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**Northern Labrador Arctic charr and Atlantic salmon:
catch and effort update for 1996**

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Abstract

Catch and effort statistics for the northern Labrador Arctic charr fishery in 1996 are summarized. Total charr landings of 14.7 t was approximately half that of 1995 and 1994 and 80% below the previous ten year (1986-95) mean of 75 t. Charr landings from the Nain Fishing Region were 13.3 t or 91% of the northern Labrador total. Over half of the catch (56%) originated from subareas north of Black Island. Effort has continued to decline and was the lowest recorded in 23 years. The decrease in effort is largely related to the licence buy-out program, although other individuals who retained their licenses chose alternate sources of employment. Catch rates in the Okak stock unit remained high, however, both the catch and effort dropped significantly. Results from the experimental in-river harvest for Arctic charr at Southwest Arm Brook, Saglek Fiord, and aerial survey results from work carried out in the Voisey's Bay area are also provided. Atlantic salmon landings at Nain, which were the lowest on record since 1977, are summarized for the period 1977-1996.

Résumé

Les statistiques sur les prises et l'effort de pêche en ce qui a trait à l'omble chevalier du nord du Labrador en 1996 sont résumées. Le total des débarquements d'ombles chevaliers, 14,7 tonnes, était inférieur de près de moitié aux débarquements de 1995 et de 1994 et de 80 % inférieur à la moyenne des dix années précédentes (1986-1995) qui était de 75 tonnes. Les débarquements d'omble chevalier dans la région de Nain s'élevaient à 13,3 tonnes, soit 91 % du total pour le nord du Labrador. Plus de la moitié des prises (56 %) provenaient de la zone située au nord de Black Island. L'effort de pêche a continué de diminuer et a atteint son plus faible niveau en 23 ans. La diminution de l'effort de pêche est due largement au programme de rachat des permis, mais certains des pêcheurs qui ont conservé leur permis ont choisi de gagner autrement leur vie. Les taux de prises du stock de l'unité Okak restent élevés mais on enregistre néanmoins une baisse significative du taux de prises et de l'effort de pêche. Les résultats de la pêche expérimentale en rivière d'ombles chevaliers à Southwest Arm Brook, Saglek Fiord, et les résultats du relevé aérien des travaux effectués dans la région de Voisey's Bay sont aussi présentés. Les statistiques sur les débarquements de saumons de l'Atlantique à Nain, les plus faibles enregistrés depuis 1977, sont résumées pour la période 1977-1996.

Introduction

Continuous records of commercial landings of anadromous Arctic charr (*Salvelinus alpinus*) from the northern Labrador coast are available since 1944. Catch statistics from the Nain and Makkovik Fishing Regions, and from subareas within the Nain Fishing Region (Fig. 1) exist since 1974. From 1977 to 1982 more than 200 t of Arctic charr were caught per year in northern Labrador but during the previous 5 years (1991-95) annual landings averaged less than 48 t. Landings have been dropping steadily in recent years. The lowest landings in the past 30 years occurred in 1996 (14.7 t) followed by 1995 (29.6 t), 1994 (31.1 t) and 1993 (38.2 t).

Much of the decline in landings in the Nain Fishing Region during the past 9 years can be directly attributed to a reduction in fishing effort. However, individual assessments of the Voisey and Nain stock units have indicated that stock sizes in the early 1990's were below levels estimated for the late 1970's and early 1980's (Dempson MS 1992, MS 1993, 1995). In recent years, the Labrador Inuit Association (LIA) has explored the feasibility of developing in-river fisheries for Arctic charr in some of the northern fiord subareas. These fisheries could provide selective harvests on some charr stocks while at the same time providing an opportunity to obtain direct evidence of actual spawning escapements.

This paper provides an updated summary of the catch information for the 1996 fishery in a format similar to that presented for the 1995 fishery (Shears and Dempson MS 1996). Data from an in-river charr fishery in 1996 are also summarized along with an update on landings of Atlantic salmon (*Salmo salar*) at Nain.

Noteworthy events or changes in 1996

- relatively few charr were caught in the 1996 food fishery at Nain Bay because of poor local ice conditions during the spring;
- prolonged ice conditions caused problems for fisherpersons in offshore and northern areas;
- an in-river terminal fishery was carried out at Southwest Arm Brook, Saglek Fiord.

Methods

Information on commercial landings of Arctic charr from the Nain Fishing Region was obtained through purchase slips prepared by Statistics and Informatics Branch of the Department of Fisheries and Oceans and processed by Salmon and Charr Section of the Pelagic Fish, Shellfish and Salmonid Division. Information on landings from the Makkovik region were obtained directly from records provided by the Makkovik fish plant. Purchase slips from the Nain Fishing Region included the following information: name of the fisherperson, licence number, area where the fish were caught, date, weight of fish (by species) landed, and number of fish caught. Landed gutted head-on catches were converted to round weight (in kilograms) using the conversion factor: gutted head-on weight x 1.22 = round weight (Dempson MS 1984). Catch per unit effort estimates in this document, expressed in terms of kilograms per person-week fished, follow the traditional values used in past reports and were derived from the method initiated by Coady and Best (1976). These unstandardized values are included for comparative purposes with past reports.

Information on length, weight and age (otolith) of Arctic charr caught in the commercial fishery was obtained as fish were processed at the Nain Fish Plant. As in previous years, a two-stage stratified sampling program was carried out. Samples were identified from individual subareas which form component parts of stock units (Dempson and Kristofferson 1987).

Results and Discussion

Total northern Labrador Arctic charr landings - overview

Figure 2 illustrates the commercial landings of Arctic charr for all or northern Labrador from 1944 to 1996. Also shown are the landings from the Nain and Makkovik fishing regions since 1974. During the past 23 years, the Nain region has contributed 85% of the total northern Labrador catch of Arctic charr, averaging 109 t per year. Commercial landings from both regions in 1996 totalled only 14.7 t, and was 69% and 80% below the previous five (48 t, 1991-95) and ten year (75 t, 1986-95) means (Table 1).

Individually, landings in the Nain Fishing Region of 13.3 t in 1996 declined by 47% from 1995. The 1996 catch was 67% and 80% below previous five (41 t, 1991-95) and ten year (65 t, 1986-95) means. The number of people fishing was relatively consistent from 1987-92 but dropped considerably in 1993. A further reduction by 50% occurred in 1994 as a result of the extension of the commercial salmon licence buy-out to north coast residents. Effort (unstandardized) in 1996 was the lowest recorded since 1974 (Appendix 1) and declined by 91% from the 1981-85 average. Much of the reduced effort in 1996 was due to local ice conditions. Ice prevented fisherpersons from fishing in Dog Island, Black Island and the more northern areas for several weeks at the beginning of the season.

