REPORT OF ICES ADVISORY COMMITTEE

ON

NORTH ATLANTIC SALMON STOCKS

TO

NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION

June 5 to 8, 2012

CNL(12)8

Advice generated by ICES in response to terms of reference from NASCO

10.1 General questions, catches, research, other questions

10.2 Northeast Atlantic Commission – catches, stock status, catch advice, *Gyrodactylus*

10.3 North American Commission – catches, stock status, catch advice

10.4 West Greenland Commission – catches, catch advice

Manuela Azevedo & Hans Lassen

Advice generated by ICES in response to terms of reference from NASCO

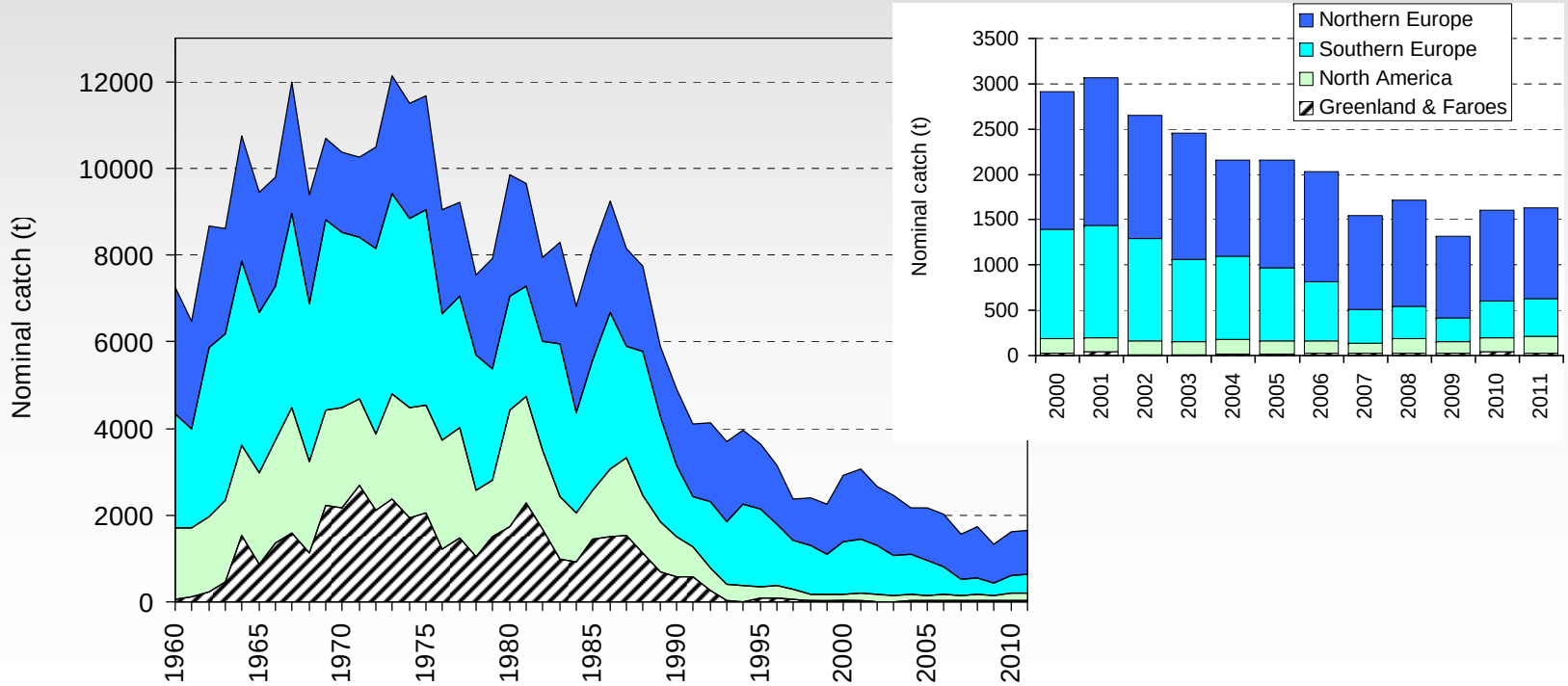
10.1 With respect to salmon in the North Atlantic:

1. **Overview of salmon catches, landings, unreported catches, catch and release, and production of farmed and ranched Atlantic salmon**
2. **Report on significant new or emerging threats to, or opportunities for, salmon conservation and management**
3. **Report on progress in review of salmon restoration and rehabilitation**
4. **Summary of compilation of tag releases by country in 2011**
5. **Summary of data deficiencies, monitoring needs and research requirements**
6. **Summary of advice for commission areas**

