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Evaluation of the 1982 commercial Arctic charr, Salvelinus alpinus,
fishery in Hebron Fiord, Northern Labrador

by

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Abstract

Catch and effort data from the 1982 commercial Arctic charr, Salvelinus alpinus, fishery in Hebron Fjord are summarized. A 1982 TAC of 29.1 t was exceeded by 30% with landings totalling 37.8 t. Decline in proportion of large charr in the commercial catch and a 45% decrease in adult escapement to Ikarut River suggest a TAC considerably lower than those derived by applying the $F_{0.1}$ catch rate to present catch levels.

Résumé

On résume les données sur les prises et l'effort de pêche d'ombles chevaliers (Salvelinus alpinus) dans les pêches commerciales en 1982 du fjord Hebron. Le T.P.A. de 1982, fixé à 29,1 t, a été dépassé de 30 %, les débarquements totalisant 37,8 t. La baisse du nombre d'ombles de grande taille dans la prise commerciale et le fait que le nombre de poissons adultes non capturés dans la rivière Ikarut a diminué de 45 % indiquent que le T.P.A. devrait être considérablement plus faible que la valeur établie en appliquant le taux $F_{0,1}$ aux prises actuelles.

Introduction

Expansion of the commercial Arctic charr, *Salvelinus alpinus*, fishery into the Hebron-Saglek region of northern Labrador (Fig. 1) was largely the result of management attempts to reduce fishing pressure by establishing quotas on several stocks in the southern part of the Nain commercial fishing region (Dempson 1982a). During 1981, 70 t of charr were removed from the Hebron-Saglek region and this represented approximately 30% of the total northern Labrador catch. The success of the 1981 fishery resulted in a substantial increase in both catch and effort in these areas during the 1982 fishery.

A review of historical catch data for the Hebron area indicated that average landings during the 1960's were approximately 20 t y⁻¹. This information, in conjunction with an examination of available freshwater production area, led to the establishment of a 20 t TAC on the Hebron stock for 1982 (Dempson 1982a). This TAC, however, was later increased to 29.1 t.

The purpose of this paper is to review characteristics of the 1982 fishery in the Hebron area and provide recommendations for a TAC in 1983.

Material and Methods

Catch and effort information were obtained from purchase slip records from the commercial fishery in Hebron Fiord during 1982 (Table 1). Age length keys (sample N = 458) and length frequencies (sample N = 2963) were used to derive an estimate of total numbers at age in the commercial catch (Table 2). Weights at age were obtained from age sampling of the 1980 experimental fishery and 1981-82 commercial fishery.

Partial recruitment rates were obtained by comparing the percent at age in the 1982 commercial catch with the percent at age from the 1982 Ikarut River counting fence data (Table 3). These latter data were used as an index of the total population. The ratio of these percentages provides a measure of selectivity with the highest value assigned the value of 1.0 for fully recruited fish. Partial recruitment rates and mean weight at age were used to calculate yield per recruit by the method of Thompson and Bell (Ricker 1975).

Total mortality was estimated from the Paloheimo method using catch per unit effort at age data (Table 2).

Results and Discussion

Commercial Arctic charr fishing in the northern region of the Labrador coast in 1982 extended from Napartok Bay to Ramah Bay (Fig. 1). Landings from this northern expansion in 1981 (69.8 t) represented 30% of the total catch of charr north of Davis Inlet. In 1982, landings increased to 88.5 t and was 44% of the total catch.

With respect to the Hebron Fiord, the 29.1 t TAC was exceeded by 30%. Landings in the Hebron area were 37.8 t (Table 1) in comparison with 39.9 t in the previous year. An estimated 17331 charr were captured with a mean age of

11.2 years (Table 2). Landings from the Hebron area were the highest from all 17 stock areas fished in 1982. Catch per unit effort was 382 kg/man-week (Table 1) and was second only to Anaktalik Bay (C/E = 402 kg/man-week). The percentage of the catch over 2.3 kg (gutted head-on weight) decreased from 34% in 1981 to 23% in 1982 (Table 1).

By assuming a natural mortality rate of 0.2, an estimate of average fishing mortality during the past two years can be obtained from catch per unit effort at age data. Total mortality estimated from the Paloheimo method was 0.44 (Table 2); thus fishing mortality was 0.24

In a previous assessment (Dempson 1982a) it was stated that catch and catch rates would remain high for several years if fishing was maintained at the same level as in 1981. This is what happened in 1982 and is likely related to the accumulated large biomass of available fish in the area resulting from the lack of a commercial fishery from 1970-81. While the above estimate of F ($F = 0.24$) appears low, it may be possible that with the accumulated stock, removals even at 38 t y^{-1} , only represent a fishing mortality rate of this level, at least for the first few years.

