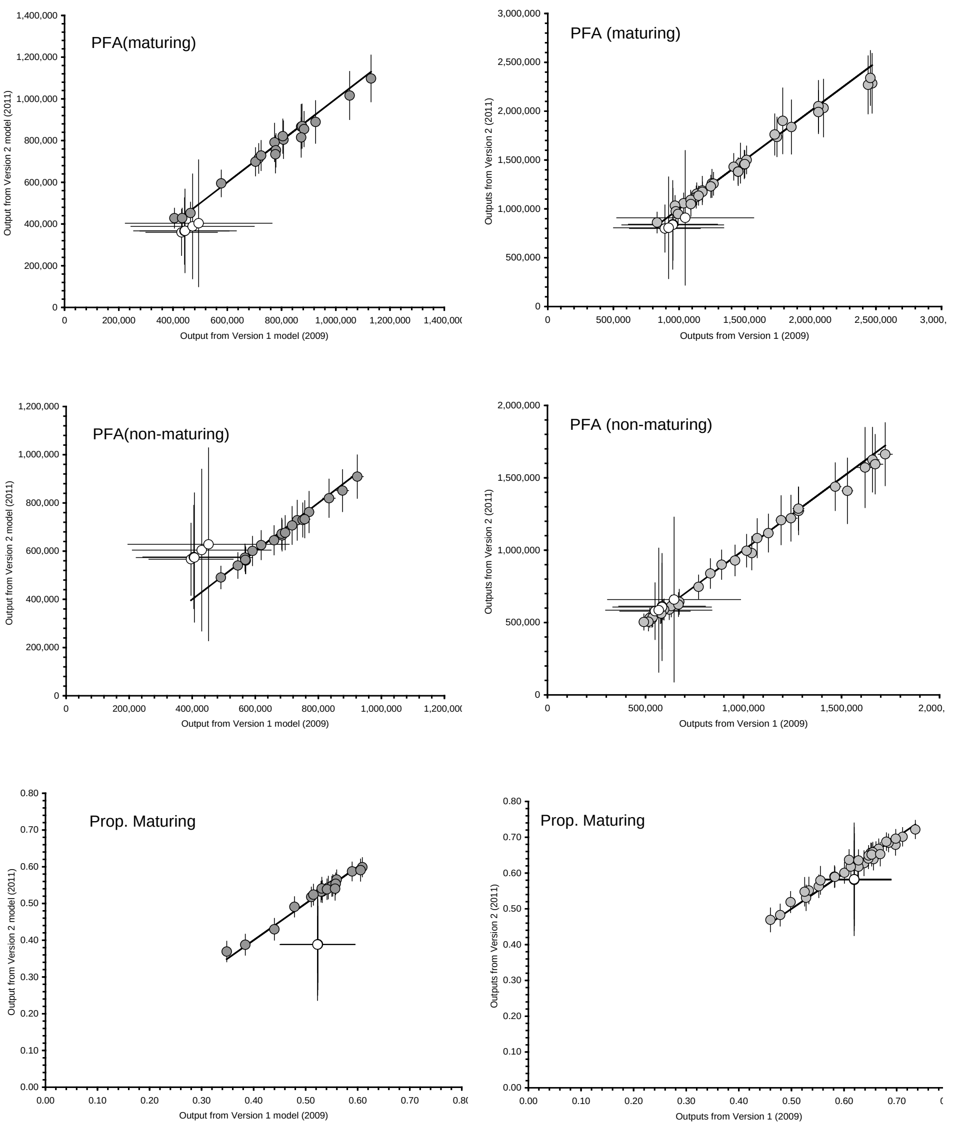
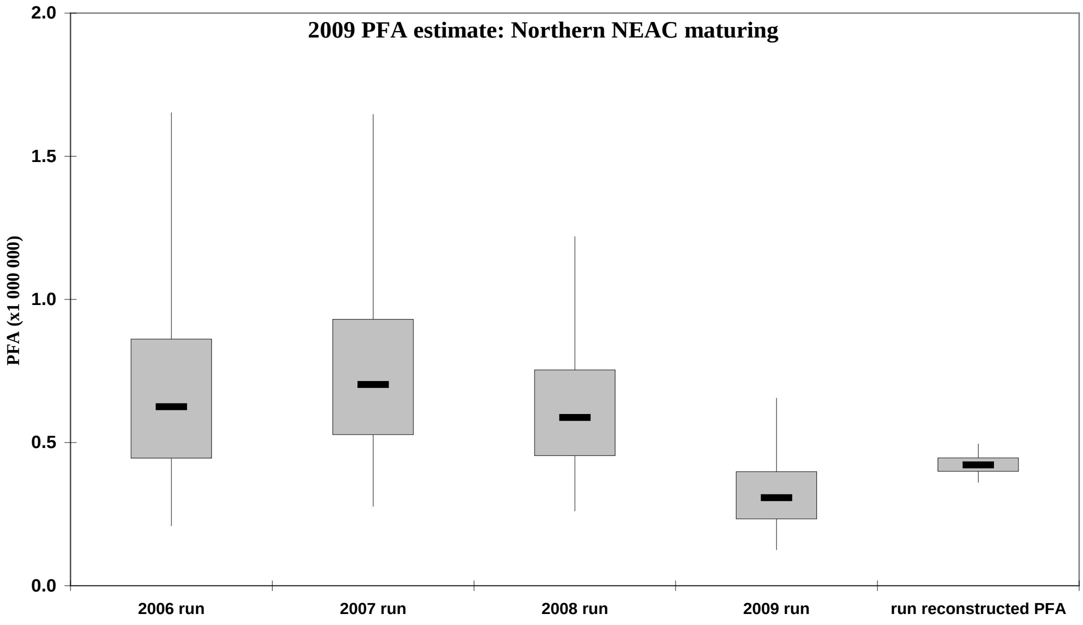


Figure 3.7.2.5. Comparison of outputs of revised Bayesian PFA model (Version 2 2011) and its predecessor (Version 1 2009) for northern (left) and southern (right) NEAC stock complexes. (PFA maturing, top; PFA non-maturing, middle; proportion PFA maturing, bottom). Median and one standard deviation are shown. Grey symbols are inferences from the modes, white symbols are values for the forecast portion of the models. The solid diagonal line is the 1:1 line.



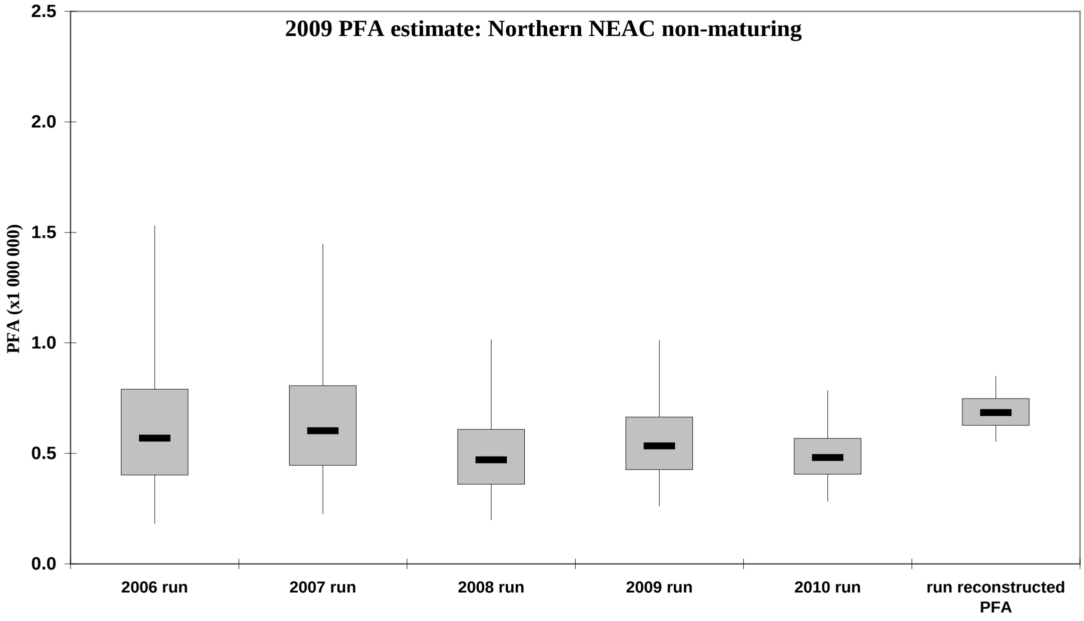


Figure 3.7.3.1. Retrospective comparisons of the model forecasts of the 2009 PFA for maturing and non-maturing Northern NEAC stock complexes. Run-reconstructed PFA is compared with model forecasts using data available to the Working Group over the period 2006 to 2009 in the case of the maturing stock and up to 2010 for the non-maturing stock. Boxplots show the 95% Bayesian Credibility Interval (B.C.I.) as the vertical line, the interquartile range as the open rectangle and the median as the horizontal dash.

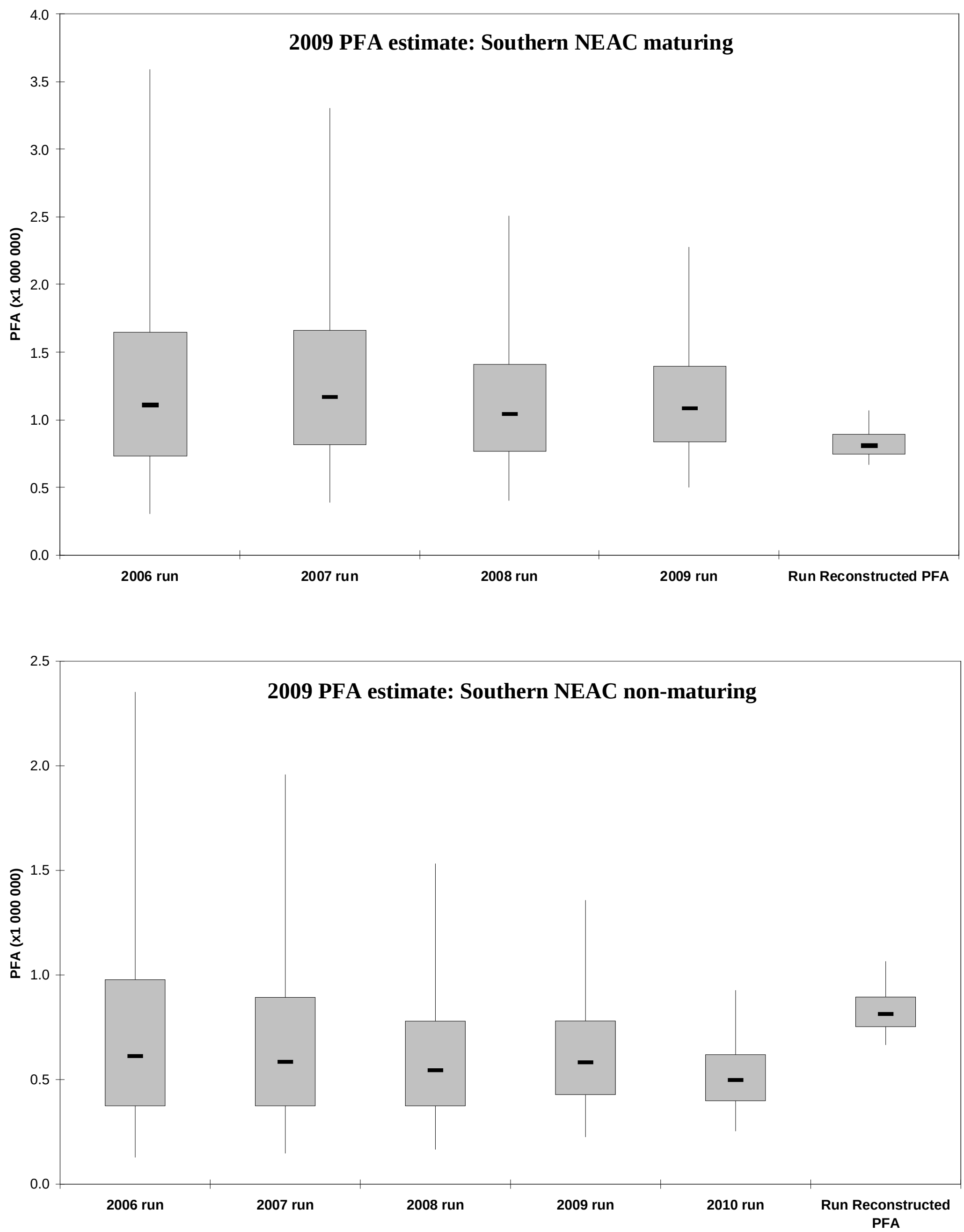


Figure 3.7.3.2. Retrospective comparisons of the model forecasts of the 2009 PFA for maturing and non-maturing Southern NEAC stock complexes. Run-reconstructed PFA is compared with model forecasts using data available to the Working Group over the period 2006 to 2009 in the case of the maturing stock and up to 20010 for the non-maturing stock. Box plots show the 95% Bayesian Credibility Interval (B.C.I.) as the vertical line, the interquartile range as the open rectangle and the median as the horizontal dash.

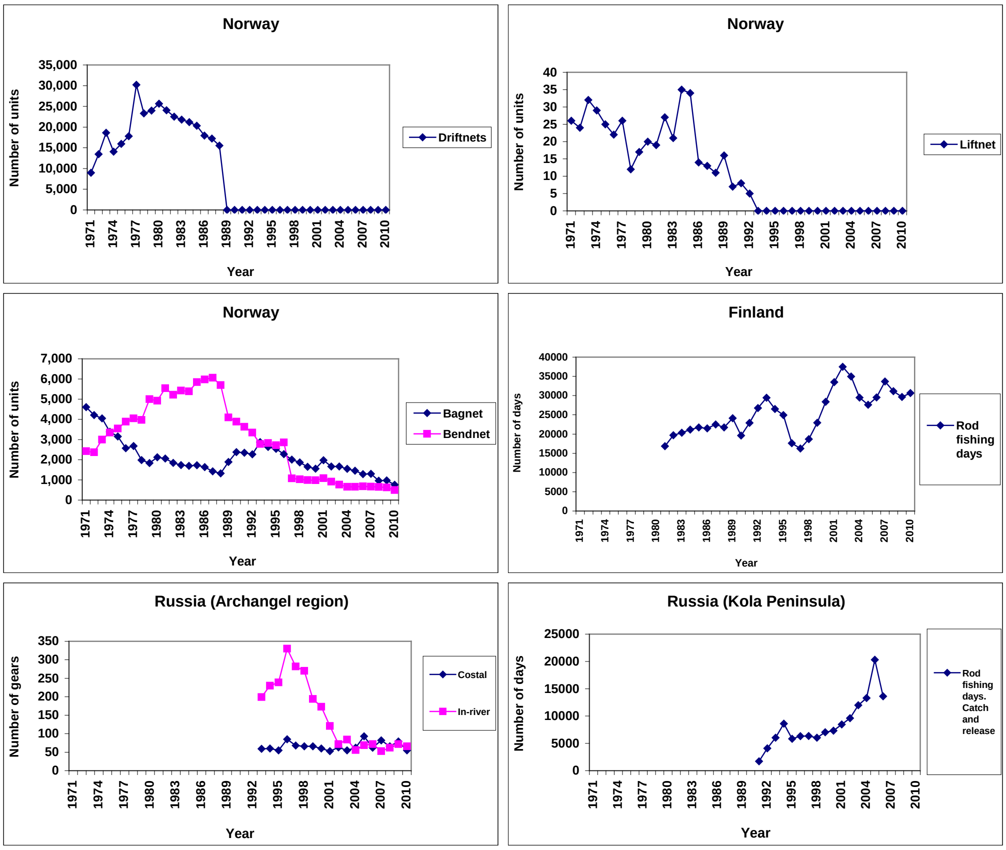


Figure 3.8.3.1. Overview of effort as reported for various fisheries and countries 1971 to 2010 in the Northern NEAC area.

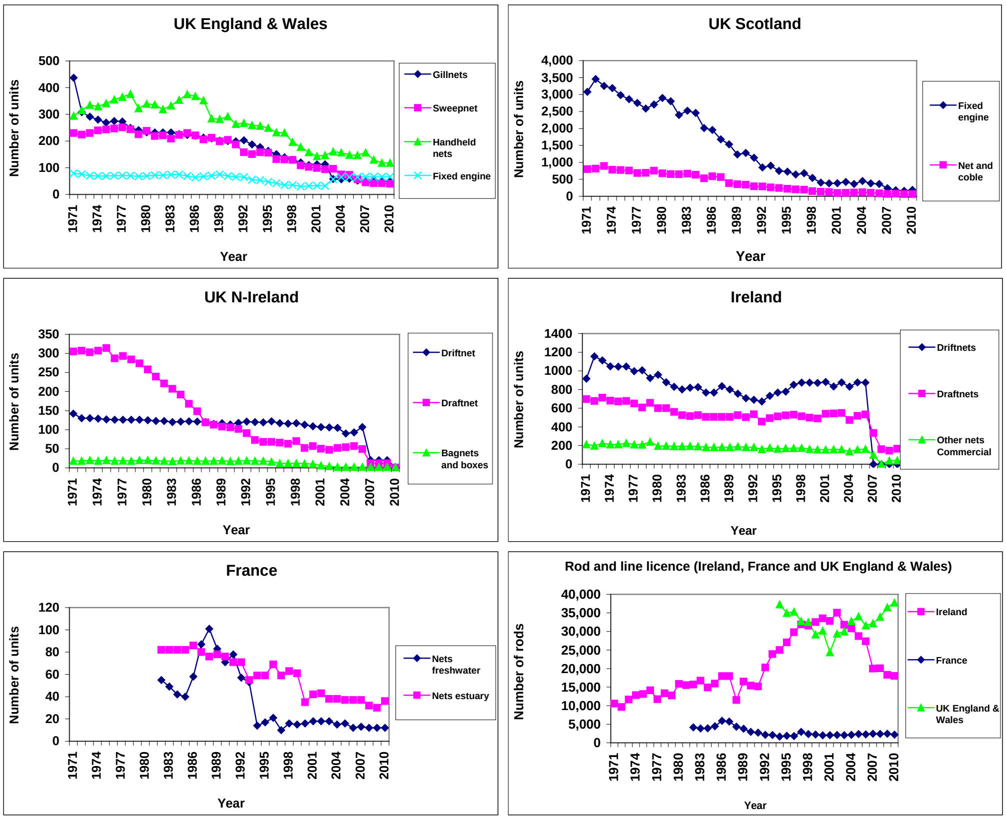


Figure 3.8.3.2. Overview of effort as reported for various fisheries and countries 1971 to 2010 in the Southern NEAC area.

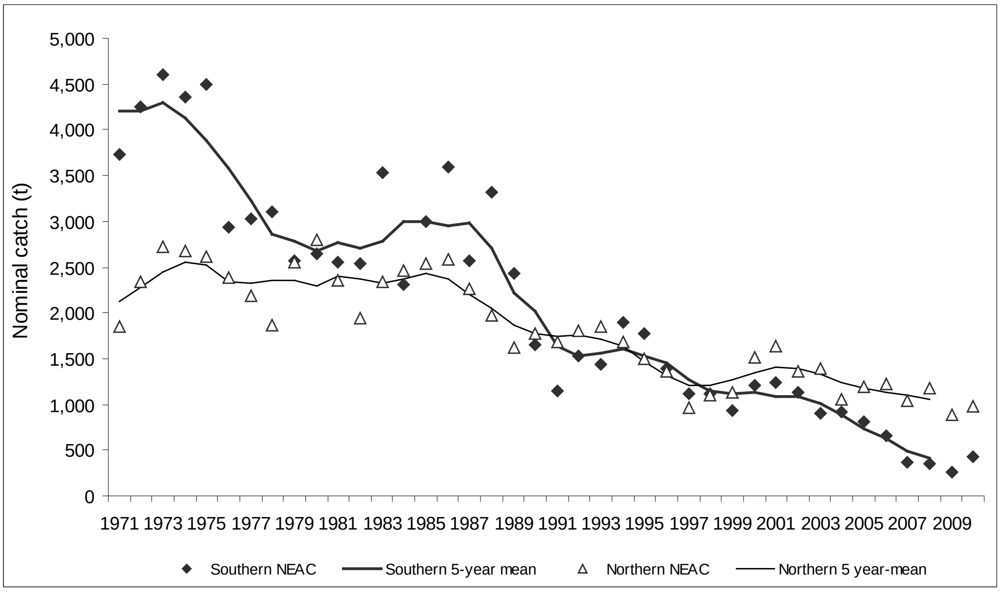


Figure 3.8.4.1. Nominal catch of salmon and 5-year running means in the Southern NEAC and Northern NEAC Areas, 1971 to 2010.

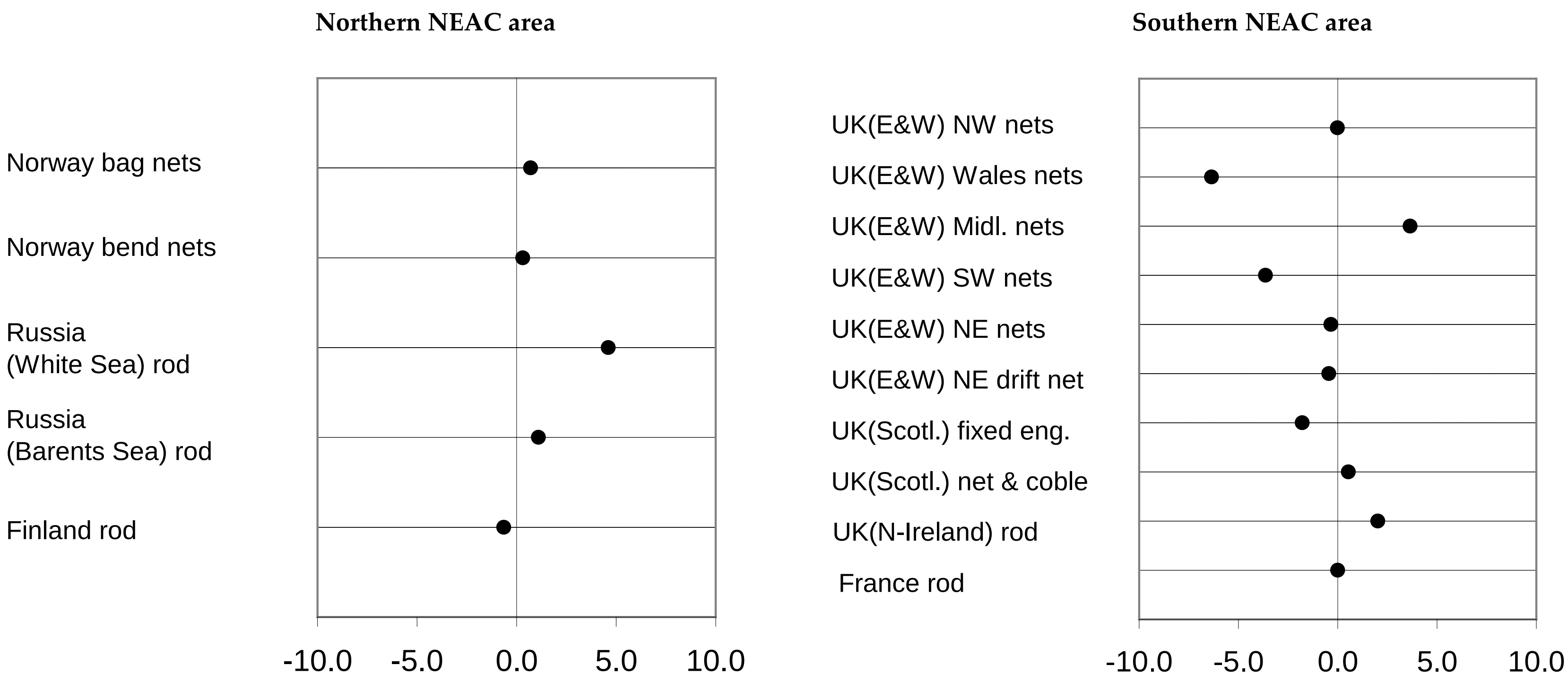


Figure 3.8.5.1. Proportional change (%) over years (for the length of each available time-series) in cpue estimates in various rod and net fisheries in Northern NEAC and Southern NEAC areas.

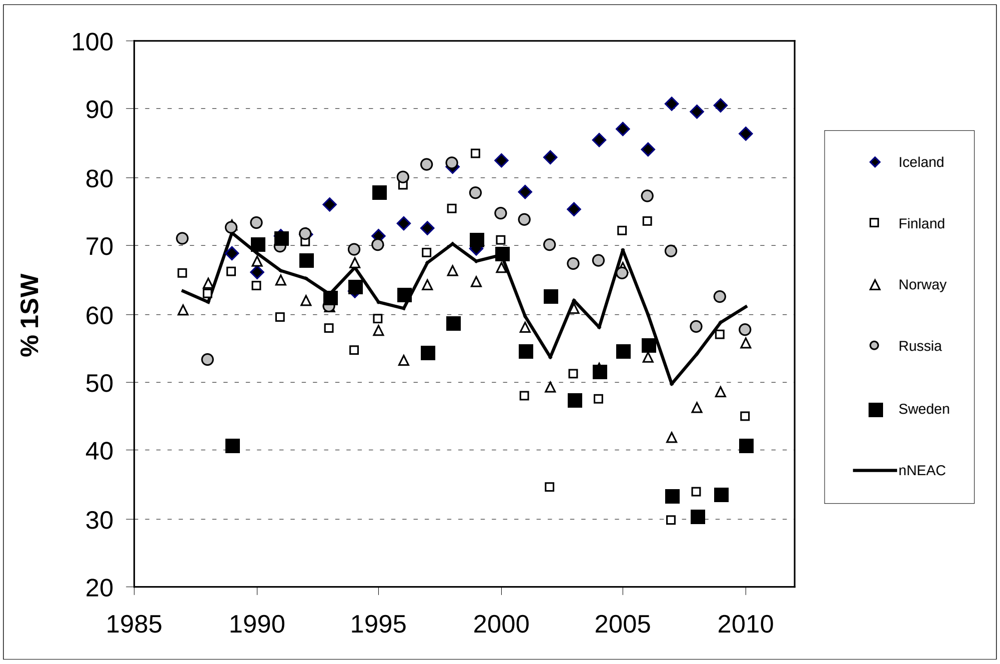


Figure 3.8.6.1. Percentage of 1SW salmon in the reported catch for Northern NEAC countries, 1987 to 2010. Solid line denotes mean value from catches in all Northern NEAC countries.

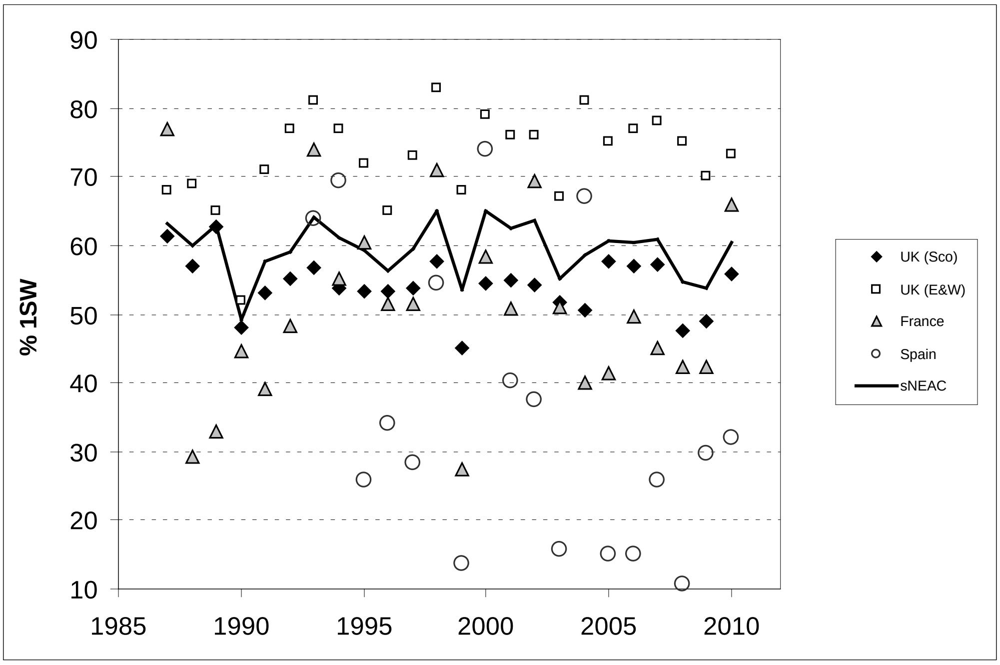


Figure 3.8.6.2. Percentage of 1SW salmon in the reported catch for Southern NEAC countries, 1987 to 2010. Solid line denotes mean value from catches in all Southern NEAC countries.

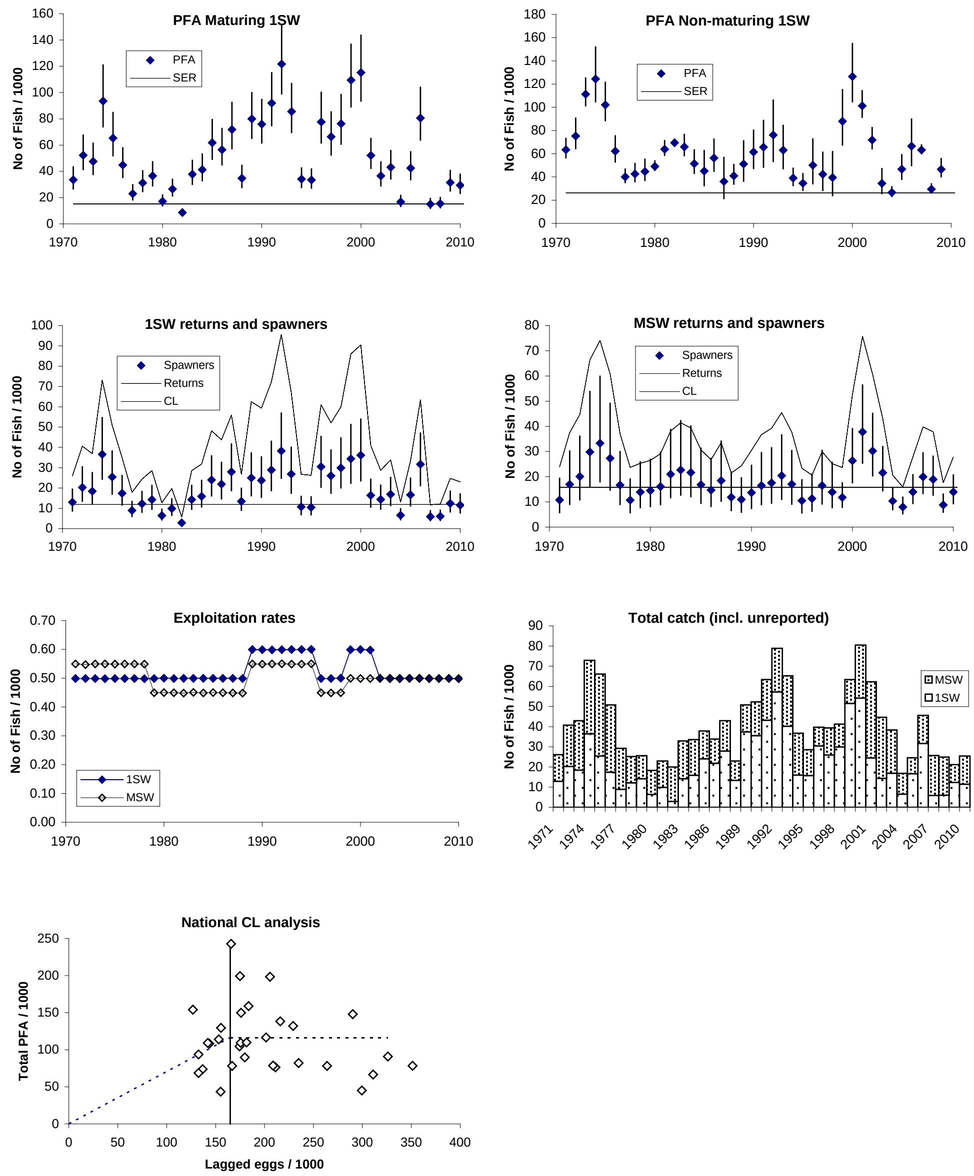
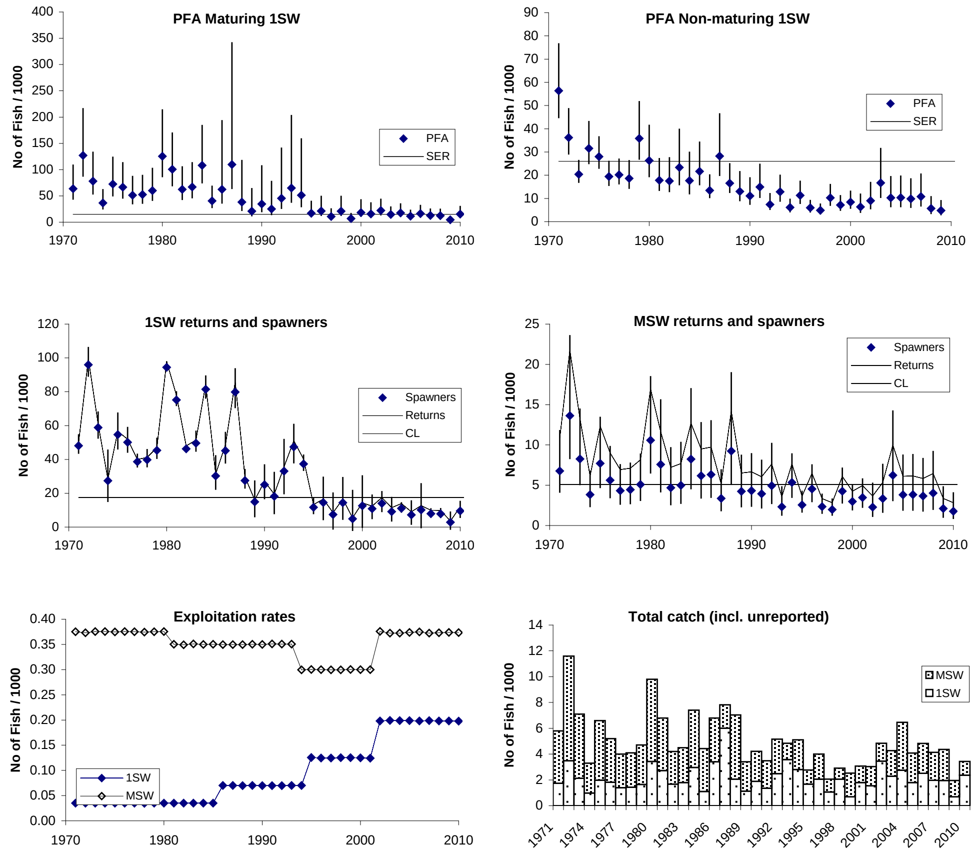


Figure 3.8.11.1a. Summary of fisheries and stock description, R. Tana/Teno (Finland and Norway combined).



conservation limit derived from river specific information

Figure 3.8.11.1b. Summary of fisheries and stock description, France.

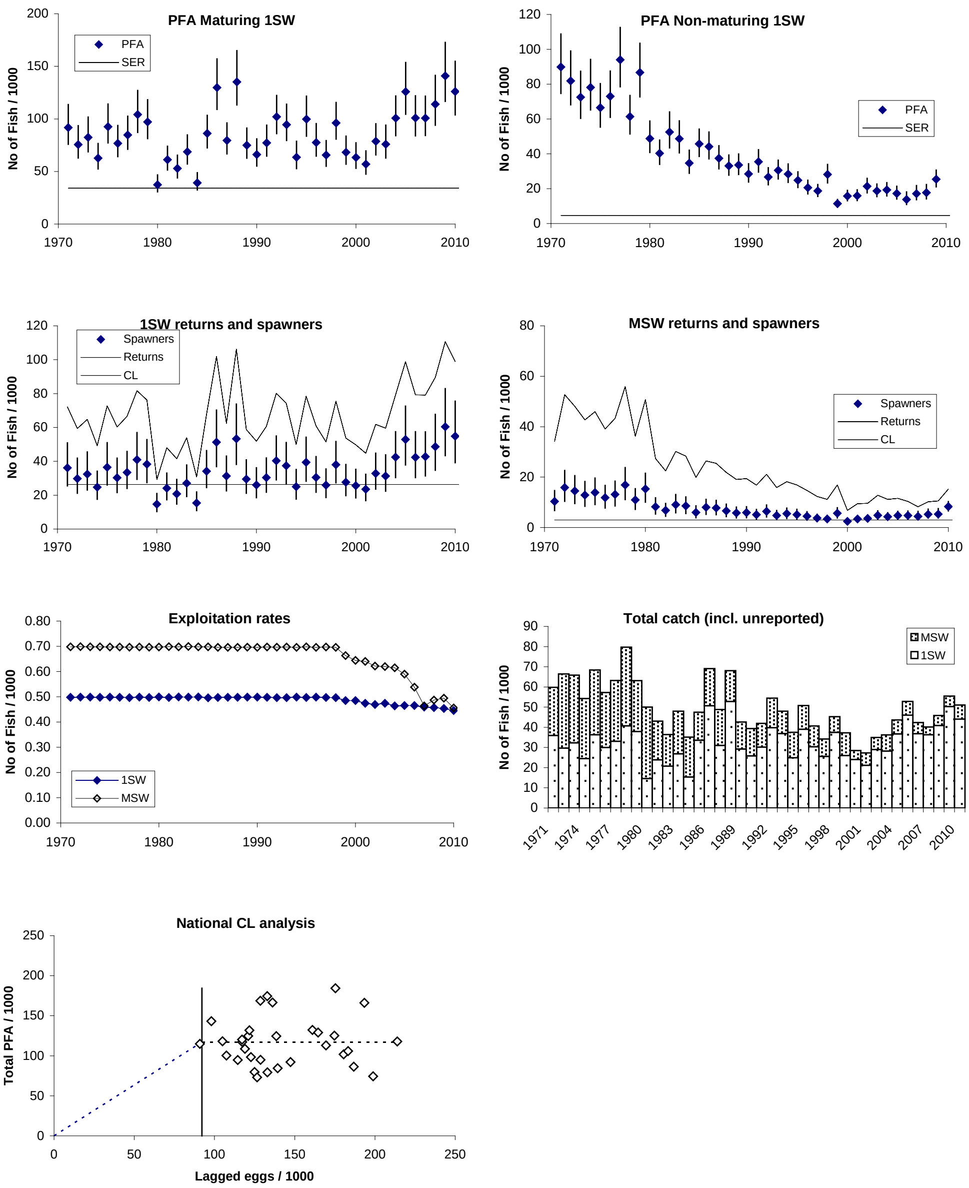


Figure 3.8.11.1c. Summary of fisheries and stock description, Iceland.

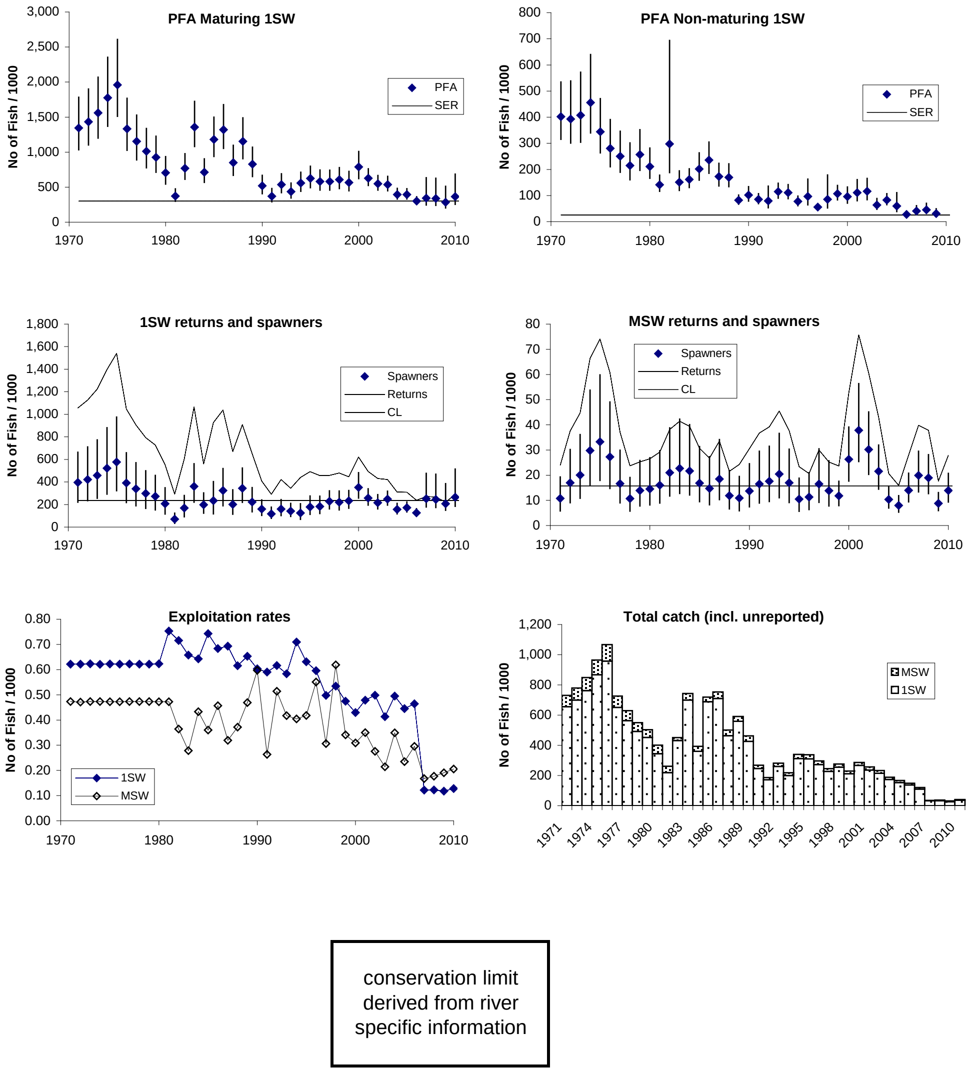
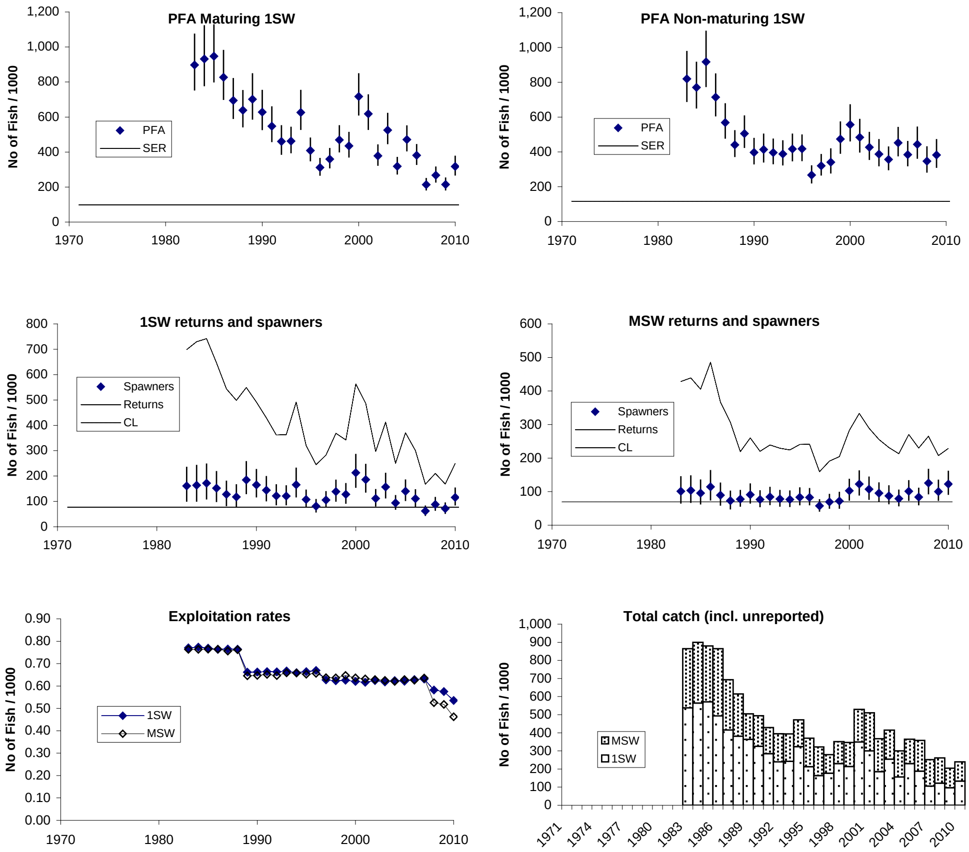


Figure 3.8.11.1d. Summary of fisheries and stock description, Ireland.



conservation limit derived from river specific information

Figure 3.8.11.1e. Summary of fisheries and stock description, Norway (minus Norwegian rod catches from the R. Teno).

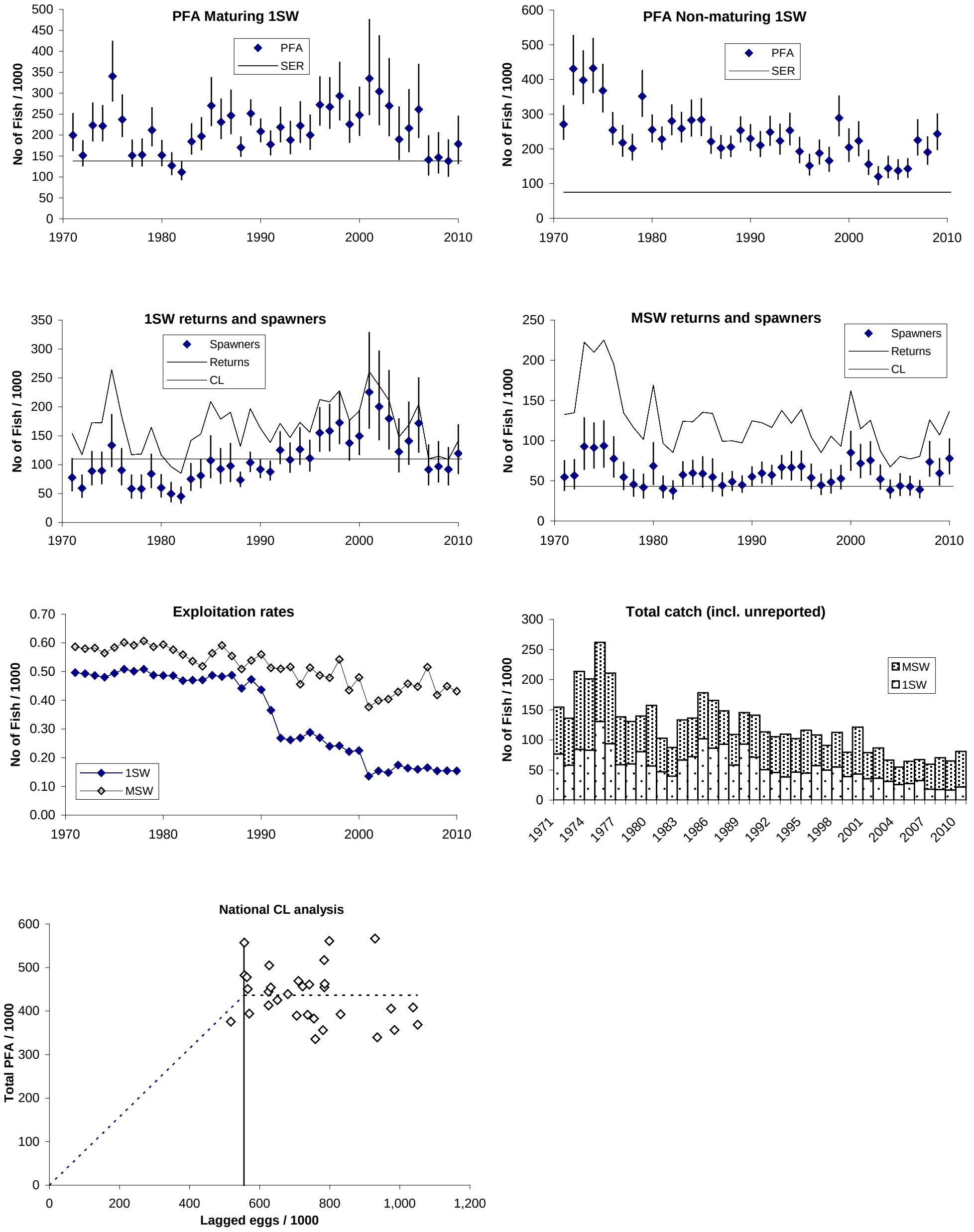


Figure 3.8.11.1f. Summary of fisheries and stock description, Russia.

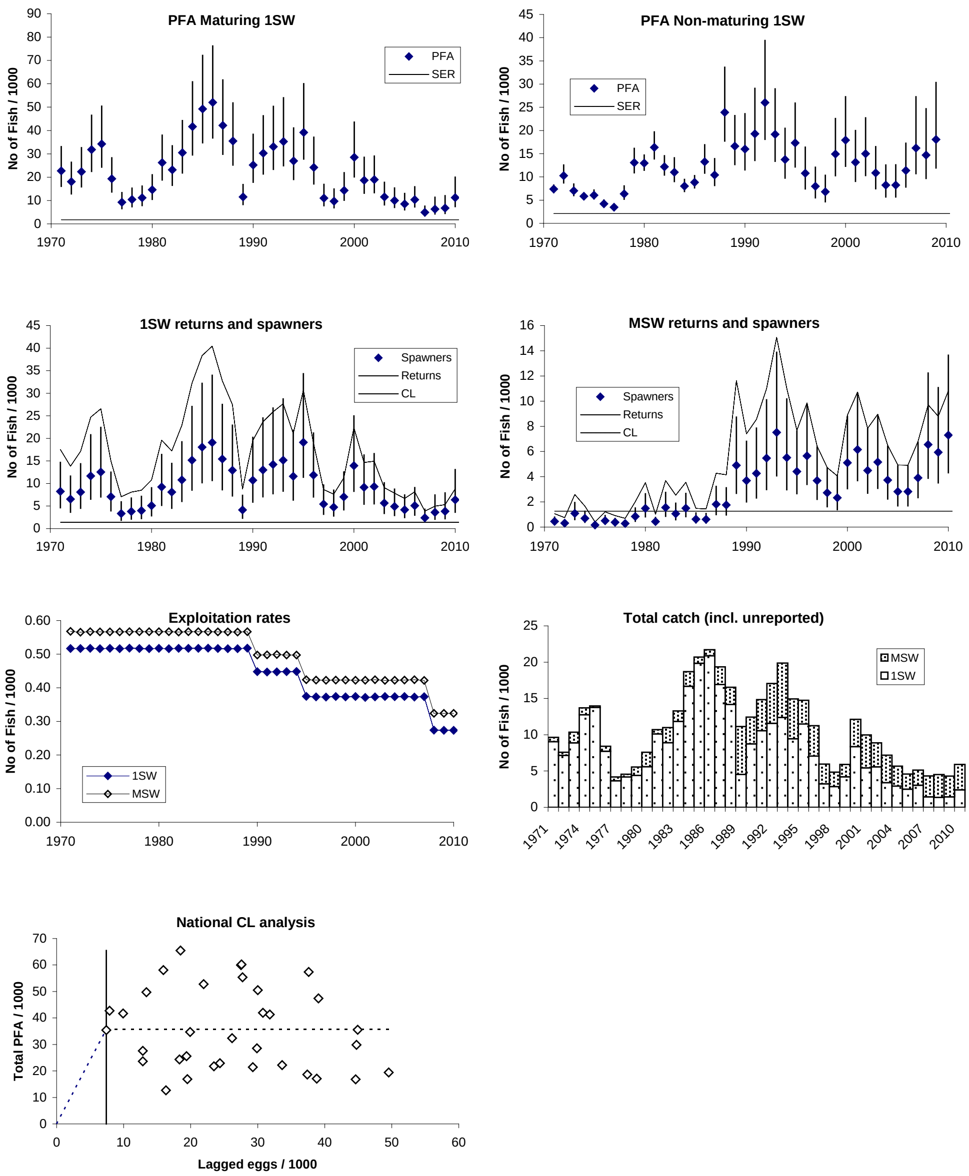


Figure 3.8.11.1g. Summary of fisheries and stock description, Sweden.

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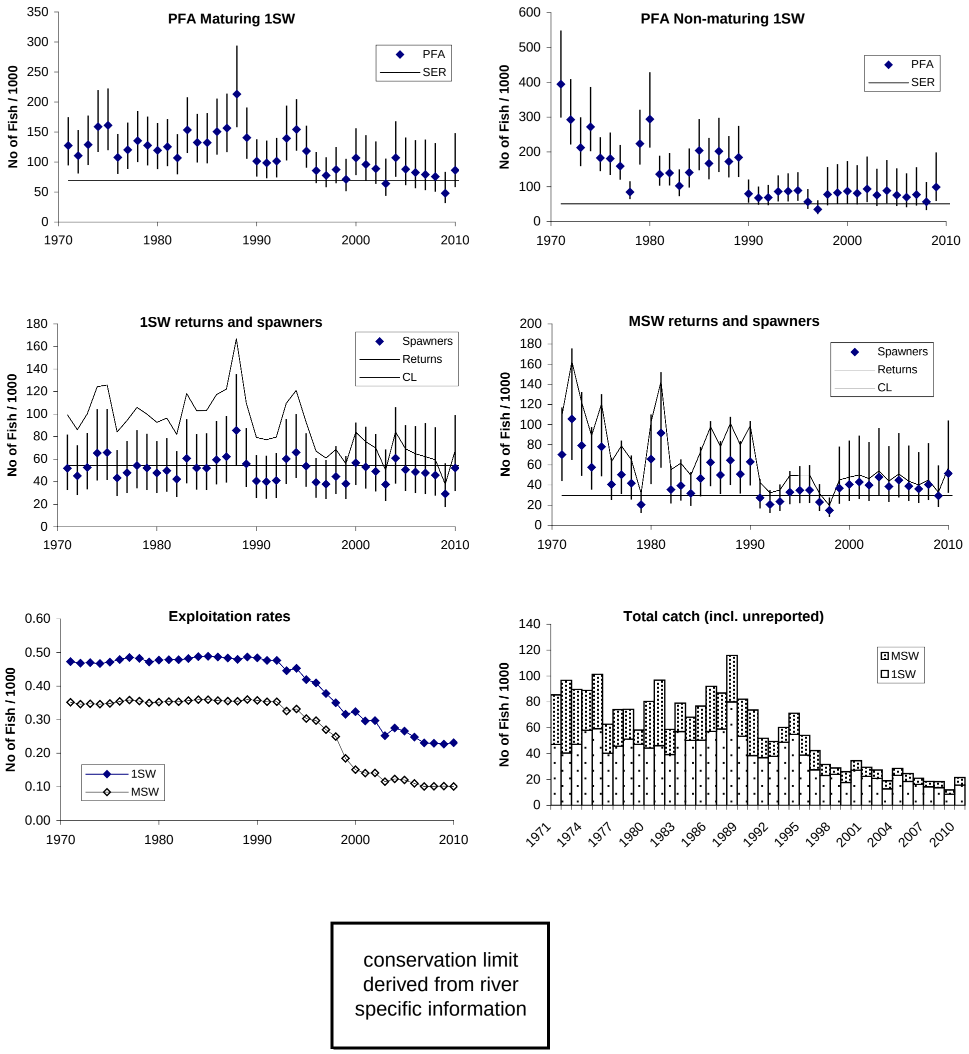


Figure 3.8.11.1h. Summary of fisheries and stock description, UK (England and Wales).

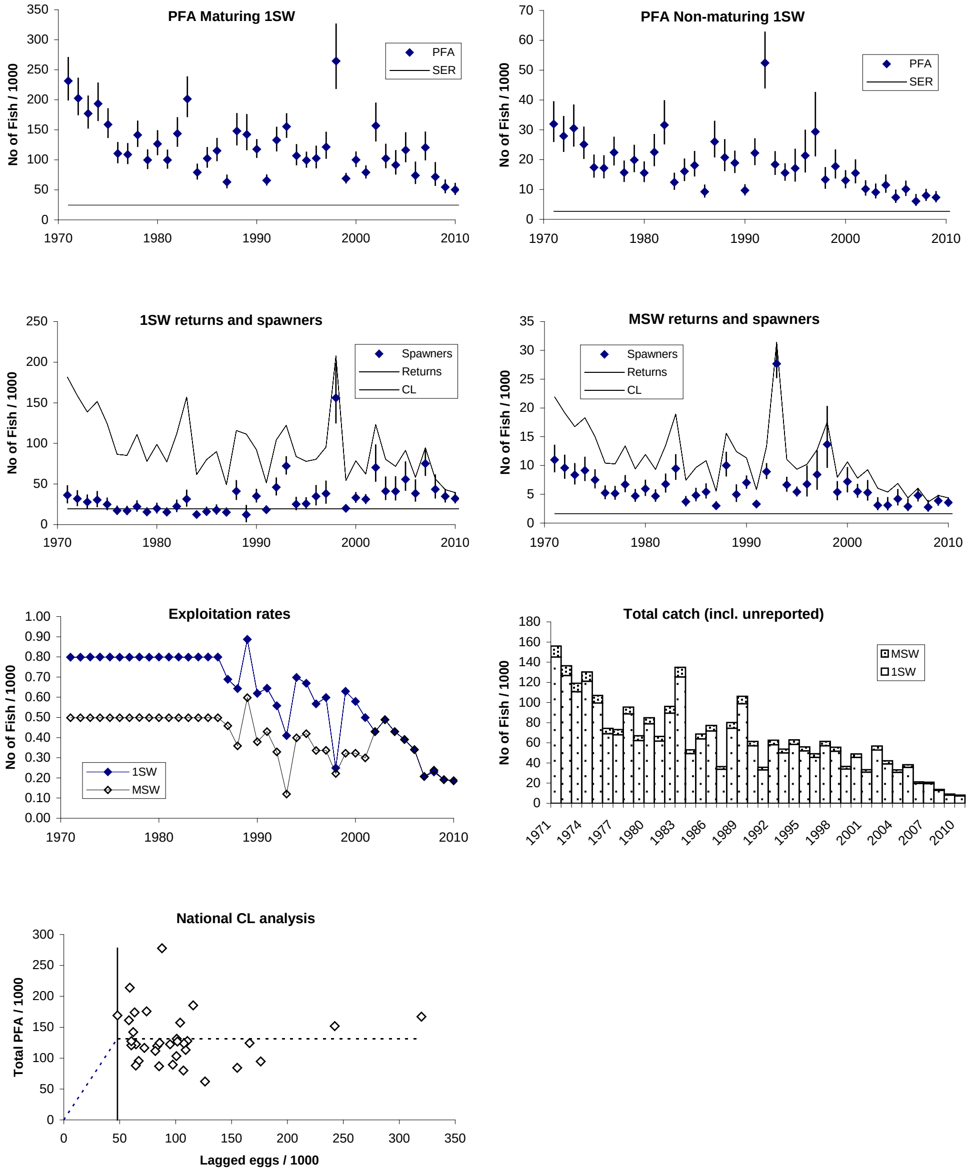


Figure 3.8.11.1i. Summary of fisheries and stock description, UK (N. Ireland).

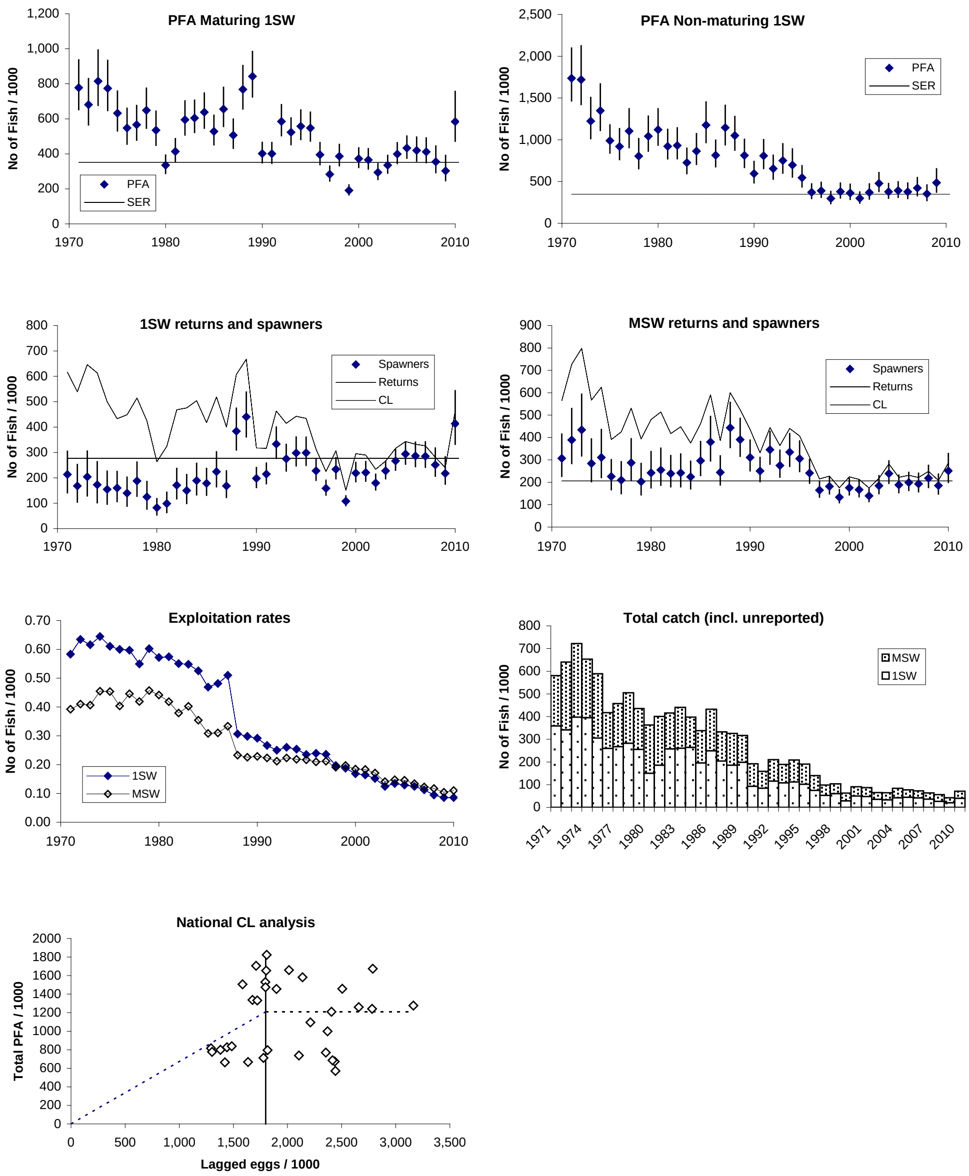


Figure 3.8.11.1j. Summary of fisheries and stock description, UK (Scotland).

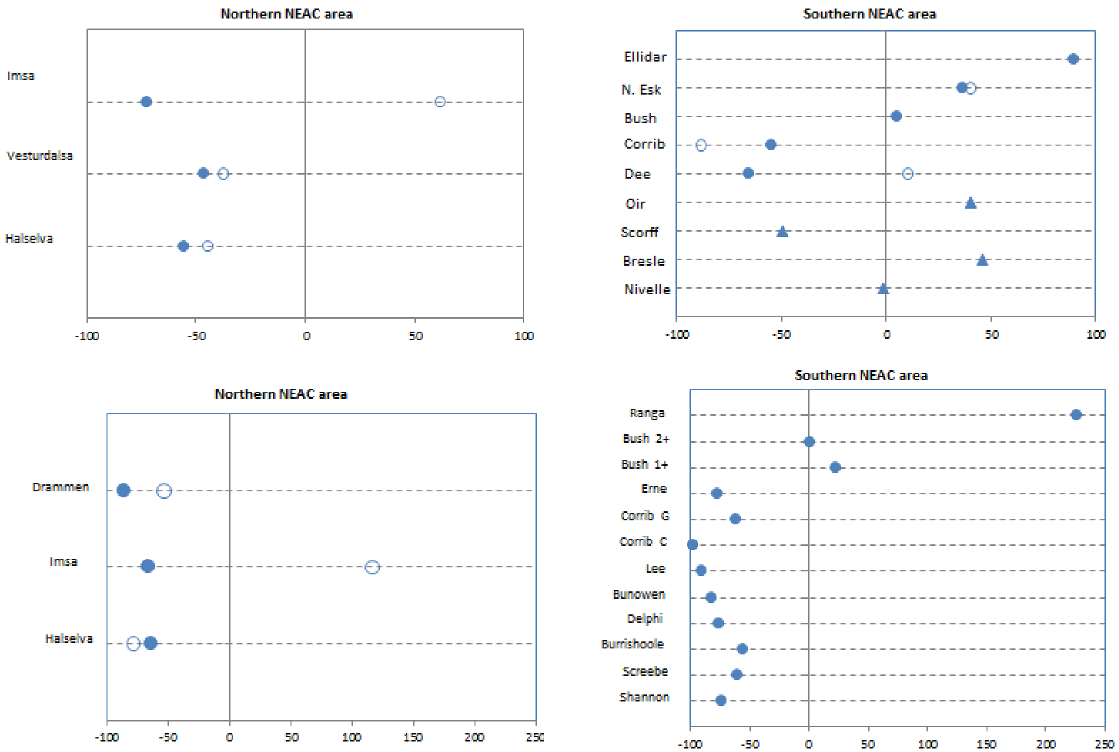


Figure 3.8.13.1. Comparison of the percent change in the five-year mean return rates for 1SW and 2SW salmon by wild (top) and hatchery (lower) salmon smolts to rivers of Northern and Southern NEAC areas for the 2000 to 2004 and 2005 to 2009 smolt years (1999 to 2003 and 2004 to 2008 for 2SW salmon). 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 3 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 percent change.

