J. Northw. Atl. Fish. Sci., Vol. 5: 105-106

NOTE

Regressions of Weight on Length for Witch Flounder, *Glyptocephalus cynoglossus*, of the Eastern Newfoundland Area

W. R. Bowering and D. E. Stansbury
Department of Fisheries and Oceans, Fisheries Research Branch
Northwest Atlantic Fisheries Centre, P. O. Box 5667
St. John's, Newfoundland, Canada A1C 5X1

Introduction

An important routine in assessment of fish stocks is deriving the numbers of fish removed from the population through fishing by converting the nominal catches from weight to numbers at age. The relationship between length and weight of a given species is a useful parameter in performing this routine. Length-weight regressions for witch flounder on the Scotian Shelf (NAFO Div. 4VWX) were reported by Powles (1967) and Kohler *et al.* (1970). Previous work on the length-weight relationship of witch flounder in the Newfoundland area was reported by Bowering (1976), but that equation was based on a combination of data collected from all areas around Newfoundland over several years and was calculated from mean weight-at-length data. This paper presents length-weight relationships for both round and gutted weights of witch flounder sampled in the autumn of 1982 from the eastern Newfoundland area (Div. 2J, 3K and 3L), which is the most important in the Northwest Atlantic in terms of catch. Recent stock discrimination studies have demonstrated that there are breeding populations in each of the divisions (Fairbairn, 1981; Bowering and Misra, 1982), and hence the present analysis considers data for each division separately.

Materials and Methods

Random samples of witch flounder were collected in late October-early December 1982 during stratified-random bottom-trawl surveys by Canadian research vessels in Div. 2J, 3K and 3L. The specimens were frozen individually in airtight plastic bags to prevent dehydration and brought to the laboratory for detailed examination. At the laboratory, the fish were thawed slowly and examined as soon as they were pliable enough to measure. Each specimen was measured from the tip of the snout to the end of the longest caudal fin ray (total length) to the nearest centimeter. Round and eviscerated (gutted without removal of gills) weights were recorded in grams. The numbers of specimens from each division are listed in Table 1.

Weighted linear regressions of weight (g) on length (cm) were calculated after logarithmic (base 10) transformation of the two variables, involving the data

TABLE 1. Regression parameters and retransformed equations for length-weight relationships of witch flounder from Div. 2J, 3K and 3L. (All regressions were highly significant, $P < 0.001$.)

Condition of fish	NAFO Div.	No. of fish	Log-log regression Slope	Intercept	r^2	Retransformed equation (g)
Round	2J	55	3.3873	-2.7678	0.96	$W = 0.001707\,L^{3.3873}$
	3K	81	3.5649	-3.0947	0.98	$W = 0.000804\,L^{3.5649}$
	3L	105	3.4131	-2.8182	0.95	$W = 0.001520\,L^{3.4131}$
	All areas	241	3.4970	-2.9654	0.97	$W = 0.001083\,L^{3.4970}$
Gutted	2J	55	3.3737	-2.7683	0.96	$W = 0.001705\,L^{3.3737}$
	3K	81	3.5647	-3.1158	0.98	$W = 0.000766\,L^{3.5647}$
	3L	105	3.4077	-2.8342	0.95	$W = 0.001465\,L^{3.4077}$
	All areas	241	3.4938	-2.9834	0.97	$W = 0.001039\,L^{3.4938}$

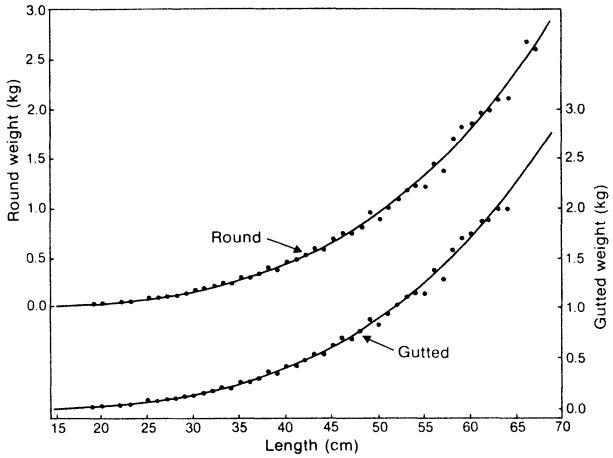

Fig. 1. Weighted length-weight relationships for witch flounder in round and gutted condition from eastern Newfoundland waters (Div. 2J, 3K and 3L). (Plotted points are mean weight-at-length values.)

for round and gutted weights from each area. Analysis of covariance was used to test for the possibility of significant differences between areas.

Results and Discussion

All weight-length regressions were highly significant ($P<0.001$), with coefficients of determination (r^2) ranging from 0.95 to 0.98 (Table 1). For fish in both round and gutted condition, covariance analysis of the relationships indicated no significant difference among the regression coefficients (slopes) for the three areas, but the y-intercept of the regression for Div. 3K differed significantly ($P<0.01$) from those for Div. 2J and 3L, although there was no significant difference between the intercepts for the latter areas. In view of the similarity in slopes for all three areas and the absence of a justifiable reason for the deviation of the intercept for Div. 3K which is geographically intermediate between Div. 2J and 3L, weighted regressions were calculated for the three areas combined (Table 1, Fig. 1). Such equations are considered practical for stock assessment purposes. Because there was no apparent systematic bias in the weighted regressions, calculation of unweighted regressions were not considered necessary.

The parameters of the round weight on length regression for combined areas differed somewhat from those of the equation reported by Bowering (1976), the y-intercept being higher and the slope lower. This implies a differential increase in weight of 13.6% for a 30-cm fish with a gradual decrease to 3.0% for a 70-cm fish. Weight-length regressions for witch flounder in more southerly waters on the Scotian Shelf (Powles, 1967; Kohler *et al.*, MS 1970) have similar y-intercepts but higher slopes than those in this paper.

References

BOWERING, W. R. 1976. Length-weight relationship in witch flounder, *Glyptocephalus cynoglossus*, in the Newfoundland area. *ICNAF Res. Bull.*, **12**: 135.

BOWERING, W. R., and R. K. MISRA. 1982. Comparisons of witch flounder (*Glyptocephalus cynoglossus*) stocks of the Newfoundland-Labrador area. *Can. J. Fish. Aquat. Sci.*, **39**: 564-570.

FAIRBAIRN, D. J. 1981. Which witch is which? A study of the stock structure of witch flounder in the Newfoundland region. *Can. J. Fish. Aquat. Sci.*, **38**: 782-794.

KOHLER, A. C., D. N. FITZGERALD, R. G. HALLIDAY, J. S. SCOTT, and A. V. TYLER. MS 1970. Length-weight relationships of marine fishes of the Canadian Atlantic region. *Fish. Res. Bd. Canada, Tech. Rep.*, No. 164, 11 p. fig., 166 tables.

POWLES, P. M. 1967. Length-weight relationships for American plaice, witch and yellowtail in NAFO Subarea 4. *ICNAF Res. Bull.*, **4**: 121-123.