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Summary of catch statistics and change in size
characteristics of northern Labrador Arctic charr populations

by

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ABSTRACT

Catch and effort statistics for the northern Labrador Arctic charr fishery are summarized. Total Labrador charr landings increased by 24% in comparison with the previous year. Catch per unit effort also was higher in 1981. Length distributions in certain areas have remained relatively stable during the past 3 years, however, weight of fish relative to length has declined.

Résumé

Le présent document contient un résumé des statistiques de prises et d'effort dans la pêche de l'omble chevalier du nord du Labrador. Les débarquements totaux de cette espèce au Labrador augmentèrent de 24 % par rapport à ceux de l'année précédente. Les prises par unité d'effort étaient aussi plus élevées en 1981. La distribution des longueurs est demeurée relativement stable dans certaines régions ces trois dernières années. Par contre, le poids des poissons par rapport à la longueur a diminué.

Introduction

Arctic charr have been harvested traditionally along the entire northern Labrador coast (Coady and Best 1976). First records of commercial exports date back to 1860 while continuous records of charr production have been available since 1942. Information from 1949-1966 represent charr exports as opposed to landings since no white or pink fleshed charr were marketed (Coady 1974). Production, however, varied annually with exports for the first ten years averaging 82 t y^{-1} . During the next twenty years (1953-1972) charr production rose to an annual average of 141 t. The general trend for increased production has continued and during the past five years in excess of 200 t y^{-1} have been landed in northern Labrador with 86% caught within the Nain fishing region (Fig. 1). Highest recorded landings were in 1981 when 252 t of anadromous charr were caught.

Catch statistics have been available from individual fishing areas since 1974. These data, in addition to biological information, indicated that several populations were being overexploited. As a result quotas were established on three stocks beginning in 1979 (Dempson 1981).

This report summarizes catch statistics from the northern Labrador Arctic charr fishery and examines changes in size characteristics of several stocks possibly resulting from exploitation.

Materials and Methods

Commercial Landings

Information on commercial landings of Arctic charr from individual fishing areas were obtained from purchase slip records that are filled out by Nain Fish Plant personnel at the time of catch receipt. Information requested consisted of the name of the fisherman, licence number, area where fish were caught (Fig. 2), date, species, weight of fish landed by size category and total number of each species caught. Charr are graded into two size categories; less than and greater than or equal to 2.3 kg gutted head on weight.

Biological Information

Commercial sampling of catches for age and size characteristics have been available from a number of areas since 1977. Fish selected for age analysis are measured for fork length, gutted head on weight and otoliths are removed for subsequent age determination. Length distribution of catches are generally derived from a series of length frequencies obtained throughout the fishing season. Numbers at age were derived from age-length keys and length frequencies and extrapolated to the total catch.

Condition factors (k) were calculated from the equation:

$$k = \frac{W \cdot C}{L^3}$$

where W = gutted head-on weight (kg); L = fork length (cm) and C is a constant which converts k to a value in the range of unity.

Results and Discussion

Figure 1 illustrates the commercial production of Arctic charr from the northern Labrador coast from 1942-1981. Despite large annual variations in catches there has been a general trend for increased production with 1978 and 1981 the highest years on record.

Table 1 summarizes charr production from the Nain and Makkovik fishing regions (Fig. 2) from 1974-1981. The Nain fishing region produced an average of 86% of the total production. During 1981 this value rose to 92%.

A summary of catch and effort statistics for individual fishing regions (Fig. 3) is presented in Table 2. Major charr producing areas during the past four years were: Tikkoatokak Bay, Okak Bay, Cutthroat and Voisey Bay. In comparison with 1980 charr landings increased in Voisey Bay, Anaktalik Bay, Webb Bay, Kiglapaits and Cutthroat areas. Catch per unit effort rose in Voisey Bay, Anaktalik Bay, Dog Island, Tikkoatokak Bay, Kiglapaits and Cutthroat areas.

The most noticeable change in catch statistics has been the decline in proportion of charr over 2.3 kg (gutted head-on) (Table 2). Over the period 1976-1979 the majority of areas had an average of at least 20% of the catch represented by large charr. In 1981 only 5 areas had landings with at least 15% of the landings in excess of 2.3 kg: Webb Bay-27%; Domes-36%; Hebron-34%; Saglek-18%; Voisey Bay-16%.

Figures 4-7 illustrate length-frequency distribution of Arctic charr landings from Voisey, Tikkoatokak and Okak Bay from 1977-1981. During the past three years (1979-1981) length distribution and mean length have remained relatively constant. However, weight of fish relative to length has declined over time in Voisey Bay, Tikkoatokak Bay and Anaktalik Bay. Table 3 summarizes mean condition factors stratified by 5 cm length intervals for Voisey, Anaktalik, Tikkoatokak and Okak Bay charr. Analysis of variance results indicate significant differences between years. In general fish of a given size group weigh less relative to length in 1980-1981 in comparison with earlier years. A similar situation has been observed in an Arctic population where length distribution has remained virtually constant but condition factor has declined over years with decrease in stock size (Johnson 1980).

