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An assessment of Arctic charr stocks in Voisey Bay, Anaktalik Bay and Okak Bay, northern Labrador

by

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Abstract

Catch and effort data from Arctic charr fisheries in Voisey Bay, Anaktalik Bay and Okak Bay are presented. Catch per unit effort in Voisey Bay and Anaktalik Bay increased substantially in 1981 while showing a slight decrease in Okak Bay. Voisey Bay and Anaktalik Bay have been under quota management since 1979 with a TAC in 1981 of 16.1 and 8.7 t respectively. A TAC of 27.3 t was established on Okak charr stocks in 1981. Stock projections for 1982 indicated an $F_{0.1}$ yield of 15.2-21.4 t for Voisey Bay, 10.3 t for Anaktalik Bay and 21.3-38.0 t for Okak Bay.

Résumé

Nous présentons dans le texte qui suit les statistiques de prises et d'effort dans les pêcheries d'omble arctique des baies Voisey, Anaktalik et Okak. Les prises par unité d'effort augmentèrent de façon substantielle en 1981 dans les baies Voisey et Anaktalik, alors que dans la baie Okak elles diminuèrent légèrement. Depuis 1979, les baies Voisey et Anaktalik sont soumises à des contingents, le TPA de 1981 étant de 16,1 et 8,7 t respectivement. On a fixé à 27,3 t le TPA de 1981 pour les stocks d'ombles chevaliers de la baie Okak . Les projections pour 1982 indiquent un rendement à $F_{0,1}$ de 15,2-21,4 t dans la baie Voisey, 10,3 t dans la baie Anaktalik et 21,3-38,0 t dans la baie Okak.

Introduction

Catch statistics from the Arctic charr fishery in Voisey Bay, Anaktalik Bay and Okak Bay (Fig. 1) have been available since 1974. The largest catches from Voisey Bay and Okak Bay were in 1978 when 33.6 t and 36.1 t were landed in each area respectively. Highest recorded landings from Anaktalik Bay were 21.6 mt in 1977. Since 1979 Voisey and Anaktalik charr stocks have been under quota regulation (Dempson 1981). The total allowable catch (TAC) for 1979 and 1980 was 22.5 t in Voisey Bay and 21.5 t in Anaktalik Bay. A TAC of 27.3 t was established on the Okak Arctic charr stock in 1981 while TAC in the Voisey and Anaktalik areas was reduced to 16.1 and 8.7 t respectively.

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

Stock Assessment

Catch and effort data from Voisey Bay, Anaktalik Bay and Okak Bay are summarized in Table 1 for 1974-1981. The TAC was taken in Voisey and Anaktalik Bay only. Effort has remained relatively constant in Voisey Bay during the past three years, however, catch per unit effort has varied considerably. Catch per unit effort increased substantially in both the Voisey and Anaktalik areas in 1981 but decreased slightly in Okak Bay. Fishing effort in the Okak area during the past two years is about half the level fished from 1977-1979 when catches were approximately the same as the TAC for 1981.

The proportion of charr over 2.3 kg (gutted head-on weight) in the commercial catch has declined since the latter 1970's but has changed little since 1980.

Numbers at age were available for Voisey and Okak landings since 1977 (Table 2 and 4). For the Anaktalik area only two years of consecutive sampling are available, 1980 and 1981 (Table 3). Data were derived from age-length keys and length frequencies then extrapolated to the total catch.

Weights at age were calculated from commercial samples and converted from gutted head on to whole condition using the conversion factor 1.24 (Coady and Best 1976) (Table 5).

Partial recruitment rates for Voisey Bay and Okak Bay were calculated from a maxtrix of fishing mortality rates generated from a cohort analysis run on the 1977-1981 data. F values were averaged at age for 1977-1979 only (Table 5). Partial recruitment rates were not available for Anaktalik Bay Arctic charr.

Yield per recruit was calculated by the method of Thompson and Bell (Ricker 1975; Rivard 1980) using partial recruitment values and mean weight at age for Voisey Bay and Okak Bay stocks. Natural mortality was assumed constant at 0.2. $F_{\bar{0}.1}$ was 0.414 and 0.431 for Voisey Bay and Okak Bay respectively.

The Beverton and Holt yield per recruit model was applied to the Anaktalik Bay charr stock using parameters listed in Table 3. $F_{\bar{0}.1}$ was calculated to be 0.365.

