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The Stock Composition of Atlantic Salmon  
off West Greenland in 1979

by

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Abstract

The proportion of North American origin salmon in the exploited stock at West Greenland in 1979 was 50%. Analysis of catches from the research vessel showed a similar proportion of 47%. The relative abundance of North American salmon is shown to increase from south to north in the commercial samples.

Introduction

Development and subsequent expansion of the West Greenland salmon fishery has been well documented (Gulland 1967; Parrish 1968, 1970 and 1974). Equally well documented have been catches of salmon at West Greenland (Parrish 1976, 1978). Since 1976 the West Greenland salmon fishery has been under quota control by International Agreement; the catch being set at 1191 tonnes. The quota was caught in 1976 and 1977, but was not reached in 1978; while in 1979, it was exceeded by 200 tonnes (Anon. 1979).

The West Greenland fishery exploits salmon from stocks originating in most of the salmon-producing countries of North America and Europe; and concern for these stocks and for the homewater fisheries based on them, led in 1965 to the establishment of the ICES/ICNAF Joint Working Party on North Atlantic Salmon.

The principal questions asked by the Working Party were:

1. What is the proportion of the original population that visits Greenland?
2. What is the proportion of these that are caught at Greenland?
3. What is the proportion of those fish which avoid capture at Greenland and survive to return to home waters?

14. What is the growth of the fish between Greenland and home waters?
15. What is the proportion of the returning fish caught in home waters?

Thus, it is important to know the proportion of North American and European salmon, the relative contributions from different regions of each continent, the stock composition changes during the fishing period, and the stock composition changes from year to year.

This paper utilizes the discriminant functions based on scale characters to separate salmon caught at Greenland into their continent of origin (Lear and Sandeman 1980). The information provided on the exploited stocks will be of use to assess the effects of the West Greenland fishery on home-waters stocks and fisheries.

### Materials and Methods

The samples were collected from the M.V. "Zagreb" which operated in Greenland coastal waters and the Labrador Sea (Fig. 1) from August 8 until September 7, 1979 (Table 1). The samples were collected randomly from each area. Up to 5000 M of drift nets (monofilament gillnets) were used at each set, and were arranged in basic units of 3 nets as follows: 1 monofilament, 126 mm; 1 monofilament, 142 mm; and 1 monofilament, 154 mm.

At the same time, salmon were also sampled in fish plants at Frederikshaab, Godthaab, Holsteinsborg and Egedesminde. All of the samples with the exception of those from Holsteinsborg are random. The sample from Holsteinsborg was stratified and subsequently adjusted so that it is representative of the total daily catch from the recorded plant landings. Scales were taken from the left side of the fish between 3-6 scale rows above the lateral line, and on a line extending from the posterior edge of the dorsal fin to the anterior edge of the anal fin. Counts of the circuli in the 2nd river zone ( $CR_2$ ) and 1st sea zone ( $CS_1$ ) were made. Only those circuli were counted that continued intact through a line drawn along the longest axis of the scale. As with Lear (1972) and Lear and Sandeman (1980) the criteria used for exclusion or inclusion of circuli were similar to those used by Tanaka et al. (1969).

A discriminant function analysis of (Lear and Sandeman 1980) was used based on  $CR_2$  and  $CS_1$  involving two linear discriminant functions to discriminate between those fish of North American (wild) origin, North American hatchery and European origin. Those scales lacking  $CR_2$  were separated by hand utilizing  $CS_1$  where a count of 35 or less circuli characterizes those fish of North American origin and greater than 35 are European origin fish.

## Results and Discussion

It was estimated from analysis of scale characters of Atlantic salmon collected in fish plants that 827 of the 1653 specimens collected were of North American origin (50.0% North American, 95% confidence interval 52.4, 47.6) (Table 1). It was estimated from analysis of scale characters of Atlantic salmon collected by research vessels that 153 of 328 specimens collected were of North American origin (46.6% North American, 95% confidence interval 52.0, 41.2) (Table 2). The difference of 3.4% between the two totals is not significant at the 5% level. As the fish plant sample is much larger than that collected by research vessel and because it is now known that the gear commonly fished at West Greenland is between 120-140 mm and not 126 to 154 mm as was the research gear, the proportion of 50.0% North American from the commercial sample is deemed more representative of the exploited stock. If samples in Table 1 are combined by ICNAF Division, then the North American proportions are 1A-1B, 51.4%; 1C-1D, 51.0%; 1E-1F 41.9%. The proportion of North American fish increases from south to north. This is opposite to that reported by Reddin, Burfitt and Lear (1979) who found the North American proportion decreased from south to north in samples collected by research vessel in 1972. The research vessel samples (Table 2) show the same trend as that reported by Reddin, Burfitt and Lear (1979) although no significant difference could be detected in proportions between areas.

