CNL(15)55

Presentation of the ICES Advice to the Council

REPORT OF ICES ADVISORY COMMITTEE

ON

NORTH ATLANTIC SALMON STOCKS

TO

NORTH ATLANTIC SALMON

CONSERVATION ORGANIZATION

June 2 to 5, 2015

CNL(15)8

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

10.1 North Atlantic - catches, new threats/opportunities, other questions, research

10.2 North East Atlantic Commission – catches, stock status, catch advice (new issue of NA fish), (stock origin - genetics)

10.3 North American Commission – catches, stock status, catch advice, (stock origin - genetics)

10.4 West Greenland Commission – catches, stock status, catch advice, (stock origin - genetics)

**10.1 With respect to salmon in the North Atlantic:**

1. **Provide an overview of salmon catches, 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. **Provide a review of salmon restoration and rehabilitation activities and make recommendations**

4. **Provide a compilation of tag releases by country in 2014**

5. **Summary of data deficiencies, monitoring needs and research requirements**

Overview of salmon catches

Nominal catch in 2014 in the North Atlantic = 1106 t

| NAC	W. Greenland	S. NEAC	N. NEAC	NEAC Total	N. Atlantic
109 t	58 t	211 t	728 t	938 t	1106 t
10%	5%	19%	66%	85%	
Lowest	19th lowest	Lowest	Lowest	Lowest	Lowest

Rank in 55 year time series
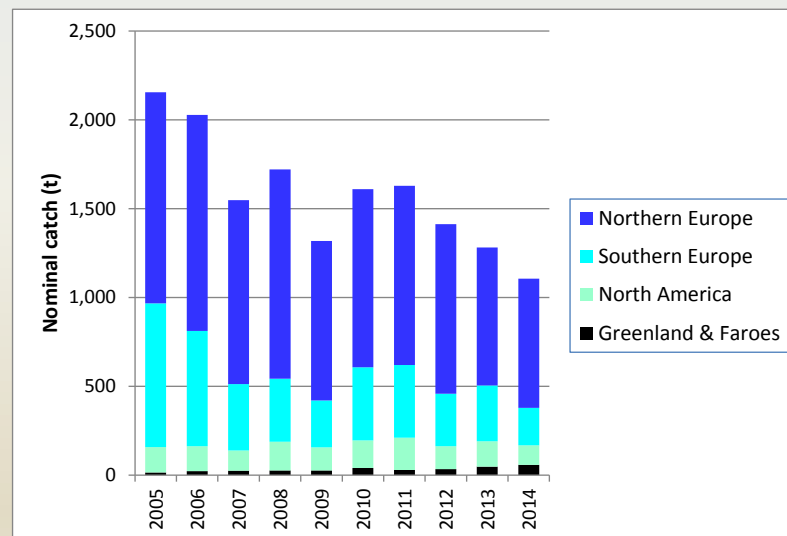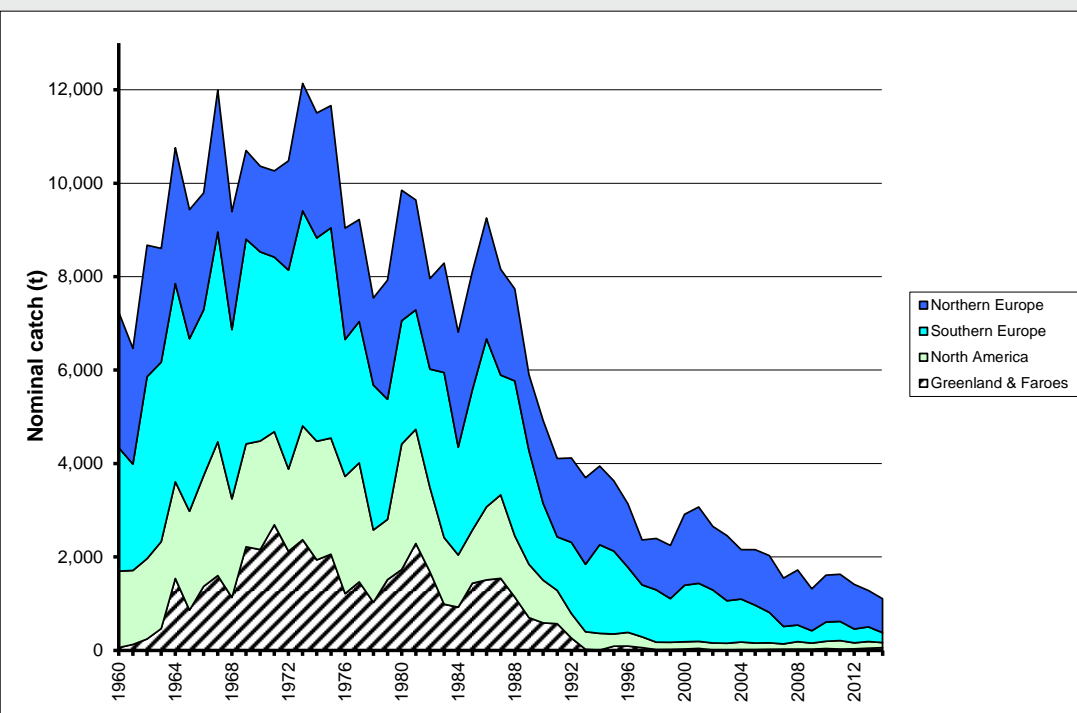
Partitioning of nominal catch by fishing location

