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Conversion of weights of Atlantic salmon with viscera-removed and heads-on to round weight at West Greenland

by

D. G. Reddin
Department of Fisheries and Oceans
Research and Resource Services
P.O. Box 5667
St. John's, Newfoundland
A1C 5X1

ABSTRACT

The factor to convert weights of Atlantic salmon with heads-on and viscera-removed to round weight calculated from research vessel samples was 1.15. The factor of 1.11 used to convert landed weight to round weight for official catch statistics resulted in a difference of 4% in reported landings.

RESUME

Le facteur servant à convertir le poids de saumons atlantiques éviscérés mais avec la tête, déterminé sur des échantillons de navire de recherche, est de 1,15. Le facteur de 1,11 utilisé pour convertir le poids au débarquement en poids rond pour les statistiques de prises officielles donne une différence de 4 % dans les prises signalées.

INTRODUCTION

Conversion factors are regularly used to convert the weight of fish recorded at processing plants where fish are landed with viscera removed and heads-on or viscera and heads removed to total round weight. Atlantic salmon landings in the Newfoundland commercial fishery are converted to round weight from viscera removed and heads-on condition by multiplying this weight by 1.20 (Reddin and Short 1981). However, Atlantic salmon landings in the West Greenland commercial fishery are converted from viscera removed and heads-on state to whole weight by a conversion factor of 1.11 (Anon 1980). The conversion factor in use by other countries is Denmark 1.20, Faroes Islands 1.15, France 1.15, Germany 1.15, Netherlands 1.15 and Sweden 1.15 (Anon 1970). This paper examines the possibility that the reported salmon landings at West Greenland are underestimated by use of this factor.

METHODS

The whole weights and gutted weights (viscera and kidneys removed with heads-on) examined in this paper were sampled from Atlantic salmon caught in nets of research vessels that operated along the coast of West Greenland in the period of the commercial fishery from 1969 to 1973, 1975 and 1978 to 1980. Source material is in Reddin (1980). All samples were weighed (to 1/10th of a kilogram) in the fresh round state and then with head-on viscera and kidneys removed. Fish were caught in 1966 by the Danish research vessels Jensen and Tornaq and were obtained from the Godthaab fish plant in 1968. These samples were frozen in round condition and shipped to St. John's, Newfoundland where they were weighed round and then reweighed with only viscera removed (J. Pippy, pers. comm.). Weights were in 1/10 th of a kilogram. All regressions were done using the Biomedical Computer Programs (P-series, 1979) developed by Health Sciences Computing Facility, University of California at Los Angeles. The weighing devices were checked (with standard weights) before and after use for accuracy and precision.

RESULTS AND DISCUSSION

The least squares non-intercept model was chosen over the intercept model to describe the relationship of round weight on gutted weight because the coefficient of determination was higher and there was no significant improvement of the residual mean square (F = 1.1025, P>0.10) (Fig. 1).

The relationships of round weight on gutted weight for 1-sea-winter (1SW) salmon were analyzed separately from 2-sea-winter (2SW) and previous spawners because sea-age composition of this component has decreased from 1969 to 1978 (Reddin and Burfitt 1979); and it was felt that their inclusion might influence the results as regressions with these sea-age groups had higher slopes than did the 1SW fish (Table 1). Comparison of the slopes of the 1SW fish by analysis of covariance (ANCOVA) from 1969 to 1979 indicated that the slopes (F = 3.46, P = 0.01) were significantly different. However, there being no apparent trend in the data, a conversion factor of 1.1538 (1.15) was derived for all 1SW fish, 2SW and previous spawners by weighting these to the recent sea-age composition. It is suggested that 1.15 be used for converting gutted weight to round weight for the West Greenland fishery.

This analysis assumes that fish can be precisely weighed on a research vessel at sea. The precision of the samples weighed at sea was examined by comparing gutted weight on fork length relationships for fish caught in 1979 by research vessel and samples examined onshore in fish plants (Fig. 2). ANCOVA showed that the slopes of the two samples were not significantly different (Table 2) while the adjusted mean weights of research sampled fish were about 4% heavier than those in the commercial samples. In addition, samples collected by research vessel and from the Godthaab fish plant that were weighed on shore both round and head-on viscera only removed condition showed conversion factors of 1.18 and 1.15 respectively (Table 1). Therefore, a conversion factor for converting gutted weights of salmon to round weights as measured on research vessels is adequate for the commercial fishery.