Total mortality (Z) calculated using the Paloheimo method indicated average values of 0.72 for Voisey Bay and 0.67 for Okak Bay (Table 2 and 4). Total mortality calculted for Voisey Bay during the past two years (Z = 0.65 and 0.39) was comparatively lower than earlier values when catches were substantially higher. The most recent value for Okak Bay, Z = 0.88, appears much too high in view of the reduced landings and effort in this area during the past three years. Thus, the relationship between effort and mortality is questionable for the Okak data.

Owing to the lack of consecutive sampling information a catch curve was used to obtain a value for total mortality on Anaktalik Bay charr stocks (Fig. 2). The total mortality of 0.62 (95% C.L. = 0.55 - 0.69), however, refers to the average mortality in effect for 1974-75 to 1979-80. A catch curve also was used to obtain a mortality rate on Okak Bay Arctic charr. The rate of 0.55 (95% C.L. = 0.38 - 0.72) similarly refers to the average mortality in effect from 1974-1980.

Stock projections for Voisey Bay were performed using a range of terminal fishing mortality rates from 0.3 to 0.5. Trial runs of cohort analysis generated population numbers for 1981 which were used in conjunction with 1981 catch information to project for 1982. Although only 5 years of data were available regressions of F on effort produced r^2 values of 0.95, 0.97, and 0.97 for terminal F values of 0.3, 0.4 and 0.5 respectively (Table 6). Recruitment estimtes for the projections were derived from the geometric mean of the age 6 population numbers for the years 1977 and 1978.

Fishing at the $F_{\hat{0}.1}$ level ($F_{\hat{0}.1}$ = 0.414) indicates a catch of 11.6 - 21.4 t is available in 1982.

Stock projections for Okak Bay were also performed using a range of terminal fishing mortality values from 0.3 to 0.5. Population numbers for 1981 were obtained from preliminary runs of cohort analysis. Regressions of F on effort yielded low r^2 values ranging from 0.65 (F_T = 0.3) to 0.31 (F_T = 0.5) (Table 7). Recruitment estimates were derived from the geometric mean of the age 6 population numbers for the years 1977 and 1978. Fishing at the $F_{\hat{0}.1}$ level ($F_{\hat{0}.1}$ = 0.431) indicates a catch of 8.7 - 15.4 t is available for 1982.

Average total mortality on the Anaktalik Bay stock from 1974-75 to 1979-80 was Z = 0.62 (F = 0.42). If this rate is assumed constant for 1981 then the calculated $F_{\hat{0}.1}$ level would reduce the total allowable catch to 7958 kg in 1982.

Discussion

Catch per unit effort information indicated that the abundance of charr in Voisey Bay and Anaktalik Bay was substantially higher than in the previous year whereas C/E in Okak Bay declined by 10%. This situation in Okak Bay is similar to that in the Voisey-Anaktalik area in 1980 where it appeared that there was a directed movement into offshore feeding areas by part of the population. Catch per unit effort in the offshore Cutthroat area was comparatively high in relation to other years. The availability of salmon coupled with the abundance of charr in the Cutthroat area was partially responsible for the

decreased fishing effort in Okak Bay during 1981. Also, establishing a quota on the Okak stock in addition to the reduced quotas in the Nain area effectively redistributed fishing effort into the northern areas of Hebron and Saglek.

Voisey Bay and Okak Bay Arctic charr stocks were assessed by cohort analysis using information obtained from the commercial fishery during the past 5 years. Owing to the limited time series of data available projections for 1982 may be questionable particularly for the Okak area where the correlations between fishing effort and mortality were poor.

Average Z for Voisey Bay from 1977-1981 was 0.72 (F = 0.52) however total mortality from 1974-1981 was 0.52 (F = 0.32) reflecting the decreased catches in comparison with those from 1977-1978. The projected available catch for 1982 at F = 0.3 was 21.4 t while at F= 0.4 the available harvest was 15.2 t (Table 8). Present TAC in Voisey Bay is 16.1 t and it is recommended that the TAC for 1982 remain at this level.

The projected TAC for Okak Bay in 1982 was 15.4 t (F = 0.3) (Table 9). This figure seems unreasonable low considering that out of a TAC of 27.3 t for 1981 only 11.0 t were taken. Total mortality for the last year (Z = 0.88) also appears too high. The low catch in 1981 appears to have had a considerable effect in reducing TAC for 1982.

In order to examine the effects of an inflated catch for Okak Bay in 1981 a series of trial cohort analyses were again run but this time assuming the TAC had been taken. Numbers at age for 1981 were obtained by extrapolating the 1981 sampling information to the TAC instead of the actual catch. Projections for 1982 were then run based upon a new series of numbers at age derived from the trial cohort analyses. Results of projections with terminal fishing mortality at 0.3 - 0.6 are summarized in Table 10. Projected catch for 1982 now ranges from 18.1 - 38.0 t. An estimate of what fishing mortality would have been had the TAC been taken is not available. Nevertheless it is evident that had effort and subsequently catch been higher in 1981 the projected available catch for 1982 would be correspondingly greater. Thus until additional information is available it is recommended that the 1982 TAC for Okak Bay remain at 27.3 t.

