NAC(15)8

Presentation of the ICES Advice to the North American Commission

REPORT OF ICES ADVISORY COMMITTEE

ON

NORTH ATLANTIC SALMON STOCKS

TO

NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION

NAC Area

CNL(15)8

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

10.3 With respect to Atlantic salmon in the North American Commission area:

1. Describe the key events of the 2014 fisheries (including the fishery at St Pierre & Miquelon);
2. Update age-specific stock conservation limits based on new information as available;
3. Describe the status of the stocks;
4. Provide catch options or alternative management advice for 2015-2018 with an assessment of risks relative to the objective of exceeding stock conservation limits, or pre-defined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding;

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

10.3 With respect to Atlantic salmon in the North American Commission area:

5. Update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice;

6. Considering the available contemporary data on stock origin of salmon in the Labrador fisheries, estimate the catches by stock origin and describe their spatial and temporal distribution; and

7. Considering the available contemporary data on stock origin of salmon in the Saint-Pierre et Miquelon fishery, estimate the catches by stock origin and describe their spatial and temporal distribution.

Key events of the 2014 fisheries

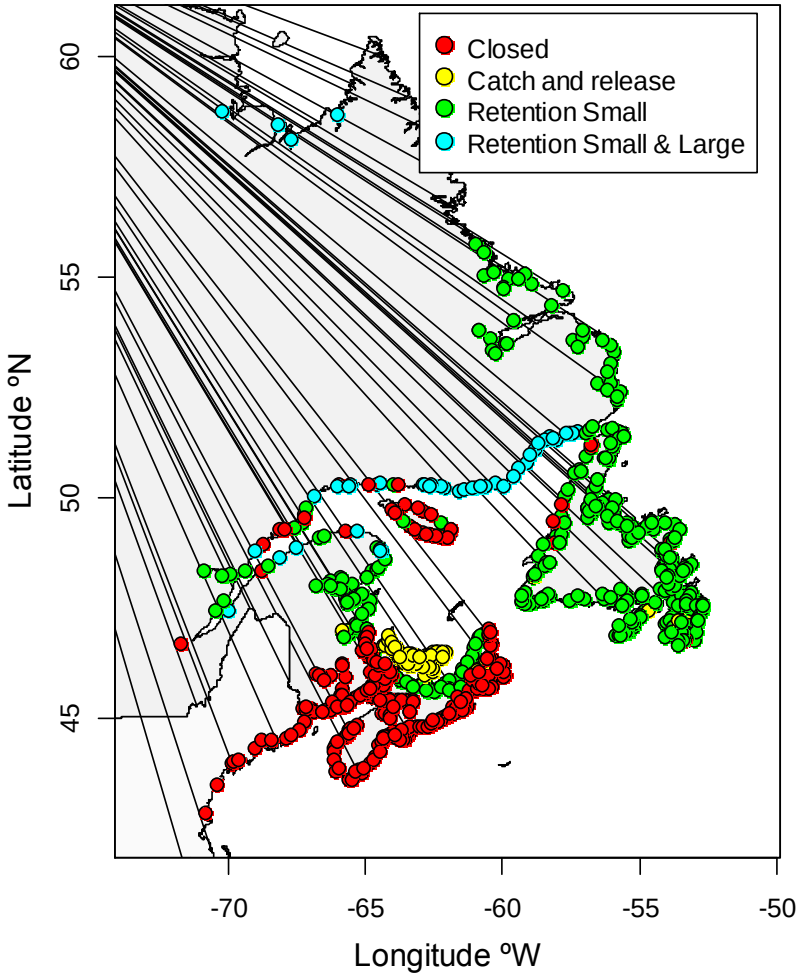
Gear and effort

- Three groups exploited salmon in Canada in 2014:
  - Aboriginal peoples;
  - Resident's subsistence fishery in Labrador; and
  - Recreational fishers.

- No commercial fisheries in Canada in 2014 (closed since 2000)
- No recreational or commercial fisheries for Atlantic salmon in USA in 2014
- France (Islands of St. Pierre & Miquelon)
  - 12 professional (max 3 nets of 360m) and 70 recreational (1 net of 180m) gill net licences issued

Gear and effort

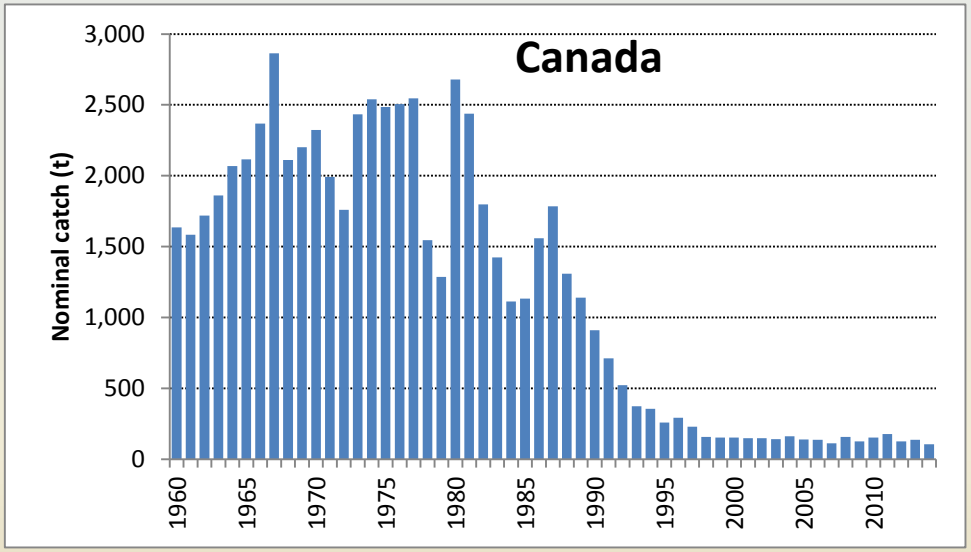
Recreational fisheries in Canada – regulatory measures vary between areas and large portions of the south closed to all directed salmon fisheries

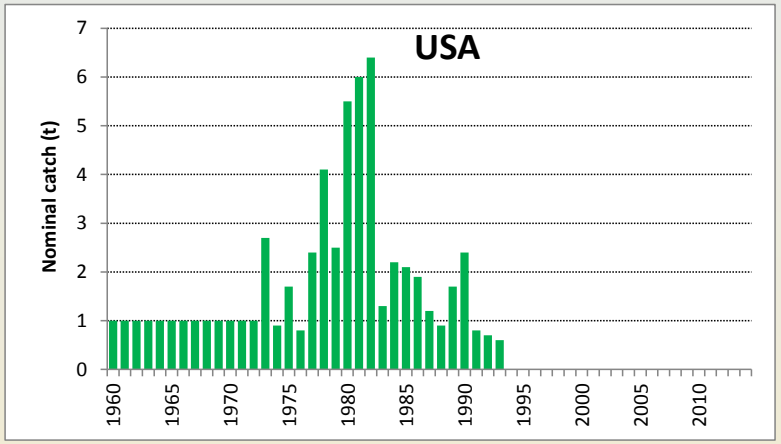


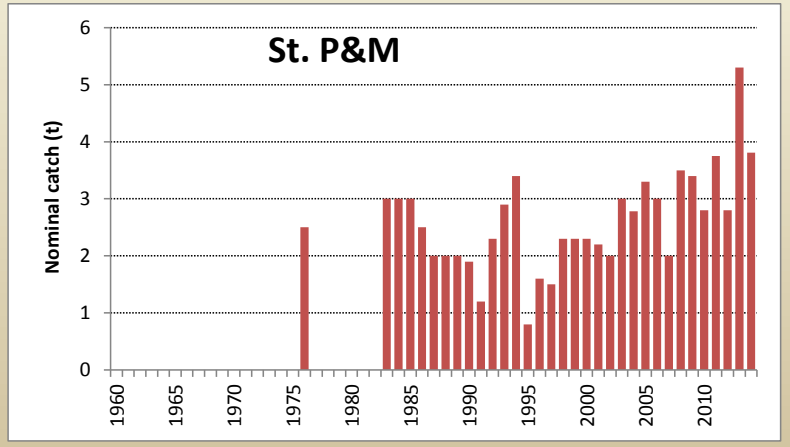
- Small salmon < 63cm FL
- Large salmon ≥ 63cm FL

Nominal catch (excl. C&R)

