Agenda Item 6.7
For Decision

Council

CNL(14)15

Management and Sampling of the St Pierre and Miquelon Salmon Fishery

CNL(14)15

Management and Sampling of the St Pierre and Miquelon Salmon Fishery

1. As in previous years, we have received from France (in respect of St Pierre and Miquelon) a report containing information on the management of the fishery, details of catches and of the number of licenses issued. This information is contained in Annex 1. The total catch in 2013 was 5.302 tonnes and there were 73 licensed fishermen (9 professional permits and 64 recreational permits).

2. A report on the age and genetic mixed stock analysis of the catch at Saint-Pierre and Miquelon in 2013 has been provided and is included in Annex 2.

3. France (in respect of St Pierre and Miquelon) has been invited to attend the Thirty-First Annual Meeting and will be represented by Ms Christiane Laurent-Monpetit (Ministère des Outre-mer), Ms Marie-Sophie Dufau-Richet (Secrétariat Général de la Mer) and Mr Jean-Marc Philippeau (Ministère de l'écologie, du développement durable et de l'énergie).

4. In 2013, in the light of the findings of the External Performance Review, the President wrote to encourage France (in respect of St Pierre and Miquelon) to accede to the Convention. The response to this letter is contained in Annex 3 of this document.

Secretary
Edinburgh
29 May 2014

Annex 1

Annual report on the Atlantic Salmon Fishery at Saint Pierre and Miquelon
2013 Season

1. Legislation

Salmon fishing in the St Pierre and Miquelon archipelago is regulated by decree No 87-182 of 19 March 1987, implemented under the Order of 20 March 1987.

This legislation establishes the following:

- The fishery is under license and subject to an Annual Fishery Plan
- The minimum capture size is 48cm
- Nets must be declared and marked
- The minimum mesh size is 125mm
- The fishery season is restricted to 1 May – 31 July
- It is not permissible to place fishing gear within 300m of a river mouth.
- Restricted fishing effort:
  - 3 x 360m nets for professional fishermen
  - 1 x 180m net for recreational fishermen
- All catch must be declared (through annual declarations and a fishing log)
- All catch in the recreational fishery must be tagged

322 boat inspections were carried out in 2013, 299 of which were of recreational vessels and 23 were professional vessels. The inspections were carried out over 18 days, both in the morning and in the evening.

2. Permit allocation

Fishing permits are allocated to professional fishermen (who may sell their catch) and recreational fishermen (who are not authorised to sell their catch).

The allocation procedure is based on fishery precedence and on compliance with catch declaration obligations throughout the previous year.

The Maritime Centre deals with permit applications and allocates each permit holder with a specific site to fish for the entire season. The fishery site plan is published by Order of the Prefect.

In 2013, 9 professional permits were issued (as in 2011 and 2012) and 64 recreational permits were issued (60 were issued in 2012). There has been a slight increase in the number of licenses issued over the last 2 years, although the number of fishers has remained constant since 2005 (an average of 50 fishers per year over the last 10 years).

3. Salmon Catch

The total 2013 catch stands at:

Professional catch: 2,291 kg (278 kg in 2012). 974 salmon caught.
Recreational catch: 3,011 kg (1,168 kg in 2012). 1,151 salmon caught.

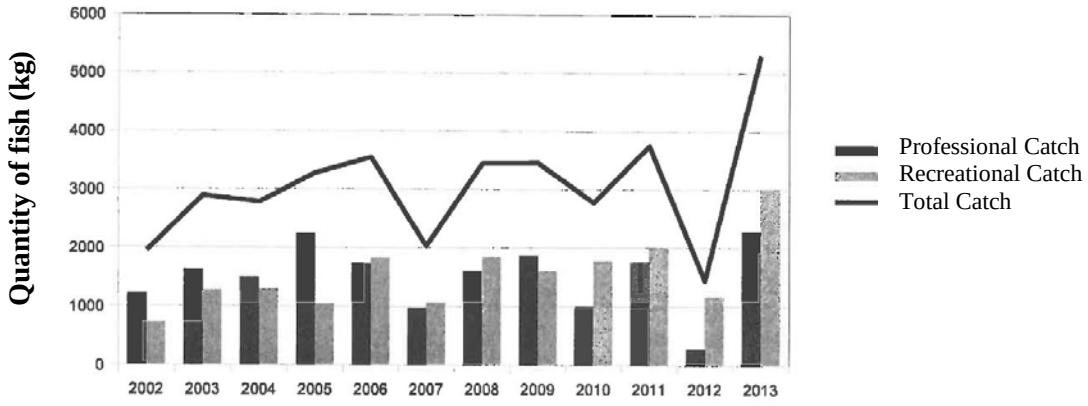
The total weight of the catch was 5,302kg.

The 1,151 salmon caught by 50 recreational boats averages around 23 salmon per recreational fisher. However, the highest catch by a single recreational vessel was 79 salmon. It should also be noted that many boats only fish for a very short period and bring their nets in well before the end of the permitted time-frame, as soon as they consider that their catch is sufficient for their personal use and that of their immediate circle.

The 974 salmon caught by 9 professional vessels averages around 108 salmon per professional fisher. The highest catch by a single professional vessel was 256 salmon, whereas one professional license holder did not fish.