References

- Coady, L. 1974. The Arctic char fishery of northern Labrador. Prog. Rep. No. 104, Res. Dev. Branch, Nfld. Region. 31 p.
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Johnson, L. 1980. The Arctic charr, Salvelinus alpinus, p. 15-98. In E.K. Balon [ed.]. Charrs, Salmonid Fishes of the Genus Salvelinus. Dr. W. Junk, Publisher. The Hague, Netherlands.

Table 1. Summary of northern Labrador Arctic charr landings (kg round weight) by fishing region, 1974-1981.

	1974	1975	1976	1977	1978	1979	1980	1981
Nain Fishery	120414	44118	134898	186135	213869	175228	167948	231170
%	81	82	90	88	86	82	83	92
Makkovik Fishery	28133	9542	15645	24205	34387	37693	35561	20733
Total	148547	53660	150543	210340	248256	212921	203509	251903

Table 2. Summary of catch (kg round), effort, and size composition statistics for Arctic charr landings from various areas in northern Labrador. Size composition expressed in 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
ANTONS								
CATCH (KG)	9135	3489	3172	2111	4006	19371	8457	7870
EFFORT (MAN-WEEKS)	34	20	6	20	17	63	32	38
C/E (KG)	269	174	529	106	236	307	264	207
0/0 > 2.3KG			21.0	24.0	28.0	22.0	14.0	13.0
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
0/0 > 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
0/0 > 2.3KG			36.0	38.0	27.0	20.0	12.0	10.0
DOG ISLAND								
CATCH (KG)	2659	653	212	2036	385	1436	3045	1516
EFFORT (MAN-WEEKS)	38	40	11	49	25	61	86	37
C/E (KG)	70	16	19	42	15	24	35	41
0/0 > 2.3KG			11.0	9.0	8.0	15.0	11.0	14.0
HAIN BAY								
CATCH (KG)	12461		3119	8460				
EFFORT (MAN-WEEKS)	37		10	28				
C/E (KG)	337		312	302				
0/0 > 2.3KG			16.0	15.0				

SUMMARY OF CATCH, EFFORT, AND SIZE COMPOSITION

YEAR	1974	1975	1976	1977	1978	1979	1980	1981
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
Ø/Ø > 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
Ø/Ø > 2.3KG			17.0	25.0	25.0	12.0	12.0	13.0
MUGFORD								
CATCH (KG)			1970	1375	1147	170	513	
EFFORT (MAN-WEEKS)			15	9	7	2	5	
C/E (KG)			131	153	164	85	103	
Ø/Ø > 2.3KG			30.0	36.0	32.0	16.0	15.0	
NAPARTOK								
CATCH (KG)			28972	28039	8551	2484	752	291
EFFORT (MAN-WEEKS)			124	126	50	33	11	3
C/E (KG)			234	223	171	75	68	97
Ø/Ø > 2.3KG			14.0	22.0	20.0	16.0	13.0	12.0
HEBRON FIORD								
CATCH (KG)				5952			2915	39890
EFFORT (MAN-WEEKS)				37				106
C/E (KG)				161				376
Ø/Ø > 2.3KG				16.0			19.0	34.0

SUMMARY OF CATCH, EFFORT, AND SIZE COMPOSITION

YEAR	1974	1975	1976	1977	1978	1979	1980	1981
-----+-----								
DOMES								
CATCH (KG)								5187
EFFORT (MAN-WEEKS)								19
C/E (KG)								273
Ø/Ø > 2.3KG								36.0
-----+-----								
SAGLEK FIORD								
CATCH (KG)								24712
EFFORT (MAN-WEEKS)								77
C/E (KG)								321
Ø/Ø > 2.3KG								18.0
-----+-----								
MAIN FISHERY								
CATCH (KG)	120414	44118	134898	186135	213869	175228	167948	231170
EFFORT (MAN-WEEKS)	531	309	616	863	966	918	880	914
C/E (KG)	227	143	219	216	221	191	191	253
Ø/Ø > 2.3KG			24.0	25.0	24.0	17.0	12.0	16.0