In 2014	Canada	USA	St. P&M
Catch (t)	105.6	0	3.8
Unreported (t)	21.0	0	n/a

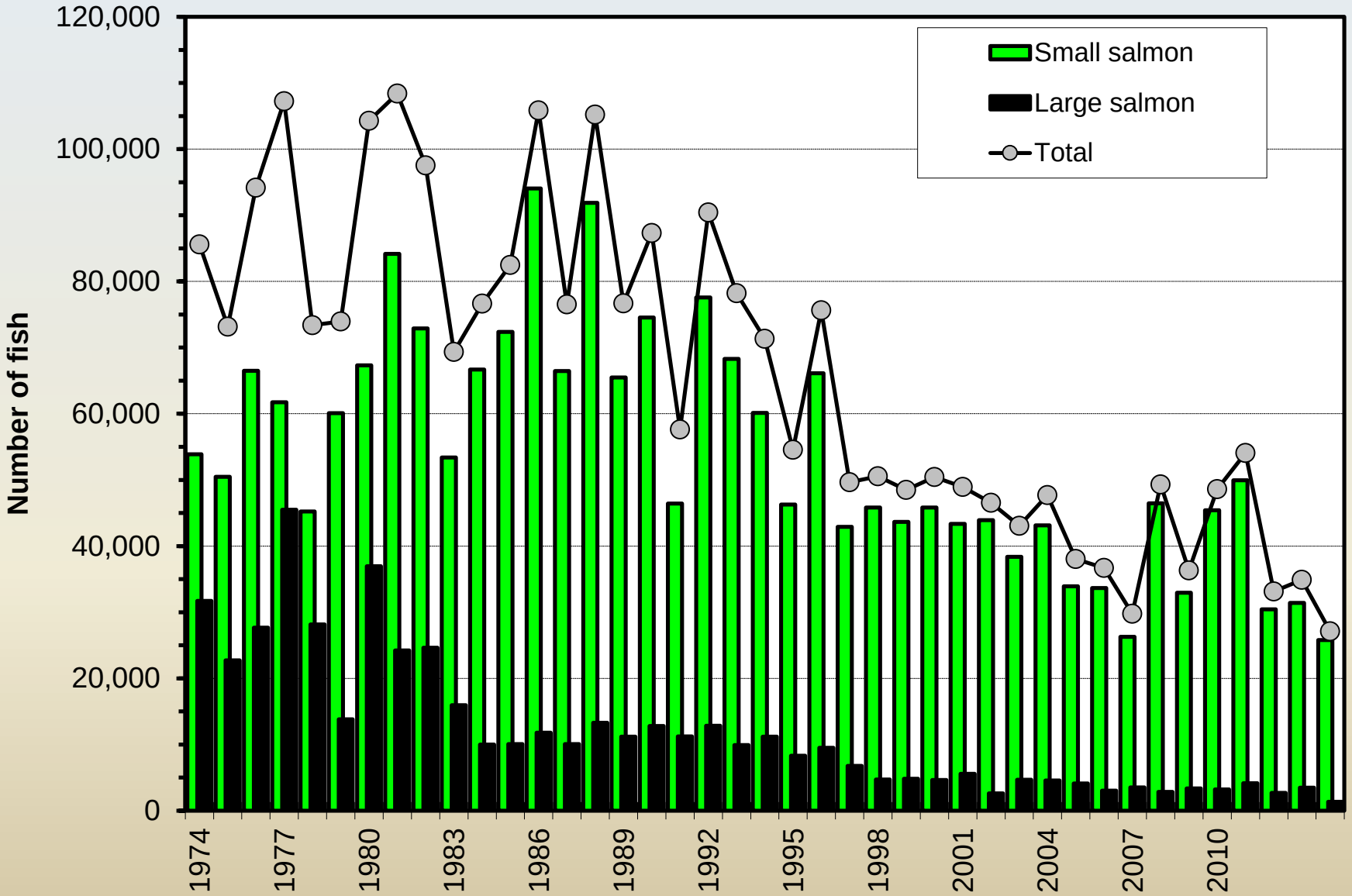




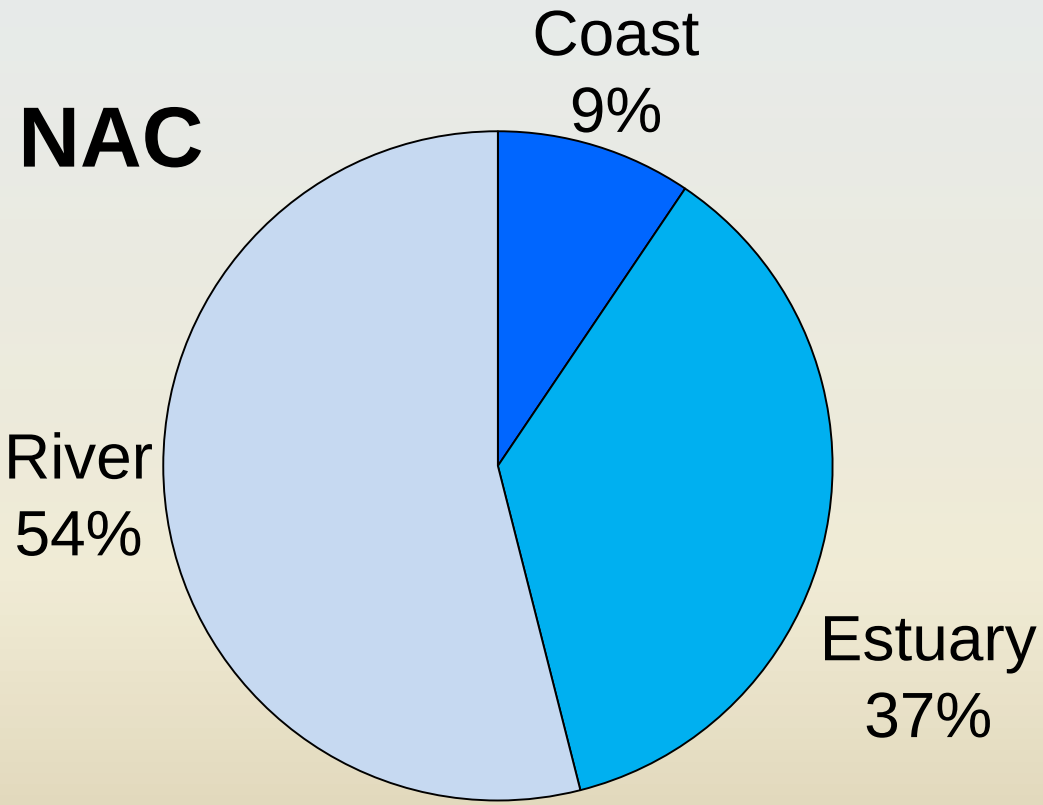


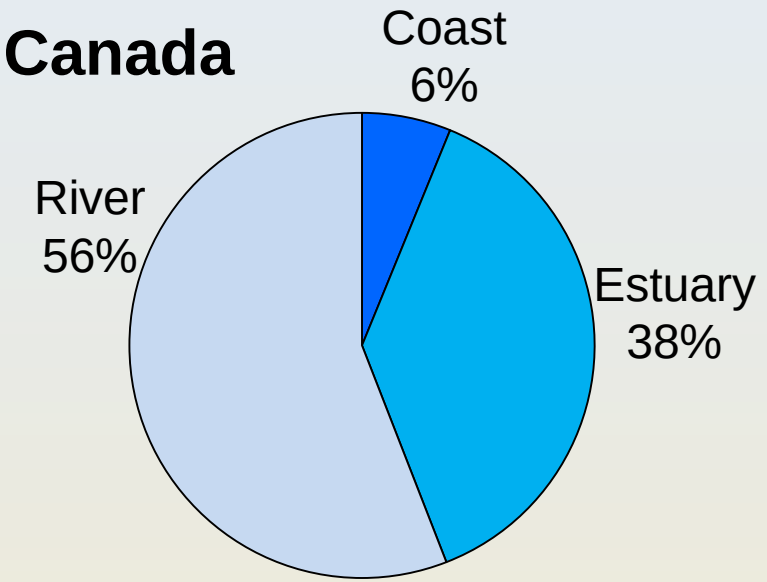
- Large decline in Canadian catches since commercial fishery moratorium (1992 on)
- Total NAC catch in 2014 (109 t) 23% less than 2013 (143 t)
- Canadian catch lowest in time series

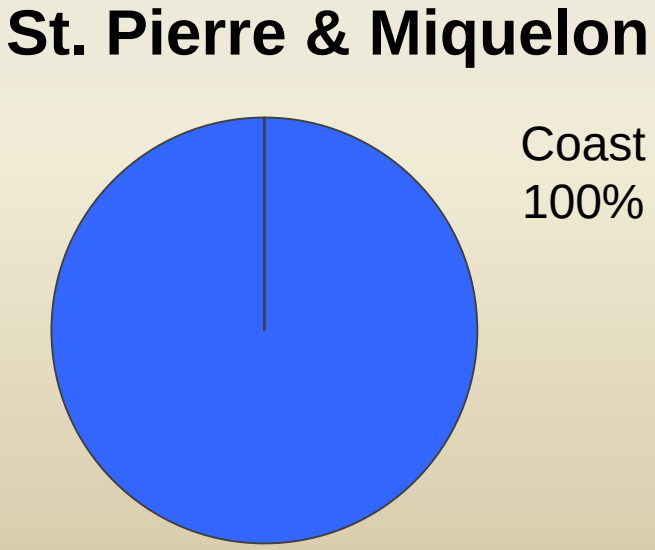
Canadian recreational catch (no.)