Charr landings from the Makkovik region dropped from 4.5 t in 1995 to a low of 1.4 t in 1996. The previous low of 1.8 t occurred in 1994. The 1996 catch represents a reduction of 82% and 87% from the previous 5 year (7.8 t, 1991-95) and 10 year (11 t, 1986-95) means. The highest landings in the Makkovik region, 39 t, occurred in 1982. In previous years concern had been expressed about low catches and the amount of small charr being caught at Makkovik, Postville, and Hopedale (Unpublished Annual Report by Fishery Officer Eric Andersen, Makkovik, Labrador). Concerns pertain equally to the local food fisheries for charr.

An in-river fishery occurred in a Saglek Fiord river in 1996. The total catch retained for harvest was 3 t. A summary of harvests from experimental river fisheries for 1996 and prior years is provided in Table 2. This river harvest is discussed in more detail under the section entitled 'Experimental Harvest at Southwest Arm Brook, Saglek'.

Appendix 1 provides an updated summary of catch and effort statistics for all subareas within the Nain Fishing Region from 1974 to 1996 (experimental harvests are not included in the appendix - refer to Table 2). Some of these subareas form component parts of larger assessment or stock units. The Nain Fishing Region is composed of three primary assessment units (Voisey, Nain, and Okak) in addition to other subareas which are not, at present, component parts of larger assessment units or stock complexes. These primary assessment units contributed an average of 80% of the commercial production of Arctic charr from the Nain Fishing Region over the period 1974-91.

With the reduction in commercial salmon and charr fishing licences in north Labrador, there was a corresponding increase in food fishing licences. A comparison with past years follows:

No. of food licences								
Community	1980	1982	1987	1988	1993	1994	1995	1996
Postville	12	7	10	8	22	48	42	46
Makkovik	19	14	15	8	13	40	40	49
Hopedale	7	12	22	14	16	51	63	67
Davis Inlet	5	5	1	1	6	10	8	6
Nain	10	7	3	16	21	40	46	50
TOTAL	53	45	51	47	78	189	199	218

Individual stock units summaries

Voisey Stock Unit

The Voisey stock unit is made up of Voisey's Bay and the Antons subareas (Fig. 1). Prior to 1994, annual landings ranged from 4 to 41 t (mean = 18 t, 1974-94), and over this interval contributed 16% of the commercial catch of charr from the Nain Fishing Region (Table 3). The highest catches occurred during the late 1970's (Fig. 3). In 1995 there was no directed commercial fishery on this stock unit. The Total Allowable Catches (TACs) listed in Table 3 for 1979 to 1984 applied only to the Voisey Bay subarea. A TAC of 14 t was maintained for 1996.

In 1996, a single fisherperson returned to fish this stock unit for a short period. The result was a catch of approximately 1 t (Table 3). Reasons for the decrease in catch and effort in recent years include: fisherpersons who traditionally fished this area sold their licences in the 1993 buy-out program; and, remaining crews who had traditionally fished this area did not participate in the 1996 commercial fishery but rather were involved with alternate employment. There is no additional information to suggest changes to the management regime for 1997.

Nain Stock Unit

The Nain stock unit consists of an inshore zone made up of Anaktalik Bay, Nain Bay, Tikkoatokak Bay, and Webb Bay subareas, and an offshore island zone made up of the Dog Island and Black Island subareas (Fig. 1). Annual landings ranged from 5 to 76 t (mean = 41.6 t, 1974-96), and over this interval contributed 40% of the commercial catch of charr from the Nain Fishing Region (Table 4). The highest catches occurred during the late 1970's and early 1980's (Fig. 3), with the catches declining in recent years. The lowest catch of approximately 5 t occurred in 1996.

The TACs listed in Table 4 for 1979 to 1983 applied to the specific subareas of Anaktalik Bay and Nain-Tikkoatokak Bay only. In 1984 and 1985, an offshore component was included in the TAC. The quota area catch (QAC) in Table 4 summarized landings for those subareas specifically under quota restrictions only, prior to the derivation of the stock units in 1986. Since 1986, the TAC has applied to the entire stock unit. Based partly on Science advice the management plan for 1994 lowered the TAC from 47 t to 32 t. This TAC remained in effect for 1996.

Landings of Arctic charr from the Nain assessment unit during 1996 totalled 4.9 t and represented 37% of the overall catch from the Nain Fishing Region during 1996 (Table 4). This was a decline in the stock unit catch of 29% from the previous year and 45% over the past two years. Effort reached its lowest level in 1995 at 41 person-weeks. This increased to 53 person-weeks in 1996 while the catch rate decreased to its lowest level since 1974, a 45% drop from 1995. A summary of landings partitioned by inshore and offshore fishing zones is presented in Table 5. The combination of effort reduction and a drop in reference level catches (TACs) have contributed to an overall decrease in the amount of charr harvested from this stock unit. During 1996, there was some effort directed at the inshore zone early in the fishing season. Fishing moved to the offshore areas when ice conditions allowed in late July. Effort again moved inshore when fisherpersons returning to Nain from Black Island and north fished until the end of the season. By this time, however, most of the charr would have already returned to freshwater overwintering areas.

There is no additional information to suggest changes to the management regime for 1997.

Spring food fishery at Nain Bay

The Nain stock unit is where the domestic or spring food fishery largely occurs. This fishery is targeted on charr as they migrate to sea at the mouth of Fraser River (Nain Bay). Efforts in the past, both by DFO and more recently by the Labrador Inuit Association (LIA), have failed to quantify adequately the amount of charr taken annually in this food fishery. This unaccounted for harvest has not been factored into the commercial landings or catch at age estimates. Removals from the spring food fishery would likely be more significant in recent years (e.g. since 1991) when overall commercial landings have averaged only $11.6 \text{ t}\cdot\text{y}^{-1}$ in contrast to the 1977-90 period when commercial landings averaged over $54 \text{ t}\cdot\text{y}^{-1}$.

The food fishery, however, did not have a significant impact in 1995 or 1996. Sea ice deteriorated quickly with the downstream migration of Arctic charr. During the prime spring fishing time, people were unable to access the mouth of Fraser River. We note that in the past, the LIA has expressed concern about this fishery.

Okak Stock Unit

The Okak stock unit consists of an inshore component made up of Okak Bay and an offshore island zone made up of the Cutthroat subarea (Fig. 1). Annual landings ranged from only 180 kg in 1992 to a high of 76 t in 1978 (mean = 26 t, 1974-96), and over this interval contributed 23% of the commercial catch of charr from the Nain Fishing Region (Table 6). The highest catches occurred during the late 1970's and early 1980's (Fig. 3), with the lowest catches in 1992 and 1993. The Total Allowable Catches (TACs) listed in Table 6 for 1981 to 1985 applied only to the Okak Bay subarea. A TAC of 31 t was maintained for 1996.

Landings of Arctic charr from the Okak assessment unit have been inconsistent in recent years. There was no fishing directly within Okak Bay itself in 1992 and 1993 while only 4 t was harvested in 1991. Landings rebounded during 1994 and 1995, with catches totalling 10.9 t and 10.6 t respectively. In 1996, landings dropped sharply to only 3.4 t. However, there was very little effort in 1996, with only 8 person-weeks recorded fishing.

