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

1–10 April 2008

Galway, Ireland

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

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Executive Summary

- In the North Atlantic, exploitation remains low and nominal catch of Atlantic salmon in 2007 was the lowest in the time series.
- Marine survival indices remain low.
- The North American Commission 2SW stock complex is suffering reduced reproductive capacity. Factors other than fisheries (marine mortality, fish passage, water quality) are contributing to continued low adult abundance.
- Northern North-East Atlantic Commission stock complexes (1SW and MSW) are at full reproductive capacity prior to the commencement of distant water fisheries.
- Southern North-East Atlantic Commission 1SW stock complex is at full reproductive capacity while the MSW stock complex is suffering reduced reproductive capacity prior to the commencement of distant water fisheries.
- There are no catch options for the fishery at the Faroes (2009–2011) that would meet precautionary management objectives.
- A number of studies were reviewed that report on significant new or emerging threats to, or opportunities for, salmon conservation and management.

1 Introduction

1.1 Main tasks

At its 2007 Statutory Meeting, ICES resolved (C. Res. 2007/2/ACOM18) that the Working Group on North Atlantic Salmon [WGNAS] (Chair: T. Sheehan, USA) will meet in Galway, Ireland, from the 1st–10th April 2008 to consider questions posed to ICES by the North Atlantic Salmon Conservation Organisation (NASCO). 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
1)	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 2007;	2.1 and 2.2
2)	report on significant new or emerging threats to, or opportunities for, salmon conservation and management;	2.3 and 2.7
3)	examine and report on associations between changes in biological characteristics of all life stages of Atlantic salmon, environmental changes and variations in marine survival with a view to identifying predictors of abundance [1];	2.4
4)	describe the natural range of variability in marine survival with particular emphasis on partitioning mortality to the narrowest geographic scale possible (estuarine, near-shore, offshore, etc.); [2]	2.5
5)	compile information on the marine migration and dispersal of escaped farmed salmon with particular emphasis on movements between countries; [3]	2.6
6)	provide a compilation of tag releases by country in 2007 and advise on progress with compiling historical tag recovery data from oceanic areas [4];	2.8
7)	identify relevant data deficiencies, monitoring needs and research requirements; [5]	Sec 6

b)	With respect to Atlantic salmon in the North-East Atlantic Commission area:	Section 3
1)	describe the key events of the 2007 fisheries; [6]	3.8
2)	provide any new information on the extent to which the objectives of any significant management measures introduced in recent years have been achieved;	3.9
3)	review and report on the development of age-specific stock conservation limits, where possible based upon individual river stocks;	3.3
4)	describe the status of the stocks and provide annual catch options or alternative management advice for 2009-2011, if possible based on forecasts of PFA for northern and southern stocks, 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; [7]	3.4, 3.6, and 3.8
5)	further develop methods to forecast PFA for northern and southern stocks with measures of uncertainty.	2.3.2 and 2.3.3

c)	With respect to Atlantic salmon in the North American Commission area:	Section 4
1)	describe the key events of the 2007 fisheries (including the fishery at St Pierre and Miquelon); [6]	4.4
2)	report on the biological characteristics (size, age, origin) of the catch in coastal fisheries and potential impacts on non-local salmon stocks.	4.4
3)	provide any new information on the extent to which the objectives of any significant management measures introduced in recent years have been achieved;	4.5
4)	update age-specific stock conservation limits based on new information as available;	4.3
5)	In the event that NASCO informs ICES that the framework (FWI) indicates that re-assessment is required: describe the status of the stocks and provide annual catch options or alternative management advice for 2008-2011 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; [7]	na

d)	With respect to Atlantic salmon in the West Greenland Commission area:	Section 5
1)	describe the key events of the 2007 fisheries; [6]	5.1
2)	provide any new information on the extent to which the objectives of any significant management measures introduced in recent years have been achieved;	5.2
3)	In the event that NASCO informs ICES that the framework (FWI) indicates that re-assessment is required: describe the status of stocks and provide annual catch options or alternative management advice for 2008-2010 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. [7,8]	na

Notes:

1. *With regard to question 1.3, there is interest in determining if declines in marine survival coincide with changes in the biological characteristics of juveniles in fresh water or are modifying characteristics of adult fish (size at age, age at maturity, condition, sex ratio, growth rates, etc.) and with environmental changes. In the event that an annual measure is agreed for the West Greenland fishery, this question should be considered a lower priority than the other questions.*
2. *With regard to question 1.4, there is interest in determining the extent to which marine survival regimes are driven by factors in estuarine, nearshore, or offshore environments. To the extent possible, this assessment should focus on discrete stock complexes corresponding to NASCO management objectives. Characterizing these losses could provide regional and stock-specific context for ongoing research and upcoming research initiatives such as SALSEA.*
3. *A number of implementation plans presented by NASCO Parties raised concern about the occurrence in their marine fisheries and rivers of farmed salmon originating in other countries.*
4. *With regard to question 1.6 the data on tag recovery information should be compiled according to the format developed by the ICES Workshop on the Development and Use of Historical Salmon Tagging Information from Oceanic areas*
5. *NASCO's International Atlantic Salmon Research Board's inventory of on-going research relating to salmon mortality in the sea will be provided to ICES to assist it in this task.*
6. *In the responses to questions 2.1, 3.1 and 4.1 ICES is asked to provide details of catch, gear,*

effort, composition and origin of the catch and rates of exploitation. For homewater fisheries, the information provided should indicate the location of the catch in the following categories: in-river; estuarine; and coastal. Any new information on non-catch fishing mortality, of the salmon gear used, and on the by-catch of other species in salmon gear, and on the by-catch of salmon in any existing and new fisheries for other species is also requested.

7. *In response to questions 2.4, 3.5 and 4.3 provide a detailed explanation and critical examination of any changes to the models used to provide catch advice.*

8. *In response to question 4.3, ICES is requested to provide a brief summary of the status of North American and North-East Atlantic salmon stocks. The detailed information on the status of these stocks should be provided in response to questions 2.4 and 3.5.*

*** NASCO should inform ICES by 31 January of the outcome of utilising the FWI.**

At the 2006 Annual Meeting of NASCO, conditional multi-annual regulatory measures were agreed to in the West Greenland Commission and for the Faroe Islands 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 (WGC (06)06, NEA(06)06). The FWI was delivered by ICES (ICES 2007c) and was accepted by the Parties to the West Greenland Commission. As such, the multi-annual regulatory measures for the WGC continued and the decision to request that ICES undertake a full stock assessment and provide multi-annual catch advice for the 2008 fishing season was dependant on the outcome of the FWI. Denmark (in respect of the Faroe Islands and Greenland) opted out of the multi-annual regulatory measures as a FWI was not provided by ICES for the fishery in the Faroes (ICES 2007c).

NASCO formed the West Greenland Framework of Indicators Coordination Group who applied the FWI and communicated the results that no change to the management advice previously provided by ICES is required for the 2008 fishery at West Greenland. NASCO communicated this outcome to ICES on February 1, 2008 via email with a copy to the Chair of the WGNAS. As a result, terms of reference c5 and d3 were not undertaken by the WGNAS.

In response to the remaining terms of reference, the Working Group considered 43 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 6.

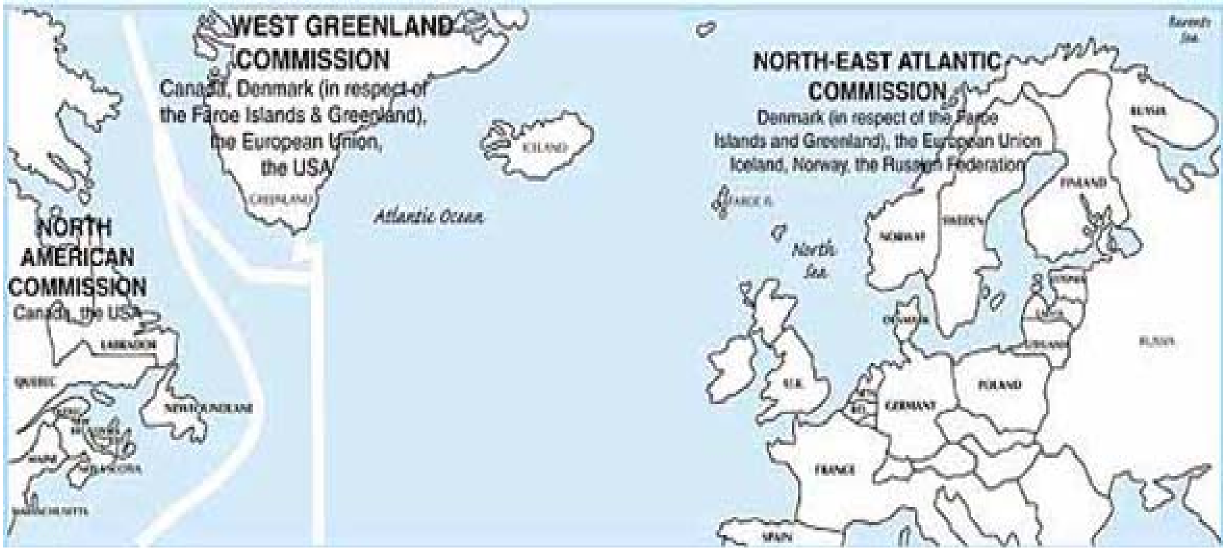
1.2 Participants

Member	Country
Sheehan, T. (Chair)	USA
Amiro, P.	Canada
Chaput, G.	Canada
Erkinaro, J.	Finland
Fiske, P.	Norway
Gudbergsson, G.	Iceland
Hansen, L. P.	Norway
Holm, M.	Norway
Ingendahl, D.	Germany
Karlsson, L.	Sweden
Kennedy, R.	UK (N. Ireland)
MacLean, J. C.	UK (Scotland)
Ó Maoiléidigh, N.	Ireland
Prusov, S.	Russia
Reddin, D. G.	Canada
Russell, I.	UK (England & Wales)
Smith, G. W.	UK (Scotland)
Ustyuzhinskiy, G.	Russia
Vauclin, V.	France
Wennevik, V.	Norway
White, J.	Ireland
Whoriskey, F.	Canada

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 Organisation (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 seven Parties that are signatories to the Convention, including the EU which represents its Member States.

NASCO discharges these responsibilities via three Commission areas shown below:



1.4 Management objectives

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

"To contribute through consultation and co-operation 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 mid point is above, then ICES considers the stock to be at risk of suffering reduced reproductive capacity.
- Finally, when the mid point 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 1960–2007 are given in Table 2.1.1.1. Catch statistics in the North Atlantic also include fish farm escapees and, in some north-east Atlantic countries, ranched fish (see Section 2.2.2). Catch and release has become increasingly commonplace in some countries, but these fish do not appear in the nominal catches (see Section 2.1.2).

Icelandic catches have traditionally been split into two separate categories, wild and ranched, reflecting the fact that Iceland has been the 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 2007 (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 & 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 2007 was 1533 tonnes, 507 t below the updated catch for 2006 (2040 t) and the lowest in the time series. The 2007 catch was over 750 t below the average of the last five years (2292 t), and over 900 t below the average of the last 10 years (2445 t). Catches were below the previous five- and ten-year averages in most countries, and were the lowest recorded in the time series in six countries, four of these in the NEAC Southern area.

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 2007 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 recognises that mixed stock fisheries present particular threats to stock status. These fisheries predominantly operate in coastal areas and NASCO specifically requests that the nominal catches in homewater fisheries be partitioned according to whether the catch is taken in coastal, estuarine or riverine areas. Figure 2.1.1.2 presents these data on a country-by-country basis. It should be noted, however, that the way in which the nominal catch is partitioned among categories varies between countries, particularly for estuarine and coastal fisheries. For example, in some countries these catches are split according to particular gear types and in other countries the split is based on whether fisheries operate inside or outside headlands.

While it is generally easier to allocate the freshwater (riverine) component of the catch, it should also be noted that catch and release is now in widespread use in several countries (Section 2.1.2) and these fish are excluded from the nominal catch. Noting these caveats, these data are considered to provide the best available indication of catch in these different fishery areas. Figure 2.1.1.2 shows that there is considerable variability 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 have fluctuated over the period with no apparent trend. Typically about half the catch has 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. In Southern Europe, catches in all fishery areas have declined over the period and, while coastal fisheries have historically made up the largest component of the catch, these fisheries have declined substantially, reflecting widespread measures to reduce exploitation in a number of countries. In 2007, the majority of the catch in this area was taken in freshwater.

In North America, the total catch over the period 2000–2007 has been relatively constant. The majority of the catch in this area has been taken in riverine fisheries, while the catch in coastal fisheries has been relatively small in any year (11 t or less).

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 North America, 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 2007 for nine countries that have records; catch and release may also be practiced in other countries while not being formally recorded (e.g. Norway). There are large differences in the percentage of the total rod catch that is released: in 2007 this ranged from 19% in UK (N. Ireland) to 90% in Russia, reflecting varying management practices and angler attitudes. Within countries, the percentage of fish released has tended to increase over time. Overall, over 178 500 salmon were reported to have been released around the North Atlantic in 2007, almost 11 000 more than in 2006. There is also evidence from some countries that larger MSW fish are released in higher proportions than smaller MSW fish. Whilst the use of catch and release is likely to result in some fish dying through exhaustion or damage, studies have demonstrated that if fish are appropriately handled, mortality following capture is low and a large proportion of fish survive to spawn (Dempson *et al.*, 2002; Webb, 1998a, 1998b; Whoriskey *et al.*, 2000).

2.1.3 Unreported catches

Unreported catches by year (1987–2007) and Commission Area are presented in Table 2.1.3.1 and are presented relative to 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). However, no estimate of unreported catch was provided in respect of Canada for 2007.

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 carcase tagging and logbook schemes).

The total unreported catch in NASCO areas in 2007 was estimated to be 475 t. The unreported catch in the North East Atlantic Commission Area in 2007 was estimated at 465 t and that for the West Greenland Commission Area at 10 t. There was no estimate for the North American Commission Area. The 2007 unreported catch by country is provided in Table 2.1.3.2.

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. These have resulted in no sightings of vessels, 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. Surveillance flights are understood to have continued in 2007, although there is no information regarding vessel sightings.

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 2007 is 947 000 t. This represents a 13% increase on 2006 and the highest value in the time series (Table 2.2.1.1 and Figure 2.2.1.1). Production increased in Norway (up 15% on 2006) and UK (Scotland) (up 8% on 2006), and these two countries continue to produce the majority of the farmed salmon in the North Atlantic (76% and 16% respectively). Farmed salmon production fell markedly in Iceland and USA.

World-wide production of farmed Atlantic salmon has been in excess of 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 2006 estimates for some countries in deriving a world-wide estimate for 2007. Noting this caveat, total production in 2007 is provisionally estimated at around 1 400 000 t (Table 2.2.1.1 and Figure 2.2.1.1), a 7% increase on 2006 and the highest in the time series. Production outside the North Atlantic is dominated by Chile and is estimated to have accounted for 32% of the total in 2007. World-wide production of farmed Atlantic salmon in 2007 was thus over 900 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 harvest by rod fisheries has been practiced in two Icelandic rivers since 1990 and has 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 2007 was 39 t, the majority of which (35 t) was taken by these Icelandic ranched rod fisheries (Figure 2.2.2.1). Small catches of ranched fish were also recorded in three other countries (Ireland, UK (N. Ireland) and Norway); the data includes catches in net, trap and rod fisheries.

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 Stock recruitment models and developing conservation limits for Atlantic salmon populations in Norway

CLs have been developed for Atlantic salmon stocks in nine rivers in Norway which have sufficient data to fit stock-recruitment (*SR*) models. In these models, spawning stock and recruitment were measured as the number of eggs (*S*) and the density of juveniles (*R*), respectively.

Different biological reference points (BRPs) were evaluated, with respect to information requirements, estimation robustness and feature optimized. Well known and applied BRPs seem to be the spawning stock giving maximum recruitment in the Shepherd *SR*-model (S_{RMAX}), and the bend point of the logistic hockey-stick model (S_{LHS}).

Based on the *SR*-relationships in these nine rivers, CLs for salmon populations in Norway were grouped into four categories of egg densities from < 1.5 eggs/m^2 to > 5 eggs/m^2 (group averages being, respectively, 1, 2, 4 and 6 eggs/m^2). Eighty major Norwegian rivers were then grouped into these four categories.

Wetted area was estimated by GIS methods from digital geographic data to a 1:50 000 scale, calculated from the river mouth to migratory barriers mapped by Norwegian management authorities. For most rivers productivity (i.e. category of egg density) was assessed based on catch statistics converted to catch per area, smolt age distribution, and other available information on the characteristic of each river. The number of eggs necessary to seed the whole river was estimated from the CL (eggs/m^2) and the number of females needed to meet that number. For some large watercourses, CLs were estimated by considering the tributaries separately. The CLs for most of the 80 watercourses, lie between 2 eggs/m^2 and 4 eggs/m^2. The highest total CL is for the River Tana (Teno), where a female spawning biomass of approximately 55 000 kg is required to meet the target for the whole river system. Other watercourses with a high CLs are the rivers Gaula, Orkla and Namsen where the female biomass requirement should exceed 18 000 kg per year, and the rivers Numedalslågen and Alta where the female biomass requirement exceed 12 000 kg per year. This must be considered *first-generation* CLs for the populations in question. The two major limitations to setting precise CLs are believed to be the estimation of productive area (as part of the wetted area) and estimation of the number of spawners extrapolated from catch statistics. CLs have been estimated for an additional 100 Norwegian rivers, but have as yet not been published.

2.3.2 Standardisation of run reconstruction models for NAC and NEAC areas

Run-reconstruction models are used in both the NAC and NEAC areas to estimate the pre-fishery abundance of 1SW salmon (Potter *et al.*, 1998; Rago *et al.*, 1993). The models work backwards from catches in homewaters or returns to rivers and progressively add in catches in the ocean at earlier periods of time, with adjustments for natural mortality, to develop estimates of abundance at a given point in the life cycle at sea prior to fisheries exploitation. In the interest of exploring Bayesian models for forecasting and for development of catch advice, the assumptions and data inputs of the run-reconstruction models were reviewed and differences in assumptions and data inputs between Commission areas were resolved. The following section describes the differences between the NAC and NEAC models and the recommended resolutions.

Returns to the coast or homewaters

Area specific details for the estimation of returns have been provided in previous reports of the ICES Working Group with annual updates that describe the changes to the input variables when they occurred. There were no issues to resolve for this portion of the models.

West Greenland fishery

There was a difference in the treatment of unreported catches from the West Greenland fishery between the NAC and NEAC models. For the NAC model, no adjustment was made for unreported catches whereas for the NEAC model, an adjustment for unreported catches was included, ranging from 5% to 15% of the reported harvest in the first part of the time series and with annual values afterwards. In discussions regarding the source of the unreported catch component and whether to include an annual correction, the following recommendation was made:

> *Recommendation 1: The inclusion of an unreported catch component should be done in both the NAC and NEAC areas. Unreported catch at West Greenland, as provided by the Greenlandic authorities, are documented in the working group report (Table 2.1.3.1) beginning in 1993. Prior to 1993, since no values are provided, no unreported catch component would be included in the models.*

Other marine fisheries

For NEAC, the Faroes fishery catches both maturing and non-maturing salmon from the northern and southern stock complexes. Based on tagging information, the catches are distributed to each stock complex and to each contributing country. There is a component of the Faroes catch which is considered to be other than 1SW maturing or 1SW non-maturing salmon and which has been excluded in the run-reconstruction. The total distribution to northern and southern NEAC represents 88% of the non-maturing salmon catch. In 2000, the Working Group on North Atlantic Salmon indicated that 10.3% of the catch that year were 3SW and older salmon. There is information from tagging experiments that salmon of North American origin also occur in this fishery (Hansen and Jacobsen, 2003). The following considerations were made to the treatment of the Faroes catch:

> *Recommendation 2: The proportion of the Faroes catch which should be attributed to North America remains to be determined but a range of 3% to 4% was proposed as an interim value pending further analysis.*

> *Recommendation 3: For NEAC, a portion the catch of salmon older than 1SW is not attributed to any country. Since NEAC homewater catches of salmon older than 1SW are all attributed to the MSW category, the same consideration should be made for the Faroes catch, i.e. attribute the remaining portion of the catch to the 1SW non-maturing category.*

For NAC, the commercial fisheries of Newfoundland and Labrador catch salmon from all geographic areas of North America. The regional origin of the catches are not known and are therefore not distributed to the level of regions.

The fishery at St. Pierre et Miquelon (SPM) intercepts salmon considered to be 100% North American origin. Annual reported landings are available since 1983, ranging between 1 and 4 t (Table 2.1.1.1). Limited sampling of the catches in the recent years indicates a high proportion (76%) of 1SW salmon, presumably maturing, with the remainder primarily 2SW fish. These catches have not been incorporated into the NAC run reconstruction.

Recommendation 4: It is recommended that the catches from this fishery be incorporated in the NAC run-reconstruction.

Standardizing assumptions and incorporating uncertainty

In both the NAC and NEAC models, natural mortality (M) is assumed to be 0.03 per month. In the NAC model, the value of M has been taken as fixed whereas in the NEAC model, M is assumed to vary between 0.02 and 0.04. Assuming M is variable introduces uncertainty in the estimation of PFA.

Recommendation 5: The use of a narrow range of variation for M as used in the NEAC model should be used instead of the fixed value applied in the NAC model.

For NAC, the uncertainty in the PFA has been presented as the range in the sum of the respective minimum values and the respective maximum values for all the input variables. Summing minima and maxima exaggerates the uncertainty in PFA. For NEAC, Monte Carlo methods are used to define the distributions of the PFA by age group at the national level and at the stock complex level.

Recommendation 6: Monte Carlo methods as used in the NEAC model should be applied to the NAC model to define the distribution of the PFA values. Spreadsheet versions of the NAC and NEAC run reconstructions which use Monte Carlo simulation tools are available. Alternate formulations for both NAC and NEAC which run under "OpenBugs" have been or are under development.

Lagged spawner calculations

The spawning stock contributing to the PFA recruitment of the year of interest is calculated by lagging forward the spawners (lagged spawners, LS) based on the expected smolt age distributions of the recruitment (Rago, 2001). The lag consists of the smolt age plus two years (one for the year of egg deposition plus one for the first year at sea).

For NAC, the lagged spawners represent 2SW salmon only and the lower ranges are derived by summing the lagged spawner values based on the minimum values of annual spawners by region. The lagged spawner upper ranges are derived by summing the lagged spawner values based on the maximum values of the annual spawners by region. For NEAC, the spawner variable is defined in terms of the total eggs which would have contributed to the PFA abundance. The spawner abundances by age group (1SW, MSW) are converted to eggs based on biological characteristics of the age groups specific to each country or sub-region. As lagged spawner and lagged egg uncertainties are included in the modelling of catch advice, a standardized approach for the accounting of the uncertainties is recommended.

Recommendation 7: The lagged spawners and lagged eggs distributions should be derived using Monte Carlo simulation, as is done for the PFA. Spreadsheet versions *have been developed. Alternate formulations for both NAC and NEAC which run under "OpenBugs" are under development.*

2.3.3 Modelling dynamics of Atlantic salmon in the NAC and NEAC areas

Forecast models and catch advice frameworks have not been developed for three of the four NEAC stock complexes, all of which were exploited in the Faroes fishery. An initiative was undertaken in November 2007 to work on the development of forecast and management models in a Bayesian context which allows the incorporation of the temporal dynamic of the recruitment process, the uncertainty in the observations and in the processes. The overall objective is to develop forecast models for all the stock complexes in the North Atlantic.

Presently used models

For the provision of the catch advice for West Greenland, two forecast models are used in the risk analysis; one for the non-maturing 1SW salmon of North American origin, the other for 1SW non-maturing salmon from the southern NEAC complex (one of the four stock complexes in NEAC but the only one which is affected by the West Greenland fishery). Both models are based on generally similar data, including a lagged spawner variable to define the spawning stock, and a recruitment variable termed the PFA (Pre-Fishery Abundance), with a function relating the spawning component to the recruitment.

The estimation of abundance prior to the fishery (PFA) is done using the run-reconstruction model developed by Rago *et al.*, 1993 and Potter *et al.*, 1998 and is briefly reviewed in Section 2.3.2. PFA refers to the number of fish of one-sea-winter age which are non-maturing, i.e. would be destined to return mostly as 2SW maiden salmon. The PFA is estimated for August 1 of the second year at sea, just prior to the start of the West Greenland fishery. PFA in the NEAC area is defined as the number of 1SW recruits on January 1st in the first sea winter, prior to the Faroes winter fishery.

For NAC, the spawners are defined in terms of only the 2SW salmon to each region because the PFA recruitment age group of interest is the 2SW maiden component. This makes the broad assumption that the recruitment of 2SW salmon is conditioned primarily by the 2SW salmon escapement. For NEAC, the spawner variable is defined in terms of the total eggs which would have contributed to the PFA abundance. The spawner abundances by age group (1SW, MSW) are converted to eggs based on biological characteristics of the age groups specific to each country. As with the North American model, the eggs are lagged forward based on the smolt age distributions of the spawners in each country.

A preliminary plot of the annual midpoint estimates of PFA relative to the LS for the southern NEAC non-maturing complex suggests two periods of productivity as noted for NAC: a high productivity period during 1979 to 1989 and a low productivity period during 1978 and 1990 to the present (Figure 2.3.3.1).

For NAC, a series of models relating PFA to LS and to assess the presence of two phases of productivity have been used by the Working Group. The PFA and LS variables were natural log transformed before analysis and the linearized form of the model was:

$$Ln(PFA)=\alpha + \beta*Ph + (\gamma + \delta*Ph)*Ln(LS) + \xi$$

With Ph representing an indicator variable for the year corresponding to the change in phase.

Seven nested models were evaluated and the parsimonious model and break point year were selected using the Akaike information criteria.

For the southern NEAC non-maturing 1SW complex, the WGNAS considered the development of a non-phase shift model to forecast the PFA (ICES, 2002, 2003). The model takes the form:

$Ln(PFA_t/LSeggs_t) = \alpha + \beta^*Ln(LSeggs_t) + \delta^*Year_t + \varepsilon$

Alternate models for NAC and NEAC

A number of functional relationships between PFA and spawners were explored. It was assumed that PFA estimates are described by a lognormal distribution. PFA abundance was modelled as a log-linear function of lagged spawners or lagged eggs (LS).

$PFA_t \sim LogNormal(E(logPFA_t), \sigma_{PFA})$
$E(logPFA_t) = log(LS_t) + \alpha_t$

α_t is a “production rate” that can be modelled in different ways:

a) simple random walk through time (dynamic model of Prévost *et al.*, 2005)

$$\alpha_t = \alpha_{t-1} + \omega_t$$

$$\omega_t \overset{iid}{\sim} N(0, \sigma_\omega)$$

b) random shift with 2 production levels but with autocorrelation in the probability of being in high state (1) or lower state (2)

$$I_t \sim Bernoulli(p_t)$$
$$\log it(p_t) = \log it(p_{t-1}) + \omega_t$$
$$\omega_t \overset{iid}{\sim} N(0, \sigma_\omega)$$
$$\begin{cases} I_t = 0 : \alpha_t = \alpha_1 \\ I_t = 1 : \alpha_t = \alpha_2 \end{cases}$$

Neither of these models match those described by Chaput *et al.*, 2005 or used by the Working Group for southern NEAC non-maturing salmon. The exploration of these models was done using the midpoints of the PFA and LS data for both the NAC and southern NEAC non-maturing component, based on the data for the years 1971 to 2006.

There has been a decrease in the production rate for NAC beginning in 1989, declining into 1997, and remaining low (1.5 PFA per LS) thereafter (Figure 2.3.3.2). The phase shift model suggests a decline in productivity between 1988 and 1994 and productivity remaining low from 1993 to the present (Figure 2.3.3.2). The probability of being in the high phase of production is low (<10% chance 75% of the time) from 1995 to the present and remains low for the forecast years 2006 to 2009 (Figure 2.3.3.3).

The results of the model fitting to the NEAC data set indicates a rapid decline in productivity during 1987 to 1992 with the biggest change over the period 1988 to 1990 (Figure 2.3.3.4). The phase shift model suggests a rapid decline in productivity during 1989 and productivity remaining low from 1990 to the present (Figure 2.3.3.4). The probability of being in the high phase of production is low (<10% chance 75% of the time) from 1993 to the present but becomes uncertain for the later forecast years 2009 and 2010 (Figure 2.3.3.3).

The phase shift model is slightly more optimistic for future PFA abundance for both NAC and NEAC, with no chance of further declines whereas the dynamic model forecasts have greater uncertainty over the 4 years of forecast with increasing chance of further declines in the future (Figures 2.3.3.2 and 2.3.3.4).

The parallel declines in productivity for both the NAC and NEAC stock complexes during 1988 to 1993 is striking. Crozier *et al*., 2003 identified possible non-stationarity in the stock and recruitment time series of several NEAC stocks during the mid 1980s and Chaput *et al*., 2005 modelled production of the NAC stock complex using a phase shift model. The productivity parameter in the models explored does not allow a determination of whether the change in productivity has occurred in freshwater, in the first year at sea survival or both.

Next steps

PFA and LS are estimated from a number of other data sources, each of which has associated uncertainties. Modelling under a Bayesian framework can include observation errors.

In order to use these models in a catch advice framework, disaggregated data for PFA reconstruction must be used. An example of such a model structure is shown in Figure 2.3.3.5. Under this structure, the catches are modelled as covariates which act as controls on the abundance of salmon at different points at sea. Additional parameters are required to partition the returns to the regions (ϕ_j), to convert tons of fish in each of the fisheries (WGt; Ct; Fat; SPMt) to number of 1SW and 2SW fish. Finally, the returns to regions post-fisheries are evaluated relative to the objective of meeting the management objectives for different catch levels in all the fisheries.

For both the NAC and NEAC stocks, some of the fisheries exploit both maturing and non-maturing 1SW salmon. As the PFA is for the combined North American or NEAC stock complexes, it must be partitioned further into regional returns by maturity group. A combined life cycle model structure is shown in Figure 2.3.3.6.

2.3.4 Thermal habitat and depths experienced by Atlantic salmon kelts migrating from Newfoundland

In 2007, data storage tags (DSTs-LAT2510, manufactured by LOTEK Inc.) in a beta test format were applied to 26 Atlantic salmon kelts at an enumeration facility at Campbellton River, Newfoundland. The tags recorded at four minute intervals date, time of day, internal and external temperatures, pressure and light. The recording of light allowed for the estimation of geolocation. The tags were surgically placed in the body cavity; the fish were allowed to recover and then returned to the river where they could enter the ocean on their own volition.

In total, ten of these DSTs were recaptured and information downloaded from eight of them (data from tag 22 and 26 could not be completely recovered). The time between release and recovery for the fish ranged from 45 to 81 days. Results from these eight recovered tags indicated considerable differences between external and internal temperatures. These differences occurred because the internally placed thermistor was insulated by the flesh of the fish surrounding the body cavity, whereas the external thermistor directly recorded the water temperature in the ocean where the fish was swimming. Depth profiles indicated that during the day salmon were frequently diving, possibly to feed on deeper occurring pelagic species, whereas at night they remained near the surface. Salmon in freshwater are visual feeders and if visual feeding carries over into the sea it would explain the observations of the frequent diving activities during the daylight hours, but little or no activity at night.

The frequency distributions of external water temperatures for all fish show a wide range of temperatures from below 0 to near 20°C for both day and night profiles. For both day and night profiles there were obviously two modes in both distributions; one at 6–7°C and the other at 11–12°C. In the day profiles, there were cooler temperatures recorded than in the night. For the depth profiles, at night 45% of the time was spent at less then one dbar in depth (approximately 1 m); while during the day only about 18% was spent at less then one dbar. This pattern is caused by the daytime diving behaviour of salmon whereas at night they are found much closer to the surface. Where possible, experimental trawl work at sea should encompass both day and night trawling to take advantage of the shallower depths recorded at night.

The tags had geolocation capability because the external light stalk recorded luminescence. The light levels were used to determine daily times of sunrise, sunset and day length, which were then used to determine latitude and longitude of the salmon. Currently the position of the fish is accurate to within +/- 100 km. The position information can be improved by the inclusion of sea surface temperature that also facilitates position fixing. The results for the eight Campbellton River salmon indicate movement within Notre Dame Bay and in some cases out to 200 km into the Labrador Sea.

2.3.5 Stock size, catch and effort in the salmon fishery in the River Ellidaar, SW Iceland

For many rivers rod catch is the only available information on salmon stock size (Crozier and Kennedy, 2001). The extent to which catch data can be used to reflect stock size is being investigated as an important input into understanding the status of stocks and changes over time.

A study using fish counter information, rod catch data from log-books and effort in the period from 1935–2002 in River Ellidaar Southwest Iceland showed high correlation between salmon run and catch ($R^2=0.68$; $p<0.001$). In the 68 year period, the catch varied from 414–2276 fish and the salmon run from 750 to 7184 fish (Figure 2.3.5.1). The exploitation was 40.3% at the average. The fishing effort increased periodically from 180 rod/days in the beginning of the period to 520 in the latest years. There was, however, a higher exploitation in the years when the run was low than when the run size was high as reflected in higher average number of fish caught per rod-day. With an increased number of rods the catch per rod-day decreased (Figure 2.3.5.2). This indicates that the rod catch reflects the salmon run at least within the observed effort range.

There was no relationship found between the number of rods used and the exploitation rate although the number of rods increased from 180 to 520 over the 68 years of the time series (Figure 2.3.5.3). This suggests that within this range the exploitation rate is not sensitive to changes in number of rod-days. Based on this analysis, if the catch is to be reduced as a management measure, it would be necessary to decrease the numbers of rod-days to lower levels than the range already observed to reduce the exploitation rate significantly. However, other management measures such as shortening of the fishing season, closure of areas for fishing or catch and release in the rod fishery may be more effective in this regard.

The overall results illustrate the value of rod catch statistics, which are readily available for most Icelandic salmon rivers, as a measure of stock abundance and for monitoring changes in stock size over time. These data will make an important contribution to the process of setting and transferring CLs among Icelandic salmon rivers.

2.3.6 The assessment of recent fishery management measures on Salmon stocks in the River Bush and in UK (N Ireland) with regard to adjacent regions

The River Bush represents the main indicator stock for monitoring Atlantic salmon populations in UK (N Ireland) and long-term assessment work includes a CWT (Coded wire tagging) programme to examine exploitation and marine survival levels. Commercial catch information and CWT data were used to investigate the impact of a recent fishery management measure (voluntary net buyout) implemented in the Fisheries Conservancy Board area (FCB) of UK (N. Ireland) in 2002. The buyout resulted in a reduction in landings from a relatively stable mean of 10 263 salmon of all sea ages (1990–2001) to around 2826 fish (2002–07) (Figure 2.3.6.1). This represents a mean reduction in landings of approximately 72.5%, or 7,436 fish. In addition, CWT data indicated reduced exploitation rates on 1SW R. Bush salmon in the FCB area following the buyout, with mean exploitation rates decreasing from around 43% to less than 17%. The potential impact of the FCB area buyout on the 1SW R. Bush stock was assessed by comparing the actual exploitation level as measured by annual microtag returns with the mean pre-buyout exploitation level for the fishery applied to the annual number of available R. Bush grilse returning to the coast. The estimated number of 1SW R. Bush salmon conserved by the measure averaged 460 fish per year (2002–2007) or approximately 42% of the R. Bush CL (Figure 2.3.6.2).

2.3.7 Red vent syndrome

For some countries in the NEAC area, salmon have been returning to rivers with swollen and/or bleeding vents. The condition, referred to as red vent syndrome, appears to be restricted to wild Atlantic salmon populations (Fisheries Research Services, 2007) and has been noted since 2005. However, the condition has become more prevalent and, in 2007, was reported from a number of NEAC countries including Ireland, Iceland, UK (Scotland), UK (England & Wales) and UK (N. Ireland).

The cause of the condition 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 anadromous species. Its life cycle may include more than one intermediary host with the final host being cetaceans. Man is reported as an accidental host, following ingestion of larvae in raw or undercooked fish (Gómez *et al.*, 2003). Press releases have been issued in a number of NEAC countries to advise anglers about the condition.

Red vent syndrome affected large numbers of fish in 2007. For example, at three adult trapping sites in UK (England & Wales), between 24% and 56% of returning fish were affected; levels were highest in August and September, coinciding with the main grilse run. The majority of fish showing symptoms are grilse, although smaller numbers of 2SW fish have also been found with the condition (Fisheries Research Services, 2007), and in UK (N. Ireland) 50 to 60% of early run fish on the River Bush were affected. Levels of infestation were also high: up to 200 nematodes were located in 10 minutes of investigation in dead fish examined in UK (N. Ireland). Both male and female adult salmon are affected; the problem has not been seen in parr or smolts.

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 the 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) is unclear.

It is also unclear whether the condition affects the survival of the fish or their spawning success. However, there was no significant difference in the condition factor of affected and unaffected fish from monitored rivers in UK (England & Wales) and affected fish have also been successfully used as broodstock in a number of countries and stripped eggs developed normally in hatcheries. In addition, an affected salmon tagged on the River Dee in UK (England & Wales) in 2006 was recaptured in spring 2007 as a kelt. The fish appeared to have spawned successfully.

2.3.8 Atlantic salmon stock assessment using DIDSON (Dual-Frequency Identification Sonar)

Split-beam hydroacoustic technology has been used to monitor adult salmon migration since 1992. It was first used in Ireland in 1999 with limited success. The trials investigated the problem of counting salmon in large rivers where use of conventional counters (resistivity and infra-red) was not feasible.

An Irish review of technologies and the Dual-Frequency Identification Sonar (DIDSON), which uses acoustic lens technology to form acoustic images of near video quality, was initiated in 2006, aiming to establish a baseline salmonid stock assessment approach for large rivers. A similar project has been initiated in Labrador in eastern Canada.

The Deel river is the largest tributary of the Moy catchment, Co. Mayo, Ireland, a large catchment area of 2108 km^2, with prolific salmon run (rod catches of 10 000 to 15 000 salmon/year) and good water quality. For similar reasons the Eagle River, Labrador, Canada, was chosen: catchment 10 824 km^2; potential production 35 000 adults/year.

DIDSON counters operate at a frequency of 1.1 MHz and 1.8 MHz, giving a range of 40 m, or 0.70 MHz and 1.2 MHz giving longer ranges of up to 80m. Counts can be obtained by reviewing on-screen images (Image Mode Analysis) or using processing software (e.g. Cluster Size Over Threshold, CSOT-Analysis). They are rapidly replacing split beam acoustic counters in Alaska and the UK and presently have over 75 fisheries installations. They work in shallow, rock-bottomed rivers, around structures and can be mounted off boats, along river-banks, at dams or in trawl nets.

Continuous data collection and analysis using CSOT Analysis motion detection to 'pick' fish movements and reduce file size are being used to establish the size of the run in the Deel River, determine fish sizes and indirectly species where possible. Migration indices generated from the counter and based on mark and recapture experiments using smolts and adult salmon will be used to examine relationships with other physical, chemical and biological data to determine the timing of migrations, distributions and residency through the system.

From work to date, the advantages of DIDSON counters over other hydroacoustic counters are summarised as:

- Marine, estuarine and freshwater applications.
- Easy to install, operate and collect data.
- Provides a full fish image rather than an acoustic signal.
- Easy to transport and move between rivers/ sites.
- Floating debris is easier to differentiate than in other hydroacoustic counters.
- Fish behaviour observations are possible, including: avoidance of debris, predation, movement with different flows, preference of river sections for upstream and downstream migration.
- Fish measurements directly from screen measurements.
- Operation in flood conditions.
- Little downtime.
- On-going development of software to reduce file processing times.

Disadvantages may be viewed as:

- Start up cost (€75 000/ €100 000).
- Large data files sizes: large file sizes (15 min files create 292 MB, resulting in daily sets of ~45 GB).
- Large file sizes restrict remote, automated download.
- Initial data analysis time: assessed in image mode, 24 hr of data requires *circa*. 12 hrs to analyze. Automated counting improves this but will depend on site and species.
- Does not give location of the fish within the water column.

DIDSONs are used extensively elsewhere, including:

British Columbia

- Counting sockeye salmon in Fraser River
- Extensively tested for accuracy and precision
- Counts as good as at a counting fence
- Counts easily repeatable by different viewers with little training required

Alaska

- Counting salmon and other species on various rivers in Alaska

Washington State

- Tested for species identification
- Works well easily differentiating various species/debris due to high quality of video

Red River, Manitoba

- Successfully used to evaluate fish passage at dam
- Showed about 50% of 10,000 fish successfully passed through spillway

River Teifi, Wales

- Counted 23,000 fish moving upstream
- Used to post-correct previous year's counts

River Simojoki, Finland (Baltic Sea area)

- DIDSON was tested in parallel with a split beam acoustic counter for counting ascending salmon
- More tests will be carried out in 2008

2.3.9 Smolt migration on the River Rhine

The downstream migration of Atlantic salmon smolts was monitored in the River Rhine in 2007 using the NEDAP Trail system (Breukelaar *et al.*, 1998). The NEDAP trail system is based on inductive coupling between an antenna loop on the river bottom and a ferrite rod antenna within the transponder tags in the fish. When the fish passes each detection station the unique ID-number of the transponder is recorded. Overall, 78 tagged fish were released into one tributary of the River Rhine about 330 km from the sea. The smolts (hatchery 2^+, weight > 150 g) were tagged with a transponder (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 was observed. The tagged fish were detected by fixed antenna arrays when leaving the tributary and during their migration through the Rhine Delta to the sea.

By the end of the migration period, 60 of the tagged fish (77%) were detected leaving the tributary and 36 (46 %) were recorded reaching the sea after passage through the Rhine Delta. The losses of tagged fish occurred in both the German part of the Rhine (14 fish, 18%) and in the Delta itself in the Netherlands (10 fish, 13 %). The study aims to investigate the success of downstream migration and the migration routes taken by the fish in relation to the obstructions within the partly dammed Rhine Delta, particularly the Haringvliet sluices. The study will be repeated after the re-opening of the Haringvliet dam, which is scheduled to occur by the end of 2008, and which is intended to facilitate passage of migratory fish species from freshwater to the sea and vice versa.

2.3.10 European regulations

In 2005, the Working Group noted the implications for salmon stocks arising from the implementation of Council Directive 92/43/EEC (on the conservation of natural habitats and of wild flora and fauna). States are obliged to take measures to ensure that the exploitation of salmon stocks is compatible with their being maintained at a favourable conservation status. Under the terms of the Directive, every 6 years member states are obliged to submit a report detailing the conservation status of their salmon stocks. The first of these reports have been submitted and are currently being assessed by the EU.

The Working Group notes that salmon management in European Member States is becoming increasingly linked with the Water Framework Directive (Directive 2000/60/EC) (WFD), and its 6 year planning cycle. The WFD aims to protect and enhance the water environment, update all existing relevant European legislation, and promote 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.

Member States will need to identify River Basin Districts (RBDs), which will be 'characterised' by assessing the pressures and impacts on the water environment, such as overuse or pollution. Once that is complete, a RBMP for each District will be prepared setting out how these impacts will be reduced through its PoM. Monitoring programmes will then chart progress towards achievement of Good Ecological Status. RBMPs and PoMs need to be agreed, finalised and published by December 2009 for the first round of the WFD planning cycle. The second round plans are to be published in 2015. The status of migratory species and access to habitats will be important elements to take into account when assessing Good Ecological Status.

The EU data collection regulation (EU DCR) has been updated and expanded recently to include both salmon and eels. This will have impacts at Community level relating specifically to the requirement for a multi-annual Community programme for collection, management and use of biological, technical, environmental, and socio-economic data concerning:

a) commercial fisheries carried out by Community fishing vessels:
   i) within Community waters, including commercial fisheries for eels and salmon in inland waters;
   ii) outside Community waters;
b) recreational fisheries carried out within Community waters including recreational fisheries for eels and salmon in inland waters;
c) aquaculture activities related to marine species, including eels and salmon, carried out within the Member States and the Community waters;
d) industries processing fisheries products; shall be defined in accordance with the procedure referred to in Article 27(2).

2.4 NASCO has asked ICES to examine and report on associations between changes in biological characteristics of all life stages of Atlantic salmon, environmental changes and variations in marine survival with a view to identifying predictors of abundance

2.4.1 Biological characteristics of salmon across the North Atlantic area

The purpose of examining these associations was to determine whether declines in marine survival coincide with changes in the biological characteristics of juveniles in fresh water or are related to characteristics of adult fish (size at age, age at maturity, condition, sex ratio, growth rates, etc.).

The Working Group assembled available information and carried out preliminary analyses on biological characteristics of salmon populations in various rivers across the North Atlantic area. This included six rivers from the Northern NEAC, seven rivers from the Southern NEAC, and seven from the NAC area (Figure 2.4.1.1). The data set includes information on time series of variations in mean smolt age, proportions of maiden sea age groups, repeat spawners, sexes, and size at age of adult salmon.

Examples of the preliminary analyses are presented in Figure 2.4.1.2. A tentative association was detected between the productivity index (PFA/lagged eggs) and the size of 1SW salmon in the Northern NEAC area, whereas the relationship was less clear for the Southern NEAC area. These preliminary results further suggest that associations between variations in marine survival and biological characteristics of salmon should be examined in more detail.

While information had been made available, further analysis will be required and the Working Group recommends that further co-ordinated efforts are made to collate data on more rivers throughout the geographic range and perform more comprehensive analyses.

2.4.2 Size of 1SW fish returning to Norway

In 2006, grilse size was low in southern parts of Norway as well as in Sweden and UK (Scotland) (ICES, 2007; Todd *et al.*, 2008). The decrease in growth in recent years has been linked to the warming in areas where salmon are located at sea (Todd *et al.*, 2008). Together with evidence of significantly smaller grilse from parts of UK (England & Wales), and ad hoc reports from Ireland, it was apparent that reduced grilse size in 2006 was a phenomenon that also affected more southerly areas of Europe.

The mean weight of grilse in samples from Norwegian rivers decreased during the 1990s increased around 2000 and has recently decreased again in more recent years (Figure 2.4.2.1). The mean grilse weight in 2007 was the lowest in the time series. The pattern in the 1990s is mainly driven by data from river populations in the central and northern parts of Norway, while the decrease since 2000 is mainly driven by data from populations in the southern part. In all regions of Norway, the mean weight of grilse in 2007 was the lowest in the time series.

In 2007, small grilse and poor grilse returns were also reported from the River Teno in Finland, North East Iceland and the west coast of Sweden. In Russia the grilse run to the White Sea coast of the Kola Peninsula was poor. In UK (N. Ireland) the grilse were smaller than the long-term average, and provisional analysis suggested that grilse size in UK (Scotland) was small and similar to that in 2006. However, grilse returning to one indicator river in UK (England and Wales) were of normal size.

The mean standardised weights of grilse in 20 Norwegian rivers correlated positively with the estimated pre fishery abundance (PFA) of the corresponding sea year class ($r^2 = 0.72$, $n = 19$ years, $p < 0.001$), and the annual mean weight of salmon smaller than 3 kg from the River Drammen correlated positively with the estimated survival of hatchery reared smolts released in the same river (r^2=0.26, $n = 23$ years, $p = 0.013$).

In 2007, the size of grilse from all parts of Norway was very small, and the number of grilse returning to Norwegian home waters was very low. The proportion of grilse among salmon smaller than 3 kg was the lowest in the time series, thus the use of catch statistics to assess the grilse returns for 2007 may overestimate the returns of grilse and underestimate the number of MSW salmon.

Growth of salmon during the first year at sea or grilse size provides an indirect measure of growth rate, and it may be that growth during the first period at sea is crucial for size selective mortality. If the conditions that smolts experience during the first period in the sea are important for survival, measurements of circuli spacing on scales during this period (Beamish *et al.*, 2004; McCarthy *et al.*, 2008) may be better correlated with survival than growth during the whole period. Furthermore, if mortality is size selective one can argue that, in years with harsh conditions, only the largest fish will survive. This may explain the relatively low correlations between survival and the size of returning fish.

2.4.3 Decline in 2SW salmon in Iceland

In Iceland a decline in the two-sea-winter (2SW) stock components is of major concern. For rivers with continuous salmon catch records from 1970, and which account for almost 90% of the total national rod catch, it is evident that similar numbers of 1SW and 2SW salmon were caught the 1970s. However, in the early 1980s a steep decline was observed for all Icelandic salmon stocks. The 1SW fish recovered in the mid 1980s but the 2SW decline still continues (Figure 2.4.3.1). In 2002, the Institute for Freshwater Fisheries, the Federation of river owners and the Association of Icelandic angling clubs formed a coalition to protect 2SW salmon. This was done by promoting voluntary release of rod caught 2SW salmon and by further restrictions on fishing. The proportion of catch and release of 2SW salmon is now 42%, while the total for the Icelandic salmon catch as a whole (1SW and 2SW salmon combined) is 24%. The decline of the 2SW stocks has affected the value of the salmon rod fisheries due to a shorter fishing season; the catch is now mainly based on 1SW fish that have a runtime around 3–4 weeks later (early July).

As well as the decline in the number of 2SW salmon caught, the average weight of 2SW also shows a declining trend over the same period. No such trends are apparent for the 1SW salmon. The low weight of 2SW salmon suggests poor conditions in the ocean, and that the 1SW and the 2SW salmon are at different feeding areas. The proportion of females in the two sea age classes has remained stable over the time period, and suggests that there has been no change in the proportion of smolts destined to become 1SW and 2SW fish. This appears to be determined before marine migration and, while the1SW salmon are returning at previous levels, many 2SW fish appear to be dying during their second year at sea. If the decline in the 2SW salmon stock component continues at the current rate, it is predicted that this will be down to very low levels by 2020. It is of particular interest for Iceland to find the mechanisms for these changes and to take action, if possible, to change the downward trend.

2.4.4 Ecosystem driven variations in return rates to a second spawning for Atlantic salmon from the Miramichi River

The Working Group reviewed an analysis of a 36 year time series of salmon abundance, demographics and estimates of return rates of post-spawning salmon that explored a possible linkage between survival to a second spawning of Atlantic salmon and changes in the small fish community of the southern Gulf of St. Lawrence.

Evidence of reduced marine survival of smolts to maiden returns is extensive and has a broad geographic distribution in the North Atlantic (ICES 2007). During the period of the 1990s when marine survival rates declined, changes in the ecosystem of the northwest Atlantic were noted including shifts in the diet of marine birds, delayed spawning times for capelin, and changes in distribution of fish species other than salmon, in particular arctic cod and capelin.

Changes in biological characteristics of adult salmon have previously been presented in the context of changes in fisheries exploitation. Moore *et al.*, 1995 attributed increases in mean length at age and increased abundance of repeat spawners in the Miramichi River to reductions in fisheries exploitation, primarily in home waters. Atlantic salmon in the Miramichi can return to spawn as consecutive or alternate spawners. Consecutive spawners are short migration fish, which return to spawn after only a few months of reconditioning. Alternate spawners undertake a more extensive feeding migration, taking some of these fish to west Greenland and returning after more than one year at sea.

Abundance of maiden salmon (1SW and 2SW) and of salmon returning to a second spawning as either consecutive or alternate spawners were calculated from the estimated returns to the river and the age structure of the adults from the sampling program. Return rates were calculated as the ratio of abundance of fish at a second spawning to the abundance of fish at the maiden age in the previous year for consecutive spawners, to abundance two years previously for alternate spawners. Note that the abundance in the previous year is corrected for removals in fisheries at the maiden age. An index of the catchability adjusted biomass of the small fish community (< 20 cm length) in the southern Gulf of St. Lawrence was derived from the annual groundfish survey conducted since 1970. Since 1998, the small fish community index, which includes juveniles of many marine fish species as well as small fish such as capelin, smelt, shanny, and stickleback, has increased to the highest levels since the early 1970s.

Salmon returning as consecutive second time spawners show average growth from the previous year of over 10 cm for 1SW salmon (19% of maiden length) and 6 cm for 2SW salmon (8% of maiden length). Alternate spawners show mean growth differences of 27 cm (47% of maiden length) for 1SW salmon while 2SW salmon show mean growth increases of 16 cm (21% of maiden length).

There has been a significant increase over time in the rate of return salmon to a second spawning as consecutive spawners, but not so for the alternate spawning life history for both 1SW and 2SW maiden salmon (Figures 2.4.4.1, 2.4.4.2). There is a significant correlation between the return rate of 1SW salmon as consecutives and 2SW salmon as consecutives at the same year of maiden spawning (Figure 2.4.4.3) such that the higher return rates of both maiden salmon age groups generally occurred for the same years.

There is an association between the biomass index of small fish and the return rate as consecutive spawners, particularly for the period between 1993 and 2006 (Figure 2.4.4.4). Higher return rates of salmon as consecutive spawners are associated with years of a high biomass index of small fish. For alternate spawners, there has not been a significant directional change in return rates but the annual variations are visually associated with the annual variations in the index of small fish biomass (Figure. 2.4.4.4).

Increased return rates of consecutive spawning salmon would be unrelated to reduced exploitation in the high seas fisheries as these fish would not migrate to those areas for the short period of time they are at sea, from 2 to 5 months. The improved return rates of consecutive spawners are closely associated with the increase in the biomass index of small fish from the southern Gulf of St. Lawrence. Benoit and Swain, 2008 attribute the increase in the small fish index to reduced predation pressure resulting from the collapse of the previously dominant groundfish stocks in this area (cod, skate, flatfish species). This increased biomass of small fish may have benefited salmon by providing a more abundant food source for reconditioning both for consecutive and alternate spawning strategies. The association between the variation in return rate of alternate spawners and the variations in the fish biomass index in either the first post-spawning year at sea or in the return year for alternates provides additional support that food supplies in the early period of return at sea may be beneficial to survival to a second spawning.

Benoit and Swain, 2008 identified top-down effects of fishing and seal predation on the fish communities but did not find any bottom-up effects of prey availability on adult fish abundance. The time series for salmon from the Miramichi suggest the opposite dynamic. For Atlantic salmon, prey abundance is an important factor in post-spawner survival.

2.4.5 West Greenland biological characteristics database, 1968–2007

Assessment of the effects of the West Greenland salmon fishery on homewater stocks and fisheries requires biological characteristics data from the exploited population as well as estimation of the proportion of the catch that is North American and European in origin. Since about 1965, Canadian, Danish, American and other researchers have been collecting biological data from catches in the Greenland commercial and local use fisheries at Greenland. The database now consists of 54 095 samples of individual fish with data on date, location of sample (NAFO Division or ICNAF squares), size (mainly fork length measured in cm with some gutted and whole weights in kg), river and sea ages plus presence of spawning marks and origin. This database is available for use by researchers interested in ecological effects of salmon at sea as well as for modelling population parameters for prediction of numbers of salmon available for harvest. For example, Figure 2.4.5.1 illustrates the changes in the fork length of North American and European 1SW salmon in West-Greenland catches from 1968 to 2006.

2.5 NASCO has asked ICES to describe the natural range of variability in marine survival with particular emphasis on partitioning mortality to the narrowest geographic scale possible (estuarine, near-shore, offshore, etc.)

2.5.1 Variability in estuarine and early marine survival of smolts

The Working Group reviewed information from studies that have used sonic telemetry to assess the migratory behaviour of smolts in estuaries and the coastal zone to derive estimates of the mortality of smolts and post smolts. These studies were concentrated in the southern portions of Europe and North America, utilized both wild and hatchery smolts, and have been replicated for up to 5 years depending on the individual river. All the investigations provided estimates of smolt survival through estuaries. However, none of the studies in the NEAC area extended beyond the estuary mouth. In contrast, some North American studies have extended into coastal areas and across the Gulf of St. Lawrence. A summary of these studies, by region, is provided in Table 2.5.1.1. It should be noted that one of the investigations was conducted in an impounded estuary affected by a barrage scheme; this accounts for some of the lower observed values of survival through estuaries (Table 2.5.1.1).

Results from these studies suggest that smolt estuary mortality, although variable, is broadly similar in the NEAC and NAC regions, with no clear correlation with latitude (Figure 2.5.1.1 A). A small drop in survival at a latitude of about 48 N is most probably explained by the longer lengths of the estuaries in the rivers in which these studies were conducted (see below). Thus smolt mortalities in the earliest portions of the marine migration do not appear to be more pronounced in southern compared to northern latitudes in either Europe or North America, at least over the range of latitudes in which the studies have been conducted. These studies also provided no evidence of either increasing or decreasing trends in survival to estuary exit over the time period in which they have been conducted.

The lengths of the estuaries in which these studies were conducted differed, and there was some indication that higher losses occurred in the longer estuaries (Figure 2.5.1.1 B). This may reflect greater losses due to predation. For some NEAC studies, the largest losses occurred in freshwater, between the tagging site and the head of tide. Such losses were associated with low flows in some years and may again reflect higher levels of predation.

For some North American studies, estimates of survival of post smolts are also available through adjacent coastal areas, and include tracks extending up to > 800 km from home river estuaries to the northern exit (the Strait of Belle Isle) from the Gulf of St. Lawrence (Figure 2.5.1.1 C). The plot suggests continued losses as fish progress along their migration route. However, these survival estimates at long distances (> 800 km) must be considered minimal values, as smolts from these rivers may have exited the Gulf through an alternate passage that was not covered by receiver arrays (e.g. Cabot Strait), or may not exit the Gulf during the life-time of the tag batteries.

2.5.2 Ocean tracking network

A major Canadian-based initiative, the Ocean Tracking Network (OTN), commenced in 2008, with the aim of deploying sonic receiver arrays at key points in the globe's oceans. Some of these arrays will provide opportunities for long range tracking of salmon post smolts in the marine environment, and in some instances for quantifying the numbers of post smolts surviving to various stages in their marine migration. In North America, sonic arrays, which will run perpendicular to the coast across the continental shelf, are planned for: the Gulf of Maine (2009) and Halifax, Nova Scotia (starting in April 2008 with completion in 2009), with further arrays across the Cabot Strait in the Gulf of St. Lawrence (2009) and off Greenland (2010). A seasonal receiver line has been deployed since 2006 in the northern exit from the Gulf of St. Lawrence (the Strait of Belle Isle) in early summer to autumn, and funding has been requested for two additional seasonal coastal shelf lines off Labrador (2008). Attempts are currently underway to find support for the establishment of additional arrays in Europe.

OTN also aims to foster research and development of innovative technologies and strategies for acoustic telemetry. This includes the development of "bioprobes", where large mobile animals such as sharks or rays will carry receivers capable of downloading information from passing tagged animals, and uploading this via satellite to data compilers when these large animals break the surface. The OTN infrastructure should be maintained for at least a ten-year period, providing a long-term platform for marine work on Atlantic salmon.

2.5.3 Sonic tracking of North American Atlantic salmon smolts to sea

The Working Group reviewed the progress of one of the North American SALSEA initiatives, a multi-year programme of sonic telemetry of Atlantic salmon (*Salmo salar*) smolts from five Canadian rivers. This programme is documenting the migration patterns and survival of smolts from fresh water release sites, through home river estuaries and across the Gulf of St. Lawrence to the Strait of Belle Isle (> 1000 km for some fish). The study rivers include four (Restigouche, Miramichi, Cascapedia and St-Jean (North Shore)) which contain a high proportion of 2 SW salmon expected to migrate to West Greenland, and one in Newfoundland (Western Arm Brook) where the vast majority of fish mature after one year at sea. The study rivers lie approximately on a 600 km latitudinal gradient.

Survival patterns of smolts were similar among years for a given river, and differed consistently among these study rivers over time. Heavy losses (up to 54%) occurred in most river estuaries, although in the Miramichi and Restigouche estuaries the proportion of smolts surviving estuary transit increased as the smolt run size increased, possibly indicating predator swamping (Figure 2.5.3.1). Travel rates in the

Gulf were estimated at 18–25 km/d; survival rates to the Strait of Belle Isle and travel speeds were not associated with fish body size. Significant numbers of smolts from the Miramichi, Restigouche and Cascapedia rivers passed through the Strait of Belle Isle, showing that this is an important migration pathway for fish from these rivers. The timing of the passage of fish from these rivers through the Strait was synchronized, despite different entry times into the Gulf of St. Lawrence. This may indicate that aggregation of smolts occurs from multiple populations within the first 30 days of entering the sea.

These telemetry studies are ongoing, and are making advances in responding to NASCO's interest in partitioning marine mortality of salmon to the narrowest possible geographic scale. The results are also proving useful in guiding planning for North American SALSEA research cruises that are scheduled for 2008.

2.6 NASCO has asked ICES to compile information on the marine migration and dispersal of escaped farmed salmon with particular emphasis on movements between countries

2.6.1 Experimental tagging programme for investigating the behaviour of escaped farmed salmon from Norway and Scotland

At the annual meeting of NASCO in 2003, it was agreed that a pilot experiment should be undertaken to help determine the fate of salmon that escape from fish farms.

In 2006, Norway and Scotland carried out an experiment releasing individually tagged large farmed salmon from farms on the coast. The main objectives of the experiment were (a) to examine the migration of large, escaped farmed salmon, (b) to examine differences in the distribution of tag recoveries from fish released simultaneously in Norway and Scotland and, specifically, (c) to determine whether fish released in Scotland were subsequently present in Norwegian waters.

Farmed Atlantic salmon reared at Ardmair near Ullapool in Scotland and at Rognaldsvåg outside Florø in Norway were individually tagged with external Lea tags and released from the fish farms in the spring of 2006 (Ardmair: 678 with mean length of 719 mm; Rognaldsvåg: 597 with mean length of 721 mm). Most of the salmon were expected to be sexually mature the autumn of 2006.

Five tags from the releases in Scotland (0.7% of the total number released) have been recovered, one of which was found on a beach in Scotland north of the release site while a second tag was found on a beach in Shetland. Individual recoveries of tags were made by rod and line in the Göta River on the west coast of Sweden, in a salmon net at the outlet of the Hardangerfjord in south west Norway and as a bycatch in a long-line fishery in the Lofoten area in north Norway.

Of the fish released from the Norwegian fish farm, 42 tags were recovered (7 % of the number released). Most of the fish moved relatively quickly into nearby fjords and entered rivers there, with only one individual travelling any significant distance; it was recaptured in the Drammenfjord in south east Norway.

Salmon released from the Norwegian fish farm showed a much higher survival (or detection) rate than the fish released at the Scottish farm and their migration pattern was very local. The migration pattern of the salmon released in Scotland can be plausibly explained by transport with the prevailing west to east Atlantic currents. The study has shown that large salmon escaping from fish farms in Scotland in the spring are capable of reaching Norwegian waters and the west coast of Sweden.

In summary, the results of the Norwegian part of this experiment were consistent with previous findings of local dispersal patterns before and at spawning. By comparison, the Scottish results suggested that survival rates for fish released in Scotland were probably very low relative to rates in Norway. In contrast to Norway, fish released in Scotland were not reported from any of the national fisheries. Those who survived the immediate post-release period showed a relatively high capacity for dispersal and proved capable of reaching coastal waters and rivers in Norway and western Sweden.

2.7 Update on marine research initiatives in the North East Atlantic

2.7.1 Irish post-smolt survey in 2007

In May 2007, the Marine Institute of Ireland, funded under Ireland's National Development Plan (NDP) and the Atlantic Salmon Trust, organised a short, directed exploratory research cruise using a pelagic trawl net designed by Norwegian scientists for post-smolt fishing. The main objective of the cruise was to test this net prior to a more comprehensive survey under the EU FP7 Framework programme of funding. Details of the cruises and the operation of the net have been reported in NASCO (CNL 07/35). The following details the analyses of country and river of origin for samples collected from the post-smolt sampling survey.

Tissue samples were provided for genetic analysis. The samples were divided by location resulting in four groups; Galway Bay, Killalla Bay, West Isle of Mull and North West Isle of Lewis (Figure 2.7.1.1). Some rivers from the South East of Ireland (Nore, Barrow, Suir, Blackwater and Bride) are genetically indistinct, therefore the latter group were considered as part of the South East Population Complex (SEPC).

The post-smolt sample data were analysed in two separate steps. The samples were first analysed against the international baseline to identify country of origin. Secondly, samples that assigned to an Irish baseline were re-analysed to determine river of origin from an extensive sample from all principal main stem Irish rivers.

A summary of the sample locations and dates is shown in Figure 2.7.1.1 with the capture details given in Table 2.7.1.1. Samples taken in Galway Bay comprised five smolts originating from the River Corrib, a large salmon river entering Galway Bay. A single fish was caught originating from the South east population complex (SEPC) of salmon rivers representing four large rivers (Blackwater, Suir, Nore and Barrow). More surprisingly, samples of one post-smolt each were identified as having originated in the River Moy and the Owenmore, both of which are a considerable distance to the North of the sampling locations, indicating that these smolts had travelled in the opposite direction to that which might have been expected for ocean migrating post-smolts possibly being influenced by local currents. Trawling in Killala Bay captured 12 post-smolts originating from the River Moy, one of the biggest rivers in the country, which flows into this Bay. Four originated from the Owenmore River which enters the sea further south while a single fish, being identified as being of Irish origin but not assigned to a river of origin, was also taken. Sampling in the area west of the Outer Hebrides (west of the Isle of Mull) comprised of a more mixed group of post-smolts. Seven of these originated from rivers in Scotland, with a further 7 identified as having originated from the River Moy. Four post-smolts from the SEPC were identified, with three more from the Owenmore. One was identified from a river in Kerry, in the very southern part of Ireland. Two fish were identified as being of Irish origin, but could not be assigned to river of origin. The final location where samples were taken was west of the Isle of Lewis and in the vicinity of the

Island of St. Kilda; two post-smolts were identified to river of origin. One was from a Scottish river, while the remaining fish was from the Foyle in the most northerly part of Ireland.

2.7.2 SALSEA MERGE

In 2007, a large scale project, SALSEA-Merge (*Advancing Understanding of Atlantic Salmon at Sea: Merging Genetics and Ecology to Resolve Stock-specific Migration and Distribution Patterns*) was provided with funding support for 2008–2011 from the European Union 7th Framework (FP7), the Atlantic Salmon Trust and the Total Fund.

The overall objective of SALSEA-Merge is, by merging genetic and ecological investigations, to advance understanding of stock specific migration and distribution patterns and overall ecology of the marine life of Atlantic salmon and to gain insight into the factors resulting in recent significant increases in marine mortality. The project will assemble and analyze data on the oceanographic and biological characteristics of the marine habitat of post-smolts in addition to obtaining biological material from three proposed annual cruises in 2008 and 2009. Significantly, material from marine salmon surveys carried out over the past two decades such as archived tissues for genetic stock identification to river/region of origin, salmon scales and tag recovery information will form a major input to the project. The Science packages of SALSEA consist of two work packages dealing with salmon genetic issues, i.e. development of genetic identification methodology and genetic identification of stock origin of samples taken at sea. Two work packages will deal with ecological data acquisition and analyses, both historical and contemporary, while a fifth work package will merge and analyze genetic, biological and oceanographic data into models for stock specific distribution and migration patterns, integrated with patterns of growth, dietary differences and oceanographic conditions. The project is expected to represent a considerable step forward to understand the marine ecology of salmon in the NE Atlantic.

2.7.3 SALSEA North America

In 2008, Canada will make available a research vessel for 23 days, primarily in August, for the sampling of pelagic fishes including post smolts off the North American Coast. Objectives include documenting the distribution and abundance of salmon, and correlating these data with the abundance of other species including microplankton, and oceanographic conditions. Personnel from Canada and the USA will participate in the cruise, and sampling will be concentrated in the Labrador Sea. Survey transects are designed to document both nearshore and offshore distributions of post smolts, and any captured salmon will be extensively sampled for stomach contents, disease status, stable isotope content, etc. In addition, Canada and the USA will continue its life history monitoring on 16 index rivers. This work provides both short and long term information on the biological responses of salmon populations to changes in marine survival. Finally, North America is investing heavily in the development of electronic technologies for tracking the movements of salmon at sea. Descriptions of this work are provided in Section 2.5 of this report.

2.7.4 SALSEA West Greenland

SALSEA is a conceptual marine sampling program for Atlantic salmon of which one aspect is an expanded sampling program for the West Greenland fishery. An overview presentation of an expanded sampling program for the West Greenland fishery was presented to the Working Group. In total, 6 samplers would be deployed across three sampling divisions over the course of the fishery. Prior arrangements will be made with fishermen from these communities for the purchase and delivery of fresh whole Atlantic salmon throughout the sampling program. These fish will be heavily sampled, including but not limited to various external characteristics, tags, tissue samples for genetic stock identification, age and growth, feeding, condition of fish through lipid content and RNA/DNA analysis, elemental analysis of otoliths, maturity status, trophic ecology through stable isotope signatures, heavy metal and pollutant loads, viral, bacterial and parasite abundance. Paramount to the success of this program is the genetic stock identification of all sampled fish to a scale finer than continent of origin to facilitate comparisons among and between various stock groupings. Annual operating costs (sampling supplies, purchase of fish, shipping costs, coordination...) for this program will be supported by continued participation by the Parties and existing funds. External funding will need to be sought to support much of costs associated with sample processing. It is expected that some of the processing may be undertaken by the participating Parties as additional in-kind support. The Working Group supports the further development and implementation of an expanded West Greenland sampling program in support of SALSEA as it is an extremel cost effective means to sample Atlantic salmon in the marine environment.

2.7.5 Update on marine research in the Barents Sea

A collaborative research project (2007–2010) involving research institutions and universities from Norway, Finland, Russia and Canada, co-funded by the Norwegian Research Council and other national institutions, aims at investigating various elements of the marine ecology of the northernmost European salmon populations in the Barents Sea area. The main goals of the project include assessment of long-term changes in the marine trophic ecology of salmon by analysis of stable isotope signatures, determining marine distribution patterns and ocean feeding areas by the use of archival data storage tags (DST's) and satellite tags on kelts, developing a time series of marine survival for one salmon stock, and examining long term co-variation in abundance and survival of salmon stocks in different Barents Sea rivers.

A video monitoring site was established in a tributary of the River Teno in 2002 for collection of data on the sea survival of salmon. This time series will be continued in this project, at least until 2010. In 2007, 30 kelts were equipped with archival satellite "pop-up" tags and released in the River Teno, and more than 300 kelts tagged with DST's were released in four different Barents Sea rivers in Norway, Finland and Russia. Tagging with DST's and conventional anchor tags will continue in 2008.