Catch by fishing area - 2014

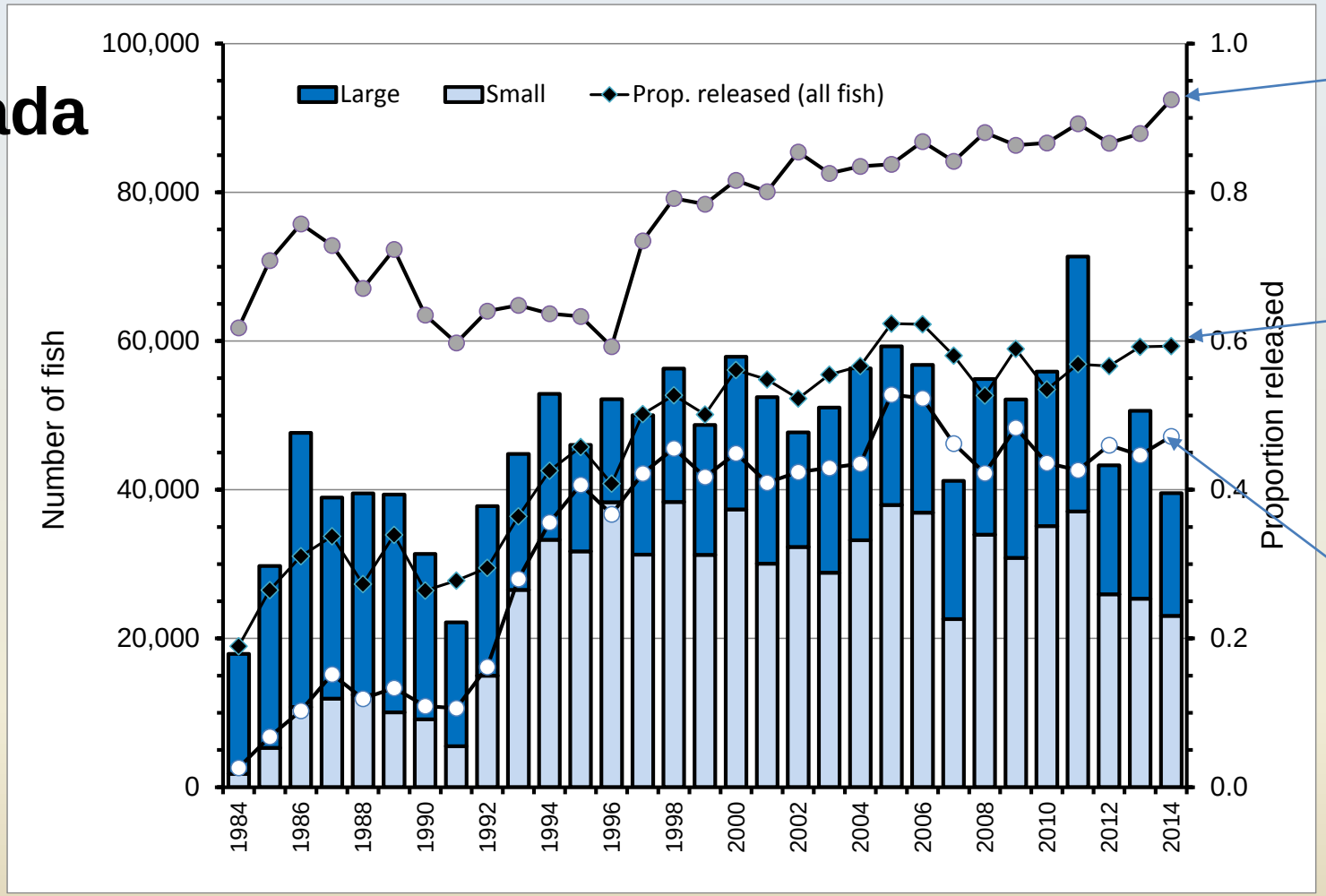






Catch & release in recreational fisheries

Canada



- Approx. 39,500 salmon (~23,000 small and 16,500 large) were reported caught and released in 2014 (59% of total)
- Proportion released > 50% since 1998

Origin and composition of catch

Aboriginal Peoples' and resident food fisheries in Labrador & the fishery at St. Pierre & Miquelon may intercept some salmon from other areas of N. America

Sampling in Labrador Aboriginal fisheries

- Sampling programme continued in 2014 – 208 samples collected:
  - 92 Northern Labrador; 42 Lake Melville; 74 Southern Labrador
- 81% 1SW salmon; 12% 2SW; 7% previous spawners
- 98% river age 3-6, so very few salmon from southern N. American stocks (US / Scotia-Fundy), as previous, which are typically river age 1-2

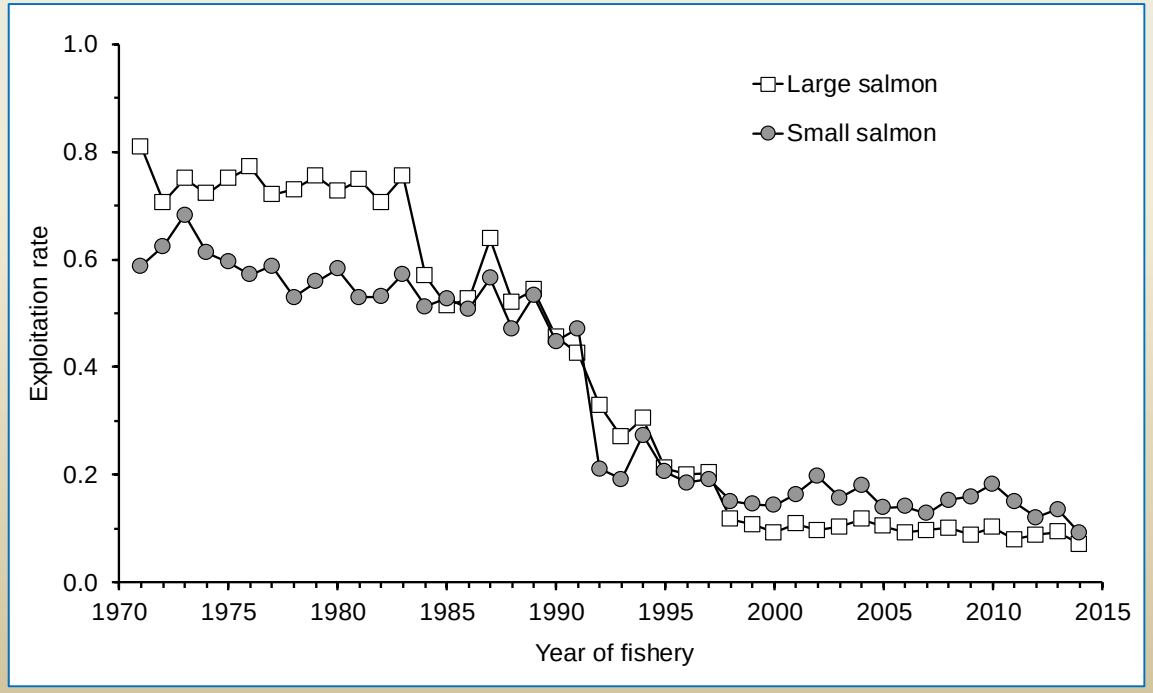
Sampling in St. Pierre & Miquelon fishery

- 71 fish sampled (26 May - 26 June) - predominantly river age 2 (27%) and 3 (48%); 2SW salmon comprised 52% of sample and 1SW salmon 42%

- ICES expressed some concern at low levels of sampling and recommended expansion (biological characteristics & stock origin important parameters for assessment models)
- Genetic analysis/ stock composition reported later (for both fisheries)

Trends in Exploitation Rates

- Exploitation of large salmon (including 2SW) declined considerably with the introduction of the non-retention of large salmon in angling fisheries and reductions in commercial fisheries;
- Exploitation of small salmon (mostly 1SW) declined after 1991 with closure of Newfoundland commercial fishery in 1992;
- Declines continued in the 1990s with additional management controls in all fisheries to reduce exploitation;
- In the last few years, exploitation rates on small and large salmon have remained at the lowest in the time-series, averaging 9% for large and 14% for small.



