Stock Assessment of Arctic Charr, Salvelinus alpinus, Populations in Voisey Bay, Anaktalik Bay and Okak Bay Northern Labrador

by

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Abstract

Catch and effort data from Arctic charr, Salvelinus alpinus, fisheries in Voisey Bay, Anaktalik Bay and Okak Bay are presented. Total allowable catches for these areas were 16.1, 8.6 and 27.2 t respectively. Only Anaktalik Bay achieved its TAC. Catch per unit effort decreased in Voisey Bay in comparison with 1981 while it increased substantially in both Anaktalik Bay and Okak Bay. Stock projections for 1983 indicated $F_{0.1}$ yields of 7.7-15.2 t for Voisey Bay; 8.0-17.9t for Anaktalik Bay and 10.8-22.3 t for Okak Bay.

Résumé

On présente les données sur les prises et l'effort de pêche d'ombles chevaliers (Salvelinus alpinus) dans les pêches des baies Voisey, Anaktalik et Okak. Le total des prises autorisées dans ces pêches était de 16,1, 8,6 et 27,2 t respectivement. On n'a atteint le T.P.A. que dans la baie Anaktalik. La prise par unité d'effort de pêche a diminué dans la baie Voisey par comparaison à 1981, mais elle a considérablement augmenté dans les baies Anaktalik et Okak. D'après les stocks prévus pour 1983, le rendement $F_{0.1}$ se situerait entre 7,7 et 15,2 t dans la baie Voisey, entre 8,0 et 17,9 t dans la baie Anaktalik et entre 10,8 et 22,3 dans la baie Okak.

Introduction

Catch statistics from the Arctic charr, Salvelinus alpinus, fishery in Voisey Bay, Anaktalik Bay and Okak Bay (Fig. 1) have been available since 1974. Highest recorded landings from these areas (21.6-36.1t) occurred in 1977 and 1978 (Table 1). Since then catches have declined in these areas, largely the result of the establishment of quotas (Dempson 1981; Dempson and LeDrew 1982) and a redirection of effort into the northern fishing areas of the Hebron-Saglek region. The total allowable catch (TAC) for 1982 in Voisey, Anaktalik and Okak bays were 16.1 t, 8.7 t and 27.3 t respectively.

This report updates the previous assessments based upon information collected from the commercial fishery during 1981.

Stock Assessment

Catch and effort data

Catch and effort data from Voisey Bay, Anaktalik Bay and Okak Bay are summarized in Table 1 for 1974-82. The TAC was only taken in Anaktalik Bay. While effort had remained relatively constant in Voisey Bay from 1979-81, it decreased by 28% in 1982. Catch and catch per unit effort decreased by 53% and 34% from 1981. However, catch per unit effort was 40% and 45% higher in Anaktalik and Okak Bay respectively in 1982.

For the three areas combined, effort was 31% lower and catch 23% lower in 1982 in comparison with 1981. As stated previously, the redistribution of effort into the expanded Hebron-Saglek region is largely responsible. In these latter two areas effort increased by 57% and catch by 27% in 1982 in relation to 1981.

Numbers at age

Numbers at age were available for Voisey and Okak Bay charr since 1977 (Table 2, 3). For Anaktalik Bay information on numbers at age were available from 1977, 1978 and 1980-82. An estimate for numbers at age in the 1979 Anaktalik Bay catch was derived from average proportion at age for 1977-78 and 1980-82 (Table 4).

Weights at age

Weights at age were calculated from 1980-82 commercial whole weight using the conversion factor 1.24 (Coady and Best 1976) (Table 5).

Partial recruitment rates

Partial recruitment rates were calculated from a matrix of fishing mortality rates generated from cohort analyses run on 1977-82 data. F values were averaged at age for 1977-80 (Table 5). Although catch at age data for Anaktalik Bay in 1979 were estimated from other years data, it was felt that

the F values obtained from the cohort analyis and averaged at age from 1977-80 would give an index of the partial recruitment rates for this stock.

Yield per recruit

Yield per recruit was calculated by the method of Thompson and Bell (Ricker 1975) using partial recruitment values and mean weight at age. Natural mortality was assumed constant at 0.2. $F_{0.1}$ values resulting from this calculation were: 0.385, 0.465 and 0.493 for Voisey Bay, Anaktalik Bay and Okak Bay. As in previous assessment (Dempson and LeDrew 1982), $F_{0.1}$ was also derived for the Anaktalik Bay charr stock using the Beverton and Hold method and found to equal 0.365.