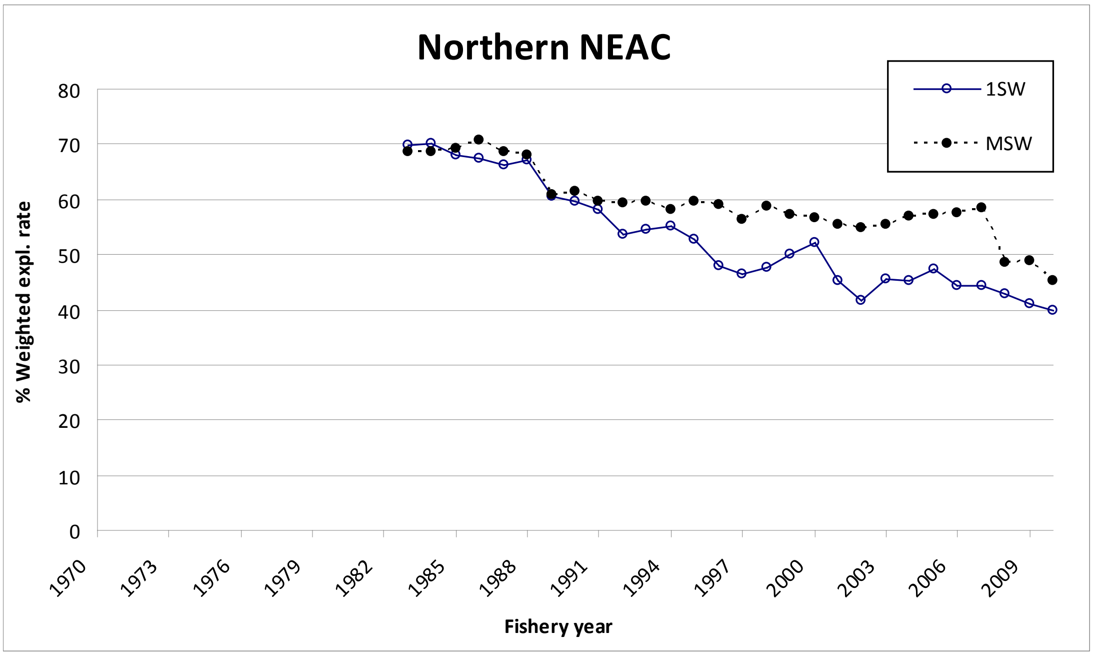


Figure 3.8.14.1. Mean annual exploitation rate of wild 1SW and MSW salmon by commercial and recreational fisheries in Northern NEAC countries from 1983 to 2010.

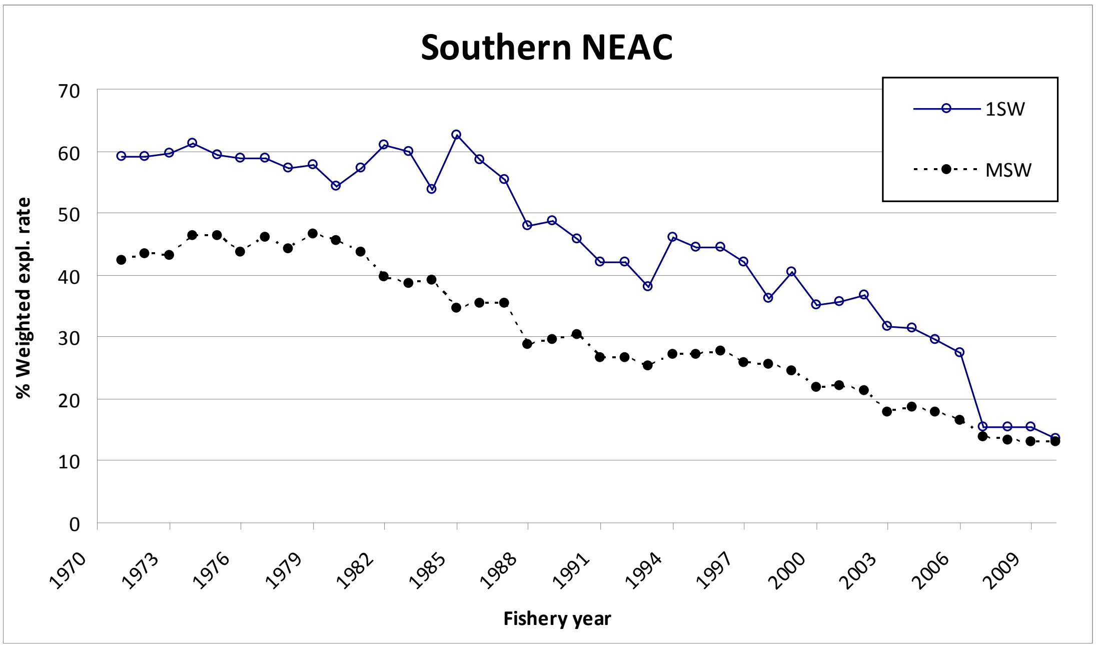


Figure 3.8.14.2. Mean annual exploitation rate of wild 1SW and MSW salmon by commercial and recreational fisheries in the Southern NEAC countries from 1971 to 2010.

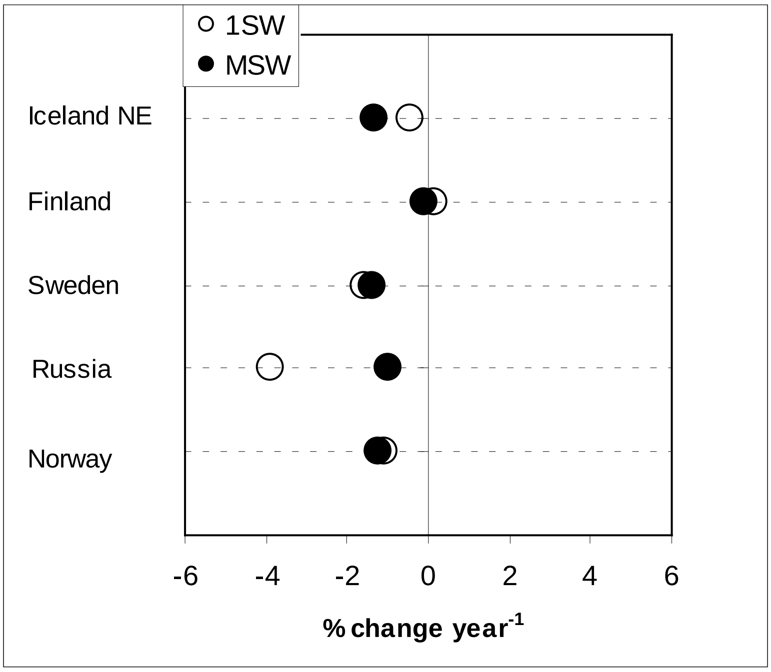


Figure 3.8.14.3. The rate of change of exploitation of 1SW and MSW salmon in Northern NEAC countries.

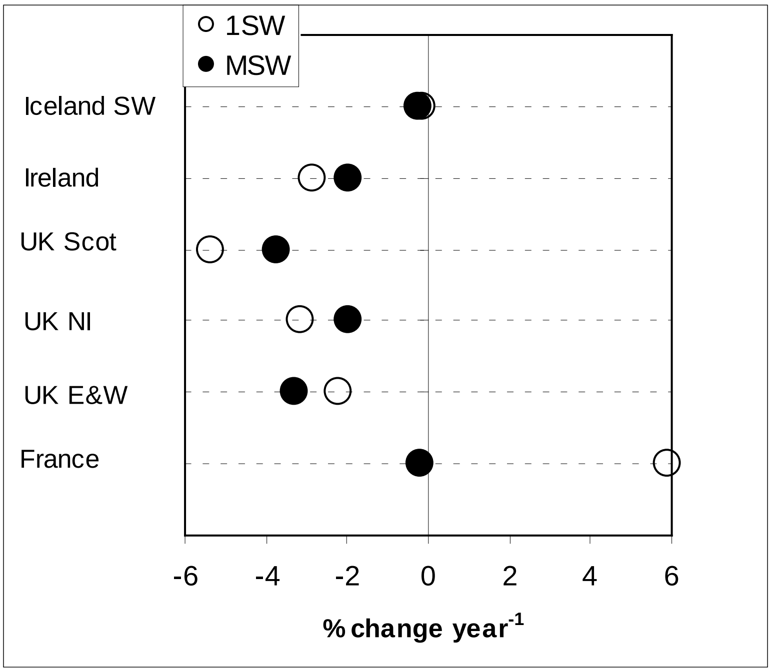


Figure 3.8.14.4. The rate of change of exploitation of 1SW and MSW salmon in Southern NEAC countries.

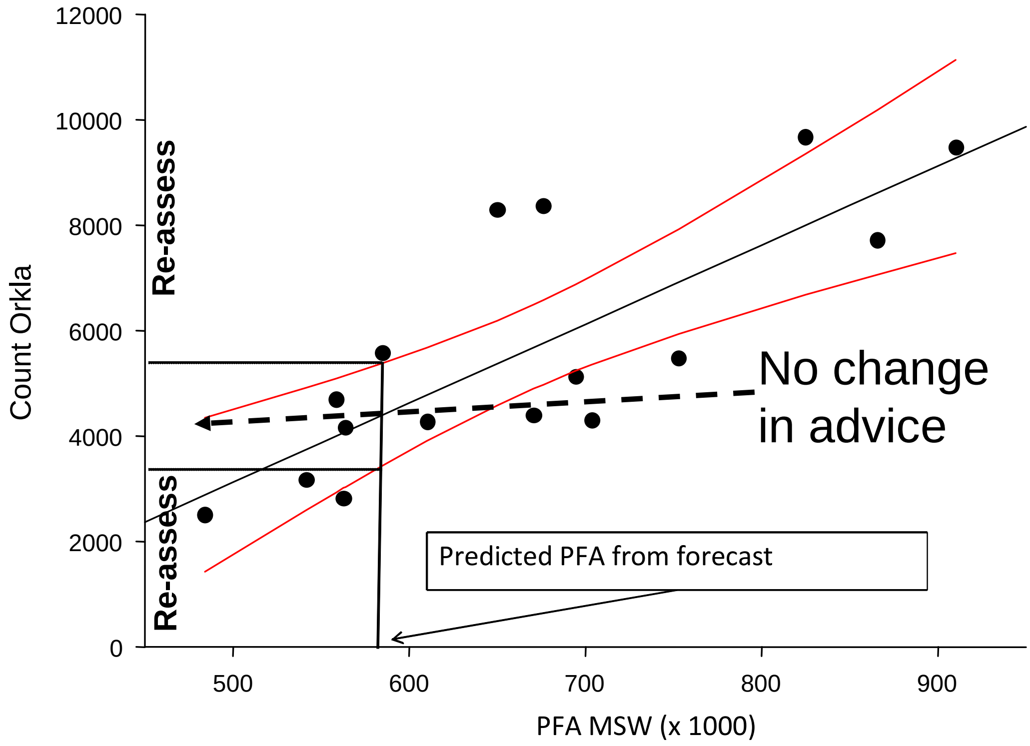


Figure 3.9.1. Example of how the reassessment intervals for the indicators are computed. The values of an indicator (counts) are plotted against the PFA. Regression line is shown in black and 95% confidence limits are shown in red. From the forecasted PFA in the year in question the values of the indicator corresponding to the upper and lower 95% confidence interval are estimated. If the indicator value falls outside these limits a reassessment is suggested by this particular indicator.

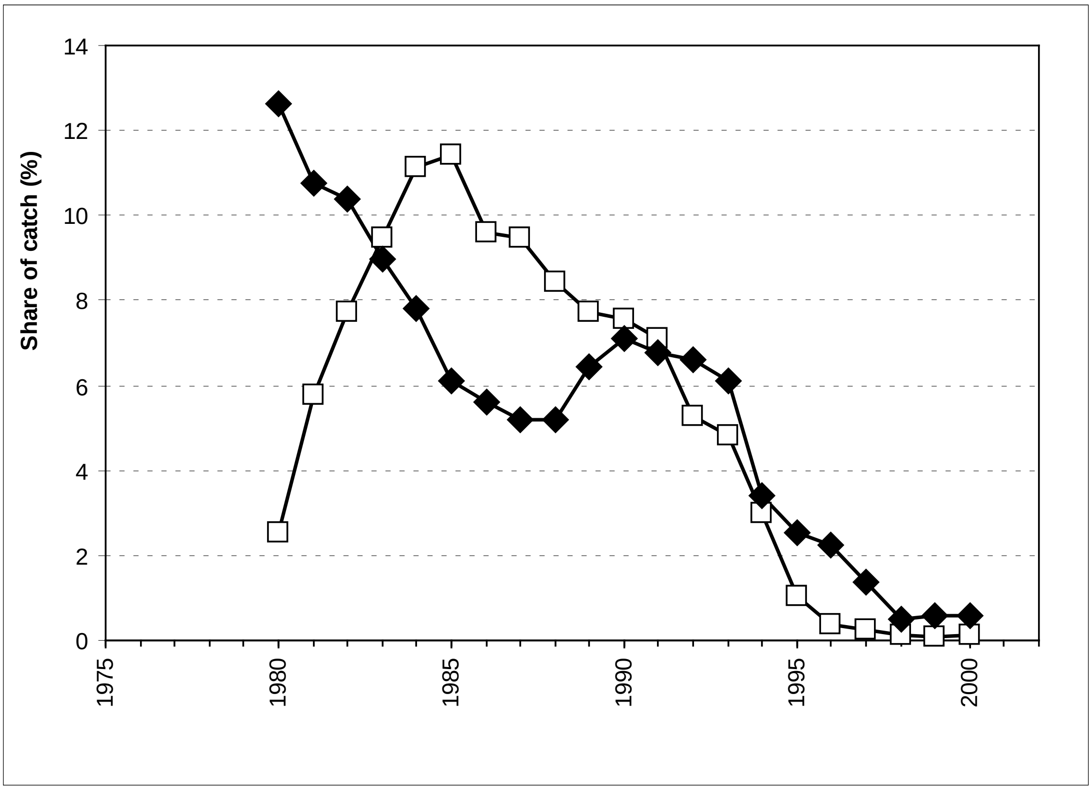


Figure 3.10.5.1. Historical shares of the total NEAC salmon (by weight) taken in the Faroese (open squares) and West Greenland (black diamonds) fisheries for the five year periods ending 1980 to 2000.

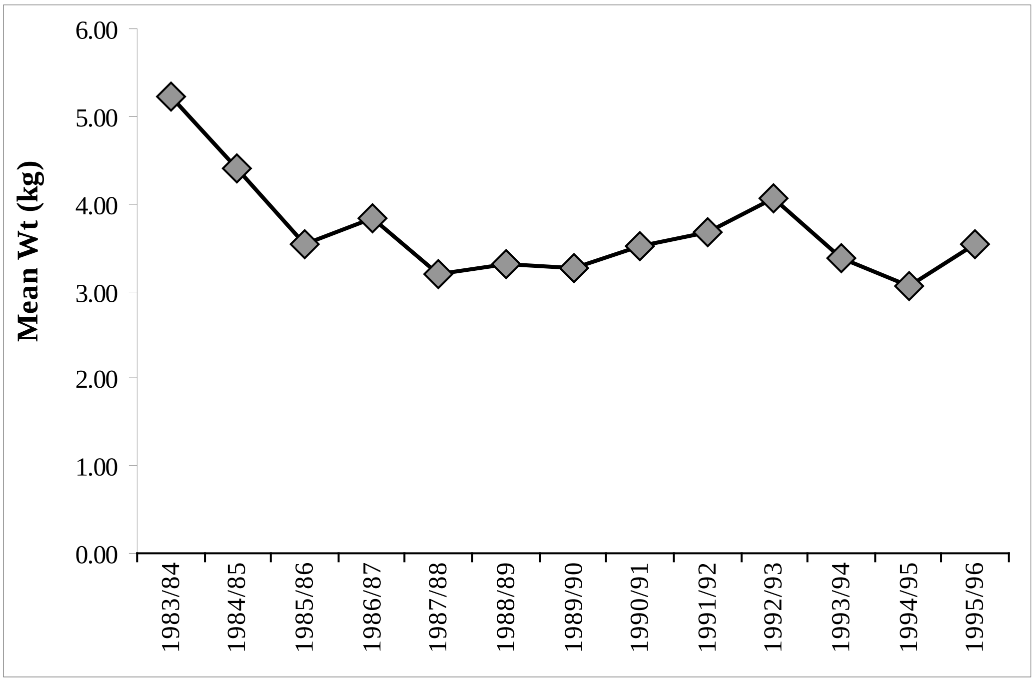


Figure 3.10.7.1. Mean weight of salmon caught in the Faroes fishery in the 1983/1984 to 1995/1996 fishing seasons.

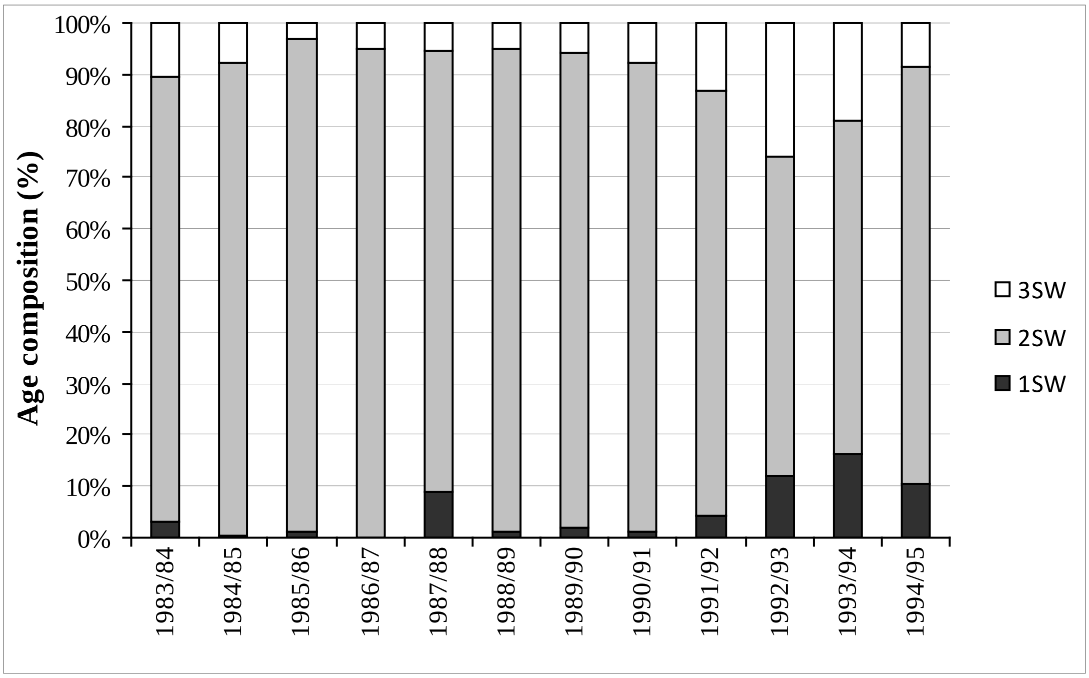


Figure 3.10.7.2. Proportions of 1SW, 2SW and 3SW+ salmon in samples taken from the Faroes fishery in the 1983/1984 to 1994/1995 fishing seasons. (1991/1992 to 1994/1995 were research fisheries).

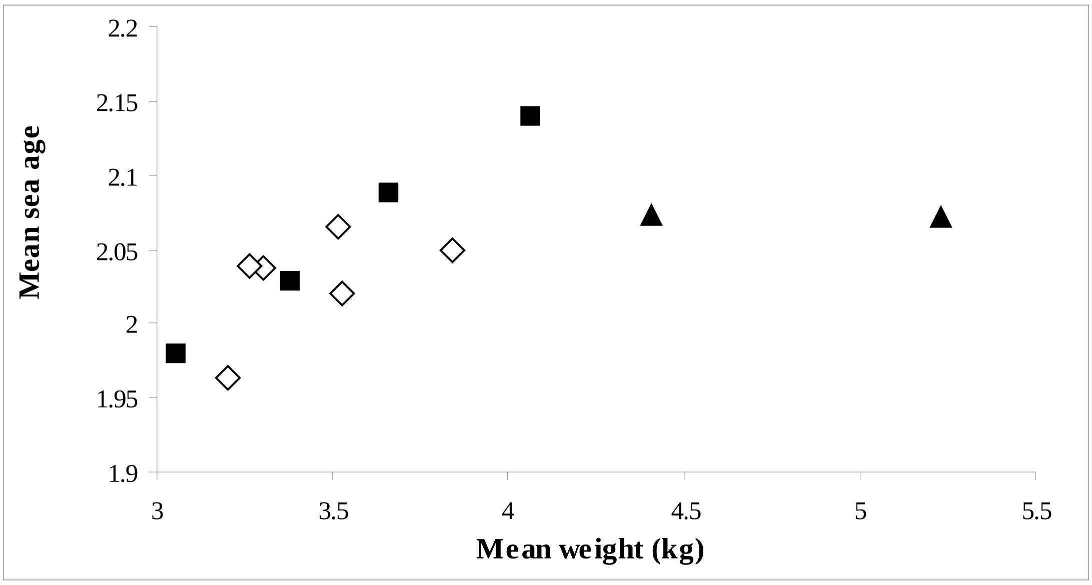


Figure 3.10.7.3. Mean sea age of catch samples against mean weight of total catch in Faroes fishery in the 1983/1984 to 1994/1995 seasons. Black triangles are for the commercial fishery in the 1983/1984 and 1994/1985 seasons; white diamonds are for commercial fishery in the 1985/1986 to 1990/1991 seasons; and black squares are for research fishery in the 1991/1992 to 1994/1995 seasons.

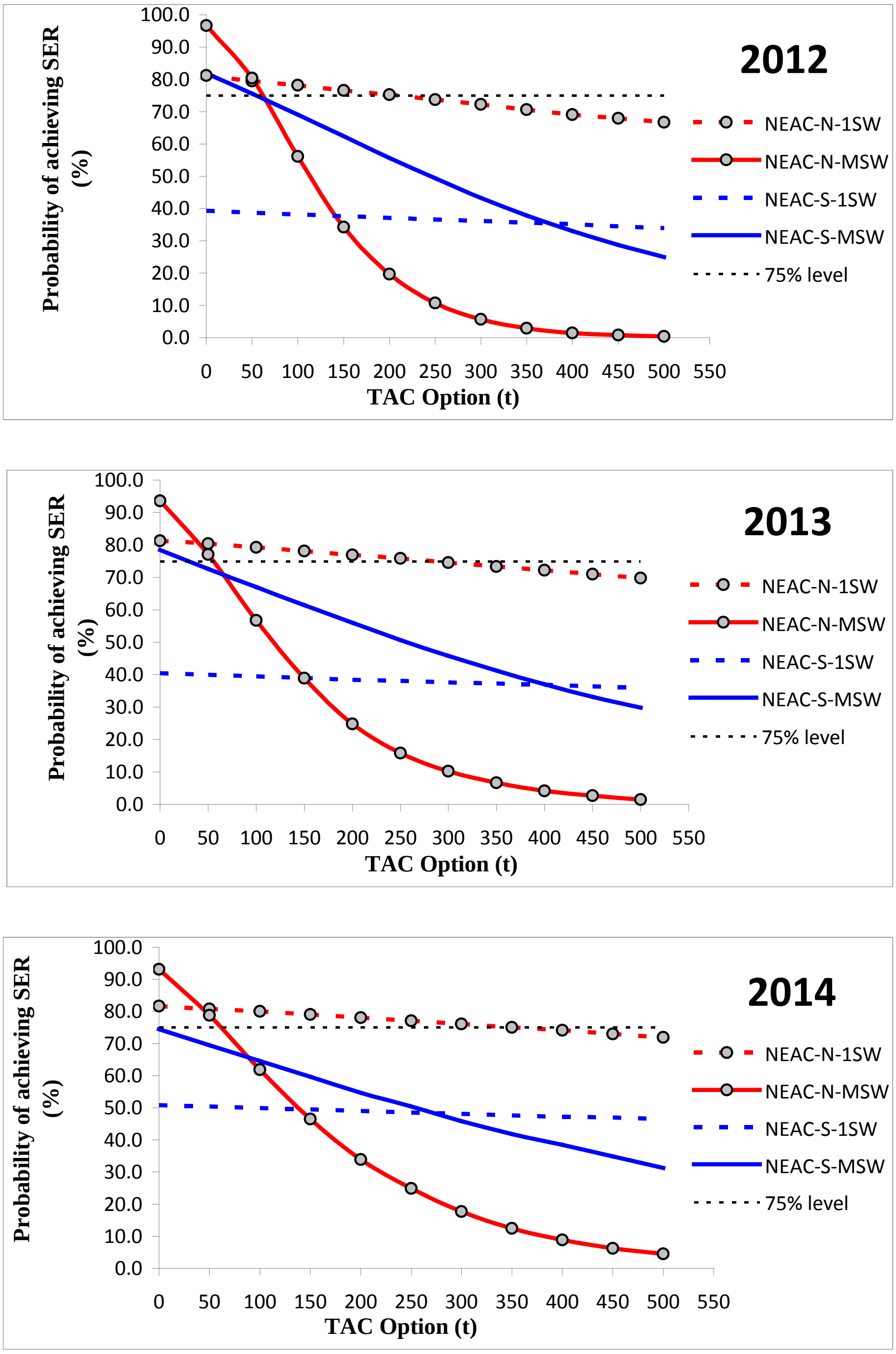
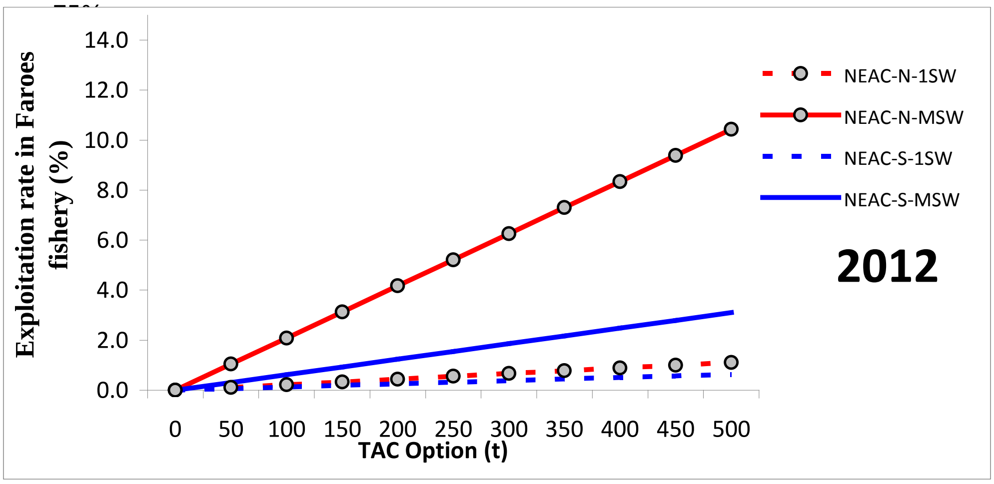
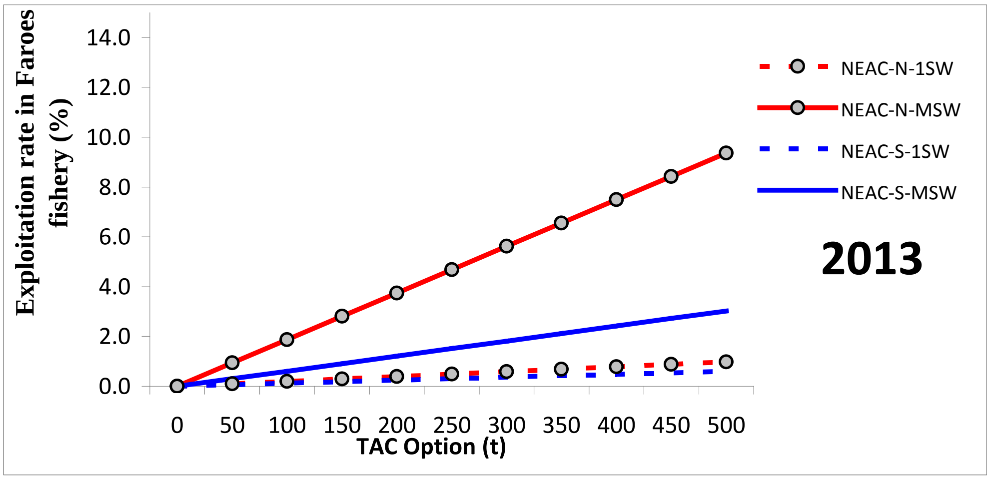


Figure 3.10.8.1. Probability (%) of 1SW and MSW salmon in Northern and Southern NEAC areas achieving their SERs for different catch options in Faroes for the years 2012 to 2014.





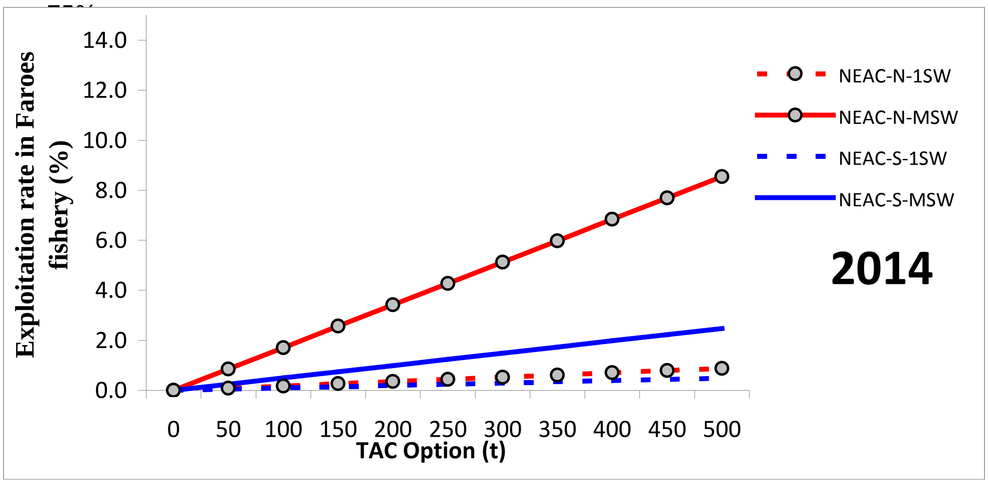


Figure 3.10.8.2. Forecast exploitation rate (%) of 1SW and MSW salmon from Northern and Southern NEAC areas in the Faroes fishery for different catch options in the years 2012 to 2014.

4 North American commission

4.1 Status of stocks/exploitation

In 2010, 2SW spawner estimates for the six geographic areas indicated that all areas were below their conservation limit (CL) (Figure 4.5.2.3) and are suffering reduced reproductive capacity.

The estimated exploitation rate of North American origin salmon in North American fisheries has declined (Figure 4.4.6.1) from approximately 80% in 1971 to 15% in 2010 for large salmon and from approximately 68% in 1973 to 19% in 2010 for small salmon. Exploitation rates in 2010 on both size groups remained among the lowest in the time-series, although exploitation rates on small salmon have increased slightly since 2007. Exploitation rates on 2SW equivalents have also been at about 15% over the past twelve years (Table 4.4.2.1).

The stock status is elaborated in Section 4.5.

4.2 Management objectives

Management objectives are described in Section 1.4.

4.3 Reference points

There are no changes to the 2SW salmon CLs from those identified previously. CLs for 2SW salmon for Canada total 123 349 and for the USA, 29 199, for a combined total of 152 548.

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

4.4 NASCO has requested ICES to describe the key events of the 2010 fisheries

4.4.1 Key events of the 2010 fisheries

- The majority of harvest fisheries were directed to small salmon.
- 2010 harvest was 54 116 small salmon and 10 988 large salmon, 26% more small salmon and 2% less large salmon compared with 2009.
- Catches remain very low relative to pre 1990 values.

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

Harvest histories (1972 to 2010) of salmon, expressed as 2SW salmon equivalents are provided in Table 4.4.2.1. 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 and terminal fisheries areas in Canada were summed with those of USA to estimate total 2SW equivalent mortalities 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 and Miquelon. Harvest equivalents within North America peaked at about 362 000 in 1976 and have remained below 14 000 2SW salmon equivalents since 1999 (Table 4.4.2.1).

In the most recent year, the harvest of cohorts destined to be 2SW salmon in terminal fisheries of North America was 65% of the total catch. The harvest percentages ranged from 19 to 32% during 1972 to 1990 and 61 to 89% during 1993 to 2010 (Table 4.4.2.1). Percentages increased significantly since 1992 with the reduction and closures of the Newfoundland and Labrador commercial mixed-stock fisheries.

4.4.3 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 Ministère des Ressources Naturelles et de la Faune and the fishing areas are designated by Q1 through Q11 (Figure 4.4.3.1). Harvest (fish which are 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 2010; Aboriginal peoples, residents fishing for food in Labrador, and recreational fishers. There were no commercial fisheries in Canada in 2010.

In 2010, four subsistence fisheries harvested salmonids in Labrador: 1) Nunatsiavut Government (NG) members fishing in the northern Labrador communities of Rigolet, Makkovik, Hopedale, Postville, and Nain and in Lake Melville; 2) Innu Nation members fishing in Natuashish and in Lake Melville from the community of Sheshatshiu; 3) the NunatuKavut Community Council (formerly the Labrador Metis Nation) members fishing in southern Labrador from Fish Cove Point to Cape St Charles and,

4) Labrador residents fishing in Lake Melville and various coastal communities. The NG, Innu, and LMN fisheries were regulated by Aboriginal Fishery Guardians jointly administered by the aboriginal groups and the Department of Fisheries and Oceans (DFO) as well as by DFO Fishery Officers and Guardian staff. The Nunatsiavut Government is directly responsible through the Torngat Fisheries Board for regulating its fishery through its Conservation Officers. The fishing gear is multifilament gillnets of 15 fathoms in length of a stretched mesh size ranging from 3 to 4 inches. 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 (95%, Figure 2.1.1.3) in North America 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 is allowed, it is closely controlled. The commercial fisheries are now closed and the remaining coastal food fisheries in Labrador are mainly located close to river mouths and likely harvest few salmon from other than local rivers.

The following management measures were in effect in 2010.

Aboriginal peoples' food fisheries

In Québec, Aboriginal peoples' food fisheries took place subject to agreements or through permits issued to the bands. There are ten bands 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 in food fisheries have to be reported collectively by each Aboriginal user group. However, if reports are not available, the catches are estimated. In the Maritimes (SFAs 15 to 23), food fishery harvest agreements were signed with several Aboriginal peoples groups (mostly First Nations) in 2010. 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), food fishery arrangements with the Nunatsiavut Government, the Innu First Nation, and the NunatuKavut Community Council, resulted in fisheries in estuaries and coastal areas. By agreement with First Nations, there were no food fisheries for salmon on the island of Newfoundland in 2010. Harvest by Aboriginal peoples with recreational licences is reported under the recreational harvest categories.

Resident food fisheries in Labrador

In 2010, a licensed subsistence trout 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 bycatch of four salmon of any size while fishing for trout and charr; four salmon tags accompanied each licence. When the bycatch of four salmon was caught the resident fishers were required to remove their net from the water. All licensees were requested to complete logbooks. DFO is responsible for regulating the Resident Fishery.

Recreational fisheries

Licences are required for all persons fishing recreationally for Atlantic salmon. Gear is restricted to fly fishing and there are daily/seasonal bag limits (Figure 4.4.3.2). Recreational fisheries management in 2010 varied by area and large portions of the southern areas remained closed to all directed salmon fisheries. Except in Québec and

Labrador (SFA 1 and some rivers of SFA 2), only small salmon could be retained in the recreational fisheries.

USA

There were no recreational or commercial fisheries for Atlantic salmon in the USA in 2010.

France (Islands of Saint-Pierre and Miquelon)

Nine professional and 57 recreational gillnet licences were issued in 2010, an increase of one professional licence and seven recreational licences from 2009. 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. The time-series of available data are in Table 4.4.3.1.

4.4.4 Catches in 2010

Canada

The provisional harvest of salmon in 2010 by all users was 146 t, about 16% higher than the 2009 harvest of 126 t (Table 2.1.1.1; Figure 4.4.4.1). The 2010 harvest was 54 116 small salmon and 10 988 large salmon, 26% more small salmon and 2% less large salmon compared with 2009. The dramatic decline in harvested tonnage since 1988 is 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' food fisheries

The total harvest by Aboriginal people in 2010 was 59.3 t (Table 4.4.4.1). Harvests (by weight) increased by 16% from 2009.

Residents fishing for food in Labrador

The estimated catch for the fishery in 2010 was 2.3 t. This represents approximately 1000 fish, 25% of which were large.

Recreational fisheries

Harvest in recreational fisheries in 2010 totalled 44 073 small and large salmon (approximately 84 t), was 21% above the 2009 harvest level, but remains at low levels similar to the previous decade (Figure 4.4.4.2). The small salmon harvest of 40 861 fish was 24% higher than the 2009 harvest. The large salmon harvest of 3212 fish was 5% below the 2009 harvest. The small salmon size group has contributed 88% 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 2010, approximately 58 300 salmon (about 35 600 small and 22 700 large) were caught and released (Table 4.4.4.2), representing about 62% of the total number caught (including retained fish). There is some mortality on these released fish, which is accounted for in the spawner estimates.

Recreational catch statistics for Atlantic salmon are not collected regularly in Canada and there is no mechanism in place that requires anglers to report their catch statistics, except in Québec. 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. 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 2010 and the catch therefore was zero.

Unreported catches

The unreported catch estimate for Canada is incomplete. The reports received from three of the four administrative regions totals 15 t in 2010. A large part of this unreported catch is illegal fisheries directed at salmon.

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. Illegal fishing activities on salmon were noted in 2010.

France (Islands of Saint-Pierre and Miquelon)

A total harvest of 2.8 t was reported in the professional and recreational fisheries in 2010, down from the higher values of about 3.5 t in 2008 and 2009 (Table 4.4.3.1).

There are no unreported catch estimates.

4.4.5 Origin and composition of catches

In the past, salmon from both Canada and the USA were taken in the commercial fisheries of eastern Canada. The Aboriginal Peoples' and resident food fisheries that occur in Labrador may intercept salmon from other areas of North America; however, in 2009 and 2010, there were no salmon tagged in other areas and reported from the food fisheries. Also none of the salmon sampled during the Food Fishery Sampling Program in those years were tagged or marked. No tags were reported from the fishery in Saint-Pierre and Miquelon.

Results of sampling programme for Labrador subsistence fisheries

A sampling programme of the subsistence fisheries in Labrador continued in 2010, conducted by the Labrador Metis Nation, aboriginal guardians, and Conservation Officers of the Nunatsiavut Government. Landed fish were sampled opportunistically for fork length, weighed (gutted weight or whole weight if available) and where possible the sex was determined. Scales were taken for subsequent age analysis. Fish were also examined for the presence of external tags, brands or elastomer marks, and adipose fin clips.

In 2010, a total of 222 samples were collected from the subsistence fisheries, 113 from northern Labrador (SFA 1) and 109 samples from southern Labrador (SFA 2, Figure 4.4.5.1). Based on the interpretation of the scale samples, 73% of all the samples taken were 1SW salmon, 16% were 2SW, and 10% were previously spawned salmon. Small and large salmon based on a 2.7 kg cut off, similar to that used in the Aboriginal fishery, indicated small salmon were 92% 1SW, 2% 2SW and 6% previously spawned salmon and large salmon were 27% 1SW, 53% 2SW and 20% previously spawned salmon. These are similar to the age structure by size groups from previous years ICES 2009a; ICES 2010b).

The river ages (Figure 4.4.5.2) of samples collected from the subsistence fisheries were compared with ages from scales (1946 samples from Northern Labrador and 975 in Southern Labrador) obtained from assessment facilities in 2000 to 2005. As noted in previous years, there was a difference in-river age distribution of adults from subsistence fisheries compared with returns to rivers in Northern Labrador (Chi-squared=24.9, P=<0.0001) with larger proportions of river age 3 and smaller proportions of river age 5 salmon in the subsistence fisheries compared with the assessment facilities. The same differences in relative proportions of river age 3 and river age 5 were also noted for Southern Labrador in 2010 (Chi-squared=11.5, P=0.075). The larger proportion of river age 3 smolts was also noted for the Lake Melville samples (Figure 4.4.5.3), but no samples are available from in-river monitoring to assess whether salmon from these populations have similar smolt age distributions to those populations in the coastal rivers of northern Labrador.

There were no river age 1 or 2 fish in the samples from the Northern Labrador fishery (SFA 1) and a low percentage of river age 1 and 2 salmon in the samples from Southern Labrador (Figure 4.4.5.2). The very low percentages of river age 1 and age 2 and the high percentage of river ages 4 to 7 salmon in the catches of 2010, as in previous years, suggests that very few salmon from the most southern stocks of North America (USA, Scotia-Fundy) are exploited in these fisheries.

The Working Group noted that the sampling programme conducted in 2010 provided biological characteristics of the harvest and that the information may be useful for updating parameters used in the Run Reconstruction Model for North America. As well it provides material (tissue samples from scales) to assess the origin of salmon in this fishery.

Results of sampling programme for Saint-Pierre and Miquelon

In 2010, biological characteristics (length, weight) were obtained from 57 salmon in the fishery and tissue samples (adipose fin tissue) were collected from 51 of these sampled fish. The tissue samples were analysed by a laboratory in France for 15 microsatellite markers commonly used for Atlantic salmon. The genetic characterization of the samples was compared with baseline populations comprised of four Canadian populations (Tobique River New Brunswick and the Sainte Marguerite, Sainte Anne, and Malbaie rivers from Québec), two populations from the USA (Narraguagus and Penobscot) and 28 populations from the NEAC area. The Working Group noted that the baseline was absent of any populations from Canadian rivers adjacent to St Pierre and Miquelon.

Of the 57 salmon sampled, 32 were of fork length less than 63 cm (range from 47 to 59 cm). The large salmon group (>= 63 cm) ranged from 67 to 84 cm fork length, with the most abundant fish in the 71 to 78 cm fork length sizes.

None of the fish sampled were genetically identified to the NEAC stocks. With the limited baselines available, three of the fish were closest to the USA characteristics, and the remaining 47 to the Canadian rivers. This is similar to the analyses from the 2004 fishery which had also indicated a predominance of Canadian origin salmon in the catches (ICES 2006).

The Working Group welcomed the efforts to sample the catches at Saint-Pierre and Miquelon to estimate stock contributions to the harvest and recommend that sampling be continued in future. However, the Working Group identified a number of issues with the sampling programme that if corrected, would greatly increase the value of data. First, it would be useful to identify the fishing sites and collection dates where the samples originated from to evaluate if the results are representative of the harvest at both spatial and temporal scales. Second, the baseline of Canadian and USA populations used was very small. Much more extensive baselines of Canadian and USA populations exist, including samples from rivers in Newfoundland. Members of the Working Group offered to run additional analyses on the samples to assess at a finer spatial scale the origin of the fish in the catches. Third, reporting on additional quality checks to demonstrate if DNA extraction, amplification and scoring efforts were effective and that no alleles were dropped would be useful information to present.

The issues identified above regarding stock origin identification of the fisheries at Labrador and Saint-Pierre and Miquelon should be resolved. Genetic analysis techniques offer the opportunity to identify the origin of harvested individuals at varying levels of origin and can provide the information necessary to evaluate the effect that these mixed-stock fisheries have on the contributing populations. Appropriate baselines that represent all populations subjected to the fishery are required to support these analyses.

The Working Group recommends that sampling of the Labrador and Saint-Pierre and Miquelon fisheries be continued and expanded (i.e. sample size, geographic coverage, tissue samples, seasonal distribution of the samples) if possible in 2011 and future years. As well, scale samples from in-river fisheries (recreational) in Labrador, should be collected to determine the river age distributions of the salmon populations not currently being monitored by the limited (three to four) assessment facilities.

4.4.6 Exploitation rates

Canada

In the Newfoundland recreational fishery, exploitation rates for retained small salmon ranged from a high of 12% on Torrent River to a low of 6% on Terra Nova River. Overall, exploitation rates of small salmon in these rivers declined from 30% in 1986 to approximately 10% in 2010 which is one of the lowest rates of the past 25 years. In Sand Hill River, Labrador, exploitation rate on small salmon was 5% and no large salmon were reported as retained in 2010.

In Québec, the 2010 total fishing exploitation rate was around 17%; slightly lower than the average of the five previous years. Native peoples’ fishing exploitation rate was 5% of the total return. Recreational fishing exploitation rate was 12% on the total run, 17% for the small and 7% for the large salmon, representing a decrease from the previous five year average of 18% for small salmon and 9% for large salmon.

USA

There was no exploitation of USA salmon in home waters, and no tagged salmon of USA origin were reported in Canadian fisheries in 2010.

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 2010 time period were calculated by dividing annual harvests in all North American fisheries by annual estimates of the returns to

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North America prior to any fisheries in North America. 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 4.4.6.1). 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, average of 15% for both small salmon and large salmon over the past ten years. However, exploitation rates across regions within North America are highly variable.

4.5 Elaboration on 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. The upward revision to that previously reported by ICES (2008a) is attributable to a number of factors detailed below. Assessments were reported for 71 of these rivers in 2010.

Canada has documented the current and best information available, based on common criteria, on rivers with anadromous Atlantic salmon in eastern Canada. Recently, the DFO regions and the province of Québec contributed information in support of the development of a status report of Atlantic salmon by COSEWIC (Committee on the Status of Endangered Wildlife in Canada). A list of rivers with Atlantic salmon was compiled with some accompanying descriptions of those rivers, the details varying among rivers and among regions (Breau *et al*., 2009; Cairns *et al*., 2010; Cameron *et al*., 2009; Chaput *et al*., 2010; Gibson and Bowlby, 2009; Gibson *et al*., 2010; Jones *et al*., 2010; MRNF 2010; Reddin *et al*., 2010).

A river was defined as a fluvial system flowing directly into tidal water (Reddin *et al*., 2010). Under this definition, some previously considered salmon rivers were deleted while some rivers were subdivided into several rivers (i.e. the Miramichi River in New Brunswick is subdivided into six rivers based on the location of river mouth in tidal waters). This database was used to update NASCO's North Atlantic-wide database of rivers with Atlantic salmon.

The updated database for Canada has entries for 1082 rivers within the five provinces of eastern Canada.

Province	Number of rivers	
Newfoundland and Labrador		581
Newfoundland	271	
Labrador	310	
Québec		113
New Brunswick		118
Prince Edward Island		59
Nova Scotia		211
Canada Total		1082

Conservation requirements in terms of eggs have been defined for 45% (485) of the 1082 rivers in the database. For rivers with conservation requirements, over 59% of them have conservation requirements less than 1 million eggs, which translates to roughly 200 to 300 spawners depending upon life-history type. Collectively, 91% of the rivers have conservation requirements less than five million eggs.

Conservation requirement (million eggs)	Frequency	% of rivers with defined requirements
<= 1	285	59%
>1, <= 5	157	32%
>5, <= 10	22	5%
>10, <= 25	16	3%
>25, <= 50	3	1%
>50	2	<1%
Canada Total	485	45%

A status category was assigned to 68% of the rivers in the database (Table 4.5.1). The largest number of rivers with the status assessed as "Unknown" is from Labrador (16% of region total) (Figure 4.5.1). A total of 49% of the assessed rivers were classified as "Not Threatened with loss" and 49% were classified as "Threatened with loss" (30%) or "Lost" (19%). Every region except Labrador has a number of rivers for which the populations are considered to be "Threatened with loss". The province of Nova Scotia has the highest percent of rivers classified as "Lost" (47%). The losses have occurred primarily in the southern uplands portion of the Atlantic coast of Nova Scotia (Gibson *et al.*, 2010). Only a handful of rivers were classified as either "Maintained", "Restored" or "Not Present but potential".

4.5.1 Smolt and juvenile abundance

Canada

Wild smolt production was estimated in 12 rivers in 2010. Of these, 12 rivers have at least eight years of information and nine have data for over 15 years (Figure 4.5.1.1).

In 2010, smolt production increased (>110%) from 2009 in six rivers, decreased (<90%) in four rivers and remained unchanged in two rivers. The relative smolt production, scaled to the size of the river using the conservation egg requirements, was highest in the rivers of Québec and lowest in the southern rivers of the Scotia Fundy region (Figure 4.5.1.1). For most of the 12 rivers there has been no significant linear trend in smolt production (P>0.05) over the available time-series with the exception of: 1) significant decreases in de la Trinité and St Jean (Québec) and 2) significant increases in Southwest Miramichi (Gulf) and Western Arm Brook (WAB) (Newfoundland).

USA

Wild salmon smolt production has been estimated on the Narraguagus River for 14 years (Figure 4.5.1.1). Smolt production in 2010 was 84% above that of 2009, but the trend since 1997 remains negative (P < 0.05).

4.5.2 Estimates of total adult abundance by geographic area

Returns of small (1SW), large, and 2SW salmon (a subset of large) to each region (Figures 4.5.2.1, 4.5.2.2 and 4.5.2.3; and Annex 6) were originally estimated by the methods and variables developed by Rago *et al*. (1993) and reported by ICES (1993). At the 2010 Working Group meeting there were some changes to the input variables used. 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.

Canada

Labrador

The median of the estimated returns of small salmon in 2010 to Labrador (91 870) was 3% higher than the previous year and 50% lower than the previous 5-year mean (184 520, Figure 4.5.2.1). The median of the estimated 2SW returns in 2010 to Labrador (8961) was 65% lower than the previous year and 47% lower than the previous 5-year mean (16 894, Figure 4.5.2.3).

Labrador regional estimates are generated from data collected at four counting facilities (one in SFA 1 and three in SFA 2, Figure 4.4.3.1), but only three facilities operated in 2010 (two in SFA 2). The production area 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 monitoring facilities in SFA 2. Further work is needed to understand the best use of these data in describing stock status and the Working Group recommends that additional monitoring data be considered in Labrador to better estimate salmon returns in that region.

Newfoundland

The median of the estimated returns of small salmon in 2010 to Newfoundland (229 800) was 3% higher than the previous year and 6% higher than the previous 5-year mean (217 620, Figure 4.5.2.1). The median (2207) of the estimated 2SW returns in 2010 to Newfoundland was 52% lower than the previous year and 51% lower than the previous 5-year mean (4483, Figure 4.5.2.3).

Québec

The median of the estimated returns of small salmon in 2010 to Québec (28 130) was 27% higher than the previous year and 3% higher than the previous 5-year mean

(27 828, Figure 4.5.2.1). The median of the estimated returns of 2SW in 2010 to Québec (29 450) was 7% higher than the previous year and 10% higher than the previous 5-year mean (26 750, Figure 4.5.2.3).

Gulf of St Lawrence

The median of the estimated returns of small salmon in 2010 to the Gulf (74 120) was 190% higher than the previous year and 60% higher than the previous 5-year mean (46 448, Figure 4.5.2.1). The median of the estimate of 2SW returns in 2010 to the Gulf (18 780) was 20% lower than the previous year and 14% lower than the previous 5-year mean (21 766, Figure 4.5.2.3).

Scotia–Fundy

The median of the estimated returns of small salmon in 2010 to Scotia-Fundy (14 870) was 251% higher than the previous year and 65% higher than the previous 5-year mean (9020, Figure 4.5.2.1). The median of the estimated 2SW returns in 2010 to Scotia-Fundy (2013) was 25% lower than the previous year and 11% lower than the previous 5-year mean (2271, Figure 4.5.2.3).

The model currently being used to extrapolate for the Nova Scotia Atlantic coast assessed rivers to total abundance (both returns and spawners) within SFAs 19-21 is likely leading to an overestimation of this portion of the regional abundance. The model is based on the assumption that the LaHave River salmon count is a representative index of this portion, an assumption that is likely invalid (ICES, 2010b). This issue is expected to have very little effect on the advice provided on overall status of salmon in North America, but does have implications for regional management.

USA

The estimated returns of small salmon in 2010 to USA (525) were 118% higher than the previous year and 24% higher than the previous 5-year mean (424, Figure 4.5.2.1). The estimated returns of 2SW in 2010 to USA (1078) were 48% lower than the previous year and 21% lower than the previous 5-year mean (1359, Figure 4.5.2.3).

4.5.3 Estimates of spawning escapements

Updated estimates for small, large and 2SW spawners (1971 to 2010) were derived for the six geographic regions. A comparison between the numbers of small and large returns and spawners is presented in Figures 4.5.2.1 and 4.5.2.2. A comparison between the numbers of 2SW returns, spawners, and CLs is presented in Figure 4.5.2.3.

Canada

Labrador

The median of the estimated numbers of 2SW spawners (8765) was 65% lower than the previous year and 47% lower than the previous 5-year mean (16 654). The 2010 2SW spawners achieved 25% of the 2SW CL for Labrador (Figure 4.5.2.3). The 2SW spawner limit has not been exceeded during the time-series. The median of the estimated numbers of small spawners (90 090) was 2% higher than the previous year and 51% lower than the previous 5-year mean (182 270, Figure 4.5.2.1).

Newfoundland

The median of the estimated numbers of 2SW spawners (2126) was 53% lower than the previous year and 52% lower than the previous 5-year mean (4405). The 2010 2SW spawners achieved 53% of the 2SW CL for Newfoundland. The 2SW CL has been met or exceeded in four out of the last ten years (Figure 4.5.2.3). The median of the estimated number of small spawners (203 000) was 3% higher than the previous year and 5% higher than the previous 5-year mean (194 060, Figure 4.5.2.1). There was a general increase in both 2SW and 1SW spawners during the period 1992 to 1996 and 1998 to 2000, which is consistent with the closure of the commercial fisheries in Newfoundland.

Québec

The median of the estimated numbers of 2SW spawners (23 580) was 13% higher than the previous year and 19% higher than the previous 5-year mean (19 894). The 2010 2SW spawners achieved 77% of the 2SW CL for Québec (Figure 4.5.2.3). The median of the estimated number of small spawners (205 000) was 27% higher than the previous year and 3% higher than the previous 5-year mean (199 000, Figure 4.5.2.1).

Gulf of St Lawrence

The median of the estimated numbers of 2SW spawners (17 990) was 20% lower than the previous year and 14% lower than the previous 5-year mean (20 900). The 2010 2SW spawners achieved 61% of the 2SW CL for the Gulf (Figure 4.5.2.3). The median of the estimated number of small spawners (47 980) was 206% higher than the previous year and 61% higher than the previous 5-year mean (29 738, Figure 4.5.2.1).

Scotia-Fundy

The median of the estimated numbers of 2SW spawners (1883) was 26% lower than the previous year and 13% lower than the previous 5-year mean (2153). The 2010 2SW spawners achieved 13% of the 2SW CL for Scotia-Fundy (Figure 4.5.2.3). The median of the estimated number of small spawners (14 780) was 263% higher than the previous year and 68% higher than the previous 5-year mean (8812, Figure 4.5.2.1). As was the case with returns, these values may be overestimates (see Section 4.5.2).

USA

The estimated numbers of 2SW spawners (1482) was 35% lower than the previous year and 16% lower than the previous 5-year mean (1759). The 2010 2SW spawners achieved 5% of the 2SW CL for USA (Figure 4.5.2.3). The estimated number of small spawners (525) was 118% higher than the previous year and 24% higher than the previous 5-year mean (424, Figure 4.5.2.1).

4.5.4 Egg depositions in 2010

Egg depositions by all sea ages combined in 2010 exceeded or equalled the river-specific CLs in 31 of the 71 assessed rivers (44%) and were less than 50% of CLs in 19 rivers (37%; Figure 4.5.4.1).

- In Labrador, none of the three assessed rivers exceeded their CLs (only one of three met the CLs in 2009) but none of the assessed rivers had egg depositions that were less than 50% of their CLs.

- In Newfoundland, 53% (eight of 15) of the rivers assessed met or exceeded the CLs and only one location (upper Exploits River) had egg depositions that were less than 50% of the CL.
- For the three assessed rivers in the Gulf, two exceeded their CLs and the third was at 80% of the CL.
- In Québec, 57% (20 of 35) of assessed rivers had egg depositions that equalled or exceeded their CLs. Six rivers were below 50% of their CLs.
- Large deficiencies in egg depositions were noted in the Bay of Fundy and Atlantic coast of Nova Scotia (SFA 19–23) where the CL was met in only one river and six of the nine assessed rivers (89%) had egg depositions that were less than 50% of their CLs. Abundance in most rivers in this region is low (four of the nine assessed rivers were below 25% of their CLs).
- Large deficiencies in egg depositions were noted in the USA, none of the six assessed rivers met their CLs. On an individual river basis, the Penobscot River met 13% (compared with 26% in 2009) of its spawner requirement while the other five USA rivers were at 0.0 to 9.0% of their CL.

4.5.5 Marine survival rates

In 2010, return rate data were available from eleven wild and three hatchery populations from rivers distributed among Newfoundland, Québec, Scotia-Fundy, and USA. In the eleven wild stocks with available data, return rates to 1SW fish in 2010 increased relative to 2009 (4% to 199%). Larger increases were also noted in 1SW return rates for hatchery stocks (>800%). However, on four rivers in Newfoundland and one in USA, return rates to 1SW fish for wild populations were still 11 to 43% below 2008 levels.

Return rates in 2010 for wild 2SW salmon from the 2008 smolt class increased (44% to 284%) relative to the 2007 smolt class in four of six rivers with available data. The exceptions were the Southwest Miramichi (12.5% decrease) and the Narraguagus (68% decrease). In contrast to generally higher return rates of wild 2SW salmon from the 2008 smolt class, returns rates for 2SW salmon decreased for all three hatchery stocks monitored, one in Canada (6%) and two in the USA (median 46%). Return rates of wild stocks exceeded those of hatchery stocks.

Time-series analyses of return rates to 1SW and 2SW adults by area (Figure 4.5.5.1) and analysis of the rates of change for individual rivers (Figures 4.5.5.2) provide insights into spatial and temporal changes in marine survival of wild and hatchery stocks.

Temporal trends

- 1SW return rates in 2010 to all areas and rivers were higher than in 2009 for both wild and hatchery stocks.
- Return rates of 2SW salmon increased from 2009 for four of six wild stocks, and decreased for the three hatchery populations.
- Mean 2006 to 2010 return rate for 1SW wild salmon smolts in Newfoundland were similar to the mean 2001 to 2005 rate.
- Mean 2006 to 2010 return rate for 1SW wild and hatchery salmon smolts across the North American Commission were higher than the mean 2001 to 2005 rate for all but two of the ten predominantly MSW rivers monitored.

- Mean 2006 to 2010 return rate for 2SW wild and hatchery salmon smolts across the North American Commission were higher than the mean 2001 to 2005 rate for six of the ten predominantly MSW rivers monitored.

Spatial trends

- 1SW return rates of wild smolts to Newfoundland, although varying annually, have no significant temporal trend over the period 1970 to 2010 ($p>0.05$).
- 1SW and 2SW return rates of wild smolts to the Gulf and Québec have both declined ($p<0.05$) over the periods for which data were available.
- 1SW and 2SW return rates of wild smolts to the Scotia-Fundy and USA, although varying annually, have no significant temporal trend over the period 1996 to 2010 ($p>0.05$).
- In Scotia-Fundy and USA, hatchery smolt return rates to 2SW salmon have decreased over the period 1970 to 2010 ($p<0.05$). 1SW return rates for Scotia-Fundy stocks also declined for the period ($p<0.05$), while for USA there has been no significant trend ($p >0.05$).
- 1SW return rates in predominately MSW salmon stocks in USA and Québec are lower than those in predominantly 1SW salmon stocks of Newfoundland.
- 1SW return rates in predominately MSW salmon stocks in Gulf and Scotia-Fundy are within the range of those in predominantly 1SW salmon stocks of Newfoundland.
- 1SW return rates in predominately MSW salmon stocks of the Scotia-Fundy, Québec, and Gulf exceed those of 2SW salmon within a smolt cohort.
- 2SW return rates in predominately MSW salmon stocks in USA exceed those of 1SW salmon within a smolt cohort.

4.5.6 Pre-fisheries abundance

4.5.6.1 North American run-reconstruction model

The run-reconstruction model developed by Rago *et al*. (1993) and described in previous Working Group reports (ICES 2008a, 2009a) 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, 2009a). Following on the recommendations from ICES (2008a), the run-reconstruction model for 2009 was developed using Monte Carlo simulation (OpenBUGS) similar to the approach applied for the NEAC area (Section 3.8.9). Updates to estimates of returns and spawners to regions were provided for 2009 and preliminary values were provided for 2010 (Annex 6).

The full set of data inputs and the summary output tables of catches, returns and spawners by sea age or size group are provided in Annex 6.

4.5.6.2 Non-maturing 1SW salmon

The non-maturing component of 1SW fish, 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 West Greenland prior to the start of the fishery on August 1st. 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 2009. This is because pre-fishery abundance estimates for 2010 require 2SW returns to rivers in North America in 2011. The medians derived from Monte Carlo simulations for 2SW salmon by region and for NAC overall are shown in Figure 4.5.2.3. The estimated abundance of 2SW to rivers for NAC in 2010 was about 62 470 fish (95% C.I. range 55 940 to 69 050). The median estimate for 2010 is 12% lower than the estimated average abundance of the previous ten years (2000 to 2009), is the second lowest in the 40 year time-series (1971 to 2010) and has remained low over the past decade relative to historical estimates.

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 4.5.6.2.1. The median of the estimates of non-maturing 1SW salmon in 2009 was 101 200 fish (95% C.I. range 88 530 to 115 500). This value is 8% lower than the previous 10-year average (1999 to 2008). The estimated non-maturing 1SW salmon in 2009 is the third lowest in the 39 year time-series (1971 to 2009).

4.5.6.3 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 4.5.2.1. The NAC total maturing 1SW salmon abundance has oscillated between 250 000 and 574 000 over the period 1971 to 2010. Estimated abundance in 2010 (439 300) was 21% above the previous year's estimate (364 500), but 9% below the previous 5-year mean (2005 to 2009) of 485 320. Increases were realized across all regions with large increases realized in the Gulf, Scotia Fundy and USA (118 to 251%). Returns in Labrador were 50% lower than the previous 5-year mean. Returns of maturing 1SW salmon have general increased over the time-series for the NAC; mainly a result of the commercial fishery closures in Canadian and increased returns over time to Labrador and Newfoundland.

The reconstructed distributions of the abundance of the 1SW maturing cohort of North American origin are shown in Figure 4.5.6.2.1. The PFA of the maturing component in 2010 was estimated as 463 500 fish, 17% above the 2009 value. Maximum abundance of the maturing cohort was estimated at over 910 000 fish in 1981 and recent estimates remain among the lowest in the time-series (1971 to 2010).

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

The pre-fishery abundance of 1SW maturing salmon for the 1971 to 2010 and 1SW non-maturing salmon from North America for 1971 to 2009 were combined to give total recruits of 1SW salmon (Figure 4.5.6.2.1). The overall abundance of the 1SW cohort, estimated in 2009, was 486 100 fish, 34% lower than estimated in 2008 and the 3rd lowest in the 39 year time-series (1971 to 2009). The abundance of the 1SW cohort has declined by 71% over the time-series (1971 to 2009) from a peak of 1 700 000 in 1975.

4.6 Summary on status of stocks

In 2010, the midpoints of the spawner abundance estimates for six geographic areas indicated that all areas were below their CLs for 2SW salmon and are suffering reduced reproductive capacity.

Estimates of pre-fishery abundance 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 2010 has increased 17% from the 2009 value and remains among the low end of the time-series. The non-maturing estimate decreased by 25% over the 2008 estimate and is also among the lowest in the time-series.

The returns of 2SW fish in 2010 decreased from 2009 in Labrador (65%), Newfoundland (51%), Gulf (14%), Scotia-Fundy (11%) and USA (21%), and increased in Québec (7%). Returns in 2010 of 1SW salmon relative to 2009 increased in all areas with a range of 3% in Labrador and Newfoundland to 251% in Scotia-Fundy. Returns were also above (3 to 65%) the previous 5-year mean (2005 to 2009) in all regions except for Labrador (50% decrease).

The rank of the estimated returns in the 1971 to 2010 time-series and the proportions of the 2SW CL achieved in 2010 for six regions in North America are shown below:

	Rank of 2010 returns in 1971 to 2010, (40=LOWEST)		Rank of 2010 returns in 2001 to 2010 (10=LOWEST)		Median estimate of 2SW spawners as percentage of Conservation Limit
Region	1SW	2SW	1SW	2SW	(%)
Labrador	15	29	8	10	25
Newfoundland	5	37	3	10	53
Québec	22	31	5	3	77
Gulf	16	34	2	8	61
Scotia-Fundy	28	37	2	7	8
USA	12	33	2	5	5

Egg depositions by all sea ages combined in 2010 exceeded or equalled the river-specific CLs in 31 of the 71 assessed rivers (44%) and were less than 50% of CLs in 19 other rivers (37%, Figure 4.5.4.1).

For insular Newfoundland smolt production has increased in two of four monitored rivers (1970 to 2010). Over the same period return rates of these smolts to 1SW salmon, although varying annually, have no significant temporal trend. Returns to Newfoundland, where rivers are primarily 1SW stocks, have increased over the period, reflecting that populations are responding to increasing spawner escapement.

