Summary of Catch Statistics for the Northern Labrador Arctic Charr Fishery in 1984

by

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Abstract

Catch and effort statistics for the northern Labrador Arctic charr fishery are summarized. Total northern Labrador landings of 148 t were 17% lower than 1983 landings and 22% below the previous 10-year mean of 190 t. Factors contributing to the decreased catches in 1984 were: reduced effort, possibly because of ice conditions along the northern Labrador coast; overall decreased abundance of charr stocks in the region; and the timing of the fishery in certain areas where information from a counting fence indicated substantial upstream migrations occurred prior to commercial fishing activities.

Résumé

On résume les données statistiques sur les prises et l'effort de pêche touchant l'omble chevalier dans le nord du Labrador. Les débarquements totaux de 148 t pour le nord du Labrador étaient inférieurs de 17 % par rapport aux débarquements de 1983 et de 22 % par rapport à la moyenne des 10 années précédentes (190 t). Les facteurs qui ont contribué à la diminution des prises en 1984 sont : un effort de pêche réduit, peut-être à cause de la condition des glaces sur la côte nord du Labrador; une diminution générale des stocks d'ombles chevaliers dans la région; et le moment de la pêche dans certaines régions (une clôture de dénombrement a indiqué des migrations substantielles en amont avant le début des activités de pêche commerciale).

Introduction

Continuous records of commercial landings of anadromous Arctic charr (Salvelinus alpinus) from the northern Labrador coast are available since 1944. Catch statistics from individual fishing areas within the Nain fishing region (Fig. 1) exist since 1974. From 1977 to 1982 more than 200 t y^{-1} of Arctic charr were caught in northern Labrador. The highest landings on record were 252 t in 1981, with the lowest catch during the past 30 years of 54 t in 1975.

This paper summarizes catch statistics for the 1984 fishery and updates previous reports (Dempson 1982; LeDrew and Dempson 1982; Dempson et al. 1984) which have examined the commercial fishery.

Methods

Information on the commercial landings of Arctic charr was obtained from Economics Branch of the Department of Fisheries and Oceans. Purchase slips, prepared by Economics, were issued to buyers and were filled out at the time of catch receipt. Information requested included the name of the fisherman, licence number, area where fish were caught, number of nets used, weight of fish landed by size category and species, and total number of each species caught.

Landed catches were converted to round weight (in kilograms) using the conversion factor: gutted head-on weight x 1.24 = round fresh weight (Coady and Best 1976) for landings prior to 1984. For 1984 landings, the conversion factor 1.22 was used (Dempson 1984).

Estimates of the area of ice concentration along the Labrador coast north of latitude 55 were updated for 1984 using weekly ice charts produced by the Navy Polar Oceanography Centre, Maryland.

Results and Discussion

Total northern Labrador landings

Figure 2 illustrates the commercial landings of Arctic charr from 1944 to 1984. Also illustrated are the landings from the Nain and Makkovik fishing regions from 1974 to 1984. The fishery has been characterized by large annual fluctuations in catches. Arctic charr landings from the Makkovik region represent about 38% of the total charr and Atlantic salmon (Salmo salar) landings. In the Nain fishery, which produces about 85% of the total northern Labrador Arctic charr production, charr landings represent 83% of the total charr and salmon catch.

Landings of charr in 1984 totalled 148 t and were 17% lower than 1983 landings and 22% below the previous 10-year mean (190 t, 1974-83). Individually, the Nain fishery was 18% below 1983 while Makkovik charr landings were 15% lower than the previous year. Landings in the Nain region of 123 t

were the lowest since 1975 despite the fact that Saglek and Hebron fiords were again fished in 1984.

Effort in the Nain fishery was 9% lower than in 1983 and was the lowest effort expended since 1976. Similarly, catch per unit effort also decreased by 9% and was the lowest recorded since 1975.