	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Professional Fishery												
No. of licenses	12	12	13	14	13	13	9	8	9	9	9	9
Catch volume	**1223**	**1620**	**1499**	**2243**	**1730**	**970**	**1604**	**1864**	**1002**	**1764**	**278**	**3011**
Recreational Fishery												
No. of licenses	42	42	42	52	52	53	55	50	57	58	60	64
Catch Volume	**729**	**1272**	**1285**	**1044**	**1825**	**1062**	**1846**	**1600**	**1780**	**1992**	**1168**	**2291**
Total catch	1952	2892	2784	3287	3855	2032	3450	3464	2782	3756	1446	5302

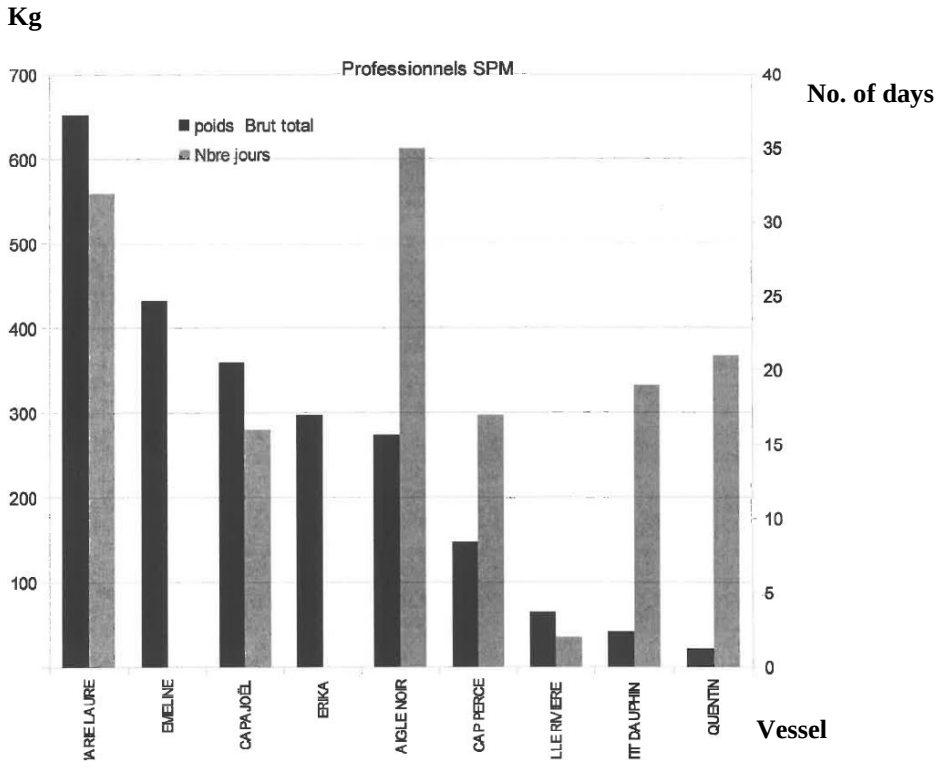
Salmon catch at St Pierre and Miquelon 2002 – 2013



There is no export of salmon and all salmon caught are consumed by the local market. Most salmon caught are retained for personal consumption, while only a few are sold to restaurants or individuals through a local fishmonger, or directly to the individual at market.

It should be noted that there is no fishing for salmon in the archipelago's rivers and that around 16 tonnes of farmed salmon are imported from Canada. The annual consumption of salmon is approximately 3 kg per inhabitant.

