A Dressed Weight to Round Weight Conversion Factor for Commercially Harvested Arctic Char (*Salvelinus alpinus*) from the Halokvik River, Nunavut

Les N. Harris, Brendan K. Malley, Jean-Sébastien Moore and Ross F. Tallman

Fisheries and Oceans Canada
Freshwater Institute
501 University Crescent
Winnipeg, MB, R3T 2N6

2020

Canadian Data Report of
Fisheries and Aquatic Sciences 1309

Fisheries and Oceans Canada | Pêches et Océans Canada

Canada

Canadian Data Report of Fisheries and Aquatic Sciences

Data reports provide a medium for filing and archiving data compilations where little or no analysis is included. Such compilations commonly will have been prepared in support of other journal publications or reports. The subject matter of the series reflects the broad interests and policies of Fisheries and Oceans Canada, namely, fisheries management, technology and development, ocean sciences, and aquatic environments relevant to Canada.

Data reports are not intended for general distribution and the contents must not be referred to in other publications without prior written clearance from the issuing establishment. The correct citation appears above the abstract of each report. Each report is abstracted in the data base *Aquatic Sciences and Fisheries Abstracts*.

Data reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page.

Numbers 1-25 in this series were issued as Fisheries and Marine Service Data Records. Numbers 26-160 were issued as Department of Fisheries and Environment, Fisheries and Marine Service Data Reports. The current series name was changed with report number 161.

Rapport statistique canadien des sciences halieutiques et aquatiques

Les rapports statistiques servent de base à la compilation des données de classement et d'archives pour lesquelles il y a peu ou point d'analyse. Cette compilation aura d'ordinaire été préparée pour appuyer d'autres publications ou rapports. Les sujets des rapports statistiques reflètent la vaste gamme des intérêts et politiques de Pêches et Océans Canada, notamment la gestion des pêches, la technologie et le développement, les sciences océaniques et l'environnement aquatique, au Canada.

Les rapports statistiques ne sont pas préparés pour une vaste distribution et leur contenu ne doit pas être mentionné dans une publication sans autorisation écrite préalable de l'établissement auteur. Le titre exact figure au haut du résumé de chaque rapport. Les rapports à l'industrie sont résumés dans la base de données *Résumés des sciences aquatiques et halieutiques*.

Les rapports statistiques sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement d'origine dont le nom figure sur la couverture et la page du titre.

Les numéros 1 à 25 de cette série ont été publiés à titre de Records statistiques, Service des pêches et de la mer. Les numéros 26-160 ont été publiés à titre de Rapports statistiques du Service des pêches et de la mer, ministère des Pêches et de l'Environnement. Le nom de la série a été modifié à partir du numéro 161.

Canadian Data Report
of Fisheries and Aquatic Sciences 1309

2020

A DRESSED WEIGHT TO ROUND WEIGHT CONVERSION FACTOR FOR COMMERCIALLY HARVESTED ARCTIC CHAR (*SALVELINUS ALPINUS*) FROM THE HALOKVIK RIVER, NUNAVUT

by

Les N. Harris[1], Brendan K. Malley[1], Jean-Sébastien Moore[2] and Ross F. Tallman[1]

[1]Fisheries and Oceans Canada
Freshwater Institute
501 University Crescent
Winnipeg, MB, R3T 2N6

[2]Institut de Biologie Intégrative et des Systèmes and Département de Biologie
Université Laval
Québec, QC, G1V 0A6

Cat. No. Fs97-13/1309E-PDF ISBN 978-0-660-35445-3 ISSN 1488-5395

Correct citation for this publication:

Harris, L.N., Malley, B.K., Moore, J-S. and Tallman, R.F. 2020. A Dressed Weight to Round Weight Conversion Factor for Commercially Harvested Arctic Char (*Salvelinus alpinus*) from the Halokvik River, Nunavut. Can. Data Rep. Fish. Aquat. Sci. 1309: v + 12 p.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Harris, L.N., Malley, B.K., Moore, J-S and Tallman, R.F. 2020. A Dressed Weight to Round Weight Conversion Factor for Commercially Harvested Arctic Char (*Salvelinus alpinus*) from the Halokvik River, Nunavut. Can. Data Rep. Fish. Aquat. Sci. 1309: v + 12 p.