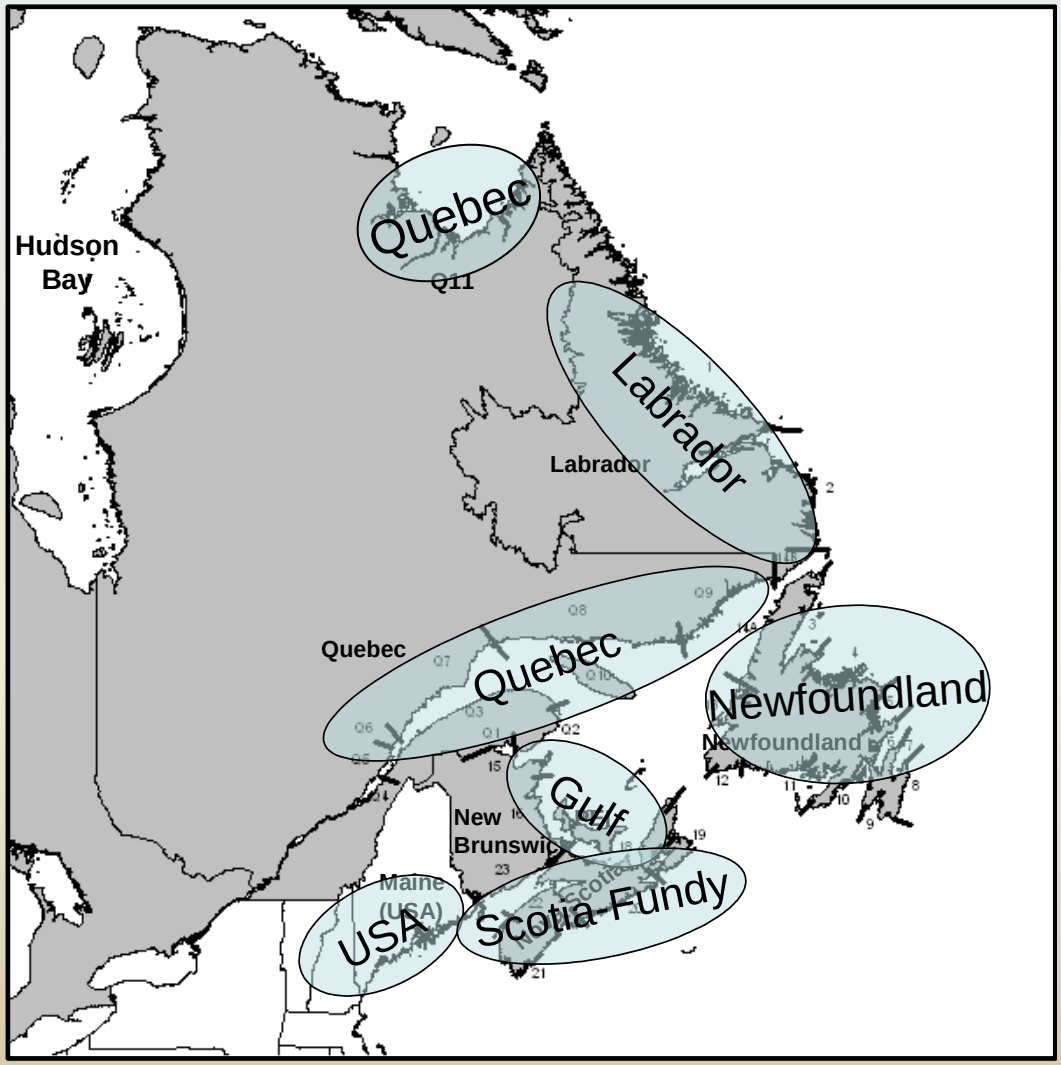
Update age-specific stock conservation limits

- No changes in 2SW salmon CLs from those used previously

Stock area	2SW Conservation Limit	2SW Management objective
Labrador	34,746	
Newfoundland	4,022	
Gulf of St Lawrence	30,430	
Quebec	29,446	
Scotia-Fundy	24,705	10,976
Canada Total	**123,349**	
USA	29,199	4,549
NAC Total	**152,548**	

Describe the Status of the Stocks

Status of stocks is described for six regions in North America



Describe the Status of the Stocks

Smolt abundance – 11 rivers

- For the majority of the rivers there is no trend in smolt production
- There are significant downward trends in 3 monitored rivers (2 in Quebec & 1 in USA) and a significant increasing trend in 1 river (in Newfoundland)

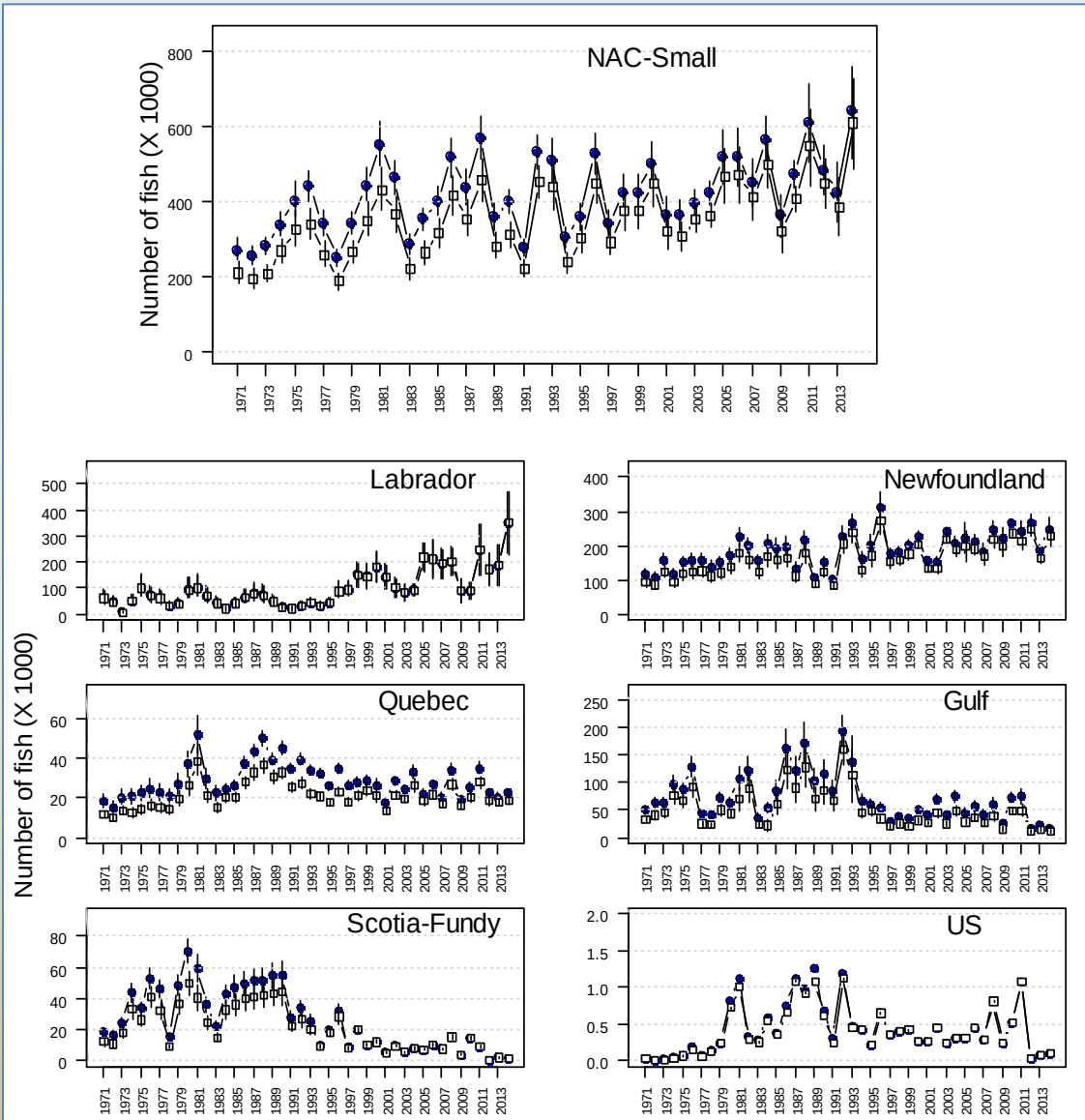
Abundance of adults

- Returns and spawners of small (1SW), large (MSW salmon) and 2SW salmon are derived for each region (run reconstruction)
- Variety of methods – counts at monitoring facilities; population estimates from M/R studies; catch and exploitation rates & measurements of freshwater habitats
- 2SW component of large returns derived from sea-age composition of indicator stocks