Total mortalilty (Z)

Total mortality (Z) calculated using the Paloheimo method indicated average values of 0.85 for Voisey Bay and 0.53 for Okak Bay (Tables 2 and 3). The figures for Voisey Bay and particularly the value for the most recent year are questionable. Substantial decline in catch per unit effort in 1982 strongly influenced the results. It is felt that this decline is not directly indicative of a decreased abundance of charr but relates more to the variation in fishing effort resulting from a redistribution of effort into northern areas.

Owing to a lack of consecutive sampling information and large variation in catch per unit effort at age data for Anaktalik Bay, an estimate of total mortality was derived from a catch curve. The total mortality rate of 0.59 (95% C.L. = 0.48-0.69) however, refers to the average mortality in effect from 1975-76 to 1980-81 and may be an overestimate in relation to the decrease in both catch and effort in the most recent years.

Stock projections

Stock projections for Voisey Bay were performed using a range of terminal fishing mortality rates from 0.2-0.4. Regressions of F on effort were performed in order to determine the best estimate for terminal fishing mortality in 1982 (Table 6). Highest r^2 value was obtained for $F_T = 0.2$. Recruitment estimates for the projection were calculated from the geometric mean of the age 6 population numbers for the years 1977-80.

Fishing at $F_{0.1}$ level ($F_{0.1} = 0.385$) and assuming natural mortality at 0.2, a catch of 7.7 to 15.2t is available in 1983 (Table 7). Long-term projections using $F_T = 0.2$-0.4 at a yield per recruit of 0.898 kg ranged from 15.3 to 19.6 t and thus it would suffice to leave the 1983 TAC at the same level for 1982 of 16.0 t round weight.

Stock projections for Okak Bay were also performed using a range of terminal fishing mortality rates from 0.2-0.4. Regressions of F on effort gave r^2 values of 0.86 to 0.91 (Table 6). Recruitment estimates were similarly derived from the geometric mean of age 6 population numbers for the years 1977-79. Fishing at the $F_{0.1}$ level ($F_{0.1}$ = 0.493) with natural mortality assumed constant at 0.2, a catch of 10.8 to 22.3t is available in 1983 (Table 8). Long-term projections of Okak Bay range from 13.0 to 19.1 t. In consideration of the decrease in catch and effort in light of the redistribution of fishing into the Hebron-Saglek region a TAC of 21 t round weight is recommended for 1983 (average of the actual projection at F_T = 0.2 and the long-term projection at F_T = 0.2).

Average total mortality on the Anaktalik Bay charr stock over the period 1975-76 to 1980-81 was Z = 0.59 (F = 0.39). Catches and effort during last several years have been lower in comparison with 1976-79 which may suggest the average mortality rate is a maximum estimate for current years.

Table 9 summarizes projected catch levels for Anaktalik Bay in 1983. Using F values derived from the catch curve with 95% confidence limits, two range of values were obtained. With $F_{0.1}$ = 0.465, which was calculated from the Thompson and Bell method, projected catch for 1983 is 10.2-17.9t. Alternatively, with $F_{0.1}$ = 0.365 as derived from the Beverton and Holt method, projected catch for 1983 is 8.0-14.1t. Assuming present F = 0.39, the average catch and recommended TAC for 1983 is 11.5 t round weight.

References

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TABLE 1. ARCTIC CHARR CATCH STATISTICS FOR 1974-1982
SUMMARY OF CATCH, EFFORT, AND SIZE COMPOSITION

YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982
VOISEY BAY									
QUOTAS (kg)						22500	22500	16100	16100
CATCH (KG)	20045	238	12232	22488	33597	21880	11557	16325	7688
EFFORT (MAN-WEEKS)	64	2	45	56	85	59	52	53	38
C/E (KG)	313	119	272	402	395	371	222	308	202
Ø/Ø > 2.3KG			42.0	35.0	34.0	32.0	17.0	16.0	17.0
AHAKTALIK BAY									
QUOTAS (kg)						21500	21500	8660	8660
CATCH (KG)	7821	2548	14670	21604	13075	14913	8045	9157	10836
EFFORT (MAN-WEEKS)	28	10	45	63	55	76	53	32	27
C/E (KG)	279	255	326	343	238	196	152	286	401
Ø/Ø > 2.3KG			36.0	38.0	27.0	20.0	12.0	10.0	11.0
OKAK BAY									
QUOTAS (kg)								27300	27300
CATCH (KG)	34250	2354	17812	27592	36125	26171	17434	11049	9031
EFFORT (MAN-WEEKS)	105	15	52	107	104	123	65	46	26
C/E (KG)	326	157	343	258	347	213	268	240	347
Ø/Ø > 2.3KG			29.0	26.0	18.0	11.0	8.0	10.0	7.0

Table 2. Estimated numbers at age and catch per unit effort at age for Voisey Bay Arctic charr, 1977-82.

Age	1977	1978	1979	1980	1981	1982
6	290	548	242	74	49	142
7	1902	3876	2506	374	645	429
8	3675	4761	4042	1880	1711	908
9	1902	2065	1724	2294	3139	1281
10	1128	1096	593	753	1543	636
11	548	1011	323	292	617	332
12	354	337	108	146	267	34
13	193	337	81	93	28	7
14	97	169	27	18		10
15		84		14		
16		42			5	
17						
18					6	
19				4		
Total	10,089	14,326	9,646	5,942	8,010	3,779
Effort	56	85	59	52	53	38
			CATCH PER UNIT EFFORT AT AGE			
6	5.2	6.0	4.1	1.4	0.9	3.7
7	34.0	45.6	42.5	7.2	12.2	11.3
8	65.6	56.0	68.5	36.2	32.3	23.9
9	34.0	24.3	29.2	44.1	59.2	33.7
10	20.1	12.9	10.1	14.5	29.1	16.7
11	9.8	11.9	5.5	5.6	11.6	8.7
12	6.3	4.0	1.8	2.8	5.0	0.9
13	3.4	4.0	1.4	1.8	0.5	0.2
14	1.7	2.0	0.5	0.3	(0.2)	0.3

$$\frac{\Sigma 10\text{-}14 \text{ year } i+1}{\Sigma\ 9\text{-}13 \text{ year } i}$$

	1977-78	1978-79	1979-80	1980-81	1981-82
=	34.8 / 73.6	19.3 / 57.1	25.0 / 48.0	46.4 / 68.8	26.8 / 105.4

$$\bar{Z} = 0.75 = 1.08 = 0.65 = 0.39 = 1.37$$

Average $\bar{Z}$ = 0.85

Table 3. Estimated numbers at age and catch per unit effort at age for Okak Bay Arctic charr, 1977-82.

Age	1977	1978	1979	1980	1981	1982
6	84	102	-	26	39	62
7	84	1228	1227	353	419	314
8	251	4040	4546	2126	791	1004
9	752	2762	3067	3305	1733	859
10	1839	2813	2020	2517	1693	987
11	2173	1892	1191	867	922	901
12	3595	1944	541	391	197	406
13	1505	1381	469	129	121	105
14	1087	256	325	162	60	82
15	920	511	253	219	51	45
16	501	153	216	-	-	16
17	84	205	144	-	34	23
18	84	51	72	-	-	15
19	84	51	36	-	-	
20			36	-	-	
Total	13,043	17,389	14,143	10,095	6060	4819
Effort	107	104	123	65	46	26
			CATCH PER UNIT EFFORT AT AGE			
6	0.8	1.0	-	0.4	0.8	2.4
7	0.8	11.8	10.0	5.4	9.1	12.1
8	2.3	38.8	37.0	32.7	17.2	38.6
9	7.0	26.6	24.9	50.8	37.7	33.0
10	17.2	27.0	16.4	38.7	36.8	36.0
11	20.3	18.2	9.7	13.3	20.0	34.7
12	33.6	18.7	4.4	6.0	4.3	15.6
13	14.1	13.3	3.8	2.0	2.6	4.0
14	10.2	2.5	2.6	2.5	1.3	3.1
15	58.6	4.9	2.1	3.4	1.1	1.7