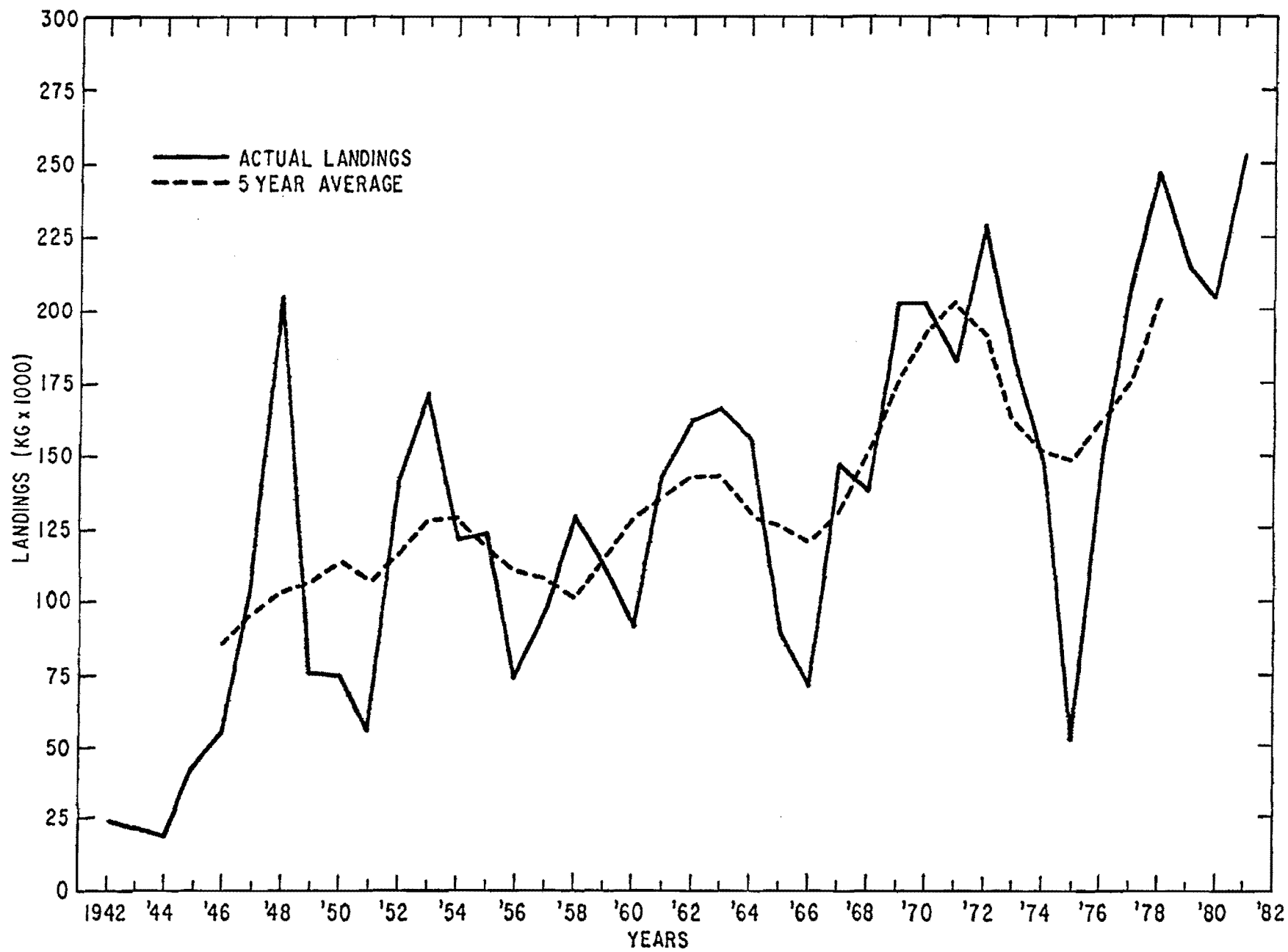
SUMMARY OF CATCH, EFFORT, AND SIZE COMPOSITION

YEAR	1974	1975	1976	1977	1978	1979	1980	1981
TIKKOATOKAK BAY								
QUOTAS						39500	39500	28500
CATCH (KG)	9960	27695	31568	39477	55047	37912	42127	28063
EFFORT (MAN-WEEKS)	28	76	81	94	147	108	130	80
C/E (KG)	356	364	390	420	374	351	324	351
g/g > 2.3KG			19.0	20.0	18.0	14.0	10.0	5.0
WEBB BAY								
CATCH (KG)	580	833	4550	2514	3473	3035	3007	8097
EFFORT (MAN-WEEKS)	1	5	15	21	16	9	8	29
C/E (KG)	580	167	303	120	217	337	376	279
g/g > 2.3KG			21.0	19.0	20.0	39.0	39.0	27.0
BLACK ISLAND								
CATCH (KG)	4264	2101	2725	3387	2961	10630	20047	14409
EFFORT (MAN-WEEKS)	60	62	48	65	81	92	130	94
C/E (KG)	71	34	57	52	37	116	154	153
g/g > 2.3KG			8.0	10.0	14.0	7.0	6.0	7.0
KIGLAPAITS								
CATCH (KG)	5131	1504	6089	5435	12097	17607	16536	21905
EFFORT (MAN-WEEKS)	26	32	59	57	103	120	95	99
C/E (KG)	197	47	103	95	117	147	174	221
g/g > 2.3KG			25.0	25.0	34.0	14.0	18.0	12.0
TASIUYAK								
CATCH (KG)	1467		281		2279	1838	1138	
EFFORT (MAN-WEEKS)	15		2		9	11	8	
C/E (KG)	98		141		253	167	142	
g/g > 2.3KG			21.0		71.0	34.0	14.0	

Table 3. Analysis of variance results comparing condition factor by length group and by year.