Commercial and exploratory fisheries for Arctic Char, *Salvelinus alpinus*, provide significant economic opportunities for Nunavummiut in several Nunavut communities. Having an accurate understanding of the weight of the Arctic Char that are harvested is important for tracking harvest and for understanding how biological parameters may be changing over time as a result of exploitation and/or climactic and environmental changes. Unfortunately, most fish enter the processing plants as dressed (gills and viscera removed) and therefore conversion factors have to be applied to reconcile whole (round) weight from dressed weight. Here, we provide an updated conversion factor based on linear regression for Arctic Char from the Halokvik River (locally known as 30 Mile) near the community of Cambridge Bay. This conversion factor can be used moving forward as the Halokvik River continues to be commercially harvested.

RÉSUMÉ

Harris, L.N., Malley, B.K., Moore, J-S and Tallman, R.F. 2020. A Dressed Weight to Round Weight Conversion Factor for Commercially Harvested Arctic Char (*Salvelinus alpinus*) from the Halokvik River, Nunavut. Can. Data Rep. Fish. Aquat. Sci. 1309: v + 12 p.

La pêche commerciale et exploratoire de l’omble chevalier, *Salvelinus alpinus*, offre des occasions économiques considérables aux Nunavummiut de plusieurs communautés du Nunavut. Connaître le poids exact de l’omble chevalier pêché est important pour le suivi de la pêche et pour comprendre comment les paramètres biologiques peuvent changer au fil du temps en raison de l’exploitation ou de changements climatiques et environnementaux. Malheureusement, la plupart des poissons arrivent aux usines de transformation déjà apprêtés (branchies et viscères retirées). Par conséquent, des facteurs de conversion doivent être utilisés pour rapprocher le poids total (brut) du poids apprêté. Nous fournissons ici un facteur de conversion actualisé, en fonction d’une régression linéaire pour l’omble chevalier de la rivière Halokvik (appelée localement rivière 30 Mile), près de la communauté de Cambridge Bay. Ce facteur de conversion peut être utilisé à partir de maintenant puisque la rivière Halokvik continue d’être exploitée commercialement.

INTRODUCTION

Arctic Char (*Salvelinus alpinus*) are an important resource to the Inuit of Nunavut, harvested in commercial, recreational and subsistence fisheries wherever this species is accessible (Harris et al. 2020). Although virtually every community in the territory of Nunavut relies on Arctic Char for subsistence purposes and food-security (Priest and Usher 2004, Watts et al. 2017), the commercial importance of this species has also been realized in recent decades (Day and Harris 2013, Tallman et al. 2018). Annually in Nunavut, there are hundreds of waterbodies that can be commercially fished across all regions of the territory (Roux et al. 2011). Given the continued importance of subsistence harvest and more recent desire for commercial fisheries development, effective management strategies that ensure the long-term sustainability of the resource must be established.

Commercial fishing in Nunavut primarily takes place in Rankin Inlet, Pangnirtung and Cambridge Bay (Roux et al. 2011, 2018, Harris et al. 2020) although exploratory waterbodies and emerging fisheries are now becoming common in many of the other communities (Tallman et al. 2015). Commercial fishing for Arctic Char in Nunavut has been documented since the late 1940s (Grainger 1953), and the largest contemporary fishery takes place near the community of Cambridge Bay on southern Victoria Island (Harris et al. 2020, Figure 1). Commercial fishing for Arctic Char in the Cambridge Bay region first began in 1960 (Barlishen and Webber 1973). Currently there are five commercial waterbodies with an annual available quota of 56,100 kgs (Table 1). Quota management and assessments on the health or status of harvested stocks, has relied on the analysis of trends in biological characteristics focusing on age, weight and, to a lesser degree, fork length and condition factor (Day and de March 2004, Day and Harris 2013, this document). These assessments primarily relied on the data collected as part of a commercial fisheries plant sampling program where commercially harvested Arctic Char are sampled for length and weight and otoliths are taken for subsequent ageing (Harris et al. 2020). Thus having accurate data on these biological characteristics is crucial for accurate assessments of stock health and sustainability. One concern with fishery-dependent data, however, are that Arctic Char enter the processing plant dressed (i.e., viscera and gills removed) and conversion factors must be applied to reconcile whole (round) weight in kilograms for biological analyses. In recent years, a dressed to round weight conversion factor of 1.2 has been applied (Day and Harris 2013, Harris et al. 2020). River-specific conversion factors are also available (Day and de March 2004) but these are almost two decades old and it is unknown if these would still be applicable to contemporarily harvested Arctic Char in the Cambridge Bay region. Here, we provide an updated conversion factor for commercially harvested Arctic Char from the Halokvik River.

