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Status of Cambridge Bay Anadromous Arctic Char Stocks

État des stocks d'omble chevalier anadrome de la baie Cambridge

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ABSTRACT

Harvest (1960 to 2003) and population parameter data (1971 to 2003) for the commercial arctic char (*Salvelinus alpinus*) fishery of Cambridge Bay, Victoria Island, Nunavut are presented and analysed. Environmental conditions of the Cambridge Bay area, various aspects of arctic char ecology and response to harvest are summarized and assessed. Historically, commercial landings were harvested primarily from 6 stock complexes (Ekalluk , Paliryuak, Halovik, Lauchlan, Ellice and Jayco Rivers). The Perry River was fished from 1977 to 1981 and in 1991 and has not been fished since. The Ellice River has not been fished since 1999. Since the inception of the fishery in 1960, total commercial landings have averaged 41,000 kgs round weight per year with total landings for this period equal to 1,799,099 kgs round weight. Other fishing sites have also been harvested occasionally but for 4 years or less at any given site (Kulgayuk River, Padliak and Elu Inlets and Starvation Cove). In 1988 a new fishery developed at HTA Lake (Takyoknitok) and since then, between 1500 and 3000 kgs round weight of char have been harvested from this system annually via a stone weir except for 5 years during this period when the fishery did not occur. The subsistence harvest of char is substantial, estimated to equal approximately one half the size of the commercial harvest, and probably is concentrated in areas close to Cambridge Bay such as the Ekalluk River. The fishery and its supportive stocks are considered stable and fished at or below their sustainable rates of harvest. All of the primary stock complexes were considered to have a low to moderate level of risk of over exploitation under current harvest regimes, with the exception of the Ellice River stock complex. Population parameter data of Ellice River char, the only mainland fishery for which data was presented, was atypical in comparison to other stock complexes in that it demonstrated a consistent decline in modal age, a consistent increase in mean condition factor and round weight, a faster growth rate and trends in recruitment fluctuation which differed from those trends observed in other fisheries. Ellice River char were considered to have a moderate to high level of risk of over exploitation but this risk is lessened by the fact that this river was fished only once between 1997 and 2003. Significant fluctuations in recruitment, expressed as relative strengths of specific birth years or year classes, were found in samples from all fisheries examined and temporal patterns of both specific year class strengths and the sampling years in which they occurred were similar for all fisheries with the exception of the Ellice River. Trends in mean age, mean fork length, mean round weight and mean condition factor were highly correlated with trends in relative year class strength.

RÉSUMÉ

Les données concernant la pêche commerciale (de 1960 à 2003) et les paramètres vitaux (de 1971 à 2003) pour l'omble chevalier (*Salvelinus alpinus*) de la baie Cambridge, dans l'île Victoria (Nunavut), sont présentées et analysées. De plus, les conditions environnementales dans la région de la baie Cambridge, divers aspects de l'écologie de l'omble chevalier et sa réponse face à l'exploitation son résumés et évalués. Par le passé, les prises commerciales provenaient principalement de six complexes de stocks (rivières Ekalluk, Paliryuak, Halovik, Lauchlan, Ellice et Jayco). Le stock de la rivière Perry a été exploité de 1977 à 1981 et en 1991, mais il n'y a pas eu de pêche à cet endroit depuis. La pêche dans la rivière Ellice a été pratiquée pour la dernière fois en 1999. Depuis le début de la pêche, en 1960, les prises commerciales moyennes étaient de 41 000 kg par année (en poids brut), le total des débarquements pour la période étant de 1 799 099 kg en poids brut. La pêche a été pratiquée à d'autres endroits, occasionnellement, mais jamais pour plus de quatre ans à l'un ou l'autre endroit (rivière Kulgayuk, ruisseaux Padliak et Elu et anse Starvation). En 1988, une nouvelle pêche a commencé au lac HTA (Takyoknitok) et, depuis, entre 1 500 et 3 000 kg d'omble (poids brut) ont été récoltés dans ce réseau chaque année, à l'aide d'un barrage de pierres, sauf pendant les cinq années au cours desquelles il n'y a pas eu de pêche. La pêche de subsistance de l'omble est substantielle; on l'estime à environ la moitié de la pêche commerciale et elle serait probablement concentrée dans les zones situées à proximité de la baie Cambridge, comme dans la rivière Ekalluk. La pêche et les stocks ciblés sont jugés stables et l'exploitation serait égale ou inférieure au niveau durable. Tous les complexes de stocks primaires étaient considérés comme comportant un risque de surexploitation faible à modéré dans les conditions d'exploitation actuelles, à l'exception du complexe de la rivière Ellice. Les données sur les paramètres de la population d'omble de la rivière Ellice, seule pêche de la terre ferme pour laquelle des données sont présentées, sont différentes de celles des autres complexes en ce qu'elles affichent une baisse constante de l'âge modal, une augmentation constante du coefficient de condition moyen et du poids brut moyen, un taux de croissance plus rapide et des tendances de la fluctuation du recrutement différentes de celles qui sont observées dans d'autres pêches. Le risque de surexploitation de l'omble de la rivière Ellice serait de modéré à élevé, mais il est atténué par le fait que la pêche n'a été pratiquée dans cette rivière qu'une seule fois entre 1997 et 2003. On observe d'importantes fluctuations du recrutement, mesuré selon l'importance relative de l'effectif des classes d'âge ou années de naissance, dans les échantillons de toutes les pêches examinées. De plus, les tendances temporelles d'effectifs de classes d'âge particulières et des années d'échantillonnage au cours desquelles ils ont été observés étaient semblables pour toutes les pêches, à l'exception de celle de la rivière Ellice. On a noté une étroite corrélation entre les tendances de l'âge moyen, de la longueur moyenne à la fourche, du poids brut moyen et du coefficient de condition moyen et l'effectif relatif des classes d'âge.