Lack of consecutive age sampling information on the Anaktalik Bay stock necessitated the use of a catch curve to obtained an estimate of total mortality. This estimate indicated an average total mortality of 0.62 for the period 1974-75 to 1979-80. By assuming that this rate is constant for 1981 and applying the $F_{\hat{0}.1}$ level of fishing mortality to the 1981, then the estimate TAC for 1982 would be 7958 kg.

With the reduction in landings and effort in the Anaktalik area during the past two years fishing mortality has undoubtedly declined as well. Thus a further reduction in the Anaktalik TAC is unwarranted particularly in light of the substantial increase in catch per unit effort in 1981.

A better estimate of the 1982 TAC is obtained by applying the $F_{\hat{0}.1}$ level of fishing mortality to the average catch from 1974-75 to 1979-80 - the period for which the estimated total mortality was calculated. In this case TAC for the Anaktalik area should be 10,263 kg in 1982. Owing to the lack of consecutive sampling information, it is recommended that the 1982 TAC for Anaktalik Bay remain at the 1981 level of 8.7 t.

References

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Table 1. Summary of catch (kg round), effort, and size composition statistics from Voisey Bay, Anaktalik Bay, Okak Bay and Cutthroat area, 1974-1981. Size composition expressed as percentage of landings greater than 2.3 kg (gutted head on).

SUMMARY OF CATCH, EFFORT, AND SIZE COMPOSITION

YEAR	1974	1975	1976	1977	1978	1979	1980	1981
VOISEY BAY								
QUOTAS						22500	22500	16100
CATCH (KG)	20045	238	12232	22485	33585	21877	11553	16321
EFFORT (MAN-WEEKS)	64	2	45	56	85	59	52	53
C/E (KG)	313	119	272	402	395	371	222	308
%/% > 2.3KG			42.0	35.0	34.0	32.0	17.0	16.0
ANAKTALIK BAY								
QUOTAS						21500	21500	8660
CATCH (KG)	7821	2548	14670	21598	13067	14907	8038	9157
EFFORT (MAN-WEEKS)	28	10	45	63	55	76	53	32
C/E (KG)	279	255	326	343	238	196	152	286
%/% > 2.3KG			36.0	38.0	27.0	20.0	12.0	10.0
OKAK BAY								
QUOTAS								27300
CATCH (KG)	34250	2354	17812	27592	36125	26168	17430	11046
EFFORT (MAN-WEEKS)	105	15	52	107	104	123	65	46
C/E (KG)	326	157	343	258	347	213	268	240
%/% > 2.3KG			29.0	26.0	18.0	11.0	8.0	10.0
CUTTHROAT								
CATCH (KG)	12641	2703	7526	15488	41146	17793	32390	37259
EFFORT (MAN-WEEKS)	95	47	103	130	267	161	205	172
C/E (KG)	133	58	73	119	154	111	158	217
%/% > 2.3KG			17.0	25.0	25.0	12.0	12.0	13.0

Table 2. Estimated numbers at age and catch per unit effort at age for Voisey Bay Arctic charr, 1977-81.

Age	1977	1978	1979	1980	1981
6	290	548	242	74	49
7	1902	3876	2506	374	645
8	3675	4761	4042	1880	1711
9	1902	2065	1724	2294	3139
10	1128	1096	593	753	1543
11	548	1011	323	292	617
12	354	337	108	146	267
13	193	337	81	93	28
14	97	169	27	18	
15		84			
16		42			5
17					
18					6
19				4	
Total	10,089	14,326	9,646	5942	8010
Effort	56	85	59	52	53
		CATCH PER UNIT EFFORT AT AGE			
6	5.2	6.0	4.1	1.4	0.9
7	34.0	45.6	42.5	7.2	12.2
8	65.6	56.0	68.5	36.2	32.3
9	34.0	24.3	29.2	44.1	59.2
10	20.1	12.9	10.1	14.5	29.1
11	9.8	11.9	5.5	5.6	11.6
12	6.3	4.0	1.8	2.8	5.0
13	3.4	4.0	1.4	1.8	0.5
14	1.7	2.0	0.5	0.3	(0.2)
$\frac{\Sigma\ 10\text{-}14}{\Sigma\ 9\text{-}13}$	=	$\frac{34.8}{73.6}$ =	$\frac{19.3}{57.1}$ =	$\frac{25.0}{48.0}$ =	$\frac{46.4}{68.8}$
$\bar{Z}$	=	0.75 =	1.08 =	0.65 =	0.39
Average $\bar{Z}$	=	0.72			

Table 3. Estimated numbers at age for Anaktalik Bay 1980-81, and summary of paramaters used in the yield per recruit analysis.