The research vessel catches and commercial catches were approximately comparable in 1979. As shown by Reddin (1979) the research catch is a slight underestimation of the commercial catch. Lear and Sandeman (1980) showed that samples from research and commercial vessels gave approximately the same continental proportion in 1972.

Comparisons of the continental proportions of either North American or European origin salmon on a yearly basis are very difficult due to variations in sample sizes, times and locations. However, the yearly proportions of North American origin salmon in the exploited stock at West Greenland has varied from a high of 51% in 1969 to a low of 34% in 1971 (Table 3). The changes in proportion over these years probably reflects relative changes in abundance of North American and/or European origin salmon in the West Greenland area due to changes in migration routes or variations in annual production.

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Table 1. Commercial Sampling at West Greenland, 1979. (NA - North American Wild; NAH - North American Hatchery; E - European.

Sampling Location	Sample Dates	I.C.N.A.F. Division	Numbers			Total	Not Determined	% of		
			NA	NAH	E			NA	NA + NAH	E
Frederikshaab	Aug. 12/79	1E	84	6	125	215	1	39.1 (45.6, 32.5)	41.9 (48.5, 35.3)	58.1 (64.7, 51.5)
Godthaab	Aug. 16/79	1D	221	16	227	464	-	47.6 (52.2, 43.1)	51.1 (55.6, 46.5)	48.9 (53.5, 44.4)
Godthaab	Aug. 20/79	1D	103	6	105	214	-	48.1 (54.8, 41.4)	50.9 (57.6, 44.2)	49.1 (55.8, 42.4)
Holsteinsborg	Aug. 16/79	1B	37	3	60	100	-	37.0 (46.5, 27.5)	40.0 (49.6, 30.4)	60.0 (69.6, 50.4)
Holsteinshorg	Aug. 17/79	1B	120	14	159	293	-	41.0 (46.6, 35.3)	45.7 (51.4, 40.0)	54.3 (60.0, 48.6)
Holsteinsborg*	Aug. 24/79	1B	101	5	50	156	1	64.7 (72.2, 57.2)	67.9 (75.3, 60.6)	32.1 (39.4, 24.7)
Egedesminde	Aug. 27/79	1A	98	13	100	211	-	46.4 (53.2, 39.7)	52.6 (59.3, 45.9)	47.4 (54.1, 40.7)
TOTAL			764	63	826	1653	2	46.2 (48.6, 43.8)	50.0 (52.4, 47.6)	50.0 (52.4, 47.6)

\*Random stratified sample adjusted from weight and number in catch, and weight and number in sample.

Table 2. The numbers and percentages of North American, North American hatchery and European origin Atlantic salmon caught by research vessel sampling at West Greenland in 1979.

ICNAF Divisions	Number			Total	Not determine	%		
	NA	NAH	E			NA	NA + NAH	E
1A - 1B	51	5	52	108	11	47.2 (56.6, 37.8)	51.9 (61.3, 42.4)	48.1 (57.6, 38.7)
1C - 1D	77	11	106	194	-	39.7 (46.6, 32.8)	45.4 (52.4, 38.4)	54.6 (61.6, 47.6)
1E - 1F*	8	1	17	26	1	30.8 (48.5, 13.0)	34.6 (52.9, 16.3)	65.4 (83.7, 47.1)
Total	136	17	175	328	12	41.5 (46.8, 36.1)	46.6 (52.0, 41.2)	53.4 (58.8, 48.0)
Labrador Sea	-	-	4	4	-	-	-	100.0

\*1F is above 60° latitude and Lab. Sea is below.

Table 3. Percentage of North American Origin Atlantic Salmon Caught at West Greenland.

