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NOTE

Regressions of Weight on Length for Greenland Halibut, *Reinhardtius hippoglossoides*, from Canadian Waters of the Northwest Atlantic

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Introduction

The relationship between length and weight is a very necessary parameter in performing proper analytical assessments of fish stocks. For Greenland halibut of the Northwest Atlantic, the only previously published information on this relationship was that by Lear (1969) based on samples collected from fishermen in Trinity Bay, Newfoundland. Recent total allowable catches of Greenland halibut in the Northwest Atlantic have totalled about 100,000 metric tons. Because of the importance of this fishery and hence the need for accurate assessment of potential yield, length-weight relationships have now been derived for most of the stocks under catch-quota management. The results are presented in this paper.

Materials and Methods

Random samples of Greenland halibut were collected during stratified-random bottom-trawl surveys by Canadian research vessels in 1980–82. Data were obtained for the Labrador (NAFO Div. 2GHJ), northeastern Newfoundland (Div. 3K), southern Newfoundland (Div. 3P) and the Gulf of St. Lawrence (Div. 4RST) areas. The specimens were frozen individually in airtight plastic bags to prevent dehydration and brought

TABLE 1. Weighted (**A**) and unweighted (**B**) regression parameters and retransformed equations for length-weight relationships of Greenland halibut from various areas of the Northwest Atlantic. (All regressions were highly significant, $P<0.001$.)

Condition of fish	NAFO Div.	No. of fish	Log-log regression Slope	Log-log regression Intercept	r^2	Retransformed equations (g)
A. Round	2G	178	3.2756	−2.5356	0.995	$W=0.002913\,L^{3.2756}$
	2H	317	3.3642	−2.6882	0.996	$W=0.002050\,L^{3.3642}$
	2J	781	3.3458	−2.6614	0.994	$W=0.002181\,L^{3.3458}$
	3K	554	3.3292	−2.6365	0.979	$W=0.002309\,L^{3.3292}$
	3P	66	3.1439	−2.3054	0.987	$W=0.004950\,L^{3.1439}$
	4RST	133	3.1253	−2.2798	0.980	$W=0.005250\,L^{3.1253}$
	2HJ+3K	1,652	3.3454	−2.6608	0.990	$W=0.002184\,L^{3.3454}$
	3P+4RST	199	3.1287	−2.2838	0.984	$W=0.005202\,L^{3.1287}$
Gutted	2G	178	3.2901	−2.5965	0.996	$W=0.002532\,L^{3.2901}$
	2H	318	3.3558	−2.7144	0.996	$W=0.001930\,L^{3.3558}$
	2J	781	3.3349	−2.6780	0.995	$W=0.002099\,L^{3.3349}$
	3K	554	3.3259	−2.6664	0.979	$W=0.002156\,L^{3.3259}$
	3P	66	3.1703	−2.3809	0.989	$W=0.004160\,L^{3.1703}$
	4RST	133	3.1444	−2.3411	0.981	$W=0.004559\,L^{3.1444}$
	2HJ+3K	1,652	3.3373	−2.6834	0.991	$W=0.002073\,L^{3.3373}$
	3P+4RST	199	3.1525	−2.3536	0.985	$W=0.004430\,L^{3.1525}$
B. Round	2HJ+3K	93[a]	3.3622	−2.6826	0.999	$W=0.002077\,L^{3.3622}$
	3P+4RST	50[a]	3.1711	−2.3576	0.996	$W=0.004389\,L^{3.1711}$
Gutted	2HJ+3K	93[a]	3.3461	−2.6932	0.999	$W=0.002027\,L^{3.3461}$
	3P+4RST	50[a]	3.1905	−2.4221	0.996	$W=0.003784\,L^{3.1905}$

[a] Number of mean weight-at-length values.

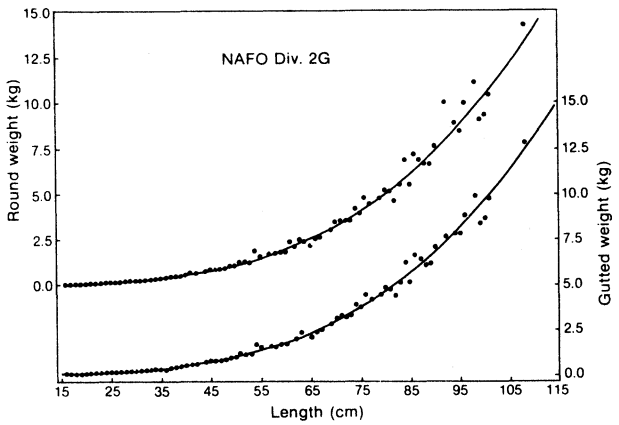

Fig. 1. Weighted length-weight relationships for Greenland halibut in round and gutted condition from Div. 2G. (Plotted points are mean weight-at-length values.)