Describe the Status of the Stocks

1SW (small) returns and spawners - NAC

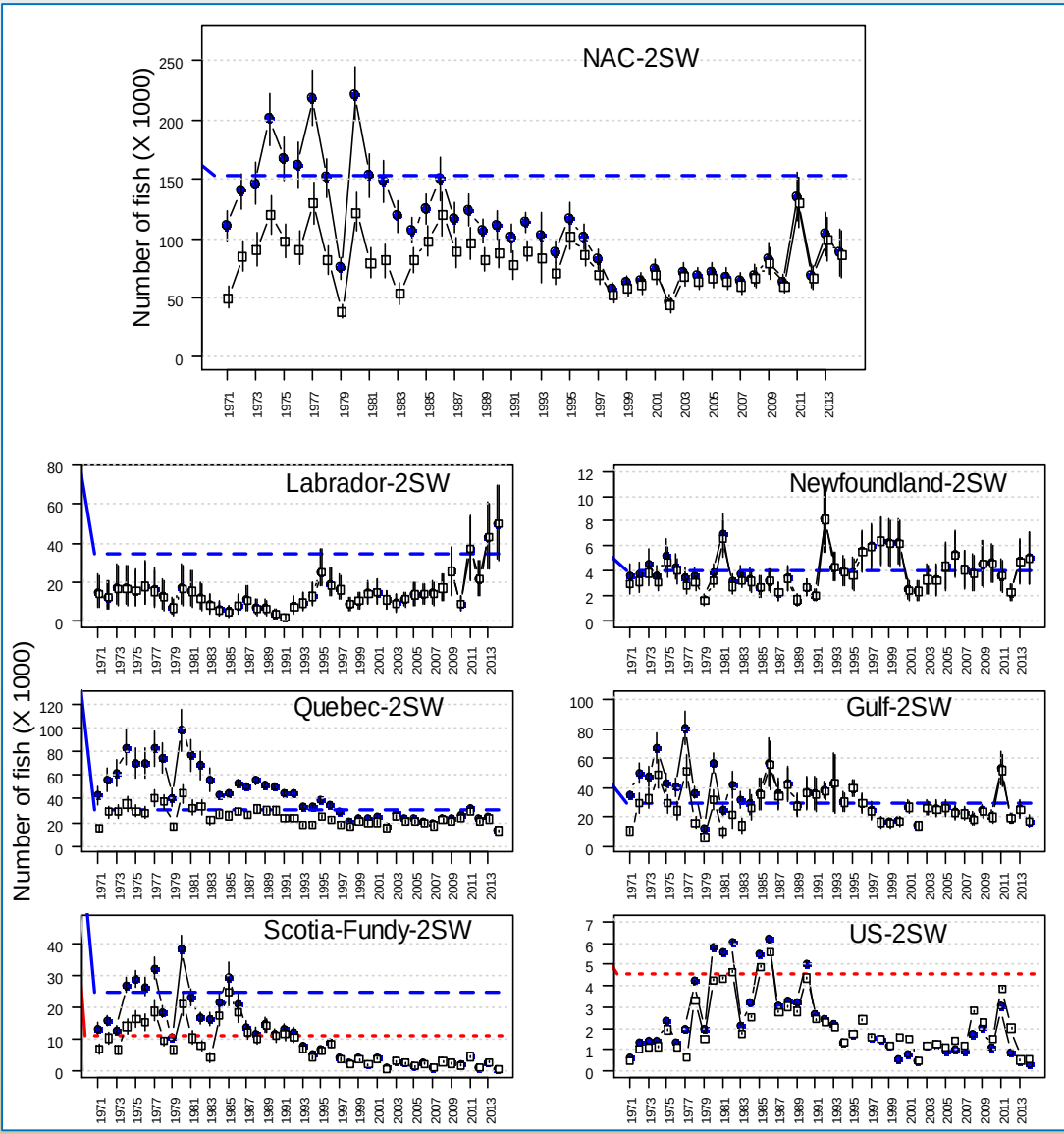
- Small returns (639k) and spawners (608k) both highest on record for NA in 2014
- 94% of small returns are from Labrador & Newfoundland, where 2014 returns highest or among highest in time series and trends increasing
- Return estimates for Labrador based on small number of monitoring facilities (1 in N. Labrador; 3 in S. Labrador)
- Elsewhere, 1SW returns & spawners low; declining trends in southerly regions



Describe the Status of the Stocks

2SW returns and spawners - NAC

- 2SW returns highest on record for Labrador and among highest in Newfoundland
- 2SW returns in 2014 lowest on record in Quebec, S-F and US and among lowest in Gulf
- 2SW spawners below CLs in 4 of the 6 regions (and overall for NAC); median estimates above CL for Labrador and N'fld
- Return estimates for Labrador based on small number of monitoring facilities (1 in N. Labrador; 3 in S. Labrador)



Describe the Status of the Stocks

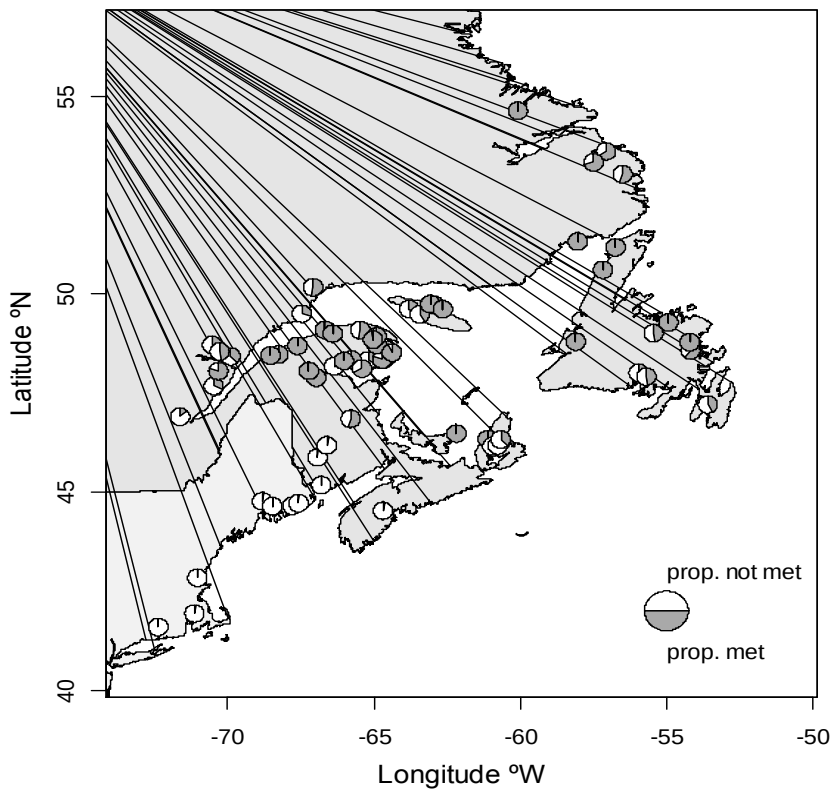
Returns of 1SW & 2SW salmon by geographic area in 2014

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

- 1SW & 2SW returns lowest or among lowest in time series for four areas, but highest in time series in Labrador and among highest in Newfoundland
- **Region-specific 2SW spawners above CLs in Labrador / N'fld, but below CLs in other regions; poorest performance in the southern regions**

Describe the Status of the Stocks

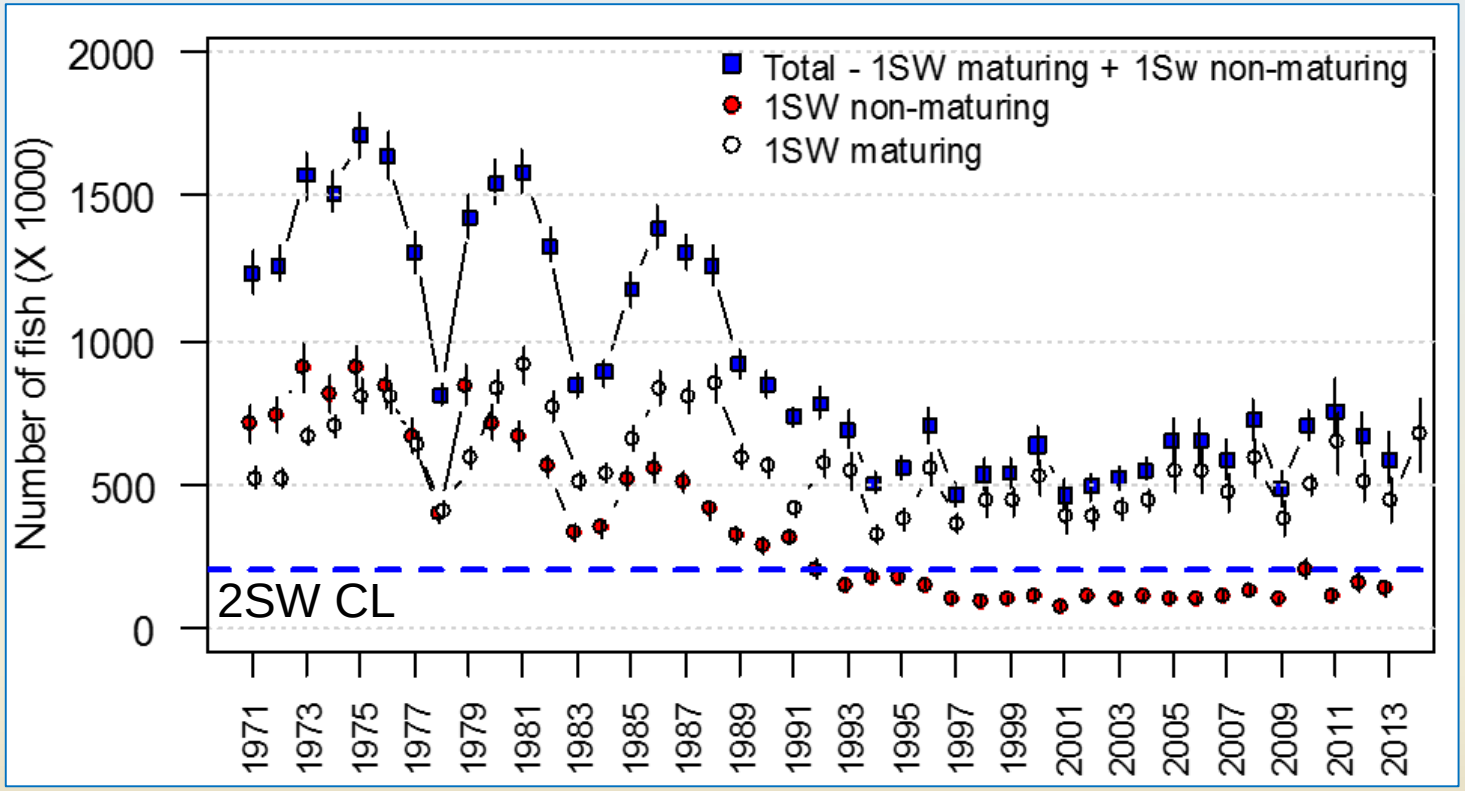
Egg depositions in rivers in 2014



- Egg deposition (all sea-ages combined) met river-specific CLs in 18 of the 66 assessed rivers (27%); down from 60% in 2013
- 31 rivers (47%) achieved less than 50% of CL
- Particularly large deficits in the southern areas of North America (USA, Scotia-Fundy)