While exploitation on a stock of this nature can theoretically be higher during the first several years of a fishery, it is not known whether the present rate is in excess of the sustainable yield of the stock.

Using the $F_{0.1}$ level derived from the yield per recruit analysis, an estimate of TAC for the Hebron Fiord can be derived by assuming the Paloheimo total mortality rate accurately represents the average mortality on this stock during the past two years. With $F_{0.1} = 0.44$ a projected catch for 1983 could be as high as 69.3 t. Even with natural mortality on this stock as low as 0.15 or 0.10 projected catches would be 57.4 t and 48.9 t respectively (Table 4). These values, however, should be viewed with caution. In comparison with stock removals in other areas from 1977-79 (Dempson 1982b), projected catches of 47.8 - 67.7 t for Hebron in 1983 appear excessive.

Results from the research project on the Ikarut River, Hebron Fiord, (Fig. 2) indicated that total escapement decreased by 38% from the previous year. Escapement of adult fish (using an arbitrary criteria of those fish greater than 30.0 cm in fork length) decreased by 45% (N adult 1981 = 3432, N adult 1982 = 1893) from 1981. It is not known if this is directly attributable to the commercial fishery or due to annual variations in spawning escapement with respect to interchange of stocks with other rivers. Commercial fishing within the Freytag Inlet (Fig. 2) which did not take place in 1981, undoubtedly was partially responsible for intercepting fish heading for the Ikarut River.

Since spawning often occurs on an alternate year basis, a third year of tagging results from the Ikarut River study should help in clarifying the annual variation seen in escapements.

In view of the decline in proportion of large charr in the commercial catch for 1982 and the substantial decrease in escapement to Ikarut River, it

is recommended that the TAC for Hebron Fiord in 1983 is considerably lower than the values suggested by the technique of applying the F0.1 catch rate to present catch levels. In the absence of any additional information it is therefore suggested that the 1983 TAC remain the same as the TAC recommended for 1982 at 20 t round weight.

REFERENCES

- Dempson, J.B. 1982a. Rationale for establishing a TAC in Hebron Fiord during 1982, CAFSAC Res. Doc. 82/38, 12p.
- 1982b. Summary of catch statistics and change in size characteristics of northern Labrador Arctic charr populations. CAFSAC Res. Doc. 82/7, 17 p.
- Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bull. Fish. Res. Board Can. 191:382p.

Table 1. Summary of catch (kg round) effort and size composition statistics from Hebron Fiord, 1981-82. Size composition expressed as percentage of landings 2.3 kg (gutted head-on weight).

	Year	
	1981	1982
Quota		29072
Catch	39890	37822
Effort	106	99
C/E	376	382
% 2.3 kg	34	23

Table 2. Estimated numbers at age and catch per unit effort at age for Hebron Fiord Arctic charr, 1980-82.

Age	Number			Catch per unit effort at age		
	1980	1981	1982	1980	1981	1982
6	-	-	6	-	-	0.1
7	21	115	151	3.5	1.1	1.5
8	166	997	655	27.7	9.4	6.6
9	342	3830	2698	57.0	36.1	27.3
10	205	4644	4707	34.2	43.8	47.6
11	125	2993	4070	20.8	28.1	41.1
12	138	2025	1492	23.0	19.1	15.1
13	93	1097	1054	15.5	10.4	10.7
14	53	881	1005	8.8	8.3	3.7
15	76	574	369	12.7	5.4	2.7
16	40	193	262	6.7	1.8	4.5
17	31	170	441	5.2	1.6	1.3
18	6	71	125	1.0	0.7	1.4
19	9	116	134	1.5	1.1	1.4
20	8	98	-	1.3	0.9	-
21	8		74	1.3		0.7
22	4		-	0.7		-
23			40			0.4
24			48			0.5
Total	1325	17804	17331			
Effort	6	106	99	$\frac{11-19}{10-18} = \frac{76.5}{127.9}$	$= \frac{81.9}{119.2}$	
Mean Age (y)	11.0	10.9	11.2	$Z = 0.514$	$= 0.375$	
				Average	$= 0.44$	

Table 3. Partial recruitment values derived from comparisons of percent at age in the commercial catch (1982) with percent at age from Ikarut River counting fence data (1982).