	Year	
	1980	1981
6	66	14
7	177	395
8	714	879
9	1896	1799
10	973	1173
11	488	608
12	252	237
13	229	75
14	132	43
15	23	-
16		8
Total	4950	5231
Effort	53	32

YIELD PER RECRUIT PARAMETERS

Woo	-	asymptatic weight (kg)	2.8
K	-	growth coefficient	0.398
to	-	theoretical age for $l_t = 0$	2.43
tp	-	age at recruitment	6.0
tp'	-	mean selection age	7.0
tλ	-	age at last significant contribution to the fishery	14.0

$F_{0.1} = 0.365$

Table 4. Estimated numbers at age and catch per unit effort at age for Okak Bay Arctic charr, 1977-81.

Age	1977	1978	1979	1980	1981
6	84	102	-	26	39
7	84	1228	1227	353	419
8	251	4040	4546	2126	791
9	752	2762	3067	3305	1733
10	1839	2813	2020	2517	1693
11	2173	1892	1191	867	922
12	3595	1944	541	391	197
13	1505	1381	469	129	121
14	1087	256	325	162	60
15	920	511	253	219	51
16	501	153	216	-	-
17	84	205	144	-	34
18	84	51	72	-	-
19	84	51	36	-	-
20			36	-	-
Total	13,043	17,389	14,143	10,095	6060
Effort	107	104	123	65	46
		CATCH PER UNIT EFFORT AT AGE			
6	0.8	1.0	-	0.4	0.8
7	0.8	11.8	10.0	5.4	6.4
8	2.3	38.8	37.0	32.7	12.2
9	7.0	26.6	24.9	50.8	26.7
10	17.2	27.0	16.4	38.7	26.0
11	20.3	18.2	9.7	13.3	14.2
12	33.6	18.7	4.4	6.0	3.0
13	14.1	13.3	3.8	2.0	1.9
14	10.2	2.5	2.6	2.5	0.9
15	8.6	4.9	2.1	3.4	0.8

$\frac{\Sigma 11\text{-}15}{10\text{-}14} = \frac{57.6}{95.4}$ $\frac{\Sigma 10\text{-}15}{\Sigma\ 9\text{-}14} = \frac{39.0}{106.3}$ $\frac{\Sigma 11\text{-}15}{\Sigma 10\text{-}14} = \frac{27.2}{36.9}$ $\frac{\Sigma 10\text{-}15}{\Sigma\ 9\text{-}14} = \frac{46.8}{113.3}$

$\bar{Z} = 0.50$ $\bar{Z} = 1.00$ $\bar{Z} = 0.30$ $\bar{Z} = 0.88$

Average $\bar{Z} = 0.67$

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

Age	Voisey		Okak	
	Weight (kg-round)	Partial recruitment	Weight (kg-round)	Partial recruitment
6	1.29	0.03	1.26	0.01
7	1.64	0.28	1.43	0.10
8	1.94	0.84	1.64	0.40
9	2.36	0.94	1.79	0.76
10	2.61	1.00	1.95	0.98
11	2.81	1.00	2.03	1.0
12	3.06	1.00	2.29	1.0
13	3.18	1.00	2.38	1.0
14	3.50	1.00	2.24	1.0
15			2.36	1.0
16			2.28	1.0
17			2.09	1.0

Table 6. Regressions of average F (ages 9-14) on effort for Voisey Bay, 1977-81.

Year	Effort (man-weeks)	F_T 0.3	0.4	0.5
1977	56	0.525	0.536	0.544
1978	85	1.118	1.162	1.192
1979	59	0.397	0.455	0.498
1980	52	0.282	0.348	0.405
1981	53	0.300	0.400	0.500
r^2 (1977-80)		0.95	0.97	0.98
r^2 (1977-81)		0.95	0.97	0.97

Table 7. Regressions of average F (ages 11-17) on effort for Okak Bay, 1977-81.

