Conversion Factors for Northern Labrador Arctic Charr Landings Statistics

by

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Abstract

Derivation of the present conversion factor of 1.24 used to convert landings of Arctic charr from the gutted head-on state to whole weight is unknown. The value also appears high in comparison to other conversion factors used for Arctic charr in different areas. A new value of 1.22 is derived from data collected in 1982 and 1983 and is less than 2% different from the present value.

Résumé

L'origine de l'actuel facteur de conversion, 1,24, utilisé pour convertir le poids des débarquements d'ombles chevaliers éviscérés et avec la tête en poids de poissons entiers est inconnue. Le nombre semble élevé en comparaison avec d'autres facteurs de conversion utilisés pour l'omble chevalier dans différentes régions. Une nouvelle valeur, 1,22, provient de données collectées en 1982 et en 1983 et diffère de moins de 2 % de la valeur actuelle.

Introduction

By convention quotas and landings for various species of fish are presented in the standard form of equivalent whole weights (Anon. 1970; Gulland 1983). In the northern Labrador commercial Arctic charr fishery, charr are landed in the gutted condition (gw) with viscera (and gills) removed and heads-on. Thus a conversion factor of 1.24 has been used in order to convert landings into equivalent whole weights (Coady and Best 1976). The derivation of this factor, however, is unknown.

During recent assessment meetings this factor was questioned as possibly being too high which, therefore, would result in overestimating converted landings. Comparisons with other areas or species also suggest that this factor may be high. The factor used in converting gutted weight to whole weight for Arctic charr in Greenland is 1.11 (Anon. 1970) while in the Northwest Territories 1.16 is used (A. Kristofferson pers. comm.). In the Newfoundland and Labrador commercial Atlantic salmon fishery a value of 1.20 is used for the conversion of gutted salmon to whole salmon and 1.25 is used for conversion of dressed (viscera removed and heads-off) to whole salmon (Short and Reddin 1981). Reddin (1983) is now recommending that these values be changed to 1.14 and 1.24 respectively. This paper presents data used to derive an updated conversion factor for Labrador Arctic charr and analyses differences both between areas and sexes.

Materials and Methods

Arctic charr specimens from five northern Labrador areas were sampled for whole and gutted weights between July 7 and August 23 of 1982 and 1983. Specimens in 1982 (N = 228) were from the Tikkoatokak Bay area only. All specimens were weighted to 0.01 kg in both the whole and gutted state. Removal of gills and viscera was done by commercial fishermen. Weighing was done by DFO personnel. Conversion factors were calculated by sex for each area and for all areas combined following the ratio formula of Cochran (1977) where:

$$R = \frac{\sum_{i}^{n} yi}{\sum_{i}^{n} xi} = \frac{\bar{y}}{\bar{x}}$$

and y and x represent the whole and gutted weights of the ith specimen repectively. Standard errors of the estimates were calculated as:

$$S(R) = \frac{1}{\sqrt{n}\,\bar{x}} \sqrt{\frac{\sum yi^2 - 2R\sum xiyi + R^2\sum xi^2}{n-1}}$$ (Cochran 1977).

Comparisons of conversion factors between areas or sexes similarily followed Cochran's (1977) method where the variance of the estimated ratios was calculated from:

$$V(R_1 - R_2) = V(R_1) + V(R_2)$$

Results and Discussion

Figure 1 illustrates a plot of the points of whole weight (ww) on gutted weight (gw) with the intercept equal to zero for all areas and sexes combined ($r^2 = 0.997$, $P = 0.0001$). The slope of the line, 1.222, provides an estimate of the conversion factor for ww on gw. The use of a regression line, however, is more appropriate when individual fish and not groups of fish are considered such as the case when containers or landing boxes are weighed off at fish plants. When the intercept is equal to zero, the ratio estimate and the regression estimate should provide similar values. For the ordinary regression of ww on gw, the intercept was statistically different from zero ($P = 0.001$, $ww = 1.1920\ gw + 0.0456$, $r^2 = 0.95$).

Mean and range of gutted and whole weight data are summarized in Table 1. Conversion factor ratios (R) for gw to ww for sexes combined ranged from 1.204 for the Okak Bay sample to 1.245 for the Tikkoatokak Bay charr, a difference of less than 4% (Table 1). In each area female Arctic charr had a higher conversion factor ratio than male charr (Table 1). Significant differences between sexes were found for all areas combined and each individual area except Black Island. Differences could result from a differential degree of gonad development between male and female charr in addition to differences resulting from the time period within the season from which specimens were obtained.

Significant differences were also found among all area comparisons except Dog Island and Black Island, and Black Island and Okak Bay (Table 2). This is not surprising as previous studies (Dempson 1982, 1984) have found significant differences in growth rates and body morphology among charr samples from various northern Labrador areas.

While it may be ideal to have separate conversion factors for each area, it is not practical. One value representative of all areas is required. The value for all areas combined ($N = 1340$) is 1.22. Weighting the conversion factor values for each area by the catches from the five individual areas for 1983 (average catch 1982-83 used for Tikkoatokak Bay), which represented 53% of the commercial production from the Nain area in 1983, similarly yields a value of 1.22. It is recommended that this value is used in place of the former conversion factor of 1.24.

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Table 1. Summary of gutted weight to whole weight conversion factor ratios (R) by area, and comparisons by sex for Arctic charr from various northern Labrador areas, 1982-83. Standard error of the ratios (S(R)) and mean and range for gutted and whole weight data (kg) are also presented. Significance level is $P < 0.01$ (**).