➢ Majority of nominal catch in 2014 was taken in rivers

➢ Higher proportion of catches from coastal areas in NEAC compared to NAC; higher proportion from estuaries in NAC

NAC

Coast 9%
River 54%
Estuary 37%

NEAC

Coast 35%
River 60%
Estuary 6%
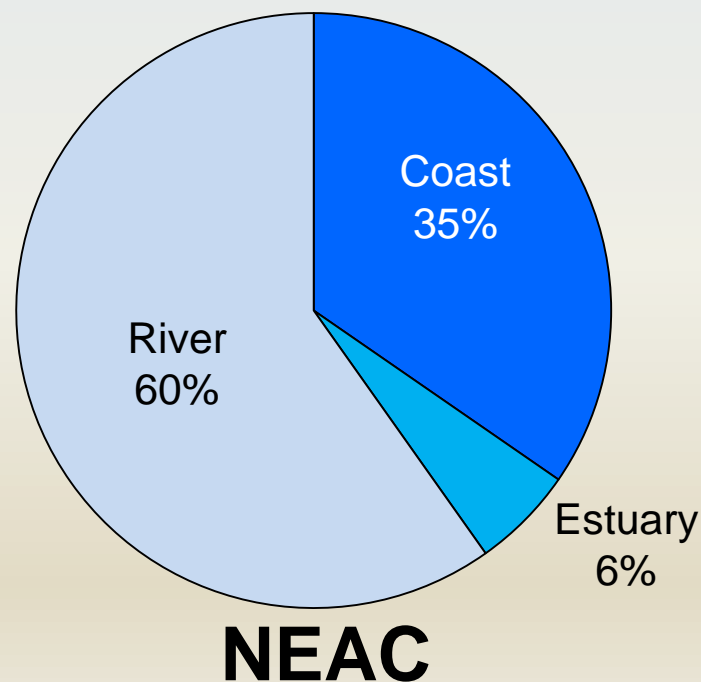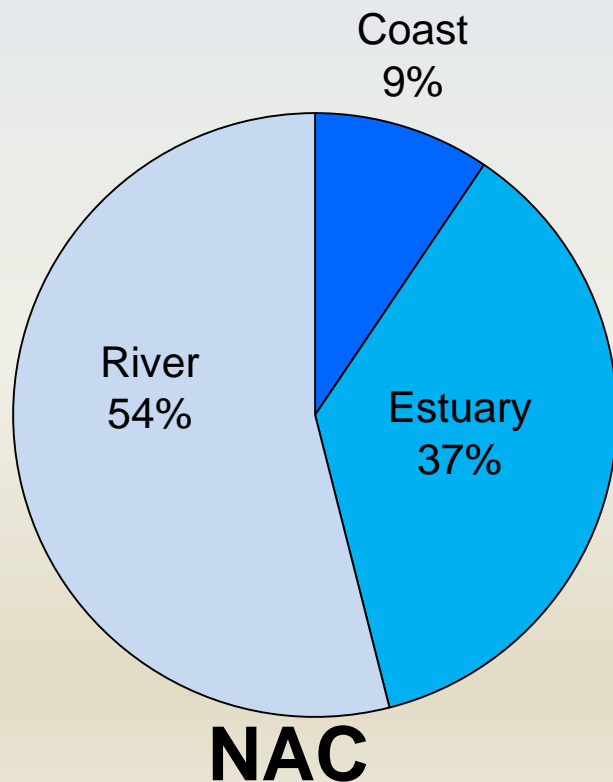
Nominal catch by fishing location