There has been little effort directed to the offshore Cutthroat subarea since 1990. Owing to local ice conditions, no fishery occurred in this offshore zone in 1994 with limited effort in 1996. In 1996, only 77 kg of charr were taken, mostly as a by-catch in the Atlantic salmon fishery at Cutthroat.

Catch rates in 1994, 1995 and 1996 were the highest recorded in the Okak stock unit, but the overall low amount of effort limits the usefulness of the catch-rate data as being truly indicative of charr abundance. In 1996, of the 13.3 t of charr taken in the Nain Fishing Region, 7.4 t (56%) came from areas north of Black Island. Of this 3.4 t (26%) came from the Okak stock unit.

Experimental Harvest at Southwest Arm Brook, Saglek

In 1996, the in-river fishery was modelled along the lines of future commercial river harvesting ventures. That is, the fishing crew went to the river and installed the trap with the intention of taking up to 8000 pounds (~ 3.6 t) of the first commercial sized (> 45 cm) charr captured. Only tagged (scientific), injured or noncommercial size charr were to be released. The fishery occurred between August 13 and August 17. The in-river harvest in 1996 cannot be used to infer abundance of charr returning to Southwest Arm Brook because of the very short interval over which the fish were harvested.

The total number of charr caught and released was unknown. However, 1916 commercial-sized charr (> 45 cm) were delivered to the fish plant in Nain on August 23. According to fish plant records, the gutted weight of harvested charr landed was 2450 kg. Of this only 49 kg were graded number two quality.

DFO science representatives were present on site only during the slaughter of the fish. At that time 193 charr were sampled for length, weight, sex and stage of maturity. Otoliths were collected for subsequent ageing. Biological characteristics data obtained from commercial-sized charr harvested in the in-river fishery are summarized in Table 2.

River Survey 1996

As in 1995, a river survey was carried out to obtain additional information on the relative abundance of Arctic charr in several northern Labrador rivers and to map the distribution of charr in several of the rivers that drain into Voisey's Bay. The 1996 aerial surveys concentrated on the most likely sections of each stream where adult charr could be gathering to spawn and/or possibly overwinter, that is in ponds or pools near areas with suitable spawning habitat. In addition, an attempt was made to capture and tag adult charr in several streams surveyed. Under ideal viewing conditions (bright day with limited shadowed sections, little to no wind, minimal reflection on the water,

etc.) an experienced observer can readily locate groups of charr and estimate their relative abundance. Records were kept on approximate numbers of charr observed.

During the 1996 survey, abundant charr concentrations (> 1000 fish/pool) were observed only in Ikadlivik Brook, the northern branch of Kogluktokoluk Brook, Voisey's Bay, in various sections above the extended standing water (pond) area. Several smaller concentrations (> 100 fish/pool) were observed upstream of the pond in the same brook, with fewer concentrations observed downstream of the pond. Forty-four charr were tagged and released in Ikadlivik Brook.

On the main stem of Kogluktokoluk Brook (Trout Brook), many charr (> 100 fish) were observed in the pool below the waterfall, approximately 5.2 km upstream from the branch with Ikadlivik Brook. The slope of the falls appears relatively steep (~ 70 degree angle), with an estimated horizontal length of 4 or 5 meters. The falls appear to be about 2 m in vertical height. Many charr, including smolt-sized fish, were attempting to jump the falls. No charr were observed to succeed in jumping and/or swimming over the falls. However, charr do obviously navigate through this section as a small school of adult charr (< 50 fish) were observed above Trout Pond (upstream of the falls). Interestingly, there were only a few charr (< 10 fish) in the pool just above Trout Pond itself where several hundred charr were observed and 50 charr were captured and tagged in 1995.

A single large concentration of charr (< 200 fish/pool) was observed in Reid Brook, while many smaller concentrations were observed throughout the river system. Charr, although low in numbers at most locations, were observed in many of the pools along this stream. Forty-five charr and 1 brook trout were tagged and released in Reid Brook.

Apart from these aerial surveys at Voisey's Bay, there are no independent estimates of Arctic charr abundance in any of the stock unit areas.

Nain Region - Atlantic salmon landings

Atlantic salmon landings specifically from the Nain Fishing Region in SFA 1 are presented for the period 1977 to 1996 (Table 7). As noted in past summaries, salmon caught in this area are, for the most part, not from 'local' rivers, that is rivers located within the Nain Fishing Region. Most of the salmon are believed to originate from other rivers in central and southern Labrador with some fish from Newfoundland, the Maritime Provinces, and Quebec (Reddin and Dempson, 1986).

Most of the salmon landed at Nain (92%) are caught in the four subareas: Dog Island, Black Island, Kiglapaits, and Cutthroat (O'Connell et al. MS 1995). Catches have ranged from a high of 60 t in 1980 to a low of just 254 kg in 1996 (Table 7). Over the 15 year period 1977-91, the Nain Fishing Region represented about 31% of the total SFA 1 catch of Atlantic salmon, and landings at Nain were associated with landings from the rest of Labrador ($r^2 = 0.63$, $P = 0.004$, $N = 15$). Catches from all subareas averaged only $2.3 \text{ t}\cdot\text{y}^{-1}$ until 1990. During the past five years (1992-96), landings have averaged only $1.9 \text{ t}\cdot\text{y}^{-1}$, with the lowest catch (254 kg) and catch rate in 1996. The low catch in 1996 was due in part to poor ice conditions and subsequent low effort in the offshore areas where most salmon have been traditionally caught.

References

- Coady, L.W., and C.W. Best. 1976. Biological and management investigations of the Arctic charr fishery at Nain, Labrador. Fish. Mar. Serv. Tech. Rep. 624. 103 p.
- Dempson, J.B. MS 1984. Conversion factors for northern Labrador Arctic charr landings statistics. CAFSAC Res. Doc. 84/6. 8 p.
- Dempson, J. B. MS 1992. Assessment of the Voisey stock unit Arctic charr population in 1991. CAFSAC Res. Doc. 92/6. 26 p.
- Dempson, J.B. MS 1993. Evaluation of the status of the Nain stock unit Arctic charr population in 1992. DFO Atlantic Fisheries Res. Doc. 93/4. 31 p.
- Dempson, J. B. 1995. Trends in population characteristics of an exploited Arctic charr, *Salvelinus alpinus*, stock in northern Labrador. Nordic J. Freshw. Res. 71: 197-216.
- Dempson, J.B., and A.H. Kristofferson. 1987. Spatial and temporal aspects of the ocean migration of anadromous Arctic char, *Salvelinus alpinus*. In, American Fisheries Society Symposium 1: 340-357.

Shears, M. and J.B. Dempson. MS 1996. Northern Labrador Arctic Charr and Atlantic salmon: catch and effort update for 1995. DFO Atlantic Fisheries Research Document 96/73. 28 p.

O'Connell, M. F., J. B. Dempson, C. C. Mullins, and D. G. Reddin. MS 1995. Status of Atlantic salmon (*Salmo salar* L.) stocks of the Newfoundland Region, 1994. DFO Atlantic Fisheries Res. Doc. 95/125. 118 p.