1977-78		1978-79		1979-80		1980-81	1981-82
$\frac{\Sigma 11\text{-}15}{10\text{-}14} = \frac{57.6}{95.4}$		$\frac{\Sigma 10\text{-}15}{\Sigma\ 9\text{-}14} = \frac{39.0}{106.3}$		$\frac{\Sigma 11\text{-}15}{\Sigma 10\text{-}14} = \frac{27.2}{36.9}$		$\frac{\Sigma 11\text{-}15}{\Sigma 10\text{-}14} = \frac{29.3}{62.5} = \frac{59.1}{65.0}$	
$\bar{Z}$ = 0.50		$\bar{Z}$ = 1.00		$\bar{Z}$ = 0.30		$\bar{Z}$ = 0.76	= 0.10

Average $\bar{Z}$ = 0.53

Table 4. Estimated numbers at age for Arctic charr caught in the Anaktalik Bay commercial fishery.

Age	1977	1978	1979*	1980	1981	1982
6	93	129	74	66	14	15
7	559	2122	805	177	395	106
8	2795	1827	1545	714	879	751
9	1957	941	1966	1895	1799	1380
10	2001	424	1337	973	1173	1158
11	1258	185	866	488	608	1189
12	419	129	429	252	237	735
13	186	74	186	229	75	192
14	93	37	108	132	43	124
15	1	37	25	23	1	32
16	1	18	10	1	7	12
17						-
18						-
19						17
Total	9363	5923	7351	4950	5231	5694
Effort	63	55	76	53	32	27

*1979 values generated from mean proportion at age for 1977-78 and 1980-82.

Table 5. Summary of weight at age data and partial recruitment rates as derived from fishing mortality values generated from cohort analyses

Age	Voisey Bay		Anaktalik Bay		Okak Bay	
	Weight (kg)	Partial Recruitment	Weight (kg)	Partial Recruitment	Weight (kg)	Partial Recruitment
6	1.03	0.03	0.90	0.02	1.18	0.01
7	1.25	0.25	1.18	0.17	1.39	0.08
8	1.65	0.76	1.38	0.47	1.60	0.32
9	2.18	0.97	1.57	0.70	1.75	0.47
10	2.47	1.00	1.76	1.00	1.92	0.83
11	2.73	1.00	1.76	1.00	1.96	1.00
12	2.78	1.00	1.72	1.00	2.15	1.00
13	3.00	1.00	1.88	1.00	2.39	1.00
14	3.73	1.00	1.68	1.00	1.84	1.00
15			1.94	1.00	1.95	1.00
16			1.81	1.00	1.43	1.00
17					2.10	1.00

Table 6. Regressions of average F on effort for Voisey Bay and Okak Bay, 1977-1982.

Year	Effort (Manweeks)	F T (ages 9-14) 0.20	0.25	0.30	0.40
Voisey Bay					
1977	56	0.506	0.517	0.525	0.536
1978	85	1.108	1.138	1.160	1.191
1979	59	0.627	0.638	0.646	0.657
1980	52	0.639	0.663	0.681	0.704
1981	53	0.747	0.863	0.962	1.126
1982	38	0.200	0.250	0.300	0.400
r^2 (1977-82)		0.85	0.77	0.68	0.51
Okak Bay					
Year	Effort (Manweeks)	F T (ages 11-17) 0.20	0.25	0.30	0.40
1977	107	0.694	0.708	0.717	0.729
1978	104	0.819	0.848	0.870	0.899
1979	123	0.747	0.805	0.850	0.914
1980	65	0.521	0.586	0.640	0.722
1981	46	0.265	0.315	0.361	0.441
1982	26	0.200	0.250	0.300	0.400
r^2 (1977-82)		0.91	0.91	0.90	0.86

Table 7. Projection for Voisey Bay in 1983 from cohort analyses run at (A) F_T = 0.20, (B) F_T = 0.25, (C) F_T = 0.30, (D) F_T = 0.40.