Fork length group (mm)	Condition factor						df	F	Significance
	Year								
	1974	1977	1978	1979	1980	1981			
VOISEY BAY									
350-399	-	-	-	-	1.074	0.092	1, 8	7.4	*
400-449	1.333	1.165	1.196	1.009	0.938	1.018	5, 9	5.6	*
450-499	1.144	1.100	1.155	1.042	0.973	1.065	5, 304	17.7	**
500-549	1.175	1.079	1.138	1.036	1.038	1.020	5, 477	26.5	**
550-599	1.175	1.088	1.127	1.044	1.024	0.987	5, 310	22.1	**
600-649	1.202	1.098	1.125	0.967	0.979	1.005	5, 214	25.4	**
650-699	1.228	1.102	1.053	1.045	0.932	0.965	5, 106	9.3	**
700-749	1.044	1.049	1.236	0.967	0.940	0.863	5, 16	7.0	**
ANAKTALIK BAY									
350-399	-	-	-	-	-	0.913			
400-449	-	-	1.134	-	0.947	0.906	2, 61	49.2	**
450-499	-	1.074	1.195	-	0.933	0.934	3, 163	90.2	**
500-549	-	1.067	1.170	-	0.970	0.956	3, 226	58.7	**
550-599	-	1.077	1.157	-	0.975	0.960	3, 211	46.6	**
600-649	-	1.084	1.176	-	0.934	0.986	3, 106	20.8	**
650-699	-	1.088	1.202	-	0.909	1.004	3, 33	12.3	**
700-749	-	1.097	1.211	-	-	0.955	2, 6	2.9	NS
TIKKOATOKAK BAY									
350-399	-	0.874	0.854	-	-	0.848	3, 10	0.8	NS
400-449	1.224	0.958	1.094	1.054	0.888	0.866	5, 25	12.0	**
450-499	1.106	1.005	1.016	1.048	0.937	0.908	5, 489	22.6	**
500-549	1.110	1.025	1.013	1.030	0.964	0.930	5, 424	25.2	**
550-599	1.123	1.009	0.992	1.036	0.983	0.934	5, 242	10.5	**
600-649	1.180	1.010	0.959	1.065	0.998	0.936	5, 103	7.8	**
650-699	-	0.900	0.932	0.985	0.934	0.875	4, 19	0.7	NS
700-749	-	0.889	-	-	0.973	1.040	2, 4	1.7	NS
OKAK BAY									
350-399	-	-	-	-	-	-	-	-	-
400-449	-	-	1.206	1.077	1.097	1.089	3, 210	1.4	NS
450-499	1.136	-	1.125	1.026	1.062	1.067	4, 364	13.0	**
500-549	1.130	1.110	1.073	1.018	1.062	0.997	5, 454	18.9	**
550-599	1.086	1.095	0.994	0.950	1.038	0.970	5, 291	13.8	**
600-649	1.156	1.013	0.969	0.945	1.066	1.025	5, 138	10.4	**
650-699	1.128	0.979	0.909	0.708	0.971	0.997	5, 19	4.9	**
700-749	1.189	0.867	-	1.052	0.964	-	3, 2	3.6	NS

Fig. 1. Summary of northern Labrador Arctic charr production, 1942-1981.