Reddin, D. G., and J. B. Dempson. 1986. Origin of Atlantic salmon (*Salmo salar* L.) caught at sea near Nain, Labrador. *Naturaliste Can. (Rev. Ecol. Syst.)* 113: 211-218.

Table 1: Summary of northern Labrador Arctic charr landings (kg round) by fishing Region, 1974-1996.

Year	Nain Fishing Region				Makkovik Fishing Region			Total Catch
	Catch	No. of Fishermen	Fathoms of Gear Licensed	Catch as % of Total	Catch	No. of Fishermen	Fathoms of Gear Licensed	
1974	120414	66		81	28133			148547
1975	44118	85		82	9542			53660
1976	134898	101		90	15645			150543
1977	186165	128		88	24205			210370
1978	213915	131	21340	86	34387	149	29300	248302
1979	175263	142	21320	82	37693	110	21225	212956
1980	167991	128	23960	83	35561	154	30635	203552
1981	231221	122	21700	92	20733	154	30990	251954
1982	203012	118	23600	84	39163	141	28200	242175
1983	149732	119	24400	84	29100	148	29600	178832
1984	123045	115	23000	83	24792	147	29400	147837
1985	107120	95	19000	76	33945	132	26400	141065
1986	99963	79	15800	88	13888	109	21800	113851
1987	97379	72	14400	91	9965	130	26000	107344
1988	74010	63	12600	83	14819	120	24000	88829
1989	85970	72	14400	85	14808	126	25200	100778
1990	86292	67	13400	86	13509	103	20600	99801
1991	54614	65	13000	78	15137	96	19200	69751
1992	60754	62	12400	82	13044	96	19200	73798
1993	33562	37	7200	88	4622	90	18000	38184
1994	29345	18	3600	94	1778	18	3600	31123
1995	25080	18	3600	85	4522	18	3600	29602
1996	13281	18	3600	91	1371	19	3800	14652
Avg. 1991-95	40671				7821			48492
Avg. 1986-95	64697				10609			75306
Avg. 1974-96	109441			85	19146			128587

For 1985, Makkovik Region, catch includes 6788 kg from spring fishery in Postville area. Catch for Nain Fishing Region includes in-river harvest in 1989, 1991, 1992, 1994, 1995 and 1996, and the trap fishery at Nachvak Fiord in 1986.

Table 2. Summary of Arctic charr landings (kg-round) from various experimental fisheries in northern Labrador.

Year	Area	Type of Fishery		
		Trap-net	River Gillnet	In-river Trap
1986	Nachvak Fiord	1777		
1989	Voisey Bay		169	
	Nain Bay		345	
	Tikkoatokak Bay		473	
	Webb Bay		146	
1991	Saglek Fiord			159
1992	Saglek Fiord			2201
1994	Saglek Fiord			2114
1995	Saglek Fiord			2584
1996	Saglek Fiord			2983

* Note these catches are included in the overall summary in Table 1 but are not included in Appendix 1.

Biological characteristic data collected from commercial sized Arctic charr obtained from various in-river fisheries in northern Labrador

Year	Rivers	Number	Mean		
			Length (cm)	Gutted Weight (kg)	Age (y)
1989	Ikadlivik Bk. Voisey's Bay	98	51.1	1.45	9.2
1989	Webb Bk. Webb Bay	102	47.6	1.19	9.5
1989	Kingurutik R. Tikkoatokak Bay	300	47.6	1.16	9.0
1989	Kamanatsuk Bk, Tikkoatokak Bay	40	47.6	1.02	9.4
1989	Fraser R. Nain Bay	287	45.4	1.02	10.0
1991	Pangertok Inlet R. Saglek Fiord	77	53.1	1.55	9.8
1994	Pangertok Inlet R. Saglek Fiord	89	53.6	1.53	9.7
1992	Southwest Arm Bk, Saglek Fiord	210	52.5	1.35	9.6
1994	Southwest Arm Bk, Saglek Fiord	151	52.4	1.41	9.3
1995	Southwest Arm Bk, Saglek Fiord	187	52.2	1.49	10.4
1996	Southwest Arm Bk, Saglek Fiord*	193	51.9	1.38	10.4
1994	North Arm Bk. Saglek Fiord	99	50.0	1.16	9.4

* only 77 fish with ages

Table 3: Catch (kg-round) and effort (person-weeks) statistics for the Voisey assessment unit from 1974 to 1996. Quota area catch (QAC) refers to the landings from those subareas specifically under TAC regulation only, prior to the derivation of assessment units in 1985. CUE is unstandardized.

Year	TAC	QAC	Catch	Effort	CUE	Unit as %	
						% Offshore	of Nain Region Total
1974			29180			31	24
1975			3727			94	8
1976			14652	57	257	21	11
1977			24108	75	321	9	13
1978			36991	102	363	11	17
1979	22500	21880	40590	116	350	47	23
1980	22500	11557	19694	82	240	42	12
1981	16100	16325	23810	90	265	33	10
1982	16100	2688	13309	60	222	45	7
1983	16100	2953	25593	80	320	89	17
1984	16100	8133	20873	101	207	62	17
1985	23400		15648	57	275	91	15
1986	23400		16655	82	203	82	17
1987	17000		21242	101	210	41	22
1988	17000		14037	52	270	60	19
1989	17000		11019	32	344	100	13
1990	17000		19895	69	288	64	23
1991	17000		10971	60	183	26	20
1992	14000		9284	39	238	96	15
1993	14000		8461	48	176	23	25
1994	14000		3335	15	222	5	11
1995	14000		0	0	0	0	0
1996	14000		977	6	163	0	7
Avg. 1991-95			6410				
Avg. 1986-95			11490				
Avg. 1974-96			16698				

TAC applied only to Voisey Bay subarea from 1979 to 1984.

Table 4: Catch (kg) and effort (person-weeks) statistics for the Nain assessment unit from 1974 to 1996. Quota area catch (QAC) refers to the landings from those subareas specifically under TAC regulation only, prior to the derivation of assessment units in 1986. CUE is unstandardized.

Year	TAC	QAC	Catch	Effort	CUE	% Offshore	Unit as % of Nain Region Total
1974			37745			18	31
1975			33830			8	77
1976			53313	196	272	5	40
1977			76255	291	262	7	41
1978			73763	314	235	4	34
1979	61000	52832	66844	336	199	18	38
1980	61000	50176	75055	390	192	30	45
1981	37160	37223	65632	278	236	24	28
1982	43600	39119	55617	235	237	22	27
1983	51000	19102	51202	289	177	34	34
1984	43200	29063	38900	244	159	37	32
1985	30500	36019	41158	252	163	48	38
1986	43000		37095	185	201	56	37
1987	47000		45872	200	229	61	47
1988	47000		38295	229	167	62	52
1989	47000		51465	183	281	41	61
1990	47000		45275	188	241	62	52
1991	47000		15892	149	107	10	29
1992	47000		19555	131	149	46	32
1993	47000		13410	116	116	58	40
1994	32000		8825	69	128	48	30
1995	32000		6835	41	167	88	27
1996	32000		4851	53	92	52	37
Avg. 1991-95			12903				
Avg. 1986-95			28252				
Avg. 1974-96			41595				

TAC applied only to Anaktalik Bay and Tikkoatokak Bay from 1979 to 1983 (1983 also includes 5 t for Nain Bay) but includes an offshore component from 1984 to 1985.