METHODS

For detailed descriptions of the study area and the history of commercial harvest at the Halokvik River, see Harris et al. (2020). In 2014, the commercial harvest of Arctic Char at the Halokvik River occurred from August 17th-21st. From August 19-20th we sampled a subset of the commercial catch that was being processed by the commercial fishers. Specifically, we measured the whole (round) weight (± 50 g) of an Arctic Char before being processed and subsequently the dressed weight (± 50 g) after the fish was processed. The dressed weight-round weight relationship for Halokvik River Arctic Char was described using the linear regression expressed as:

$$Dr\,Wt = b * (Rd\,Wt) + a + \varepsilon_i$$

where *Dr Wt* and *Rd Wt* are the dressed (g) and round weights (g), respectively, ***a*** is the y-intercept, ***b*** is the slope of the regression and ε_i is a normally distributed error term for the *i*th fish. Histograms were used to visualize the frequency distributions of each data type.

RESULTS AND DISCUSSION

Over two days of sampling 150 Arctic Char were measured for whole weight and then subsequently for dressed weight after having been processed by the commercial fishers. All raw data are presented in Table 1 and the frequency distributions for whole weight and round weight are shown in Figure 2. The relationship between whole weight and dressed weight was highly significant ($P < 0.01$, Adjusted $R^2 = 0.97$, Figure 3). There were four noticeable outliers that were likely the result of measurement error. Accordingly, the linear equation that best predicts whole weight from dressed weight is:

$$Rd\ Wt = 1.145 * (Dr\ Wt) - 19.500 + \varepsilon_i$$

Given that Arctic Char population dynamics (e.g., growth and maturity) can change over time as a result of exploitation and thus also the relationship between dressed and whole weight, it is important that these conversion factors be updated periodically. For example, as reported in Day and de March (2004) the formula to estimate round weight from dressed weight was:

$$Rd\ Wt = 1.156 * (Dr\ Wt)\ - 50.500$$

For a 10,000 g dressed weight individual the two formulas would estimate round weight differently by 79 g. Although this difference is not large for an Arctic Char of this size (although the relevance of such a difference to formal stock assessments is not known), updating the dressed to round weight formula is relevant and our results suggest that this relationship has remained relatively constant over time. However, applying the 1.20 conversion factor (see Day and Harris 2013, Harris et al. 2020) for the same dressed weight individual would result in a difference in estimated round weight of 569.5 g. This much larger difference highlights the need to use linear equations over crude conversion factors. The differences between these conversion factors is also shown for the length-weight relationship using the Cambridge Bay fishery-dependent (commercial fish plant sampling) data for the Halokvik River collected in 2014 (Figure 4). This figure highlights the disparity between the conversion factor of 1.2 and both formulas above when estimating whole weight from dressed weight. Also, given that there could be stock differences in weight and growth parameters between systems, it is also recommended that conversion factors be updated for each commercial waterbody. Until that can be done, the formulas provided by Day and de March (2004) should suffice for estimating round weight when only dressed weight is available.

ACKNOWLEDGEMENTS

We thank the Ekaluktutiak Hunters and Trappers Association, Stéphane Laccase of Kitikmeot Foods Ltd. and all commercial fishers for their ongoing support of our Arctic char research in the region. We especially thank Brent Nakashook, Dennis Kaomayok and Johnny Pedersen for allowing us to sample their commercially harvested Arctic char. Funding support was provided by Fisheries and Oceans Canada through the Nunavut Implementation Funds and the Nunavut Wildlife Management Board. We thank Colin Gallagher and Yamin Janjua for reviewing and providing comments on this report. All data used for all analyses in this report are publically available from the Government of Canada Open Data Portal https://open.canada.ca/en/open-data.