Smolt production has declined since the mid to late 1980s in two monitored Québec rivers with data extending to 2010. Return rates of these smolts to 1SW and 2SW salmon both declined over the same period. As a consequence, over the period 1980 to 2010, returns of 1SW and 2SW to Québec declined from above CL to below CL.

For the Gulf smolt production has increased in one of three monitored rivers from the late 1990s to 2010, and over the same period return rates of these smolts to 1SW and

2SW salmon have both declined. Declining return rates resulted in declining 2SW returns and spawners over the period, with the CL currently not being met.

Smolt production has remained relatively constant since the late 1990s in two monitored Scotia-Fundy rivers with data extending to 2010. Similarly, return rates of these smolts to 1SW and 2SW salmon, although varying annually, are low and have no significant temporal trend. Low smolt output and return rates resulted in declining returns and spawners of 1SW and 2SW to Scotia-Fundy over the period.

Smolt production on the Narraguagus River in USA declined over the period 1997 to 2010; however survival of wild smolts to 1SW and 2SW salmon, although varying annually, has no significant temporal trend. For hatchery smolt, a large component of smolt production in USA, return rates to 2SW salmon have declined from 1970 to 2010. Declining wild smolt output and declining return rates to 2SW salmon for hatchery smolts resulted in declining returns and spawners of 1SW and 2SW since the late 1980s.

Based on region-specific CL for 2SW all salmon stocks are suffering reduced reproductive capacity, with particularly large deficits in the Bay of Fundy, Atlantic coast and USA. Despite major changes in fisheries management 18 to 25 years ago and increasingly more restrictive fisheries measures since, returns in these regions have remained near historical lows and many populations are currently threatened with extirpation. In 2010, the estimated PFA of 1SW maturing salmon ranks 28th out of the 40-year time-series and the estimated PFA of 1SW non-maturing salmon ranks 37th out of the 39-year time-series. The continued low abundance of salmon stocks across North America, despite significant fishery reductions, further strengthens the conclusions that factors other than fisheries are constraining production.

COSEWIC, the organization that assesses the status of wildlife species which may be at risk of extinction in Canada, assessed the status of Atlantic salmon populations in Canada in 2010. Summaries of assessments on Atlantic salmon are currently available to the public on the COSEWIC website (www.cosewic.gc.ca) and will be submitted to the Federal Minister of the Environment in late summer 2011 for listing consideration under the Species at Risk Act (SARA). At that time, the full status reports and status appraisal summaries will be publicly available on the Species at Risk Public Registry (www.sararegistry.gc.ca).

Table 4.4.2.1. Reported harvests expressed as 2SW salmon equivalents in North American salmon fisheries. Only midpoints of the estimated values have been used.

	CANADA																			
	MIXED STOCK					TERMINAL FISHERIES IN (Year i)														
Year (i)	NF-LAB Comm 1SW (Year i-1) (a)	% 1SW of total 2SW equivalents (Year i)	NF-LAB Comm 2SW (Year i) (a)	NF-Lab comm total (Year i)	Saint-Pierre and Miquelon (Year i)	Labrador	Newfoundland	Quebec	Gulf	Scotia - Fundy	Canadian total	USA	North American Total	Terminal Fisheries 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	19987	0.11	153816	173802	0	420	585	27500	20270	5600	54375	345	228522	24	196338	424860	54	302300	0.76
1973	17272	0.07	219321	236592	0	1010	776	32760	15440	6198	56184	327	293103	19	148458	441561	66	376900	0.78
1974	23548	0.09	236012	259560	0	800	507	47650	18260	13030	80247	247	340054	24	186633	526687	65	449500	0.76
1975	23237	0.09	237662	260899	0	330	494	41100	14120	12510	68554	389	329842	21	154856	484698	68	416600	0.79
1976	34611	0.12	256683	291294	323	830	383	42130	16180	11110	70633	191	362441	20	194469	556910	65	431400	0.84
1977	26500	0.10	241350	267850	0	1280	776	42160	29160	13470	86846	1355	356051	25	112655	468706	76	473300	0.75
1978	26751	0.15	157406	184157	0	760	534	37350	20320	9368	68332	894	253383	27	141269	394651	64	317200	0.80
1979	13406	0.13	92095	105501	0	609	124	25240	6248	3844	36065	433	141999	26	103525	245524	58	172000	0.83
1980	20373	0.09	217283	237655	0	890	637	53470	27000	17350	99347	1533	338535	30	141772	480307	70	453400	0.75
1981	33338	0.14	201464	234803	0	520	444	44360	14819	12860	73003	1267	309073	24	120851	429924	72	365800	0.84
1982	33203	0.20	134504	167707	0	620	393	35280	21080	8935	66308	1413	235428	29	161183	396610	59	291500	0.81
1983	24929	0.18	111601	136530	323	428	424	34540	17640	12298	65330	386	202569	32	145654	348223	58	237600	0.85
1984	18815	0.19	82847	101662	323	510	188	24860	3650	3960	33168	675	135828	25	26830	162658	84	204900	0.66
1985	14164	0.15	78800	92964	323	294	20	27810	1020	5040	34184	645	128116	27	32503	160619	80	218100	0.59
1986	19357	0.16	104905	124262	269	467	33	34220	1920	2950	39590	606	164727	24	98780	263507	63	273400	0.60
1987	24496	0.16	132272	156768	215	630	18	34230	2030	1430	38338	300	195621	20	123727	319348	61	266100	0.74
1988	31172	0.28	81178	112349	215	710	17	34630	1230	1450	38037	248	150850	25	123942	274792	55	221300	0.68
1989	21646	0.21	81401	103046	215	461	6	29340	1290	320	31417	397	135076	24	84689	219765	61	200600	0.67
1990	19046	0.25	57392	76438	205	357	19	28430	1090	650	30546	695	107883	29	43660	151544	71	180800	0.60
1991	11693	0.22	40458	52151	129	93	13	29650	830	1400	31986	231	84497	38	52359	136856	62	153600	0.55
1992	9729	0.28	25125	34854	248	782	0	30480	1140	1150	33552	167	68821	49	79657	148477	46	151400	0.45
1993	3091	0.19	13285	16376	312	387	0	23550	540	1166	25643	166	42497	61	29857	72354	59	126400	0.34
1994	2056	0.15	11946	14002	366	490	0	24580	700	780	26550	2	40920	65	1873	42793	96	111500	0.37
1995	1178	0.12	8683	9861	86	460	0	23690	560	360	25070	0	35017	72	1881	36898	95	139000	0.25
1996	1028	0.15	5649	6677	172	380	0	22680	770	816	24646	0	31495	78	19217	50712	62	118700	0.27
1997	934	0.15	5394	6328	161	210	0	18620	770	605	20205	0	26695	76	19346	46041	58	96460	0.28
1998	1116	0.39	1762	2879	248	202	0	11270	540	332	12344	0	15470	80	13041	28512	54	66550	0.23
1999	174	0.17	842	1016	250	270	0	9170	780	457	10677	0	11943	89	4321	16263	73	69810	0.17
2000	149	0.12	1050	1199	244	270	0	8900	580	199	9949	0	11392	87	6441	17832	64	71320	0.16
2001	281	0.17	1337	1618	232	310	0	9660	900	265	11135	0	12985	86	5944	18929	69	81900	0.16
2002	258	0.19	1079	1337	210	200	0	6190	530	182.8	7102.8	0	8650	82	8598	17249	50	52360	0.17
2003	306	0.15	1690	1995	311	232	0	8520	800	212	9764	0	12070	81	3224	15295	79	79350	0.15
2004	347	0.11	2872	3219	300	270	0	8420	820	116	9626	0	13145	73	3477	16621	79	77430	0.17
2005	458	0.17	2188	2646	354	270	0	7460	1000	106	8836	0	11836	75	4337	16174	73	78550	0.15
2006	551	0.19	2401	2952	383	230	0	7140	770	151	8291	0	11626	71	4177	15803	74	74600	0.16
2007	552	0.21	2060	2612	210	240	0	6720	840	111	7911	0	10733	74	4928	15661	69	70670	0.15
2008	489	0.14	3037	3525	381	230	0	6440	790	0	7460	0	11366	66	6617	17983	63	77750	0.15
2009	533	0.17	2598	3131	372	230	0	6520	930	0	7680	0	11184	69	7549	18732	60	91670	0.12
2010	434	0.13	2905	3339	299	196	0	5870	790	0	6856	0	10494	65	6667	17162	61	67670	0.16
2011	540														8756				

NF-Lab comm as 1SW = NC1(mid-pt) * 0.677057 (M of 0.03 per month for 13 months to July for Canadian terminal fisheries)
NF-Lab comm as 2SW = NC2 (mid-pt) * 0.970446 (M of 0.03 per month for 1 month to July of Canadian terminal fisheries)
Terminal fisheries = 2SW returns (mid-pt) - 2SW spawners (mid-pt) (excludes Saint-Pierre and Miquelon and NF-Lab Comm fisheries)
a - starting in 1998, there was no commercial fishery in Labrador; numbers reflect size of aboriginal fish harvest in 1998-2010 and resident food fishery harvest in 2000-2010

Table 4.4.3.1. The number of professional and recreational gillnet licences issued at Saint-Pierre and 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

Table 4.4.4.1. Harvests (by weight) and the percent large by weight and number in the Aboriginal Peoples' Food Fisheries in Canada.

Aboriginal peoples' food 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

Table 4.4.4.2. Numbers of salmon hooked and-released in Eastern Canadian salmon angling fisheries. Data for years prior to 1997 are incomplete.

	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	17,011							2,451	17,154	19,605
1985		315	315	1,323	6,346	7,669	1,098	3,963	3,809	17,815	26,685			67				6,384	28,285	34,669
1986		798	798	1,463	10,750	12,213	5,217	9,333	6,941	25,316	46,807							16,013	43,805	59,818
1987		410	410	1,311	6,339	7,650	7,269	10,597	5,723	20,295	43,884							19,177	32,767	51,944
1988		600	600	1,146	6,795	7,941	6,703	10,503	7,182	19,442	43,830	767	256	1,023				19,119	34,275	53,394
1989		183	183	1,562	6,960	8,522	9,566	8,518	7,756	22,127	47,967							19,646	37,026	56,672
1990		503	503	1,782	5,504	7,286	4,435	7,346	6,067	16,231	34,079			1,066				13,563	28,305	41,868
1991		336	336	908	5,482	6,390	3,161	3,501	3,169	10,650	20,481	1,103	187	1,290				8,673	19,824	28,497
1992	5,893	1,423	7,316	737	5,093	5,830	2,966	8,349	5,681	16,308	33,304			1,250				17,945	28,505	46,450
1993	18,196	1,731	19,927	1,076	3,998	5,074	4,422	7,276	4,624	12,526	28,848							30,970	22,879	53,849
1994	24,442	5,032	29,474	796	2,894	3,690	4,153	7,443	4,790	11,556	27,942	577	147	724				37,411	24,419	61,830
1995	26,273	5,166	31,439	979	2,861	3,840	770	4,260	880	5,220	11,130	209	139	348		922	922	32,491	15,188	47,679
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	20,987	210	118	328	182	1,643	1,825	34,748	22,504	57,252
1998	31,368	4,375	35,743	688	2,476	3,164	3,154	5,760	3,452	8,298	20,664	233	114	347	297	2,680	2,977	41,500	21,395	62,895
1999	24,567	4,153	28,720	562	2,186	2,748	3,155	5,631	3,456	8,281	20,523	192	157	349	298	2,693	2,991	34,405	20,926	55,331
2000	29,705	6,479	36,184	407	1,303	1,710	3,154	6,689	3,455	8,690	21,988	101	46	147	445	4,008	4,453	40,501	23,981	64,482
2001	22,348	5,184	27,532	527	1,199	1,726	3,094	6,166	3,829	11,252	24,341	202	103	305	809	4,674	5,483	33,146	26,241	59,387
2002	23,071	3,992	27,063	829	1,100	1,929	1,034	7,351	2,190	5,349	15,924	207	31	238	852	4,918	5,770	33,344	17,580	50,924
2003	21,379	4,965	26,344	626	2,106	2,732	1,555	5,375	1,042	7,981	15,953	240	123	363	1,238	7,015	8,253	30,413	23,232	53,645
2004	23,430	5,168	28,598	828	2,339	3,167	1,050	7,517	4,935	8,100	21,602	135	68	203	1,291	7,455	8,746	34,251	28,065	62,316
2005	33,129	6,598	39,727	933	2,617	3,550	1,520	2,695	2,202	5,584	12,001	83	83	166	1,116	6,445	7,561	39,476	23,529	63,005
2006	30,491	5,694	36,185	1,014	2,408	3,422	1,071	4,186	2,638	5,538	13,433	128	42	170	1,091	6,185	7,276	37,981	22,505	60,486
2007	17,719	4,607	22,326	896	1,520	2,416	1,164	2,963	2,067	7,040	13,234	63	41	104	951	5,392	6,343	23,756	20,667	44,423
2008	25,226	5,007	30,233	1,016	2,061	3,077	1,146	6,361	1,971	6,130	15,608	3	9	12	1,361	7,713	9,074	35,113	22,891	58,004
2009	26,681	4,272	30,953	670	2,665	3,335	1,338	2,387	1,689	8,174	13,588	6	25	31	1,091	6,180	7,271	32,173	23,005	55,178
2010	27,256	5,458	32,714	717	1,966	2,683	463	5,730	1,920	5,660	13,773	61	27	88	1,356	7,683	9,039	35,583	22,714	58,297

Table 4.5.1. Summary of NASCO status categories by region for rivers in the database from Canada.

NASCO Status Category	Labrador	Newfoundland	Quebec	New Brunswick	Prince Edward Island	Nova Scotia	Total
Not threatened with loss	39	194	63	49	1	17	363
Threatened with loss		102	21	17	21	61	222
Lost	3	3	4	24	37	71	142
Maintained						1	1
Restored		1	5				6
Not present but potential	2						2
Total assessed	44	300	93	90	59	150	736
% of total	16.2%	96.8%	82.3%	76.3	100.0%	71.1	68.0%
Unknown	227	10	20	28	0	61	346
Total	271	310	113	118	59	211	1082

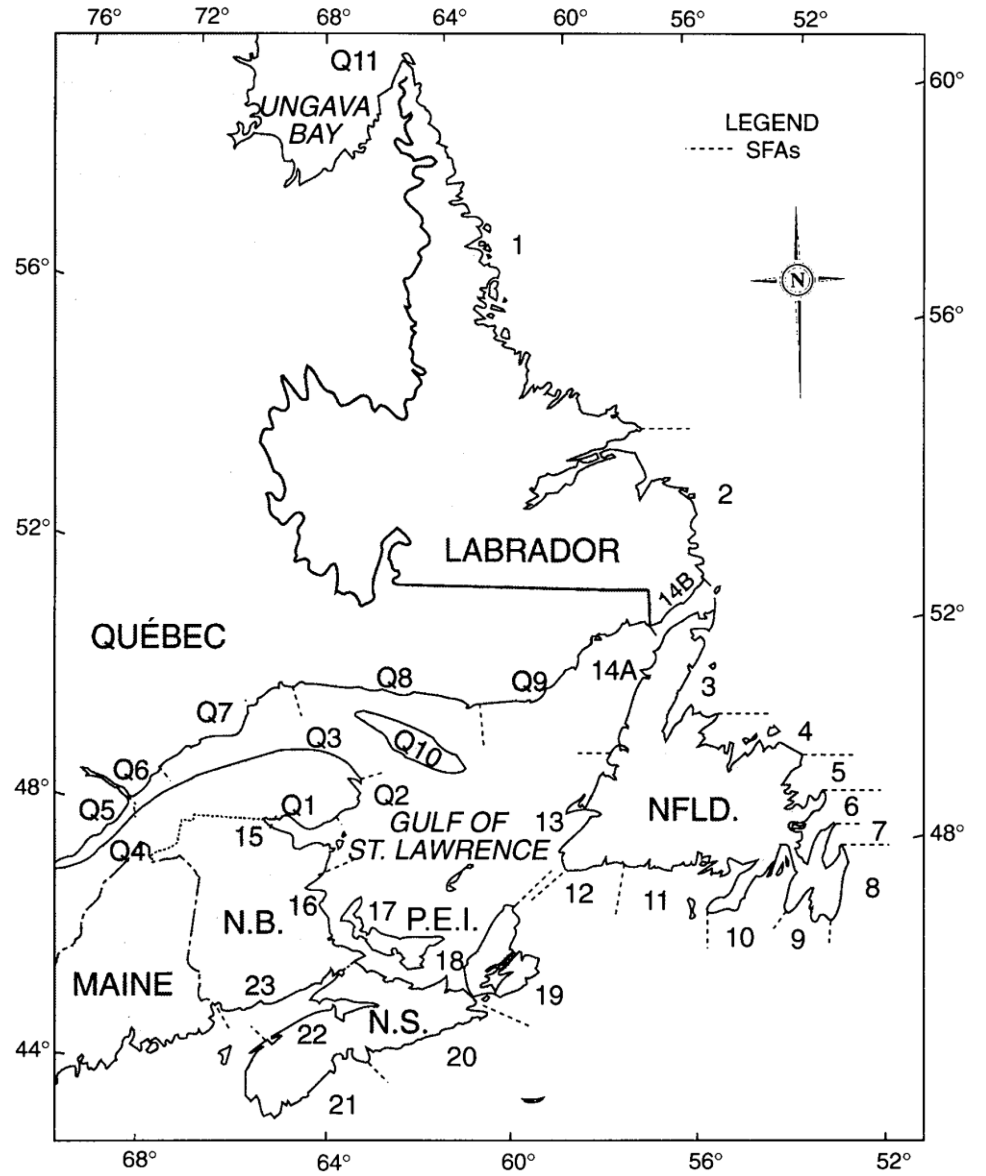

Figure 4.4.3.1. Map of Salmon Fishing Areas (SFAs) and Québec Management Zones (Qs) in Canada.

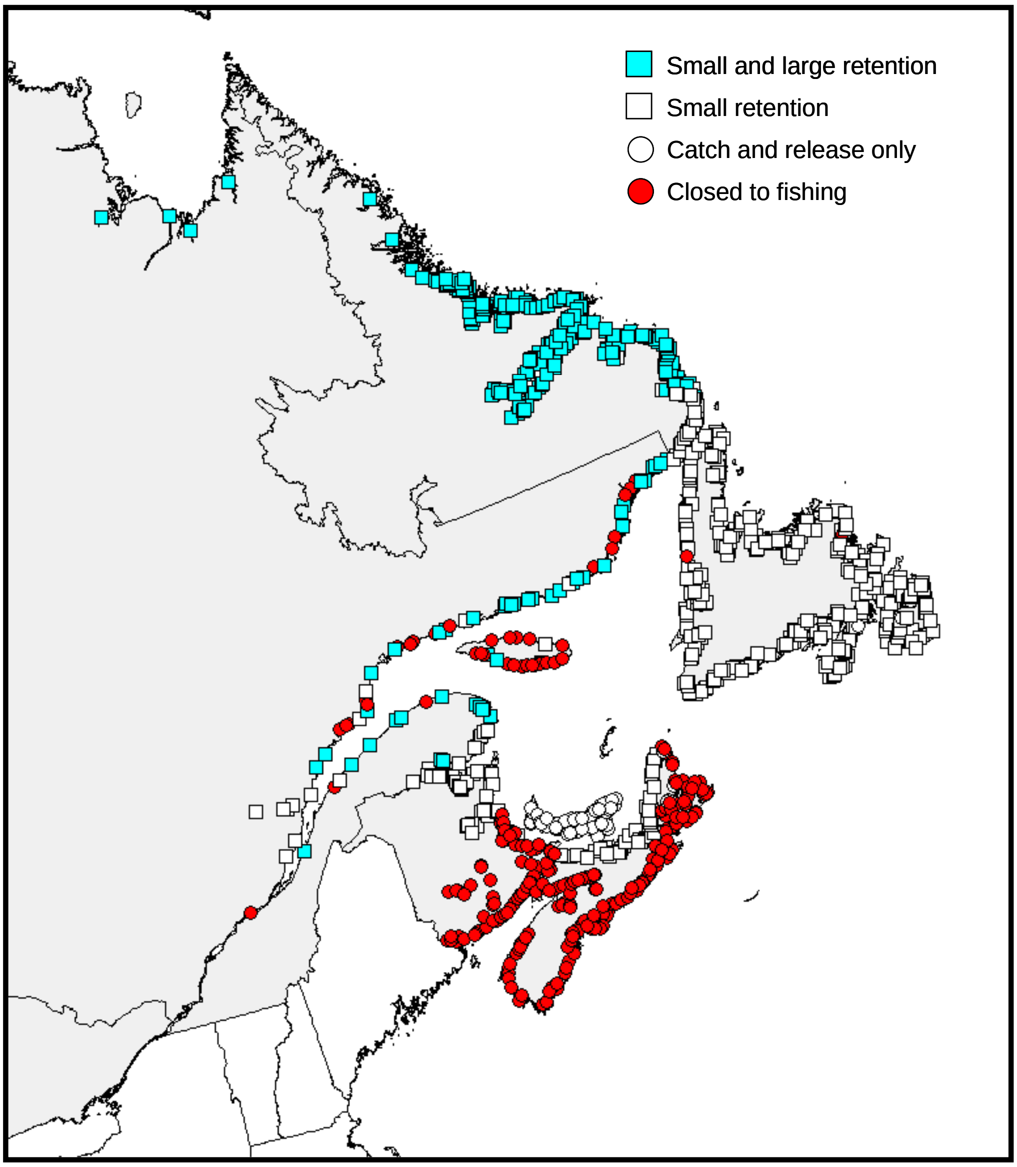

Figure 4.4.3.2. Summary of recreational fisheries retention management measures in Canada in 2010.

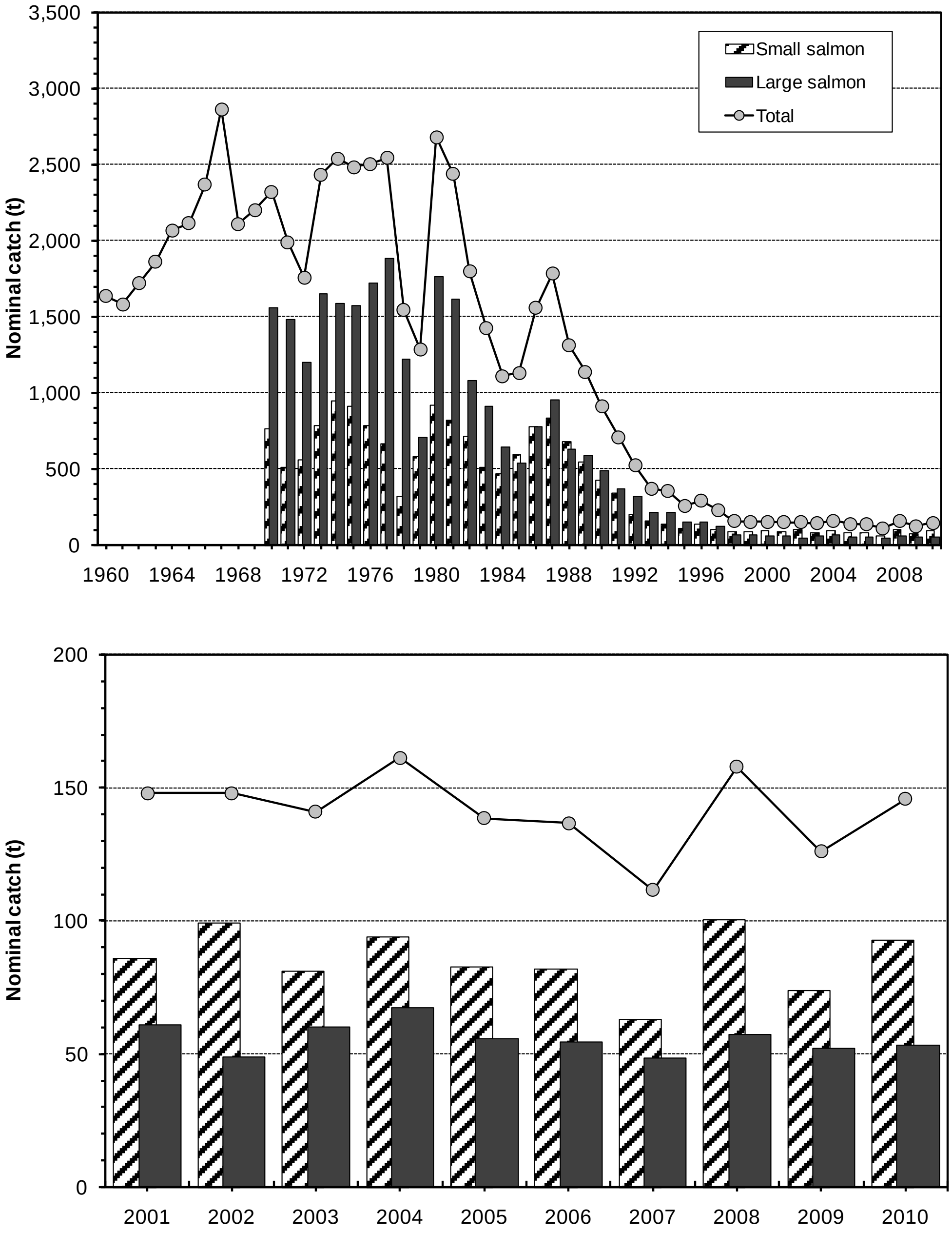

Figure 4.4.4.1. Harvest (t) of small salmon, large salmon and combined for Canada, 1960 to 2010 (top panel) and 2001 to 2010 (bottom panel) by all users.

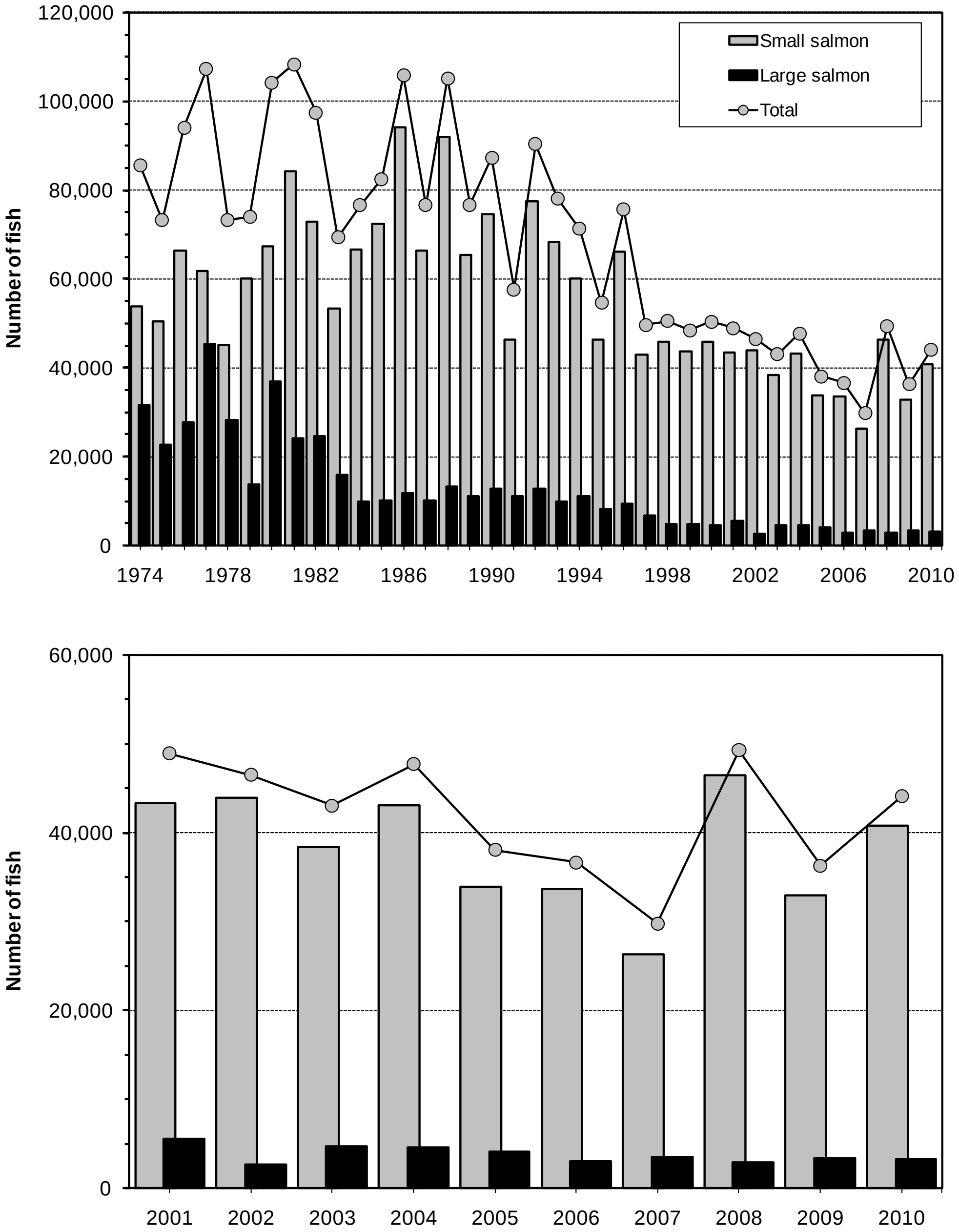

Figure 4.4.4.2. Harvest (number) of small salmon, large salmon and both sizes combined in the recreational fisheries of Canada, 1974 to 2010 (top panel) and 2001 to 2010 (bottom panel).

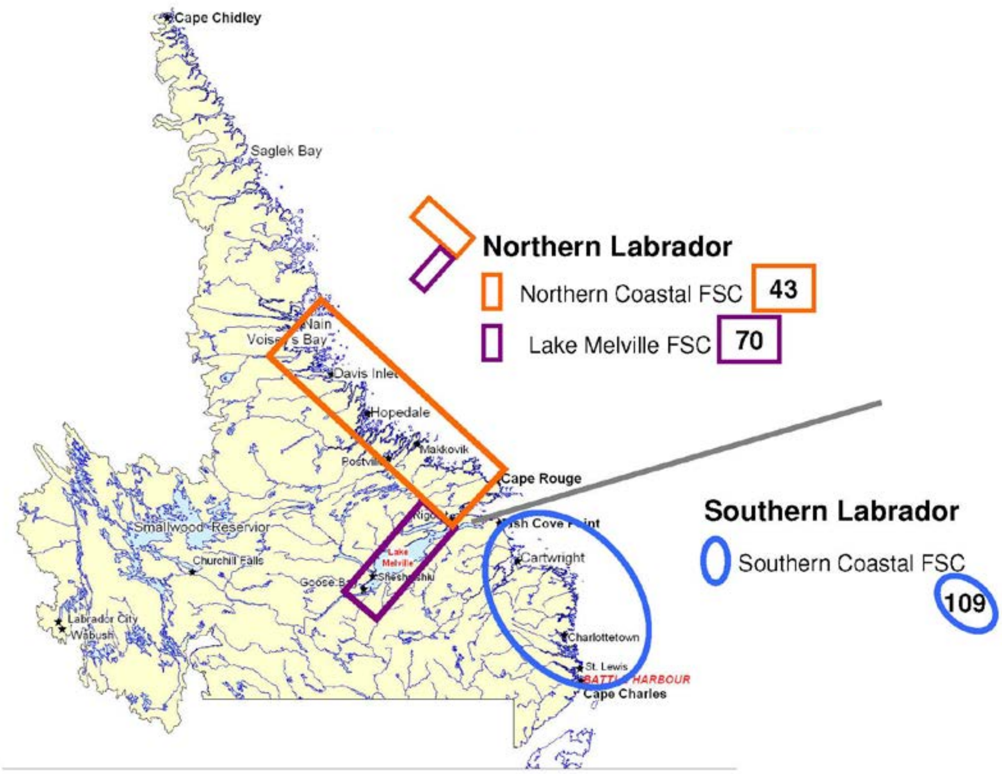

Figure 4.4.5.1. Generalized locations and sample sizes by location for the 2010 Food, Social and Ceremonial Fisheries in Labrador.

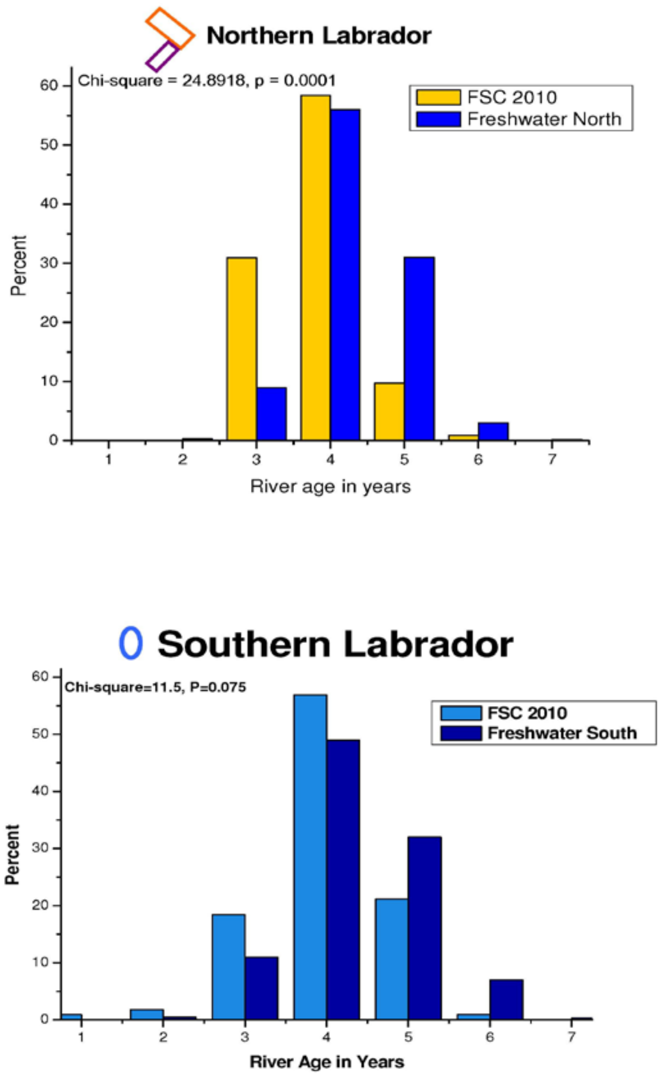

Figure 4.4.5.2. A comparison of the river age distribution of salmon from FSC (food social and ceremonial purposes) fisheries in North and South Labrador in 2010 to those at assessment facilities in the same regions in 2000 to 2005.

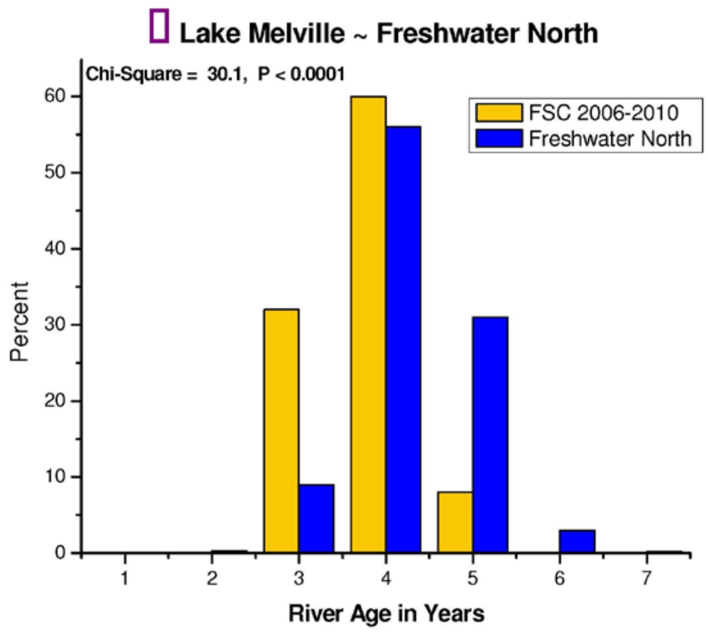

Figure 4.4.5.3. A comparison of the river age distribution of salmon from FSC (food social and ceremonial purposes) fishery in Lake Melville (FSC) compared with freshwater samples from North Labrador to those in 2000 to 2005.

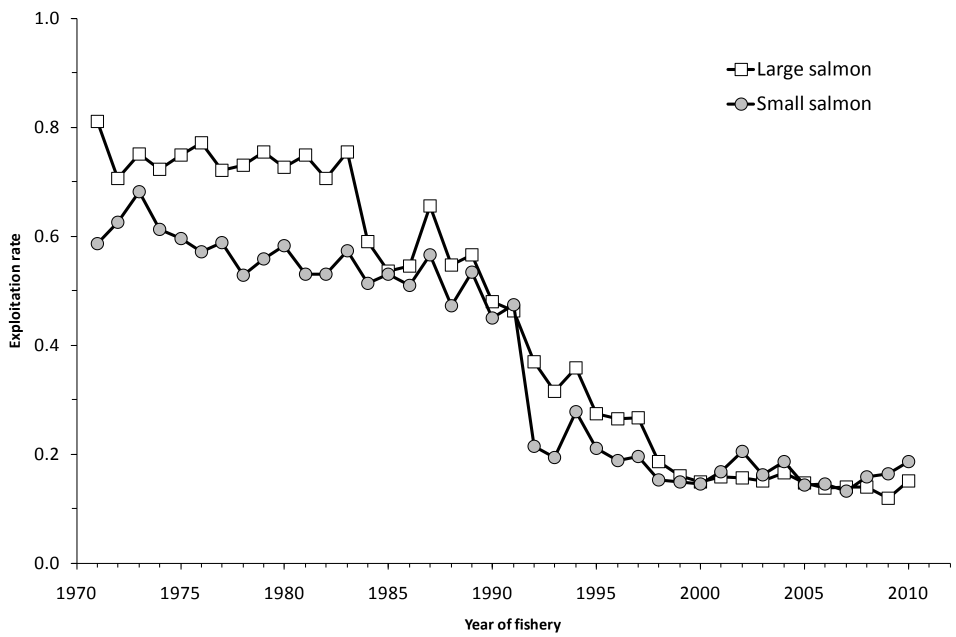

Figure 4.4.6.1. Exploitation rates in North America on the North American stock complex of 1SW and 2SW salmon.

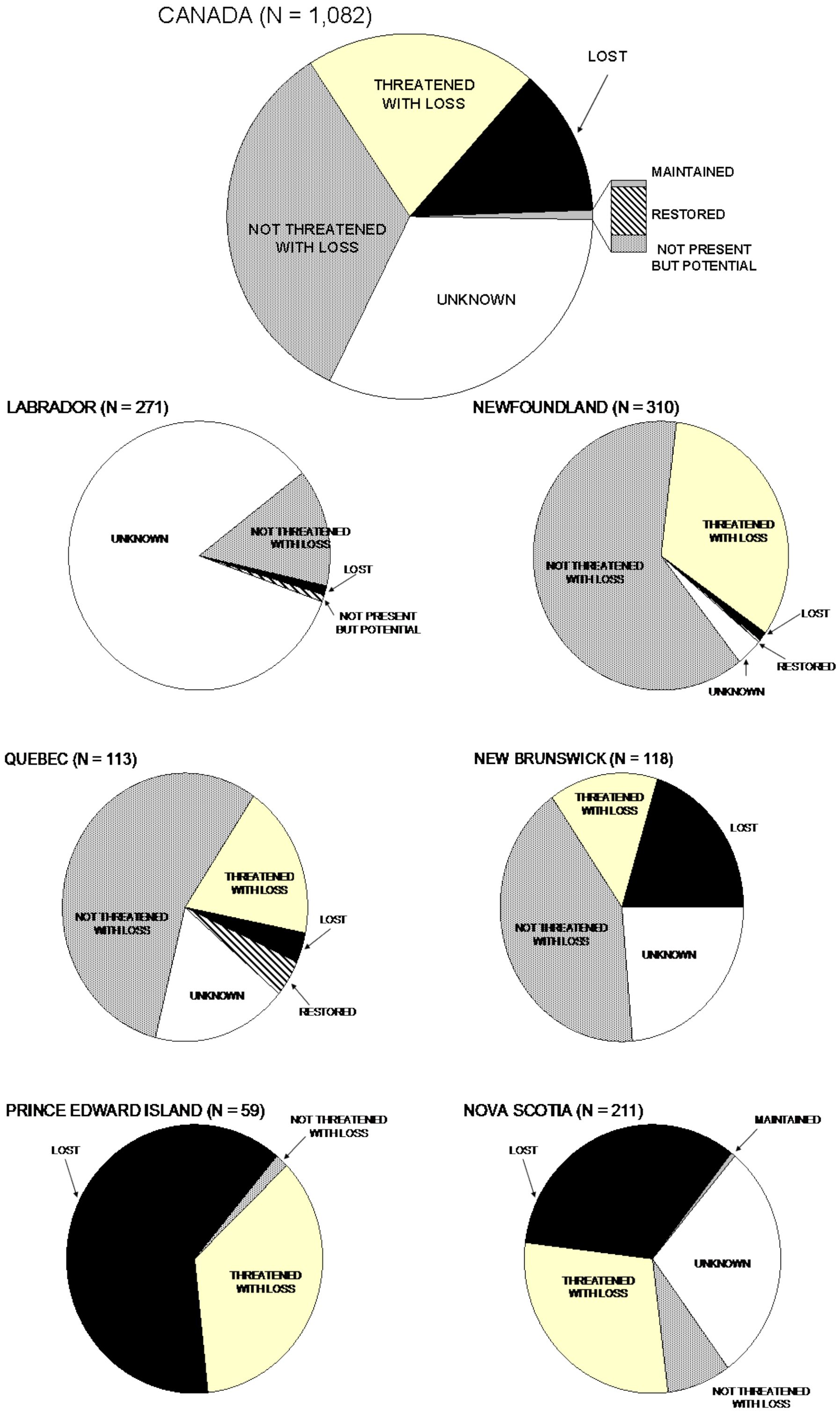

Figure 4.5.1. Proportion of rivers in the database by NASCO status category for Canada and for six regions/provinces of eastern Canada.

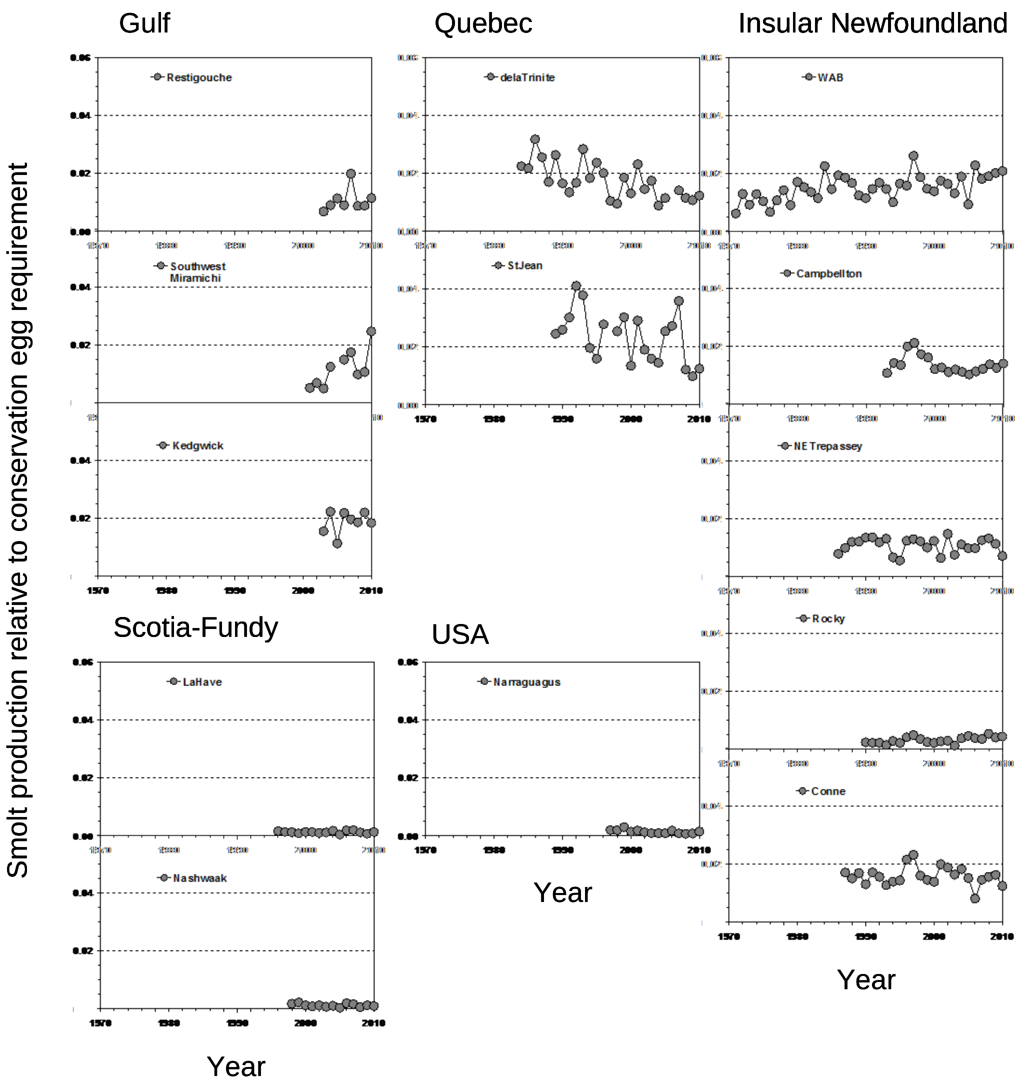

Figure 4.5.1.1. Time-series of wild smolt production from twelve monitored rivers in eastern Canada and one river in eastern USA. Smolt production is expressed as a proportion of the conservation egg requirements for the river.

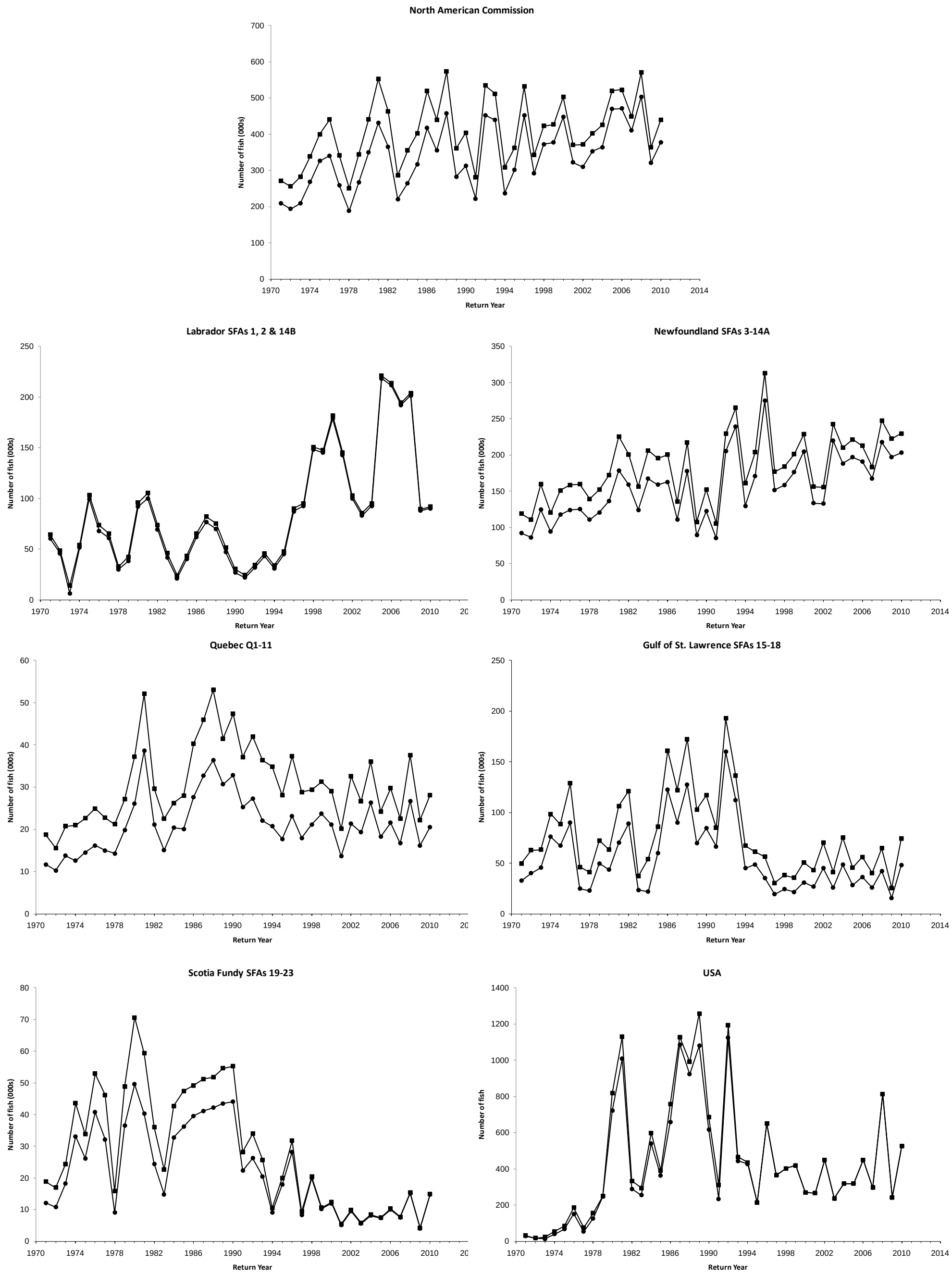

Figure 4.5.2.1. Comparison of estimated medians of small returns (squares) to and small spawners (circles) in six geographic areas of North America. Returns and spawners for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23. Note the difference in scale for USA.

Figure 4.5.2.2. Comparison of estimated medians of large returns (squares) to and large spawners (circles) in six geographic areas of North America. 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. Also, note the difference in scale for USA and the concern detailed in Section 4.5.2 when interpreting the large increase in estimated 2009 Labrador large and 2SW return and spawners.

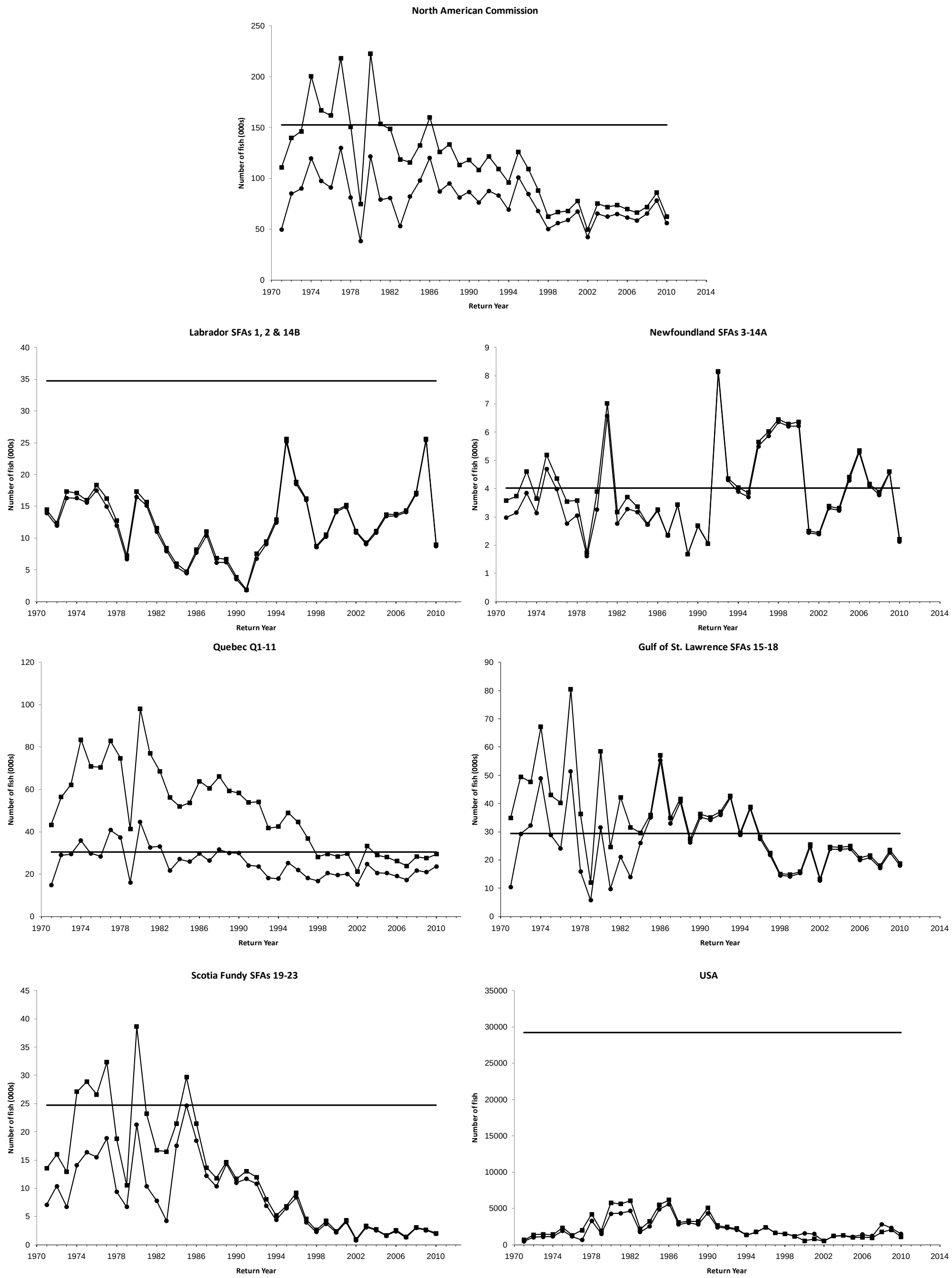

Figure 4.5.2.3. Comparison of the 2SW conservation limits to the estimated medians of 2SW returns (squares) to 2SW spawners (circles) in six geographic areas of North America. Returns and spawners for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23. For USA, estimated spawners exceed the estimated returns due to adult stocking restoration efforts. Also, note the difference in scale for USA and the concern detailed in Section 4.5.2 when interpreting the large increase in estimated 2009 Labrador large and 2SW return and spawners.

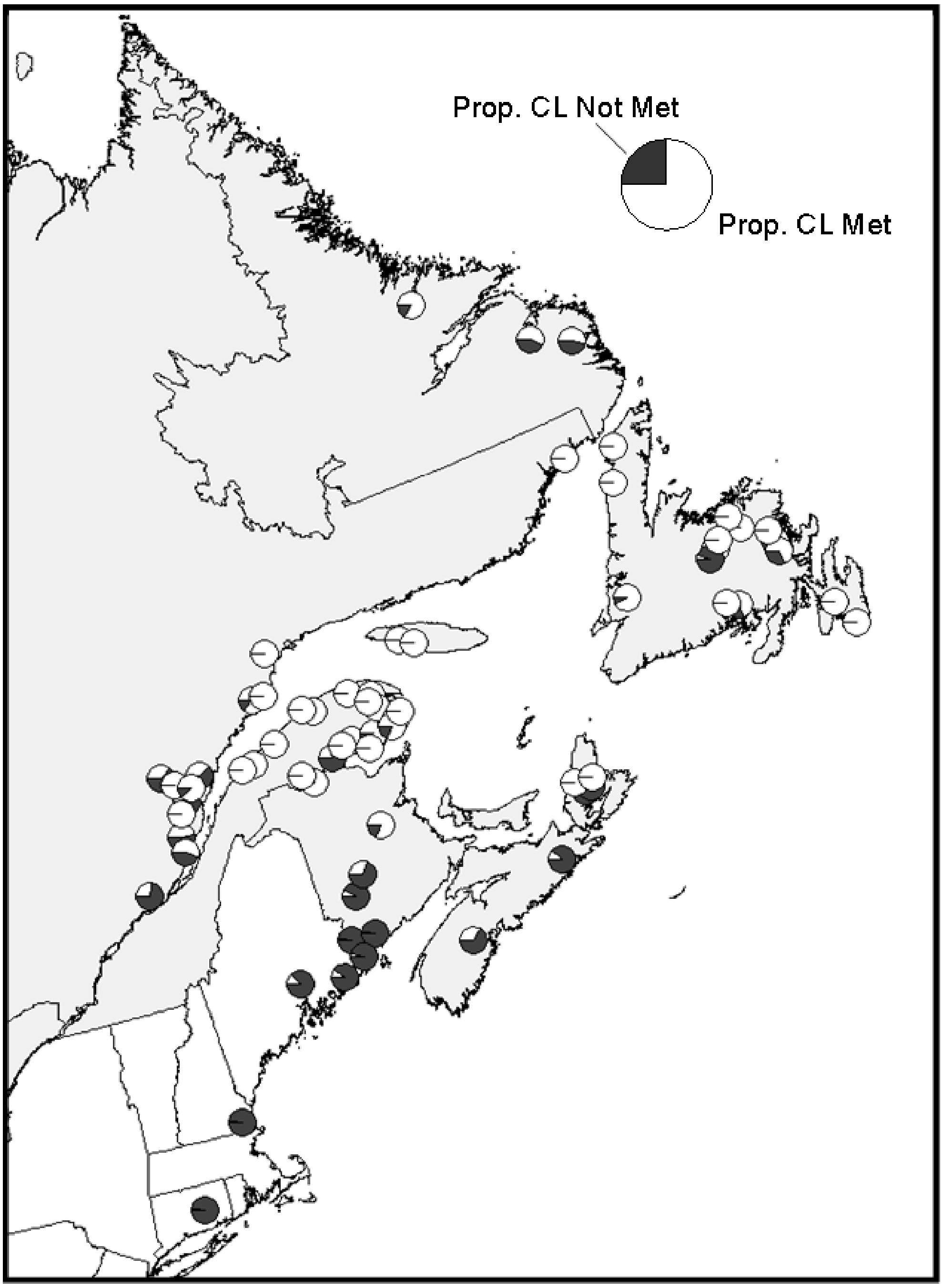

Figure 4.5.4.1. Proportion of the conservation requirement attained in assessed rivers of the North American Commission area in 2010.

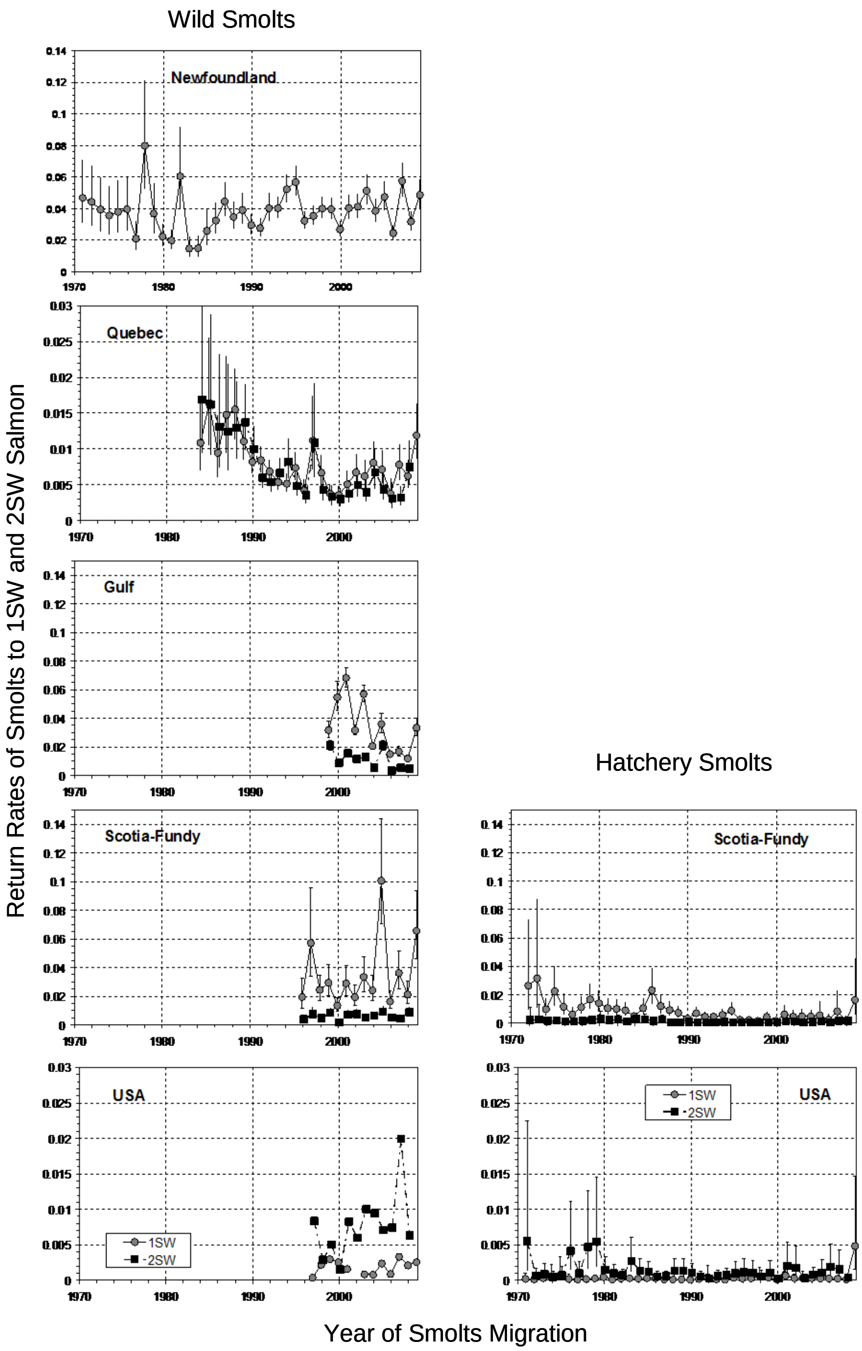

Figure 4.5.5.1. Standardized mean (one standard error bars) annual return rates of wild and hatchery origin smolts to 1SW and 2SW salmon to the geographic areas of North America. The standardized values are annual means derived from a general linear model analysis of rivers in a region. Survival rates were log transformed prior to analysis. Note y-scale differences among panels. Error bars are not included for estimates based on a single population.

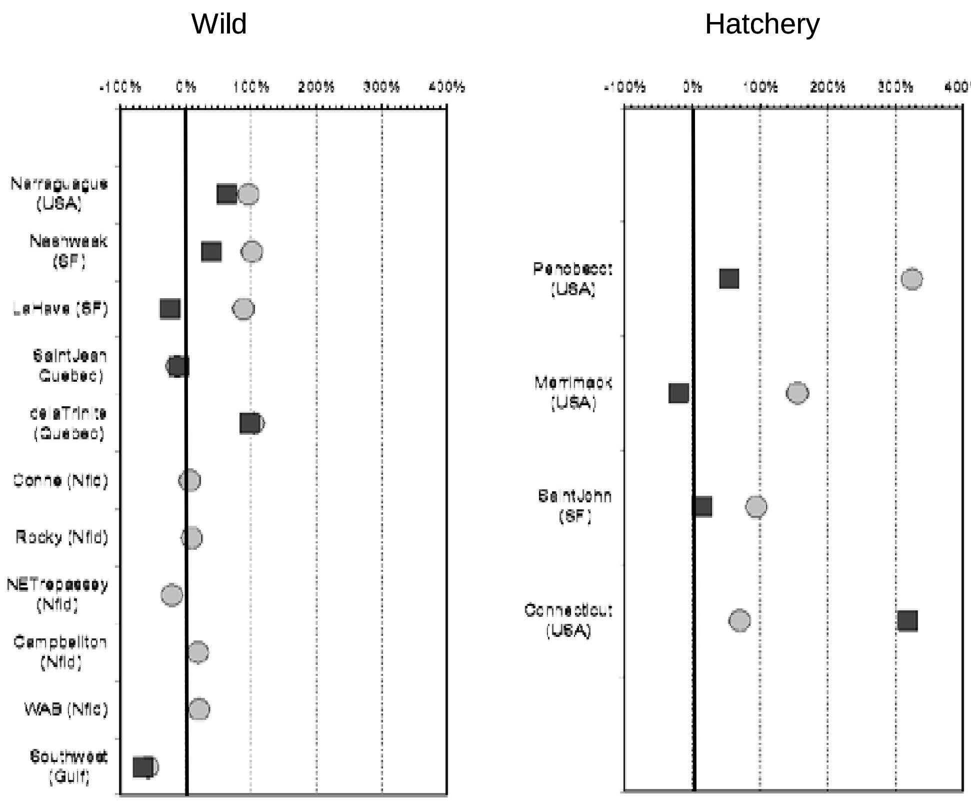

Figure 4.5.5.2. The percent change in the five-year mean return rates for 1SW and 2SW salmon smolts returning to rivers of eastern North America in 2006 to 2010 compared with the previous period (2001 to 2005). Grey circles are for 1SW and dark squares are for 2SW dataseries. Populations with at least three data points in each of the two time periods are included in the analysis.