INTRODUCTION

The arctic char, *Salvelinus alpinus* (L.) is distributed across the Canadian Arctic, including the islands of the Arctic Archipelago. It occupies many rivers and lakes on Victoria Island, near the Community of Cambridge Bay, as well as on the mainland to the south of this island. It is the anadromous (searun) Arctic char that is most sought after for subsistence and commercial use. In this report we provide general information on the environment conditions in which char from this region live, summarize the harvest history of the Cambridge Bay char fishery, and examine trends in landings and biological characteristics of char from different rivers as a means by which the status of stocks is evaluated.

THE FISHERY

History

Commercial fishing first began at Cambridge Bay in 1960, with a gillnet operation on Freshwater Creek. In 1962, the commercial fishery was relocated to the mouth of the Ekalluk River, where it empties into Wellington Bay. As the fishery developed, other sites were utilized, including the Paliryuak (Surrey) River, the Halovik (Thirty Mile) River and the Lauchlan (Byron Bay) River, the Jayco River, and the Ellice and Perry rivers. Initially, an “area” quota was established for Wellington Bay, but the decline in the fishery at Ekalluk River, where most of the fishing took place, necessitated the establishment of “river-specific” quotas to distribute fishing effort. Over the years, other sites were periodically fished, including Dease Point (Kulgayuk River) on the mainland in 1972, 1976, 1991 and 1993. Padliak Inlet was fished in 1977. Elu Inlet, on the mainland was fished in 1977 and 1978. Starvation Cove, on the south coast of Victoria Island, west of Cambridge Bay, was fished in 1977. Starvation Cove, on the south coast of Victoria Island, west of Cambridge Bay, was fished in 1977. In 1988, an experimental fishery started at a site called HTA Lake (Takyoknitok), on the southeast coast of Victoria Island where fishing has occurred annually except for the years 1992, 1995, 1997, 1998 and 2000. Commercial fishing sites are located at the mouths of various rivers in the area, and target either the downstream run in spring or the upstream run in fall. Initially, gillnets of various mesh sizes were used but, ultimately, the minimum mesh size was established as 140 mm. Since the inception of the fishery in 1960, commercial landings from the primary fishing sites and stock complexes (Ekalluk, Ellice, Halovik, Lauchlan, Jayco, Perry and Paliryuak Rivers) have averaged 41,000 kgs round weight per year with total landings for this period equal to 1,799,099 kgs round weight.

Prior to the onset of the commercial fishery it is likely that all river systems in this area were fished for food. In the Cambridge Bay area, between 1996 and 2001, annual numbers of subsistence harvesters of char varied between 23 and 55, harvest occurred mostly during the period of June to September and annual harvests varied from between 1437 and 12435 with a mean of 6461 char per year (Nunavut Wildlife Harvest Study, 2004). Assuming that the average size of a char from the subsistence harvest is

similar to the average commercially harvested size (3.5 kgs), the annual char subsistence harvest may be approximately equal to 22,600 kgs or about one half the size of the annual commercial harvest. The mesh sizes of mesh used by the subsistence fishery are unknown, therefore, the above assumption may be incorrect. Unlike the commercial harvest, the subsistence harvest of char probably comes primarily from locations in the vicinity of Cambridge Bay such as the Ekalluk River. Harvests of char, and fishery quotas and closures are summarized in table 1.

In recent years there has been a change in fishing gear from gillnets to weirs for several of the Cambridge Bay area fisheries (table 2). Prior to 1994, gillnets were used exclusively for the harvest of char from the Halovik and Jayco River fisheries but from 1994 to the present, these two fisheries have been conducted with weirs except for the Halovik in 1995 and 2001 and the Jayco in 1995 when gillnets were used. Char have been harvested from HTA Lake by a stone weir since this fishery began in 1988. From the onset of the Cambridge Bay commercial arctic char fishery through to the present, harvest has been conducted exclusively with gillnets at the Ellice, Paliryuak, Lauchlan and Ekalluk River fisheries with the exception of 1994 and 1995 when weirs constructed of netting material were used at the Ekalluk River whereas all other Cambridge Bay weir fisheries have used conduit weirs described by Kristofferson et al. (1986).