10.1.5 Overview of salmon catches and landings

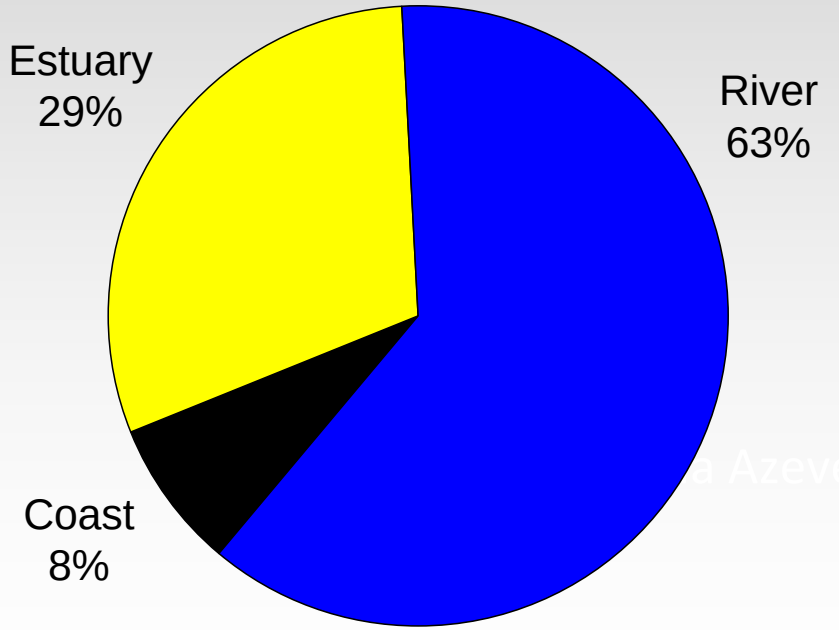
Nominal catch in 2011 in the North Atlantic = 1634 t

NAC	West Greenland	Southern NEAC	Northern NEAC	NEAC	North Atlantic
182 t	28 t	422 t	1003 t	1424 t	1634 t
14th lowest	13th lowest	5th lowest	3rd lowest	4th lowest	4th lowest

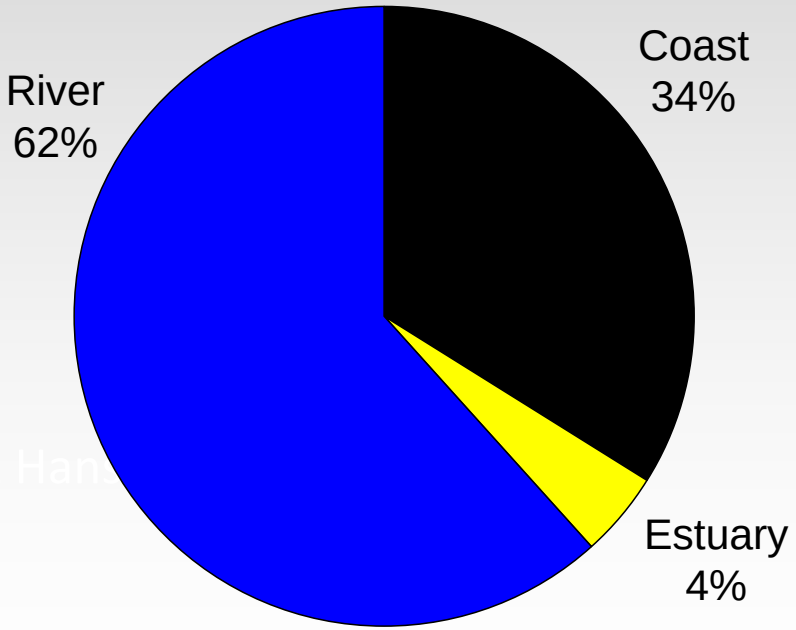


10.1.5.1 Partitioning of nominal catch into areas fished

- Majority of nominal catch in 2011 was taken in rivers
- Higher proportion of catches from coastal areas in NEAC compared to NAC, higher proportion from estuaries in NAC



NAC



NEAC

10.1.5.1 Partitioning of nominal catch into areas fished

North American Commission

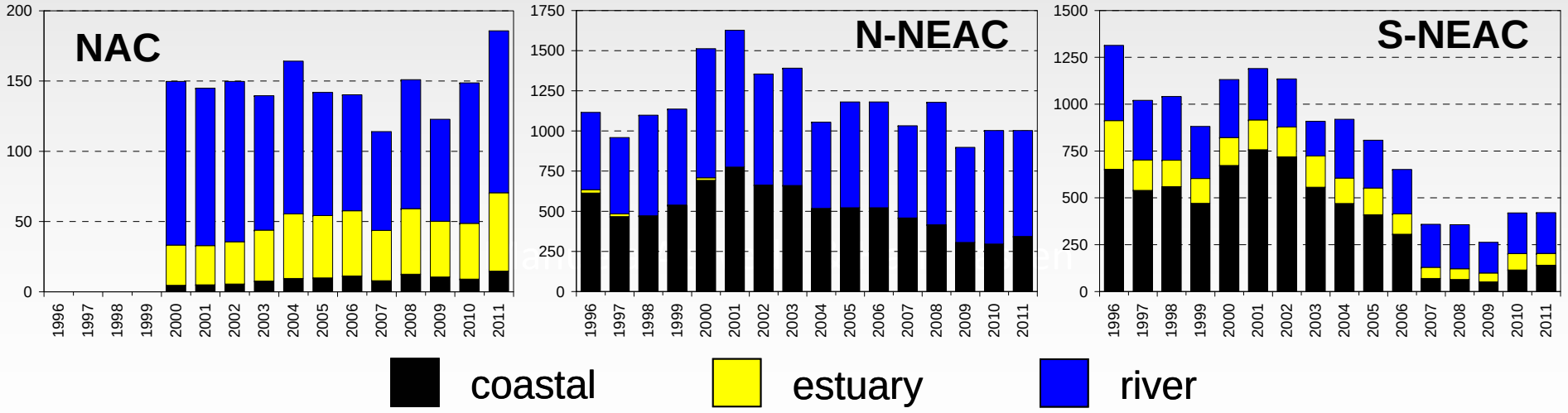
- Total catch relatively constant, majority in river fisheries