REFERENCES

Barlishen, W.J., and Webber, T.N. 1973. A history of the development of commercial fishing in the Cambridge Bay area of the Northwest Territories. Report for the Federal-Territorial Task Force report on Fisheries Development in the Northwest Territories. 37 p.

Day, A.C. and de March, B. 2004. Status of Cambridge Bay Anadromous Arctic Char Stocks. DFO Can. Sci. Advis. Sec. Res. Doc. 2004/052.

Day, A.C., and Harris, L.N. 2013. Information to support an updated stock status of commercially harvested Arctic Char (*Salvelinus alpinus*) in the Cambridge Bay region of Nunavut, 1960-2009. DFO Can. Sci. Adv. Sec. Res. Doc. 2013/068. v + 30 p.

Grainger, E.H. 1953. On the age, growth, migration, reproductive potential and feeding of Arctic Charr (*Salvelinus alpinus*) of Frobisher Bay, Baffin Island. J. Fish. Res. Board Can. 10: 326-370.

Harris, L.N., Cahill, C.L., Jivan, T., Zhu, X., and Tallman, R.F. 2020. Updated stock status of commercially harvested Arctic Char (*Salvelinus alpinus*) from the Jayko and Halokvik rivers, Nunavut: A summary of harvest, catch-effort and biological information. DFO Can. Sci. Advis. Sec. Res. Doc. 2019/062. v + 120 p.

Priest, H., and Usher, P.J. 2004. Nunavut wildlife harvest study. Nunavut Wildlife Management Board, Iqualuit, Nunavut, Canada

Roux, M.J., Tallman, R.F., and Lewis, C.W. 2011 Small-scale Arctic charr *Salvelinus alpinus* fisheries in Canada's Nunavut: management challenges and options. J. Fish Biol. 79(6): 1625-1647.

Roux, M.J., Tallman, R.F., and Martin, Z.A. 2018. Small-scale fisheries in Canada's Arctic: Combining science and fishers knowledge towards sustainable management. Mar. Policy. 101: 177-186.

Tallman, R.F., Hedges, K.J., Martin, Z., Janjua, M.Y., VanGerwen-Toyne, M., and Harris, L.N. 2015. Towards determining optimal harvest levels for Arctic Char, *Salvelinus alpinus*, in Nunavut: Overview and proposed research plans. Can. Manuscr. Rep. Fish. Aquat. Sci. 3085: vi +85 p.

Tallman, R.F., Roux, M.-J., and Martin, Z.A. 2018. Governance and assessment of small-scale data-limited Arctic Charr fisheries using productivity-susceptibility analysis coupled with life history invariant models. Mar. Policy. 101: 187-197.

Watts, P., Koutouki, K., Booth, S. and Blum, S. 2017. Inuit food security in Canada: arctic marine ethnoecology. Food Secur. 9: 421-440.

TABLES

Table 1. Table of all raw Halokvik River Arctic Char weight data used in the analyses for converting dressed weight to round weight.

Date	Sample #	Fork Length (mm)	Round Weight (g)	Dressed Weight (g)
2014-08-19	1	739	4600	4150
2014-08-19	2	613	2350	2000
2014-08-19	3	762	4250	4250
2014-08-19	4	699	3400	2950
2014-08-19	5	665	2950	2550
2014-08-19	6	848	7100	6300
2014-08-19	7	815	6250	5500
2014-08-19	8	815	6000	5400
2014-08-19	9	634	2750	2500
2014-08-19	10	820	5600	4850
2014-08-19	11	776	4600	4000
2014-08-19	12	787	5650	5050
2014-08-19	13	788	5400	4850
2014-08-19	14	709	3700	3400
2014-08-19	15	602	2300	2000
2014-08-19	16	819	6200	5300
2014-08-19	17	682	3550	3250
2014-08-19	18	611	2200	1950
2014-08-19	19	603	4100	3800
2014-08-19	20	683	3650	3300
2014-08-19	21	712	4150	3700
2014-08-19	22	632	2650	2400
2014-08-19	23	820	5700	5000
2014-08-19	24	790	5650	5000
2014-08-19	25	686	3950	3500
2014-08-19	26	839	5600	5100
2014-08-19	27	686	4050	3600
2014-08-19	28	713	4400	3500
2014-08-19	29	710	3900	3150
2014-08-19	30	705	3650	3250
2014-08-19	31	695	3850	3400
2014-08-19	32	670	3550	3150
2014-08-19	33	724	4200	3850
2014-08-19	34	662	3300	2850
2014-08-19	35	640	3050	2700
2014-08-19	36	672	3300	2900
2014-08-19	37	716	4350	3800
2014-08-19	38	715	4300	3750
2014-08-19	39	642	3050	2650
2014-08-19	40	731	4650	4000

Table 1. Continued.

