Canadian Atlantic Fisheries
Scientific Advisory Committee

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The Status of Arctic Charr Stocks in Labrador and
Advice for their Management in 1986

At its meeting of March 5-6, 1986, CAFSAC considered the status of various Arctic charr stocks in Labrador and formulated advice for their management.

General

Landings since the late 1940's have generally been in excess of 100 t (Fig. 1). From 1977 to 1982 more than 200 t of charr were caught annually in the northern Labrador area. Landings in 1985 totalled 141 t and were 5% lower than in 1984 and 26% below the mean of 190 t for the period 1975-84. Landings from the Nain fishing region (Fig. 2) totalled 107 t and 13% were lower than in 1984 while effort also decreased by 13%. Landings from the Makkovik region totalled 34 t and were 37% higher than the previous year. Part of this increase was due to a catch of 7 t from the Postville area during a spring fishery intended for anadromous brook charr. Only 1.7 t of brook charr, however, were landed.

Factors which may have contributed to the decreased landings in the 1985 fishery were: reduced effort, overall decrease in abundance of charr relative to years prior to 1983, heavy ice conditions along the northern Labrador coast which prevented gear from being set and also damaged and destroyed gear, and lack of a consistent fishery in the northern fiord subareas. It is noted that various alternative sources of employment have been available periodically to regular full-time fishermen.

In an analysis of the 1,842 recoveries over a period of years from the tagging of about 7,500 specimens, a number of stock complexes were identified. The Voisey stock complex consists of the Voisey Bay and Antons subareas. The Nain stock complex consists of Anaktalik Bay, Nain Bay, Tikkoatokak Bay and Webb Bay for the inshore zone and Dog Island and Black Island for the offshore zone. The Okak stock complex includes the Okak Bay and Cutthroat subareas and there may be evidence to include the Kiglapaits, Mugford and Tasiuyak subareas as well. Hebron and Saglek were also recognized as separate stock complexes.

Nain Stock Complex

In previous years assessments were conducted separately on the Nain-Tikkoatokak and on the Anaktalik Bay Arctic charr populations. Quotas were applied to both these areas beginning in 1979. Analyses of tag recaptures at sea indicate that charr from these areas should be considered as one stock complex consisting of the Anaktalik Bay, Nain Bay, Tikkoatokak Bay and Webb Bay for the inshore zone, and Dog Island and Black Island for the offshore zone. Annual landings from this stock complex reached a peak of 76 t in 1978 and over the period 1977-85 represented about 36% of the total commercial production of charr from the Nain fishing region. Landings declined from about 75 t in 1980 to about 40 t in 1984 and 1985.

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
TAC (kg)[1]				61,000	61,000	37,160	43,660	46,000	43,200	30,500
Catch (kg)	53,313	76,255	73,763	66,844	75,055	65,632	56,317	51,202	38,900	41,158
Effort (man-weeks)	196	291	314	336	390	278	235	289	244	252
C/E	272	262	235	199	192	236	240	177	159	163

[1] Quota applied only to Anaktalik Bay and Tikkoatokak Bay in 1979-83 but includes an offshore component in 1984-85.

Since 1981 fishing effort (man weeks) has been relatively constant. Catch rates were at about 240 kg per man-week in 1981-82 and in 1984-85 were 160 kg per man-week. The excess of catch over the total allowable catch in 1985 and some other years reflects the inclusion of landings from the nonregulated subareas within the Nain stock complex (Webbs Bay, Dog Island, Black Island).

A cohort analysis was completed using catch-at-age data from the period 1977-85. The partial recruitment pattern (proportion of full fishing mortality exerted) was derived from analysis of fishing mortalities over the whole period. Fishing mortality = .45 in 1985 for the stock complex as a whole was consistent with the relationship between fishing mortality and effort as well as that between population biomass and catch rate. Fishing mortality estimates from the Paloheimo method and from tagging experiments were .44 and .40 respectively.

A yield-per-recruit analysis using mean weight-at-age values for 1974 and 1977-78, and the current partial recruitment pattern resulted in an $F_{0.1}$ value = 0.4 with yield per recruit of 0.9 kg. Natural mortality was assumed to be 0.2.

Age	6	7	8	9	10	11	12	13	14	15	16	17
Average Weight (kg)	1.01	1.52	1.82	2.16	2.51	2.64	2.70	3.25	3.00	3.17	3.17	3.17
Partial Recruitment	.017	.147	.48	.73	1	1	1	1	1	1	1	1

The catch in 1986 at the $F_{0.1}$ level of fishing mortality using geometric mean (1979-83) recruitment for age 6 in 1986 and average weights at age for the period 1983-84 is estimated at 43 t.