2013 Professional Salmon Catch

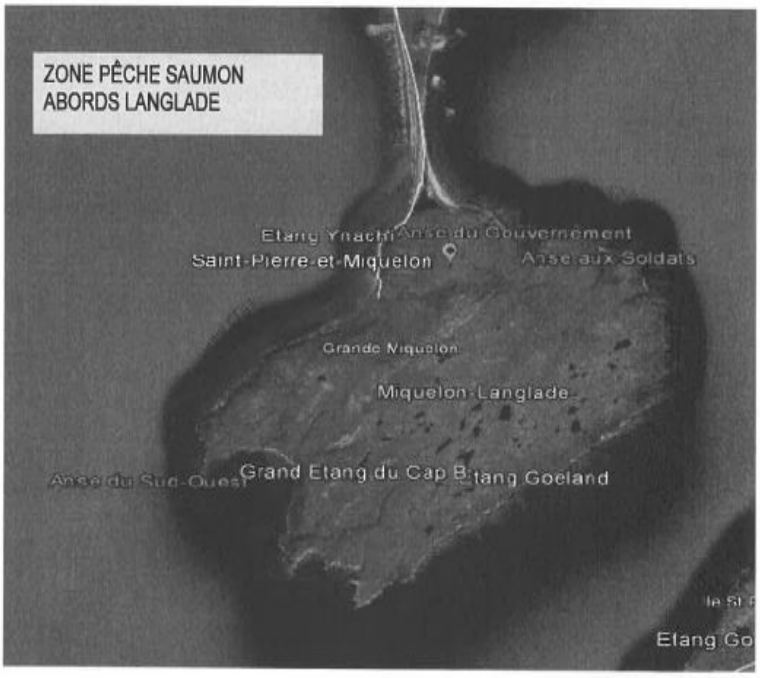


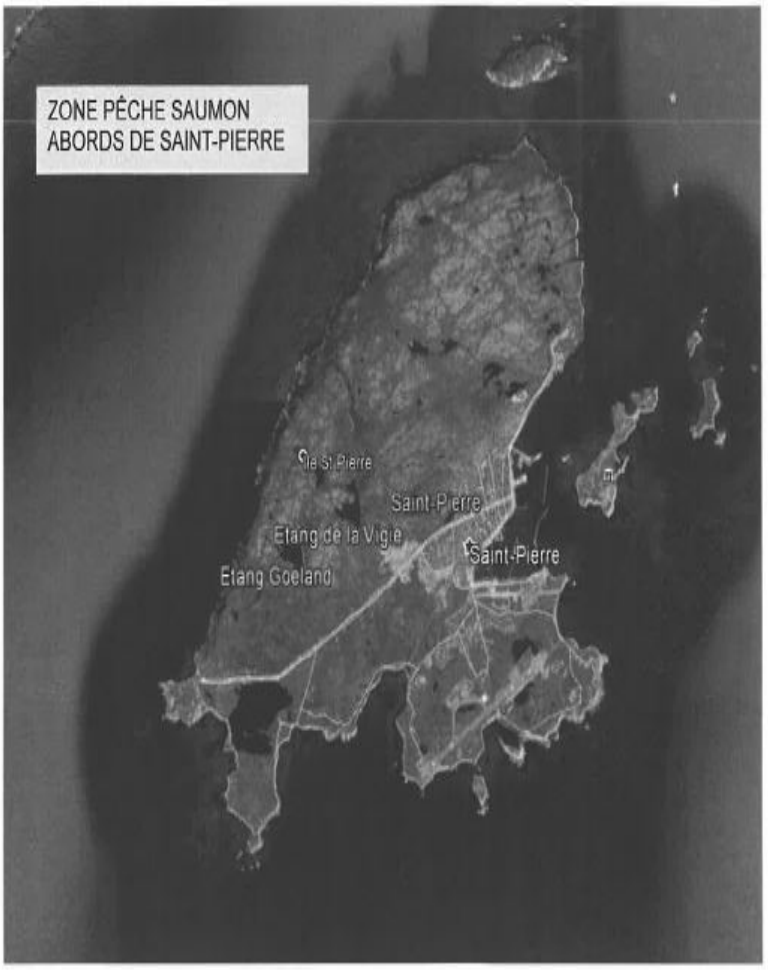
4. Profile of fishers/location of fishing sites

The average fisher on the archipelago is male (there are no female salmon fishers on the archipelago) with an average age of 58 (the oldest being 76 and the youngest 38).

The fishing sites are located around the archipelago as follows:


ZONE DE PÊCHE SAUMON
ABORDS DE MIQUELON
Saint Pierre et Miquelon


ZONE PÊCHE SAUMON
ABORDS LANGLADE
Etang Ynacht
Anse du Gouvernement
Saint-Pierre-et-Miquelon
Anse aux Soldats
Grande Miquelon
Miquelon-Langlade
Anse du Sud-Ouest
Grand Etang du Cap B
tang Goeland
Etang Go



Head of the St Pierre and Miquelon Maritime Centre

Amaury de Guillebon

AGE ANALYSIS AND GENETIC MIXED STOCK ANALYSIS OF ATLANTIC SALMON HARVESTED IN THE SAINT-PIERRE ET MIQUELON FISHERY IN 2013

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SUMMARY

Age interpretation and genetic mixed stock analysis was carried out on 74 scale samples and 71 tissue samples from 79 Atlantic salmon collected in the fishery in waters around Saint-Pierre et Miquelon in 2013. Bayesian mixture and assignment was conducted using a baseline for North American salmon containing 15 loci and 11,575 individuals which allowed for assignment to 11 regional groups throughout the Northwest Atlantic. The salmon sampled in 2013 comprised mostly two-sea-winter maiden salmon (49 samples) with fewer one-sea-winter maiden salmon (22 samples) and 3 repeat spawning salmon. Based on the genetic data, analysis indicated that the sample (n = 71) contained 37% Gaspe Peninsula salmon (30 fish), 34% Newfoundland salmon (23 fish), 22% Maritimes salmon (13 fish), and 7% Upper North Shore Quebec salmon (5 fish). Contributions of the other 7 regional groups were all negligible (i.e. <1%; n = 0). Scale analysis of fishery individuals by reporting group indicates river age increases and sea age declines with increasing latitude of regional group consistent with expectations based on known characteristics of these stocks. Continued analysis of additional years will be informative of the characteristics of the salmon, age and size structure and origin of the fish and the variation in the stock specific characteristics of the catches.

PROJECT DESCRIPTION:

Atlantic salmon from throughout the western Atlantic migrate to the Labrador Sea as smolts where they feed (Pippy 1982; Ritter 1989; Reddin and Short 1991; Reddin and Friedland 1999). As well as being exploited at West Greenland primarily during their second summer feeding at sea, they may be exploited on their return migration in coastal fisheries in the waters around Saint Pierre and Miquelon and Labrador, as well as in rivers. Failure to identify the composition of mixed stock harvests may put at risk of over exploitation and extinction small and vulnerable populations, the loss of which may threaten the ability of species to respond to changing environmental conditions and ultimately the stability and persistence of populations and fisheries (Hilborn et al. 2003; Schindler et al 2010). Multiple approaches have been used to examine the composition of mixtures of salmon populations, though genetic approaches are considered the most practical and cost effective (Koljonen et al. 2007). The power of genetic approaches to resolve populations contributing to mixed harvests depends on the degree of isolation among the contributing populations and the markers used. Previous studies have utilized a variety of genetic markers including allozymes (e.g., Reddin et al. 1990, Koljonen and Pella 1997), mtDNA, microsatellites (e.g., Gauthier-Ouellet et al. 2009), and single nucleotide polymorphisms (e.g., Beacham et al. 2010). Presently, microsatellites remain the preferred marker due to the high allelic variability frequently observed (Koljonen et al. 2007), though combined panels are also receiving support (Beacham et al. 2010). In previous work using microsatellites, Gauthier-Ouellet et al. (2009) estimated with greater than 90% accuracy simulated mixtures of Atlantic salmon caught off west Greenland to regions of North America (e.g., Labrador, New Brunswick, Maine). This baseline has recently been extended to encompass all North American salmon stocks and allows assignment of fish harvested in the Northwest Atlantic to region of origin (see Bradbury et al. in review).

OBJECTIVES

The main objective of this study was to estimate the region of origin of Atlantic salmon harvested in the Saint-Pierre et Miquelon salmon fishery using samples collected in 2013. Previous work (NASCO 2011, 2012) had indicated that all salmon sampled from this fishery were of North American origin, no European origin salmon had been identified from these samples.