Northern North-East Atlantic Commission

- Approx. 50:50 river to coastal, increasing in rivers (66% river in 2011)

Southern North-East Atlantic Commission

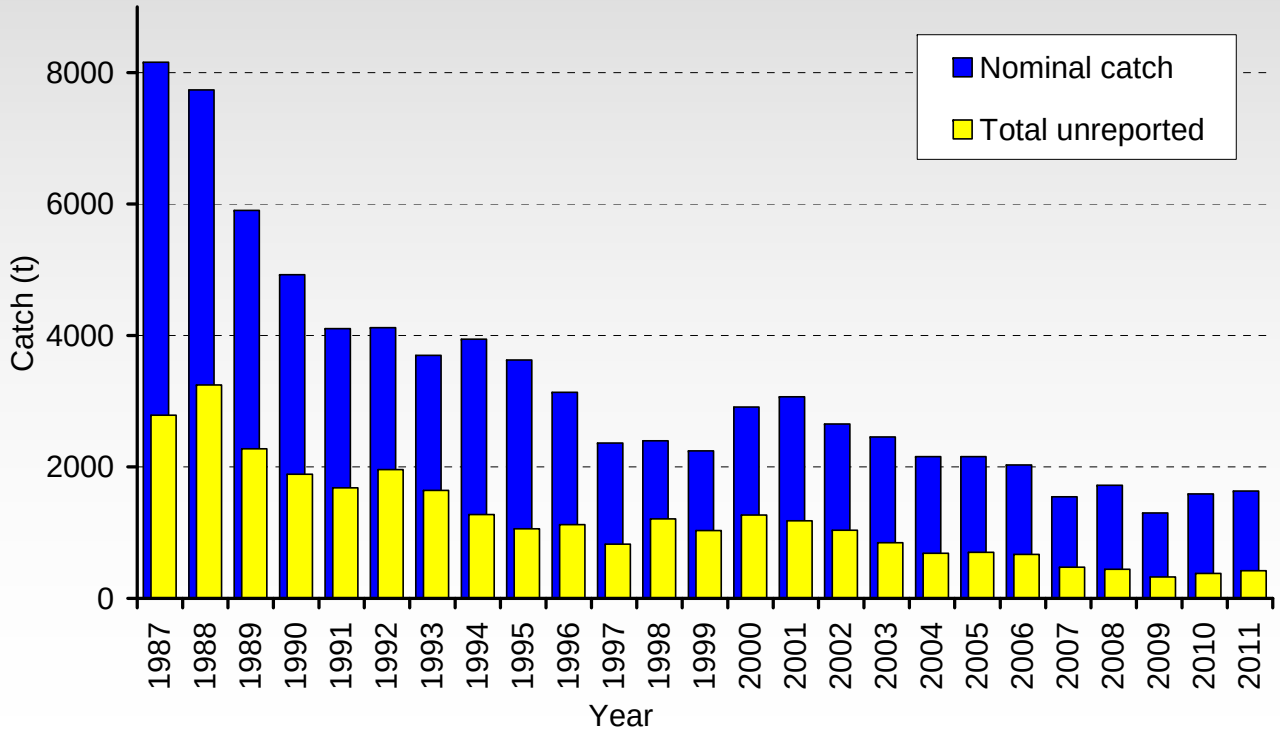
- Large declines in coastal fisheries, majority of catch since 2007 taken in rivers (52% in 2011)