Catch and effort data - Nain fishing region area analysis

The Nain fishing region has been subdivided on a geographical basis into a number of specific fishing areas (Fig. 1). Table 2 summarizes catch and effort statistics for these areas for 1974-84.

Landings and effort increased in both Voisey and Anaktalik bays in 1984. Voisey Bay landings were the highest since 1981. This area is closely associated with the Antons area and should probably be considered as one stock unit similar to the Nain Bay-Tikkoatokak Bay region. Catch rates in Voisey Bay were the highest since 1979, while catch rates in Antons and Anaktalik Bay were below average.

The trend for decreased catch and effort in Tikkoatokak Bay continued in 1984. Landings of 9 t were the lowest recorded for that area. Some of the effort was again directed into Webb Bay where landings of 10 t were below the 1983 value, but were well above average. Landings in the offshore areas of Dog Island and Black Island were 18% lower than in 1983, but were still approximately 30% higher than the previous 10-year mean. With respect to the other two major offshore fishing areas of Kiglapaits and Cutthroat, both catch and effort were substantially lower than last year. Catch, effort, and catch per unit effort in the Cutthroat area were the lowest recorded since 1975. On the other hand, although effort was quite low in the Okak area, catch per unit effort was the highest recorded.

Northern areas from Hebron Fiord to Ramah Bay (Fig. 1) were again fished in 1984 after a one-year break in activity. Catch and catch per unit effort were low in all areas (Hebron, Saglek, Domes, Ramah) (Table 2). The TAC of 20 t for Hebron Fiord was, however, virtually reached with 1984 landings of 19.5 t. The northern fishery contributed 24% of the total charr catch from the Nain fishing region. This is in contrast with 1982 when landings from the northern areas represented 44% of the total catch.

Factors contributing to decreased catches in 1984

The reduction in effort in the Nain fishery in 1984 was partially responsible for the decrease in catches in comparison with the previous year. Catch per unit effort was also lower, suggesting an overall decreased abundance of charr available to the fishery.

The temporal distribution of catch and effort may also have influenced catches and catch rates in 1984. From 1977 to 1982 an average of 51% of the total charr landings from the Nain fishing region had been obtained by the week ending July 29, with 46% of the effort. In 1984, however, fishing during the early part of the season was substantially lower than in other years. Only 30%

of the catch had been obtained with 34% of the effort by the same date. Fishing did not begin in the Hebron Fiord and Okak Bay, for example, until August 2 and August 8 respectively. The significance of this is more apparent when the timing of the runs back into the rivers is considered.

Investigations on the Fraser River, located northwest of Nain (Fig. 1), determined that upstream charr migrations begin during the latter half of July, although peak migrations occur in August (Dempson and Green 1985). In the Ikarut River, Hebron Fiord, charr have entered the river as early as July 10 in some years. Figure 3 illustrates the cumulative proportion of adult Arctic charr escapements into Ikarut River, Hebron Fiord, for 1982 and 1984. A commercial fishery occurred in Hebron Fiord during both of these years (no fishery conducted in 1983). Weeks have been standardized to compare the same periods that the counting fence was operated in both years. Week 1 is from July 23 - 29 while week 10 is from September 24 - 30. By week 2 (July 30 - August 5), 54% of the adult escapement had occurred in 1984 in comparison with only 21% in 1982. The cumulative frequency distributions for the two years were compared using Kolmogorov-Smirnov test (Sokal and Rohlf 1969). The two distribuions were significantly different ($d = 0.33$, $p < 0.01$). Specifically, adult escapements in 1984 were significantly earlier for weeks 1 - 4 ($p < 0.01$) in comparison with 1982. These data suggest that a substantial proportion of the fishable stock was not available to the fishery in 1984 and as such could have contributed to the overall decline in both catch and catch per unit effort in the Nain fishery.