Table 5: Summary of catch and effort statistics for the Nain stock unit, 1974-96. Quotas and landings are in kg round weight, effort is expressed as person-weeks fished. Refer to text for information on quotas and quota area catch. CUE = unstandardized catch per unit effort.

Year	Inshore			Offshore				Total				
	Catch	Effort	CUE	Catch	Effort	CUE	% Catch Offshore	Catch	Effort*	CUE	TAC	Quota Area Catch
1974	30822			6923			18.1	37745				
1975	31076			2754			8.1	33830				
1976	50813	146	348	2500	52	48	4.7	53313	196	272		
1977	70908	183	387	5347	114	47	7.0	76255	291	262		
1978	70465	212	332	3298	106	31	4.5	73763	314	235		
1979	54967	189	291	11877	152	78	17.8	66844	336	199	61000	52832
1980	52328	183	286	22727	215	106	30.3	75055	390	192	61000	50176
1981	49956	157	318	15676	131	120	23.9	65632	278	236	37160	37223
1982	43108	119	362	12509	117	107	22.2	55617	235	237	43660	39119
1983	33603	147	229	17599	149	118	34.4	51202	289	177	51000	19102
1984	24558	131	187	14342	128	112	36.9	38900	244	159	43200	29063
1985	21527	125	172	19631	130	151	47.7	41158	252	163	30500	36019
1986	16347	91	180	20748	101	205	55.9	37095	185	201	43000	
1987	17840	71	251	28032	135	208	61.1	45872	200	229	47000	
1988	14535	90	162	23759	149	159	62.1	38295	229	167	47000	
1989	30449	103	296	21016	87	242	40.8	51465	183	281	47000	
1990	17069	88	194	28205	108	261	62.3	45275	188	241	47000	
1991	10162	102	100	5730	50	115	36.1	15892	149	107	47000	
1992	10504	71	148	9051	60	151	46.3	19555	131	149	47000	
1993	5591	60	93	7819	59	133	58.3	13410	116	116	47000	
1994	4592	31	148	4232	38	111	48.0	8825	69	128	32000	
1995	844	11	77	5991	33	182	88.0	6835	41	167	32000	
1996	2306	32	72	2545	21	121	52.0	4851	53	92	32000	

* Total effort should be equal to or less than the sum of the inshore and offshore effort.

Table 6: Catch (kg) and effort (person-weeks) statistics for the Okak assessment unit from 1974 to 1996. Quota area catch (QAC) refers to the landings from those subareas specifically under TAC regulation only, prior to the derivation of assessment units in 1986. CUE is unstandardized.

Year	TAC	QAC	Catch	Effort	CUE	% Offshore	Unit as % of Nain Region Total
1974			46891			27	39
1975			5057			53	11
1976			25338	148	171	30	19
1977			42392	243	174	37	23
1978			76024	352	216	54	36
1979			43261	283	153	41	25
1980			49035	253	194	66	29
1981	27300	11049	47541	202	235	78	21
1982	27300	9031	34171	186	184	75	17
1983	21000	30732	48978	286	171	39	33
1984	27000	13864	18146	94	193	25	15
1985	27000	24746	33261	208	160	26	31
1986	42000		28896	172	168	30	29
1987	43000		19649	134	147	20	20
1988	31000		17450	136	128	28	24
1989	31000		16563	163	102	10	20
1990	31000		16125	100	161	22	19
1991	31000		4432	31	143	7	8
1992	31000		180	13	14	100	<1
1993	31000		578	9	64	100	2
1994	31000		10866	23	472	0	37
1995	31000		10635	26	409	2	42
1996	31000		3425	8	428	2	26
Avg. 1991-95			5338				
Avg. 1986-95			12537				
Avg. 1974-96			26039				

Table 7. Summary of Atlantic salmon landings at Nain, Labrador, 1977 - 1996. Catch, effort and CUE as in Arctic charr landings tables.

Year		Catch	Effort	CUE
1977		41581	560	74
1978		48945	562	87
1979		35722	650	55
1980		60332	619	97
1981		48124	598	80
1982		32974	491	67
1983		20105	542	37
1984		15596	339	46
1985		14653	308	48
1986		20090	350	57
1987		14414	275	52
1988		20090	282	71
1989		29960	359	83
1990		12892	246	52
1991		2688	89	30
1992		2671	85	31
1993		1848	76	24
1994		1899	64	30
1995		2989	65	46
1996		254	24	11