Describe the Status of the Stocks

Pre-fishery abundance (PFA)



- Continued low abundance of North American adult salmon
- Total population of 1SW and 2SW Atlantic salmon shows generally declining trend since the 1970s with a period of persistent low abundance since the early 1990s
- PFA of maturing 1SW salmon in 2014 increased by 49% on 2013; highest since 1988
- PFA of non-maturing 1SW salmon (for 2013) decreased by 13% from 2012

Summary of Stock Status

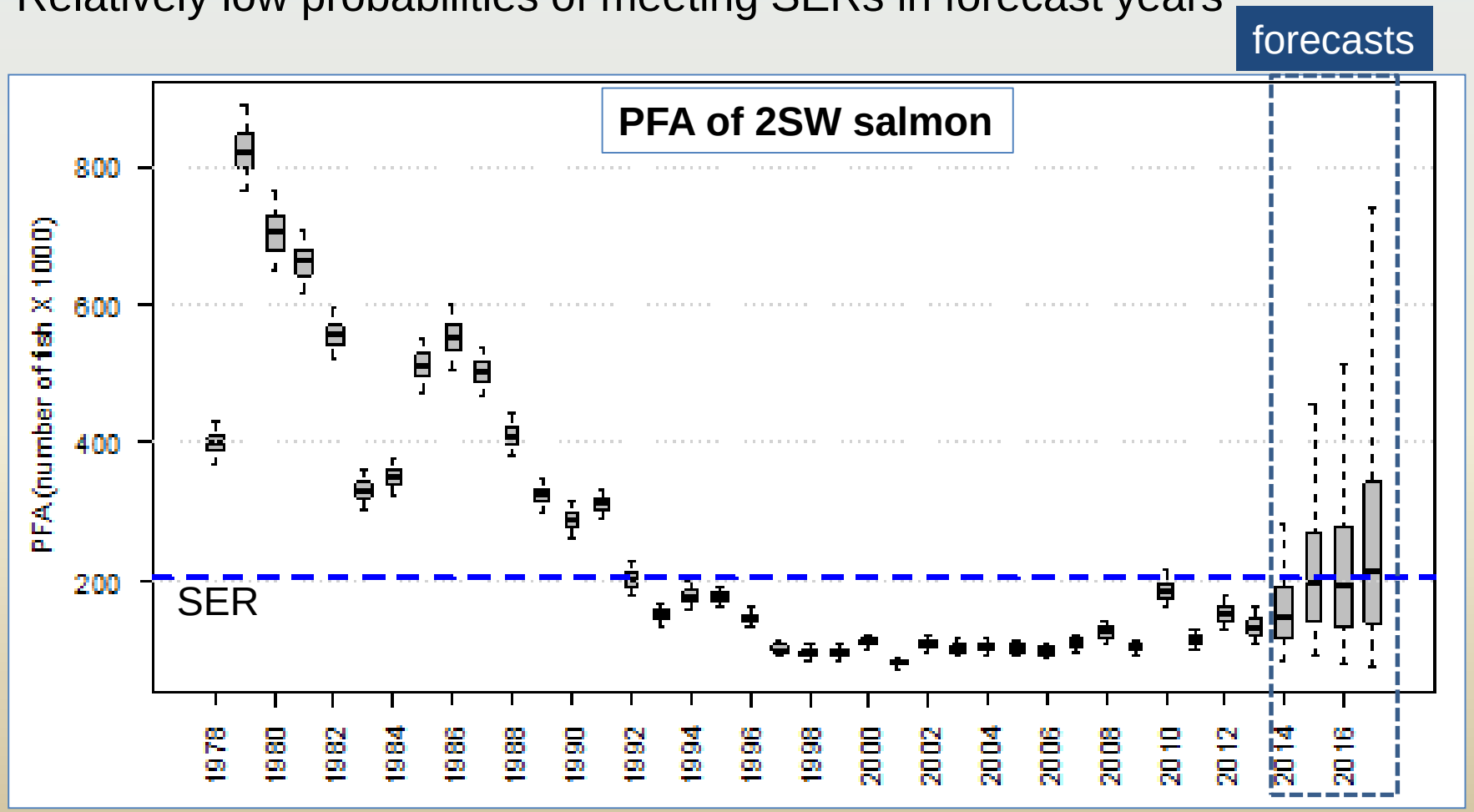
- 2SW salmon stocks in four of the six areas are below CL / suffering reduced reproductive capacity, with particularly large deficits in the southern areas (Scotia-Fundy and USA)
- For Labrador and Newfoundland the midpoint of the estimated 2SW spawners exceeded the CL
- Despite major changes in fisheries management around 20-25 years ago and increasingly more restrictive fisheries measures since then, returns remain near historical lows and many populations are currently threatened with extirpation
- Continued low abundance, despite significant fishery reductions and generally sustained smolt production, strengthens the view that factors acting on survival in the first and second years at sea are constraining abundance

Catch options & management advice

NASCO has asked ICES to provide catch options or alternative management advice for 2015-2018 with an assessment of risks relative to the objective of exceeding stock conservation limits, or pre-defined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding.

Forecasts of PFA - NAC

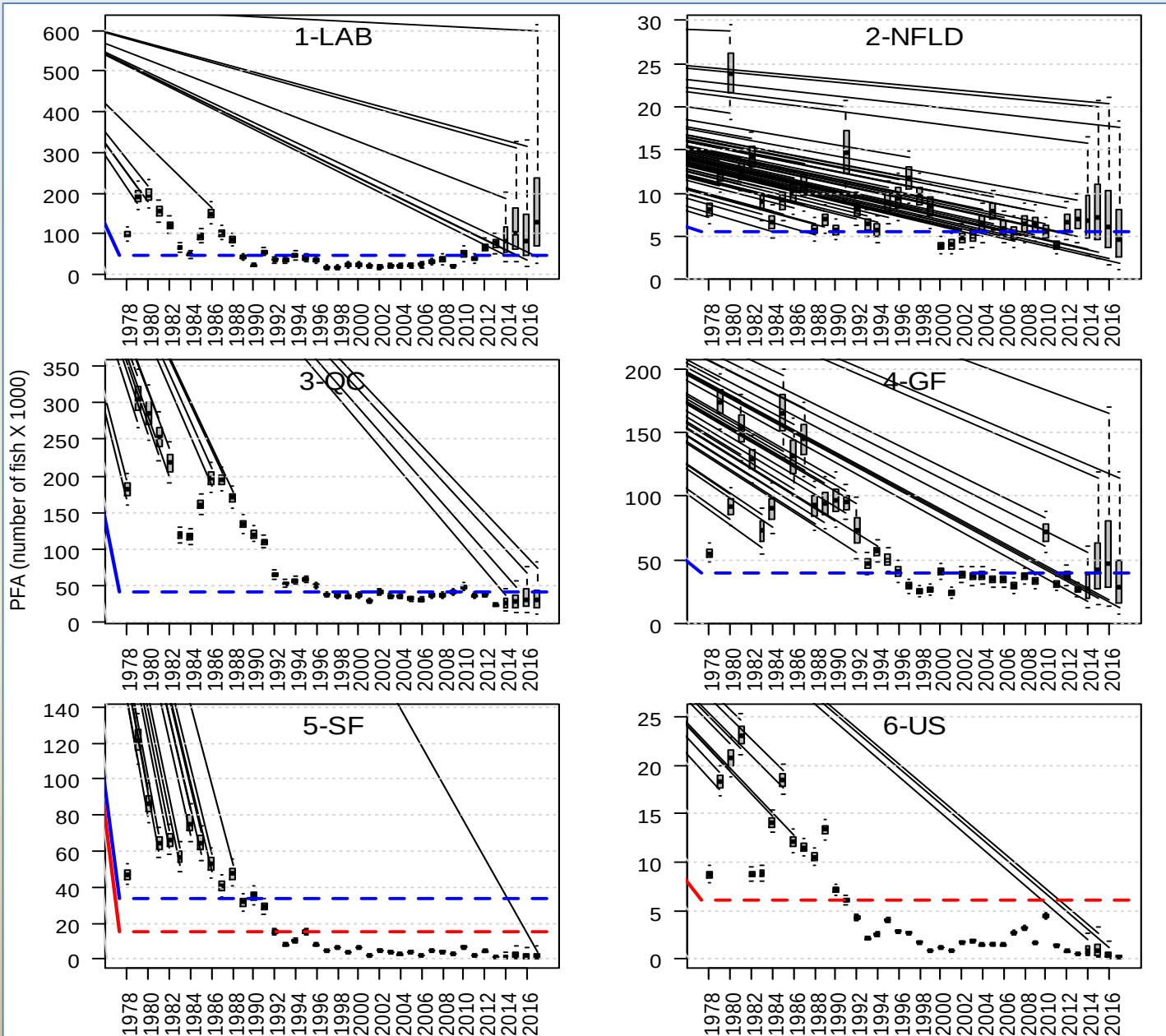
- Catch options only provided for non-maturing 1SW and maturing 2SW components as maturing 1SW component not fished outside of homewaters.
- Possible to provide catch options for four years based on forecasts of PFA
- Relatively low probabilities of meeting SERs in forecast years



Forecasts of PFA - Regions

Region-specific forecasts of PFA

- Values for 2014 to 2017 are forecasts
- Dashed blue line is 2SW SER (out of range for US)
- For Scotia-Fundy and US, dashed red line is 2SW mgm't objective
- Forecasts have high uncertainty and this increases over time
- <95% probability of meeting SERs in all regions in all forecast years



Catch options

Probabilities of meeting the 2SW Management Objectives

- Probabilities that 2SW returns will meet or exceed the MOs for the six regions of NA in the absence of any fishing
- In all years, there is a zero probability of simultaneous attainment of all objectives

Region	2SW Objective	2015	2016	2017	2018
Labrador	34,746	0.82	0.85	0.74	0.85
Newfoundland	4,022	0.64	0.64	0.55	0.41
Quebec	29,446	0.07	0.18	0.30	0.29
Gulf	30,430	0.19	0.49	0.56	0.32
Scotia-Fundy	10,976	0.00	0.01	0.01	0.01
USA	4,549	0.00	0.01	0.00	0.00
Simultaneous to N. America		0.00	0.00	0.00	0.00

Catch Advice

- In the absence of any fishing, there is less than 75% probability that the numbers of 2SW salmon returning to the 6 regions of N. America in 2015 to 2018 will be above the management objectives simultaneously.