The influence of environmental factors on the dynamics of fish populations and commercial fisheries has been receiving considerable attention during recent years (example, Scarnecchia 1981; Summers et al. 1982; Ulanowicz et al. 1982; Sutcliffe et al. 1983; Leggett et al. 1984). Movement patterns and distribution of stocks are subject to environmental variability. Pinhorn and Halliday (1984) have stated that the success of coastal fixed-gear fisheries is highly dependent not only on the distribution and migration route of the target species, but on the prey species as well. The Northern Labrador charr fishery is carried out using shore-set surface gill nets. The annual marine residency of charr is short (one to two months) and it is presumed that during much of period charr are actively feeding, primarily on capelin in the Nain area. Environmental conditions, therefore, can have both a direct and an indirect effect on the distribution and catchability of charr in this region.

Table 3 summarizes the coastal area of ice concentration between 55° and 60° latitude from 1979 to 1984. Total ice area was substantially greater in both 1983 and 1984 in comparison with previous years. As stated last year (Dempson et al. 1984), the amount of ice during the month of July is significant as it has disrupted fishing activities in a number of areas, principally Dog Island, Black Island, Kiglapaits, and Cutthroat. The quantity of ice is correlated with annual charr landings ($r = 0.79$, $p = 0.06$), although only six years of data (1979-84) are available at the present time. The late start of fishing operations in northern areas was largely a result of ice concentrations along the northern Labrador coast. Atlantic salmon landings from the Nain fishing region have averaged 52 t y^{-1} from 1975 to 1982. During 1983 and 1984 salmon landings averaged 18 t y^{-1}. Salmon landings were also correlated with ice ($r = 0.85$, $p = 0.03$).

In summary, several factors have contributed to the decreased landings in the 1984 Arctic charr fishery. These were: reduced effort, possibly as a direct result of ice conditions along the northern Labrador coast, overall decreased abundance of charr stocks in the region, reduced catchability of charr, and timing of the fishery in certain areas where information has indicated substantial upstream migrations occurred prior to commercial fishing activities.

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Table 1. Summary of northern Labrador Arctic charr landings (kg round) by fishing region, 1974-84.

	Nain Fishery				Makkovik Fishery			
Year	Catch	No. of fishermen	Fathoms of gear licenced	Catch as % of total	Catch	No. of fishermen	Fathoms of gear licenced	Total catch
1974	120,414			81	28,133			148,457
1975	44,118			82	9,542			53,660
1976	134,898	101	-	90	15,645			150,543
1977	186,165	128	-	88	24,205			210,370
1978	213,915	131	21,340	86	34,387	149	29,300	248,302
1979	175,263	142	21,320	82	37,693	110	21,225	212,956
1980	167,991	128	23,960	83	35,561	154	30,635	203,552
1981	231,221	122	21,700	92	20,733	154	30,990	251,954
1982	203,012	118	23,600	84	39,163	141	28,200	242,175
1983	149,732	119	24,400	84	29,100	148	29,600	178,832
1984	123,045	115	23,000	83	24,792	147	29,400	147,837