Year	Effort (man-weeks)	F_T 0.3	0.4	0.5
1977	107	0.718	0.733	0.743
1978	104	0.879	0.915	0.939
1979	123	0.872	0.954	1.013
1980	65	0.758	0.902	1.018
1981	46	0.300	0.400	0.500
r^2 (1977-80)		0.23	0.00	0.07
r^2 (1977-81)		0.65	0.48	0.31

Table 8. Projection to 1982 from cohort analyses run at (A) F=0.3, (B) F=0.4, and (C) F=0.5. Data for Voisey Bay.

A.

POPULATION NUMBERS

	1981	1982
6	6033	32065
7	9244	4895
8	8499	6986
9	14116	5419
10	6536	8735
11	2614	3964
12	1131	1586
13	119	686
14	18	72
6+	48310	64409
7+	42277	32344
8+	33033	27449
9+	24534	20462

CATCH NUMBERS

	1981	1982
6	49	359
7	645	487
8	1711	1871
9	3139	1594
10	1543	2702
11	617	1226
12	267	491
13	28	212
14	11	22
6+	8010	8963
7+	7961	8605
8+	7316	8118
9+	5605	6247

CATCH BIOMASS

	1981	1982
6	63	463
7	1058	798
8	3319	3629
9	7408	3761
10	4027	7053
11	1734	3446
12	817	1501
13	89	675
14	39	78
6+	18554	21404
7+	18491	20941
8+	17433	20143
9+	14114	16514

B.

POPULATION NUMBERS

	1981	1982
6	4531	27557
7	6819	3665
8	6513	5001
9	10886	3795
10	5130	6095
11	2051	2815
12	888	1126
13	93	487
14	16	51
6+	36927	50594
7+	32396	23037
8+	25577	19371
9+	19064	14370

CATCH NUMBERS

	1981	1982
6	49	308
7	645	364
8	1711	1339
9	3139	1116
10	1543	1886
11	617	871
12	267	348
13	28	151
14	11	16
6+	8010	6399
7+	7961	6091
8+	7316	5727
9+	5605	4388

CATCH BIOMASS

	1981	1982
6	63	398
7	1058	597
8	3319	2598
9	7408	2634
10	4027	4921
11	1734	2448
12	817	1066
13	89	480
14	39	55
6+	18554	15197
7+	18491	14799
8+	17433	14201
9+	14114	11603

C.

POPULATION NUMBERS

	1981	1982
6	3630	25028
7	5435	2928
8	5466	3869
9	9164	2940
10	4291	4689
11	1716	2131
12	743	852
13	78	369
14	15	39
6+	30538	42845
7+	26908	17817
8+	21473	14889
9+	16007	11020

CATCH NUMBERS

	1981	1982
6	49	280
7	645	291
8	1711	1036
9	3139	865
10	1543	1451
11	617	659
12	267	264
13	28	114
14	11	12
6+	8010	4971
7+	7961	4691
8+	7316	4400
9+	5605	3364

CATCH BIOMASS

	1981	1982
6	63	361
7	1058	477
8	3319	2010
9	7408	2041
10	4027	3786
11	1734	1852
12	817	807
13	89	363
14	39	42
6+	18554	11739
7+	18491	11378
8+	17433	10901
9+	14114	8891

Table 9. Projection to 1982 from cohort analyses run at (A) F=0.3, (B)F=0.4, and (C) F=0.5. Data for Okak Bay.

A.

	POPULATION NUMBERS		CATCH NUMBERS		CATCH BIOMASS	
	1981	1982	1981	1982	1981	1982
6	14364	26272	39	104	49	131
7	15634	11725	419	449	599	642
8	7702	12422	791	1788	1297	2932
9	9271	3593	1733	1424	3102	2548
10	7385	6031	1693	1896	3301	3698
11	3905	4524	922	1446	1872	2936
12	834	2368	197	757	451	1734
13	513	506	121	162	288	385
14	254	311	60	99	134	223
15	216	154	51	49	120	116
16	4	131	1	42	2	95
17	57	2	34	1	71	2
6+	60139	70540	6061	8217	11288	15441
7+	45775	43768	6022	8113	11239	15310
8+	30141	32043	5603	7664	10640	14668
9+	22439	19621	4812	5876	9342	11736

B.

	POPULATION NUMBERS		CATCH NUMBERS		CATCH BIOMASS	
	1981	1982	1981	1982	1981	1982
6	10778	23132	39	90	49	114
7	11782	8789	419	336	599	481
8	5887	9268	791	1334	1297	2188
9	7341	4107	1733	1045	3102	1871
10	5747	4453	1693	1400	3301	2730
11	3065	3186	922	1018	1872	2067
12	655	1682	197	538	451	1231
13	402	359	121	115	288	273
14	199	221	60	70	134	158
15	170	109	51	35	120	82
16	3	93	1	30	2	68
17	51	2	34	0	71	1
6+	46080	55401	6061	6013	11288	11265
7+	35302	32269	6022	5922	11239	11151
8+	23520	23480	5603	5586	10640	10670
9+	17633	14212	4812	4252	9342	8483

C.