A

	POPULATION NUMBERS		POPULATION BIOMASS (AVERAGE)		CATCH BIOMASS	
	1982	1983	1982	1983	1982	1983
6	21843	21843	20320.47	20277.83	146	234
7	9697	17755	10724.84	19205.04	536	1856
8	7087	7552	9857.17	9841.01	1498	2873
9	7989	4984	14394.55	8272.06	2793	3083
10	3858	5387	7853.96	10074.44	1571	3879
11	2014	2586	4531.62	5344.97	906	2058
12	206	1350	471.94	2841.37	95	1094
13	42	138	103.73	313.54	21	121
14	20	28	47.42	79.31	37	31
6+1	52756	61624	68305.70	76249.57	7603	15230
7+1	30913	39781	47985.24	55971.73	7457	14996
8+1	21216	22026	37260.40	36766.70	6921	13140
9+1	14129	14474	27403.23	26925.69	5423	10266

B

	POPULATION NUMBERS		POPULATION BIOMASS (AVERAGE)		CATCH BIOMASS	
	1982	1983	1982	1983	1982	1983
6	19975	19975	18576.61	18543.69	146	213
7	7744	16226	8611.70	17550.77	536	1696
8	5771	5953	7884.87	7757.49	1498	2267
9	6549	3907	11539.34	6484.72	2793	2417
10	3159	4209	6283.26	7871.47	1571	3031
11	1649	2014	3625.11	4163.10	906	1607
12	169	1051	379.37	2212.93	95	852
13	33	108	84.63	244.79	21	94
14	18	22	40.29	63.11	37	24
6+1	45069	53465	56924.18	64892.10	7603	12191
7+1	25094	33491	38347.56	46348.41	7457	11978
8+1	17350	17266	29735.86	28797.64	6921	10282
9+1	11579	11312	21850.99	21040.15	5423	8015

Table 7 (cont'd)

C

	POPULATION NUMBERS		POPULATION BIOMASS (AVERAGE)		CATCH BIOMASS	
	1982	1983	1982	1983	1982	1983
6	18697	18697	17383.55	17357.26	146	200
7	6043	15180	7130.56	16419.00	536	1587
8	4895	4970	6570.39	6476.27	1498	1892
9	5587	3191	9628.60	5295.05	2793	1977
10	2694	3423	5236.44	6400.33	1571	2464
11	1406	1634	3020.47	3377.21	906	1300
12	144	853	315.02	1794.72	95	691
13	30	87	70.96	198.36	21	76
14	17	16	36.67	51.59	37	20
6+1	40013	48052	49412.86	57369.99	7603	10205
7+1	21316	29355	32029.31	40012.73	7457	10004
8+1	14773	14175	24878.75	23593.73	6921	8417
9+1	9878	9206	18308.16	17117.47	5423	6525

D

	POPULATION NUMBERS		POPULATION BIOMASS (AVERAGE)		CATCH BIOMASS	
	1982	1983	1982	1983	1982	1983
6	17045	17045	15841.34	15823.64	146	182
7	4966	13827	5362.92	14956.02	536	1445
8	3802	3679	4927.36	4794.00	1498	1401
9	4376	2297	7215.79	3811.77	2793	1411
10	2114	2433	3926.36	4549.72	1571	1752
11	1104	1160	2266.52	2397.69	906	923
12	113	606	236.21	1275.38	95	491
13	23	62	51.75	140.82	21	54
14	15	13	29.23	33.44	37	16
6+1	33058	41121	39827.70	47734.15	7603	7885
7+1	16013	24076	24016.37	31960.51	7457	7500
8+1	11047	10249	18653.44	17004.49	6921	6055
9+1	7245	6570	13725.88	12210.49	5423	4654

Table 8. Projection for Okak Bay in 1983 from cohort analyses run at (A) F_T = 0.20, (B) F_T = 0.25, (C) F_T = 0.30, (D) F_T = 0.40.

A

POPULATION NUMBERS

	1982	1983
5	26215	26215
7	21821	21407
8	18124	17582
9	10547	13933
10	7100	7860
11	5466	4924
12	2463	3664
13	637	1651
14	497	427
15	273	333
16	97	183
17	76	65
6+	93316	98244
7+	67101	72029
8+	45280	50622
9+	27156	33040

POPULATION BIOMASS (AVERAGE)

	1982	1983
6	28001.27	28009.99
7	27279.07	26473.03
8	25498.54	23673.00
9	15991.46	19797.06
10	11415.75	11295.32
11	9829.98	6958.93
12	4364.51	5680.33
13	1254.79	2845.39
14	753.64	566.83
15	438.76	468.35
16	114.32	198.70
17	101.46	98.44
6+	124043.55	126054.86
7+	96042.29	98044.98
8+	68763.21	71571.95
9+	43264.67	47899.95