2.8 NASCO has asked ICES to provide a compilation of tag releases by country in 2007 and advise on progress with compiling historical tag recovery data from oceanic areas

2.8.1 Compilation of tag releases and fin clip data by ICES member countries in 2007

Data on releases of tagged, fin-clipped and otherwise marked salmon in 2007 were provided to the Working Group and are compiled as a separate report (ICES, 2008b). In summary (Table 2.8.1.1), about 4.36 million salmon were marked in 2007, an increase from the 3.96 million fish marked in 2006. The adipose clip was the most commonly used primary mark (3.3 million), with microtags (0.72 million) the next most common primary mark. Most marks were applied to hatchery-origin juveniles (4.22 million), while 122 768 wild juveniles and 15 971 adults were also marked. The use of PIT (Passive Integrated Transponder) and other implanted tags has increased in recent years and these are also now listed in a separate column in Table 2.8.1.1. In 2007, 50 563 PIT tagged salmon, Data Storage Tags (DSTs), radio and/or sonic transmitting tags (pingers) were also used for marking Atlantic salmon.

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-Maine, and Iceland) require that some or all of the sea-cage farmed fish reared in their area be marked. In Maine, some firms have opted for a genetic "marking" procedure. The broodstock of these firms has been screened with molecular genetic techniques, which makes it feasible to trace an escaped farmed salmon back to its hatchery of origin through analysis of its DNA. One company has applied ventral fin clip, but has not reported numbers for reasons of commercial confidentiality. In Iceland, coded wire tags are being applied to about 10% of sea-cage farm production. The Icelandic data are included in ICES 2008b, but the USA numbers are not included.

2.8.2 Workshop on salmon historical information-new investigations from old tagging data (WKSHINI)

At the 2007 ICES Annual Science Conference it was decided that a Workshop on Salmon historical information-new investigations from old tagging data [WKSHINI] (Chair: Lars Petter Hansen, Norway) will be established (2007/2/DFC02), and will meet in Halifax, Canada, from 18–20 September 2008 to:

- build on progress made in WKDUHSTI (2007);
- provide further information from historical oceanic tagging and recovery programmes in the format agreed at WKDUHSTI;
- update the database of tagging and tag recovery information which was established in WKDUHSTI;
- develop testable hypotheses of salmon migration and behaviour;
- test these hypotheses using information compiled in WKDUHSTI and any new information which becomes available;
- Use the information to describe distribution of salmon of different river (stock) origins and sea age in time and space and assess changes in the distribution over time in relation to hydrographical factors.

WKSHINI will report by 1 November 2008 for the attention of the Diadromous Fish Committee and WGNAS.

Table 2.1.1.1 Reported total nominal catch of salmon by country (in tonnes round fresh weight), 1960–2007. (2007 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)	Den.	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.

Year	NAC Area			NEAC (N. Area)							NEAC (S. Area)						Faroes & Greenland				Total	Unreported catches	
	Canada (1)	USA	St. P&M	Norway (2)	Russia (3)	Iceland Wild	Iceland Ranch (4)	Sweden (West)	Den.	Finland	Ireland (5,6)	UK (E & W)	UK (N.Irl.) (6,7)	UK (Scotl.)	France (8)	Spain (9)	Faroes (10)	East Grld.	West Grld. (11)	Other (12)	Reported Nominal Catch	NASCO Areas (13)	International waters (14)
1991	711	1	1	876	215	129	346	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	3	-	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	-	2,396	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	106	11	25	4	78	551	89	56	192	13	7	0	0	9	-	2,462	847	-
2004	161	0	3	784	82	118	11	19	4	39	489	111	48	245	19	7	0	0	15	-	2,155	686	-
2005	139	0	3	888	82	132	17	15	8	47	422	97	52	215	11	13	0	0	15	-	2,156	700	-
2006	137	0	3	932	91	104	17	14	2	67	326	80	29	192	13	11	0	0	22	-	2,040	670	-
2007	112	0	2	767	63	87	35	16	3	58	85	76	24	159	11	10	0	0	25	-	1,533	475	-
Average																							
2002-2006	145	0	3	939	96	110	13	20	4	65	494	108	53	207	13	9	0	0	14	-	2,294	788	-
1997-2006	157	0	2	932	106	102	23	22	4	70	553	136	62	234	12	8	2	0	22	-	2,445	946	-

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 recently developed 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.
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), 1960–2007. (2007 figures include provisional data). S = Salmon (2SW or MSW fish). G = Grilse (1SW fish). Sm = small. Lg = large; for definitions, see Section 4.1. 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	130	345	38	3	53	17	70	-	-	404	200	55	285	177	462	13	11	3,534
1992	323	199	522	1	566	301	867	167	175	461	49	10	49	28	77	-	-	630	171	91	361	238	599	20	11	3,851
1993	214	159	373	1	611	312	923	139	160	496	56	9	53	17	70	-	-	541	248	83	320	227	547	16	8	3,670
1994	216	139	355	0	581	415	996	141	141	308	44	6	38	11	49	-	-	804	324	91	400	248	648	18	10	3,935
1995	153	107	260	0	590	249	839	128	150	298	37	3	37	11	48	-	-	790	295	83	364	224	588	10	9	3,538
1996	154	138	292	0	571	215	787	131	122	239	33	2	24	20	44	-	-	685	183	77	267	160	427	13	7	3,042
1997	126	103	229	0	389	241	630	111	106	50	19	1	30	15	45	-	-	570	142	93	182	114	296	8	3	2,303
1998	70	87	157	0	445	296	740	131	130	34	15	1	29	19	48	-	-	624	123	78	162	121	283	8	4	2,376
1999	64	88	152	0	493	318	811	103	120	26	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	83	2	33	5	56	39	95	-	-	621	219	78	160	114	274	11	7	2,881
2001	61	86	148	0	850	417	1,267	114	88	0	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	97	0	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	110	0	25	4	63	15	78	-	-	551	89	56	122	70	192	13	7	2,444
2004	68	94	161	0	577	207	784	82	130	0	19	4	32	7	39	-	-	489	111	48	158	87	245	19	7	2,138
2005	56	83	139	0	581	307	888	82	149	0	15	8	31	16	47	-	-	422	97	52	125	90	215	11	13	2,138
2006	55	82	137	0	671	261	932	91	121	0	14	2	38	29	67	-	-	326	80	29	117	75	192	13	11	2,015
2007	48	64	112	0	627	140	767	63	122	0	16	3	52	6	58	-	-	85	76	24	95	64	159	11	10	1,506
Average																										
2002-2006	58	88	145	0	661	277	939	96	121	0	20	4	49	16	65	-	-	494	108	53	128	79	207	13	9	2275
1997-2006	67	90	157	0	616	316	932	106	113	11	22	4	49	21	70	-	-	553	136	62	144	90	234	12	8	2419

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 recently developed 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, 1991–2007. Figures for 2007 are provisional.

Year	Canada		USA		Iceland		Russia		UK (E&W)		UK (Scotland)		Ireland		UK (N Ireland) [1]		Denmark	
	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	6	14,823	87	3,132	24	10,965	18						
1998	62,895	53	273	100	2,826	8	12,776	81	5,365	31	13,464	18						
1999	55,331	50	211	100	3,055	11	11,450	77	5,447	44	14,846	28						
2000	64,482	55	0	-	2,918	12	12,914	74	7,470	42	21,072	32						
2001	59,387	55	0	-	3,607	15	16,945	76	6,143	43	27,724	38						
2002	50,924	52	0	-	5,985	19	25,248	80	7,658	50	24,058	42						
2003	53,645	55	0	-	5,361	17	33,862	81	6,425	56	29,160	56						
2004	62,316	55	0	-	7,294	17	24,679	76	13,211	48	46,279	50					255	19
2005	63,005	62	0	-	9,224	19	23,592	87	11,983	56	45,970	55	2,553	12			606	27
2006	60,486	62	1	100	8,735	23	33,380	82	10,959	56	47,471	55	5,409	22	427	22	794	65
2007	42,820	59	3	100	9,263	24	44,341	90	9,802	54	57,943	61	13,125	40	305	19	959	57

Key: [1] Data for FCB area only

Table 2.1.3.1 Estimates of unreported catches (tonnes round fresh weight) by various methods within national EEZs in the North East Atlantic, North American and West Greenland Commissions of NASCO, 1987–2007.

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
Mean 2002-2006	690	89	10	788

* No unreported catch estimate available for Canada, Spain, or St. Pierre et Miquelon in 2007.

Table 2.1.3.2 Estimates of unreported catches (tonnes round fresh weight) by various methods by country within national EEZs in the North East Atlantic, North American and West Greenland Commissions of NASCO, 2007.

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	3	0.1	48
NEAC	Finland	15	0.7	20
NEAC	Iceland	12	0.6	9
NEAC	Ireland	9	0.4	9
NEAC	Norway	328	16.3	30
NEAC	Russia	50	2.5	44
NEAC	Sweden	2	0.1	10
NEAC	France	3	0.1	22
NEAC	UK (E & W)	22	1.1	22
NEAC	UK (N.Ireland)	0	0.0	1
NEAC	UK (Scotland)	22	1.1	12
NAC	USA	0	0.0	0
WGC	West Greenland	10	0.5	29
	Total Unreported Catch *	475	23.7	
	Total Reported Catch of North Atlantic salmon	1,533		

* No unreported catch estimate available for Canada, Spain, or St. Pierre et Miquelon in 2007.

Table 2.2.1.1 Production of farmed Atlantic salmon in the North Atlantic area and in areas other than the North Atlantic (in tonnes round fresh weight), 1980–2007.

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	39,300	12,003	0	500	233,473	905,447
2001	436,103	138,519	46,014	37,606	23,312	13,202	2,645	250	0	697,651	200,000	5,443	58,000	13,815	0	500	277,758	975,409
2002	462,495	145,609	45,150	42,131	22,294	6,798	1,471	250	0	726,198	273,000	5,948	71,600	14,699	0	1,000	366,247	1,092,445
2003	509,544	176,596	52,526	39,760	16,347	6,007	3,710	250	298	805,038	261,000	10,329	55,600	13,324	0	1,000	341,253	1,146,291
2004	563,815	158,099	40,492	39,014	14,067	8,515	6,620	250	203	831,075	261,000	6,659	46,100	14,317	0	1,000	329,076	1,160,151
2005	586,512	129,588	18,962	44,090	13,764	5,263	6,300	250	179	804,908	385,000	6,123	53,800	16,827	0	1,000	462,750	1,267,658
2006	626,382	131,847	11,905	47,880	11,000	4,674	5,745	250	229	839,912	370,000	5,823	70,018	22,417	0	1,000	469,258	1,309,170
2007	723,000	142,556	22,305	44,000	11,000	2,715	1,158	250	280	947,264	350,000	6,261	70,018	25,000	0	1,000	452,279	1,399,543
5-yr mean 2002-2006	549,750	148,348	33,807	42,575	15,494	6,251	4,769	250		801,426	310,000	6,976	59,424	16,317	0	1,000	393,717	1,195,143
% change on 5-year mean	+32	-4	-34	+3	-29	-57	-76	0		+18	+13	-10	18	+53		+0	+15	+17

Notes:
Data for 2007 are provisional for many countries.
Where production figures were not available for 2007, values as in 2006 were assumed.
West Coast USA = Washington State.
West Coast Canada = British Columbia.
Australia = Tasmania.
Source of production figures for non-Atlantic areas: miscellaneous fishing publications & Government reports (including Kjonhaug, 2008).
'Other' includes South Korea & China.

Table 2.5.1.1 Summary of acoustic smolt tracking studies, by region.

Region	No. rivers	No. of studies with wild smolts	No. of studies with hatchery smolts	Impounded rivers	No. of replicates	Estuary length (km)	Time period
S. NEAC	5	4	1	1	1 - 4	1.2 - 2.9	1992 - 2007
USA	4	3	3	0	2 - 7	2.0 - 47.5	1997 - 2006
Scotia Fundy	1	1	0	0	2	127	2002 - 2003
Gulf	4	0	4	0	3 - 5	2.5 - 122	2003 - 2007
Newfoundland	1	1	0	0	1	3	2007

Table 2.7.1.1 Details of capture locations and river/country of origin of post-smolts during experimental trawling experiments in the North East Atlantic in May 2007 (Celtic Voyager).

Date	Fish No.	River	Country	Location Start trawl			
				North		West	
9/5/2007	1	Corrib		53	12.69	9	45.71
9/5/2007	2	Corrib		53	12.69	9	45.71
9/5/2007	3	Corrib		53	12.69	9	45.71
9/5/2007	4	SEPC		53	12.69	9	45.71
9/5/2007	5	Owenmore		53	12.69	9	45.71
10/5/2007	1	Corrib		53	8.59	9	27.03
10/5/2007	2	Corrib		53	8.59	9	27.03
10/5/2007	4	Moy		53	8.59	9	27.03
11/5/2007	1	Moy		54	20.88	9	19.18
11/5/2007	2	Moy		54	20.88	9	19.18
11/5/2007	3	?	Ireland	54	20.88	9	19.18
11/5/2007	4	Moy		54	20.88	9	19.18
11/5/2007	5	Owenmore		54	20.88	9	19.18
11/5/2007	6	Moy		54	20.88	9	19.18
11/5/2007	7	Owenmore		54	20.88	9	19.18
11/5/2007	8	Moy		54	20.88	9	19.18
11/5/2007	9	Owenmore		54	20.88	9	19.18
11/5/2007	10	Owenmore		54	20.88	9	19.18
11/5/2007	11	Moy		54	20.88	9	19.18
11/5/2007	13	Moy		54	20.88	9	19.18
11/5/2007	14	Moy		54	20.88	9	19.18
11/5/2007	15	Moy		54	20.88	9	19.18
11/5/2007	17	Moy		54	20.88	9	19.18
11/5/2007	18	Moy		54	20.88	9	19.18
11/5/2007	19	Moy		54	20.88	9	19.18
12/5/2007	2	Ireland		56	18.95	7	59.66
12/5/2007	3	SEPC		56	18.95	7	59.66
12/5/2007	4	Moy		56	18.95	7	59.66
12/5/2007	5	SEPC		56	18.95	7	59.66
12/5/2007	7	Scotland	Scotland	56	18.95	7	59.66
12/5/2007	8	Ireland	Ireland	56	18.95	7	59.66
12/5/2007	9	Moy		56	18.95	7	59.66
12/5/2007	11	SEPC		56	18.95	7	59.66
12/5/2007	1	Moy		56	28.96	7	54.15
12/5/2007	4	Scotland	Scotland	56	28.96	7	54.15
12/5/2007	1			56	38.68	7	52.06
12/5/2007	2	Scotland	Scotland	56	38.68	7	52.06
12/5/2007	3	SEPC		56	38.68	7	52.06
12/5/2007	4	Moy		56	38.68	7	52.06
12/5/2007	5	Owenmore		56	38.68	7	52.06
12/5/2007	7	Owenmore		56	38.68	7	52.06
12/5/2007	8	Scotland	Scotland	56	38.68	7	52.06
12/5/2007	9	Scotland	Scotland	56	38.68	7	52.06
12/5/2007	10	Moy		56	38.68	7	52.06
12/5/2007	15	Moy		56	38.68	7	52.06
12/5/2007	16	Moy		56	38.68	7	52.06
12/5/2007	18	Scotland	Scotland	56	38.68	7	52.06
12/5/2007	19	Scotland	Scotland	56	38.68	7	52.06
12/5/2007	20	Moy		56	38.68	7	52.06
12/5/2007	21	Owenmore		56	38.68	7	52.06
12/5/2007	22	SEPC		56	38.68	7	52.06
12/5/2007	24	Roughty		56	38.68	7	52.06
12/5/2007	25	SEPC		56	38.68	7	52.06
13/5/2007	1	Foyle		58	32.78	7	59.29
13/5/2007	2	Scotland		58	32.78	7	59.29

Table 2.8.1.1 Summary of Atlantic salmon tagged and marked in 2007-'Hatchery' and 'Wild' refer to smolts and parr; 'Adults' relates to both wild and hatchery-origin fish.

		Primary Tag or Mark				
Country	Origin	Microtag	External mark	Adipose clip	Pit tag[2]	Total
Belgium	Hatchery	11,800	0	0	0	11,800
	Wild	0	0	0	0	0
	Adult	0	0	0	0	0
	Total	11,800	0	0	0	11,800
Canada	Hatchery	0	4,360	768,978	157	773,495
	Wild	0	23,746	29,223	574	53,543
	Adult	0	4,308	1,226	311	5,845
	Total	0	32,414	799,427	1,042	832,883
France[1]	Hatchery	0	0	459,267	0	459,267
	Wild	0	0	746	1,881	2,627
	Adult	0	0	175	65	240
	Total	0	0	460,188	1,946	462,134
Germany	Hatchery	33,146	0	7765	0	40,911
	Wild	0	300	0	0	300
	Adult	0	0	0	0	0
	Total	33,146	300	7,765	0	41,211
Iceland	Hatchery	121,140	0	0	0	121,140
	Wild	2,360	0	0	0	2,360
	Adult	0	2,774	0	0	2,774
	Total	123,500	2,774	0	0	126,274
Ireland	Hatchery	227,531	0	0	0	227,531
	Wild	4,157	0	0	0	4,157
	Adult	0	0	0	0	0
	Total	231,688	0	0	0	231,688
Norway	Hatchery	19,425	43,928	0	0	63,353
	Wild	236	2,709	0	0	2,945
	Adult	0	1290	0	0	1,290
	Total	19,661	47,927	0	0	67,588
Russia	Hatchery	0	0	1,231,544	0	1,231,544
	Wild	0	2,975	263	135	3,373
	Adult	0	0	0	0	0
	Total	0	2,975	1,231,807	135	1,234,917
Spain	Hatchery	241,845	0	144,940	0	386,785
	Wild	0	0	0	0	0
	Adult	0	0	0	0	0
	Total	241,845	0	144,940	0	386,785
Sweden	Hatchery	0	3,000	192,261	0	195,261
	Wild	0	450	0	0	450
	Adult	0	0	0	0	0
	Total	0	3,450	192,261	0	195,711
UK (England & Wales)	Hatchery	27,371	0	151,732	0	179,103
	Wild	14,110	0	14,098	0	28,208
	Adult	0	1,937	0	0	1,937
	Total	41,481	1,937	165,830	0	209,248
UK (N. Ireland)	Hatchery	17,382	0	31,949		49,331
	Wild	1819	0	0	0	1,819
	Adult	0	0	0	0	0
	Total	19,201	0	31,949	0	51,150
UK (Scotland)	Hatchery	62,976	0	0	0	62,976
	Wild	9,005	3,874	0	9,252	22,131
	Adult	0	0	0	0	0
	Total	71,981	3,874	0	9,252	85,107
USA	Hatchery	0	105,577	277,162	37,377	420,116
	Wild	0	855	0	0	855
	Adult	0	2,145	929	811	3,885
	Total	0	108,577	278,091	38,188	424,856
All Countries	Hatchery	717,670	156,865	3,257,833	37,534	4,222,613
	Wild	31,687	34,609	44,330	11,842	122,768
	Adult	0	12,454	2,330	1,187	15,971
	Total	749,357	203,928	3,304,493	50,563	4,361,352

[1] does not include 87,155 juveniles marked with fluorescent pigments nor 865 adults marked by dermojet.

[2] includs pit tags or other internal tags

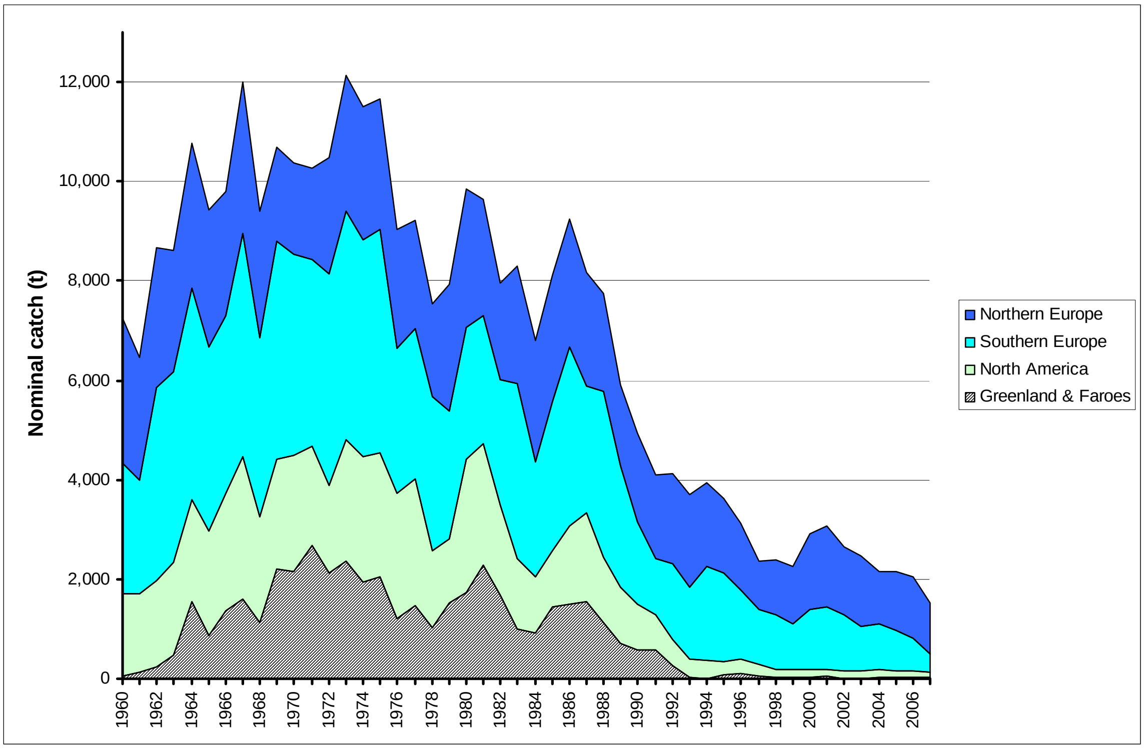


Figure 2.1.1.1 Reported total nominal catch of salmon (tonnes round fresh weight) in four North Atlantic regions, 1960–2007.

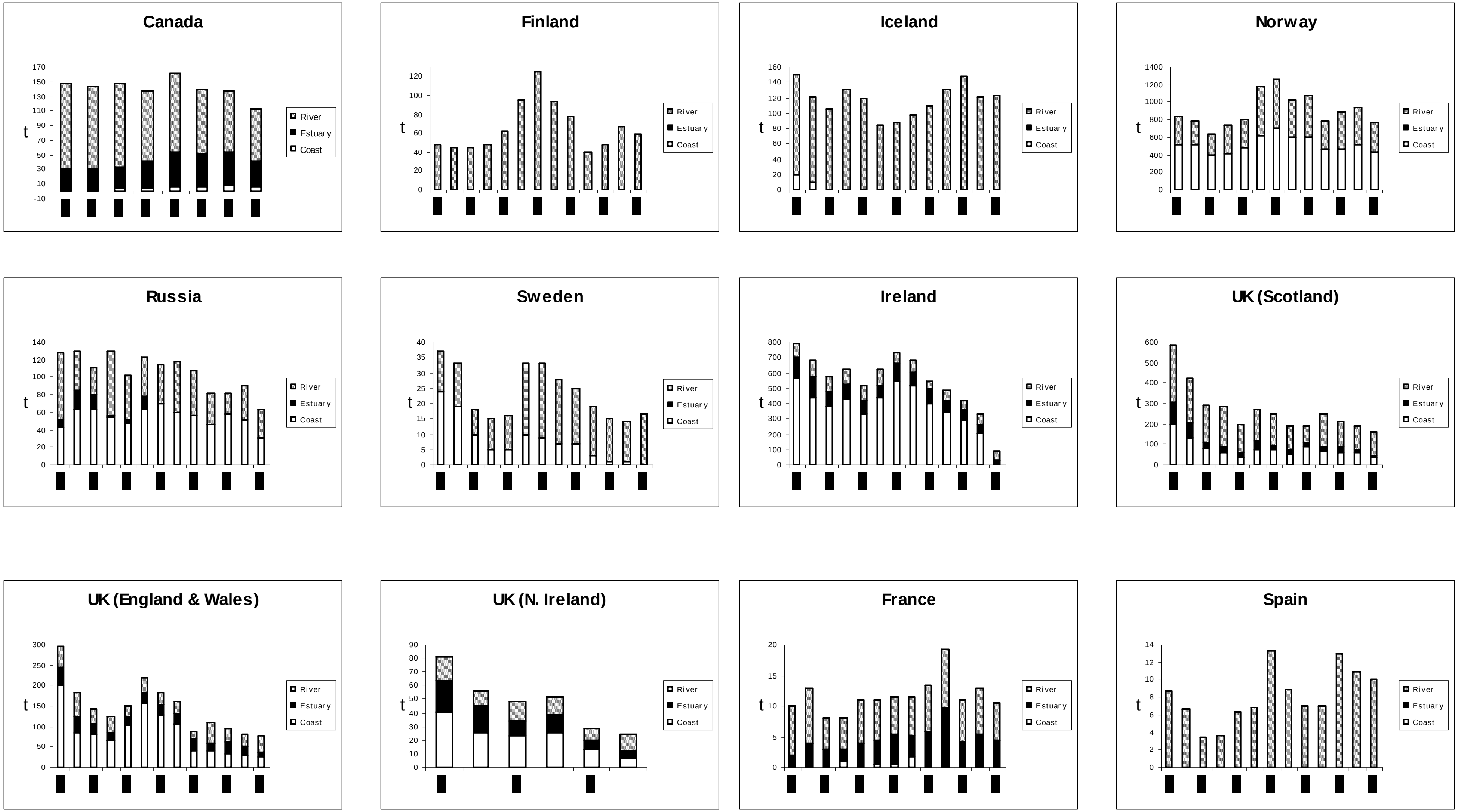


Figure 2.1.1.2 Nominal catch (tonnes) taken in coastal, estuarine and riverine fisheries by country. Note that time series and y-axes vary.

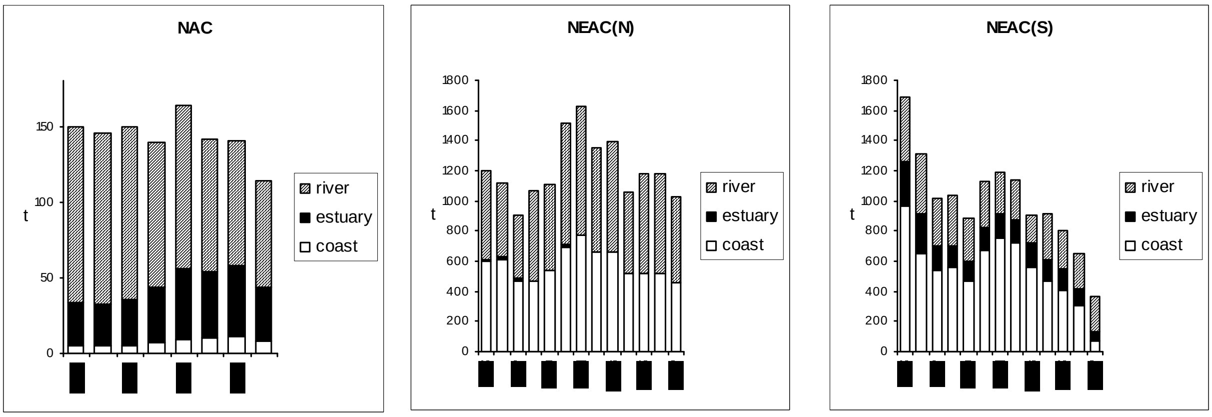


Figure 2.1.1.3 Nominal catch taken in coastal, estuarine and riverine fisheries for the NAC area, and for the NEAC northern and southern areas. Note that time series and y-axes vary.

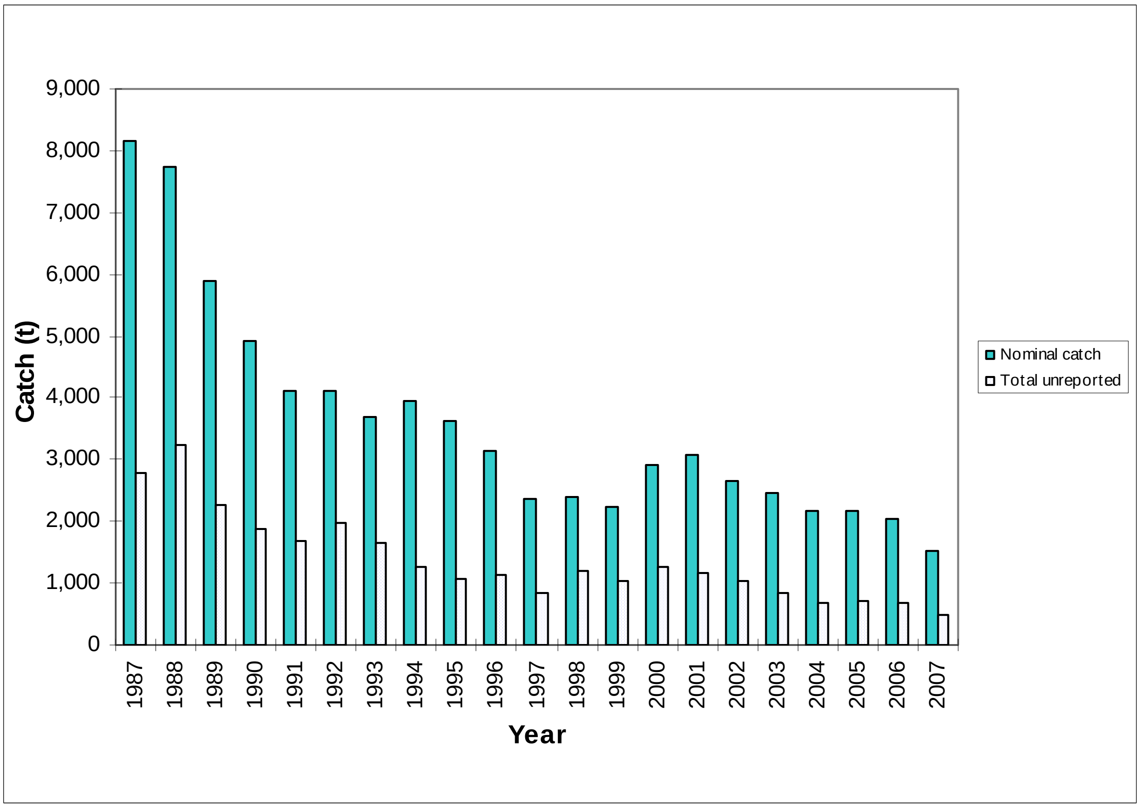


Figure 2.1.3.1 Nominal North Atlantic salmon catch and unreported catch in NASCO areas, 1987–2007.

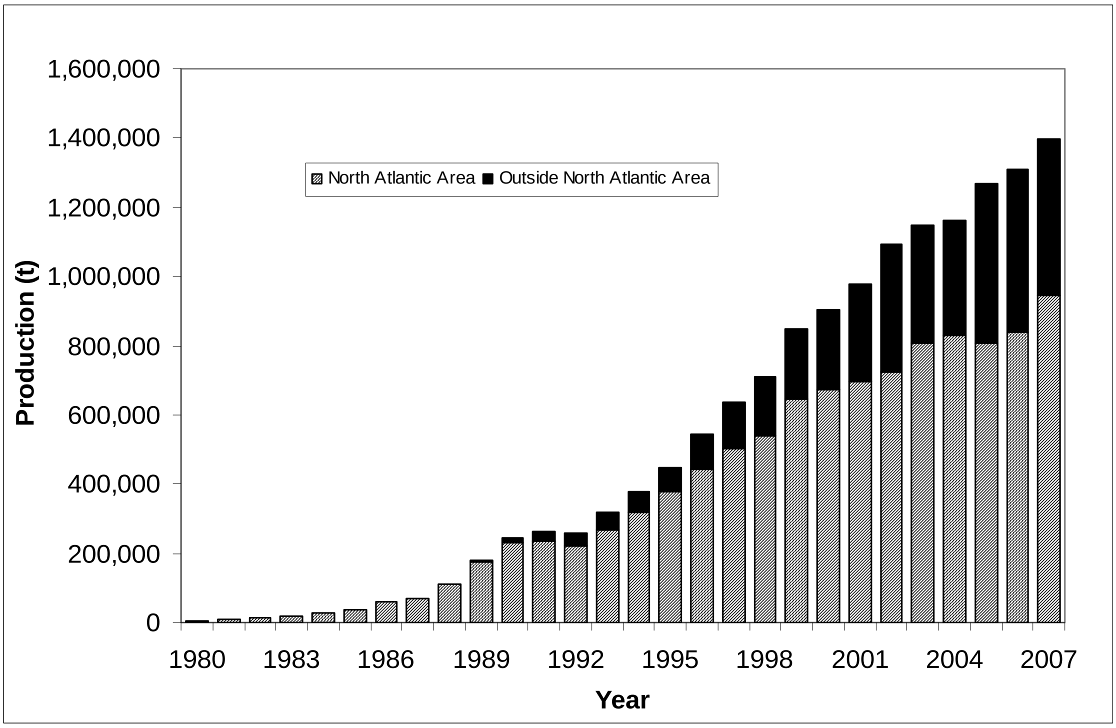


Figure 2.2.1.1 World-wide production of farmed Atlantic salmon, 1980–2007.

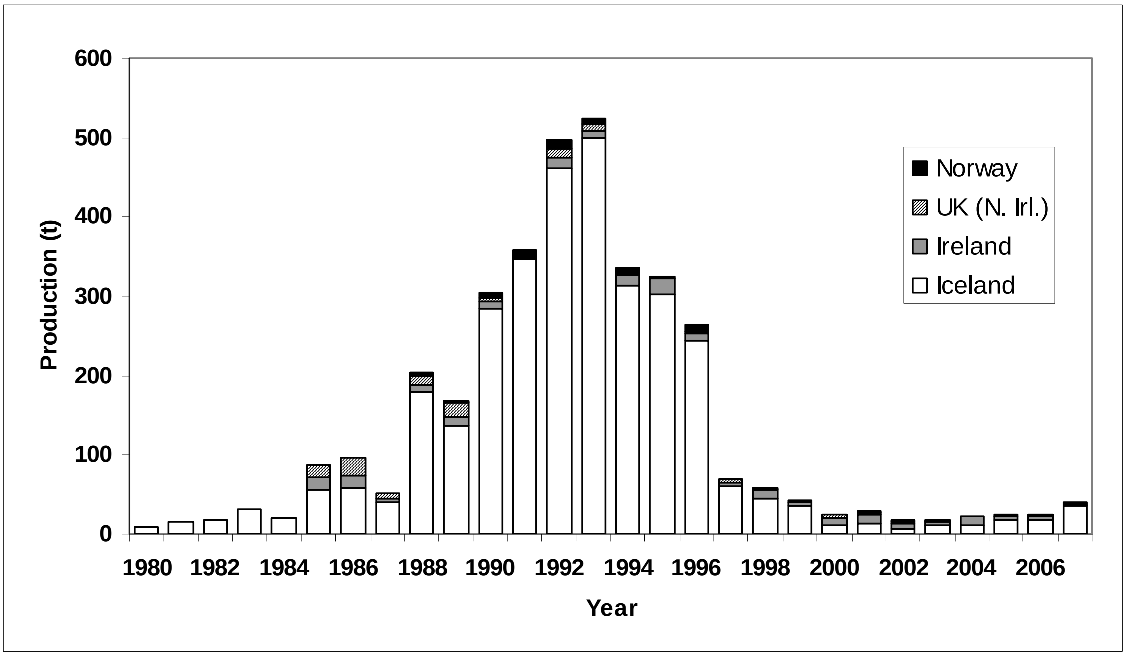


Figure 2.2.2.1 Production of ranched Atlantic salmon (tonnes round fresh weight) in the North Atlantic, 1980–2007.

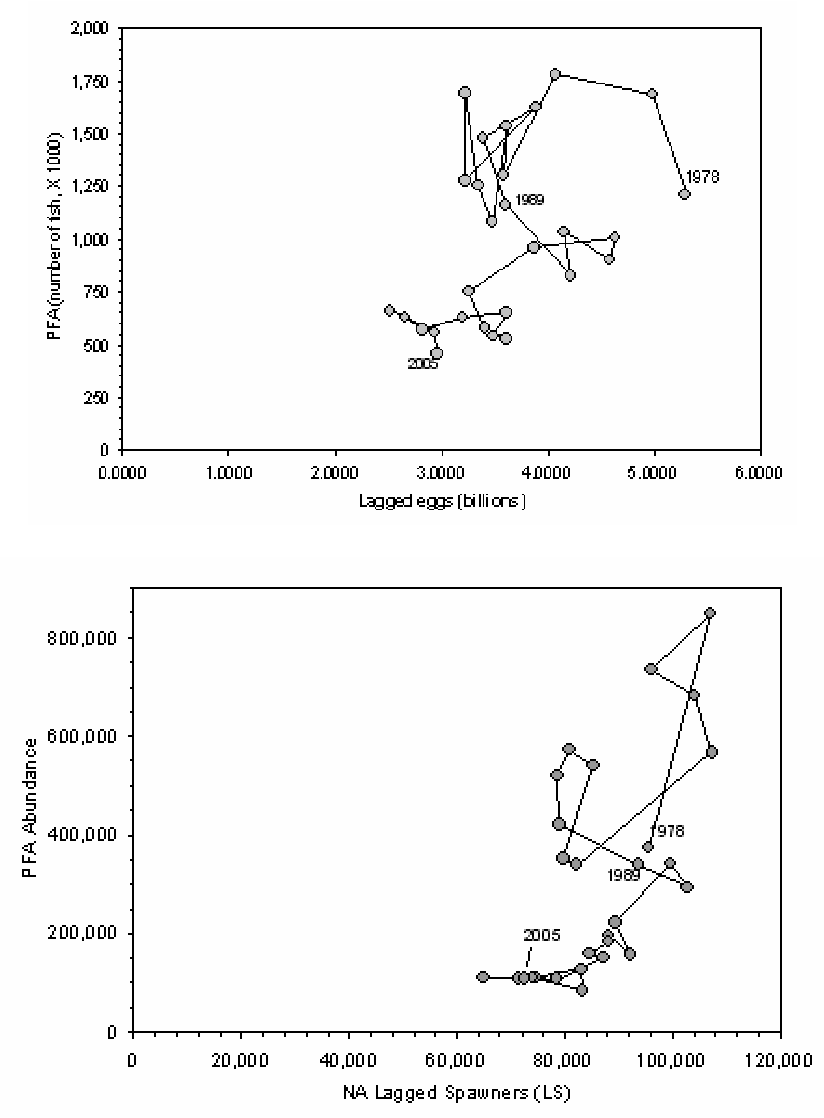


Figure 2.3.3.1 Relationship (based on mid-points) between PFA and lagged spawners for NAC (upper panel) and for southern NEAC non-maturing 1SW (lower panel), 1978 to 2006.

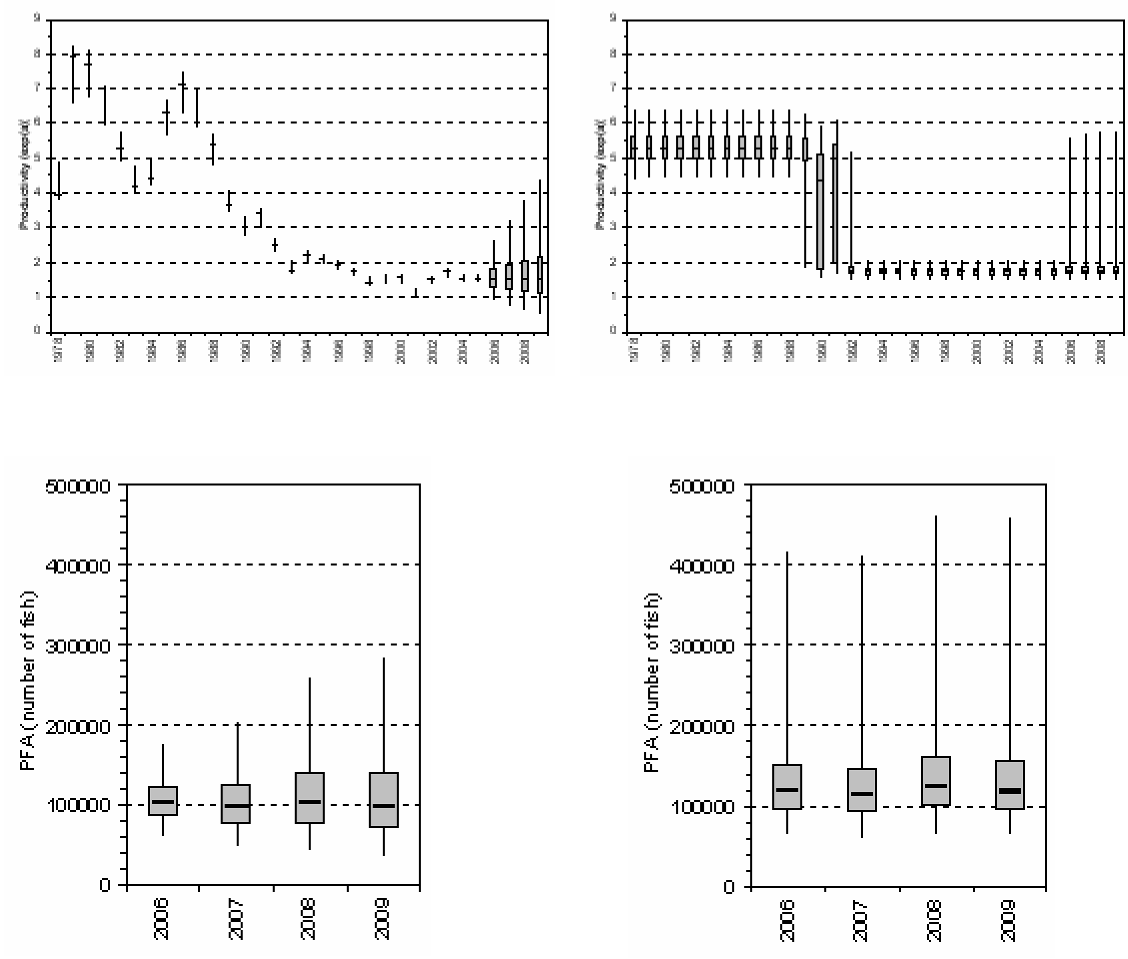


Figure 2.3.3.2 Estimates of productivity parameter (exp^{a}) for the dynamic model (upper left) and the phase shift model (upper right), predicted PFA for 2006 to 2009 from the dynamic (lower left) and the phase-shift (lower right) models for the NAC area.

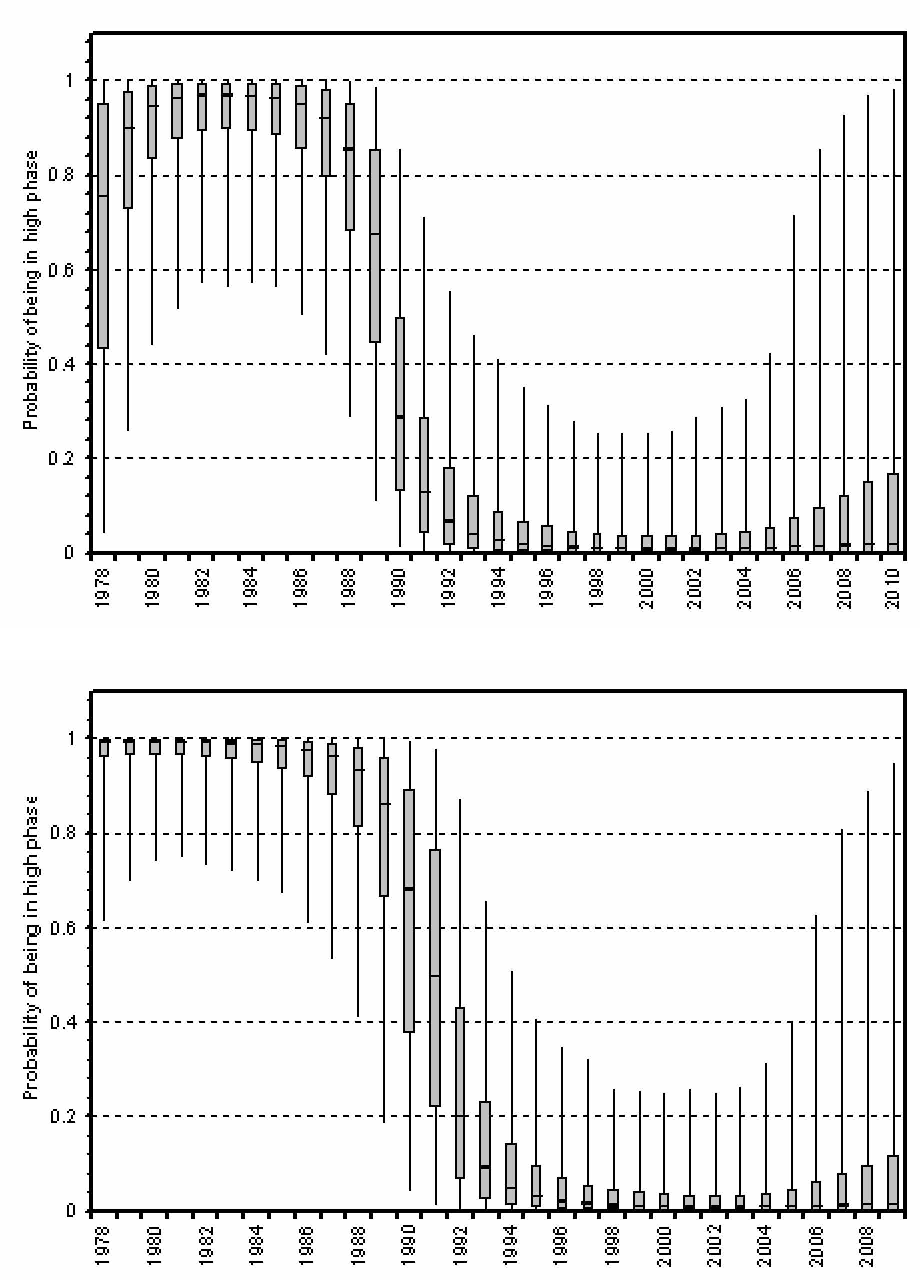


Figure 2.3.3.3 The probability of the productivity being in the high phase for the NAC model (upper panel) and for the NEAC model (lower panel).

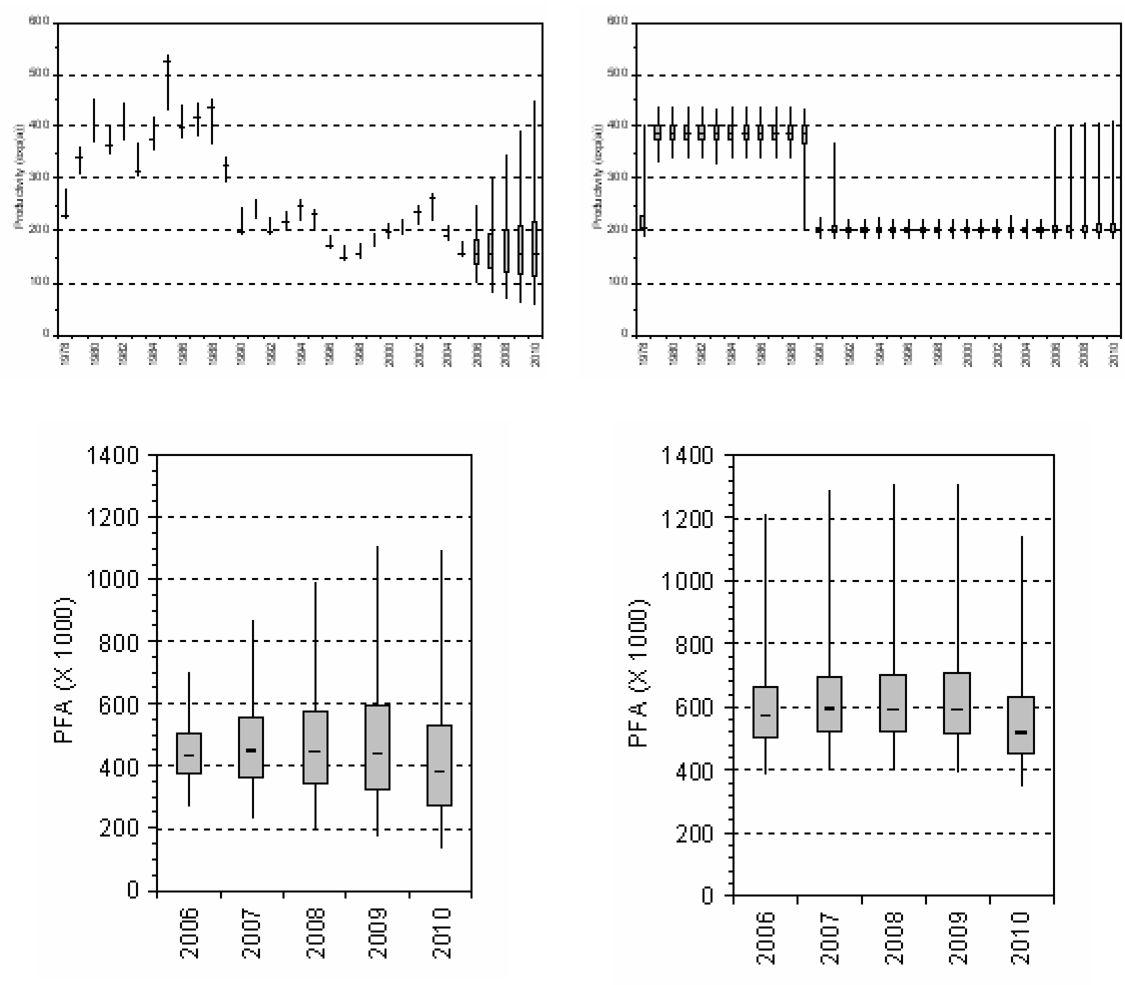


Figure 2.3.3.4 Estimates of productivity parameter (exp[a]) for the dynamic model (upper left) and the phase shift model (upper right) and predicted PFA for 2006 to 2010 from the dynamic (left lower) and the phase-shift (lower right) models for the southern NEAC area.

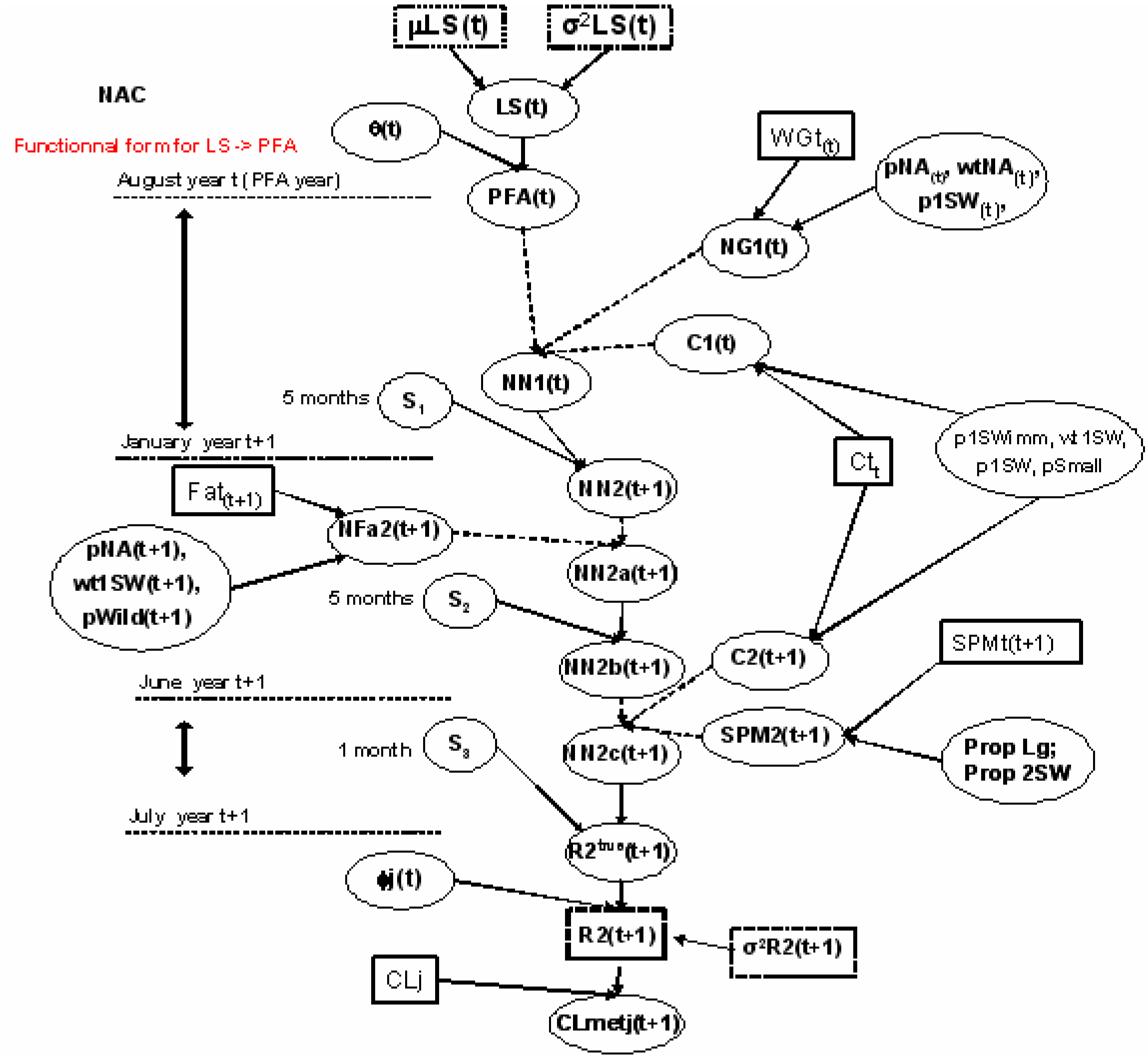


Figure 2.3.3.5 Directed Acyclic Graph of the PFA reconstruction, forecast and catch advice model for North America. Items in rectangles are observations, pseudo-observations or covariates.

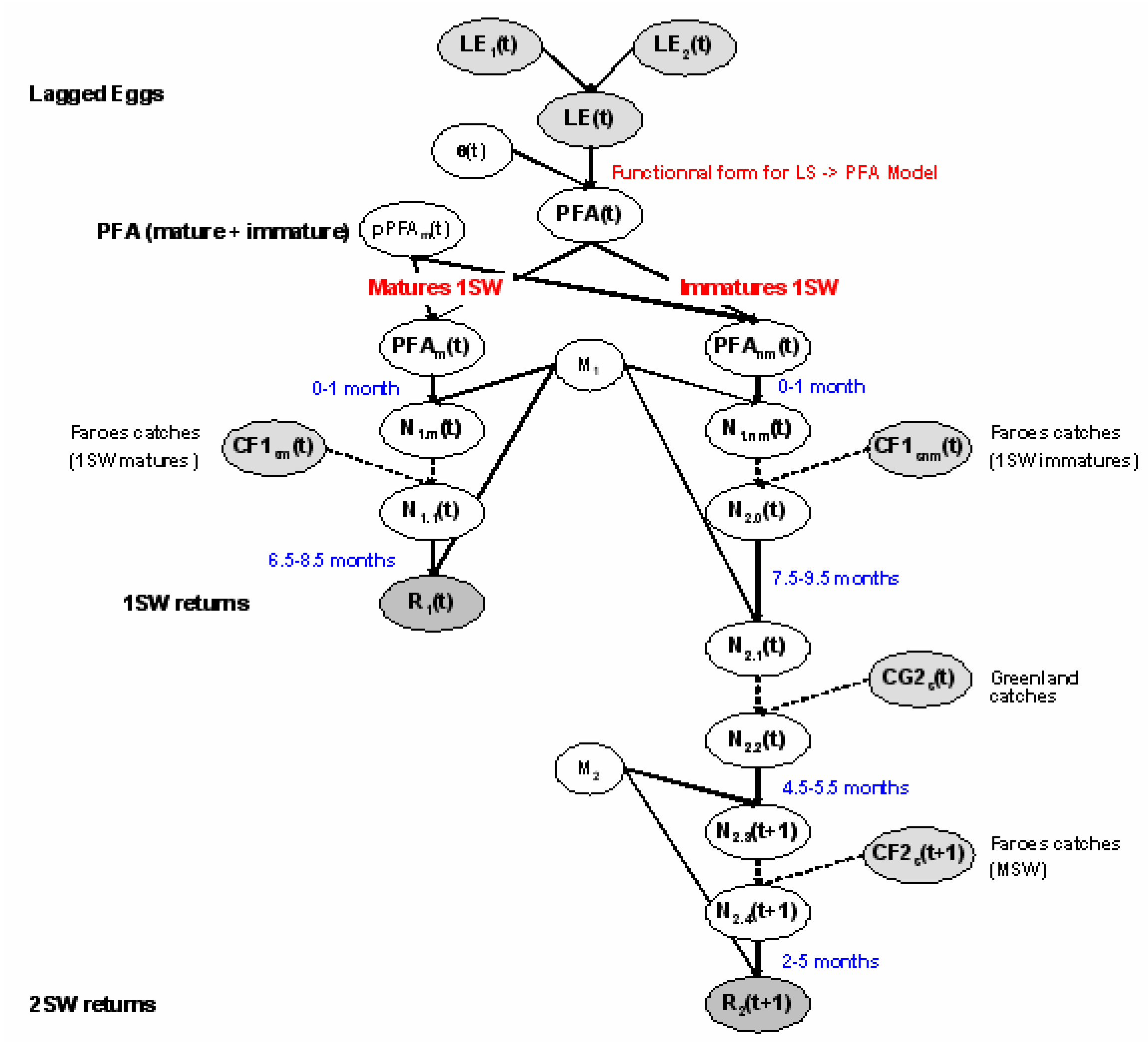


Figure 2.3.3.6 Example of Directed Acyclic Graph of the PFA reconstruction, forecast and catch advice model for both maturity groups for southern NEAC.

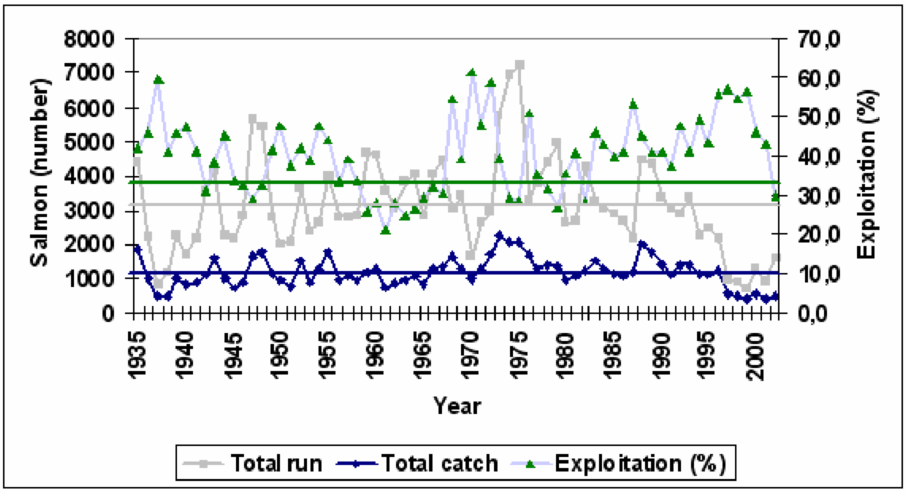


Figure 2.3.5.1 Total salmon run, catch and exploitation in the salmon rod fishery in River Ellidaar 1935–2002.

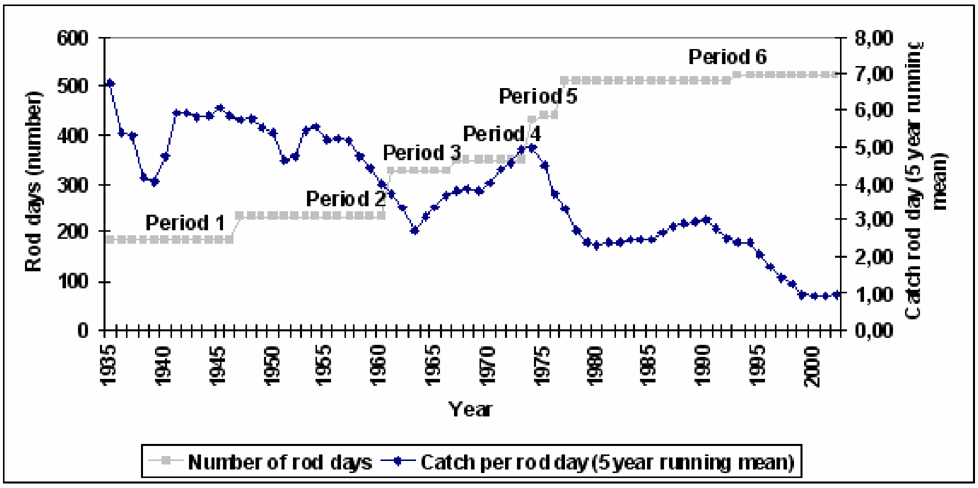


Figure 2.3.5.2 Number of rod days used in salmon fishery in River Ellidaar 1935–2002, and the catch per rod day (5 year running mean).

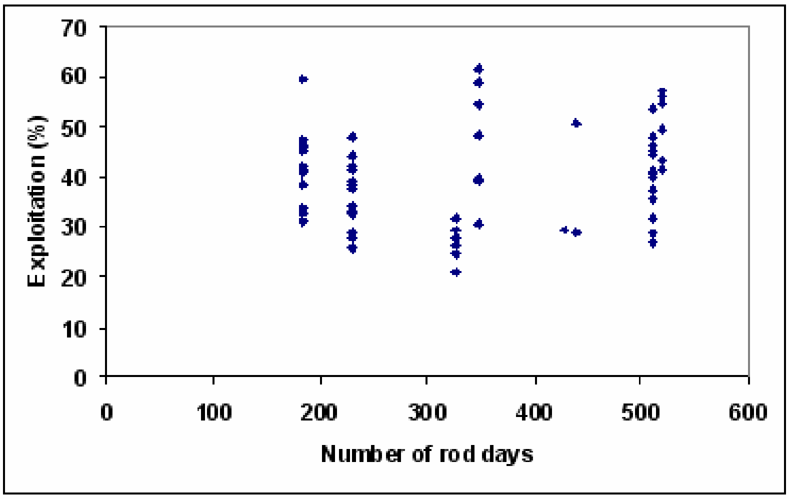


Figure 2.3.5.3 Angling exploitation in River Ellidaar related to number of rod days.

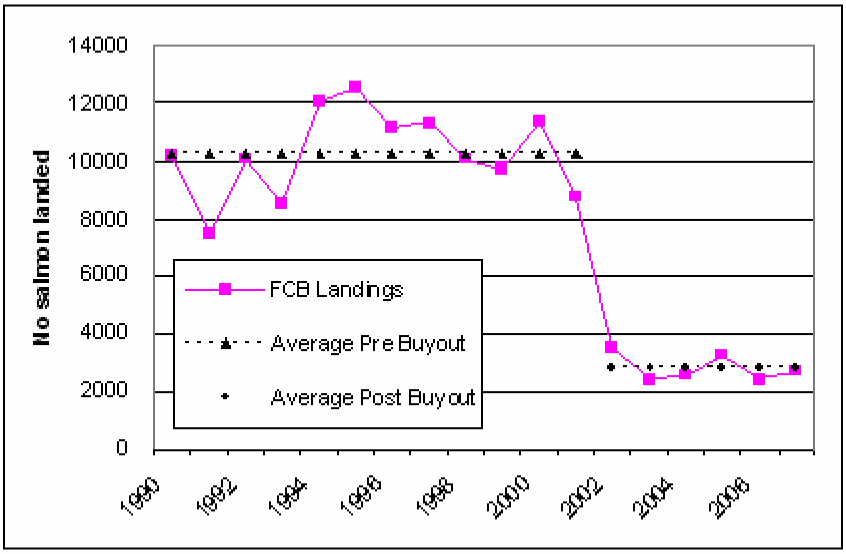


Figure 2.3.6.1 The annual catch of salmon of all sea ages in the FCB coastal fishery from 1990–2007, indicating pre (1990–2001) and post (2002–2007) commercial net buyout.

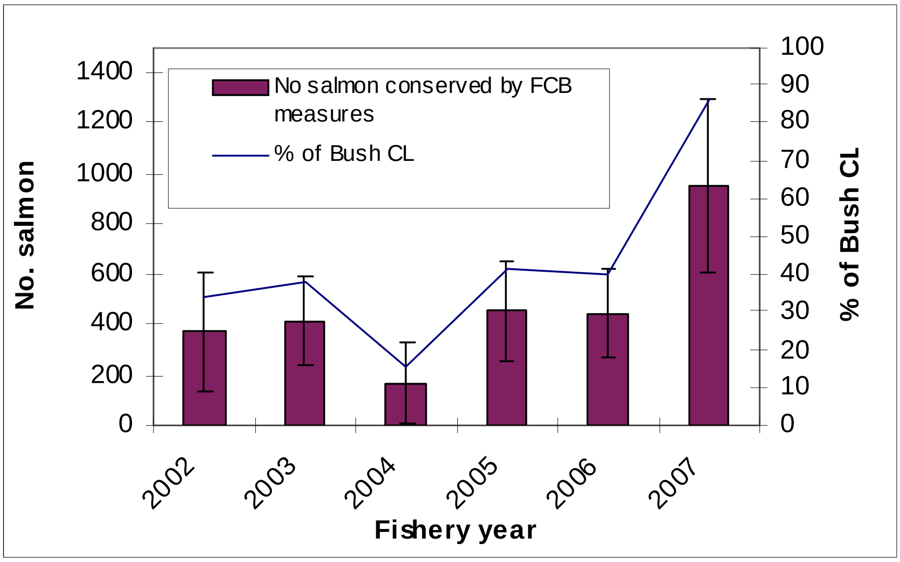


Figure 2.3.6.2 The number of 1 SW R. Bush salmon conserved due to FCB management measures (+/- std. dev.) and potential contribution to R. Bush CL.

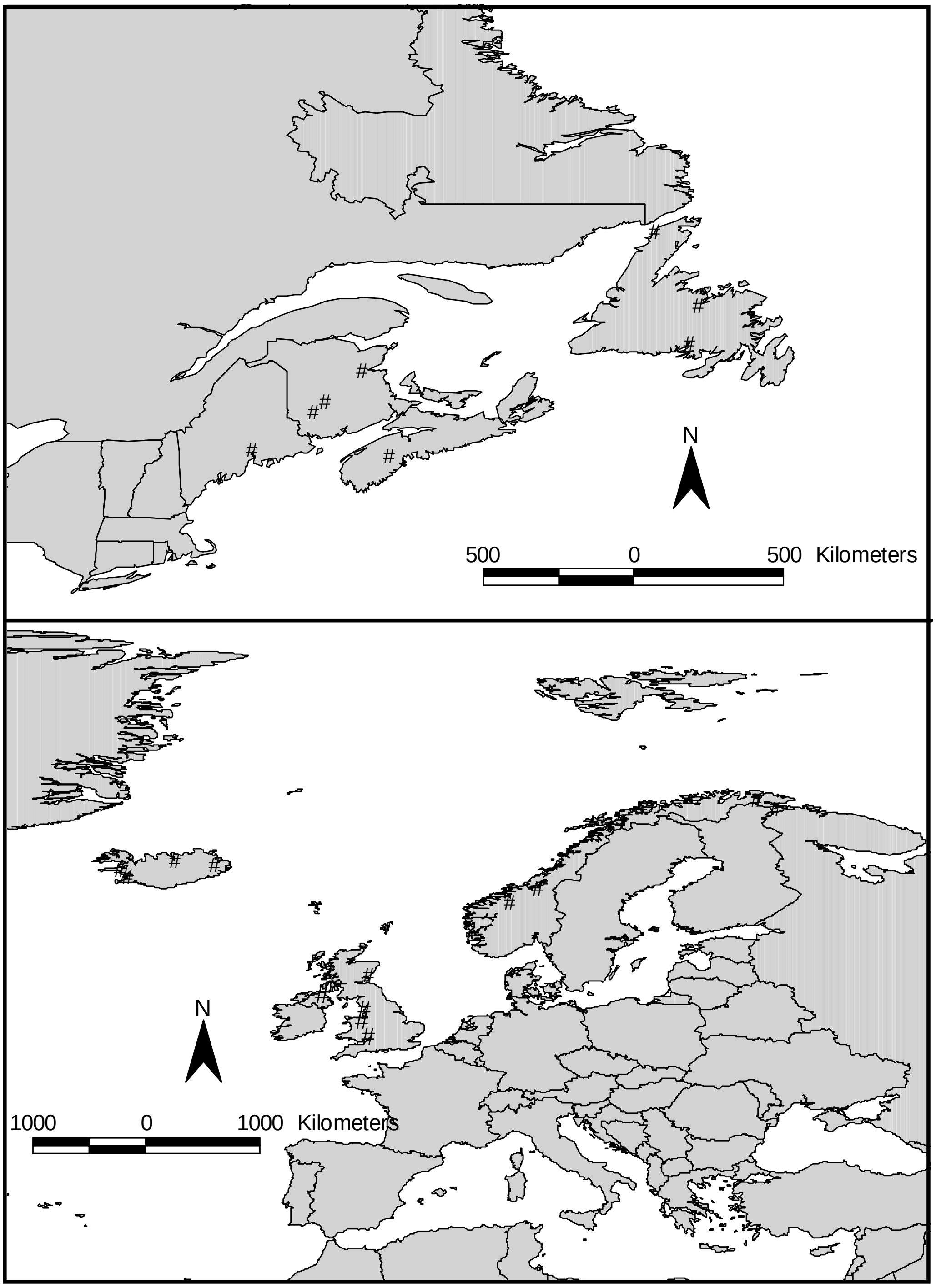
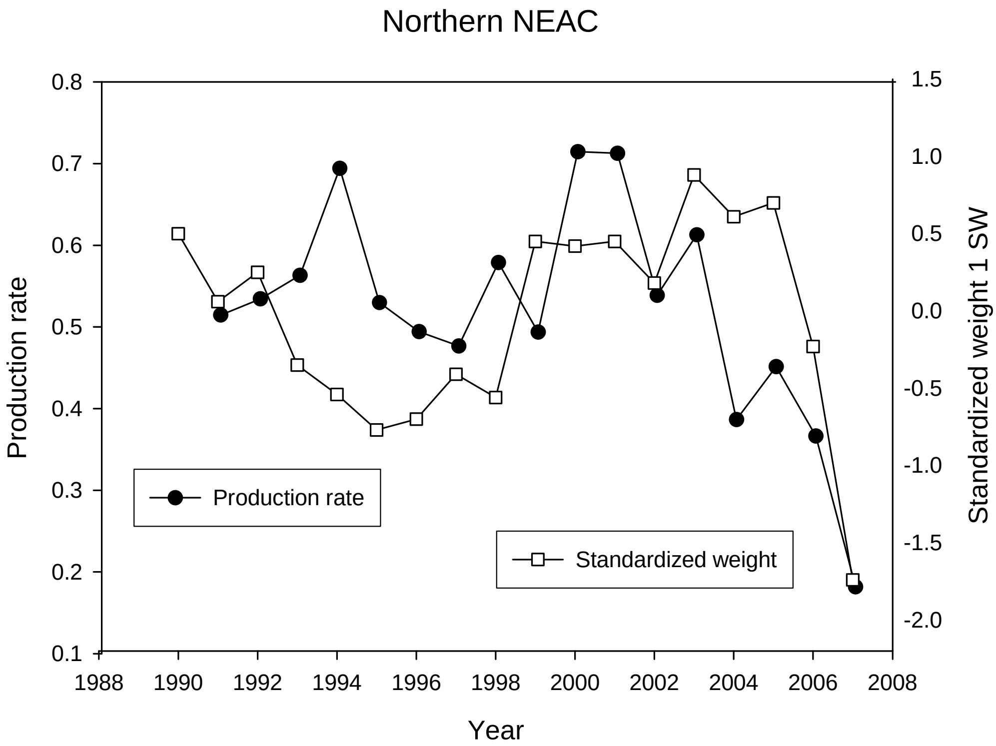


Figure 2.4.1.1 River locations where biological characteristics data were obtained and provided for both the North American and Northeast Atlantic Commission areas.