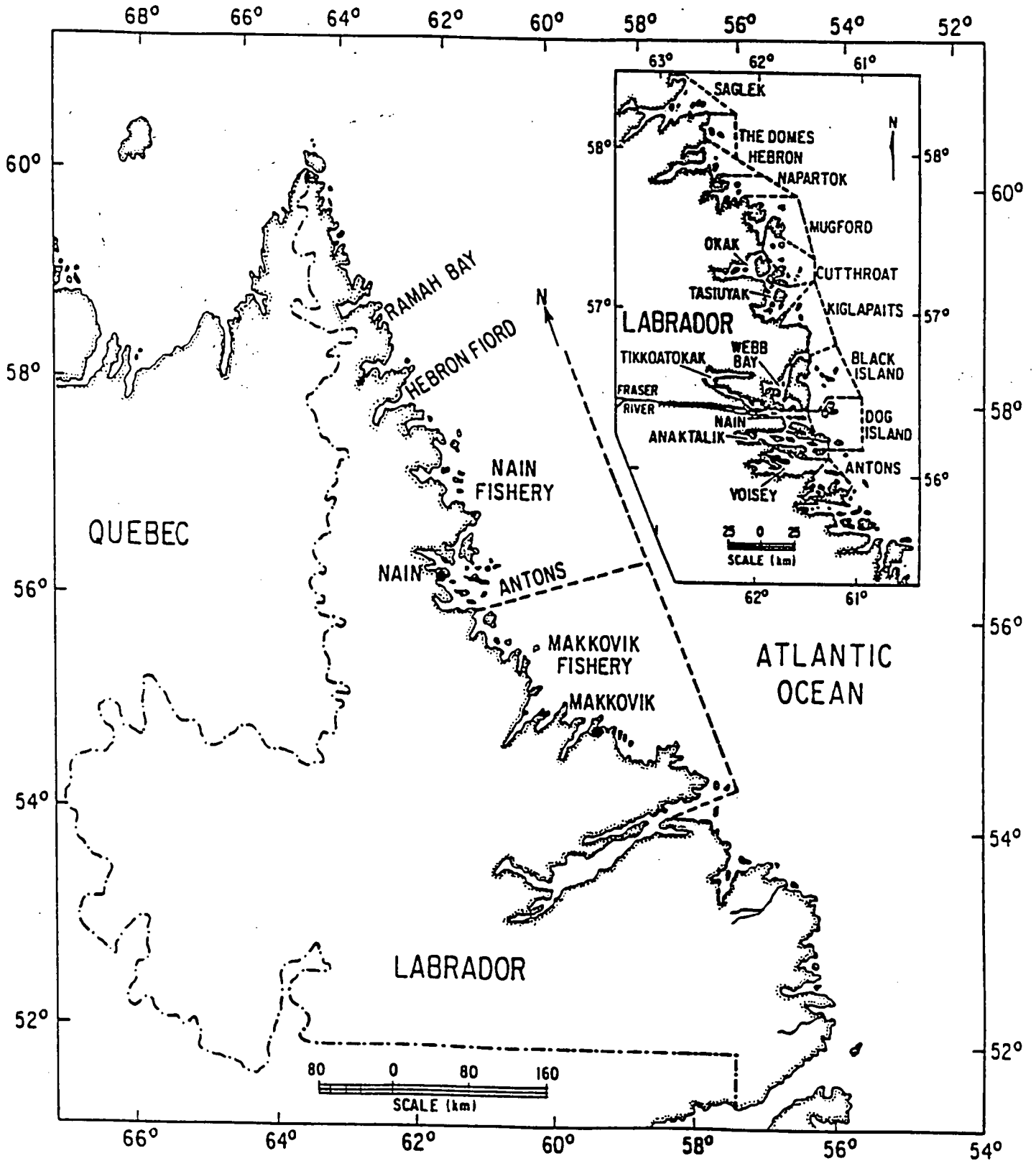


Fig 1: Location of the Nain and Makkovik Fishing Regions in northern Labrador. Insert illustrates the location of subareas within the Nain Fishing Region.

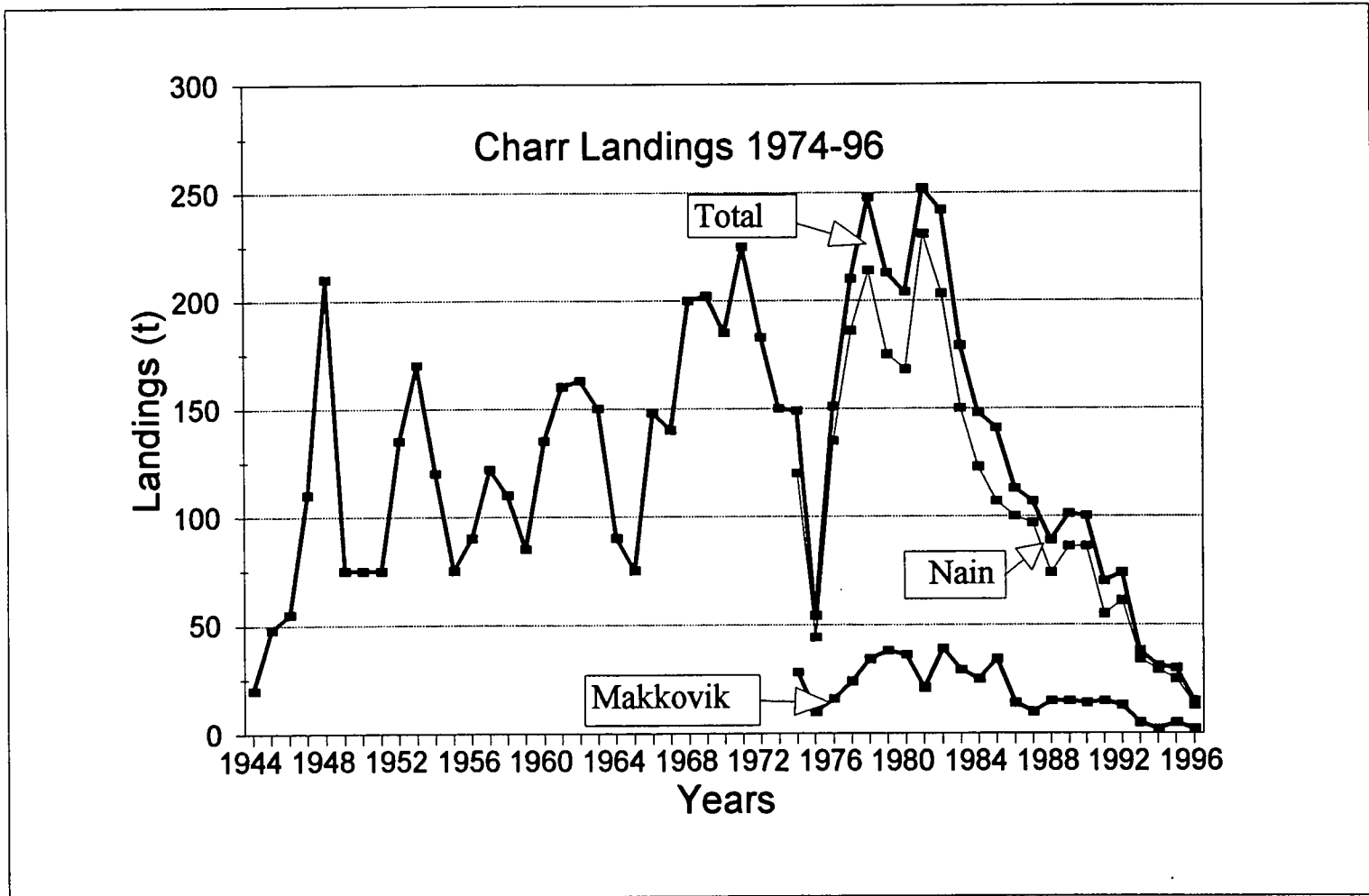


Fig 2: Summary of northern Labrador Arctic charr Landings (tonnes), 1944-95 with separate landings for Nain and Makkovik from 1974 to 1996.