TABLE 2, ARCTIC CHARR CATCH STATISTICS FOR N. LABRADOR, 1974 - 1984 ;
SUMMARY OF CATCH, EFFORT, AND SIZE COMPOSITION

YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ANTONS											
CATCH (KG)	9135	3489	3172	2111	4011	19371	8460	7870	6191	23062	13099
EFFORT (MAN-WEEKS)	34	20	6	20	17	63	32	38	24	63	82
C/E (KG)	269	174	529	106	236	307	264	207	258	366	160
%/% > 2.3KG			21.0	24.0	28.0	22.0	14.0	13.0	12.0	9.0	7.4
VOISEY BAY											
QUOTAS						22500	22500	16100	16100	16000	16000
CATCH (KG)	20045	238	12232	22488	33597	21880	11557	16325	7688	2953	8113
EFFORT (MAN-WEEKS)	64	2	45	56	85	59	52	53	38	17	24
C/E (KG)	313	119	272	402	395	371	222	308	202	174	338
%/% > 2.3KG			42.0	35.0	34.0	32.0	17.0	16.0	17.0	16.7	16.4
ANAKTALIK BAY											
QUOTAS						21500	21500	8660	8660	11000	6100
CATCH (KG)	7821	2548	14670	21604	13075	14913	8045	9157	10836	2359	3980
EFFORT (MAN-WEEKS)	28	10	45	63	55	76	53	32	27	24	34
C/E (KG)	279	255	326	343	238	196	152	286	401	98	117
%/% > 2.3KG			36.0	38.0	27.0	20.0	12.0	10.0	11.0	10.9	11.5
DOG ISLAND											
CATCH (KG)	2659	653	212	2039	386	1440	3048	1516	1105	6858	6666
EFFORT (MAN-WEEKS)	38	40	11	49	25	61	86	37	38	62	66
C/E (KG)	70	16	19	42	15	24	35	41	29	111	101
%/% > 2.3KG			11.0	9.0	8.0	15.0	11.0	14.0	7.0	7.9	9.8
NAIN BAY											
QUOTAS										5000	
CATCH (KG)	12461		3119	8464				5450	85	532	1886
EFFORT (MAN-WEEKS)	37		10	28				29	1	8	15
C/E (KG)	337		312	302				188	85	67	126
%/% > 2.3KG			16.0	15.0				4.0		2.3	5.7

TABLE 2, CONTINUED;
SUMMARY OF CATCH, EFFORT, AND SIZE COMPOSITION

YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
TIKKOATOKAK BAY											
QUOTAS						39500	39500	28500	35000	35000	26000
CATCH (KG)	9960	27695	31568	39483	55061	37919	42131	28066	28283	16211	8618
EFFORT (MAN-WEEKS)	28	76	81	94	147	108	130	80	75	65	43
C/E (KG)	356	364	390	420	374	351	324	351	377	249	200
%/% > 2.3KG			19.0	20.0	18.0	14.0	10.0	5.0	7.0	8.2	5.1
WEBB BAY											
CATCH (KG)	580	833	4550	2516	3472	3035	3008	8100	4607	15055	10476
EFFORT (MAN-WEEKS)	1	5	15	21	16	9	8	29	27	56	43
C/E (KG)	580	167	303	120	217	337	376	279	171	269	244
%/% > 2.3KG			21.0	19.0	20.0	39.0	39.0	27.0	11.0	5.4	7.2
BLACK ISLAND											
CATCH (KG)	4264	2101	2725	3389	2966	10632	20051	14413	11602	11028	7913
EFFORT (MAN-WEEKS)	60	62	48	65	81	92	130	94	79	87	62
C/E (KG)	71	34	57	52	37	116	154	153	147	127	128
%/% > 2.3KG			8.0	10.0	14.0	7.0	6.0	7.0	8.0	4.2	4.8
KIGLAPAITS											
CATCH (KG)	5131	1504	6089	5435	12097	17606	16543	21911	8326	20625	11431
EFFORT (MAN-WEEKS)	26	32	59	57	103	120	95	99	34	103	55
C/E (KG)	197	47	103	95	117	147	174	221	245	200	208
%/% > 2.3KG			25.0	25.0	34.0	14.0	18.0	12.0	16.0	11.5	8.7
TASIUYAK											
CATCH (KG)	1467		281		2280	1837	1137		1060	1259	3423
EFFORT (MAN-WEEKS)	15		2		9	11	8		6	7	23
C/E (KG)	98		141		253	167	142		177	180	149
%/% > 2.3KG			21.0		71.0	34.0	14.0		11.0	12.9	4.5