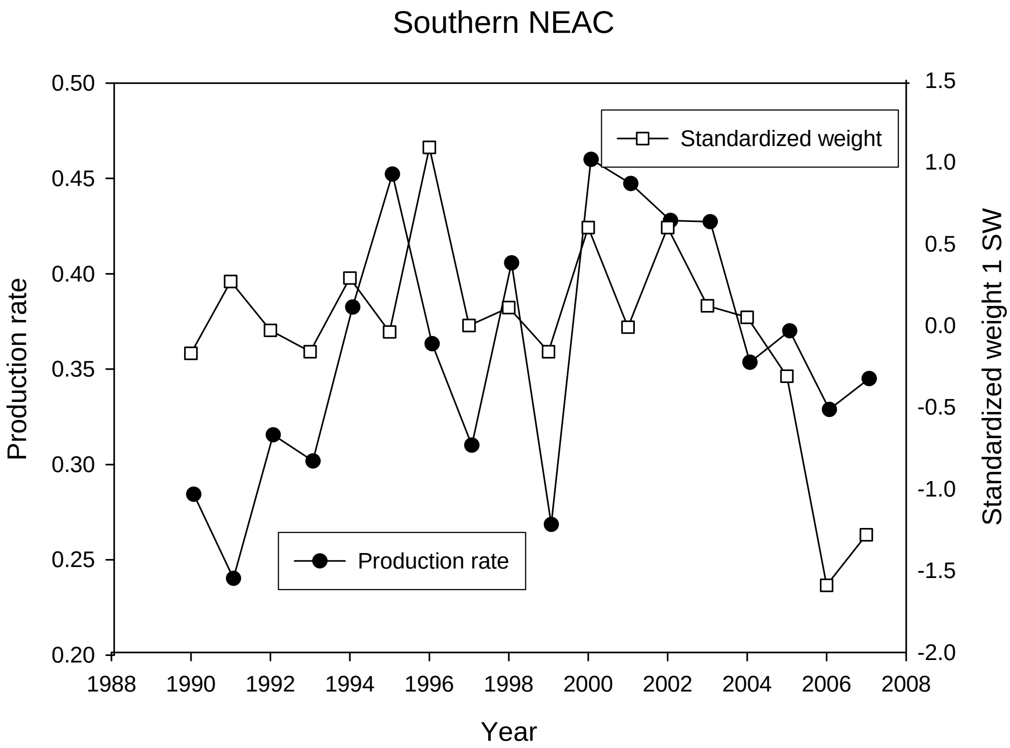


Figure 2.4.1.2 Production rate (calculated as PFA abundance divided by lagged eggs) and mean standardized (Z-score) weight of 1SW salmon (from 6 rivers in Northern and 7 rivers in Southern NEAC) plotted by year for Northern and Southern NEAC.

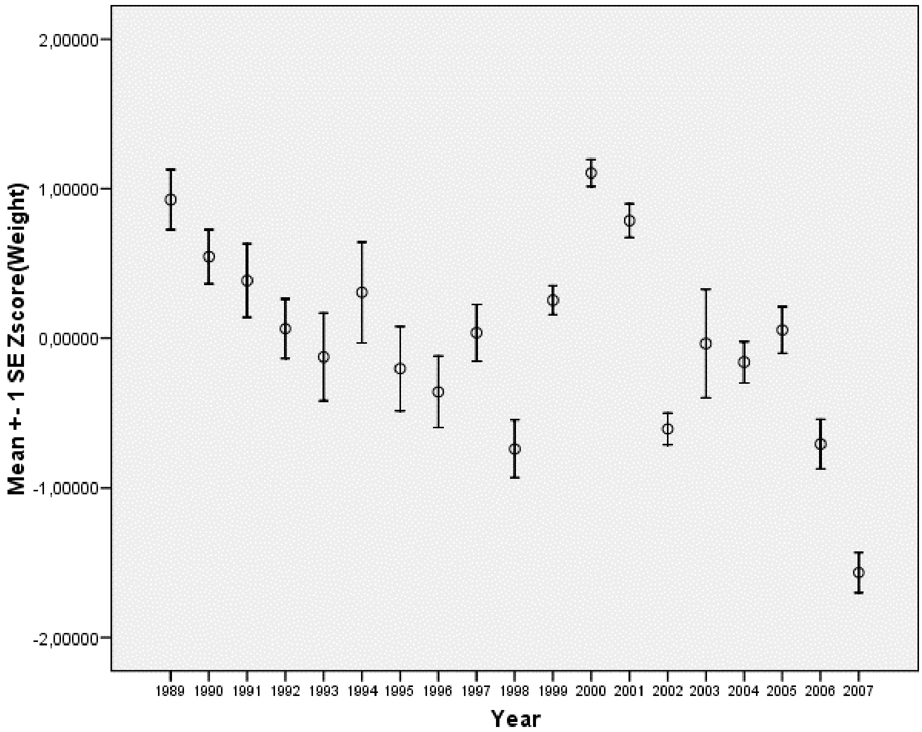


Figure 2.4.2.1 Mean standardised weight of 1 SW salmon in 20 Norwegian rivers in the period 1989–2007. The total number of 1 SW salmon analysed was 21 054.

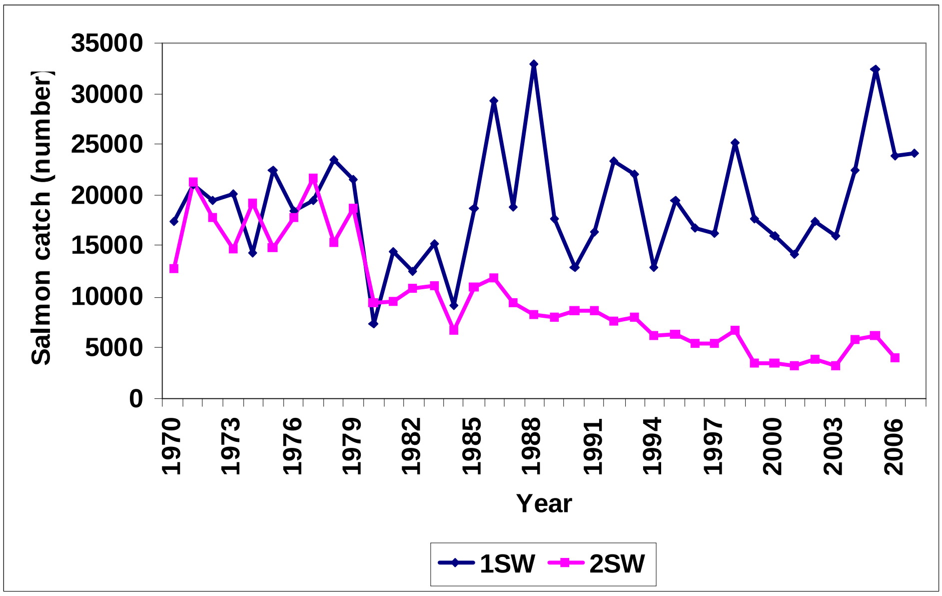


Figure 2.4.3.1 Sea-age composition of Icelandic salmon stocks in rod fisheries from 1970–2007.

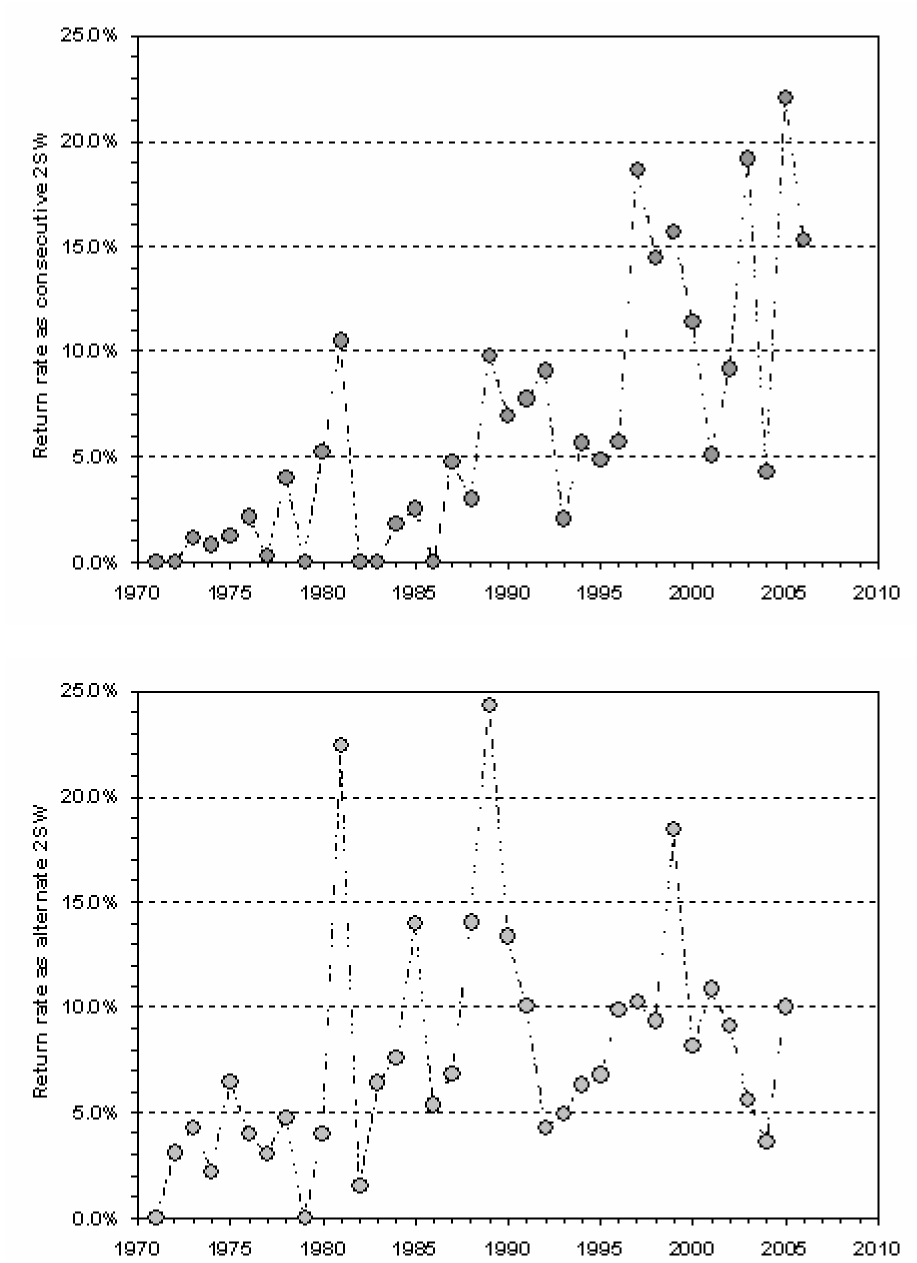


Figure 2.4.4.1 Return rate to a second spawning of 2SW maiden salmon as consecutive repeat spawners (upper) and as alternate repeat spawners (lower).

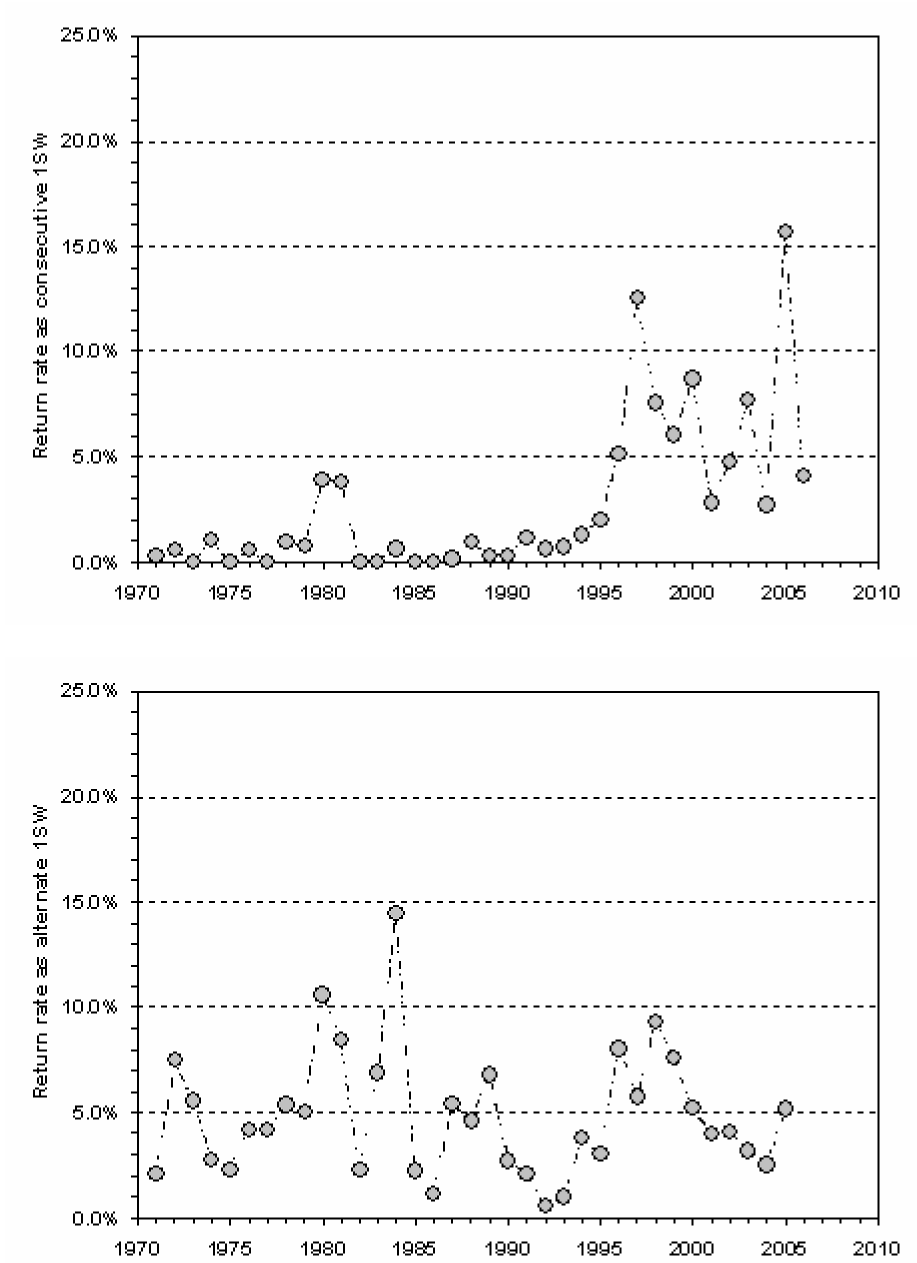


Figure 2.4.4.2 Return rate to a second spawning of 1SW maiden salmon as consecutive repeat spawners (upper) and as alternate repeat spawners (lower).

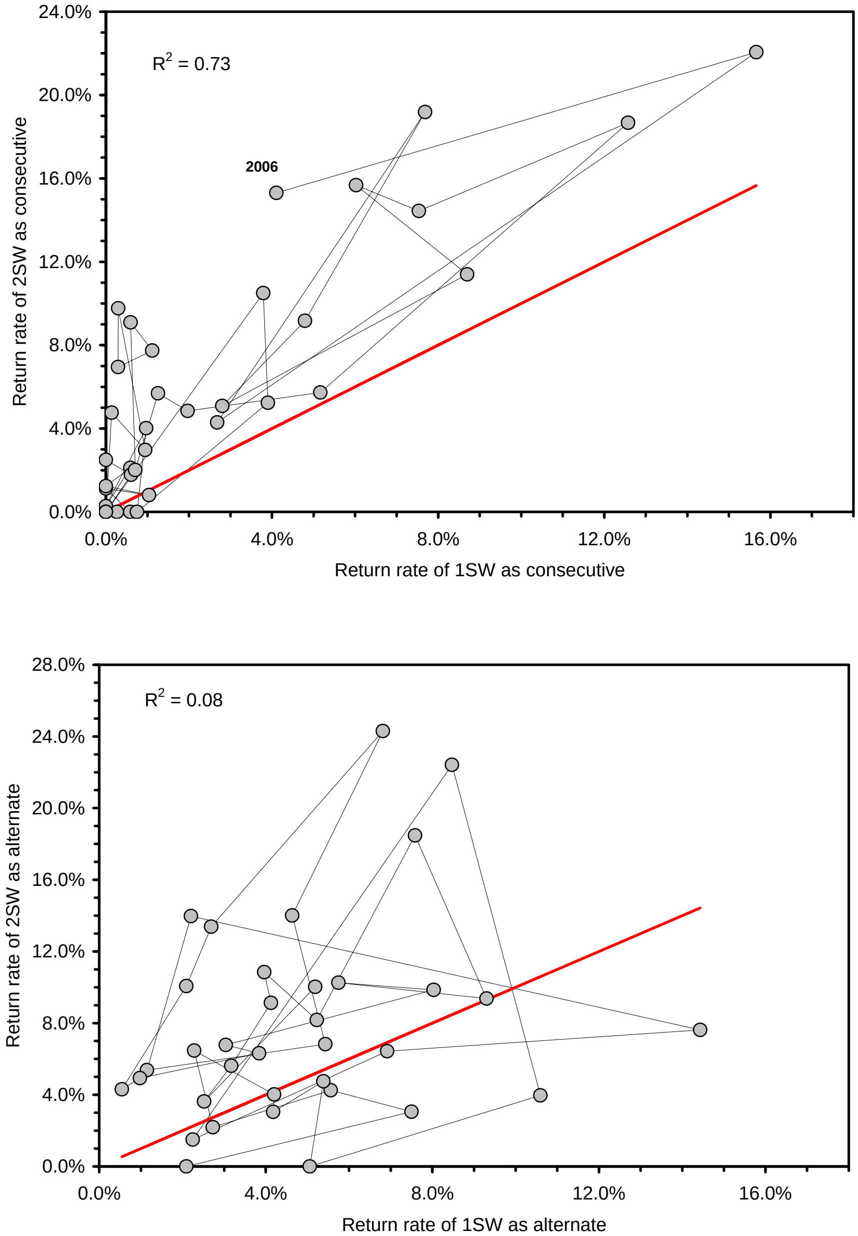


Figure 2.4.4.3 Associations between return rates of 1SW vs 2SW salmon as consecutive spawners (upper) and as alternate spawners (lower). Diagonal line is the 1:1 line.

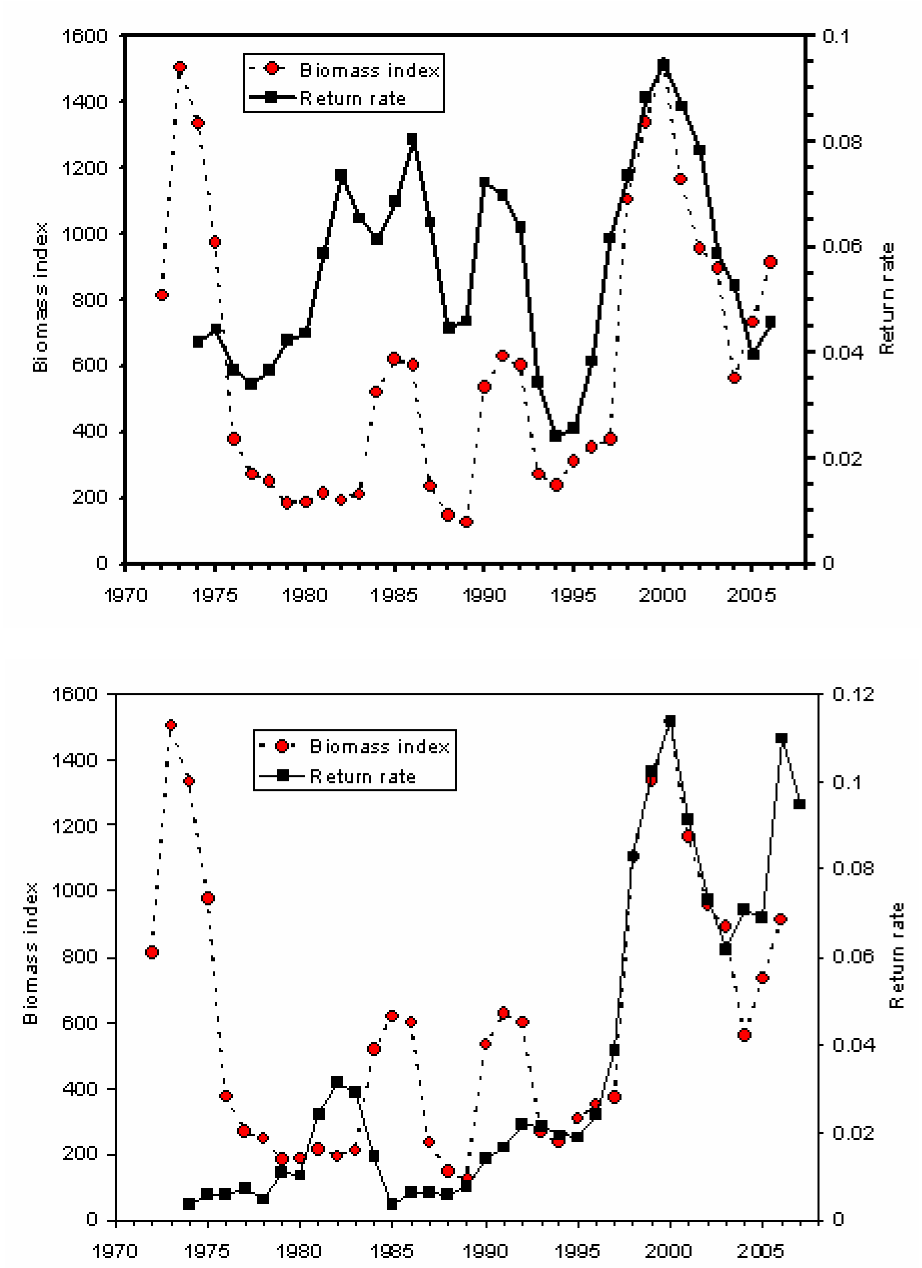


Figure 2.4.4.4 Trends in the biomass index of small fish from the southern Gulf of St. Lawrence and return rates to a second spawning of 1SW and 2SW salmon combined as consecutive spawners (upper panel) and alternate spawners (lower panel). The year corresponds to the year of the September groundfish survey for biomass and the year of reconditioning in the first return year at sea post-spawning for consecutives, in the second year at sea post spawning for alternates. All series are smoothed using 3-year running averages.

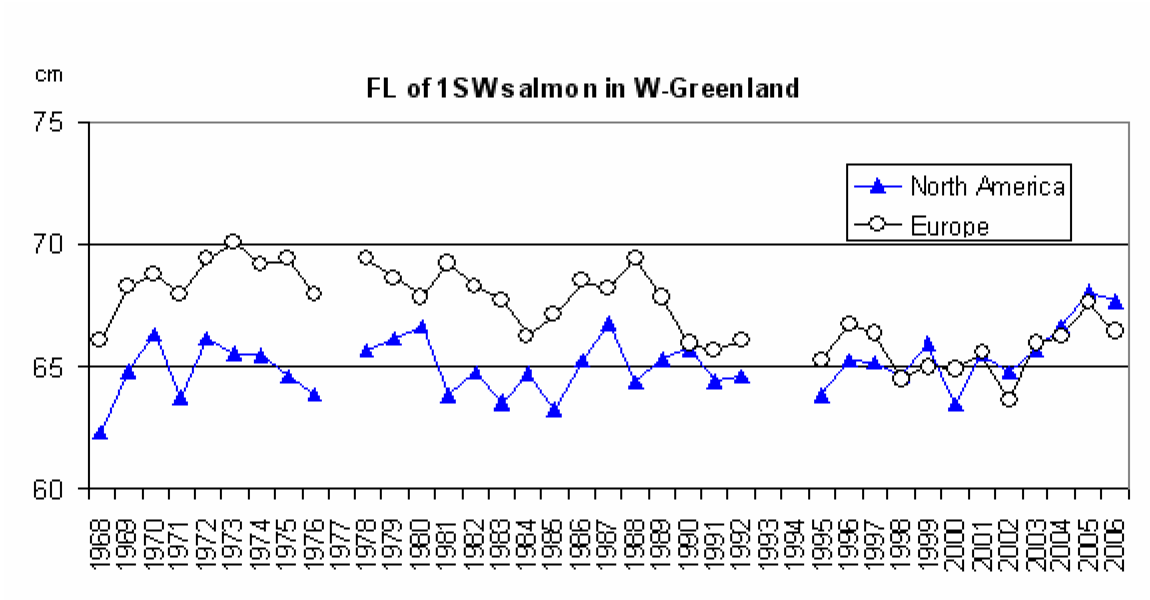


Figure 2.4.5.1 Fork length of North American and European 1SW salmon in West-Greenland catches, 1968–2006.

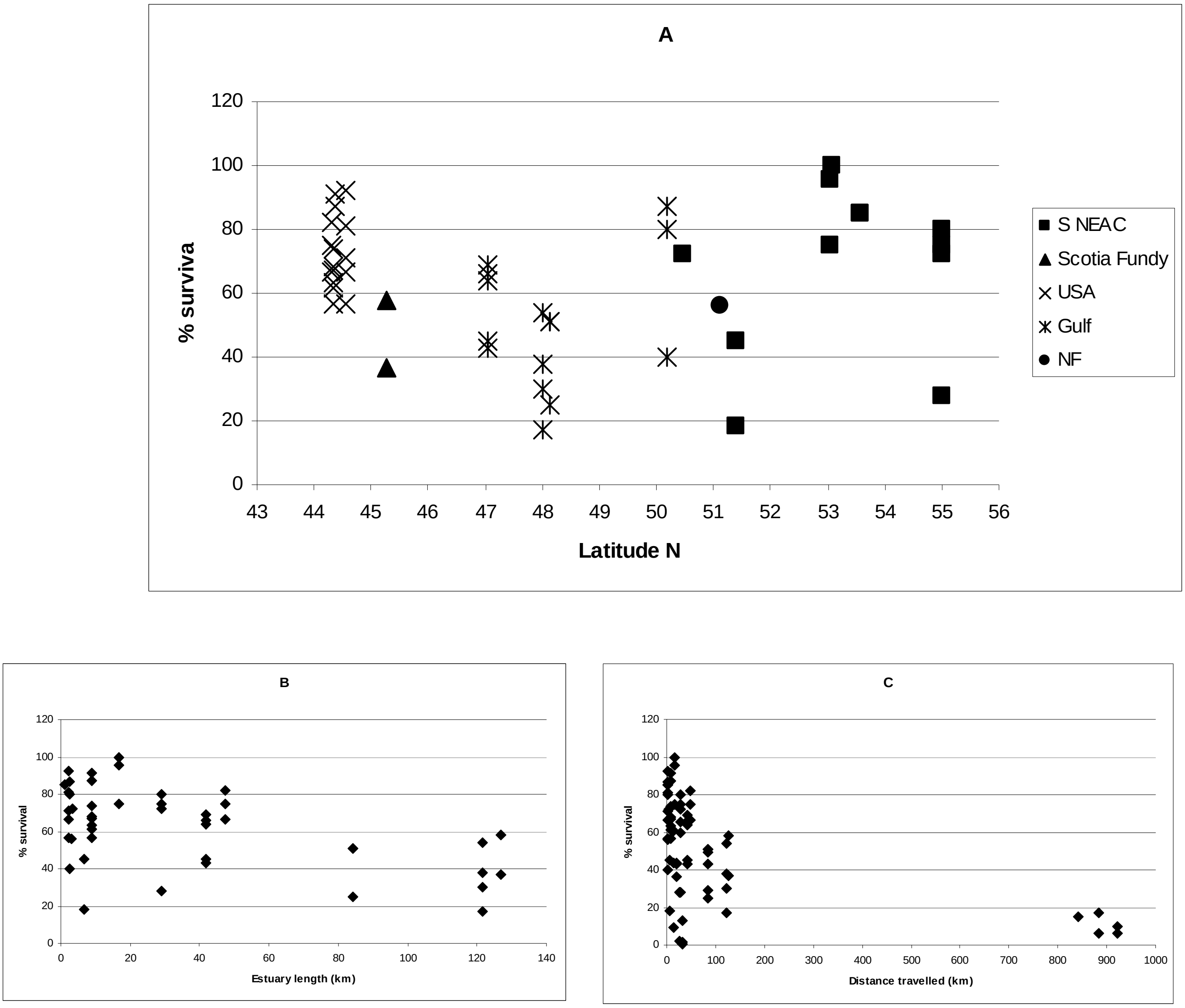


Figure 2.5.1.1 Plots of the percentage of sonically tagged smolts surviving to exit home river estuaries. Plots include data from studies in the NAC and NEAC areas and wild and hatchery origin smolts. Estimates from the same river in different years have been treated as independent observations. A: % survival vs. latitude. B: % survival vs. estuary length C: % of smolts from North American rivers known to be alive at various points in the coastal and ocean migration.

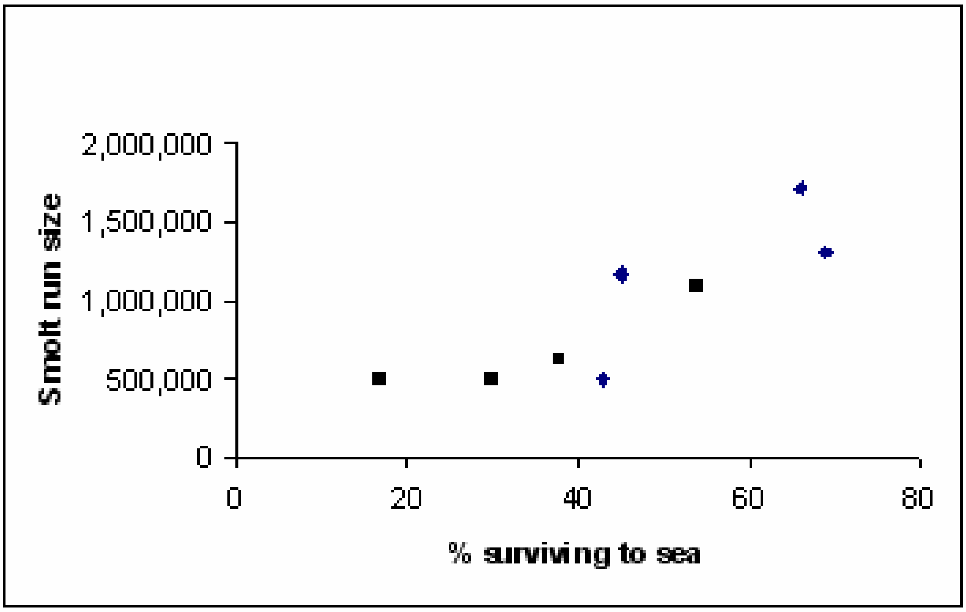


Figure 2.5.3.1 Relation between the percentage of the sample of sonically tagged salmon surviving estuary transit to enter the sea, and the midpoint estimate of the size of the smolt run from which the sample was drawn. Data come from the years 2003–2007 and are for the Miramichi (diamonds) and Restigouche (squares) Rivers.

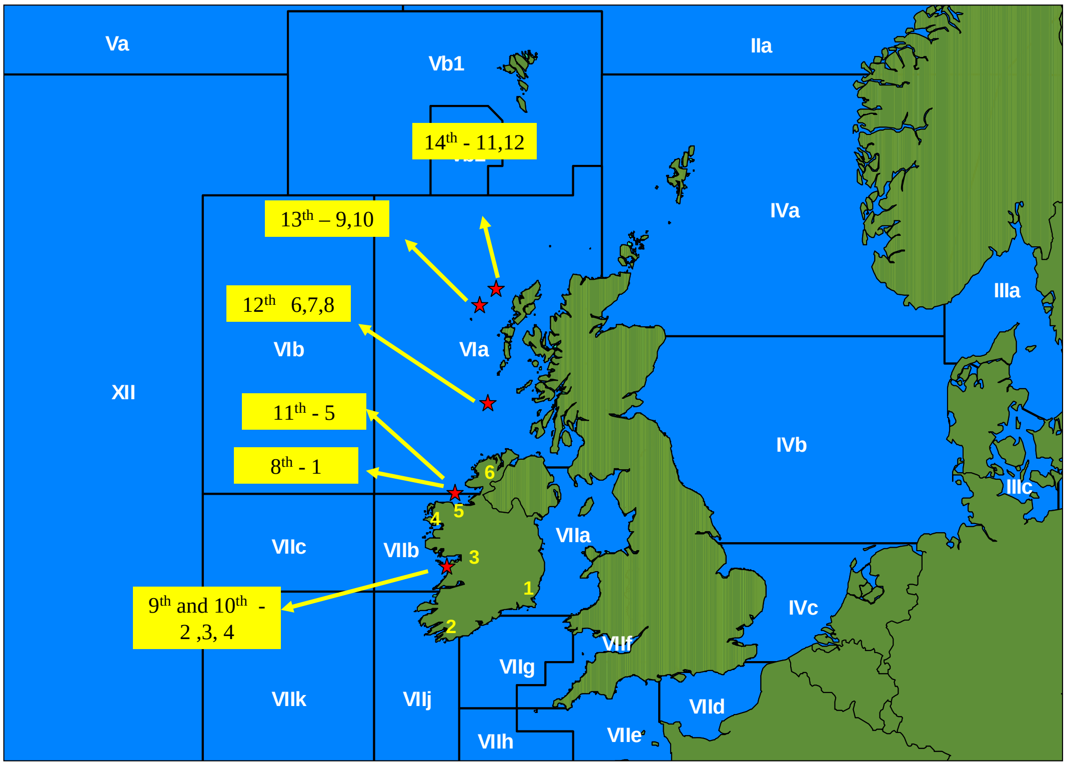


Figure 2.7.1.1 Location of post-smolt trawling locations and trawl numbers in May 2007. The rivers of origin of the Irish fish sampled based on the genetic stock identification are as follows: 1 = South Eastern Population Complex (SEPC), 2 = Roughty River (Kerry), 3 = River Corrib (Galway), 4 = Owenmore River (Mayo), 5 – Moy River (Mayo), Foyle River (Donegal/Derry).

3 North-East Atlantic Commission

3.1 Status of stocks/exploitation

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

The interpretation of conservation limits (CLs) has 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. However, management targets have not yet been adopted for all Atlantic salmon stocks. Therefore 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 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 EUROPEAN COUNTRIES:	NORTHERN EUROPEAN 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 prior to the commencement of distant water fisheries with respect to the SER requirements is:

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

The status of stocks is shown in Figure 3.1.1 and is elaborated upon in Section 3.4.

Estimated exploitation rates have generally been decreasing over the time period for both 1SW and MSW stocks in Northern and Southern NEAC areas (Figure 3.8.15.1 and Figure 3.8.15.2). Exploitation on Northern 1SW stocks is higher than on Southern

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

1SW and considerably higher for MSW stocks. There has been a slight increase in exploitation on MSW Southern NEAC stocks since 2003. However, the current estimates for both stock complexes are amongst 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 therefore been developed for estimating national CLs for countries that cannot provide one based upon river-specific estimates. The approach is based on establishing pseudo-stock-recruitment relationships for national salmon stocks in the North East Atlantic Commission (NEAC) area (Potter *et al.*, 1998).

As described in 2002 (ICES, 2002), the model provides a means for relating estimates of the numbers of spawners and recruits 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 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 minimises 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 2007 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 3.8.12) and the CLs are used for countries where no river specific CLs have been developed. Where river-specific estimates have been derived (i.e. France, Ireland and UK (England & Wales)) 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–242 688
- Northern NEAC MSW spawners–126 398
- Southern NEAC 1SW spawners–662 652
- Southern NEAC MSW spawners–294 638

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 Jan) and return to home waters) for maturing and non-maturing 1SW salmon from the Northern and Southern Europe 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 for evaluating the historic 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

Most NEAC countries have not developed river-specific CLs. In 2007, progress with setting, and developing, river-specific CLs and associated compliance assessment was reported for UK (England and Wales), UK (Scotland), Iceland and Norway.

In UK (England and Wales), where river specific CLs have been in use for a number of years, effort data derived from the catch returns is used to estimate angling exploitation on salmon, and to derive estimates of egg deposition for use in the CL compliance procedure. As many anglers fish for both salmon and sea trout, it is important to understand what proportion of the total effort is targeted at each species. To this end, a short questionnaire was sent to all holders of a migratory salmonid fishing licence in 2006 (approximately 22 000 anglers). The results of this survey indicate that around a quarter (27%) of angler effort nationally is directed at sea trout only. These results will be used to refine effort data and assessments in the future.

In UK (Scotland), work has continued to develop procedures for setting catchment specific CLs. GIS applications, in conjunction with field based observation and a literature review of salmon distribution, have been used to develop a map based useable wetted area model for salmon which can be used to transport CLs among catchments. A CL has been derived for the North Esk and this has been transported, using the useable wetted area model, to each of the 109 defined salmon fishery districts in Scotland to provide provisional CLs. Refinements to the useable wetted area transport model will be undertaken over the next year. Estimates of spawning escapement in each of these catchments are being developed in order to assess compliance with respect to the CLs.

In Iceland, work is progressing on several rivers to derive river specific CLs. Several datasets and techniques (catch data, counter data, habitat mapping, wetted area and juvenile surveys) are being used to estimate salmon production, run size and spawning escapement. To date work has indicated highly variable spawning reference levels. The next stage of the work will explore if and how CLs can be transported to recipient rivers.

In Norway, CLs have been set for 180 rivers. This work is based on stock recruitment relationships in nine rivers, and further transportation to data poor rivers based on similarities in productivity and stock age structure. Productivity is mostly based on catch statistics, and scale samples used to assess the river age and sea age structure in a sub set of the populations. To derive the CLs, wetted area has been computed for the rivers based on digital maps and knowledge of how far salmon can migrate in the rivers. CLs for salmon populations in Norway were grouped into four categories of egg densities being, respectively, approximately 1, 2, 4 and 6 eggs/m^2 wetted area. Most of the rivers fall into the 2 and 4 eggs/m^2 wetted area categories.

3.4 Management advice

The Working Group is unable to provide quantitative catch options for most stock complexes at this stage. To do so requires predictive estimates of PFA, which have not yet been developed for all stock complexes. Initial attempts to develop forecast models for the Northern maturing 1SW, the Northern non-maturing 1SW and the Southern maturing 1SW stock complexes did not have sufficient predictive power to prove useful. Recent progress in the development of such models is reported in Section 2.3.3. The Working Group recommends further attempts to develop predictive models for all NEAC stock complexes. A quantitative prediction of PFA for Southern European MSW stocks is again provided. The Working Group considers that the following qualitative catch advice is appropriate based upon the PFA data and estimated SERs shown in Figure 3.1.1. In the evaluation of the status of stocks, PFA or recruitment values should be assessed against the SER values while the spawner numbers should be compared with the CLs.

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.

The interpretations presented below are based on the results presented in Figure 3.1.1.

3.4.1 Northern European maturing 1SW stock

- The lower bound of the PFA estimate has been above the SER throughout the series, indicating an exploitable surplus and that this stock is currently **at full reproductive capacity** prior to the commencement of distant water fisheries. However, the Working Group noted a substantial decrease in PFA in 2007.
- The lower bound of the spawner estimate has fluctuated around the CL throughout most of the time series. In 2007, the mid-point of the spawner estimate was below the CL for the first time in the series and this stock complex **is suffering reduced reproductive capacity** after homewater fisheries have taken place**.**
- 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 shown to be at full reproductive capacity. **The Working Group considers that reductions in exploitation are required for as many stocks as possible, to increase the probability of the complex meeting CLs.** 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 European non-maturing 1SW stock

- The lower bound of the PFA estimate has been above the SER throughout the series indicating an exploitable surplus and that this stock is currently **at full reproductive capacity** prior to the commencement of distant water fisheries.
- The lower bound of the spawner estimate has fluctuated around the CL throughout most of the time series. In 2007, the lower bound of the spawner estimate was above the CL and this stock complex is currently **at full reproductive capacity** after homewater fisheries have taken place.
- 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 shown 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 European maturing 1SW stocks

- The lower bound of the PFA estimate is currently above the SER, as it has been throughout most of the series, indicating an exploitable surplus and that this stock is currently **at full reproductive capacity** prior to the commencement of distant water fisheries.
- The mid-point and the lower bound of the spawner estimate have fluctuated around the CL throughout most of the time series. In 2007, the mid-point of the spawner estimate is above the CL but the lower bound of the spawner estimate is below the CL and thus this stock complex **is at risk of suffering reduced reproductive capacity** after homewater fisheries have taken place.
- 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 shown to be at full reproductive capacity. The Working Group considers that reductions in exploitation are required for as many stocks as possible, to increase the probability of the complex meeting CLs. 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 European non-maturing 1SW stocks

- The mid-point of the PFA estimate has been above the SER throughout most of the series, but is currently below. Thus this stock complex is currently **suffering reduced reproductive capacity** prior to the commencement of distant water fisheries.
- The mid-point and the lower bound of spawner estimate have been close to or below the CL since 1997. Currently, both the mid-point and the lower

bound of the spawner estimate are below the CL and thus this stock complex **is suffering reduced reproductive capacity** after homewater fisheries have taken place**.**

- The quantitative PFA mid-point forecasts for 2008–2011 are below the SER and therefore there should be no fishing on this complex at West Greenland or Faroes. 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 shown to be at full reproductive capacity. The Working Group considers that reductions in exploitation are required for as many stocks as possible, to increase the probability of the complex meeting CLs. 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 Working Group reiterated its concerns about harvesting salmon in mixed stock fisheries, particularly for fisheries exploiting river stocks and sub-river populations that are at risk or suffering reduced reproductive capacity. Annual adjustments in quotas or effort regulations based on changes in the status of the stock complexes are unlikely to provide adequate protection to the individual river stocks that are most heavily exploited by the fishery or are in the weakest condition.

For all stock complexes, the Working Group considers that management of single stock fisheries should be based upon local assessments of the status of stocks. Conservation would be best achieved by fisheries in estuaries and rivers targeting stocks that have been shown to be above escapement requirements. It should also be noted that the inclusion of farmed fish in the Norwegian data would result in the stock status being overestimated.

The Working Group also emphasised that the national stock CLs discussed above are not appropriate for the management of homewater fisheries, particularly where these exploit separate river stocks. This is because of the relative imprecision of the national CLs and because they will not take account of differences in the status of different river stocks or sub-river populations. 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 to the distant water fisheries.

3.5.1 Grouping of national stocks

National outputs of the NEAC PFA model are combined into Southern European and northern European groups (see Section 3.1) to provide NASCO with catch advice or alternative 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 European MSW salmon stocks only.

3.6 Pre-fishery abundance forecast for 2007–2011 for the Southern NEAC stock complex

The Working Group has previously considered the development of a model to forecast the PFA of non-maturing (potential MSW) salmon from the Southern European stock group (ICES, 2002, 2003). The model has been used to provide such forecasts (ICES, 2006) which are used as one of the inputs to the risk analysis of the catch options for the Greenland fishery (ICES, 2007). The full model takes the form

$$PFA = Spawners^{\lambda} \times e^{\beta_0 + \beta_1 Habitat + \beta_2 \log(PFAm) + \beta_3 Year + noise}$$

where *Spawners* are expressed as lagged egg numbers, *PFAm* refers to pre-fishery abundance of maturing 1SW salmon (derived from NEAC PFA model-see Section 3.8.9) and the habitat term is the same as that previously used in the North American model (ICES, 2003). As updated data for the *Habitat* parameter have not been available to the Working Group since 2003, however, the term was not included in the parameter selection process in 2008.

Provision of 3-year management advice for the Faroese fishery requires that PFA forecasts be extended to 2011. The number of years for which forecasts may be provided is limited by the *Spawner* (lagged egg) parameter within the model. The time series for this parameter extends only as far as those lagged eggs assigned to 1-year old smolts from the most recent available spawning year, currently lagged eggs for 2010 derived from 2007 spawner estimates. As previously described (ICES, 2007), to allow PFA forecasts for 2011, lagged egg production assigned to 1-year old smolts for 2011 for each home water country was estimated by taking the average of the previous 5 years.

In previous years (ICES, 2004), parameter selection was achieved by adding variables (Spawners, PFAm and Year) until the addition of others did not result in an increase in the explanatory power of the model. The model was fitted to data from 1978 to 2006 (Table 3.6.1.1) and, as in previous years, the parameters selected were *Spawners* and *Year*. The final model took the form

$$\text{Log}(PFA/Spawners) = -1.26\log(Spawners) + 115.8 - 0.050 Year$$

which is equivalent to:

$$\text{PFA} = Spawners^{-0.26} \text{ x } e^{115.8 - 0.050 Year}$$

The PFA forecasts (Figure 3.6.1.1, Table 3.6.1.2) indicate that from 2008 to 2011, the stock complex will be suffering reduced reproductive capacity. No forecasts are available for other stock components or complexes in the NEAC area.

3.7 Comparison with previous assessment

3.7.1 National PFA model and national conservation limit model

Changes were made to the method for estimating the abundance of returns and spawners in Ireland. These were made necessary by changes in the available data as a consequence of the closure of the mixed stock marine fishery and a number of rivers to angling. The majority of the reported catch in Ireland in 2007 was accounted for by angling fisheries and the total reported rod catch (retained plus released) was successively raised by estimates of unreported catch and exploitation rate to provide an estimate of the returns for rivers where angling occurred. Returns to rivers closed to angling were estimated by summing the forecasted returns for the individual rivers based on the average count, if available, or by extrapolation of the most recent

5 year rod catch in these rivers prior to closure. Similarly, an addition was made for small rivers (<10 rod caught fish annually) which were assumed to be meeting only 33% of their CL. Total returns to freshwater and reported net catches, raised by estimates of unreported catch, were summed to give returns to home waters. As with other home water countries, estimates of spawning escapement were made by subtracting the total numbers of fish caught and killed (net catch plus fish caught and retained by the rod fishery raised by the appropriate estimates of unreported catch) from the estimated returns to home waters.

Provisional catch data for 2006 were updated where appropriate. In addition, changes were made to the input data from Iceland. In 2007, exploitation rates were reduced from 1986 to present because of the increasing practice of catch and release in the rod fishery (ICES, 2007). These data were further modified in 2008 in light of new information.

Unreported catch values for Greenland were modified to standardise run-reconstruction analyses between commission areas, as were estimates of the proportion of the Greenland catch originating from countries in the North East Atlantic (Section 2.3.2).

3.7.2 PFA forecast model

The midpoints of updated forecasts of the Southern NEAC MSW PFA for the years 2007 to 2010 were 465 000, 445 000, 423 000 and 411 000 respectively. All were within 3% of the forecasts provided last year (ICES, 2007).

3.8 NASCO has requested ICES to describe the key events of the 2007 fisheries and the status of the stocks

3.8.1 Fishing at Faroes in 2006/2007

No fishery for salmon has been carried out since 2000. No buyout arrangement has been in force since 1999.

3.8.2 Significant events in NEAC homewater fisheries in 2007

Ireland

In 2001, significant progress was made towards establishing CLs for each river in each of the 17 salmon fishing districts and estimating the surplus (if any) after CLs have been met. An initial commercial Total Allowable Catch (TAC) of 219 619 fish was imposed for the 2002 season, followed by reduced TACs of 182 000 fish for 2003, 162 000 fish in 2004 and 139 900 in 2005. A TAC of 91 000 salmon was recommended for the 2006 fishery based on the recommendations of the National Salmon Commission. However, a government decision was taken in 2006 to comply with scientific advice provided by the Commission through its Standing Scientific Committee which was:

- The overall exploitation in most districts should immediately decrease, so that CLs can be consistently met.
- Furthermore, due to the different status of individual stocks within the stock complex, mixed stock fisheries present particular threats to the status of individual stocks.
- Thus, the most precautionary way to meet national and international objectives is to operate fisheries on individual river stocks that are shown

to be within precautionary limits i.e. those stocks which are exceeding their CLs.

- Fisheries operated in estuaries and rivers are more likely to fulfil these requirements.

In 2007, no driftnet licences were issued. This measure was supported by the introduction of a hardship scheme. Many of the inshore draft net fishermen voluntarily participated in the hardship scheme which resulted in a reduction in these licences also. Similarly, in the Foyle area whose fisheries are under the joint jurisdiction of the Loughs Agency (a cross-border institution of the Republic of Ireland and UK (N. Ireland)), a voluntary net buyout saw a decrease in driftnet licences from 107 in 2006 to 18 in 2007. All of these licences fished within the Foyle estuary as recommended by the Standing Scientific Committee.

UK (Northern Ireland)

In 2007 the Loughs Agency area of UK (N Ireland) introduced a set of new regulations, to reduce the extent of mixed stock interceptory fisheries and to manage exploitation around clearly defined, single stock fisheries with identifiable surpluses. In the Loughs Agency, the policy resulted in the prohibition of driftnet fishing seaward of Lough Foyle. This measure was supported by the introduction of a hardship scheme to encourage drift and draft net licence holders to relinquish fishing activity. Since CLs are regularly achieved in all the tributaries within the Foyle catchment, a reduced number of drift and draft nets were licensed to operate inside Lough Foyle. The regulations and buy-out scheme applied to the fishery over the years have resulted in a marked decline in gear and effort in the fishery.

A number of restrictions were also introduced into the recreational fishery in the Loughs Agency area in 2007, inclusive of daily and seasonal bag limits for salmon and sea trout. These included a bag limit of 1 salmon (or sea-trout over 40cm in length) between 1st March and 31st May. After 31st May, no more than 2 salmon, (or sea trout over 40 cm in length), and no more than 25 fish (being either salmon, or sea trout over 40 cm in length, or a combination of both) in any calendar year could be retained.

UK (England & Wales)

Progress to phase out various net fisheries continued in 2007. A previously agreed phase out of both trammel and seinenet fisheries on the River Dee (North Wales) was accelerated by compensation payments. There are now 2 trammel and 4 seinenets operating, down from 4 and 13 respectively in 2005. Reductions in effort were also introduced for two rivers in Wales: the River Teifi seinenet fishery was reduced to 3 nets (from 4) and the River Tywi coracle fishery to 8 nets (from 12). In addition, on the River Exe in south west England the number of seinenets was reduced to 4 (from 6 in 2006 and 11 in 2005). The latter was the result of a buy off agreement (7 of the 11 licensees were compensated not to fish for the entire season in 2007).

3.8.3 Gear and effort

No changes in the gear used were reported in 2007, however, substantial changes in effort were recorded. The Irish marine and coastal mixed stock fishery was closed following a decision by the Irish Government and no licences were issued for driftnets and many draft nets.

The number of gear units licensed or authorised 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 utilised or the time each licencee 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 two remaining methods, bagnets and bendnets, show contrasting patterns of effort until the early 1990s when both show downward trends until the end of the time-series. In the Archangel region of Russia, the effort in the river commercial fishery shows a decline while the effort in the coastal fishery shows no trend for the time series reported. In Southern NEAC, all countries show a downward trend in net effort data of various degrees.

Rod effort, where available, shows both upward and downward trends for the period reported. 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 available for 2007). In Finland, the number of fishing days has shown an increase throughout the time period. In the Southern NEAC area, rod fishing effort in 2007 was close to the long term average in UK (England & Wales). In Ireland, there has been an apparent increase in rod fishing effort due to the introduction of one day licences in the early 1990s and has remained stable over the past decade. 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 2007 was 1394 tonnes, around 25% below that in 2006 (1878 t). The NEAC catch represents 91% of the total North Atlantic nominal catch in 2007. The catch in the NEAC Southern area (365 t) fell by 44% on 2006, reflecting significant reductions in fishing effort, particularly in Ireland. The catch in the NEAC Southern area was the lowest in the time series and almost 60% below the average of the past five years. The catch in the NEAC Northern area (1029 t) was 16% lower than the catch in 2006, and was among the lowest in the time-series.

Figure 3.8.4.1 shows the trends in nominal catches of salmon in the Southern and Northern NEAC areas from 1971 until 2007. The catch in the Southern area has declined over the period from about 4500 t in 1972–75 to below 1500 t since 1986, and is now well below 400 t. The catch declined particularly sharply in 1976 and again in 1989–91 and 2007. The catch in the Northern area also shows an overall decline over the time series, but this is less steep than for the Southern area. The catch in the Northern area varied between 1850 and 2700 t from 1971 to 1986, fell to a low of 962 t in 1997, and then increased to over 1600 t in 2001. The catch has shown a downward trend again since this time. 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 effort (cpue)

Cpue is a measure that can be influenced by various factors, and 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 many 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 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 shows a general decrease in UK (Scotland) and UK (England & Wales) net fisheries (Figure 3.8.5.1). Cpue for the net fishery showed mostly lower figures compared to 2006 and the previous 5-year averages (Table 3.8.5.3). In UK (Northern Ireland), the river Bush rod fishery cpue has increased after 2002, which was the lowest level in recent years, and the 2007 figure was the highest in the time series (Table 3.8.5.1).

In the Northern NEAC area, there has been an increasing trend in the cpue figures for Norwegian net fisheries and Russian rod fisheries in Barents Sea rivers (Figure 3.8.5.1). A decreasing trend was noted for rod fisheries in Finland (River Teno) (Figure 3.8.5.1). In comparison with the previous year, most cpue values were down and mostly lower than 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 area) and 3.8.6.2 (Southern area). The overall percentage of 1SW fish in the NEAC Northern area catch remained reasonably consistent in the period 1987–2000 (range 61–72%), but has fallen in more recent years (range 50–69%), when greater variability between countries has also been evident. The percentage of 1SW fish in the Northern area fell markedly in 2007 to 50%, with three countries (Finland, Norway and Sweden) recording the lowest values in the time series. On average, 1SW fish comprise a higher percentage of the catch in Iceland and Russia than in the other Northern area countries (Figure 3.8.6.1). The percentage of 1SW fish in the catch shows an increasing trend in Iceland, but appears to be declining in Norway, Sweden and Finland.

In the Southern NEAC area, the overall percentage of 1SW fish in the catch (60%) was the same as the recent 5- and 10-year means (60%) and has remained reasonably consistent over the time series (range 49–65%), although there is considerable variability between individual countries (Figure 3.8.6.2). On average, 1SW fish comprise a higher proportion of the catch (70–80%) in UK (England & Wales) than in the other Southern NEAC countries.

3.8.7 Farmed and ranched salmon in catches

The contribution of farmed and ranched salmon to national catches in the NEAC area in 2007 was again generally low (<2% in most countries) and is similar to the values that have been reported in previous reports (e.g. ICES, 2007). Thus, the occurrence of such fish is usually ignored in assessments of the status of national stocks (Section 3.8.12). However, in Norway farmed salmon continue to form a large proportion of the catch in coastal (29% in 2007), fjordic (30% in 2007) and rod fisheries (9% in 2007). An assessment of the likely effect of these fish on the output data from the PFA model has been reported previously (ICES, 2001).

3.8.8 National origin of catches

In the course of collecting coded wire tagged salmon from Irish tagging programmes, tags have also been recovered from salmon that originate from other countries where coded wire tagging takes place. However, with the closure of the Irish driftnet fishery in 2007, the recovery of tags originating from fish released in other countries largely ceased. In 2007, just one tag originating from UK (Northern Ireland) was recovered in Irish fisheries (Table 3.8.8.1).

Due to the large difference in the number of tagged salmon being released by each country and the consistency of tagging programmes, tag recoveries are expressed as recapture rates per 1000 fish released (raised to the total fishery and including an estimate of unreported catch) to provide the relative contribution of tagged salmon by each country to the Irish fishery (Table 3.8.8.1). Tag release information is derived from information reported annually to ICES (Reports of the ICES Compilation of Microtags, Finclips and External Tag Releases, 1985 to 2007). For UK (England and Wales) tagged parr have comprised a large proportion of the fish tagged in some years, and these are generally regarded as contributing to returns two years after release, but this is known to vary. Similarly, by combining the indices at a country level important regional differences may be obscured. Noting these caveats, highest average recapture rates for tagged salmon released in areas other than Ireland are UK (N. Ireland), UK (Scotland), Denmark, France, UK (England and Wales), Spain, Germany and Norway respectively.

River-specific models based on the run reconstruction approach were presented for a number of English and Welsh stocks (ICES 2004); the inclusion of confidence limits on the estimates of exploitation marked a further advance on earlier models. Table 3.8.8.2 provides updated estimates up to 2006 and prior to closure of the Irish driftnet fishery in 2007. Prior to 1997, exploitation rates in the Irish fishery were estimated at about 1% for stocks from the north east of England, higher (13 to 17%) for two rivers in Wales, but highest (28%) for the River Test in southern England. New management measures were introduced in the Irish fishery in 1997 and from 2002 the fishery was regulated by quotas, which reduced each year. Exploitation rate estimates since 1997 indicate a reduction in exploitation of English and Welsh stocks, with average values of 0.5% for the Tyne (data for one year only), 2 to 8% for Welsh rivers and 12% for the River Test (1997-2000 only). Later estimates (2003–2006) for the River Tamar in south west England indicated an exploitation rate of about 2% for this stock.

The Working Group has previously recognised that exploitation rates varied considerably from year-to-year and that exploitation rates on particular stocks could be relatively high in some years and negligible in others. For stocks below their CL, the Working Group has noted that even low levels of exploitation may represent an impediment to stock recovery, particularly for those rivers designated as Special Areas of Conservation (Section 3.9). Special Areas of Conservation (SACs) are strictly protected sites designated under the EC Habitats Directive. Article 3 of the Habitats Directive requires the establishment of a European network of important high-quality conservation sites that will make a significant contribution to conserving the habitat types and species identified in Annexes I and II of the Directive (as amended). The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds).

Recoveries of tags have also been made in other NEAC homewater fisheries. Four tags of Irish origin were taken in fisheries in the UK (N. Ireland) FCB area while a single tag of Irish origin was recovered from rod fishery in UK (Scotland).

3.8.9 The NEAC-PFA 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 0.02–0.04) 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.*, 1998 provides full details of the model. Further modifications, to improve the model were incorporated during the Working Group meeting in 2005 (ICES, 2005).

3.8.10 Sensitivity of the PFA model

The sensitivity of the PFA and spawner estimates for the Northern and Southern European stock complexes was carried out using the tools within Crystal Ball. The relative contribution of model parameters to variance in the estimates of recruits (maturing and non-maturing 1SW) and spawner numbers (1SW and MSW) for both Northern and Southern NEAC stock complexes were estimated using the data presented to the ICES Working Group in 2008 (catch data for 2007). PFA estimates have been shown to be particularly sensitive to the marine mortality parameter (ICES, 2006), due both to the range (0.02–0.04) attributed to marine mortality in the Monte Carlo simulation and also to the time over which stocks are raised.

Given a fixed value for M, parameters which have accounted for at least 5% of the variance of a given variable are shown in Table 3.8.10.1. Taking both stock complexes together these account for 13 (11%) of the 117 parameters used to estimate PFA and 10 (14%) of the 72 parameters used to estimate spawner numbers. The sensitivity of forecast variables to these parameters has been shown to be remarkably consistent among years (ICES, 2006). While this remained generally true for the analyses of data presented to the 2008 Working Group, changes in the model structure with respect to Ireland (Section 3.7.1) resulted in increased uncertainty around abundance estimates for maturing Southern NEAC 1SW fish (Figure 3.1.1). This is reflected in the sensitivity analysis where the only model parameter accounting for more than 5% of the variance of forecast variables for maturing 1SW fish in the Southern NEAC stock complex was exploitation rate for Ireland.

3.8.11 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)
- Exploitation levels (min and max)

The model input data are provided in Tables 3.8.11.1(a–t). 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.

Descriptions of how the model input has 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 2008 are indicated in Section 3.7.1.

3.8.12 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. These figures should also be regarded as uncertain and should only be used with caution in developing management options. A further 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 3.8.12.1(a–j)) comprising the following:

- Estimated total returns and spawners (95% confidence limits).
- Estimated total catch (including non-reported) of 1SW and MSW salmon.
- Estimated pre-fishery abundance (PFA) of maturing 1SW and non-maturing 1SW salmon (labelled as 1SW and MSW).
- Total exploitation rate of 1SW and MSW salmon estimated from the total returns and total catches derived from the model.
- 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.

3.8.13 Trends in the PFA for NEAC stocks

Tables 3.8.13.1–3.8.13.6 show 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 and Southern European groups are shown in Figure 3.1.1.

The 95% confidence limits (dotted lines for PFA and vertical bars for the spawning escapement in Figure 3.1.1) indicate the uncertainty in this assessment procedure. The Working Group recognised 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 Europe (Figure 3.1.1) show 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 number 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. However, in 2007, the 1SW spawner estimate indicated that the stock complex was suffering reduced reproductive capacity for the first time in the series. These patterns 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 3.8.14).

Recruitment patterns of maturing 1SW salmon and of non-maturing 1SW recruits for Southern Europe (Figure 3.1.1) show broadly similar declining trends over the time period. The maturing 1SW stock complex has been at full reproductive capacity over the time period with the exception of 2006 when it was at risk of suffering reduced reproductive capacity before homewater fisheries have taken place. 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 after homewater fisheries took place in five of the nine years between 1997 and 2005 and was suffering reduced reproductive capacity for the first time in 2006.

Declining trends in spawner number are evident in the Southern stock complexes for both 1SW and MSW. However 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 when the stock was either at risk of reduced reproductive capacity or suffering reduced reproductive capacity. This is broadly consistent with the general pattern of decline in marine survival of 1SW and 2SW returns in most monitored stocks in the area (Section 3.8.14).

3.8.14 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) for the 2006 and 2005 smolt year classes (returning 1SW and 2SW salmon, respectively) is presented in Figure 3.8.14.1. The survival indices presented are the annual rates of change in marine survival. The original survival indices for different rivers and experimental facilities are presented in Tables 3.8.14.1 and 3.8.14.2.

An overall trend in both Northern and Southern NEAC areas, both wild and hatchery smolts, show a decline in marine survival with the annual decline varying between 1% and 20% (Figure 3.8.14.1). Most of the survival indices for wild and reared smolts were lower than those of the previous year and below the previous 5- and 10-year averages. One of the few exceptions was the River Bush (UK Northern Ireland) where both wild and reared smolts showed higher survival rates than in the previous year and the 5- and 10-year average figures (Table 3.8.14.2). Return rates of hatchery released fish, however, may not always be a reliable indicator of marine survival of wild fish.

Results from these analyses are consistent with the information on estimated returns and spawners as derived from the PFA model (Section 3.8.13), and suggest that returns are strongly influenced by factors in the marine environment.

3.8.15 Exploitation indices for NEAC stocks

Exploitation estimates have been charted for 1SW and MSW salmon from the Northern and Southern NEAC areas for the period 1971–2007 (1983–2007 for Norway) and are displayed in Figures 3.8.15.1 and 3.8.15.2. These figures have been collated from the NEAC pre-fishery abundance model and represent an estimate of total national exploitation rates inclusive of both commercial and recreational fisheries. Data gathered prior to the 1980's represent estimates of national exploitation rates whilst post 1980's 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 year^{-1}) 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 3.8.15.3 and 3.8.15.4).

The exploitation of 1SW salmon in both Northern and Southern NEAC areas has shown a general decline over the time series (Figure 3.8.15.1 and 3.8.15.2). An increase in the exploitation rate in the Northern NEAC area was observed for both 1SW and MSW fish in 1983, however, this can be attributed to the inclusion of Norwegian exploitation data from this point onwards. Exploitation rates on 1SW salmon in the Northern NEAC area was 42% in 2007 representing no change from the previous year (42%) and close similarity to the 10 year average (43%). Exploitation on 1SW fish in the Southern NEAC stock was 21% in 2007 indicating a substantial decrease on both the previous year (33%) and the 10 year average (33%). Exploitation was similar in 2007 to the previous year in most Southern NEAC countries, however, a substantial decline was observed in Ireland and UK (Northern Ireland) with exploitation on 1SW stocks decreasing by around 76% and 85% respectively.

The exploitation rate of MSW fish also exhibited an overall decline over the time-series in both Northern and Southern areas (Figures 3.8.15.1 and 3.8.15.2). For the Northern NEAC area, exploitation was 50% in 2007, similar to the previous 10 year average (51%). For the Southern NEAC area, exploitation was 25% in 2007, a decrease compared to the previous 10 year average (33%).

The relative rate of change of exploitation over the entire time series for the Northern NEAC stock complex is shown in Figure 3.8.15.3. This indicates an overall reduction of exploitation in all 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 shown a general decrease in exploitation rate (Figure 3.8.15.4) on both 1SW and MSW components. The greatest rate of decrease, for both 1SW and MSW fish, was in UK (Scotland). A substantial rate of decrease in 1SW exploitation was also noted in Ireland and UK (Northern Ireland) and exploitation has decreased markedly over the time series on MSW fish in UK (England and Wales). The only positive change indicative of increasing exploitation was detected on 1SW fish in France.

3.9 NASCO has requested ICES to provide any new information on the extent to which the objectives of any significant management measures introduced in recent years have been achieved

Most management measures introduced in recent years in relation to international, national and local objectives have aimed to reduce levels of exploitation on NEAC stocks, to increase freshwater escapement and in some countries specifically to meet river specific CLs. Many of the inputs relate specifically to national plans or strategies or to commitments under National or EU directives. Although some local measures have had notable success (Table 3.9.1) the Working Group notes that three of the four NEAC stock complexes are currently either suffering, or at risk of suffering, reduced reproductive capacity after homewater fisheries have taken place (Section 3.4).

3.10 Bycatch of salmon in non-targeted catches in 2007

Although not specifically directed at salmon, pelagic research fishing was carried out by Norwegian vessels in 2007. Only 5 adult salmon (farm escapees) and 1 post-smolt were captured as a bycatch in 4 separate pelagic research cruises in the Northern parts of the Norwegian Sea between 25th July and 23rd August, 2007. There were no reports of salmon captures from the commercial fisheries in Norway in 2007, nor were there any reports from Russian research or commercial vessels in the Norwegian or Barents Sea.

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 Europe						
Finland	16,597	15,418			16,597	15,418
Iceland (north & east)	7,264	1,458			7,264	1,458
Norway[1]	100,715	69,163			100,715	69,163
Russia	116,152	39,206			116,152	39,206
Sweden	1,960	1,153			1,960	1,153
			Conservation limit		242,688	126,398
			Spawner Escapement Reserve		306,318	213,495

[1]Norwegian conservation limits calculated on data from 1983

	National Model CLs		River Specific CLs		Conservation limit used	
	1SW	MSW	1SW	MSW	1SW	MSW
Southern Europe						
France			17,400	5,100	17,400	5,100
Iceland (south & west)	19,708	1,482			19,708	1,482
Ireland			236,044	15,334	236,044	15,334
UK (E&W)			54,491	29,605	54,491	29,605
UK (NI)	17,323	2,449			17,323	2,449
UK (Sco)	317,687	240,667			317,687	240,667
			Conservation limit		662,652	294,638
			Spawner Escapement Reserve		842,396	498,216

Table 3.6.1.1 Southern NEAC input data (year and spawners/eggs) used in PFA forecast model.

Model Parameters			Southern NEAC non-maturing PFA
Year	Spawner (lagged eggs)	PFAm	
1978	5,637,507	2,148,659	1,233,740
1979	5,316,424	1,905,734	1,682,839
1980	4,306,816	1,506,135	1,775,800
1981	3,801,911	1,223,979	1,313,208
1982	3,869,734	1,786,531	1,565,726
1983	3,706,562	2,539,094	1,090,618
1984	3,603,746	1,788,820	1,272,692
1985	3,535,537	2,111,506	1,693,709
1986	3,521,182	2,482,818	1,280,182
1987	4,222,413	1,814,963	1,619,108
1988	3,688,731	2,498,234	1,475,366
1989	3,859,877	2,081,567	1,173,659
1990	4,492,725	1,277,475	829,449
1991	4,391,879	1,055,373	1,024,083
1992	4,778,636	1,507,947	888,543
1993	4,839,680	1,460,797	1,016,317
1994	4,063,678	1,554,256	965,326
1995	3,421,841	1,547,687	759,918
1996	3,509,238	1,275,009	581,807
1997	3,730,770	1,157,032	528,433
1998	3,631,496	1,473,408	545,985
1999	3,764,172	1,010,816	653,319
2000	3,315,041	1,524,754	630,245
2001	2,920,282	1,306,229	568,485
2002	2,733,687	1,169,721	625,300
2003	2,626,281	1,122,243	659,275
2004	3,067,645	1,084,613	571,524
2005	3,100,812	1,147,428	549,622
2006	2,903,734	954,837	469,894
2007	2,972,974		
2008	2,913,888		
2009	2,923,306		
2010	2,710,146		
2011	2,749,947		

Table 3.6.1.2 Predictions and 95% confidence limits of PFA non-maturing salmon and the associated SERs for Southern NEAC using Spawners (Eggs) and Year for the years 2007 to 2011.