by country: Figure 10.1.5.2

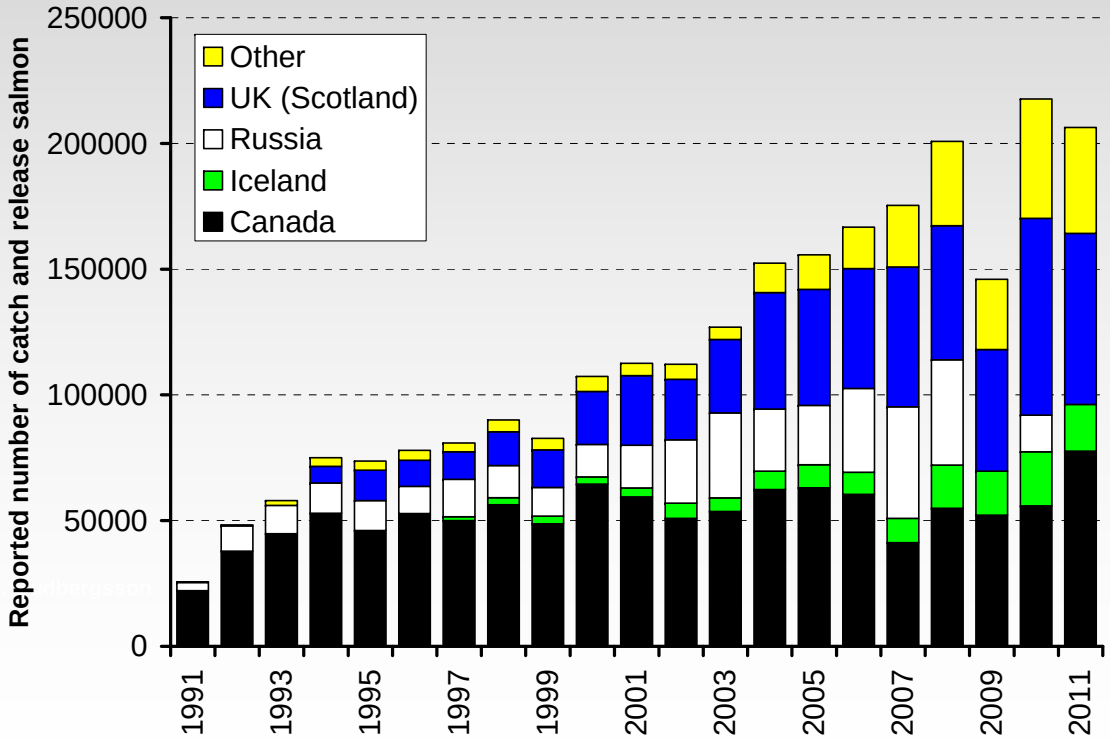
10.1.5.2 Unreported Catches

- **421 t in 2011** (no report from St. P&M, Russia, Spain)
  - 382 t from NEAC
  - 10 t from West Greenland
  - 29 t from NAC
- **Unreported catch has been 23% to 34% of nominal catch, over the period 1987 to 2006**

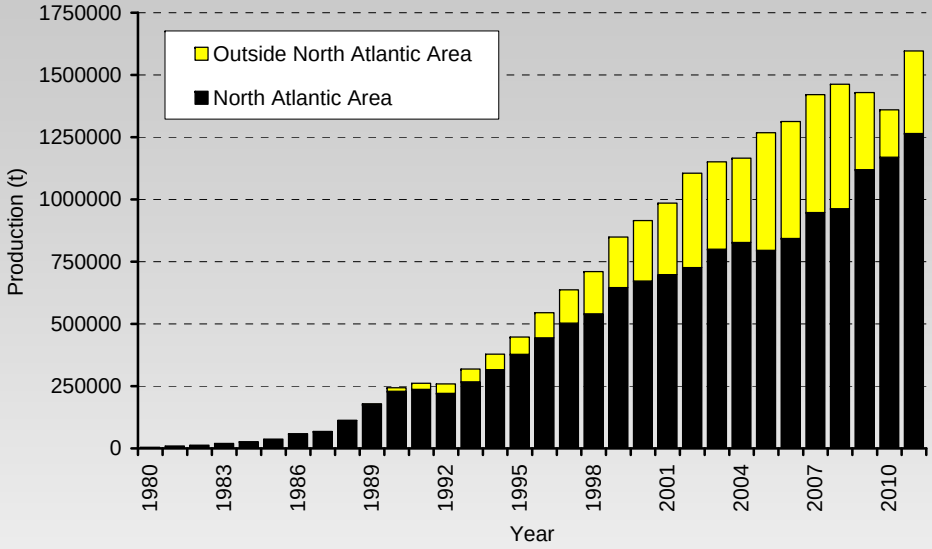


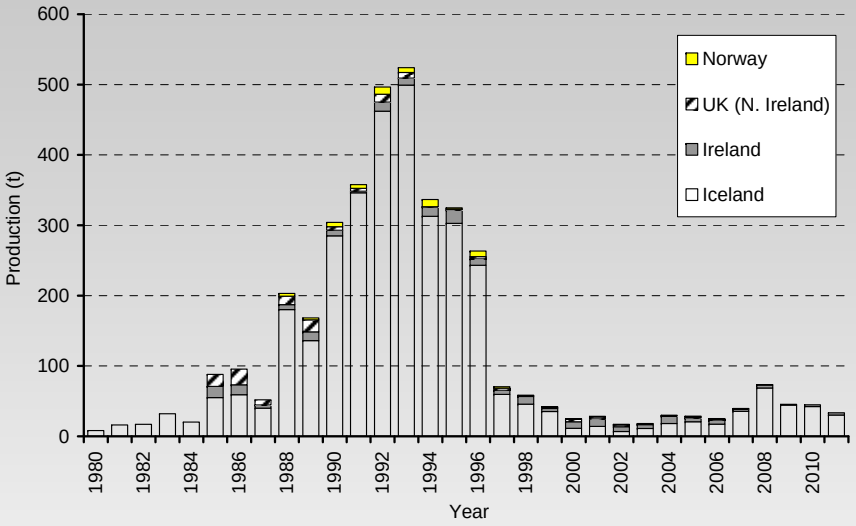
10.1.5.3 Catch and release fishing (by country Table 10.1.5.3)