METHODOLOGY

Baseline samples

Baseline samples encompassed 189 individual river samples ranging from Ungava Bay in the north to the Penobscot River in Maine to the south (Figure 1) (see Bradbury et al. 2014, Dionne et al. 2008 for regional analyses and further details). Reporting groups largely represent regional clusters identified in previous landscape analyses of population structure (e.g., Bradbury et al. 2014, Dionne et al. 2008) and were evaluated for use in mixture analysis for this study. In total, 11 regional groups were used for individual assignment and mixture analysis (Figure 1), based on both new data and previously published data from Quebec, Labrador, and New Brunswick from Dionne et al. (2008) and Newfoundland and Labrador from Bradbury et al. (2014). Regional groups comprise:

(1) Southern Labrador / Lower North Shore Quebec,

(2) Higher North Shore Quebec / Quebec City,

(3) the Gaspe Peninsula / Anticosti Island,

(4) Ungava Bay and Northern Labrador,

(5) Central Labrador,

(6) Avalon Peninsula,

(7) Northeast Brook Trepassey,

(8) remainder of insular Newfoundland,

(9) Maritimes samples (i.e. southern Gulf of St. Lawrence, Nova Scotia and New Brunswick),

(10) the Inner Bay of Fundy, and

(11) USA populations.

The USA Atlantic salmon regional group was characterized from 100 individual sampled fish (50 individuals from each of two years) collected from the Penobscot River.

Fishery Samples

Fishery samples were collected in 2013 from the fishery around the Island of Saint-Pierre as well as from the fishery conducted around the Island of Miquelon. Samples were provided by Ifremer (St Pierre et Miquelon). In total 77 salmon were sampled in 2013 from which scale samples for scale ageing were available for 74 sampled fish and fin clips for genetic analysis were collected from 69 sampled salmon in 2013 (plus 2 samples provided from the 2012 fishery). Samples for which both scales and tissues for genetic analyses totaled 66 fish in 2013.

DNA extraction and genotyping

DNA was extracted using the Qiagen DNeasy 96 Blood and Tissue extraction kit (Qiagen) following the guidelines of the manufacturer. DNA was quantified using QuantIT PicoGreen (Life Technologies), and diluted to a final concentration of 10ng/μL in 10mM Tris (Buffer EB, Qiagen). Microsatellite polymorphisms were quantified at 15 loci as follows: Ssa85, Ssa202, Ssa197 (O'Reilly et al. 1996), SSOSL417 (Slettan et al. 1995), SsaD85 (T. King, unpublished), SsaD58, SsaD71, SsaD144, SsaD486 (King et al. 2005), MST-3 (hereafter referred to as U3) (Presa and Guyomard 1996), SSsp2201, SSsp2210, SSsp2215, SSsp2216 and SSspG7 (Paterson et al. 2004). Genotyping of baseline samples are described elsewhere (Bradbury et al. 2014, Dionne et al. 2008). Genotyping of fishery samples follows the methods outlined in Bradbury et al. (2014).

Genetic Stock Identification

Stock composition was estimated using the microsatellite data described above and an implementation of a Bayeisan mixture model from Pella and Masuda (2001) as implemented in cBAYES (Neaves et al. 2005). In this analysis eight 20,000 iteration Monte Carlo Markov chains were used each with starting values of 0.90. Convergence was assessed using a shrink factor (< 1.2 indicating convergence) and the last 1,000 iterations were used to calculate stock composition and individual assignments.

RESULTS AND DISCUSSION

Biological characteristics

Of the fish sampled in 2013 with recorded fork lengths, 23 were small salmon (< 63 cm fork length) and 46 were large salmon (>= 63 cm fork length). The river age of the fish sampled was almost equally distributed between two years (34 samples) and three years (38 samples) in freshwater. There were proportionally more river age 3 fish in the 1SW salmon group compared to the 2SW salmon group which had proportionally more river age 2 years fish.

As expected, the 1SW salmon were exclusively in the small salmon category (< 63 cm fork length) whereas the large salmon category was comprised of 2SW and repeat spawning salmon (Figure 2). The three repeat spawning salmon in the samples were all alternate spawning salmon with a maiden age of 1SW.

Table 1. Number of samples by age group.

Freshwater age (years)	Total sea age				All samples
	1SW	2SW	Repeat	Not determined	
2	7	27			34
3	15	20	3		38
Not determined		2		3	5
All samples	22	49	3	3	77

Region of origin

Bayesian mixture analysis of the genetic data from the 71 individuals indicated that the sample contained 37% Gaspe Peninsula salmon (30 samples), 34% Newfoundland salmon (23 samples), 22% Maritimes salmon (13 samples), and 7% Upper North Shore Quebec salmon (5 samples). Contributions of the other 7 regional groups were all negligible (i.e. <1%; no samples assigned to those regions) (Figure 3). The two samples from 2012 were assigned one to each of the Newfoundland and Gaspe groups.

Scale analysis indicated clear trends in biological characteristics of individuals analyzed consistent with the region to which they were assigned (Figure 4). Average river age of assigned individuals declined from Newfoundland to the Maritimes, and conversely average sea age increased from north to south (Figure 4).

Most (two-thirds) of the samples assigned to the Newfoundland region were 1SW salmon whereas most of the fish assigned to the other regions were 2SW salmon (Figure 5).

	Se age				
Assigned region	1SW	2SW	Repeat	Not determined	All age groups
Gaspe	3	23	2	2	30
Maritimes	4	9	0	0	13
Newfoundland	14	6	1	2	23
Quebec North	1	3	0	1	5
All samples	22	41	3	5	71

Also, scale analysis suggested one individual sampled in the fishery may have been an aquaculture escapee. This individual was screened using an existing database for aquaculture salmon currently in use in Newfoundland and Labrador and was identified as being from the Quebec Upper North Shore region. However, the baseline for aquaculture salmon only contains data on salmon currently in production in Newfoundland and Labrador and as such it's possible a miss-identification may occur if an escapee from elsewhere was sampled.