	% at age		Partial Recruitment		Mean Weight (kg)
	Research (R)	Commercial (C)	C/R	PR	
6	4.5	0.03	0.007	0.001	0.66
7	7.6	0.9	0.118	0.02	1.05
8	2.8	3.8	1.357	0.20	1.27
9	6.0	15.6	2.600	0.38	1.51
10	6.0	27.2	4.533	0.67	1.81
11	4.0	23.5	5.875	0.87	1.97
12	1.4	8.6	6.143	0.91	2.06
13	0.9	6.1	6.778	1.00	2.18
14	1.0	5.8	5.800	1.00	2.28
15	0.4	2.1	5.250	1.00	2.07
16	0.2	1.5	7.500	1.00	2.04
17	0.3	2.5	8.333	1.00	2.03
18	0.1	0.7	7.00	1.00	2.10
19	0.1	0.8	8.00	1.00	1.94
20	0.1	-			
21		0.4			
22		-			
23		0.2			
24		0.3			

Table 4. Projected available catch of Arctic charr in Hebron Fiord in 1983 using an $F_{0.1}$ value derived from the Thompson and Bell method (0.43) and an estimate of total fishing mortality obtained from the Paloheimo method.

	Natural Mortality		
	0.10	0.15	0.20
Estimated present F	0.34	0.29	0.24
Landings (t) 1982	37.8	37.8	37.8
Catch at $F_{0.1}$ (t)	48.9	57.4	69.3

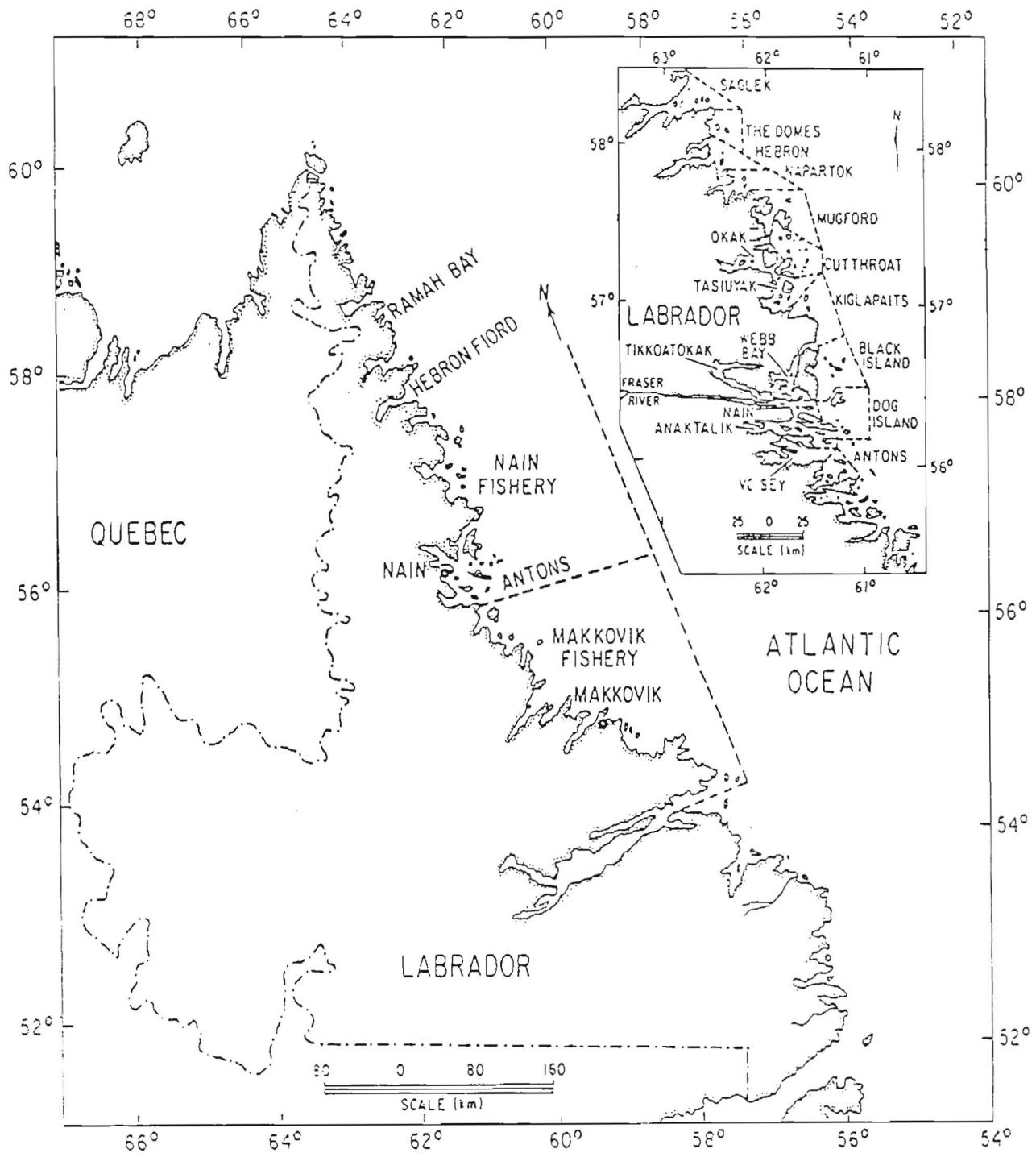


Fig. 1. Major Arctic charr commercial fishing regions in Northern Labrador. Insert shows area breakdown within Nain fishing region.