North American Commission

➤ Total catch relatively constant

➤ Relatively small coastal catch

➤ Majority taken in river fisheries

Northern NEAC

➤ Mainly coastal & river fisheries

➤ Negligible estuary catch

➤ Increasing % in rivers; reducing % on coast

Southern NEAC

➤ Large decline in coastal fisheries

➤ Since 2007, largest proportion of catch taken in rivers

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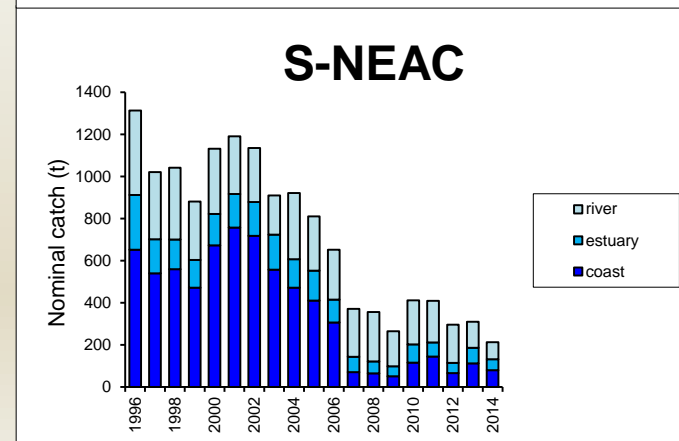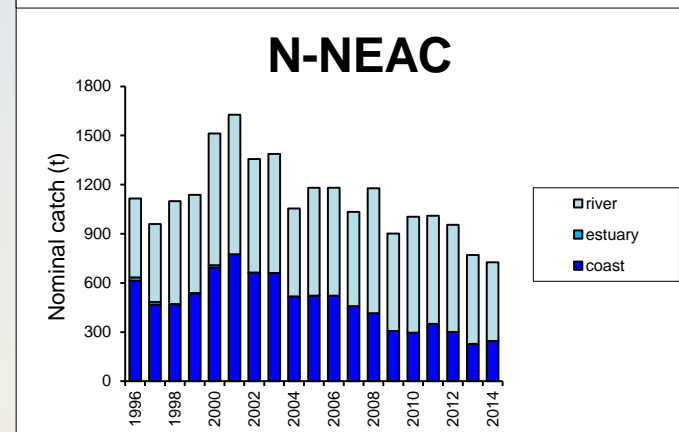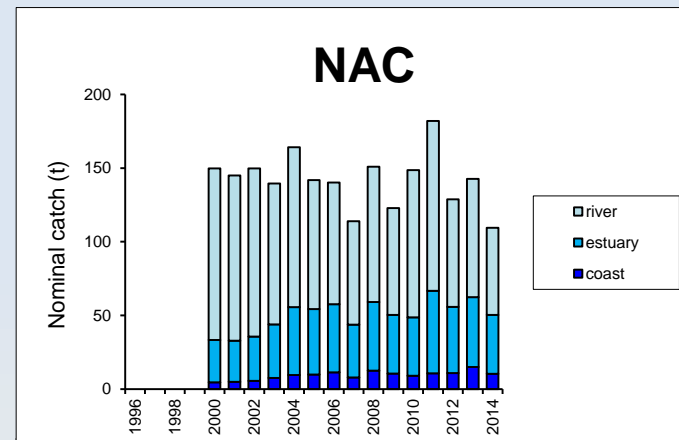
Unreported Catches