	POPULATION NUMBERS		CATCH NUMBERS		CATCH BIOMASS	
	1981	1982	1981	1982	1981	1982
6	8627	20754	39	81	49	102
7	9471	7028	419	269	599	385
8	4799	7376	791	1062	1297	1741
9	6010	3217	1733	819	3102	1466
10	4783	3365	1693	1058	3301	2063
11	2564	2399	922	767	1872	1557
12	548	1273	197	407	451	932
13	337	272	121	87	288	207
14	167	168	60	54	134	120
15	142	83	51	27	120	63
16	3	71	1	23	2	51
17	480	2	34	0	71	1
6+	37931	46007	6061	4652	11288	8687
7+	29304	25253	6022	4571	11239	8585
8+	19833	18225	5603	4302	10640	8201
9+	15034	10849	4812	3241	9342	6459

Table 10. Projection to 1982 from cohort analyses run at (A) F=0.3, (B) F=0.4, (C) F=0.5, and (D) F=0.6. Data for Okak Bay assuming TAC taken in 1981.

A.

	POPULATION NUMBERS	
	1981	1982
6	35358	42465
7	38582	28862
8	19018	30655
9	22895	13810
10	18237	14893
11	9645	11173
12	2059	5850
13	1267	1249
14	627	769
15	534	380
16	8	324
17	140	5
6+	148370	150434
7+	113012	107969
8+	74430	79107
9+	55412	48452

	CATCH NUMBERS	
	1981	1982
6	96	166
7	1034	1104
8	1953	4412
9	4280	3515
10	4181	4683
11	2277	3571
12	486	1870
13	299	399
14	148	246
15	126	122
16	2	104
17	84	2
6+	14966	20193
7+	14870	20027
8+	13836	18923
9+	11883	14511

	CATCH BIOMASS	
	1981	1982
6	121	209
7	1479	1579
8	3203	7236
9	7661	6292
10	8153	9132
11	4622	7249
12	1113	4282
13	712	950
14	332	550
15	297	287
16	5	236
17	176	3
6+	27873	38006
7+	27752	37797
8+	26273	36218
9+	23070	28982

B.

	POPULATION NUMBERS	
	1981	1982
6	26531	34288
7	29076	21635
8	14535	22872
9	18129	10141
10	14192	10996
11	7570	7867
12	1616	4155
13	994	887
14	492	546
15	419	270
16	7	230
17	126	4
6+	113687	113889
7+	87156	79601
8+	58080	57966
9+	43545	35094

	CATCH NUMBERS	
	1981	1982
6	96	134
7	1034	828
8	1953	3292
9	4280	2581
10	4181	3458
11	2277	2514
12	486	1328
13	299	283
14	148	174
15	126	86
16	2	74
17	84	1
6+	14966	14754
7+	14870	14620
8+	13836	13792
9+	11883	10500

	CATCH BIOMASS	
	1981	1982
6	121	168
7	1479	1184
8	3203	5399
9	7661	4620
10	8153	6742
11	4622	5104
12	1113	3041
13	712	675
14	332	391
15	297	204
16	5	168
17	176	3
6+	27873	27698
7+	27752	27530
8+	26273	26346
9+	23070	20947

C.

	POPULATION NUMBERS	
	1981	1982
6	21235	29143
7	23373	17299
8	11848	18203
9	14843	7942
10	11812	8310
11	6332	5925
12	1352	3144
13	832	672
14	412	413
15	350	205
16	6	174
17	118	3
6+	92513	91433
7+	71278	62290
8+	47905	44990
9+	36057	26788

	CATCH NUMBERS	
	1981	1982
6	96	114
7	1034	662
8	1953	2620
9	4280	2022
10	4181	2613
11	2277	1894
12	486	1005
13	299	215
14	148	132
15	126	65
16	2	56
17	84	1
6+	14966	11398
7+	14870	11284
8+	13836	10622
9+	11883	8002

	CATCH BIOMASS	
	1981	1982
6	121	143
7	1479	946
8	3203	4297
9	7661	3619
10	8153	5096
11	4622	3844
12	1113	2301
13	712	511
14	332	296
15	297	154
16	5	127
17	176	2
6+	27873	21336
7+	27752	21193
8+	26273	20247
9+	23070	15950

Table 10 Cont'd. Projection to 1982 from cohort analyses run at (A) F=0.3, (B) F=0.4, (C) F=0.5, and (D) F=0.6. Data for Okak Bay assuming TAC taken in 1981.