Date	Sample #	Fork Length (mm)	Round Weight (g)	Dressed Weight (g)
2014-08-19	41	665	3150	2750
2014-08-19	42	675	3850	3450
2014-08-19	43	700	4500	3900
2014-08-19	44	777	5300	4650
2014-08-19	45	598	2300	2100
2014-08-19	46	528	1450	1250
2014-08-19	47	725	3900	3350
2014-08-19	48	664	3550	3100
2014-08-19	49	691	4200	3750
2014-08-19	50	583	2150	1900
2014-08-19	51	722	4700	4100
2014-08-19	52	738	4850	4300
2014-08-19	53	744	4650	4100
2014-08-19	54	773	5050	4450
2014-08-19	55	619	2800	2450
2014-08-19	56	699	4100	3600
2014-08-19	57	800	6400	5650
2014-08-19	58	738	5050	4350
2014-08-19	59	650	3150	2800
2014-08-19	60	857	6400	4650
2014-08-20	61	798	5250	4600
2014-08-20	62	758	5200	4700
2014-08-20	63	760	5650	4950
2014-08-20	64	702	4150	3750
2014-08-20	65	714	3900	3500
2014-08-20	66	723	4650	4100
2014-08-20	67	733	5750	4500
2014-08-20	68	660	3450	3100
2014-08-20	69	635	3350	3400
2014-08-20	70	768	4500	3900
2014-08-20	71	725	4550	4050
2014-08-20	72	753	5300	4750
2014-08-20	73	745	5050	4450
2014-08-20	74	787	4700	4250
2014-08-20	75	690	4000	3500
2014-08-20	76	672	3800	3300
2014-08-20	77	668	3400	3050
2014-08-20	78	780	4600	3700
2014-08-20	79	912	6500	5800
2014-08-20	80	840	7000	6100

Table 1. Continued.

Date	Sample #	Fork Length (mm)	Round Weight (g)	Dressed Weight (g)
2014-08-20	81	748	5000	4350
2014-08-20	82	726	4600	4000
2014-08-20	83	661	3500	3150
2014-08-20	84	653	3400	3100
2014-08-20	85	555	2000	1800
2014-08-20	86	634	3050	2700
2014-08-20	87	672	3950	3550
2014-08-20	88	698	4250	3800
2014-08-20	89	807	5050	4500
2014-08-20	90	700	4200	3650
2014-08-20	91	690	3650	3250
2014-08-20	92	690	4100	3500
2014-08-20	93	676	4100	3600
2014-08-20	94	791	4900	4300
2014-08-20	95	735	4900	4300
2014-08-20	96	754	4900	4250
2014-08-20	97	657	3550	3100
2014-08-20	98	669	3750	3350
2014-08-20	99	675	4000	3600
2014-08-20	100	848	7700	6850
2014-08-20	101	648	3400	3050
2014-08-20	102	665	3550	3050
2014-08-20	103	680	3800	3300
2014-08-20	104	671	3550	3050
2014-08-20	105	780	4700	4100
2014-08-20	106	698	3800	3350
2014-08-20	107	711	4800	4200
2014-08-20	108	683	4350	3750
2014-08-20	109	746	4800	4400
2014-08-20	110	783	6100	5350
2014-08-20	111	665	3600	3200
2014-08-20	112	663	3850	3300
2014-08-20	113	784	4750	4050
2014-08-20	114	678	3900	3450
2014-08-20	115	705	4450	3900
2014-08-20	116	755	5000	4550
2014-08-20	117	771	5700	5000
2014-08-20	118	804	5800	5150
2014-08-20	119	745	5750	4300
2014-08-20	120	682	4150	3550

Table 1. Continued.