CATCH BIOMASS

	1982	1983
6	73	55
7	436	1020
8	1606	3664
9	1503	4596
10	1893	4637
11	1766	3438
12	873	2806
13	251	1406
14	151	280
15	88	231
16	23	93
17	80	49
6+	8745	22295
7+	8672	22240
8+	8236	21220
9+	6629	17536

B

POPULATION NUMBERS

	1982	1983
6	22917	22917
7	17490	18707
8	14564	14036
9	8498	11018
10	5779	6183
11	4476	3943
12	2017	2854
13	522	1286
14	407	333
15	224	259
16	79	143
17	68	50
6+	77041	81630
7+	54124	58713
8+	36634	40006
9+	22070	25970

POPULATION BIOMASS (AVERAGE)

	1982	1983
6	24474.09	24486.08
7	21822.66	23133.85
8	20334.06	18898.66
9	12738.82	15685.91
10	9111.02	8885.10
11	7064.71	5431.23
12	3492.16	4424.77
13	1004.75	2216.51
14	602.99	441.71
15	351.84	364.80
16	90.90	147.36
17	85.39	76.15
6+	101173.40	104162.13
7+	76699.31	79676.10
8+	54876.65	56542.25
9+	34542.59	37643.59

CATCH BIOMASS

	1982	1983
6	73	48
7	436	891
8	1606	2941
9	1503	3635
10	1893	3647
11	1766	2693
12	873	2186
13	251	1095
14	151	218
15	88	180
16	23	73
17	80	38
6+	8745	17636
7+	8672	17587
8+	8036	16696
9+	6629	13755

Table 8 (cont'd)

C

	POPULATION NUMBERS		POPULATION BIOMASS (AVERAGE)		CATCH BIOMASS	
	1982	1983	1982	1983	1982	1983
6	20747	20747	22153.30	22162.50	73	44
7	15231	16930	18976.62	20936.73	436	807
8	12204	12187	16909.77	16408.43	1606	2553
9	7190	9086	10661.60	12910.77	1503	2998
10	4920	5113	7610.41	7846.65	1895	3016
11	3816	3140	5885.68	4439.14	1756	2192
12	1720	2314	2910.17	3588.07	873	1773
13	443	1043	832.66	1797.97	251	888
14	347	268	502.37	356.00	151	176
15	191	210	293.19	295.84	88	146
16	68	116	76.56	119.54	23	59
17	63	41	75.17	62.50	80	31
6+	66940	71196	86887.50	90428.20	8745	14682
7+	46193	50449	64734.20	68260.70	8672	14639
8+	30962	33519	45757.58	47323.94	8236	13832
9+	18758	21333	28847.81	30915.51	6629	11279

D

	POPULATION NUMBERS		POPULATION BIOMASS (AVERAGE)		CATCH BIOMASS	
	1982	1983	1982	1983	1982	1983
6	17936	17936	19146.96	19164.04	73	38
7	11344	14629	14079.43	18090.67	436	697
8	9338	9004	12749.90	12123.57	1606	1887
9	5513	6740	7996.42	9877.29	1503	2223
10	3833	3740	5707.13	5374.52	1895	2206
11	2995	2252	4414.14	3182.07	1756	1577
12	1350	1644	2182.71	2548.06	873	1259
13	349	741	627.20	1276.94	251	631
14	273	192	377.85	254.10	151	126
15	150	150	220.08	210.81	88	104
16	53	82	51.95	81.88	23	42
17	57	29	62.58	43.97	80	22
6+	53191	57138	67621.36	71931.03	8745	10803
7+	35255	39202	48474.40	52767.00	8672	10765
8+	23911	24573	34394.96	34676.33	8236	10071
9+	14573	15569	21645.07	22552.76	6629	8183

Table 9. Projected available catch of Arctic charr in Anaktalik Bay in 1983 using $F_{0.1}$ values derived from the Thompson and Bell method (0.465) and the Beverton and Holt method (0.365). Estimated present F values obtained catch curve value with 95% confidence limits.