In terms of the timing of the samples, most of the small salmon were sampled after June 1 while most of the large salmon were sampled prior to June 1 in 2013 (Figure 6). Since most of the salmon assigned to the Newfoundland region of origin were small salmon, the fish from this region were mostly from the samples collected in June whereas fish from the other regions were mostly sampled in May.

This work is the first analysis of assignment to region of origin for eastern North America using the extended baseline of samples from salmon populations of eastern North America.

The samples obtained from the fishery in 2013 differed in characteristics from the samples from the 2003 and 2004 fisheries (Lenormand et Briand 2004). In 2003 and 2004, approximately two-thirds of the fish sampled were small salmon (<63 cm fork length) but the sample size in those years was also much larger, 340 and 355 samples in each year respectively.

Where possible, it would be informative to analyse the samples from previous years using the extended baseline database from eastern North America to assess the region of origin of salmon in this fishery. Continued sampling of this fishery is recommended with a consideration of obtaining samples which are representative of the catches in the fishery in both the Saint-Pierre and the Miquelon areas. If tissue samples are too difficult to collect, scale samples could also be considered; scale samples could be collected by fishermen directly from their catches which could enhance the number of samples available for analysis.

Additional years of analysis would be needed to quantify the origin the catches in this fishery.

ACKNOWLEDGEMENTS

The ages of the scale samples were interpreted by Art Walsh (DFO Newfoundland Region) and Noella McDonald (DFO Gulf Region). Images of the scales were collected by Noella McDonald.

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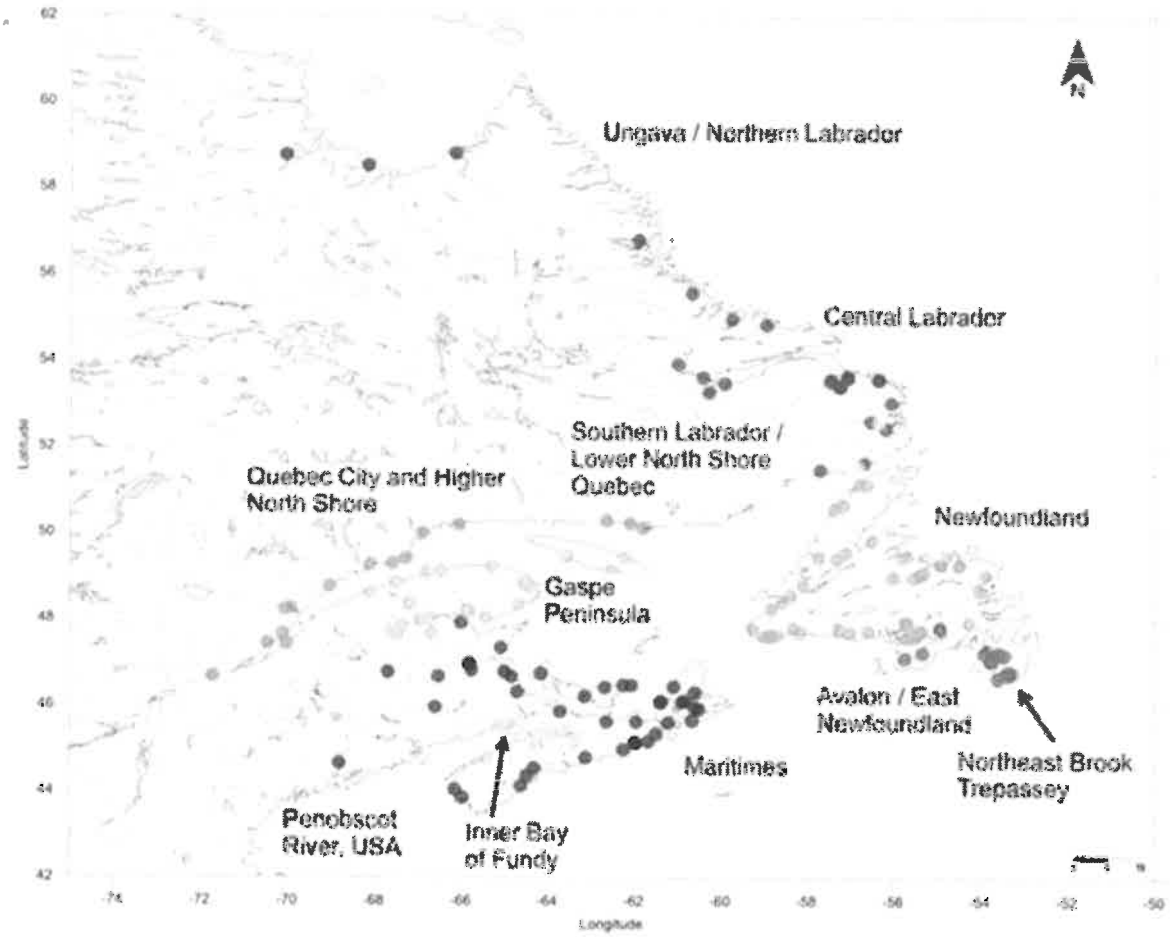

Figure 1. Map of baseline samples and reporting groups used in mixture and assignment analysis. Eleven reporting groups are included (see Methods for details regarding reporting groups). Figure from Bradbury et al. (in review).