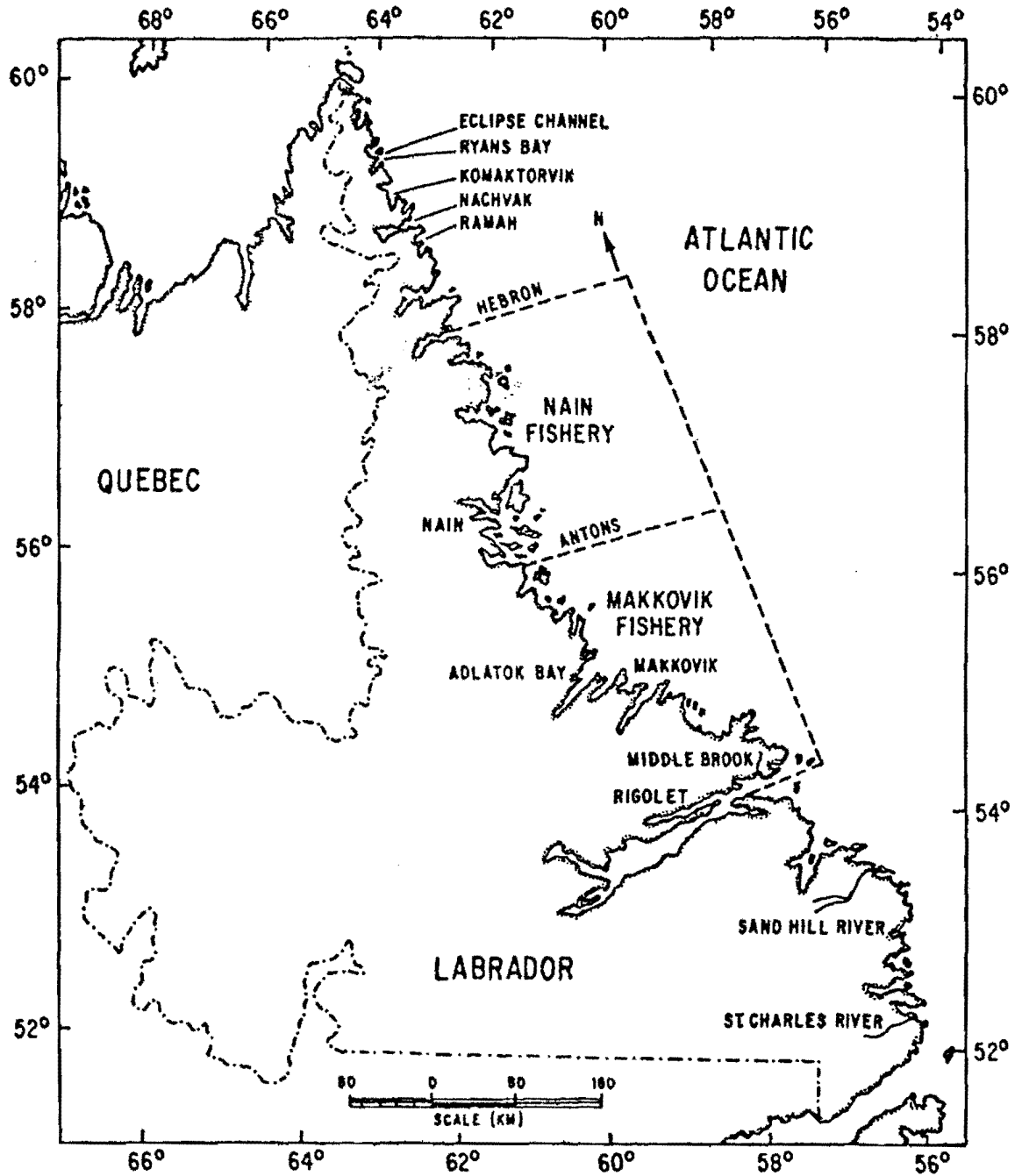


Fig. 2. Extent of the major Arctic charr fishing regions in Labrador.