Year	PFA	lower	upper	SER
2007	465,300	311,582	694,854	498,216
2008	445,204	297,331	666,617	498,216
2009	423,444	281,978	635,883	498,216
2010	410,961	272,969	619,330	498,216
2011	389,742	257,969	588,829	498,216

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

Year	England & Wales					UK (Scotland)		UK (N. Ireland)			Norway			
	Gillnet licences	Sweepnet	Hand-held net	Fixed engine	Rod & Line	Fixed engine[1]	Net and coble[2]	Driftnet	Draftnet	Bagnets and boxes	Bagnet	Bendnet	Liftnet	Driftnet (No. nets)
1971	437	230	294	79	-	3,069	802	142	305	18	4,608	2,421	26	8,976
1972	308	224	315	76	-	3,437	810	130	307	18	4,215	2,367	24	13,448
1973	291	230	335	70	-	3,241	884	130	303	20	4,047	2,996	32	18,616
1974	280	240	329	69	-	3,182	777	129	307	18	3,382	3,342	29	14,078
1975	269	243	341	69	-	2,978	768	127	314	20	3,150	3,549	25	15,968
1976	275	247	355	70	-	2,854	756	126	287	18	2,569	3,890	22	17,794
1977	273	251	365	71	-	2,742	677	126	293	19	2,680	4,047	26	30,201
1978	249	244	376	70	-	2,572	691	126	284	18	1,980	3,976	12	23,301
1979	241	225	322	68	-	2,698	747	126	274	20	1,835	5,001	17	23,989
1980	233	238	339	69	-	2,892	670	125	258	20	2,118	4,922	20	25,652
1981	232	219	336	72	-	2,704	647	123	239	19	2,060	5,546	19	24,081
1982	232	221	319	72	-	2,415	647	123	221	18	1,843	5,217	27	22,520
1983	232	209	333	74	-	2,530	669.5	120	207	17	1,735	5,428	21	21,813
1984	226	223	354	74	-	2,443	653	121	192	19	1,697	5,386	35	21,210
1985	223	230	375	69	-	2,196	551	122	168	19	1,726	5,848	34	20,329
1986	220	221	368	64	-	1,996	618.5	121	148	18	1,630	5,979	14	17,945
1987	213	206	352	68	-	1,762	577	120	119	18	1,422	6,060	13	17,234
1988	210	212	284	70	-	1,577	402	115	113	18	1,322	5,702	11	15,532
1989	201	199	282	75	-	1,235	355.5	117	108	19	1,888	4,100	16	0
1990	200	204	292	69	-	1,280	339.5	114	106	17	2,375	3,890	7	0
1991	199	187	264	66	-	1,136	289	118	102	18	2,343	3,628	8	0
1992	203	158	267	65	-	850	292.5	121	91	19	2,268	3,342	5	0
1993	187	151	259	55	-	900	263.5	120	73	18	2,869	2,783	-	0
1994	177	158	257	53	37,278	752	243.5	119	68	18	2,630	2,825	-	0
1995	163	156	249	47	34,941	729	221.5	122	68	16	2,542	2,715	-	0
1996	151	132	232	42	35,281	644	200.5	117	66	12	2,280	2,860	-	0
1997	139	131	231	35	32,781	688	190	116	63	12	2,002	1,075	-	0
1998	130	129	196	35	32,525	545	143.5	117	70	12	1,865	1,027	-	0
1999	120	109	178	30	29,132	384	128.5	113	52	11	1,649	989	-	0
2000	110	103	158	32	30,139	385	119	109	57	10	1,557	982	-	0
2001	113	99	143	33	24,350	387	95	107	50	6	1,976	1,081	-	0
2002	113	94	147	32	29,407	427	101	106	47	4	1,666	917	-	0
2003	58	96	160	57	29,936	363	109	105	52	2	1,664	766	-	0
2004	57	75	157	65	32,766	409	96	90	54	2	1,546	659	-	0
2005	59	73	148	65	34,040	382	101	93	57	2	1,453	661	-	0
2006	52	57	147	65	31,606	338	82	107	49	2	1,283	685	-	0
2007	53	45	157	66	31,958	211	50	18	10	2	1,302	669	-	0
Mean 2002-2006	68	79	152	57	31,551	384	98	100	52	2	1,522	738		0
% change[3]	-21.8	-43.0	3.4	16.2	1.3	-45.0	-48.9	-82.0	-80.7	-16.7	-14.5	-9.3		
Mean 1997-2006	95	97	167	45	30,668	431	117	106	55	6	1,666	884		0
% change[3]	-44.3	-53.4	-5.7	47.0	4.2	-51.0	-57.1	-83.1	-81.9	-68.3	-21.9	-24.3		

[1] Number of gear units expressed as trap months.
[2] Number of gear units expressed as crew months.
[3] (2005/mean - 1) * 100
[3] (2005/mean - 1) * 100
[4] Dash means "no data"

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

	Ireland				Finland				France			Russia		
					The Teno River			R. Näätämö				Kola Peninsula	Archangel region	
	Driftnets No.	Draftnets	Other nets Commercial	Rod	Recreational fishery Tourist anglers		Local rod and net fishery	Recreational fishery	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	
Year					Fishing days	Fishermen	Fishermen	Fishermen					Coastal	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	-	-	-	-	22,487	7,759	754	689	5,724 [4]	87 [4]	80	-	-	-
1988	836	-	-	11,539	21,708	7,755	741	538	4,346	101	76	-	-	-
1989	801	-	-	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	32,814	37,491	10,560	853	660	2,082	18	43	9,624	63	72
2003	877	549	159	32,725	34,979	10,032	832	644	2,048	18	38	11,898	55	84
2004	831	473	136	31,809	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	27,337	29,516	7,749	836	552	2,269	12	37	13,604	62	72
2007	0	335	100	30,000	33,664	8,763	780	716	2,434	13	37	-	73	24
Mean 2002-2006	859	523	155	30,685	31,821	8,978	821	644	2,183	16	39	13,747	67	71
% change [3]	-100.0	-36.0	-35.4	-2.2	5.8	-2.4	-5.0	11.2	11.5	-17.7	-4.1		9.0	-66.0
Mean 1997-2006	865	519	160	31,570	27,888	8,018	746	654	2,256	15	45	10,395	65	139
% change [3]	-100.0	-35.5	-37.3	-5.0	20.7	9.3	4.6	9.4	7.9	-15.6	-18.3		12.7	-82.8

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

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

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

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

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

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

[6] (2005/mean - 1) * 100

[7] Dash means "no data"

Table 3.8.4.1 Nominal catch of salmon in NEAC Area (in tonnxes round fresh weight), 1960–2007 (2007 figures are provisional).

Year	Southern countries	Northern countries	Faroes (1)	Other catches in international waters	Total Reported Catch	Unreported catches NEAC Area	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	1,685	6	-	3,587	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	1,227	0	-	1,878	604	-
2007	365	1,029	0	-	1,394	465	-
Means							
2002-2006	885	1246	0	-	2130	690	-
1997-2006	1004	1258	2	-	2264	840	-

1. Since 1991, fishing carried out at the Faroes has only been for research purposes.
2. Estimates refer to season ending in given year.

Table 3.8.5.1 Cpue for salmon rod catches in Finland (Teno and Naatamo), France and UK(N.Ireland) (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	2.31	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	1.01	0.252
2005	2.7	0.8	1.3	0.2	0.68	0.323
2006	3.4	1.0	1.9	0.4	0.94	0.457
2007	2.9	0.8	1.0	0.2	1.00	0.600
Mean 2002-06	2.6	0.8	1.1	0.2	0.8	0.3

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

Table 3.8.5.2 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	Varzina	Iokanga	Ponoy	Varzuga	Kitsa	Umba
1991					2.79	1.87		1.33
1992	2.37	1.45	1.07	0.14	4.50	2.26	1.21	1.37
1993	1.18	1.46	0.49	0.65	3.57	1.28	1.43	2.72
1994	0.71	0.85	0.55	0.33	3.30	1.60	1.59	1.44
1995	0.49	0.78	1.22	0.72	3.77	2.52	1.78	1.20
1996	0.70	0.85	1.50	1.40	3.78	1.44	1.76	0.93
1997	1.20	0.71	0.61	1.41	6.09	2.36	2.48	1.46
1998	1.01	0.55	0.44	0.87	4.52	2.28	2.78	0.98
1999	0.95	0.77	0.43	1.19	3.30	1.71	1.66	0.76
2000	1.35	0.77	0.57	2.28	3.55	1.53	3.02	1.25
2001	1.48	0.92	0.89	0.73	4.35	1.86	1.81	1.04
2002	2.39	0.99	0.80	2.82	7.28	1.44	2.11	0.36
2003	1.61	1.14	0.79	2.01	8.39	1.17	1.61	0.36
2004	1.07	0.98	0.65	1.00	5.80	1.14	1.10	0.36
2005	1.09	0.82	0.46	0.88	4.42	0.57	0.89	0.28
2006	0.98	1.49	1.45		6.28	2.23		0.73
2007	0.92	0.78	1.16		5.96			
Mean 2002-06	1.43	1.09	0.83	1.68	6.44	1.31	1.43	0.42

Table 3.8.5.3 Cpue data for net and fixed engine fisheries by Region in UK (England & Wales). Data expressed as catch per licence-tide, except for the North East, 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	Midlands	Wales	North West
1988		5.49			-	-
1989		4.39			0.90	0.82
1990		5.53			0.78	0.63
1991		3.20			0.62	0.51
1992		3.83			0.69	0.40
1993	8.23	6.43			0.68	0.63
1994	9.02	7.53			1.02	0.71
1995	11.18	7.84			1.00	0.79
1996	4.93	3.74			0.73	0.59
1997	6.48	4.40	0.58	0.48	0.31	0.63
1998	5.92	3.81	1.07	0.42	0.51	0.46
1999	8.06	4.88	0.65	0.72	0.44	0.52
2000	13.06	8.11	0.85	0.66	0.33	1.05
2001	10.34	6.83	0.58	0.79	0.45	0.71
2002	8.55	5.59	0.86	1.39	0.57	0.90
2003	7.13	4.82	1.00	1.13	0.41	0.62
2004	8.17	5.88	0.96	0.46	0.45	0.69
2005	7.23	4.13	0.52	0.97	0.41	1.28
2006	5.60	3.20	0.53	0.97	0.35	0.82
2007	7.24	4.17	0.26	1.26	0.58	0.75
Mean 2002-06	7.34	4.72	0.77	0.98	0.44	0.86

Table 3.8.5.4 Cpue data for Scottish net fisheries. Catch in numbers of fish per unit 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	53.7	105.2
2001	60.3	76.1
2002	43.8	67.3
2003	67.3	66.5
2004	51.1	66.5
2005	55.1	80.9
2006	49.2	76.1
2007	51.6	33.7
Mean 2002-06	53.3	71.5

[1] Excludes catch and effort for Solway Region

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

	Bagnet			Bendnet		
Year	**< 3kg**	**3-7 kg**	**>7 kg**	**< 3kg**	**3-7 kg**	**>7 kg**
1998	0.88	0.66	0.12	0.80	0.56	0.13
1999	1.16	0.72	0.16	0.75	0.67	0.17
2000	2.01	0.90	0.17	1.24	0.87	0.17
2001	1.52	1.03	0.22	1.03	1.39	0.36
2002	0.91	1.03	0.26	0.74	0.87	0.32
2003	1.57	0.90	0.26	0.84	0.69	0.28
2004	0.89	0.97	0.25	0.59	0.60	0.17
2005	1.17	0.81	0.27	0.72	0.73	0.33
2006	1.02	1.33	0.27	0.72	0.86	0.29
2007	0.43	0.90	0.32	0.57	0.95	0.33
Mean 2002-06	1.11	1.01	0.26	0.72	0.75	0.28

Table 3.8.6.1 Percentage of 1SW salmon in catches from countries in the North East Atlantic, 1987–2007.

Year	Iceland	Finland	Norway	Russia	Sweden	**Northern countries**	UK (Scot)	UK (E&W)	France	Spain (1)	**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**	50	81	40	67	**59**
2005	88	72	67	66	55	**69**	58	75	41	15	**60**
2006	84	71	54	77	56	**60**	57	77	50	15	**60**
2007	91	24	42	69	33	**50**	56	78	45	26	**60**
Means											
2002-2006	83	55	57	70	54	**61**	54	75	50	30	**60**
1997-2006	80	62	60	74	58	**64**	54	76	51	36	**60**

1. Based on catches in Asturias (~90 % of the Spanish catch).

Table 3.8.8.1 Recapture rate per 1000 fish released for coded wire tagged salmon taken in Irish fisheries.

Fishing year	Ireland	UK (N. Ireland)	UK (England & Wales)	UK (Scotland)	France	Spain	Norway	Denmark	Germany
1985	180	-	0.5	21.5	-	-	-	-	-
1986	433	-	1.2	59.4	-	-	-	-	-
1987	157	22	0.8	16.0	-	-	-	-	-
1988	190	31	3.1	19.2	-	-	-	-	-
1989	144	23	1.6	2.5	-	-	-	-	-
1990	83	16	0.9	12.4	2.0	-	-	-	-
1991	71	23	0.4	4.2	-	-	-	-	-
1992	50	23	1.8	0.2	0.4	-	-	-	-
1993	100	21	0.6	0.1	0.1	0.5	0.08	-	-
1994	70	17	1.0	0.3	-	-	0.04	-	-
1995	90	15	1.8	0.5	11.4	0.1	-	-	-
1996	58	7	1.6	1.5	-	0.1	-	-	-
1997	68	11	0.5	-	-	0.1	-	-	-
1998	92	11	0.4	0.5	-	1.6	-	2.0	-
1999	46	4	2.6	-	0.2	0.5	-	3.8	0.4
2000	80	17	3.8	0.2	-	0.8	-	-	0.3
2001	83	24	1.8	-	-	0.4	-	-	-
2002	69	8	1.8	0.5	-	-	-	-	0.5
2003	80	17	1.1	0.0	-	3.2	0.00	-	-
2004	83	24	0.3	0.8	-	0.6	0.00	-	-
2005	69	8	0.3	0.0	-	0.3	0.00	-	0.4
2006	37	7	0.4	0.0	-	3.2	0.00	-	0.8
2007	30	0.1	0.0	0.0	0.0	0.0	0.00	0.0	0.0
AVERAGE	106	17	1	9	3	1	0.1	3	0.5

Table 3.8.8.2 Average exploitation rates in Ireland for selected English and Welsh salmon stocks, based on aggregated data for the periods before and after the introduction of management measures in the Irish fishery in 1997.

River	Pre 1997			Post 1997		
	Years	Expl. Rate (%)	95% CL (%)	Years	Expl. Rate (%)	95% CL (%)
Tyne - NE England	1986-96	1.3	± 0.4	1997	0.5	± 0.7
Wear - NE England	1986-96	0.9	± 0.2	1997	0	
Dee - N. Wales	1992-96	16.8	± 5.7	1997-2006	1.7	± 0.8
Taff - S. Wales	1991-96	13.5	± 4.7	1997-2006	7.6	± 3.2
Tamar - SW England	No data			2003-2006	2.1	± 1.3
Test - S. England	1991-96	28.4	± 5.9	1997-2000	12.0	± 4.2

Table 3.8.10.1 Summary of the results of a sensitivity analysis of the NEAC run-reconstruction model. The relative contribution of model parameters to the variance in the predictions of the number of recruits (maturing and non-maturing 1SW) and spawners (1SW and MSW) for both Northern and Southern NEAC stock complexes were estimated using the data presented to the ICES Working Group in 2008 (2007 catches). Parameters which have accounted for at least 5% of the variance of a given forecast variable in one or more years are indicated by X.

Stock complex	Region	Parameter	Forecast Variable			
			PFA		Spawners	
			Maturing	Non-Maturing	1SW	MSW
Northern NEAC	Russia (Kola Pen. White Sea Basin)	Exploitation rate	X		X	
	Norway (mid)	Exploitation rate	X	X		X
		Unreported catch		X		
	Norway (north)	Exploitation rate		X		X
		Unreported catch		X		
	Norway (south)	Exploitation rate		X		X
	Russia (Barents Sea)	Exploitation rate	X		X	
	Finland	Exploitation rate	X			X
Southern NEAC	UK (Scot) (East)	Exploitation rate		X		X
	Ireland	Exploitation rate	X		X	
	UK (E&W)	Exploitation rate		X		X
	UK (Scot) (West)	Exploitation rate		X		X

Table 3.8.11.1a Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation-R. Tana/Teno (Finland/Norway).

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	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

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

Table 3.8.11.1b 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

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

Table 3.8.11.1c 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	17,954	1,505	10	15	10	15	37	57	55	75

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

Table 3.8.11.1d 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	7,035	1,508	10	15	10	15	33	53	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

Table 3.8.11.1e 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

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

Table 3.8.11.1f Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation-Norway-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	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	40,511	37,105	40	60	40	60	65	85	65	85
1984	34,248	38,614	40	60	40	60	65	85	65	85
1985	47,877	36,968	40	60	40	60	65	85	65	85
1986	51,839	41,890	40	60	40	60	65	85	65	85
1987	48,690	39,641	40	60	40	60	65	85	65	85
1988	53,775	37,145	40	60	40	60	65	85	65	85
1989	43,128	25,279	40	60	40	60	55	75	55	75
1990	44,259	25,907	40	60	40	60	55	75	55	75
1991	30,771	19,054	40	60	40	60	55	75	55	75
1992	32,488	24,124	40	60	40	60	55	75	55	75
1993	34,503	22,835	30	50	30	50	55	75	55	75
1994	42,551	20,903	30	50	30	50	55	75	55	75
1995	32,685	24,725	30	50	30	50	55	75	55	75
1996	27,739	26,029	30	50	30	50	55	75	55	75
1997	31,381	14,922	25	45	25	45	50	70	50	70
1998	38,299	16,966	25	45	25	45	50	70	50	70
1999	31,256	9,881	25	45	25	45	50	70	50	70
2000	54,671	22,208	25	45	25	45	50	70	50	70
2001	59,425	29,896	25	45	25	45	50	70	50	70
2002	39,068	21,513	25	45	25	45	50	70	50	70
2003	41,642	28,168	20	40	20	40	50	70	50	70
2004	35,616	22,226	20	40	20	40	50	70	50	70
2005	51,159	22,350	20	40	20	40	50	70	50	70
2006	36,331	31,235	20	40	20	40	50	70	50	70
2007	18,571	24,514	20	40	20	40	50	70	50	70

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

Table 3.8.11.1g 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

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

Table 3.8.11.1h 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

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

Table 3.8.11.1i Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation-Russia-Archangelsk & Karelia.

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	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

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

Table 3.8.11.1j 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

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

Table 3.8.11.1k 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 (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
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
2006	15,004	2,071	30	40	30	40	10	20	10	20
2007	7,807	1,404	30	40	30	40	10	20	10	20

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

Table 3.8.11.1l 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	24,596	27,404	5	15	5	15	50	80	50	80
1990	50	49,950	5	15	5	15	50	80	50	80
1991	7,975	47,025	5	15	5	15	50	80	50	80
1992	550	54,450	5	15	5	15	50	80	50	80
1993	68	67,932	5	15	5	15	50	80	50	80
1994	3,900	48,100	5	15	5	15	50	80	50	80
1995	9,280	70,720	5	15	5	15	50	80	50	80
1996	8,664	48,336	5	15	5	15	50	80	50	80
1997	1,440	38,560	5	15	5	15	50	80	50	80
1998	780	59,220	5	15	5	15	50	80	50	80
1999	2,120	37,880	5	15	5	15	50	80	50	80
2000	84	83,916	5	15	5	15	50	80	50	80
2001	2,244	41,756	5	15	5	15	50	80	50	80
2002	405	44,595	5	15	5	15	50	80	50	80
2003	1,650	31,350	5	15	5	15	50	80	50	80
2004	6,075	20,925	5	15	5	15	50	80	50	80
2005	2,852	28,148	5	15	5	15	50	80	50	80
2006	1,472	30,528	5	15	5	15	50	80	50	80
2007	817	42,183	5	15	5	15	50	80	50	80

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

Table 3.8.11.1m 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

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

Table 3.8.11.1n Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation-UK (England & Wales).

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	28,915	23,611	29	48	29	48	36	56	30	50
1972	24,613	34,364	29	49	29	49	35	55	29	49
1973	28,989	26,097	29	48	29	48	35	55	29	49
1974	35,431	18,776	29	49	29	49	34	54	29	49
1975	36,465	25,819	29	48	29	48	35	55	29	49
1976	25,422	14,113	28	46	28	46	35	55	30	50
1977	27,836	17,260	29	49	29	49	36	56	31	51
1978	31,397	14,228	29	48	29	48	36	56	30	50
1979	29,030	6,803	29	48	29	48	35	55	30	50
1980	26,997	22,019	29	49	29	49	36	56	30	50
1981	28,414	31,115	29	48	29	48	36	56	30	50
1982	24,139	12,003	29	48	29	48	36	56	30	50
1983	35,903	13,861	28	46	28	46	37	57	31	51
1984	31,923	11,355	27	46	27	46	37	57	31	51
1985	30,759	16,020	29	49	29	49	37	57	31	51
1986	35,695	21,822	28	47	28	47	37	57	31	51
1987	36,339	17,101	29	48	29	48	37	57	31	51
1988	47,989	21,560	30	50	30	50	37	57	31	51
1989	33,610	18,098	28	46	28	46	38	58	32	52
1990	24,152	22,294	28	46	28	46	38	58	32	52
1991	23,018	9,402	28	47	28	47	37	57	31	51
1992	22,787	6,806	30	50	30	50	37	57	31	51
1993	30,526	7,160	28	47	28	47	34	54	28	48
1994	41,662	12,444	18	30	18	30	35	55	29	49
1995	30,148	11,724	17	28	17	28	32	52	26	46
1996	21,848	11,764	15	26	15	26	31	51	25	45
1997	18,690	6,913	14	24	14	24	27	47	22	42
1998	19,466	3,987	14	24	14	24	25	45	20	40
1999	14,603	6,872	13	22	13	22	20	40	12	32
2000	23,116	6,145	11	19	11	19	20	40	8	28
2001	19,119	6,037	11	18	11	18	18	38	7	27
2002	17,676	5,582	11	19	11	19	19	39	7	27
2003	10,459	5,152	13	22	13	22	17	37	6	26
2004	19092	4478	13	22	13	22	19	39	7	27
2005	15200	5067	13	22	13	22	18	38	7	27
2006	13293	3970	13	22	13	22	17	37	6	26
2007	11235	3169	13	22	13	22	17	37	6	26

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

Table 3.8.11.1o Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation-UK (N. Ireland)-Foyle Fisheries Area.

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	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	37,914	2,854	0	5	0	5	45	65	25	35
2003	30,441	2,291	0	1	0	1	40	55	20	30
2004	20,730	1,560	0	1	0	1	30	40	15	25
2005	23,746	1,787	0	1	0	1	25	35	45	55
2006	11,324	852	0	1	0	1	25	35	25	35
2007	5,050	322	0	1	0	1	5	10	5	10

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

Table 3.8.11.1p 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 (%)	
	1SW	MSW	min	max	min	max	min	max	min	max
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	3,315	249	0	5	0	5	45	65	25	35
2003	2,236	168	0	5	0	5	40	55	20	30
2004	2,411	181	0	1	0	1	30	40	15	25
2005	3,012	227	0	1	0	1	25	35	45	55
2006	2,288	172	0	1	0	1	25	35	25	35
2007	2,533	162	0	1	0	1	5	10	5	10

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

Table 3.8.11.1q 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	180,276	128,813	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	80,498	72,523	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	37,468	34,845	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	27,014	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	26,579	21,720	5	15	5	15	16.1	22.5	16.9	25.4
2003	25,817	24,214	5	15	5	15	14.5	20.0	15.0	23.5
2004	31,324	30,676	5	15	5	15	14.5	20.0	15.0	23.5
2005	31,106	23,524	5	15	5	15	14.5	20.0	15.0	23.5
2006	30,410	22,888	5	15	5	15	12.5	18.0	13.0	20.0
2007	22,155	18,716	5	15	5	15	11.0	16.5	11.5	18.5

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

Table 3.8.11.1r 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	31359	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	18,277	12,295	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	5,509	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	4,149	3,589	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	4,194	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	3,060	15	25	15	25	4.0	5.5	4.0	6.5
2004	5,836	6,010	15	25	15	25	6.0	8.0	6.0	9.0
2005	7,426	4,913	15	25	15	25	6.0	8.0	6.0	9.0
2006	5,767	4,326	15	25	15	25	6.0	8.0	6.0	9.0
2007	6,713	4,088	15	25	15	25	6.0	8.0	6.0	9.0

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

Table 3.8.11.1s 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

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 0.170
max 0.270

Table 3.8.11.1t Input data for NEAC Pre Fishery Abundance analysis using Monte Carlo simulation-West Greenland.

Year	Catch (numbers)		Unrep. as % of total 1SW		Unrep. as % of total MSW		Exp. rate 1SW (%)		Exp. rate MSW (%)		Prop'n EU
	1SW	MSW	min	max	min	max	min	max	min	max	
1971	0	856,369	0	0			100	100	100	100	0.66
1972	0	614,244	0	0			100	100	100	100	0.64
1973	0	560,048	0	0			100	100	100	100	0.51
1974	0	535,475	0	0			100	100	100	100	0.57
1975	0	650,641	0	0			100	100	100	100	0.56
1976	0	386,513	0	0			100	100	100	100	0.57
1977	0	442,368	0	0			100	100	100	100	0.55
1978	0	293,731	0	0			100	100	100	100	0.57
1979	0	417,665	0	0			100	100	100	100	0.50
1980	0	370,807	0	0			100	100	100	100	0.48
1981	0	398,738	0	0			100	100	100	100	0.41
1982	0	346,302	0	0			100	100	100	100	0.41
1983	0	100,000	0	0			100	100	100	100	0.60
1984	0	95,498	0	0			100	100	100	100	0.50
1985	0	301,045	0	0			100	100	100	100	0.50
1986	0	316,832	0	0			100	100	100	100	0.43
1987	0	305,696	0	0			100	100	100	100	0.41
1988	0	280,818	0	0			100	100	100	100	0.57
1989	0	117,422	0	0			100	100	100	100	0.44
1990	0	101,859	0	0			100	100	100	100	0.25
1991	0	178,113	0	0			100	100	100	100	0.35
1992	0	84,342	0	0			100	100	100	100	0.46
1993	0	4,404	0	0			100	100	100	100	0.35
1994	0	4,404	0	0			100	100	100	100	0.35
1995	0	32,422	0	0			100	100	100	100	0.32
1996	0	31,944	0	0			100	100	100	100	0.27
1997	0	21,402	0	0			100	100	100	100	0.20
1998	0	3,957	0	0			100	100	100	100	0.21
1999	0	6,169	0	0			100	100	100	100	0.10
2000	0	8,171	0	0			100	100	100	100	0.30
2001	0	14,333	0	0			100	100	100	100	0.31
2002	0	3,369	0	0			100	100	100	100	0.32
2003	0	4,050	0	0			100	100	100	100	0.32
2004	0	5,412	0	0			100	100	100	100	0.27
2005	0	5,219	0	0			100	100	100	100	0.24
2006	0	7,105	0	0			100	100	100	100	0.28
2007	0	8,324	0	0			100	100	100	100	0.18

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

Table 3.8.13.1 Estimated number of returning maturing 1SW salmon by NEAC country or region and year.

Year	Northern Europe								Southern Europe								
	Finland	Iceland	Norway	Russia	Sweden	Total			France	Iceland	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total		
		N&E				2.5%	50.0%	97.5%		S&W					2.5%	50.0%	97.5%
1971	25,898	9,426		154,289	17,569				49,674	62,475	1,052,704	102,739	181,602	664,547	1,874,733	**2,129,612**	2,468,056
1972	40,638	8,646		117,559	13,808				99,096	50,779	1,126,392	90,692	158,846	573,683	1,837,680	**2,114,966**	2,474,742
1973	36,866	10,352		172,826	17,143				60,579	54,317	1,227,959	105,524	138,775	699,095	2,004,523	**2,302,264**	2,685,934
1974	73,079	10,302		172,365	24,688				28,170	38,644	1,395,951	133,318	151,677	667,439	2,100,994	**2,426,370**	2,866,610
1975	51,025	12,537		264,421	26,538				57,058	59,960	1,538,519	132,931	124,659	549,948	2,130,429	**2,471,437**	2,949,974
1976	34,974	12,601		184,435	14,964				51,419	47,475	1,051,359	90,565	86,520	447,629	1,537,986	**1,783,067**	2,112,314
1977	17,890	17,523		117,229	7,054				40,260	48,439	905,128	100,021	85,383	494,413	1,464,170	**1,681,526**	1,970,845
1978	24,358	17,865		118,118	8,022				41,154	63,763	791,756	111,245	111,103	565,756	1,496,304	**1,693,325**	1,950,538
1979	28,488	17,052		164,436	8,512				46,952	58,954	728,201	105,651	77,915	475,134	1,323,234	**1,502,436**	1,738,283
1980	12,776	2,587		117,177	10,811				98,067	26,618	553,505	97,049	98,662	299,727	1,042,264	**1,185,178**	1,366,820
1981	19,760	13,349		96,702	19,663				77,783	34,499	291,452	101,304	77,387	370,206	870,645	**963,532**	1,066,354
1982	5,783	6,142		85,015	17,229				48,039	35,391	603,716	85,814	112,011	513,878	1,266,624	**1,407,288**	1,578,880
1983	28,511	9,077	702,556	142,116	22,907	793,966	**905,766**	1,034,540	51,344	44,756	1,069,120	121,628	157,200	550,262	1,782,240	**1,999,611**	2,271,936
1984	31,910	3,278	729,820	153,158	32,393	834,509	**953,199**	1,097,077	84,178	27,474	560,098	107,653	61,729	560,054	1,269,889	**1,412,827**	1,578,519
1985	48,017	22,704	742,142	209,511	38,275	943,636	**1,065,317**	1,208,768	31,417	44,436	928,569	108,480	80,091	465,698	1,473,708	**1,662,391**	1,899,381
1986	43,756	28,189	643,034	178,353	40,519	834,844	**939,070**	1,058,424	48,000	73,180	1,038,448	122,500	89,919	567,294	1,733,746	**1,957,134**	2,238,254
1987	55,969	16,632	542,509	190,562	32,932	751,143	**843,154**	947,142	86,422	45,520	668,103	126,837	49,179	430,683	1,254,139	**1,431,845**	1,666,665
1988	26,791	24,071	498,806	131,951	27,424	634,618	**710,642**	798,222	29,457	81,900	906,853	171,429	115,842	648,528	1,750,965	**1,968,832**	2,237,158
1989	62,424	12,975	552,847	196,754	8,783	746,698	**836,396**	949,744	15,785	45,800	652,276	111,826	111,480	696,894	1,472,618	**1,642,177**	1,848,736
1990	59,184	9,731	495,271	163,419	19,391	668,791	**750,465**	849,736	27,283	42,007	408,220	80,297	92,040	347,455	903,371	**1,007,166**	1,133,197
1991	72,146	14,053	431,315	138,628	23,545	610,050	**683,195**	769,818	19,559	46,411	291,174	78,890	51,561	336,531	748,822	**832,773**	928,323
1992	95,641	26,498	363,522	171,696	26,053	619,500	**686,885**	762,046	35,807	53,163	422,712	81,400	104,350	479,722	1,070,125	**1,189,688**	1,333,486
1993	67,011	21,832	365,540	146,701	27,550	570,892	**633,094**	699,995	50,711	52,024	343,804	111,842	122,115	454,627	1,041,641	**1,152,314**	1,291,505
1994	26,741	6,965	495,203	173,720	21,123	642,068	**726,737**	825,963	40,182	43,000	439,142	122,147	83,857	482,568	1,104,337	**1,225,355**	1,369,842
1995	26,271	20,103	322,877	156,176	30,642	502,925	**559,589**	623,839	13,427	58,102	492,138	92,631	77,842	481,678	1,102,279	**1,222,240**	1,363,652
1996	60,916	10,705	245,650	212,408	18,968	499,148	**552,816**	614,448	16,413	50,106	455,912	67,330	80,274	327,694	900,242	**1,004,790**	1,135,998
1997	52,094	14,581	282,699	207,962	8,686	512,186	**569,336**	633,285	8,510	36,609	457,259	62,344	95,578	247,342	812,705	**912,078**	1,036,931
1998	59,969	24,934	368,235	227,797	7,632	622,641	**692,295**	773,456	16,537	50,190	479,547	68,375	207,560	331,106	1,047,516	**1,162,779**	1,302,885
1999	86,147	12,638	342,014	176,300	11,284	567,654	**631,399**	702,479	5,566	40,988	446,590	58,615	54,168	186,307	703,297	**796,040**	914,640
2000	90,306	13,391	563,708	192,990	22,459	793,102	**887,102**	992,295	14,461	36,456	620,515	88,929	78,633	356,222	1,066,965	**1,203,322**	1,370,695
2001	40,874	12,199	486,970	259,989	14,671	715,524	**822,096**	953,767	12,256	32,172	492,450	79,276	62,210	343,682	940,468	**1,030,906**	1,134,377
2002	28,711	20,956	297,350	236,545	14,831	525,428	**603,023**	708,949	17,309	40,735	430,897	71,230	77,099	276,904	842,144	**922,775**	1,017,052
2003	33,744	11,001	412,455	210,108	9,085	596,132	**684,203**	791,911	11,530	48,185	422,568	47,044	69,406	279,308	808,522	**885,063**	974,058
2004	13,133	29,719	250,100	148,244	7,906	402,189	**456,850**	523,690	13,882	47,991	310,456	79,239	66,454	329,882	782,445	**856,200**	938,037
2005	33,340	26,708	371,439	168,503	6,676	542,820	**614,414**	701,996	9,020	70,757	310,442	64,925	89,684	351,552	830,030	**905,525**	985,443
2006	63,031	27,960	300,196	204,451	8,165	536,860	**608,364**	699,053	12,702	50,157	237,098	59,698	45,679	340,994	686,939	**755,089**	828,005
2007	11,743	18,877	168,378	110,496	3,884	276,335	**316,095**	364,550	9,995	43,337	270,183	50,060	103,618	315,487	696,251	**804,653**	1,037,518
10yr Av.	46,100	19,838	356,085	193,542	10,659	557,868	**631,584**	721,215	12,326	46,097	402,074	66,739	85,451	311,144	840,458	932,235	1,050,271

Table 3.8.13.2 Estimated number of returning non-maturing 1SW salmon by NEAC country or region and year.

Year	Northern Europe								Southern Europe								
	Finland	Iceland	Norway	Russia	Sweden	Total			France	Iceland	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total		
		N&E				2.5%	50.0%	97.5%		S&W					2.5%	50.0%	97.5%
1971	23,792	9,672		132,533	1,058				10,837	24,405	157,644	96,712	21,890	613,231	815,952	**933,345**	1,073,369
1972	37,440	15,079		134,676	743				21,610	37,553	168,243	145,652	19,151	782,198	1,037,173	**1,187,544**	1,367,610
1973	44,936	14,073		222,473	2,587				13,303	33,806	182,594	109,457	16,736	858,071	1,063,249	**1,222,165**	1,420,511
1974	66,654	13,405		209,795	1,662				6,138	29,178	206,440	79,594	18,308	603,673	829,170	**949,811**	1,099,481
1975	74,105	14,768		225,021	403				12,309	31,013	231,161	108,866	15,031	669,074	932,913	**1,073,769**	1,244,845
1976	60,655	12,182		194,962	1,204				9,017	26,798	160,186	56,171	10,434	401,022	582,668	**669,421**	776,217
1977	36,976	16,984		134,403	909				6,958	26,157	139,403	69,448	10,286	461,984	630,081	**721,905**	829,247
1978	23,566	21,852		116,241	693				7,066	33,701	120,620	58,536	13,399	561,830	692,723	**799,167**	933,216
1979	25,137	14,410		101,564	2,011				8,141	21,627	109,155	27,825	9,378	409,814	507,364	**588,500**	690,625
1980	26,367	20,109		168,894	3,526				16,974	30,345	119,830	91,087	11,913	517,026	699,643	**795,386**	910,483
1981	29,395	7,054		96,386	1,022				11,681	20,270	88,086	127,562	9,327	577,206	743,399	**840,854**	958,186
1982	38,346	8,096		85,370	3,692				7,192	14,318	51,365	49,040	13,489	445,971	513,089	**583,984**	676,715
1983	41,528	6,155	427,828	124,086	2,541	536,103	**603,854**	683,275	7,710	23,927	152,797	53,929	18,928	485,362	639,492	**758,413**	997,059
1984	39,324	7,947	437,567	123,830	3,550	544,395	**614,058**	693,035	12,639	20,263	76,291	44,135	7,434	400,662	500,002	**564,240**	643,743
1985	30,602	5,126	404,035	135,298	1,488	514,149	**578,790**	652,070	9,537	14,720	83,731	64,748	9,681	493,072	600,449	**678,631**	773,210
1986	26,860	13,964	483,837	133,994	1,440	585,486	**662,163**	751,514	9,674	12,296	94,555	85,826	10,845	630,516	747,321	**846,841**	974,588
1987	33,444	14,390	362,414	99,356	4,281	457,298	**516,261**	584,122	5,152	10,911	117,448	68,733	5,543	404,942	543,612	**616,148**	703,441
1988	21,494	9,286	305,855	99,802	4,178	394,810	**442,455**	497,344	14,086	12,400	84,951	88,628	15,651	624,227	741,576	**842,432**	967,113
1989	24,254	7,904	216,466	97,213	11,635	321,960	**358,345**	401,080	6,523	11,106	77,596	68,977	12,426	545,256	640,158	**724,690**	825,912
1990	30,589	8,308	257,080	124,694	7,421	385,790	**429,603**	484,054	6,713	10,980	37,216	84,860	11,332	471,596	556,695	**625,863**	712,963
1991	36,830	5,779	217,028	122,057	8,564	355,349	**392,425**	435,690	6,065	10,975	55,973	36,917	5,811	342,351	408,175	**460,558**	524,876
1992	39,292	8,614	234,994	116,273	10,959	372,770	**412,498**	458,523	7,606	12,357	42,919	27,957	13,338	449,168	487,331	**555,929**	639,169
1993	45,313	9,710	226,823	137,769	15,056	400,035	**436,273**	478,398	3,611	6,063	42,193	30,465	31,410	375,777	432,920	**493,576**	567,518
1994	37,547	8,233	222,120	121,748	11,031	366,163	**403,377**	445,854	7,603	9,807	67,361	42,208	11,051	454,966	527,570	**595,250**	681,910
1995	23,303	5,756	238,008	138,572	7,728	377,416	**415,126**	458,956	3,637	11,062	65,258	42,107	9,331	429,824	500,617	**563,267**	645,910
1996	20,620	7,519	238,648	104,722	9,836	346,665	**383,014**	423,643	6,507	7,122	43,576	42,309	10,215	321,522	384,957	**434,143**	499,149
1997	30,020	4,251	159,364	85,296	6,403	259,906	**287,058**	318,044	3,344	8,022	56,848	26,668	12,719	225,167	293,843	**337,850**	391,023
1998	25,269	6,162	191,131	105,504	4,706	304,308	**334,495**	369,220	2,803	4,956	32,844	16,399	17,412	233,801	275,081	**309,489**	354,640
1999	23,614	7,056	204,558	93,160	4,045	300,675	**333,912**	372,011	6,078	9,603	51,193	38,172	7,956	201,064	275,491	**322,207**	385,547
2000	52,592	4,162	282,870	162,197	8,906	466,752	**513,561**	566,165	4,249	2,616	63,971	40,835	10,605	256,851	339,454	**385,538**	446,302
2001	75,510	4,799	333,094	114,777	10,733	488,337	**541,742**	601,134	4,937	4,593	56,979	42,299	7,818	246,339	321,538	**370,178**	436,613
2002	60,561	4,532	288,961	125,161	7,810	476,393	**525,040**	579,455	3,714	5,020	65,817	38,491	10,633	202,132	289,800	**333,020**	390,191
2003	42,862	4,702	255,419	87,116	8,923	387,836	**426,358**	470,279	5,278	7,988	69,263	38,790	9,910	230,699	318,021	**370,398**	439,800
2004	20,628	4,658	231,390	67,346	6,470	313,727	**347,967**	387,922	9,917	6,485	37,960	31,026	8,756	288,851	336,491	**389,615**	454,227
2005	15,955	5,721	213,899	80,454	4,908	312,967	**344,879**	381,600	6,081	5,674	49,296	36,231	4,048	229,261	292,243	**337,496**	397,666
2006	27,903	5,486	272,150	77,292	4,922	375,969	**413,034**	457,053	6,163	4,703	36,045	30,601	3,433	235,108	275,947	**324,583**	386,672
2007	39,717	3,844	230,897	80,509	6,754	363,660	**396,939**	433,790	5,854	2,649	15,954	23,768	6,653	215,758	234,922	**276,828**	329,480
10yr Av.	38,461	5,112	250,437	99,352	6,818	379,062	**417,793**	461,863	5,507	5,429	47,932	33,661	8,722	233,986	295,899	**341,935**	402,114

Table 3.8.13.3 Estimated pre fishery abundance of maturing 1SW salmon (potential 1SW returns) by NEAC country or region and year.

Year	Northern Europe								Southern Europe							
	Finland	Iceland	Norway	Russia	Sweden	Total			France	Iceland	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total	
		N&E				2.5%	50.0%	97.5%		S&W					2.5%	50.0%
1971	33,088	11,988		198,578	22,421				63,147	79,477	1,338,891	131,081	231,234	837,238	2,294,898	**2,706,264**
1972	51,796	10,993		150,998	17,689				126,299	64,723	1,434,915	115,679	202,162	721,893	2,262,721	**2,686,616**
1973	47,103	13,196		222,001	21,919				77,382	69,108	1,562,001	134,930	176,677	879,372	2,463,778	**2,919,639**
1974	93,025	13,111		220,837	31,518				36,086	49,034	1,774,122	170,147	192,935	840,056	2,586,147	**3,082,977**
1975	65,035	16,001		339,986	33,761				72,646	76,494	1,957,412	169,729	158,846	692,225	2,626,305	**3,137,883**
1976	44,562	16,033		236,808	19,083				65,715	60,304	1,336,769	115,635	110,172	564,299	1,892,503	**2,262,406**
1977	22,843	22,322		150,817	9,037				51,265	61,636	1,150,322	127,571	108,763	622,645	1,807,560	**2,135,826**
1978	31,064	22,711		151,942	10,238				52,431	81,048	1,005,431	141,956	141,363	711,729	1,837,928	**2,148,659**
1979	36,306	21,778		211,490	10,920				59,818	74,987	925,305	134,542	99,195	598,184	1,622,352	**1,905,734**
1980	16,502	3,295		150,705	13,953				125,139	33,906	703,531	123,886	125,667	378,094	1,284,136	**1,506,135**
1981	25,496	16,993		125,238	25,347				99,535	43,826	371,686	129,592	98,747	466,949	1,073,527	**1,223,979**
1982	7,700	7,832		109,663	22,254				61,678	45,042	767,767	109,924	142,677	648,419	1,551,826	**1,786,531**
1983	36,619	11,555	895,753	182,530	29,494	985,424	**1,157,217**	1,359,135	65,847	56,938	1,359,370	155,744	200,416	693,801	2,189,078	**2,539,094**
1984	40,883	4,177	929,168	196,249	41,278	1,036,980	**1,213,430**	1,441,497	107,469	35,031	712,685	137,346	78,783	705,638	1,563,157	**1,788,820**
1985	61,311	28,930	944,007	269,222	48,753	1,168,632	**1,358,794**	1,582,777	40,125	56,486	1,179,218	138,606	102,041	585,449	1,811,842	**2,111,506**
1986	55,864	35,844	819,063	229,454	51,701	1,033,156	**1,199,781**	1,394,570	61,283	92,899	1,323,270	156,205	114,554	713,300	2,129,019	**2,482,818**
1987	71,281	21,160	691,910	245,458	41,939	928,150	**1,076,104**	1,247,070	110,177	57,947	848,857	161,640	62,662	542,708	1,544,058	**1,814,963**
1988	34,263	30,634	635,751	169,185	35,040	785,981	**906,635**	1,050,795	37,741	104,217	1,152,698	218,654	147,694	817,266	2,149,262	**2,498,234**
1989	79,582	16,504	704,497	250,492	11,292	920,529	**1,066,380**	1,245,393	20,184	58,240	827,608	142,775	141,848	876,756	1,809,591	**2,081,567**
1990	75,420	12,373	630,770	208,571	24,780	825,905	**954,821**	1,115,548	34,692	53,553	517,831	102,518	117,166	438,275	1,112,819	**1,277,475**
1991	91,846	17,892	549,234	177,677	30,094	751,211	**870,738**	1,011,358	24,890	59,097	370,644	100,657	65,647	424,190	918,930	**1,055,373**
1992	121,856	33,752	462,242	219,200	33,082	760,645	**873,473**	1,006,158	45,594	67,762	537,132	103,770	132,554	604,119	1,314,403	**1,507,947**
1993	85,419	27,773	464,784	187,731	35,074	703,021	**805,984**	923,363	64,668	66,097	436,474	142,272	155,310	572,893	1,275,753	**1,460,797**
1994	34,014	8,857	629,731	222,595	26,878	793,116	**925,966**	1,083,669	50,968	54,682	557,009	155,865	106,648	606,758	1,355,140	**1,554,256**
1995	33,469	25,628	410,729	199,871	39,105	621,846	**713,705**	823,244	17,096	73,860	625,248	118,168	99,096	605,889	1,351,912	**1,547,687**
1996	77,738	13,621	312,614	271,881	24,245	613,700	**704,868**	812,693	20,956	63,782	579,383	85,797	102,127	412,127	1,106,179	**1,275,009**
1997	66,196	18,616	359,991	266,846	11,058	631,454	**726,094**	839,958	10,818	46,551	580,769	79,552	121,619	311,103	995,948	**1,157,032**
1998	76,365	31,735	468,422	292,929	9,702	764,835	**884,635**	1,022,398	21,034	63,882	610,025	86,978	264,135	416,529	1,286,542	**1,473,408**
1999	109,790	16,089	435,066	225,337	14,357	699,613	**804,128**	926,037	7,073	52,129	567,834	74,494	68,908	234,320	861,267	**1,010,816**
2000	114,586	17,042	717,046	247,920	28,567	977,357	**1,129,939**	1,309,970	18,410	46,471	788,045	113,342	99,929	447,862	1,309,956	**1,524,754**
2001	51,930	15,546	619,368	333,085	18,650	884,668	**1,047,703**	1,252,455	15,565	40,911	625,736	101,065	79,175	432,558	1,148,018	**1,306,229**
2002	36,577	26,774	378,704	303,688	18,954	649,709	**771,451**	931,820	21,993	51,842	548,052	90,648	97,905	348,263	1,027,967	**1,169,721**
2003	42,942	14,034	524,724	268,818	11,581	737,267	**870,885**	1,033,638	14,668	61,287	537,706	59,854	88,197	351,972	986,947	**1,122,243**
2004	16,719	37,841	318,066	189,470	10,058	497,229	**583,090**	687,310	17,676	61,073	395,838	100,732	84,732	415,136	954,547	**1,084,613**
2005	42,415	33,996	472,516	216,356	8,514	669,151	**782,641**	923,169	11,434	89,943	394,929	82,934	114,078	443,078	1,012,537	**1,147,428**
2006	80,376	35,677	381,870	261,166	10,405	661,714	**776,288**	918,895	16,149	63,698	302,044	76,126	58,137	429,502	841,221	**954,837**
2007	14,939	24,013	214,191	141,179	4,951	342,924	**402,295**	478,693	12,695	55,165	344,765	63,947	131,739	398,250	856,595	**1,025,725**
10yr Av.	58,664	25,275	452,997	247,995	13,574	688,447	**805,305**	948,438	15,670	58,640	511,497	85,012	108,693	391,747	1,028,560	**1,181,977**

Table 3.8.13.4 Estimated pre fishery abundance of non-maturing 1SW salmon (potential MSW returns) by NEAC country or region and year.

Year	Northern Europe								Southern Europe								
	Finland	Iceland N&E	Norway	Russia	Sweden	Total			France	Iceland S&W	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total		
						2.5%	50.0%	97.5%							2.5%	50.0%	97.5%
1971	63,116	26,107		272,236	7,557				56,277	63,580	400,024	366,172	31,877	1,833,084	2,295,641	**2,770,940**	3,348,186
1972	75,731	24,438		431,940	10,454				36,144	57,324	392,696	270,438	27,950	1,818,715	2,142,201	**2,614,877**	3,204,933
1973	111,715	23,020		399,713	7,220				20,435	49,364	408,062	195,995	30,502	1,286,414	1,646,787	**2,004,691**	2,460,818
1974	124,405	25,416		434,273	5,981				31,425	52,415	454,712	251,285	25,059	1,421,427	1,837,056	**2,245,930**	2,762,732
1975	102,020	20,952		369,152	6,246				27,992	45,352	345,314	171,053	17,410	1,006,816	1,352,049	**1,623,542**	1,950,378
1976	62,108	28,795		255,442	4,348				19,469	43,980	280,360	164,915	17,154	982,632	1,246,407	**1,519,791**	1,858,372
1977	39,869	36,981		217,975	3,588				20,447	56,710	252,500	149,820	22,357	1,165,526	1,367,716	**1,675,136**	2,060,379
1978	42,277	24,526		202,097	6,522				19,542	36,550	220,680	83,202	15,661	853,874	1,000,062	**1,233,740**	1,521,012
1979	44,506	34,553		352,763	13,170				35,768	51,714	256,511	204,289	19,870	1,104,157	1,387,352	**1,682,839**	2,062,289
1980	49,082	13,289		256,989	13,219				25,813	35,364	208,295	265,821	15,552	1,217,333	1,463,474	**1,775,800**	2,171,224
1981	64,055	14,927		232,013	16,837				17,809	25,333	142,201	126,777	22,479	976,443	1,084,639	**1,313,208**	1,606,451
1982	69,407	11,403		283,890	12,689				17,978	41,059	302,425	128,389	31,566	1,006,389	1,235,073	**1,565,726**	2,068,801
1983	65,797	14,013	825,260	262,276	11,469	961,114	**1,177,285**	1,445,802	23,284	34,634	151,997	92,965	12,395	771,624	888,690	**1,090,618**	1,341,688
1984	51,111	9,311	773,422	284,446	8,261	917,031	**1,123,551**	1,371,165	17,599	25,351	162,451	126,423	16,108	917,325	1,031,082	**1,272,692**	1,573,024
1985	45,104	24,224	918,142	285,832	9,025	1,039,941	**1,279,187**	1,565,796	21,499	21,379	201,691	183,560	18,077	1,242,883	1,378,477	**1,693,709**	2,084,377
1986	56,103	24,916	710,913	223,036	13,550	841,534	**1,028,293**	1,256,702	13,492	19,072	236,346	150,893	9,235	847,228	1,051,935	**1,280,182**	1,567,455
1987	35,963	16,036	571,578	204,044	10,640	682,945	**836,804**	1,026,190	27,974	21,260	173,317	180,382	26,046	1,184,962	1,315,808	**1,619,108**	2,006,110
1988	40,731	13,858	439,449	206,940	24,177	593,434	**723,732**	877,764	16,594	19,205	170,497	154,524	20,800	1,088,978	1,208,140	**1,475,366**	1,800,109
1989	51,238	14,491	503,079	254,429	16,814	686,504	**837,513**	1,023,632	13,053	18,934	82,340	160,428	18,892	874,201	948,827	**1,173,659**	1,449,441
1990	61,436	9,916	393,559	230,238	16,156	581,438	**708,867**	863,941	11,069	18,520	102,321	70,557	9,694	613,630	666,706	**829,449**	1,029,936
1991	65,987	14,532	407,708	210,974	19,326	583,675	**714,171**	878,733	14,920	20,820	85,569	61,127	22,203	817,156	824,982	**1,024,083**	1,274,802
1992	75,928	16,372	392,505	248,795	25,965	619,968	**754,655**	916,412	7,419	10,224	79,637	60,759	52,334	672,555	713,809	**888,543**	1,109,631
1993	62,815	13,872	384,401	223,472	19,239	571,588	**701,810**	859,984	12,756	16,529	114,774	73,837	18,409	776,382	810,411	**1,016,317**	1,276,011
1994	39,053	9,725	413,016	253,777	13,829	590,677	**723,114**	886,744	6,146	18,579	111,496	73,930	15,584	736,548	771,542	**965,326**	1,219,932
1995	34,578	12,689	413,560	193,297	17,299	544,062	**667,720**	818,136	11,352	12,014	77,271	76,412	17,090	561,485	607,998	**759,918**	953,980
1996	50,258	7,094	267,232	152,104	10,812	395,867	**486,159**	594,767	5,953	13,439	96,697	48,222	21,297	389,125	462,565	**581,807**	734,834
1997	42,149	10,325	320,604	187,948	7,937	460,354	**565,588**	691,878	4,864	8,302	55,665	29,260	29,151	399,027	420,694	**528,433**	662,939
1998	39,530	11,784	342,266	166,160	6,796	457,250	**564,749**	690,944	10,226	16,081	85,824	65,865	13,295	341,110	426,229	**545,985**	704,817
1999	88,007	6,946	473,203	289,484	14,938	704,757	**865,422**	1,064,145	7,136	4,370	107,061	70,997	17,719	436,335	519,847	**653,319**	824,804
2000	126,304	8,036	556,710	204,232	17,927	741,423	**910,526**	1,117,314	8,377	7,667	96,415	73,744	13,061	420,429	495,514	**630,245**	805,319
2001	101,041	7,590	483,245	222,815	13,102	721,742	**883,466**	1,080,430	6,397	8,390	110,776	67,577	17,757	346,330	448,634	**568,485**	725,781
2002	71,503	7,883	427,162	155,651	14,941	583,878	**717,524**	880,427	8,884	13,329	116,210	67,182	16,610	390,589	489,683	**625,300**	808,094
2003	34,440	7,817	386,358	120,250	10,817	476,494	**585,356**	721,714	16,716	10,816	64,108	53,677	14,675	488,651	515,608	**659,275**	840,259
2004	26,594	9,583	357,957	144,001	8,245	474,203	**582,268**	715,610	10,257	9,489	82,662	63,011	6,758	388,022	450,921	**571,524**	731,905
2005	46,634	9,214	455,127	137,854	8,228	566,569	**695,436**	850,727	10,356	7,864	60,502	53,224	5,743	398,155	428,480	**549,622**	706,995
2006	66,306	6,450	386,154	142,623	11,335	545,733	**666,183**	811,270	9,846	4,421	27,390	41,657	11,103	366,324	365,687	**469,894**	607,309
10yr Av.	64,251	8,563	418,879	177,102	11,427	573,240	**703,652**	862,446	9,306	9,073	80,661	58,619	14,587	397,497	456,130	**580,208**	741,822

Table 3.8.13.5 Estimated number of 1SW spawners by NEAC country or region and year.

Year	Northern Europe								Southern Europe								
	Finland	Iceland	Norway	Russia	Sweden	Total			France	Iceland	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total		
		N&E				2.5%	50.0%	97.5%		S&W					2.5%	50.0%	97.5%
1971	12,886	4,714		77,607	8,267				47,934	31,197	391,362	55,282	36,410	261,836	212,623	**883,276**	286,646
1972	20,317	4,336		59,795	6,519				95,616	25,445	420,890	49,716	31,780	202,813	232,918	**871,213**	305,458
1973	18,416	5,185		88,688	8,080				58,449	27,137	460,668	57,873	27,733	257,409	243,863	**944,036**	325,794
1974	36,451	5,152		89,569	11,652				27,180	19,272	523,911	74,712	30,355	228,044	260,722	**955,310**	370,383
1975	25,558	6,262		133,896	12,468				55,078	29,939	573,384	72,770	24,959	203,511	274,141	**1,007,137**	406,496
1976	17,472	6,284		90,833	7,020				49,599	23,743	396,791	49,723	17,367	175,006	196,625	**730,602**	276,419
1977	8,919	8,753		58,436	3,312				38,860	24,149	336,660	53,766	17,152	186,519	174,276	**705,397**	245,337
1978	12,163	8,949		57,984	3,768				39,719	31,927	295,754	59,830	22,270	239,245	161,648	**740,034**	218,477
1979	14,186	8,517		84,178	4,016				45,307	29,578	271,762	57,806	15,604	176,135	150,525	**650,509**	200,783
1980	6,385	1,294		60,340	5,068				94,637	13,273	206,461	52,175	19,736	118,345	121,937	**547,470**	158,795
1981	9,880	6,693		49,719	9,249				75,063	17,265	70,757	54,492	15,453	144,559	79,327	**427,714**	91,403
1982	2,889	3,077		45,135	8,108				46,359	17,701	169,024	46,050	22,509	216,043	114,511	**567,283**	136,795
1983	14,264	4,554	165,157	75,320	10,865	64,449	**260,154**	76,414	49,544	22,390	360,535	63,725	31,564	223,927	166,999	**825,606**	214,374
1984	15,989	1,637	165,369	81,115	15,309	69,216	**281,312**	81,442	81,218	13,729	198,281	56,859	12,348	245,035	118,679	**668,964**	138,929
1985	23,936	11,356	172,885	107,530	17,902	71,131	**322,640**	82,758	30,317	22,161	236,859	57,339	16,025	226,352	140,557	**635,435**	184,150
1986	21,778	14,087	152,167	91,967	19,035	63,132	**312,288**	74,181	44,600	36,550	325,476	64,513	18,015	273,315	180,140	**823,706**	227,454
1987	27,978	8,330	128,803	97,636	15,573	55,794	**277,856**	64,014	80,409	22,774	199,848	67,103	15,299	199,179	146,286	**637,974**	204,487
1988	13,413	12,051	119,110	73,665	12,967	49,400	**247,052**	55,969	27,394	41,081	342,457	90,481	41,274	424,970	173,800	**1,022,888**	213,621
1989	24,890	6,505	189,296	103,797	4,134	58,485	**322,120**	76,674	14,661	22,946	222,480	57,722	12,303	469,645	138,245	**840,261**	167,259
1990	23,518	4,883	169,035	92,078	10,613	54,216	**307,990**	66,103	25,397	21,007	159,775	41,556	34,961	227,205	85,641	**548,505**	103,767
1991	28,887	7,018	146,058	88,051	12,904	48,767	**280,657**	58,702	18,197	23,261	117,862	41,528	18,382	234,326	70,988	**480,414**	82,681
1992	38,255	13,233	123,673	125,711	14,367	46,693	**307,798**	53,051	33,317	26,628	159,742	42,947	45,861	349,179	102,648	**685,694**	123,367
1993	26,656	10,927	122,962	108,170	15,069	46,618	**292,809**	49,856	47,130	26,002	140,998	62,522	72,042	314,991	97,635	**712,562**	130,162
1994	10,735	3,480	170,097	127,012	11,603	58,287	**313,540**	70,521	37,372	21,558	124,014	67,321	25,194	337,793	104,359	**661,482**	127,626
1995	10,517	10,089	109,837	111,213	19,077	41,981	**272,868**	48,080	11,758	29,040	179,852	53,636	25,697	346,081	99,636	**687,736**	117,722
1996	30,528	5,347	82,095	155,066	11,818	38,563	**270,778**	42,675	14,350	25,048	182,108	39,811	34,633	242,692	87,866	**557,047**	106,236
1997	26,070	7,255	105,391	157,670	5,441	45,159	**305,160**	48,245	7,450	18,305	227,539	39,250	38,442	180,903	81,897	**531,050**	102,340
1998	29,998	12,470	138,193	172,649	4,756	51,492	**350,731**	59,609	14,472	25,148	221,454	44,260	155,911	257,716	98,824	**742,047**	119,700
1999	34,446	6,552	127,636	136,836	7,060	52,419	**340,422**	57,326	4,876	21,046	233,164	40,876	20,057	142,619	75,323	**481,228**	98,983
2000	35,885	6,982	213,655	149,532	14,026	70,775	**414,459**	82,552	12,669	18,708	351,419	61,660	32,934	279,990	114,157	**793,089**	143,989
2001	16,324	6,513	186,741	224,591	9,138	75,633	**420,443**	86,868	10,712	16,652	255,768	56,958	31,157	274,808	89,085	**675,928**	102,578
2002	14,368	11,309	111,757	199,872	9,208	65,580	**359,858**	77,366	13,827	21,358	215,505	50,406	23,390	223,534	78,685	**574,677**	93,218
2003	16,728	5,889	157,285	178,902	5,661	73,189	**384,316**	87,083	9,222	25,009	248,233	34,306	30,056	241,176	76,008	**600,119**	88,154
2004	6,564	16,194	93,861	122,342	4,955	48,141	**269,662**	56,504	11,117	24,741	156,818	55,941	35,576	281,103	72,991	**580,201**	80,527
2005	16,630	14,939	141,049	140,767	4,155	55,379	**314,546**	63,482	7,205	36,481	172,615	46,513	53,918	302,443	74,382	**633,584**	79,322
2006	31,274	15,286	111,328	171,729	5,100	58,037	**329,624**	64,736	10,139	25,975	126,927	43,575	25,828	295,569	67,229	**541,234**	72,268
2007	5,862	10,814	61,964	92,186	2,432	38,944	**206,716**	48,438	8,013	22,826	250,365	36,435	88,613	278,181	107,362	**700,388**	233,165
10yr Av.	20,808	10,695	134,347	158,941	6,649	58,959	**339,078**	68,396	10,225	23,794	223,227	47,093	49,744	257,714	85,405	**632,249**	111,190

Table 3.8.13.6 Estimated number of MSW spawners by NEAC country or region and year.

Year	Northern Europe								Southern Europe								
	Finland	Iceland	Norway	Russia	Sweden	Total			France	Iceland	Ireland	UK(EW)	UK(NI)	UK(Scot)	Total		
		N&E				2.5%	50.0%	97.5%		N&E					2.5%	50.0%	97.5%
1971	10,641	2,911		54,843	448				6,777	7,311	82,718	58,049	10,969	356,709	104,082	**565,578**	125,268
1972	16,831	4,533		56,508	313				13,490	11,293	87,692	88,628	9,589	445,131	131,198	**706,398**	160,313
1973	20,373	4,207		92,813	1,090				8,333	10,135	96,112	66,323	8,389	493,998	140,360	**729,404**	174,859
1974	30,053	4,049		91,227	702				3,828	8,753	107,874	48,265	9,167	321,695	108,034	**531,952**	132,063
1975	33,251	4,427		93,402	169				7,689	9,305	120,691	66,165	7,530	355,897	121,992	**603,175**	152,135
1976	27,172	3,663		77,559	505				5,637	8,040	83,837	33,556	5,224	236,095	78,249	**385,403**	96,853
1977	16,610	5,114		54,825	384				4,358	7,891	73,229	40,852	5,147	246,755	80,321	**410,119**	97,620
1978	10,525	6,549		45,675	291				4,401	10,066	62,986	34,970	6,707	317,584	91,970	**462,088**	116,838
1979	13,724	4,307		42,046	848				5,086	6,497	57,148	16,646	4,699	218,465	69,920	**321,742**	89,574
1980	14,452	6,040		68,255	1,484				10,604	9,044	62,648	54,450	5,962	279,772	87,190	**455,817**	106,257
1981	16,229	2,128		40,741	428				7,601	6,057	45,928	76,289	4,665	318,395	88,319	**509,101**	108,593
1982	21,264	2,448		37,631	1,554				4,672	4,294	32,414	29,277	6,755	267,648	64,047	**367,603**	85,720
1983	22,808	1,844	101,607	57,518	1,077	42,392	**179,003**	49,721	5,010	7,164	110,469	31,640	9,496	279,274	113,650	**483,502**	235,817
1984	21,609	2,391	103,581	59,676	1,493	42,857	**192,957**	49,384	8,199	6,053	42,905	26,023	3,723	249,812	58,274	**356,964**	74,301
1985	16,795	1,543	95,297	58,875	628	38,862	**166,783**	44,210	6,207	4,419	53,478	38,167	4,840	328,057	71,798	**460,272**	88,300
1986	14,819	4,201	114,874	54,802	608	46,304	**188,292**	54,025	6,274	3,697	50,773	50,620	5,430	419,526	92,982	**567,059**	121,192
1987	18,342	4,279	87,708	44,137	1,804	40,284	**168,144**	44,380	3,346	3,278	79,645	40,532	2,997	263,320	66,066	**409,185**	81,269
1988	11,844	2,773	73,388	48,900	1,769	30,071	**136,021**	34,962	9,122	3,702	52,943	52,217	10,029	467,984	95,537	**615,326**	118,824
1989	10,911	2,378	74,716	45,048	4,922	26,361	**144,523**	31,549	4,241	3,338	40,887	39,859	4,980	411,979	81,178	**522,929**	98,061
1990	13,748	2,485	88,213	55,021	3,714	30,485	**158,070**	37,022	4,381	3,280	14,919	49,067	7,031	346,209	66,763	**453,670**	84,103
1991	16,605	1,733	73,548	59,639	4,263	27,230	**158,230**	31,594	3,940	3,298	41,066	21,657	3,311	261,106	50,392	**343,987**	62,802
1992	17,705	2,588	80,197	57,220	5,463	29,663	**166,219**	34,145	4,935	3,704	20,888	16,450	8,941	350,194	66,300	**412,280**	81,862
1993	20,343	2,904	75,515	66,820	7,529	29,103	**163,965**	32,224	2,357	1,824	24,522	18,843	27,642	287,053	58,698	**373,646**	73,094
1994	16,846	2,463	74,705	66,486	5,509	29,183	**166,163**	31,700	5,313	2,930	40,105	25,775	6,635	349,415	65,077	**441,317**	84,843
1995	10,450	1,741	80,944	67,710	4,454	29,603	**163,511**	33,587	2,542	3,313	37,987	26,966	5,409	328,672	60,146	**419,695**	80,321
1996	11,299	2,252	80,075	54,119	5,632	29,126	**163,768**	32,677	4,564	2,134	19,594	27,454	6,772	250,841	47,834	**319,447**	63,641
1997	16,517	1,282	57,749	44,643	3,679	24,076	**133,708**	27,226	2,343	2,407	39,418	18,095	8,420	174,482	43,273	**255,283**	52,598
1998	13,904	1,839	69,529	48,515	2,701	24,542	**131,287**	27,301	1,957	1,485	12,531	11,479	13,503	187,545	34,003	**232,526**	44,172
1999	11,794	2,446	72,315	52,974	2,312	25,992	**144,169**	29,371	4,247	3,023	33,642	29,790	5,392	159,374	46,205	**250,885**	63,154
2000	26,239	1,504	102,762	85,124	5,123	34,630	**196,176**	39,175	2,972	878	44,096	33,578	7,169	208,308	45,394	**310,572**	60,518
2001	37,703	1,839	122,581	71,778	6,172	44,751	**259,548**	49,799	3,448	1,499	37,058	35,226	5,486	200,607	48,183	**297,263**	66,059
2002	30,233	1,829	106,951	75,308	4,467	39,035	**223,658**	43,225	2,329	1,770	47,768	31,934	6,598	166,606	42,819	**269,854**	56,781
2003	21,365	2,190	95,570	51,910	5,118	33,076	**222,929**	37,378	3,285	2,556	54,412	32,533	6,948	197,380	52,093	**308,058**	69,193
2004	10,315	2,098	87,474	38,477	3,705	28,865	**176,098**	33,876	6,187	2,156	24,671	25,564	6,429	245,632	52,578	**318,894**	64,343
2005	7,971	2,606	79,591	43,701	2,807	25,089	**147,770**	28,301	3,774	1,969	37,700	30,093	1,355	195,279	44,858	**278,770**	59,807
2006	13,934	2,999	101,709	42,842	2,827	31,226	**192,168**	35,195	3,858	1,631	25,477	25,792	1,939	202,986	48,353	**271,423**	62,019
2007	19,840	2,122	84,107	39,119	3,868	27,394	**176,476**	30,234	3,643	930	14,345	19,939	5,684	188,624	41,567	**240,603**	52,330
10yr Av.	19,330	2,147	92,259	54,975	3,910	31,460	**187,028**	35,385	3,570	1,790	33,170	27,593	6,050	195,234	45,605	**277,885**	59,838

Table 3.8.14.1 Estimated survival of wild smolts (%) to return to homewaters (prior to coastal fisheries) for various monitored rivers in the NE Atlantic Area.

Smolt	Iceland[1]			Norway[2]				Ireland		UK (Scotland)[2]		UK (NI)[7]	UK (E & W)		France		
migration	Ellidaar	R.Vesturdalsa[4]		R. Halselva		R. Imsa		R. Corrib		North Esk		R. Bush	R. Dee		Nivelle[5]	Scorff	Oir
year	1SW	1SW	2SW	1SW	2SW	1SW	2SW	1SW	2SW	1SW	MSW	1SW[3]	1SW	MSW	All ages	All ages	All ages
1975	20.8																
1980								17.9	1.1								
1981						17.3	4.0	7.6	3.8	9.9	4.6						
1982						5.3	1.2	20.9	3.3	11.4	5.0						
1983						13.5	1.3	10.0	1.8								
1984						12.1	1.8	26.2	2.0	6.8	4.5						
1985	9.4					10.2	2.1	18.9	1.8	13.9	5.4						
1986						3.8	4.2	-	-			31.3			15.1		
1987				2.0	0.3	17.3	5.6	16.6	0.7	9.4	3.5	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	1.0	8.7	2.2	6.7	0.7	6.4	4.0	25.0			3.5		
1990	5.4			3.9	1.6	3.0	1.3	5.0	0.6	6.2	3.2	34.7			1.8		
1991	8.8			2.1	0.3	8.7	1.2	7.3	1.3	7.8	3.2	27.8			9.2		
1992	9.6			2.1	0.4	6.7	0.9	7.3	-			29.0			8.9		5.3
1993	9.8			2.1	0.0	15.6		10.8	0.1				6.3	2.5	7.2 [6]		17.0
1994	9.0			0.6	0.4			9.8	1.4	9.1	3.0	27.1	1.3	1.2	2.3 [6]		3.5
1995	9.4		1.5	0.9	0.0	1.8	1.5	8.4	0.1	8.6	3.9		2.7	0.4	4.4		5.0
1996	4.6	2.5	0.4	2.8	0.0	3.5	0.9	6.3	1.2	7.5	3.5	31.0	4.8	2.1	3.4		4.8
1997	5.3	1.0	1.5	0.8	0.0	1.7	0.3	12.7	0.8	7.8	4.6	19.8	6.2	3.4	2.7		14.0
1998	5.3	1.5	1.0	1.5	0.6	7.2	1.0	5.5	1.1			13.4	2.3	3.7	1.9		6.6
1999	7.7	1.3	1.2	1.3	0.0	4.2	2.2	6.4	0.9			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	5.3	2.4	10.1	2.0	0.9	3.3	10.9	2.4
2001	5.1	3.4	1.3	1.3	1.3	2.5	2.2	7.2	1.1	4.7	2.8	12.4	4.3	0.0	0.4	6.2	3.7
2002	4.4	1.1	2.3	0.8	0.5	5.5	1.1	6.0	0.5	3.7	3.3	11.3	2.9	0.7	0.8	21.6	3.1
2003	9.1	5.5	0.6	4.3	0.9	3.5	0.7	8.3	2.1			6.8	2.6	0.4	0.5	11.8	
2004	7.7	5.7	0.6	3.1	1.2	6.1	1.3	6.3	0.8	10.2	6.4	6.8	4.5	1.0		6.3	
2005	6.4	2.5	0.9	2.5	0.0	3.7	1.8			7.3	3.0	5.9	5.1	0.5			
2006	7.1	1.8		0.0		0.8		1.2		3.3		14.0	4.3				
Mean																	
(5-year)	6.5	3.6	1.1	2.4	1.0	4.3	1.4	7.0	0.9	6.5	3.6	8.6	3.9	0.5	0.6	11.5	3.4
(10-year)	6.2	2.6	1.1	1.9	0.6	5.0	1.3	7.6	0.8	6.6	3.8	13.4	4.0	2.5	2.0	12.1	5.8

[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 3.8.14.2 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		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	0.9	0.2	2.1	0.3	2.8	1.5	0.3	0.4	5.2	3.1
1991	0.1	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	0.9	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	0.9	0.1	-	-	0.4	0.0	0.7	0.3	3.9	0.6
1996	0.1	0.0	1.2	0.2	2.1	0.2	0.3	0.2	3.5	0.5
1997	0.2	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	0.6	0.0	2.3	0.2	12.0	1.1	1.9	1.6	2.1	
2000	1.0	0.1	1.0	0.7	8.4	0.1	1.1	0.6		
2001	0.2	0.1	1.9	0.6	3.4	0.1	2.2	1.2		
2002	0.4		1.4	0.0	4.5	0.8	1.1	0.9		
2003			0.5	0.3	2.6	0.7	0.3	0.7		
2004			0.2	0.1	3.6	0.7	0.3	0.4		
2005			1.2	0.2	2.8	1.1	0.3	0.6		
2006			0.0		1.0		0.1			
Mean										
(5-year)	0.3	0.1	1.0	0.3	3.4	0.5	0.8	0.8		
(10-year)	0.4	0.1	1.1	0.3	4.3	0.4	1.0	0.7	2.0	0.6

[1] Microtagged.