TABLE 2, CONTINUED;
SUMMARY OF CATCH, EFFORT, AND SIZE COMPOSITION

YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
MUSFORD											
CATCH (KG)			1970	1374	1148	170	513			15	
EFFORT (MAN-WEEKS)			15	9	7	2	5			1	
C/E (KG)			131	153	164	85	103			15	
%/% > 2.3KG			30.0	36.0	32.0	16.0	15.0				
OKAK BAY											
QUOTAS								27300	27300	21000	27000
CATCH (KG)	34250	2354	17812	27592	36125	26171	17434	11049	9031	30732	13864
EFFORT (MAN-WEEKS)	105	15	52	107	104	123	65	46	26	147	30
C/E (KG)	326	157	343	258	347	213	268	240	347	209	462
%/% > 2.3KG			29.0	26.0	18.0	11.0	8.0	10.0	7.0	6.5	2.2
CUTTHROAT											
CATCH (KG)	12641	2703	7526	15488	41146	17803	32397	37263	25699	19043	4570
EFFORT (MAN-WEEKS)	95	47	103	130	267	161	205	172	164	164	65
C/E (KG)	133	58	73	119	154	111	158	217	157	116	70
%/% > 2.3KG			17.0	25.0	25.0	12.0	12.0	13.0	15.0	10.1	6.9
NAPARTOK											
CATCH (KG)			28972	28039	8551	2486	752	291	16485		
EFFORT (MAN-WEEKS)			124	126	50	33	11	3	60		
C/E (KG)			234	223	171	75	68	97	275		
%/% > 2.3KG			14.0	22.0	20.0	16.0	13.0	12.0	8.0		
HEBRON FIORD											
QUOTAS									29072	20000	20000
CATCH (KG)				5957			2915	39901	37822		19531
EFFORT (MAN-WEEKS)				37				106	98		112
C/E (KG)				161				376	386		174
%/% > 2.3KG				16.0			19.0	34.0	23.0		

TABLE 2, CONTINUED;
SUMMARY OF CATCH, EFFORT, AND SIZE COMPOSITION

YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
DOMES											
CATCH (KG)								5187	2643		976
EFFORT (MAN-WEEKS)								19	14		10
C/E (KG)								273	189		98
%/% > 2.3KG								36.0	17.0		
SAGLEK FIORD											
CATCH (KG)								24722	23791		5389
EFFORT (MAN-WEEKS)								77	118		40
C/E (KG)								321	202		135
%/% > 2.3KG								18.0	7.0		
RAMAH											
CATCH (KG)									7758		3110
EFFORT (MAN-WEEKS)									26		25
C/E (KG)									298		124
%/% > 2.3KG									20.0		
MAIN FISHERY											
CATCH (KG)	120414	44118	134898	186165	213915	175263	167991	231221	203012	149732	123045
EFFORT (MAN-WEEKS)	531	309	616	863	966	918	880	914	856	804	729
C/E (KG)	227	143	219	216	221	191	191	253	237	186	169
%/% > 2.3KG			24.0	25.0	24.0	17.0	12.0	16.0	13.0	8.3	7.3

Table 3. Summary of the area (square kilometers) of ice coverage along the Labrador coast between 55° and 60° latitude, 1979-84.

Week	1979	1980	1981	1982	1983	1984
June 14-19	59,280	106,704	83,904	130,416	93,024	132,891
21-26	40,128	78,432	67,488	147,744	128,592	130,809
28-July 3	81,168	73,872	29,184	84,816	122,208	134,428
July 5-10	27,360	-	-	31,920	131,328	106,704
12-17	5,400	-	-	16,416	80,256	112,358
19-24	-	-	-	-	100,320	97,552
26-31	-	-	-	-	35,568	8,868
Total	213,336	259,008	180,576	411,312	691,296	723,610

