



## SUMMARY OF PRODUCT WEIGHT TO ROUND WEIGHT CONVERSION FACTORS FOR THE NAFO DIVISION 0A AND 0B GREENLAND HALIBUT FISHERY

### Context

Conversion factors (CFs) are used to convert product weight to live or round weight to estimate the total amount harvested for catch reporting (product weight x CF = round weight or estimated weight of catch). DFO staff use CFs to convert landed product weight (e.g. STACAC 1984) to round weight. Vessel captains use CFs to enter round weight in their fishing logbooks which may be based on the FAO list or other publicly available lists, specific directions from their companies, or discussion with observers. Fisheries observers will use CFs to determine round weight for their records and these are derived from lists in their training manual or experiments done during a trip.

Conversion factors for any given product can vary between vessels due primarily to processing methods because small changes to the angle of cuts can affect the outcome. There can also be variability in CFs between trips for the same vessel as a result of the crew's experience, size of fish in the catch and fish condition. As a result there can be a variety of conversion factors applied to similar products in a fishery. Fisheries Management in DFO Central and Arctic Region is investigating options for the standardization of CFs in the turbot fishery in Division 0A and 0B in order to ensure catch reporting is as accurate as possible. Science has been asked to review available data from fishery observers and provide advice on the appropriate conversion factors for the current product forms in the SA0 turbot fishery.

### Background

The Division 0A turbot fishery has had 100% observer coverage for all fleets since it began in 1996 so most of the data available to the Central and Arctic Region comes from this fishery. However, since 2003 our region has also received copies of observer reports from some of the Div. 0B turbot directed vessels and these data have been included in this review.

### Product Types

The product types that are currently being produced in the Div. 0A and 0B fisheries are:

- 1) frozen, gutted – used primarily on small fish (observer product code 100)
- 2) frozen, gutted, head off, tail off and collar bone out (observer product code 120)
- 3) frozen, heads only (observer product code 505)

A fourth product type, gutted, head off, may also be produced but this is not a common product at this time.

## Conversion Factors

Fisheries and Oceans Canada (STACAC 1984):

- 1) Gutted head on – 1.1
- 2) Gutted head off – 1.4
- 3) gutted, head off, tail off and collar bone out – None

Food and Agriculture Organization of the United Nations (FAO 2000):

- 1) Frozen, gutted – 1.11 (Germany), 1.15 (Greenland)
- 2) Frozen, gutted, head off – 1.39 (Germany); 1.35 (Greenland); 1.2 (Norway)  
- hand cut – 1.43 (Poland); Japan cut – 1.5 (Greenland)
- 3) Frozen, gutted, head off, tail off – 1.44 (Germany)

Observer Data From Some Non-Canadian Fisheries in the NAFO Regulatory Area, 2006 (Bill Brodie, DFO N&L, pers. comm.):

- 1) gutted, head off, tail off – 1.49 (S.E. 0.05)
- 2) gutted, head off, tail off, without skin – 1.53 (S.E. 0.09)

Newfoundland Fishery Observer Program Manual (2000):

- 1) gutted – 1.09
- 2) gutted, head off – 1.46
- 3) gutted, head off, tail off – 1.49 (the lowest value based on the research reported in Kulka 1985)

Previous versions of the observer manual (based on values in Kulka 1985):

- 1) gutted, head off, tail off
  - a. single cut (Japan) – 1.49
  - b. single cut (Faroes) – 1.58
  - c. double cut (East Germany) – 1.94

Biorex (Quebec and Gulf Regions-France Henry and Maurice Jean, pers. comm.):

Biorex observers are instructed to conduct experiments on each trip, every two weeks for longer trips, and apply the resulting conversion factor(s) to their calculations.