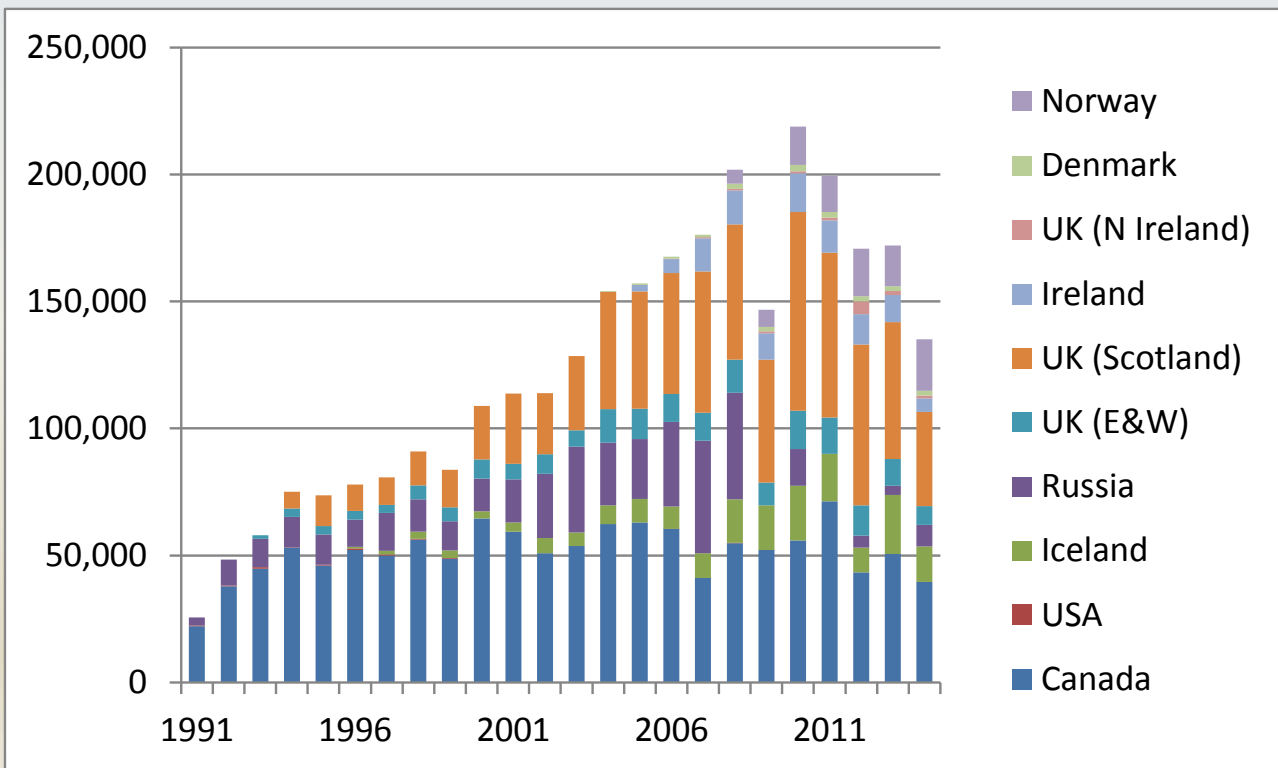| NAC	NEAC	WGC	Total
21 t	256 t	10 t	287 t

- No unreported estimates from Russia, St. P&M or Spain in 2014
- Unreported catches declined from peak values of 3,000 t in late 1980s to about 700 t in 2005-2006 (last years when reports available from all areas)
- Unreported catch 23-34% of total catch from 1987 to 2006 (21% in 2014)

Illegal net seized in UK (England & Wales) photo courtesy of Environment Agency
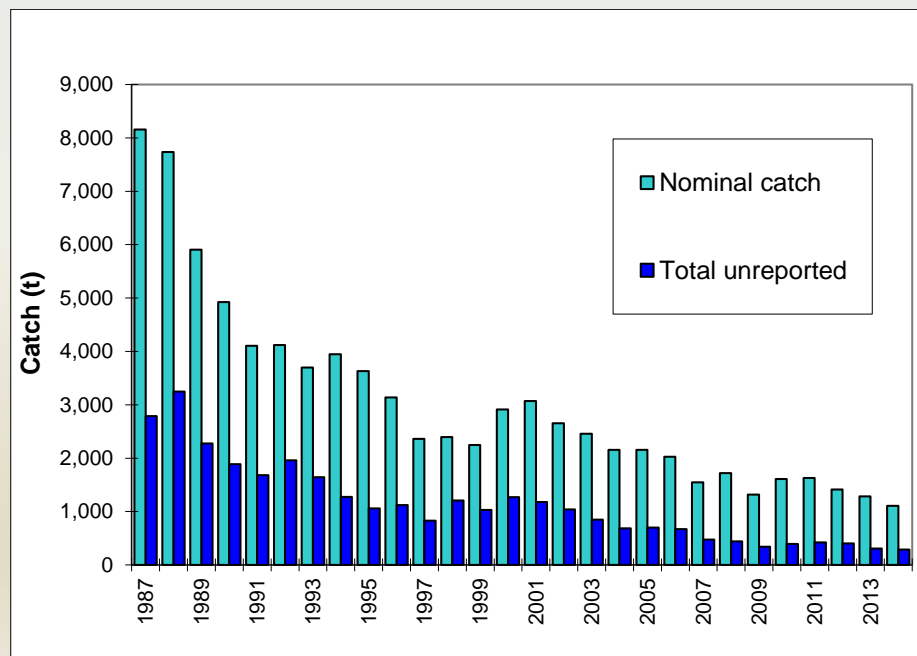
Catch and release (C&R) fishing