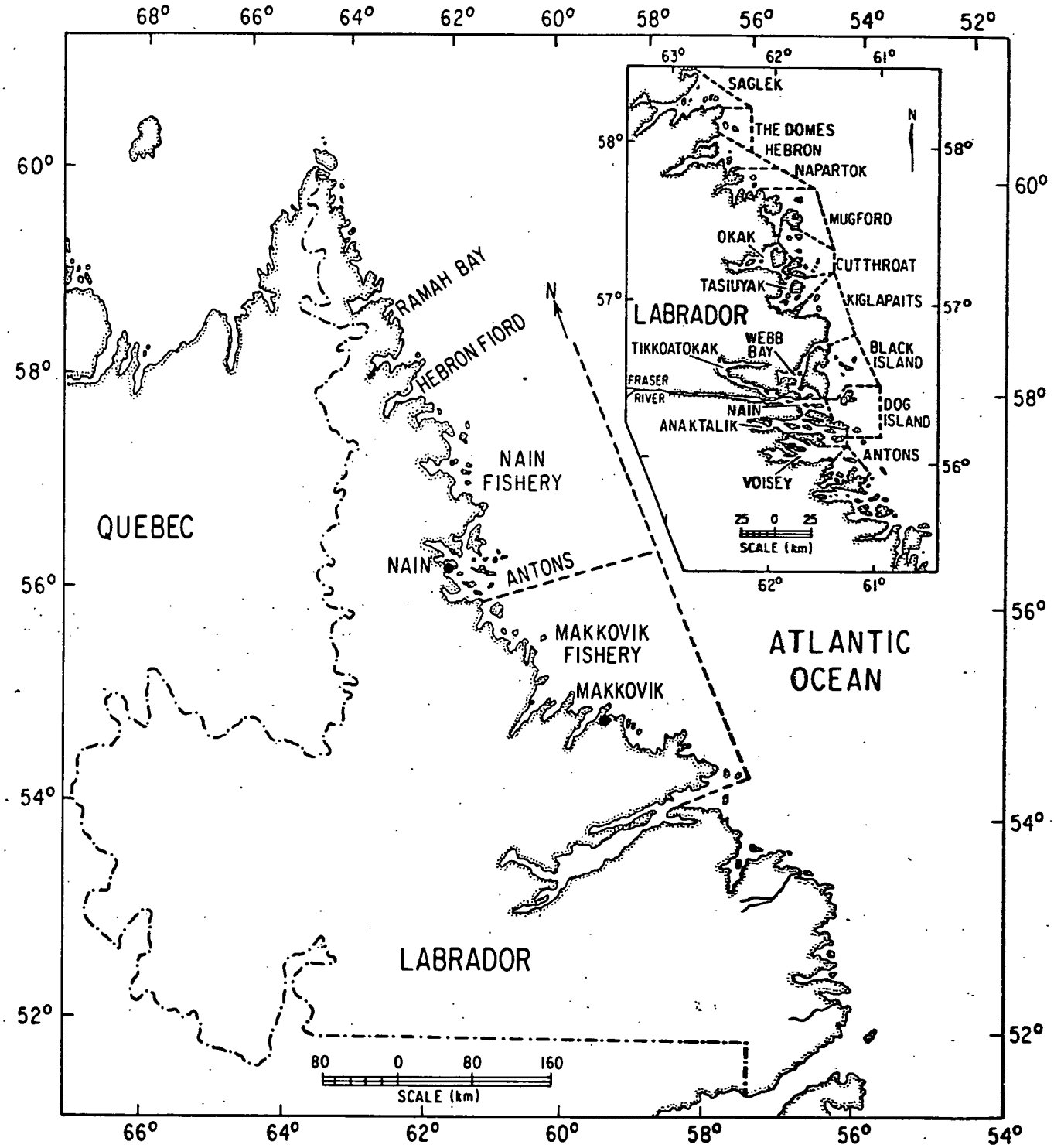

Fig. 1. Location of the Nain and Makkovik Arctic charr commercial fishing regions in northern Labrador. Insert illustrates the fishing area breakdown within the Nain fishing region.