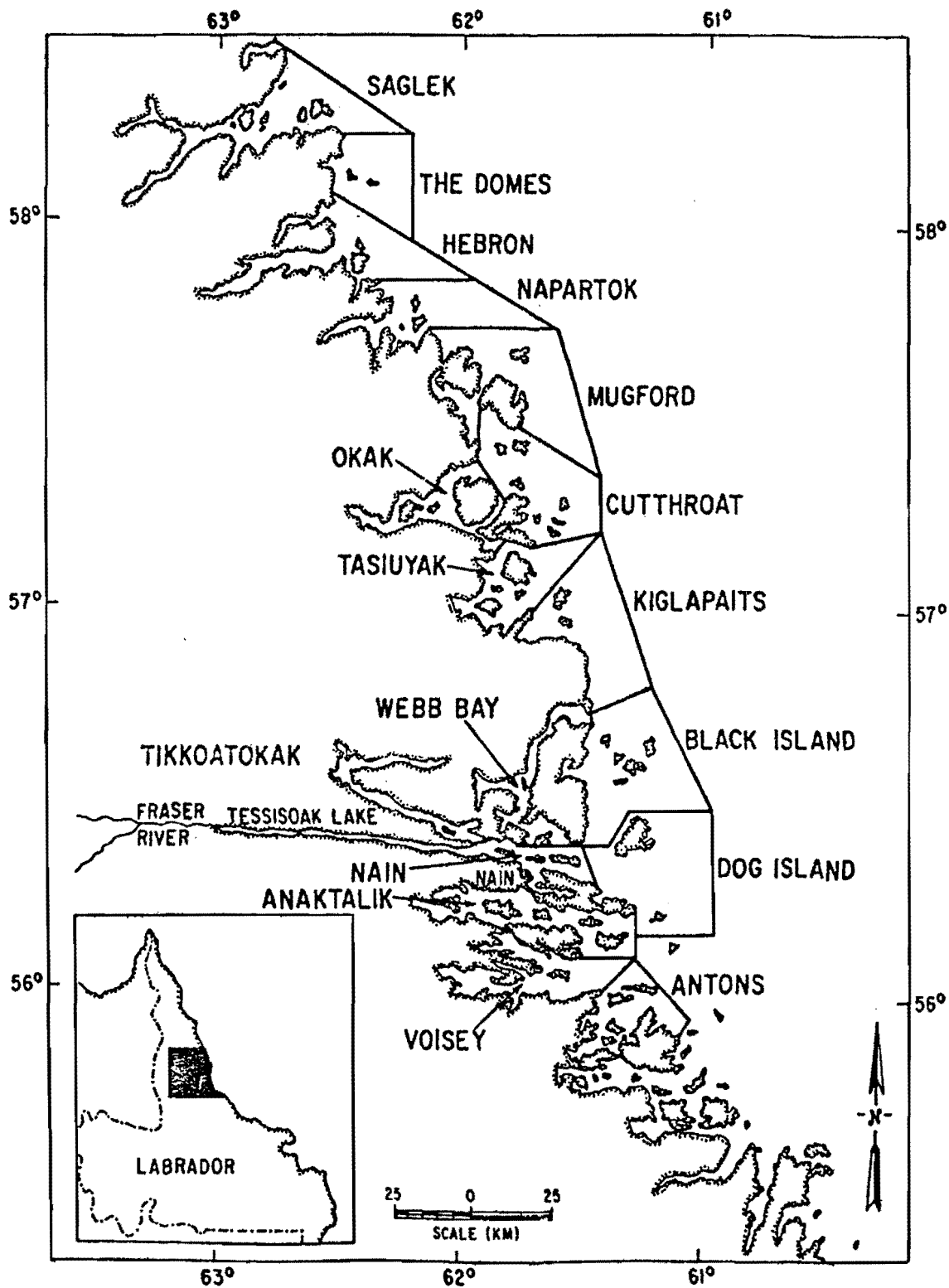


Fig. 3. Coastal breakdown of Nain commercial fishing areas.