- ➤ Not included in nominal catch
- ➤ Practice increasing – 9 countries reporting in 2014; also practiced in some other countries, but not reported
- ➤ Ranged from 19% for Norway to 82% in UK (Scotland)
- ➤ Data incomplete for many countries, not a reporting requirement
- ➤ In 2014, >135 000 fish were released

Legend (bar chart):
- Norway
- Denmark
- UK (N Ireland)
- Ireland
- UK (Scotland)
- UK (E&W)
- Russia
- Iceland
- USA
- Canada

Environment Agency

Environment Agency

Farming and Sea Ranching

Farmed production in 2014

➢ North Atlantic = 1555 kt (72%)

   - 79% Norway; 10% UK (Scotland)

➢ Worldwide = 2171 kt

   > 1 million t produced since 2001

   > 2 million t since 2012

   > 1900 times the 2014 nominal catch
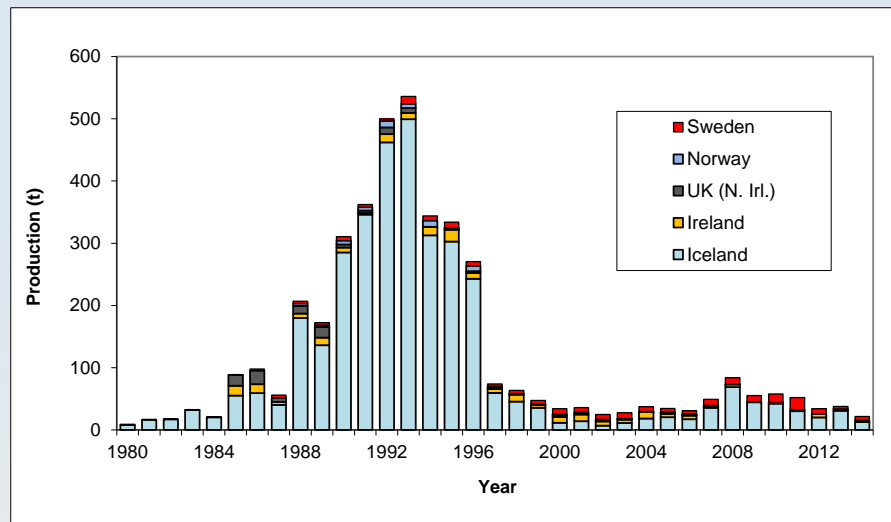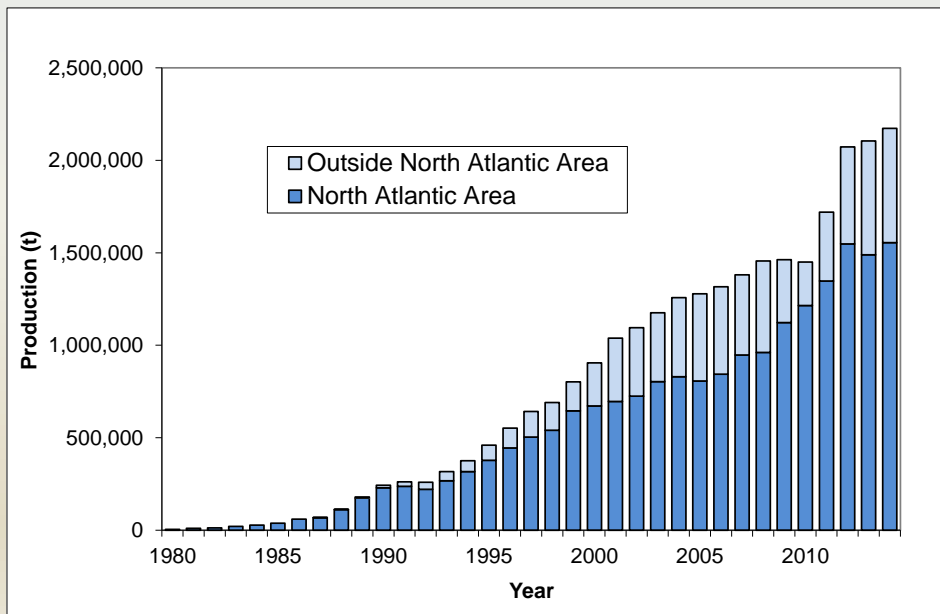
Sea ranching in 2014