- **Occur in river rod fisheries, not included in nominal catch**
- **Increasing number of countries are reporting (8 in 2011)**
- **Often incomplete reporting**
- **Practice is increasing in popularity**
  - 206 000 released fish in 2011



10.1.5.4 Farming and Sea Ranching





Farmed production in 2011

- **North Atlantic = 1 273 kt**
  - **78% from Norway**
  - **12% from UK(Scotland)**
- **Worldwide = 1 596 kt**
  - **above 1 million t since 2002**
  - **980 times the nominal catch in 2011**

Sea ranching in 2011 = 33 t

- **30** t from Iceland as ranching to rod fisheries

10.1.6 Report on significant new or emerging threats to, or opportunities for, salmon conservation and management

10.1.6.1 Update on SALSEA

- Update provided on SALSEA Merge project
- Overview of SALSEA North America

10.1.6.2 Atlantic salmon genetics

- In 2011 a new EU project “Trilateral co-operation on our common resource; the Atlantic salmon in the Barents region” (Kolarctic Salmon) was started
    - develop a baseline for the salmon populations of northernmost Europe, develop practical tool for the management of mixed stock coastal fisheries in Norway and Russia.

- Initiative to construct, combine, calibrate, and integrate databases of Canadian and USA Atlantic salmon populations to provide a tool for identifying the North American origin of salmon from the Greenland, the Labrador, and the Saint-Pierre & Miquelon fisheries.

10.1.6 Report on significant new or emerging threats to, or opportunities for, salmon conservation and management

10.1.6.3 Recent studies on marine ecology of US origin salmon

- Ultrasonic telemetry, marine trawl surveys, feeding studies, and modelling of environmental variables and salmon marine survival have been conducted to develop a better understanding of salmon's role in the marine ecosystem and the causal mechanisms of marine survival while looking for opportunities for management intervention
- some highlights:
  - predator refuge is considered minimal for emigrating post-smolts, given a mismatch in the size overlap among species and low abundance of other co-occurring diadromous populations
  - post-smolts that lived in the river longer (i.e., from naturally reared and parr-stocked origins) were smaller and consumed more fish than invertebrates compared to larger post-smolts that originated from smolt stocking programme
  - associations between hatchery return rates, climate variation, and shifting predator distributions in the Gulf of Maine were reported, consistent with the predator hypothesis of recruitment control for this stock complex

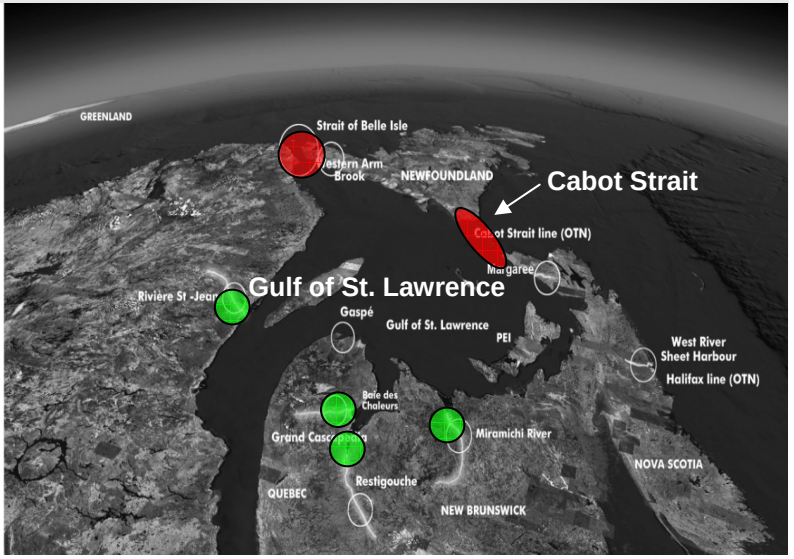
10.1.6 Report on significant new or emerging threats to, or opportunities for, salmon conservation and management

10.1.6.4 Recent results from acoustic tacking investigations in Canada

- Atlantic Salmon Federation (ASF) has continued to assess estuarine and coastal survival of tagged Atlantic salmon released in rivers of the Gulf of St. Lawrence
- Inferred survival for smolts in 2011 from freshwater release points to the head of tide (80–90%), and from the head of tide to estuary exits (40–60%), migrating across the Gulf of St. Lawrence to the Strait of Belle Isle (25–45%)