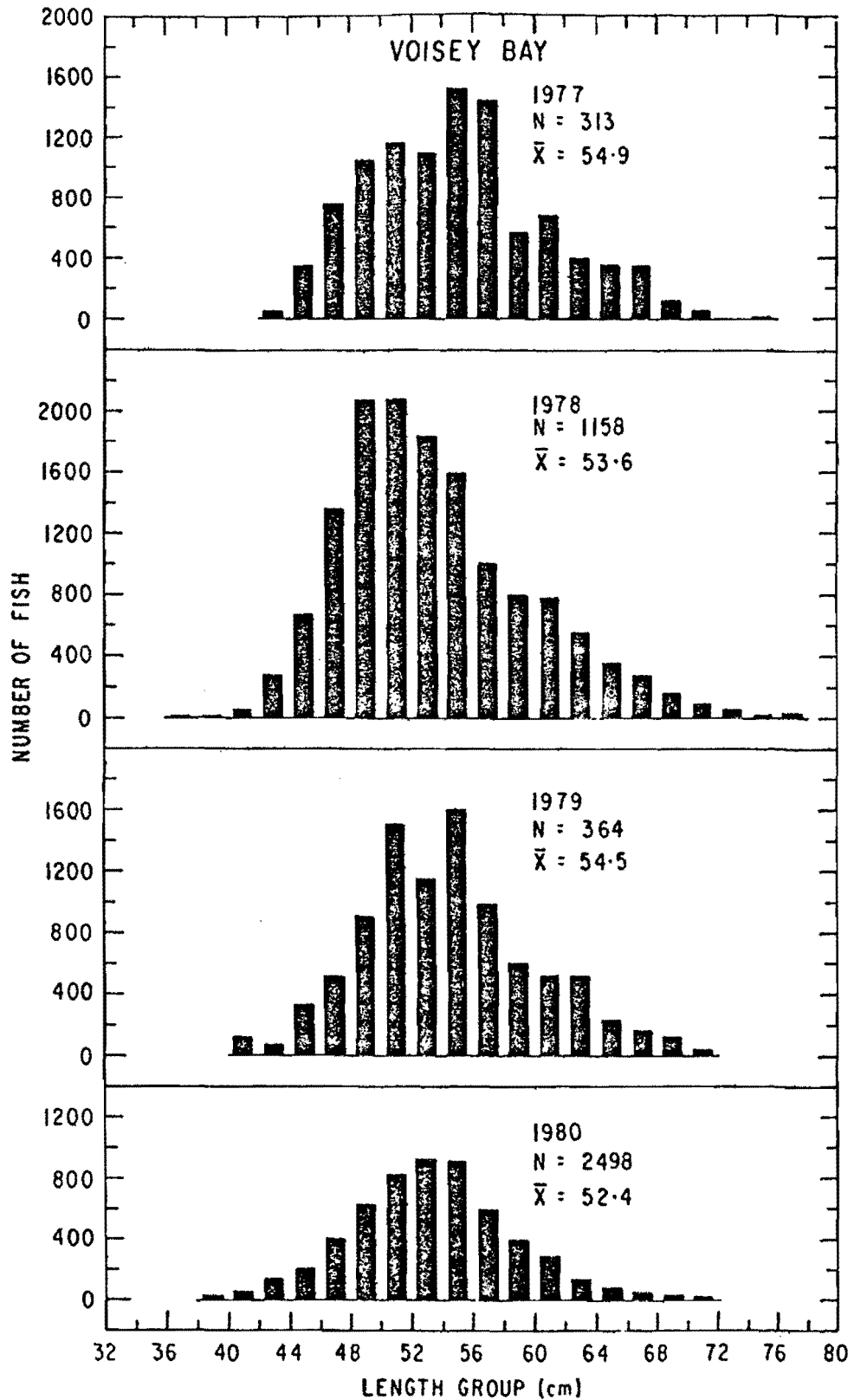


Fig. 4. Length-frequency distribution of Arctic charr landings from Voisey Bay, 1977-1980. Number (N) refers to number sampled for length.

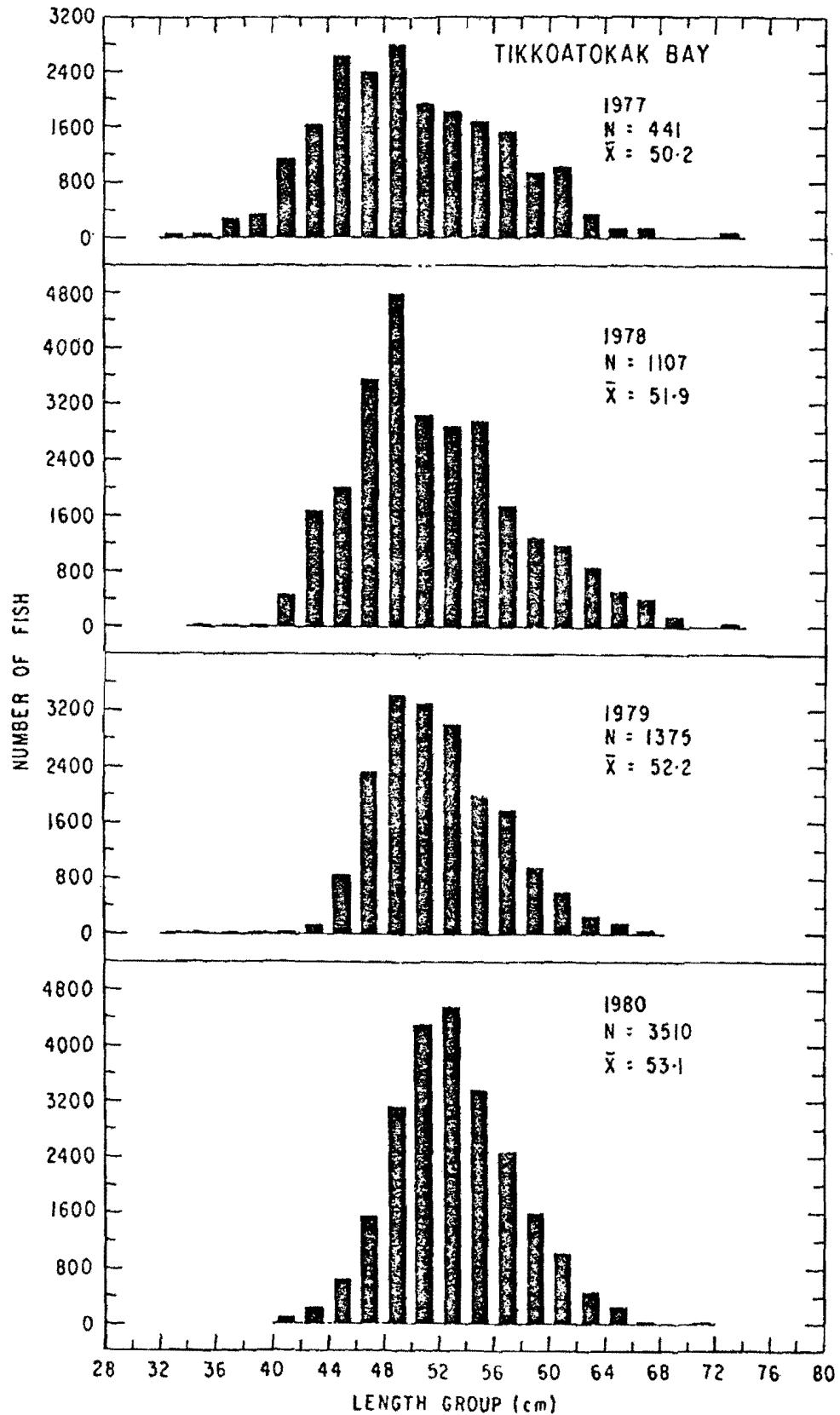


Fig. 5. Length-frequency distribution of Arctic charr landings from Tikkoatokak Bay, 1977-1980. Number (N) refers to number sampled for length.