Date	Sample #	Fork Length (mm)	Round Weight (g)	Dressed Weight (g)
2014-08-20	121	770	5200	4650
2014-08-20	122	742	4150	3650
2014-08-20	123	735	4650	4150
2014-08-20	124	737	4800	4250
2014-08-20	125	823	5850	5150
2014-08-20	126	754	5450	4800
2014-08-20	127	692	3750	3300
2014-08-20	128	761	5050	4550
2014-08-20	129	709	4250	3700
2014-08-20	130	815	5650	5000
2014-08-20	131	744	4600	4150
2014-08-20	132	690	4000	3600
2014-08-20	133	803	5400	4800
2014-08-20	134	706	4400	3850
2014-08-20	135	804	5050	4400
2014-08-20	136	669	3750	3300
2014-08-20	137	582	2300	1950
2014-08-20	138	675	3800	3300
2014-08-20	139	696	3800	3500
2014-08-20	140	631	3050	2650
2014-08-20	141	753	6500	4900
2014-08-20	142	652	3700	3250
2014-08-20	143	719	4250	3750
2014-08-20	144	656	3600	3150
2014-08-20	145	776	4500	3950
2014-08-20	146	734	4950	4400
2014-08-20	147	724	4400	4000
2014-08-20	148	657	3650	3200
2014-08-20	149	686	3750	3400
2014-08-20	150	753	3750	4700

FIGURES

Figure 1. Map of the current Arctic Char commercial fishing locations in the Cambridge Bay region of Nunavut. The community of Cambridge Bay is shown with a black star and the Halokvik River is shown with a red star.

