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A Preliminary Report of the Composition of the Spawning Runs of Atlantic Salmon (Salmo salar) in Maine Rivers for period 1962-1966.

by

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Preliminary investigations corroborated suspicions that creel census data provide an unrealistic approach to determining spawning run composition of Atlantic salmon (Salmo salar) in Maine. Consequently, trapping of the runs, or a significant portion thereof, in the lower reaches of the river was considered a prerequisite and a trapping study was initiated in 1962 and continued through 1966. Age class composition, sex ratios, and length-weight relationships of the trapped portions of the ascending runs are presented in this report.

A fishway trap was installed on the Narraguagus River in May, 1962. Located approximately one mile above tidewater this structure provides an opportunity to check a significant portion of the ascending runs. Fish are able to negotiate the adjacent spillway of the dam during moderate to high flows, but studies indicate that we sample from 40 to 80 percent of the ascending run depending upon water levels during the peak migration periods.

In the period 1962 through 1966 all ascending salmon were measured, weighed, sexed, and tagged. Lengths were recorded in tenths of inches and weights in pounds and ounces. Lengths are total lengths with tail relaxed. Scale samples were taken for later age determination from the region between the lateral line and the posterior edge of the dorsal fin.

In 1966, studies were expanded to include the Machias River. A fishway at Whitneyville, five miles above tidewater, was provided with a trap, and data from the 1966 season are incorporated in this report.

Fish of hatchery-origin are present in the ascending runs of the Narraguagus and Machias Rivers but they are of minor importance. The predominance of grilse among these fish precluded their being representative of the native spawning runs. Data presented in this report pertains strictly to native stock.

Composition of the Ascending Runs of Salmon

Scale interpretation allowed ageing of each fish and assignment to age class and component portion of the ascending run. Age at smolt migration as well as

the number of years spent in the marine environment were recorded for each fish. Fish were divided into maiden (virgin) salmon, and salmon showing one or more spawning marks on their scales. The latter are referred to as repeat spawners and are so listed in the age class composition of the ascending runs by years as presented in Table 1.

Frequently, the maiden portion of a spawning run is divided into grilse (one-sea-year fish), small salmon, and large (three-sea-year) salmon. The relative scarcity of both grilse and large salmon in Maine waters make this an arbitrary division of little real significance. Grilse accounted for less than two percent of the fish throughout the study period with yearly fluctuations ranging from zero to 4.6 percent of the salmon from the Narraguagus. The 1966 figure of 3.6 percent grilse for the Machias is within this range.

Large salmon account for 1.2 to 2.3 percent of the ascending fish with an average of 1.7 percent for the Narraguagus (Table 1).

The repeat spawner portion of the runs range yearly from 5.1 to 13.3 percent with an average of 9.0 percent for the study period. Dominant in this portion of the run are fish returning on a second spawning migration (88 percent of the repeat spawners).

Dominant fish in the salmon streams of Maine are two-sea-year fish (Table 1). They account for 88 percent of the fish handled during the study period on the Narraguagus and 84 percent of the fish from the Machias in 1966.

TABLE I

Age Class Composition of the Spawning Runs of Atlantic Salmon in Maine Rivers

		NARRAGUAGUS RIVER					MACHIAS RIV.		
Year	No. of Fish	1962	1963	1964	1965	1966	Total	Percent of total	1966
		253	173	249	227	193	1095	100.0	531
M A F	1-sea year	-	8	-	2	3	13	1.2	19
I I	2-sea year	235	138	216	208	167	964	88.1	446
D S	3-sea year	5	4	3	4	3	19	1.7	15
E H									
N	Maiden fish (percent)	94.9	86.7	87.9	94.3	89.6		91.0	90.4
S									
R P									
E A	2nd Run	11	17	29	10	20	87	7.9	41
P W	3rd Run	2	6	1	3	-	12	1.1	10
E N									
A E	Repeaters (percent)	5.1	13.3	12.1	5.7	10.4		9.0	9.6
T R									
S									

TABLE I (continued)

Age Class Composition of the Spawning Runs of Atlantic Salmon in Maine Rivers

		NARRAGUAGUS RIVER					MACHIAS RIVER		
Year	-	1962	1963	1964	1965	1966	Total	Percent of total	1966
No. of Fish	-	253	173	249	227	193	1095	100.0	531
S									
M A	1-year	-	-	-	-	-	-	-	4
O G	2-year	217	139	216	172	167	911	83.2	473
L E	3-year	36	34	33	55	26	184	16.8	53
T S	4-year	-	-	-	-	-	-	-	1
	2-year smolt (percent)	85.8	80.4	86.8	75.8	86.5		83.2	89.1

Smolt ages of the returning adults for the Narraguagus River were entirely two- and three-year old fish. The two-year smolt age class was dominant with 76 to 86 percent of the returning adults in this group. Average for the study period was 83 percent for fish of two-year smolt origin. Less than one percent of the fish from the Machias were from one-year smolts and the two-year smolt age group was dominant.