- **Therefore, in line with the objectives agreed by NASCO, there are no mixed-stock fishery options on 1SW non-maturing salmon and 2SW salmon in North America in 2015 to 2018.**

Relevant factors to be considered in management

- ICES advises that when the MSY approach is applied, fishing should only take place on salmon from rivers where stocks have been shown to be at full reproductive capacity.

- Because of the different status of individual stocks within stock complexes, mixed-stock fisheries present particular threats.

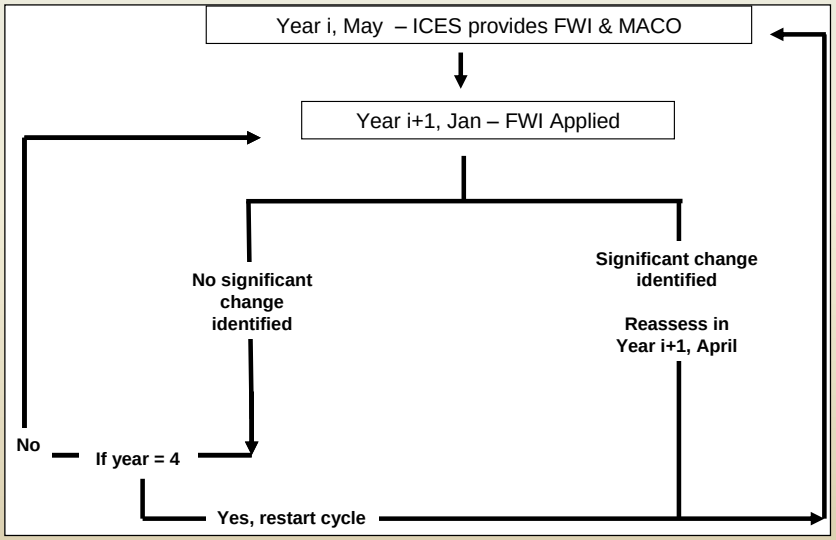
- The management of a fishery should ideally be based upon the individual status of all stocks exploited in the fishery.

Framework of Indicators (FWI)

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

- FWI originally developed by ICES and accepted by NASCO in 2007
- FWI was applied for first time in 2008, subsequently updated in 2009 & 2012 in support of multi-annual regulatory measures

- FWI applied in January to provide check on previous catch advice
- If significant change identified, then ICES would provide updated catch advice; otherwise existing advice continues to apply
- FWI uses various indicator data sets (counts, return rates)



Framework of Indicators (FWI)

Developments in 2015

- Values of the indicator variables for the most recent years added
- Indicators assessed against appropriate variable of interest (e.g. PFA) to determine whether they meet inclusion criteria and are considered ‘informative’
- FWI spreadsheet updated – indicator variables added / revised and functions for evaluating the indicator scores updated
- 23 indicators from 14 different rivers retained for NAC area

Framework of Indicators (FWI)

Retained indicator variables

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

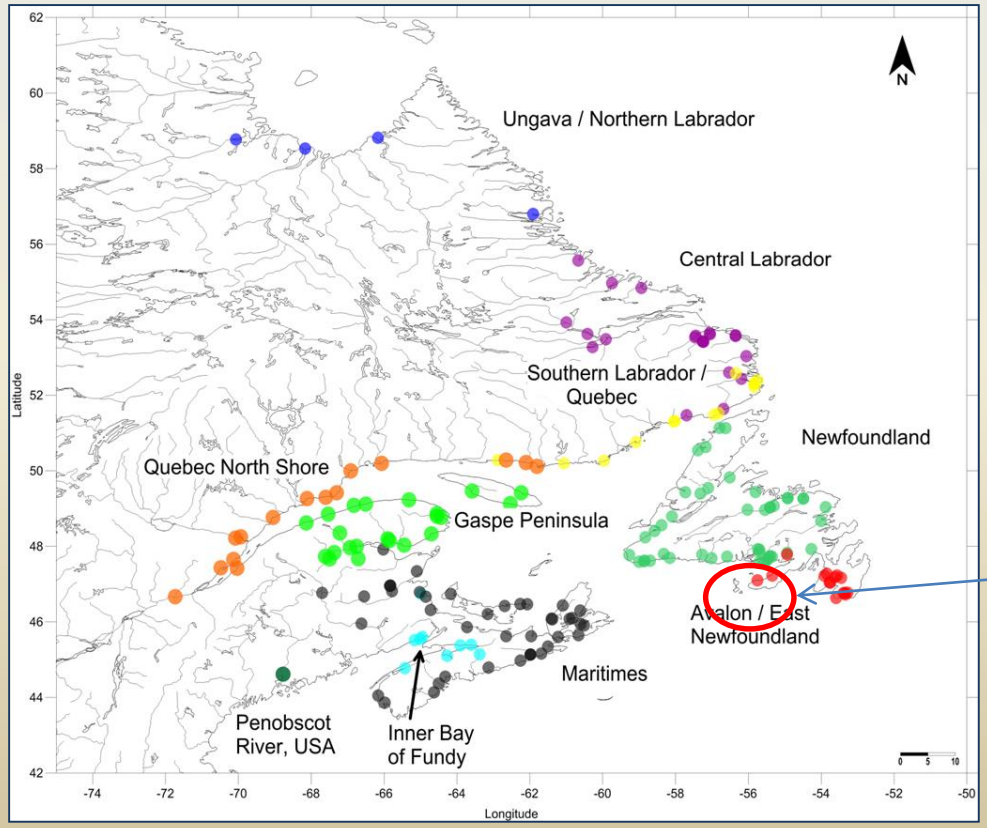
FWI Spreadsheet

	Catch Advice	Catch option > 0 (Yes = 1, No = 0)			0					
		Overall Recommendation								
		No Significant Change Identified by Indicators								
Geographic Area	River/ Indicator	2014 Value	Ratio Value to Threshold	Threshold	True Low	True High	Indicator State	Probability of Correct Assignment	Indicator Score	Management Objective Met?
USA	Penobscot 2SW Returns	174	7%	2,368	100%	100%	-1	1	-1	
	possible range				*-1.00*	*1.00*				
	Average		7%						**-1.00**	**No**
Scotia-Fundy	Saint John Return Large	46	1%	3,329	96%	100%	-1	0.96	-0.96	
	Lahave Return Large	41	14%	285	79%	85%	-1	0.79	-0.79	
	North Return Large	84	13%	626	96%	96%	-1	0.96	-0.96	
	Saint John Survival 2SW (%)	0.10	76%	0.131	96%	81%	-1	0.96	-0.96	
	Saint John Survival 1SW (%)	0.11	14%	0.763	88%	73%	-1	0.88	-0.88	
	Saint John Return 1SW	112	5%	2,276	88%	80%	-1	0.88	-0.88	
	LaHave Return 1SW	84	5%	1,679	95%	67%	-1	0.95	-0.95	
	possible range				*-0.91*	*0.83*				
	Average		19%						**-0.91**	**No**
Gulf	Miramichi Return 2SW	6,922	47%	14,695	100%	82%	-1	1.00	-1.00	
	Miramichi Return 1SW	7,475	18%	41,588	90%	68%	-1	0.90	-0.90	
	Margaree Return Large	1,812	52%	3,471	86%	56%	-1	0.86	-0.86	
	possible range				*-0.92*	*0.69*				
	Average		39%						**-0.92**	**No**
Quebec	Bonaventure Return Large	665	45%	1,493	81%	73%	-1	0.81	-0.81	
	Grande Rivière Return Large	86	19%	442	100%	82%	-1	1.00	-1.00	
	Saint-Jean Return Large	278	27%	1013	77%	100%	-1	0.77	-0.77	
	Dartmouth Return Large	408	54%	756	82%	79%	-1	0.82	-0.82	
	Madeleine Return Large	308	44%	693	93%	81%	-1	0.93	-0.93	
	Sainte-Anne Return Large	519	89%	584	88%	80%	-1	0.88	-0.88	
	Mitis Return Large	290	79%	369	89%	59%	-1	0.89	-0.89	
	De la Trinité Return Large	65	17%	385	84%	92%	-1	0.84	-0.84	
	Madeleine Return Small	274	46%	600	79%	82%	-1	0.79	-0.79	
	De la Trinité Return Small	235	25%	949	77%	100%	-1	0.77	-0.77	
	De la Trinité 1SW Survival	0.56	38%	1.49	78%	80%	-1	0.78	-0.78	
	De la Trinité 2SW Survival	0.09	17%	0.54	92%	73%	-1	0.92	-0.92	
	possible range				*-0.85*	*0.82*				
	Average		42%						**-0.85**	**No**
Newfoundland										
	possible range									
	Average								**NA**	**Unknown**
Labrador										
	possible range									
	Average								**NA**	**Unknown**
Southern NEAC										
	possible range									
	Average								**NA**	**Unknown**