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

Table 3.8.14.2 Cont'd. Estimated survival of hatchery smolts (%) to return to 1SWadult return to homewaters (prior to coastal fisheries) for monitored rivers and experimental facilities in Ireland and UK (N. Ireland).

	Ireland									UK (N. Ireland)[3]	
Smolt year	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		3.3			8.3	0.9				
1981	2.8		6.9			2.0	1.5				
1982	4.0		8.2			16.3	2.7	0.4			
1983	3.9		2.3			2.0	2.8	0.0		1.9	8.1
1984	5.0	10.4	23.5			2.3	5.2	0.0	9.2	13.3	
1985	17.8	12.3	26.3			14.7	1.4	0.0	7.9	15.4	17.5
1986	2.1	0.4	7.6			16.4		0.0	10.1	2.0	9.7
1987	4.7	8.3	11.2			8.8		0.0	7.0	6.5	19.4
1988	4.9	9.2	13.8			5.5	4.2		2.6	4.9	6.0
1989	5.0	1.6	7.9			1.7	6.0	0.0	1.2	8.1	23.2
1990	1.3	0.0	7.1			2.5	0.2	16.1	2.5	5.6	5.6
1991	4.2	0.2	12.5	11.3		0.8	4.9	4.1	1.3	5.4	8.8
1992	4.4	1.3	6.3	10.7	4.2		0.9	13.2		6.0	7.8
1993	2.9	2.2	12.0	14.0	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	10.1	3.4					2.0	2.3
1997	6.0	0.4	13.3	16.2	5.3	7.0			7.6	-	4.1
1998	3.1	1.3	4.9	7.0	2.9	4.6	3.3	2.3	2.5	2.3	4.5
1999	1.0	2.8	8.1	15.4	2.0			4.0	3.5	2.7	5.8
2000	1.2	3.8	11.8	15.9	5.4	3.5	6.7		4.0	2.8	4.4
2001	2.0	2.5	9.7	17.2	3.2	2.0	3.4		5.9	1.1	2.2
2002	1.0	4.1	9.2	11.5	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	4.3	0.0	0.2	0.4	2.9	0.9	2.0	3.8
Mean											
(5-year)	1.0	3.0	7.8	10.2	1.9	2.3	3.4	5.3	2.6	1.3	2.1
(10-year)	1.9	2.4	8.3	11.6	2.9	3.3	4.5	3.9	3.4	1.8	3.2

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

[2] Different release sites

[3] Microtagged.

Table 3.9.1 Summary of national objectives, recent management measures and attainment of management objectives.

Country	Objective	Introduced	Assessed	Measure	Assessment	Outcome/extent achieved	Further consideration
Russia	Reduce commercial fishing effort and enhance recreational catch and release fisheries	1997 - 2001	2002-2006	Various management measures including prohibition of some important commercial in-river fisheries and allocation quotas for fisheries	Examination of catch statistics	Mean total commercial catch reduced by 38% and mean in-river commercial catch reduced by 67% (2002-2006 compared to 1997-2001). Catch and release increased twice in past 5 years	Further reductions unlikely to be introduced. However, restrictions to fisheries which take mixed stocks and stocks below their CLs will be considered.
Ireland	Reduce exploitation rates and increase freshwater returns leading to simultaneous attainment of CLs in all rivers	2002	2002 to 2006	TAC imposed in 2002 which has been reduced by 17%, 11%, 14% and 35% annually or 58% in total. Restrictions in angling catch including bag limits and mandatory catch and release operated from the 1st of September in 8 fishery districts which were assessed as being below their CLs	Fish counter data for 19 rivers. Mandatory logbooks for all fishing methods. Coded wire tagging returns to Irish and UK rivers pre and post imposition of TACs. Juvenile indices of salmon abundance	Exploitation rate reduced from 61% (pre-2002) to 46% (post 2002) for wild salmon, 82% to 69% for hatchery salmon. Exploitation rate on UK stocks reduced by up to 50% following management measures in 1997 and imposition of TACs	Mixed stock marine fisheries will not operate in 2008 and hereafter.
	Maintain salmon stocks in SAC rivers at favorable conservation status			As above	Examination of counter (14 rivers) or rod catch (16 rivers) data to assess CL compliance for 30 SAC rivers.	Following re-appraisal in 2007 and with the closure of the Irish coastal and marine mixed stock fishery, 19 of 30 SAC rivers are estimated to be meeting CLs	Under the EU Water Framework Directive water quality and fish passage are expected to improve
	As above	2006	post 2006	Closure of mixed stock fishery in marine and coastal waters	As above	Commercial catch reduced from over 70% of total catch. Rod catch now 63% of total catch. Catch and release 41% of total rod catch. Increase in river returns and spawners in virtually all rivers with counters or traps.	53 of 150 rivers only meeting CL. Specific in-river problems need to be examined.
UK (England & Wales)	Meet objectives of National Salmon Management Strategy (launched 1n 1996) and ensure stocks meet or exceed CLs in at least 4 years out of 5.	1996	annually	Programme of Salmon Action Plans (SAPs) for each of the 64 principal salmon rivers to provide prioritized list of actions for each river.	Examination of catch statistics, monitoring data and completion of annual compliance assessment	Programme of SAPs was finalized in 2004 and these are now subject to review to ensure they match current circumstances and provide a realistic programme to address issues facing each river.	Continue with targeted actions identified in SAPs and review annually.
	Safeguard MSW stock component	1999	2007	National spring salmon measures introduced in 1999 (restricted net fishing before June and required compulsory catch & release by anglers up to June 16)	Estimated 800 salmon saved from net fisheries and 1,600 saved from rod fisheries in 2007 due to these measures	Spawning escapement of spring salmon may have increased by up to one third on some rivers due to measures	Measures will remain in place until at least 2008. Proposals for continuation to be advertised in 2008.
	Phase out mixed stock fisheries	1993	annually	Mixed stock fishery measures imposed since 1993, including phase outs, closures, buy outs and reductions in fisheries.	Examination of catch statistics, monitoring data and completion of annual compliance assessment	Coastal fishery catch reduced from average of 41,000 (88-92) to under 32,000 (98-02) and to about 9,000 (03-07) Declared rod catch in 5 north east rivers 56% higher on average in the 5 years since net buy out in 2003, relative to average of 5 years before buy out. Recorded runs (salmon & sea trout) into the Tyne 87% higher since NE net buy out in 2003 compared with mean of	Continuing to phase out remaining mixed stock fisheries and focus on other limiting factors. Annual application of decision structure to assess need for effort controls.
	Reduce exploitation rates and increase freshwater returns leading to compliance with CLs.	1993	annually	Promote catch and release (mainly voluntary), including 100% catch and release in some catchments.	Examination of catch statistics, release rates and annual compliance	Catch and release increased to over 50% of rod caught fish in recent years & 100% C&R on some catchments. Estimated to have contributed an extra 31 million eggs in 2007.	Continuing promotion of C&R at national and local levels.

Table 3.9.1 Cont'd. Summary of national objectives, recent management measures and attainment of management objectives.

Country	Objective	Introduced	Assessed	Measure	Assessment	Outcome/extent achieved	Further consideration
UK (England & Wales)	To meet a management target on the River Lune of 14.4 million eggs or about 5,000 adults	2000	annually	Regulations on River Lune introduced in 2000 to reduce exploitation in net and rod fisheries by 50% and 25% respectively.	Assessment of counter data, catch statistics and juvenile monitoring data	Increase in salmon spawning and management target exceeded in all years since the regulation. Increases in juvenile production and net catch.	Continue to meet management objectives
	Maintain salmon stocks in SAC rivers at favorable conservation status	1996	annually	Fishing controls, catch and release and addressing issues identified in Salmon Action Plans as appropriate.	Examination of counter/rod data to assess CL compliance for 18 rivers designated as SACs	2 rivers are currently considered to be complying with the management objective of passing the CL 4 years out of 5.	Continue with management plan to meet management objectives. Targeted actions as identified in Salmon Action Plans.
UK (Northern Ireland)	To conserve, enhance, restore and manage salmon stocks in catchments throughout UK (NI) through two salmon management plans (FCB and Loughs Agency areas).	2001-07	2002-07	Voluntary net buyout scheme initiated in FCB area in 2001/2. Cessation of coastal fisheries in LA area in 2007.	Examination of fish counter & rod catch data to assess spawning escapement on index rivers with defined CLs. Examination of CWT data to assess exploitation / survival rates. Assessment of commercial exploitation through a carcass tagging scheme in both LA and FCB areas.	FCB buyout decreased salmon catch by 73% during 2002-07. Analysis of CWT data indicated the FCB measure conserved 1SW R. Bush salmon to a level of around 42% of the R. Bush CL between 2002-07. Netting restrictions in coastal areas of LA area reduced catch in 2007 by around 80% on previous 5 year average. Most monitored rivers in FCB and LA areas exhibited increased escapement in 2007	Continue monitoring and management protocols under the salmon management plans.
		2007	Not yet evaluated	Introduction of conservation policies in angling byelaws. New byelaws in LA area in 2007 include limit of 1 salmon per day between 1st March and 31st May, 2 salmon per day thereafter and no more than 25 salmon or sea trout per season.	Assessment of recreational exploitation through a carcass tagging scheme in both FCB and Loughs Agency areas.	Ongoing	Further develop monitoring mechanisms and define/refine CLs.
		2005-07	2008-2010	Habitat enhancement measure funded by European Economic Area (EEA) on several selected catchments in Loughs Agency and FCB areas.	Fully quatitative electro-fishing	Ongoing	Monitor effect of habitat enhancement schemes.
UK (Scotland)	Improve status of early running MSW salmon	2000	2007	Agreement by Salmon Net Fishing Association (most, but not all, net fishing operations are members) to delay fishing until the beginning of April. Introduced in 2000	Examination of catch statistics	Annual assessment. Reduction in MSW net fishery catch in February to March relative to period prior to 2000.	Further reduction in exploitation
		2003	Not yet evaluated	Bervie, N.and S. Esk salmon district net fishery delayed until 1st May with catch and release only in the rod fishery until 1st June	Examination of catch statistics	Exploitation removed for both nets and rods for respective periods.	Measure in place for 5 years. Re-evaluation after this period

Table 3.9.1 Cont'd. Summary of national objectives, recent management measures and attainment of management objectives.

Country	Objective	Introduced	Assessed	Measure	Assessment	Outcome/extent achieved	Further consideration
France	Reduce exploitation on MSW in particular and increase escapement and compliance with river specific CLs	1994	2007	Closure since 1994 of Loire-Allier sport and commercial fisheries	Measured against compliance objectives for the area	This did not seem to enhance salmon numbers to the expected level	Physical obstructions (noticeably Poutès-Monistrol Hydropower Dam) and other environmental factors, including higher temperatures, also being considered
		1996, 2000	2000 to 2003	TACs introduced in 1996 in Brittany and Lower Normandy and MSW TACs introduced in 2000 that have lead to temporary closures on some rivers	Examination of catch statistics	Reduced catch have probably increased spawning numbers. Reduced catch in MSW catch in Brittany since 2000 and Lower Normandy since 2003 but MSW TACS are exceeded each year on some rivers.	Monitored river (Scorff) has failed to meet CL consistently since 1994. However, the Scorff is non typical of exploitation pattern in the area (small fishery)
		1999	2007	Closure for two days each week with days varying since 1999	Examination of catch statistics	Some reduction in rod catch but current regulations have been unable to reduce the exploitation rate on MSW stocks as expected	Specific limitations on MSW catches should be considered
Germany	Reintroduction of Atlantic salmon stocks extinct since the middle of 20th century but improvements in conditions and water quality were thought to be sufficient to support salmon	1988	Annually	Restocking of rivers running into North Sea (Rhine, Ems, Weser and Elbe). 2 million juveniles (mainly fry) released annually	Trap and counter data (Sieg, upper Rhine)	300-700 adults recorded annually. Return rates of less than 1%. Records of natural production in some tributaries show an Increase.	Low return rates thought to reflect obstructions to upstream and downstream migration in the Rhine and its delta as well as spawning tributaries and probably due to bye-catch in non-target fisheries
	Establish free migration routes for salmon and other migratory fishes, protection of downstream migrants at power plants and rehabilitation of habitat in rivers basins	1988	Annually	Collaborative programme has started e.g. Rheinprogramm 2020 (ICPR) International Commission for the Protection of the River Rhine	Assessment in progress	Assessment in progress	

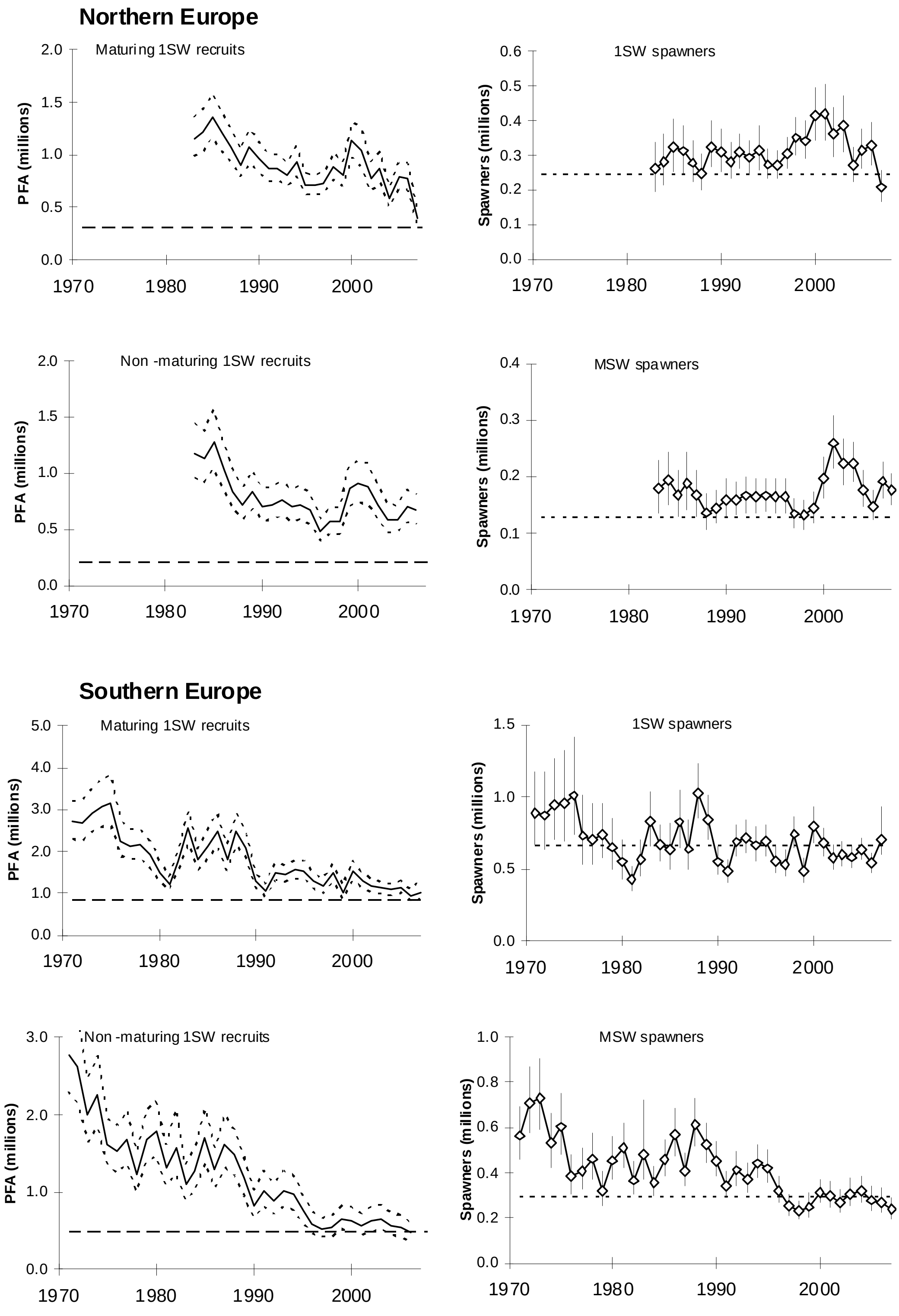


Figure 3.1.1 Estimated PFA (recruits, left panels) and spawning escapement (right panels), with 95% confidence limits, for maturing 1SW and non-maturing 1SW salmon in Northern and Southern Europe.

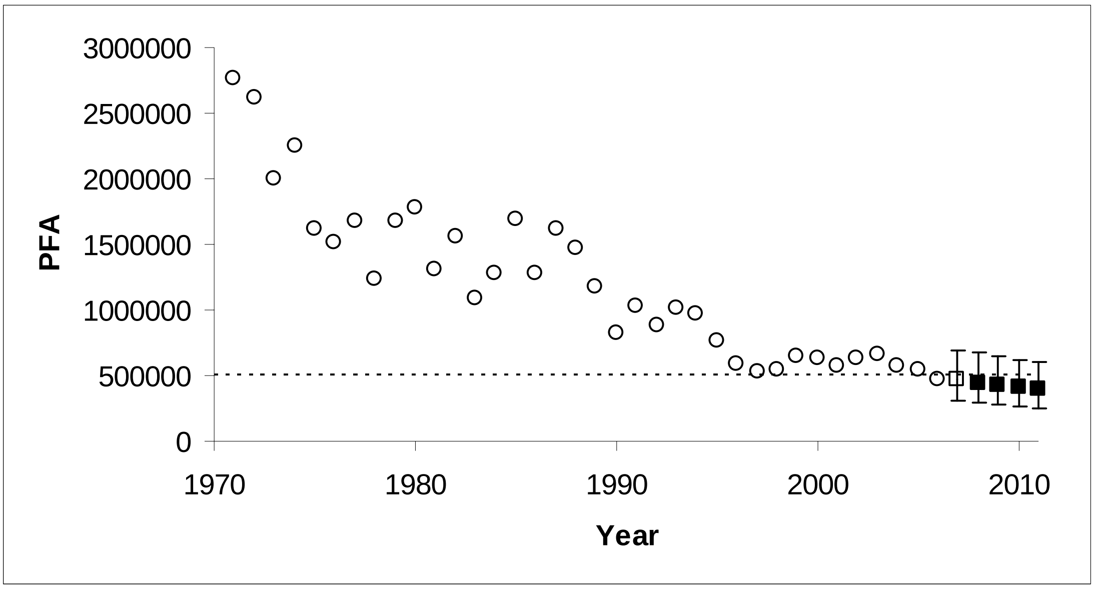


Figure 3.6.1.1 PFA estimates and predictions (95% confidence limits) for non-maturing 1SW southern NEAC stock. Note: open square is 2007 update and blocked squares are 2008 to 2011 forecasts.

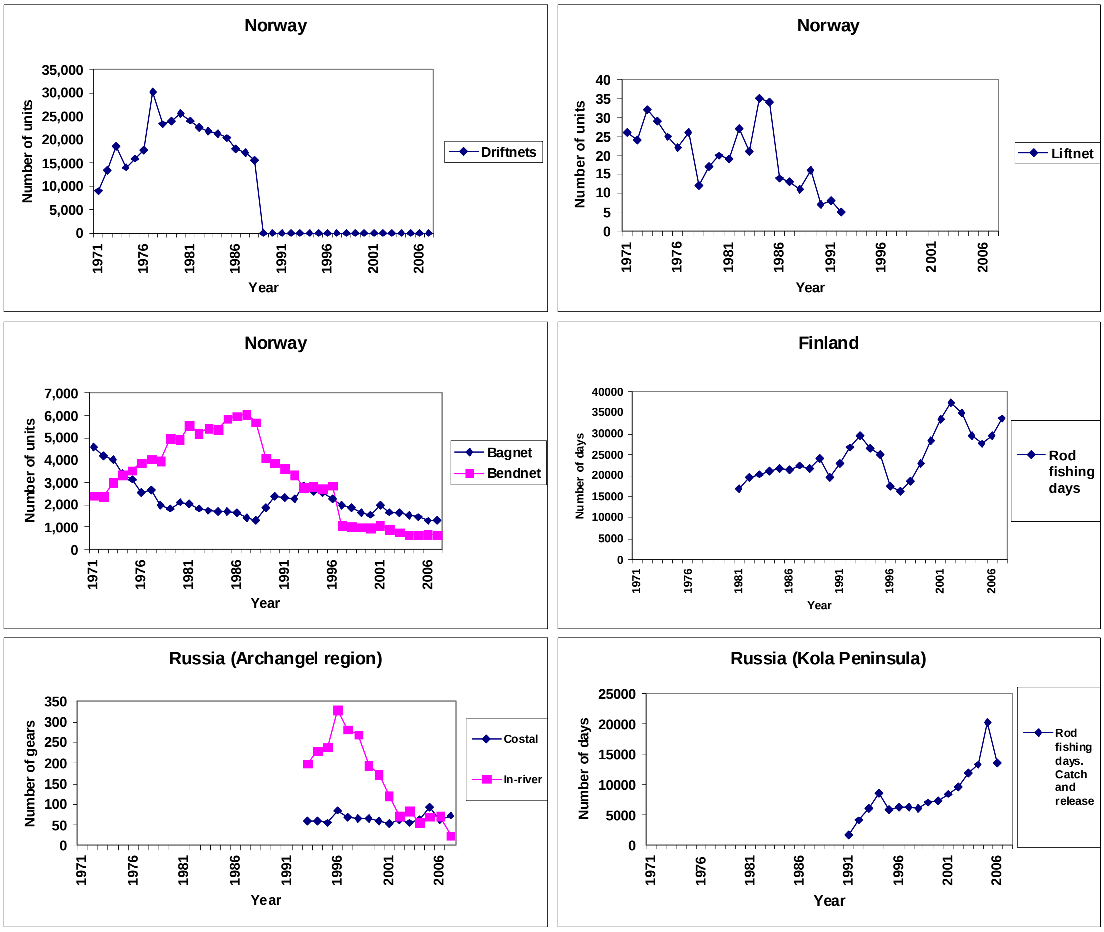


Figure 3.8.3.1 Overview of effort as reported for various fisheries and countries 1971–2007 in the Northern NEAC area.

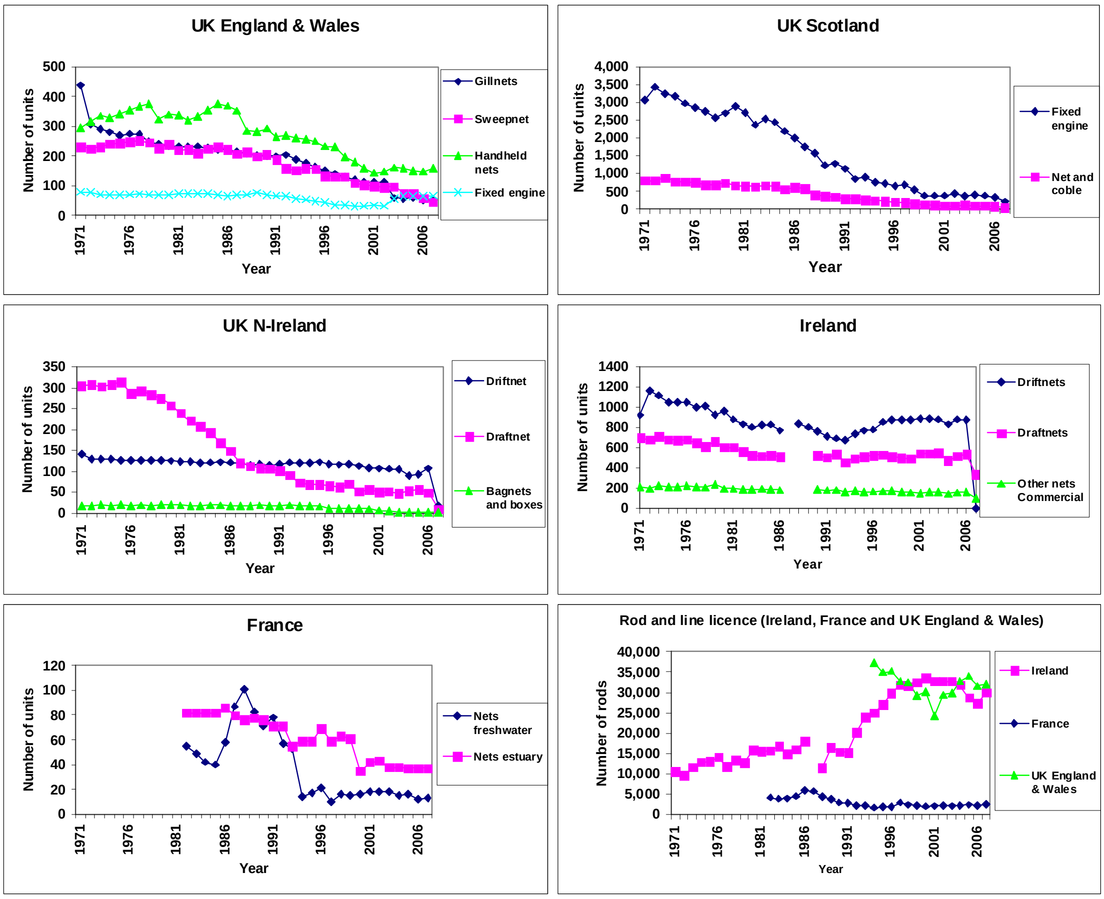


Figure 3.8.3.2 Overview of effort as reported for various fisheries and countries 1971–2007 in the Southern NEAC area.

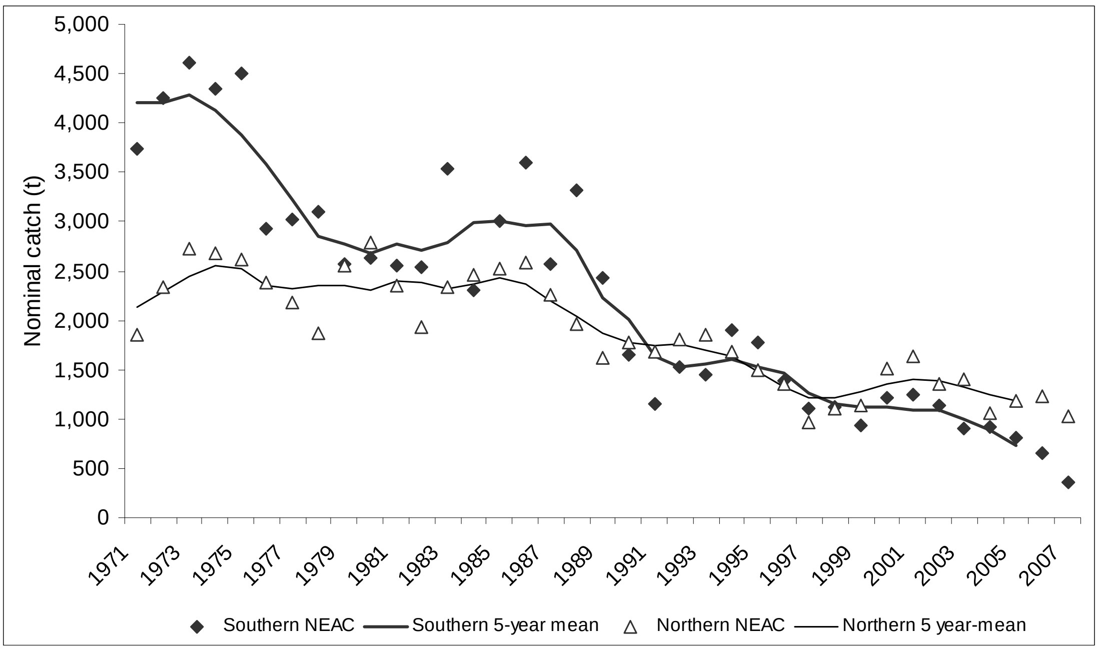


Figure 3.8.4.1 Nominal catch of salmon and 5-year running means in the Southern and Northern NEAC Areas, 1971–2007.

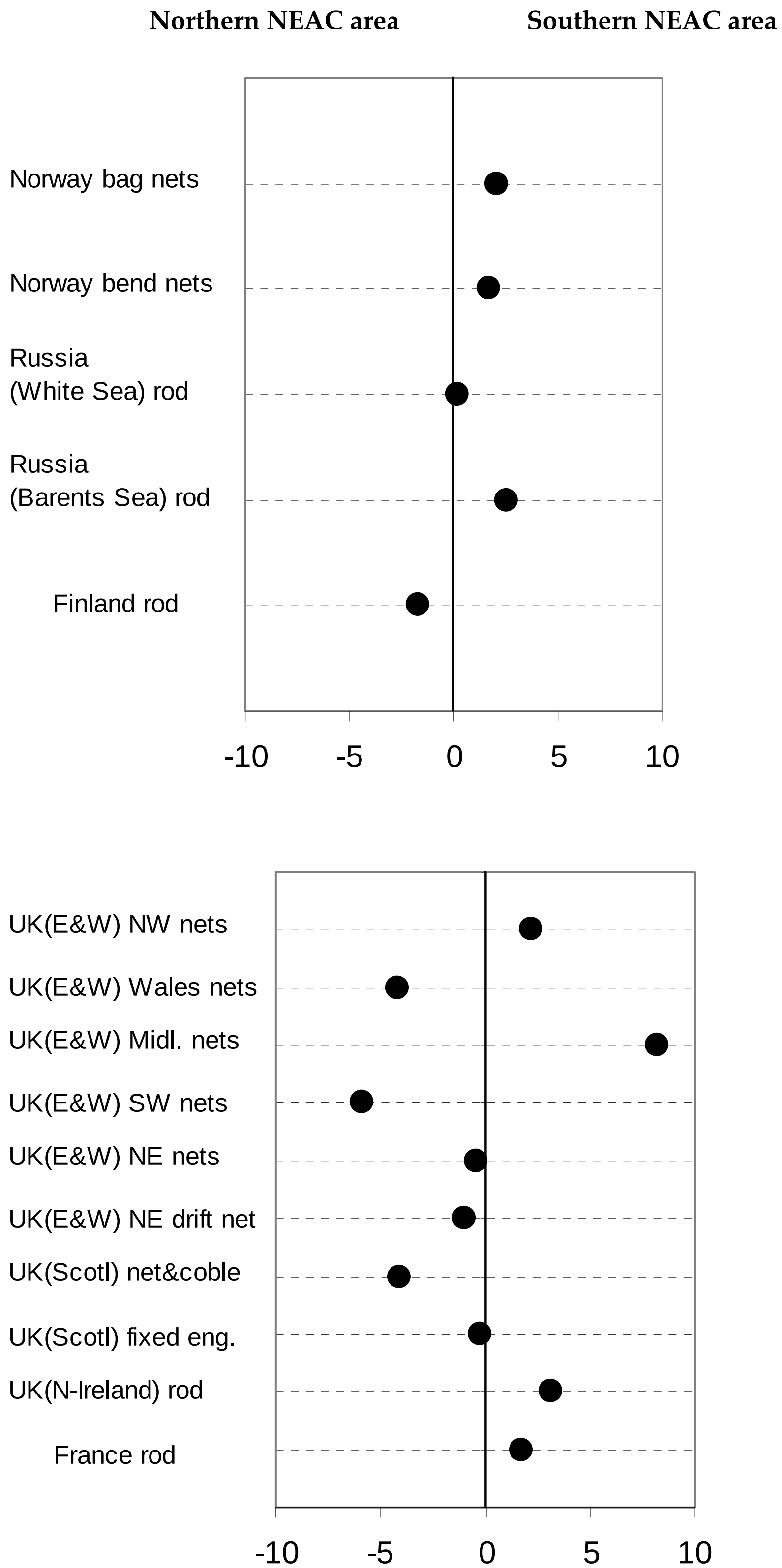


Figure 3.8.5.1 Proportional change (%) over years in cpue estimates in various rod and net fisheries in Northern and Southern NEAC areas.

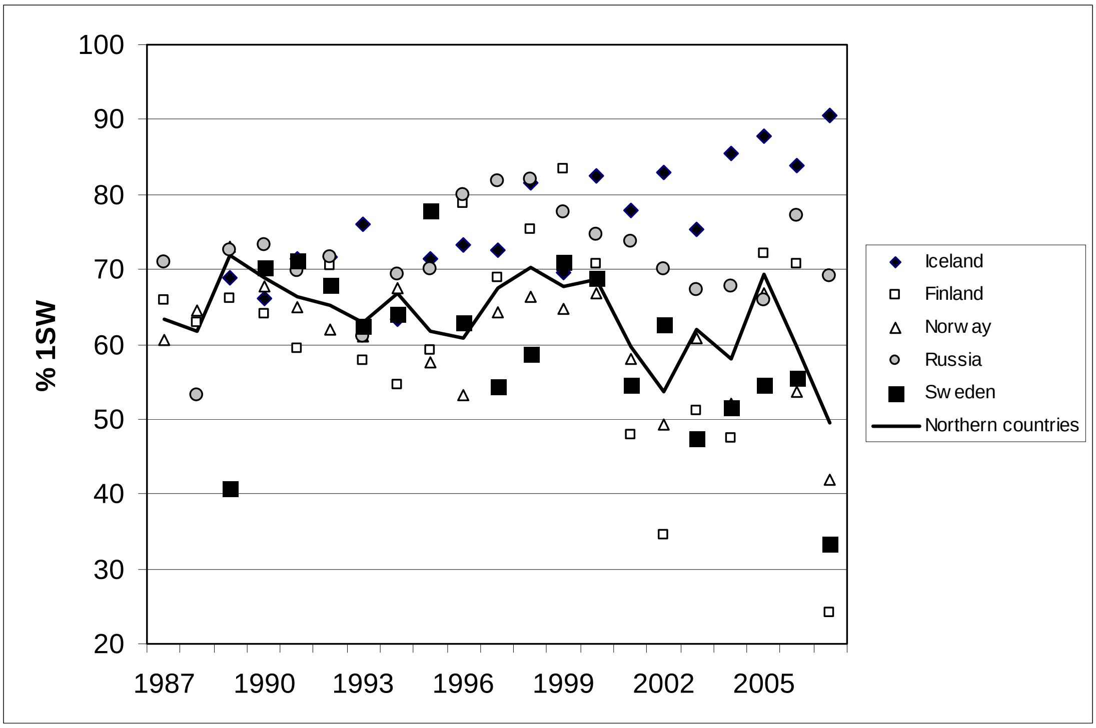


Figure 3.8.6.1 Percentage of 1SW salmon in the reported catch for Northern NEAC countries, 1987–2007. Solid line denotes mean value from catches in all NEAC Northern countries.

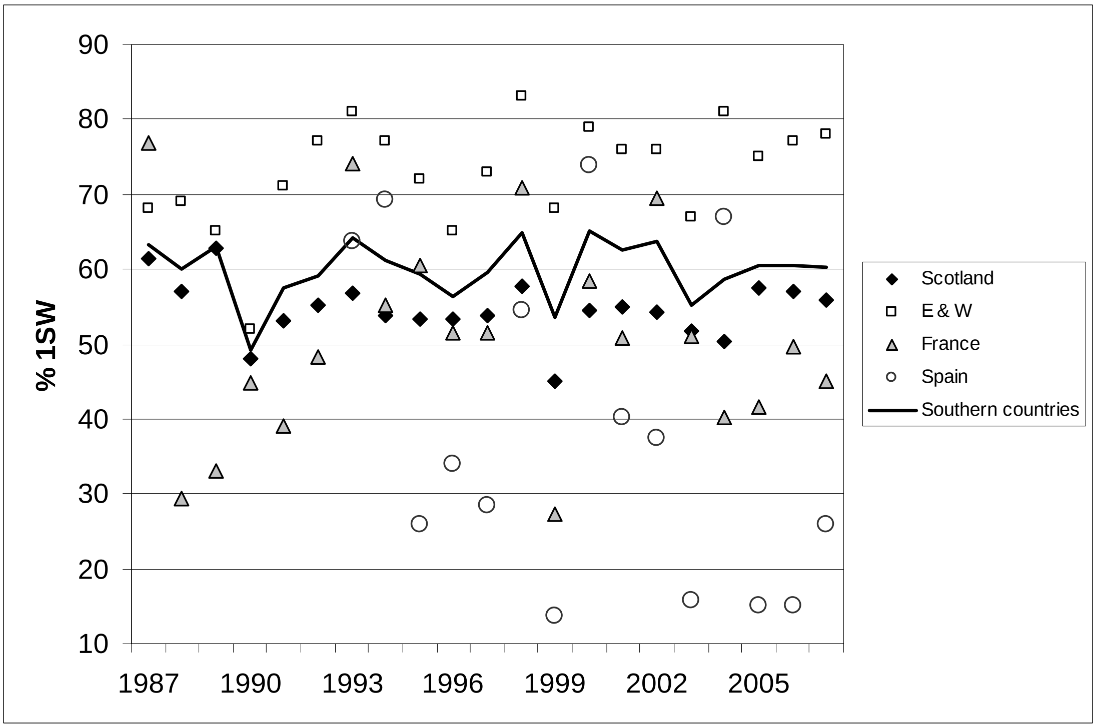


Figure 3.8.6.2 Percentage of 1SW salmon in the reported catch for Southern NEAC countries, 1987–2007. Solid line denotes mean value from catches in all NEAC Southern countries.

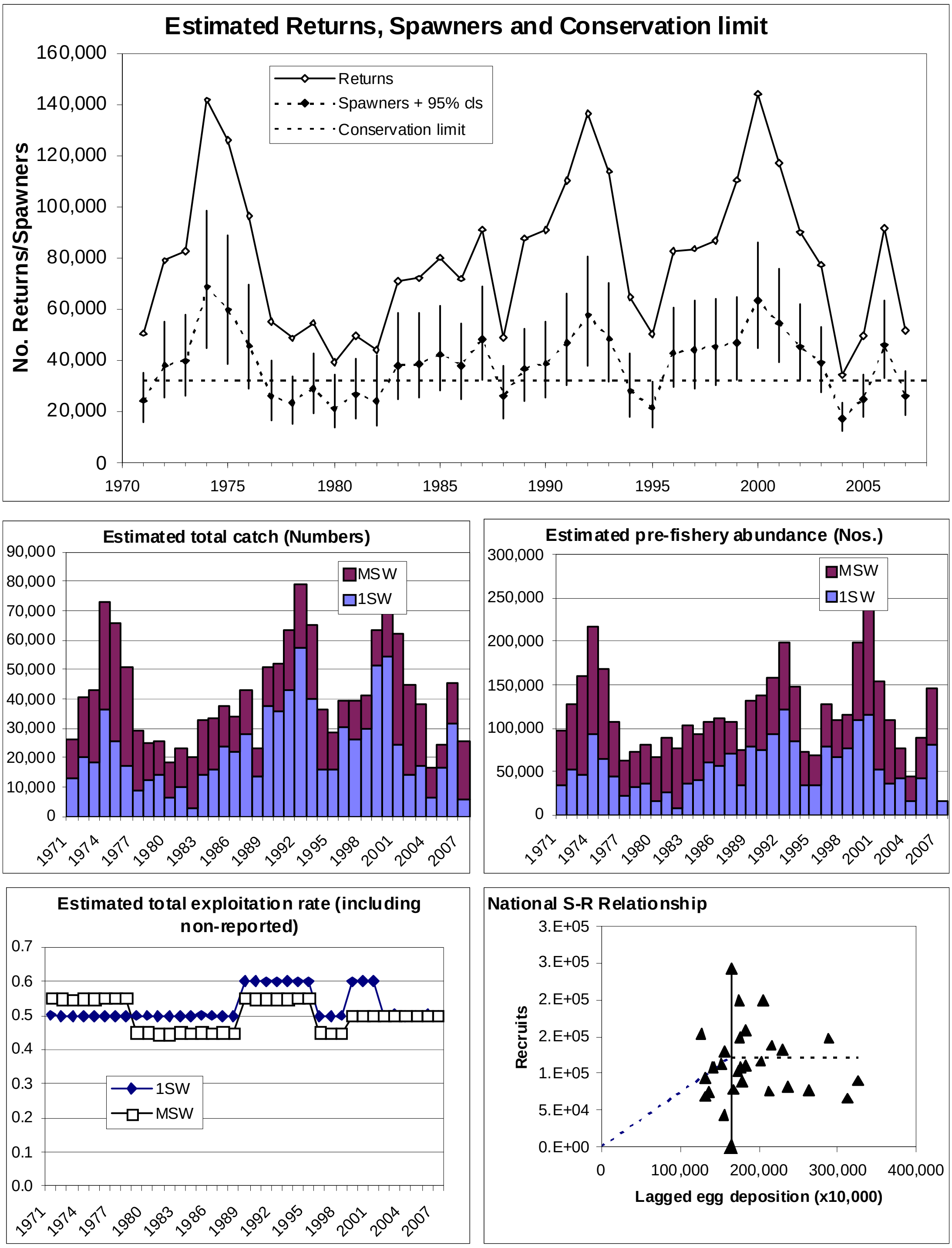


Figure 3.8.12.1a Summary of fisheries and stock description. R. Tana/Teno (Finland & Norway combined).

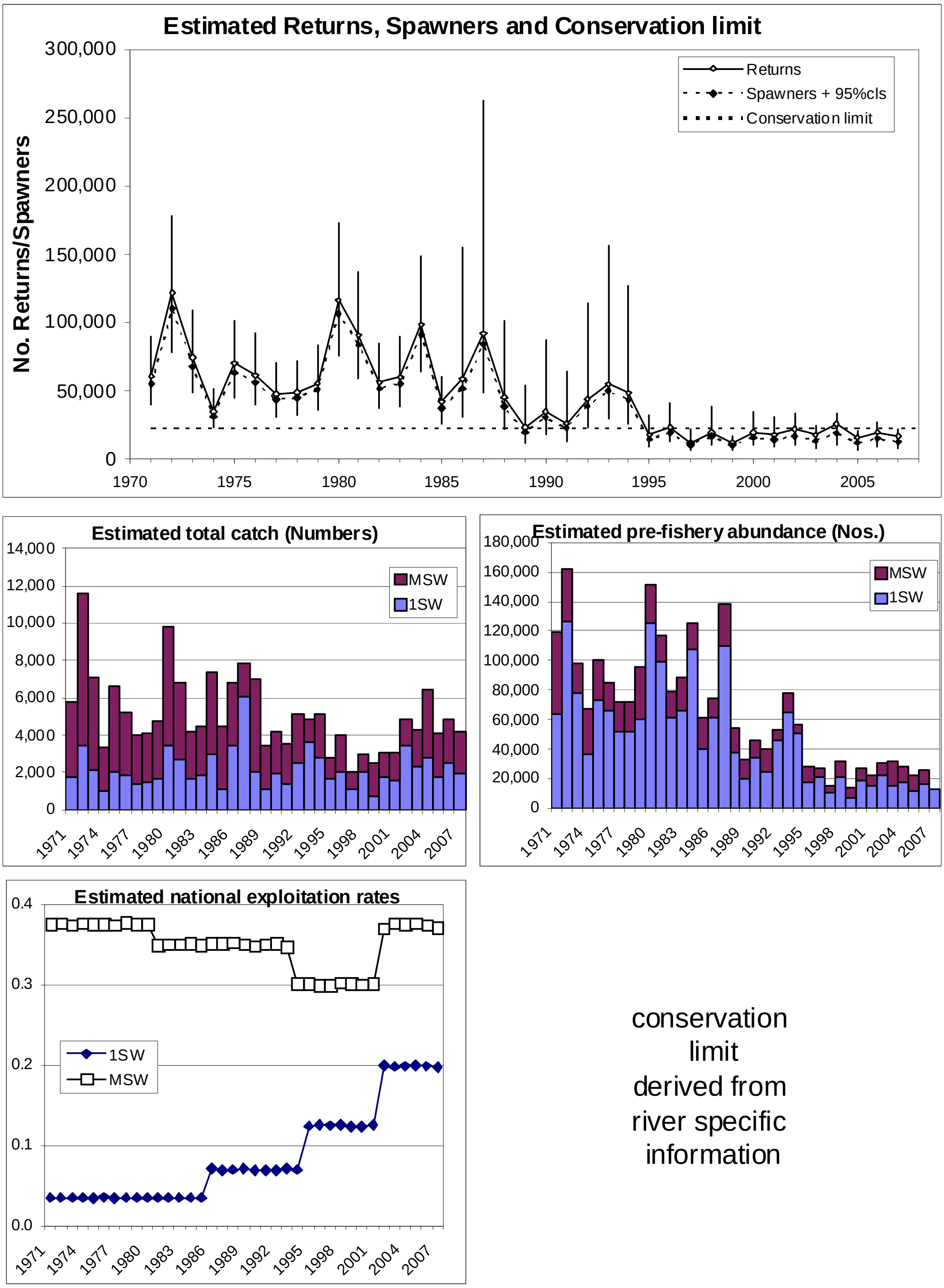


Figure 3.8.12.1b Summary of fisheries and stock description. France.

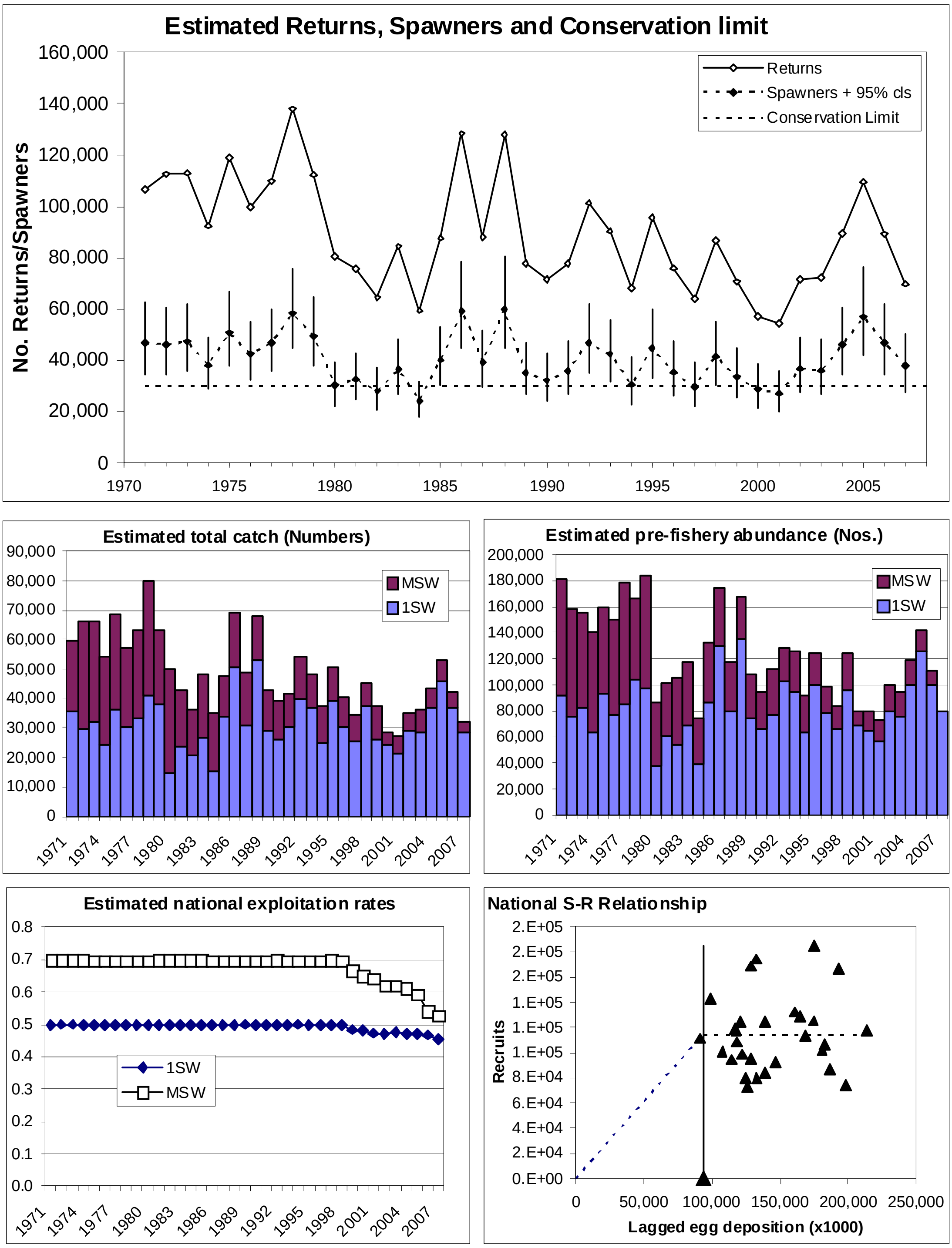


Figure 3.8.12.1c Summary of fisheries and stock description. Iceland.

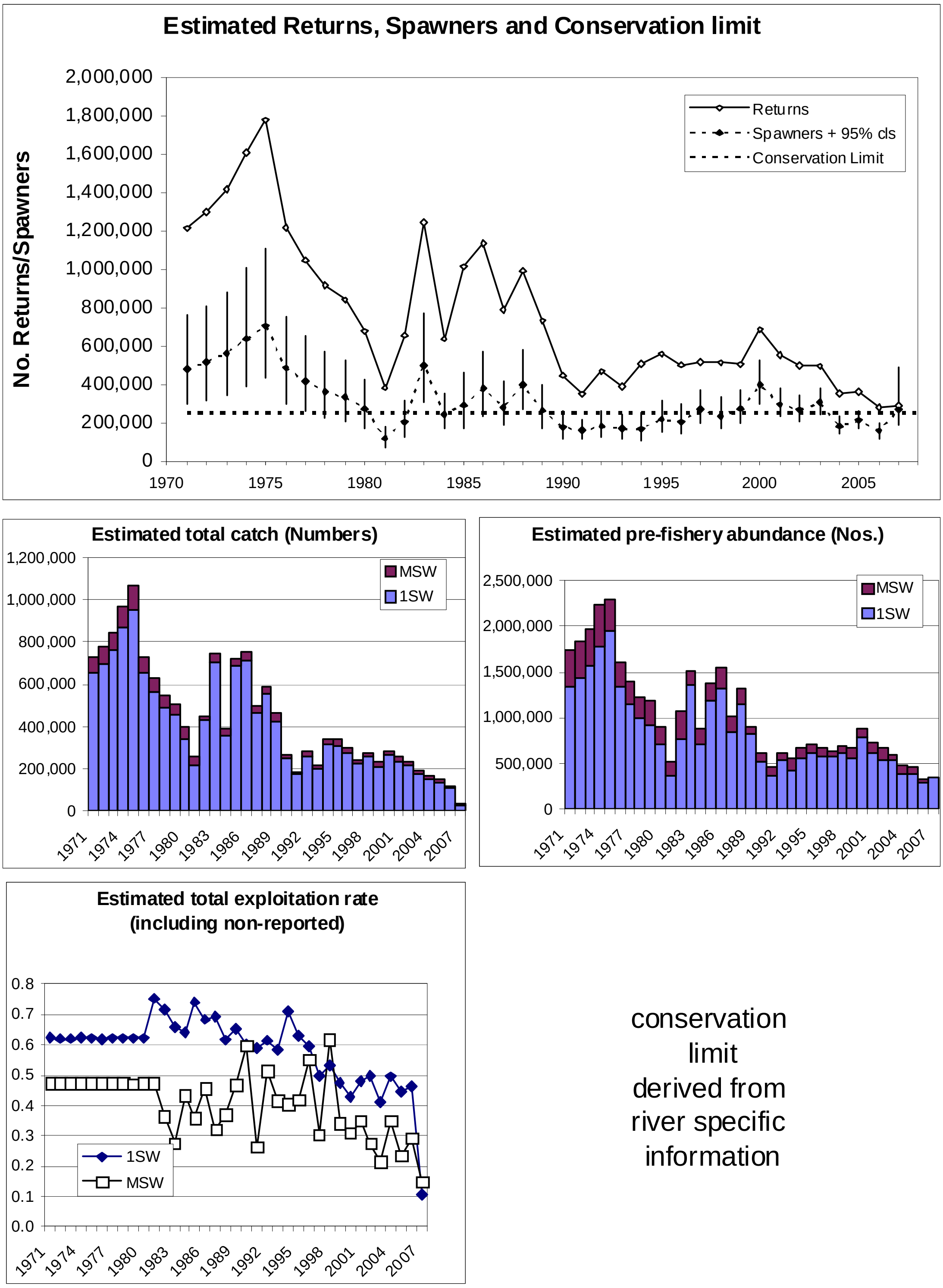


Figure 3.8.12.1d Summary of fisheries and stock description. Ireland.

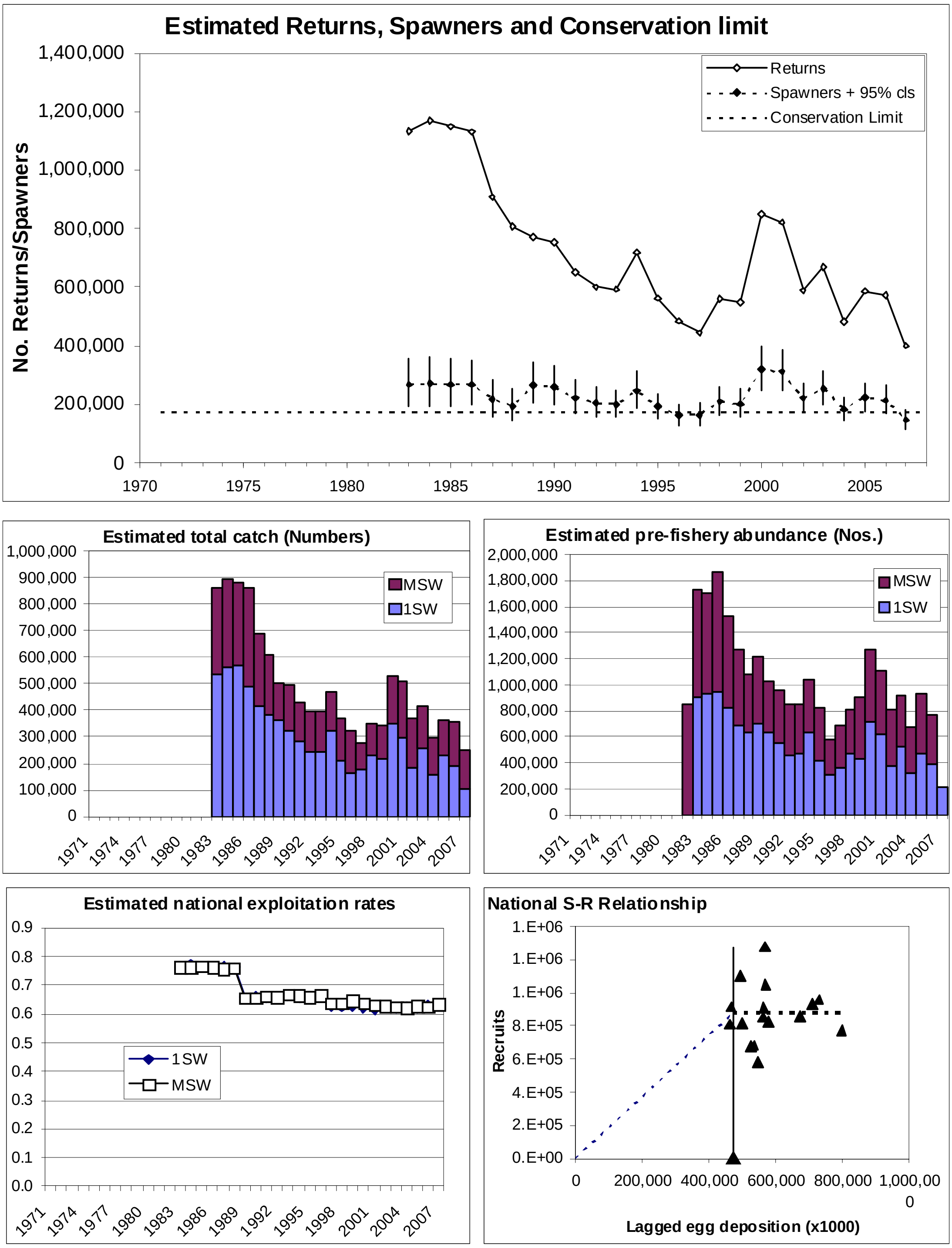


Figure 3.8.12.1e Summary of fisheries and stock description. Norway (minus Norwegian rod catches from the R. Teno).

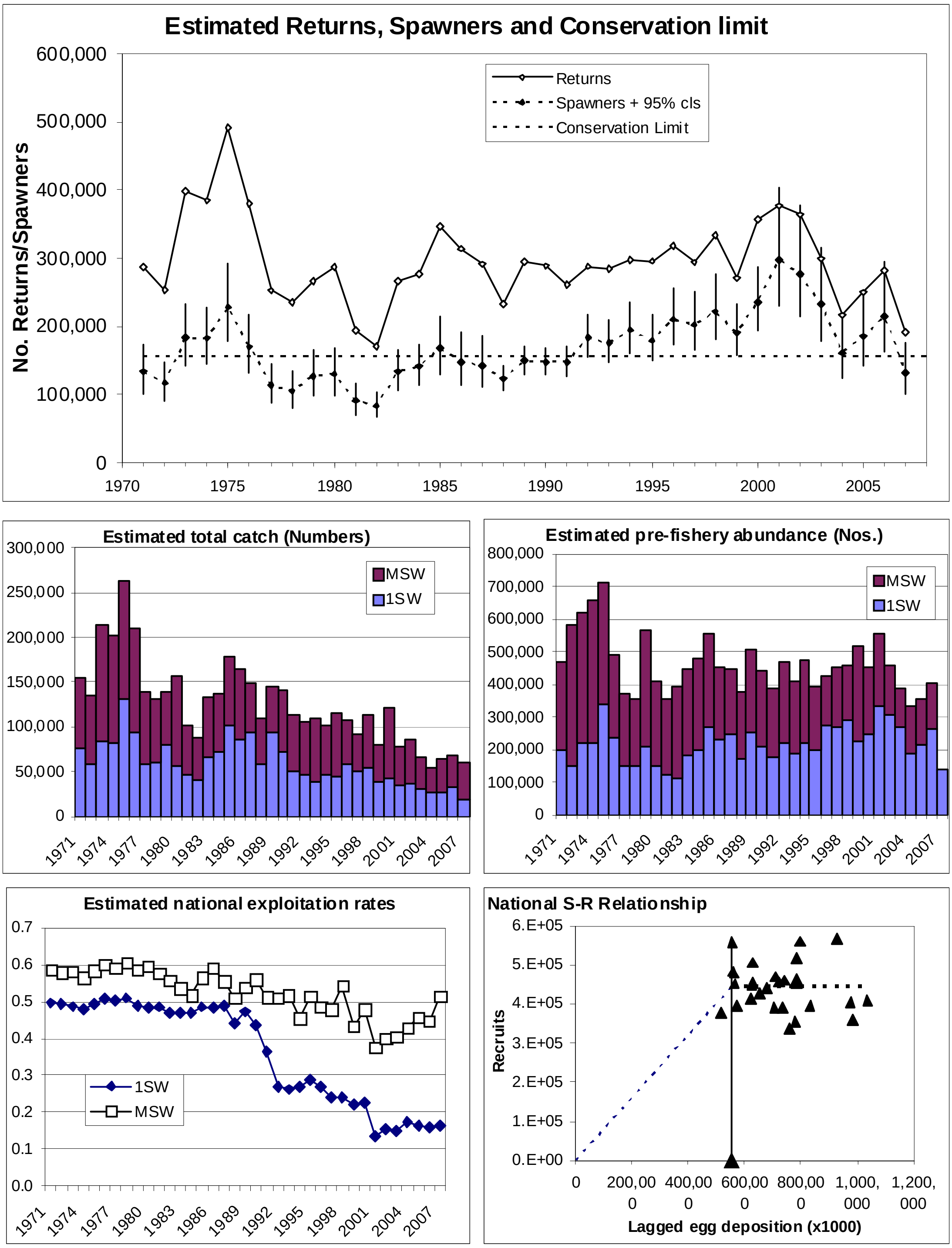


Figure 3.8.12.1f Summary of fisheries and stock description. Russia.

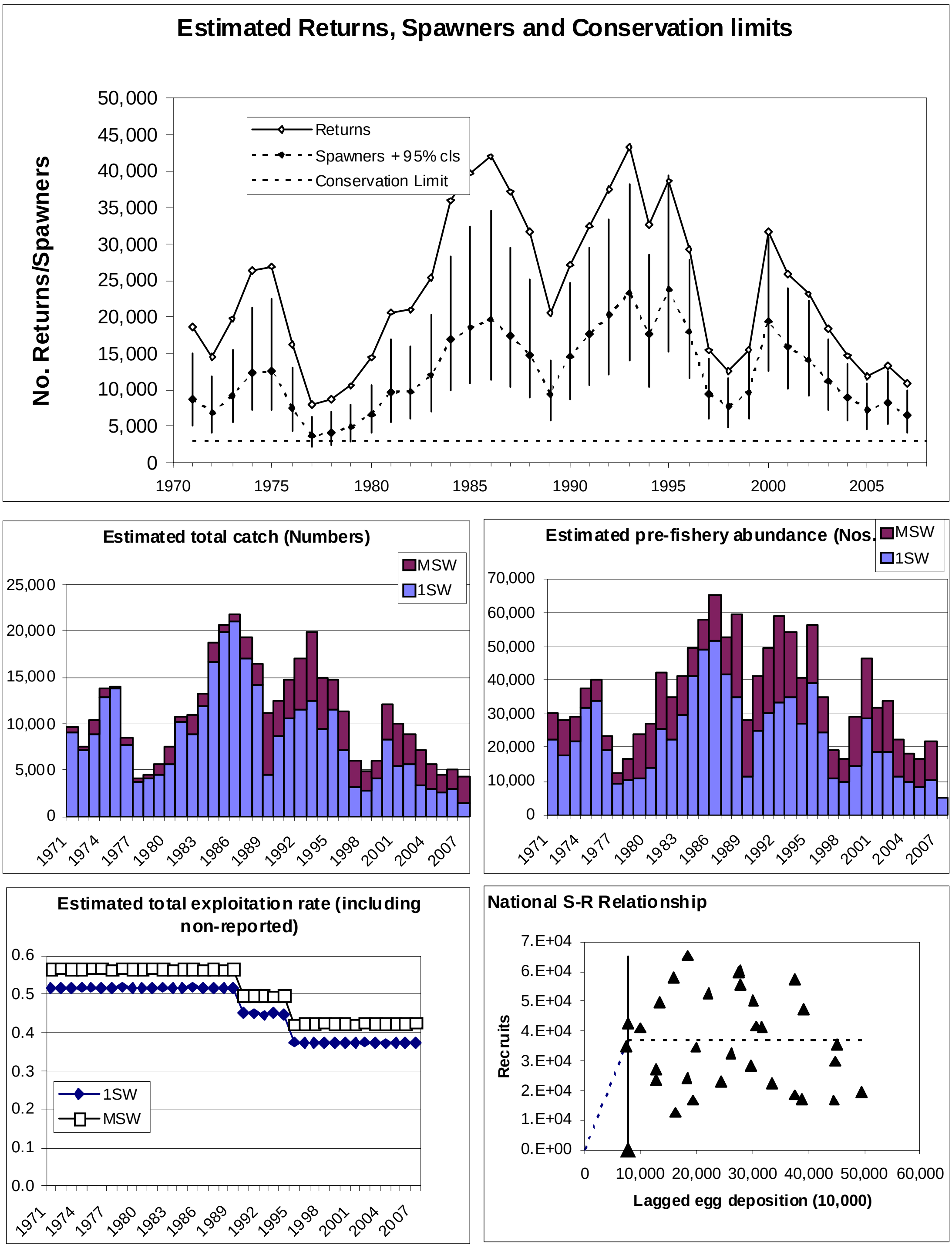


Figure 3.8.12.1g Summary of fisheries and stock description. Sweden.

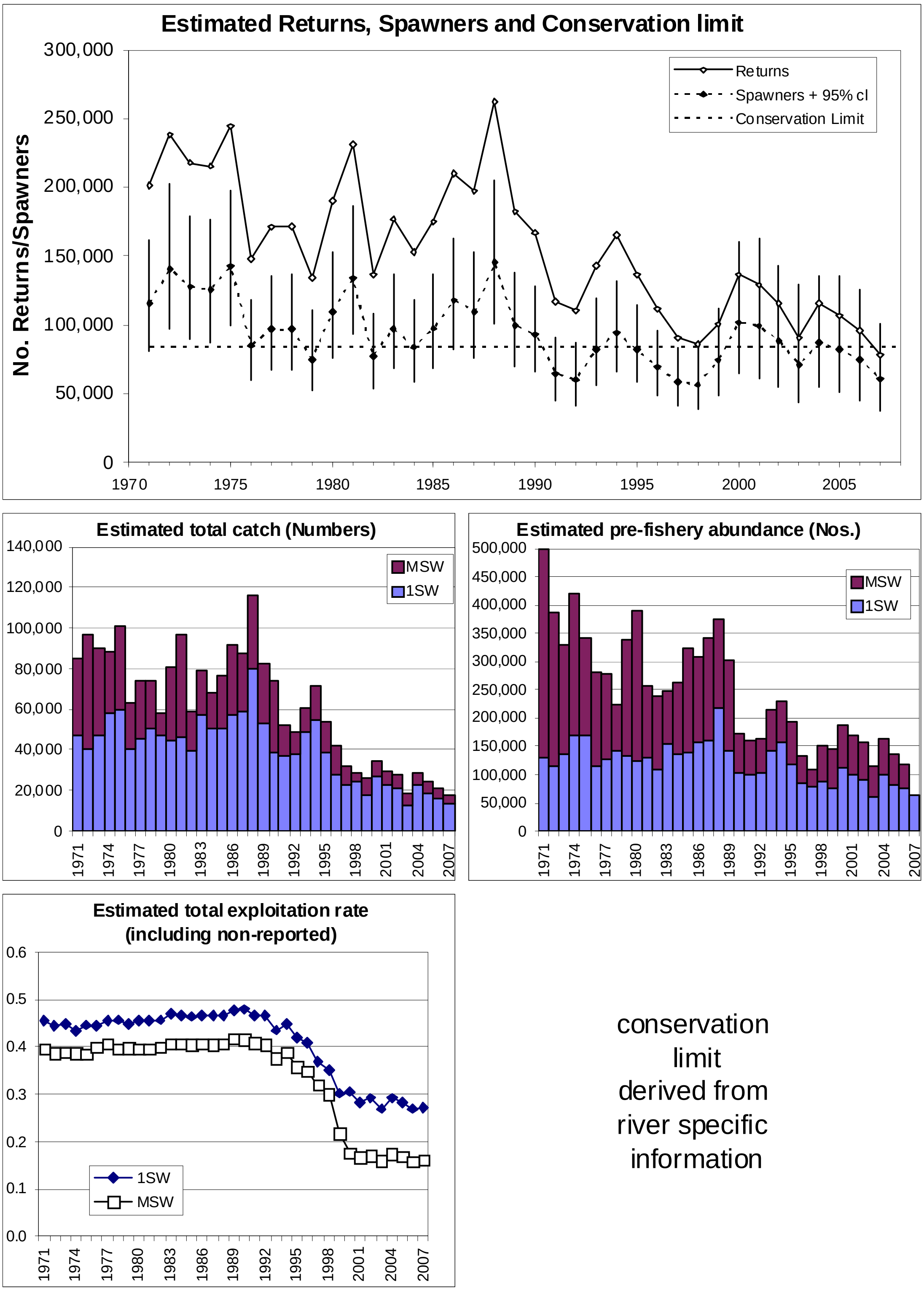


Figure 3.8.12.1h Summary of fisheries and stock description. UK (England & Wales).