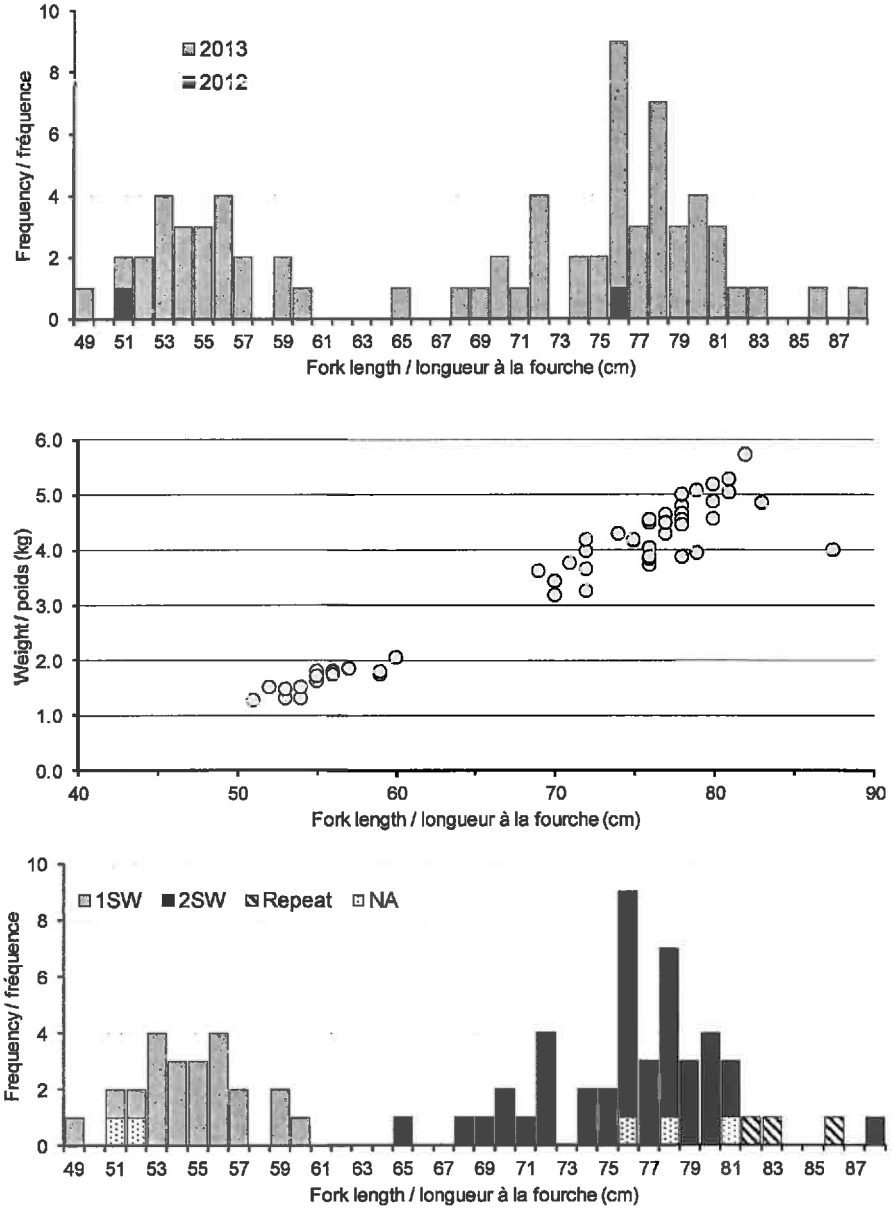

Figure 2. Biological characteristics of the Atlantic salmon sampled from the fishery at Saint-Pierre et Miquelon in 2013.