- Kelts are also being tagged and tracked, documenting migration rates, times at sea of consecutive and alternate spawners

- Ocean Tracking Network (OTN) has completed a receiver line across Cabot Strait so that all migrations of tagged marine organisms (fish, mammals) into and out of the Gulf of St. Lawrence can be tracked



10.1.6 Report on significant new or emerging threats to, or opportunities for, salmon conservation and management

10.1.6.5 Changing biological characteristics

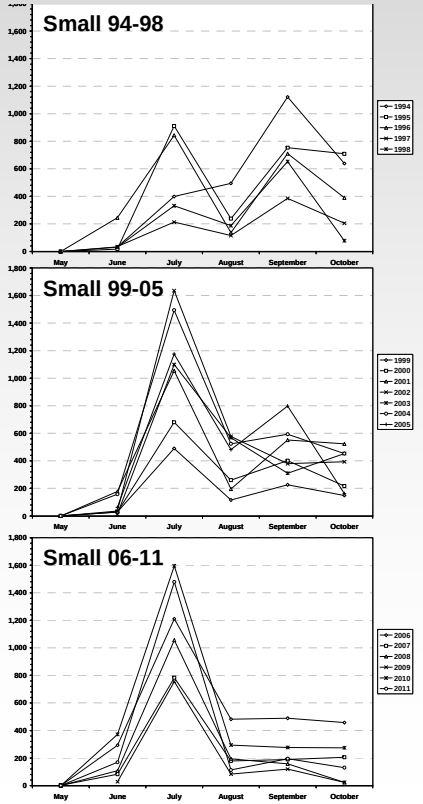
- Trends in various biological characteristics of salmon were previously reported in the ICES SGBICEPS (ICES 2010)
- Decreasing mean fork lengths in returning adult 1SW fish in the River Bush and in River Bann in UK (N. Ireland) were noted
- Also notable was the increase in numbers of 2SW returns to the River Bush in UK (N. Ireland) and the increase in the relative proportion of 2SW vs. 1SW since 2003.
- Similar change in 1SW:MSW ratios was found in the Norwegian stocks; from 2006 smolt cohort onwards, the proportion returning as 1SW decreased from about 50% to about 30% and has remained so.
- Above observations could indicate a shift in life history strategy from 1SW to MSW in some Northern NEAC and Southern NEAC stocks, possibly due to poor growth in the first season at sea.

10.1.6 Report on significant new or emerging threats to, or opportunities for, salmon conservation and management

10.1.6.6 Change in run timing and body wounds on the Miramichi River salmon

- Run timing of salmon to the Miramichi River (Canada) in the early and mid 1990s was characterized by distinct early (June and July) and late (Sept. and Oct.) modes but has changed in past five years to a early mode (July). The reduced late run believed to be related to a change in behaviour.

- Since 2009, wounds on salmon were noted, all occurences in June and July.
  - wounds are specific to salmon
  - many of the wounds are severe lacerations
  - similar wounds on salmon, attributed to predators, have been reported from other locations in the North Atlantic particularly UK (Scotland)



10.1.6 Report on significant new or emerging threats to, or opportunities for, salmon conservation and management

10.1.6.9 Red vent syndrome and other parasites

- red vent syndrome (RVS; characterised by swollen and/or bleeding vents), noted in Atlantic salmon since 2005, linked to the presence of nematode, *Anisakis simplex*
- reduction in 2011 from previous years and no indication that RVS affects survival or spawning success, affected vents showed signs of progressive healing in freshwater

10.1.6 Report on significant new or emerging threats to, or opportunities for, salmon conservation and management

10.1.6.9 Red vent syndrome and other parasites

- Possible new salmon parasite
- In 2011, *Paragnathia formica*, an estuarine crustacean isopod, was detected on 5% of salmon caught at the trap facility located near the upper limit of the estuary of the Scorff River (France)
- Not clear if new or been undetected until now
- Symptoms include inflammation in the vent area and on the fins and may be mistaken for sea lice bites or red vent syndrome
- Monitoring is ongoing

10.1.6 Report on significant new or emerging threats to, or opportunities for, salmon conservation and management

10.1.6.10 Dumping of mine tailings in Norwegian fjords

- Plans for expansion of existing mining activities in many regions in Norway. Several of the existing and planned mining activities are located within National Salmon Fjords and close to National Salmon Rivers

- Runoff from mines containing sulfides and heavy metals to rivers and streams may affect freshwater production and survival

- Dumping of mine tailings in fjords may have negative impacts on smolt survival, and the fjord ecosystems in general.