Experiments conducted by Newfoundland Region fishery observers:

1980-1985 (Kulka 1983 and 1985)

- 1) gutted, head off, tail off: double cut - 1.94; single cut -1.49 and 1.58.
- 2) gutted, head off: double cut – 1.58; single cut – 1.46
- 3) gutted – 1.09

1996-2006 in Div. 0A and 0B (Table 1A and B):

- 1) gutted, head off, tail off and collar bone out (processing code 120)
  - a. range 1.37-1.60
  - b. mean 1.47
  - c. median 1.49

Vessel Captains 1996-2006 in Div. 0A and 0B (Table 2):

- 1) gutted, head off, tail off and collar bone out (processing code 120)
  - a. range 1.37-1.50
  - b. mean 1.43
  - c. median 1.44

## Analysis and Responses

### Gutted and Gutted Head Off Products

Observers assigned to vessels operating in Div. 0A and 0B have not conducted any experiments in recent years with which to assess CFs for the gutted, head off products or gutted products. There is therefore no science basis for determining whether the CFs for these products given in the DFO STACAC list (1.10 for gutted, 1.40 for gutted, head off) or those values found in the Newfoundland and Labrador Observer Manual (1.09 for gutted, 1.46 for gutted, head off) would be more appropriate for the SA0 fishery. However, the production of this product is low and the variation in CF used would have only a small impact on the overall catch.

### Gutted Head Off and Tail Off Products

Some of the confusion around CFs for the gutted, head off, tail off product may result from this product form not being listed by DFO (STACAC 1984). In Div. 0A from 1996 to 1999, foreign vessels were under charter to Canadian companies and those vessels tended to use the FAO CF of 1.44 (Table 2). The CF of 1.4 was first used by a vessel in 2001, about the time Canadian vessels began to operate in this fishery. The Canadian Captains may be basing their choice of CF on the DFO list (STACAC 1984) which does not have a CF for gutted, head off, tail off product and so they choose the next closest CF, 1.4 for gutted, head off.

Fishery observers have been doing experiments over the years on gutted, head off, tail off products (Table 1A and B). However, these experiments were for routine monitoring purposes. They were not conducted in a targeted manner (e.g. across all months, all gear types, etc.) and not all observers documented their experiments (e.g. description or sketches of the cut locations). It is recommended that additional information would be required from a full season for DFO to determine an appropriate conversion factor for the gutted, head off, tail off product that would account for the variability in type of cut, fish size and condition. These experiments could be conducted by observers and would result in:

1. Accurate description of the products produced.
2. Data on whether processing methods used in the fishery differ from vessel to vessel (e.g. single cut or double cut to remove the head).

DFO C&A Region should consider approaching the other regions involved in the Greenland halibut fishery (Quebec, Newfoundland and Labrador, Maritimes) to determine what if any CFs their C&P Sectors are using for Greenland halibut, gutted, head off, tail off products. For example Newfoundland and Labrador Region may be using the 1.49 found in their region's Observer Training Manual.

Further discussions on the establishment of a DFO Atlantic wide CF for Greenland halibut, gutted, head off, tail off product should also be pursued. In the meantime, there is a need to establish an interim CF for use by vessels fishing in the Div. 0A and 0B fishery in order to more accurately calculate catch weight. For example, based on a TAC of 6500 for Div. 0A the difference in catch using a CF of 1.4 vs. 1.49 would be approximately 200 t.

Some options that may be considered:

- 1) Adopt the value of 1.49 found in the Newfoundland and Labrador Observer Training Manual.

- 2) Select a value based on more recent observer experiments (e.g. 1.47 (mean) or 1.49 (median)).

## Conclusions

DFO has not published a CF for the gutted, head off, tail off product form for Greenland halibut and as a result a range of factors are being applied by vessel captains and observers. In order to provide accurate conversion factors for the NAFO Division 0A and 0B fisheries, as well as Greenland halibut fisheries in other stock areas, experiments should be conducted to account for the variability in type of cut, fish size and condition. These experiments could be conducted by observers and would result in an accurate description of the products produced and data on whether processing methods used in the fishery differ from vessel to vessel (e.g. single cut or double cut to remove the head). Until such time as data are collected to determine the conversion factor(s), an interim conversion factor should be set so that more accurate catch reporting can be achieved.

## Authors or Editor and other Contributors

Margaret Treble (author)	DFO-Science, Central and Arctic Region
Joe Firth	DFO-Science, Newfoundland and Labrador Region
Mark Showell	DFO-Science, Maritimes Region
Bill Brodie	DFO-Science, Newfoundland and Labrador Region

## Approved by

Michelle Wheatley, Director of Science, Central and Arctic Region

Don Cobb, A/Science Division Manager, Arctic Aquatic Research

## Sources of Information

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Kulka, D. W. 1985. A description of gutted and head off production for selected species with special reference to conversion factors from product to whole weight. CAFSAC Res. Doc. 85/105. 27 pp.