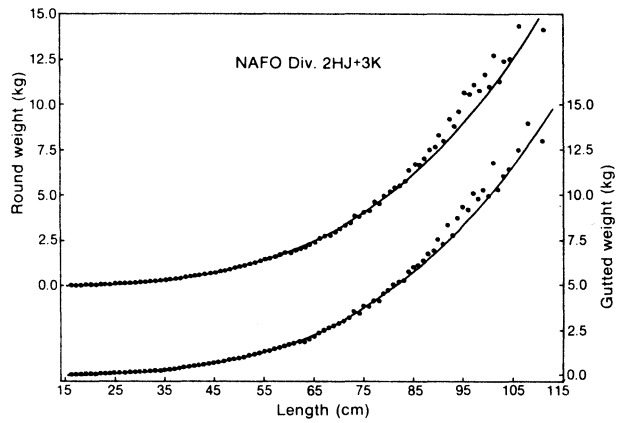

Fig. 2. Weighted length-weight relationships for Greenland halibut in round and gutted condition from Div. 2HJ+3K. (Plotted points are mean weight-at-length values.)

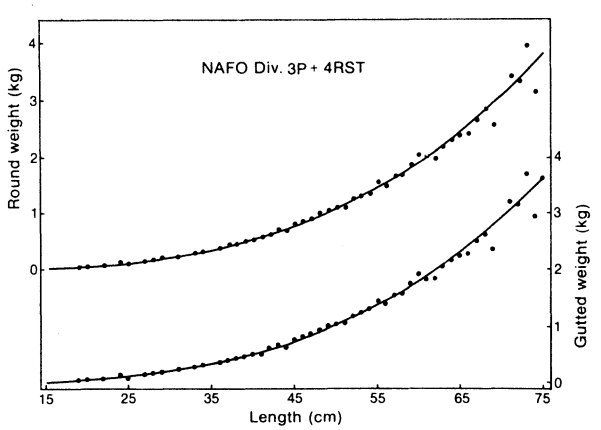

Fig. 3. Weighted length-weight relationships for Greenland halibut in round and gutted condition from Div. 3P+4RST. (Plotted points are mean weight-at-length values.)

to the laboratory for detailed examination. After thawing, each specimen was measured from the tip of the snout to midfork of the tail (fork length) to the nearest centimeter. Round and evicerated (gutted) weights were recorded in grams. The numbers of specimens from the various areas are listed in Table 1. Fish sizes sampled from Div. 2G, 2H, 2J and 3K ranged from a minimum of 16 cm in each division to maxima of 102–114 cm, and those from Div. 3P and 4RST were 20–75 cm.

Weighted linear regressions of weight (g) on length (cm) were calculated after logarithmic (base 10) transformation of the two variables, involving the data for round and gutted weights from each NAFO division. Analysis of covariance was used to test for the possibility of significant differences among areas.

Results and Discussion

The weight-length regressions were highly significant ($P<0.001$), with coefficients of determination ranging from 0.979 to 0.999 (Table 1). Covariance analyses of the relationships resulted in definition of three area groups: Div. 2G, 2HJ+3K and 3P+4RST, for which the relationships are given in Table 1A and illustrated in Fig. 1–3. Because of some evidence of systematic bias in the weighted equations, particularly at large fish sizes (e.g. Fig. 2), unweighted regressions of mean weight on length were calculated for Div. 2HJ+3K and 3P+4RST (Table 1B). For practical purposes, these equations (not illustrated) are probably more representative of the populations at larger fish sizes than the weighted relationships.

The lowest weight at length occurred in data from the Gulf of St. Lawrence (Div. 4RST) and the highest in data from central Labrador (Div. 2H). The specimens collected in Div. 4RST were from spawning concentrations and may not have been in as good condition when examined as those from the Labrador area which were mainly immature (see Bowering, 1983). The length-weight equation reported by Lear (1969) for a sample from Trinity Bay, Newfoundland, is similar to that for Div. 3K, which is the closest of the divisions for which data were analyzed in this paper.

References

BOWERING, W. R. 1983. Age, growth, and sexual maturity of Greenland halibut, *Reinhardtius hippoglossoides* (Walbaum), in the Canadian Northwest Atlantic. *Fish. Bull. U. S.*, **81**(3): (in press).

LEAR, W. H. 1969. Length-weight relationship of commercial-sized Greenland halibut, *Reinhardtius hippoglossoides* (Walbaum). *ICNAF Res. Bull.*, **6**: 119–121.