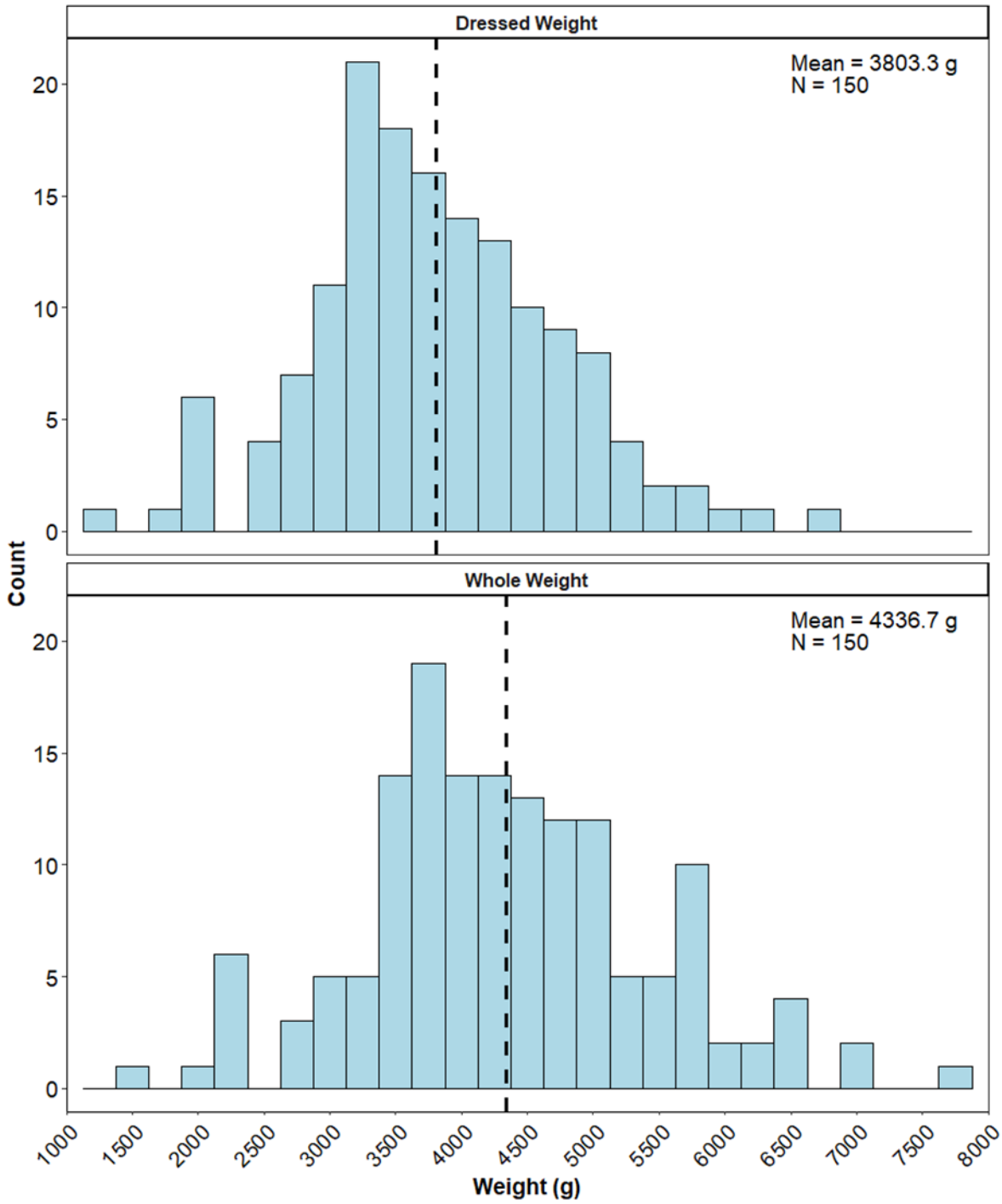

Figure 2. Frequency distributions of dressed weight and round weight for commercially harvested Arctic Char sampled during the 2014 commercial fishery at Halokvik River, Nunavut. The mean for each type of weight is shown with the dashed line.