Newfoundland Fishery Observer Program Manual (2000).

STACAC 1984. Statistical Co-ordinating Committee for the Atlantic Coast Standards. STACAC Document No. 2, Revision #1, June 1984. 7 pp.

Table 1A. Summary of conversion factor experiments conducted in the Division 0A Greenland halibut fishery by Observers as part of their routine monitoring duties (na=not available). This is a subset of the list found in Table 2.

\*Observer noted this was a new crew that used different angle on cuts.

Year	Div.	Trip	Captain	Observer	Observer's Source	Type of Product
1996	0A	167	1.43	1.47-1.59 (mean 1.52)	6 experiments	gutted, head off, tail off, collar bone out (code 120)
1997	0A	920	1.44	1.55	2/week tests	na
1998	0A	124	1.44	1.47-1.51 (mean 1.49)	2/week tests	gutted, head off, tail off, collar bone out (code 120)
1999	0A	924	1.44	1.44-1.47 (mean 1.46)	2/week tests	na
2001	0A	668	na	1.49	3 experiments	gutted, head off, tail off, collar bone out (code 120)
2002	0A	J02-0372	1.50	1.489	experiment, n=200 fish	gutted, head off, tail off, collar bone out (code 120)
	0A	668	1.40	1.50	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	408	1.49	1.47-1.52 (mean 1.50)	4 experiments	gutted, head off, tail off, collar bone out (code 120)
2003	0A	945	na	1.4-1.48 (mean 1.45)	6 experiments	gutted, head off, tail off, collar bone out (code 120)
	0A	612	1.49	1.43-1.52 (mean 1.48)	9 experiments	gutted, head off, tail off, collar bone out (code 120)
	0A	600	1.4	1.46-1.58 (mean 1.53)	3 experiments	gutted, head off, tail off, collar bone out (code 120)
	0A	639	1.37	1.37*	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	538	1.39	1.39*	experiment	gutted, head off, tail off, collar bone out (code 120)
2004	0A	954	na	1.45-1.48 (mean 1.47)	3 experiments	gutted, head off, tail off, collar bone out (code 120)
	0A	363	1.4	1.38	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	285	1.4	1.4	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	482	1.42	1.40-1.50 (mean 1.42)	5 experiments	gutted, head off, tail off, collar bone out (code 120)
	0A	521	1.41	1.41	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	497	1.46	1.48	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	519	1.4	1.46	experiment	gutted, head off, tail off, collar bone out (code 120)
2005	0A	542	1.46	1.46	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	G_116	1.40	1.46	experiment	gutted, head off, tail off, collar bone out (code 120)
2006	0A	G_140	1.40	1.46	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	G_94	1.40	1.45	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	G_94	1.40	1.47	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	Q_114	1.44	1.39-1.45 (mean 1.42)	6 experiments	gutted, head off, tail off, collar bone out (code 120)
	0A	Q_133	1.40	1.60	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	Q_133	1.40	1.40	experiment	gutted, head off, tail off, collar bone out (code 120)

Table 1B. Summary of conversion factor experiments conducted in the Division 0B Greenland halibut fishery by Observers as part of their routine monitoring duties (na=not available). This is a subset of the list found in Table 2.

\*Observer noted this was a new crew that used different angle on cuts.

Year	Div.	Trip	Captain	Observer	Observer's Source	Type of Product
2003	0B	950	na	1.43-1.46 (mean 1.45)	3 experiments	gutted, head off, tail off, collar bone out (code 120)
	0B	941	na	1.43-1.48 (mean 1.46)	3 experiments	gutted, head off, tail off, collar bone out (code 120)
	0B	943	na	1.45 and 1.46	2 experiments	gutted, head off, tail off, collar bone out (code 120)
2004	0B	72	1.4	1.53	experiment	gutted, head off, tail off, collar bone out (code 120)
	0B	270	1.4	1.54	2 experiments	gutted, head off, tail off, collar bone out (code 120)
2006	0B	Q_001	1.44	1.45-1.52 (mean 1.49)	4 experiments	gutted, head off, tail off, collar bone out (code 120)
	0B	Q_007	na	1.47-1.51 (mean 1.49)	4 experiments	gutted, head off, tail off, collar bone out (code 120)