Year	North American (wild & hatchery) %	95% Confidence Intervals		North American Hatchery %
		Upper	Lower	
1969	51	57	44	8
1970	35	43	26	14
1971	34	40	28	5
1972	36	37	34	7
1973	49	59	39	1
1974	43	46	39	6
1975	44	48	40	4
1976	43	48	38	6
1977	41*	-	-	6
1978	38	41	34	5
1979	50	52	48	4

\* Estimated from unweighted mean 1969-1976.

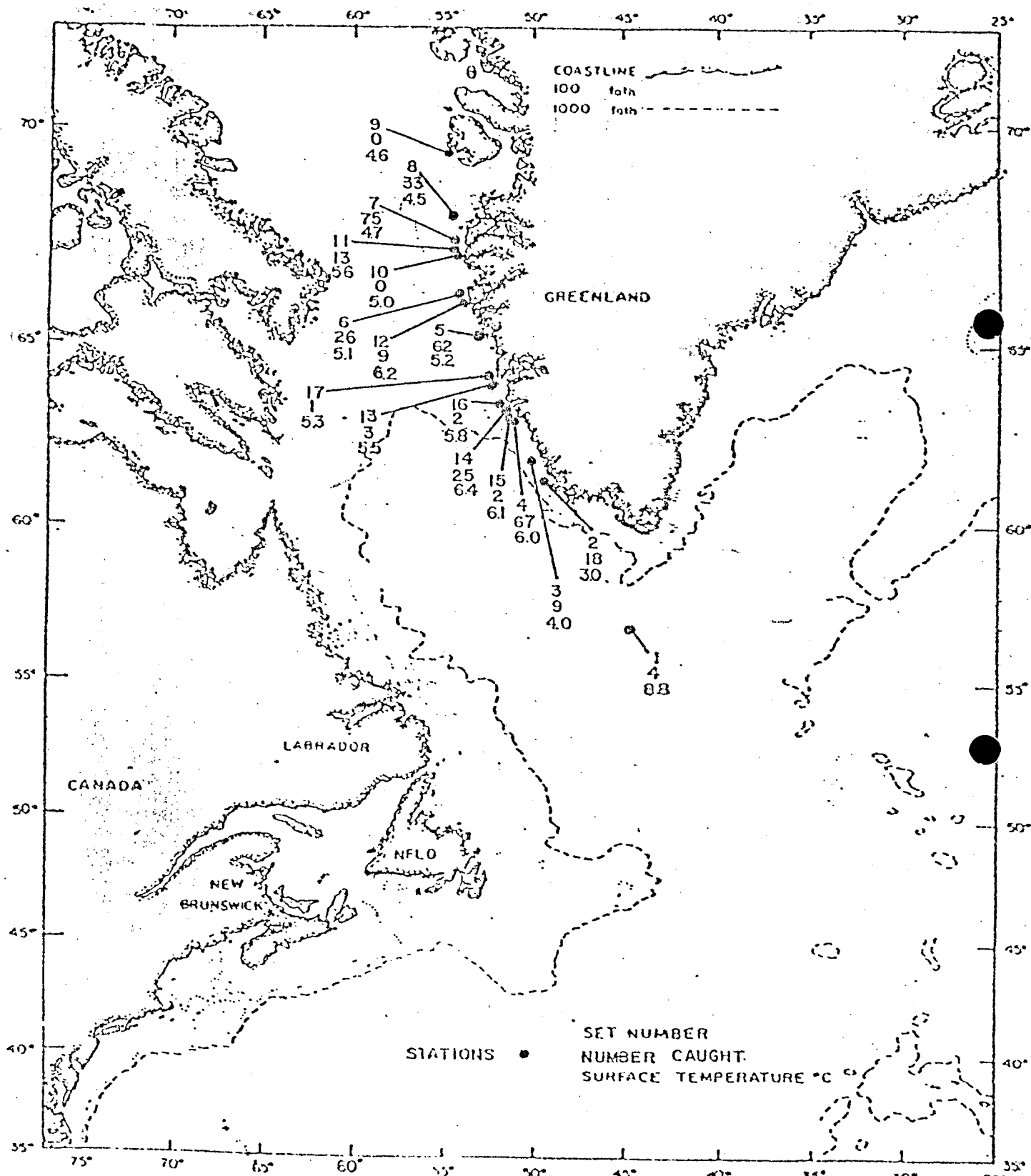


Figure 1. The stations, catch, set number and water temperature of West Greenland experimental work, 1979.