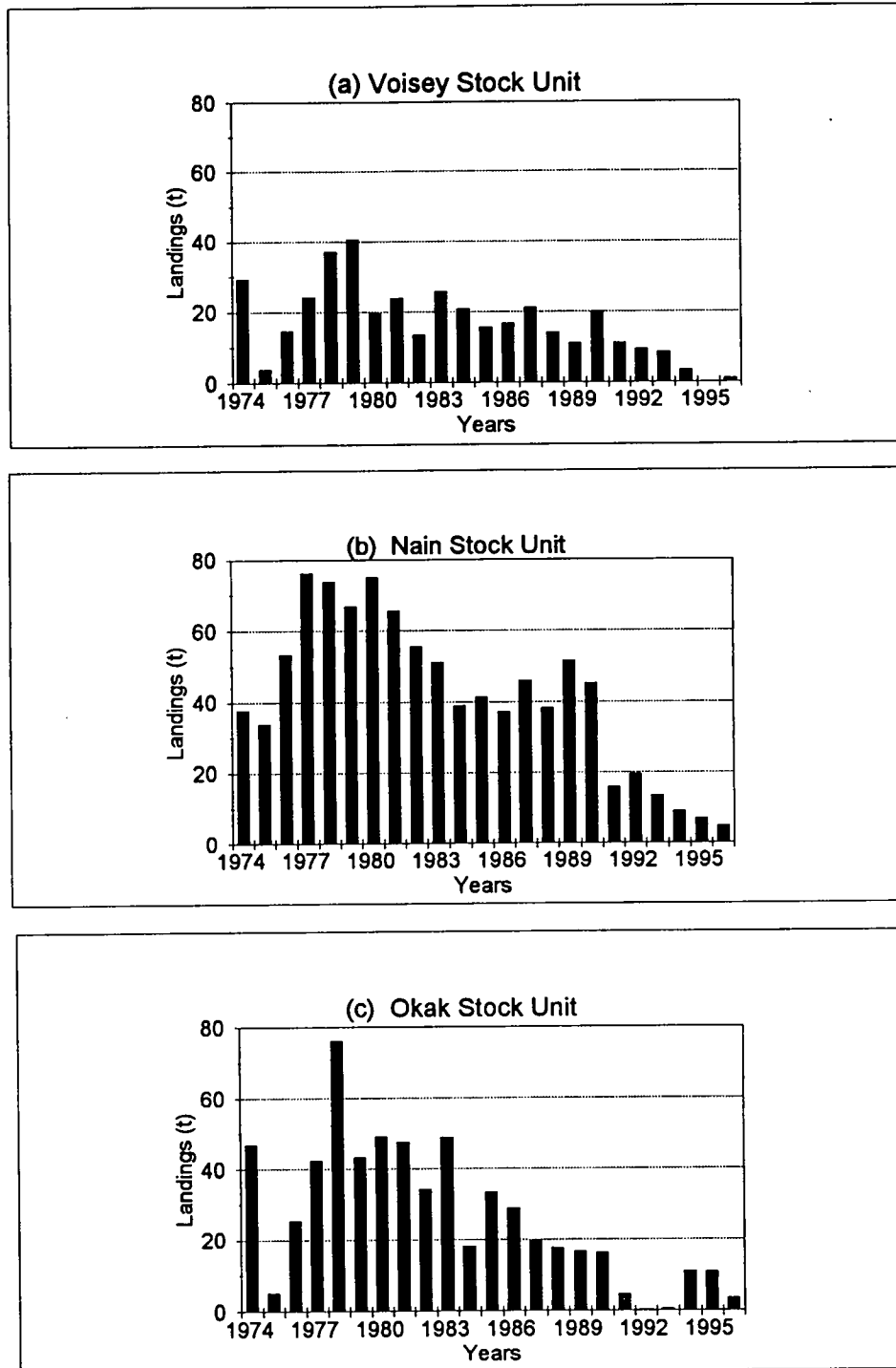


Fig 3: Commercial Landings of anadromous Arctic charr from the (a) Voisey, (b) Nain, and (c) Okak stock units, 1974-96.

Appendix 1, Arctic Charr Catch Statistics, 1974-1996
Summary of Catch and Effort Data For the Nain Fishing Region

Area=Antons												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)	9135	3489	3172	2111	4011	19371	8460	7870	6191	23062	13099	14212
Effort (Person-wks)	34	20	6	20	17	63	32	38	24	63	82	51
C/E (Kg)	269	174	529	106	236	307	264	207	258	366	160	279
% > 2.3 Kg			21	24	28	22	14	13	12	9	7	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)	13589	8611	8460	11019	12659	2813	413	1904	180			
Effort (Person-wks)	67	55	29	32	45	20	6	11	2			
C/E (Kg)	203	157	292	344	281	141	69	173	90			
% > 2.3 Kg												
Area=Voisey's Bay												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas						22500	22500	16100	16100	16000	16000	23400
Catch (Kg)	20045	238	12232	22488	33597	21880	11557	16325	7688	2953	8113	1435
Effort (Person-wks)	64	2	45	56	85	59	52	53	38	17	24	6
C/E (Kg)	313	119	272	402	395	371	222	308	202	174	338	239
% > 2.3 Kg			42	35	34	32	17	16	17	17	16	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)	3065	12630	5577		7236	8158	8851	6558	3155		977	
Effort (Person-wks)	22	54	26		24	43	36	38	13		6	
C/E (Kg)	139	234	215		301	190	246	173	243		163	
% > 2.3 Kg												
Area=Anaktalik												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas						21500	21500	8660	8660	11000	6100	8400
Catch (Kg)	7821	2548	14670	21604	13075	14913	8045	9157	10836	2359	3980	7477
Effort (Person-wks)	28	10	45	63	55	76	53	32	27	24	34	39
C/E (Kg)	279	255	326	343	238	196	152	286	401	98	117	192
% > 2.3 Kg			36	38	27	20	12	10	11	11	12	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas		5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	
Catch (Kg)	180	2002	1075	1175	454	1484	70	230	19			
Effort (Person-wks)	7	18	12	13	5	17	3	6	1			
C/E (Kg)	26	111	90	90	91	87	23	38	19			
% > 2.3 Kg												

Area=Dog Island												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)	2659	653	212	2039	386	1440	3048	1516	1105	6858	6666	6882
Effort (Person-wks)	38	40	11	49	25	61	86	37	38	62	66	62
C/E (Kg)	70	16	19	42	15	24	35	41	29	111	101	111
% > 2.3 Kg			11	9	8	15	11	14	7	8	10	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)	3289	16881	11735	2794	7219	1240	2134	2218	1485	1199	1687	
Effort (Person-wks)	32	86	88	27	44	14	16	18	14	11	13	
C/E (Kg)	103	196	133	103	164	89	133	123	106	109	130	
% > 2.3 Kg												

Area=Nain Bay												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas										5000		
Catch (Kg)	12461		3119	8464				5450	85	532	1886	2667
Effort (Person-wks)	37		10	28				29	1	8	15	32
C/E (Kg)	337		312	302				188	85	67	126	83
% > 2.3 Kg			16	15				4		2	6	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)	6437	3806	5179	20734	10265	4039	4762	2346	3349	388	1613	
Effort (Person-wks)	39	15	33	61	61	59	45	33	23	7	25	
C/E (Kg)	165	254	157	340	168	68	106	71	146	55	65	
% > 2.3 Kg												

Area=Tikkoatokak Bay												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas						39500	39500	28500	35000	35000	26000	12500
Catch (Kg)	9960	27695	31568	39483	55061	37919	42131	28066	28283	16211	8618	6243
Effort (Person-wks)	28	76	81	94	147	108	130	80	75	65	43	24
C/E (Kg)	356	364	390	420	374	351	324	351	377	249	200	260
% > 2.3 Kg			19	20	18	14	10	5	7	8	5	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas		16000	16000	16000	16000	16000	16000	16000	16000	16000	16000	
Catch (Kg)	3841	3608	2240	2636	1491	2296	2560	2088	1224	457	693	
Effort (Person-wks)	16	12	12	13	12	16	9	15	7	4	7	
C/E (Kg)	240	301	187	203	124	143	284	139	175	114	99	
% > 2.3 Kg												