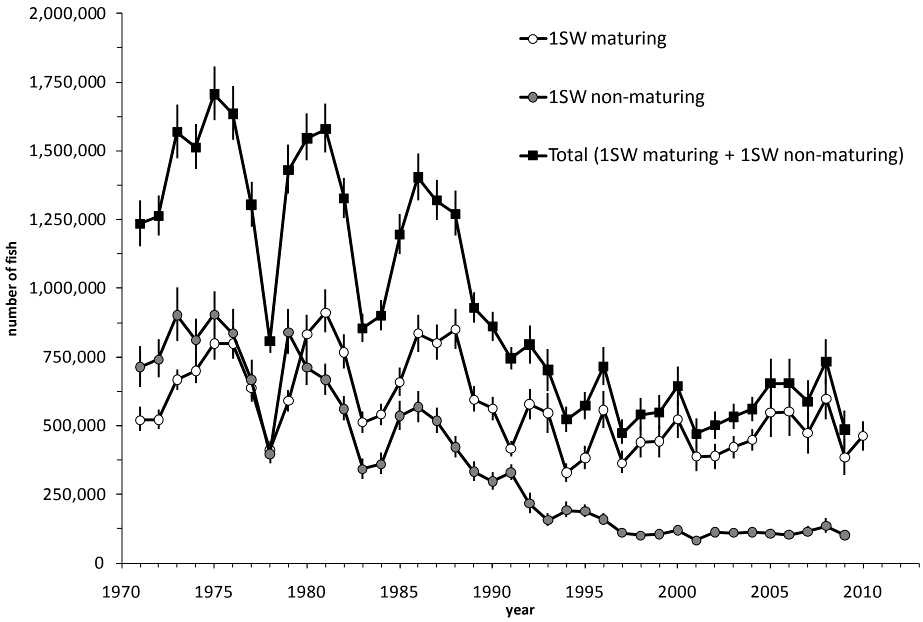

Figure 4.5.6.2.1. Estimates of PFA for 1SW maturing, 1SW non-maturing salmon and the total cohort of 1SW salmon based on the Monte Carlo simulations of the run-reconstruction model for NAC. Median and 95% CI interval ranges derived from Monte Carlo simulations are shown.

5 Atlantic salmon in the West Greenland Commission

5.1 NASCO has requested ICES to describe the events of the 2010 fishery and status of the stocks

5.1.1 Catch and effort in 2010

The salmon fishery is currently regulated according to The Government of Greenland Executive Order no. 21 of August 10, 2002. Only angling, fixed gillnets and driftnet are allowed to target salmon directly and the minimum mesh size has been 140 mm stretched since 1985. Fishing seasons have varied from year to year, but in general the season has started in August and continued until the quota was met or until a specified date later in the season. As in recent years the 2010 season was August 1 to October 31.

The catch data provided were screened for errors and missing values. Catches were assigned to NAFO/ICES area by reported 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 2.75 kg gutted weight per salmon. Since 2005 it has been mandatory to report gutted weights, and data has been converted to whole weight by means of a conversion factor of 1.11.

Catches of Atlantic salmon decreased until the closure of the commercial fishery for export in 1998, but the subsistence fishery has been increasing in recent years. Catches were distributed among the six NAFO divisions on the west coast of Greenland and ICES Division XIV (East Greenland). A total catch of 40 t of salmon was reported for the 2010 fishery compared with 26 t of salmon in the 2009 fishery and represented an increase of 53% (Table 5.1.1.1). As in 2009, a catch of 1.7 t was also reported from East Greenland (Figure 5.1.1.1, Table 5.1.1.2), accounting for approximately 4.3% of the total reported catch. The increase in the total catch in 2010 is associated with the significant increase in the reported catch in NAFO Division 1A (Table 5.1.1.2) which represented 43% of the total reported catch. The total catch reported in this Division, 1.7 t, was the highest reported since 1989 at 17 t, compared with only 0.2 t in 2009 and 5 t in 2008. In contrast, the catches reported in other Divisions in 2010 were similar to previous years although the catches have fluctuated considerably. Such a large increase seems unlikely to be caused by a change in reporting practice and therefore implies that there may have been a more northerly distribution of salmon and potentially a higher overall abundance than in 2009. According to fishermen the salmon fishery was unusually good in 2010.

There is currently no quantitative approach for estimating the unreported catch but the 2010 value is likely to have been at the same level proposed in recent years (10 t).

Of the total catch, 12 t was reported as commercial and 28 t was reported as being for private consumption. However, 15 t of the private consumption catch was reported by licensed fishers.

The seasonal distribution of catches has previously been reported to ICES up to 2001. However in recent years this has not been possible although fishers are required to report their catch immediately after fishing. Comparisons of summed reported catch and number of returned catch reports reveals that a large number of fishers report their total catch in only one report for the entire season although they are required to report after each fishing.

The Greenland Authorities received 389 reports of salmon catches from 208 fishers in 2010 compared with 238 reports from 145 fishers in 2009 (Table 5.1.1.3). The increase is due mainly to an increased number of people reporting and reports received in Division 1A. The total number of fishers reporting catches from all areas has steadily 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 fishery from 1987 to 1991. Since October 2006, the Greenland Home Rule Licence Office has broadcast TV requests that catch reports be submitted for the season. Despite this, the number of people reporting catches and the number of licensed fishers has fluctuated considerably in recent years.

These fluctuations in the numbers of people reporting catches and the catches themselves in each of the NAFO Divisions suggest that there are inconsistencies in the catch data and highlight the need for better data. The Working Group recommends that in addition to the information currently requested, fishers also be requested to provide information on catch site, catch date, numbers of nets, net dimensions, and numbers of hours the nets were fishing when submitting their catch logs. These data will help characterize the nature and extent of the current fishery. Therefore, the Working Group supports the proposal from the Greenlandic authorities for the introduction of a logbook as a condition of the licensing system for the salmon fishery at West Greenland. Such a logbook or equivalent reporting form should require the inclusion of the information above so that a more accurate fishing effort index can be developed.

5.1.2 Biological characteristics of the catches

International sampling programme

The international sampling programme for the fishery at West Greenland agreed by the parties at NASCO continued in 2010. The sampling was undertaken by participants from Canada, Ireland, UK (Scotland), UK (England and Wales), and USA. Additionally, staff from the Greenland Institute of Natural Resources assisted with the overall coordination of the programme and sampling in Nuuk. Sampling began in August and continued through October.

Samplers were stationed in three different communities representing three different NAFO Divisions. As in previous years no sampling occurred in the fishery in East Greenland in 2010.

In the Baseline Sampling Programme, tissue and biological samples were collected from three landing sites: Sisimiut (NAFO Div. 1B), Nuuk (NAFO Div. 1D), and Qaqortoq (NAFO Division 1F; Figure 5.1.1.1).

In total 1265 individual salmon were inspected representing 10% by weight of the reported landings. Of these, 1261 were measured for fork length, 1155 for gutted weight and 453 for whole weight (Table 5.1.2.1). Scales samples were taken from 1265 salmon for age and origin determination and tissue was removed from 1240 for DNA analysis and subsequently used for assignment of continent of origin. In addition the sex of 360 fish was identified from gonadal examination.

Of the 21 adipose finclipped fish recovered, seven had either external or internal tags. There were no additional tags submitted to the Nature Institute by local fishers from unsampled fish. The overall breakdown was six coded wire tags (four from the Ireland, one from Norway and one from Canada) and one visual implant elastomer tag (USA).

Access to fish in support of the Baseline Sampling Programme was affected early in the sampling season in Nuuk. The sampler and representatives from the GNIR were informed by NAPP (Nuuk Hunter's and Fishermen's Association, the Nuuk department of KNAPK) that a fee would be requested for access to each fish sampled at the market. A meeting was organized with the sampler, NAPP representatives, GINR representatives and representatives from the Home Rule Government to rectify this situation. No solution was agreed to and the Nuuk samplers were unable to collect any more than 28 Baseline Samples from Nuuk in 2010. The samplers were able to collect Enhanced Samples as these fish were purchased directly from the fishermen and the NAPP did not have a problem with this arrangement. This problem only occurred in Nuuk. In recent years there have been similar discussions with representatives from NAPP, although the situation only lasted a few days before sampling resumed without monetary compensation. In total, the Nuuk samplers were only able to collect of 230 samples, 28 from the baseline sampling and 202 from the Enhanced Sampling Programme. This represents 18% of the samples collected for 2010. However, the samplers documented a total of approximately 1600 salmon landed in Nuuk during the time they were present.

The decentralized landings and broad geographic distribution of the fishery causes practical problems for the sampling teams; however, the sampling programme was successful in adequately sampling the Greenland catch, both temporally and spatially. Additional access to the fish landed in Nuuk, especially in future once the Enhanced Sampling Programme is completed, is essential.

Reported landings amounted to 38 metric tons (not including the East Greenland catch). Non-reporting of harvest becomes evident upon comparison of the reported landings to the sample data. Since 2002, in at least one of the divisions where international samplers were present, the sampling team observed more fish than were reported as being landed. When there is this type of weight 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. In 2010 this occurred in all three sampled communities. The total discrepancy equalled 5.1 t. The reported landings and subsequent adjusted landings for 2002-2010 are presented in Table 5.1.2.2.

Biological characteristics (length, weight, and age) were recorded for all sampled fish. Overall, the mean sampled fork length was 66.5 cm and the mean gutted weight was 3.05 kg across all sea ages. In 2010, the mean length and weight of North American 1SW salmon was 66.7 cm and 3.44 kg weight and the mean for European 1SW salmon was 65.2 cm and 3.23 kg. The North American estimate is an increase from 2009 while the European estimate is a decrease, but both estimates are greater than the previous ten year mean.

Information is available from sampling the fishery at West Greenland fishery to examine the changing weights and condition factors of 1SW non-maturing salmon (Table 5.1.2.3). Over the period of sampling (1969 to 2010) 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 5.1.2.1). These mean weight trends are unadjusted for the period of sampling and it is known that salmon grow quickly during the period of sampling in the fishery from August to October. Therefore the Working Group examined the variations in whole weight adjusted for date of sampling and length of fish. The data available for analysis covered the period 2002 to 2010.

The number of samples of known continent of origin of 1SW non-maturing salmon in the database ranged from 329 to 1533 fish originating from NAC annually and 116 to 482 fish from NEAC. Samples were most commonly available from standard weeks 33 (August 13th to August 19th) to 40 (October 1st to October 7th) for salmon from both NAC and NEAC, with the fewest samples in standard weeks 31 and 44.

Date of sampling within the year alone accounted for 19% of the total variance in whole weight, but continent of origin was not a significant explanatory variable (P > 0.1) when date of sampling was included in the model. There was a significant year effect after correcting for date of sampling; whole weights were highest in 2010 and lowest in 2002 and 2007. Condition of the fish (expressed as the predicted weight at a standardized length of 64 cm) increased almost monotonically with increasing standard week and salmon from NEAC tended to have slightly higher weights at length than NAC fish, except for the end of the sampling period (week 44) when NAC fish had higher condition (Figure 5.1.2.2). However, there were very few samples from week 31 all of which were taken in 2008 or week 44 which were available only from 2008 and 2010.

For the standardized sampling week 36 (from which the most samples were obtained over 2002 to 2010) and for a standardized fork length of 64 cm, there was a significant year effect in the predicted whole weight of salmon for 2002 to 2010 (Figure 5.1.2.3). The heaviest fish at length for NAC were sampled in 2009 and the lightest fish at length in 2005. For NEAC origin salmon, the lightest fish at length were also sampled in 2005 and the heaviest fish at length were sampled in 2002 (Figure 5.1.2.3).

The analysis of condition of salmon over the period 2002 to 2010 contrasts with the interpretation of salmon size at West Greenland based entirely on weights or lengths unadjusted for the period of sampling or for the length of the fish. With the exception of the 2005 sampling year for NAC and 2005 as well as 2002 for NEAC, there is no apparent change in condition of 1SW non-maturing salmon at West Greenland. The trend in increasing weights from the samples can be attributed to both increasing length and variations in sampling period. 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.

North American salmon up to river age six were caught at West Greenland in 2010 (Table 5.1.2.4), comprising predominantly 2 year old (21.7%), 3 year old (47.9%) and 4 year old (21.7%) smolts. The river ages of European salmon ranged from 1 to 5 years in the river (Table 5.1.2.4). Of these, 57.1% were river age 2 with river age 3 comprising 27.3%.

As expected, the 1SW age group dominated the collection at 98.0% (Table 5.1.2.5). This value was an increase from the 2009 (92.9%) value. The increased proportion of 1SW fish was evident for both North American and European origin contributors and was accompanied by corresponding decreases in the contribution of older age fish.

As part of the sampling programme a total of 360 individuals had their sex identified by gonadal examination. The sex ratio was 15.8% males (n=57) to 84.2% females (n=303).

In addition to the Baseline Sampling Programme described above, an Enhanced Sampling Programme (SALSEA Greenland) was developed to conduct broader and more detailed sampling on a fixed number of fish harvested from the waters off West Greenland. The Enhanced Sampling was designed to be integrated within the Baseline Sampling Programme's infrastructure. Fresh whole fish were purchased directly from individual fishers and these fish were included in the Baseline Sampling Programme plus a more detailed sampling programme (Enhanced Sampling). The SALSEA Greenland Programme is an integral part of the larger SALSEA research programme.

The enhanced samples collected were:

- Counts and preservation of sea lice;
- Preserved gill, pyloric caeca, spleen, kidney tissue samples for disease analysis;
- Preserved muscle tissue for lipid content analysis;
- Preserved liver, dorsal muscle, caudal fin and scales samples for stable isotope analysis;
- Preserved stomachs for feeding ecology studies;
- Preserved intestines, pyloric caeca, gill arch, liver, spleen, kidney for parasite analysis;
- Preserved otoliths for elemental analysis;
- Preserved kidney samples for ISAv.

The Enhanced Sampling Programme was successfully undertaken in 2010. A total of 358 fresh whole fish were purchased directly from individual fishers. All carcasses, post sampling, were donated for consumption to the communities where the sampling took place.

5.1.3 Continent of origin of catches at West Greenland

A total of 1240 useable genetic samples were collected from three NAFO divisions: Sisimiut in 1B (n=637), Nuuk in 1D (n=227), and Qaqortoq in 1F (n=376). DNA isolation and the subsequent microsatellite analysis were performed (King *et al*., 2001). A database of approximately 5000 Atlantic salmon genotypes of known origin was used as a baseline to assign these individuals to continent of origin. In total, 79.9% of the salmon sampled were of North American origin and 20.1% were determined to be of European origin. The NAFO Division-specific continent of origin assignments in 2010 are presented in Table 5.1.3.1.

These data reveal the large proportion of North American origin individuals contributing to the fishery over the past ten years (Table 5.1.3.2). The variability in the recent continental representation among divisions underscores the need to sample multiple NAFO regions 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 from 1987–2010 are displayed in Table 5.1.3.2 and the weighted numbers of North American and European Atlantic salmon caught at West Greenland (excluding the reported harvest from ICES area XIV) were calculated. In 2010, approximately 10 000 (34 t) North American origin fish and approximately 2600 (9 t) European origin fish were harvested. These totals remain among the lowest in the time-series, although they are the highest on record since 2001.

The Working Group again recommends a continuation and expansion of the broad geographic sampling programme (multiple NAFO divisions) to more accurately estimate continent of origin in the mixed-stock fishery.

5.2 Status of stocks

The stock complex at West Greenland is below conservation limits and thus suffering reduced reproductive capacity. In European and North American areas, the overall status of stocks contributing to the West Greenland fishery is among the lowest recorded, and as a result, the abundance of salmon within the West Greenland area is thought to be extremely low compared with 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).

In summary, North American 2SW spawner estimates for the six geographic areas indicated that all areas were below their CL, (Figure 4.5.2.3) in 2010 and are suffering reduced reproductive capacity. Within each of the geographic areas there are varying numbers of individual river stocks which are failing to meet conservation limits, particularly in Scotia-Fundy and the USA. The estimated exploitation rate of North American origin salmon in North American fisheries has declined (Figure 4.4.6.1) from approximately 80% in 1971 to 15% in 2010 for 2SW salmon and from approximately 68% in 1973 to 19% in 2010 for 1SW salmon. 2010 exploitation rates on 1SW and 2SW salmon remained among the lowest in the time-series, although exploitation rates on 1SW have increased slightly since 2007.

The status of stocks in the four Northeast Atlantic stock complexes are assessed with respect to the spawning escapement reserve (SER) and prior to the commencement of distant water fisheries. All four stock complexes (Northern NEAC 1SW and MSW and Southern NEAC 1SW and MSW) are considered to be at full reproductive capacity. However, at a country level, stock status from several jurisdictions is below CL and further, within the countries there are many river stocks which are not meeting CLs. Exploitation rates on these stocks are currently at their lowest level historically. Exploitation rates on 1SW salmon in the Northern NEAC and Southern NEAC area in 2010 was 40% and 14% respectively, both of which were below the five and ten years averages; for the MSW stocks, the exploitation rates in 2010 were 45% and 13% respectively, also below the five and ten year averages.

The results from the standardized analysis of length, weight and condition for the period 2002 to 2010, contrasts with the interpretation of salmon size at West Greenland based entirely on weights or lengths unadjusted for the period of sampling or for the length of the fish (Section 5.1.2). With the exception of the 2005 sampling year for NAC and 2005 as well as 2002 for NEAC, there is no apparent change in condition of 1SW non-maturing salmon at West Greenland. The trend in increasing weights from the samples can be attributed to both increasing length and variations in sampling period.

Table 5.1.1.1. Nominal catches of salmon at West Greenland since 1977 (metric tons round fresh weight).

Year	Total	Quota	Comments
1971	2689	-	
1972	2113	1100	
1973	2341	1100	
1974	1917	1191	
1975	2030	1191	
1976	1175	1191	
1977	1420	1191	
1978	984	1191	
1979	1395	1191	
1980	1194	1191	
1981	1264	1265	Quota set to a specific opening date for the fishery
1982	1077	1253	Quota set to a specific opening date for the fishery
1983	310	1191	
1984	297	870	
1985	864	852	
1986	960	909	
1987	966	935	
1988	893	840	Quota for 1988-90 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	900	
1990	274	924	
1991	472	840	
1992	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	77	Quota advised by NASCO
1996	92	174	Quota set by Greenland authorities
1997	58	57	Private (non-commercial) catches to be reported from now
1998	11	20	Fishery restricted to catches used for internal consumption in Greenland
1999	19	20	
2000	21	20	
2001	43	114	Final quota calculated according to the ad hoc management system
2002	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		Quota set to nil (no factory landing allowed), fishery restricted to catches used for internal consumption in Greenland, and higher catch figures based on sampling programme information are used for the assessments
2004	15		same as previous year

Year	Total	Quota	Comments
2005	15		same as previous year
2006	22		Quota set to nil (no factory landing allowed) and fishery restricted to catches used for internal consumption in Greenland
2007	25		Quota set to nil (no factory landing allowed), fishery restricted to catches used for internal consumption in Greenland, and higher catch figures based on sampling programme information are used for the assessments
2008	26		same as previous year
2009	26		same as previous year
2010	40		same as previous year

Table 5.1.1.2. Distribution of nominal catches (metric tons) by Greenland vessels since 1977.

	NAFO Division									
Year	1A	1B	1C	1D	1E	1F	NK	West Greenland	East Greenland	Total
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
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 *	5	2	10	2	3	5	0	26	-	26
2009 *	0.2	6	7	3	4	5	0	26	1	26
2010 *	17	5	2	3	7	4	0	38	2	40

[1] The fishery was suspended.

+ Small catches <5 t.

- No catch.

*** Corrected from gutted weight to total weight (factor 1.11).**

Table 5.1.1.3. Number of people (licensed and unlicensed) reporting catches of Atlantic salmon in Greenland fishery and Total number of issued licences and presented in NAFO/ICES divisions. Reports received by fish plants prior to1997 and to the Licence Office from 1998 to present.

Year	1A	1B	1C	1D	1E	1F	ICES	1NK	Licences	Total
1987	78	67	74		99	233				579
1988	63	46	43	53	78	227				516
1989	30	41	98	46	46	131				393
1990	32	15	46	52	54	155				362
1991	53	39	100	41	54	123				410
1992	3	9	73	9	36	82				212
1993										
1994										
1995	0	17	52	21	24	31				145
1996	1	8	74	15	23	42				163
1997	0	16	50	7	2	6				80
1998	16	5	8	7	3	30				69
1999	3	8	24	18	21	29				102
2000	1	1	5	12	2	25				43
2001	2	7	13	15	6	37			452	76
2002	1	1	9	13	9	8			479	41
2003	11	1	4	4	12	10			150	42
2004	20	2	8	4	20	12			155	66
2005	11	7	17	5	17	18			185	75
2006	43	14	17	20	17	30			159	141
2007	29	12	26	10	33	22			260	132
2008	44	8	41	10	16	24	0		260	143
2009	19	11	35	15	25	31	9		294	145
2010	86	17	19	16	30	27	13		309	208

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	(41,34)	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	13272	2917		50	(53,46)	50	(54,47)
	1986	20394	3509		57	(66,48)	43	(52,34)
	1987	13425	2960		59	(63,54)	41	(46,37)
	1988	11047	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	(72,65)	32	(35,28)
	1996	3341	1297		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)
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	

[1] CI - confidence interval calculated by method of Pella and Robertson (1979) for 1984 -86 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 as reported by the Home Rule Government and the division-specific adjusted landings where the sampling teams observed more fish landed than were reported.

		NAFO Division						
Year		1A	1B	1C	1D	1E	1F	Total
2002	Reported	14	78	2100	3752	1417	1661	9022
	Adjusted						2408	9769
2003	Reported	619	17	1621	648	1274	4516	8694
	Adjusted			1782	2709		5912	12 312
2004	Reported	3476	611	3516	2433	2609	2068	14 712
	Adjusted				4929			17 209
2005	Reported	1294	3120	2240	756	2937	4956	15 303
	Adjusted				2730			17 276
2006	Reported	5427	2611	3424	4731	2636	4192	23 021
	Adjusted							
2007	Reported	2019	5089	6148	4470	4828	2093	24 647
	Adjusted						2252	24 806
2008	Reported	4882	2210	10024	1595	2457	4979	26 147
	Adjusted				3577		5478	28 627
2009	Reported	195	6151	7090	2988	4296	4777	25 497
	Adjusted				5466			27 975
2010	Reported	17263	4558	2363	2747	6766	4252	37 949
	Adjusted		4824		6566		5274	43 056

Table 5.1.2.3. Annual mean whole weights (kg) and fork lengths (cm) of Atlantic salmon caught at West Greenland 1969 to 1992 and 1995 to present (NA = North America and E = Europe).

	Whole weight (kg) Sea age & origin									Fork length (cm) Sea age & origin					
	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
1977	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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
1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	2.37	2.67	6.09	5.88	3.71	4.98	2.45	2.75	2.56	61.0	63.2	81.3	81.0	70.9	81.3
1996	2.63	2.86	6.50	6.30	4.98	5.44	2.83	2.90	2.88	62.8	64.0	81.4	81.1	77.1	79.4
1997	2.57	2.82	7.95	6.11	4.82	6.90	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	63.0	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

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.

YEAR	1	2	3	4	5	6	7	8
					North American			
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
Overall Mean	2.7	31.5	39.5	18.2	6.8	1.2	0.1	0.0

Table 5.1.2.4. (continued). River age distribution (%) and mean river age for all European origin salmon caught at West Greenland 1968 to 1992 and 1995 to present.

YEAR	1	2	3	4	5	6	7	8
					European			
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
Overall Mean	17.8	61.0	18.2	2.7	0.3	0.0	0.0	0.0

1 1995–1997 new percent based on scale characteristics from DNA database.

2 1999 and 2001 new percent based on DNA database and scale database if DNA origins not known.

3 2002–2010 based on DNA only.

Table 5.1.2.5. 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

Table 5.1.3.1. The number of samples and continent of origin of Atlantic salmon by NAFO Division sampled at West Greenland in 2010. NA = North America, E = Europe.

2010		Numbers			Percentages	
NAFO Div	Sample dates	NA	E	Totals	NA	E
1B	Aug 25–Oct 6	541	96	637	84.9	15.1
1D	Aug 16–Oct 11	186	41	227	81.9	18.1
1F	Aug 15–Oct 9	264	112	376	70.2	29.8
Total		991	249	1240	79.9	20.1

Table 5.1.3.2. 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.

	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	90	10	7000	800
2010	81	19	10 000	2600

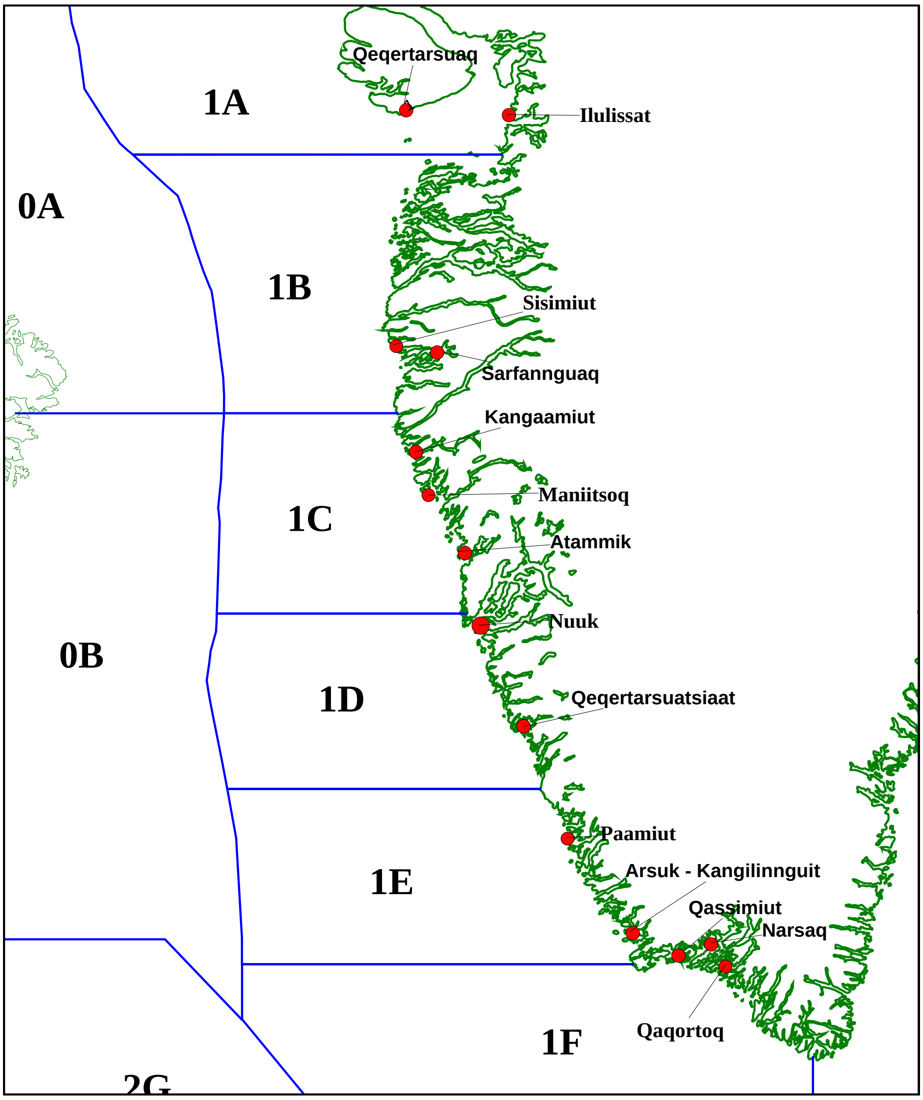

Figure 5.1.1.1. Location of NAFO divisions along the coast of West Greenland.

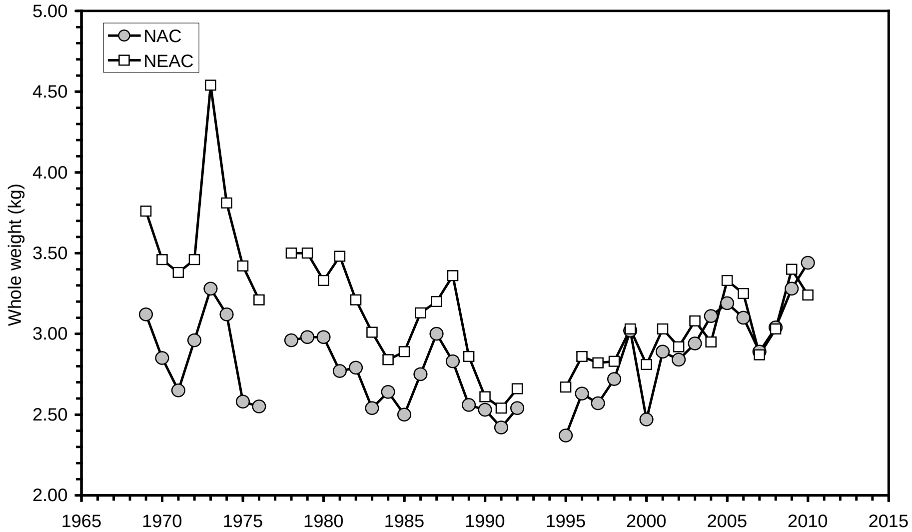

Figure 5.1.2.1. Sampled mean whole weight (kg) of 1SW non-maturing salmon by continent of origin over the period 1969 to 2010. The weights are not adjusted for the date of sampling or for the length of the fish.

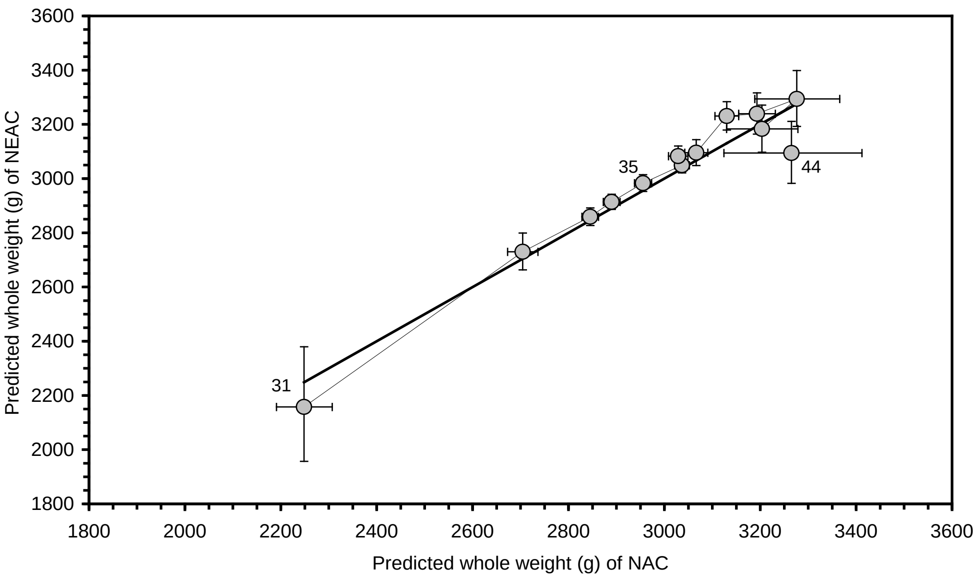

Figure 5.1.2.2. Comparison of predicted whole weight (g; mean; +/- 2 std errors) of 1SW non-maturing salmon from NAC and NEAC, adjusted to a common fork length of 64 cm, by standard week of sampling, all years (2002 to 2010) combined. Very few samples (64 from NAC, 4 from NEAC) are available from week 31 and all the samples were from the 2008 sampling year. The diagonal line is the equivalency line.

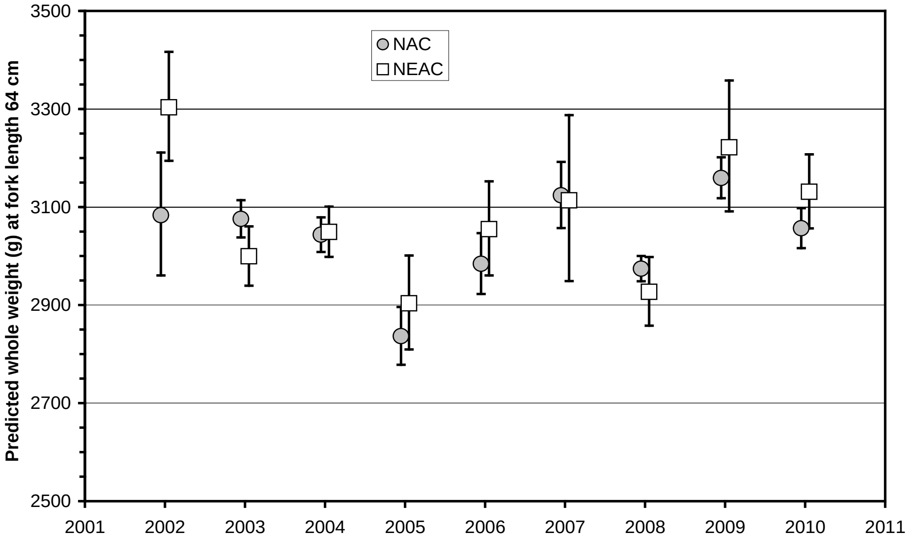

Figure 5.1.2.3. Predicted whole weight (g) (mean, +/- 2 std errors) of 1SW non-maturing salmon, by continent of origin, sampled at West Greenland and adjusted for standard sampling week 36 and a standardized fork length of 64 cm.

6 Additional term of reference from ICES MSFDSG and SIASM

In a communication dated March 10, 2011, the chair of the ICES Science Committee and the Chair of the Advisory Committee requested assistance from ICES expert groups to two groups created jointly by ACOM and SCICOM, the Marine Strategy Directive Framework Steering Group (MSDFSG) and the Strategic Initiative on Area Based Science and Management (SIASM).

These additional TORs from ICES steering groups are an additional task to the WGNAS which is currently fully committed to addressing questions by NASCO. These specific TORs may be better considered by other expert groups tasked specifically with such one-off requests and who would not also be tasked with responding to the large suite of questions on fisheries descriptions, stock status and provision of catch advice.

6.1 TOR from MSFDSG

ICES requested all its Expert Groups (EG) to identify and describe the work streams of relevance to the Descriptors in Annex I of Directive 2008/56/EC regarding criteria for good environmental status of marine waters. The criteria and methodologies are set out in the COMMISSION DECISION report of 1 September 2010 (notified under document C(2010) 5956). In addition, the EGs are asked to provide views on what good environmental status might be for those descriptors, including methods that could be used to determine status.

The descriptors to be used to assess the good environmental status relevant to Directive 2008/56/EC are:

Descriptor	Characteristic
1. Biological diversity	Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climate conditions.
2. Non-indigenous species	Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem.
3. Safe biological limits	Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.
4. State of marine foodwebs	All elements of the marine foodwebs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.
5. Human-induced eutrophication	Human-induced eutrophication is minimized, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters.
6. Seabed integrity	Seabed integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.
7. Alteration of hydrographical conditions	Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.
8. Contaminants in the environment	Concentrations of contaminants are at levels not giving rise to pollution effects.
9. Contaminants in fish and seafood	Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.

Descriptor	Characteristic
10. Marine litter	Properties and quantities of marine litter do not cause harm to the coastal and marine environment.
11. Energy projects	Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

The following overview summarizes the scientific inputs for the assessment of status of Atlantic salmon in the North Atlantic by the Working Group and the potential contributions of the Working Group to the work of the ICES Marine Strategy (MSFDG). In addition, what would be considered good environmental status for the descriptors and methods to determine the status are presented, when applicable.

Biological diversity

Elements of WGNAS contributing to determination of status:

- At the species level, WGNAS provides information on the distributional range and the distributional pattern within the range of Atlantic salmon in the North Atlantic rivers. In a large number of rivers and geographic areas, estimates of population size, population abundance and population demographic characteristics (e.g. body size or age-class structure, sex ratio, fecundity rates, survival/ mortality rates) are available. The descriptions of the population genetic structure are now well known or will be over the next few years.
- At the habitat level, the habitat requirements of the species and the availability and quality of the freshwater habitat are well known but such information is not routinely assessed and reviewed by WGNAS. Information on habitat requirements at sea and the changes in habitat quality and accessibility are less well known.
- At the ecosystem level, the relative abundance of Atlantic salmon in the freshwater fish communities is relatively well known and variations in abundance and characteristics are monitored in a large number of rivers annually but such information is not routinely assessed and reviewed by WGNAS. Similar information is generally lacking for the marine portion of the life cycle, Atlantic salmon being a less abundant fish species (in number and weight) within the pelagic fish community of the North Atlantic.

Environmental indicators and methods to determine status:

- Variations in abundance of Atlantic salmon and distribution and the relative abundance of salmon within the freshwater fish communities would be an appropriate indicator of biological diversity.

Non-indigenous species

Elements of WGNAS contributing to determination of status:

- The introduction of non-indigenous species in Atlantic salmon rivers and their consequences on populations are frequently documented in WGNAS. Recent examples of these interactions include the impacts of the transfer of parasites (*Gyrodactylus salaris* in Europe), non-indigenous expansions into Iceland of diadromous (sea lamprey) and marine (flounder) species, rainbow trout in Europe, and freshwater predator species (*Esox* sp., *Micropterus dolomuei*) in Canadian and USA waters. Trends in abundance, temporal occurrence and spatial distribution in the wild of some of these species, including in relation to the main vectors and pathways of spreading of such species are information which have been discussed at WGNAS.

Environmental indicators and methods to determine status:

- Documentation of non-indigenous species, changes in distribution through time are indicators of environmental health which could be documented by national authorities.

Safe biological limits

Elements of WGNAS contributing to determination of status:

- Atlantic salmon status is assessed relative to defined conservation limits (limit reference point) and management of fisheries is based on management objectives of achieving conservation limits in individual rivers. The status of Atlantic salmon in the North Atlantic is assessed relative to these conservation limits annually by WGNAS. Conservation limits for sea age groups are also defined to guide management for age structure and population diversity.

Environmental indicators and methods to determine status:

- Conservation limits and the compliance of stocks in individual rivers is the appropriate indicator for this descriptor.

State of marine foodwebs

Elements of WGNAS contributing to determination of status:

- WGNAS would not input into this descriptor.

Human-induced eutrophication

Elements of WGNAS contributing to determination of status:

- Atlantic salmon are particularly vulnerable to degraded water quality particularly in freshwater and estuaries. WGNAS opportunistically reviews reports of Atlantic salmon populations impacted by human-induced activities, but assessment of eutrophication or water quality is not a generic term of reference for WGNAS.

Environmental indicators and methods to determine status:

- Monitoring of juvenile salmon abundances and the fish communities could be used to assess water quality and eutrophication states of the freshwater environment. Indicators of environmental quality that relate to Atlantic salmon are defined in relation to the EU Water Framework Directive.

Seabed integrity

Elements of WGNAS contributing to determination of status:

- WGNAS would not input into this descriptor, salmon are pelagic ocean species and fisheries are concentrated in rivers or very near the coast, or when at sea, using pelagic gear.

Alteration of hydrographical conditions

Elements of WGNAS contributing to determination of status:

- Atlantic salmon during their life stages residing and migrating through estuaries and in freshwater are particularly vulnerable to alterations in hydrographical conditions in freshwater and estuaries. There is a large amount of scientific literature on the impacts of barrages on Atlantic salmon populations, including extirpations of populations and on technological approaches to facilitate fish passage. The description of threats to Atlantic salmon from modified flow regimes and fish passage have been terms of reference considered by WGNAS but not on an annually recurring basis.

Environmental indicators and methods to determine status:

- Indicators would include estimates of habitat loss due to barrages and modified flow regimes, number of rivers impacted by barrages, progress in removing deterrents or improving access to salmon to habitat, are all potential indicators of environmental status for this descriptor.

Contaminants in the environment

Elements of WGNAS contributing to determination of status:

- WGNAS would not routinely assess or report on contaminant levels leading to pollution. However, Atlantic salmon have been revealed to be susceptible to non-acute exposure to various chemicals whose levels in the environment can be at low concentrations but that can affect salmon developmental states, particularly for the vulnerable stages transitioning between freshwater and the marine environments. Such interactions are documented in literature and discussed at WGNAS on an ad hoc basis.

Environmental indicators and methods to determine status:

- Work to define the environmental indicators for these chemicals is not being conducted by WGNAS.

Contaminants in fish and seafood

Elements of WGNAS contributing to determination of status:

- WGNAS would not input into this descriptor.

Marine litter

Elements of WGNAS contributing to determination of status:

- WGNAS would not input into this descriptor.

Energy projects

Elements of WGNAS contributing to determination of status:

- As indicated for descriptor 7, Atlantic salmon populations are vulnerable to modifications in fish passage and water regime regulation. The description of threats to Atlantic salmon from modified flow regimes and fish passage have been terms of reference considered by WGNAS but not on an annual basis.

Environmental indicators and methods to determine status:

- Indicators as for descriptor 7 above would be appropriate.

Implications for WGNAS

WGNAS regularly meets to address questions posed to ICES by NASCO. The addition of a term of reference to address on annual basis the elements of the descriptors of good environmental status would be an important workload addition for WGNAS and would require additional national participation of specialists in habitat and environmental quality. Elements from WGNAS specific to population abundance and status relative to safe biological limits for Atlantic salmon are contained in WGNAS reports and could be considered by MSFDG in delivery of their tasks.

6.2 ToR from SIASM

The main objective of the Strategic Initiative on Area Based Science and Management (SIASM) is to demonstrate to ICES clients, Member Countries and stakeholders that ICES has the expertise and facilities to deliver solid, robust and independent science and advice on marine area based management and spatial planning.

From SIASM, the following term of reference was added to all EGs for 2011:

- take note of and comment on the Report of the Workshop on the Science for area-based management: Coastal and Marine Spatial Planning in Practice (WKCMSP);
- provide information that could be used in setting pressure indicators that would complement biodiversity indicators currently being developed by the Strategic Initiative on Biodiversity Advice and Science (SIBAS). Particular consideration should be given to assessing the impacts of very large renewable energy plans with a view to identifying/predicting potentially catastrophic outcomes;
- identify spatially resolved data, for e.g. spawning grounds, fishery activity, habitats, etc.

The WGNAS took note of the workshop report referred to in the ToR and has commented on the recommendations of the workshop for science input in the development of area-based management. Specifically, WGNAS has the capacity to document the spatial locations of Atlantic salmon rivers as well as information on timing of migrations between rivers and estuaries of specific river stocks throughout the species distributional range. Status of river-specific stocks is documented annually and this could be used as a pressure indicator that complements (in this case, similar to descriptor 3 in Section 6.1) the descriptors of interest to MSFDSG. For this, reference could be made to the database of Atlantic salmon rivers in the North Atlantic which has been compiled by NASCO based on inputs from countries of the North Atlantic. Recently, work has been undertaken to rescue and secure tag and recovery data of Atlantic salmon in the North Atlantic, the data being georeferenced and time stamped (ICES 2007a; ICES 2008b; ICES 2009b). In the next few years, extensive data on post-smolt migrations and distributions at sea will become available through the SALSEA-MERGE initiative in the Northeast Atlantic (ICES 2010b).

The potential impacts of renewal energy plans have been raised by NASCO with a question to ICES. In the context of Atlantic salmon, the impacts of renewal energy installations are important and are a growing threat to salmon, as discussed in Section 2.3.2 and the information provided in this report is a preliminary look at the question.

Annex 1: Working documents submitted to the Working Group on North Atlantic Salmon, 2011

Number	author(s)	title
1	T. F. Sheehan, R. Nygaard, D. G. Reddin, and T. L. King	The International Sampling Program, Continent of Origin and Biological Characteristics of Atlantic Salmon Collected at West Greenland in 2010
2	T. F. Sheehan	Tag Recaptures at Greenland (2003–2010)
3	S. Douglas, G. Chaput, C. Breau, D. Cairns, P. Cameron	Stock Status of Atlantic Salmon in Canada's Gulf Region (SFAs 15–18)
4	J. Trial, J. Sweka, J. Kocik, and T. Sheehan	National Report for the United States, 2010
5	Fiske, P., Hansen, L.P., Jensen, A.J., Sægrov, H., Wennevik, V., Hvidsten, N.A. and Jonsson, N.	Atlantic Salmon; National Report for Norway 2010
6	G. Gudbergsson, T. Antonsson, and S. Gudjonsson	National Report for Iceland The 2010 Salmon Season
7	Isaksson, A.	Bycatch of Atlantic Salmon in Pelagic Fisheries for Mackerel
8	J. Erkinaro, P. Orell1, M. Länsman, J. Kuusela, M. Kylmäaho, E. Niemelä, M. Johansen, and T.G. Heggberget	Status of Atlantic salmon stocks in the rivers Teno/Tana and Näätämöjoki/Neidenelva
9	D. Ensing, R. Kennedy , W.W. Crozier, and P. Boylan	Summary of Salmon Fisheries and Status of Stocks in Northern Ireland for 2010
10	S. Prusov and G. Ustyuzhinskiy	Atlantic Salmon Fisheries and Status of Stocks in Russia. National Report for 2010
11	Fey, D.	Salmon Return Germany 2010/2011
12	White, J.	Report of Workshop on Age Determination Salmon
13	Ó Maoiléidigh, N., Cullen, A., Bond, N., McLaughlin, D., O'Higgins, K.,Rogan,G., Cotter, D., White, J., and Gargan, P.	National Report for Ireland - the 2010 Salmon Season
14	Anon.	Annual Assessment of Salmon Stocks and Fisheries in England and Wales 2010
15	Riley, W.D., Ibbotson, A.T., Lower, N., Maxwell, D.L., and Russell, I.C.	The impact of capture, handling, anaesthesia and tagging (CWT) on Atlantic salmon (*Salmo salar* L.) smolt physiology, migratory behaviour and subsequent adult return rates.
16	E. Degerman, J. Persson, S. Palm, and B. Sers	Salmon Fisheries and Status of Salmon Stocks in Sweden: National Report for 2010
17	J. Carr, D. Meerburg, and F. Whoriskey	Atlantic Salmon Research Programmes in 2010
18	J.C. MacLean, G.W. Smith, and I.S. McLaren	National Report for UK (Scotland): 2010 season
19	Jeronimo de la Hoz	Salmon fisheries and status of stocks in Spain (Asturias - 2010)
20	Gibson, A.J.F., A. L. Levy, R. A. Jones, and H. D. Bowlby	Status of Atlantic Salmon in Canada's Maritimes Region (Salmon Fishing Areas 19 to 23)
21	DFO	Stock Assessment of Newfoundland and Labrador Atlantic Salmon - 2010.

22	M. Dionne, V. Cauchon, and D. Fournier	Status of Atlantic salmon Stocks in Québec in 2010
23	M. Dionne, V. Cauchon, and D. Fournier	Smolt production, freshwater and sea survival on two index rivers in Québec, the Saint-Jean and the Trinité.
24	Chaput, G., C. Breau, D. Cairns, P. Cameron, M. Dionne, S. Douglas, J. Gibson, R. Jones, R. Poole, and G. Veinott	Catch Statistics and Aquaculture Production Values for Canada: preliminary 2010, updated 2009
25	Reddin, D., R. Poole, R. Wilcott, and R. Kemuksigak	Salmon sampling programme in Labrador, 2010
26	G. Chaput, H. Bowlby, C. Breau, D. Cairns, P. Cameron, M. Dionne, J. Gibson, R. Jones, and D. Reddin	Atlantic Salmon Rivers Database from Eastern Canada
27	E. Degerman and I. Russell	Fish passage in rivers
28	Nygaard, R.	The Salmon Fishery in Greenland 2010
29	Goraguer, H.	Compte rendu des observations biologiques sur les captures de saumon atlantique (*Salmo salar*) pendant la campagne 2010 à Saint-Pierre et Miquelon
30	Potter, T., Chaput, G., Saunders, R., and Feldthaus, S.	Report of the Framework of Indicators Working Group 2011
31	Euzenat, G.	France Report 2010
32	Jacobsen., J.A.	Status of the fisheries for Atlantic salmon and production of farmed salmon in 2010 for the Faroe Islands
33	Potter, T.	Notes Relating to the Inclusion of Salmon and Eel in the EU-Data Collection Framework

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Annex 4: Reported catch of Atlantic salmon

Reported catch of Atlantic salmon in numbers and weight (tonnes round fresh weight) by sea –age class. Catches reported for 2010 may be provisional. Methods used for estimating age composition given in footnotes.

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	315,532	-	17,810	-	-	-	-	-	-	-	-	-	2,688	-	336,030	1,077
	1983	90,500	-	8,100	-	-	-	-	-	-	-	-	-	1,400	-	100,000	310
	1984	78,942	-	10,442	-	-	-	-	-	-	-	-	-	630	-	90,014	297
	1985	292,181	-	18,378	-	-	-	-	-	-	-	-	-	934	-	311,493	864
	1986	307,800	-	9,700	-	-	-	-	-	-	-	-	-	2,600	-	320,100	960
	1987	297,128	-	6,287	-	-	-	-	-	-	-	-	-	2,898	-	306,313	966
	1988	281,356	-	4,602	-	-	-	-	-	-	-	-	-	2,296	-	288,254	893
	1989	110,359	-	5,379	-	-	-	-	-	-	-	-	-	1,875	-	117,613	337
	1990	97,271	-	3,346	-	-	-	-	-	-	-	-	-	860	-	101,477	274
	1991	167,551	415	8,809	53	-	-	-	-	-	-	-	-	743	4	177,103	472
	1992	82,354	217	2,822	18	-	-	-	-	-	-	-	-	364	2	85,540	237
	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1995	31,241	-	558	-	-	-	-	-	-	-	-	-	478	-	32,277	83
	1996	30,613	-	884	-	-	-	-	-	-	-	-	-	568	-	32,065	92
	1997	20,980	-	134	-	-	-	-	-	-	-	-	-	124	-	21,238	58
	1998	3,901	-	17	-	-	-	-	-	-	-	-	-	88	-	4,006	11
	1999	6,124	18	50	0	-	-	-	-	-	-	-	-	84	1	6,258	19
	2000	7,715	21	0	0	-	-	-	-	-	-	-	-	140	0	7,855	21
	2001	14,795	40	324	2	-	-	-	-	-	-	-	-	293	1	15,412	43
	2002	3,344	10	34	0	-	-	-	-	-	-	-	-	27	0	3,405	10
	2003	3,933	12	38	0	-	-	-	-	-	-	-	-	73	0	4,044	12
	2004	4,488	14	51	0	-	-	-	-	-	-	-	-	88	0	4,627	15
	2005	3,120	13	40	0	-	-	-	-	-	-	-	-	180	1	3,340	14
	2006	5,746	20	183	1	-	-	-	-	-	-	-	-	224	1	6,153	22
	2007	6,037	24	82	0	6	0	-	-	-	-	-	-	144	1	6,263	25
	2008	9,311	26	47	0	0	0	-	-	-	-	-	-	177	1	9,535	26
	2009	7,442	27	268	1	0	0	-	-	-	-	-	-	328	1	8,038	29
	2010							-	-	-	-					11,747	40
Canada	1982	358,000	716	-	-	-	-	-	-	-	-	240,000	1,082	-	-	598,000	1,798
	1983	265,000	513	-	-	-	-	-	-	-	-	201,000	911	-	-	466,000	1,424
	1984	234,000	467	-	-	-	-	-	-	-	-	143,000	645	-	-	377,000	1,112
	1985	333,084	593	-	-	-	-	-	-	-	-	122,621	540	-	-	455,705	1,133
	1986	417,269	780	-	-	-	-	-	-	-	-	162,305	779	-	-	579,574	1,559
	1987	435,799	833	-	-	-	-	-	-	-	-	203,731	951	-	-	639,530	1,784
	1988	372,178	677	-	-	-	-	-	-	-	-	137,637	633	-	-	509,815	1,310
	1989	304,620	549	-	-	-	-	-	-	-	-	135,484	590	-	-	440,104	1,139
	1990	233,690	425	-	-	-	-	-	-	-	-	106,379	486	-	-	340,069	911
	1991	189,324	341	-	-	-	-	-	-	-	-	82,532	370	-	-	271,856	711
	1992	108,901	199	-	-	-	-	-	-	-	-	66,357	323	-	-	175,258	522
	1993	91,239	159	-	-	-	-	-	-	-	-	45,416	214	-	-	136,655	373
	1994	76,973	139	-	-	-	-	-	-	-	-	42,946	216	-	-	119,919	355
	1995	61,940	107	-	-	-	-	-	-	-	-	34,263	153	-	-	96,203	260
	1996	82,490	138	-	-	-	-	-	-	-	-	31,590	154	-	-	114,080	292
	1997	58,988	103	-	-	-	-	-	-	-	-	26,270	126	-	-	85,258	229
	1998	51,251	87	-	-	-	-	-	-	-	-	13,274	70	-	-	64,525	157
	1999	50,901	88	-	-	-	-	-	-	-	-	11,368	64	-	-	62,269	152
	2000	55,263	95	-	-	-	-	-	-	-	-	10,571	58	-	-	65,834	153
	2001	51,225	86	-	-	-	-	-	-	-	-	11,575	61	-	-	62,800	147
	2002	53,464	99	-	-	-	-	-	-	-	-	8,439	49	-	-	61,903	148
	2003	46,768	81	-	-	-	-	-	-	-	-	11,218	60	-	-	57,986	141
	2004	54,253	94	-	-	-	-	-	-	-	-	12,933	68	-	-	67,186	162
	2005	47,368	83	-	-	-	-	-	-	-	-	10,937	56	-	-	58,305	139
	2006	46,747	82	-	-	-	-	-	-	-	-	11,248	55	-	-	57,995	137
	2007	37,075	63	-	-	-	-	-	-	-	-	10,311	49	-	-	47,386	112
	2008	58,386	100	-	-	-	-	-	-	-	-	11,736	57	-	-	70,122	158
	2009	42,943	74	-	-	-	-	-	-	-	-	11,226	52	-	-	54,169	126
	2010	54,156	93	-	-	-	-	-	-	-	-	10,989	53	-	-	65,145	146

Annex 4 (continued).

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	-	1,206	-	5	-	-	-	-	-	-	-	21	-	1,265	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
Faroe Islands	1982/83	9,086	-	101,227	-	21,663	-	448	-	29	-	-	-	-	-	132,453	625
	1983/84	4,791	-	107,199	-	12,469	-	49	-	-	-	-	-	-	-	124,508	651
	1984/85	324	-	123,510	-	9,690	-	-	-	-	-	-	-	1,653	-	135,177	598
	1985/86	1,672	-	141,740	-	4,779	-	76	-	-	-	-	-	6,287	-	154,554	545
	1986/87	76	-	133,078	-	7,070	-	80	-	-	-	-	-	-	-	140,304	539
	1987/88	5,833	-	55,728	-	3,450	-	0	-	-	-	-	-	-	-	65,011	208
	1988/89	1,351	-	86,417	-	5,728	-	0	-	-	-	-	-	-	-	93,496	309
	1989/90	1,560	-	103,407	-	6,463	-	6	-	-	-	-	-	-	-	111,436	364
	1990/91	631	-	52,420	-	4,390	-	8	-	-	-	-	-	-	-	57,449	202
	1991/92	16	-	7,611	-	837	-	-	-	-	-	-	-	-	-	8,464	31
	1992/93	-	-	4,212	-	1,203	-	-	-	-	-	-	-	-	-	5,415	22
	1993/94	-	-	1,866	-	206	-	-	-	-	-	-	-	-	-	2,072	7
	1994/95	-	-	1,807	-	156	-	-	-	-	-	-	-	-	-	1,963	6
	1995/96	-	-	268	-	14	-	-	-	-	-	-	-	-	-	282	1
	1996/97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
	1997/98	339	-	1,315	-	109	-	-	-	-	-	-	-	-	-	1,763	6
	1998/99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
	1999/00	225	-	1,560	-	205	-	-	-	-	-	-	-	-	-	1,990	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

Annex 4 (continued).

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	2,598	5	-	-	-	-	-	-	-	-	5,408	49	-	-	8,006	54
	1983	3,916	7	-	-	-	-	-	-	-	-	6,050	51	-	-	9,966	58
	1984	4,899	9	-	-	-	-	-	-	-	-	4,726	37	-	-	9,625	46
	1985	6,201	11	-	-	-	-	-	-	-	-	4,912	38	-	-	11,113	49
	1986	6,131	12	-	-	-	-	-	-	-	-	3,244	25	-	-	9,375	37
	1987	8,696	15	-	-	-	-	-	-	-	-	4,520	34	-	-	13,216	49
	1988	5,926	9	-	-	-	-	-	-	-	-	3,495	27	-	-	9,421	36
	1989	10,395	19	-	-	-	-	-	-	-	-	5,332	33	-	-	15,727	52
	1990	10,084	19	-	-	-	-	-	-	-	-	5,600	41	-	-	15,684	60
	1991	9,213	17	-	-	-	-	-	-	-	-	6,298	53	-	-	15,511	70
	1992	15,017	28	-	-	-	-	-	-	-	-	6,284	49	-	-	21,301	77
	1993	11,157	17	-	-	-	-	-	-	-	-	8,180	53	-	-	19,337	70
	1994	7,493	11	-	-	-	-	-	-	-	-	6,230	38	-	-	13,723	49
	1995	7,786	11	-	-	-	-	-	-	-	-	5,344	38	-	-	13,130	49
	1996	12,230	20	1,275	5	1,424	12	234	4	19	1	-	-	354	3	15,536	44
	1997	10,341	15	2,419	10	1,674	15	141	2	22	1	-	-	418	3	15,015	45
	1998	11,792	19	1,608	7	1,660	16	147	3	0	0	-	-	460	3	15,667	48
	1999	18,830	33	1,528	8	1,579	16	129	2	6	0	-	-	490	3	22,562	62
	2000	20,817	39	5,152	24	2,379	25	110	2	0	0	-	-	991	6	29,449	95
	2001	13,296	21	6,286	32	5,369	57	103	2	0	0	-	-	2,372	13	27,426	125
	2002	6,427	12	5,227	20	4,048	43	145	2	11	0	-	-	2,496	16	18,354	93
	2003	8,130	15	1,828	7	3,599	35	161	3	6	0	-	-	2,204	15	15,928	75
	2004	3,849	7	1,425	6	1,152	11	251	3	6	1	-	-	1,404	11	8,087	39
	2005	9,263	16	1,027	5	1,571	16	66	1	48	1	-	-	833	8	12,808	47
	2006	17,345	29	4,168	18	1,324	13	63	1	0	0	-	-	720	5	23,620	67
	2007	3,857	6	5,628	21	2,284	23	24	1	0	0	-	-	1,232	8	13,025	59
	2008	4,424	6	2,236	8	4,216	41	239	4					1,992	11	13,107	71
	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36
	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49
Iceland	1991	29,601	-	11,892	-	-	-	-	-	-	-	-	-	-	-	41,493	130
	1992	38,538	-	15,312	-	-	-	-	-	-	-	-	-	-	-	53,850	175
	1993	36,640	-	11,541	-	-	-	-	-	-	-	-	-	-	-	48,181	160
	1994	24,224	59	14,088	76	-	-	-	-	-	-	-	-	-	-	38,312	135
	1995	32,767	90	13,136	56	-	-	-	-	-	-	-	-	-	-	45,903	145
	1996	26,927	66	9,785	52	-	-	-	-	-	-	-	-	-	-	36,712	118
	1997	21,684	56	8,178	41	-	-	-	-	-	-	-	-	-	-	29,862	97
	1998	32,224	81	7,272	37	-	-	-	-	-	-	-	-	-	-	39,496	119
	1999	22,620	59	9,883	52	-	-	-	-	-	-	-	-	-	-	32,503	111
	2000	20,270	49	4,319	24	-	-	-	-	-	-	-	-	-	-	24,589	73
	2001	18,538	46	5,289	28	-	-	-	-	-	-	-	-	-	-	23,827	74
	2002	25,277	64	5,194	26	-	-	-	-	-	-	-	-	-	-	30,471	90
	2003	24,738	61	8,119	37	-	-	-	-	-	-	-	-	-	-	32,857	99
	2004	32,600	84	6,128	28	-	-	-	-	-	-	-	-	-	-	38,728	111
	2005	39,980	101	5,941	28	-	-	-	-	-	-	-	-	-	-	45,921	129
	2006	29,857	71	5,635	23	-	-	-	-	-	-	-	-	-	-	35,492	93
	2007	31,899	74	3,262	15	-	-	-	-	-	-	-	-	-	-	35,161	89
	2008	44,391	106	5,129	26	-	-	-	-	-	-	-	-	-	-	49,520	132
	2009	43,981	103	4,561	24	-	-	-	-	-	-	-	-	-	-	48,542	126
	2010	38,558	93	6,078	31	-	-	-	-	-	-	-	-	-	-	44,636	124

Annex 4 (continued).

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Sweden	1990	7,428	18	-	-	-	-	-	-	-	-	3,133	15	-	-	10,561	33
	1991	8,987	20	-	-	-	-	-	-	-	-	3,620	18	-	-	12,607	38
	1992	9,850	23	-	-	-	-	-	-	-	-	4,656	26	-	-	14,506	49
	1993	10,540	23	-	-	-	-	-	-	-	-	6,369	33	-	-	16,909	56
	1994	8,304	18	-	-	-	-	-	-	-	-	4,661	26	-	-	12,965	44
	1995	9,761	22	-	-	-	-	-	-	-	-	2,770	14	-	-	12,531	36
	1996	6,008	14	-	-	-	-	-	-	-	-	3,542	19	-	-	9,550	33
	1997	2,747	7	-	-	-	-	-	-	-	-	2,307	12	-	-	5,054	19
	1998	2,421	6	-	-	-	-	-	-	-	-	1,702	9	-	-	4,123	15
	1999	3,573	8	-	-	-	-	-	-	-	-	1,460	8	-	-	5,033	16
	2000	7,103	18	-	-	-	-	-	-	-	-	3,196	15	-	-	10,299	33
	2001	4,634	12	-	-	-	-	-	-	-	-	3,853	21	-	-	8,487	33
	2002	4,733	12	-	-	-	-	-	-	-	-	2,826	16	-	-	7,559	28
	2003	2,891	7	-	-	-	-	-	-	-	-	3,214	18	-	-	6,105	25
	2004	2,494	6	-	-	-	-	-	-	-	-	2,330	13	-	-	4,824	19
	2005	2,122	5	-	-	-	-	-	-	-	-	1,770	10	-	-	3,892	15
	2006	2,211	4	-	-	-	-	-	-	-	-	1,772	10	-	-	3,983	14
	2007	1,228	3	-	-	-	-	-	-	-	-	2,442	13	-	-	3,670	16
	2008	1,197	3	-	-	-	-	-	-	-	-	2,752	16	-	-	3,949	19
	2009	1,269	3	-	-	-	-	-	-	-	-	2,495	14	-	-	3,764	17
	2010	2,109	5	-	-	-	-	-	-	-	-	3,066	17	-	-	5,175	22
Norway	1981	221,566	467	-	-	-	-	-	-	-	-	213,943	1,189	-	-	435,509	1,656
	1982	163,120	363	-	-	-	-	-	-	-	-	174,229	985	-	-	337,349	1,348
	1983	278,061	593	-	-	-	-	-	-	-	-	171,361	957	-	-	449,422	1,550
	1984	294,365	628	-	-	-	-	-	-	-	-	176,716	995	-	-	471,081	1,623
	1985	299,037	638	-	-	-	-	-	-	-	-	162,403	923	-	-	461,440	1,561
	1986	264,849	556	-	-	-	-	-	-	-	-	191,524	1,042	-	-	456,373	1,598
	1987	235,703	491	-	-	-	-	-	-	-	-	153,554	894	-	-	389,257	1,385
	1988	217,617	420	-	-	-	-	-	-	-	-	120,367	656	-	-	337,984	1,076
	1989	220,170	436	-	-	-	-	-	-	-	-	80,880	469	-	-	301,050	905
	1990	192,500	385	-	-	-	-	-	-	-	-	91,437	545	-	-	283,937	930
	1991	171,041	342	-	-	-	-	-	-	-	-	92,214	535	-	-	263,255	877
	1992	151,291	301	-	-	-	-	-	-	-	-	92,717	566	-	-	244,008	867
	1993	153,407	312	62,403	284	35,147	327	-	-	-	-	-	-	-	-	250,957	923
	1994	-	415	-	319	-	262	-	-	-	-	-	-	-	-	-	996
	1995	134,341	249	71,552	341	27,104	249	-	-	-	-	-	-	-	-	232,997	839
	1996	110,085	215	69,389	322	27,627	249	-	-	-	-	-	-	-	-	207,101	786
	1997	124,387	241	52,842	238	16,448	151	-	-	-	-	-	-	-	-	193,677	630
	1998	162,185	296	66,767	306	15,568	139	-	-	-	-	-	-	-	-	244,520	741
	1999	164,905	318	70,825	326	18,669	167	-	-	-	-	-	-	-	-	254,399	811
	2000	250,468	504	99,934	454	24,319	219	-	-	-	-	-	-	-	-	374,721	1,177
	2001	207,934	417	117,759	554	33,047	295	-	-	-	-	-	-	-	-	358,740	1,266
	2002	127,039	249	98,055	471	33,013	299	-	-	-	-	-	-	-	-	258,107	1,019
	2003	185,574	363	87,993	410	31,099	298	-	-	-	-	-	-	-	-	304,666	1,071
	2004	108,645	207	77,343	371	23,173	206	-	-	-	-	-	-	-	-	209,161	784
	2005	165,900	307	69,488	320	27,507	261	-	-	-	-	-	-	-	-	262,895	888
	2006	142,218	261	99,401	453	23,529	218	-	-	-	-	-	-	-	-	265,148	932
	2007	78,165	140	79,146	363	28,896	264	-	-	-	-	-	-	-	-	186,207	767
	2008	89,228	170	69,027	314	34,124	322	-	-	-	-	-	-	-	-	192,379	807
	2009	73,045	135	53,725	241	23,663	219	-	-	-	-	-	-	-	-	150,433	595
	2010	98,490	184	56,260	250	22,310	208	-	-	-	-	-	-	-	-	177,060	642

Annex 4 (continued).