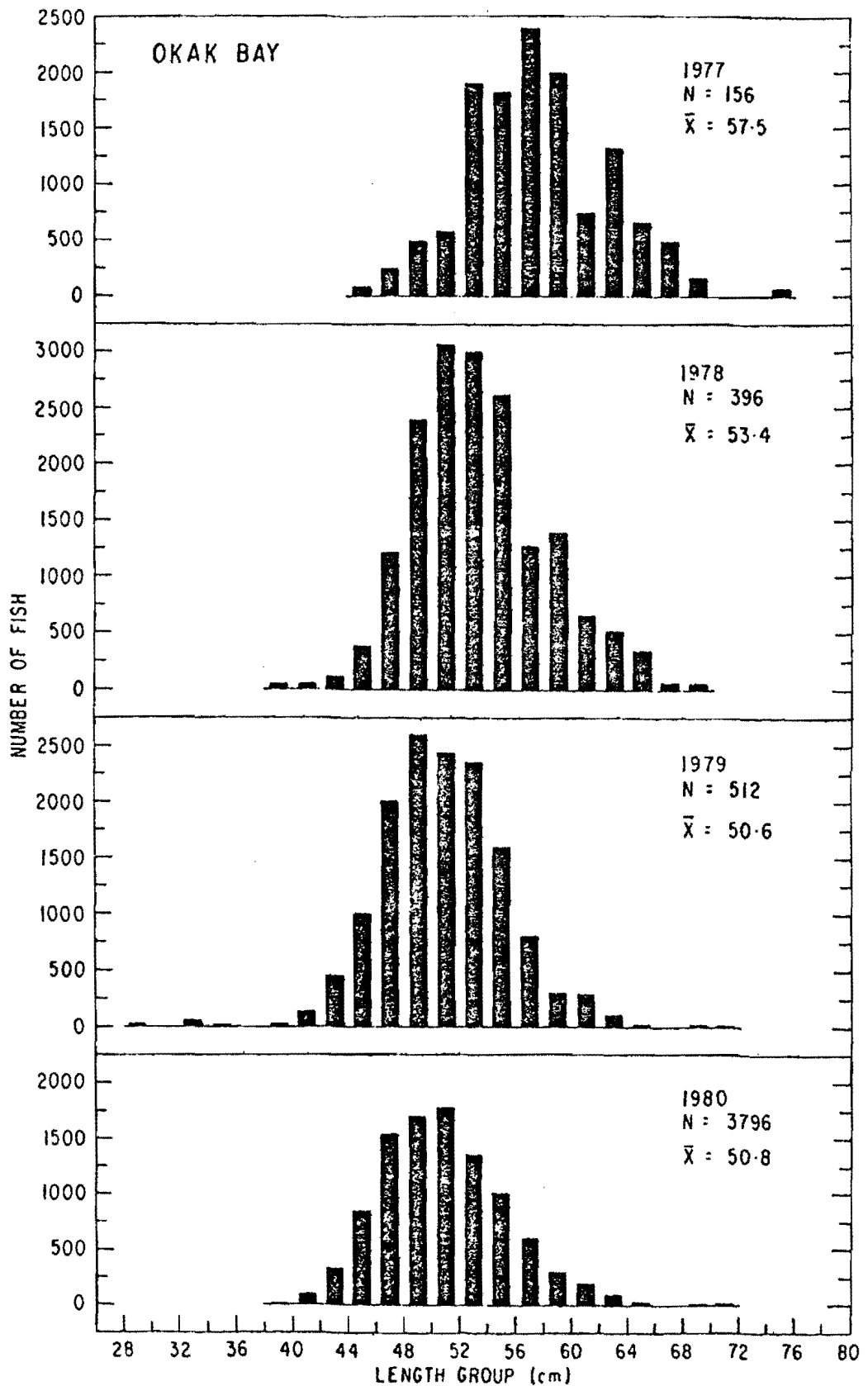


Fig. 6. Length-frequency distribution of Arctic charr landings from Okak Bay, 1977-1980. Number (N) refers to number sampled for length.

Fig. 7. Length-frequency distributions of Arctic charr landings from various areas in northern Labrador, 1981.