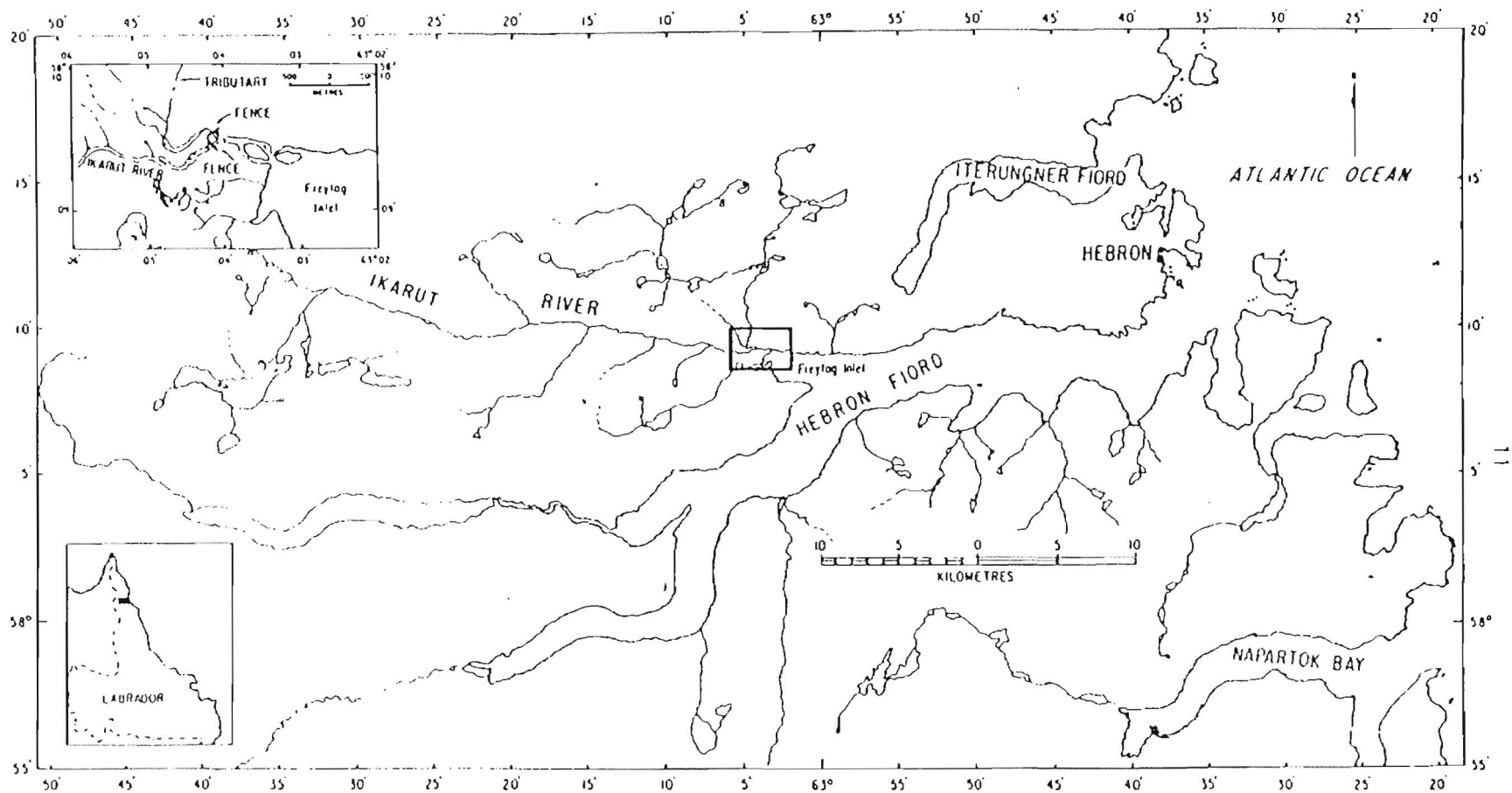


Fig. 2. Hebron Fiord area of northern Labrador illustrating location of Ikarut River counting fence River project.