D.

	POPULATION NUMBERS		CATCH NUMBERS		CATCH BIOMASS	
	1981	1982	1981	1982	1981	1982
6	17705	25922	96	101	121	127
7	23373	14409	1034	551	1479	788
8	10059	18203	1953	2620	3203	4297
9	12935	6478	4280	1649	7661	2952
10	10382	6753	4181	2123	8153	4141
11	5513	4759	2277	1521	4622	3088
12	1177	2477	486	792	1113	1813
13	724	529	299	169	712	402
14	358	325	148	104	332	233
15	305	161	126	51	297	121
16	5	137	2	44	5	100
17	112	2	84	1	176	2
6+	82648	80156	14966	9727	27873	18064
7+	64943	54234	14870	9626	27752	17937
8+	41570	39825	13836	9074	26273	17148
9+	31511	21622	11883	6454	23070	12851

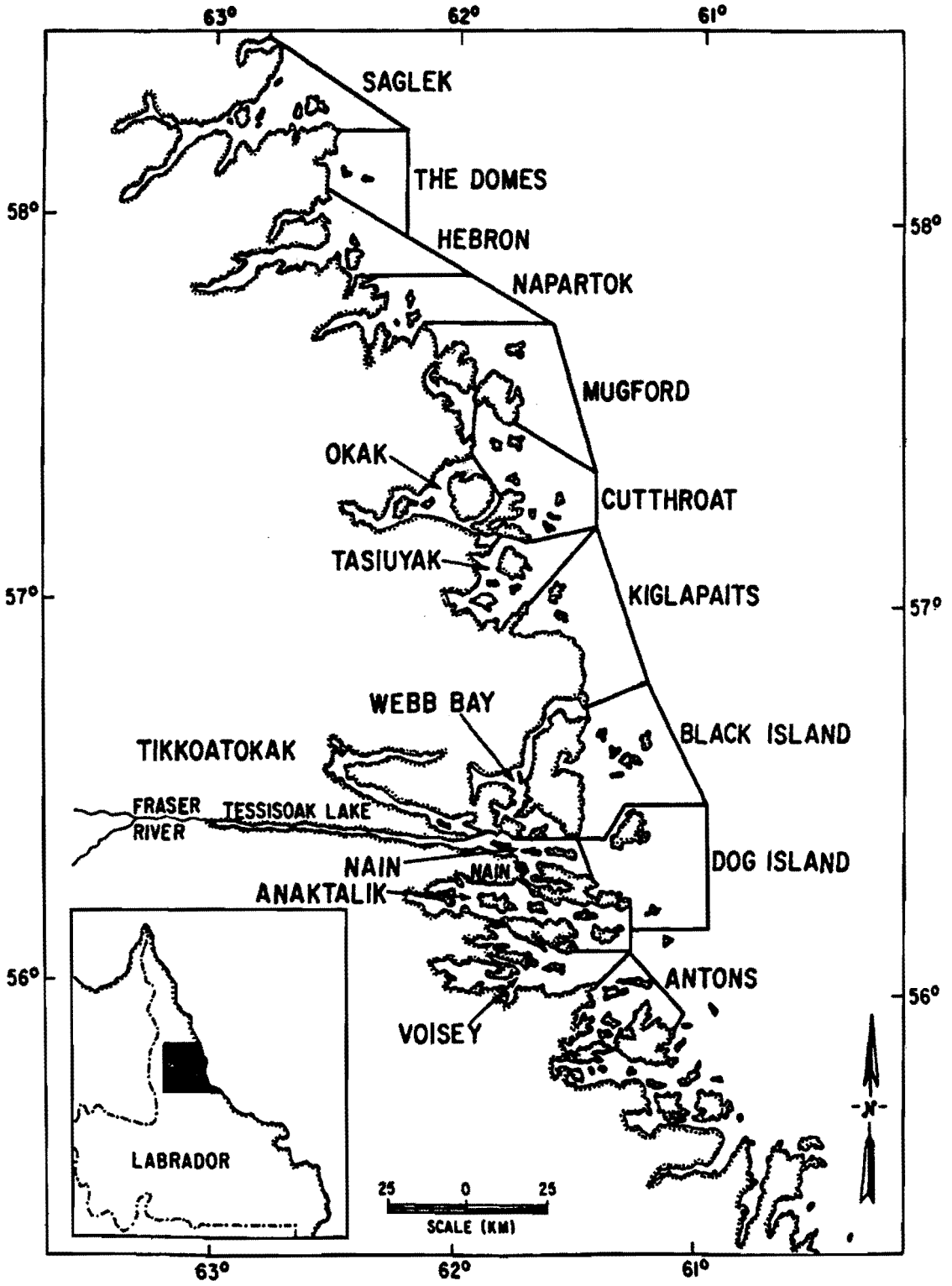

Fig. 1. Coastal breakdown of Nain commercial fishing areas.