Management Considerations

For some years there has been a trend for an increase in catches of charr in the offshore zone relative to the inshore fishing subareas. This may be related to environmental conditions influencing the distribution of capelin, the major prey of charr, and thus the oceanic distribution of charr. It may also be related to the greater availability in the offshore areas of salmon which are much more desirable economically. It is a matter of concern that nonregulated landings in the offshore zone may result in exceeding the TAC for the entire stock complex. The combined landings from both inshore and offshore zones should not exceed the TAC for the stock complex. In addition, while intermixing of populations from specific rivers occurs at sea, the majority of the TAC could potentially be obtained from any specific inshore subarea. CAFSAC therefore recommends that the distribution of catch be closely monitored and if exceptionally high catches occur in any one bay then, in future years, consideration should be given to local catch restrictions.

Voisey Stock Complex

In 1984 the Voisey Bay and Antons subareas were assessed as one stock complex. Quotas have been applied to the Voisey Bay subarea since 1979. Annual landings since 1975 have ranged from 4 to 41 t and from 1977 to 1985 represented 14% of the commercial charr catches from the Nain fishing region. The TAC for the stock complex in 1985 was 23.4 t with landings totalling 16 t. These landings were lower than the previous year since, in spite of a rather higher catch rate, effort decreased considerably.

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
TAC (kg) [1]				22,500	22,500	16,100	16,100	16,100	16,100	23,400
Catch (kg)	14,652	24,108	36,991	40,590	19,694	23,810	13,309	25,593	20,873	15,648
Effort (man-weeks)	57	75	102	116	82	90	60	80	101	57
C/E	257	321	363	350	240	265	222	320	207	275

[1] Quota applied only to Voisey Bay subarea for 1979-84 and to Voisey Bay and Antons for 1985.

A cohort analysis was completed using catch-at-age data from the period 1977-85. The partial recruitment was derived from an analysis of fishing mortality over the whole period. Fishing mortality and fishing effort were most highly correlated at F = .25. The highest correlation between population biomass and catch rate was at F = .25 although the lowest 1985 residual value occurred at F = .45. From the Paloheimo method F was estimated at 0.6. An F value of .45 was considered appropriate.

A yield-per-recruit analysis using mean weight-at-age values for 1974 and 1977-78, and the current partial recruitment pattern resulted in an $F_{0.1}$ value = 0.4 with yield per recruit of 1.1 kg.

Age	6	7	8	9	10	11	12	13	14	15	16
Average Weight (kg)	1.66	1.82	2.08	2.72	2.82	2.93	3.36	3.21	3.84	3.75	3.75
Partial Recruitment	0.03	.27	.787	1	1	1	1	1	1	1	1

The catch in 1986 at the $F_{0.1}$ level of fishing mortality using geometric mean (1979-83) recruitment for age 6 in 1986 and average weights at age for the period 1983-85 is estimated at about 20 t.

Okak Stock Complex

On the basis of tag recapture information, the Okak Bay and Cutthroat subareas were considered as one stock complex. Quotas have been applied to the Okak Bay subarea since 1981. Annual landings have ranged from 5 to 76 t and from 1977 to 1985 have represented 26% of the total commercial production of Arctic charr from the Nain fishing region. The TAC in 1985 for Okak Bay only was 27 t. Landings from the two subareas totalled 33 t and were 83% higher than the previous year while effort increased by 121%.

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
TAC (kg)[1]						27,300	27,300	21,000	27,000	27,000
Catch (kg)	25,338	42,392	76,024	43,261	49,035	47,541	34,171	48,978	18,146	33,261
Effort (man-weeks)	148	243	352	283	253	202	186	286	94	208
C/E	171	174	216	153	194	235	184	171	193	160

[1] Quota applied only to Okak Bay subarea

A cohort analysis was completed using catch-at-age data for the period 1977-85. The partial recruitment pattern was derived from analysis of fishing mortalities over the whole period. For the relationships fishing mortality - fishing effort and population biomass - catch rate, correlations worsened with increase in fishing mortality in the range F = 0.2 to 0.6. The residual of the 1985 point was lowest in the range F = .35 to .50. For the 1977-83 period (that is omitting the 1984 and 1985 points) relationships were best correlated at a fishing mortality of 0.4 - 0.45 in 1985. The value of F = 0.45 was considered appropriate. CAFSAC notes fishing mortalities in the recent past, as estimated from catch curves, were about 0.5.

A yield-per-recruit analysis using mean weight-at-age values for 1974 and 1977-78 and the current partial recruitment pattern resulted in an $F_{0.1}$ value = 0.4 with yield per recruit of 0.77 kg.