The difference between using 1.11 or 1.15 to convert landed weight to round weight can readily be calculated. In 1980, the quota of 1190 t was 1072 t gutted weight (conversion 1.11); however, using the revised conversion factor of 1.15 the round weight would be 1233 t; a difference of 42.9 t. Thus, the harvest (1980) above the reported catch in numbers and weight of North American and European fish is 6,473 or 19.8 t; and, 7,012 or 23.1 t (Table 3). The real landings are under-reported by approximately 4%.

Since the assessment of the West Greenland fishery by Ritter et al. (1980) and Anon (1980) on homewater stocks and fisheries used reported landings converted to numbers by mean weights from research vessel cruises; this analysis will also underestimate the impact on homewater stocks and fisheries by 4%.

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Table 1. Regressions of whole weight on gutted weight (Y = aX) for Atlantic salmon caught at West Greenland.

Year	Coefficient	T	P	R^2	F	P	N
1966 (1SW)	1.1808	239.59	<0.001	0.999	5.74×10^4	<0.0001	57
1968 (1SW)	1.1546	484.55	<0.001	0.999	2.35×10^5	<0.0001	168
1969 (1SW)	1.1405	514.57	<0.001	0.999	2.65×10^5	<0.0001	212
1970 (1SW)	1.1442	337.43	<0.001	0.999	1.14×10^5	<0.0001	136
1971 (1SW)	1.1510	549.64	<0.001	0.999	3.02×10^5	<0.0001	249
1972 (1SW)	1.1440	867.59	<0.001	0.999	$7.53.10^5$	<0.0001	800
1973 (1SW)	1.1292	162.48	<0.001	0.999	$2.64.10^4$	<0.0001	15
1975 (1SW)	1.1441	682.87	<0.001	0.999	4.66×10^5	<0.0001	520
1978 (1SW)	1.1689	272.56	<0.001	0.999	7.43×10^4	<0.0001	105
1979 (1SW)	1.1561	484.78	<0.001	0.999	2.35×10^5	<0.0001	309
1980 (1SW)	1.1696	567.72	<0.001	0.998	3.22×10^5	<0.0001	611
All years (1SW)	1.1534	1606.4	<0.001	0.999	2.58×10^6	<0.0001	3182
All years (2SW, 3SW and previous spawners)	1.1637	232.67	<.01	0.998	1.97×10^5	<0.0001	343
All years (all sea ages)	1.1548	1645.66	<0.001	0.999	2.71×10^6	<0.0001	3525

Table 2. Summaries of ANCOVA for gutted weight on fork length of Atlantic Salmon caught at West Greenland in 1979.

Sample type	Origin	Comparison of slopes		Comparision of adjusted means	
		F	P	F	P
COMMERCIAL	ALL	8.33	0.0003	5.30	0.0051
RESEARCH + COMMERCIAL	[1]NA	0.36	0.5482	16.56	0.0001
RESEARCH + COMMERCIAL	[2]NAH	0.0016	0.9680	0.0953	0.7585
RESEARCH + COMMERCIAL	[3]E	1.39	0.2381	37.23	0.0000

[1]-North American, [2]-North American Hatchery, [3]-European

Table 3. Summary of difference between catch in round weight and reported catch at West Greenland.