➢ 21 t – Iceland, Sweden & Ireland

➢ Very small quantities elsewhere, but no data for 2014

G. Gudbergsson

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

Interactions between farmed and wild salmon – UK (N. Ireland)

➢ Genetic assignment techniques used to examine 1100 samples taken from fish caught in commercial coastal fishery in 2006 and 2007

➢ Samples compared against baseline – 1100 juveniles from 10 regional rivers plus 350 individuals from 2 common Norwegian farmed strains

➢ Samples genotyped using suite of 17 microsatellite loci and a panel of 90 Single Nucleotide Polymorphism (SNP) markers

➢ Various assignment procedures used

➢ Farmed contribution estimated at: 0.7 – 2.9% (microsatellites) & 1.2 – 1.7 % (SNPs)

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

Tracking & acoustic tagging studies in Canada

➤ Collaborative tracking projects led by ASF, >2300 smolts acoustically tagged since 2003 in 4 rivers

➤ Bayesian model developed to aid interpretation of detection rates at receiver arrays at head of tide, exit of bays and Strait of Belle Isle – aim to help partition early marine mortality

Salmon kelts (>300 acoustic & 32 archival pop-up tags)

Pop-off locations 2012 (pink), 2013 (yellow), 2014 (green) - solid circles = tag provided data
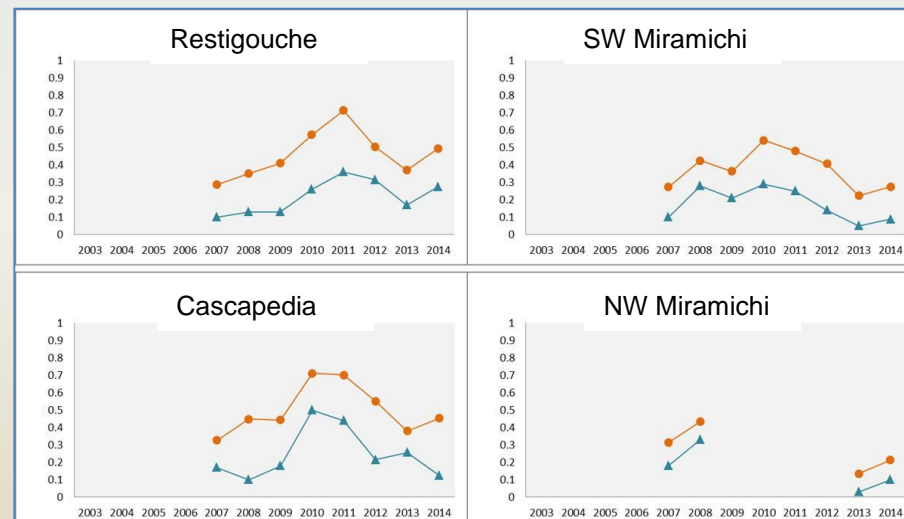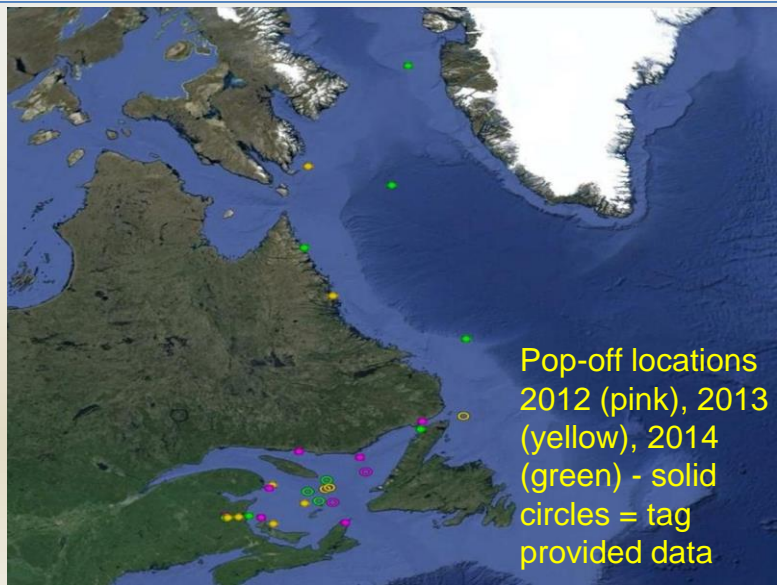
Proportion of tags detected (blue triangle) & estimated probability of survival (corrected for incomplete detections, orange circle) of smolts from their release site to the Strait of Belle Isle (exit from GoSL to the Labrador Sea)