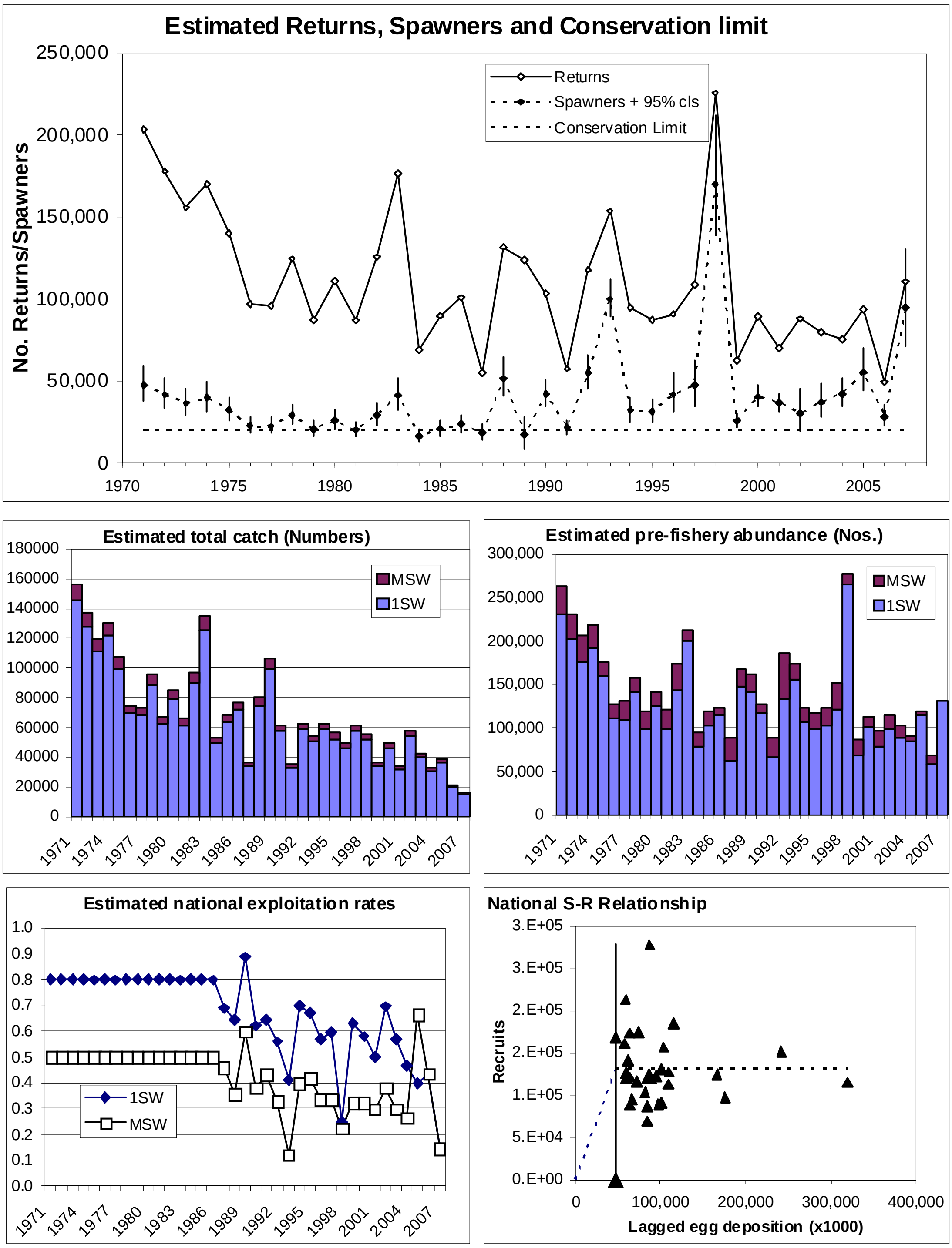


Figure 3.8.12.1i Summary of fisheries and stock description. UK (Northern Ireland).

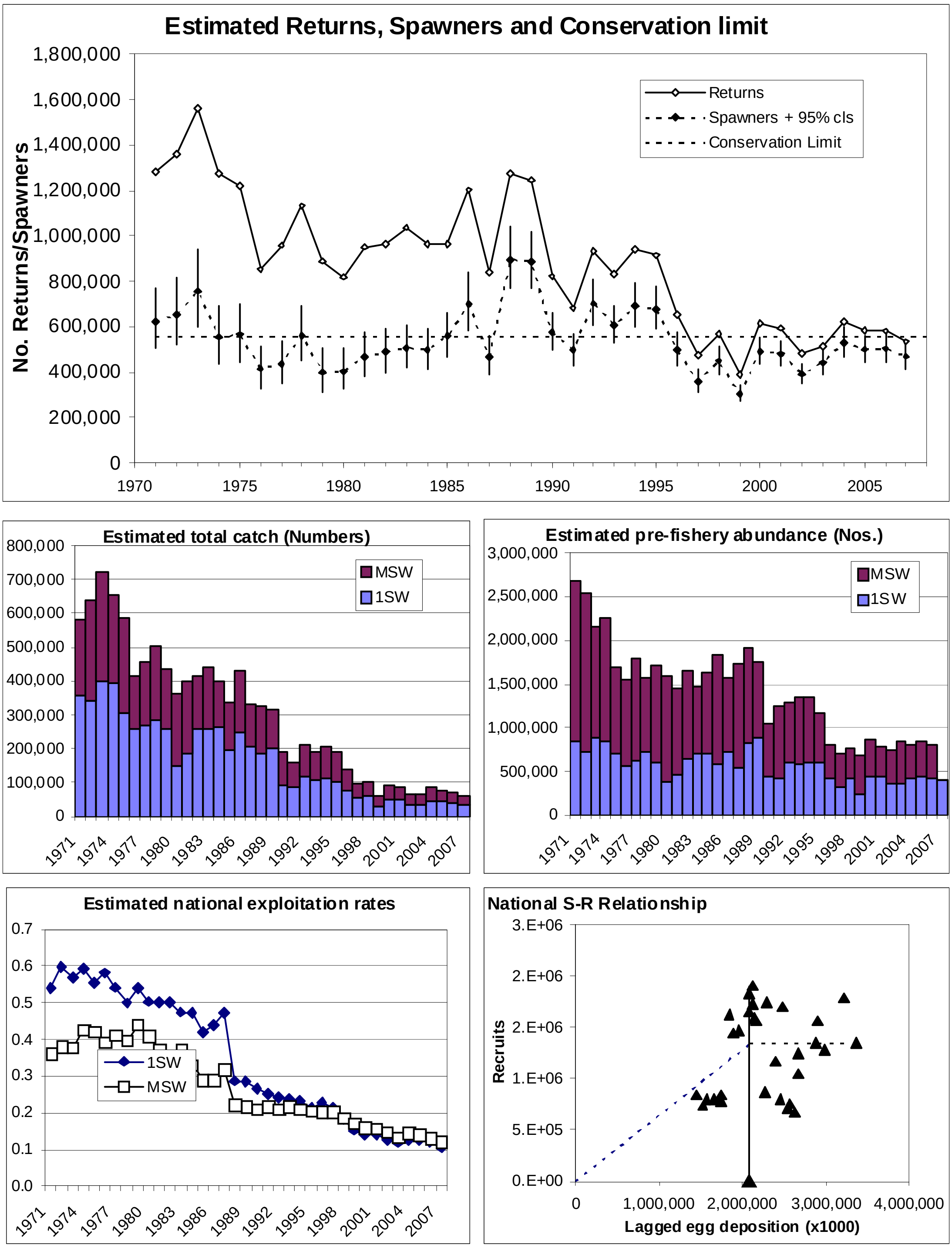


Figure 3.8.12.1j Summary of fisheries and stock description. UK (Scotland).

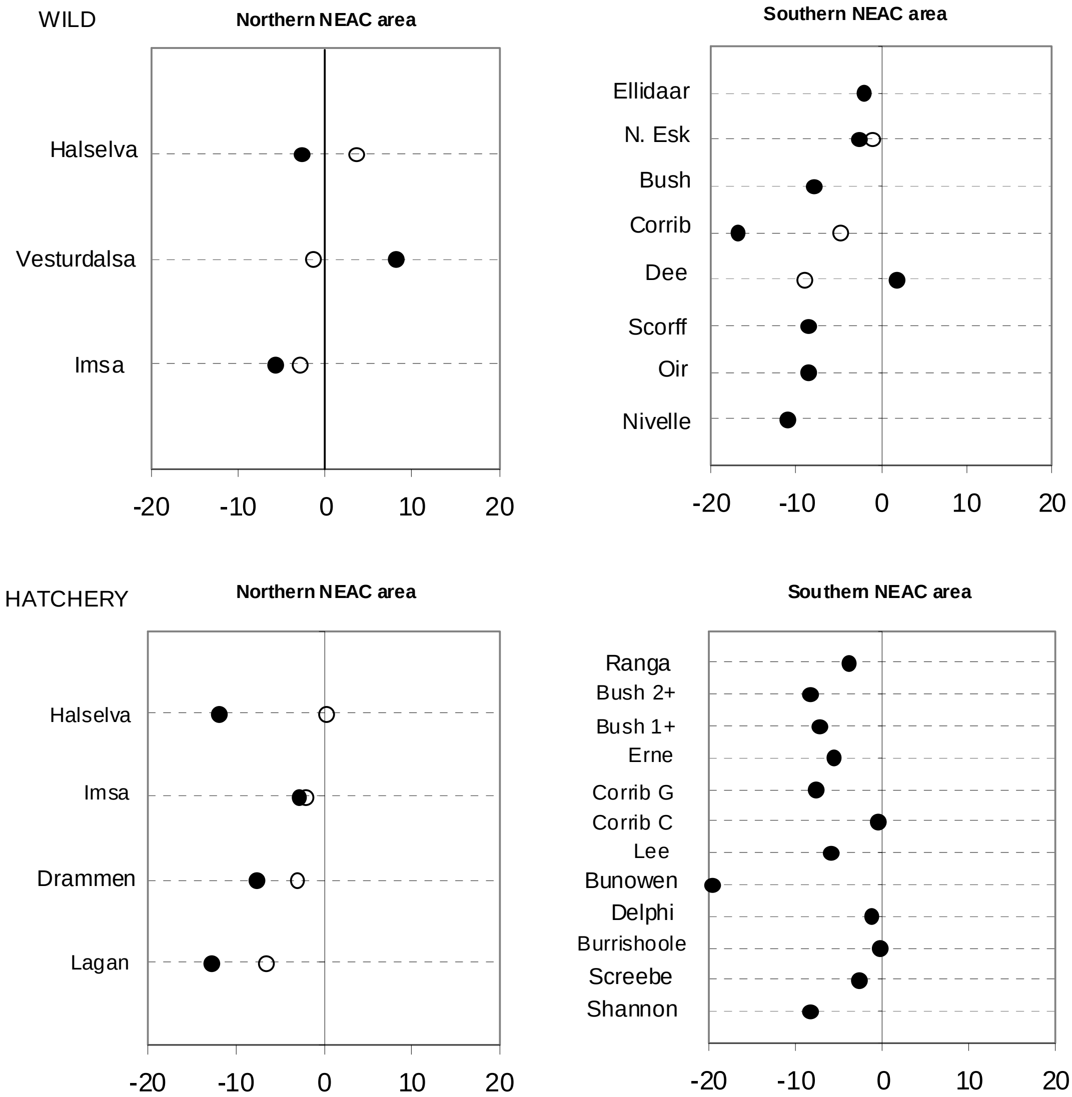


Figure 3.8.14.1 Annual rates of change (%) in marine survival indices of wild and hatchery smolts to adult returns to homewaters (prior to coastal fisheries) in different rivers in Northern and Southern NEAC areas. Filled circle = 1SW salmon; open circle = 2SW salmon. NB. The annual rates of change presented come from data sets of variable durations. Therefore comparisons between rivers are not appropriate.

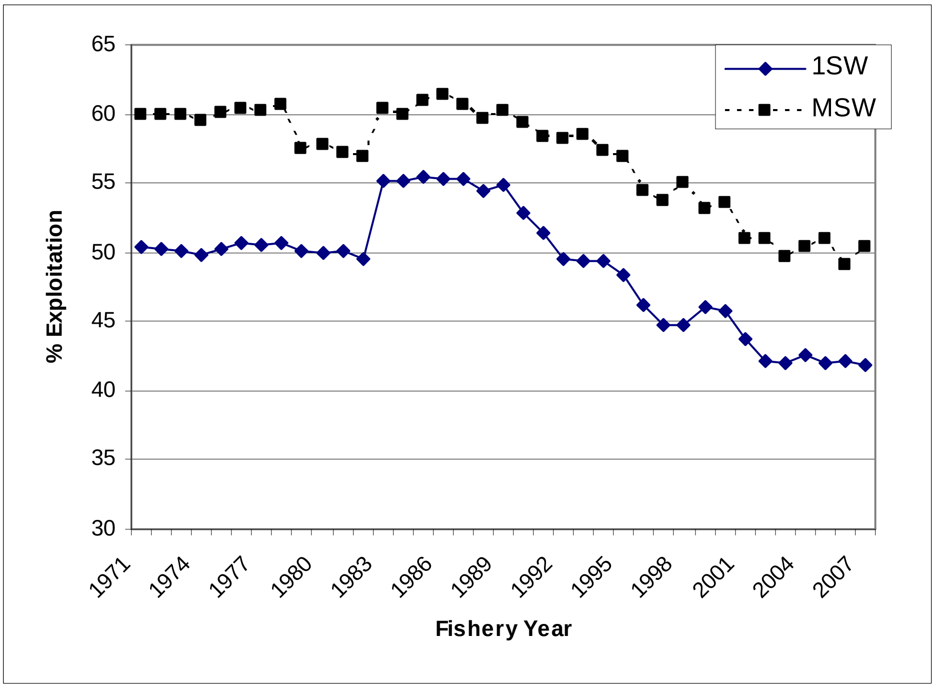


Figure 3.8.15.1 Exploitation rates of wild 1SW and MSW salmon by commercial and recreational fisheries in the Northern NEAC area from 1971–2007.

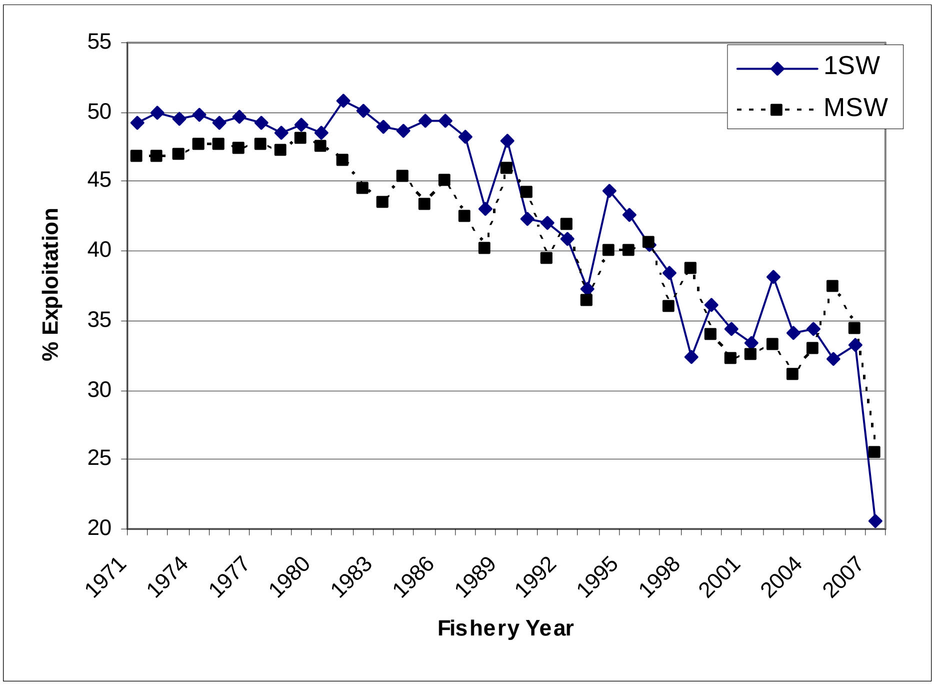


Figure 3.8.15.2 Exploitation rates of wild 1SW and MSW salmon by commercial and recreational fisheries in the Southern NEAC area from 1971–2007.

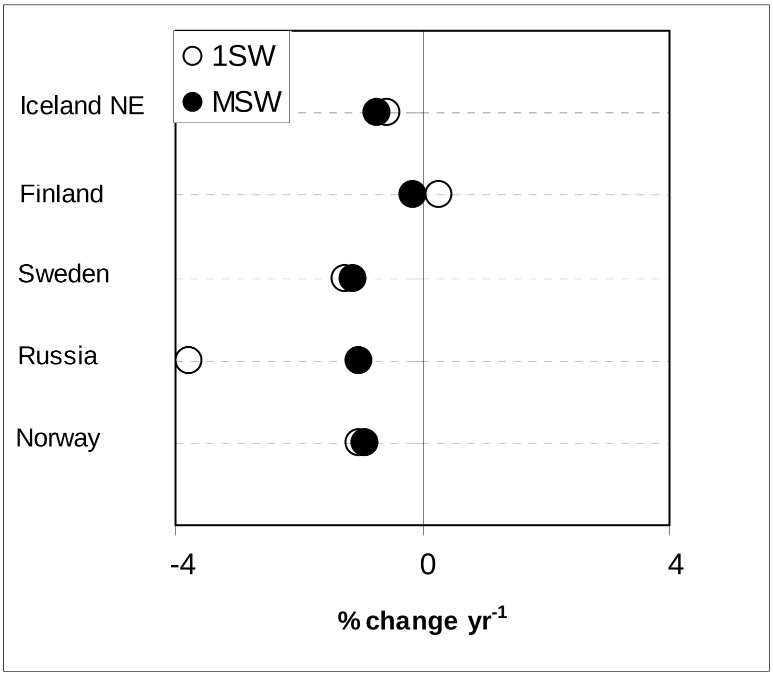


Figure 3.8.15.3 The rate of change of exploitation of 1SW and MSW salmon in northern NEAC countries.

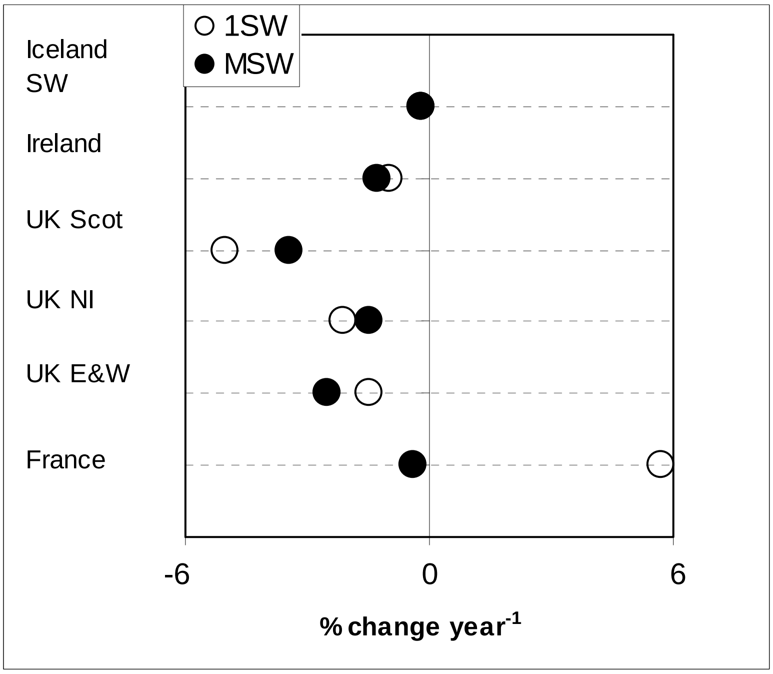


Figure 3.8.15.4 The rate of change of exploitation of 1SW and MSW salmon in southern NEAC countries.

4 North American commission

4.1 Status of stocks/exploitation

In 2007, 2SW spawner estimates for the six geographic areas indicated that all areas were below their CL (Figure 4.4.7.2.2) 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% to 14% for 2SW salmon and from approximately 60% to 14% for 1SW salmon. In 2007, exploitation rates on 1SW and 2SW salmon declined to the lowest in the time series.

The stock status is elaborated in Section 4.4.7

4.2 Management objectives

Management objectives are included in Section 1.4.

4.3 Reference points

There are no changes recommended in 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 2007 fisheries (including the fishery at St Pierre and Miquelon)

4.4.1 Key events of the 2007 fisheries

- The majority of harvest fisheries were directed to small salmon.
- Total harvest was 47 796 salmon in 2007, down 21% from the five year mean.
- Catches remain low relative to pre 1990 values.

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

Harvest histories (1972–2007) of salmon, expressed as 2SW salmon equivalents are provided in Tables 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. Starting in 1998, the Labrador commercial fishery was closed. Aboriginal Peoples' fisheries in Labrador (1998–2007) have been included. As well, a residents' food fishery in Labrador which started in 2000 is included. Mortalities (principally in fisheries) 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. Harvest equivalents within North America peaked at about 365 000 in 1976 and are now about 10 200 2SW salmon equivalents.

In the most recent year, the harvest of cohorts destined to be 2SW salmon in terminal fisheries of North America was 75% of the total catch. Harvest values ranged from 20 to 31% in 1972–1982 to 59–89% in 1996–2007 (Table 4.4.2.1). Percentages increased significantly since 1992 with the reduction and closures of the Newfoundland and Labrador commercial mixed stock fisheries. The number of 2SW salmon equivalents taken in the food fisheries in Labrador was 2188 fish in 2007.

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 2007; Aboriginal peoples, residents fishing for food in Labrador, and recreational fishers. There were no commercial fisheries in Canada in 2007.

In 2007, 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)** Labrador residents fishing in Lake Melville and coastal communities in southern Labrador from Cartwright to Cape St. Charles and, **4)** LMN (Labrador Métis Nation) members fishing in southern Labrador from Fish Cove Point to Cape St. Charles. The NG, Innu, and LMN fisheries were jointly regulated by Aboriginal Fishery Guardians administered under the Aboriginal Fisheries Strategy Program with the Department of Fisheries and Oceans (DFO) as well as by DFO Fishery Officers and Guardian staff. The new 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 log book reports and fisheries guardians. The overall reporting rate for subsistence fisheries was 79% in 2005 and 2006. To date, reporting rates for 2007 are 66%.

Most catches (95%, Figure 2.1.1.2) 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 2007;

Aboriginal peoples' food fisheries

In Québec, Aboriginal peoples' food fisheries took place subject to agreements or through permits issued to the bands. There are 10 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 2007. 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 LMN, resulted in fisheries in estuaries and coastal areas. There are further details on the Labrador Aboriginal fisheries in Section 4.4.5. By agreement with First Nations there were no food fisheries for salmon in Newfoundland in 2007. Harvest by Aboriginal peoples with recreational licenses is reported under the recreational harvest categories.

Residents food fisheries in Labrador

In 2007, a licensed food fishery for local residents took place, using gillnets, in Lake Melville (SFA 1) and in estuary and coastal areas of southern Labrador (SFA 2). Residents who requested a license were permitted to retain a maximum of four salmon of any size while fishing for trout and charr; four salmon tags accompanied each license. All licensees were requested to complete logbooks. DFO is responsible for regulating the Resident Fishery.

Recreational fisheries

Licenses are required for all persons fishing recreationally for Atlantic salmon. Gear is generally restricted to fly fishing and there are restrictive daily/seasonal bag limits. Recreational fisheries management in 2007 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

In the USA there was a one month fall catch and release recreational fishery for sea-run Atlantic salmon on a 2 km reach on one river. This was the second year for this fishery which re-opened in 2006 after closure from 1999 to 2005. A total of 90 licenses was sold and there were 83 angler trips reported.

France (Islands of Saint-Pierre and Miquelon)

The Working Group received no information on the number of professional and recreational gill net licenses issued in 2007 at Saint-Pierre and Miquelon. The time series of available data is below:

Year	Number of Professional Licenses	Number of Recreational Licenses
1995	12	42
1996	12	42
1997	6	36
1998	9	42
1999	7	40
2000	8	35
2001	10	42
2002	12	42
2003	12	42
2004	13	42
2005	14	52
2006	14	48
2007	na	na

4.4.4 Catches in 2007

Canada The provisional harvest of salmon in 2007 by all users was 112 t, about 18% lower than the 2006 harvest (Table 2.1.1.1; Figure 4.4.4.1). The 2007 harvest was 37 540 small salmon and 10 256 large salmon, 20% less small salmon and 7% less large salmon, compared to 2006 (Annex 4). 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. These reductions were introduced as a result of declining abundance of salmon.

Aboriginal peoples' food fisheries

The total harvest by Aboriginal people in 2007 was 47.6 tonnes (Table 4.4.4.1). Harvests (by weight) were down 22 % from 2006 and 12 % lower than the previous 5-year average harvest.

Residents fishing for food in Labrador

The estimated total catch for the fishery in 2007 was 1.7 t, about 733 fish (13% large salmon by number).

Recreational fisheries

Harvest in recreational fisheries in 2007 totalled 30 247 small and large salmon (approximately 63 t), 18% below the previous 5-year average, 18% below the 2006 harvest level, and the lowest total harvest reported (Figure 4.4.4.2). The small salmon harvest of 26 750 fish was 21% below 2006 and 31% below the previous 5-year mean. The large salmon harvest of 3497 fish was 8% below the previous five-year mean and 16% above 2006. The small salmon size group has contributed 88% on average of the total 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 2007, about 42 820 salmon (about 23 134 large and 19 686 small) were caught and released (Table 4.4.4.2), representing about 59% of the total number caught, including retained fish. This was a 29% decrease from the number released in 2006. There is some mortality on these released fish, which is accounted for in rivers assessed for their attainment of CLs.

Commercial fisheries

All commercial fisheries for Atlantic salmon remained closed in Canada in 2007 and the catch therefore was zero.

Unreported catches

There was no total unreported catch estimate available for Canada in 2007.

USA

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

France (Islands of Saint-Pierre and Miquelon) harvests

The harvest of 1.95 t of salmon in 2007 was the lowest annual total since 1997 and the 5th lowest in the 18 year time series. The time series of available data is below:

YEAR	PROFESSIONAL LICENSES (T)	RECREATIONAL LICENSES (T)	TOTAL (T)
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	0.392	0.445	0.837
1996	0.951	0.617	1.568
1997	0.762	0.729	1.491
1998	1.039	1.268	2.307
1999	1.182	1.140	2.322
2000	1.134	1.133	2.267
2001	1.544	0.611	2.155
2002	1.223	0.729	1.952
2003	1.620	1.272	2.892
2004	1.499	1.285	2.784
2005	2.243	1.044	3.287
2006	1.730	1.825	3.555
2007	0.970	0.977	1.947

There are no unreported catch estimates for France (Islands of Saint-Pierre and Miquelon).

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. These fisheries have been closed. The Aboriginal Peoples' and resident food fisheries that exist in Labrador may intercept some salmon from other areas of North America; in 2007 one salmon tagged in the Miramichi River as a returning 1SW salmon on September 23, 2006 was reported caught at Makkovik (Labrador) on August 23, 2007. Only twelve fish (all >71 cm) were sampled in 2007 from the Saint-Pierre and Miquelon landings. None were reported to have been tagged and their country of origin is not known.

Results of sampling program for Labrador subsistence fisheries

A sampling program was in place for the subsistence fisheries in Labrador in 2007. Landed fish were sampled opportunistically. Fish were measured (fork length to the nearest cm), weighed (gutted weight or whole weight if available to the nearest 1/10th of a kg) and if 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 southern Labrador, Aboriginal Fishery Guardians hired by the Labrador Metis Nation conducted the sampling. In northern Labrador, Conservation Officers of the Nunatsiavut Government conducted the sampling.

In total, 196 samples were collected. Scale reading indicated that the sample consisted of 82% 1SW, 10% 2SW and 8% 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 97% 1SW, 1% 2SW and 2% previously spawned salmon and large salmon were 36% 1SW, 40% 2SW and 24% previously spawned salmon.

The river ages (Figure 4.4.5.1) for the subsistence fisheries (for food social and ceremonial purposes (FSC)) samples were compared to ages from scales obtained from adults at four assessment facilities in Labrador. Freshwater samples numbered 1946 from north Labrador and 975 in south Labrador.

There was a difference in river age distribution of adults from fisheries compared to returns to rivers in North (Chi-square=23.10, P=0.0003) but possibly not South Labrador (Chi-square=10.61, P=0.06). Further, the freshwater age distribution did not differ (Chi-square=2.32, P=0.80) between the two regions of Labrador.

The absence of age 1 and rarity of age 2 smolts in the catches in 2007 suggests that these fisheries did not exploit southern North America stocks to any great extent. The presence of river age 5 to 7 years in the samples provides evidence that the fisheries are exploiting northern area (predominantly Labrador) stocks. However, the presence of a relatively higher number of river age 3 salmon compared to the freshwater samples suggests that salmon from other regions of Canada were exploited in northern Labrador in 2007.

The Working Group noted that the sampling program conducted in 2007 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 to assess the origin of salmon in this fishery. The Working Group recommended that sampling be continued and expanded.

4.4.6 Exploitation rates

Canada

In the Newfoundland recreational fishery, exploitation rates for retained small salmon ranged from a high of 16% on Middle Brook to a low of 5% on Gander River. Overall, exploitation of small salmon in these rivers declined from 30% in 1986 to 11%

in 2007 and was the second lowest in 24 years. In Labrador, exploitation on small salmon was 4% at Sand Hill River. Exploitation on large salmon was zero as no large salmon were retained.

In Quebec for 2007, the total fishing exploitation rate was around 20%; about the average of the five previous years. Native peoples' fishing exploitation rate was 7% of the total return. Recreational fishing exploitation rate was 13% on the total run, 16% for the small and 10% for the large salmon, down 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 2007.

Exploitation trends for North American salmon fisheries

Annual exploitation rates of 1SW and 2SW salmon in North America for the 1970 to 2007 time period were calculated by dividing annual harvests in all North American fisheries by annual estimates of the returns to all six regions of 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 1SW and 2SW salmon fluctuated annually but remained relatively steady until 1984 when exploitation of 2SW salmon declined considerably 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 1SW declined substantially in North America after 1991 with the closure of the Newfoundland commercial fishery in 1992. Declines continued in the 1990s with continuing management controls put in place in all fisheries to reduce exploitation. In the last two years, exploitation rates on 1SW salmon have declined to the lowest in the time series and 2SW are amongst the lowest. Exploitation rates across regions within North America are highly variable.

4.4.7 Elaboration on status of stocks

To date, approximately 550 Atlantic salmon rivers have been identified in eastern Canada and 21 rivers in eastern USA, each of which could contain at least one population of salmon. Assessments were reported for 53 of these rivers in 2007.

4.4.7.1 Smolt and juvenile abundance

Canada

Wild smolt production was estimated in 12 rivers in 2007. Of these, ten rivers have at least ten years of information (Figure 4.4.7.1).

In 2007, smolt production increased (>10% change) from 2006 in five rivers, decreased in two rivers and remained unchanged in four rivers (Figure 4.4.7.1). The relative smolt production, scaled to the size of the river using the conservation egg requirements, was highest in the rivers of Québec and low in the southern rivers of the Scotia Fundy and the USA river. In the nine rivers monitored over at least the past ten years, there has generally been no significant linear change (P>0.05) in smolt production with the exception of significant decreases in Narraguagus (US) and Campbellton River (Newfoundland) (Figure 4.4.7.1).

Juvenile salmon abundance has been monitored annually since 1971 in the Miramichi (SFA 16) and Restigouche (SFA 15) rivers and for shorter and variable time periods in a large number of other rivers in the Maritime Provinces. In the rivers of the southern Gulf of St. Lawrence, densities of young-of-the-year (age 0+) and parr (age-1+ and 2+) have increased since 1985 in response to increased spawning escapements and densities of fry and parr in 2007 remained at high values. Rivers in SFAs 20 and 21 along the Atlantic coast of Nova Scotia are high in dissolved organics, have low productivity, and influenced by acid deposition. In the partially acidified St. Mary's River, fry and older parr densities remained among the lowest of record (1985–2007). Trends in densities of age-1+ and older parr in the outer Bay of Fundy (SFA 23) have varied since 1980, with densities in the Nashwaak River and Saint John River above Mactaquac Dam declining in response to reduced spawning escapements. For the salmon stock in 35 rivers of the inner Bay of Fundy (SFA 22 and a portion of SFA 23), juvenile densities remained critically low.

USA

Wild salmon smolt production has been estimated on the Narraguagus River for eleven years (Figure 4.4.7.1). Smolt production in 2007 was 53% below that of 2006 with a significantly ($P < 0.05$) decreasing trend since 1998. The mean juvenile densities in this river have been low over the period of sampling dating to 1997.

4.4.7.2 Estimates of total adult abundance by geographic area

Returns of 1SW and 2SW salmon to each region (Tables 4.4.7.2.1 and 4.4.7.2.2; Figures 4.4.7.2.1 and 4.4.7.2.2; and Annex 5) were estimated by the methods and variables developed by Rago *et al.*, 1993b and reported in ICES, 1993. The returns for both sea-age groups were derived by applying a variety of methods to data available for individual river systems and management areas. These methods included counts of salmon at monitoring facilities, population estimates from mark-recapture studies, and the application of angling and commercial catch statistics, angling exploitation rates, and measurements of freshwater habitat. The 2SW component of the MSW 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 returns to create the PFA of North American salmon. The basis for estimates of 2SW and 1SW salmon returns and spawners for Labrador (SFAs 1, 2 & 14B) prior to 1998 are catch data from angling and commercial fisheries. In 1998, the commercial fishery in Labrador was closed and the model for returns and spawners from commercial catch data could not be used. From 2002–2007, there were counting projects on four salmon rivers in Labrador. Because the same four out of about 100 rivers (one in SFA 1A, Northern Labrador and three in SFA 2) were monitored, the Working Group extrapolated from return rates per accessible drainage areas to the un-surveyed rivers in Labrador (ICES 2005).

Estimates of 1SW and 2SW returns and spawners for Newfoundland (SFAs 3–12 & 14A) were previously documented based on the classification scheme of the Salmon Management Plan. Returns and spawners were updated for 2006 and new estimates were provided for 2007 based on catches, calculated exploitation rates and large to small salmon ratios from the Licence Stub Return System in 2007. It has been noticed that when recreational catches are completed, the estimates of return and spawners decrease.

A revised method for estimating returns to SFAs 19–23 was developed which indexed returns from counts at a fishway trap in the LaHave River. Prior to closures of commercial fisheries in 1985 and most recreational fisheries in 1997 returns of salmon to SFA 19 to 21 were estimated by sums of catches and counts across fisheries. Since 1997, returns to SFA 19 to 21 were based on a significant relationship between estimated escapements, recreational catches in these SFAs and counts at an index river, LaHave River, that have been made since 1972.

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

Returns do not include aquaculture escapes in rivers where removal is possible. In the Magaguadavic River (SFA 23) 5 fish farm escapees were removed in 2007. A single aquaculture escapes was also intercepted on the St. Croix River.

Canada

Labrador

The mid-point of the estimated returns (192 144) of 1SW salmon to Labrador rivers in 2007 is 10% lower than in 2006 (Figure 4.4.7.2.1, Annex 5). The mid-point (15 256) of the estimated 2SW returns to Labrador rivers in 2007 was 7% higher than in 2006 and 12% higher than the recent 5-year average of 12 256 (Figure 4.4.7.2.2).

Newfoundland

The mid-point of the estimated returns (162 322) of 1SW salmon to Newfoundland rivers in 2007 is 25% lower than the average 1SW returns (203 424) for the past five years (Figure 4.4.7.2.1). The mid-point (3946) of the estimated 2SW returns to Newfoundland rivers in 2007 was 33% lower than in 2006 and 27% lower than the recent 5-year average of 3946 (Figure 4.4.7.2.2).

Québec

The mid-point of the estimated returns to Québec in 2007 of 1SW salmon (22 654) is 24% below that estimated in 2006 26% below the previous five-year mean (Figure 4.4.7.2.1). The mid-point of the estimated returns of 2SW (23 500) salmon is 10% that estimated for 2006 and 27% below the previous 5-year average (Figure 4.4.7.2.2).

Gulf of St. Lawrence, SFAs 15–18

The mid-point (50 400) of the estimated returns in 2007 of 1SW salmon to the Gulf of St. Lawrence was 10% lower than 2006 and 13% below the previous five year mean return. The values noted in 1997 through 2007 are low relative to the values observed during 1985–1993 (Figure 4.4.7.2.1). The mid-point (25 200) of the estimate of 2SW returns in 2007 is 11% higher than for 2006 and 9% above the previous 5-year average return (Figure 4.4.7.2.2).

Scotia-Fundy, SFAs 19–23

The results indicated a 1SW return estimate of 4863, a 5% increase over the five year mean, but low relative to the 1971–2007 time series (Figure 4.4.7.2.1). Estimated MSW returns were 1488 or 54% of the five year mean. Estimated 2SW returns were 616, or 54% of the five year mean (Figure 4.4.7.2.2).

USA

Total returns of salmon to USA rivers was 1255, a 15% decrease from returns in 2006 (1480). Total salmon returns to the rivers of New England remain below the long term average of 2106 (1967–2006). The 2007 level is below both the 5-year and 10-year average. Returns of 1SW salmon were 297; below both the 5-year (352) and 10-year (334) averages (Figure 4.4.7.2.1). Returns of 2SW salmon were 954; below both the 5-year (997) and 10-year (1009) averages (Figure 4.4.7.2.2).

4.4.7.3 Estimates of spawning escapements

Updated estimates for 1SW spawners were derived for the six geographic regions (Table 4.4.7.2.3). Estimates of 2SW spawners, 1971–2007 are provided in Table 4.4.7.2.4. A comparison between the numbers of spawners, returns, and CLs for 2SW salmon (Figure 4.4.7.2.2).

Canada

Labrador

Spawner estimates for Labrador in 1998–2007 were developed, using the monitoring facilities for 2002–2007 and the proportional method for 1998–2001 (Section 4.4.10.1). The mid-point of the estimated numbers of 2SW spawners (15 042) was 7% above the previous year and was 43% of the total 2SW CL for Labrador (Figure 4.4.7.2.2). The 2SW spawner limit has only been exceeded once (1998) since 1971. The mid-point of the estimated numbers of 1SW spawners (191 920) was 11% lower that estimated for 2006 (Figure 4.4.7.2.1).

Newfoundland

The mid-point of the estimated numbers of 2SW spawners (2835) in 2007 was 33% below that estimated in 2006 (4217) and was 70% of the total 2SW CL for all rivers. The 2SW consevation limit has been met or exceeded at the mid-point of spawner estimates in seven years out of the last ten (Figure 4.4.7.2.2). The 1SW spawner abundance (145 667) in 2007 was 31% lower than in 2006 (191 346). The abundance of 1SW spawners in 1992 was higher than in 1989–1991 and similar to levels in the late 1970s and 1980s (Figure 4.4.7.2.1), although in 1995–1996 it was unusually high. There was a general increase in both 2SW and 1SW spawners during the period 1992–96 and 1998–2000, which is consistent with the closure of the commercial fisheries in Newfoundland.

Québec

The mid-point of the estimated numbers of 2SW spawners in 2007 was 12% below 2006, 16% below the previous five year mean, and was about 57% of the sum of the 2SW CL for all rivers (Figure 4.4.7.2.2). The mid-point of the estimated 1SW spawner abundance in 2007 (16 800) was 29% below the value in 2006 (Figure 4.4.7.2.1) and 22% below the previous five-year average.

Gulf of St. Lawrence

The mid-point of the estimated numbers of 2SW spawners in 2007 was 11% above 2006, and 12% above the previous five year mean, and was about 81% of the sum of the 2SW CL for all rivers (Figure 4.4.7.2.2). The mid-point of the estimated 1SW spawner abundance in 2007 (23 000) was 11% below 2006 (Figure 4.4.7.2.1) and approximates the 10 year average.

Scotia-Fundy

Estimated numbers of 2SW spawning salmon in the Scotia Fundy area was about 1200 fish which was 59% of the previous five year mean and a 47% decline from 2006 (Figure 4.4.7.2.2). Estimated 1SW spawners was about 7500, an 8% decrease from the previous five year mean and a 33% decline from 2006 (Figure 4.4.7.2.1).

USA

Pre-spawning adults were stocked into USA rivers, however, even with these, all age classes of spawners (1SW, 2SW, 3SW, and repeat) in 2007 (1490 salmon) represented only 5.1% of the 2SW spawner requirements for all USA rivers combined.

4.4.8 Egg depositions in 2007

Egg depositions by all sea-ages combined in 2007 exceeded or equalled the river specific CLs in 17 of the 53 assessed rivers (32%) and were less than 50% of CLs in 25 other rivers (47%) (Figure 4.4.8.1).

- In Newfoundland, 30% of the rivers assessed met or exceeded the CLs and 35% had egg depositions that were less than 50% of limits.
- Due to high water conditions 6 of 7 rivers in St. George Bay in southwest Newfoundland (SFA 13) where 2SW salmon are more prominent in the populations could not be assessed in 2007.
- All three assessed rivers in the Gulf and 33% of the assessed rivers in Québec had egg depositions that equalled or exceeded CLs.
- Large deficiencies in egg depositions were noted in the Bay of Fundy and Atlantic coast of Nova Scotia (SFA 19–23) where 7 of the 8 assessed rivers (88%) had egg depositions that were less than 50% of CLs.
- Large deficiencies in egg depositions were noted in the USA. On an individual river basis, the Penobscot River met 10% of its spawner requirement while all the other USA rivers were between 0.0–3.0% of their 2SW requirements.

4.4.9 Marine survival rates

In 2007, return rate data were available from 11 wild and two hatchery populations from rivers distributed among Newfoundland, Québec, Scotia-Fundy and USA (Figure 4.4.9.1). In the nine wild stocks with data in both 2006 and 2007, return rates to 1SW fish in 2007 decreased greatly relative to 2006 (-18% to -86%). A similar large decrease was noted in the two hatchery stocks (-36% to -57%).

Return rates for 2SW salmon from the 2005 smolt class increased relative to the 2004 smolt class for only one wild stock (+19%) and one hatchery stock (+33%) while return rates declined in the other three wild stocks (-20% to -42%) and the other hatchery stock (-6%).

These time series of return rates of smolts to 1SW and 2SW adults (Figure 4.4.9.1) and analysis of the rates of change (Figures 4.4.9.2) provide insights into management measures and/or temporal changes in marine survival of wild and hatchery 1SW and 2SW stocks. Specifically:

- Return rates in 2007 to many rivers were among the lowest of the time series and were low compared to historical levels,
- Return rates of fish to home waters did not increase as expected after closure of the commercial fisheries in 1984 and subsequently in 1992,

- 1SW return rates in MSW salmon stocks (USA, Scotia-Fundy, Gulf, Quebec) are lower than those in predominantly 1SW salmon stocks of Newfoundland,
- 1SW return rates in MSW salmon stocks of the Scotia-Fundy and Gulf exceed those of 2SW salmon but 2SW returns rates are greater than 1SW return rates in Québec and Maine populations, and
- Return rates of wild stocks exceed those of hatchery stocks.

SUMMARY OF RETURN RATES OF MONITORED STOCKS FOR THE LAST FIVE YEARS

Origin	Age Group	Region	Return rate Mean (%)	Return rate Range (%)	Number Of stocks
Wild	1SW	Maine (USA)	0.10	0.01 to 0.24	1
		Scotia-Fundy	4.22	1.13 to 12.73	2
		Gulf	3.29	1.90 to 6.40	2
		Québec	0.73	0.27 to 1.49	2
		Newfoundland	5.65	1.30 to 15.10	5
Wild	2SW	Maine (USA)	0.80	0.57 to 0.94	1
		Scotia-Fundy	0.96	0.24 to 1.58	2
		Gulf	1.60	0.80 to 2.20	1
		Québec	0.70	0.19 to 1.39	2
Hatchery	1SW	Maine (USA)	0.05	0.04 to 0.06	1
		Scotia-Fundy	0.37	0.24 to 0.56	1
Hatchery	2SW	Maine (USA)	0.13	0.11 to 0.17	1
		Scotia-Fundy	0.11	0.06 to 0.15	1

4.4.10 Pre-fisheries abundance

4.4.10.1 North American run-reconstruction model

The Working Group has used the "North American Run-Reconstruction Model" to estimate pre-fishery abundance, which serves as the basis of abundance forecasts used in the provision of catch advice. The catch statistics (Table 4.4.10.1) used to derive returns and spawner estimates have been updated from those used in ICES (2007).

4.4.10.2 Non-maturing 1SW salmon

The non-maturing component of 1SW fish, destined to be 2SW returns (excludes 3SW and previous spawners) is represented by the pre-fishery abundance estimator for year i designated as [NN1(i)]. This annual pre-fishery abundance is the estimated number of salmon in West Greenland prior to the start of the fishery on August 1st. Definitions of the variables are given in Table 4.4.10.2. It is constructed by summing 2SW returns in year i+1 [NR2(i+1)], 2SW salmon catches in commercial and Aboriginal peoples' food fisheries in Canada [NC2(i+1)], and catches in year i from fisheries on non-maturing 1SW salmon in Canada [NC1(i)] and Greenland [NG1(i)] (Table 4.4.10.3). In Labrador, Aboriginal peoples' food harvests of small (AH_s) and large salmon (AH_l) were included in the reported catches for 1999–2007 (Table 4.9.10.1). Because harvests occurred in both Lake Melville and coastal areas of northern Labrador, the fraction of these catches that are immature was labelled as af_imm. This was necessary because non-maturing salmon do not occur in Lake Melville where much of the catch originated. However, non-maturing salmon may occur in marine areas in the remainder of northern Labrador. Consequently, af_imm for the fraction of Aboriginal peoples' harvests that was non-maturing was set at 0.05 to 0.1 which is half of f_imm from commercial fishery samples. The full details and equations for calculating prefishery abundance are in ICES (2004). The model does not take into account non-catch fishing mortality in any of the fisheries. The West Greenland (1993 and 1994), Newfoundland (1992–2007), and Labrador commercial fishery (1998–2007), were closed in these years.

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 2006. This is because pre-fishery abundance estimates for 2007 require 2SW returns to rivers in North America in 2008. The minimum and maximum values of the catches and returns for the 2SW cohort are summarized in Table 4.4.10.3. The 2006 abundance estimates ranged between 71 997 and 137 312 salmon. The mid-point of this range (104 655) is similar to the 2005 value (106 635) and is the 6th lowest in the 34-year time-series (Figure 4.9.10.1). Even though the 2006 value has increased somewhat from 2001, which was the lowest in the time series, the general trend towards lower values in recent years is still evident and current year values are still much lower than the 917 051 in 1975.

4.4.10.3 Maturing 1SW salmon

Maturing 1SW salmon are in some areas a major component of salmon stocks, and their abundance provides an index of the entire smolt cohort.

For the commercial catches in Newfoundland and Labrador, all small salmon are assumed to be 1SW fish based on catch samples which show the percentage of 1SW salmon to be in excess of 95%. Large salmon are primarily MSW salmon, but some maturing and non-maturing 1SW are also present in commercial catches in SFAs 1–7, and 14B. Estimates of fractions of non-maturing salmon present in the Newfoundland and Labrador catch were presented in ICES (1991). The large category in SFAs 1–7 and 14B consists of 0.1–0.3 1SW salmon (Rago *et al.*, 1993a; ICES, 1993). Salmon catches in SFAs 8–14A are mainly maturing salmon (Idler *et al.*, 1981). These values were assumed to apply to the Aboriginal food fishery catches in marine coastal areas of northern Labrador. Catches used in the run-reconstruction model for the Newfoundland commercial fishery were set to zero for 1992–2007 and for Labrador for 1998–2007 to remain consistent with catches used in other years in these areas. Full details on the method used to calculate the numbers of maturing 1SW salmon are in ICES (2004).

The minimum and maximum values of the catches and returns for the 1SW cohort are summarized in Table 4.4.10.4. The mid-point values of the reconstructed abundance of the 1SW maturing cohort are shown in Figure 4.4.10.1. The mid-point of the range of pre-fishery abundance estimates for 2007 (459 876) is 17% lower than in 2006 (552 667), had increased considerably from the value of 292 634 in 1994, which was the lowest estimated in the time-series 1971–2007.

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

The pre-fishery abundance of 1SW maturing salmon for the 1971–2007 and 1SW non-maturing salmon from North America for 1971–2006 were combined to give total recruits (Figure 4.4.10.2). While maturing 1SW salmon in 1998–2007 have increased over the lowest value in 1994, the non-maturing portion of these cohorts remains basically unchanged since 1997. The prefishery abundance of the non-maturing portion (potential 2SW salmon) has been consistently well below the Spawning Escapement Reserve (derived from the CL) since 1993. The maturing component has declined by 51% the non maturing has declined by 88% from their highest values.

4.4.11 Summary on status of stocks

In 2007, the midpoints of the spawner abundance estimates for six geographic areas indicated that all areas were below their CL 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. During 1993 to 2007, 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 component has declined by 47% the non maturing has declined by 92%.

The returns of 2SW fish in 2007 increased from 2006 in Labrador and the Gulf of St. Lawrence but lower in the other areas. In all areas returns remain close to the lower end of the 37-year time-series (1971–2007). While 2SW salmon are a minor component of Newfoundland stocks even here decreases of about 30% have occurred from peak levels of the 1990's. Returns in 2007 of 1SW salmon relative to 2006 decreased from 10% to 25% in all areas of North America and with exception to Labrador, returns were among the lowest of the time series.

The rank of the estimated returns in the 1971–2007 time-series and the proportions of the 2SW CL achieved in 2007 for six regions in North America are shown below:

	Rank of 2007 returns in 1971-2007, (37=lowest)		Rank of 2007 returns in 19987-2007 (10=lowest)		Mid-point estimate of 2SW spawners as percentage of conservation limit (S_{LIM})
Region	1SW	2SW	1SW	2SW	(%)
Labrador	3	16	3	5	43
Newfoundland	27	30	8	10	70
Québec	29	36	9	9	57
Gulf	27	28	5	4	81
Scotia-Fundy	34	36	7	9	5
USA	23	33	7	7	4

Egg depositions by all sea-ages combined in 2007 exceeded or equalled the river specific CLs in 17 of the 53 assessed rivers (32%) and were less than 50% of CLs in 25 other rivers (47%; Figure 4.4.81).

Return rates to 1SW and 2SW salmon remain variable and unpredictable with higher return rates in the northern areas (Newfoundland) and lower rates in the southern areas, including southern Newfoundland, Maritimes and USA.

Return rates of 2SW salmon in monitored stocks remain low. An additional concern is that all salmon stocks are suffering reduced reproductive capacity, with particular deficits in the Bay of Fundy, Atlantic coast and USA. Despite major changes in fisheries management, returns have continued to decline in these areas and many populations are currently threatened with extirpation.

4.5 NASCO has requested ICES to evaluate the extent to which the objectives of any significant management measures introduced in recent years have been achieved

There have been no significant management measures introduced within the NAC in recent years.

Table 4.4.2.1 Catches expressed as 2SW salmon equivalents in North American salmon fisheries, 1972–2006, based on the mid-points of the estimated values.

Year i	CANADA – MIXED STOCK: NF-LAB Comm 1SW (Year i-1) (a)	CANADA – MIXED STOCK: Year i % 1SW of total 2SW equivalents	CANADA – MIXED STOCK: Year i NF-LAB Comm 2SW (a)	CANADA – MIXED STOCK: Year i NF-Lab comm total	CANADA – TERMINAL FISHERIES IN YEAR i: Labrador rivers	CANADA – TERMINAL FISHERIES IN YEAR i: Nfld rivers	CANADA – TERMINAL FISHERIES IN YEAR i: Quebec Region	CANADA – TERMINAL FISHERIES IN YEAR i: Gulf Region	CANADA – TERMINAL FISHERIES IN YEAR i: Scotia - Fundy Region	CANADA – TERMINAL FISHERIES IN YEAR i: 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	Exploitation rates in North America: 1SW	Exploitation rates in North America: 2SW
1972	20,857	9	153,775	174,632	314	633	27,417	22,389	4,819	230,204	346	230,550	24	206,814	437,364	53	0.574	0.724
1973	17,971	6	219,175	237,146	719	895	32,751	17,914	5,144	294,570	327	294,897	20	144,348	439,245	67	0.643	0.757
1974	24,564	7	235,910	260,475	593	542	47,631	21,430	11,628	342,299	247	342,546	24	173,615	516,161	66	0.616	0.741
1975	24,181	7	237,598	261,779	241	528	41,097	15,677	11,556	330,877	389	331,266	21	158,583	489,849	68	0.576	0.773
1976	35,801	10	256,586	292,388	618	412	42,139	18,090	10,147	363,794	191	363,985	20	200,464	564,449	64	0.571	0.793
1977	27,519	8	241,217	268,736	954	946	42,301	33,433	12,202	358,571	1,355	359,927	25	112,077	472,004	76	0.586	0.732
1978	27,836	11	157,299	185,135	580	559	37,421	23,806	8,414	255,914	894	256,808	28	136,386	393,194	65	0.534	0.743
1979	14,086	10	92,058	106,144	469	144	25,234	6,300	3,155	141,447	433	141,880	25	85,446	227,326	62	0.547	0.770
1980	20,894	6	217,209	238,103	646	699	53,567	29,832	15,370	338,216	1,533	339,749	30	143,829	483,577	70	0.572	0.729
1981	34,486	11	201,336	235,822	384	485	44,375	16,329	11,089	308,484	1,267	309,751	24	135,157	444,908	70	0.524	0.783
1982	34,341	14	134,417	168,757	473	433	35,204	25,709	8,345	238,920	1,413	240,333	30	163,718	404,051	59	0.525	0.736
1983	25,701	12	111,562	137,263	313	445	34,472	27,097	11,595	211,185	386	211,571	35	139,985	351,556	60	0.560	0.788
1984	19,432	14	82,807	102,238	379	215	24,408	5,997	3,628	136,866	675	137,540	26	23,897	161,437	85	0.507	0.629
1985	14,650	11	78,760	93,410	219	15	27,483	2,707	4,930	128,765	645	129,409	28	27,978	157,387	82	0.530	0.573
1986	19,832	12	104,890	124,723	340	39	33,846	4,541	2,824	166,313	606	166,919	25	100,098	267,017	63	0.512	0.584
1987	25,163	13	132,208	157,371	457	20	33,807	3,756	1,370	196,781	300	197,081	20	123,472	320,553	61	0.522	0.689
1988	32,081	21	81,130	113,211	514	29	34,262	3,853	1,373	153,241	248	153,489	26	124,868	278,357	55	0.474	0.614
1989	22,197	16	81,355	103,551	337	9	28,901	3,443	265	136,506	397	136,903	24	83,947	220,849	62	0.546	0.626
1990	19,577	18	57,359	76,937	261	24	27,986	2,715	593	108,516	696	109,212	30	43,634	152,846	71	0.440	0.562
1991	12,048	14	40,433	52,481	66	16	29,277	1,796	1,331	84,968	231	85,199	38	52,560	137,759	62	0.474	0.542
1992	9,979	14	25,108	35,087	581	67	30,016	2,694	1,114	69,560	167	69,728	50	79,571	149,298	47	0.249	0.438
1993	3,229	8	13,273	16,502	378	0	23,153	1,210	1,110	42,352	166	42,519	61	30,091	72,609	59	0.211	0.340
1994	2,139	5	11,938	14,077	455	0	24,052	2,219	756	41,560	1	41,561	66	0	41,561	100	0.306	0.371
1995	1,242	3	8,677	9,918	408	0	23,331	2,019	330	36,006	0	36,006	72	0	36,006	100	0.234	0.261
1996	1,075	3	5,646	6,721	334	0	22,413	2,412	766	32,646	0	32,646	79	15,343	47,989	68	0.206	0.277
1997	969	4	5,390	6,360	158	0	18,574	1,849	581	27,521	0	27,521	77	15,776	43,297	64	0.212	0.288
1998	1,155	7	1,872	3,027	231	0	11,256	2,238	322	17,074	0	17,074	82	12,088	29,162	59	0.174	0.183
1999	179	1	894	1,073	320	0	9,032	1,127	450	12,002	0	12,002	91	2,175	14,177	85	0.165	0.161
2000	152	1	1,115	1,267	262	0	9,425	1,714	193	12,861	0	12,861	90	3,863	16,725	77	0.168	0.169
2001	286	2	1,380	1,666	338	0	10,104	1,400	255	13,763	0	13,763	88	4,005	17,768	77	0.189	0.154
2002	263	3	1,185	1,448	207	0	7,297	927	179	10,058	0	10,058	86	6,982	17,040	59	0.194	0.185
2003	312	2	1,794	2,106	222	0	8,870	1,193	189	12,580	0	12,580	83	1,617	14,197	89	0.164	0.158
2004	355	2	3,049	3,403	259	0	8,756	3,328	105	15,852	0	15,852	79	1,914	17,766	89	0.191	0.195
2005	470	4	2,323	2,793	291	0	7,803	637	91	11,615	0	11,615	76	2,755	14,370	81	0.142	0.152
2006	563	5	2,549	3,112	213	0	7,147	587	137	11,196	0	11,196	72	2,635	13,831	81	0.146	0.151
2007	564	6	2,188	2,751	0	0	6,716	650	95	10,212	0	10,212	73	3,421	13,633	75	0.141	0.142

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)

a - starting in 1998, there was no commercial fishery in Labrador; numbers reflect size of aboriginal fish harvest in 1998-2006 and resident food fishery harvest in 2000-2006

Table 4.4.4.1 Aboriginal peoples' food fishery harvests (t) and percent large by weight classification and by number 1990 to 2007.

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	47.6	61	40

Table 4.4.4.2. The numbers of caught and released salmon in the angling fisheries of Eastern Canada.

Year	Newfoundland			Nova Scotia			New Brunswick					Prince Edward Island			Quebec			CANADA*		
	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	17,168	3,892	21,060	883	1,471	2,354	1,106	2,963	1,850	7,040	12,959	63	41	104	951	5,392	6,343	**23,134**	**19,686**	**42,820**

* totals for all years prior to 1997 are incomplete and are considered minimal estimates
blank cells indicate no information available

Table 4.4.7.2.1 Estimated numbers of 1SW returns in North America by geographic regions, 1971–2007.

	Labrador		Newfoundland		Quebec		Gulf of St. Lawrence		Scotia-Fundy		USA	North America		
Year	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		Min	Max	Mid-points
1971	32,966	115,382	112,644	226,129	14,969	22,453	33,115	57,968	14,813	23,011	32	208,539	444,976	326,758
1972	24,675	86,362	109,282	219,412	12,470	18,704	42,195	73,700	13,043	20,975	18	201,683	419,172	310,427
1973	5,399	18,897	144,267	289,447	16,585	24,877	43,653	77,061	19,207	29,799	23	229,134	440,103	334,619
1974	27,034	94,619	85,216	170,748	16,791	25,186	65,663	114,068	34,450	53,050	55	229,208	457,725	343,467
1975	53,660	187,809	112,272	225,165	18,071	27,106	58,607	101,878	28,595	39,219	84	271,288	581,261	426,275
1976	37,540	131,391	115,034	230,595	19,959	29,938	90,292	155,669	43,237	62,793	186	306,248	610,571	458,409
1977	33,409	116,931	110,114	220,501	18,190	27,285	31,311	56,070	37,538	54,879	75	230,638	475,743	353,190
1978	16,155	56,542	97,375	195,048	16,971	25,456	26,003	45,407	13,732	17,878	155	170,391	340,486	255,439
1979	21,943	76,800	107,402	215,160	21,683	32,524	50,771	93,190	39,467	59,604	250	241,516	477,529	359,522
1980	49,670	173,845	121,038	242,499	29,791	44,686	45,688	81,695	58,559	82,890	818	305,563	626,432	465,998
1981	55,046	192,662	157,425	315,347	41,667	62,501	70,085	128,432	46,903	71,983	1,130	372,256	772,055	572,156
1982	38,136	133,474	141,247	283,002	23,699	35,549	79,756	143,370	28,819	43,359	334	311,991	639,088	475,540
1983	23,732	83,061	109,934	220,216	17,987	26,981	25,325	43,905	18,202	26,911	295	195,476	401,370	298,423
1984	12,283	42,991	130,836	262,061	21,566	30,894	37,670	63,906	33,243	52,380	598	236,196	452,830	344,513
1985	22,732	79,563	121,731	243,727	22,771	33,262	61,215	110,517	36,379	58,426	392	265,219	525,887	395,553
1986	34,270	119,945	125,329	251,033	33,758	46,937	114,665	204,378	37,596	60,835	758	346,376	683,887	515,132
1987	42,938	150,283	128,578	257,473	37,816	54,034	86,734	156,240	39,268	62,832	1,128	336,461	681,989	509,225
1988	39,892	139,623	133,237	266,895	43,943	62,193	122,841	219,791	39,963	63,937	992	380,869	753,432	567,151
1989	27,113	94,896	60,260	120,661	34,568	48,407	73,064	129,769	41,794	66,816	1,258	238,058	461,808	349,933
1990	15,853	55,485	99,543	199,416	39,962	54,792	84,786	151,029	41,883	68,279	687	282,715	529,690	406,202
1991	12,849	44,970	64,552	129,308	31,488	42,755	56,653	101,349	22,393	34,054	310	188,245	352,746	270,495
1992	17,993	62,094	118,778	237,811	35,257	48,742	149,785	231,312	26,698	41,187	1,194	349,705	622,340	486,023
1993	25,186	80,938	134,150	268,550	30,645	42,156	74,500	188,643	20,190	30,908	466	285,137	611,662	448,399
1994	18,159	56,888	80,830	167,590	29,667	40,170	50,368	82,257	9,160	12,536	436	188,619	359,876	274,247
1995	25,022	76,453	141,607	256,164	23,851	32,368	46,400	71,828	16,626	24,025	213	253,719	461,051	357,385
1996	51,867	153,553	173,285	357,444	32,008	42,558	40,926	70,781	26,228	38,972	651	324,965	663,960	494,462
1997	66,972	169,030	99,332	157,167	24,300	33,018	22,142	42,416	8,275	11,525	365	221,387	413,521	317,454
1998	9,233	192,621	132,736	177,551	24,495	34,301	28,841	53,682	18,263	22,367	403	213,971	480,925	347,448
1999	6,761	188,043	163,417	215,042	25,880	36,679	27,814	45,851	9,510	11,474	419	233,801	497,508	365,655
2000	4,022	216,034	148,710	254,736	24,129	35,070	37,942	56,734	11,113	13,517	270	226,186	576,361	401,273
2001	3,419	169,125	136,949	194,299	16,939	24,452	31,868	49,805	4,891	5,898	266	194,331	443,845	319,088
2002	60,917	148,152	134,679	187,273	28,609	39,275	52,326	83,158	8,824	10,786	450	285,805	469,095	377,450
2003	47,127	127,368	174,862	256,264	23,142	31,892	30,398	49,473	5,199	6,427	237	280,964	471,662	376,313
2004	68,331	125,093	160,252	243,479	30,423	43,266	54,477	91,296	7,393	9,325	319	321,195	512,778	416,986
2005	154,976	287,868	185,846	261,393	20,685	29,531	28,552	78,757	6,529	8,383	319	396,906	666,252	531,579
2006	128,406	300,923	181,207	248,981	24,925	34,641	37,065	75,427	8,980	11,457	450	381,034	671,879	526,456
2007	125,231	263,058	133,333	191,331	18,524	26,784	24,667	76,180	6,757	8,614	297	308,810	566,264	437,537

Labrador : SFAs 1,2&14B
Newfoundland: SFAs 3-14A
Gulf of St. Lawrence: SFAs 15-18
Scotia-Fundy: SFAs 19-23 (SFA 22 is not included as it does not produce 2SW salmon)
Quebec: Q1-Q11

Table 4.4.7.2.2 Estimated numbers of 2SW returns in North America by geographic regions, 1971–2007.

	Labrador		Newfoundland		Quebec		Gulf of St. Lawrence		Scotia-Fundy		USA	North America		
Year	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		Min	Max	Mid-points
1971	4,312	29,279	2,388	8,923	34,568	51,852	29,450	46,846	11,796	16,613	653	82,513	153,513	118,013
1972	3,706	25,168	2,511	9,003	45,094	67,642	35,604	59,953	14,209	19,347	1,383	102,509	182,497	142,503
1973	5,183	35,196	2,995	11,527	49,765	74,647	34,871	59,568	11,289	15,160	1,427	105,531	197,525	151,528
1974	5,003	34,148	1,940	6,596	66,762	100,143	49,044	83,418	21,999	28,480	1,394	146,142	254,179	200,161
1975	4,772	32,392	2,305	7,725	56,695	85,042	31,153	51,874	23,338	30,361	2,331	120,594	209,725	165,159
1976	5,519	37,401	2,334	7,698	56,365	84,547	29,238	51,439	21,854	29,419	1,317	116,626	211,822	164,224
1977	4,867	33,051	1,845	6,247	66,442	99,663	58,774	100,788	28,679	38,402	1,998	162,606	280,149	221,378
1978	3,864	26,147	1,991	6,396	59,826	89,739	30,411	51,505	17,006	22,000	4,208	117,306	199,994	158,650
1979	2,231	15,058	1,088	3,644	32,994	49,491	8,643	14,337	9,673	13,233	1,942	56,571	97,705	77,138
1980	5,190	35,259	2,432	7,778	78,447	117,670	43,359	73,863	33,273	44,868	5,796	168,497	285,234	226,866
1981	4,734	32,051	3,451	12,035	61,633	92,449	17,695	29,615	21,381	29,454	5,601	114,495	201,206	157,850
1982	3,491	23,662	2,914	9,012	54,655	81,982	31,591	51,156	17,407	23,420	6,056	116,113	195,288	155,700
1983	2,538	17,181	2,586	8,225	44,886	67,329	28,987	46,897	15,263	21,394	2,155	96,415	163,180	129,798
1984	1,806	12,252	2,233	7,060	44,661	59,160	20,437	34,150	17,011	25,447	3,222	89,371	141,291	115,331
1985	1,448	9,779	958	3,059	45,916	61,460	22,965	43,606	24,445	38,251	5,529	101,261	161,684	131,473
1986	2,470	16,720	1,606	5,245	55,159	72,560	35,866	71,110	16,963	29,544	6,176	118,240	201,355	159,798
1987	3,289	22,341	1,336	4,433	52,699	68,365	22,513	43,630	10,846	18,524	3,081	93,764	160,374	127,069
1988	2,068	14,037	1,563	5,068	56,870	75,387	27,526	53,511	9,560	17,166	3,286	100,874	168,454	134,664
1989	2,018	13,653	697	2,299	51,656	67,066	17,846	35,107	11,175	19,410	3,197	86,590	140,732	113,661
1990	1,148	7,790	1,347	4,401	50,261	66,352	22,233	42,164	9,580	16,765	5,051	89,620	142,523	116,071
1991	548	3,740	1,054	3,429	46,841	60,724	20,616	39,369	10,058	16,442	2,647	81,764	126,352	104,058
1992	2,515	15,548	3,111	10,554	46,917	61,285	28,839	49,043	9,296	15,033	2,459	93,137	153,924	123,530
1993	3,858	18,234	1,499	5,094	37,023	46,484	18,117	66,064	6,468	9,407	2,231	69,197	147,514	108,355
1994	5,653	24,396	1,294	4,424	37,703	47,180	20,498	41,459	4,238	5,990	1,346	70,732	124,794	97,763
1995	12,368	44,205	1,641	5,504	43,755	54,186	29,993	48,353	5,116	7,620	1,748	94,621	161,616	128,118
1996	9,113	32,759	2,483	6,605	39,413	49,846	19,316	40,342	7,088	10,494	2,407	79,820	142,454	111,137
1997	8,919	26,674	2,714	5,909	32,443	41,017	15,291	32,670	3,791	5,385	1,611	64,769	113,265	89,017
1998	21,886	50,512	3,682	7,208	24,358	31,832	8,656	23,526	2,479	2,981	1,526	62,587	117,586	90,086
1999	5,245	30,259	2,599	9,661	25,415	33,710	9,924	19,947	3,771	4,330	1,168	48,122	99,075	73,598
2000	7,108	32,391	2,022	12,023	24,317	33,992	10,964	20,804	2,064	2,506	533	47,009	102,250	74,629
2001	7,869	36,361	1,614	7,832	25,562	35,398	19,206	32,264	3,559	4,240	788	58,598	116,882	87,740
2002	5,446	17,586	1,268	5,796	18,714	26,135	8,249	19,374	1,093	1,285	511	35,281	70,688	52,984
2003	4,006	15,399	1,419	6,894	28,787	38,262	16,868	34,939	2,645	3,120	1,192	54,917	99,806	77,362
2004	6,578	16,395	1,309	6,934	25,401	33,207	17,692	40,066	2,394	2,886	1,283	54,658	100,771	77,714
2005	6,695	21,865	1,324	5,900	24,622	31,996	14,600	34,634	1,499	1,847	984	49,725	97,227	73,476
2006	7,448	21,146	1,467	7,142	22,573	29,792	13,049	32,202	2,190	2,704	1,023	47,750	94,010	70,880
2007	7,777	22,736	1,107	4,689	20,062	26,861	15,076	35,256	1,178	1,415	954	46,154	91,910	69,032

Labrador : SFAs 1,2&14B
Newfoundland: SFAs 3-14A
Gulf of St. Lawrence: SFAs 15-18
Scotia-Fundy: SFAs 19-23 (SFA 22 is not included as it does not produce 2SW salmon)
Quebec: Q1-Q11

Table 4.4.7.2.3 Estimated numbers of 1SW spawners in North America by geographic regions, 1971–2007.