Length-Weight Relationship of Narraguagus Salmon

The length-weight relationship of Narraguagus River salmon is well within the established ranges for Salmo salar and Table II presents the lengths and weights of Narraguagus salmon by class. Part of the wide range for maiden fish can be attributed to dimorphism for no attempt is here made to separate sexes.

All lengths and weights of Narraguagus salmon, with the exception of grilse, are well within the ranges exploited by the Greenland fishery.

Sex Ratios of the Ascending Adults

In the study period 1962 through 1966 ascending fish (901 salmon) have been sexed at the fishway trap. Sex ratios by class and year are presented in Table III. The ratio of male to female has ranged from 1.0 : 1.29 to a low of 1.0 : 1.83 for the study period with an average of 1.0 : 1.49.

The low number of males can be attributed in part to the relative scarcity of grilse in the spawning runs of Maine streams. A more realistic approach to the sex composition of the spawning runs can perhaps be made by expressing the number of males in percent. Males throughout the study period have averaged 40 percent of the fish in each run (Table III).

Age Composition of the Smolt Migrations versus Returning Adults

A brief comparison of the age class composition of smolt migrations and the determined smolt ages of the returning adults was undertaken. From Table 1 we find that the majority of the returning adults are two-sea-year fish originating

Table II

Length-Weight Relationship of Narraguagus River Salmon, Maine, USA.

Class	Lengths <sup>1</sup>		Weights	
	Range	mean	Range	mean
Grilse	21.7 - 25.6	23.5 (59.7cm)	2 lb. 12 oz.- 4 lb. 14 oz.	3 lb. 15 oz. (1.786 kg)
Maiden Fish				
2-sea year	27.0 - 33.6	30.0 (76.1cm)	6 lb. 4 oz. - 12 lb. 12 oz.	8 lb. 14 oz. (3.926 kg)
3-sea year	33.0 - 36.0	35.1 (89.1cm)	14 lb. 10 oz. - 17 lb. 0 oz.	15 lb. 12 oz. (7.144 kg)
Repeat Spawners				
2nd Trip	32.5 - 41.0	35.0 (88.8cm)	12 lb. 4 oz. - 19 lb. 2 oz.	15 lb. 8 oz. (7.029 kg)
3rd Trip	35.7 - 42.0	38.5 (97.7cm)	17 lb. 2 oz. - 24 lb. 2 oz.	20 lb. 4 oz. (9.185 kg)

<sup>1</sup>Total lengths with tail relaxed expressed in 0.1 inches.  
Figures in parenthesis are metric equivalents.

TABLE III

Sex Ratio of the Trap Caught Portion of the Spawning Runs of Atlantic Salmon in the Narraguagus River, Maine, USA for the period 1962-1966.

Class	Year Sex	1962		1963		1964		1965		1966		Total	
		M	F	M	F	M	F	M	F	M	F	M	F
Grilse		0	0	6	1	0	0	2	0	2	1	10	2
Maiden Fish		70	123	46	67	88	101	65	97	60	89	329	477
Repeat Spawners		2	9	4	13	7	22	3	7	6	10	22	61
Totals		72	132	56	81	95	123	70	104	68	100	361	540
Ratio M:F		1.0 : 1.83		1.0 : 1.45		1.0 : 1.29		1.0 : 1.48		1.0 : 1.47		1.0 : 1.49	
Total Fish Sexed		204		137		218		174		168		901	
Males (percent)		35.29		40.87		43.58		40.23		40.48		40.06	

from two-year-old smolts. Consequently, the returning maiden adults have been compared with the smolt migrations occurring two years prior to their return.

The percentage of two-year-old fish in the smolt migrations for the period 1960 through 1964 have ranged from 60 to 90 percent. Three-year-old smolts account for the remainder of the fish handled in our assessment studies on the Narraguagus River. Comparing these figures with the smolt ages of the ascending adults for the period 1962 through 1966 we find that 72 to 87 percent of the maiden fish originated from two-year smolts.

The difference in the figures for smolt migrations as compared with the returning adults can perhaps be accounted for in two ways. Three-year smolts are usually larger and this may enhance survival. Secondly, the assessment figures may not be truly representative of the smolt migration for the entire watershed.