10.1.6 Report on significant new or emerging threats to, or opportunities for, salmon conservation and management

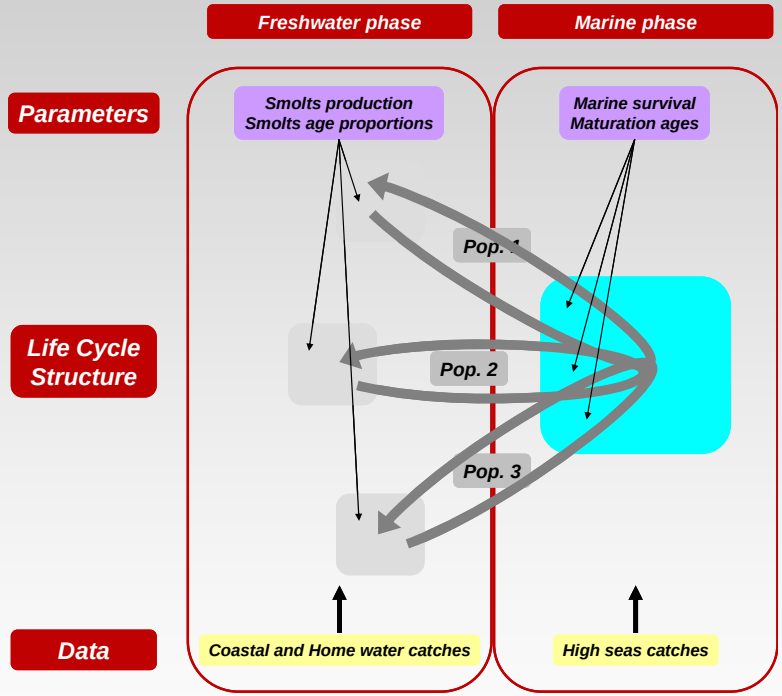
10.1.6.7 ECOKNOWS progress

- EU 7th framework project (2010-2014)

Objective: to develop models that make use of all types of relevant biological knowledge in fisheries science

- Generic assessment tools are being applied to case study stocks/fisheries including Atlantic salmon assessment and forecast models used in the Baltic and North Atlantic area

- Commitment of ECOKNOWS to report regularly to ICES WGNAS and WGBAST



10.1.6 Report on significant new or emerging threats to, or opportunities for, salmon conservation and management

10.1.6.8 Workshop on Age Determination of Salmon

Objective: reviewing assessing, documenting, and making recommendations on current methods of ageing Atlantic salmon

- standardising digital scale reading,
- compilation of a digital image reference collection,
- detailing of characteristics and reference points or
- itemising scale marks and issues in their separation.

- Second Workshop convened for September 2012 to address issues regarding protocols, inter-laboratory calibration and quality control as they relate to the interpretation of age and calculation of growth and other features from scales

10.1.6 Report on significant new or emerging threats to, or opportunities for, salmon conservation and management

10.1.6.11 River Classification System

- River Classification System in Newfoundland (Canada) defined different season bag limits for individual recreational fisheries licences based on four categories of river status.
- Rivers were assigned to a category and the corresponding season retention limits were based on the size of the river and its assessed status relative to consevation objectives.
- Expectations from the plan were realized.
  - Reductions in harvest occurred on rivers with the lowest allowable retention (Class II and III rivers; 4 and 2 fish per year).
  - On rivers that allowed an annual retention of 6 fish (Class I rivers), the total harvest increased by approximately 2100 fish per year after the implementation of the plan.
  - Effort and catch shifted from the lowest class rivers (Class II and III) to the highest class rivers (Class I).

10.1.6 Report on significant new or emerging threats to, or opportunities for, salmon conservation and management

10.1.6.12 Environmental thresholds for managing salmon fisheries

- In several rivers of New Brunswick (Canada), water temperatures during June to August can frequently exceed 25°C.
- Recent science review in Canada considered defining environmental thresholds related to water temperature for the management of Atlantic salmon fisheries
- For Miramichi River:
  - Closure trigger if T_{min} over each of two consecutive days >= 20°C.
  - Opening trigger if T_{min} over each of two consecutive days is < 20°C.
- Choice of T_{min} and two days as indication of physiological stress is motivated by studies on behavioural changes in juvenile Atlantic salmon.
- Dedicated research to determine if 20ºC is a good choice for adult Atlantic salmon and for other populations

10.1.7 Provide a review of examples of successes and failures in wild salmon restoration and rehabilitation and develop a classification of activities which could be recommended under various conditions or threats to the persistence of populations

- No progress to report on this question

- Study Group to consider this question has been rejuvenated and progress is expected in the coming year

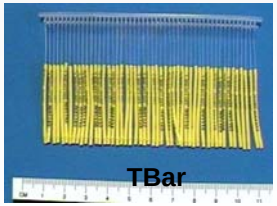
Manuela Azevedo & Hans Lassen

10.1.8 Provide a compilation of tag releases by country in 2011

Tag releases and fin clips in 2011

- compiled as a separate report (ICES 2012)
- approx. 4 million salmon were marked in 2011, a decrease from the 4.4 million fish marked in 2010
- most marks were applied to hatchery-origin juveniles
- since 2003, marks have been applied to farmed salmon in Iceland, these are included in the compilation

- broad range of tag types and increasing numbers of PIT, acoustic, radio, and DST tags being used



streamer

10.1.9 NASCO has requested ICES to identify relevant data deficiencies, monitoring needs and research requirements

Recommendations provided by Commission Area

EU Data Collection Framework was discussed:

- For the index river data used in the Baltic salmon assessment, the collection of these data is covered by the Data Collection Famework (DCF)
- Not the case presently for the North Atlantic
- DCF is due to be reviewed in 2013
- To provide advice for that process, an ICES workshop (WKESDCF) will be convened in Copenhagen from July 3 to July 6, 2012 to examine the data requirements for salmon (and eel).