Table 2. Processed to round weight conversion factors used by vessels in NAFO Div. 0A and 0B Greenland halibut fishery (na=not available, list=Observer list from manual). Not all trip reports were available to C&A Region staff at the time of this review, particularly for Div. 0B, therefore, this is not a complete listing. Also, in some cases the conversion factors used were indicated in the Observer data sheets but the full Trip Report was not available and details on product type could not be determined.

\*Observer noted this was a new crew that used different angle on cuts.

Year	Div.	Trip	Captain	Observer	Observer's Source	Type of Product	
1996	0A	167	1.43	1.51	6 experiments	gutted, head off, tail off, collar bone out (code 120)	
1997	0A	227	1.44	1.48	na	gutted, head off, tail off, collar bone out (code 120)	
	0A	920	1.44	1.55	2/week tests	na	
	0A	266	1.40	1.40	na	gutted, head off, tail off, collar bone out (code 120)	
1998	0A	124	1.44	1.47-1.51	2/week tests	gutted, head off, tail off, collar bone out (code 120)	
1999	0A	924	1.44	1.44-1.47	2/week tests	na	
2000	0A	956	1.40	1.41	na	na	
	0A	955	1.40	1.43	na	na	
2001	0A	958	1.40	1.45	na	gutted, head off, tail off, collar bone out (code 120)	
	0A	959	1.50	1.45, 1.48	na	gutted, head off, tail off (Code na)	
	0A	657	1.49	1.49	list	gutted, head off, tail off, collar bone out (code 120)	
2002	0A	668	1.49	1.49	3 experiments	gutted, head off, tail off, collar bone out (code 120)	
	0A	J02-0363	1.40	1.40	list	gutted, head off, trimmed (code 120)	
	0A	J02-0363	1.10	1.10	list	gutted (code 100)	
	0A	J02-0372	1.50	1.48	experiment	gutted, head off, tail off, collar bone out (code 120)	
	0A	669	1.40	1.49	list	gutted, head off, tail off, collar bone out (code 120)	
	0A	668	1.40	1.50	experiment	gutted, head off, tail off, collar bone out (code 120)	
	0A	615	1.43	1.49	na	gutted, head off, tail off, collar bone out (code 120)	
	0A	508	1.43	1.49	list	gutted, head off, tail off, collar bone out (code 120)	
	0A	626	1.49	1.49	list	gutted, head off, tail off, collar bone out (code 120)	
	0A	494	1.40	1.49	list	gutted, head off, tail off, collar bone out (code 120)	
	0A	575	1.49	1.49	list	gutted, head off, tail off, collar bone out (code 120)	
	0A	408	1.49	1.49	4 experiments	gutted, head off, tail off, collar bone out (code 120)	
	0A	937	na	1.47	na	gutted, head off, tail off, collar bone out (code 120)	
	2003	0A	417	1.49	1.49	list	gutted, head off, tail off, collar bone out (code 120)
		0A	945	na	1.4-1.48	6 experiments	gutted, head off, tail off, collar bone out (code 120)
0A		612	1.49	1.43-1.52	9 experiments	gutted, head off, tail off, collar bone out (code 120)	
0A		421	1.49	1.49	list	gutted, head off, tail off, collar bone out (code 120)	
0A		608	1.49	1.49	list	gutted, head off, tail off, collar bone out (code 120)	
0A		600	1.40	1.49	list	gutted, head off, tail off, collar bone out (code 120)	
0A		600	1.40	1.46-1.58	3 experiments	gutted, head off, tail off, collar bone out (code 120)	
0A		639	1.37	1.37*	experiment	gutted, head off, tail off, collar bone out (code 120)	
0A		538	1.39	1.39*	experiment	gutted, head off, tail off, collar bone out (code 120)	
2004		0A	954	na	1.45-1.48	3 experiments	gutted, head off, tail off, collar bone out (code 120)
	0A	363	1.40	1.38	experiment	gutted, head off, tail off, collar bone out (code 120)	
	0A	285	1.39	1.49	list	gutted, head off, tail off, collar bone out (code 120)	
	0A	285	1.40	1.40	experiment	gutted, head off, tail off, collar bone out (code 120)	
	0A	418	1.39	1.49	list	gutted, head off, tail off, collar bone out (code 120)	
	0A	482	1.42	1.40-1.50	5 experiments	gutted, head off, tail off, collar bone out (code 120)	
	0A	521	1.41	1.41	experiment	gutted, head off, tail off, collar bone out (code 120)	
	0A	497	1.46	1.48	experiment	gutted, head off, tail off, collar bone out (code 120)	