Diseases and parasites

Red vent syndrome (RVS)

➢ Characterised by swollen and/or bleeding vents

➢ Noted since 2005, linked to nematode (*Anisakis simplex)*

➢ No apparent effect on survival or spawning

➢ Affected vents heal progressively in freshwater

➢ Reduced in previous years, but higher in 2013-14

Sea lice investigations in Norway

➢ Sea lice still considered a serious problem

➢ Surveillance programme ongoing – for most areas, lice levels were low to moderate during smolt migration period, as a result of co-ordinated actions at fish farms. However, elevated lice levels noted in two areas.

➢ Ongoing concerns about development of resistance to treatment chemicals – multi-resistant lice now present in all areas of Norway except Finnmark County (northernmost Norway)

➢ Recent study has examined use of protected areas to minimise sea lice impact – distance of >30 km estimated, but likely site-specific

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

Implementing the Quality Norm for Norwegian salmon populations

➤ New management system adopted in 2013 - stocks evaluated in two dimensions: (1) CL attainment and potential harvest and (2) genetic integrity

➤ Genetic integrity takes account of: species hybridisation; introgression from farmed salmon & altered selection due to selective harvest or human-induced changes of the environment

➤ In 2014, preliminary classification established according to CL & harvest potential dimension. First classifications based on both dimensions in 2015

		Conservation limit attainment and harvest potential				
		Very bad	Bad	Moderate	Good	Very good
Genetic integrity	Very bad					
	Bad					
	Moderate					
	Good					
	Very good					

The worst classification in either of the dimensions determines the final classification of the stock

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

Changing biological characteristics

➢ Changing characteristics reported previously by WGNAS (e.g. shorter length of 1SW returns on Rivers Bush & Bann in UK (NI) since 1973)

➢ Anecdotal reports of some very small 1SW fish in various parts of N America in 2014. However, no evidence of below average return size on monitored rivers

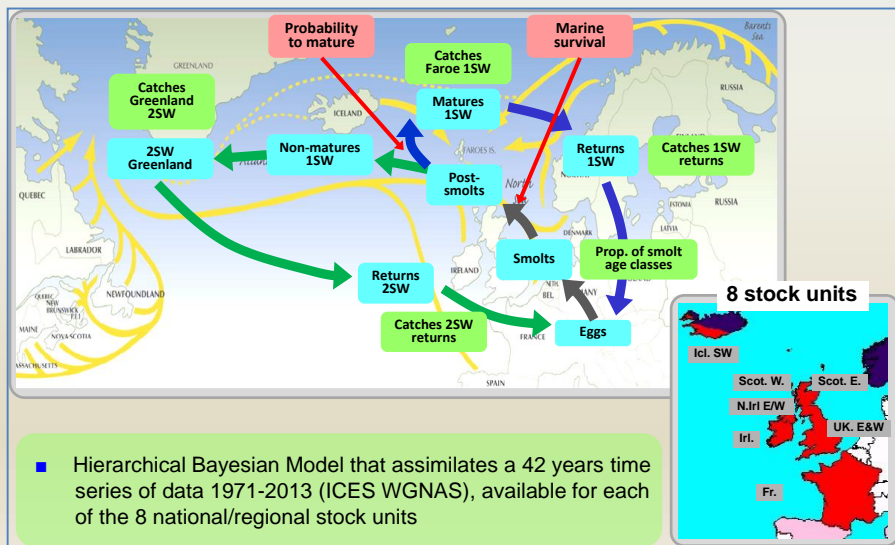## Determining sex ratios in Atlantic salmon populations

➢ Sex ratios an important parameter in assessments

➢ Often requires lethal sampling (though external features widely used on returning adult fish)

➢ New genetic approaches using sdY locus successfully used to determine sex in populations in Newfoundland & Labrador

➢ Comparison with externally assessed fish indicated significant discrepancies

➢ Valuable new tool, particularly for populations with low abundance

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

ECOKNOWS progress

➤ EU 7th framework project (2010-2014) - develop models in fisheries science making use of all types of biological knowledge. Structured in a Bayesian environment