	Labrador		Newfoundland		Quebec		Gulf of St. Lawrence		Scotia-Fundy		USA	North America		
Year	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		Min	Max	Mid-points
1971	29,032	111,448	85,978	199,463	9,338	14,007	18,714	35,529	7,984	16,182	29	151,075	376,659	263,867
1972	21,728	83,415	84,880	195,010	8,213	12,320	22,883	43,310	6,388	14,320	17	144,109	348,392	246,251
1973	0	11,405	108,785	253,965	10,987	16,480	26,468	51,224	12,913	23,505	13	159,166	356,592	257,879
1974	24,533	92,118	58,731	144,263	10,067	15,100	45,426	84,673	23,652	42,252	40	162,448	378,446	270,447
1975	49,688	183,837	78,882	191,775	11,606	17,409	40,108	74,913	20,798	31,422	67	201,148	499,422	350,285
1976	31,814	125,665	80,571	196,132	12,979	19,469	52,720	99,791	30,833	50,389	151	209,069	491,597	350,333
1977	28,815	112,337	75,762	186,149	12,004	18,006	13,339	27,572	23,320	40,661	54	153,295	384,780	269,037
1978	13,464	53,851	68,756	166,429	11,447	17,170	13,008	25,469	6,925	11,071	127	113,727	274,117	193,922
1979	17,825	72,682	76,233	183,991	15,863	23,795	28,073	57,265	26,320	46,457	247	164,560	384,435	274,497
1980	45,870	170,045	85,189	206,650	20,817	31,226	25,014	50,265	37,229	61,560	722	214,841	520,467	367,654
1981	49,855	187,471	110,755	268,677	30,952	46,428	37,218	77,324	27,511	52,591	1,009	257,301	633,501	445,401
1982	34,032	129,370	99,376	241,131	16,877	25,316	48,992	96,935	17,035	31,575	290	216,602	524,618	370,610
1983	19,360	78,689	77,514	187,796	12,030	18,045	12,821	24,669	10,413	19,122	255	132,392	328,576	230,484
1984	9,348	40,056	91,505	222,730	16,316	24,957	16,981	33,633	23,048	42,185	540	157,739	364,102	260,920
1985	19,631	76,462	85,179	207,175	15,608	25,140	37,301	73,871	25,001	47,048	363	183,083	430,059	306,571
1986	30,806	116,481	87,833	213,537	22,230	33,855	77,403	149,553	27,714	50,953	660	246,645	565,039	405,842
1987	37,572	144,917	104,096	232,991	25,789	40,481	56,009	110,287	29,138	52,702	1,087	253,690	582,464	418,077
1988	34,369	134,100	93,396	227,054	28,582	44,815	80,832	159,806	29,991	53,965	923	268,094	620,664	444,379
1989	22,429	90,212	41,798	102,199	24,710	37,319	42,161	81,697	30,847	55,869	1,080	163,025	368,377	265,701
1990	12,544	52,176	69,576	169,449	26,594	39,826	49,760	124,531	30,651	57,047	617	189,742	443,648	316,695
1991	10,526	42,647	44,023	108,779	20,582	30,433	36,475	87,038	16,373	28,034	235	128,214	297,165	212,690
1992	15,229	59,331	95,096	214,129	21,754	33,583	106,918	192,842	18,943	33,432	1,124	259,065	534,441	396,753
1993	22,499	78,251	107,816	242,217	17,493	27,444	50,042	169,880	15,075	25,681	444	213,370	543,916	378,643
1994	15,242	53,971	52,756	139,516	16,758	25,642	27,038	56,937	7,451	10,760	427	119,671	287,254	203,462
1995	22,199	73,630	113,615	228,171	14,409	21,548	21,202	46,851	14,108	21,507	213	185,745	391,920	288,833
1996	48,924	150,610	139,954	324,113	18,923	27,805	13,691	41,225	21,766	34,477	651	243,910	578,881	411,395
1997	64,389	166,446	78,276	136,110	14,724	22,210	7,069	24,496	6,696	9,937	365	171,518	359,564	265,541
1998	6,726	190,114	110,336	155,150	16,743	25,730	16,621	35,276	17,835	21,914	403	168,664	428,588	298,626
1999	4,244	185,526	138,692	190,317	18,969	28,808	16,658	30,517	9,198	11,156	419	188,180	446,743	317,462
2000	752	212,764	124,643	230,669	16,444	25,865	23,236	38,147	10,772	13,151	270	176,116	520,865	348,490
2001	906	166,612	111,756	169,106	10,836	16,989	19,007	35,523	4,588	5,566	266	147,359	394,063	270,711
2002	58,341	145,576	111,970	164,564	17,070	25,625	31,937	62,210	8,555	10,484	450	228,323	408,909	318,616
2003	44,522	124,763	151,998	233,401	15,445	23,187	18,587	36,099	4,976	6,180	237	235,766	423,867	329,816
2004	65,927	122,689	138,564	221,790	20,513	32,081	30,952	60,520	7,168	9,067	319	263,443	446,467	354,955
2005	152,257	285,149	161,379	236,926	14,295	22,278	17,868	52,225	6,365	8,193	319	352,484	605,091	478,787
2006	126,169	298,686	157,806	224,885	17,305	25,893	22,762	50,467	8,788	11,215	450	333,281	611,596	472,438
2007	123,007	260,833	116,741	174,593	13,032	20,477	15,400	50,646	6,596	8,415	297	275,072	515,261	395,167

Labrador : SFAs 1,2&14B
Newfoundland: SFAs 3-14A
Gulf of St. Lawrence: SFAs 15-18
Scotia-Fundy: SFAs 19-23 (SFA 22 is not included as it does not produce 2SW salmon)
Quebec: Q1-Q11

Table 4.4.7.2.4 Estimated numbers of 2SW spawners in North America by geographic regions, 1971–2007.

	Labrador		Newfoundland		Quebec		Gulf of St. Lawrence		Scotia-Fundy		USA	North America		
Year	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		Min	Max	Mid-points
1971	4,012	28,882	1,817	8,055	11,822	17,733	4,270	8,251	6,245	10,646	490	28,657	74,058	51,357
1972	3,435	24,812	2,008	8,240	23,160	34,741	17,768	33,012	9,472	14,445	1,038	56,882	116,288	86,585
1973	4,565	34,376	2,283	10,449	23,564	35,346	20,469	38,143	6,230	9,930	1,100	58,211	129,343	93,777
1974	4,490	33,475	1,510	5,942	28,657	42,985	31,661	57,942	10,526	16,697	1,147	77,991	158,188	118,089
1975	4,564	32,119	1,888	7,086	23,818	35,726	18,450	33,223	11,907	18,680	1,942	62,569	128,776	95,673
1976	4,984	36,701	2,011	7,198	22,653	33,980	14,787	29,709	11,954	19,025	1,126	57,516	127,739	92,627
1977	4,042	31,969	1,114	5,088	32,602	48,902	32,485	60,210	16,763	25,914	643	87,648	172,727	130,187
1978	3,361	25,490	1,557	5,712	29,889	44,834	11,446	22,859	8,761	13,417	3,314	58,329	115,626	86,978
1979	1,823	14,528	980	3,463	12,807	19,210	3,541	6,839	6,600	9,996	1,509	27,259	55,544	41,402
1980	4,633	34,525	1,888	6,925	35,594	53,390	19,884	37,673	18,317	29,084	4,263	84,579	165,861	125,220
1981	4,403	31,615	3,074	11,442	26,132	39,199	4,599	10,054	10,726	17,931	4,334	53,269	114,575	83,922
1982	3,081	23,127	2,579	8,481	26,492	39,738	10,965	20,363	9,374	14,764	4,643	57,134	111,115	84,125
1983	2,267	16,824	2,244	7,677	17,308	25,963	7,375	14,316	4,209	9,258	1,769	35,172	75,807	55,489
1984	1,478	11,822	2,063	6,800	22,345	32,659	15,308	27,286	13,585	21,617	2,547	57,327	102,731	80,029
1985	1,258	9,530	946	3,042	20,668	31,742	21,057	40,101	19,789	33,046	4,884	68,602	122,345	95,473
1986	2,177	16,334	1,575	5,198	24,088	35,939	32,682	65,211	14,296	26,563	5,570	80,388	154,815	117,601
1987	2,895	21,821	1,320	4,409	21,723	31,727	19,756	38,874	9,553	17,078	2,781	58,028	116,690	87,359
1988	1,625	13,452	1,540	5,033	25,390	38,343	24,833	48,498	8,264	15,717	3,038	64,690	124,081	94,386
1989	1,727	13,270	690	2,289	25,016	35,905	15,346	30,721	10,925	19,131	2,800	56,504	104,115	80,310
1990	923	7,493	1,327	4,372	24,422	36,219	20,103	38,865	9,020	16,139	4,356	60,150	107,443	83,796
1991	491	3,665	1,041	3,410	19,959	29,052	19,187	37,205	8,801	15,037	2,416	51,895	90,785	71,340
1992	2,012	14,889	3,057	10,474	19,337	28,833	26,728	45,765	8,243	13,857	2,292	61,670	116,110	88,890
1993	3,624	17,922	1,449	5,017	15,774	21,428	17,108	64,652	5,414	8,241	2,065	45,435	119,324	82,379
1994	5,347	23,992	1,176	4,238	15,631	21,147	18,836	38,682	3,541	5,175	1,344	45,876	94,578	70,227
1995	12,083	43,828	1,533	5,331	22,575	28,703	28,376	45,933	4,803	7,274	1,748	71,117	132,817	101,967
1996	8,878	32,448	2,353	6,398	19,010	25,421	17,474	37,361	6,368	9,682	2,407	56,491	113,717	85,104
1997	8,785	26,497	2,596	5,721	15,531	20,780	13,834	30,429	3,241	4,774	1,611	45,598	89,813	67,705
1998	21,574	50,200	3,599	7,073	14,240	19,439	6,985	20,721	2,175	2,641	1,526	50,099	101,601	75,850
1999	4,832	29,846	2,551	9,565	17,250	23,811	9,113	18,504	3,330	3,871	1,168	38,244	86,764	62,504
2000	6,701	31,984	1,829	11,781	16,128	23,331	9,461	18,879	1,881	2,304	1,587	37,588	89,866	63,727
2001	7,384	35,876	1,534	7,709	16,696	24,056	17,529	31,141	3,320	3,969	1,491	47,954	104,241	76,098
2002	5,263	17,370	1,175	5,586	12,467	17,787	7,426	18,344	927	1,093	511	27,769	60,690	44,230
2003	3,793	15,147	1,375	6,803	20,738	28,570	15,696	33,726	2,467	2,920	1,192	45,260	88,358	66,809
2004	6,332	16,104	1,259	6,834	17,462	23,633	15,710	35,391	2,297	2,773	1,283	44,344	86,018	65,181
2005	6,443	21,567	1,276	5,804	17,529	23,482	14,175	33,786	1,416	1,748	1,088	41,928	87,476	64,702
2006	7,244	20,904	1,404	7,030	16,185	21,887	12,672	31,405	2,064	2,557	1,419	40,987	85,203	63,095
2007	7,581	22,503	1,032	4,638	14,008	19,484	14,636	34,395	1,091	1,312	1,189	39,537	83,521	61,529

Labrador : SFAs 1,2&14B
Newfoundland: SFAs 3-14A
Gulf of St. Lawrence: SFAs 15-18
Scotia-Fundy: SFAs 19-23 (SFA 22 is not included as it does not produce 2SW salmon)
Quebec: Q1-Q11

Table 4.4.10.1 Run reconstruction data inputs for harvests used to estimate pre-fishery abundance of maturing and non-maturing 1SW salmon of North American origin (terms defined in Table 4.4.10.2).

	{1}			{1-7, 14b}		{8-14a}		{1-7, 14b}
1SW Year (i)	AH_Small (i)	AH_Large (i+1)	AH_Large (i)	H_Small (i)	H_Large (i)	H_Small (i)	H_Large (i+1)	H_Large (i+1)
1971	0	0	0	158896	199176	70936	42861	144496
1972	0	0	0	143232	144496	111141	43627	227779
1973	0	0	0	188725	227779	176907	85714	196726
1974	0	0	0	192195	196726	153278	72814	215025
1975	0	0	0	302348	215025	91935	95714	210858
1976	0	0	0	221766	210858	118779	63449	231393
1977	0	0	0	220093	231393	57472	37653	155546
1978	0	0	0	102403	155546	38180	29122	82174
1979	0	0	0	186558	82174	62622	54307	211896
1980	0	0	0	290127	211896	94291	38663	211006
1981	0	0	0	288902	211006	60668	35055	129319
1982	0	0	0	222894	129319	77017	28215	108430
1983	0	0	0	166033	108430	55683	15135	87742
1984	0	0	0	123774	87742	52813	24383	70970
1985	0	0	0	178719	70970	79275	22036	107561
1986	0	0	0	222671	107561	91912	19241	146242
1987	0	0	0	281762	146242	82401	14763	86047
1988	0	0	0	198484	86047	74620	15577	85319
1989	0	0	0	172861	85319	60884	11639	59334
1990	0	0	0	104788	59334	46053	10259	39257
1991	0	0	0	89099	39257	42721	0	32341
1992	0	0	0	24249	32341	0	0	17096
1993	0	0	0	17074	17096	0	0	15377
1994	0	0	0	8640	15377	0	0	11176
1995	0	0	0	7980	11176	0	0	7272
1996	0	0	0	7849	7272	0	0	6943
1997	0	2269	0	9753	6943	0	0	0
1998	2988	1084	2269	0	0	0	0	0
1999	2739	1352	1084	0	0	0	0	0
2000	5323	1673	1352	0	0	0	0	0
2001	4789	1437	1673	0	0	0	0	0
2002	5806	2175	1437	0	0	0	0	0
2003	6477	3696	2175	0	0	0	0	0
2004	8385	2817	3696	0	0	0	0	0
2005	10436	3090	2817	0	0	0	0	0
2006	10377	2652	3090	0	0	0	0	0
2007	9208		2652	0	0	0	0	0

Table 4.4.10.2 Definitions of key variables used in continental run-reconstruction models for North American salmon.

I	Year of the fishery on 1SW salmon in Greenland and Canada
M	Natural mortality rate (0.03 per month)
t1	Time between the mid-point of the Canadian fishery and return to river = 1 months
S1	Survival of 1SW salmon between the homewater fishery and return to river {exp(-M t1)}
H_s(i)	Number of "Small" salmon caught in Canada in year i; fish <2.7 kg
H_l(i)	Number of "Large" salmon caught in Canada in year i; fish >=2.7 kg
AH_s	Aboriginal and resident food harvests of small salmon in northern Labrador
AH_l	Aboriginal and resident food harvest of large salmon in northern Labrador
f_imm	Fraction of 1SW salmon that are immature, i.e. non-maturing: range = 0.1 to 0.2
af_imm	Fraction of 1SW salmon that are immature in native and resident food fisheries in N Lab
q	Fraction of 1SW salmon present in the large size market category; range = 0.1 to 0.3
MC1(i)	Harvest of maturing 1SW salmon in Newfoundland and Labrador in year i
i+1	Year of fishery on 2SW salmon in Canada
MR1(i)	Return estimates of maturing 1SW salmon in Atlantic Canada in year i
NN1(i)	Pre-fishery abundance of non-maturing 1SW + maturing 2SW salmon in year i
NR(i)	Return estimates of non-maturing + maturing 2SW salmon in year i
NR2(i+1)	Return estimates of maturing 2SW salmon in Canada
NC1(i)	Harvest of non-maturing 1SW salmon in Nfld + Labrador in year i
NC2(i+1)	Harvest of maturing 2SW salmon in Canada
NG(i)	Catch of 1SW North American origin salmon at Greenland
S2	Survival of 2SW salmon between Greenland and homewater fisheries
MN1(i)	Pre-fishery abundance of maturing 1SW salmon in year i
RFL1	Labrador raising factor for 1SW used to adjust pre-fishery abundance
RFL2	Labrador raising factor for 2SW used to adjust pre-fishery abundance

Table 4.4.10.3 Run reconstruction data inputs used to estimate pre-fishery abundance of non-maturing (NN1) 1SW salmon of North American origin (terms defined in Table 4.4.10.2).

1SW Year (i)	NG1(i)	NC1(i) min	max	NC2(i+1) min	max	NR2(i+1) min	max	NN1(i) min	max	mid-point
1971	287672	17881	43730	144008	172907	102509	182497	642531	818649	730590
1972	200784	15768	37316	203072	248628	105531	197525	637461	848464	742962
1973	241493	21150	51412	223422	262767	146142	254179	767511	1001159	884335
1974	220584	21187	50243	223332	266337	120594	209725	710979	922064	816521
1975	278839	32385	73371	243315	285486	116626	211822	801888	1032214	917051
1976	155896	24285	57005	225424	271703	162606	280149	710652	969340	839996
1977	189709	24323	57902	146535	177644	117306	199994	575003	765592	670297
1978	118853	11796	29813	86644	103079	56571	97705	326294	423712	375003
1979	200061	19478	42242	202634	245013	168497	285234	727440	969788	848614
1980	187999	31132	70739	186367	228568	114495	201206	629959	847144	738551
1981	227727	31000	70441	125578	151442	116113	195288	589750	774232	681991
1982	194715	23583	52338	104116	125802	96415	163180	492949	643847	568398
1983	33240	17688	39712	76554	94103	89371	141291	278577	396509	337543
1984	38916	13255	30019	74062	88256	101261	161684	292995	412966	352981
1985	139233	18582	40002	97329	118841	118240	201355	453663	619732	536697
1986	171745	23343	50988	121610	150859	93764	160374	489667	649446	569557
1987	173687	29639	65127	74996	92205	100874	168454	444872	597593	521232
1988	116767	20709	44860	75300	92364	86590	140732	359565	482059	420812
1989	60693	18139	39691	53173	65040	89620	142523	275267	386423	330845
1990	73109	11072	24518	37739	45590	81764	126352	248854	334918	291886
1991	110680	9302	20175	22639	29107	93137	153924	280092	384249	332170
1992	41855	2748	6790	11967	15386	69197	147514	157008	274602	215805
1993	0	1878	4441	10764	13839	70732	124794	114794	196706	155750
1994	0	1018	2651	7823	10058	94621	161616	143193	241030	192112
1995	21341	910	2267	5090	6545	79820	142454	140149	230590	185370
1996	21944	858	2006	4860	6249	64769	113265	119453	189933	154693
1997	16814	1045	2367	1588	2269	62587	117586	107059	185802	146431
1998	3026	161	367	759	1084	48122	99075	71147	142666	106906
1999	5374	142	306	946	1352	47009	102250	72182	149731	110957
2000	5571	273	573	1171	1673	58598	116882	88933	170981	129957
2001	9712	248	529	1006	1437	35281	70688	60392	110505	85448
2002	2249	297	624	1523	2175	54917	99806	80990	144635	112813
2003	2663	335	713	2587	3696	54658	100771	82517	148535	115526
2004	3832	438	949	1972	2817	49725	97227	76097	143823	109960
2005	3665	536	1128	2163	3090	47750	94010	73540	139730	106635
2006	4758	534	1130	1856	2652	46154	91910	71997	137312	104655
2007	6587	474	1000					7061	7587	7324

Table 4.4.10.4 Run reconstruction data inputs and estimated pre-fishery abundance for maturing (MN1) 1SW salmon (grilse) of North American origin (terms defined in Table 4.4.10.2).

	{1}			{1-7, 14b}		{8-14a}		{1-7, 14b}
1SW Year (i)	AH_Small (i)	AH_Large (i+1)	AH_Large (i)	H_Small (i)	H_Large (i)	H_Small (i)	H_Large (i+1)	H_Large (i+1)
1971	0	0	0	158896	199176	70936	42861	144496
1972	0	0	0	143232	144496	111141	43627	227779
1973	0	0	0	188725	227779	176907	85714	196726
1974	0	0	0	192195	196726	153278	72814	215025
1975	0	0	0	302348	215025	91935	95714	210858
1976	0	0	0	221766	210858	118779	63449	231393
1977	0	0	0	220093	231393	57472	37653	155546
1978	0	0	0	102403	155546	38180	29122	82174
1979	0	0	0	186558	82174	62622	54307	211896
1980	0	0	0	290127	211896	94291	38663	211006
1981	0	0	0	288902	211006	60668	35055	129319
1982	0	0	0	222894	129319	77017	28215	108430
1983	0	0	0	166033	108430	55683	15135	87742
1984	0	0	0	123774	87742	52813	24383	70970
1985	0	0	0	178719	70970	79275	22036	107561
1986	0	0	0	222671	107561	91912	19241	146242
1987	0	0	0	281762	146242	82401	14763	86047
1988	0	0	0	198484	86047	74620	15577	85319
1989	0	0	0	172861	85319	60884	11639	59334
1990	0	0	0	104788	59334	46053	10259	39257
1991	0	0	0	89099	39257	42721	0	32341
1992	0	0	0	24249	32341	0	0	17096
1993	0	0	0	17074	17096	0	0	15377
1994	0	0	0	8640	15377	0	0	11176
1995	0	0	0	7980	11176	0	0	7272
1996	0	0	0	7849	7272	0	0	6943
1997	0	2269	0	9753	6943	0	0	0
1998	2988	1084	2269	0	0	0	0	0
1999	2739	1352	1084	0	0	0	0	0
2000	5323	1673	1352	0	0	0	0	0
2001	4789	1437	1673	0	0	0	0	0
2002	5806	2175	1437	0	0	0	0	0
2003	6477	3696	2175	0	0	0	0	0
2004	8385	2817	3696	0	0	0	0	0
2005	10436	3090	2817	0	0	0	0	0
2006	10377	2652	3090	0	0	0	0	0
2007	9208		2652	0	0	0	0	0

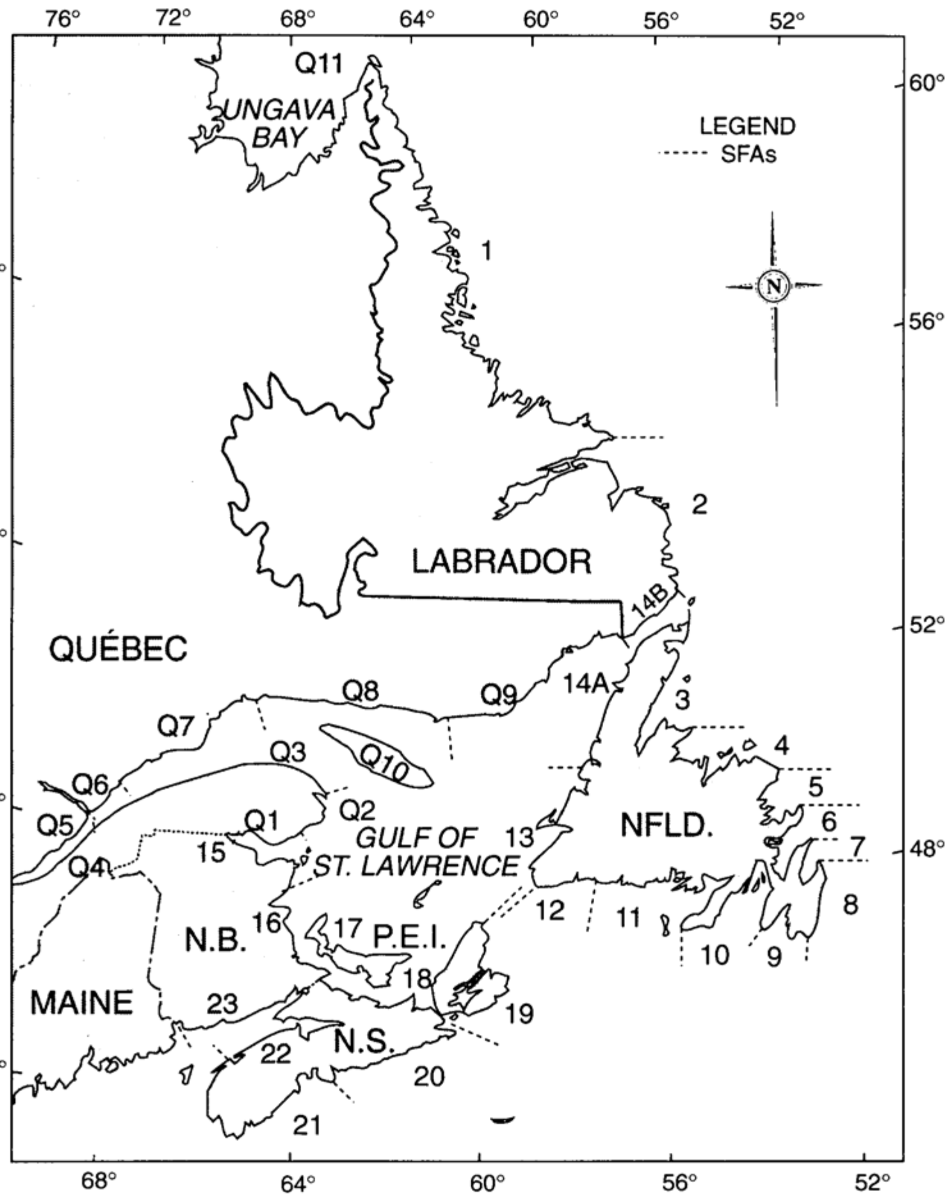


Figure 4.4.3.1 Map of Salmon Fishing Areas (SFAs) and Québec Management Zones (Qs) in Canada (NFLD. = Newfoundland, P.E.I. = Prince Edward Island, N.B. = New Brunswick, and N.S. = Nova Scotia.

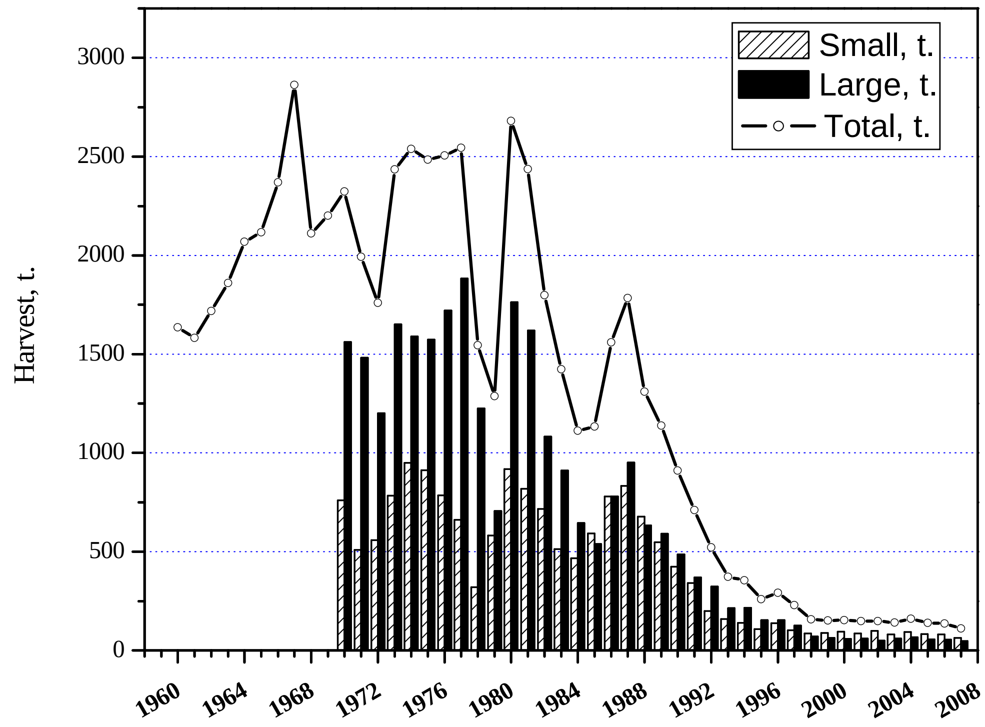


Figure 4.4.4.1 Harvest (t) of small salmon, large salmon and combined for Canada, 1960–2007 by all users.

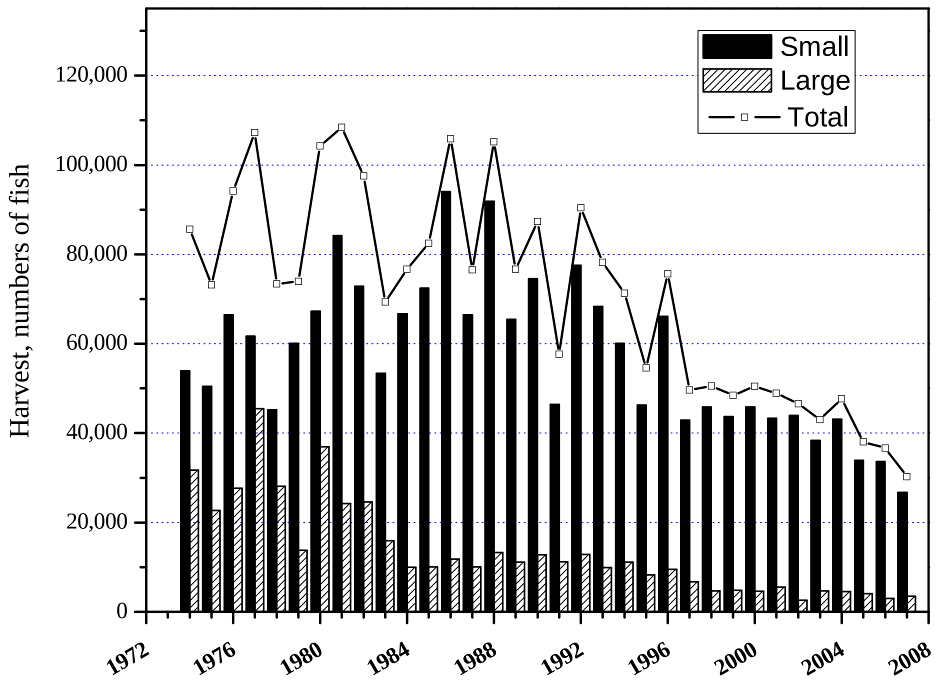


Figure 4.4.4.2 Harvest (number) of small salmon, large salmon and both sizes combined in the recreational fisheries of Canada, 1974–2007.

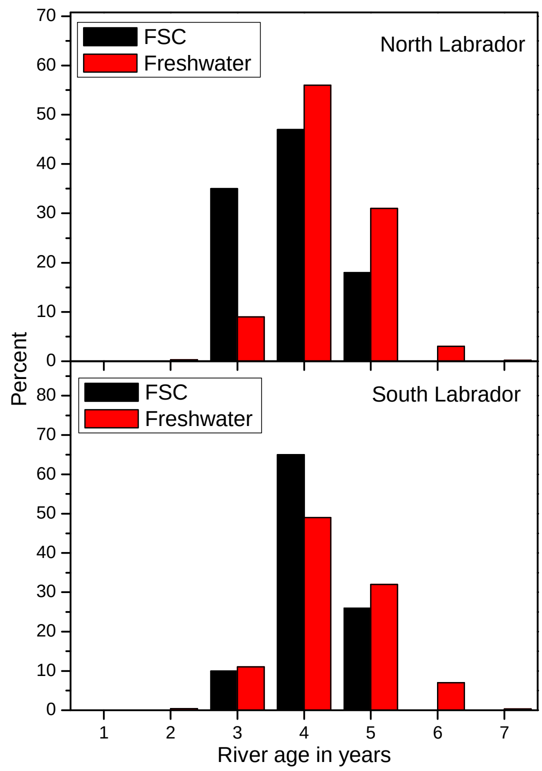


Fig. 4.4.5.1 A comparison of the river age distribution of river ages of salmon from FSC fisheries in North and South Labrador in 2007 to those at assessment facilities in 2000–2005.

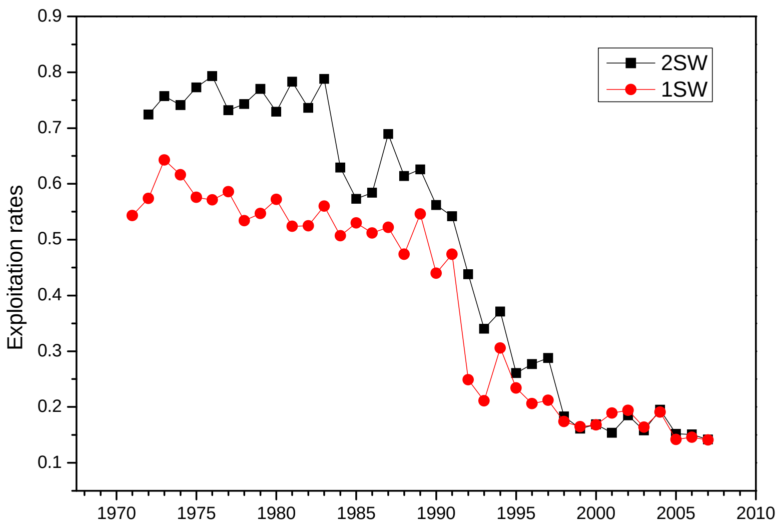


Figure. 4.4.6.1 Exploitation rates in North America on the North American stock complex of 1SW and 2SW salmon.

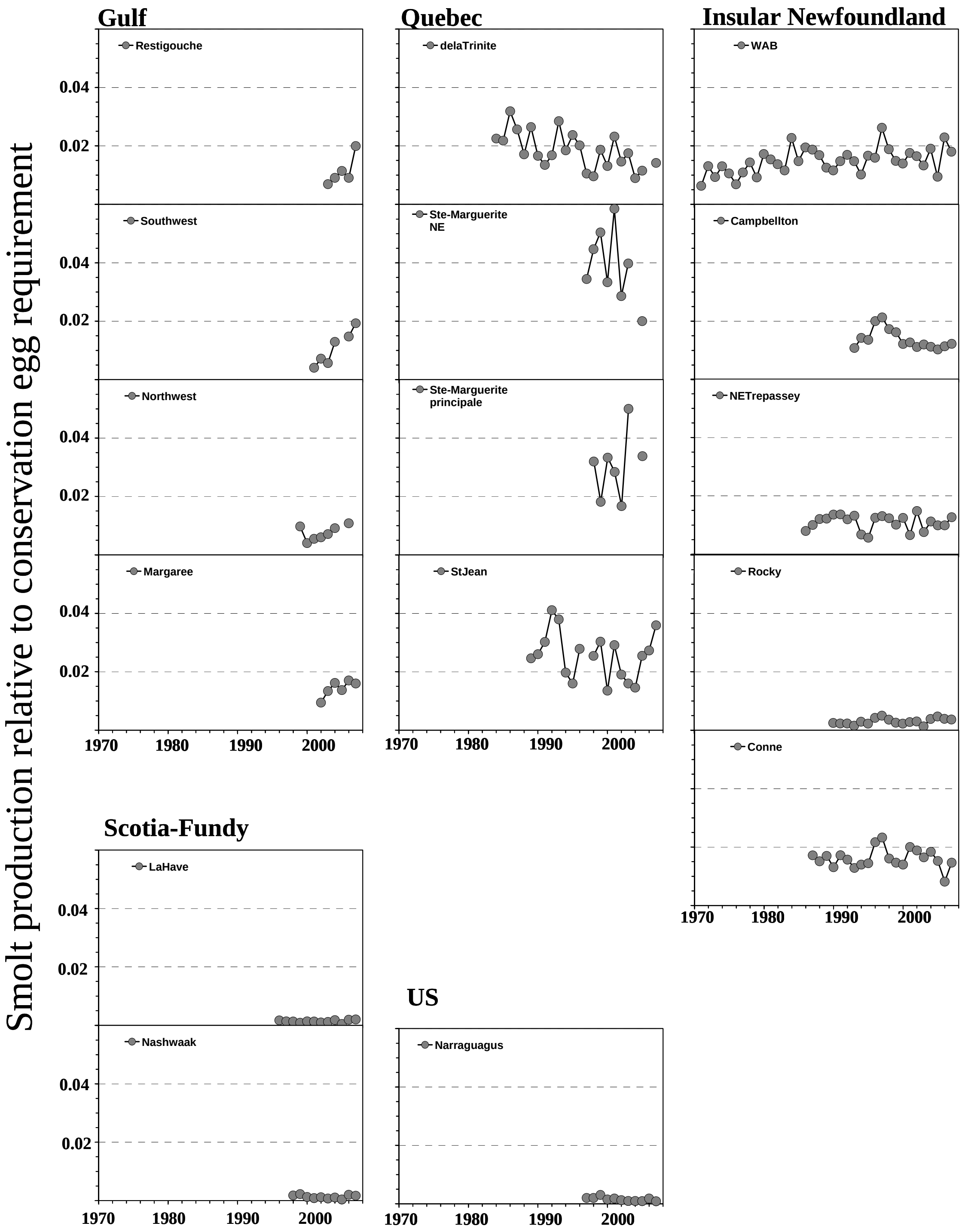


Figure 4.4.7.1 Time series of wild smolt production from fifteen monitored rivers in eastern Canada and one river of eastern USA, 1971–2007. Smolt production is expressed relative to the conservation egg requirements of the rivers.

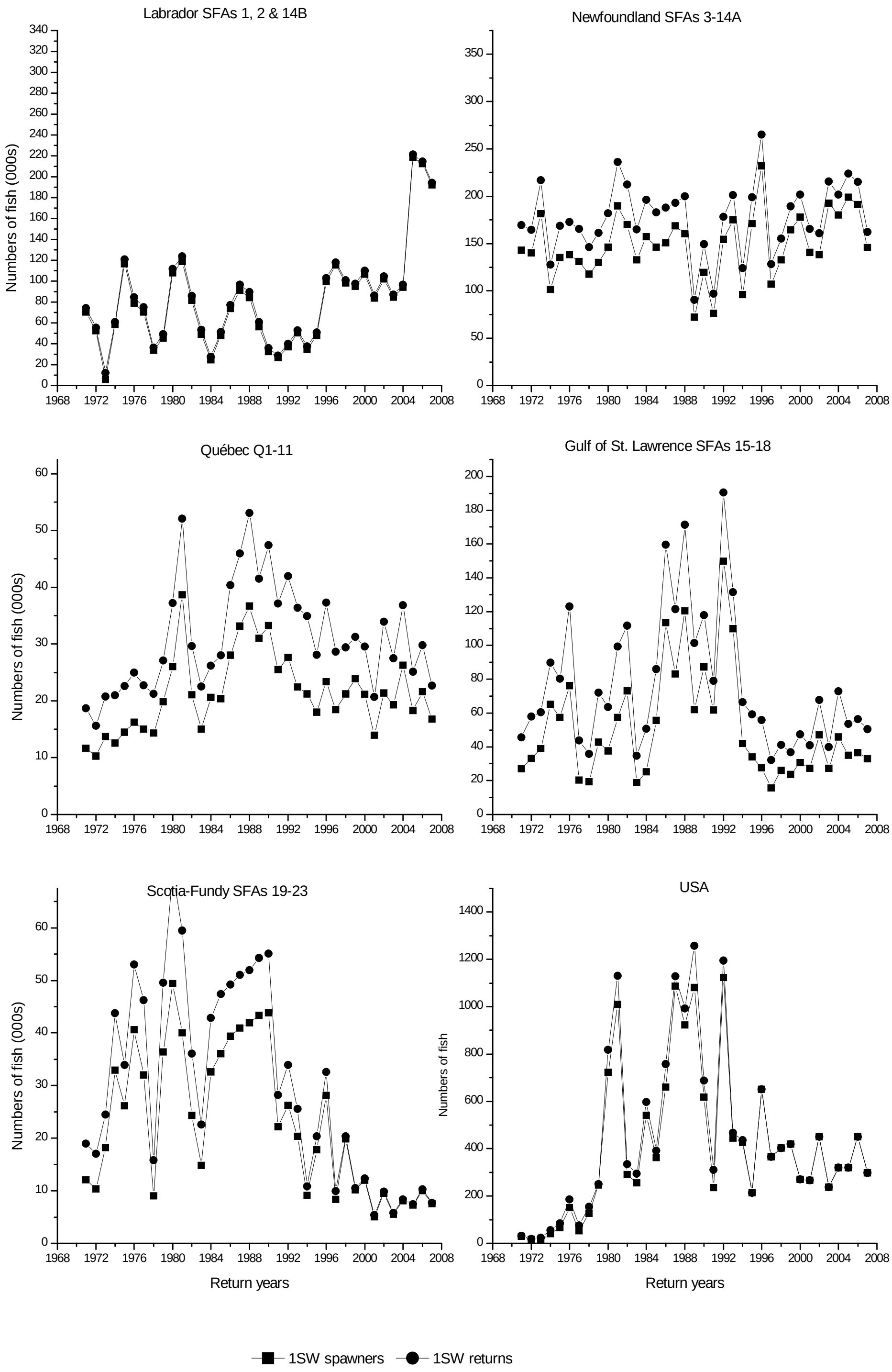


Figure 4.4.7.2.1 Comparison of estimated mid-points of 1SW returns to and 1SW spawners in rivers of six geographic areas in North America. Returns and spawners for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23. Note scale differences for USA.

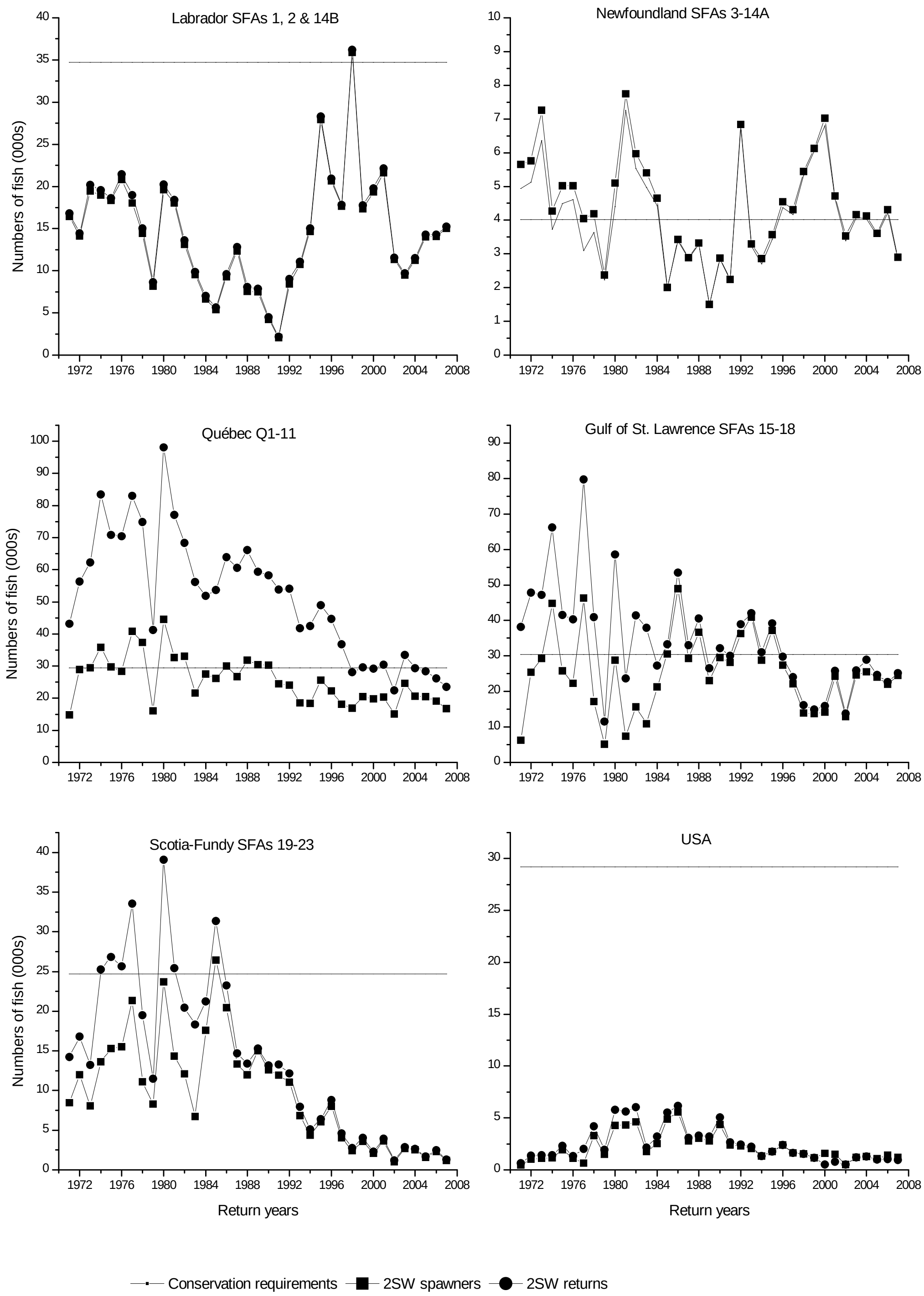


Figure 4.4.7.2.2 Comparison of estimated mid-points of 2SW returns, 2SW spawners, and 2SW conservation requirements for six geographic areas in North America. Returns and spawners for Scotia-Fundy do not include those from SFA 22 and a portion of SFA 23.

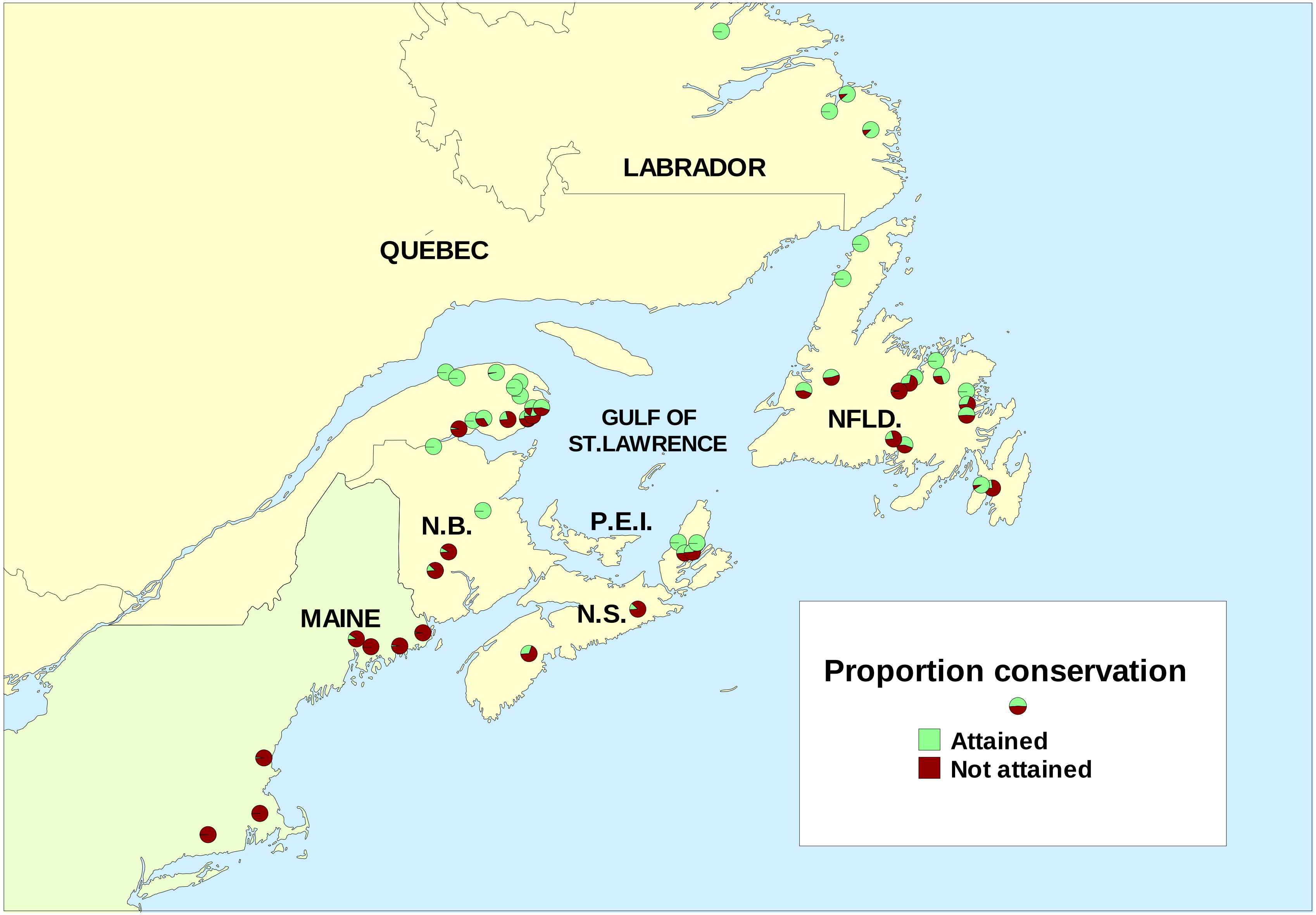


Figure 4.4.8.1 Proportion of the conservation requirement attained in assessed rivers of the North American Commission in 2007.

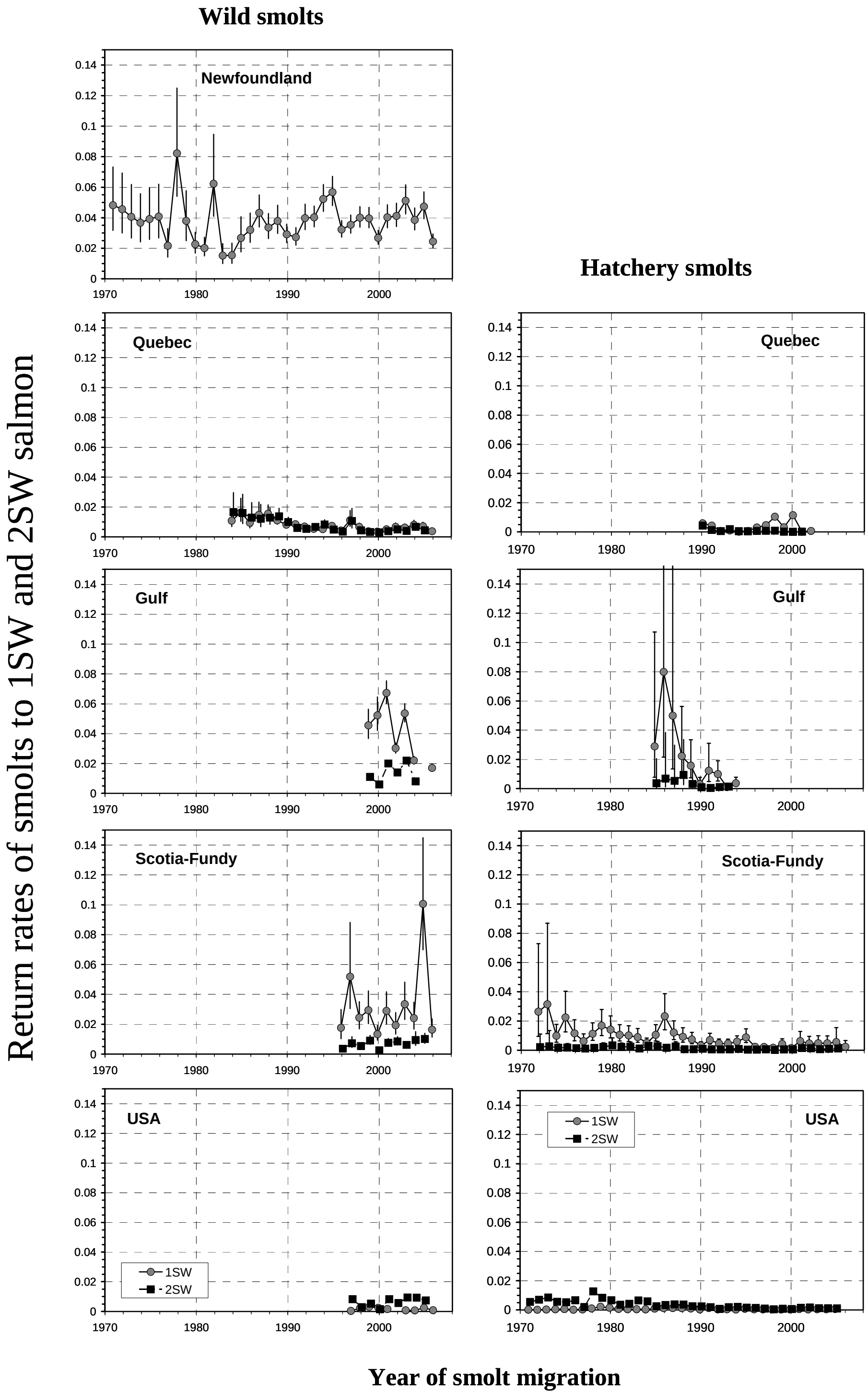


Figure 4.4.9.1 Standardized mean (one standard error bars) annual return rates of wild and hatchery origin smolts to 1SW and 2SW salmon to the geographic areas of North America The standardized values are annual means derived from a general linear model analysis of rivers in a region. Survival rates were log transformed prior to analysis.

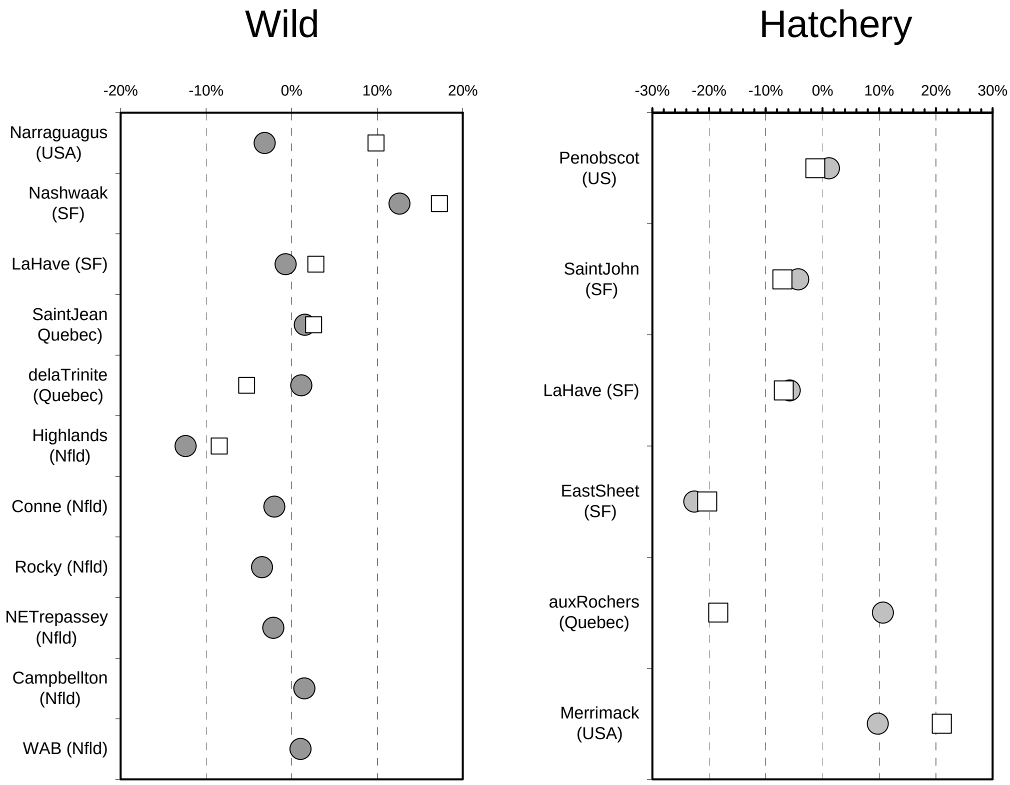


Figure 4.4.9.2 Annual rate of change (%) of return rates to 1SW and 2SW salmon by wild (left) and hatchery (right) salmon smolts to rivers of eastern North America. Grey circles are for 1SW and open squares are for data series.

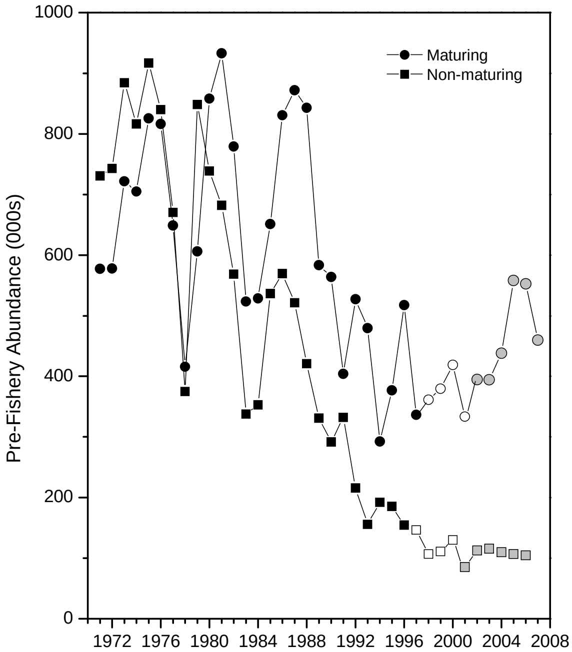


Figure 4.4.10.1 Prefishery abundance estimate of maturing and non-maturing salmon in North America. Open symbols are for the years that returns to Labrador were assumed as a proportion of returns to other areas in North America and the grey symbols for deriving returns to Labrador using returns per unit of drainage area.

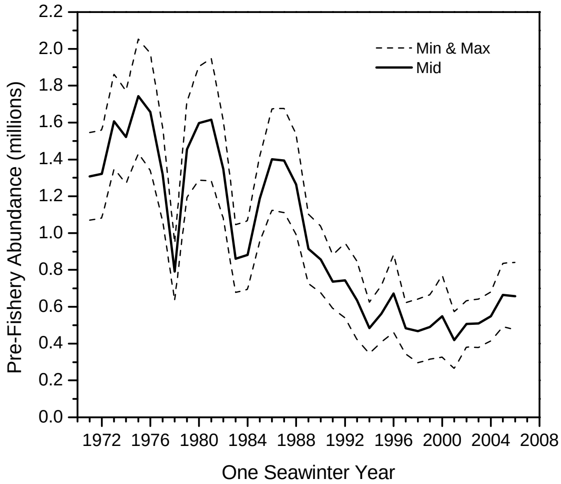


Figure 4.4.10.2 Total 1SW recruits (non-maturing and maturing) originating in North America.

5 Atlantic salmon in the West Greenland commission

5.1 NASCO has requested ICES to describe the key events of the 2007 fishery

At its annual meeting in June 2007, NASCO agreed to restrict the fishery at West Greenland to that amount used for internal subsistence consumption in Greenland. This assumes that the Framework of Indicators would determine that no change to the management advice previously provided by ICES was required. Consequently, the Greenlandic authorities set the commercial quota to nil, i.e. landings to fish plants, resale in grocery shops/markets, and commercial export of salmon from Greenland was forbidden. Licensed fishermen were allowed to sell salmon at the open markets, to hotels, restaurants, and institutions. A private fishery for personal consumption without a license was allowed. All catches, licensed and private were to be reported to the License Office on a daily basis. In agreement with the Organization for Fishermen and Hunters in Greenland the fishery for salmon was allowed from August 1 to October 31.

5.1.1 Catch and effort in 2007

A total of 24.6 t of landed salmon were reported during the 2007 fishery (Table 5.1.1.1). Catches were distributed among the six NAFO divisions at West Greenland (Figure 5.1.1.1), with approximately 80% of the catches coming from divisions 1B–1E (Table 5.1.1.2). The 2005 and 2006 landings data reported previously (ICES 2007) were mistakenly reported as gutted weights instead of whole weights. This error was corrected and all the landings data reported in Tables 5.1.1.1 and 5.1.1.2 represent whole weight. There is currently no quantitative approach for estimating the unreported catch. However, in 2007 it is likely to have been at the same level proposed in recent years (10 t).

Seasonal distribution of catches has previously been reported through ICES. However, it has become clear that the data to support this breakdown is no longer available. The reporting of fishing date is not required and some reported landings represent catches occurring on multiple days. As such, the seasonal distribution of reported landings is no longer provided.

In total, 234 reports were received in 2007; the same number received in 2006. A total of 132 people landed salmon as compared to the 136 in 2006. The number of fishermen reporting catches over the past few years has steadily increased from a low of 41 in 2002 to the current level. These levels remain well below the 400 to 600 people reporting landings in the commercial fishery from 1987 to 1991.

5.1.2 Biological characteristics of the catches

The international sampling program at West Greenland initiated by NASCO in 2001 was continued in 2007. The sampling teams from Canada, Greenland, Ireland, UK (Scotland), UK (England & Wales), and United States were in place at the start of the fishery and throughout the fishing season. Tissue and biological samples were collected from five landing sites: Qaqortoq (NAFO Division 1F), Paamiut (1E), Nuuk (1D), Maniitsoq (1C), and Ilulissat/Qeqertarsauq (1A) (Figure 5.1.1.1). In total, 1162 salmon were inspected, which represents 16% of the reported landings (by weight). Of these, 1116 were measured for fork length, 880 measured for gutted weight, 236 for whole weight, scales were collected from 1119, and tissue samples were taken from 1126 salmon for DNA analysis (Table 5.1.2.1). The broad geographic distribution of the subsistence fishery caused practical problems for the sampling teams.

However, the spatial and temporal coverage of the sampling program was adequate to assess the fishery. As in previous years, the Working Group did need to adjust the total landings by replacing the reported catch with the weight of fish sampled for use in assessment calculations (Table 5.1.2.2). In 2007 this adjustment was limited to one division only (1F) and represented a very small proportion of the reported landings (~150 kg).

The average whole weight of a fish from the 2007 catch was 2.98 kg across all ages, with North American 1SW fish averaging 63.5 cm and 2.89 kg and European 1SW salmon averaging 63.3 cm and 2.87 kg (Table 5.1.2.3). The mean lengths and mean weights for the 2007 samples dropped from the 2006 values but remained close to the 10 year mean. It should be noted that these average weights are not adjusted for the time of sampling and may not represent the true trend across the time series.

North American salmon up to river age 6 were caught at West Greenland in 2007 (Table 5.1.2.4), with >70% being river age 3 or older. The river ages of European salmon ranged from 1 to 5 (Table 5.1.2.4). Almost half (48.5%) of the European fish in the catch were river-age 2 and 33.0% were river age 3.

In 2007, 1SW salmon dominated (96.5%) the North American component, with previous spawners decreasing to 2.5% from the 2006 value of 5.6% (Table 5.1.2.5). 95.6% of the European samples were 1SW salmon, with previous spawners representing 1.5% of the samples (Table 5.1.2.5).

As part of the sampling program, whole fresh fish were obtained to support a variety of complementary sampling efforts. In total, 150 fish were obtained from Nuuk (1D) and sampled for sex identification, disease (kidney tissue samples), feeding and parasites (stomach and intestines), and lipid/stable isotope analysis (liver, caudal, and muscle tissue). Sex was determined through direct gonad examination; 19 (12.7%) were males and 131 (87.3%) were females. All disease samples were tested for the presence of ISAv by RT-PCR assay and all test results were negative. Stomach, parasite, and lipid/stable isotope samples are currently being processed and analyzed.

Of the 1126 samples collected for genetic characterization, three samples were removed from the analysis. The remaining samples were either genotyped at three (n=8) or four (n=1115) microsatellites (Ssa202, Ssa289, SSOSL438, and SSOSL311). A database of approximately 5000 Atlantic salmon genotypes of known origin was used as a baseline to assign these salmon to continent of origin. In total, 81.7% of the salmon sampled from the 2007 fishery were of North American origin and 18.3% of the fish were European origin.

The continent of origin proportions of the samples varied among the divisions (see table below). The Working Group recommends the continuation of a broad geographic sampling program (multiple NAFO divisions) to accurately estimate continent of origin in this mixed stock fishery.

NAFO division	North America		Europe	
	Number	%	Number	%
1A	5	50.0%	5	50%
1C	128	70.7%	53	29.3%
1D	462	88.3%	61	11.7%
1E	112	65.5%	59	34.5%
1F	210	88.2%	28	11.8%
Total	917	81.7%	206	18.3%

Applying the continental percentages for the NAFO division catches resulted in estimates of 18.5 t of North American origin and 6.3 t of European origin fish (6100 and 1900 individuals rounded to the nearest 100 fish, respectively) landed in West Greenland in 2007 (Table 5.1.2.6).

5.2 NASCO has requested ICES to provide any new information on the extent to which the objectives of any significant management measures introduced in recent years have been achieved

NASCO's present management is directed towards reducing exploitation to increase spawning escapement to allow river specific CLs to be achieved. It is not possible to evaluate the extent to which the objectives of any significant management measures for the West Greenland Commission have been achieved, as an assessment of the status of the stocks for the North American Commission in 2007 was not performed. A full assessment is scheduled to occur in 2009 and the extent to which the objectives of any significant management measures for the West Greenland Commission have been achieved can be evaluated at that time. The North American stock complex is the primary contributor to the West Greenland fishery.

Table 5.1.1.1 Nominal catches of salmon, West Greenland 1971–2007 (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		895	The fishery was suspended.
1994		137	The fishery was suspended and the quotas were bought out.
1995	83	77	
1996	92	174	Quota set by Greenland authorities.
1997	58	57	
1998	11	206	
1999	19	206	
2000	21	206	
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		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.

YEAR	TOTAL	QUOTA	COMMENTS
2005	15		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.
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.

Table 5.1.1.2 Distribution of nominal catches (rounded to nearest metric ton) by Greenland vessels (1977-2007).

	NAFO Division							Total		
Year	1A	1B	1C	1D	1E	1F	NK	West Greenland	East Greenland	Greenland
1977	201	393	336	207	237	46	-	1420	6	1 426
1978	81	349	245	186	113	10	-	984	8	992
1979	120	343	524	213	164	31	-	1395	+	1395
1980	52	275	404	231	158	74	-	1194	+	1194
1981	105	403	348	203	153	32	20	1264	+	1264
1982	111	330	239	136	167	76	18	1077	+	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[2]	1	3	2	1	3	5	-	15	-	15
2006[2]	6	2	3	4	2	4	-	22	-	22
2007	2	5	6	4	5	2	-	25	-	25

[1] The fishery was suspended

[2] Values reported in ICES (2007) were gutted weight. Values have been corrected to represent whole weight.

+ Small catches <0.5 t

- No catch

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 (1969–82) from commercial samples (1978–92, 1995–97 and 2001) and from local consumption samples (1998–2000 and 2002–2007).

		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	

[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 (2002–2007) 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[1]	Reported	1294	3120	2240	756	2937	4956	15 303
	Adjusted				2730			17 276
2006[1]	Reported	5427	2611	3424	4731	2636	4192	23 021
	Adjusted							
2007	Reported	2019	5089	6148	4470	4828	2093	24 647
	Adjusted						2252	24 806

[1] Values reported in ICES (2007) were gutted weight. Values have been corrected to represent whole weight.

Table 5.1.2.3 Annual mean whole weights (kg) and fork lengths (cm) of Atlantic salmon caught at West Greenland 1969–1992 and 1995–2007 (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

Table 5.1.2.4 River age distribution (%) and mean river age for all North American and European origin salmon caught at West Greenland 1968–1992 and 1995–2007.

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	36.0	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
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
Overall Mean	**3.5**	**31.6**	**38.3**	**18.8**	**6.7**	**1**	**0.1**	**0**

Table 5.1.2.4 cont. River age distribution (%) and mean river age for all European origin salmon caught at West Greenland 1968–1992 and 1995–2007.

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
1998	28.6	60.0	7.6	2.9	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
Overall Mean	**19.6**	**60.2**	**17.1**	**2.7**	**0.4**	**0**	**0**	**0**

Table 5.1.2.5 Sea-age composition (%) of samples from fishery landings at West Greenland 1985–2007 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

Table 5.1.2.6 The catch weighted numbers of North American (NA) and European (E) Atlantic salmon caught at West Greenland 1971-1992 and 1995-2007 and the proportion of the catch by weight. Numbers are rounded to the nearest hundred fish.

Year	Numbers of Salmon caught		Proportion weighted bycatch in number	
	NA	E	NA	E
1971	291 166	565 204	34	66
1972	221 128	393 116	36	64
1973	274 423	285 624	49	51
1974	230 254	305 221	43	57
1975	286 282	364 359	44	56
1976	166 201	220 313	43	57
1977	199 065	243 302	45	55
1978	126 304	167 427	43	57
1979	208 832	208 832	50	50
1980	192 820	177 988	52	48
1981	235 256	163 483	59	41
1982	130 900	204 700	57	43
1983	314 900	302 500	40	60
1984	229 000	425 300	54	46
1985	291 200	56 5300	47	53
1986	221 200	393 200	59	41
1987	274 500	285 700	59	41
1988	230 300	305 300	43	57
1989	286 300	364 400	55	45
1990	166 300	220 400	74	26
1991	199 100	243 400	63	37
1992	126 400	167 500	45	55
1993	-	-	-	-
1994	-	-	-	-
1995	22 100	10 400	67	33
1996	23 400	8700	70	30
1997	17 200	4300	85	15
1998	3200	900	79	21
1999	5600	700	91	9
2000	5800	2500	65	35
2001	9900	4500	67	33
2002	2300	1100	72	28
2003	2800	1300	65	35
2004	4000	1500	72	28
2005	3700	1200	76	24
2006	4000	1800	69	31
2007	6100	1900	76	24

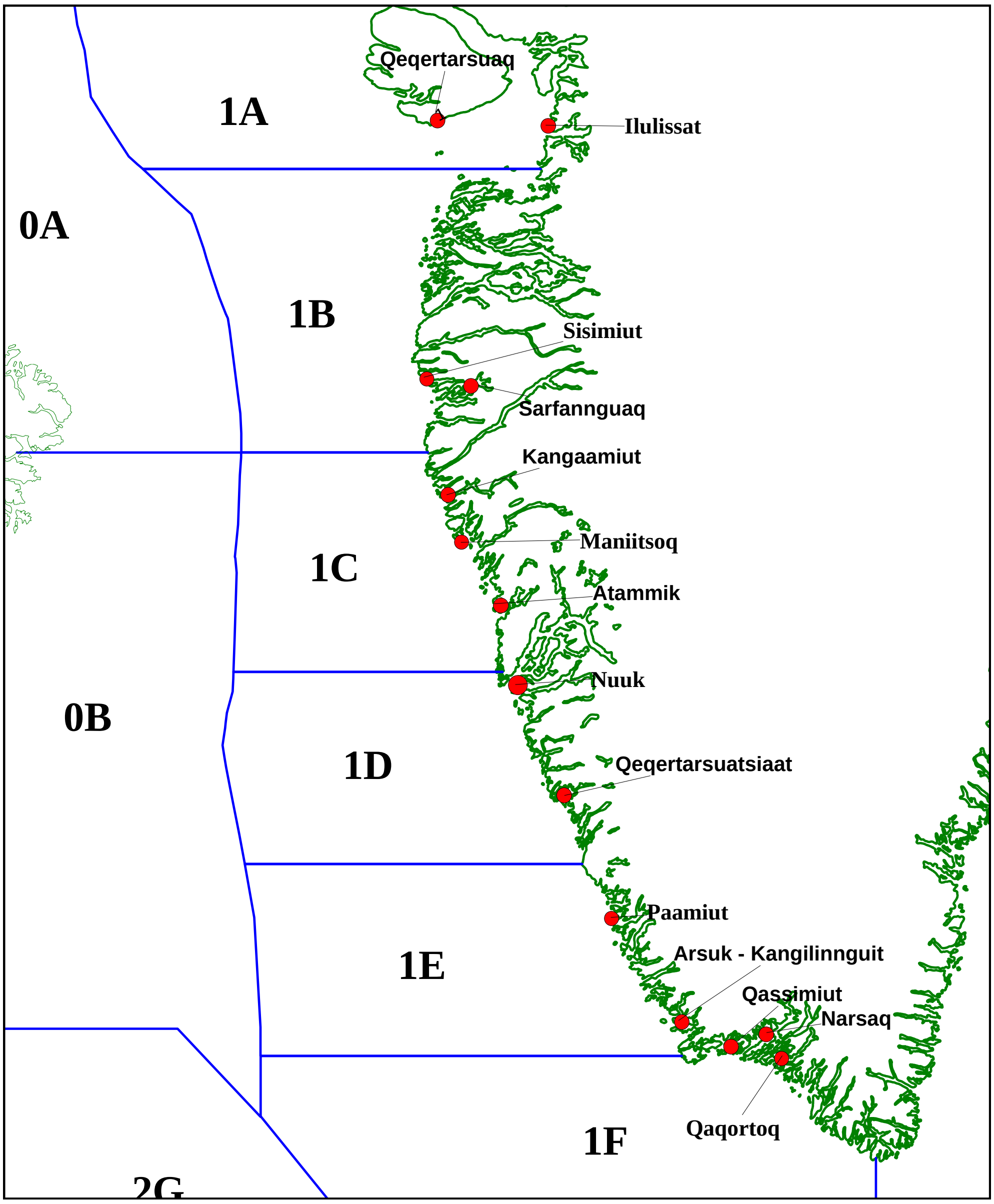


Figure 5.1.1.1 Location of NAFO divisions along the west coast of Greenland.