Age	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Average Weight (kg)	1.58	1.59	1.73	2.00	2.21	2.25	2.49	2.45	2.52	2.75	2.72	2.50	2.73	2.83
Partial Recruitment	.003	.041	.228	.678	1	1	1	1	1	1	1	1	1	1

The catch in 1986 at the $F_{0.1}$ level of fishing mortality using geometric mean (1979-85) recruitment for age 6 in 1986 and average weights at age for the period 1983-85 is estimated at 42 t.

It is a matter of concern that nonregulated landings in the offshore Cutthroat subarea could result in exceeding the TAC for the total stock unit. CAFSAC recommends that the total catch from both subareas not exceed the TAC for the assessment unit.

CAFSAC notes that the series of years with detailed catch-at-age data will soon be sufficient to determine with confidence the degree of stability in recruitment, average weights at age and in partial recruitment to the fishery. To the extent that these prove to be stable, catch restrictions over a period longer than one year may be appropriate.
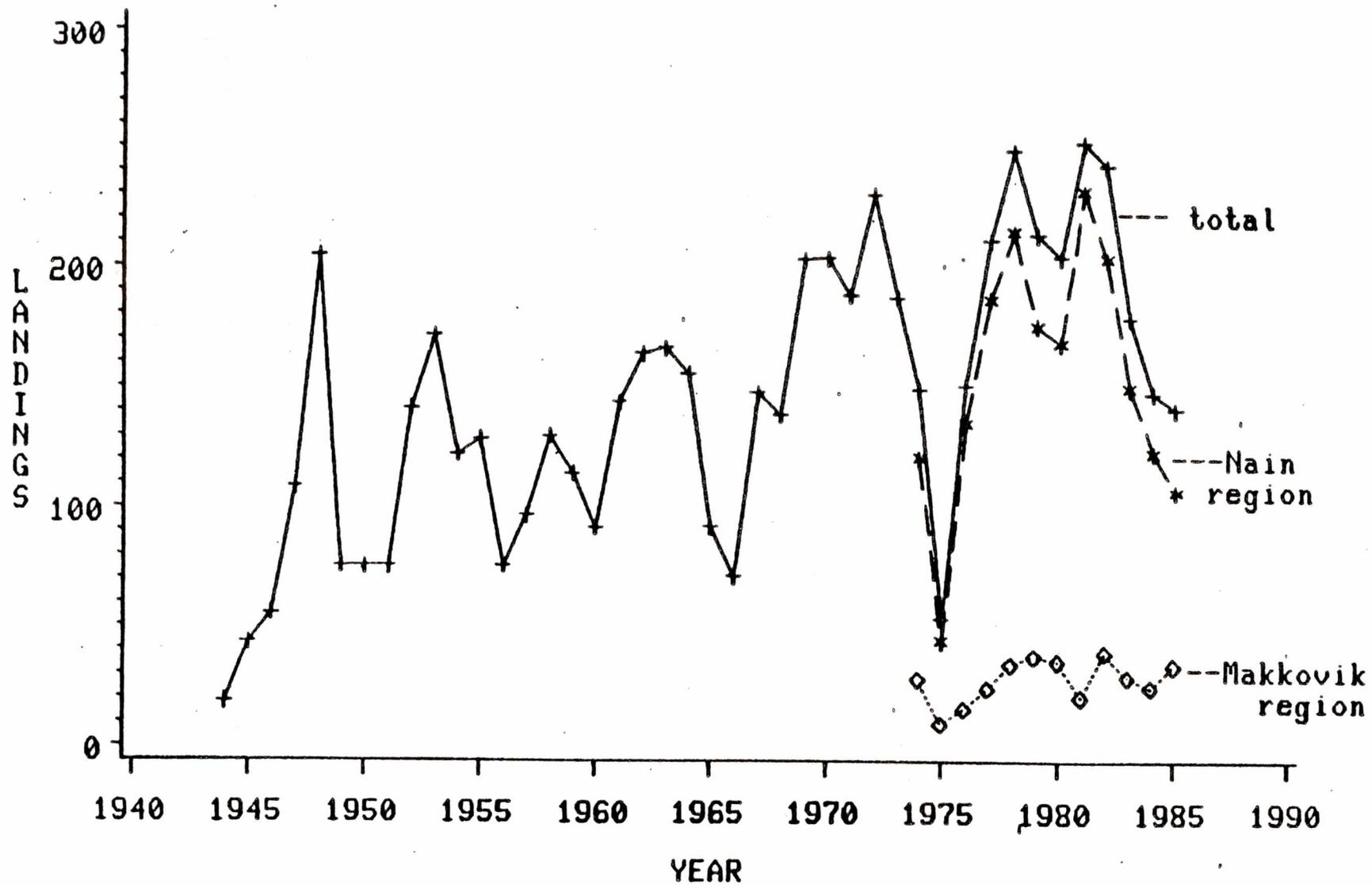
Figure 1. Summary of northern Labrador Arctic Charr landings (t), 1944-1985.
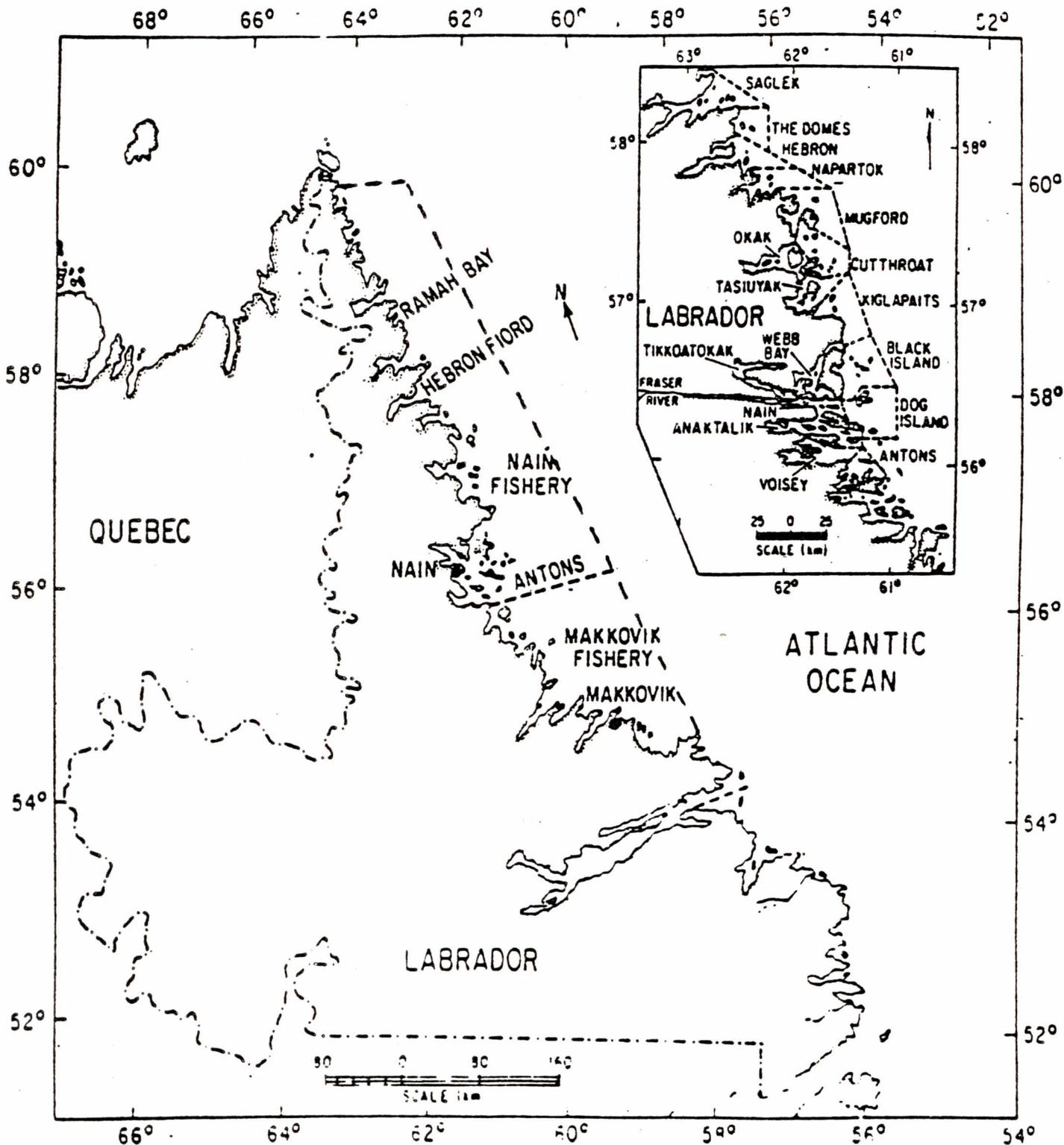
Fig. 2. Location of the Nain and Makkovik Arctic charr fishing regions in northern Labrador, and boundaries from which area of ice was determined. Insert illustrates the location of subareas within the Nain Fishing Region.