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Russia	1987	97,242	-	27,135	-	9,539	-	556	-	18	-	-	-	2,521	-	137,011	564
	1988	53,158	-	33,395	-	10,256	-	294	-	25	-	-	-	2,937	-	100,065	420
	1989	78,023	-	23,123	-	4,118	-	26	-	0	-	-	-	2,187	-	107,477	364
	1990	70,595	-	20,633	-	2,919	-	101	-	0	-	-	-	2,010	-	96,258	313
	1991	40,603	-	12,458	-	3,060	-	650	-	0	-	-	-	1,375	-	58,146	215
	1992	34,021	-	8,880	-	3,547	-	180	-	0	-	-	-	824	-	47,452	167
	1993	28,100	-	11,780	-	4,280	-	377	-	0	-	-	-	1,470	-	46,007	139
	1994	30,877	-	10,879	-	2,183	-	51	-	0	-	-	-	555	-	44,545	141
	1995	27,775	62	9,642	50	1,803	15	6	0	0	0	-	-	385	2	39,611	129
	1996	33,878	79	7,395	42	1,084	9	40	0.5	0	0	-	-	41	1	42,438	131
	1997	31,857	72	5,837	28	672	6	38	0.5	0	0	-	-	559	3	38,963	110
	1998	34,870	92	6,815	33	181	2	28	0.3	0	0	-	-	638	3	42,532	130
	1999	24,016	66	5,317	25	499	5	0	0	0	0	-	-	1,131	6	30,963	102
	2000	27,702	75	7,027	34	500	5	3	0.1	0	0	-	-	1,853	9	37,085	123
	2001	26,472	61	7,505	39	1,036	10	30	0.4	0	0	-	-	922	5	35,965	115
	2002	24,588	60	8,720	43	1,284	12	3	0	0	0	-	-	480	3	35,075	118
	2003	22,014	50	8,905	42	1,206	12	20	0.3	0	0	-	-	634	4	32,779	107
	2004	17,105	39	6,786	33	880	7	0	0.0	0	0	-	-	529	3	25,300	82
	2005	16,591	39	7,179	33	989	8	1	0.0	0	0	-	-	439	3	25,199	82
	2006	22,412	54	5,392	28	759	6	0	0.0	0	0	-	-	449	3	29,012	91
	2007	12,474	30	4,377	23	929	7	0	0.0	0	0	-	-	277	2	18,057	62
	2008	13,404	28	8,674	39	669	4	8	0.1	0	0	-	-	312	2	23,067	73
	2009	13,580	30	7,215	35	720	5	36	0	0	0	-	-	173	1	21,724	71
	2010	14,834	33	9,821	48	844	6	49	0	0	0	-	-	186	1	25,734	88
Ireland	1980	248,333	745	-	-	-	-	-	-	-	-	39,608	202	-	-	287,941	947
	1981	173,667	521	-	-	-	-	-	-	-	-	32,159	164	-	-	205,826	685
	1982	310,000	930	-	-	-	-	-	-	-	-	12,353	63	-	-	322,353	993
	1983	502,000	1,506	-	-	-	-	-	-	-	-	29,411	150	-	-	531,411	1,656
	1984	242,666	728	-	-	-	-	-	-	-	-	19,804	101	-	-	262,470	829
	1985	498,333	1,495	-	-	-	-	-	-	-	-	19,608	100	-	-	517,941	1,595
	1986	498,125	1,594	-	-	-	-	-	-	-	-	28,335	136	-	-	526,460	1,730
	1987	358,842	1,112	-	-	-	-	-	-	-	-	27,609	127	-	-	386,451	1,239
	1988	559,297	1,733	-	-	-	-	-	-	-	-	30,599	141	-	-	589,896	1,874
	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	330,558	1,079
	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	188,890	567
	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	135,474	404
	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	235,435	631
	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200,120	541
	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	286,266	804
	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	288,225	790
	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	249,623	685
	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	209,214	570
	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	237,663	624
	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	180,477	515
	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	228,220	621
	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	270,963	730
	2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	256,808	682
	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	204,145	551
	2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	175,656	488
	2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	156,308	422
	2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120,834	326
	2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30,946	84
	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33,200	89
	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25,170	68
	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36,508	99

Annex 4 (continued).

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
UK	1985	62,815	-	-	-	-	-	-	-	-	-	32,716	-	-	-	95,531	361
(England & Wales)	1986	68,759	-	-	-	-	-	-	-	-	-	42,035	-	-	-	110,794	430
	1987	56,739	-	-	-	-	-	-	-	-	-	26,700	-	-	-	83,439	302
	1988	76,012	-	-	-	-	-	-	-	-	-	34,151	-	-	-	110,163	395
	1989	54,384	-	-	-	-	-	-	-	-	-	29,284	-	-	-	83,668	296
	1990	45,072	-	-	-	-	-	-	-	-	-	41,604	-	-	-	86,676	338
	1991	36,671	-	-	-	-	-	-	-	-	-	14,978	-	-	-	51,649	200
	1992	34,331	-	-	-	-	-	-	-	-	-	10,255	-	-	-	44,586	171
	1993	56,033	-	-	-	-	-	-	-	-	-	13,144	-	-	-	69,177	248
	1994	67,853	-	-	-	-	-	-	-	-	-	20,268	-	-	-	88,121	324
	1995	57,944	-	-	-	-	-	-	-	-	-	22,534	-	-	-	80,478	295
	1996	30,352	-	-	-	-	-	-	-	-	-	16,344	-	-	-	46,696	183
	1997	30,203	-	-	-	-	-	-	-	-	-	11,171	-	-	-	41,374	142
	1998	30,641	-	-	-	-	-	-	-	-	-	6,276	-	-	-	36,917	123
	1999	27944	-	-	-	-	-	-	-	-	-	13,150	-	-	-	41,094	150
	2000	48,153	-	-	-	-	-	-	-	-	-	12,800	-	-	-	60,953	219
	2001	38993	-	-	-	-	-	-	-	-	-	12,314	-	-	-	51,307	184
	2002	34708	-	-	-	-	-	-	-	-	-	10,961	-	-	-	45,669	161
	2003	14,878	-	-	-	-	-	-	-	-	-	7,328	-	-	-	22,206	89
	2004	24,753	-	-	-	-	-	-	-	-	-	5,806	-	-	-	30,559	111
	2005	19,622	-	-	-	-	-	-	-	-	-	6,541	-	-	-	26,162	97
	2006	16,983	-	-	-	-	-	-	-	-	-	5,073	-	-	-	22,056	80
	2007	15,540	-	-	-	-	-	-	-	-	-	4,383	-	-	-	19,923	67
	2008	14,277	-	-	-	-	-	-	-	-	-	4,759	-	-	-	19,036	64
	2009	10,015	-	-	-	-	-	-	-	-	-	3,895	-	-	-	13,910	54
	2010	23,529	-	-	-	-	-	-	-	-	-	8,702	-	-	-	32,231	113
UK (Scotland)	1982	208,061	496	-	-	-	-	-	-	-	-	128,242	596	-	-	336,303	1,092
	1983	209,617	549	-	-	-	-	-	-	-	-	145,961	672	-	-	355,578	1,221
	1984	213,079	509	-	-	-	-	-	-	-	-	107,213	504	-	-	320,292	1,013
	1985	158,012	399	-	-	-	-	-	-	-	-	114,648	514	-	-	272,660	913
	1986	202,838	525	-	-	-	-	-	-	-	-	148,197	744	-	-	351,035	1,269
	1987	164,785	419	-	-	-	-	-	-	-	-	103,994	503	-	-	268,779	922
	1988	149,098	381	-	-	-	-	-	-	-	-	112,162	501	-	-	261,260	882
	1989	174,941	431	-	-	-	-	-	-	-	-	103,886	464	-	-	278,827	895
	1990	81,094	201	-	-	-	-	-	-	-	-	87,924	423	-	-	169,018	624
	1991	73,608	177	-	-	-	-	-	-	-	-	65,193	285	-	-	138,801	462
	1992	101,676	238	-	-	-	-	-	-	-	-	82,841	361	-	-	184,517	600
	1993	94,517	227	-	-	-	-	-	-	-	-	71,726	320	-	-	166,243	547
	1994	99,479	248	-	-	-	-	-	-	-	-	85,404	400	-	-	184,883	648
	1995	89,971	224	-	-	-	-	-	-	-	-	78,511	364	-	-	168,482	588
	1996	66,465	160	-	-	-	-	-	-	-	-	57,998	267	-	-	124,463	427
	1997	46,866	114	-	-	-	-	-	-	-	-	40,459	182	-	-	87,325	296
	1998	53,503	121	-	-	-	-	-	-	-	-	39,264	162	-	-	92,767	283
	1999	25,255	57	-	-	-	-	-	-	-	-	30,694	143	-	-	55,949	199
	2000	44,033	114	-	-	-	-	-	-	-	-	36,767	161	-	-	80,800	275
	2001	42,586	101	-	-	-	-	-	-	-	-	34,926	150	-	-	77,512	251
	2002	31,385	73	-	-	-	-	-	-	-	-	26,403	118	-	-	57,788	191
	2003	29,598	71	-	-	-	-	-	-	-	-	27,588	122	-	-	57,091	192
	2004	37,631	88	-	-	-	-	-	-	-	-	36,856	159	-	-	74,033	245
	2005	39,093	91	-	-	-	-	-	-	-	-	28,666	126	-	-	67,117	215
	2006	36,668	75	-	-	-	-	-	-	-	-	27,620	118	-	-	63,848	192
	2007	32,335	71	-	-	-	-	-	-	-	-	24,098	100	-	-	56,433	171
	2008	23,431	51	-	-	-	-	-	-	-	-	25,745	110	-	-	49,176	161
	2009	18,189	37	-	-	-	-	-	-	-	-	19,027	83	-	-	37,216	120
	2010	35,239	73	-	-	-	-	-	-	-	-	27,968	116	-	-	63,207	189

Annex 4 (continued).

Country	Year	1SW No.	1SW Wt	2SW No.	2SW Wt	3SW No.	3SW Wt	4SW No.	4SW Wt	5SW No.	5SW Wt	MSW (1) No.	MSW (1) Wt	PS No.	PS Wt	Total No.	Total Wt
France	1987	6,013	18	-	-	-	-	-	-	-	-	1,806	9	-	-	7,819	27
	1988	2,063	7	-	-	-	-	-	-	-	-	4,964	25	-	-	7,027	32
	1989	1,124	3	1,971	9	311	2	-	-	-	-	-	-	-	-	3,406	14
	1990	1,886	5	2,186	9	146	1	-	-	-	-	-	-	-	-	4,218	15
	1991	1,362	3	1,935	9	190	1	-	-	-	-	-	-	-	-	3,487	13
	1992	2,490	7	2,450	12	221	2	-	-	-	-	-	-	-	-	5,161	21
	1993	3,581	10	987	4	267	2	-	-	-	-	-	-	-	-	4,835	16
	1994	2,810	7	2,250	10	40	1	-	-	-	-	-	-	-	-	5,100	18
	1995	1,669	4	1,073	5	22	0	-	-	-	-	-	-	-	-	2,764	10
	1996	2,063	5	1,891	9	52	0	-	-	-	-	-	-	-	-	4,006	13
	1997	1,060	3	964	5	37	0	-	-	-	-	-	-	-	-	2,061	8
	1998	2,065	5	824	4	22	0	-	-	-	-	-	-	-	-	2,911	8
	1999	690	2	1,799	9	32	0	-	-	-	-	-	-	-	-	2,521	11
	2000	1,792	4	1,253	6	24	0	-	-	-	-	-	-	-	-	3,069	11
	2001	1,544	4	1,489	7	25	0	-	-	-	-	-	-	-	-	3,058	11
	2002	2,423	6	1,065	5	41	0	-	-	-	-	-	-	-	-	3,529	11
	2003	1,598	5	-	-	-	-	-	-	-	-	1,540	8	-	-	3,138	13
	2004	1,927	5	-	-	-	-	-	-	-	-	2,880	14	-	-	4,807	19
	2005	1,236	3	-	-	-	-	-	-	-	-	1,771	8	-	-	3,007	11
	2006	1,763	3	-	-	-	-	-	-	-	-	1,785	9	-	-	3,548	13
	2007	1,378	2	-	-	-	-	-	-	-	-	1,685	9	-	-	3,063	11
	2008	1,471	3	-	-	-	-	-	-	-	-	1,931	9	-	-	3,402	12
	2009	487	1	-	-	-	-	-	-	-	-	975	4	-	-	1,462	5
	2010	1,658	4	-	-	-	-	-	-	-	-	821	4	-	-	2,479	8
Spain (2)	1993	1,589	-	827	-	75	-	-	-	-	-	-	-	-	-	2,491	8
	1994	1,658	5	-	-	-	-	-	-	-	-	735	4	-	-	2,393	9
	1995	389	1	-	-	-	-	-	-	-	-	1,118	6	-	-	1,507	7
	1996	349	1	-	-	-	-	-	-	-	-	676	3	-	-	1,025	4
	1997	169	0	-	-	-	-	-	-	-	-	425	2	-	-	594	3
	1998	481	1	-	-	-	-	-	-	-	-	403	2	-	-	884	3
	1999	157	0	-	-	-	-	-	-	-	-	986	5	-	-	1,143	6
	2000	1,227	3	-	-	-	-	-	-	-	-	433	3	-	-	1,660	6
	2001	1,129	3	-	-	-	-	-	-	-	-	1,677	9	-	-	2,806	12
	2002	651	2	-	-	-	-	-	-	-	-	1,085	6	-	-	1,736	8
	2003	210	1	-	-	-	-	-	-	-	-	1,116	6	-	-	1,326	6
	2004	1,195	3	-	-	-	-	-	-	-	-	589	3	-	-	1,784	6
	2005	412	1	-	-	-	-	-	-	-	-	2,336	11	-	-	2,748	12
	2006	335	1	-	-	-	-	-	-	-	-	1,879	9	-	-	2,214	10
	2007	520	1	-	-	-	-	-	-	-	-	1,487	7	-	-	2,007	9
	2008	520	1	-	-	-	-	-	-	-	-	1,487	7	-	-	1,966	9
	2009	138	1	-	-	-	-	-	-	-	-	324	1	-	-	462	2
	2010		0	-	-	-	-	-	-	-	-		0	-	-	247	

1. MSW includes all sea ages >1, when this cannot be broken down.
   Different methods are used to separate 1SW and MSW salmon in different countries:
   - Scale reading: Faroe Islands, Finland (1996 onwards), France, Russia, USA and West Greenland.
   - Size (split weight/length): Canada (2.7 kg for nets; 63cm for rods), Finland up until 1995 (3 kg),
   Iceland (various splits used at different times and places), Norway (3 kg), UK Scotland (3 kg in some places and 3.7 kg in others),
   All countries except Scotland report no problems with using weight to catergorise catches into sea age classes; mis-classification may be very high in some years.
   In Norway, catches shown as 3SW refer to salmon of 3SW or greater.
2. Based on catches in Asturias (80-90% of total catch). No data for 2008, previous year data is used.

Annex 5: Input data for run reconstruction of Atlantic salmon in the NEAC area

Annex 5.i. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – R. Tana/Teno (Finland/Norway).

Year	Catch (numbers)		Unrep. as % of total 1SW		Unrep. as % of total MSW		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	8,422	8,538	30	40	30	40	40	60	40	70
1972	13,160	13,341	30	40	30	40	40	60	40	70
1973	11,969	15,958	30	40	30	40	40	60	40	70
1974	23,709	23,709	30	40	30	40	40	60	40	70
1975	16,527	26,417	30	40	30	40	40	60	40	70
1976	11,323	21,719	30	40	30	40	40	60	40	70
1977	5,807	13,227	30	40	30	40	40	60	40	70
1978	7,902	8,452	30	40	30	40	40	60	40	70
1979	9,249	7,390	30	40	30	40	40	60	30	60
1980	4,792	8,938	20	30	20	30	40	60	30	60
1981	7,386	9,835	20	30	20	30	40	60	30	60
1982	2,163	12,826	20	30	20	30	40	60	30	60
1983	10,680	13,990	20	30	20	30	40	60	30	60
1984	11,942	13,262	20	30	20	30	40	60	30	60
1985	18,039	10,339	20	30	20	30	40	60	30	60
1986	16,389	9,028	20	30	20	30	40	60	30	60
1987	20,950	11,290	20	30	20	30	40	60	30	60
1988	10,019	7,231	20	30	20	30	40	60	30	60
1989	28,091	10,011	20	30	20	30	50	70	40	70
1990	26,646	12,562	20	30	20	30	50	70	40	70
1991	32,423	15,136	20	30	20	30	50	70	40	70
1992	42,965	16,158	20	30	20	30	50	70	40	70
1993	30,197	18,720	20	30	20	30	50	70	40	70
1994	12,016	15,521	20	30	20	30	50	70	40	70
1995	11,801	9,634	20	30	20	30	50	70	40	70
1996	22,799	6,956	20	30	20	30	40	60	30	60
1997	19,481	10,083	20	30	20	30	40	60	30	60
1998	22,460	8,497	20	30	20	30	40	60	30	60
1999	38,687	8,854	20	30	20	30	50	70	40	60
2000	40,654	19,707	20	30	20	30	50	70	40	60
2001	18,372	28,337	20	30	20	30	50	70	40	60
2002	10,757	22,717	20	30	20	30	40	60	40	60
2003	12,699	16,093	20	30	20	30	40	60	40	60
2004	4,912	7,718	20	30	20	30	40	60	40	60
2005	12,499	5,969	20	30	20	30	40	60	40	60
2006	23,727	10,473	20	30	20	30	40	60	40	60
2007	4,407	14,878	20	30	20	30	40	60	40	60
2008	4,539	14,165	20	30	20	30	40	60	40	60
2009	9,260	6,600	20	30	20	30	40	60	40	60
2010	8627	10434	20	30	20	30	40	60	40	60

M(min)=	0.020	Return time (m)=	1SW(min)	7	MSW(min)	16
M(max)=	0.040		1SW(max)	9	MSW(max)	18

Annex 5.ii. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – France.

Year	Catch (numbers)		Unrep. as % of total 1SW		Unrep. as % of total MSW		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
	Non-reporting included in exploitation rates until 2002									
1971	1,740	4,060	0	0	0	0	2	5	25	50
1972	3,480	8,120	0	0	0	0	2	5	25	50
1973	2,130	4,970	0	0	0	0	2	5	25	50
1974	990	2,310	0	0	0	0	2	5	25	50
1975	1,980	4,620	0	0	0	0	2	5	25	50
1976	1,820	3,380	0	0	0	0	2	5	25	50
1977	1,400	2,600	0	0	0	0	2	5	25	50
1978	1,435	2,665	0	0	0	0	2	5	25	50
1979	1,645	3,055	0	0	0	0	2	5	25	50
1980	3,430	6,370	0	0	0	0	2	5	25	50
1981	2,720	4,080	0	0	0	0	2	5	20	50
1982	1,680	2,520	0	0	0	0	2	5	20	50
1983	1,800	2,700	0	0	0	0	2	5	20	50
1984	2,960	4,440	0	0	0	0	2	5	20	50
1985	1,100	3,330	0	0	0	0	2	5	20	50
1986	3,400	3,400	0	0	0	0	2	12	20	50
1987	6,013	1,806	0	0	0	0	2	12	20	50
1988	2,063	4,964	0	0	0	0	2	12	20	50
1989	1,124	2,282	0	0	0	0	2	12	20	50
1990	1,886	2,332	0	0	0	0	2	12	20	50
1991	1,362	2,125	0	0	0	0	2	12	20	50
1992	2,490	2,671	0	0	0	0	2	12	20	50
1993	3,581	1,254	0	0	0	0	2	12	20	50
1994	2,810	2,290	0	0	0	0	2	12	20	40
1995	1,669	1,095	0	0	0	0	5	20	20	40
1996	2,063	1,943	0	0	0	0	5	20	20	40
1997	1,060	1,001	0	0	0	0	5	20	20	40
1998	2,065	846	0	0	0	0	5	20	20	40
1999	690	1,831	0	0	0	0	5	20	20	40
2000	1,792	1,277	0	0	0	0	5	20	20	40
2001	1,544	1,489	0	0	0	0	5	20	20	40
2002	2,423	1,065	20	40	15	30	10	30	20	55
2003	1,598	1,540	20	40	15	30	10	30	20	55
2004	1,927	2,880	20	40	15	30	10	30	20	55
2005	1,256	1,771	20	40	15	30	10	30	20	55
2006	1,763	1,785	20	40	15	30	10	30	20	55
2007	1,378	1,685	20	40	15	30	10	30	20	55
2008	1,365	1,865	20	40	15	30	10	30	20	55
2009	487	975	20	40	15	30	10	30	20	55
2010	1,658	821	20	40	15	30	10	30	20	55

M(min)=	0.020	Return time (m)=	1SW(min)	7	MSW(min)	16
M(max)=	0.040		1SW(max)	9	MSW(max)	18

Annex 5.iii. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – Iceland (West & South).

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	30,618	16,749	1	3	1	3	40	60	60	80
1972	24,832	25,733	1	3	1	3	40	60	60	80
1973	26,624	23,183	1	3	1	3	40	60	60	80
1974	18,975	20,017	1	3	1	3	40	60	60	80
1975	29,428	21,266	1	3	1	3	40	60	60	80
1976	23,233	18,379	1	3	1	3	40	60	60	80
1977	23,802	17,919	1	3	1	3	40	60	60	80
1978	31,199	23,182	1	3	1	3	40	60	60	80
1979	28,790	14,840	1	3	1	3	40	60	60	80
1980	13,073	20,855	1	3	1	3	40	60	60	80
1981	16,890	13,919	1	3	1	3	40	60	60	80
1982	17,331	9,826	1	3	1	3	40	60	60	80
1983	21,923	16,423	1	3	1	3	40	60	60	80
1984	13,476	13,923	1	3	1	3	40	60	60	80
1985	21,822	10,097	1	3	1	3	40	60	60	80
1986	35,891	8,423	1	3	1	3	40	60	60	80
1987	22,302	7,480	1	3	1	3	40	60	60	80
1988	40,028	8,523	1	3	1	3	40	60	60	80
1989	22,377	7,607	1	3	1	3	40	60	60	80
1990	20,584	7,548	1	3	1	3	40	60	60	80
1991	22,711	7,519	1	3	1	3	40	60	60	80
1992	26,006	8,479	1	3	1	3	40	60	60	80
1993	25,479	4,155	1	3	1	3	40	60	60	80
1994	20,985	6,736	1	3	1	3	40	60	60	80
1995	25,371	6,777	10	15	10	15	40	60	60	80
1996	21,913	4,364	10	15	10	15	40	60	60	80
1997	16,007	4,910	10	15	10	15	40	60	60	80
1998	21,900	3,037	10	15	10	15	40	60	60	80
1999	17,448	5,757	10	15	10	15	39	59	58	78
2000	15,502	1,519	10	15	10	15	39	59	56	76
2001	13,586	2,707	10	15	10	15	38	58	57	77
2002	16,952	2,845	10	15	10	15	38	58	55	75
2003	20,271	4,751	10	15	10	15	38	58	58	78
2004	20,319	3,784	10	15	10	15	38	58	57	77
2005	29,969	3,241	10	15	10	15	38	58	55	75
2006	21,153	2,689	10	15	10	15	38	58	55	75
2007	23,728	1,679	10	15	10	15	38	56	56	76
2008	28,774	1,659	10	15	10	15	37	57	47	67
2009	33,190	2,838	10	15	10	15	38	58	56	74
2010	29937	3476	10	15	10	15	37	57	52	72

M(min)=	0.020	Return time (m)=	1SW(min)	7	MSW(min)	16
M(max)=	0.040		1SW(max)	9	MSW(max)	18

Annex 5.iv. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation - Iceland (North & East).

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	4,610	6,625	1	3	1	3	40	60	60	80
1972	4,223	10,337	1	3	1	3	40	60	60	80
1973	5,060	9,672	1	3	1	3	40	60	60	80
1974	5,047	9,176	1	3	1	3	40	60	60	80
1975	6,152	10,136	1	3	1	3	40	60	60	80
1976	6,184	8,350	1	3	1	3	40	60	60	80
1977	8,597	11,631	1	3	1	3	40	60	60	80
1978	8,739	14,998	1	3	1	3	40	60	60	80
1979	8,363	9,897	1	3	1	3	40	60	60	80
1980	1,268	13,784	1	3	1	3	40	60	60	80
1981	6,528	4,827	1	3	1	3	40	60	60	80
1982	3,007	5,539	1	3	1	3	40	60	60	80
1983	4,437	4,224	1	3	1	3	40	60	60	80
1984	1,611	5,447	1	3	1	3	40	60	60	80
1985	11,116	3,511	1	3	1	3	40	60	60	80
1986	13,827	9,569	1	3	1	3	40	60	60	80
1987	8,145	9,908	1	3	1	3	40	60	60	80
1988	11,775	6,381	1	3	1	3	40	60	60	80
1989	6,342	5,414	1	3	1	3	40	60	60	80
1990	4,752	5,709	1	3	1	3	40	60	60	80
1991	6,900	3,965	1	3	1	3	40	60	60	80
1992	12,996	5,903	1	3	1	3	40	60	60	80
1993	10,689	6,672	1	3	1	3	40	60	60	80
1994	3,414	5,656	1	3	1	3	40	60	60	80
1995	8,776	3,511	10	15	10	15	40	60	60	80
1996	4,681	4,605	10	15	10	15	40	60	60	80
1997	6,406	2,594	10	15	10	15	40	60	60	80
1998	10,905	3,780	10	15	10	15	40	60	60	80
1999	5,326	4,030	10	15	10	15	38	58	55	75
2000	5,595	2,324	10	15	10	15	38	58	54	74
2001	4,976	2,587	10	15	10	15	37	57	52	72
2002	8,437	2,366	10	15	10	15	36	56	50	70
2003	4,478	2,194	10	15	10	15	36	56	43	63
2004	11,823	2,239	10	15	10	15	35	55	45	65
2005	10,297	2,726	10	15	10	15	34	54	44	64
2006	11,082	2,179	10	15	10	15	35	55	35	55
2007	8,046	1,672	10	15	10	15	34	54	26	46
2008	7,021	2,693	10	15	10	15	32	52	35	55
2009	10,779	1,735	10	15	10	15	30	50	26	46
2010	8621	2602	10	15	10	15	29	49	29	39

M(min)=	0.020	Return time (m)=	1SW(min)	7	MSW(min)	16
M(max)=	0.040		1SW(max)	9	MSW(max)	18

Annex 5.v. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – Ireland.

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	409,965	46,594	30	45	30	45	50.00	75.00	35.00	60.00
1972	437,089	49,863	30	45	30	45	50.00	75.00	35.00	60.00
1973	476,131	54,008	30	45	30	45	50.00	75.00	35.00	60.00
1974	542,124	60,976	30	45	30	45	50.00	75.00	35.00	60.00
1975	598,524	68,260	30	45	30	45	50.00	75.00	35.00	60.00
1976	407,018	47,358	30	45	30	45	50.00	75.00	35.00	60.00
1977	351,745	41,256	30	45	30	45	50.00	75.00	35.00	60.00
1978	307,569	35,708	30	45	30	45	50.00	75.00	35.00	60.00
1979	282,700	32,144	30	45	30	45	50.00	75.00	35.00	60.00
1980	215,116	35,447	30	45	30	45	50.00	75.00	35.00	60.00
1981	137,366	26,101	30	45	30	45	64.38	87.10	35.00	60.00
1982	269,847	11,754	30	45	30	45	61.08	82.64	28.34	44.99
1983	437,751	26,479	30	45	30	45	56.14	75.96	10.34	45.41
1984	224,872	20,685	30	45	30	45	54.91	74.28	37.02	50.00
1985	430,315	18,830	30	45	30	45	63.39	85.76	32.75	39.45
1986	443,701	27,111	30	45	30	45	58.40	79.01	36.95	55.00
1987	324,709	26,301	20	40	20	40	59.34	80.28	27.50	36.86
1988	391,475	22,067	20	40	20	40	52.73	71.34	31.85	43.00
1989	297,797	25,447	20	40	20	40	55.85	75.56	38.35	56.00
1990	172,098	15,549	20	40	20	40	51.62	69.84	53.85	66.00
1991	120,408	10,334	20	40	20	40	50.55	68.39	23.00	30.00
1992	182,255	15,456	20	40	20	40	52.75	71.36	47.66	55.26
1993	150,274	13,156	15	35	15	35	49.85	67.44	24.00	60.00
1994	234,126	20,506	15	35	15	35	60.70	82.12	38.06	43.00
1995	232,480	20,454	15	35	15	35	53.94	72.98	40.65	43.00
1996	203,920	18,021	15	35	15	35	50.90	68.87	51.93	58.28
1997	170,774	14,724	15	35	10	20	42.59	57.62	18.51	43.00
1998	191,868	17,269	15	35	10	20	45.66	61.78	60.47	63.25
1999	158,818	14,801	15	35	10	20	40.60	54.92	16.00	52.29
2000	199,827	16,848	15	35	10	20	36.75	49.72	26.51	35.48
2001	218,715	18,436	5	10	5	10	40.80	55.20	27	43.00
2002	198,719	16,702	5	10	5	10	42.41	57.37	20	35.00
2003	161,270	13,745	5	10	5	10	35.13	47.52	16	27.00
2004	142251	12299	5	10	5	10	42	57	27	43
2005	127371	10716	5	10	5	10	38	51	20	27
2006	101938	9740	5	10	5	10	40	53	16	43
2007	30,418	2,477	5	10	5	10	7	24	15	33
2008	30257	3935	5	10	5	10	7	24	15	33
2009	24184	4756	5	10	5	10	7	24	15	33
2010	33989	3518	5	10	5	10	7	24	15	33

M(min)= 0.020   Return time (m)=   1SW(min) 7   MSW(min) 16
M(max)= 0.040   1SW(max) 9   MSW(max) 18

Annex 5.v. (cont). Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – Ireland. Net catch and spawner numbers 2007 to 2010.

Net Catch		Catch & release		Spawners Small rivers		Spawners Closed rivers	
1SW	MSW	1SW	MSW	1SW	MSW	1SW	MSW
8,334	679	12,137	988	9,548	777	40,255	3,278
8,253	650	10,485	1,492	12,206	961	34,382	4,580
6,264	493	9,799	1,623			46,570	4,964
13,125	1,034	13,903	1,255			35,804	1,504

Annex 5.vi. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – Norway – Southeast.

Year	Catch		Unrep. as		Unrep. as		Exp. rate		Exp. rate	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0
1983	9,039	9,004	40	60	40	60	60	80	55	75
1984	11,402	11,527	40	60	40	60	60	80	55	75
1985	18,699	11,883	40	60	40	60	60	80	55	75
1986	23,089	12,077	40	60	40	60	60	80	55	75
1987	19,601	14,179	40	60	40	60	60	80	55	75
1988	17,520	9,443	40	60	40	60	60	80	55	75
1989	23,965	12,254	40	60	40	60	55	75	50	70
1990	25,792	11,502	40	60	40	60	55	75	50	70
1991	21,064	10,753	40	60	40	60	55	75	50	70
1992	26,044	15,332	40	60	40	60	55	75	50	70
1993	23,070	12,596	30	50	30	50	55	75	50	70
1994	23,987	9,988	30	50	30	50	55	75	50	70
1995	21,847	11,630	30	50	30	50	55	75	50	70
1996	20,738	13,538	30	50	30	50	55	75	50	70
1997	21,121	7,756	25	45	25	45	50	70	50	70
1998	32,586	10,396	25	45	25	45	50	70	50	70
1999	23,904	6,664	25	45	25	45	50	70	50	70
2000	43,151	14,261	25	45	25	45	50	70	50	70
2001	47,339	19,210	25	45	25	45	50	70	50	70
2002	33,087	14,400	25	45	25	45	50	70	50	70
2003	33,371	20,648	20	40	20	40	50	70	50	70
2004	28,506	15,948	20	40	20	40	50	70	50	70
2005	40,628	14,628	20	40	20	40	50	70	50	70
2006	30,979	21,192	20	40	20	40	50	70	50	70
2007	15,735	18,130	20	40	20	40	50	70	50	70
2008	15,696	16,678	20	40	20	40	45	65	40	60
2009	15,584	11,995	20	40	20	40	45	65	40	60
2010	22,139	12,175	20	40	20	40	40	60	30	50

M(min)= 0.020 Return time (m)= 1SW(min) 7 MSW(min) 16
M(max)= 0.040 1SW(max) 9 MSW(max) 18

Annex 5.vii. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – Norway – Southwest.

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0
1983	31,845	28,601	40	60	40	60	70	90	70	90
1984	23,428	27,641	40	60	40	60	70	90	70	90
1985	29,857	25,515	40	60	40	60	70	90	70	90
1986	29,894	30,769	40	60	40	60	70	90	70	90
1987	30,005	26,623	40	60	40	60	70	90	70	90
1988	36,976	28,255	40	60	40	60	70	90	70	90
1989	19,183	13,041	40	60	40	60	60	80	55	75
1990	18,490	14,423	40	60	40	60	60	80	55	75
1991	9,759	8,323	40	60	40	60	60	80	55	75
1992	6,448	8,832	40	60	40	60	60	80	55	75
1993	11,433	10,239	30	50	30	50	60	80	55	75
1994	18,597	10,961	30	50	30	50	60	80	55	75
1995	10,863	13,122	30	50	30	50	60	80	55	75
1996	7,048	12,546	30	50	30	50	60	80	55	75
1997	10,279	7,194	25	45	25	45	50	70	50	70
1998	5,726	6,583	25	45	25	45	50	70	50	70
1999	7,357	3,219	25	45	25	45	50	70	50	70
2000	11,538	7,961	25	45	25	45	50	70	50	70
2001	12,109	10,716	25	45	25	45	50	70	50	70
2002	6,000	7,145	25	45	25	45	50	70	50	70
2003	8,269	7,602	20	40	20	40	50	70	50	70
2004	7,180	6,420	20	40	20	40	50	70	50	70
2005	10,370	7,334	20	40	20	40	50	70	50	70
2006	5,173	9,381	20	40	20	40	50	70	50	70
2007	2,630	6,011	20	40	20	40	50	70	50	70
2008	3,143	4,807	20	40	20	40	45	65	40	60
2009	3,069	3,792	20	40	20	40	45	65	40	60
2010	3,450	2,447	20	40	20	40	40	60	25	45

M(min)=	0.020	Return time (m)=	1SW(min)	7	MSW(min)	16
M(max)=	0.040		1SW(max)	9	MSW(max)	18

Annex 5.viii. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – Norway – Mid.

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0
1983	121,221	74,648	40	60	40	60	65	85	65	85
1984	94,373	67,639	40	60	40	60	65	85	65	85
1985	114,613	56,641	40	60	40	60	65	85	65	85
1986	106,921	77,225	40	60	40	60	65	85	65	85
1987	83,669	62,216	40	60	40	60	65	85	65	85
1988	80,111	45,609	40	60	40	60	65	85	65	85
1989	94,897	30,862	40	60	40	60	55	75	55	75
1990	78,888	40,174	40	60	40	60	55	75	55	75
1991	67,370	30,087	40	60	40	60	55	75	55	75
1992	51,463	33,092	40	60	40	60	55	75	55	75
1993	58,326	28,184	30	50	30	50	55	75	55	75
1994	113,427	33,520	30	50	30	50	55	75	55	75
1995	57,813	42,696	30	50	30	50	55	75	55	75
1996	28,925	31,613	30	50	30	50	55	75	55	75
1997	43,127	20,565	25	45	25	45	50	70	50	70
1998	63,497	26,817	25	45	25	45	50	70	50	70
1999	60,689	28,792	25	45	25	45	50	70	50	70
2000	109,278	42,452	25	45	25	45	50	70	50	70
2001	88,096	52,031	25	45	25	45	50	70	50	70
2002	42,669	52,774	25	45	25	45	50	70	50	70
2003	91,118	46,963	20	40	20	40	50	70	50	70
2004	38,286	49,760	20	40	20	40	50	70	50	70
2005	63,749	37,941	20	40	20	40	50	70	50	70
2006	46,495	47,691	20	40	20	40	50	70	50	70
2007	26,608	33,106	20	40	20	40	50	70	50	70
2008	31,936	34,869	20	40	20	40	45	65	35	55
2009	26,267	30,715	20	40	20	40	45	65	35	55
2010	37,557	30,524	20	40	20	40	40	60	35	55

M(min)=	0.020	Return time (m)=	1SW(min)	7	MSW(min)	16
M(max)=	0.040		1SW(max)	9	MSW(max)	18

Annex 5.ix. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – Norway – North.

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0
1983	104,040	49,413	40	60	40	60	70	90	70	90
1984	150,372	58,858	40	60	40	60	70	90	70	90
1985	118,841	58,956	40	60	40	60	70	90	70	90
1986	84,150	63,418	40	60	40	60	70	90	70	90
1987	72,370	34,232	40	60	40	60	70	90	70	90
1988	53,880	32,140	40	60	40	60	70	90	70	90
1989	42,010	13,934	40	60	40	60	60	80	60	80
1990	38,216	17,321	40	60	40	60	60	80	60	80
1991	42,888	21,789	40	60	40	60	60	80	60	80
1992	34,593	19,265	40	60	40	60	60	80	60	80
1993	51,440	39,014	30	50	30	50	60	80	60	80
1994	37,489	33,411	30	50	30	50	60	80	60	80
1995	36,283	26,037	30	50	30	50	60	80	60	80
1996	40,792	36,636	30	50	30	50	60	80	60	80
1997	39,930	30,115	25	45	25	45	60	80	60	80
1998	46,645	34,806	25	45	25	45	60	80	60	80
1999	46,394	46,744	25	45	25	45	60	80	60	80
2000	61,854	51,569	25	45	25	45	60	80	60	80
2001	46,331	54,023	25	45	25	45	60	80	60	80
2002	38,101	43,100	25	45	25	45	60	80	60	80
2003	44,947	35,972	20	40	20	40	60	80	60	80
2004	34,640	28,077	20	40	20	40	60	80	60	80
2005	45,530	33,334	20	40	20	40	60	80	60	80
2006	48,688	39,508	20	40	20	40	60	80	60	80
2007	28,748	44,550	20	40	20	40	60	80	60	80
2008	34,338	40,553	20	40	20	40	55	75	55	75
2009	22,511	28,241	20	40	20	40	55	75	55	75
2010	29,836	28,611	20	40	20	40	55	75	45	65

M(min)=	0.02	Return time (m)=	1SW(min)	7	MSW(min)	16
M(max)=	0.04		1SW(max)	9	MSW(max)	18

Annex 5.x. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – Russia – Archangelsk & Karelia.

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	134	16,592	5	15	5	15	40	80	40	80
1972	116	14,434	5	15	5	15	40	80	40	80
1973	169	20,924	5	15	5	15	40	80	40	80
1974	170	21,137	5	15	5	15	40	80	40	80
1975	140	17,398	5	15	5	15	40	80	40	80
1976	111	13,781	5	15	5	15	40	80	40	80
1977	78	9,722	5	15	5	15	40	80	40	80
1978	82	10,134	5	15	5	15	40	80	40	80
1979	112	13,903	5	15	5	15	40	80	40	80
1980	156	19,397	5	15	5	15	40	80	40	80
1981	68	8,394	5	15	5	15	40	80	40	80
1982	71	8,797	5	15	5	15	40	80	40	80
1983	48	11,938	5	15	5	15	40	80	40	80
1984	21	10,680	5	15	5	15	40	80	40	80
1985	454	11,183	5	15	5	15	40	80	40	80
1986	12	12,291	5	15	5	15	40	80	40	80
1987	647	8,734	5	15	5	15	40	80	40	80
1988	224	9,978	5	15	5	15	40	80	40	80
1989	989	10,245	5	15	5	15	40	80	40	80
1990	1,418	8,429	10	20	10	20	40	80	40	80
1991	421	8,725	15	25	15	25	40	80	40	80
1992	1,031	3,949	20	30	20	30	40	80	40	80
1993	196	4,251	25	35	25	35	40	80	40	80
1994	334	5,631	30	40	30	40	40	80	40	80
1995	386	5,214	40	50	40	50	40	80	40	80
1996	231	3,753	50	60	50	60	40	80	40	80
1997	721	3,351	50	60	50	60	40	80	40	80
1998	585	4,208	50	60	50	60	40	80	40	80
1999	299	3,101	50	60	50	60	40	80	40	80
2000	514	3,382	50	60	50	60	40	80	40	80
2001	363	2,348	50	60	50	60	40	80	40	80
2002	1,676	2,439	50	60	50	60	40	80	40	80
2003	893	2,041	50	60	50	60	40	80	40	80
2004	990	3,761	50	60	50	60	40	80	40	80
2005	1,349	4,915	50	60	50	60	40	80	40	80
2006	2,183	2,841	50	60	50	60	40	80	40	80
2007	1,618	2,621	50	60	50	60	40	80	40	80
2008	332	2,496	50	60	50	60	40	80	40	80
2009	252	2,214	50	60	50	60	40	80	40	80
2010	397	3,823	50	60	50	60	40	80	40	80

M(min)=	0.02	Return time (m)	1SW(min)	7	MSW(min)	19
M(max)=	0.04		1SW(max)	8	MSW(max)	21

Annex 5.xi. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – Russia – Kola Peninsula: Barents Sea Basin.

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	4892	5979	10	20	10	20	40	50	40	50
1972	7978	9750	10	20	10	20	40	50	40	50
1973	9376	11460	10	20	10	20	35	45	35	45
1974	12794	15638	10	20	10	20	35	45	35	45
1975	13872	13872	10	20	10	20	40	50	40	50
1976	11493	14048	10	20	10	20	50	60	50	60
1977	7257	8253	10	20	10	20	45	55	45	55
1978	7106	7113	10	20	10	20	50	60	50	60
1979	6707	3141	10	20	10	20	35	45	35	45
1980	6621	5216	10	20	10	20	35	45	35	45
1981	4547	5973	10	20	10	20	35	45	35	45
1982	5159	4798	10	20	10	20	30	40	30	40
1983	8,504	9,943	10	20	10	20	30	40	30	40
1984	9,453	12,601	10	20	10	20	30	40	30	40
1985	6,774	7,877	10	20	10	20	30	40	30	40
1986	10,147	5,352	10	20	10	20	35	45	35	45
1987	8,560	5,149	10	20	10	20	35	45	35	45
1988	6,644	3,655	10	20	10	20	30	40	30	40
1989	13,424	6,787	10	20	10	20	35	45	35	45
1990	16,038	8,234	10	20	10	20	35	45	35	45
1991	4,550	7,568	10	20	10	20	25	35	25	35
1992	11,394	7,109	10	20	10	20	25	35	25	35
1993	8,642	5,690	10	20	10	20	25	35	25	35
1994	6,101	4,632	10	20	10	20	25	35	25	35
1995	6,318	3,693	10	20	10	20	25	35	25	35
1996	6,815	1,701	15	25	15	25	20	30	20	30
1997	3,564	867	20	30	20	30	10	20	10	20
1998	1,854	280	30	40	30	40	10	15	10	15
1999	1,510	424	35	45	35	45	5	10	5	10
2000	805	323	45	55	45	55	4	8	4	8
2001	591	241	55	65	55	65	2	5	2	5
2002	1,436	2,478	40	60	40	60	5	15	15	25
2003	1,938	1,095	40	60	40	60	5	15	15	25
2004	1,095	850	40	60	40	60	5	15	15	25
2005	859	426	50	70	50	70	5	15	15	25
2006	1,372	844	50	70	50	70	5	15	15	25
2007	784	707	50	70	50	70	5	15	15	25
2008	1,446	997	50	70	50	70	10	20	15	25
2009	2,882	1,080	50	70	50	70	10	20	15	25
2010	3,884	1,486	50	70	50	70	10	20	15	25

M(min)=	0.020	Return time (m)	1SW(min)	6	MSW(min)	17
M(max)=	0.040		1SW(max)	8	MSW(max)	20

Annex 5.xii. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – Russia - Kola Peninsula: White Sea Basin.

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)		Catch (numbers) Previous year	
	1SW	MSW	min	max	min	max	min	max	min	max	1SW	MSW
1971	67845	29077	1	5	1	5	40	60	50	70		
1972	45837	19644	1	5	1	5	40	60	50	70		
1973	68684	29436	1	5	1	5	40	60	50	70		
1974	63892	27382	1	5	1	5	40	60	50	70		
1975	109038	46730	1	5	1	5	40	60	50	70		
1976	76281	41075	1	5	1	5	40	60	50	70		
1977	47943	32392	1	5	1	5	40	60	50	70		
1978	49291	17307	1	5	1	5	40	60	50	70		
1979	69511	21369	1	5	1	5	40	60	50	70		
1980	46037	23241	1	5	1	5	40	60	50	70		
1981	40172	12747	1	5	1	5	40	60	50	70		
1982	32619	14840	1	5	1	5	40	60	50	70		
1983	54,217	20,840	1	5	1	5	40	60	50	70		
1984	56,786	16,893	1	5	1	5	40	60	50	70		
1985	87,274	16,876	1	5	1	5	40	60	50	70		
1986	72,102	17,681	1	5	1	5	40	60	50	70		
1987	79,639	12,501	1	5	1	5	40	60	40	60		
1988	44,813	18,777	1	5	1	5	40	50	40	50		
1989	53,293	11,448	5	10	5	10	40	50	40	50		
1990	44,409	11,152	10	15	10	15	40	50	40	50		
1991	31,978	6,263	15	20	15	20	30	40	30	40		
1992	23,827	3,680	20	25	20	25	20	30	20	30		
1993	20,987	5,552	20	30	20	30	20	30	20	30		
1994	25,178	3,680	25	35	25	35	20	30	10	20		
1995	19,381	2,847	30	40	30	40	20	30	10	20		
1996	27,097	2,710	30	40	30	40	20	30	10	20		
1997	27,695	2,085	30	40	30	40	20	30	10	20		
1998	32,693	1,963	30	40	30	40	20	30	10	20		
1999	22,330	2,841	30	40	30	40	20	30	10	20		
2000	26,376	4,396	30	40	30	40	20	30	10	20		
2001	20,483	3,959	30	40	30	40	10	20	10	20		
2002	19,174	3,937	30	40	30	40	10	20	10	20		
2003	15,687	3,734	30	40	20	30	10	20	10	20		
2004	10,947	1,990	30	40	30	40	10	20	10	20		
2005	13,172	2,388	30	40	30	40	10	20	10	20	1,212	878
2006	15,004	2,071	30	40	30	40	10	20	10	20	3,852	399
2007	7,807	1,404	30	40	30	40	10	20	10	20	2,264	852
2008	8,447	4,711	30	40	30	40	10	20	10	20	3,175	832
2009	5,351	3,105	30	40	30	40	10	20	10	20	5,130	1,710
2010	6,731	4,158	30	40	30	40	10	20	10	20	3,684	1,228

M(min)=	0.020	Return time (m)	1SW(min)	7	MSW(min)	18
M(max)=	0.040		1SW(max)	10	MSW(max)	21

Annex 5.xiii. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation - Russia – Pechora River.

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	605	17,728	10	30	10	30	50	80	50	80
1972	825	24,175	10	30	10	30	50	80	50	80
1973	1,705	49,962	10	30	10	30	50	80	50	80
1974	1,320	38,680	10	30	10	30	50	80	50	80
1975	1,298	38,046	10	30	10	30	50	80	50	80
1976	991	34,394	10	30	10	30	50	80	50	80
1977	589	20,464	10	30	10	30	50	80	50	80
1978	759	26,341	10	30	10	30	50	80	50	80
1979	421	14,614	10	30	10	30	50	80	50	80
1980	1,123	39,001	10	30	10	30	50	80	50	80
1981	126	20,874	10	30	10	30	50	80	50	80
1982	54	13,546	10	30	10	30	50	80	50	80
1983	598	16,002	10	30	10	30	50	80	50	80
1984	1,833	15,967	10	30	10	30	50	80	50	80
1985	2,763	29,738	10	30	10	30	50	80	50	80
1986	66	32,734	10	30	10	30	50	80	50	80
1987	21	21,179	10	30	10	30	50	80	50	80
1988	3,184	12,816	10	30	10	30	50	80	50	80
			Input data for analisis of total adult returns to Home Waters				**Input data for spawner abundance analysis**			
	Estimated numbers of adult returns to fresh water		**Marine Unrep. as % of adult returns to FW 1SW**		**Marine Unrep. as % of adult returns to FW MSW**		**Freshwater Unrep. as % of adult returns to FW 1SW**		**Freshwater Unrep. as % of adult returns to FW MSW**	
	1SW	**MSW**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**
1989	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0
2008	0	0	turn time (	0	1SW(min)	7	MSW(min)	18	0	0
2009	0	0	0	0	1SW(max)	10	MSW(max)	21	0	0
2010	0	0	0	0	0	0	0	0	0	0

M(min)=	0.020	Return time (m)=	1SW(min)	7	MSW(min)	19
M(max)=	0.040		1SW(max)	8	MSW(max)	21

Annex 5.xiv. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – Sweden.

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	6,330	420	15	45	15	45	40	65	45	70
1972	5,005	295	15	45	15	45	40	65	45	70
1973	6,210	1,025	15	45	15	45	40	65	45	70
1974	8,935	660	15	45	15	45	40	65	45	70
1975	9,620	160	15	45	15	45	40	65	45	70
1976	5,420	480	15	45	15	45	40	65	45	70
1977	2,555	360	15	45	15	45	40	65	45	70
1978	2,917	275	15	45	15	45	40	65	45	70
1979	3,080	800	15	45	15	45	40	65	45	70
1980	3,920	1,400	15	45	15	45	40	65	45	70
1981	7,095	407	15	45	15	45	40	65	45	70
1982	6,230	1,460	15	45	15	45	40	65	45	70
1983	8,290	1,005	15	45	15	45	40	65	45	70
1984	11,680	1,410	15	45	15	45	40	65	45	70
1985	13,890	590	15	45	15	45	40	65	45	70
1986	14,635	570	15	45	15	45	40	65	45	70
1987	11,860	1,700	15	45	15	45	40	65	45	70
1988	9,930	1,650	15	45	15	45	40	65	45	70
1989	3,180	4,610	15	45	15	45	40	65	45	70
1990	7,430	3,135	5	25	5	25	30	60	35	65
1991	8,990	3,620	5	25	5	25	30	60	35	65
1992	9,850	4,655	5	25	5	25	30	60	35	65
1993	10,540	6,370	5	25	5	25	30	60	35	65
1994	8,035	4,660	5	25	5	25	30	60	35	65
1995	9,761	2,770	5	25	5	25	25	50	30	55
1996	6,008	3,542	5	25	5	25	25	50	30	55
1997	2,747	2,307	5	25	5	25	25	50	30	55
1998	2,421	1,702	5	25	5	25	25	50	30	55
1999	3,573	1,460	5	25	5	25	25	50	30	55
2000	7,103	3,196	5	25	5	25	25	50	30	55
2001	4,634	3,853	5	25	5	25	25	50	30	55
2002	4,733	2,826	5	25	5	25	25	50	30	55
2003	2,891	3,214	5	25	5	25	25	50	30	55
2004	2,494	2,330	5	25	5	25	25	50	30	55
2005	2,122	1,770	5	25	5	25	25	50	30	55
2006	2,585	1,772	5	25	5	25	25	50	30	55
2007	1,228	2,442	5	25	5	25	25	50	30	55
2008	1,197	2,752	5	20	5	20	15	40	20	45
2009	1,269	2,495	5	20	5	20	15	40	20	45
2010	2,109	3,066	5	20	5	20	15	40	20	45

M(min)= 0.020 Return time (m)= 1SW(min) 7 MSW(min) 16
M(max)= 0.040 1SW(max) 9 MSW(max) 18

Annex 5.xv. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – UK (England & Wales).

Year	Catch		Unrep. as		Unrep. as		Exp. rate		Exp. rate	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	28,915	23,611	29	48	29	48	25	45	38	58
1972	24,613	34,364	29	49	29	49	25	45	38	58
1973	28,989	26,097	29	48	29	48	25	45	38	58
1974	35,431	18,776	29	49	29	49	25	45	37	57
1975	36,465	25,819	29	48	29	48	25	45	38	58
1976	25,422	14,113	28	46	28	46	26	46	38	58
1977	27,836	17,260	29	49	29	49	26	46	39	59
1978	31,397	14,228	29	48	29	48	26	46	39	59
1979	29,030	6,803	29	48	29	48	25	45	38	58
1980	26,997	22,019	29	49	29	49	25	45	38	58
1981	28,414	31,115	29	48	29	48	26	46	38	58
1982	24,139	12,003	29	48	29	48	26	46	38	58
1983	35,903	13,861	28	46	28	46	26	46	39	59
1984	31,923	11,355	27	46	27	46	26	46	39	59
1985	30,759	16,020	29	49	29	49	26	46	39	59
1986	35,695	21,822	28	47	28	47	26	46	39	59
1987	36,339	17,101	29	48	29	48	26	46	39	59
1988	47,989	21,560	30	50	30	50	26	46	39	59
1989	33,610	18,098	28	46	28	46	26	46	39	59
1990	24,152	22,294	28	46	28	46	26	46	39	59
1991	23,018	9,402	28	47	28	47	25	45	38	58
1992	22,787	6,806	30	50	30	50	25	45	38	58
1993	30,526	7,160	28	47	28	47	23	43	35	55
1994	41,662	12,444	18	30	18	30	23	43	35	55
1995	30,148	11,724	17	28	17	28	20	40	32	52
1996	21,848	11,764	15	26	15	26	20	40	31	51
1997	18,690	6,913	14	24	14	24	17	37	28	48
1998	19,466	3,987	14	24	14	24	15	35	25	45
1999	14,603	6,872	13	22	13	22	12	32	16	36
2000	23,116	6,145	11	19	11	19	13	33	12	32
2001	19,119	6,037	11	18	11	18	11	31	10	30
2002	17,676	5,582	11	19	11	19	11	31	10	30
2003	10,459	5,152	13	22	13	22	8	28	7	27
2004	19092	4478	13	22	13	22	9	29	8	28
2005	15200	5067	13	22	13	22	9	29	7	27
2006	13293	3970	13	22	13	22	7	27	6	26
2007	11820	3334	13	22	13	22	6	26	5	25
2008	11252	3751	13	22	13	22	6	26	5	25
2009	7607	2958	9	14	9	14	6	26	5	25
2010	14006	5180	8	13	8	13	6	26	5	25

M(min)=	0.020	Return time (m)=	1SW(min)	7	MSW(min)	17
M(max)=	0.040		1SW(max)	9	MSW(max)	19

Annex 5.xvi. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – UK (N. Ireland) – Foyle Fisheries Area.

Year	Catch (numbers)[1]		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)		Reported net catch	
	1SW	MSW	min	max	min	max	min	max	min	max	1SW	MSW
1971	78,037	5,874	10	33	10	33	75	85	45	55		
1972	64,663	4,867	10	33	10	33	75	85	45	55		
1973	57,469	4,326	10	33	10	33	75	85	45	55		
1974	72,587	5,464	10	33	10	33	75	85	45	55		
1975	51,061	3,843	10	33	10	33	75	85	45	55		
1976	36,206	2,725	10	33	10	33	75	85	45	55		
1977	36,510	2,748	10	33	10	33	75	85	45	55		
1978	44,557	3,354	10	33	10	33	75	85	45	55		
1979	34,413	2,590	10	33	10	33	75	85	45	55		
1980	45,777	3,446	10	33	10	33	75	85	45	55		
1981	32,346	2,435	10	33	10	33	75	85	45	55		
1982	55,946	4,211	10	33	10	33	75	85	45	55		
1983	77,424	5,828	10	33	10	33	75	85	45	55		
1984	27,465	2,067	10	33	10	33	75	85	45	55		
1985	37,685	2,836	10	33	10	33	75	85	45	55		
1986	43,109	3,245	10	33	10	33	75	85	45	55		
1987	17,189	1,294	10	33	10	33	62	76	41	51		
1988	43,974	3,310	10	33	10	33	58	71	32	40		
1989	60,288	4,538	10	37	10	37	80	98	54	66		
1990	39,875	3,001	10	17	10	17	56	68	34	42		
1991	21,709	1,634	10	17	10	17	58	71	39	47		
1992	39,299	2,958	10	23	10	23	50	62	30	36		
1993	35,366	2,662	10	17	10	17	37	45	11	13		
1994	36,144	2,720	10	28	10	28	63	77	36	44		
1995	33,398	2,514	10	17	10	17	60	74	38	46		
1996	28,406	2,138	10	20	10	20	47	67	24	44		
1997	40,886	3,077	5	15	5	15	50	70	24	44		
1998	37,154	2,797	5	15	5	15	20	30	15	30		
1999	21,660	1,630	5	15	5	15	58	68	25	40		
2000	30,385	2,287	5	15	5	15	53	63	25	40		
2001	21,368	1,608	0	10	0	10	45	55	25	35		
2002	9,163	690	0	5	0	5	12.0	18.0	12.0	18.0	37,914	2,854
2003	4,576	344	0	1	0	1	12.0	18.0	12.0	18.0	30,441	2,291
2004	4,570	344	0	1	0	1	12.0	18.0	12.0	18.0	20,730	1,560
2005	7,079	533	0	1	0	1	12.0	18.0	12.0	18.0	23,746	1,787
2006	4,886	368	0	1	0	1	12.0	18.0	12.0	18.0	11,324	852
2007	9,530	608	0	1	0	1	12.0	18.0	12.0	18.0	5,050	322
2008	4,755	304	0	1	0	1	12.0	18.0	12.0	18.0	3,880	292
2009	3,640	405	0	1	0	1	12.0	18.0	12.0	18.0	1,743	194
2010	4,257	473	0	1	0	1	12.0	18.0	12.0	18.0	0	0

M(min)=	0.02	Return time (m)=	1SW(min)	7	MSW(min)	16
M(max)=	0.04		1SW(max)	9	MSW(max)	18

[1] catch numbers are net catches for the period 1971 to 2001 and rod catches 2007 to 2010.

Annex 5.xvii. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation - UK (N. Ireland) – FCB Area.

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)		Reported net catch	
	1SW	MSW	min	max	min	max	min	max	min	max	1SW	MSW
1971	35506	2673	10	33	10	33	75	85	45	55		
1972	34550	2601	10	33	10	33	75	85	45	55		
1973	29229	2200	10	33	10	33	75	85	45	55		
1974	22307	1679	10	33	10	33	75	85	45	55		
1975	26701	2010	10	33	10	33	75	85	45	55		
1976	17886	1346	10	33	10	33	75	85	45	55		
1977	16778	1263	10	33	10	33	75	85	45	55		
1978	24857	1871	10	33	10	33	75	85	45	55		
1979	14323	1078	10	33	10	33	75	85	45	55		
1980	15967	1202	10	33	10	33	75	85	45	55		
1981	15994	1204	10	33	10	33	75	85	45	55		
1982	14068	1059	10	33	10	33	75	85	45	55		
1983	20,845	1,569	10	33	10	33	75	85	45	55		
1984	11,109	836	10	33	10	33	75	85	45	55		
1985	12,369	931	10	33	10	33	75	85	45	55		
1986	13,160	991	10	33	10	33	75	85	45	55		
1987	9,240	695	10	33	10	33	62	76	41	51		
1988	14,320	1,078	10	33	10	33	58	71	32	40		
1989	15,081	1,135	10	37	10	37	80	98	54	66		
1990	9,499	715	10	17	10	17	56	68	34	42		
1991	6,987	526	10	17	10	17	58	71	39	47		
1992	9,346	703	10	23	10	23	50	62	30	36		
1993	7,906	595	10	17	10	17	37	45	11	13		
1994	11,206	843	10	28	10	28	63	77	36	44		
1995	11,637	876	10	17	10	17	60	74	38	46		
1996	10,383	781	10	20	10	20	47	67	24	44		
1997	10,479	789	5	15	5	15	50	70	24	44		
1998	9,375	706	5	15	5	15	20	30	15	30		
1999	9,011	678	5	15	5	15	58	68	25	40		
2000	10,598	798	5	15	5	15	53	63	25	40		
2001	8,104	610	0	10	0	10	45	55	25	35		
2002	2,218	167	0	5	0	5	5.0	22.5	5.0	22.5	3,315	249
2003	1,884	141	0	5	0	5	5.7	18.9	5.7	18.9	2,236	168
2004	3,053	230	0	1	0	1	8.6	28.0	8.6	28.0	2,411	181
2005	1,791	135	0	1	0	1	4.8	18.9	4.8	18.9	3,012	227
2006	1,289	97	0	1	0	1	4.5	20.4	4.5	20.4	2,288	172
2007	2,427	155	0	1	0	1	7.5	14.6	7.5	14.6	2,533	162
2008	2,444	156	0	1	0	1	6.8	21.0	6.8	21.0	1,825	116
2009	1,457	162	0	1	0	1	6.9	12.8	6.9	12.8	1,383	154
2010	1,327	147	0	1	0	1	12.1	17.1	12.1	17.1	1,723	191

M(min)= 0.020 Return time (m)= 1SW(min) 7 MSW(min) 16
M(max)= 0.040 1SW(max) 9 MSW(max) 18

[1] catch numbers are net catches for the period 1971 to 2001 and rod catches 2007 to 2010.

Annex 5.xviii. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – UK (Scotland) – East.

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	216,873	135,527	15	35	15	35	62.8	87.9	39.9	59.9
1972	220,106	183,872	15	35	15	35	64.0	89.6	41.2	61.7
1973	259,773	204,825	15	35	15	35	62.4	87.4	39.9	59.8
1974	245,424	158,951	15	35	15	35	68.3	95.6	45.1	67.6
1975	181,940	180,828	15	35	15	35	67.1	93.9	44.0	66.1
1976	150,069	92,179	15	35	15	35	63.8	89.3	40.5	60.8
1977	154,306	118,645	15	35	15	35	67.9	95.0	44.6	66.9
1978	158,844	139,688	15	35	15	35	63.0	88.2	40.8	61.2
1979	160,791	116,514	15	35	15	35	65.3	91.4	43.1	64.6
1980	101,665	155,646	10	25	10	25	64.0	89.6	41.6	62.4
1981	129,690	156,683	10	25	10	25	63.3	88.6	41.0	61.4
1982	175,355	113,180	10	25	10	25	59.2	82.9	36.2	54.3
1983	170,843	126,104	10	25	10	25	64.2	89.8	39.5	59.3
1984	175,675	90,829	10	25	10	25	58.4	81.8	35.1	52.7
1985	133,073	95,012	10	25	10	25	51.5	72.2	31.1	46.7
1986	180,259	128,613	10	25	10	25	49.6	69.4	30.0	45.1
1987	139,252	88,519	10	25	10	25	53.8	75.3	32.4	48.6
1988	118,580	91,068	10	25	10	25	33.6	47.0	23.4	35.0
1989	142,992	85,348	5	15	5	15	31.3	43.8	22.4	33.5
1990	63,297	73,954	5	15	5	15	33.2	46.5	23.0	34.5
1991	53,835	53,676	5	15	5	15	30.7	42.9	22.0	32.9
1992	79,883	67,968	5	15	5	15	26.8	37.5	20.7	31.0
1993	73,396	60,496	5	15	5	15	29.4	41.2	21.5	32.3
1994	80,405	72,746	5	15	5	15	27.6	38.6	20.9	31.3
1995	72,961	69,047	5	15	5	15	25.8	36.1	20.3	30.5
1996	56,610	50,356	5	15	5	15	24.0	33.6	19.6	29.4
1997	37,448	34,850	5	15	5	15	25.5	35.7	20.1	30.2
1998	44,952	32,231	5	15	5	15	20.2	28.3	18.3	27.5
1999	20,907	27,011	5	15	5	15	20.7	28.9	18.7	28.0
2000	36,871	31,280	5	15	5	15	18.2	25.5	17.8	26.7
2001	36,646	30,470	5	15	5	15	17.0	23.8	17.1	26.1
2002	26,618	21,740	5	15	5	15	16.1	22.5	16.9	25.4
2003	25,871	24,270	5	15	5	15	14.5	20.0	15.0	23.5
2004	31,667	30,773	5	15	5	15	14.5	20.0	15.0	23.5
2005	31,597	23,676	5	15	5	15	14.5	20.0	15.0	23.5
2006	30,739	22,954	5	15	5	15	12.5	18.0	13.0	20.0
2007	26,015	19,444	5	15	5	15	11.0	16.5	11.5	18.5
2008	18,586	20,757	5	15	5	15	8.0	13.5	10.5	17.5
2009	14,863	15,042	5	15	5	15	7.0	12.5	9.5	16.5
2010	29,803	23,914	5	15	5	15	7.0	12.5	9.5	16.6

M(min)=	0.02	Return time (m)=	1SW(min)	7	MSW(min)	17.0
M(max)=	0.04		1SW(max)	8	MSW(max)	18.0

Annex 5.xix. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – UK (Scotland) – West.