Year	Reported round wt (t)	Gutted head-on (1.11)[2]	Revised round (t) (1.15)[3]	Mean weight (kg)	Difference in numbers of fish	Weight (t) overharvested (Z.)	[1]NA:E proportion	Weight (t) (Number of NA salmon)	Weight(t) (Number of E salmon)
1978	984	886	1019	3.34	10,617	35.5	38:62	12.4 (4034)	23.1 (6582)
1979	1395	1257	1445	3.33	15,096	50.3	50:50	23.5 (7548)	26.8 (7548)
1980	1190	1072	1233	3.18	13,485	42.9	48:52	19.8 (6473)	23.1 (7012)

[1] NA-North American origin salmon, E-European origin salmon
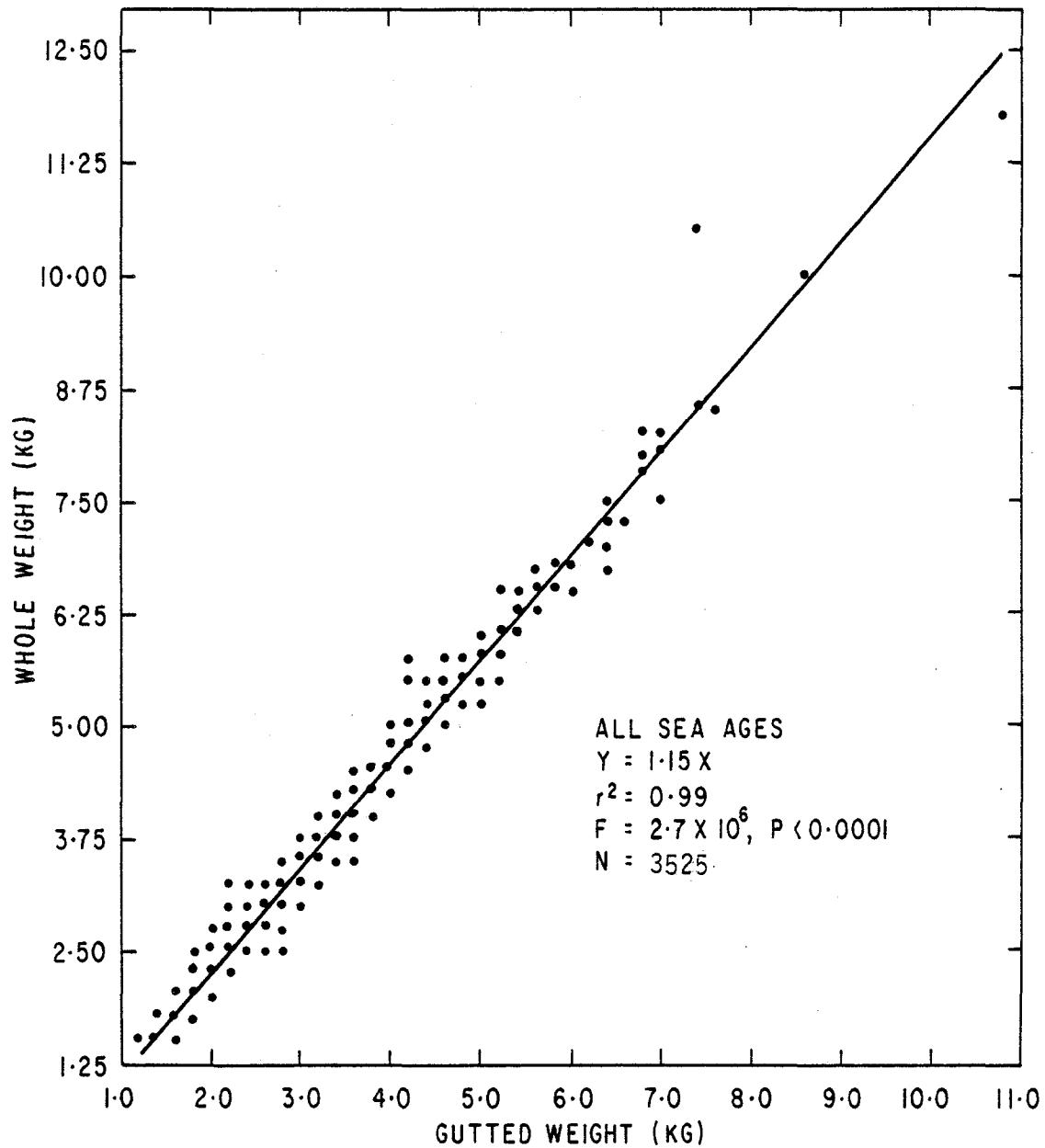[2] Previous conversion factor
[3] Revised conversion factor