	Male			Female				Total						
											Gutted Weight		Whole Weight	
	N	R	S(R)	N	R	S(R)	t	N*	R	S(R)	Mean	Range	Mean	Range
Dog Island	27	1.203	0.005	37	1.223	0.007	2.88**	64	1.216	0.005	1.57	1.00-3.14	1.91	1.20-3.67
Black Island	35	1.199	0.014	34	1.216	0.012	0.94NS	70	1.206	0.009	1.34	0.84-2.37	1.62	0.94-2.85
Okak Bay	130	1.193	0.003	288	1.209	0.003	3.76**	419	1.204	0.002	1.40	0.62-2.58	1.69	0.76-3.08
Tikkoatokak Bay	74	1.220	0.006	134	1.259	0.009	3.58**	261	1.245	0.005	1.46	0.70-2.70	1.82	1.00-3.25
Webb Bay	190	1.213	0.004	333	1.243	0.004	5.70**	526	1.231	0.003	1.45	0.56-3.90	1.77	0.72-4.74
Total	456	1.207	0.002	826	1.232	0.002	7.21**	1340	1.224	0.002	1.44	0.56-3.90	1.76	0.72-4.74

*Total includes unsexed fish.

Table 2. Summary of Labrador Arctic charr gutted weight to whole weight comversion factor ratio comparisons between areas with t-statistic above diagonal and corresponding significant level below diagonal. Significance levels are $P < 0.05$ (*) and $P < 0.01$ (**).

	Dog Island	Black Island	Okak Bay	Tikkoatokak Bay	Webb Bay
Dog Island		0.96	2.35	3.97	2.76
Black Island	NS		0.24	3.57	2.59
Okak Bay	*	NS		7.02	7.83
Tikkoatokak Bay	**	**	**		2.21
Webb Bay	**	**	**	*	

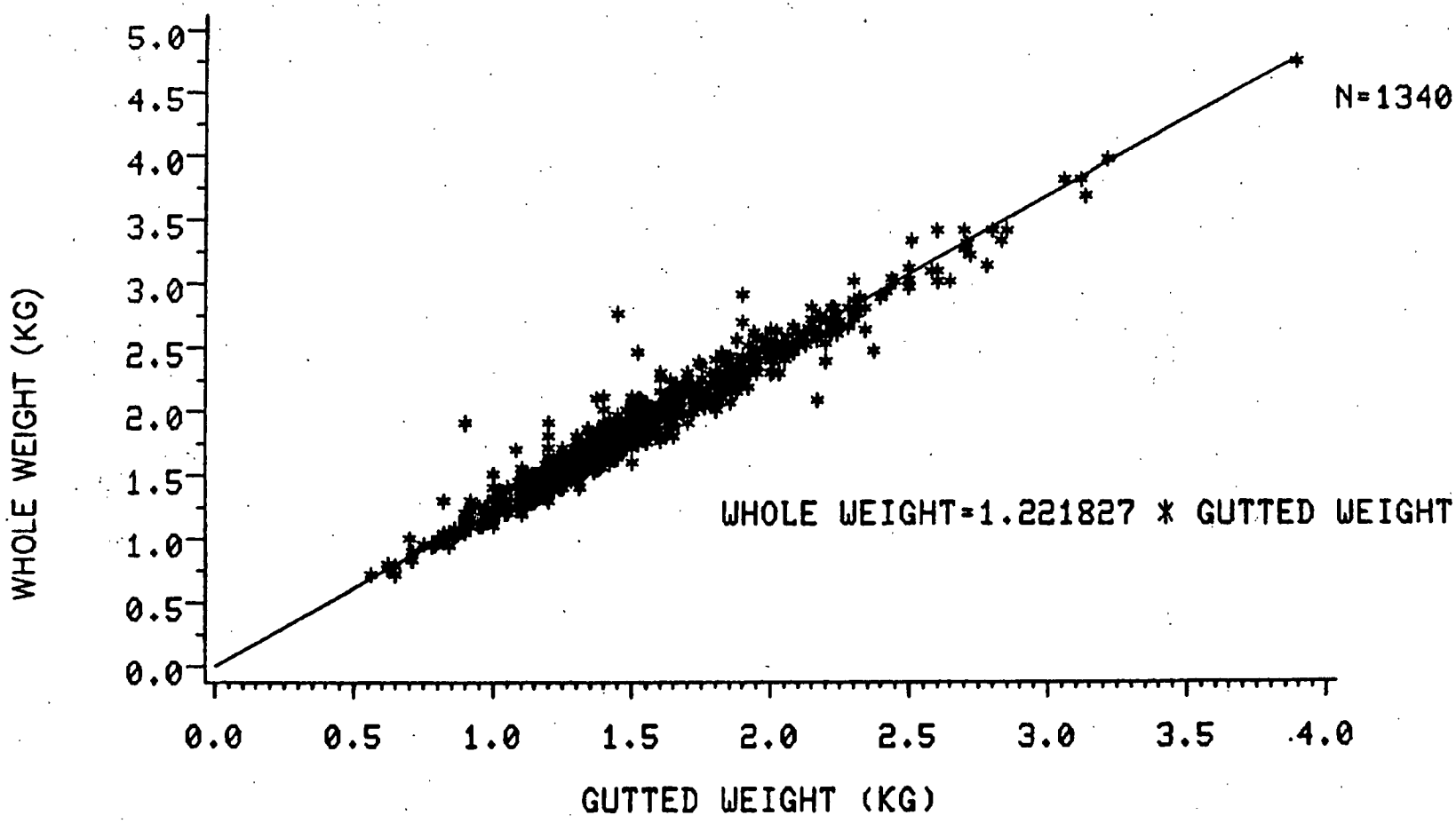

FIG 1. RELATIONSHIP BETWEEN WHOLE WEIGHT AND GUTTED WEIGHT FOR ARCTIC CHARR SAMPLES FROM ALL AREAS FOR 1982-83