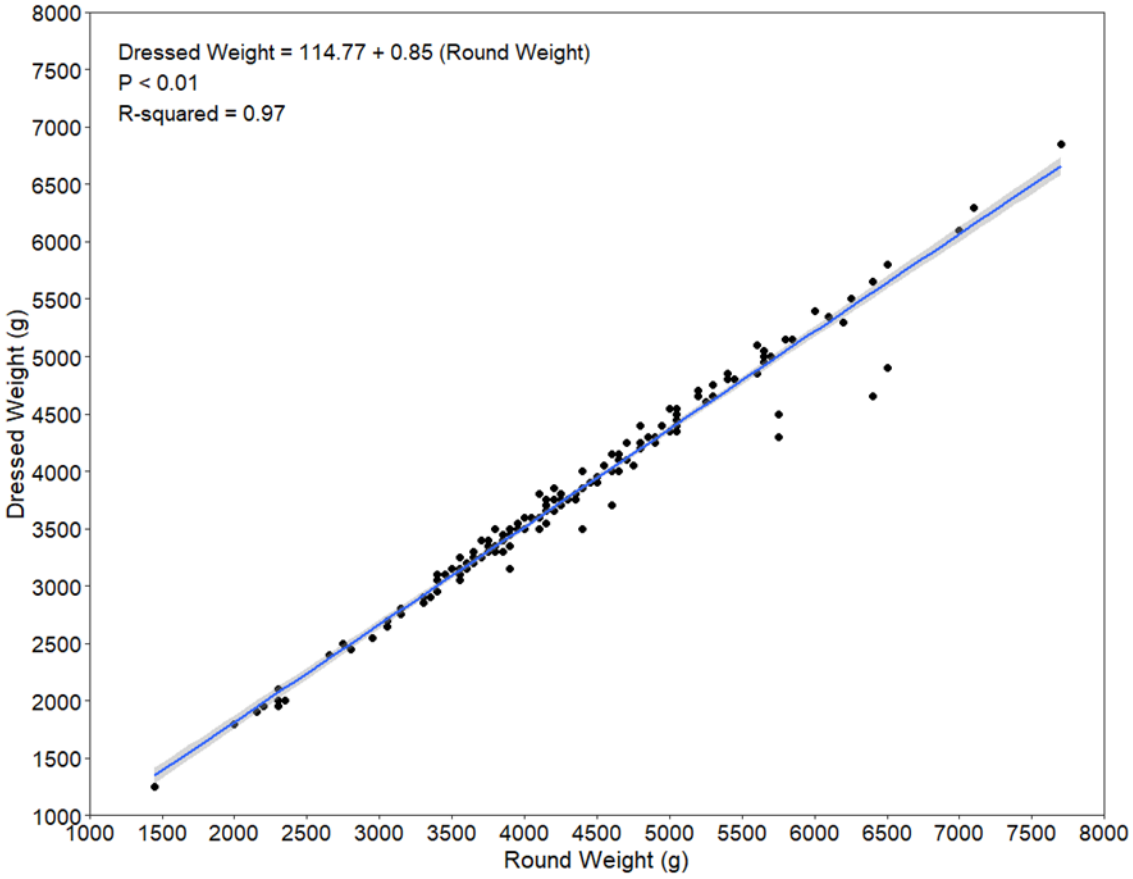

Figure 3. Dressed weight-round (whole) weight relationships for commercially harvested Arctic Char from Halokvik River, NU sampled in 2014. Parameters of the relationships, significance of the relationship, and fit of the relationship are shown in the upper right corner of the plot.

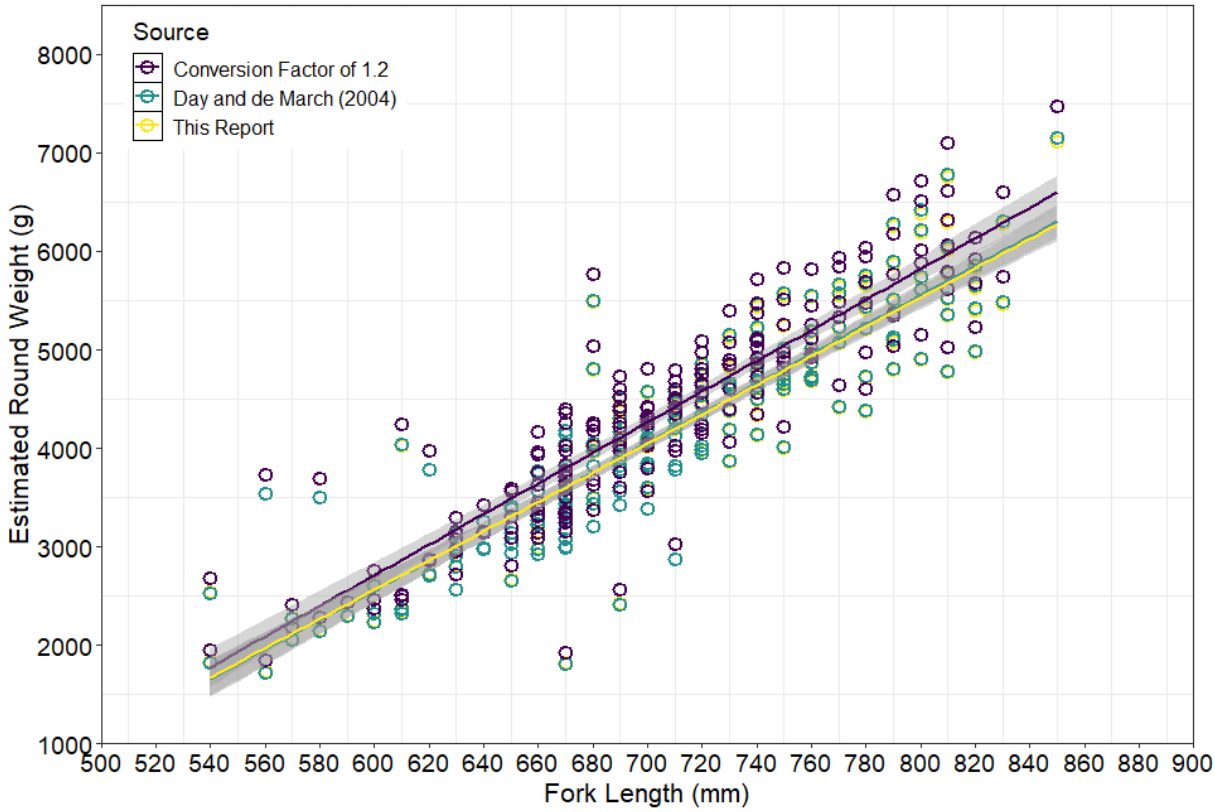

Figure 4. Shown is the weight-length relationship for Halokvik River Arctic Char when whole weight is estimate from dressed weight using a conversion factor of 1.2, the linear equation provided in Day and de March (2004) and the linear equation provided in this report. Length and dressed weight data are from the 2014 Cambridge Bay fishery-dependent (commercial fish processing plant) sampling program.