➤ Life-cycle approach, following cohorts through river, sea and return. Working model developed (and published) for Southern NEAC stock complex

➤ Advantages over current PFA modelling (e.g. separates freshwater & marine phases; offers flexibility to improve hypothesis testing)

➤ Not yet possible for ICES to utilize. Main issues - model running time, extending to other stock complexes

Integrated life cycle model developed for each unit of the S. NEAC stock complex

■ Hierarchical Bayesian Model that assimilates a 42 years time series of data 1971-2013 (ICES WGNAS), available for each of the 8 national/regional stock units

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

New opportunity for sampling salmon at sea

➢ International Ecosystem Survey of the Nordic Seas (IESSNS) provides opportunity for new samples of salmon caught at sea during pelagic surveys

➢ WGNAS have been in contact with IESSNS co-ordinator and preliminary discussions held to clarify sampling protocols and agree contacts

New opportunity for collecting information on salmon by-catch

➢ New PIT / RFID tagging programme initiated in pelagic fisheries in NE Atlantic (co-ordinated by IMR Norway)

➢ PIT tag detectors installed at various ports around NE Atlantic and more planned

➢ Opportunity for incidental detection of PIT tags used on salmon (~30k such tags applied in 2014)

➢ Tagging co-ordinator has agreed to supply details of 'unknown' tags

PIT

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

➢ Working Group on Effectiveness of Recovery Actions for Atlantic Salmon [WGERAAS] – Chair Dennis Ensing, UK (N. Ireland)

➢ Summary of ToRs:

1. Develop a classification system for recovery / re-building programmes for Atlantic salmon
2. Populate system by collecting data on such programmes from around the N. Atlantic
3. Summarise resulting data set to determine conditions under which various recovery / re-building actions are successful and when they are not
4. Provide recommendations on appropriate recovery / rebuilding actions for Atlantic salmon given threats to populations, status and life history

➢ WGERAAS met again in May 2014 - progress with case studies & with development of a database detailing effectiveness of recovery actions for Atl. salmon (DBERAAS)

➢ Interim report produced following the May meeting – provided 8 case studies and initial exploratory analysis of available database entries

➢ Further work planned to extend the case studies, populate database and make recommendations

➢ WGERAAS plans to meet again in autumn 2015 and will report to ICES in 2016

ICES Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (WGRECORDS)

➢ Co-ordinate work on diadromous species; organise expert groups, theme sessions & symposia

➢ Successful theme session at 2014 ICES ASC – analytical approaches for using telemetry data to assess marine survival

➢ Theme session developed by WGRECORDS for 2015 ASC – 'Practical application of genetic stock identification for the conservation, management and restoration of diadromous fish species'

Provide a compilation of tag releases by country in 2014

➢ Compilation of releases of tagged, fin-clipped, and otherwise marked salmon in 2014 provided as a separate report (ICES 2015)

➢ About 4.2 million salmon released with marks in 2014 (3.6 million in 2013)

➢ Most marks were applied to hatchery-origin juveniles (4.1 million)

➢ Adipose fin clips (3.5 m) and microtags (0.5 m) most common

➢ Since 2003 marks have been applied to farmed salmon in Iceland - also included in the compilation

acoustic

PIT

❑ Broad range of tag types and increasing numbers of PIT, acoustic, radio, and DST tags being used
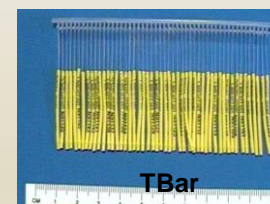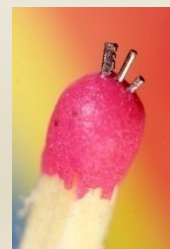
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streamer

Recommendations

➢ Covered, as appropriate, in Commission presentations

Stock annex

➢ Full description of the assessment approaches used by ICES provided in a stock annex (separate to the WGNAS report). Available on the ICES website at: http://ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2015/WGNAS/WGNAS%20Stock%20Annex%20for%20Atlantic%20salmon.pdf

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

Supporting information and details in the report of the ICES Working Group on North Atlantic Salmon available at:
http://www.ices.dk/publications/library

Acknowledgements

Members (24) of participating countries (10) to the Working Group on North Atlantic Salmon, 17-26 March 2015, Moncton, Canada

Section coordinators: Dave Meerburg / Scott Douglas (Canada)