Area=Webb Bay												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)	580	833	4550	2516	3472	3035	3008	8100	4607	15055	10476	5143
Effort (Person-wks)	1	5	15	21	16	9	8	29	27	56	43	35
C/E (Kg)	580	167	303	120	217	337	376	279	171	269	244	147
% > 2.3 Kg			21	19	20	39	39	27	11	5	7	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas		9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	
Catch (Kg)	5890	8424	6041	5904	4859	2343	3111	928				
Effort (Person-wks)	34	27	33	17	10	10	16	8				
C/E (Kg)	173	312	183	347	486	234	194	116				
% > 2.3 Kg												
Area=Black Island												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)	4264	2101	2725	3389	2966	10632	20051	14413	11602	11028	7913	12750
Effort (Person-wks)	60	62	48	65	81	92	130	94	79	87	62	68
C/E (Kg)	71	34	57	52	37	116	154	153	147	127	128	188
% > 2.3 Kg			8	10	14	7	6	7	8	4	5	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)	17458	11151	12024	18222	20987	4490	6917	5601	2747	4792	858	
Effort (Person-wks)	72	50	61	60	65	37	44	41	24	22	8	
C/E (Kg)	242	223	197	304	323	121	157	137	114	218	107	
% > 2.3 Kg												
Area=Kiglapaits												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)	5131	1504	6089	5435	12097	17606	16543	21911	8326	20625	11431	6184
Effort (Person-wks)	26	32	59	57	103	120	95	99	34	103	55	41
C/E (Kg)	197	47	103	95	117	147	174	221	245	200	208	151
% > 2.3 Kg			25	25	34	14	18	12	16	12	9	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)	6983	1620	862	2605	1051	1110	653	524	529	354		
Effort (Person-wks)	55	14	9	22	10	15	4	4	4	4		
C/E (Kg)	127	116	96	118	105	74	163	131	132	89		
% > 2.3 Kg												

Area=Tasiuyak												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)	1467		281		2280	1837	1137		1060	1259	3423	4724
Effort (Person-wks)	15		2		9	11	8		6	7	23	36
C/E (Kg)	98		141		253	167	142		177	180	149	131
% > 2.3 Kg			21		71	34	14		11	13	5	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)	6749	8997	2823	3186	3302	1077	3063	1153	3675	4671	1044	
Effort (Person-wks)	26	61	22	23	17	5	13	3	11	9	2	
C/E (Kg)	260	147	128	139	194	215	236	384	334	519	522	
% > 2.3 Kg												
Area=Mugford												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)			1970	1374	1148	170	513			15		
Effort (Person-wks)			15	9	7	2	5			1		
C/E (Kg)			131	153	164	85	103			15		
% > 2.3 Kg			30	36	32	16	15					
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)												
Effort (Person-wks)												
C/E (Kg)												
% > 2.3 Kg												
Area=Okak Bay												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas								27300	27300	21000	27000	27000
Catch (Kg)	34250	2354	17812	27592	36125	26171	17434	11049	9031	30732	13864	24746
Effort (Person-wks)	105	15	52	107	104	123	65	46	26	147	30	119
C/E (Kg)	326	157	343	258	347	213	268	240	347	209	462	208
% > 2.3 Kg			29	26	18	11	8	10	7	7	2	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas	27000	26000	22000	26000	26000	26000	26000	26000	26000	26000	26000	
Catch (Kg)	20141	15695	12608	14973	12497	4112			10866	10377	3348	
Effort (Person-wks)	91	71	51	84	45	13			23	18	5	
C/E (Kg)	221	221	247	178	278	316			472	576	670	
% > 2.3 Kg												

Area=Cutthroat												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)	12641	2703	7526	15488	41146	17803	32397	37263	25699	19043	4570	8515
Effort (Person-wks)	95	47	103	130	267	161	205	172	164	164	65	106
C/E (Kg)	133	58	73	119	154	111	158	217	157	116	70	80
% > 2.3 Kg			17	25	25	12	12	13	15	10	7	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)	8756	3954	4842	1591	3628	320	180	578		259	77	
Effort (Person-wks)	89	70	89	84	55	18	13	9		8	3	
C/E (Kg)	98	56	54	19	66	18	14	64		32	26	
% > 2.3 Kg												

Area=Napartok												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)			28972	28039	8551	2486	752	291	16485			
Effort (Person-wks)			124	126	50	33	11	3	60			
C/E (Kg)			234	223	171	75	68	97	275			
% > 2.3 Kg			14	22	20	16	13	12	8			
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)						242	4414					
Effort (Person-wks)						4	16					
C/E (Kg)						60	276					
% > 2.3 Kg												

Area=Hebron Fiord												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas									29072		20000	
Catch (Kg)				5957			2915	39901	37822		19531	
Effort (Person-wks)				37				106	98		112	
C/E (Kg)				161				376	386		174	
% > 2.3 Kg				16			19	34	23			
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)			543		643	20731	21252	5608				
Effort (Person-wks)			6		1	49	92	34				
C/E (Kg)			91		643	423	231	165				
% > 2.3 Kg												

Area=Domes												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)								5187	2643		976	
Effort (Person-wks)								19	14		10	
C/E (Kg)								273	189		98	
% > 2.3 Kg								36	17			
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)												
Effort (Person-wks)												
C/E (Kg)												
% > 2.3 Kg												
Area=Saglek Fiord												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)								24722	23791		5389	
Effort (Person-wks)								77	118		40	
C/E (Kg)								321	202		135	
% > 2.3 Kg								18	7			
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)								3247				
Effort (Person-wks)								4				
C/E (Kg)								812				
% > 2.3 Kg												
Area=Ramah												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)									7758		3110	
Effort (Person-wks)									26		25	
C/E (Kg)									298		124	
% > 2.3 Kg												
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)							172	580				
Effort (Person-wks)							2	2				
C/E (Kg)							86	290				
% > 2.3 Kg												

Area=Nachvak												
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)												6142
Effort (Person-wks)												18
C/E (Kg)												341
% > 2.3 Kg												
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)	1808											
Effort (Person-wks)	4											
C/E (Kg)	452											
% > 2.3 Kg												
Area=Nain Fishery												
	1974	1975	1976	1977*	1978	1979	1980	1981	1982	1983	1984	1985
Quotas												
Catch (Kg)	120414	44118	134898	186165	213915	175263	167991	231221	203012	149732	123045	107120
Effort (Person-wks)	531	309	616	863	966	918	880	914	858	804	729	637
C/E (Kg)	227	143	219	216	221	191	191	253	237	186	169	168
% > 2.3 Kg			24	25	25	17	12	16	13	8	6	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Quotas												
Catch (Kg)	98186	97379	74010	84837	86292	54455	58553	33562	27230	22497	10298	
Effort (Person-wks)	554	533	471	436	394	320	315	226	122	83	66	
C/E (Kg)	180	183	157	195	219	170	186	149	223	278	156	
% > 2.3 Kg												

* Includes 186 kg unaccounted for by area.