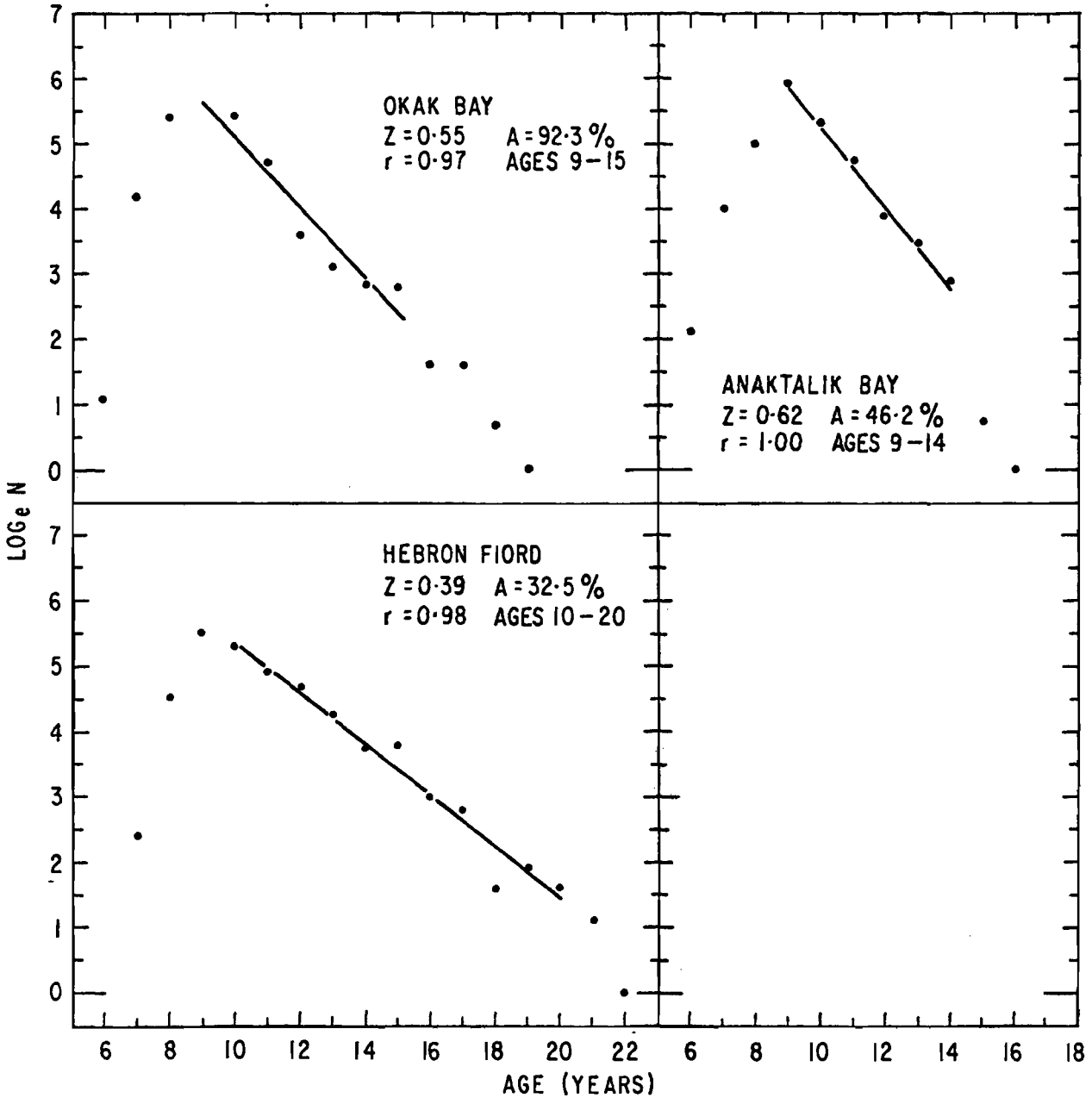

Fig. 2. Catch curves of Arctic charr age frequency distributions from various areas taken by commercial gill nets.