6 NASCO has requested ICES to identify relevant data deficiencies, monitoring needs and research requirements taking into account NASCO's international Atlantic salmon research board's inventory of on-going research relating to salmon mortality in the sea

The Working Group recommends that it should meet in 2009 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 30th March to 8th April 2009.

6.1 Prioritized list of recommendations

1) The Working Group recommends that efforts are continued to identify and collate further information on biological characteristics from river populations and fisheries throughout the North Atlantic. It is proposed that a study group be commissioned to facilitate a unified effort to further develop and investigate these datasets, for changes in biological characteristics and stock performance.

2) The Working Group recommends a study group be commissioned to facilitate the development of PFA modeling approaches for both NAC and NEAC prior to the 2009 WGNAS.

3) The Working Group recommends that Denmark, (in respect of Greenland and the Faroes) provide a participant to the WGNAS in 2009.

4) The Working Group recognises that river specific management requires extensive monitoring and recommends expanded monitoring programmes across both stock complexes.

5) The Working Group recommends the completion of a metadata directory of datasets from the West Greenland fishery, which should be referenced in the quality handbook. This data would be informative to the study group on Biological Characteristics recommended in 6.1.1.

6) The Working Group recommends that the data which forms the allocation of the Faroese catch amongst home water countries be re-examined, some progress towards this action will be generated from the WKSHINI (Section 2.8.2).

Annex 1: Working documents submitted to the Working Group on North Atlantic Salmon, 2008

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Annex 4: Reported catch of salmon in numbers and weight (tonnes round fresh weight) by sea-age class

Catches reported for 2007 may be provisional. Methods used for estimating age composition given in footnote.

Annex 4. Reported catch of salmon in numbers and weight (tonnes round fresh weight) by sea-age class. Catches reported for 2007 may be provisional. Methods used for estimating age composition given in footnote

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW (1)		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
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
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	37 540	64	-	-	-	-	-	-	-	-	10 256	48	-	-	47 796	112

Appendix 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
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

Appendix 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	13 062	21	6 308	32	5 415	58	104	2	0	0	-	-	2 360	13	27 249	126
	2002	6 531	12	5 361	20	4 276	43	148	2	11	0	-	-	2 619	16	18 946	93
	2003	8 130	15	1 828	7	3 599	38	161	3	6	0	-	-	2 204	15	15 928	78
	2004	3 815	7	1 424	6	1 153	11	251	4	6	1	-	-	1 400	11	8 049	39
	2005	9 216	16	1 027	5	1 575	16	66	1	48	1	-	-	837	8	12 769	47
	2006	16 886	29	4 165	18	1 347	14	64	1	0	0	-	-	1 379	5	23 841	67
	2007	2 746	4	5 156	21	2 362	24	26	1	0	0	-	-	1 113	8	11 403	58
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	98
	2004	35 664	92	6 045	31	-	-	-	-	-	-	-	-	-	-	41 709	122
	2005	41 394	105	5 769	30	-	-	-	-	-	-	-	-	-	-	47 163	135
	2006	29 835	73	5 746	23	-	-	-	-	-	-	-	-	-	-	35 581	96
	2007	31 099	72	3 249	15	-	-	-	-	-	-	-	-	-	-	34 348	87
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

Appendix 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
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
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

Appendix 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
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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31 469	85
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	14 955	-	-	-	-	-	-	-	-	-	4 218	-	-	-	19 173	76

Appendix 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 (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	202 855	526	-	-	-	-	-	-	-	-	148 397	745	-	-	351 252	1 271
	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	599
	1993	94 517	227	-	-	-	-	-	-	-	-	71 726	320	-	-	166 243	547
	1994	99 459	248	-	-	-	-	-	-	-	-	85 404	400	-	-	184 863	648
	1995	89 921	224	-	-	-	-	-	-	-	-	78 452	364	-	-	168 373	588
	1996	66 413	160	-	-	-	-	-	-	-	-	57 920	267	-	-	124 333	427
	1997	46 872	114	-	-	-	-	-	-	-	-	40 427	182	-	-	87 299	296
	1998	53 447	121	-	-	-	-	-	-	-	-	39 248	162	-	-	92 695	283
	1999	25 183	57	-	-	-	-	-	-	-	-	30 651	142	-	-	55 834	199
	2000	43 879	114	-	-	-	-	-	-	-	-	36 657	160	-	-	80 536	274
	2001	42 565	101	-	-	-	-	-	-	-	-	34 908	150	-	-	77 473	251
	2002	31 347	73	-	-	-	-	-	-	-	-	26 383	118	-	-	57 730	191
	2003	29 547	71	-	-	-	-	-	-	-	-	27 544	122	-	-	57 091	192
	2004	37 288	87	-	-	-	-	-	-	-	-	36 745	158	-	-	74 033	245
	2005	38 602	90	-	-	-	-	-	-	-	-	28 515	125	-	-	67 117	215
	2006	36 355	75	-	-	-	-	-	-	-	-	27 493	117	-	-	63 848	192
	2007	29 001	64	-	-	-	-	-	-	-	-	22 968	95	-	-	51 969	159
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

Appendix 4. continued

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

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

Annex 5: Estimated numbers of salmon returns, recruits and spawners

(i) Estimated numbers of 1SW salmon returns, recruits and spawners for Labrador

Year	Commercial Small Catch	Grilse Recruits SFA 1, 2 & 14B +Nfld		Grilse to rivers SFA 1,2&14B		Labrador grilse spawners Angling catch subtracted SFA 1, 2 & 14B	
		Min	Max	Min	Max	Min	Max
*1969	38722	48912	122280	18587	65053	15476	61942
*1970	29441	66584	166459	25302	88556	21289	84543
*1971	38359	86754	216884	32966	115382	29032	111448
*1972	28711	64934	162335	24675	86362	21728	83415
*1973	6282	14208	35520	5399	18897	0	11405
1974	37145	71142	177856	27034	94619	24533	92118
1975	57560	141210	353024	53660	187809	49688	183837
1976	47468	98790	246976	37540	131391	31814	125665
1977	40539	87918	219796	33409	116931	28815	112337
1978	12535	42513	106282	16155	56542	13464	53851
1979	28808	57744	144360	21943	76800	17825	72682
1980	72485	130710	326776	49670	173845	45870	170045
1981	86426	144859	362147	55046	192662	49855	187471
1982	53592	100357	250892	38136	133474	34032	129370
1983	30185	62452	156129	23732	83061	19360	78689
1984	11695	32324	80811	12283	42991	9348	40056
1985	24499	59822	149555	22732	79563	19631	76462
1986	45321	90184	225461	34270	119945	30806	116481
1987	64351	112995	282486	42938	150283	37572	144917
1988	56381	104980	262449	39892	139623	34369	134100
1989	34200	71351	178377	27113	94896	22429	90212
1990	20699	41718	104296	15853	55485	12544	52176
1991	20055	33812	84531	12849	44970	10526	42647
1992	13336	29632	79554	17993	62094	15229	59331
1993	12037	33382	93231	25186	80938	22499	78251
1994	4535	22306	63109	18159	56888	15242	53971
1995	4561	28852	82199	25022	76453	22199	73630
1996	5308	55634	159204	51867	153553	48924	150610
1997	8025	72467	176071	66972	169030	64389	166446
1998	0	9233	192621	9233	192621	6726	190114
1999	0	9500	190782	6761	188043	4244	185526
2000	0	9345	221357	4022	216034	752	212764
2001	0	8209	173915	3419	169125	906	166612
2002	0	66663	154260	60917	148152	58341	145576
2003	0	53606	134301	47127	127368	44522	124763
2004	0	76825	134255	68331	125093	65927	122689
2005	0	165333	298897	154976	287868	152257	285149
2006	0	138739	311949	128406	300923	126169	298686
2007	0	134388	272822	125231	263058	123007	260833

Estimates are based on:

EST SMALL RETURNS - (COMM CATCH*PROP LAB ORIGIN)/EXP RATE,

PROP SFAs1,2&14B=.6-.8, SFA 1:0.36-0.42&SFA 2:0.75-0.85(97)

EXP RATE-SFAs1,2&14B=.3-.5(69-91),.22-.39(92),.13-.25(93),

- .10-.19(94),.07-.13(95),.04-.07(96), SFA 1:0.07-0.14&SFA 2:0.04-0.07 (97)

EST GRILSE RETURNS CORRECTED FOR NON-MATURING 1SW - (SMALL RET*PROP GRILSE),

PROP GRILSE SFAs1,2&14B=0.8-0.9

EST RET TO FRESHWATER - (EST GRILSE RET-GRILSE CATCHES)

EST GRILSE SPAWNERS = EST GRILSE RETURNS TO FRESHWATER - GRILSE ANGLING CATCHES

*Catches for 1969-73 are Labrador totals distributed into SFAs as the proportion of landings by SFA in 1974-78.

Furthermore small catches in 1973 were adjusted by ratio of large:small in 1972&74 (SFA 1-1.4591, SFA 2-2.2225, SFA 14B-1.55

Returns in 1998-2001 were estimated from regression

Returns in 2002 to present are from counting fence returns and drainage areas

(ii) Estimated numbers of 2SW salmon returns, recruits and spawners for Labrador

Year	Commercial Large Catch	Labrador 2SW Recruits, SFAs 1,2 &14B Min	Labrador 2SW Recruits, SFAs 1,2 &14B Max	NF & Greenland Labrador a Greenland	Labrador salmon Totals Min	Labrador salmon Totals Max	Labrador 2SW to rivers in SFAs 1,2 &14B Min	Labrador 2SW to rivers in SFAs 1,2 &14B Max	Labrador 2SW spawners in SFAs 1,2 &14B Angling catch subtracted Min	Labrador 2SW spawners in SFAs 1,2 &14B Angling catch subtracted Max
*1969	78052	32483	69198	34280	80636	133032	3248	20760	2890	20287
*1970	45479	30258	68490	56379	99561	154121	3026	20547	2676	20085
*1971	64806	43117	97596	24299	85831	163577	4312	29279	4012	28882
*1972	55708	37064	83895	59203	112096	178927	3706	25168	3435	24812
*1973	77902	51830	117319	22348	96314	189771	5183	35196	4565	34376
1974	93036	50030	113827	38035	109433	200476	5003	34148	4490	33475
1975	71168	47715	107974	40919	109012	195006	4772	32392	4564	32119
1976	77796	55186	124671	67730	146485	245646	5519	37401	4984	36701
1977	70158	48669	110171	28482	97937	185706	4867	33051	4042	31969
1978	48934	38644	87155	32668	87816	157045	3864	26147	3361	25490
1979	27073	22315	50194	18636	50481	90267	2231	15058	1823	14528
1980	87067	51899	117530	21426	95490	189152	5190	35259	4633	34525
1981	68581	47343	106836	32768	100331	185233	4734	32051	4403	31615
1982	53085	34910	78873	43678	93497	156236	3491	23662	3081	23127
1983	33320	25378	57268	30804	67021	112531	2538	17181	2267	16824
1984	25258	18063	40839	4026	29802	62306	1806	12252	1478	11822
1985	16789	14481	32596	3977	24644	50494	1448	9779	1258	9530
1986	34071	24703	55734	17738	52991	97275	2470	16720	2177	16334
1987	49799	32885	74471	29695	76625	135970	3289	22341	2895	21821
1988	32386	20681	46789	27842	57355	94614	2068	14037	1625	13452
1989	26836	20181	45509	26728	55528	91673	2018	13653	1727	13270
1990	17316	11482	25967	9771	26158	46828	1148	7790	923	7493
1991	7679	5477	12467	7779	15596	25571	548	3740	491	3665
1992	19608	14756	37045	13713	28469	50758	2515	15548	2012	14889
1993	9651	10242	29482	6592	16834	36074	3858	18234	3624	17922
1994	11056	11396	34514	0	11396	34514	5653	24396	5347	23992
1995	8714	16520	51530	0	16520	51530	12368	44205	12083	43828
1996	5479	11814	37523	4960	16773	42483	9113	32759	8878	32448
1997	5550	12605	31973	5161	17766	37134	8919	26674	8785	26497
1998	0	21886	50512	3990	25876	54502	21886	50512	21574	50200
1999	0	6329	31343	506	6835	31849	5245	30259	4832	29846
2000	0	8460	33743	873	9333	34616	7108	32391	6701	31984
2001	0	9542	38034	1232	10774	39266	7869	36361	7384	35876
2002	0	6308	18606	2958	9265	21564	5446	17586	5263	17370
2003	0	5311	16943	387	5698	17331	4006	15399	3793	15147
2004	0	8796	19019	554	9350	19573	6578	16395	6332	16104
2005	0	8386	23865	727	9112	24592	6695	21865	6443	21567
2006	0	9302	23340	1016	10318	24356	7448	21146	7244	20904
2007	0	9368	24619	1362	10731	25981	7777	22736	7581	22503

Estimates are based on:

EST LARGE RETURNS - (COMM CATCH*PROP LAB ORIGIN)/EXP RATE, PROP SFAs1,2&14B=.6-.8,SFA 1: 0.64-0.72 & SFA 2 0.88-0.95 (97);

EXP RATE-SFAs1,2&14B=.7-.9(69-91),.58-.83(92),.38-.62(93),.29-.50(94), .15-.26(95), .13-.23(96), - SFA 1: 0.22-0.40, SFA 2: 0.16-0.28 (97)

EST 2SW RETURNS - (EST LARGE RETURNS*PROP 2SW), PROP 2SW SFA 1=.7-.9,SFAs 2&14B=.6-.8

WG - are North American 1SW salmon of river age 4 and older of which 70% are Labrador origin

EST RET TO FRESHWATER - (EST 2SW RET-2SW CATCHES)

EST 2SW SPAWNERS = EST 2SW RETURNS TO FRESHWATER - 2SW ANGLING CATCHES

*Catches for 1969-73 are Labrador totals distributed into SFAs as the proportion of landings by SFA in 1974-78.

**1997 Preliminary values adjusted for size category and SFA 14B recruits derived as 0.0426 of SFAs 1+2 based on proportionate drainage areas

Returns in 1998-2001 were estimated from regression

Returns in 2002 to present are from counting fence returns and drainage areas

(iii) Atlantic salmon returns to freshwater, total recruits prior to the commercial fishery and spawners summed for Salmon Fishing Area 3–14A, insular Newfoundland

Year	Small catch	Small returns to river		Small recruits		Small spawners		Large returns to river		Large recruits		Large catch	Large spawners		2SW returns to river		2SW spawners	
	Retained	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Retained	Min	Max	Min	Max	Min	Max
1969	34944	109580	219669	219160	732230	74636	184725	10634	25631	35446	256307	2310	8324	23321	2193	8995	1383	7760
1970	30437	140194	281466	280388	938221	109757	251030	12731	29313	42435	293127	2138	10593	27175	3135	11517	2359	10340
1971	26666	112644	226129	225288	753763	85978	199463	9999	23221	33330	232208	1602	8397	21619	2388	8923	1817	8055
1972	24402	109282	219412	218564	731374	84880	195010	10368	23434	34560	234343	1380	8988	22054	2511	9003	2008	8240
1973	35482	144267	289447	288534	964822	108785	253965	13489	31645	44964	316451	1923	11566	29722	2995	11527	2283	10449
1974	26485	85216	170748	170431	569159	58731	144263	10541	21113	35137	211133	1213	9328	19900	1940	6596	1510	5942
1975	33390	112272	225165	224544	750550	78882	191775	11605	23260	38682	232596	1241	10364	22019	2305	7725	1888	7086
1976	34463	115034	230595	230068	768650	80571	196132	10863	21768	36211	217677	1051	9812	20717	2334	7698	2011	7198
1977	34352	110114	220501	220229	735004	75762	186149	9795	19624	32650	196237	2755	7040	16869	1845	6247	1114	5088
1978	28619	97375	195048	194751	650159	68756	166429	7892	15841	26307	158411	1563	6329	14278	1991	6396	1557	5712
1979	31169	107402	215160	214803	717199	76233	183991	5469	10962	18230	109619	561	4908	10401	1088	3644	980	3463
1980	35849	121038	242499	242076	808330	85189	206650	9400	18866	31335	188656	1922	7478	16944	2432	7778	1888	6925
1981	46670	157425	315347	314850	1051158	110755	268677	21022	42096	70074	420961	1369	19653	40727	3451	12035	3074	11442
1982	41871	141247	283002	282494	943342	99376	241131	9060	18174	30198	181736	1248	7812	16926	2914	9012	2579	8481
1983	32420	109934	220216	219868	734053	77514	187796	9717	19490	32391	194903	1382	8335	18108	2586	8225	2244	7677
1984	39331	130836	262061	261673	873537	91505	222730	8115	16268	27052	162684	511	7604	15757	2233	7060	2063	6800
1985	36552	121731	243727	243461	812424	85179	207175	3672	7370	12240	73702	0	3641	7339	958	3059	946	3042
1986	37496	125329	251033	250657	836778	87833	213537	7052	14140	23505	141400	0	6972	14060	1606	5245	1575	5198
1987	24482	128578	257473	257157	858244	104096	232991	6394	12817	21313	128170	0	6353	12776	1336	4433	1320	4409
1988	39841	133237	266895	266474	889652	93396	227054	6572	13183	21908	131832	0	6512	13123	1563	5068	1540	5033
1989	18462	60260	120661	120520	402203	41798	102199	3234	6482	10780	64815	0	3216	6463	697	2299	690	2289
1990	29967	99543	199416	199086	664721	69576	169449	5939	11909	19798	119093	0	5889	11859	1347	4401	1327	4372
1991	20529	64552	129308	129105	431027	44023	108779	4534	9090	15112	90896	0	4500	9056	1054	3429	1041	3410
1992	23118	118778	237811	118778	237811	95096	214129	16705	33463	16705	33463	0	16564	33322	3111	10554	3057	10474
1993	24693	134150	268550	134150	268550	107816	242217	8121	16267	8121	16267	0	7957	16103	1499	5094	1449	5017
1994	26150	80830	167590	80830	167590	52756	139516	6939	14285	6939	14285	0	6507	13853	1294	4424	1176	4238
1995	25986	141607	256164	141607	256164	113615	228171	10884	19851	10884	19851	0	10460	19427	1641	5504	1533	5331
1996	30479	173285	357444	173285	357444	139954	324113	15287	30677	15287	30677	0	14758	30148	2483	6605	2353	6398
1997	18940	99332	157167	99332	157167	78276	136110	15068	23284	15068	23284	0	14663	22879	2714	5909	2596	5721
1998	19964	132736	177551	132736	177551	110336	155150	21233	27055	21233	27055	0	20887	26709	3682	7208	3599	7073
1999	22870	163417	215042	163417	215042	138692	190317	22018	37509	22018	37509	0	21697	37189	2599	9661	2551	9565
2000	21808	148710	254736	148710	254736	124643	230669	16432	54789	16432	54789	0	15929	54286	2022	12023	1829	11781
2001	20977	136949	194299	136949	194299	111756	169106	14601	37188	14601	37188	0	14201	36788	1614	7832	1534	7709
2002	20913	134679	187273	134679	187273	111970	164564	10855	26315	10855	26315	0	9555	25015	1268	5796	1175	5586
2003	21226	174862	256264	174862	256264	151998	233401	12456	32090	12456	32090	0	12094	31727	1419	6894	1375	6803
2004	19946	160252	243479	160252	243479	138564	221790	11497	30067	11497	30067	0	11133	29702	1309	6934	1259	6834
2005	21869	185846	261393	185846	261393	161379	236926	16573	34961	16573	34961	0	16042	34430	1324	5900	1276	5804
2006	18006	181207	248981	181207	248981	157806	224885	20893	47047	20893	47047	0	20268	46157	1467	7142	1404	7030
2007	15091	133333	191331	133333	191331	116741	174593	16790	32863	16790	32863	0	16466	32493	1107	4689	1032	4638

SRR (Small returns to river) are the sum of Bay St. George small returns (Reddin & Mullins 1996)
plus Humber R small returns (Mullins & Reddin 1996) plus small returns in SFAs 3-12 & 14A.
SSR (Small recruits) = SRR/(1-Exploitation rate commercial (ERC)) where ERC=0.5-0.7, 1969-91 & ERC=0, 1992-98.
SS (Small spawners) = SSR-(SC+(SR*0.1))
SC = small salmon catch retained
SR = small salmon catch released with assumed mortalities at 10%
RL (RATIO large:small) are from counting facilities in SFAs 3-11, 13 & 14A, angling catches in SFA 12.
LRR (Large returns to river) = SRR * RL
LR (Large recruits) = LRR*(1-Exploitation rate large (ERL)), where ERL=0.7-0.9, 1969-91; & ERL=0, 1992-98.
LS (Large spawners) = LRR-large catch retained (LC)-(0.1*large catch released)
2SW-RR (2SW returns to river)= LRR*proportion 2SW of 0.4-0.6 for SFAs 12-14A & 0.1-0.2 for SFAs 3-11.
2SW-S (2SW spawners) = LS * proportion 2SW of 0.4-0.6 for SFAs 12-14A & 0.1-0.2 for SFAs 3-11.
2SW-R (2SW recruits) = LR * proportion 2SW of 0.4-0.6 for SFAs 12-14A& 0.1-0.2 for SFAs 3-11.

(iv) Small, large, and 2SW return and spawner estimates for SFA 15

Year	Small salmon				2SW salmon				Large salmon				Proportion 2SW in large salmon
	Returns		Spawners		Returns		Spawners		Returns		Spawners		
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
1970	3513	7505	1497	4418	16221	23694	1246	3606	24955	36452	1917	5548	0.65
1971	2629	5566	1116	3246	7863	11318	550	1518	12096	17412	846	2335	0.65
1972	2603	5537	1092	3235	6266	12958	2550	7130	10621	21963	4323	12085	0.59
1973	5146	9852	1589	4720	7835	16023	3096	8648	10588	21653	4184	11686	0.74
1974	2869	6007	1159	3422	9564	19968	3902	11112	13102	27353	5345	15221	0.73
1975	3150	6567	1262	3717	5711	10976	1906	5261	7229	13894	2413	6660	0.79
1976	11884	20582	2619	7647	9362	19301	3804	10878	12318	25396	5005	14313	0.76
1977	7438	14652	2606	7527	11629	23571	4754	13270	14011	28399	5728	15988	0.83
1978	5215	9595	1477	4244	7287	14418	2826	7437	9716	19224	3768	9917	0.75
1979	5451	11163	2223	6260	1864	3196	568	1327	3655	6267	1114	2602	0.51
1980	9692	18781	3164	9285	9294	18255	3708	9717	11473	22537	4577	11997	0.81
1981	11367	21188	3362	9669	5677	9995	1487	3903	12078	21265	3163	8305	0.47
1982	8889	16834	2736	7978	5565	8856	1068	2713	9431	15011	1810	4599	0.59
1983	3621	6207	799	2268	5476	8770	976	2648	9281	14864	1654	4489	0.59
1984	11861	18589	1646	4732	5470	9667	2847	5848	6924	12237	3603	7403	0.79
1985	8525	18272	3639	10801	6175	12741	4788	10140	9802	20224	7600	16096	0.63
1986	12895	27635	5490	16311	10126	20617	7853	16317	13324	27128	10333	21470	0.76
1987	11708	24768	4930	14408	6161	12197	4437	9217	9627	19058	6932	14401	0.64
1988	16037	34159	6796	20027	9213	18880	7151	14979	12796	26222	9932	20804	0.72
1989	7673	16088	3185	9249	5646	11284	4172	8655	9905	19797	7319	15185	0.57
1990	9527	19902	3975	11418	5525	11070	4125	8592	8125	16280	6066	12636	0.68
1991	5276	10962	2219	6270	3092	6104	2311	4694	6185	12207	4621	9388	0.50
1992	10529	22220	4462	12930	5146	10399	3848	8052	9530	19257	7125	14911	0.54
1993	6578	13541	2739	7643	1763	3497	1262	2659	4407	8742	3156	6647	0.40
1994	10446	21861	4390	12580	5096	10286	3828	7990	8493	17143	6379	13317	0.60
1995	3310	6832	1344	3830	3636	7077	2587	5290	5590	10880	3977	8132	0.65
1996	7468	15529	3259	9043	5067	10234	3836	7979	7796	15745	5902	12275	0.65
1997	7666	16238	3572	9898	3446	6891	2605	5392	5302	10602	4008	8295	0.65
1998	7657	18381	3710	12036	1866	4916	390	2584	2871	7562	600	3976	0.65
1999	5712	12785	3096	8614	2225	4778	1632	3709	3423	7350	2511	5706	0.65
2000	7659	12983	4581	9160	3108	4676	1823	3145	4782	7193	2805	4838	0.65
2001	4640	10143	2563	8066	3604	7878	3507	7781	5545	12120	5396	11972	0.65
2002	11838	25877	6539	20578	2246	4910	2186	4850	3456	7555	3363	7462	0.65
2003	3226	7052	1782	5608	4032	8815	3924	8706	6204	13561	6037	13394	0.65
2004	12497	27317	6248	19122	3019	6599	2928	6480	4644	10152	4505	9970	0.65
2005	4535	9913	2268	6939	3540	7739	3434	7599	5446	11906	5283	11691	0.65
2006	9034	19748	4517	13824	2582	5644	2504	5542	3972	8683	3853	8526	0.65
2007	4443	9713	2222	6799	4456	9742	4323	9566	6856	14987	6650	14717	0.65

(v) Small, large, and 2SW return and spawner estimates for SFA 16

Year	Small salmon				2SW salmon				Large salmon				Proportion 2SW in large salmon
	Returns		Spawners		Returns		Spawners		Returns		Spawners		
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
1971	30420	52137	17557	32075	19697	32746	3508	5832	21457	35672	3822	6353	0.918
1972	39461	67633	21708	39659	24645	40972	14992	24924	25538	42456	15535	25827	0.965
1973	37986	65104	24550	44852	22896	38065	17134	28486	23905	39742	17889	29741	0.958
1974	62607	107303	44149	80656	33999	56523	27495	45711	37444	62250	30281	50343	0.908
1975	55345	94857	38775	70839	21990	36558	16366	27209	25334	42117	18855	31347	0.868
1976	78095	133848	49904	91171	17118	28459	10760	17889	20045	33325	12600	20947	0.854
1977	23658	40547	10598	19361	43160	71753	27404	45560	45575	75769	28938	48109	0.947
1978	20711	35496	11482	20977	18539	30822	8197	13627	21532	35797	9520	15827	0.861
1979	43460	74487	24678	45086	5484	9117	2751	4573	7960	13233	3992	6637	0.689
1980	35464	60782	21515	39307	30332	50426	15762	26204	31928	53080	16592	27584	0.950
1981	55661	95399	31943	58358	9489	15775	2702	4492	14226	23651	4051	6735	0.667
1982	68543	117477	44800	81846	21875	36368	9429	15676	27040	44954	11655	19377	0.809
1983	21476	36807	11879	21702	19762	32854	5986	9951	24549	40812	7436	12362	0.805
1984	25333	43418	15143	27665	12562	20884	12189	20264	13307	22123	12912	21466	0.944
1985	51847	88862	33452	61114	15861	26369	15390	25586	18231	30309	17690	29409	0.870
1986	100240	171802	71518	130659	23460	39003	22659	37670	27503	45724	26564	44162	0.853
1987	72327	123962	50222	91751	13590	22594	12635	21006	17073	28385	15873	26390	0.796
1988	103966	178189	72222	131945	15599	25933	15050	25021	19116	31781	18444	30663	0.816
1989	64153	109953	38708	70717	9880	16426	8921	14831	15131	25155	13662	22712	0.653
1990	72484	124286	44376	98325	14452	24087	13785	23420	23462	39102	22378	38019	0.616
1991	48713	83516	33289	69878	14892	24820	14321	24249	24615	41025	23670	40080	0.605
1992	136440	202198	100557	172041	21106	30340	20377	29610	34127	49058	32948	47879	0.618
1993	65555	169011	45516	151446	14946	58092	14483	57629	21684	84280	21012	83609	0.689
1994	39087	57794	22232	41929	13155	24008	12826	23679	17440	31827	17003	31390	0.754
1995	41524	61253	18895	39208	24711	35937	24192	35419	29278	42579	28664	41965	0.844
1996	30041	44423	8618	22923	10711	18429	10185	17903	15708	27026	14936	26255	0.682
1997	13470	23300	3051	12766	8254	13759	7727	13231	14210	23686	13302	22778	0.581
1998	19962	31885	12360	21044	4565	11229	4428	10892	11032	27138	10701	26323	0.414
1999	21073	29884	13048	19723	6059	9627	5877	9339	12449	19782	12076	19189	0.487
2000	29411	40958	18211	27032	6280	10757	6092	10435	13250	22696	12853	22015	0.474
2001	26041	35923	15854	24886	13778	18184	12236	17247	21341	28165	18952	26713	0.646
2002	39397	53659	24853	39123	4688	9950	3952	9043	9335	19813	7869	18006	0.502
2003	25870	38495	16126	27698	10276	17395	9262	16408	17560	29725	15828	28040	0.585
2004	40815	59725	24203	38619	11889	23840	10057	19427	20857	41824	17643	34083	0.570
2005	23067	65681	15224	43350	8731	19057	8469	18485	13121	28637	12727	27778	0.665
2006	27021	52187	17834	34443	8231	18930	7984	18362	15868	36495	15392	35400	0.519
2007	19517	63758	12881	42080	9088	20160	8815	19555	15352	34055	14891	33033	0.592

(vi) Small, large, and 2SW return and spawner estimates for SFA 17

	Small recruits		Small spawners		Large recruits		Large spawners		2SW recruits		2SW spawners	
Year	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
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	5	9	3	7	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	14	28	8	22	2	5	1	4	2	5	1	4
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	2	5	1	4	5	9	3	7	5	9	3	7
1980	12	23	7	18	2	5	1	4	2	5	1	4
1981	259	498	151	390	40	77	36	73	40	77	36	73
1982	175	336	102	263	16	31	8	23	16	31	8	23
1983	17	32	10	25	17	32	15	30	17	32	15	30
1984	17	32	10	25	13	26	13	26	13	26	13	26
1985	113	217	66	170	8	15	8	15	8	15	8	15
1986	566	1088	330	852	5	11	5	11	5	11	5	11
1987	1141	2194	665	1718	66	128	66	128	66	128	66	128
1988	1542	2963	899	2320	96	185	96	185	96	185	96	185
1989	400	770	233	603	149	287	149	287	149	287	149	287
1990	1842	3539	1074	2771	284	545	284	545	284	545	284	545
1991	1576	3028	919	2371	188	361	188	361	188	361	188	361
1992	1873	3599	1092	2818	95	183	95	183	95	183	95	183
1993	1277	2454	745	1922	22	43	22	43	22	43	22	43
1994	210	385	118	292	169	310	166	307	169	310	166	307
1995	1058	1914	585	1441	85	154	81	151	85	154	81	151
1996	1161	2576	738	2154	158	351	154	347	158	351	154	347
1997	485	932	283	730	31	59	30	58	31	59	30	58
1998	635	1221	370	956	79	151	76	149	79	151	76	149
1999	379	728	221	570	23	45	20	41	23	45	20	41
2000	304	584	177	457	56	108	55	107	56	108	55	107
2001	429	824	250	645	57	110	55	107	57	110	55	107
2002	307	591	179	463	46	88	45	87	46	88	45	87
2003	591	1135	344	889	77	148	74	145	77	148	74	145
2004	163	313	95	245	32	61	31	61	32	61	31	61
2005	221	424	129	332	35	68	34	66	35	68	34	66
2006	208	401	122	314	33	64	32	63	33	64	32	63
2007	40	77	23	60	6	12	5	11	6	12	5	11
70-89 X	213	410	124	321	21	40	20	40	21	40	20	40
90-07 X	748	1450	438	1139	87	168	85	166	87	168	85	166

Notes

Number of small retained salmon in 1993 was not recorded. The number given is the mean for 1986-1992

For 1970-1980, percent small is calculated from numbers of small and large salmon in the retained catch in each year. For 1981-1997, 1999, and 2002, percent small is calculated from numbers of small and large salmon taken at the Leard's Pond trap. For 1998, 2000, 2001, 2003, and 2004 percent small is taken from seining catches at Mooneys Pool.

For 2005 and subsequently, percent small is the mean of percent small derived from seining catches in 2000, 2001, 2003, and 2004

Small recruits are calculated as small retained salmon/exploitation rate. Angler exploitation was calculated as 0.34, 0.347, and 0.264 of estimated returns in 1994, 1995, and 1996, respectively. For other years the mean of these values is used. The min and max max numbers of small recruits are calculated using exploitation + or - 0.1; e.g. 0.34 + or - 0.1 gives 0.24 and 0.44.

Small spawners = number of small recruits - number of small retained

Large recruits = (number of small recruits/(0.01*percent small))-number of small recruits

Large spawners = number of large recruits - number of large retained

It is asssumed that large salmon and 2SW salmon are equivalent

(vii) Total returns and spawners of small salmon and large salmon and 2SW salmon returns and spawners to SFA 18

Year	Small salmon				2SW salmon				Large salmon			
	Returns		Spawners		Returns		Spawners		Returns		Spawners	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1970	264	1073	167	842	4744	6836	546	2314	6161	7858	709	2660
1971	65	265	41	208	1891	2782	213	901	2456	3198	276	1036
1972	131	530	82	416	4693	6024	226	958	6095	6924	293	1101
1973	516	2095	325	1645	4140	5481	238	1009	5376	6299	309	1160
1974	187	757	118	595	5481	6928	264	1119	7119	7963	343	1286
1975	112	454	71	357	3452	4340	178	752	4483	4989	231	864
1976	299	1212	188	951	2755	3674	222	939	3578	4223	288	1080
1977	215	871	135	684	3985	5463	326	1381	5175	6280	424	1587
1978	78	316	49	248	4585	6265	424	1794	5954	7201	550	2062
1979	1857	7536	1170	5915	1290	2014	220	932	1676	2315	286	1071
1980	520	2108	327	1655	3732	5177	413	1748	4846	5951	536	2009
1981	2797	11348	1762	8908	2490	3769	375	1586	3234	4332	487	1823
1982	2150	8722	1354	6847	4135	5901	461	1951	5370	6783	598	2242
1983	212	858	133	674	3733	5241	398	1686	4848	6024	517	1938
1984	460	1867	182	1210	2391	3573	259	1148	3105	4107	337	1320
1985	730	3167	144	1786	921	4481	871	4359	1196	5150	1131	5010
1986	965	3854	64	1731	2274	11479	2164	11213	2953	13195	2811	12889
1987	1557	5316	191	2410	2695	8711	2618	8524	3500	10012	3400	9798
1988	1296	4481	915	5514	2617	8513	2535	8313	3399	9785	3293	9555
1989	838	2958	35	1129	2171	7110	2104	6948	2819	8172	2732	7986
1990	934	3303	335	12017	1972	6461	1909	6308	2561	7427	2479	7250
1991	1088	3843	48	8519	2443	8084	2368	7901	3173	9292	3075	9082
1992	943	3295	807	5053	2492	8123	2409	7921	3236	9336	3129	9104
1993	1090	3637	1043	8869	1386	4432	1341	4322	1800	5094	1741	4968
1994	626	2217	298	2136	2078	6855	2016	6706	2698	7880	2619	7708
1995	508	1829	379	2372	1561	5184	1516	5074	2027	5959	1969	5832
1996	2256	8253	1076	7105	3380	11328	3299	11132	4389	13021	4285	12795
1997	521	1947	163	1103	3559	11960	3472	11748	4622	13748	4509	13503
1998	587	2195	181	1240	2147	7231	2091	7096	2788	8312	2715	8156
1999	651	2454	293	1610	1618	5497	1584	5416	2101	6319	2057	6225
2000	569	2209	267	1498	1520	5263	1491	5192	1974	6049	1936	5968
2001	758	2915	339	1927	1766	6091	1731	6005	2294	7002	2248	6902
2002	783	3031	366	2046	1269	4426	1243	4364	1648	5087	1615	5016
2003	711	2793	335	1905	2483	8581	2436	8466	3225	9864	3163	9731
2004	1002	3940	406	2535	2753	9566	2694	9423	3575	10995	3499	10831
2005	729	2738	248	1604	2294	7771	2238	7635	2979	8932	2906	8776
2006	801	3091	290	1886	2203	7565	2151	7438	2861	8695	2793	8549
2007	666	2632	274	1707	1525	5342	1493	5262	1981	6140	1939	6049

(viii) Total 1SW returns and spawners, SFAs 19, 20, 21 and 23

Year	RETURNS SFA 19-21 MIN	RETURNS SFA 19-21 MAX	RETURNS Commercial 19-21	RETURNS SFA 23 Wild MIN	RETURNS SFA 23 Wild MAX	RETURNS SFA 23 Hatch	TOTAL RETURNS SFAs 19,20,21,23 MIN	TOTAL RETURNS SFAs 19,20,21,23 MAX	SPAWNERS angled 19-21	SPAWNERS Spawners 19-21 MIN	SPAWNERS Spawners 19-21 MAX	SPAWNERS SFA 23 H+W rtns MIN	SPAWNERS SFA 23 H+W rtns MAX	SPAWNERS SFA 23 Harvest	SFA 19-23 TOTAL 1SW SPAWNERS MIN	SFA 19-23 TOTAL 1SW SPAWNERS MAX
1970	15,713	24,698	3,139	5,206	7,421	100	21,019	32,219	3,609	8,808	17,793	5,306	7,521	1,420	12,694	23,894
1971	11,565	18,470	1,904	2,883	4,176	365	14,813	23,011	2,761	6,768	13,673	3,248	4,541	2,032	7,984	16,182
1972	11,212	18,469	1,054	1,546	2,221	285	13,043	20,975	2,917	7,115	14,372	1,831	2,506	2,558	6,388	14,320
1973	13,733	22,787	1,063	3,509	5,047	1,965	19,207	29,799	3,604	8,876	17,930	5,474	7,012	1,437	12,913	23,505
1974	24,255	40,149	2,012	6,204	8,910	3,991	34,450	53,050	6,340	15,581	31,475	10,195	12,901	2,124	23,652	42,252
1975	10,573	16,118	2,814	11,648	16,727	6,374	28,595	39,219	2,227	5,435	10,980	18,022	23,101	2,659	20,798	31,422
1976	20,402	33,929	1,471	13,761	19,790	9,074	43,237	62,793	5,404	13,261	26,788	22,835	28,864	5,263	30,833	50,389
1977	23,800	38,208	3,638	6,746	9,679	6,992	37,538	54,879	5,841	14,124	28,532	13,738	16,671	4,542	23,320	40,661
1978	7,461	10,183	3,651	3,227	4,651	3,044	13,732	17,878	1,113	2,669	5,391	6,271	7,695	2,015	6,925	11,071
1979	24,111	39,087	3,154	11,529	16,690	3,827	39,467	59,604	5,428	14,680	29,656	15,356	20,517	3,716	26,320	46,457
1980	33,420	51,407	8,248	14,346	20,690	10,793	58,559	82,890	7,253	17,632	35,619	25,139	31,483	5,542	37,229	61,560
1981	30,077	50,180	1,945	11,199	16,176	5,627	46,903	71,983	8,163	19,706	39,809	16,826	21,803	9,021	27,511	52,591
1982	17,008	27,723	2,014	8,773	12,598	3,038	28,819	43,359	4,361	10,503	21,218	11,811	15,636	5,279	17,035	31,575
1983	8,932	14,319	1,613	7,706	11,028	1,564	18,202	26,911	2,047	5,281	10,668	9,270	12,592	4,138	10,413	19,122
1984	17,687	30,702	0	14,105	20,227	1,451	33,243	52,380	4,724	12,758	25,773	15,556	21,678	5,266	23,048	42,185
1985	23,323	40,498	0	11,038	15,910	2,018	36,379	58,426	6,360	16,837	34,012	13,056	17,928	4,892	25,001	47,048
1986	23,322	40,652	0	13,412	19,321	862	37,596	60,835	6,182	16,989	34,319	14,274	20,183	3,549	27,714	50,953
1987	25,910	45,170	0	10,030	14,334	3,328	39,268	62,832	7,056	18,881	38,141	13,358	17,662	3,101	29,138	52,702
1988	23,582	40,853	0	15,131	21,834	1,250	39,963	63,937	6,384	16,930	34,201	16,381	23,084	3,320	29,991	53,965
1989	24,215	42,295	0	16,240	23,182	1,339	41,794	66,816	6,629	17,723	35,803	17,579	24,521	4,455	30,847	55,869
1990	28,063	49,103	0	12,287	17,643	1,533	41,883	68,279	7,391	20,626	41,666	13,820	19,176	3,795	30,651	57,047
1991	9,352	16,369	0	10,602	15,246	2,439	22,393	34,054	2,399	6,878	13,895	13,041	17,685	3,546	16,373	28,034
1992	13,135	22,783	0	11,340	16,181	2,223	26,698	41,187	3,629	9,458	19,106	13,563	18,404	4,078	18,943	33,432
1993	12,580	22,080	0	7,610	8,828		20,190	30,908	3,327	9,313	18,813	5,762	6,868		15,075	25,681
1994	3,390	5,926	0	5,770	6,610		9,160	12,536	493	2,486	5,022	4,965	5,738		7,451	10,760
1995	8,361	14,567	0	8,265	9,458		16,626	24,025	1,885	6,083	12,289	8,025	9,218		14,108	21,507
1996	13,321	23,716	0	12,907	15,256		26,228	38,972	2,211	10,190	20,585	11,576	13,892		21,766	34,477
1997	3,767	6,546	0	4,508	4,979		8,275	11,525	493	2,725	5,504	3,971	4,433		6,696	9,937
1998	9,060	11,566	0	9,203	10,801		18,263	22,367	0	9,060	11,566	8,775	10,348		17,835	21,914
1999	4,002	5,108	0	5,508	6,366		9,510	11,474	67	4,002	5,108	5,196	6,048		9,198	11,156
2000	6,317	8,064	0	4,796	5,453		11,113	13,517	0	6,317	8,064	4,455	5,087		10,772	13,151
2001	2,378	3,036	0	2,513	2,862		4,891	5,898	0	2,378	3,036	2,210	2,530		4,588	5,566
2002	5,323	6,795	0	3,501	3,991		8,824	10,786	0	5,323	6,795	3,232	3,689		8,555	10,484
2003	2,907	3,711	0	2,292	2,716		5,199	6,427	0	2,907	3,711	2,069	2,469		4,976	6,180
2004	3,939	5,028	0	3,454	4,297		7,393	9,325	0	3,939	5,028	3,229	4,039		7,168	9,067
2005	2,932	3,743	0	3,597	4,640		6,529	8,383	0	2,932	3,743	3,433	4,450		6,365	8,193
2006	5,260	6,714	0	3,720	4,743		8,980	11,457	0	5,260	6,714	3,528	4,501		8,788	11,215
2007	4,291	5,478	0	2,466	3,136		6,757	8,614	0	4,291	5,478	2,305	2,937		6,596	8,415

SFAs 19, 20, 21: Escapement (spawners) were estimated by liklihood profiles of the ratio of the counted escapement in the LaHave River to the reported recreatioanl catch in the LaHave and then to SFA 19-21(Amiro et al 2008) and from reported harvests in the commercial fishery (Cutting MS 1984).

SFA 22: Inner Fundy stocks and inner-Fundy SFA 23 (primarily 1SW fish) do not go to the North Atlantic.

SFA 23: For 1970-'97, similar to SFAs 19-21 except that estimated wild 1SW returns destined for Mactaquac Dam, Saint John River, replaced values for recreational catch and estimated proportions that production above Mactaquac is of the total (0.4-0.6) river replaced exploitation rates (commercial harvest, bi-catch etc., incl. in estimated returns); hatchery returns attributed to above Mactaquac only; 1SW production in rest of SFA (outer Fundy) omitted.

"a"- Revision of method, SFA 23, 1993-2004, estimated returns to Nashwaak fence raised by proportion of area below Mactaquac (0.21-0.30) and added to total estimated returns originating upriver of Mactaquac (Marshall et al. 1998); MIN and MAX removals below Mactaquac based on Nashwaak losses, Mactaquac losses are a single value and together summed and removed from returns to establish estimate of spawners.

(ixa) Total 2SW returns to SFAs 19, 20, 21 and 23

	RETURNS								REMOVALS				SFAs 19,20,21,23	
	MSW returns		Comm-	SFA 23			TOTAL RTNS						TOTAL	
	SFA 19-21		ercial	Wild		Hatch	SFAs 19,20,21,23		angled	SFA 23			MSW escapement	
Year	MIN	MAX	19-21	MIN	MAX		MIN	MAX	19-21	MID	MIN	MAX	MIN	MAX
1970	6,884	10,032	2,644	9,691	13,945	0	16,575	23,977	1,528	8,240			8,335	15,737
1971	5,124	6,992	2,607	7,979	11,496	77	13,180	18,565	902	4,168			9,012	14,397
1972	7,207	9,337	4,337	8,298	11,944	592	16,097	21,873	1,024	1,644			14,453	20,229
1973	7,776	10,428	4,206	4,255	6,133	505	12,536	17,066	1,231	1,710			10,826	15,356
1974	12,775	15,697	8,841	9,862	14,119	2,325	24,962	32,141	1,419	3,097			21,865	29,044
1975	12,028	14,045	9,311	12,619	18,141	2,210	26,857	34,396	963	2,494			24,363	31,902
1976	8,619	10,645	5,893	13,826	19,873	2,302	24,747	32,820	985	4,945			19,802	27,875
1977	13,714	17,089	9,169	16,440	23,458	2,725	32,879	43,272	1,626	5,713			27,166	37,559
1978	10,168	12,671	6,796	6,801	9,808	2,534	19,503	25,013	1,209	3,387			16,116	21,626
1979	4,948	6,922	2,291	4,668	6,715	1,188	10,804	14,825	945	1,639			9,165	13,186
1980	15,800	20,722	9,171	18,472	26,488	2,992	37,264	50,202	2,368	8,274			28,990	41,928
1981	11,146	16,128	4,438	9,753	14,015	2,728	23,627	32,871	2,361	8,687			14,940	24,184
1982	9,171	11,673	5,803	9,378	13,534	1,769	20,318	26,976	1,218	6,244			14,075	20,733
1983	6,334	8,878	2,977	9,804	14,131	1,104	17,242	24,113	1,079	10,816			6,426	13,297
1984	1,697	3,666		16,591	23,877	1,115	19,403	28,658	468	4,031			15,372	24,627
1985	10,276	18,750		17,707	25,414	875	28,858	45,039	0	5,478			23,380	39,561
1986	9,194	19,869		10,345	14,964	797	20,336	35,630	0	3,138			17,198	32,492
1987	5,102	11,026		7,385	10,636	480	12,967	22,142	0	1,522			11,445	20,620
1988	6,298	13,610		4,448	6,400	912	11,658	20,922	0	1,525			10,133	19,397
1989	6,000	12,966		6,924	9,911	469	13,393	23,346	0	294			13,099	23,052
1990	5,322	11,501		5,660	8,135	575	11,557	20,211	0	659			10,898	19,552
1991	3,537	7,643		7,612	10,959	700	11,849	19,302	0	1,479			10,370	17,823
1992	3,143	6,792		6,971	9,948	778	10,892	17,518	0	1,238			9,654	16,280
1993	2,760	5,963		5,260	5,980		8,020	11,943	0		1,234	1,234	8,020	11,943
1994	1,501	3,244		3,659	4,155		5,160	7,399	0		832	882	5,160	7,399
1995	2,179	4,709		3,728	4,289		5,907	8,998	0		366	366	5,907	8,998
1996	3,067	6,627		5,535	6,365		8,602	12,992	0		847	868	8,602	12,992
1997	1,329	2,872		3,210	3,678		4,539	6,550	0		645	650	4,539	6,550
1998	1,439	1,741		2,032	2,437		3,471	4,178	0		357	363	3,471	4,178
1999	1,815	2,196		2,734	3,090		4,549	5,286	0		483	489	4,549	5,286
2000	1,398	1,691		1,189	1,430		2,587	3,121	0		214	214	2,587	3,121
2001	2,107	2,549		2,113	2,501		4,220	5,050	0		282	291	4,220	5,050
2002	793	959		639	752		1,432	1,711	0		197	210	1,432	1,711
2003	2,065	2,499		1,128	1,289		3,193	3,788	0		209	215	3,193	3,788
2004	1,377	1,666		1,402	1,698		2,779	3,364	0		115	124	2,779	3,364
2005	897	1,085		890	1,121		1,787	2,206	0		99	109	1,787	2,206
2006	1,648	1,994		997	1,276		2,645	3,270	0		150	163	2,645	3,270
2007	730	883		689	841		1,419	1,724	0		104	115	1,419	1,724

SFA 21: Indexed from LaHave River (Amiro et al 2008) (see 1SW for method).
SFA 22: Inner Fundy stocks are 1SW and do not go to the to the North Atlantic.
SFA 23: Similar approach as for SFAs 19-21 except that estimated wild MSW returns destined for Mactaquac Dam, Saint John River, replaced values for recreational catch; and estimated proportions that production above Mactaquac is of the total (0.4-0.6) river replaced exploitation rates (commercial harvest, bycatch etc., incl. in estimated returns); hatchery returns attributed to above Mactaquac only; MSW production in remainder of SFA (outer Fundy) omitted.
SFA 23: Similar approach as for SFAs 19-21 except that estimated wild MSW returns destined for Mactaquac Dam, Saint John River, replaced values for recreational catch; and estimated proportions that production above Mactaquac is of the total (0.4-0.6)

(ixb) Total 2SW spawners in SFAs 19, 20, 21 and 23

	Returns SFA 19-21		SPAWNERS SFAs (19-21)		SFA 23 RETURNS		SFA 23 REMOVALS		SFA 19-23 Returns SFA 19-23		SFA 19-23 TOTAL 2SW SPAWNERS	
Year	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1970	6,472	8,893	4,436	6,857	8,540	12,674	7,004	7,828	15,012	21,567	5,972	11,703
1971	4,641	6,077	2,633	4,070	7,155	10,536	3,543	3,960	11,796	16,613	6,245	10,646
1972	6,340	7,979	3,001	4,639	7,869	11,368	1,397	1,562	14,209	19,347	9,472	14,445
1973	7,084	9,124	3,479	5,519	4,205	6,036	1,454	1,625	11,289	15,160	6,230	9,930
1974	11,244	13,492	2,403	4,651	10,755	14,988	2,632	2,942	21,999	28,480	10,526	16,697
1975	10,231	11,783	920	2,472	13,107	18,578	2,120	2,369	23,338	30,361	11,907	18,680
1976	7,580	9,138	1,883	3,442	14,274	20,281	4,203	4,698	21,854	29,419	11,954	19,025
1977	11,810	14,407	4,750	7,346	16,869	23,995	4,856	5,427	28,679	38,402	16,763	25,914
1978	8,781	10,706	3,415	5,341	8,225	11,294	2,879	3,218	17,006	22,000	8,761	13,417
1979	4,508	6,026	2,828	4,346	5,165	7,207	1,393	1,557	9,673	13,233	6,600	9,996
1980	14,217	18,003	6,293	10,079	19,056	26,865	7,033	7,860	33,273	44,868	18,317	29,084
1981	10,355	14,187	7,085	10,917	11,026	15,267	7,384	8,253	21,381	29,454	10,726	17,931
1982	7,625	9,549	4,899	6,824	9,782	13,871	5,307	5,932	17,407	23,420	9,374	14,764
1983	5,601	7,558	3,740	5,697	9,662	13,836	9,194	10,275	15,263	21,394	4,209	9,258
1984	1,305	2,820	1,305	2,820	15,706	22,627	3,426	3,829	17,011	25,447	13,585	21,617
1985	7,904	14,423	7,904	14,423	16,541	23,828	4,656	5,204	24,445	38,251	19,789	33,046
1986	7,072	15,283	7,072	15,283	9,891	14,261	2,667	2,981	16,963	29,544	14,296	26,563
1987	3,924	8,481	3,924	8,481	6,922	10,043	1,294	1,446	10,846	18,524	9,553	17,078
1988	4,844	10,469	4,844	10,469	4,716	6,697	1,296	1,449	9,560	17,166	8,264	15,717
1989	4,615	9,973	4,615	9,973	6,560	9,437	250	279	11,175	19,410	10,925	19,131
1990	4,094	8,847	4,094	8,847	5,486	7,918	560	626	9,580	16,765	9,020	16,139
1991	2,721	5,879	2,721	5,879	7,337	10,563	1,257	1,405	10,058	16,442	8,801	15,037
1992	2,418	5,224	2,418	5,224	6,878	9,809	1,052	1,176	9,296	15,033	8,243	13,857
1993	2,123	4,587	2,123	4,587	4,345	4,820	1,054	1,166	6,468	9,407	5,414	8,241
1994	1,155	2,495	1,155	2,495	3,084	3,495	697	815	4,238	5,990	3,541	5,175
1995	1,676	3,622	1,676	3,622	3,439	3,998	313	346	5,116	7,620	4,803	7,274
1996	2,359	5,097	2,359	5,097	4,729	5,397	720	812	7,088	10,494	6,368	9,682
1997	1,022	2,209	1,022	2,209	2,769	3,176	550	611	3,791	5,385	3,241	4,774
1998	1,107	1,339	1,107	1,339	1,372	1,642	304	340	2,479	2,981	2,175	2,641
1999	1,396	1,689	1,396	1,689	2,375	2,640	441	459	3,771	4,330	3,330	3,871
2000	1,075	1,301	1,075	1,301	988	1,206	183	202	2,064	2,506	1,881	2,304
2001	1,621	1,961	1,621	1,961	1,938	2,279	239	271	3,559	4,240	3,320	3,969
2002	610	738	610	738	483	548	166	192	1,093	1,285	927	1,093
2003	1,588	1,922	1,588	1,922	1,056	1,198	178	200	2,645	3,120	2,467	2,920
2004	1,059	1,281	1,059	1,281	1,335	1,605	97	113	2,394	2,886	2,297	2,773
2005	690	835	690	835	809	1,012	83	99	1,499	1,847	1,416	1,748
2006	1,268	1,534	1,268	1,534	922	1,171	126	148	2,190	2,704	2,064	2,557
2007	562	679	562	679	616	736	86	103	1,178	1,415	1,091	1,312

SFA 19-21 method changed in 2008 (Amiro et al 2008) (see 1SW) 2SW propotions of MSW were annually determined from aged data at LaHave River. SFA 23 is as previously calculated (see 1Sw). "Removals" of 2SW fish in SFAs 19-21 have been few, largely illegal and unascribed since the catch-and-release angling regulations in 1985; removals in SFA 23, 1985-1997, had been in total, the assessed losses to stocks originating above Mactaquac. The revised method, 1993-2000, incorporates 5th and 95th percentile values for losses noted on the Nashwaak raised to the total production area downstream of Mactaquac as well as the previously assessed and used values for stocks upstream of Mactaquac.

(x) Estimated numbers of salmon returns and spawners for Québec

	Recruit of small salmon			Recruit of large salmon			Spawner of small salmon			Spawner of large salmon			Percent	Recruit of 2SW salmon		Spawner of 2SW salmon		Prop
Year	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Large	Min	Max	Min	Max	2SW
1969	25,355	31,694	38,032	74,653	93,316	111,979	16,313	20,392	24,470	25,532	31,915	38,299	25%	54,496	81,745	18,639	27,958	0.73
1970	18,904	23,630	28,356	82,680	103,350	124,020	11,045	13,806	16,568	31,292	39,115	46,937	19%	60,356	90,534	22,843	34,264	0.73
1971	14,969	18,711	22,453	47,354	59,192	71,031	9,338	11,672	14,007	16,194	20,243	24,292	24%	34,568	51,852	11,822	17,733	0.73
1972	12,470	15,587	18,704	61,773	77,217	92,660	8,213	10,267	12,320	31,727	39,658	47,590	17%	45,094	67,642	23,160	34,741	0.73
1973	16,585	20,731	24,877	68,171	85,214	102,256	10,987	13,734	16,480	32,279	40,349	48,419	20%	49,765	74,647	23,564	35,346	0.73
1974	16,791	20,988	25,186	91,455	114,319	137,182	10,067	12,583	15,100	39,256	49,070	58,884	16%	66,762	100,143	28,657	42,985	0.73
1975	18,071	22,589	27,106	77,664	97,080	116,497	11,606	14,507	17,409	32,627	40,784	48,940	19%	56,695	85,042	23,818	35,726	0.73
1976	19,959	24,948	29,938	77,212	96,515	115,818	12,979	16,224	19,469	31,032	38,790	46,548	21%	56,365	84,547	22,653	33,980	0.73
1977	18,190	22,737	27,285	91,017	113,771	136,525	12,004	15,005	18,006	44,660	55,825	66,990	17%	66,442	99,663	32,602	48,902	0.73
1978	16,971	21,214	25,456	81,953	102,441	122,930	11,447	14,309	17,170	40,944	51,180	61,416	17%	59,826	89,739	29,889	44,834	0.73
1979	21,683	27,103	32,524	45,197	56,497	67,796	15,863	19,829	23,795	17,543	21,929	26,315	32%	32,994	49,491	12,807	19,210	0.73
1980	29,791	37,239	44,686	107,461	134,327	161,192	20,817	26,021	31,226	48,758	60,948	73,137	22%	78,447	117,670	35,594	53,390	0.73
1981	41,667	52,084	62,501	84,428	105,535	126,642	30,952	38,690	46,428	35,798	44,747	53,697	33%	61,633	92,449	26,132	39,199	0.73
1982	23,699	29,624	35,549	74,870	93,587	112,305	16,877	21,096	25,316	36,290	45,363	54,435	24%	54,655	81,982	26,492	39,738	0.73
1983	17,987	22,484	26,981	61,488	76,860	92,232	12,030	15,038	18,045	23,710	29,638	35,565	23%	44,886	67,329	17,308	25,963	0.73
1984	21,566	26,230	30,894	61,180	71,110	81,041	16,316	20,636	24,957	30,610	37,674	44,739	27%	44,661	59,160	22,345	32,659	0.73
1985	22,771	28,016	33,262	62,899	73,545	84,192	15,608	20,374	25,140	28,312	35,897	43,482	28%	45,916	61,460	20,668	31,742	0.73
1986	33,758	40,347	46,937	75,561	87,479	99,397	22,230	28,042	33,855	32,997	41,114	49,232	32%	55,159	72,560	24,088	35,939	0.73
1987	37,816	45,925	54,034	72,190	82,920	93,650	25,789	33,135	40,481	29,758	36,610	43,462	36%	52,699	68,365	21,723	31,727	0.73
1988	43,943	53,068	62,193	77,904	90,587	103,269	28,582	36,699	44,815	34,781	43,653	52,524	37%	56,870	75,387	25,390	38,343	0.73
1989	34,568	41,488	48,407	70,762	81,316	91,871	24,710	31,015	37,319	34,268	41,727	49,185	34%	51,656	67,066	25,016	35,905	0.73
1990	39,962	47,377	54,792	68,851	79,872	90,893	26,594	33,210	39,826	33,454	41,535	49,615	37%	50,261	66,352	24,422	36,219	0.73
1991	31,488	37,121	42,755	64,166	73,675	83,184	20,582	25,508	30,433	27,341	33,569	39,797	34%	46,841	60,724	19,959	29,052	0.73
1992	35,257	42,000	48,742	64,271	74,112	83,953	21,754	27,668	33,583	26,489	32,993	39,497	36%	46,917	61,285	19,337	28,833	0.73
1993	30,645	36,400	42,156	50,717	57,197	63,677	17,493	22,469	27,444	21,609	25,481	29,353	39%	37,023	46,484	15,774	21,428	0.73
1994	29,667	34,918	40,170	51,649	58,139	64,630	16,758	21,200	25,642	21,413	25,191	28,968	38%	37,703	47,180	15,631	21,147	0.73
1995	23,851	28,109	32,368	59,939	67,083	74,227	14,409	17,978	21,548	30,925	35,122	39,320	30%	43,755	54,186	22,575	28,703	0.73
1996	32,008	37,283	42,558	53,990	61,136	68,282	18,923	23,364	27,805	26,042	30,433	34,824	38%	39,413	49,846	19,010	25,421	0.73
1997	24,300	28,659	33,018	44,442	50,315	56,187	14,724	18,467	22,210	21,275	24,871	28,466	36%	32,443	41,017	15,531	20,780	0.73
1998	24,495	29,398	34,301	33,368	38,487	43,605	16,743	21,237	25,730	19,506	23,068	26,629	43%	24,358	31,832	14,240	19,439	0.73
1999	25,880	31,279	36,679	34,815	40,496	46,178	18,969	23,889	28,808	23,631	28,124	32,618	44%	25,415	33,710	17,250	23,811	0.73
2000	24,129	29,599	35,070	33,312	39,938	46,565	16,444	21,154	25,865	22,094	27,027	31,960	43%	24,317	33,992	16,128	23,331	0.73
2001	16,939	20,696	24,452	35,016	41,753	48,490	10,836	13,913	16,989	22,871	27,913	32,954	33%	25,562	35,398	16,696	24,056	0.73
2002	28,609	33,942	39,275	25,635	30,718	35,801	17,070	21,347	25,625	17,079	20,722	24,366	52%	18,714	26,135	12,467	17,787	0.73
2003	23,142	27,517	31,892	39,435	45,924	52,413	15,445	19,316	23,187	28,409	33,773	39,137	37%	28,787	38,262	20,738	28,570	0.73
2004	30,423	36,844	43,266	34,796	40,142	45,488	20,513	26,297	32,081	23,920	28,147	32,374	48%	25,401	33,207	17,462	23,633	0.73
2005	20,685	25,108	29,531	33,728	38,780	43,831	14,295	18,287	22,278	24,012	28,090	32,168	39%	24,622	31,996	17,529	23,482	0.73
2006	24,925	29,783	34,641	30,922	35,866	40,811	17,305	21,599	25,893	22,171	26,077	29,983	45%	22,573	29,792	16,185	21,887	0.73
2007	18,524	22,654	26,784	27,482	32,139	36,796	13,032	16,754	20,477	19,189	22,939	26,690	41%	20,062	26,861	14,008	19,484	0.73
Mean 84-07	**28,306**	**33,907**	**39,507**	**50,293**	**58,030**	**65,768**	**18,547**	**23,482**	**28,416**	**25,923**	**31,323**	**36,723**						
2007 vs																		
2006		**-24%**			**-10%**			**-22%**			**-12%**							
2002-2006		**-26%**			**-16%**			**-22%**			**-16%**							

Annex 6: 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.

ASAP *(The Atlantic Salmon Arc Project)* The initial aim of ASAP is to collect samples from the majority of salmon rivers on the Western Atlantic coast of Europe and use methods of Genetic Stock Identification (GSI).

BHSRA *(Bayesian Hierarchical Stock and Recruitment Approach)* Models for the analysis of a group of related stock–recruit data sets. Hierarchical modeling is a statistical technique that allows the modeling 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.

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.

CPUE *(Catch Per Unit 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.

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

FV *(Fishing Vessel)* A vessel that undertakes cruise for commercial fishing purposes.

GIS *(Geographic Information Systems)* A computer technology that uses a geographic information system as an analytic framework for managing and integrating data.

GSI *(Genetic Stock Identification)* Methods used to 'genetically type' salmon from particular regions and rivers across Atlantic.

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

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.

PFA *(Pre-Fishery Abundance)* The numbers of salmon estimated to be alive in the ocean from a particular stock at a specified time.

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.

RT-PCR *(Reverse Transcription-Polymerase Chain Reaction)* is the most sensitive technique for mRNA detection and quantitation currently available. Compared to the two other commonly used techniques for quantifying mRNA levels, Northern blot analysis and RNase protection assay, RT-PCR can be used to quantify mRNA levels from much smaller samples.

RV *(Research Vessel)* A vessel that undertakes cruises to conduct scientific research.

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.

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 and met in November 2006.

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.

SAC *(Special Areas of Conservation)* To comply with the EU Habitats Directive (92/43/EEC) on Conservation of Natural Habitat and of Wild Fauna and Flora, which stipulates that member states maintain or restore habitats and species to favourable conservation status, a number of rivers in the NEAC area that support important populations of vulnerable qualifying species have been designated SACs. Where salmon is a "qualifying species", additional protection measures specifically for salmon are required.

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

VHSV *(Viral Haemorrhagic Septicaemia Virus)* VHS is a highly infectious virus disease caused by the virus family *Rhabdoviridae*, genus *Novirhabdovirus*.

VIE *(Visual Implant Elastomer)* The VIE tags consist of fluorescent elastomer material which is subcutaneously injected as a liquid into transparent or translucent tissue via a hand-held injector.

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.

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.

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

Annex 7: Review of the Report of the Working Group on North Atlantic Salmon (WGNAS)

April 21–23, 2008 (by correspondence)

Reviewers

- Denis Rivard (Chair)
- Kjell Leonardsson (External Reviewer)
- Kevin Friedland (External Reviewer)

Chair WG

- Tim Sheehan

Secretariat

- Michala Ovens

Overall

- The results of stock status are consistent overall with previous reports and our understanding of general trends for these stocks.
- The information and analyses provided follow the assessment procedures developed in past years and, as such, this report amounts more to an update of the assessment using the latest data from 2007. In some cases, updates were also made to the 2005 and 2006 data as appropriate.
    - The comparison of the methodology for North American stocks and European stocks is well done and identifies improvements that could be implemented in future assessments.
- This report goes a long way in responding to the Terms of Reference and in laying out the progress made in advancing special studies and research aiming at elucidating the science questions requiring attention (such as stock differentiation using genetic tools and mortality at sea). Overall, the WG report was very well written and carefully prepared.
- Technical Minutes 2007 are available in the WGNAS 2007 Report.

1. Introduction

- Concise and informative. Provides a good introduction to the report.
- This report from the WGNAS addresses all Terms of Reference to the degree possible with available data and knowledge. The matching of the elements of the terms of reference and the Section of the Report is a good tool to ensure that all elements of the Terms of Reference are addressed.

2. Atlantic Salmon in the North Atlantic Area

- **Section 2.1.2** The WG assumes that catch and release mortality is insignificant and thus does not calculate these removals or include them as a source of mortality in their modelling. The WG cites four reports to support this view, but these reports do not necessarily support their position. The report by Whoriskey *et al.* only reports on a trial where fish were held 24 hours after angling, which is likely not sufficient to characterize delayed mortalities. The paper by Dempson *et al.* reports mortality rates of 8% and as high as 12% in warmer water conditions. If we use the later rates, catch and release would be a significant source of mortality. The WG needs to reconsidered its data on catch and release mortality.

- In **Section 2.1.3**, we note that there is no estimate of unreported catch for the North American Commission Area for 2007. These estimates should be provided next year.
- **Section 2.3.2** Standardization of run reconstruction models. We note that the assumptions and data inputs of the run-reconstruction models were reviewed and that differences in assumption and data between Commission Areas were resolved. The RG supports the seven recommendations identified by the WG and encourages their implementation. This is a good initiative which should help future explorations of Bayesian models for forecasting and for development of catch advice.
- **Section 2.3.3** "Modelling the dynamics of Atlantic Salmon in the NAC and NEAC areas". The RG notes the progress made in the development of forecast and management models. The overall objective is to develop forecast models for all the stock complexes in the North Atlantic. This objective is well stated, together with the next steps which recognize the need to identify the level of disaggregation required for making such forecasts relevant to the various fisheries. The WG should explore the utility of including environmental forcing variables in future model development. Along this front, the WG is encouraged to consider the ideas contained in Cooperative Research Report 282 (ICES 2006, Incorporation Of Process Information Into Stock–Recruitment Models) and recent reports on environmental correlates relevant to recruitment (Beuagrand and Reid 2003; Friedland *et al*., 2000; 2003a, 2003b).
- **Sections 2.3.4 to 2.8** Informative updates on various issues and research initiatives. We are encouraged with the direction of many of these initiatives on marine survival, salmon tracking using various technologies, etc.
- **Section 2.4** While it is recognized that the purpose of this Section is to report on associations between biological characteristics and marine survival and that there are numerous ways to address this issues, the WG is encouraged to remain cognizant of the vast amount of information on this subject in the published literature. As an example, Friedland *et al.*, 2000 shows a relationship between post-smolt growth and return rate for the North Esk stock. This relationship is supported by data for an Irish Stock (Peyronnet *et al*., 2007) and a Norwegian stock (McCarthy *et al*., 2008). McCarthy *et al*., 2008 also shows that post-smolt growth during the summer period appears to be a critical period for salmon survival. These reports support a growth-mortality hypothesis of recruitment control in Atlantic salmon in the NE Atlantic. The WG should liaise with non-WG members from their individual countries and encourage them to develop working papers addressing the Terms of Reference for the meeting. This could greatly expand the scope of information presented to address the questions posed by NASCO.
- **Section 2.4.3** Decline in 2SW salmon stocks in Iceland. The proportion of females in the two sea age classes has remained stable over the time

period, and suggests that there has been no change in the proportion of smolts destined to become 1SW and 2SW fish.

The logic in that statement is not entirely clear. Reaction norms in fish generally allow for plasticity in the individual's response to the environment. Therefore the possibility for an earlier maturation should not be excluded from the candidate hypothesis. In addition, the intense fishery during the past decades has imposed a selection pressure, directly via mortality and indirectly via the ecosystem changes, on the reaction norms, favouring earlier returns. An important resource for information along this front could be the International Institute for Applied Systems Analysis's Evolution and Ecology Program: (http://www.iiasa.ac.at/Research/EEP/)

3. North-East Atlantic Commission

Section 3.6 The use of "year" as a forecast variable remains a concern. With its negative coefficient, the model suggests that the stocks will not increase with the progression of time until sufficient data is accumulated to change the sign of that coefficient. As such, this forecast model is not responsive to stock dynamics. The RG does note however that the results from the run reconstruction model and all monitoring indices do support the PFA forecasts and the conclusion that suggests stock abundance has remained depressed. Regardless, a more realistic approach to forecast the PFA abundance is needed and new assessment models being looked at need to be evaluated in this context. The Review Group notes that the progress made in the development of forecast and management models discussed above will likely correct this issue.

4. North American Commission

- The Review Group notes that no catch advice or stock status information was requested and that the WG has adequately addressed the remaining Terms of Reference.

5. Atlantic Salmon in the West Greenland Commission

- The Review Group notes that no catch advice or stock status information was requested and that the WG has adequately addressed the remaining Terms of Reference.
- Noted that the 2005 and 2006 landings data reported previously were corrected (were initially reported as gutted weights instead of whole weight).

6. List of recommendations

- <u>ICES to note proposed study group</u> to facilitate a unified effort to further develop and investigate the biological characteristics datasets for changes in biological characteristics and stock performance.
- <u>ICES to note proposed study group</u> to facilitate the development of PFA modelling approaches for both the NAC and NEAC prior to the 2009 WGNAS.

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