Year	Catch (numbers)		Unrep. as % of total		Unrep. as % of total		Exp. rate 1SW (%)		Exp. rate MSW (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
1971	45287	26074	25	45	25	45	31.4	44.0	20.0	29.9
1972	31358	34151	25	45	25	45	32.0	44.8	20.6	30.9
1973	33317	33095	25	45	25	45	31.2	43.7	19.9	29.9
1974	43992	29406	25	45	25	45	34.2	47.8	22.5	33.8
1975	40424	27150	25	45	25	45	33.5	46.9	22.0	33.0
1976	38423	22403	25	45	25	45	31.9	44.7	20.3	30.4
1977	39958	20342	25	45	25	45	33.9	47.5	22.3	33.5
1978	45626	23266	25	45	25	45	31.5	44.1	20.4	30.6
1979	26445	15995	25	45	25	45	32.7	45.7	21.5	32.3
1980	19776	16942	20	35	20	35	32.0	44.8	20.8	31.2
1981	21048	18038	20	35	20	35	31.6	44.3	20.5	30.7
1982	32706	15062	20	35	20	35	29.6	41.5	18.1	27.2
1983	38,774	19,857	20	35	20	35	32.1	44.9	19.8	29.6
1984	37,404	16,384	20	35	20	35	29.2	40.9	17.6	26.3
1985	24,939	19,636	20	35	20	35	25.8	36.1	15.6	23.4
1986	22,579	19,584	20	35	20	35	24.8	34.7	15.0	22.5
1987	25,533	15,475	20	35	20	35	26.9	37.6	16.2	24.3
1988	30,518	21,094	20	35	20	35	16.8	23.5	11.7	17.5
1989	31,949	18,538	15	25	15	25	15.6	21.9	11.2	16.8
1990	17,797	13,970	15	25	15	25	16.6	23.2	11.5	17.2
1991	19,773	11,517	15	25	15	25	15.3	21.5	11.0	16.5
1992	21,793	14,873	15	25	15	25	13.4	18.7	10.3	15.5
1993	21,121	11,230	15	25	15	25	14.7	20.6	10.8	16.2
1994	18,258	12,316	15	25	15	25	13.8	19.3	10.4	15.6
1995	16,843	9,141	15	25	15	25	12.9	18.0	10.2	15.2
1996	9,559	7,472	15	25	15	25	12.0	16.8	9.8	14.7
1997	9,066	5,504	15	25	15	25	12.7	17.8	10.1	15.1
1998	8,369	6,150	15	25	15	25	10.1	14.1	9.2	13.8
1999	4,147	3,587	15	25	15	25	10.3	14.5	9.3	14.0
2000	6,974	5,301	15	25	15	25	9.1	12.7	8.9	13.4
2001	5,603	4,191	15	25	15	25	8.5	11.9	8.5	13.1
2002	4,691	4,548	15	25	15	25	8.0	11.2	8.5	12.7
2003	3,536	3,061	15	25	15	25	4.0	5.5	4.0	6.5
2004	5,836	6,024	15	25	15	25	6.0	8.0	6.0	9.0
2005	7,428	4,913	15	25	15	25	6.0	8.0	6.0	9.0
2006	5,767	4,403	15	25	15	25	6.0	8.0	6.0	9.0
2007	6,178	4,470	15	25	15	25	6.0	8.0	6.0	9.0
2008	4,740	4,853	15	25	15	25	6.0	8.0	6.0	9.0
2009	3,250	3,937	15	25	15	25	5.0	7.0	5.0	8.0
2010	5,365	4,025	15	25	15	25	5.0	7.0	5.0	8.0

M(min)=	0.020	Return time (m)=	1SW(min)	7	MSW(min)	16.0
M(max)=	0.040		1SW(max)	9	MSW(max)	18.0

Annex 5.xx. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – Faroes.

Year n/n+1	Catch (numbers)		Unrep. as % of total 1SW		Unrep. as % of total MSW		Exp. rate 1SW (%)		Exp. rate MSW (%)		Prop'n wild
	1SW	MSW	min	max	min	max	min	max	min	max	
1971	2,620	105,796	5	15	0	0	100	100	100	100	1.00
1972	2,754	111,187	5	15	0	0	100	100	100	100	1.00
1973	3,121	126,012	5	15	0	0	100	100	100	100	1.00
1974	2,186	88,276	5	15	0	0	100	100	100	100	1.00
1975	2,798	112,984	5	15	0	0	100	100	100	100	1.00
1976	1,830	73,900	5	15	0	0	100	100	100	100	1.00
1977	1,291	52,112	5	15	0	0	100	100	100	100	1.00
1978	974	39,309	5	15	0	0	100	100	100	100	1.00
1979	1,736	70,082	5	15	0	0	100	100	100	100	1.00
1980	4,523	182,616	5	15	0	0	100	100	100	100	1.00
1981	7,443	300,542	5	15	0	0	100	100	100	100	0.98
1982	6,859	276,957	5	15	0	0	100	100	100	100	0.98
1983	15,861	215,349	5	15	0	0	100	100	100	100	0.98
1984	5,534	138,227	5	15	0	0	100	100	100	100	0.96
1985	378	158,103	5	15	0	0	100	100	100	100	0.92
1986	1,979	180,934	5	15	0	0	100	100	100	100	0.96
1987	90	166,244	5	15	0	0	100	100	100	100	0.97
1988	8,637	87,629	5	15	0	0	100	100	100	100	0.92
1989	1,788	121,965	5	15	0	0	100	100	100	100	0.82
1990	1,989	140,054	5	15	0	0	100	100	100	100	0.54
1991	943	84,935	5	15	0	0	100	100	100	100	0.54
1992	68	35,700	5	15	0	0	100	100	100	100	0.62
1993	6	30,023	5	15	0	0	100	100	100	100	0.69
1994	15	31,672	5	15	0	0	100	100	100	100	0.72
1995	18	34,662	5	15	0	0	100	100	100	100	0.80
1996	101	28,381	5	15	0	0	100	100	100	100	0.75
1997	0	0	10	20	0	0	100	100	100	100	0.80
1998	339	1,424	10	20	0	0	100	100	100	100	0.80
1999	0	0	10	20	0	0	100	100	100	100	0.80
2000	225	1,765	10	20	0	0	100	100	100	100	0.80
2001	0	0	10	20	0	0	100	100	100	100	0.80
2002	0	0	10	20	0	0	100	100	100	100	0.80
2003	0	0	10	20	0	0	100	100	100	100	0.80
2004	0	0	10	20	0	0	100	100	100	100	0.80
2005	0	0	10	20	0	0	100	100	100	100	0.80
2006	0	0	10	20	0	0	100	100	100	100	0.80
2007	0	0	10	20	0	0	100	100	100	100	0.80
2008	0	0	10	20	0	0	100	100	100	100	0.80
2009	0	0	10	20	0	0	100	100	100	100	0.80
2010	0	0	10	20	0	0	100	100	100	100	0.80

Stock composition	1SW	MSW
France	0.05	0
Finland	0.05	0
Iceland	0	0.006
Ireland	0.1	0.057
Norway	0.3	0.396
Russia	0.1	0.183
Sweden	0.05	0.023
UK(E&W)	0.1	0.023
UK(NI)	0.05	0
UK(Sc)	0.2	0.192
Other		0.122
Total	1	1.002

M(min)= 0.020
M(max)= 0.040

Return time (m)= 1SW(min) 0 MSW(min) 13
1SW(max) 1 MSW(max) 14

Prop'n 1SW returning as grilse = min 0.730
max 0.830

Annex 5.xxi. Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation – West Greenland.

Year	NEAC Catch 1SW	NEAC Catch MSW	European stock composition	MSW
1971	0	565,204	France	0.027
1972	0	396,188	Finland	0.001
1973	0	285,624	Iceland	0.001
1974	0	307,898	Ireland	0.147
1975	0	364,359	Norway	0.027
1976	0	220,313	Russia	0.000
1977	0	232,062	Sweden	0.003
1978	0	140,991	UK(E&W)	0.149
1979	0	208,832	UK(NI)	0.000
1980	0	192,820	UK(Sc)	0.645
1981	0	161,489		
1982	0	131,595	Other	
1983	0	60,500		
1984	0	47,749	Total	1.000
1985	0	152,028		
1986	0	136,238		
1987	0	126,864		
1988	0	158,662		
1989	0	51,666		
1990	0	25,974		
1991	0	62,340		
1992	0	39,219		
1993	0	1,629		
1994	0	1,629		
1995	0	12,674		
1996	0	10,306		
1997	0	4,766		
1998	0	1,701		
1999	0	972		
2000	0	3,594		
2001	0	5,477		
2002	0	2,221		
2003	0	2,338		
2004	0	2,333		
2005	0	1,957		
2006	0	2,807		
2007	0	2,142		
2008	0	1,758		
2009	0	924		
2010	0	3,118		

M(min)=	0.020	1SW(min)	7	MSW(min)	8
M(max)=	0.040	1SW(max)	8	MSW(max)	10

Annex 6: Input data for run-reconstruction of Atlantic salmon in the NAC area used to do the run-reconstruction, and estimates of returns and spawners by size group and age group for North America

Annex 6.i. Input data for the fishery at West Greenland used in the run reconstruction model.

				Genetic samples		Scale discrimination analysis		Proportion 1SW salmon in catch	
Year of the fishery	Reported harvest (t)	Unreported harvest estimate (t)	Mean weight of salmon all age groups (kg)	NAC origin	NEAC origin	Prop. NAC min	Prop. NAC max	NAC	NEAC
1970									
1971	2689	0	3.14			0.28	0.40	0.945	0.964
1972	2113	0	3.44			0.34	0.37	0.945	0.964
1973	2341	0	4.18			0.39	0.59	0.945	0.964
1974	1917	0	3.58			0.39	0.46	0.945	0.964
1975	2030	0	3.12			0.40	0.48	0.945	0.964
1976	1175	0	3.04			0.38	0.48	0.945	0.964
1977	1420	0	*3.21*			0.38	0.57	0.945	0.964
1978	984	0	3.35			0.47	0.57	0.945	0.964
1979	1395	0	3.34			0.48	0.52	0.945	0.964
1980	1194	0	3.22			0.45	0.51	0.945	0.964
1981	1264	0	3.17			0.58	0.61	0.945	0.964
1982	1077	0	3.11			0.60	0.64	0.945	0.964
1983	310	0	3.10			0.38	0.41	0.945	0.964
1984	297	0	3.11			0.47	0.53	0.945	0.964
1985	864	0	2.87			0.46	0.53	0.925	0.950
1986	960	0	3.03			0.48	0.66	0.951	0.975
1987	966	0	3.16			0.54	0.63	0.963	0.980
1988	893	0	3.18			0.38	0.49	0.967	0.981
1989	337	0	2.87			0.52	0.60	0.923	0.955
1990	274	0	2.69			0.70	0.79	0.957	0.963
1991	472	0	2.65			0.61	0.69	0.956	0.934
1992	237	0	2.81			0.50	0.57	0.919	0.975
1993	0	12	2.73			0.50	0.76	0.95	0.96
1994	0	12	2.73			0.50	0.76	0.95	0.96
1995	83	20	2.56			0.65	0.72	0.968	0.973
1996	92	20	2.88			0.71	0.76	0.941	0.961
1997	58	5	2.71			0.75	0.84	0.982	0.993
1998	11	11	2.78			0.73	0.84	0.968	0.994
1999	19	12.5	3.08			0.84	0.97	0.968	1.000
2000	21	10	2.57	344	146			0.974	1.000
2001	43	10	3.00	1	1	0.67	0.71	0.982	0.978
2002	9.8	10	2.90	338	163			0.973	1.000
2003	12.3	10	3.04	1212	567			0.967	0.989
2004	17.2	10	3.18	1192	447			0.970	0.970
2005	17.3	10	3.31	585	182			0.924	0.967
2006	23.0	10	3.24	857	326			0.930	0.988
2007	24.8	10	2.98	917	206			0.965	0.956
2008	28.6	10	3.08	1593	260			0.974	0.988
2009	28.0	10	3.50	1483	138			0.934	0.894
2010	43.1	10	3.42	991	249			0.982	0.975
Winbugs labels	WGHarv[]	WGUnHarv[]	WGMeanWt[]	WGSampleNAC[]	WGSampleNEAC[]	WGPropNACMin[]	WGPropNACMax[]	WGProp1SWNAC[]	WGProp1SWNEAC[]

Annex 6.ii. Input data for sea fisheries on large salmon and small salmon from Newfoundland and Labrador used in the run reconstruction model. FSC Labrador represents harvests from Labrador in aboriginal fisheries for food, social and ceremonial purposes (FSC).

Year of the fishery	Catches of large salmon			Catches of small salmon		
	SFA 1 to 7	SFA 8 to 14A	FSC Labrador	SFA 1 to 7	SFA 8 to 14A	FSC Labrador
1970	0	0	0	0	0	0
1971	199176	0	0	158896	70936	0
1972	144496	42861	0	143232	111141	0
1973	227779	43627	0	188725	176907	0
1974	196726	85714	0	192195	153278	0
1975	215025	72814	0	302348	91935	0
1976	210858	95714	0	221766	118779	0
1977	231393	63449	0	220093	57472	0
1978	155546	37653	0	102403	38180	0
1979	82174	29122	0	186558	62622	0
1980	211896	54307	0	290127	94291	0
1981	211006	38663	0	288902	60668	0
1982	129319	35055	0	222894	77017	0
1983	108430	28215	0	166033	55683	0
1984	87742	15135	0	123774	52813	0
1985	70970	24383	0	178719	79275	0
1986	107561	22036	0	222671	91912	0
1987	146242	19241	0	281762	82401	0
1988	86047	14763	0	198484	74620	0
1989	85319	15577	0	172861	60884	0
1990	59334	11639	0	104788	46053	0
1991	39257	10259	0	89099	42721	0
1992	32341	0	0	24249	0	0
1993	17096	0	0	17074	0	0
1994	15377	0	0	8640	0	0
1995	11176	0	0	7980	0	0
1996	7272	0	0	7849	0	0
1997	6943	0	0	9753	0	0
1998	0	0	2269	0	0	2988
1999	0	0	1084	0	0	2739
2000	0	0	1352	0	0	5323
2001	0	0	1721	0	0	4789
2002	0	0	1389	0	0	5806
2003	0	0	2175	0	0	6477
2004	0	0	3696	0	0	8385
2005	0	0	2817	0	0	10436
2006	0	0	3090	0	0	10377
2007	0	0	2652	0	0	9208
2008	0	0	3909	0	0	9834
2009	0	0	3344	0	0	7988
2010	0	0	3739	0	0	9997
Winbugs labels	Nlg_LBandNF1to7[]	Nlg_NF8to14a[]	Nlg_LBFSC[]	Nsm_LBandNF1to7[]	Nsm_NF8to14a[]	Nsm_LBFSC[]

Annex 6.iii. Input data for sea fisheries on large salmon and small salmon from St-Pierre and Miquelon used in the run reconstruction model.

Year of the fishery	Reported harvest (kg)	Small salmon (number)	Large salmon (number)	All salmon (number)
1970	0	0	0	0
1971	0	0	0	0
1972	0	0	0	0
1973	0	0	0	0
1974	0	0	0	0
1975	0	0	0	0
1976	3000	1331	333	998
1977	0	0	0	0
1978	0	0	0	0
1979	0	0	0	0
1980	0	0	0	0
1981	0	0	0	0
1982	0	0	0	0
1983	3000	1331	333	998
1984	3000	1331	333	998
1985	3000	1331	333	998
1986	2500	1109	277	832
1987	2000	887	222	665
1988	2000	887	222	665
1989	2000	887	222	665
1990	1900	843	211	632
1991	1200	532	133	399
1992	2300	1020	255	765
1993	2900	1287	322	965
1994	3400	1508	377	1131
1995	800	355	89	266
1996	1600	710	177	532
1997	1500	665	166	499
1998	2300	1020	255	765
1999	2322	1030	258	773
2000	2267	1006	251	754
2001	2155	956	239	717
2002	1952	866	217	650
2003	2892	1283	321	962
2004	2784	1235	309	926
2005	3287	1458	365	1094
2006	3555	1577	394	1183
2007	1947	864	216	648
2008	3540	1571	393	1178
2009	3460	1535	384	1151
2010	2780	1233	308	925
Winbugs labels	SPMHarv[]	Nall_StP&M	SPMNLarge[]	SPMNSmall[]

Annex 6.iv. Input data for large salmon for Labrador used in the run reconstruction.

	Commercial harvest			Proportion Labrador origin						Exploitation rate		Prop. 2SW		Returns to Labrador rivers		Angling catches	
Year of	SFA 1	SFA 2	SFA 14B	SFA 1		SFA 2		SFA 14B		All SFAs				Large		Large	
fishery				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Retained	Released
1970	17633	45479	9595	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	562	0
1971	25127	64806	13673	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	486	0
1972	21599	55708	11753	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	424	0
1973	30204	77902	16436	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	1009	0
1974	13866	93036	15863	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	803	0
1975	28601	71168	14752	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	327	0
1976	38555	77796	15189	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	830	0
1977	28158	70158	18664	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	1286	0
1978	30824	48934	11715	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	767	0
1979	21291	27073	3874	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	609	0
1980	28750	87067	9138	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	889	0
1981	36147	68581	7606	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	520	0
1982	24192	53085	5966	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	621	0
1983	19403	33320	7489	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	428	0
1984	11726	25258	6218	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	510	0
1985	13252	16789	3954	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	294	0
1986	19152	34071	5342	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	467	0
1987	18257	49799	11114	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	633	0
1988	12621	32386	4591	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	710	0
1989	16261	26836	4646	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	461	0
1990	7313	17316	2858	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	357	0
1991	1369	7679	4417	0.60	0.80	0.60	0.80	0.60	0.80	0.70	0.90	0.70	0.90	0	0	93	0
1992	9981	19608	2752	0.60	0.80	0.60	0.80	0.60	0.80	0.58	0.83	0.70	0.90	0	0	781	10
1993	3825	9651	3620	0.60	0.80	0.60	0.80	0.60	0.80	0.38	0.62	0.70	0.90	0	0	378	91
1994	3464	11056	857	0.60	0.80	0.60	0.80	0.60	0.80	0.29	0.50	0.70	0.90	0	0	455	347
1995	2150	8714	312	0.60	0.80	0.60	0.80	0.60	0.80	0.14	0.25	0.70	0.90	0	0	408	508
1996	1375	5479	418	0.60	0.80	0.60	0.80	0.60	0.80	0.13	0.23	0.70	0.90	0	0	334	489
1997	1393	5550	263	0.64	0.72	0.88	0.95	0.60	0.80	0.17	0.30	0.70	0.90	0	0	158	566
1998	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.71	7374	19486	231	814
1999	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.71	8827	23328	320	931
2000	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.71	12052	31850	262	1446
2001	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.71	12744	33677	338	1468
2002	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.71	9076	24769	207	978
2003	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.71	6676	21689	222	1326
2004	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.71	10964	23092	259	1519
2005	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.71	11159	30796	291	1290
2006	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.71	12414	29783	227	1133
2007	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.71	11887	31913	235	1222
2008	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.71	14700	37677	200	1461
2009	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.70	18643	60062	218	1299
2010	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.17	0.30	0.60	0.70	7498	20099	200	1020
Winbugs labels	LB_SFA1_Lg_Comm[]	LB_SFA2_Lg_Comm[]	LB_SFA14B_Lg_Comm[]	pLB_SFA1_Lg_L[]	pLB_SFA1_Lg_H[]	pLB_SFA2_Lg_L[]	pLB_SFA2_Lg_H[]	pLB_SFA14B_Lg_L[]	pLB_SFA14B_Lg_H[]	ER_LB_Lg_L[]	ER_LB_Lg_H[]	p2SW_L[]	p2SW_H[]	LB_Lg_L[]	LB_Lg_H[]	LB_Ang_Lg_Ret[]	LB_Ang_Lg_Rel[]

Annex 6.iv. (Continued). Input data for small salmon for Labrador used in the run reconstruction.

Year of fishery	Commercial harvest			Proportion Labrador origin						Exploitation rate		Returns to Labrador rivers		Angling catches all Labrador	
	SFA 1	SFA 2	SFA 14B	SFA 1		SFA 2		SFA 14B		All SFAs		Small		Small	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Retained	Released
1970	14666	29441	8605	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	4013	0
1971	19109	38359	11212	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	3934	0
1972	14303	28711	8392	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	2947	0
1973	3130	6282	1836	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	7492	0
1974	9848	37145	9328	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	2501	0
1975	34937	57560	19294	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	3972	0
1976	17589	47468	13152	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	5726	0
1977	17796	40539	11267	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	4594	0
1978	17095	12535	4026	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	2691	0
1979	9712	28808	7194	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	4118	0
1980	22501	72485	8493	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	3800	0
1981	21596	86426	6658	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	5191	0
1982	18478	53592	7379	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	4104	0
1983	15964	30185	3292	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	4372	0
1984	11474	11695	2421	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	2935	0
1985	15400	24499	7460	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	3101	0
1986	17779	45321	8296	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	3464	0
1987	13714	64351	11389	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	5366	0
1988	19641	56381	7087	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	5523	0
1989	13233	34200	9053	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	4684	0
1990	8736	20699	3592	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	3309	0
1991	1410	20055	5303	0.60	0.80	0.60	0.80	0.60	0.80	0.30	0.50	0	0	2323	0
1992	9588	13336	1325	0.60	0.80	0.60	0.80	0.60	0.80	0.22	0.39	0	0	2738	251
1993	3893	12037	1144	0.60	0.80	0.60	0.80	0.60	0.80	0.13	0.25	0	0	2508	1793
1994	3303	4535	802	0.60	0.80	0.60	0.80	0.60	0.80	0.10	0.19	0	0	2549	3681
1995	3202	4561	217	0.60	0.80	0.60	0.80	0.60	0.80	0.07	0.13	0	0	2493	3302
1996	1676	5308	865	0.60	0.80	0.60	0.80	0.60	0.80	0.04	0.07	0	0	2565	3776
1997	1728	8025	332	0.36	0.42	0.75	0.85	0.60	0.80	0.05	0.08	0	0	2365	2187
1998	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	97408	205197	2131	3758
1999	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	94894	199901	2076	4407
2000	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	117063	246602	2561	7095
2001	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	93660	197301	2049	4640
2002	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	62321	142951	2071	5052
2003	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	48256	122813	2112	4924
2004	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	69808	120244	1808	5968
2005	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	160038	281401	2007	7120
2006	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	132205	294669	1656	5815
2007	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	131895	257360	1762	4641
2008	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	142851	264694	1936	5917
2009	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	38031	140890	1240	3091
2010	0	0	0	1.00	1.00	1.00	1.00	1.00	1.00	0.05	0.08	55949	127622	1375	4081
Winbugs labels	LB_SFA1_Sm_Comm[]	LB_SFA2_Sm_Comm[]	LB_SFA14B_Sm_Comm[]	pLB_SFA1_Sm_L[]	pLB_SFA1_Sm_H[]	pLB_SFA2_Sm_L[]	pLB_SFA2_Sm_H[]	pLB_SFA14B_Sm_L[]	pLB_SFA14B_Sm_H[]	ER_LB_Sm_L[]	ER_LB_Sm_H[]	LB_Sm_L[]	LB_Sm_H[]	LB_Ang_Sm_Ret[]	LB_Ang_Sm_Rel[]

Annex 6.v. Input data for returns of small salmon and large salmon for Salmon Fishing Areas 3 to 8 in Newfoundland used in the run reconstruction.

	Salmon Fishing Area 3				Salmon Fishing Area 4				Salmon Fishing Area 5				Salmon Fishing Area 6				Salmon Fishing Area 7				Salmon Fishing Area 8			
	Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon	
Year	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1970	2613	5227	155	737	16163	32327	957	4559	7420	14840	439	2093	280	560	17	79	67	133	4	19	62	123	4	17
1971	2473	4947	146	698	12610	25220	746	3557	5600	11200	331	1579	183	367	11	52	133	267	8	38	83	167	5	24
1972	1660	3320	98	468	11480	22960	679	3238	6317	12633	374	1782	397	793	23	112	203	407	12	57	93	187	6	26
1973	3960	7920	234	1117	22367	44733	1324	6308	7040	14080	417	1986	833	1667	49	235	437	873	26	123	313	627	19	88
1974	2797	5593	322	645	17910	35820	2065	4131	5457	10913	629	1258	1010	2020	116	233	443	887	51	102	170	340	20	39
1975	3690	7380	520	1041	19810	39620	2794	5587	6627	13253	935	1869	313	627	44	88	133	267	19	38	290	580	41	82
1976	3157	6313	380	760	22277	44553	2683	5365	6327	12653	762	1524	823	1647	99	198	100	200	12	24	267	533	32	64
1977	5100	10200	482	964	27987	55973	2645	5290	15387	30773	1454	2908	1337	2673	126	253	260	520	25	49	270	540	26	51
1978	2527	5053	150	299	29247	58493	1731	3461	9527	19053	564	1128	987	1973	58	117	330	660	20	39	147	293	9	17
1979	6800	13600	390	779	26753	53507	1533	3067	4437	8873	254	509	813	1627	47	93	417	833	24	48	333	667	19	38
1980	5810	11620	261	522	31380	62760	1410	2819	9007	18013	405	809	1067	2133	48	96	340	680	15	31	400	800	18	36
1981	7860	15720	1045	2090	45120	90240	5998	11996	11627	23253	1546	3091	2017	4033	268	536	410	820	55	109	257	513	34	68
1982	8780	17560	212	424	33243	66487	802	1604	8110	16220	196	391	960	1920	23	46	517	1033	12	25	283	567	7	14
1983	5390	10780	247	495	29847	59693	1370	2740	7857	15713	361	721	987	1973	45	91	463	927	21	43	137	273	6	13
1984	3532	7526	55	540	34933	74436	548	5337	9538	20323	150	1457	1101	2346	17	168	339	722	5	52	279	594	4	43
1985	4772	9879	72	683	44408	91931	671	6352	12692	26275	192	1816	1563	3235	24	224	408	845	6	58	375	777	6	54
1986	2826	5898	70	413	34015	70993	840	4977	14835	30963	366	2170	1629	3400	40	238	373	779	9	55	505	1054	12	74
1987	2218	4458	57	318	21485	43175	556	3078	6556	13175	170	939	540	1085	14	77	110	222	3	16	169	340	4	24
1988	6624	13644	159	956	37171	76566	892	5367	15715	32370	377	2269	1618	3333	39	234	483	995	12	70	298	614	7	43
1989	3004	6114	90	461	15409	31367	461	2365	5767	11740	172	885	1001	2038	30	154	269	547	8	41	403	820	12	62
1990	6750	11816	236	920	22244	38934	776	3033	9485	16602	331	1293	1312	2297	46	179	193	337	7	26	338	591	12	46
1991	5650	9281	193	750	21005	34499	718	2788	8793	14443	301	1167	799	1312	27	106	155	254	5	21	47	78	2	6
1992	11418	22836	416	4095	38670	77339	1408	13867	14189	28377	516	5088	1681	3363	61	603	292	585	11	105	0	0	0	0
1993	11793	22699	415	1614	45610	87791	1605	6242	16661	32071	586	2280	2574	4954	91	352	462	890	16	63	422	813	15	58
1994	13082	28738	769	3268	29401	64585	1729	7343	9740	21395	573	2433	539	1183	32	135	64	141	4	16	111	243	7	28
1995	10205	24587	609	2665	31439	75745	1877	8211	11108	26762	663	2901	386	931	23	101	233	560	14	61	185	446	11	48
1996	19519	43650	1439	4273	52515	117438	3870	11497	17384	38875	1281	3806	643	1438	47	141	151	338	11	33	224	500	16	49
1997	11763	21437	1226	3970	24074	43872	2509	8125	6468	11786	674	2183	235	429	25	79	60	110	6	20	60	110	6	20
1998	19617	27571	1956	6992	52347	73573	5219	18658	11863	16673	1183	4228	538	756	54	192	249	350	25	89	161	227	16	58
1999	13981	20350	1286	4196	62141	90450	5717	18651	10474	15245	964	3143	405	589	37	122	69	100	6	21	151	220	14	45
2000	19313	26033	1466	3728	37551	50618	2850	7248	12414	16734	942	2396	1128	1520	86	218	159	214	12	31	106	143	8	20
2001	11754	15383	907	2104	39901	52218	3080	7143	10007	13095	773	1791	296	387	23	53	53	69	4	9	20	26	2	4
2002	10500	15736	684	2006	34310	51418	2234	6556	3870	5799	252	739	241	361	16	46	0	0	0	0	72	108	5	14
2003	21615	26166	1092	3485	74615	90328	3768	12032	6583	7970	332	1062	458	555	23	74	104	126	5	17	52	63	3	8
2004	7992	12452	396	1686	49598	77280	2455	10464	8385	13065	415	1769	180	281	9	38	0	0	0	0	41	64	2	9
2005	6421	18899	487	2678	36753	108180	2790	15329	5309	15627	403	2214	114	336	9	48	0	0	0	0	26	76	2	11
2006	10757	17194	1251	3239	42745	68322	4971	12872	8571	13700	997	2581	69	110	8	21	0	0	0	0	172	275	20	52
2007	10422	21117	1182	3828	36934	74834	4188	13567	8734	17696	990	3208	78	157	9	28	129	262	15	47	17	35	2	6
2008	13901	23285	1062	3396	63476	106328	4851	15508	11459	19195	876	2800	330	552	25	81	84	141	6	21	196	329	15	48
2009	13313	24903	787	5088	59555	111403	3518	22760	10610	19847	627	4055	485	908	29	185	0	0	0	0	135	252	8	52
2010	14872	26625	1039	1738	57049	102132	3986	6667	12709	22752	888	1485	332	594	23	39	166	297	12	19	83	148	6	10
Winbugs labels	SFA3Sm_L[]	SFA3Sm_H[]	SFA3Lg_L[]	SFA3Lg_H[]	SFA4Sm_L[]	SFA4Sm_H[]	SFA4Lg_L[]	SFA4Lg_H[]	SFA5Sm_L[]	SFA5Sm_H[]	SFA5Lg_L[]	SFA5Lg_H[]	SFA6Sm_L[]	SFA6Sm_H[]	SFA6Lg_L[]	SFA6Lg_H[]	SFA7Sm_L[]	SFA7Sm_H[]	SFA7Lg_L[]	SFA7Lg_H[]	SFA8Sm_L[]	SFA8Sm_H[]	SFA8Lg_L[]	SFA8Lg_H[]

Annex 6.v. (Continued). Input data for returns of small salmon and large salmon for Salmon Fishing Areas 9 to 14A in Newfoundland used in the run reconstruction.

	Salmon Fishing Area 9				Salmon Fishing Area 10				Salmon Fishing Area 11				Salmon Fishing Area 12				Salmon Fishing Area 13				Salmon Fishing Area 14A			
	Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon	
Year	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1970	6310	12620	373	1780	2003	4007	119	565	16760	33520	992	4727	2497	4993	148	704	25942	38282	3251	5060	14817	29633	365	2571
1971	5400	10800	320	1523	3093	6187	183	872	13533	27067	801	3817	1513	3027	90	427	26011	40151	2678	4750	12523	25047	308	2173
1972	3797	7593	225	1071	1890	3780	112	533	16350	32700	968	4611	3093	6187	183	872	23526	37589	3107	5169	8057	16113	198	1398
1973	7200	14400	426	2031	5950	11900	352	1678	16187	32373	958	4565	2153	4307	127	607	27287	40227	3303	5200	17607	35213	433	3055
1974	4980	9960	574	1149	4040	8080	466	932	14920	29840	1720	3441	2193	4387	253	506	19274	28824	2913	4257	10400	20800	902	1805
1975	6240	12480	880	1760	1423	2847	201	401	15003	30007	2116	4232	1700	3400	240	479	33671	54424	4497	7424	16060	32120	507	1015
1976	5410	10820	651	1303	2433	4867	293	586	13880	27760	1671	3343	990	1980	119	238	29382	46902	3378	5488	24603	49207	1437	2874
1977	3600	7200	340	680	3657	7313	346	691	13653	27307	1290	2581	1860	3720	176	352	17610	25240	2877	3598	19023	38047	666	1331
1978	4343	8687	257	514	5317	10633	315	629	13320	26640	788	1576	1220	2440	72	144	17807	27681	4716	5289	10803	21607	266	532
1979	5680	11360	326	651	2830	5660	162	324	11433	22867	655	1311	2443	4887	140	280	20372	31829	1183	1862	21927	43853	233	467
1980	7930	15860	356	712	5080	10160	228	456	16897	33793	759	1518	2733	5467	123	246	26538	38871	5236	5913	12477	24953	694	1388
1981	6207	12413	825	1650	4390	8780	584	1167	23540	47080	3129	6258	3533	7067	470	939	31359	45989	5148	7452	19607	39213	1090	2180
1982	6083	12167	147	293	4187	8373	101	202	24460	48920	590	1180	5183	10367	125	250	31628	46698	3442	3831	15877	31753	3094	6189
1983	7677	15353	352	705	3800	7600	174	349	15897	31793	730	1460	2223	4447	102	204	20828	31701	4465	5100	12667	25333	1704	3407
1984	7989	17023	125	1221	5141	10955	81	785	24767	52774	389	3784	6782	14451	106	1036	26184	37852	2296	3710	16962	36143	266	2591
1985	6375	13198	96	912	4831	10000	73	691	21213	43914	320	3034	3996	8273	60	572	16028	25505	1375	2508	13209	27345	199	1890
1986	8411	17555	208	1231	5619	11727	139	822	20300	42368	501	2970	3433	7166	85	502	22881	36916	2079	3649	18411	38426	455	2694
1987	3416	6865	88	489	1690	3397	44	242	15087	30317	391	2162	3274	6580	85	469	19629	32325	1546	3022	18203	36580	471	2608
1988	5179	10668	124	748	4308	8873	103	622	18985	39106	456	2741	5330	10979	128	770	26162	43480	1950	3917	23580	48570	566	3405
1989	5352	10895	160	821	3655	7440	109	561	12047	24524	360	1849	2279	4640	68	350	10154	16156	849	1565	13036	26537	390	2001
1990	7332	12834	256	1000	3281	5743	115	447	17470	30578	610	2382	3363	5887	117	459	21518	31183	1778	3084	19843	34732	693	2706
1991	2404	3949	82	319	988	1622	34	131	7956	13068	272	1056	2765	4542	95	367	16225	20945	1709	2433	15307	25141	523	2031
1992	5044	10088	184	1809	1791	3582	65	642	16615	33231	605	5958	4671	9342	170	1675	25990	44119	3087	8928	34927	69854	1271	12525
1993	11402	21948	401	1560	5578	10736	196	763	24574	47301	865	3363	5936	11426	209	812	27523	46889	2618	4746	31116	59893	1095	4258
1994	3007	6607	177	751	2544	5588	150	635	7649	16803	450	1910	2761	6066	162	690	22103	37166	3476	5879	13321	29263	783	3327
1995	5321	12821	318	1390	4371	10532	261	1142	10757	25916	642	2809	2294	5527	137	599	27022	49781	1843	5096	20840	50209	1244	5443
1996	6015	13450	443	1317	8245	18438	608	1805	18938	42350	1396	4146	5025	11238	370	1100	36576	67672	3479	7132	32761	73263	2415	7172
1997	3636	6627	379	1227	5071	9242	528	1712	16648	30339	1735	5619	4556	8303	475	1538	31402	46494	4240	8521	25241	45998	2630	8519
1998	4694	6597	468	1673	7821	10992	780	2788	8467	11900	844	3018	2360	3318	235	841	21816	27955	3194	7080	23995	33724	2392	8552
1999	4015	5844	369	1205	5113	7443	470	1535	9643	14036	887	2894	1139	1658	105	342	32407	40858	3878	7739	26960	39241	2480	8091
2000	7850	10582	596	1515	7639	10297	580	1475	17260	23266	1310	3332	2634	3551	200	509	54330	67784	5519	10048	36819	49632	2795	7107
2001	2043	2674	158	366	2924	3826	226	523	9396	12296	725	1682	2201	2880	170	394	37393	45761	3749	6510	20775	27188	1604	3719
2002	1917	2873	125	366	3713	5565	242	709	9011	13505	587	1722	2321	3478	151	443	34070	46011	3452	6469	26558	39801	1729	5075
2003	2229	2699	113	359	3771	4565	190	608	14208	17201	718	2291	5917	7163	299	954	50367	57997	4421	8434	40802	49395	2061	6579
2004	1926	3001	95	406	3697	5760	183	780	13762	21443	681	2903	3131	4879	155	661	49924	66549	4308	9118	30057	46833	1488	6341
2005	1948	5734	148	813	2779	8180	211	1159	6260	18425	475	2611	2686	7905	204	1120	40658	88340	4595	12966	17340	51040	1316	7232
2006	4355	6960	506	1311	5344	8542	622	1609	11033	17634	1283	3322	3460	5530	402	1042	53311	74546	8499	15058	28081	44883	3266	8456
2007	2377	4817	270	873	3497	7086	397	1285	5650	11449	641	2076	2808	5689	318	1031	33808	59140	4691	10959	19966	40454	2264	7334
2008	3944	6606	301	963	4786	8016	366	1169	11136	18654	851	2721	2610	4373	200	638	51933	75122	3901	9668	25802	43220	1972	6304
2009	3445	6443	203	1316	5137	9608	303	1963	7536	14097	445	2880	1746	3266	103	667	36368	55458	3722	10806	21146	39555	1249	8081
2010	3649	6532	255	426	5466	9786	382	639	5653	10120	395	661	2135	3823	149	250	40832	56861	4190	5143	27616	49439	1929	3227
Winbugs labels	SFA9S m_L[]	SFA9S m_H[]	SFA9Lg _L[]	SFA9Lg _H[]	SFA10S m_L[]	SFA10S m_H[]	SFA10L g_L[]	SFA10L g_H[]	SFA11S m_L[]	SFA11S m_H[]	SFA11L g_L[]	SFA11L g_H[]	SFA12S m_L[]	SFA12S m_H[]	SFA12L g_L[]	SFA12L g_H[]	SFA13S m_L[]	SFA13S m_H[]	SFA13L g_L[]	SFA13L g_H[]	SFA14A Sm_L[]	SFA14A Sm_H[]	SFA14A Lg_L[]	SFA14A Lg_H[]

Annex 6.vi. Input data for spawners of small salmon and large salmon for Salmon Fishing Areas 3 to 8 in Newfoundland used in the run reconstruction.

	Salmon Fishing Area 3				Salmon Fishing Area 4				Salmon Fishing Area 5				Salmon Fishing Area 6				Salmon Fishing Area 7				Salmon Fishing Area 8			
	Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon	
Year	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1970	1829	4443	154	736	11314	27478	910	4512	5194	12614	404	2058	196	476	14	76	47	113	3	18	43	105	0	13
1971	1731	4205	135	687	8827	21437	688	3499	3920	9520	293	1541	128	312	10	51	93	227	8	38	58	142	0	15
1972	1162	2822	98	468	8036	19516	655	3214	4422	10738	354	1762	278	674	23	112	142	346	12	57	65	159	6	26
1973	2772	6732	232	1115	15657	38023	1275	6259	4928	11968	405	1974	583	1417	49	235	306	742	26	123	219	533	15	84
1974	1958	4754	318	641	12537	30447	1983	4049	3820	9276	608	1237	707	1717	115	232	310	754	49	100	119	289	20	39
1975	2583	6273	520	1041	13867	33677	2628	5421	4639	11265	912	1846	219	533	43	87	93	227	19	38	203	493	41	82
1976	2210	5366	379	759	15594	37870	2495	5177	4429	10755	697	1459	576	1400	97	196	70	170	12	24	187	453	32	64
1977	3570	8670	478	960	19591	47577	1559	4204	10771	26157	1410	2864	936	2272	107	234	182	442	24	48	189	459	26	51
1978	1769	4295	149	298	20473	49719	1229	2959	6669	16195	536	1100	691	1677	51	110	231	561	19	38	103	249	9	17
1979	4760	11560	390	779	18727	45481	1206	2740	3106	7542	234	489	569	1383	45	91	292	708	24	48	233	567	19	38
1980	4067	9877	224	485	21966	53346	903	2312	6305	15311	376	780	747	1813	34	82	238	578	14	30	280	680	18	36
1981	5502	13362	1042	2087	31584	76704	5637	11635	8139	19765	1511	3056	1412	3428	239	507	287	697	53	107	180	436	34	68
1982	6146	14926	124	336	23270	56514	544	1346	5677	13787	143	338	672	1632	6	29	362	878	2	15	198	482	0	5
1983	3773	9163	245	493	20893	50739	1073	2443	5500	13356	191	551	691	1677	35	81	324	788	0	9	96	232	1	8
1984	2531	6525	55	540	25033	64536	533	5322	6835	17620	149	1456	789	2034	12	163	243	626	1	48	200	515	4	43
1985	3462	8569	72	683	32218	79741	671	6352	9208	22791	192	1816	1134	2806	24	224	296	733	6	58	272	674	6	54
1986	2054	5126	70	413	24722	61700	840	4977	10782	26910	366	2170	1184	2955	40	238	271	677	9	55	367	916	12	74
1987	1655	3895	57	318	16032	37722	556	3078	4892	11511	170	939	403	948	14	77	82	194	3	16	126	297	4	24
1988	4868	11888	159	956	27317	66712	892	5367	11549	28204	377	2269	1189	2904	39	234	355	867	12	70	219	535	7	43
1989	2266	5376	90	461	11623	27581	461	2365	4350	10323	172	885	755	1792	30	154	203	481	8	41	304	721	12	62
1990	5032	10098	236	920	16583	33273	776	3033	7071	14188	331	1293	978	1963	46	179	144	288	7	26	252	505	12	46
1991	4334	7965	193	750	16113	29607	718	2788	6745	12395	301	1167	613	1126	27	106	119	218	5	21	36	67	2	6
1992	9844	21262	415	4094	33228	71898	1407	13866	12175	26363	516	5088	1450	3132	61	603	252	545	11	105	0	0	0	0
1993	10054	20961	400	1599	39162	81344	1590	6226	14370	29779	576	2270	2243	4623	90	351	404	831	16	63	369	760	15	58
1994	9146	24802	749	3247	20576	55760	1644	7259	6855	18510	560	2420	381	1026	30	133	46	122	4	16	79	212	6	27
1995	7409	21791	580	2636	22872	67179	1801	8135	8122	23776	642	2880	287	831	23	100	173	501	14	60	135	397	11	48
1996	15729	39860	1412	4247	42346	107268	3757	11383	14095	35586	1263	3787	522	1317	46	139	124	311	11	33	180	457	16	48
1997	9422	19095	1209	3954	19309	39107	2467	8083	5228	10547	668	2177	190	384	24	79	49	99	6	20	48	98	6	20
1998	16390	24345	1933	6969	43559	64785	5160	18599	9943	14753	1155	4201	455	673	53	191	212	313	25	88	135	201	16	57
1999	11804	18173	1279	4189	52390	80698	5650	18583	8832	13603	947	3126	343	528	37	121	58	90	6	21	119	188	14	45
2000	17003	23723	1449	3711	32879	45946	2803	7201	10897	15217	923	2377	993	1386	84	217	140	195	12	31	88	125	8	20
2001	9861	13489	892	2089	33365	45682	3023	7086	8344	11433	767	1786	250	342	23	53	42	59	4	9	17	23	2	4
2002	8620	13856	671	1994	28099	45208	2175	6498	3194	5124	250	737	199	319	15	45	0	0	0	0	55	91	5	14
2003	19386	23938	1085	3478	67026	82739	3738	12001	5926	7312	331	1060	412	508	23	74	94	116	5	17	47	58	3	8
2004	6942	11402	390	1680	43104	70785	2430	10438	7307	11987	412	1766	158	259	9	38	0	0	0	0	35	58	2	9
2005	5056	17534	473	2664	28896	100323	2695	15235	4200	14518	394	2205	92	314	8	47	0	0	0	0	18	69	2	11
2006	9402	15839	1228	3216	37156	62732	4925	12825	7495	12623	969	2554	61	102	8	20	0	0	0	0	141	244	20	52
2007	9147	19842	1171	3818	32243	70143	4122	13501	7641	16603	978	3196	68	148	8	28	112	245	12	45	15	33	2	6
2008	11799	21183	1045	3379	53591	96443	4745	15402	9669	17405	867	2791	274	497	22	78	69	125	4	18	159	292	15	48
2009	11205	22795	779	5080	49881	101728	3491	22732	8828	18065	622	4049	412	834	28	185	0	0	0	0	111	228	7	51
2010	12549	24302	1029	1728	48201	93284	3916	6597	10724	20767	873	1470	281	543	23	39	140	271	12	19	67	133	5	9
Winbugs labels	SFA3SS m_L[]	SFA3SS m_H[]	SFA3SL g_L[]	SFA3SL g_H[]	SFA4SS m_L[]	SFA4SS m_H[]	SFA4SL g_L[]	SFA4SL g_H[]	SFA5SS m_L[]	SFA5SS m_H[]	SFA5SL g_L[]	SFA5SL g_H[]	SFA6SS m_L[]	SFA6SS m_H[]	SFA6SL g_L[]	SFA6SL g_H[]	SFA7SS m_L[]	SFA7SS m_H[]	SFA7SL g_L[]	SFA7SL g_H[]	SFA8SS m_L[]	SFA8SS m_H[]	SFA8SL g_L[]	SFA8SL g_H[]

Annex 6.vi. (Continued). Input data for spawners of small salmon and large salmon for Salmon Fishing Areas 9 to 14A in Newfoundland used in the run reconstruction.

	Salmon Fishing Area 9				Salmon Fishing Area 10				Salmon Fishing Area 11				Salmon Fishing Area 12				Salmon Fishing Area 13				Salmon Fishing Area 14A			
	Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon		Small salmon		Large salmon	
Year	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1970	4417	10727	361	1768	1402	3406	112	558	11732	28492	918	4653	1748	4244	69	625	16203	28543	1608	3417	10372	25188	134	2340
1971	3780	9180	301	1504	2165	5259	166	855	9473	23007	736	3752	1059	2573	74	411	16489	30629	1633	3705	8766	21290	0	1850
1972	2658	6454	217	1063	1323	3213	108	529	11445	27795	882	4525	2165	5259	163	852	15125	29188	2004	4066	5640	13696	83	1283
1973	5040	12240	406	2011	4165	10115	310	1636	11331	27517	923	4530	1507	3661	102	582	17019	29959	1911	3808	12325	29931	91	2713
1974	3486	8466	565	1140	2828	6868	452	918	10444	25364	1682	3403	1535	3729	240	493	12085	21635	1997	3341	7280	17680	789	1692
1975	4368	10608	874	1754	996	2420	192	392	10502	25506	2076	4192	1190	2890	220	459	21668	42421	3611	6538	11242	27302	417	925
1976	3787	9197	639	1291	1703	4137	283	576	9716	23596	1629	3301	693	1683	114	233	18999	36519	2752	4862	17222	41826	1337	2774
1977	2520	6120	331	671	2560	6216	341	686	9557	23211	1272	2563	1302	3162	128	304	10898	18528	1828	2549	13316	32340	194	859
1978	3040	7384	240	497	3722	9038	273	587	9324	22644	770	1558	854	2074	52	124	12518	22392	3861	4434	7562	18366	194	460
1979	3976	9656	311	636	1981	4811	154	316	8003	19437	648	1304	1710	4154	130	270	14363	25820	1070	1749	15349	37275	174	408
1980	5551	13481	295	651	3556	8636	201	429	11828	28724	715	1474	1913	4647	94	217	18625	30958	4243	4920	8734	21210	514	1208
1981	4345	10551	773	1598	3073	7463	555	1138	16478	40018	3088	6217	2473	6007	453	922	22059	36689	4485	6789	13725	33331	953	2043
1982	4258	10342	114	260	2931	7117	91	192	17122	41582	537	1127	3628	8812	110	235	22062	37132	2847	3236	11114	26990	2987	6082
1983	5374	13050	281	634	2660	6460	95	270	11128	27024	703	1433	1556	3780	94	196	14491	25364	3855	4490	8867	21533	1635	3338
1984	5725	14759	120	1216	3684	9498	79	783	17748	45755	374	3769	4860	12529	38	968	18413	30081	1987	3401	12155	31336	179	2504
1985	4625	11448	96	912	3505	8674	73	691	15390	38091	320	3034	2899	7176	57	569	10726	20203	1349	2482	9583	23719	197	1887
1986	6113	15257	208	1231	4084	10192	139	822	14754	36822	501	2970	2495	6228	81	499	15535	29570	2013	3583	13381	33396	445	2683
1987	2549	5998	88	489	1261	2968	44	242	11258	26488	391	2162	2443	5749	82	466	13611	26307	1512	2988	13583	31960	467	2604
1988	3806	9295	124	748	3166	7731	103	622	13952	34073	456	2741	3917	9566	126	767	17945	35263	1909	3877	17329	42319	549	3388
1989	4037	9580	160	821	2757	6542	109	561	9087	21564	360	1849	1719	4080	67	349	6980	12982	836	1552	9833	23334	385	1996
1990	5466	10968	256	1000	2446	4908	115	447	13024	26132	610	2382	2507	5031	114	456	14866	24531	1744	3051	14793	29682	679	2692
1991	1844	3389	82	319	758	1392	34	131	6103	11215	272	1056	2121	3898	93	365	11037	15757	1689	2413	11742	21576	512	2020
1992	4334	9378	183	1809	1496	3287	65	642	14239	30854	605	5958	3985	8657	162	1667	20506	38635	2992	8833	30096	65023	1234	12488
1993	9956	20502	400	1559	4809	9967	194	761	21423	44150	861	3359	5176	10666	207	810	22341	41708	2544	4673	27010	55787	1058	4221
1994	2124	5723	172	746	1804	4848	144	630	5295	14449	430	1891	1949	5253	154	681	15381	30444	3207	5611	9385	25327	742	3286
1995	3887	11386	304	1376	3218	9378	253	1133	7770	22930	625	2792	1689	4922	130	592	20570	43329	1607	4860	15218	44587	1187	5385
1996	4868	12304	431	1304	6687	16880	592	1789	15226	38638	1362	4113	4082	10295	358	1088	29056	60152	3199	6852	26584	67085	2357	7115
1997	2927	5918	372	1221	4086	8257	519	1702	13304	26995	1718	5602	3655	7401	464	1527	25508	40599	3985	8266	20359	41117	2578	8467
1998	3937	5840	458	1663	6606	9777	771	2779	7024	10457	836	3009	1968	2925	225	831	18279	24417	3031	6918	19992	29721	2347	8507
1999	3401	5230	359	1195	4313	6642	455	1520	8086	12478	881	2889	958	1477	102	339	28647	37098	3760	7621	22659	34941	2402	8013
2000	6913	9645	581	1501	6664	9322	534	1429	14895	20901	1288	3310	2291	3208	195	504	48055	61508	5250	9779	32314	45127	2731	7044
2001	1709	2339	151	359	2436	3338	215	513	7804	10704	714	1671	1818	2497	162	386	31037	39405	3536	6297	17331	23744	1559	3674
2002	1562	2518	118	360	3049	4901	231	699	7347	11840	581	1716	1896	3053	147	439	28083	40025	3313	6330	21764	35007	1668	5013
2003	1985	2454	109	355	3368	4162	185	603	12701	15693	703	2276	5282	6528	288	943	45027	52657	4206	8218	36597	45189	1988	6506
2004	1674	2749	91	402	3210	5273	177	774	11863	19544	660	2882	2704	4452	149	655	43889	60513	4074	8883	26116	42892	1429	6282
2005	1478	5264	130	794	2171	7572	194	1142	4827	16992	456	2591	2062	7282	191	1107	33349	81031	4320	12691	13676	47376	1246	7163
2006	3791	6397	498	1302	4627	7824	602	1590	9554	16155	1271	3310	2986	5056	392	1032	46296	67532	8247	14807	24532	41334	3210	8400
2007	2063	4502	263	867	3047	6636	387	1275	4907	10706	636	2071	2442	5323	314	1027	29402	54734	4511	10780	17446	37934	2222	7293
2008	3285	5948	293	955	3971	7202	351	1154	9314	16832	841	2711	2178	3940	193	631	43277	66465	3580	9346	21887	39305	1915	6246
2009	2835	5834	198	1311	4193	8665	298	1957	6203	12763	442	2877	1450	2970	100	664	31106	50196	3526	10610	17820	36229	1200	8032
2010	3028	5911	243	414	4564	8884	371	628	4677	9144	388	654	1797	3484	146	246	34359	50388	3941	4894	23238	45062	1863	3161
Winbugs labels	SFA9SSm_L[]	SFA9SSm_H[]	SFA9SLg_L[]	SFA9SLg_H[]	SFA10SSm_L[]	SFA10SSm_H[]	SFA10SLg_L[]	SFA10SLg_H[]	SFA11SSm_L[]	SFA11SSm_H[]	SFA11SLg_L[]	SFA11SLg_H[]	SFA12SSm_L[]	SFA12SSm_H[]	SFA12SLg_L[]	SFA12SLg_H[]	SFA13SSm_L[]	SFA13SSm_H[]	SFA13SLg_L[]	SFA13SLg_H[]	SFA14ASSm_L[]	SFA14ASSm_H[]	SFA14ASLg_L[]	SFA14ASLg_H[]

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Annex 6.vii. Input data for 2SW salmon returns and spawners for Salmon Fishing Areas 3 to 8 in Newfoundland used in the run reconstruction.

	Salmon Fishing Area 3				Salmon Fishing Area 4				Salmon Fishing Area 5				Salmon Fishing Area 6				Salmon Fishing Area 7				Salmon Fishing Area 8			
	Returns		Spawners		Returns		Spawners		Returns		Spawners		Returns		Spawners		Returns		Spawners		Returns		Spawners	
Year	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1970	15	147	15	147	96	912	91	902	44	419	40	412	2	16	1	15	0	4	0	4	0	3	0	3
1971	15	140	14	137	75	711	69	700	33	316	29	308	1	10	1	10	1	8	1	8	0	5	0	3
1972	10	94	10	94	68	648	66	643	37	356	35	352	2	22	2	22	1	11	1	11	1	5	1	5
1973	23	223	23	223	132	1262	127	1252	42	397	40	395	5	47	5	47	3	25	3	25	2	18	1	17
1974	32	129	32	128	207	826	198	810	63	252	61	247	12	47	12	46	5	20	5	20	2	8	2	8
1975	52	208	52	208	279	1117	263	1084	93	374	91	369	4	18	4	17	2	8	2	8	4	16	4	16
1976	38	152	38	152	268	1073	249	1035	76	305	70	292	10	40	10	39	1	5	1	5	3	13	3	13
1977	48	193	48	192	264	1058	156	841	145	582	141	573	13	51	11	47	2	10	2	10	3	10	3	10
1978	15	60	15	60	173	692	123	592	56	226	54	220	6	23	5	22	2	8	2	8	1	3	1	3
1979	39	156	39	156	153	613	121	548	25	102	23	98	5	19	4	18	2	10	2	10	2	8	2	8
1980	26	104	22	97	141	564	90	462	40	162	38	156	5	19	3	16	2	6	1	6	2	7	2	7
1981	104	418	104	417	600	2399	564	2327	155	618	151	611	27	107	24	101	5	22	5	21	3	14	3	14
1982	21	85	12	67	80	321	54	269	20	78	14	68	2	9	1	6	1	5	0	3	1	3	0	1
1983	25	99	25	99	137	548	107	489	36	144	19	110	5	18	4	16	2	9	0	2	1	3	0	2
1984	6	108	6	108	55	1067	53	1064	15	291	15	291	2	34	1	33	1	10	0	10	0	9	0	9
1985	7	137	7	137	67	1270	67	1270	19	363	19	363	2	45	2	45	1	12	1	12	1	11	1	11
1986	7	83	7	83	84	995	84	995	37	434	37	434	4	48	4	48	1	11	1	11	1	15	1	15
1987	6	64	6	64	56	616	56	616	17	188	17	188	1	15	1	15	0	3	0	3	0	5	0	5
1988	16	191	16	191	89	1073	89	1073	38	454	38	454	4	47	4	47	1	14	1	14	1	9	1	9
1989	9	92	9	92	46	473	46	473	17	177	17	177	3	31	3	31	1	8	1	8	1	12	1	12
1990	24	184	24	184	78	607	78	607	33	259	33	259	5	36	5	36	1	5	1	5	1	9	1	9
1991	19	150	19	150	72	558	72	558	30	233	30	233	3	21	3	21	1	4	1	4	0	1	0	1
1992	42	819	42	819	141	2773	141	2773	52	1018	52	1018	6	121	6	121	1	21	1	21	0	0	0	0
1993	42	323	40	320	161	1248	159	1245	59	456	58	454	9	70	9	70	2	13	2	13	1	12	1	12
1994	46	457	45	455	104	1028	99	1016	34	341	34	339	2	19	2	19	0	2	0	2	0	4	0	4
1995	37	373	35	369	113	1150	108	1139	40	406	39	403	1	14	1	14	1	9	1	8	1	7	1	7
1996	86	598	85	595	232	1610	225	1594	77	533	76	530	3	20	3	19	1	5	1	5	1	7	1	7
1997	74	556	73	554	151	1138	148	1132	40	306	40	305	1	11	1	11	0	3	0	3	0	3	0	3
1998	117	979	116	976	313	2612	310	2604	71	592	69	588	3	27	3	27	1	12	1	12	1	8	1	8
1999	77	587	77	586	343	2611	339	2602	58	440	57	438	2	17	2	17	0	3	0	3	1	6	1	6
2000	88	522	87	520	171	1015	168	1008	57	335	55	333	5	30	5	30	1	4	1	4	0	3	0	3
2001	39	196	38	194	132	664	130	659	33	167	33	166	1	5	1	5	0	1	0	1	0	0	0	0
2002	29	187	29	185	96	610	94	604	11	69	11	69	1	4	1	4	0	0	0	0	0	1	0	1
2003	47	324	47	323	162	1119	161	1116	14	99	14	99	1	7	1	7	0	2	0	2	0	1	0	1
2004	17	157	17	156	106	973	104	971	18	165	18	164	0	4	0	4	0	0	0	0	0	1	0	1
2005	21	249	20	248	120	1426	116	1417	17	206	17	205	0	4	0	4	0	0	0	0	0	1	0	1
2006	54	301	53	299	214	1197	212	1193	43	240	42	237	0	2	0	2	0	0	0	0	1	5	1	5
2007	51	356	50	355	180	1262	177	1256	43	298	42	297	0	3	0	3	1	4	1	4	0	1	0	1
2008	46	316	45	314	209	1442	204	1432	38	260	37	260	1	7	1	7	0	2	0	2	1	4	1	4
2009	34	473	33	472	151	2117	150	2114	27	377	27	377	1	17	1	17	0	0	0	0	0	5	0	5
2010	45	162	44	161	171	620	168	614	38	138	38	137	1	4	1	4	0	2	0	2	0	1	0	1
Winbugs labels	SFA3R2 _L[]	SFA3R2 _H[]	SFA3S2 _L[]	SFA3S2 _H[]	SFA4R2 _L[]	SFA4R2 _H[]	SFA4S2 _L[]	SFA4S2 _H[]	SFA5R2 _L[]	SFA5R2 _H[]	SFA5S2 _L[]	SFA5S2 _H[]	SFA6R2 _L[]	SFA6R2 _H[]	SFA6S2 _L[]	SFA6S2 _H[]	SFA7R2 _L[]	SFA7R2 _H[]	SFA7S2 _L[]	SFA7S2 _H[]	SFA8R2 _L[]	SFA8R2 _H[]	SFA8S2 _L[]	SFA8S2 _H[]

Annex 6.vii. (Continued). Input data for 2SW salmon returns and spawners for Salmon Fishing Areas 9 to 14A in Newfoundland used in the run reconstruction.

	Salmon Fishing Area 9				Salmon Fishing Area 10				Salmon Fishing Area 11				Salmon Fishing Area 12				Salmon Fishing Area 13				Salmon Fishing Area 14A			
	Returns		Spawners		Returns		Spawners		Returns		Spawners		Returns		Spawners		Returns		Spawners		Returns		Spawners	
Year	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1970	37	356	36	354	12	113	11	112	99	945	92	931	15	141	7	125	1300	3036	643	2050	36	514	13	468
1971	32	305	30	301	18	174	17	171	80	763	74	750	9	85	7	82	1071	2850	653	2223	31	435	0	370
1972	22	214	22	213	11	107	11	106	97	922	88	905	18	174	16	170	1243	3101	802	2439	20	280	8	257
1973	43	406	41	402	35	336	31	327	96	913	92	906	13	121	10	116	1321	3120	764	2285	43	611	9	543
1974	57	230	57	228	47	186	45	184	172	688	168	681	25	101	24	99	1165	2554	799	2005	90	361	79	338
1975	88	352	87	351	20	80	19	78	212	846	208	838	24	96	22	92	1799	4454	1445	3923	51	203	42	185
1976	65	261	64	258	29	117	28	115	167	669	163	660	12	48	11	47	1351	3293	1101	2917	144	575	134	555
1977	34	136	33	134	35	138	34	137	129	516	127	513	18	70	13	61	1151	2159	731	1530	67	266	19	172
1978	26	103	24	99	31	126	27	117	79	315	77	312	7	29	5	25	1886	3173	1544	2660	27	106	19	92
1979	33	130	31	127	16	65	15	63	66	262	65	261	14	56	13	54	473	1117	428	1049	23	93	17	82
1980	36	142	30	130	23	91	20	86	76	304	71	295	12	49	9	43	2094	3548	1697	2952	69	278	51	242
1981	83	330	77	320	58	233	55	228	313	1252	309	1243	47	188	45	184	2059	4471	1794	4073	109	436	95	409
1982	15	59	11	52	10	40	9	38	59	236	54	225	13	50	11	47	1377	2298	1139	1941	309	1238	299	1216
1983	35	141	28	127	17	70	10	54	73	292	70	287	10	41	9	39	1786	3060	1542	2694	170	681	163	668
1984	13	244	12	243	8	157	8	157	39	757	37	754	11	207	4	194	918	2226	795	2041	27	518	18	501
1985	10	182	10	182	7	138	7	138	32	607	32	607	6	114	6	114	550	1505	540	1489	20	378	20	377
1986	21	246	21	246	14	164	14	164	50	594	50	594	8	100	8	100	832	2190	805	2150	45	539	44	537
1987	9	98	9	98	4	48	4	48	39	432	39	432	8	94	8	93	618	1813	605	1793	47	522	47	521
1988	12	150	12	150	10	124	10	124	46	548	46	548	13	154	13	153	780	2350	764	2326	57	681	55	678
1989	16	164	16	164	11	112	11	112	36	370	36	370	7	70	7	70	339	939	334	931	39	400	39	399
1990	26	200	26	200	11	89	11	89	61	476	61	476	12	92	11	91	711	1851	698	1830	69	541	68	538
1991	8	64	8	64	3	26	3	26	27	211	27	211	9	73	9	73	684	1460	676	1448	52	406	51	404
1992	18	362	18	362	7	128	6	128	60	1192	60	1192	17	335	16	333	1235	5357	1197	5300	127	2505	123	2498
1993	40	312	40	312	20	153	19	152	86	673	86	672	21	162	21	162	1047	2848	1018	2804	110	852	106	844
1994	11	105	10	104	9	89	9	88	27	267	26	265	10	97	9	95	1390	3528	1283	3366	47	466	44	460
1995	19	195	18	193	16	160	15	159	39	393	38	391	8	84	8	83	737	3058	643	2916	75	762	71	754
1996	27	184	26	183	36	253	35	250	84	580	82	576	22	154	22	152	1391	4279	1280	4111	145	1004	141	996
1997	23	172	22	171	32	240	31	238	104	787	103	784	28	215	28	214	1696	5113	1594	4960	158	1193	155	1185
1998	28	234	27	233	47	390	46	389	51	422	50	421	14	118	13	116	1278	4248	1212	4151	144	1197	141	1191
1999	22	169	22	167	28	215	27	213	53	405	53	404	6	48	6	48	1551	4643	1504	4573	149	1133	144	1122
2000	36	212	35	210	35	206	32	200	79	466	77	463	12	71	12	71	2208	6029	2100	5867	168	995	164	986
2001	7	34	7	33	10	49	9	48	31	156	31	155	7	37	7	36	697	2324	658	2248	69	346	67	342
2002	5	34	5	33	10	66	10	65	25	160	25	160	6	41	6	41	642	2309	616	2260	74	472	72	466
2003	5	33	5	33	8	57	8	56	31	213	30	212	13	89	12	88	822	3011	782	2934	89	612	85	605
2004	4	38	4	37	8	73	8	72	29	270	28	268	7	61	6	61	801	3255	758	3171	64	590	61	584
2005	6	76	6	74	9	108	8	106	20	243	20	241	9	104	8	103	855	4629	804	4531	57	673	54	666
2006	22	122	21	121	27	150	26	148	55	309	55	308	17	97	17	96	1581	5376	1534	5286	140	786	138	781
2007	12	81	11	81	17	119	17	119	28	193	27	193	14	96	13	95	872	3912	839	3849	97	682	96	678
2008	13	90	13	89	16	109	15	107	37	253	36	252	9	59	8	59	726	3451	666	3337	85	586	82	581
2009	9	122	9	122	13	183	13	182	19	268	19	268	4	62	4	62	692	3858	656	3788	54	752	52	747
2010	11	40	10	39	16	59	16	58	17	61	17	61	6	23	6	23	779	1836	733	1747	83	300	80	294
Winbugs labels	SFA9R2_L[]	SFA9R2_H[]	SFA9S2_L[]	SFA9S2_H[]	SFA10R2_L[]	SFA10R2_H[]	SFA10S2_L[]	SFA10S2_H[]	SFA11R2_L[]	SFA11R2_H[]	SFA11S2_L[]	SFA11S2_H[]	SFA12R2_L[]	SFA12R2_H[]	SFA12S2_L[]	SFA12S2_H[]	SFA13R2_L[]	SFA13R2_H[]	SFA13S2_L[]	SFA13S2_H[]	SFA14AR2_L[]	SFA14AR2_H[]	SFA14AS2_L[]	SFA14AS2_H[]

Annex 6.viii. Input data for small salmon returns to Quebec by category of data used in the run reconstruction.