Fig. 1. The relationship between gutted weight and whole weight for all sea ages from 1969 to 1980.
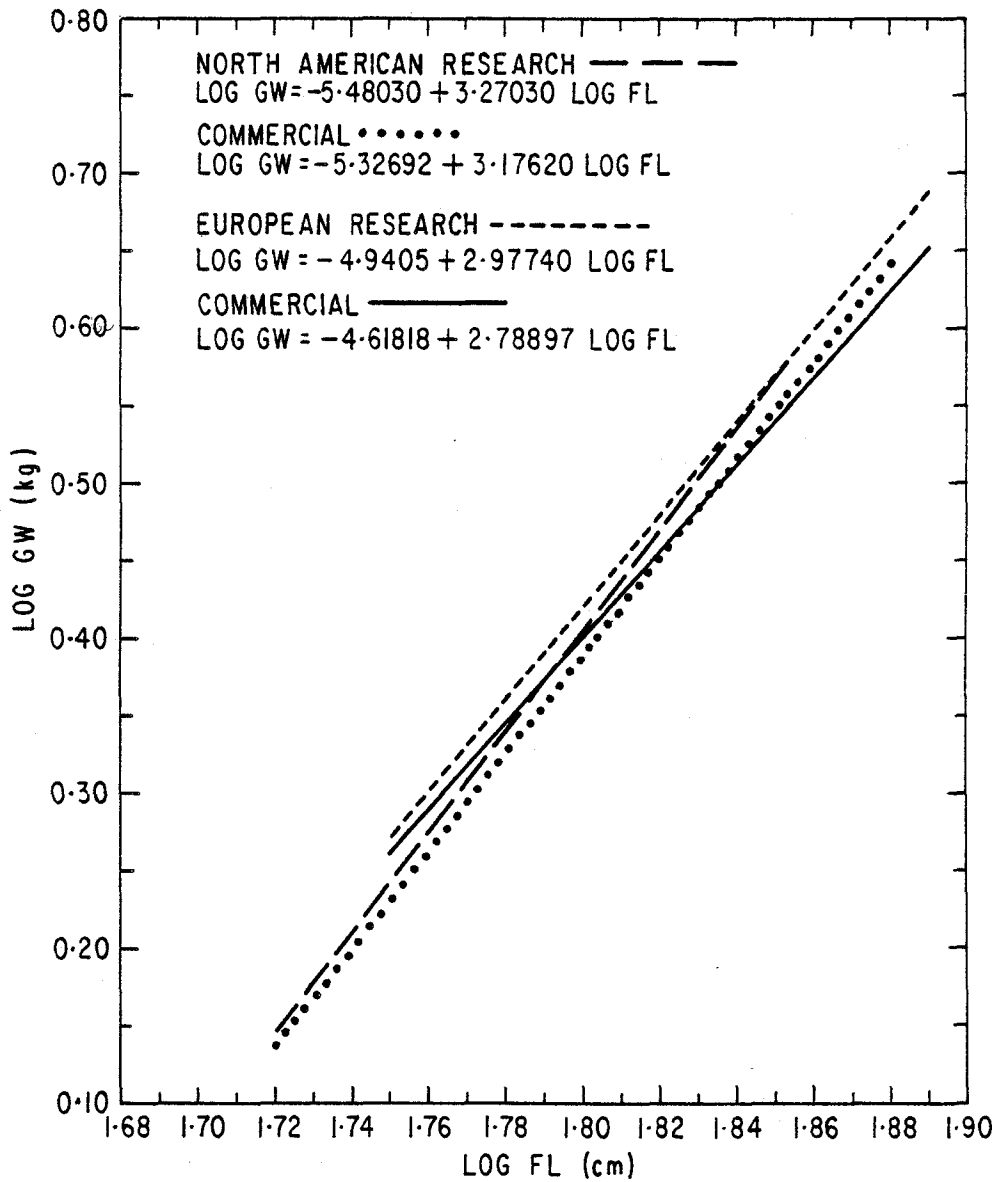
Fig. 2. The relationships between gutted weight and fork length for Atlantic salmon caught at West Greenland by research vessel or in the commercial fishery.