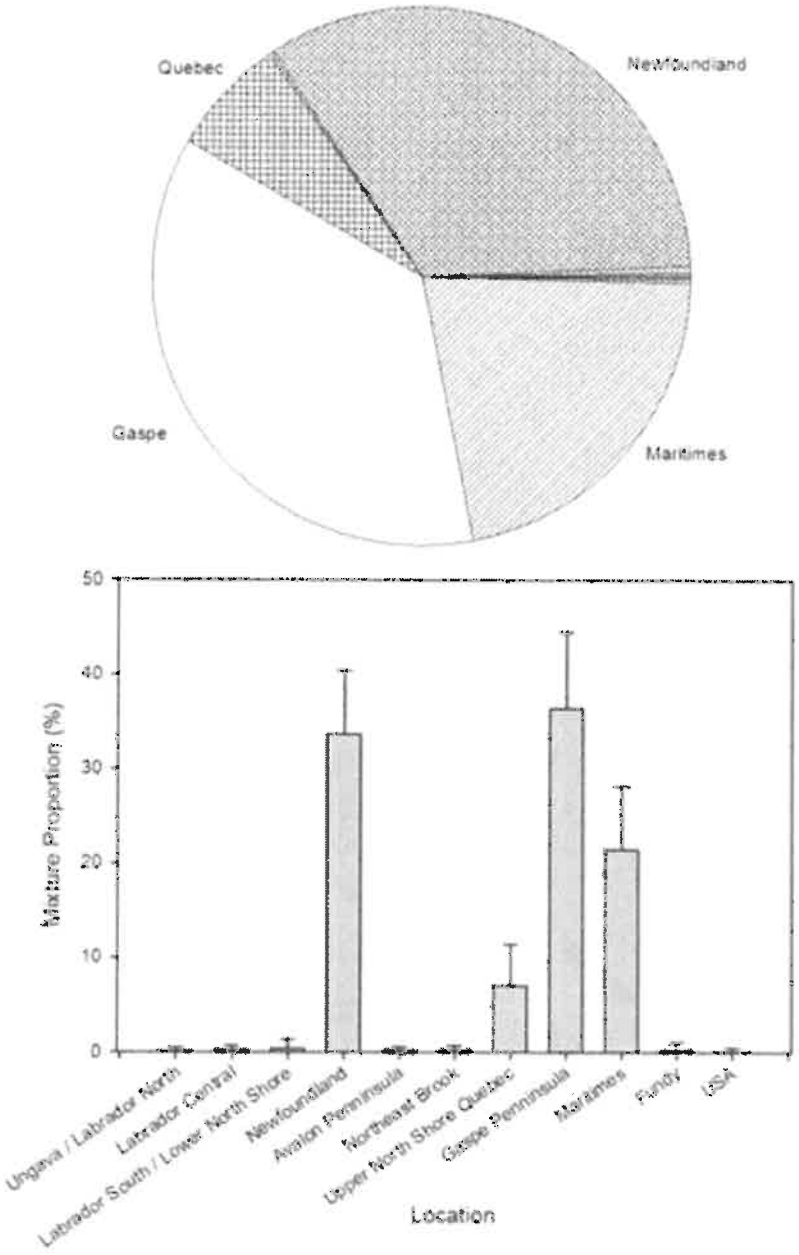

Figure 3. Mixture composition of fishery samples collected in Saint-Pierre et Miquelon in 2013. Eleven reporting groups are included (see Methods for details regarding reporting groups). Error bars represent standard deviation around estimate.

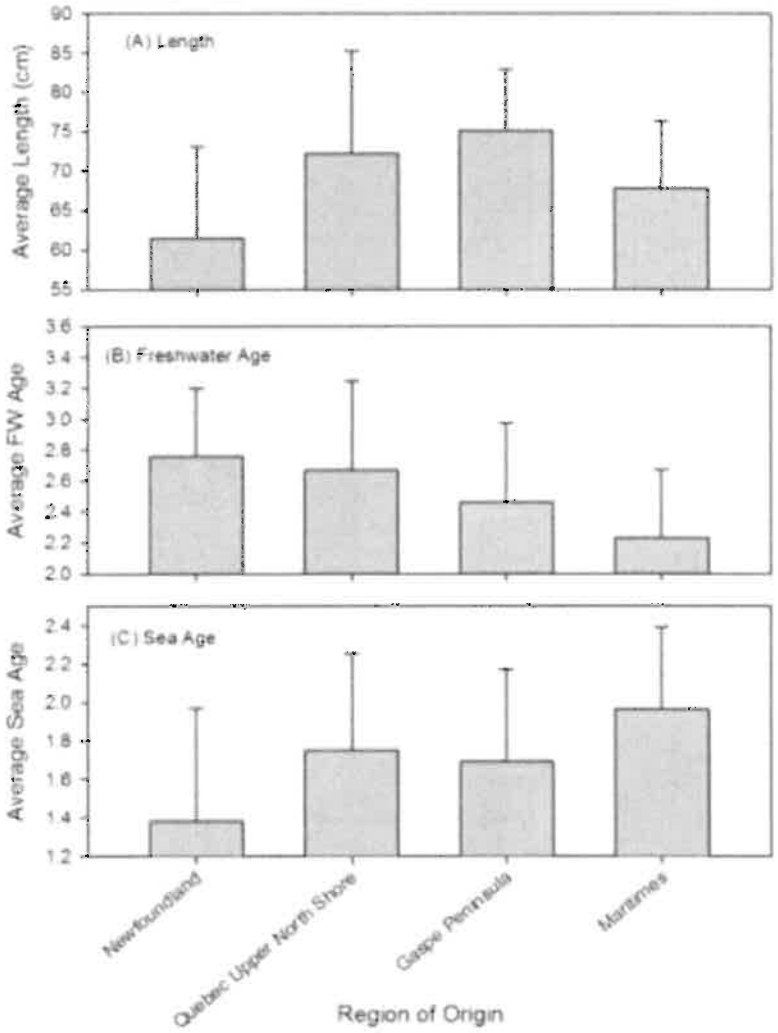

Figure 4. Average biological characteristics (A) length, (B) average freshwater age, and (C) average sea age of salmon sampled from the Saint-Pierre et Miquelon fishery in 2013, by region of origin as determined by genetic mixed stock analysis. Error bars represent standard deviation.