	Minimum small salmon returns								Maximum small salmon returns							
	Data reliability category						FN	Other	Data reliability category						FN	Other
Year	C1	C2	C3	C4	C5	C6	Harvest	rivers	C1	C2	C3	C4	C5	C6	Harvest	rivers
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	3830	5434	2955	460	1670	5160	267	31	4085	5639	6053	792	2784	8599	445	52
1985	5266	2271	1767	210	5449	4384	267	40	5869	2336	3586	352	9224	7307	445	67
1986	8648	5193	2396	63	6719	5133	267	77	9471	5321	4895	107	11198	8555	445	129
1987	10043	4775	3852	327	8396	5501	267	71	10869	4910	7875	546	13993	9168	445	118
1988	11190	5968	4404	468	8440	6423	267	85	12244	6133	8962	780	14067	10705	445	142
1989	10121	4743	2924	301	6744	5622	267	68	10910	4878	5940	503	11240	9369	445	113
1990	12245	7332	4377	694	7096	2976	377	77	13278	7511	8917	1158	11826	4960	628	129
1991	9554	5851	3776	349	5009	2001	256	57	10249	5987	7679	584	8348	3336	426	95
1992	9188	6928	4567	428	5131	3462	243	70	9847	7144	9297	715	8552	5770	405	117
1993	8143	6325	3973	1029	4315	1447	525	55	8883	6517	8075	1717	7192	2412	875	92
1994	8707	5928	3840	1051	4011	437	408	30	9442	6129	7828	1753	6686	729	681	50
1995	6943	3439	2697	1017	3853	434	184	30	7538	3527	5471	1696	6422	723	306	50
1996	15010	1809	3600	477	4666	500	120	5	16122	1923	7370	797	7816	833	200	8
1997	11491	201	3457	292	3529	462	58	563	12089	242	7049	487	5882	770	97	938
1998	11285	1183	3578	328	5121	1127	58	0	11849	1406	7347	555	8536	1878	97	0
1999	10877	708	3194	1868	5401	1429	0	0	11556	741	6536	3098	9002	2382	0	0
2000	11886	429	1116	602	7399	633	0	0	12635	458	2284	1004	14050	1055	0	0
2001	8050	185	2632	266	3225	728	0	0	8588	228	5392	443	5374	1213	0	0
2002	14599	31	3189	689	4333	1448	0	0	15494	36	6530	1149	7222	2414	0	0
2003	11362	0	3203	721	3566	1512	0	0	11903	0	6538	1201	5944	2520	0	0
2004	13747	107	6526	284	4889	1639	0	0	14177	127	13104	474	8149	2731	0	0
2005	8771	0	3689	794	3353	1508	0	0	9188	0	7485	1323	5588	2513	0	0
2006	12762	0	3736	1800	2944	1455	0	0	13369	0	7584	2999	4907	2426	0	0
2007	8515	0	3758	1710	1830	1024	0	0	8964	0	7631	2850	3051	1707	0	0
2008	16445	0	5542	2266	3144	1401	0	0	17350	0	11261	3776	5240	2336	0	0
2009	8872	0	3601	903	1907	1056	0	0	9315	0	7306	1505	3178	1759	0	0
2010	12706	0	4801	1164	1675	1081	0	0	13347	0	9746	1941	2792	1802	0	0
Winbugs labels	QCSmC1_L[]	QCSmC2_L[]	QCSmC3_L[]	QCSmC4_L[]	QCSmC5_L[]	QCSmC6_L[]	QCSmFn_L[]	QCSmO_L[]	QCSmC1_H[]	QCSmC2_H[]	QCSmC3_H[]	QCSmC4_H[]	QCSmC5_H[]	QCSmC6_H[]	QCSmFn_H[]	QCSmO_H[]

Annex 6.viii. (Continued). Input data for small salmon returns to Quebec by category of data used in the run reconstruction.

	Minimum large salmon returns								Maximum large salmon returns							
	Data reliability category						FN	Other	Data reliability category						FN	Other
Year	C1	C2	C3	C4	C5	C6	Harvest	rivers	C1	C2	C3	C4	C5	C6	Harvest	rivers
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	14119	9501	2922	3407	3712	5071	329	108	15631	9788	6035	6477	6187	8452	548	181
1985	14015	7028	3836	345	9215	3351	329	76	15611	7281	7809	577	15827	5586	548	127
1986	18589	8598	6152	35	5877	4971	329	89	20602	8839	12596	61	9795	8284	548	149
1987	17574	6715	5178	273	6335	3012	329	82	19017	6889	10575	458	10558	5019	548	137
1988	21445	6432	7540	346	6789	4781	329	98	22979	6618	15336	576	11315	7969	548	164
1989	20278	8503	5530	278	5718	4567	329	106	21906	8736	11252	465	9531	7611	548	176
1990	17098	10803	8164	1365	5179	2424	442	112	18222	11041	16613	2276	8631	4040	737	187
1991	19112	6988	7183	696	3856	357	242	101	20443	7192	14602	1161	6427	595	403	168
1992	18392	7360	7930	372	2687	1503	461	76	19578	7560	16149	622	4478	2505	769	127
1993	14578	10133	2866	373	2649	333	423	52	15454	11463	5849	624	4414	555	705	87
1994	16538	9172	2644	506	2853	145	427	60	17594	10241	5411	845	4755	242	712	100
1995	21658	9598	1926	813	4390	154	246	31	22968	10936	3915	1358	7317	256	410	52
1996	22679	5822	3843	577	2486	135	113	4	24117	6941	7844	964	4155	225	189	7
1997	18106	4221	2816	333	2865	138	48	9	19154	5154	5768	553	4775	229	80	15
1998	13180	4927	2861	347	2790	291	48	0	13891	5962	5907	592	4649	485	80	0
1999	16912	842	2554	3661	3870	492	0	0	17700	995	5232	6103	6450	838	0	0
2000	14568	619	3901	560	6420	563	0	0	15300	669	7947	933	10700	949	0	0
2001	17837	633	5320	241	3988	556	0	0	18889	879	10914	402	6647	926	0	0
2002	12335	8	4515	339	2103	345	0	0	13001	9	9277	565	3505	575	0	0
2003	21853	0	5787	269	4889	384	0	0	22893	0	11779	449	8148	641	0	0
2004	18369	107	4870	357	4432	401	0	0	19043	126	9170	595	7387	668	0	0
2005	19154	0	3204	734	4815	351	0	0	20066	0	6515	1223	8025	585	0	0
2006	16704	0	3387	901	3945	403	0	0	17500	0	6904	1502	6575	672	0	0
2007	14832	0	3638	1301	3171	305	0	0	15604	0	7406	2168	5285	508	0	0
2008	15216	0	5187	1328	5423	390	0	0	16002	0	10595	2213	9038	649	0	0
2009	18479	0	3727	950	4556	275	0	0	19412	0	7589	1584	7594	458	0	0
2010	21350	0	4488	1275	3656	338	0	0	22428	0	9157	2125	6093	564	0	0
Winbugs labels	QCLgC1_L[]	QCLgC2_L[]	QCLgC3_L[]	QCLgC4_L[]	QCLgC5_L[]	QCLgC6_L[]	QCLgFn_L[]	QCLgO_L[]	QCLgC1_H[]	QCLgC2_H[]	QCLgC3_H[]	QCLgC4_H[]	QCLgC5_H[]	QCLgC6_H[]	QCLgFn_H[]	QCLgO_H[]

Annex 6.viii. (Continued). Input data for small salmon spawners to Quebec by category of data used in the run reconstruction.

	Minimum small salmon spawners						Maximum small salmon spawners					
	Data reliability category						Data reliability category					
Year	C1	C2	C3	C4	C5	C6	C1	C2	C3	C4	C5	C6
1970	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	3061	4342	1915	415	1264	5160	3316	4547	5013	747	2378	8599
1985	3960	1622	1025	209	4241	4384	4563	1687	2844	351	8016	7307
1986	6337	3827	1499	63	5151	5133	7160	3955	3998	107	9630	8555
1987	7493	3489	2365	291	6411	5501	8319	3624	6388	510	12008	9168
1988	8173	4188	2738	419	6432	6423	9227	4353	7296	731	12059	10705
1989	7779	3810	1878	273	5149	5622	8568	3945	4894	475	9645	9369
1990	8735	5757	2822	604	5437	2976	9768	5936	7362	1068	10167	4960
1991	7247	4551	2465	316	3827	2001	7942	4687	6368	551	7166	3336
1992	5989	4841	2937	370	3957	3462	6648	5057	7667	657	7378	5770
1993	4852	4311	2524	747	3339	1447	5592	4503	6626	1435	6216	2412
1994	5506	3996	2501	894	3089	437	6241	4197	6489	1596	5764	729
1995	5348	2835	1760	877	2956	434	5943	2923	4534	1556	5525	723
1996	10636	1330	2260	372	3678	500	11748	1444	6030	692	6828	833
1997	8238	142	2250	266	3074	462	8836	178	5842	461	5426	770
1998	7734	995	2347	289	4229	1124	8298	1218	6116	516	7643	1875
1999	8155	509	2495	1653	4581	1426	8834	542	5837	2883	8182	2379
2000	8291	372	693	519	5900	583	9040	401	1861	921	12551	1005
2001	5329	143	1870	263	2579	658	5867	186	4140	440	4729	1137
2002	9296	31	2231	658	3405	1448	10191	36	5572	1118	6294	2414
2003	8180	0	2269	661	2826	1509	8721	0	5604	1141	5204	2517
2004	9030	29	5574	278	3962	1639	9460	49	12152	468	7222	2731
2005	6339	0	3025	716	2709	1506	6756	0	6821	1245	4945	2511
2006	8628	0	3159	1691	2372	1455	9235	0	7007	2890	4335	2426
2007	5768	0	3226	1511	1501	1024	6217	0	7099	2651	2722	1707
2008	10562	0	4882	1756	2522	1401	11467	0	10601	3266	4618	2336
2009	6293	0	3115	764	1633	1056	6736	0	6820	1366	2904	1759
2010	8679	0	4289	1085	1311	1080	9320	0	9234	1862	2428	1801
Winbugs labels	QCSSm C1_L[]	QCSSm C2_L[]	QCSSm C3_L[]	QCSSm C4_L[]	QCSSm C5_L[]	QCSSm C6_L[]	QCSSm C1_H[]	QCSSm C2_H[]	QCSSm C3_H[]	QCSSm C4_H[]	QCSSm C5_H[]	QCSSm C6_H[]

Annex 6.viii. (Continued). Input data for large salmon spawners to Quebec by category of data used in the run reconstruction.

	Minimum large salmon spawners						Maximum large salmon spawners					
	Data reliability category						Data reliability category					
Year	C1	C2	C3	C4	C5	C6	C1	C2	C3	C4	C5	C6
1970	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	10421	7648	1861	2357	2815	5071	11933	7935	4974	5427	5290	8452
1985	9985	4991	2125	340	7214	3351	11581	5244	6098	572	13826	5586
1986	13659	5804	3695	35	4498	4971	15672	6045	10139	61	8416	8284
1987	13432	4791	3025	246	4830	3012	14875	4965	8422	431	9053	5019
1988	15535	4258	4381	312	5172	4781	17069	4444	12177	542	9698	7969
1989	14645	6742	3239	253	4375	4567	16273	6975	8961	440	8188	7611
1990	12398	8463	4557	1228	3950	2424	13522	8701	13006	2139	7402	4040
1991	14061	5019	3970	596	2940	357	15392	5223	11389	1061	5511	595
1992	12850	4819	4492	325	2044	1503	14036	5019	12711	575	3835	2505
1993	9848	6936	1809	282	2038	333	10724	8266	4792	533	3803	555
1994	10468	5920	1693	448	2173	145	11524	6989	4460	787	4075	242
1995	16562	8323	1321	781	3367	154	17872	9661	3310	1326	6294	256
1996	16431	4417	2389	394	1924	135	17869	5536	6390	781	3593	225
1997	13433	3393	1744	308	2237	138	14481	4326	4696	528	4147	229
1998	10402	4429	1849	302	2213	290	11113	5464	4895	547	4073	484
1999	14169	747	1962	3100	2956	491	14957	900	4640	5542	5536	837
2000	11937	570	3322	491	5096	363	12669	620	7368	864	9376	749
2001	14527	505	4281	239	2980	348	15579	751	8986	400	5639	717
2002	10843	8	4071	313	1500	344	11509	9	8833	539	2902	574
2003	18832	0	5164	267	3763	383	19872	0	11156	447	7022	640
2004	15558	107	4231	355	3268	401	16232	126	8531	593	6223	668
2005	16485	0	2901	719	3556	351	17397	0	6212	1208	6766	585
2006	14977	0	3055	872	2863	403	15773	0	6572	1473	5493	672
2007	12470	0	3203	1287	2444	303	13242	0	6971	2154	4558	506
2008	13725	0	4676	1266	4296	390	14511	0	10084	2151	7911	649
2009	16489	0	3188	849	3588	275	17422	0	7050	1483	6626	458
2010	19150	0	3926	1251	3017	338	20228	0	8595	2101	5454	564
Winbugs labels	QCSLg C1_L[]	QCSLg C2_L[]	QCSLg C3_L[]	QCSLg C4_L[]	QCSLg C5_L[]	QCSLg C6_L[]	QCSLg C1_H[]	QCSLg C2_H[]	QCSLg C3_H[]	QCSLg C4_H[]	QCSLg C5_H[]	QCSLg C6_H[]

Annex 6.viii. (Continued). Year specific harvest data (1984 to 2009) and returns and spawners data for Quebec for years when category splits are not available (1970 to 1983) used in the run reconstruction.

	Harvests in various fisheries not in the other inputs						These data are specific to the 1970 to 1983 period when detailed returns by river category are not available.							
	Small salmon			Large salmon			Small returns		Large returns		Small spawners		Large spawners	
Year	Sport	FN	Commercial	Sport	FN	Commercial	Min	Max	Min	Max	Min	Max	Min	Max
1970	0	0	0	0	0	0	18904	28356	82680	124020	11045	16568	31292	46937
1971	0	0	0	0	0	0	14969	22453	47354	71031	9338	14007	16194	24292
1972	0	0	0	0	0	0	12470	18704	61773	92660	8213	12320	31727	47590
1973	0	0	0	0	0	0	16585	24877	68171	102256	10987	16480	32279	48419
1974	0	0	0	0	0	0	16791	25186	91455	137182	10067	15100	39256	58884
1975	0	0	0	0	0	0	18071	27106	77664	116497	11606	17409	32627	48940
1976	0	0	0	0	0	0	19959	29938	77212	115818	12979	19469	31032	46548
1977	0	0	0	0	0	0	18190	27285	91017	136525	12004	18006	44660	66990
1978	0	0	0	0	0	0	16971	25456	81953	122930	11447	17170	40944	61416
1979	0	0	0	0	0	0	21683	32524	45197	67796	15863	23795	17543	26315
1980	0	0	0	0	0	0	29791	44686	107461	161192	20817	31226	48758	73137
1981	0	0	0	0	0	0	41667	62501	84428	126642	30952	46428	35798	53697
1982	0	0	0	0	0	0	23699	35549	74870	112305	16877	25316	36290	54435
1983	0	0	0	0	0	0	17987	26981	61488	92232	12030	18045	23710	35565
1984	3492	357	794	8561	4530	13053	0	0	0	0	0	0	0	0
1985	4046	273	2093	9883	3623	16619	0	0	0	0	0	0	0	0
1986	6266	372	3707	11643	4519	20889	0	0	0	0	0	0	0	0
1987	7443	366	2992	9740	4466	22745	0	0	0	0	0	0	0	0
1988	8663	397	4760	12980	4747	19750	0	0	0	0	0	0	0	0
1989	6080	196	2615	11040	2905	18175	0	0	0	0	0	0	0	0
1990	8581	108	3425	12132	2900	16092	0	0	0	0	0	0	0	0
1991	6271	265	3282	11194	4335	16372	0	0	0	0	0	0	0	0
1992	8263	120	3849	12291	4550	15851	0	0	0	0	0	0	0	0
1993	8319	7	3627	9798	3976	11242	0	0	0	0	0	0	0	0
1994	7655	161	3861	10932	4496	10424	0	0	0	0	0	0	0	0
1995	4187	353	3915	7892	6194	10038	0	0	0	0	0	0	0	0
1996	7265	72	4532	9618	6113	7454	0	0	0	0	0	0	0	0
1997	5075	35	3531	6771	4875	7202	0	0	0	0	0	0	0	0
1998	5867	35	1068	4702	4875	1038	0	0	0	0	0	0	0	0
1999	4428	710	814	4407	3683	471	0	0	0	0	0	0	0	0
2000	5553	821	0	4297	3818	0	0	0	0	0	0	0	0	0
2001	4213	770	0	5558	3574	0	0	0	0	0	0	0	0	0
2002	7206	1672	0	2484	3164	0	0	0	0	0	0	0	0	0
2003	4898	972	0	4610	3541	0	0	0	0	0	0	0	0	0
2004	6633	1158	0	4412	3558	0	0	0	0	0	0	0	0	0
2005	3767	909	0	3973	3062	0	0	0	0	0	0	0	0	0
2006	5366	1117	0	3032	3512	0	0	0	0	0	0	0	0	0
2007	3787	869	0	3419	2932	0	0	0	0	0	0	0	0	0
2008	7604	1171	0	3038	2971	0	0	0	0	0	0	0	0	0
2009	3444	1141	0	3338	2752	0	0	0	0	0	0	0	0	0
2010	4917	1057	0	3166	2362	0	0	0	0	0	0	0	0	0
Winbugs labels	QCSportSm[]	QCFnSm[]	QCCmSm[]	QCSportLg[]	QCFnLg[]	QCCmLg[]	QCSm_L[]	QCSm_H[]	QCLg_L[]	QCLg_H[]	QCSSm_L[]	QCSSm_H[]	QCSLg_L[]	QCSLg_H[]

Annex 6.ix. Input data for 2SW salmon returns to Salmon Fishing Areas 15 to 23 for Canada and for USA used in the run reconstruction.

Year of return to rivers	Returns of 2SW: SFA 15 Min	SFA 15 Max	SFA 16 Min	SFA 16 Max	SFA 17 Min	SFA 17 Max	SFA 18 Min	SFA 18 Max	SFA 19-21 Min	SFA 19-21 Max	SFA 23 Min	SFA 23 Max	USA Point estimate
1970	8243	10576	42901	45798	31	60	4744	6836	5600	7447	8540	12674	0
1971	3587	4616	26038	30669	29	29	1891	2782	4120	5215	7155	10536	653
1972	4980	9756	29092	43510	402	402	4693	6024	5744	6993	7869	11368	1383
1973	6211	12009	26599	40492	206	206	4140	5481	6922	8659	4205	6036	1427
1974	7264	14570	39270	60090	386	386	5481	6928	13138	15363	10755	14988	1394
1975	4353	7922	25889	39325	345	345	3452	4340	12261	13797	13107	18578	2331
1976	7293	14416	20448	30758	575	578	2755	3674	8607	10104	14274	20281	1317
1977	9174	18077	49881	73330	606	606	3985	5463	10872	12851	16869	23995	1998
1978	5458	10749	19504	26041	0	0	4585	6265	8272	9779	8225	11294	4208
1979	1472	2535	6501	9306	459	463	1290	2014	3781	4879	5165	7207	1942
1980	7102	14045	35163	48457	1699	1702	3732	5177	14094	17318	19056	26865	5796
1981	4572	7357	11144	19268	257	294	2490	3769	8662	11471	11026	15267	5601
1982	4314	6313	21442	41643	432	447	4135	5901	4458	5353	9782	13871	6056
1983	3453	5280	16349	28419	343	358	3733	5241	4134	5356	9662	13836	2155
1984	3329	6092	12216	31455	59	72	2391	3573	1758	2854	15706	22627	3222
1985	4805	9500	14614	37625	8	15	921	4481	6894	12124	16541	23828	5529
1986	7831	15403	21617	55640	5	11	2274	11479	6755	11878	9891	14261	6176
1987	4836	9123	12524	32224	66	128	2611	8323	3748	6591	6922	10043	3081
1988	7152	13998	14384	36938	96	185	2533	8149	4393	7735	4716	6697	3286
1989	4390	8492	9113	23385	149	287	2108	6867	4808	8469	6560	9437	3197
1990	4326	8369	14269	36639	284	545	1893	6136	3591	6320	5486	7918	5051
1991	2387	4668	14685	37736	188	361	2350	7688	2960	5213	7337	10563	2647
1992	4002	7787	21381	30728	95	183	2374	7648	2633	4634	6878	9809	2459
1993	1395	2684	15579	60246	22	43	1341	4246	2542	4470	4345	4820	2231
1994	3960	7745	13652	24887	169	310	1981	6463	1360	2396	3084	3495	1346
1995	2713	5333	25593	37215	85	154	1498	4919	2253	3969	3439	3998	1748
1996	3917	7754	11126	19117	158	351	3247	10786	3000	5278	4729	5397	2407
1997	2488	4898	8545	14244	31	59	3421	11382	1163	2045	2769	3176	1611
1998	1687	3260	5723	10355	79	151	2055	6835	924	1270	1372	1642	1526
1999	1780	3425	6788	10968	23	45	1557	5267	1419	1951	2375	2640	1168
2000	2270	4410	6913	11496	56	108	1467	5032	1078	1483	988	1206	533
2001	3779	7442	13640	18466	57	110	1689	5790	1822	2506	1938	2279	788
2002	2335	4540	5172	8884	53	103	1228	4238	382	525	483	548	504
2003	3947	7778	10352	16444	91	175	2380	8151	1854	2548	1056	1198	1192
2004	3005	5886	10473	17969	42	80	2639	9101	1028	1413	1335	1605	1283
2005	3422	6725	10327	19602	44	85	2217	7421	662	906	809	1012	984
2006	2551	4973	8868	15612	40	78	2114	7195	1263	1734	922	1171	1023
2007	4267	8422	8927	15149	13	25	1463	5010	603	825	616	736	954
2008	2848	5572	5959	11729	18	34	2189	7686	1793	2465	812	1042	1764
2009	3948	7781	10707	17951	17	32	1378	5210	827	1135	1485	1886	2069
2010	3007	5891	7914	12579	0	1	1726	6427	931	1275	829	992	1078
Winbugs labels	SF15R2_L[]	SF15R2_H[]	SF16R2_L[]	SF16R2_H[]	SF17R2_L[]	SF17R2_H[]	SF18R2_L[]	SF18R2_H[]	SF19_21R2_L[]	SF19_21R2_H[]	SF23R2_L[]	SF23R2_H[]	USAR2[]

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Annex 6.ix. (Continued). Input data for large salmon returns to Salmon Fishing Areas 15 to 23 for Canada and for USA used in the run reconstruction.

Year of return	Returns of large salmon												
	SFA 15		SFA 16		SFA 17		SFA 18		SFA 19-21		SFA 23		USA
to rivers	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Point estimate
1970	12681	16270	46462	49599	31	60	6161	7858	7273	9671	9691	13945	0
1971	5518	7102	28365	33409	29	29	2456	3198	5350	6773	8056	11573	653
1972	8441	16536	30146	45087	402	402	6095	6924	7460	9082	8890	12536	1383
1973	8393	16229	27771	42276	206	206	5376	6299	8049	10069	4760	6638	1427
1974	9950	19959	43249	66179	386	386	7119	7963	13138	15363	12187	16444	1394
1975	5510	10028	29826	45305	345	345	4483	4989	12261	13797	14829	20351	2331
1976	9596	18969	23943	36016	575	578	3578	4223	8873	10416	16128	22175	1317
1977	11053	21779	52673	77434	606	606	5175	6280	14119	16690	19165	26183	1998
1978	7277	14332	22653	30245	0	0	5954	7201	10471	12378	9335	12342	4208
1979	2886	4971	9435	13507	459	463	1676	2315	5180	6684	5856	7903	1942
1980	8768	17340	37014	51008	1699	1702	4846	5951	16388	20137	21464	29480	5796
1981	9729	15652	16708	28887	257	294	3234	4332	11706	15501	12481	16743	5601
1982	7311	10700	26504	51475	432	447	5370	6783	9485	11390	11147	15303	6056
1983	5852	8950	20309	35304	343	358	4848	6024	6562	8501	10908	15235	2155
1984	4214	7711	12941	33321	59	72	3105	4107	2408	3909	17706	24992	3222
1985	7627	15080	16798	43247	8	15	1196	5150	8512	14968	18582	26289	5529
1986	10305	20267	25342	65228	5	11	2953	13195	10722	18854	11142	15761	6176
1987	7556	14255	15734	40483	66	128	3391	9566	5950	10462	7865	11116	3081
1988	9933	19441	17627	45267	96	185	3289	9366	7321	12891	5360	7312	3286
1989	7701	14898	13955	35812	149	287	2738	7894	6969	12275	7393	10380	3197
1990	6362	12307	23164	59479	284	545	2458	7053	6191	10897	6235	8710	5051
1991	4773	9335	24273	62373	188	361	3052	8837	4112	7240	8312	11659	2647
1992	7411	14420	34573	49686	95	183	3083	8790	3657	6437	7749	10726	2459
1993	3487	6711	22602	87407	22	43	1742	4881	3218	5658	5260	5980	2231
1994	6600	12908	18098	32992	169	310	2573	7429	1743	3071	3659	4155	1346
1995	4171	8199	30324	44094	85	154	1946	5654	2532	4460	3728	4289	1748
1996	6026	11929	16317	28035	158	351	4217	12398	3571	6283	5535	6365	2407
1997	3828	7535	14711	24521	31	59	4443	13083	1550	2726	3210	3678	1611
1998	2595	5015	13830	25025	79	151	2669	7856	1359	1867	2032	2437	1526
1999	2738	5269	13948	22537	23	45	2022	6054	1709	2350	2734	3090	1168
2000	3493	6785	14585	24255	56	108	1905	5784	1315	1809	1189	1430	533
2001	5815	11449	21126	28601	57	110	2194	6655	1980	2724	2113	2501	797
2002	3592	6985	10299	17691	53	103	1595	4871	749	1029	639	752	526
2003	6072	11966	17691	28100	91	175	3091	9369	1952	2682	1128	1289	1199
2004	4623	9055	18373	31524	42	80	3427	10461	1302	1789	1402	1698	1316
2005	5265	10346	15529	29477	44	85	2879	8530	860	1177	890	1121	994
2006	3924	7651	17053	30023	40	78	2746	8270	1559	2141	997	1276	1030
2007	6565	12957	15131	25677	13	25	1900	5759	701	959	689	841	958
2008	4382	8572	10642	20944	18	34	2843	8834	1928	2650	858	1105	1799
2009	6074	11970	17270	28953	17	32	1789	5989	1034	1418	1678	2158	2095
2010	4627	9063	15518	24664	0	1	2242	7387	1058	1448	1117	1398	1098
Winbugs labels	SF15Lg_L[]	SF15Lg_H[]	SF16Lg_L[]	SF16Lg_H[]	SF17Lg_L[]	SF17Lg_H[]	SF18Lg_L[]	SF18Lg_H[]	SF19_21Lg_L[]	SF19_21Lg_H[]	SF23Lg_L[]	SF23Lg_H[]	USALg[]

Annex 6.ix. (Continued). Input data for small salmon returns to Salmon Fishing Areas 15 to 23 for Canada and for USA used in the run reconstruction.

Year of return	Returns of small salmon												
	SFA 15		SFA 16		SFA 17		SFA 18		SFA 19-21		SFA 23		USA
to rivers	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Point estimate
1970	2834	6279	47779	67697	0	0	264	1073	16177	24106	5306	7521	0
1971	2113	4681	38388	54120	0	0	65	265	11911	18004	3248	4541	32
1972	2185	4699	48886	69270	0	0	131	530	11587	17992	1831	2506	18
1973	3010	6668	47190	66835	5	9	516	2095	14169	22159	5474	7012	23
1974	2226	4895	78091	110470	0	0	187	757	25032	39058	10195	12901	55
1975	2393	5298	69993	98443	0	0	112	454	10860	15753	18022	23101	84
1976	8667	14696	96504	136107	14	28	299	1212	21071	33009	22835	28864	186
1977	6085	12084	30621	42689	0	0	215	871	24599	37314	13738	16671	75
1978	4350	7749	29783	39927	0	0	78	316	7621	10023	6271	7695	155
1979	4378	9495	50667	70714	2	5	1857	7536	24298	37514	15356	20517	250
1980	7994	15278	41687	58839	12	23	520	2108	34377	50250	25139	31483	818
1981	9380	17119	63278	108226	259	498	2797	11348	31204	48945	16826	21803	1130
1982	6541	13383	78072	133171	175	336	2150	8722	17619	27075	11811	15636	334
1983	2723	4638	24585	41332	17	32	212	858	9313	14068	9270	12592	295
1984	12003	15867	28714	49595	17	32	460	1867	18382	29867	15556	21678	598
1985	7003	15516	53393	92224	113	217	730	3167	24384	39541	13056	17928	392
1986	10813	23926	103230	178295	566	1088	965	3854	24369	39663	14274	20183	758
1987	9630	21220	74485	128644	1141	2194	1646	5713	27269	44266	13358	17662	1128
1988	13168	29092	107071	184904	1542	2963	1381	4833	24509	39750	16381	23084	992
1989	6357	13900	66069	114097	400	770	893	3208	25602	41557	17579	24521	1258
1990	7880	17314	73020	126115	1842	3539	983	3528	29471	48039	13820	19176	687
1991	4441	9828	53453	92327	1576	3028	1160	4166	9762	15955	13041	17685	310
1992	8853	19614	142416	204708	1873	3599	994	3531	13754	22269	13563	18404	1194
1993	5783	12812	70090	175096	1277	2454	1146	3892	13297	21681	7610	8828	466
1994	9136	20208	41773	59888	210	385	671	2425	3154	5393	5770	6610	436
1995	2902	6429	44357	63453	1058	1914	543	1985	8397	13873	8265	9458	213
1996	6034	13370	32067	45995	1161	2576	2431	8958	13120	22293	12907	15256	651
1997	5797	12845	14377	24122	485	932	561	2134	3410	5863	4508	4979	365
1998	6288	13932	20748	30339	635	1221	633	2419	8833	11927	9203	10801	403
1999	4936	10929	21494	29776	379	728	705	2681	3971	5337	5508	6366	419
2000	7459	16520	31320	41911	304	584	615	2428	6155	8312	4796	5453	270
2001	4947	10953	27349	37691	429	824	822	3205	2326	3138	2513	2862	266
2002	11719	25958	41229	56223	361	694	844	3319	5197	7015	3501	3991	450
2003	3119	6904	26849	39932	697	1339	773	3088	2844	3837	2292	2716	237
2004	12091	26783	43549	62480	213	409	1092	4339	3847	5192	3454	4297	319
2005	4117	9116	27065	46189	275	529	781	3015	2870	3871	3597	4640	319
2006	8724	19322	29204	49807	252	484	869	3406	5144	6940	3720	4743	450
2007	4259	9430	21297	41786	47	89	718	2820	4198	5664	2466	3136	297
2008	13601	30129	25722	51775	23	43	1508	6890	7282	9831	5924	7691	814
2009	5169	11445	10800	21456	0	0	363	1889	2066	2788	1603	2027	241
2010	7817	17312	48077	69465	0	0	913	4491	3684	4973	9114	11994	525
Winbugs labels	SF15Sm_L[]	SF15Sm_H[]	SF16Sm_L[]	SF16Sm_H[]	SF17Sm_L[]	SF17Sm_H[]	SF18Sm_L[]	SF18Sm_H[]	SF19_21Sm_L[]	SF19_21Sm_H[]	SF23Sm_L[]	SF23Sm_H[]	USASm[]

Annex 6.ix. (Continued). Input data for 2SW salmon spawners to Salmon Fishing Areas 15 to 23 for Canada and for USA used in the run reconstruction.

Year of return to rivers	Spawners of 2SW												
	SFA 15		SFA 16		SFA 17		SFA 18		SFA 19-21		SFA 23		USA
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Point estimate
1970	1156	3252	5346	8242	18	47	304	1587	2388	4234	1536	4846	0
1971	510	1434	6724	11354	0	0	133	694	1418	2513	3612	6576	490
1972	2367	6656	17031	31450	0	0	148	775	1616	2865	6472	9806	1038
1973	2873	8081	19277	33170	0	0	165	863	2246	3984	2752	4412	1100
1974	3620	10183	31192	52012	0	0	151	790	2878	5103	8123	12046	1147
1975	1769	4975	18536	31972	0	0	91	473	1987	3523	10987	16209	1942
1976	3530	9928	11842	22152	1	4	116	604	1935	3432	10071	15583	1126
1977	4412	12408	30623	54071	0	0	198	1033	2559	4539	12013	18568	643
1978	2622	7375	6998	13535	0	0	223	1166	1948	3455	5346	8076	3314
1979	527	1482	3000	5806	3	7	115	598	1419	2517	3772	5650	1509
1980	3440	9677	17667	30961	1	4	198	1033	4170	7394	12023	19005	4263
1981	1380	3880	2392	10515	36	73	196	1027	3631	6439	3642	7014	4334
1982	991	2786	8418	28619	8	23	253	1322	1158	2053	4475	7939	4643
1983	906	2547	5516	17586	15	30	210	1100	1579	2800	468	3561	1769
1984	2656	5402	11650	30889	13	26	259	1148	1416	2512	12280	18798	2547
1985	4514	9180	14019	37030	8	15	871	4359	6761	11990	11885	18624	4884
1986	7279	14804	20606	54630	5	11	2164	11213	6624	11748	7224	11280	5570
1987	4122	8383	11414	31114	66	128	2534	8136	3676	6519	5628	8597	2781
1988	6582	13386	13801	36355	96	185	2451	7949	4322	7664	3420	5248	3038
1989	3944	8021	8466	22739	149	287	2042	6705	4735	8396	6310	9158	2800
1990	3886	7903	13669	36039	284	545	1829	5982	3530	6260	4926	7292	4356
1991	2193	4460	14200	37251	188	361	2275	7505	2912	5165	6080	9158	2416
1992	3639	7400	20770	30116	95	183	2291	7446	2588	4589	5826	8633	2292
1993	1239	2521	15239	59907	22	43	1296	4136	2493	4421	3291	3654	2065
1994	3639	7401	13418	24653	166	307	1920	6314	1339	2375	2387	2680	1344
1995	2519	5124	25326	36949	81	151	1453	4809	2218	3934	3126	3652	1748
1996	3688	7502	10743	18662	154	347	3166	10590	2946	5224	4009	4585	2407
1997	2316	4710	8106	13754	30	58	3334	11170	1140	2022	2219	2565	1611
1998	1512	3076	5533	10124	76	149	2000	6700	915	1261	1068	1302	1526
1999	1581	3217	6282	10424	20	41	1523	5185	1409	1941	1934	2181	1168
2000	2057	4184	6620	11163	55	107	1438	4962	1072	1477	805	1004	1587
2001	3521	7161	13077	17859	55	107	1654	5704	1812	2497	1699	2008	1491
2002	2120	4312	4937	8615	53	102	1203	4176	378	521	317	356	511
2003	3683	7491	9959	15996	87	171	2333	8036	1834	2528	878	998	1192
2004	2770	5633	10022	17451	41	79	2581	8958	1017	1401	1238	1492	1283
2005	3175	6457	9780	18972	42	83	2162	7286	646	890	726	914	1088
2006	2329	4737	8433	15116	39	76	2062	7068	1248	1720	796	1023	1419
2007	3994	8124	8444	14610	10	22	1431	4931	587	809	530	633	1189
2008	2618	5325	5523	11241	18	34	2131	7546	1778	2450	736	953	2809
2009	3684	7494	10188	17366	16	31	1335	5107	811	1118	1391	1774	2292
2010	2772	5638	7444	12067	0	1	1694	6348	910	1253	726	877	1482
Winbugs labels	SF15S2_L[]	SF15S2_H[]	SF16S2_L[]	SF16S2_H[]	SF17S2_L[]	SF17S2_H[]	SF18S2_L[]	SF18S2_H[]	SF19_21S2_L[]	SF19_21S2_H[]	SF23S2_L[]	SF23S2_H[]	USAS2[]

Annex 6.ix. (Continued). Input data for large salmon spawners to Salmon Fishing Areas 15 to 23 for Canada and for USA used in the run reconstruction.

Year of return to rivers	Spawners of large salmon												
	SFA 15		SFA 16		SFA 17		SFA 18		SFA 19-21		SFA 23		USA
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Point estimate
1970	1779	5003	5790	8926	18	47	395	1824	3101	5499	1451	5705	0
1971	785	2207	7324	12369	0	0	173	797	1841	3264	3888	7405	490
1972	4011	11282	17648	32589	0	0	193	891	2099	3721	7246	10892	1038
1973	3883	10920	20126	34632	0	0	215	992	2612	4632	3050	4928	1100
1974	4960	13949	34352	57282	0	0	196	908	2878	5103	9090	13347	1147
1975	2239	6297	21355	36834	0	0	118	544	1987	3523	12335	17857	1942
1976	4644	13063	13867	25940	1	4	151	694	1995	3538	11183	17230	1126
1977	5315	14949	32337	57097	0	0	257	1187	3324	5895	13452	20470	643
1978	3496	9833	8128	15720	0	0	290	1340	2466	4373	5948	8955	3314
1979	1033	2906	4355	8426	3	7	149	688	1944	3448	4217	6264	1509
1980	4248	11947	18597	32590	1	4	257	1187	4849	8598	13190	21206	4263
1981	2935	8256	3586	15765	36	73	255	1181	4907	8702	3794	8056	4334
1982	1679	4723	10405	35376	8	23	329	1519	2464	4369	4903	9059	4643
1983	1535	4317	6852	21846	15	30	273	1264	2506	4445	92	4419	1769
1984	3362	6838	12341	32721	13	26	337	1320	1940	3441	13675	20961	2547
1985	7164	14571	16114	42563	8	15	1131	5010	8347	14803	13104	20811	4884
1986	9577	19479	24157	64044	5	11	2811	12889	10515	18647	8004	12623	5570
1987	6441	13099	14340	39088	66	128	3291	9352	5835	10347	6343	9594	2781
1988	9141	18592	16913	44553	96	185	3183	9137	7203	12773	3835	5787	3038
1989	6919	14072	12965	34822	149	287	2652	7707	6862	12168	7099	10086	2800
1990	5715	11623	22190	58504	284	545	2376	6876	6087	10793	5576	8051	4356
1991	4386	8920	23472	61572	188	361	2955	8627	4045	7173	6833	10180	2416
1992	6738	13704	33583	48697	95	183	2976	8558	3594	6374	6511	9488	2292
1993	3099	6302	22109	86914	22	43	1683	4754	3156	5596	4026	4746	2065
1994	6065	12334	17787	32682	166	307	2493	7257	1717	3045	2827	3273	1344
1995	3873	7877	30007	43778	81	151	1887	5528	2492	4420	3362	3923	1748
1996	5674	11541	15755	27367	154	347	4112	12173	3507	6219	4688	5497	2407
1997	3563	7247	13955	23677	30	58	4330	12839	1520	2696	2565	3028	1611
1998	2326	4732	13373	24467	76	149	2597	7701	1346	1854	1675	2074	1526
1999	2433	4948	12908	21420	20	41	1979	5960	1697	2338	2251	2601	1168
2000	3165	6437	13968	23551	55	107	1867	5703	1307	1801	975	1216	1587
2001	5417	11018	20254	27661	55	107	2148	6556	1970	2714	1831	2210	1491
2002	3261	6633	9830	17155	53	102	1562	4800	741	1021	442	542	511
2003	5666	11525	17019	27335	87	171	3029	9237	1931	2661	919	1074	1192
2004	4261	8666	17582	30615	41	79	3351	10297	1287	1774	1287	1574	1283
2005	4884	9934	14707	28529	42	83	2807	8374	839	1156	791	1012	1088
2006	3583	7288	16217	29070	39	76	2678	8124	1541	2123	847	1113	1419
2007	6145	12498	14312	24763	10	22	1858	5668	683	941	586	726	1189
2008	4028	8192	9863	20073	18	34	2768	8673	1912	2634	767	1007	2231
2009	5668	11529	16432	28010	16	31	1734	5870	1014	1398	1565	2034	2318
2010	4265	8674	14596	23661	0	1	2200	7296	1034	1424	996	1275	1502
Winbugs labels	SF15SLg_L[]	SF15SLg_H[]	SF16SLg_L[]	SF16SLg_H[]	SF17SLg_L[]	SF17SLg_H[]	SF18SLg_L[]	SF18SLg_H[]	SF19_21SLg_L[]	SF19_21SLg_H[]	SF23SLg_L[]	SF23SLg_H[]	USASLg[]

Annex 6.ix. (Continued). Input data for small salmon spawners to Salmon Fishing Areas 15 to 23 for Canada and for USA used in the run reconstruction.

Year of return to rivers	Spawners of small salmon												
	SFA 15		SFA 16		SFA 17		SFA 18		SFA 19-21		SFA 23		USA
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Point estimate
1970	1417	4396	25958	45876	0	0	167	842	9429	17358	3886	6101	0
1971	1056	3277	22463	38195	0	0	41	208	7246	13339	1216	2509	29
1972	1034	3208	27639	48023	0	0	82	416	7616	14021	0	1	17
1973	1505	4668	31703	51349	3	7	325	1645	9502	17492	4037	5575	13
1974	1098	3405	57376	89755	0	0	118	595	16680	30706	8071	10777	40
1975	1195	3707	50438	78888	0	0	71	357	5819	10712	15363	20442	67
1976	2480	7692	64526	104130	8	22	188	951	14196	26134	17572	23601	151
1977	2467	7653	13270	25338	0	0	135	684	15120	27835	9196	12129	54
1978	1398	4337	14689	24833	0	0	49	248	2857	5259	4256	5680	127
1979	2104	6528	31829	51876	1	4	1170	5915	15716	28932	11640	16801	247
1980	2996	9293	27791	44943	7	18	327	1655	18876	34749	19597	25941	722
1981	3183	9874	35423	80370	151	390	1762	8908	21096	38837	7805	12782	1009
1982	3038	9027	51324	106423	102	263	1354	6847	11244	20700	6532	10357	290
1983	820	2486	13298	30045	10	25	133	674	5653	10408	5132	8454	255
1984	1620	4971	7389	28271	10	25	177	1200	13658	25143	10290	16412	540
1985	3557	10936	32275	71106	66	170	145	1788	18024	33181	8164	13036	363
1986	5589	16990	71918	146983	330	852	63	1729	18187	33481	10725	16634	660
1987	4867	14920	49971	104131	665	1718	527	3075	20213	37210	10257	14561	1087
1988	6664	20468	71967	149800	899	2320	344	2388	18125	33366	13061	19764	923
1989	3191	9741	37696	85724	233	603	232	1650	18973	34928	13124	20066	1080
1990	3996	12190	46902	99996	1074	2771	229	1750	22080	40648	10025	15381	617
1991	2215	6872	39648	78522	919	2371	271	2068	7363	13556	9495	14139	235
1992	4426	13728	116657	178949	1092	2818	189	1634	10125	18640	9485	14326	1124
1993	2891	8968	52050	157056	745	1922	261	1805	9970	18354	5762	6868	444
1994	4554	14125	25649	43764	118	292	179	1266	2661	4900	4965	5738	427
1995	1451	4501	34650	53746	585	1441	148	1055	6512	11988	8025	9218	213
1996	3017	9359	19511	29260	738	2154	1005	5596	10909	20082	11576	13892	651
1997	2899	8991	8702	15524	283	730	203	1290	2917	5370	3971	4433	365
1998	3144	9752	13144	19858	370	956	228	1464	8818	11912	8775	10348	403
1999	2465	7646	12193	17991	221	570	347	1837	3895	5261	5196	6048	419
2000	3727	11560	18415	25829	177	457	314	1717	6148	8305	4455	5087	270
2001	2470	7663	16300	23539	250	645	403	2217	2315	3127	2210	2530	266
2002	5857	18166	26016	36512	210	543	426	2334	5180	6998	3232	3689	450
2003	1557	4829	15950	25108	406	1048	396	2201	2829	3822	2069	2469	237
2004	6043	18744	27641	40892	124	320	496	2934	3833	5178	3229	4039	319
2005	2056	6377	16101	29488	160	414	300	1881	2854	3855	3433	4450	319
2006	4359	13522	18736	33158	147	379	358	2201	5119	6915	3528	4501	450
2007	2127	6597	13201	27544	47	121	326	1894	4176	5642	2305	2937	297
2008	6798	21086	16299	34536	64	165	726	5048	7252	9801	5729	7467	814
2009	2581	8007	5853	13313	0	0	166	1425	2051	2773	1472	1864	241
2010	3905	12114	30474	45446	2	4	540	3612	3674	4963	9032	11901	525
Winbugs labels	SF15SSm_L[]	SF15SSm_H[]	SF16SSm_L[]	SF16SSm_H[]	SF17SSm_L[]	SF17SSm_H[]	SF18SSm_L[]	SF18SSm_H[]	SF19_21SSm_L[]	SF19_21SSm_H[]	SF23SSm_L[]	SF23SSm_H[]	USASSm[]

Annex 6.x. Estimated SMALL salmon returns for the six North American regions and North American total from the run reconstruction model.

Return	Labrador			Newfoundland			Quebec			Gulf			Scotia-Fundy			USA			NAC		
year	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile
1970	49,150	32,910	75,830	135,600	117,600	153,800	23,610	19,140	28,120	62,970	53,120	72,830	26,560	22,420	30,690				298,900	268,700	333,800
1971	64,350	43,000	99,020	118,800	103,200	134,500	18,740	15,160	22,260	49,850	42,110	57,580	18,840	15,790	21,920	32	32	32	271,500	240,200	310,900
1972	48,610	32,500	74,530	110,600	95,410	125,700	15,600	12,630	18,550	62,780	52,990	72,700	16,940	13,880	20,030	18	18	18	255,600	227,600	288,000
1973	13,980	8,946	20,950	159,700	138,900	180,800	20,720	16,790	24,660	63,190	53,370	73,040	24,400	20,440	28,400	23	23	23	282,200	257,000	308,100
1974	53,860	36,040	82,760	120,500	104,500	136,700	20,980	17,000	24,970	98,410	82,880	113,800	43,590	36,590	50,580	55	54	56	338,700	304,000	377,300
1975	103,400	68,840	159,300	150,900	130,000	172,200	22,640	18,290	26,880	88,340	74,710	102,000	33,850	30,000	37,730	84	83	85	400,300	352,300	462,800
1976	73,730	49,310	113,500	158,600	135,800	181,800	24,930	20,210	29,690	128,800	109,400	148,100	52,880	45,780	60,000	186	184	188	440,800	395,200	493,000
1977	65,540	43,880	100,900	159,700	136,800	182,500	22,740	18,420	27,050	46,290	39,190	53,460	46,180	39,710	52,600	75	74	76	341,800	304,700	385,500
1978	32,760	21,970	49,900	139,400	119,000	159,700	21,210	17,170	25,250	41,080	35,660	46,550	15,810	14,290	17,300	155	154	157	251,300	225,300	279,200
1979	42,340	28,140	65,530	152,000	129,900	174,000	27,110	21,950	32,240	72,350	61,350	83,270	48,860	41,480	56,160	250	248	252	344,100	310,900	379,500
1980	95,750	63,610	149,200	172,400	149,200	195,800	37,250	30,150	44,290	63,210	53,460	72,970	70,680	61,800	79,500	818	810	826	441,700	394,200	501,700
1981	105,200	69,650	164,200	225,700	193,300	257,600	52,120	42,170	61,980	106,500	83,490	129,400	59,380	50,100	68,640	1,130	1,119	1,141	552,300	489,400	625,200
1982	73,570	48,670	114,000	200,700	173,300	228,000	29,670	23,990	35,260	121,300	94,320	148,300	36,050	30,760	41,390	334	331	337	463,400	410,200	521,700
1983	45,930	30,570	71,140	156,700	134,700	178,600	22,500	18,220	26,750	37,200	29,120	45,300	22,630	19,470	25,780	295	292	298	286,400	254,400	321,500
1984	24,190	16,160	37,190	206,400	175,300	237,400	26,230	23,590	28,850	54,250	43,890	64,670	42,750	35,820	49,640	598	592	604	355,300	319,000	391,800
1985	43,240	28,780	66,910	195,500	164,100	227,200	28,010	25,150	30,870	86,250	66,550	105,800	47,490	39,390	55,620	392	388	396	402,300	356,900	448,900
1986	65,480	43,410	101,600	200,300	170,400	229,800	40,340	36,840	43,840	161,200	124,300	198,400	49,230	40,740	57,730	758	751	765	519,400	459,100	583,000
1987	82,020	54,130	128,500	135,500	115,600	155,500	45,930	41,560	50,290	122,100	94,920	149,600	51,230	42,520	60,020	1,128	1,117	1,139	440,300	388,300	499,400
1988	75,470	49,850	117,800	217,400	185,300	249,300	53,050	48,300	57,890	172,400	133,400	211,600	51,760	43,140	60,550	992	983	1,001	573,400	508,500	643,100
1989	51,780	34,340	80,230	107,600	92,680	122,700	41,480	37,740	45,180	102,900	79,230	126,400	54,610	45,550	63,740	1,258	1,246	1,270	361,000	321,500	404,100
1990	30,220	20,080	47,060	152,300	135,600	168,900	47,370	43,480	51,250	117,100	90,860	143,300	55,250	45,500	65,020	687	681	694	404,100	365,300	442,900
1991	24,290	15,900	38,010	105,600	94,870	116,400	37,110	34,120	40,120	84,990	65,960	104,000	28,210	24,000	32,420	310	307	313	281,400	254,300	309,100
1992	34,400	23,270	53,200	229,200	195,200	262,600	42,000	38,470	45,510	192,800	162,000	223,600	33,980	28,780	39,240	1,194	1,183	1,205	534,600	483,000	586,600
1993	45,670	32,060	69,760	265,400	230,200	301,000	36,390	33,490	39,310	136,300	86,320	186,300	25,710	21,620	29,800	466	462	470	512,000	442,600	581,500
1994	33,890	24,350	50,260	161,000	135,100	186,800	34,910	32,160	37,660	67,350	55,920	78,850	10,470	9,238	11,690	436	432	440	309,200	277,300	341,900
1995	47,770	34,690	69,850	204,000	168,400	239,700	28,110	25,900	30,310	61,320	51,790	70,830	20,010	17,230	22,760	213	211	215	362,800	321,100	405,800
1996	90,110	65,680	132,300	313,100	261,300	364,400	37,280	34,410	40,120	56,320	47,000	65,610	31,790	27,060	36,520	651	645	657	531,600	469,000	598,200
1997	95,150	71,620	135,500	177,000	155,800	198,000	28,850	26,420	31,290	30,630	24,020	37,180	9,380	8,151	10,600	365	362	369	342,500	306,900	388,700
1998	150,700	100,100	202,400	183,800	169,500	198,100	29,400	26,540	32,240	38,080	31,330	44,860	20,400	18,540	22,240	403	399	407	423,100	367,800	479,200
1999	147,500	97,470	197,200	201,200	183,500	219,100	31,290	28,380	34,140	35,800	30,150	41,500	10,600	9,721	11,460	419	415	423	426,800	370,600	482,700
2000	181,800	120,300	243,500	228,800	214,700	242,800	29,030	25,650	32,420	50,600	42,800	58,280	12,360	11,220	13,500	270	267	273	502,700	437,600	568,200
2001	145,400	96,270	194,700	156,300	146,800	165,800	20,150	18,160	22,120	43,180	36,550	49,640	5,419	4,958	5,878	266	264	269	370,700	319,100	422,300
2002	102,700	64,290	140,900	155,600	141,300	169,900	32,580	29,940	35,200	70,200	58,670	81,630	9,853	8,909	10,800	450	446	454	371,500	326,400	416,400
2003	85,610	50,130	121,000	242,500	231,400	253,600	26,670	24,320	29,030	41,350	34,330	48,340	5,849	5,279	6,406	237	235	239	402,200	362,500	441,700
2004	95,120	71,070	119,000	210,200	189,200	231,000	35,990	32,030	39,980	75,480	62,370	88,660	8,396	7,539	9,247	319	316	322	425,500	388,200	462,700
2005	220,900	163,200	278,300	221,500	169,600	273,900	24,260	21,770	26,740	45,480	35,520	55,490	7,488	6,696	8,283	319	316	322	520,000	435,600	604,900
2006	213,800	136,400	290,700	212,800	191,100	234,400	29,740	27,190	32,280	56,120	43,620	68,490	10,280	9,178	11,370	450	446	454	522,900	438,500	607,100
2007	194,400	135,100	254,200	183,500	154,600	212,700	22,610	20,320	24,890	40,250	29,630	50,770	7,732	6,887	8,579	297	294	300	448,900	377,000	520,500
2008	204,000	146,000	261,600	247,700	218,200	277,000	37,580	34,170	40,990	64,800	47,820	81,740	15,360	13,670	17,040	814	806	822	570,300	498,200	641,800
2009	89,500	40,840	138,300	222,600	190,400	255,000	22,220	20,070	24,350	25,590	18,920	32,240	4,242	3,796	4,691	241	239	243	364,500	300,300	428,800
2010	91,870	57,780	125,900	229,800	199,800	259,600	28,130	25,440	30,790	74,120	61,640	86,580	14,870	13,220	16,540	525	520	530	439,300	388,000	490,700

Annex 6.xi. Estimated SMALL salmon spawners for the six North American regions and North American total from the run reconstruction model.

Return	Labrador			Newfoundland			Quebec			Gulf			Scotia-Fundy			USA			NAC		
year	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile
1970	45,130	28,900	71,820	105,200	87,380	123,200	13,800	11,180	16,430	39,430	29,570	49,080	18,400	14,270	22,530						
1971	60,420	39,070	95,090	92,050	76,580	107,800	11,680	9,449	13,890	32,620	24,950	40,310	12,160	9,108	15,220	29	29	29	209,900	178,700	249,100
1972	45,670	29,560	71,590	86,180	71,070	101,300	10,260	8,316	12,220	40,200	30,390	50,000	10,810	7,780	13,860	17	17	17	194,000	166,300	226,700
1973	6,483	1,454	13,450	124,400	103,700	145,200	13,750	11,120	16,340	45,630	35,940	55,280	18,300	14,320	22,280	13	13	13	208,800	184,000	233,900
1974	51,360	33,530	80,260	93,960	78,000	109,900	12,600	10,190	14,970	76,070	60,780	91,590	33,140	26,140	40,090	40	40	40	268,600	234,600	306,800
1975	99,410	64,870	155,400	117,600	96,870	138,700	14,530	11,750	17,260	67,340	53,740	80,950	26,160	22,300	30,020	67	66	68	326,300	278,400	388,600
1976	68,000	43,590	107,800	124,000	101,100	147,200	16,220	13,140	19,310	89,900	70,820	109,200	40,730	33,680	47,830	151	150	152	340,900	296,300	392,700
1977	60,950	39,280	96,270	125,300	102,500	147,900	15,000	12,160	17,850	24,740	17,910	31,610	32,160	25,700	38,580	54	53	55	259,500	222,700	302,900
1978	30,070	19,280	47,210	110,800	90,440	131,100	14,310	11,590	17,020	22,810	17,460	28,110	9,036	7,519	10,520	127	126	128	188,100	162,100	215,900
1979	38,220	24,020	61,410	120,800	98,860	142,600	19,860	16,060	23,590	49,650	39,020	60,290	36,560	29,150	43,900	247	245	249	266,600	233,500	301,400
1980	91,950	59,810	145,400	136,500	113,300	159,800	26,060	21,070	30,970	43,470	34,140	52,960	49,620	40,740	58,460	722	715	729	349,600	302,700	409,500
1981	100,000	64,460	159,000	178,800	146,400	210,900	38,690	31,340	46,040	70,070	47,520	92,640	40,270	31,020	49,480	1,009	999	1,019	431,200	368,500	504,800
1982	69,460	44,570	109,900	158,900	131,700	186,000	21,110	17,090	25,110	89,130	62,450	116,000	24,430	19,140	29,740	290	287	293	365,400	312,200	422,400
1983	41,560	26,200	66,770	124,200	102,200	146,000	15,050	12,180	17,900	23,730	15,720	31,780	14,840	11,660	17,990	255	253	257	220,800	189,200	255,900
1984	21,260	13,230	34,260	167,100	135,900	198,300	20,380	17,770	23,010	21,890	11,590	32,110	32,780	25,790	39,690	540	535	545	264,600	228,100	301,500
1985	40,140	25,680	63,810	158,900	127,500	190,200	20,110	17,280	22,940	59,960	40,720	79,380	36,220	28,080	44,280	363	360	366	317,000	272,300	363,600
1986	62,020	39,950	98,180	162,800	133,200	192,500	27,690	24,270	31,170	122,400	85,670	159,000	39,560	31,040	48,020	660	654	666	417,200	357,000	479,900
1987	76,650	48,760	123,100	111,000	91,010	131,000	32,780	28,440	37,170	90,080	62,990	116,900	41,150	32,380	49,870	1,087	1,077	1,097	354,900	302,500	413,900
1988	69,950	44,330	112,300	177,600	145,400	209,200	36,380	31,680	41,090	127,500	88,880	165,900	42,170	33,470	50,890	923	914	932	457,100	392,100	525,600
1989	47,100	29,650	75,540	89,170	74,170	104,100	30,710	27,020	34,380	69,610	46,160	93,000	43,540	34,450	52,630	1,080	1,070	1,090	282,700	242,900	325,300
1990	26,920	16,770	43,750	122,300	105,700	139,000	32,810	28,970	36,650	84,360	58,470	110,500	44,060	34,320	53,790	617	611	623	312,100	274,300	351,100
1991	21,960	13,580	35,690	85,120	74,350	95,810	25,220	22,280	28,180	66,540	47,590	85,290	22,280	18,050	26,500	235	233	237	222,300	195,200	249,800
1992	31,630	20,510	50,440	205,200	171,300	239,300	27,340	23,890	30,840	159,900	129,300	190,200	26,280	21,070	31,530	1,124	1,113	1,135	452,800	401,500	505,000
1993	42,980	29,370	67,070	239,300	204,300	275,000	22,020	19,160	24,850	112,400	62,980	162,600	20,460	16,400	24,540	444	440	448	439,600	370,900	510,100
1994	30,970	21,430	47,340	129,600	103,900	155,700	20,730	18,050	23,400	44,950	34,070	55,920	9,129	7,916	10,340	427	423	431	237,100	205,300	269,200
1995	44,950	31,870	67,030	171,200	136,000	206,500	17,710	15,570	19,850	48,710	39,390	58,180	17,870	15,110	20,620	213	211	215	302,000	260,800	344,800
1996	87,170	62,740	129,400	274,800	224,000	326,500	23,180	20,410	25,940	35,330	28,470	42,220	28,180	23,490	32,920	651	645	657	452,100	390,100	518,400
1997	92,560	69,040	132,900	151,800	130,900	172,800	17,970	15,620	20,320	19,310	14,260	24,360	8,349	7,124	9,569	365	362	369	291,600	256,500	337,300
1998	148,200	97,630	199,900	158,400	144,000	172,700	21,180	18,340	24,040	24,450	19,200	29,660	19,930	18,090	21,770	403	399	407	372,700	317,400	428,300
1999	145,000	94,950	194,700	176,400	158,500	194,300	23,730	20,870	26,600	21,620	17,300	25,990	10,200	9,332	11,060	419	415	423	377,400	321,300	433,000
2000	178,500	117,100	240,200	204,700	190,700	218,800	21,080	17,720	24,430	31,090	25,120	37,080	12,010	10,870	13,130	270	267	273	447,700	383,200	512,500
2001	142,800	93,760	192,200	133,500	124,000	143,100	13,680	11,910	15,440	26,730	21,810	31,710	5,092	4,639	5,543	266	264	269	322,100	270,800	373,600
2002	100,100	61,720	138,400	132,900	118,600	147,300	21,350	18,800	23,890	45,040	36,060	53,920	9,548	8,617	10,480	450	446	454	309,400	265,300	353,400
2003	83,000	47,520	118,400	219,600	208,400	230,900	19,320	16,970	21,670	25,740	20,650	30,880	5,594	5,040	6,152	237	235	239	353,300	314,300	392,700
2004	92,720	68,670	116,600	188,400	167,500	209,400	26,330	22,330	30,250	48,580	38,500	58,810	8,140	7,295	8,985	319	316	322	364,500	328,100	401,000
2005	218,200	160,500	275,600	196,900	144,200	249,300	18,290	15,820	20,740	28,330	21,160	35,590	7,297	6,513	8,078	319	316	322	469,500	384,400	553,800
2006	211,600	134,100	288,500	191,000	169,200	212,700	21,590	19,110	24,080	36,400	27,170	45,740	10,030	8,940	11,120	450	446	454	471,200	387,100	554,400
2007	192,100	132,800	251,900	167,600	138,600	196,700	16,700	14,460	18,960	25,910	18,240	33,610	7,528	6,697	8,368	297	294	300	410,200	339,900	481,500
2008	201,500	143,500	259,100	217,600	188,200	246,900	26,710	23,350	30,090	42,380	29,520	55,300	15,130	13,450	16,790	814	806	822	503,900	432,900	574,700
2009	87,950	39,290	136,800	197,200	164,800	229,600	16,210	14,100	18,320	15,670	10,610	20,750	4,077	3,641	4,520	241	239	243	321,300	257,500	385,100
2010	90,090	56,000	124,100	203,000	172,800	233,100	20,550	17,900	23,200	47,980	38,720	57,310	14,780	13,130	16,440	525	520	530	377,000	326,400	427,800

Annex 6.xii. Estimated LARGE salmon returns for the six North American regions and North American total from the run reconstruction model.