	$F_{0.1}$ = 0.465			$F_{0.1}$ = 0.365		
Estimated present F	0.28	0.39	0.49	0.28	0.39	0.49
Landings (t) 1982	10.8	10.8	10.8	10.8	10.8	10.8
Catch at $F_{0.1}$ (t)	17.9	12.9	10.2	14.1	10.1	8.0

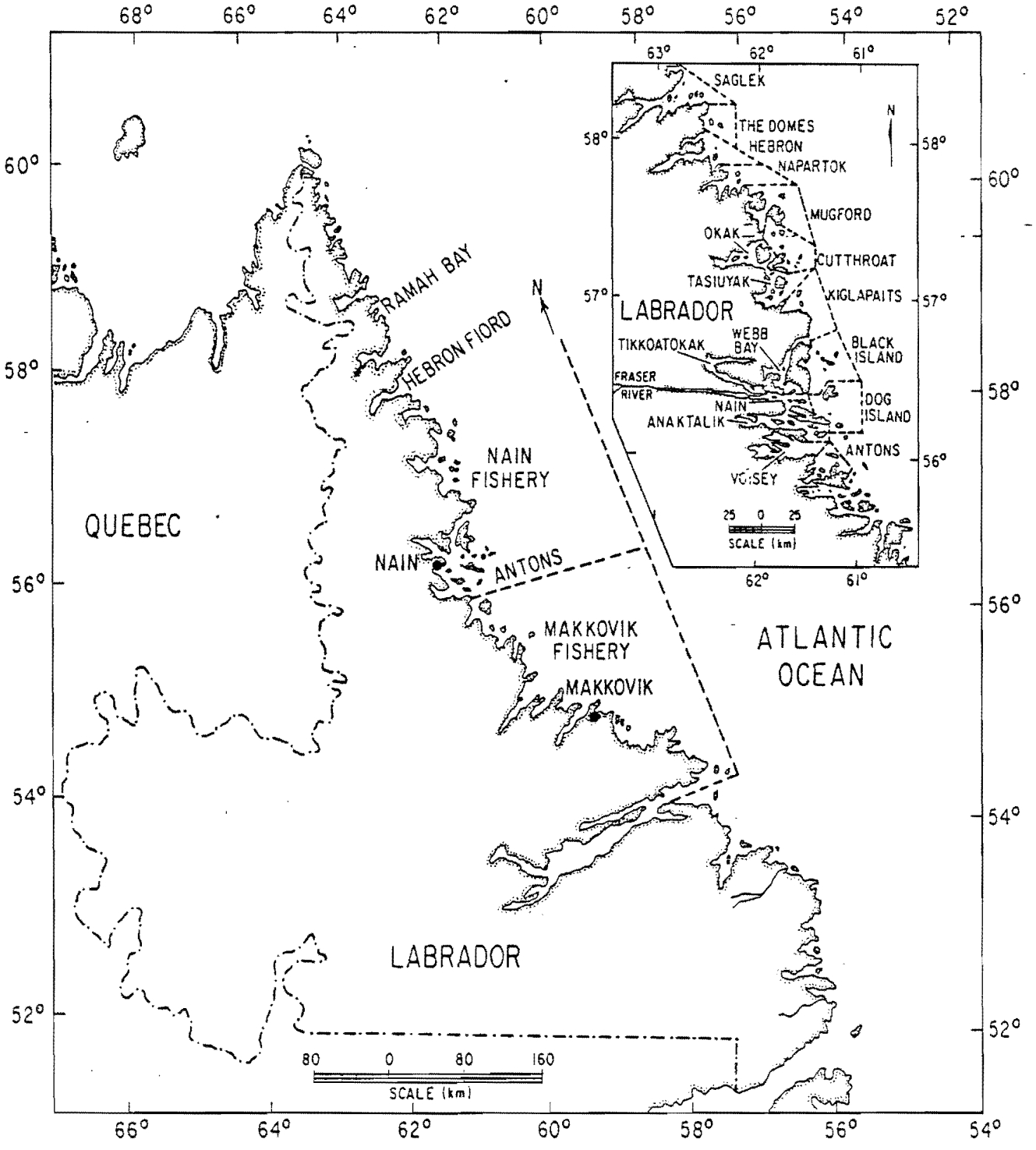

Fig. 1. Major Arctic charr commercial fishing regions in northern Labrador. Insert shows area breakdown within Nain fishing region.