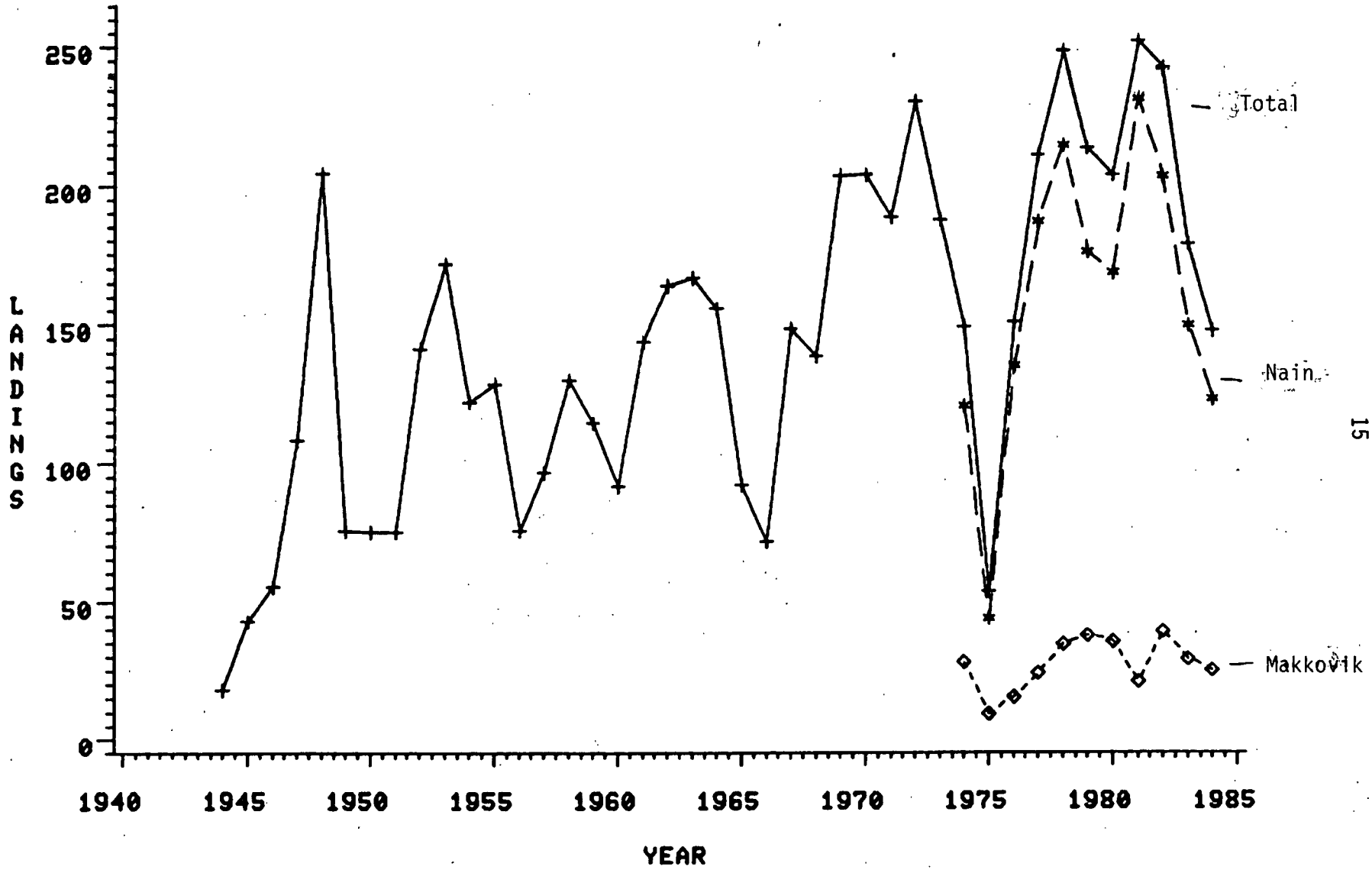

FIG. 2 SUMMARY OF NORTHERN LABRADOR ARCTIC CHARR LANDINGS (METRIC TONNES), 1944–1984

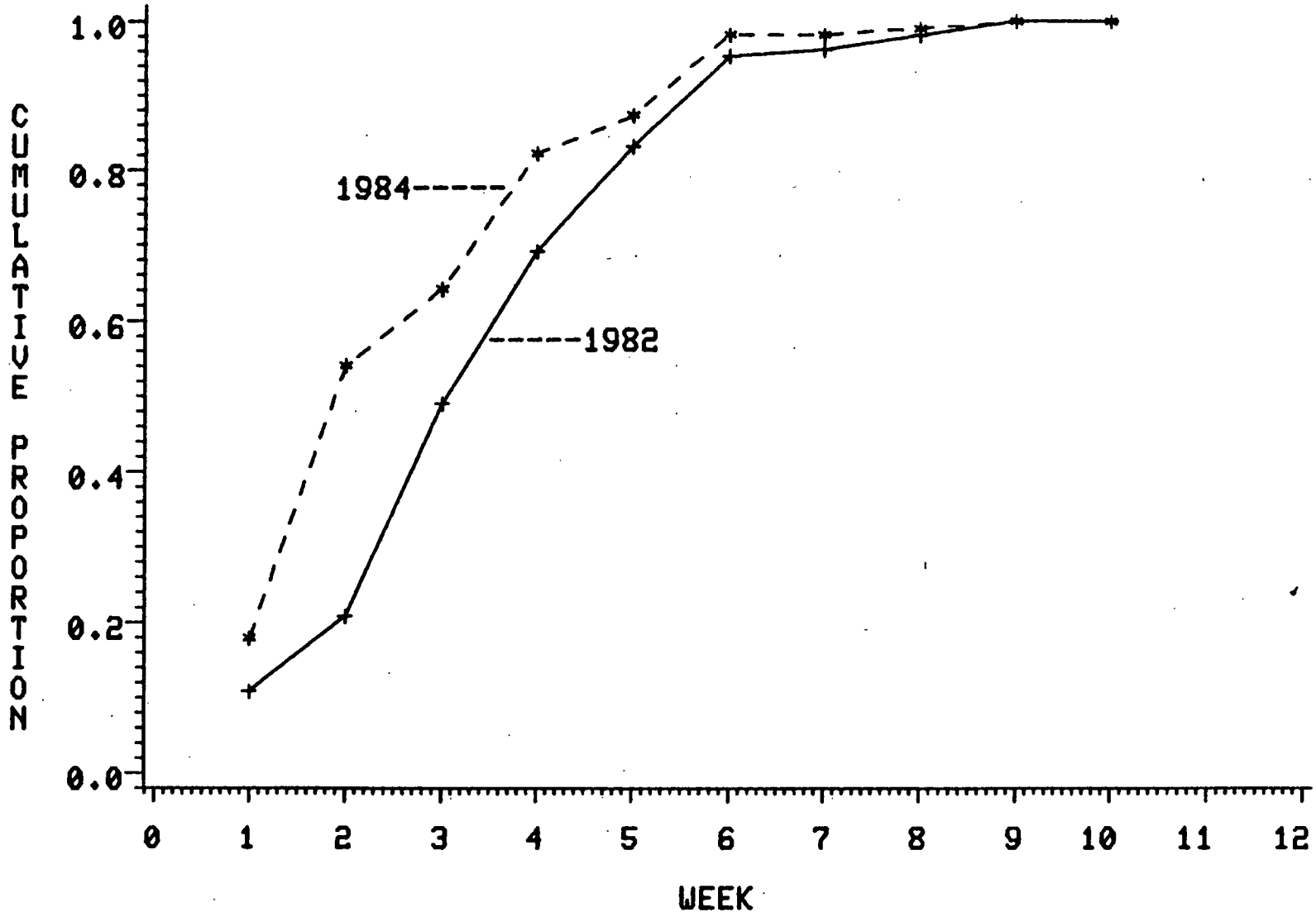

FIG. 3 CUMULATIVE PROPORTION OF ADULT ARCTIC CHARR ESCAPEMENTS BY WEEK, BEGINNING JULY 23–29, IN IKARUT RIVER, HEBRON FIORD, FOR 1982(+) AND 1984(*)