Return	Labrador			Newfoundland			Quebec			Gulf			Scotia-Fundy			USA			NAC		
year	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile
1970	10,070	4,624	17,880	14,870	11,300	18,370	103,200	83,680	123,000	69,570	66,760	72,360	20,290	17,680	22,900				218,400	195,700	241,600
1971	14,450	6,601	25,590	12,570	9,556	15,550	59,230	47,950	70,450	40,060	37,340	42,770	15,870	13,900	17,840	653	647	659	143,200	126,400	160,900
1972	12,370	5,655	22,000	12,650	9,680	15,660	77,300	62,560	91,900	57,050	48,010	66,050	18,990	16,900	21,070	1,383	1,370	1,396	180,000	158,700	201,700
1973	17,330	7,929	30,620	17,330	13,130	21,500	85,130	69,010	101,400	53,450	44,620	62,130	14,750	13,250	16,270	1,427	1,413	1,441	189,800	165,800	214,800
1974	17,060	7,771	30,410	14,270	12,420	16,110	114,300	92,590	136,000	77,570	64,600	90,640	28,560	26,020	31,130	1,394	1,381	1,407	253,700	222,800	284,900
1975	15,950	7,299	28,290	18,390	15,740	21,070	97,090	78,630	115,500	50,360	42,260	58,530	30,610	27,730	33,490	2,331	2,309	2,353	215,200	189,600	241,000
1976	18,310	8,418	32,360	16,640	14,290	19,000	96,500	78,170	114,900	48,810	40,370	57,150	28,810	25,680	31,910	1,317	1,304	1,330	210,900	184,800	237,800
1977	16,230	7,418	28,800	14,590	12,680	16,530	113,600	92,100	135,300	87,870	73,710	102,000	38,050	34,230	41,900	1,998	1,979	2,017	273,000	241,600	304,700
1978	12,750	5,859	22,510	11,340	10,190	12,500	102,300	82,960	121,900	43,830	38,110	49,590	22,270	20,360	24,180	4,208	4,168	4,248	197,100	173,300	221,300
1979	7,253	3,326	12,840	7,196	6,162	8,243	56,510	45,760	67,230	17,850	15,410	20,310	12,810	11,420	14,200	1,942	1,924	1,960	103,700	90,790	117,100
1980	17,350	7,935	30,860	12,050	10,960	13,150	134,300	108,700	159,800	64,170	55,310	73,070	43,720	39,080	48,370	5,796	5,741	5,851	278,100	245,700	310,600
1981	15,650	7,179	27,640	28,860	24,730	33,000	105,500	85,520	125,600	39,560	32,380	46,740	28,220	25,100	31,340	5,601	5,548	5,654	223,900	197,300	250,900
1982	11,600	5,297	20,550	11,600	9,926	13,290	93,710	75,830	111,300	54,460	42,320	66,650	23,670	21,280	26,060	6,056	5,999	6,114	201,500	175,100	227,700
1983	8,395	3,836	14,850	12,450	11,090	13,820	76,930	62,270	91,450	40,980	33,450	48,550	20,600	18,130	23,090	2,155	2,135	2,175	161,800	142,200	181,400
1984	6,002	2,753	10,620	12,380	8,608	16,140	71,130	67,100	75,170	32,740	22,680	42,870	24,510	20,860	28,160	3,222	3,191	3,253	150,100	136,400	164,100
1985	4,742	2,164	8,358	10,950	7,178	14,660	73,550	68,580	78,560	44,630	30,570	58,610	34,160	28,690	39,680	5,529	5,477	5,581	173,700	156,200	191,100
1986	8,157	3,728	14,390	12,300	8,948	15,610	87,490	82,140	92,950	68,550	46,950	90,110	28,230	23,220	33,250	6,176	6,117	6,235	211,100	186,600	235,800
1987	11,020	5,063	19,550	8,432	6,118	10,780	82,940	77,930	87,890	45,610	32,150	59,000	17,700	14,660	20,710	3,081	3,052	3,110	169,200	151,700	186,900
1988	6,851	3,157	12,220	12,980	9,359	16,600	90,600	84,540	96,500	52,680	37,280	68,050	16,440	13,430	19,470	3,286	3,255	3,317	183,100	164,500	201,500
1989	6,638	3,048	11,760	6,918	5,092	8,708	81,310	76,510	86,160	41,720	29,600	53,890	18,510	15,250	21,760	3,197	3,167	3,227	158,500	143,600	173,500
1990	3,853	1,751	6,796	10,270	8,014	12,540	79,880	74,480	85,330	55,960	37,670	74,020	16,000	13,200	18,850	5,051	5,003	5,099	171,000	150,800	191,300
1991	1,872	858	3,304	7,557	5,912	9,216	73,660	68,860	78,510	56,600	37,640	75,460	15,650	13,150	18,190	2,647	2,622	2,672	158,000	137,700	178,400
1992	7,520	3,734	13,400	31,550	20,600	42,500	74,110	69,070	79,130	59,100	49,780	68,530	14,290	12,040	16,520	2,459	2,436	2,482	189,300	172,600	206,200
1993	9,445	5,618	15,890	17,100	13,250	20,970	57,200	54,410	59,960	63,320	32,520	94,240	10,070	8,769	11,350	2,231	2,210	2,252	159,800	127,100	192,300
1994	12,940	8,072	21,360	17,340	13,250	21,540	58,140	55,390	60,900	40,540	31,630	49,410	6,315	5,583	7,041	1,346	1,333	1,359	137,100	124,600	150,400
1995	25,610	17,300	39,410	19,060	13,960	24,180	67,070	64,010	70,180	47,350	39,740	54,910	7,508	6,496	8,513	1,748	1,731	1,765	168,900	154,500	185,700
1996	18,850	12,820	29,060	28,920	22,840	34,900	61,120	57,860	64,390	39,700	31,240	48,200	10,880	9,437	12,310	2,407	2,384	2,430	162,400	148,800	177,100
1997	16,230	11,160	24,780	27,970	22,030	33,970	50,320	47,650	53,000	34,120	26,590	41,540	5,581	4,926	6,237	1,611	1,596	1,626	136,300	124,200	149,300
1998	13,410	7,681	19,180	35,310	26,160	44,390	38,490	35,980	41,010	28,660	22,010	35,250	3,847	3,495	4,201	1,526	1,511	1,541	121,300	107,400	135,100
1999	16,100	9,187	22,970	32,090	23,950	40,240	40,490	37,750	43,250	26,340	21,100	31,540	4,941	4,549	5,335	1,168	1,157	1,179	121,100	108,000	134,400
2000	22,020	12,540	31,330	26,980	22,250	31,730	38,910	35,440	42,370	28,430	22,700	34,250	2,873	2,581	3,161	533	528	538	119,700	106,000	133,300
2001	23,230	13,250	33,170	17,860	14,690	21,020	40,700	37,210	44,250	37,990	32,280	43,720	4,658	4,214	5,102	797	789	805	125,200	111,900	138,600
2002	16,930	9,477	24,370	16,820	13,130	20,460	29,200	26,450	31,950	22,570	17,880	27,300	1,584	1,428	1,741	526	521	531	87,620	76,720	98,390
2003	14,190	7,038	21,330	24,440	18,610	30,310	45,430	41,590	49,300	38,280	30,770	45,690	3,527	3,156	3,897	1,199	1,188	1,210	127,100	113,600	140,400
2004	17,040	11,260	22,780	22,180	16,090	28,230	39,660	36,590	42,720	38,870	30,400	47,140	3,096	2,791	3,402	1,316	1,304	1,329	122,100	109,100	135,000
2005	20,970	11,660	30,310	28,420	19,270	37,590	38,300	35,510	41,030	36,120	27,680	44,550	2,024	1,811	2,239	994	985	1,003	126,800	109,700	144,100
2006	21,090	12,860	29,330	35,720	29,030	42,430	35,850	33,160	38,550	34,920	27,220	42,560	2,987	2,646	3,328	1,030	1,020	1,040	131,500	117,100	146,100
2007	21,860	12,380	31,440	29,570	22,460	36,790	32,760	30,180	35,330	33,990	27,000	41,000	1,594	1,434	1,755	958	949	967	120,800	105,700	135,900
2008	26,160	15,260	37,090	28,860	21,590	36,150	38,660	34,980	42,370	28,100	21,270	35,040	3,271	2,883	3,660	1,799	1,782	1,816	126,900	110,300	143,500
2009	39,510	19,690	59,040	34,350	22,390	46,450	37,640	34,750	40,520	36,000	28,660	43,390	3,144	2,810	3,476	2,095	2,075	2,115	152,700	126,500	179,200
2010	13,800	7,820	19,780	16,780	15,010	18,570	40,350	37,370	43,360	31,750	25,530	37,950	2,512	2,249	2,773	1,098	1,088	1,108	106,300	96,190	116,500

Annex 6.xiii. Estimated LARGE salmon spawners for the six North American regions and North American total from the run reconstruction model.

Return	Labrador			Newfoundland			Quebec			Gulf			Scotia-Fundy			USA			NAC		
year	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile
1970	9,512	4,062	17,320	12,730	9,186	16,290	39,090	31,680	46,560	11,910	9,295	14,480	7,892	5,258	10,490						
1971	13,970	6,115	25,100	10,970	7,965	13,960	20,240	16,400	24,080	11,820	9,149	14,500	8,206	6,226	10,160	490	485	495	65,830	54,770	78,960
1972	11,950	5,231	21,570	11,280	8,254	14,250	39,630	32,130	47,190	33,290	24,540	42,060	11,970	9,874	14,060	1,038	1,028	1,048	109,500	93,570	126,000
1973	16,320	6,920	29,610	15,430	11,250	19,570	40,260	32,690	48,010	35,370	26,860	43,890	7,615	6,103	9,120	1,100	1,090	1,110	116,500	98,710	135,700
1974	16,260	6,968	29,610	13,050	11,190	14,900	49,050	39,760	58,380	55,780	43,040	68,540	15,220	12,650	17,780	1,147	1,136	1,158	150,900	129,500	173,400
1975	15,620	6,972	27,960	17,150	14,480	19,830	40,780	33,030	48,520	33,730	25,660	41,690	17,870	14,980	20,730	1,942	1,924	1,960	127,400	110,300	145,800
1976	17,480	7,588	31,530	15,600	13,240	17,940	38,790	31,410	46,170	29,140	21,170	37,220	16,970	13,860	20,080	1,126	1,115	1,137	119,500	101,900	138,700
1977	14,950	6,132	27,510	11,840	9,933	13,780	55,860	45,200	66,440	55,600	41,850	69,310	21,560	17,720	25,420	643	637	649	161,000	137,900	184,600
1978	11,990	5,092	21,740	9,782	8,619	10,930	51,140	41,460	60,890	19,400	13,920	24,860	10,880	8,955	12,820	3,314	3,282	3,346	106,900	91,490	123,000
1979	6,644	2,717	12,230	6,645	5,584	7,682	21,940	17,760	26,110	8,774	6,398	11,160	7,940	6,556	9,325	1,509	1,495	1,523	53,630	46,110	61,750
1980	16,460	7,046	29,970	10,130	9,033	11,230	61,050	49,350	72,500	34,430	25,920	42,960	23,890	19,240	28,600	4,263	4,223	4,303	150,700	129,800	172,500
1981	15,130	6,659	27,120	27,480	23,370	31,610	44,770	36,260	53,250	16,070	9,090	23,010	12,730	9,616	15,880	4,334	4,293	4,375	120,900	103,700	139,200
1982	10,980	4,676	19,930	10,340	8,682	12,030	45,390	36,770	53,950	26,980	14,970	39,080	10,400	8,009	12,810	4,643	4,599	4,687	109,100	89,850	128,700
1983	7,967	3,408	14,420	11,070	9,711	12,440	29,610	24,020	35,260	18,010	10,580	25,570	5,714	3,244	8,222	1,769	1,752	1,786	74,380	61,810	87,290
1984	5,492	2,243	10,110	11,880	8,121	15,640	37,070	33,590	40,560	28,510	18,410	38,570	20,020	16,350	23,660	2,547	2,523	2,571	105,700	92,190	119,300
1985	4,448	1,870	8,064	10,920	7,165	14,660	35,450	31,010	39,900	43,260	29,280	57,260	28,490	23,050	34,040	4,884	4,838	4,930	127,700	110,400	144,900
1986	7,690	3,261	13,920	12,220	8,889	15,550	40,610	35,960	45,290	66,610	44,950	88,070	24,920	19,890	29,900	5,570	5,517	5,623	157,900	133,500	182,100
1987	10,390	4,430	18,920	8,398	6,070	10,720	36,050	32,060	40,060	42,840	29,400	56,360	16,070	13,030	19,070	2,781	2,755	2,807	116,900	99,810	134,400
1988	6,141	2,447	11,510	12,920	9,307	16,530	43,160	37,890	48,400	50,860	35,510	66,320	14,810	11,770	17,830	3,038	3,009	3,067	131,200	112,900	149,600
1989	6,177	2,587	11,300	6,889	5,093	8,691	41,110	36,860	45,350	39,800	27,730	51,890	18,110	14,850	21,360	2,800	2,773	2,827	115,000	100,400	129,800
1990	3,496	1,394	6,439	10,220	7,978	12,490	40,930	36,000	45,810	54,080	35,920	72,170	15,250	12,440	18,080	4,356	4,315	4,397	128,500	108,300	148,500
1991	1,779	765	3,211	7,542	5,878	9,187	33,040	28,940	37,170	55,340	36,390	74,110	14,120	11,610	16,630	2,416	2,393	2,439	114,200	94,050	134,400
1992	6,738	2,952	12,620	31,470	20,570	42,310	32,360	28,090	36,630	57,320	47,920	66,650	12,990	10,730	15,230	2,292	2,270	2,314	143,400	126,900	160,000
1993	9,058	5,231	15,500	16,940	13,060	20,850	24,940	22,860	27,030	62,480	31,640	93,300	8,762	7,476	10,040	2,065	2,045	2,085	124,700	92,330	157,200
1994	12,450	7,582	20,870	16,910	12,800	21,020	24,460	22,440	26,500	39,560	30,610	48,500	5,428	4,712	6,149	1,344	1,331	1,357	100,700	88,190	113,800
1995	25,150	16,840	38,960	18,590	13,490	23,690	34,610	32,380	36,860	46,580	38,940	54,240	7,103	6,086	8,113	1,748	1,731	1,765	134,300	120,100	151,000
1996	18,470	12,430	28,680	28,350	22,310	34,360	30,050	27,500	32,580	38,550	30,150	46,850	9,957	8,533	11,380	2,407	2,384	2,430	128,300	115,000	142,900
1997	16,020	10,950	24,560	27,580	21,640	33,550	24,820	22,750	26,880	32,850	25,540	40,270	4,903	4,250	5,559	1,611	1,596	1,626	108,200	96,450	121,000
1998	13,100	7,368	18,870	34,910	25,800	43,950	23,050	20,980	25,080	27,700	21,130	34,260	3,474	3,121	3,827	1,526	1,511	1,541	103,800	90,150	117,500
1999	15,690	8,773	22,560	31,800	23,660	39,900	27,930	25,380	30,450	24,850	19,680	30,020	4,441	4,050	4,832	1,168	1,157	1,179	105,900	92,640	119,000
2000	21,610	12,140	30,930	26,480	21,750	31,220	26,710	23,450	29,990	27,410	21,700	33,140	2,650	2,359	2,940	1,587	1,572	1,602	106,500	92,900	119,800
2001	22,750	12,770	32,690	17,470	14,380	20,610	27,470	24,520	30,430	36,590	30,950	42,270	4,360	3,919	4,804	1,491	1,477	1,505	110,100	97,030	123,400
2002	16,630	9,172	24,060	16,520	12,890	20,160	20,710	18,180	23,270	21,680	17,030	26,390	1,373	1,220	1,525	511	506	516	77,440	66,700	88,210
2003	13,840	6,683	20,980	24,140	18,260	29,970	33,760	30,090	37,440	37,020	29,690	44,340	3,295	2,925	3,659	1,192	1,181	1,203	113,200	99,850	126,500
2004	16,630	10,850	22,370	21,810	15,750	27,850	28,130	25,280	30,970	37,410	29,140	45,720	2,962	2,656	3,264	1,283	1,271	1,295	108,300	95,210	121,200
2005	20,550	11,240	29,890	27,860	18,800	37,030	28,080	25,520	30,700	34,670	26,310	43,060	1,898	1,687	2,108	1,088	1,078	1,098	114,200	97,210	131,200
2006	20,750	12,520	28,990	35,250	28,530	41,960	26,060	23,610	28,550	33,550	25,900	41,140	2,812	2,478	3,149	1,419	1,406	1,432	119,800	105,500	134,200
2007	21,500	12,020	31,080	29,250	22,180	36,460	23,560	21,160	25,960	32,590	25,710	39,560	1,468	1,311	1,624	1,189	1,178	1,200	109,600	94,440	124,700
2008	25,820	14,920	36,740	28,300	21,050	35,590	29,830	26,290	33,400	26,820	20,040	33,630	3,161	2,771	3,549	2,231	2,210	2,252	116,100	99,770	132,600
2009	39,170	19,340	58,700	34,140	22,160	46,130	28,720	25,940	31,470	34,680	27,300	41,920	3,004	2,675	3,339	2,318	2,296	2,340	142,100	115,300	168,500
2010	13,500	7,518	19,480	16,340	14,560	18,110	32,300	29,370	35,230	30,370	24,200	36,490	2,364	2,103	2,626	1,502	1,488	1,516	96,390	86,310	106,400

Annex 6.xiv. Estimated 2SW salmon returns for the six North American regions and North American total from the run reconstruction model.

Return	Labrador			Newfoundland			Quebec			Gulf			Scotia-Fundy			USA			NAC		
year	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile
1970	10,070	4,624	17,880	4,127	2,930	5,339	75,350	61,090	89,770	59,580	57,210	61,940	17,130	14,750	19,510				166,700	149,100	184,500
1971	14,450	6,601	25,590	3,581	2,462	4,707	43,240	35,010	51,430	34,830	32,400	37,240	13,510	11,710	15,330	653	647	659	110,600	96,610	125,800
1972	12,370	5,655	22,000	3,729	2,571	4,898	56,430	45,670	67,090	49,500	41,640	57,210	15,990	14,080	17,880	1,383	1,370	1,396	139,700	122,000	157,600
1973	17,330	7,929	30,620	4,614	3,284	5,959	62,150	50,380	74,010	47,630	39,790	55,580	12,900	11,520	14,300	1,427	1,413	1,441	146,400	126,500	167,600
1974	17,060	7,771	30,410	3,642	2,755	4,541	83,450	67,590	99,280	67,170	55,810	78,580	27,110	24,570	29,670	1,394	1,381	1,407	200,300	175,100	226,400
1975	15,950	7,299	28,290	5,195	3,709	6,693	70,870	57,400	84,330	43,020	36,050	49,920	28,880	26,010	31,720	2,331	2,309	2,353	166,700	145,700	188,100
1976	18,310	8,418	32,360	4,362	3,175	5,538	70,450	57,060	83,880	40,250	33,440	47,030	26,620	23,540	29,710	1,317	1,304	1,330	161,800	140,600	184,400
1977	16,230	7,418	28,800	3,546	2,750	4,351	82,940	67,230	98,800	80,500	67,570	93,550	32,320	28,560	36,020	1,998	1,979	2,017	218,200	192,000	244,800
1978	12,750	5,859	22,510	3,586	2,843	4,335	74,680	60,560	89,010	36,300	31,600	40,970	18,780	16,980	20,590	4,208	4,168	4,248	150,700	132,000	170,200
1979	7,253	3,326	12,840	1,741	1,281	2,199	41,260	33,410	49,080	12,010	10,390	13,630	10,530	9,280	11,750	1,942	1,924	1,960	74,950	64,720	85,540
1980	17,350	7,935	30,860	3,898	3,102	4,700	98,040	79,380	116,700	58,510	50,540	66,490	38,630	34,270	43,050	5,796	5,741	5,851	222,800	196,700	249,500
1981	15,650	7,179	27,640	7,028	5,255	8,805	77,040	62,430	91,680	24,560	20,110	29,030	23,220	20,460	25,970	5,601	5,548	5,654	153,600	132,900	174,900
1982	11,600	5,297	20,550	3,163	2,425	3,907	68,410	55,350	81,280	42,220	32,550	52,070	16,730	14,670	18,800	6,056	5,999	6,114	148,500	127,700	169,600
1983	8,395	3,836	14,850	3,705	2,926	4,474	56,160	45,460	66,760	31,590	25,570	37,580	16,500	14,300	18,690	2,155	2,135	2,175	118,700	103,300	134,300
1984	6,002	2,753	10,620	3,364	2,292	4,432	51,920	48,990	54,880	29,620	20,220	38,990	21,460	18,080	24,860	3,222	3,191	3,253	115,700	103,500	128,100
1985	4,742	2,164	8,358	2,745	1,784	3,705	53,690	50,060	57,350	36,030	24,240	47,770	29,680	24,800	34,550	5,529	5,477	5,581	132,600	118,100	147,000
1986	8,157	3,728	14,390	3,252	2,237	4,274	63,870	59,960	67,850	57,140	38,770	75,540	21,400	17,690	25,090	6,176	6,117	6,235	160,200	139,700	180,900
1987	11,020	5,063	19,550	2,353	1,557	3,146	60,550	56,890	64,160	34,920	24,260	45,600	13,640	11,330	15,960	3,081	3,052	3,110	125,900	111,500	140,900
1988	6,851	3,157	12,220	3,429	2,285	4,566	66,140	61,710	70,450	41,720	29,280	54,090	11,770	9,677	13,850	3,286	3,255	3,317	133,400	118,700	148,300
1989	6,638	3,048	11,760	1,686	1,168	2,199	59,350	55,860	62,900	27,480	19,340	35,550	14,620	12,090	17,170	3,197	3,167	3,227	113,200	102,500	124,000
1990	3,853	1,751	6,796	2,686	1,899	3,480	58,310	54,370	62,290	36,230	24,760	47,640	11,660	9,661	13,680	5,051	5,003	5,099	117,900	104,800	131,200
1991	1,872	858	3,304	2,058	1,487	2,621	53,770	50,270	57,310	35,080	23,270	46,830	13,050	10,910	15,170	2,647	2,622	2,672	108,500	95,540	121,500
1992	7,520	3,734	13,400	8,161	4,997	11,330	54,100	50,420	57,760	37,100	30,880	43,260	11,970	10,050	13,900	2,459	2,436	2,482	121,600	111,800	131,700
1993	9,445	5,618	15,890	4,365	3,054	5,665	41,760	39,720	43,770	42,690	21,510	64,060	8,087	7,101	9,074	2,231	2,210	2,252	109,100	86,280	131,900
1994	12,940	8,072	21,360	4,048	2,751	5,336	42,440	40,430	44,460	29,580	22,960	36,320	5,169	4,593	5,744	1,346	1,333	1,359	95,940	86,210	107,100
1995	25,610	17,300	39,410	3,859	2,396	5,300	48,960	46,730	51,230	38,760	32,440	45,060	6,825	5,909	7,746	1,748	1,731	1,765	126,100	114,000	141,600
1996	18,850	12,820	29,060	5,662	3,828	7,509	44,620	42,240	47,000	28,190	21,840	34,640	9,198	8,002	10,400	2,407	2,384	2,430	109,400	99,010	121,700
1997	16,230	11,160	24,780	6,023	4,021	8,021	36,740	34,790	38,690	22,530	17,070	28,010	4,577	4,064	5,088	1,611	1,596	1,626	88,060	79,160	98,500
1998	8,763	4,988	12,880	6,458	4,219	8,677	28,090	26,260	29,940	15,100	11,310	18,840	2,605	2,362	2,843	1,526	1,511	1,541	62,570	56,050	69,170
1999	10,520	5,941	15,430	6,292	4,078	8,470	29,560	27,560	31,580	14,930	11,710	18,110	4,192	3,878	4,509	1,168	1,157	1,179	66,650	59,850	73,540
2000	14,360	8,134	21,070	6,369	4,318	8,417	28,400	25,870	30,930	15,880	12,480	19,280	2,378	2,133	2,622	533	528	538	67,930	59,510	76,470
2001	15,190	8,600	22,290	2,499	1,597	3,406	29,710	27,160	32,300	25,460	21,370	29,540	4,273	3,868	4,676	788	781	796	77,910	69,110	87,010
2002	11,070	6,156	16,370	2,426	1,495	3,346	21,310	19,310	23,320	13,290	10,360	16,200	969	887	1,052	504	499	509	49,540	42,930	56,320
2003	9,273	4,582	14,320	3,380	2,073	4,673	33,170	30,360	35,990	24,670	19,540	29,760	3,330	2,980	3,676	1,192	1,181	1,203	75,020	66,870	83,340
2004	11,120	7,252	15,360	3,309	1,925	4,713	28,950	26,710	31,190	24,580	18,920	30,250	2,690	2,435	2,944	1,283	1,271	1,295	71,980	64,190	79,830
2005	13,700	7,571	20,350	4,408	2,324	6,507	27,960	25,920	29,960	24,950	18,910	30,970	1,694	1,521	1,867	984	975	993	73,690	63,810	83,670
2006	13,760	8,311	19,710	5,359	3,342	7,394	26,170	24,210	28,140	20,710	15,890	25,500	2,545	2,259	2,830	1,023	1,013	1,033	69,610	61,180	78,190
2007	14,290	8,040	21,100	4,160	2,446	5,866	23,920	22,030	25,790	21,630	17,050	26,210	1,391	1,255	1,524	954	945	963	66,310	57,530	75,330
2008	17,090	9,878	24,900	3,882	2,270	5,496	28,220	25,540	30,930	18,010	13,380	22,670	3,057	2,691	3,420	1,764	1,747	1,781	72,030	62,150	82,080
2009	25,630	12,750	39,090	4,606	2,542	6,702	27,480	25,370	29,580	23,530	18,600	28,440	2,668	2,391	2,943	2,069	2,049	2,089	85,990	70,990	101,200
2010	8,961	5,043	13,150	2,207	1,586	2,827	29,450	27,280	31,650	18,780	14,730	22,790	2,013	1,813	2,213	1,078	1,068	1,088	62,470	55,940	69,050

Annex 6.xv. Estimated 2SW salmon spawners for the six North American regions and North American total from the run reconstruction model.

Return	Labrador			Newfoundland			Quebec			Gulf			Scotia-Fundy			USA			NAC		
year	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile	Median	2.5%ile	97.5%ile
1970	9,512	4,062	17,320	3,239	2,161	4,314	28,530	23,130	33,990	9,985	7,890	12,050	6,499	4,474	8,515						
1971	13,970	6,115	25,100	2,976	1,942	4,020	14,780	11,970	17,580	10,410	8,078	12,750	7,070	5,442	8,689	490	485	495	49,760	39,920	61,960
1972	11,950	5,231	21,570	3,144	2,066	4,213	28,930	23,450	34,450	29,230	21,610	36,830	10,390	8,551	12,210	1,038	1,028	1,048	84,970	71,050	99,650
1973	16,320	6,920	29,610	3,838	2,608	5,072	29,390	23,860	35,050	32,190	24,560	39,900	6,702	5,374	8,015	1,100	1,090	1,110	89,890	74,340	107,300
1974	16,260	6,968	29,610	3,135	2,323	3,959	35,800	29,020	42,620	48,910	37,870	60,070	14,080	11,660	16,490	1,147	1,136	1,158	119,800	100,900	139,900
1975	15,620	6,972	27,960	4,701	3,280	6,112	29,770	24,110	35,420	28,900	22,040	35,740	16,370	13,620	19,090	1,942	1,924	1,960	97,600	82,520	114,100
1976	17,480	7,588	31,530	3,979	2,861	5,110	28,320	22,930	33,700	24,070	17,510	30,590	15,510	12,660	18,380	1,126	1,115	1,137	90,820	75,440	108,200
1977	14,950	6,132	27,510	2,770	2,092	3,457	40,780	33,000	48,500	51,340	38,710	64,050	18,850	15,380	22,280	643	637	649	129,800	109,500	150,900
1978	11,990	5,092	21,740	3,052	2,390	3,711	37,330	30,270	44,450	15,980	11,530	20,380	9,412	7,739	11,080	3,314	3,282	3,346	81,340	68,490	95,180
1979	6,644	2,717	12,230	1,617	1,178	2,057	16,020	12,970	19,060	5,762	4,235	7,317	6,686	5,511	7,842	1,509	1,495	1,523	38,390	32,150	45,440
1980	16,460	7,046	29,970	3,261	2,564	3,962	44,570	36,030	52,920	31,510	23,770	39,240	21,280	17,240	25,340	4,263	4,223	4,303	121,600	103,700	141,000
1981	15,130	6,659	27,120	6,584	4,879	8,301	32,680	26,470	38,880	9,741	5,432	14,070	10,360	7,946	12,760	4,334	4,293	4,375	79,010	65,480	94,530
1982	10,980	4,676	19,930	2,770	2,075	3,456	33,130	26,840	39,380	21,140	11,560	30,900	7,795	6,026	9,590	4,643	4,599	4,687	80,770	65,030	97,170
1983	7,967	3,408	14,420	3,281	2,562	4,001	21,620	17,530	25,740	13,950	8,043	19,850	4,202	2,482	5,926	1,769	1,752	1,786	53,010	42,660	63,820
1984	5,492	2,243	10,110	3,176	2,132	4,216	27,060	24,520	29,610	25,970	16,620	35,410	17,500	14,310	20,710	2,547	2,523	2,571	82,000	69,980	94,100
1985	4,448	1,870	8,064	2,725	1,766	3,684	25,880	22,640	29,130	35,010	23,260	46,730	24,640	19,980	29,290	4,884	4,838	4,930	97,690	83,570	112,000
1986	7,690	3,261	13,920	3,219	2,205	4,248	29,650	26,250	33,060	55,220	37,180	73,580	18,450	14,860	22,020	5,570	5,517	5,623	120,100	99,870	140,700
1987	10,390	4,430	18,920	2,335	1,532	3,127	26,320	23,410	29,250	32,890	22,330	43,600	12,210	9,955	14,470	2,781	2,755	2,807	87,310	73,150	102,200
1988	6,141	2,447	11,510	3,412	2,275	4,552	31,510	27,660	35,330	40,490	28,050	52,840	10,320	8,311	12,340	3,038	3,009	3,067	95,160	80,570	109,700
1989	6,177	2,587	11,300	1,680	1,166	2,195	30,010	26,910	33,100	26,190	18,120	34,220	14,300	11,770	16,830	2,800	2,773	2,827	81,340	70,880	92,070
1990	3,496	1,394	6,439	2,667	1,890	3,456	29,880	26,280	33,440	35,140	23,640	46,510	11,010	9,034	13,000	4,356	4,315	4,397	86,680	73,640	99,690
1991	1,779	765	3,211	2,045	1,484	2,613	24,120	21,130	27,140	34,250	22,480	45,980	11,650	9,577	13,730	2,416	2,393	2,439	76,290	63,600	89,060
1992	6,738	2,952	12,620	8,113	4,964	11,290	23,620	20,510	26,740	35,960	29,860	42,130	10,820	8,933	12,700	2,292	2,270	2,314	87,800	78,280	97,830
1993	9,058	5,231	15,500	4,301	3,002	5,605	18,210	16,690	19,730	42,150	20,920	63,400	6,921	5,971	7,887	2,065	2,045	2,085	83,110	60,410	106,000
1994	12,450	7,582	20,870	3,890	2,623	5,146	17,860	16,380	19,350	28,880	22,240	35,590	4,389	3,851	4,928	1,344	1,331	1,357	69,270	59,700	80,210
1995	25,150	16,840	38,960	3,708	2,278	5,132	25,270	23,640	26,910	38,200	31,910	44,520	6,465	5,557	7,374	1,748	1,731	1,765	100,900	88,960	116,200
1996	18,470	12,430	28,680	5,502	3,681	7,322	21,940	20,080	23,780	27,420	21,030	33,790	8,382	7,209	9,548	2,407	2,384	2,430	84,460	74,370	96,560
1997	16,020	10,950	24,560	5,874	3,906	7,857	18,120	16,610	19,630	21,760	16,290	27,160	3,972	3,483	4,461	1,611	1,596	1,626	67,660	58,930	77,970
1998	8,561	4,788	12,670	6,357	4,156	8,571	16,820	15,310	18,310	14,560	10,890	18,290	2,273	2,045	2,499	1,526	1,511	1,541	50,110	43,740	56,630
1999	10,250	5,677	15,140	6,205	3,999	8,412	20,390	18,530	22,230	14,150	10,960	17,300	3,735	3,423	4,041	1,168	1,157	1,179	55,880	49,140	62,690
2000	14,090	7,874	20,780	6,219	4,171	8,271	19,500	17,120	21,890	15,300	11,910	18,630	2,179	1,941	2,418	1,587	1,572	1,602	58,860	50,560	67,400
2001	14,880	8,293	21,950	2,437	1,559	3,317	20,050	17,900	22,210	24,560	20,550	28,610	4,008	3,612	4,401	1,491	1,477	1,505	67,420	58,760	76,360
2002	10,870	5,965	16,160	2,382	1,458	3,299	15,120	13,270	16,990	12,760	9,877	15,660	786	712	861	511	506	516	42,390	35,830	49,190
2003	9,041	4,353	14,070	3,303	2,021	4,592	24,650	21,970	27,330	23,870	18,770	28,930	3,118	2,776	3,461	1,192	1,181	1,203	65,150	57,020	73,350
2004	10,850	6,990	15,080	3,229	1,877	4,621	20,530	18,450	22,610	23,760	18,150	29,310	2,574	2,325	2,824	1,283	1,271	1,295	62,270	54,610	70,020
2005	13,430	7,305	20,070	4,294	2,252	6,393	20,500	18,630	22,410	23,950	18,030	29,900	1,588	1,420	1,757	1,088	1,078	1,098	64,910	55,150	74,830
2006	13,530	8,093	19,480	5,287	3,299	7,273	19,030	17,240	20,840	19,940	15,170	24,660	2,394	2,118	2,669	1,419	1,406	1,432	61,620	53,290	70,120
2007	14,050	7,812	20,860	4,097	2,395	5,806	17,200	15,450	18,950	20,790	16,280	25,310	1,280	1,151	1,409	1,189	1,178	1,200	58,590	49,890	67,610
2008	16,860	9,659	24,670	3,780	2,180	5,363	21,780	19,190	24,390	17,220	12,630	21,770	2,959	2,599	3,317	2,809	2,782	2,836	65,380	55,690	75,440
2009	25,400	12,530	38,850	4,569	2,497	6,620	20,960	18,930	22,970	22,600	17,720	27,500	2,546	2,279	2,816	2,292	2,270	2,314	78,360	63,480	93,660
2010	8,765	4,851	12,950	2,126	1,522	2,733	23,580	21,440	25,720	17,990	13,990	21,960	1,883	1,686	2,081	1,482	1,468	1,496	55,830	49,310	62,350

Annex 6.xvi. North American pre-fishery abundance (PFA) estimates from the run reconstruction model.

node	PFANAC1SW			PFANACSm			PFANAC1SWcohort		
description	PFA 1SW non-maturing			PFA 1SW maturing			PFA total (1SW non-maturing + maturing)		
Year	**Median**	**2.5%ile**	**97.5%ile**	**Median**	**2.5%ile**	**97.5%ile**	**Median**	**2.5%ile**	**97.5%ile**
1970									
1971	713,400	639,600	790,300	520,200	478,700	568,000	1,235,000	1,153,000	1,320,000
1972	740,100	675,500	812,900	520,800	486,400	559,800	1,262,000	1,193,000	1,338,000
1973	901,300	807,600	1,002,000	667,000	630,800	704,400	1,568,000	1,473,000	1,669,000
1974	811,500	740,100	891,000	699,300	655,700	747,100	1,512,000	1,433,000	1,597,000
1975	904,300	828,000	988,400	798,900	738,400	872,100	1,705,000	1,613,000	1,807,000
1976	835,000	753,400	925,600	798,700	743,600	859,800	1,635,000	1,541,000	1,736,000
1977	667,000	596,000	741,300	636,400	587,900	690,800	1,304,000	1,224,000	1,388,000
1978	396,600	363,300	432,600	410,600	378,100	444,600	807,400	764,000	853,700
1979	839,100	762,500	924,700	589,700	551,800	630,100	1,429,000	1,345,000	1,522,000
1980	711,100	646,000	784,200	832,500	773,900	903,600	1,545,000	1,464,000	1,637,000
1981	667,100	613,500	726,300	911,500	838,600	994,400	1,579,000	1,495,000	1,673,000
1982	560,800	517,700	608,200	766,000	706,500	830,700	1,327,000	1,257,000	1,403,000
1983	341,800	306,500	381,400	511,200	474,100	551,700	853,800	805,100	906,100
1984	360,400	323,300	402,000	540,000	500,700	580,000	900,700	846,800	957,200
1985	535,500	484,900	591,900	658,700	609,600	709,900	1,195,000	1,125,000	1,269,000
1986	567,400	511,800	627,400	835,300	769,800	904,800	1,403,000	1,320,000	1,492,000
1987	517,400	473,900	564,500	801,200	741,200	868,600	1,319,000	1,249,000	1,395,000
1988	421,300	382,600	462,700	849,700	779,800	923,700	1,271,000	1,192,000	1,354,000
1989	332,900	299,800	369,900	594,900	551,000	642,800	928,400	874,700	986,300
1990	297,300	268,200	329,600	562,100	520,900	604,100	859,800	808,800	913,100
1991	329,600	303,000	358,800	415,500	386,200	445,600	745,100	705,000	787,400
1992	216,200	180,200	256,900	577,800	524,200	631,800	794,600	727,000	864,100
1993	156,200	136,100	179,900	546,000	474,400	617,800	702,500	626,700	779,200
1994	192,100	166,700	223,100	329,600	296,700	363,700	522,200	478,400	569,400
1995	188,500	166,900	213,700	382,800	339,800	427,500	571,700	521,400	623,600
1996	158,600	140,600	179,700	556,200	491,500	624,800	715,400	646,700	787,500
1997	109,600	96,960	123,900	363,000	326,000	410,600	473,000	432,200	523,000
1998	100,400	87,100	115,400	439,800	382,800	498,100	540,400	480,000	601,800
1999	105,300	90,260	122,500	443,400	385,200	501,200	548,900	487,300	610,700
2000	119,100	102,700	137,700	524,000	456,500	591,600	643,500	571,600	715,800
2001	82,960	71,560	95,930	387,300	334,200	441,000	470,500	414,500	527,200
2002	112,000	96,550	129,200	389,100	342,400	435,400	501,100	450,000	552,400
2003	109,700	95,050	126,300	421,900	380,700	462,900	531,900	486,000	578,200
2004	112,600	95,700	131,700	447,700	409,200	486,300	560,500	517,000	605,200
2005	107,300	92,060	124,400	547,100	460,000	635,000	654,300	565,000	744,600
2006	103,000	87,660	120,200	550,400	463,000	637,200	653,400	563,700	744,100
2007	114,800	97,810	134,200	472,100	398,000	546,200	587,300	509,800	665,000
2008	134,700	110,600	162,200	598,500	524,200	672,700	733,700	652,600	814,700
2009	101,200	88,530	115,500	384,700	318,400	451,100	486,100	417,700	555,100
2010				463,500	410,500	516,500			

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 analysis prepared in the ICES expert groups and the advisory process include peer review of the analysis before it can be used as basis for the 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. S_{lim} *(Conservation Limit)* Demarcation of undesirable stock levels or levels of fishing activity; the ultimate objective when managing stocks and regulating fisheries will be to ensure that there is a high probability that undesirable levels are avoided.

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 programmes and services that support sustainable use and development of Canada's waterways and aquatic resources.

DNA *(Deoxyribonucleic Acid)* DNA is a nucleic acid that contains the genetic instructions used in the development and functioning of all known living organisms (with the exception of RNA- Ribonucleic Acid viruses). The main role of DNA molecules is the long-term storage of information. DNA is often compared with a set of blueprints, like a recipe or a code, because 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)* FWI indicate if any significant change in the status of stocks used to inform the previously provided multi-annual management advice had occurred.

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 Anemia Virus)* ISA 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.

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

MSW *(Multi-Sea-Winter)* An adult salmon which has spent two or more winters at sea or a repeat spawner.

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

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.

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

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

RR model *(Run-Reconstruction model)* RR model is used to estimate PFA and national CLs.

RVS *(Red Vent Syndrome)* The condition, known as RVS, 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 (1st January) and return to home waters.

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*) A study group established by ICES that met in November 2006.

SGERAAS *(Study Group on Effectiveness of Recovery Actions for Atlantic Salmon)* SGERASS had been established by ICES. The task of study 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.

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.

S_{lim}, 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.

SST (*Sea surface temperatures*) the water temperatures close to the surface. In practical terms, the exact meaning of surface varies according to the measurement method used. A satellite infrared radiometer indirectly measures the temperature of a very thin layer of about 10 micrometres thick of the ocean which leads to the phrase skin temperature. A microwave instrument measures subskin temperature at about 1 mm. A thermometer attached to a moored or drifting buoy in the ocean would measure the temperature at a specific depth, (e.g. at one meter below the sea surface). The measurements routinely made from ships are often from the engine water intakes and may be at various depths in the upper 20 m of the ocean. In fact, this temperature is often called sea surface temperature, or foundation temperature.

TAC *(Total Allowable Catch)* 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.

WGF *(West Greenland Fishery)* Regulatory measures for 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.

WKADS *(Workshop on Age Determination of Salmon)* WKADS had recently taken 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 had primarily focused on digital scale reading to measure age and growth, with a view to standardization.

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

WKSHINI (*Workshop on Salmon historical information-new investigations from old tagging data*) The Workshop is set to meet from 18–20 September 2008 in Halifax, Canada.

WKLUSTRE *(Workshop on Learning from Salmon Tagging Records)* The ICES Workshop established to complete compilation of available data and analyses of the resulting distributions of salmon at sea. WKLUSTRE will report by 30 November 2009 for the attention of the WGNAS.

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 2012 to address questions posed by ICES, including those posed by NASCO. The Working Group intends to convene in the headquarters of the ICES in Copenhagen, Denmark from 20 to 29 March 2012.

List of recommendations

1) The Working Group recommends that further work be undertaken to address the issues raised by the Workshop on Age Determination of Salmon regarding protocols, inter-laboratory calibration and quality control as they relate to the interpretation of age and calculation of growth and other features from scales and a second Workshop should be convened to facilitate this work and reporting.

2) The Working Group recommends continuing with the annual compilation of salmon tag releases and encourages further use of the scientific information gathered from tagging programmes.

3) The Working Group recommends that further work be undertaken to check the appropriateness of the various data inputs used in the catch advice framework for the Faroese fishery, including seeking original datasets from the sampling programmes of the fishery in the historical time period.

4) A preliminary proposal for a Framework of Indicators for the NEAC stock complexes was developed in 2011. The Working Group recommends that until alternative management units are agreed by NASCO, this procedure be developed further and that new possible indicators be brought forward to the Working Group for the next assessment in 2012.

5) The Working Group noted that the sampling programme conducted in 2010 in Labrador and Saint-Pierre and Miquelon provided biological characteristics of the harvest and that the information may be useful for updating parameters used in the Run Reconstruction Model for North America. This sampling also provides material (tissue samples from scales) to assess the origin of salmon in these fisheries. The Working Group recommends that sampling be continued and expanded if possible in 2011 and future years. As well, scale samples from in-river fisheries (recreational), in Labrador should be collected to determine the river age distributions of the salmon populations not currently being monitored by the limited assessment facilities in Labrador.

6) The Working Group supports the proposal from the Greenlandic authorities for the introduction of a logbook as a condition of the licensing system for the salmon fishery at West Greenland.

7) The Working Group recommends a continuation and expansion of the broad geographic sampling programme (multiple NAFO divisions) to more accurately estimate continent of origin and biological characteristics of the salmon in the West Greenland mixed-stock fishery.

8) The Working Group recommends that SALSEA West Greenland be conducted in 2011 for a third year and that efforts continue to integrate the results from this sampling programme with results obtained from both SALSEA-Merge and SALSEA North America.

9) In support of the management objective from NASCO to ensure that individual river stocks meet their conservation limits, the Working Group recommends that additional monitoring data or analyses of existing monitoring data (catches, juvenile surveys, short-term count data), be considered to augment the river-specific data used to develop the stock status and to improve management advice in both NAC and NEAC areas.

Annex 9: Response of WGNAS 2011 to Technical Minutes of the Review Group (ICES 2010b)

As per the request of the ICES Review Group (RG) this section is the response of the Working Group North Atlantic Salmon (WGNAS) to the Technical Minutes of the RG provided in Annex 7 of ICES (2010b). The comments are presented by subject area or section of the report. Where appropriate, the specific comment(s) from the RG is provided between quotations in italicized text.

"The RG notes … that the WG should strive to agree on a consistent way of presenting graphical data. Some graphics utilized an axis style that has tick marks that indicate the location of a datum, while other graphs had tick marks that marked the space between data. This shifting style proved to be confusing."

With a diverse range of software being used to generate graphs (Excel©, R©, and others), it is not easy to standardize the look of the outputs. Some information is more amenable to presentation as graphs with tick marks on the datum whereas others, boxplots in particular in some packages, have by default tick marks in the spaces. Where the option exists, the WGNAS has endeavoured to use consistent graphs and axes formats.

Section 3.5.1 Grouping of national stocks from ICES 2010b

The RG identified the important consideration for the grouping of stocks within the stock complex and this issue is important in the development of the advice framework for the Faroe Islands. Work leading to the development of jurisdiction disaggregated forecast models is ongoing, in recognition of the differences in stock status among regions and to facilitate the research on environmental and biological factors which may be conditioning survival in freshwater, survival at sea, and inter-regional differences in biological characteristics.

Section 4.4.6 Exploitation rates from ICES 2010b

The exploitation rates table was corrected.

Section 5.1.1 Catch and effort in 2009 from ICES 2010b

Done.

Section 5.1.2 Biological characteristics of the catches from ICES 2010b

The RG commented on the adjustment of the West Greenland harvests based on the larger number of fish sampled than is subsequently reported by the fishers at West Greenland and the RG was concerned about putting science staff at risk in these situations. It should be noted that the discrepancy between the observed fish by the samplers and the underreporting from a specific location is not noted during the time of sampling but rather after the fishery when collating the statistics. At no time have any samplers reported being in an adversarial position with the people at West Greenland. In fact, the people of West Greenland have generally been accommodating and courteous to the samplers.

The remainder of the comments of the RG are related to the forecast modelling for generating multiyear catch advice. As indicated by the RG, the models developed and used by the WG are similar for NAC and NEAC. The RG had two main points of concern and the response will be organized accordingly.

"There are two main points of concern in regard to the development of these models: 1) the manner in which spawning stock size is applied in the model; and 2) the lack of progress in developing a predictive capability that includes an environmental driver related to marine survival."

"The provision of forecasted advice is both a pragmatic and mechanistic process. Forecast drivers may prove to be competent in producing a robust statistical forecast, but if the mechanistic underpinnings of the driver variables are not understood, the forecast has a greater risk of becoming inaccurate. Because the processes related to recruitment in Atlantic salmon are conservative and autocorrelated, the current model would appear to be adequate for the provision of advice, but the RG encourages the WG to consider alternate strategies of including the spawner driver in the models."

The RG commented on the form in which spawning–stock and recruitment are structured in the model. As indicated by the RG, there is clear evidence of Atlantic salmon that the recruitment dynamic in freshwater is compensatory and the response can be quite strong depending upon the characteristics of the habitat and the steepness of the survival function at low spawning–stock (and unrelated to whether it is Beverton and Holt, Ricker, or power function; Chaput *et al*., 1998; Crozier *et al*., 2003; Michielsens and McAllister, 2004; Gibson *et al*., 2008). In the present circumstance of modelling spawning–stock and recruitment at a high level of stock aggregation, the variations in freshwater recruitment (smolts) from regional variations in spawning–stock are lost. The spawner abundances in the southern regions of NAC and in the southern NEAC area have declined substantially over the period of assessment and in these areas, freshwater production would be expected to respond to variations in spawner abundance. Spatially disaggregated models as currently being explored by the WG would provide an opportunity to more properly describe this density-dependent dynamic between spawners and recruitment. At some point in the development of these region-disaggregated models the WG should consider an alternate parameterization to the proportional relationship currently applied for the regional spawner variable.

"The RG raises the concern that lagged spawned may be a function of recruitment after the post-smolt year, which would be opposite to the manner in which the quantity is applied in the models used by the WG. If this were the case, the reason the lagged spawner variable works in the currently configured forecast models is that since they are both a function of environmental conditions that are autocorrelated on a decadal scale, they remain correlated over the period they are lagged in the model. This possibility needs to be investigated by the WG."

The WG does not understand this statement. Spawners are contingent on recruitment after exploitation in fisheries. In the earlier portion of the time-series for NAC (up to the 1992 PFA year and prior to the Atlantic salmon commercial fishery moratorium in Newfoundland and the large reductions in harvest at West Greenland), spawners and recruitment were not correlated because of the extensive fisheries exploitation which occurred between PFA and the spawning escapement the next year (Figure 9.1). As fisheries closed, an increasingly important component of the PFA recruitment survived to spawners, and the PFA reconstructed recruitment and spawners were strongly correlated. It should come as no surprise that the recruitment to spawner relationship is strong, particularly after the post-smolt year as mortality is assumed to be independent of density and assumed to be unchanged over the time-series. The spawner to recruitment function should however be expected to be statistically weaker because of the multiple points in the life cycle when mortality can vary not only with density but independently with environmental factors acting at different points and times in the life cycle. This relationship between recruitment which gives spawners and then spawners giving recruitment is an underlying dynamic in all natural resource models and not a misrepresentation of the functional relationship.

"The RG agrees with the WG on the desirability of including environmental information as a driver of the marine productivity parameters of the forecast models. However, this agreement does not ameliorate the lack of progress in this area or the critical nature of the issue in evaluating the state of salmon resources in the North Atlantic."

The WG is tasked with terms of reference submitted by NASCO which include documenting catches, fisheries performances, status of stocks and preparation of multiyear catch advice. The variable status of Atlantic salmon stocks among the regions in the North Atlantic is well documented in the report. The forecast models which have been developed to date are effective at providing catch advice to management, and none of the models have yet to predict abundance of salmon that was outside the realized abundances. The absence of forecast models that consider environmental drivers of productivity in the marine and freshwater environments in the recent and current WG modelling efforts reflects the current state of data availability and modelling opportunities rather than a neglect on the part of the WG members. The forecast models as currently used by the WG do not address cause and effect associations. However, the recruitment dynamic which is characterized by the productivity parameter and in the NEAC model, the proportion maturing parameters, opens the door to the examination of linkages to possible explanatory drivers in freshwater and/or marine, physical and/or biological.

"The RG recommends that ICES encourage national parties to support the WG in this work by providing resources and expertise to advance this work in the salmon assessments. The RG suggests that WG member explore options for participation in other working groups at ICES as a vehicle to expand the available expertise and skill set of the WG. Further, the RG recommends that ICES consider how allied expert groups within the ICES structure may constructively assist the WG in the specialized areas of expertise lacking in the constitution of the WG."

Participation at the WG is open to all interested contributors from the scientific community. Individuals with an interest in contributing to the development of stock status and provision of catch advice as per the terms of reference from NASCO have participated in the previous meetings and are encouraged to do so. The WG has progressed far in its capacity to provide catch advice using risk analysis frameworks that include uncertainties in the input data and the process dynamics, in conformity with assessments and advice models used in other assessment working groups and science advisory bodies. Scientific experts from outside the immediate national nominated delegates of the WG have contributed to numerous initiatives to address specific questions of interest to the WG, including three workshops on the analysis of tagging data and associations with environmental variables (ICES 2007; ICES 2008; ICES 2009b), the Study Groups on the Identification of Biological Characteristics for use as Predictors of Salmon Abundance (SGBICEPS) (ICES 2009a, 2010a), and the Study Groups on assessment and forecast models (SGSSAFE, see Section 2.5). Outside ICES and NASCO, there is a large amount of effort that has been expended to address Atlantic salmon ecology and marine dynamics including numerous special publications on Atlantic salmon (see for example Hansen and Quinn, 1998), special conferences and publications (Mills, 1993; Mills, 1998; Prévost and Chaput, 2001; Crozier *et al.*, 2003) and more are ongoing including the SALSEA projects (see ICES 2010b), and recent multidisciplinary activities including ECOKNOWS.

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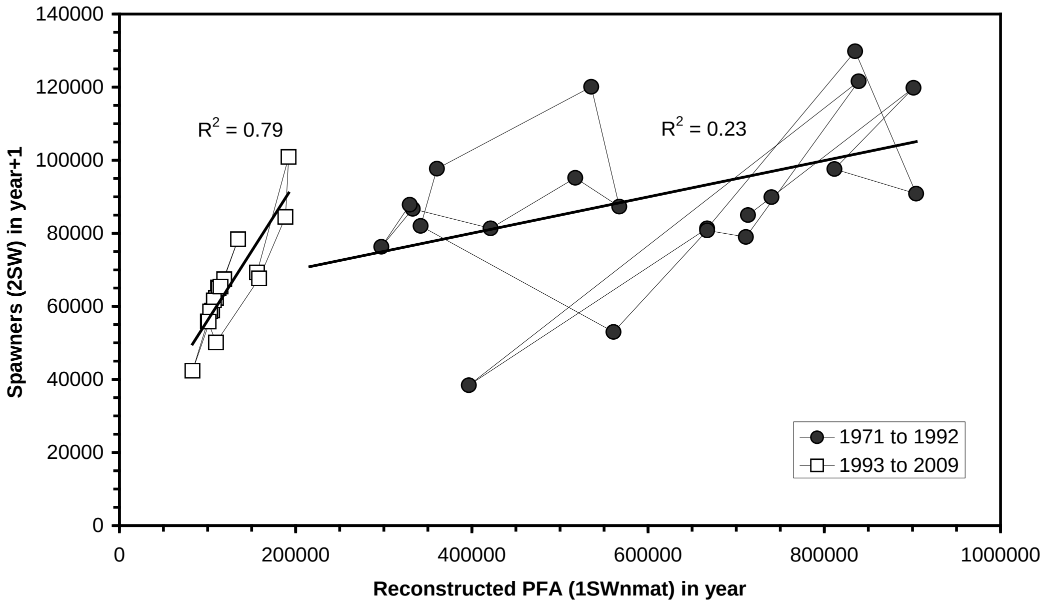

Figure 9.1. Relationship between estimated PFA in year t and estimated spawners in year+1. Data are from run reconstruction for two periods for NAC: 1971 to 1992 PFA years, and 1993 to 2009 PFA years. The 2SW spawners are estimated back in North America in PFA year + 1.

Annex 10: Technical minutes

- RGSALMON
- April 18–21, 2011
- **Participants:** Manuela Azevedo (Chair), Kevin Friedland (external reviewer), Kjell Leonardsson (external reviewer), Gérald Chaput (Chair of WGNAS), Johan Dannewitz (Chair of WGBAST), Stig Pedersen, Henrik Sparholt (ICES Secretariat), Michala Ovens (Secretarial Support).
- Working Group on North Atlantic Salmon (WGNAS)

General comments

The Working Group continues to produce an excellent assessment of Atlantic salmon populations in the North Atlantic, while at the same time advancing the methodologies used in the assessment of populations of species with short lifespans, especially those with a heavy dependence on environmental effects. These approaches should be of utility to other researchers working within the ICES community and worldwide as well. Our concerns continue to be with the mechanistic underpinnings of the forecast model used to estimate stock abundances in both North America and Europe. These concerns center on the issue of representing stock effects on recruitment as a compensatory function and adding environmental indices to model the effects of environment on post-smolt survival. Both of these concepts can be supported with data presented in the WG report and from the peer review literature. The RG is concerned that the WG needs additional time and flexibility in respect to its workload to make progress on critical issues related to model extensions to reflect the effect of climate variation on salmon stocks.

Section 2.3.4–Recent results from acoustic tracking investigations in Canada

These research findings speak to the mechanistic processes at work in shaping the recruitment of Atlantic salmon in North America. As reported by Friedland *et al*. (2003) and recently reexamined by Friedland *et al*. (in press), recruitment variability is associated with spring, inshore temperature conditions. Because recruitment variability is not associated with variation in post-smolt growth (i.e. the Miramichi River, a Gulf stock, Friedland *et al*., 2009), it could be attributed to variations in predation rate governed by shifting predator densities. These changes in predator densities would most likely be associated with distributional changes related to warming conditions along the coast. The new data presented to the Working Group in this section suggests that most of the marine mortality affecting Gulf stocks occurs during the first month at sea, within the confines of the Gulf itself and before smolts exit the Strait of Belle Ilse. These sorts of process studies can be used to develop and justify an environmental variable for use in inference and forecast modelling.

Section 2.3.5–Assessing the impact of common assessment procedures on smolt physiology, behaviour and adult return rates

This section is not consistently supported with reference citations; it would be desirable for the reader to be able to find the source information for these results.

Section 2.5–NASCO has asked ICES to further develop approaches to forecast pre-fishery abundance for North American and European stocks with measures of uncertainty

It is stated: A preliminary examination of this assumption could be done by comparing the variation in the proportion maturing parameter with the corresponding proportions of the lagged eggs contributed by one of the sea age groups of the spawners.

This is a worthwhile exercise, but it should be approached with caution. Variation in marine survival has been related to geography with the greater erosion in survival rates being experienced by southern tier stocks in both North America and Europe. The maturation rate associated with stocks is also related to geography and assumed to reflect stock genetics and environment. The shift in survival conditions may overwhelm any conservative genetic trait related to maturation, precluding the test the Working Group describes.

It is stated: The factors vary between NAC and NEAC and even within areas of NEAC. Progress on this term of reference would require the development of models at scales below the stock complex level.

It is becoming increasingly clear that model development may have to be conducted below the stock complex level. It is disappointing that the study group was unable to make any progress on this issue considering the importance of understanding these processes on the continued persistence of Atlantic salmon in continental subregions. It is encouraging that further work on this topic will be conducted by the EU project "Effective Use of Ecosystem and Biological Knowledge in Fisheries", which is welcomed and will be of benefit to the tasks of the Working Group, but the expertise to implement these sorts of data analyses and modelling needs to be developed and applied within the Working Group as well.

Section 3.6.1–Description of the forecast model

The WG acknowledged the desirability and the difficulties of incorporating compensatory stock–recruitment relationships in the modelling of both North American and European salmon populations at the stock complex levels. At issue is the use of a proportional relationship between lagged eggs and PFA and the conclusion that PFA abundance will respond directly and predictably with changes in lagged eggs. This assumes that freshwater production is below carrying capacity. This has not been demonstrated for these stocks, in fact spawners in NEAC have been at or above the conservation limits over most of the time-series and the expectation should be that at these levels of spawners, smolt production should not have been variable. A nuance of one of the stock indicator time-series stimulated discussion in the RG. The case in point was the estimate of smolt production from one of the most important NE Atlantic index rivers, the North Esk in Scotland. The figure below (Figure 1) provides an estimate of the population of migrating smolts from the Esk by year (J. MacLean, personal communication). Smolts are captured at a trap situated on a lade that runs off the main river ca. 7 km from the sea and rejoins the river ca. 2 km from the sea. A mark release and recapture experiment is used to estimate the total smolt production from the river.

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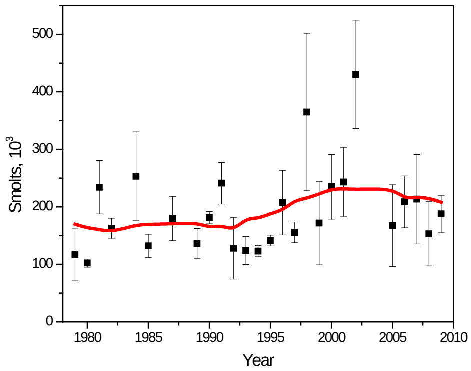

Figure 1. Time-series of North Esk smolt migration estimates with 95% CI, smoothing line in 10 point adjacent average.

For the assumed SR relationship attributed to lagged eggs to be true, the recruitment pattern would have to be reflected in the production of smolts. The spawner escapement data that produced these smolts were not available in the WG report. But the lagged eggs for the southern NEAC stock corresponding to this smolt production period have varied by half, and declined over the time period. The fact that the estimated smolt production has not declined suggests that the SR function in freshwater is more likely defined by a compensatory function (Ricker or Beverton–Holt for example) and the balance of the recruitment pattern is defined by the marine survival of post-smolts. The RG encourages the WG to consider this and other data in the context of what they suggest about the recruitment process and how it may guide the development of model variants. The RG suggests that taking an ensemble approach to model formulation may be a useful and instructive exercise for the WG because there are still significant gaps in our knowledge of salmon population dynamics. The way forward proposed by the WG is to model the spawner and recruitment dynamic at subregional scales which would provide an opportunity for the compensatory form of the SR relationship to be inferred from the region specific data. A multi region SR model could be developed which would provide a mean stock and recruitment function for a large complex and an example of this was provided by the RG. The solution to the multi-region SR functions is obtained from the Taylor expansion of the Ricker equation:

$$a E e^{-bE} + \sigma_b^2 \left(\frac{1}{2} a E^3 e^{-bE}\right) + \left(-a b e^{-bE} + \frac{1}{2} a b^2 E e^{-bE}\right) \sigma_E^2,$$

where a and b are parameters in the simple version of the Ricker function, σ^2_b denote the variance of the parameter b, and E corresponds to the expected number of eggs. The variance of the total number of eggs (σ^2_E) is most likely not a constant but will rather vary with the total egg numbers. One simple assumption about such change in variance would be to use the coefficient of variation (CV), i.e. $\sigma^2_E=(CV*E)^2$. The covariance and higher-order components have been left out from the above equation.

The RG appreciates the difficulty to incorporate environmental data into the stock complex level models. The demands of the routine assessment activities and the lack of capability to deal with these types of data at the WG are real problems; the RG hopes to contribute to a strategy to find a solution to these problems. The RG considered a worked example of how forcing variables may be identified. An easily accessible independent variable to represent the marine survival process is SST, though SST is most likely a proxy for a shift in primary and secondary productive changes that have occurred in the Northeast Atlantic. From Friedland *et al*. (2009a), the August SST field yielded the strongest correlates that overlap the summer post-smolt nursery area described by Holm *et al*. (2000). The following figure is the relationship between S-NEAC non-maturing PFA and SST from the ERSST dataset (Smith *et al*., 2008) for the location 14°E 74°N (Figure 2).

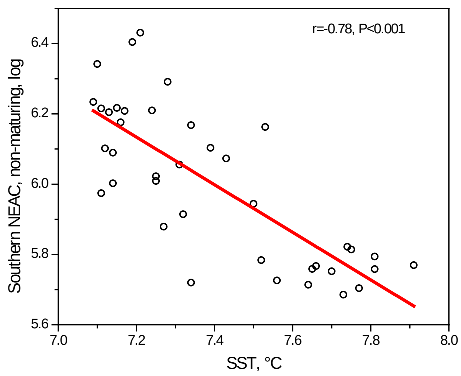

Figure 2. Relationship between Southern NEAC Non-maturing PFA and Northeast Atlantic SST for 14°E 74°N during August of the post-smolt year.

Little effort was put into optimizing this environmental correlate; a better fit may be achieved by doing an EOF (principal components) on the SST and looking at indices constructed from data from multiple months. This would seem to provide a means to either explicitly add a forcing variable or calibrate a survival rate function believed to vary with temperature conditions. As variations in SST may be a proxy for factors that modify marine survival, the SST data or other environmental forcing variable would be expected to modify the recruitment rate parameter, as currently modelled by the WG, lagging for the period corresponding to the post-smolt summer at sea. The importance of studying this aspect of recruitment can be put into perspective by looking at the long-term time-series of SST from this location. As typical of the Norwegian Sea and surrounding areas, and not just for August, SST is at record high levels, with 2010 (last point in time-series of the graph below) being the highest in the temperature record (Figure 3).

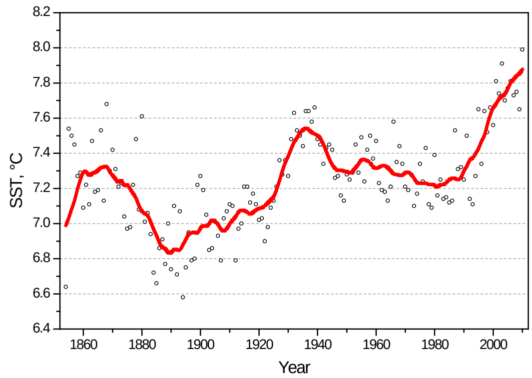

Figure 3. Northeast Atlantic SST for 14°E 74°N during August for the period 1854 to 2010.

The expectation of further increases in ocean temperature makes interfacing stock dynamics and the environment that much more critical (Stock *et al*., 2011).

So to reiterate, the RG suggests that the WG consider a review of how the stock parameter is applied in the inference and forecast model; and, that productivity be modelled with a covariate variable(s) that have been proposed to describe the mechanistic underpinnings of the effect of environment on marine survival of post-smolt salmon. The RG believes that moving the assessment in this direction would make the model more responsive to contemporary fisheries issues and also make it more relevant to the issue of persistence of Atlantic salmon in a climate and ecosystem change context.

Section 3.7.1–Changes to the NEAC PFA model and national conservation limit model

The WG is encouraged to attempt to re-evaluate the 1971–1982 data for Norway to see if a parsimonious solution can be found to provide PFA estimates for that time period. Moving to the subcomplex scale provides an opportunity to incorporate the longer time-series in the other jurisdictions, without waiting on the extension of the dataset for Norway.

Section 4.5.6–Pre-fisheries abundance

The WG is using the same model form as used in the NEAC to model NAC PFA. Here again, the RG encourages exploration of different SR forms for the modelling work (as described in RG comments of Section 3.6.1). For NAC, the RG discussed the important insights provided by the time-series of smolt production from two Quebec Rivers (Figure 4.5.1.1). Smolt production has declined in the St Jean and de la Trinite rivers for a period beginning in the middle 1980s; at the same time escapement of 2SW fish were at conservation limits up until the middle 1980s and declined below CLs since, thus the decline in smolts could be attributed to the deficit in spawners (Figure 4.5.2.3). Unlike the example for the NEAC provided by the data for the North Esk and the lagged eggs for the S-NEAC complex, there is no data for a period of escapement exceeding CL to match with smolt production, but it is difficult to see why the SR dynamic in North American rivers should respond differently. These data underscore the importance of the form used for modelling the stock component in the forecast model and reinforces the CL concept for salmon.

Drawing on recent information described above, a putative environmental variable was selected to link with the time-series variation in PFA of the North American stocks (SST from June in a location associated with coastal post-smolt habitats, 66°W 50°N). This SST time-series provides a candidate independent variable to forecast North American PFA (Figure 4).

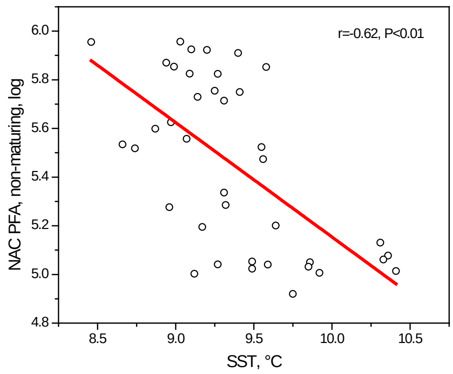

Figure 4. Relationship between NAC Non-maturing PFA and Northwest Atlantic SST for 66°W 50°N during June of the post-smolt year.

No effort was made to optimize the SST variable, so as suggested in the NEAC comments above, the potential to improve the index exists. As with the key habitat location highlighted in the NEAC comments, this area in North America is also experiencing extreme thermal conditions; though 2010 was not the highest observation in the time-series, it was among the highest and is representative of a trend of extreme warming occurring in this part of North America (Figure 5).

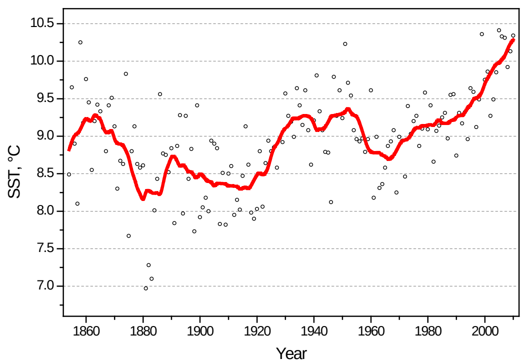

Figure 5. Northwest Atlantic SST for 66°W 50°N during June for the period 1854 to 2010.

So to reiterate, the RG suggests that the WG examine the manner it represents SR in the forecast model and consider exploring the incorporation of physical forcing in the model that reflects the state of our knowledge of the mechanistic underpinnings of the effect of environment on marine survival of post-smolt salmon.

Section 4.6–Summary on status of stocks

Stated: The continued low abundance of salmon stocks across North America, despite significant fishery reductions, further strengthens the conclusions that factors other than fisheries are constraining production.

The WG could try to be more specific as to what is going on with the stocks. It is widely accepted that marine mortality has increased and there is evidence to support mechanistic explanations.

Section 5.1.1–Catch and effort in 2010

Logbooks can be a source of information or a source of misinformation. It is critical that the fishers understand the intended use of the logbook data to ensure the best and most accurate data be available.

Recommendation from the Review Groups to be considered by ACOM

The RG recommends that ICES develop a SG process to focus on how environmental forcing may be incorporated into salmon assessments and how these data may be made operational for use by the WG. This RG appreciates that there are parallel concerns on this matter in respect to Baltic salmon (WGBAST).

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