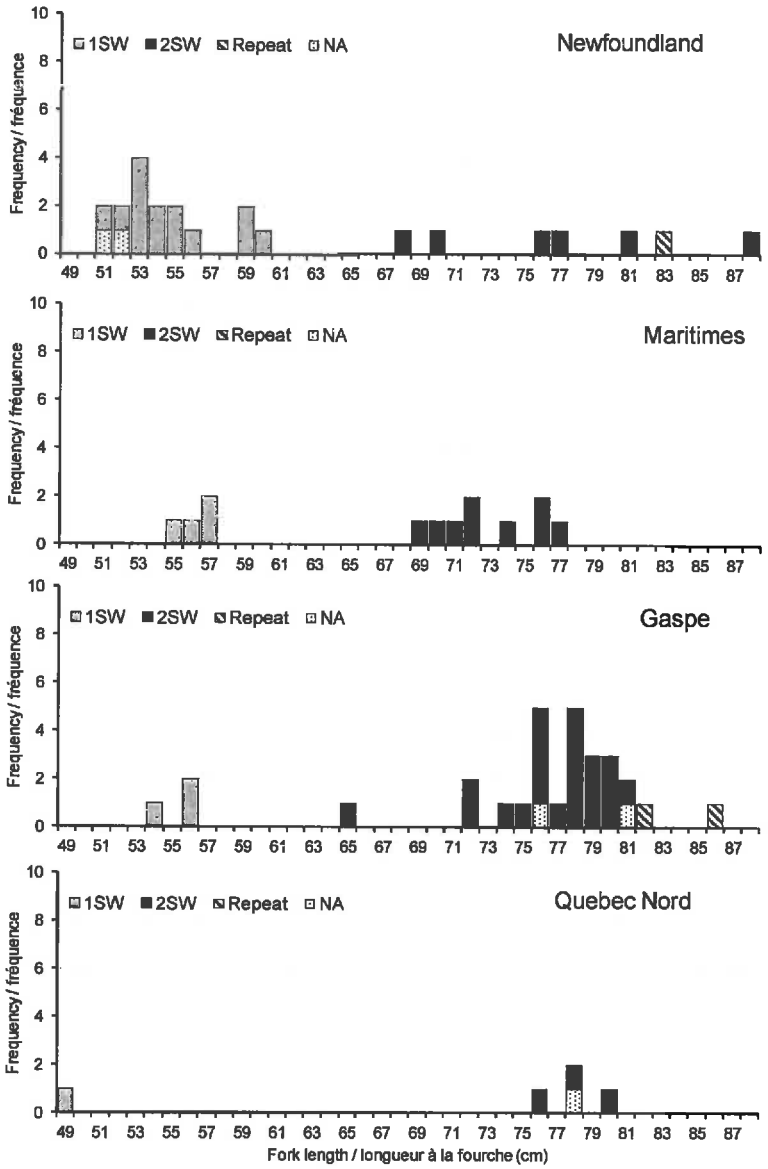

Figure 5. Fork length and sea age characteristics by assigned regional grouping of origin of Atlantic salmon sampled from the Saint-Pierre et Miquelon fishery in 2013. Two samples from 2012 are in the unaged (NA) category assigned to each of Gaspe (76 cm) and Newfoundland (51 cm).

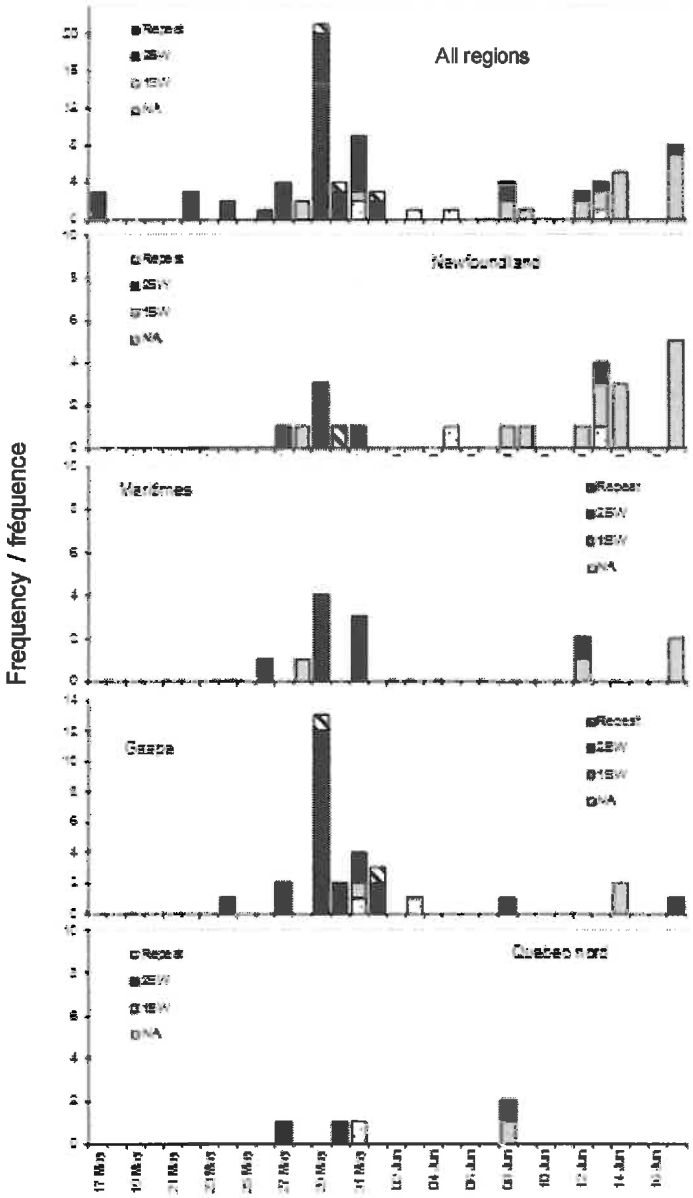

Figure 6. Timing of the samples from the Saint-Pierre et Miquelon fishery in 2013 by sea age group and assigned region of origin. Two samples from 2012 are in the unaged (NA) category assigned to each of Gaspe (3 June) and Newfoundland (5 June).

Annex 3

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

PREMIER MINISTRE

Secrétariat général de la mer

Le Secrétaire général

Paris, 28 mai 2014

N° 777/SGMER

Madam,

France has the pleasure to welcome the upcoming annual meeting of the North Atlantic Salmon Conservation Organization (NASCO) in Brittany in Saint –Malo.

The status of France in respect of St-Pierre-et-Miquelon (SPM) holds our attention, but at this stage observer status seems satisfactory to meet our objectives. We would like, however, to emphasize that France in respect of SPM remains committed to close cooperation with NASCO and will pursue scientific cooperation with NASCO Contracting Parties.

We are truly pleased to participate, with increasing interest, in NASCO meetings, and to contribute to research on the Atlantic salmon with an ongoing sampling programme for age and genetic origin determination. Another step next year will be the collection of size and parasitism data for a significant number of salmons harvested around the islands. This has been made possible mainly by the decision to keep a permanent IFREMER scientist position in St Pierre, with additional human resources in both islands from the local State services (Pôle maritime) and, on the island of Miquelon, from the scientific staff, financed through the Office for the development of agriculture and aquaculture in overseas territories plus increasing involvement of the fishermen themselves.

Furthermore, I am pleased to send the report for the fishery in 2013:

- administrative information provided by the "Pôle maritime",
- scientific information by the IFREMER representative in St Pierre, in cooperation with DFO-Newfoundland and New Brunswick.

We would like to take this opportunity to sincerely congratulate you for your two mandates as president of NASCO.

Michel AYMERIC

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