**Central and Arctic Region**

**Science Response: Conversion Factors**

2005	0A	363	1.40	1.46	list	gutted, head off, tail off, collar bone out (code 120)
	0A	371	1.44	1.49	list	gutted, head off, tail off, collar bone out (code 120)
	0A	380	1.46	1.49	list	gutted, head off, tail off, collar bone out (code 120)
	0A	383	1.44	1.44	CF	gutted, head off, tail off, collar bone out (code 120)
	0A	430	1.49	1.49	list	gutted, head off, tail off, collar bone out (code 120)
	0A	474	1.49	1.49	list	gutted, head off, tail off, collar bone out (code 120)
	0A	521	1.46	1.49	list	gutted, head off, tail off, collar bone out (code 120)
	0A	509	1.40	1.49	list	gutted, head off, tail off, collar bone out (code 120)
	0A	519	1.40	1.46	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	542	1.46	1.46	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	586	1.40	1.40	list	gutted, head off, tail off, collar bone out (code 120)
2006	0A	G_116	1.40	1.46	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	G_140	1.40	1.46	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	G_94	1.40	1.45	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	G_94	1.40	1.47	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	Q_114	1.44	1.49	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	Q_133	1.40	1.60	experiment	gutted, head off, tail off, collar bone out (code 120)
	0A	Q_133	1.40	1.40	experiment	gutted, head off, tail off, collar bone out (code 120)
2003	0B	906	1.44	na	na	gutted, head off, tail off, collar bone out (code 120)
	0B	950	na	1.43-1.46	3 experiments	gutted, head off, tail off, collar bone out (code 120)
	0B	914	1.44	na	na	gutted, head off, tail off, collar bone out (code 120)
	0B	941	na	1.43-1.48	3 experiments	gutted, head off, tail off, collar bone out (code 120)
	0B	943	na	1.45, 1.46	2 experiments	gutted, head off, tail off, collar bone out (code 120)
	0B	445	1.40	1.49	list	gutted, head off, tail off, collar bone out (code 120)
	2004	0B	72	1.40	1.53	experiment
0B		72	1.10	1.09	list	gutted - small turbot only (code 100)
0B		507	1.40	1.49	list	gutted, head off, tail off, collar bone out (code 120)
0B		935	na	1.46	na	gutted, head off, tail off, collar bone out (code 120)
0B		956	na	1.44	na	gutted, head off, tail off, collar bone out (code 120)
0B		957	na	1.48	na	gutted, head off, tail off, collar bone out (code 120)
0B		947	na	1.47	na	gutted, head off, tail off, collar bone out (code 120)
0B		270	1.40	1.54	12 experiments	gutted, head off, tail off, collar bone out (code 120)
0B		270	1.10	1.09	list	gutted - small turbot only (code 100)
2005		0B	396	1.40	1.49	list
	0B	586	1.40	1.40	list	gutted, head off, tail off, collar bone out (code 120)
2006	0B	Q_001	1.44	1.49	experiment	gutted, head off, tail off, collar bone out (code 120)
	0B	Q_007	na	1.49	experiment	gutted, head off, tail off, collar bone out (code 120)



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Fisheries and Oceans Canada  
501 University Crescent  
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Telephone: (204) 983-5131

Fax: (204) 984-2403

E-Mail: [xcna-csa-cas@dfo-mpo.gc.ca](mailto:xcna-csa-cas@dfo-mpo.gc.ca)

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