Highlights of the Commission advice

Three Commission Areas of NASCO

- North-East Atlantic Commission (NEAC)
  - Northern NEAC countries (Russia, Finland, Norway, Sweden, Iceland (N&E)
  - Southern NEAC countries (France, Ireland, UK (N.Ireland), UK (England & Wales), UK (Scotland), Iceland (S&W))
  - *Faroese fishery:* catches salmon from both Northern NEAC, Southern NEAC
- North American Commission (NAC)
  - two countries (Canada, USA)
  - six regions (5 for Canada, 1 for USA)
  - *coastal fisheries* in Canada and SP&M harvest salmon from multiple regions in Canada and USA
- West Greenland Commission
  - no wild salmon produced in Greenland (1 small river exception)
  - *Greenland fishery*: catches salmon from NAC (one age group – 2SW) and from Southern NEAC (one age group – MSW) during their second summer at sea feeding at West Greenland

Highlights of the Commission advice

NASCO's Action Plan for Application of the Precautionary Approach (NASCO 1999) :

"Management measures should be aimed at maintaining all stocks above their conservation limits by the use of management targets."

NASCO has adopted the region specific Conservation Limits as limit reference points :

- having populations fall below these limits should be avoided with high probability

Where there are no specific management objectives (NEAC) :

- ICES considers a stock to be at full reprductive capacity if there is a 95% or greater probability that spawners will be above Conservation Limits

For West Greenland and North American Commissions :

- a risk level of 75% of simultaneously achieving management objectives in 7 (WGC) or 6 (NAC) management units

Highlights of the NEAC advice (10.2)

- Three of the four NEAC stock complexes (Northern NEAC 1SW and MSW and Southern NEAC MSW) are considered to recently be at full reproductive capacity while the Southern NEAC 1SW is considered to be at risk of suffering reduced reproductive capacity.
- At a country level, stocks from several jurisdictions are below CLs.
- In the absence of any fisheries in 2012 to 2015, there is a less than 95% probability of meeting the CL (full reproductive capacity) in two age groups of the southern NEAC stock complex therefore there are no mixed-stock fisheries options on the NEAC complexes at Faroes in 2012 to 2015.
- Fishing should only take place on maturing 1SW and non-maturing 1SW salmon from rivers where stocks have been shown to be at full reproductive capacity.

Highlights of the NAC advice (10.3)

- Improvements in abundance of 1SW and 2SW salmon were noted in 2011.
- Non-maturing 1SW salmon PFA estimate for 2010 increased by 100% over 2009 but ranked 23rd of the 40-year time series.
- North American 2SW spawner estimates were below their CLs in four of the six regions.
- Within each of the geographic areas there are varying numbers of individual river stocks which are failing to meet CLs, particularly in the southern areas of Scotia-Fundy and the USA.
- There are no mixed stock fishery options on 2SW salmon in North America in 2012 to 2015 that would be consistent with a 75% chance or greater of simultaneously meeting region specific management objectives for 2SW salmon.

Highlights of the WGC advice (10.4)

- For West Greenland, stock status for 1SW non-maturing salmon (destined to be 2SW salmon) of North America and the Southern NEAC MSW complex are relevant.
- In European and North American areas, the overall abundance of stocks contributing to the West Greenland fishery has recently increased, however the abundance is low compared to historical levels.
- The region-specific PFA abundances, even in the absence of fishing, are predicted to be below the management objectives in several regions in 2012 to 2014.
- There are no mixed-stock fisheries catch options at West Greenland in 2012, 2013, and 2014.
    - In the absence of fishing mortality there is only a 6% to 8% chance (2012 to 2014) of simultaneously meeting or exceeding the management objectives of the seven management units in 2012 to 2014.

Highlights of the North Atlantic

- Multi-year catch advice is provided for the mixed-stock fisheries of Greenland and North America, as well as for any potential fisheries considerations at Faroes.
- Framework of Indicators templates are provided for West Greenland and for NEAC in support of the multi-year management advice.
- Marine survival indices in the North Atlantic were generally improved in the most recent two years in some stocks but the declining trend has persisted and survival indices remain low.
- Factors other than marine fisheries, acting in freshwater and in the ocean in both NAC and NEAC (marine mortality, fish passage, water quality), are contributing to continued low abundance of wild Atlantic salmon.

- **supporting information and details in the report of the ICES Working Group on North Atlantic Salmon available at:**
  http://www.ices.dk/reports/ACOM/2012/WGNAS/wgnas_2012_final.pdf

Acknowledgements

Members (25) of participating countries (12) to Working Group on North Atlantic Salmon, March 26 – April 4, 2012