Considering the available contemporary data on stock origin of salmon in the Labrador / St Pierre & Miquelon fisheries, estimate the catches by stock origin and describe their temporal and spatial distribution

Origin and composition of catch

- Stock composition of salmon harvested in these mixed stock fisheries determined using recently developed N. American genetic baseline.
- 12 regional groups in eastern NA reliably identified using 15 microsatellite loci – fish assigned to these groups using Bayesian mixture model
- Accuracy of assignment very high - 94.5%. The power of the baseline to resolve rare stock contributions examined using simulations - accurate estimation possible when such stocks comprise 0.5-1.0% and above.



SPM

Origin and composition of catch

- The 14 regional groups do not correspond directly to the six regions used by ICES to characterize stock status and to provide catch advice

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

Labrador

- Estimated % of salmon from each regional group in Labrador subsistence fisheries for 2006-11 and 2012-14.
- Labrador Central (LAB) represents majority of fish in subsistence fishery with minor contributions from other regional groups

Region-code	Region-name	2006 to 2011	2012 to 2014
UNG	Ungava-Northern Labrador	0.5	2.7
LAB	Central Labrador	**96.0**	**95.3**
QLS	Lower North Shore-Southern Labrador	1.3	0.02
NFL	Newfoundland	0.9	1.1
AVA	Avalon-East Newfoundland	0.002	0.001
QUE	Higher North Shore Quebec	0.3	0.04
GAS	Gaspé Peninsula	0.3	0.2
ANT	Anticosti	0.001	0
GUL	Southern Gulf of St Lawrence	0.4	0.7
NOS	Nova Scotia	0.006	0.004
FUN	Inner Bay of Fundy	0.005	0.002
USA	USA	0.3	0.01

Labrador

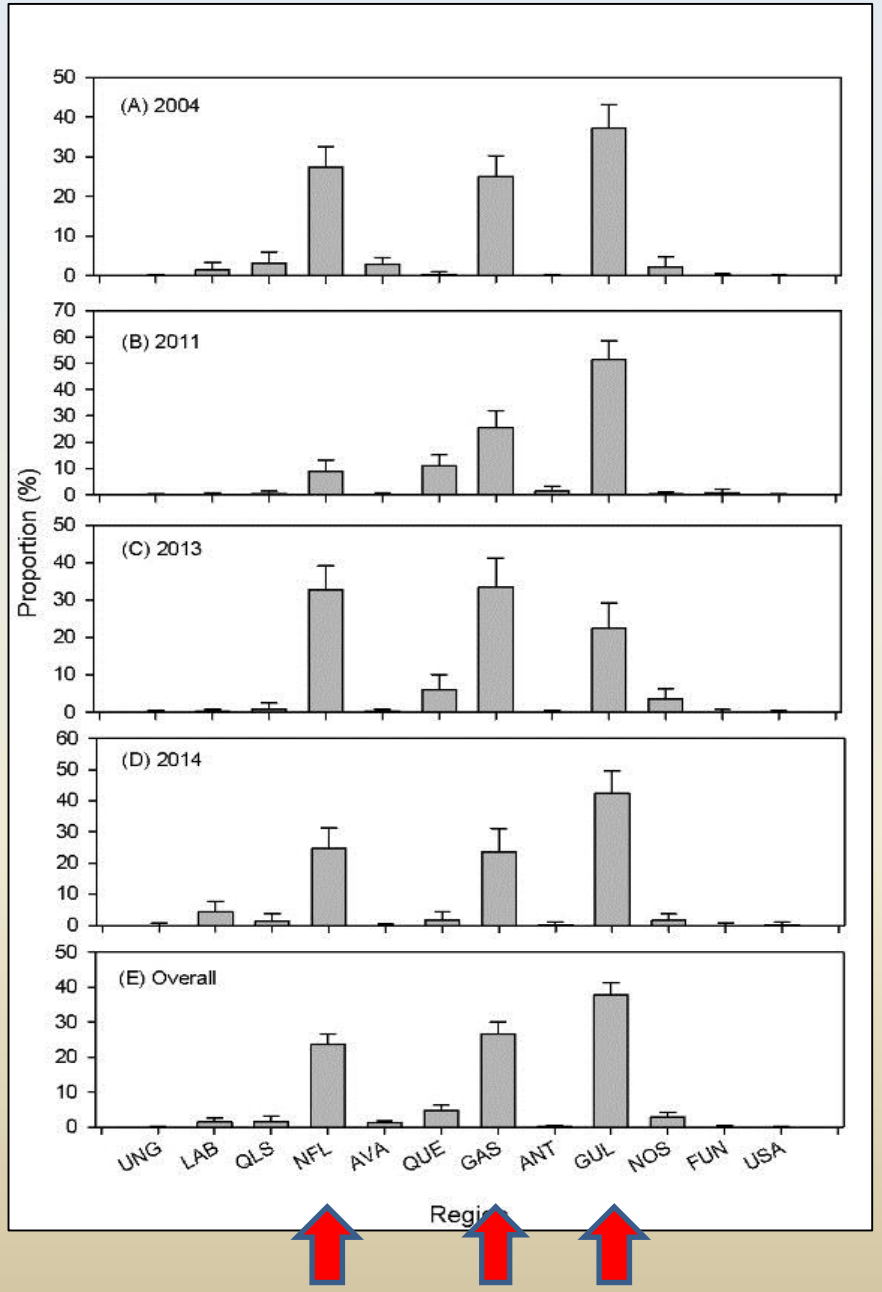
- % estimates raised to total catch in the fisheries for 2012-14
- Central Labrador (LAB) accounted for majority of catch
- No USA origin salmon identified in samples from 2012 to 2014

Acronym	2012	2013	2014	Average
Catch (no.)	14,204	13,538	12,968	13,570
UNG	365	352	338	351
LAB	13,543	12,904	12,368	12,938
QLS	0	0	0	0
NFL	145	139	128	137
AVA	0	0	0	0
QUE	0	0	0	0
GAS	20	18	16	18
ANT	0	0	0	0
GUL	86	78	80	81
NOS	0	0	0	0
FUN	0	0	0	0
USA	0	0	0	0

St. Pierre & Miquelon

- Sampling at SPM conducted in:
  - 2004 (138 samples)
  - 2011 (73 samples)
  - 2013 (71 samples)
  - 2014 (71 samples)
  - Total = 353

- Genetic assignment indicates consistent dominance of three regions:
  - Gulf (GUL)
  - Gaspé Peninsula (GAS)
  - Newfoundland (NFL)



St. Pierre & Miquelon

- Estimated catches for 2004-14: Gulf (GUL) 38%, Quebec (GAS, QUE) 32% & N'fld (NFL) 24%
- Scotia-Fundy has comprised about 3% of the catch; US origin salmon have not occurred

Acronym	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Ave	%
Catch (no.)	1,235	1,458	1,577	863	1,570	1,535	1,233	1,666	643	2,351	1,690	**1,438**	
UNG	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
LAB	16	18	19	11	20	18	15	22	8	29	20	**17**	**1.3**
QLS	15	18	19	11	19	17	16	20	7	28	20	**17**	**1.2**
NFL	292	340	371	204	371	360	289	392	151	550	400	**338**	**23.9**
AVA	12	14	15	8	15	16	12	16	6	23	16	**13**	**1.0**
QUE	54	65	71	38	71	70	56	76	28	107	75	**64**	**4.6**
GAS	326	385	417	229	418	408	327	441	170	627	449	**381**	**27.0**
ANT	1	1	1	1	1	1	1	1	0	2	2	**1**	**0.1**
GUL	467	550	597	324	591	581	464	630	242	887	641	**543**	**38.4**
NOS	32	38	42	23	41	41	33	43	18	63	44	**38**	**2.7**
FUN	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
USA	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**

Recommendations

- ICES recommends that sampling and supporting descriptions of the Labrador and Saint-Pierre & Miquelon mixed-stock fisheries be continued and expanded (i.e. sample size, geographic coverage, tissue samples, seasonal distribution of the samples) in future years to improve the information on biological characteristics and stock origin of salmon harvested in these mixed-stock fisheries.

- ICES recommends that additional monitoring be considered in Labrador to better estimate salmon returns in that region.

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

NAC sub-group chair: Martha Robertson (Canada)