The early history of this fishery is described in Abrahamson (1964) and Barlishen and Webber (1973). Figure 1 depicts fishing and known spawning areas for Cambridge Bay area char.

Freshwater Creek

The first commercial effort, at Freshwater Creek (which flows by the community of Cambridge Bay) in 1960, produced a harvest of about 2 000 kg of Arctic char and in 1961, 7 550 kg were harvested from a quota of 10 500 kg. Due to evidence of a declining stock at that location, and its importance as a subsistence fishery, commercial fishing ceased there and resumed at the Ekalluk River in 1962.

Ekalluk River

In 1962, a quota of 18 160 kg was set for the Ekalluk River. This site has been traditionally fished in the fall. During the years 1962-66, the average annual harvest at the Ekalluk River was 14 570 kg. The annual quota was increased to 45 400 kg in 1967, and was issued for the entire Wellington Bay area in an attempt to spread fishing effort to the other systems flowing into this bay. However, all fishing was concentrated at the Ekalluk River that year, with a harvest of 27 700 kg. In 1968, fishing took place at the Ekalluk, Paliryuak and Halovik rivers, again under the 45 400 kg area quota. The reported harvest for Ekalluk River that year was 34 300 kg. In 1969, 22 700 kg was harvested at the Ekalluk River. The average annual harvest at the Ekalluk River over this three year period was 28 200 kg, but the average weight of Arctic char taken at the Ekalluk River was reported to have declined from 3.0 kg in 1967 to 1.4 kg in 1969. By comparison, the average weight of Arctic char taken at Halovik River in 1969 was

3.2 kg. Consequently, the commercial fishery at Ekalluk River was closed in 1970 and remained so until 1973 when the average weight was 2.7 kg. The original quota of 18 160 kg was set for 1973, and 9 630 kg were harvested that year. The quota was reduced to 11 350 kg in 1974 and an average of 13 790 kg were harvested over the years 1974-78. The quota was increased to 14 500 kg in 1979, and the average harvest at this site over the years 1979-90 was 14 290 kg. The Ekalluk River was not fished in 1991 or 1992, due to a variety of reasons including declining size of Arctic char in the catch the previous years and declining prices for the product. A small harvest of 1 480 kg was taken in 1993 under a quota of 7 500 kg, and 1 640 kg were harvested in 1994, under an increased quota of 20 000 kg. An experimental weir, located at the outlet of Ferguson Lake, was used during both years. The plan was to hold char alive in a pen until transport to market could be assured. There was some success in getting a fresh product to market using this technique. Although the fishery was opened in 1995 with the 20 000 kg quota, only 4 665 kg were harvested. However, in 1996, 10 210 kg were harvested using the traditional gillnets set near the mouth of the river, 14 328 kg were taken in 1997, and 19 825 kg were taken in 1998. Annual harvest for the period 1999 to 2002 averaged 16 072 kg, under the 20 000 kg quota. However, harvest at Paliryuak River averaged 6 217 kg over that same period. Tagging studies indicated that most of the Arctic char taken by the fishery at Paliryuak River were from Ekalluk River stocks, therefore, the actual harvest of Ekalluk River char could have been about 22 200 kg over that time period.

Paliryuak River (Surrey River)

Commercial fishing first took place here in 1968 in the spring. The harvest that year was 6 470 kg, under the Wellington Bay area quota of 45 400 kg. It was not fished in 1969, but a harvest of 5 880 kg was reported for 1970. Fishing ceased here until 1977, when a harvest of 3 260 kg was reported under a quota of 4 500 kg assigned specifically to this site. The quota was increased to 6 800 kg in 1978, with a reported harvest that year of 8 420 kg. The quota was once again increased in 1979, this time to 9 100 kg. The average harvest at this site from 1979-93 was 8 880 kg. In 1994 the quota was rationalized with the Ekalluk River quota, based on the results of tagging studies that indicated most char taken there were from Ekalluk River stocks. No fishing took place at this site from 1994 to 1998. The average annual harvest from 1999 to 2002 inclusive was 6 217 kg.

There appears to be no fall upstream migration at this site but harvesters report that there are large red char in the system.

Halovik River (Thirty Mile River)

Commercial fishing began here in 1968, and took place in fall, similar to the fishery at Paliryuak River. An average harvest of 16 290 kg was reported taken from 1968 to 1971, under the Wellington Bay area quota of 45 400 kg. In 1972, a quota of 9 100 kg was assigned to this specific location and average harvest from 1972-73 was 4 200 kg. Due to declining catches and size of Arctic char in the catch, the fishery was closed for

the period 1974-75. The fishery resumed in 1976 under the 9 100 kg quota, and 2 780 kg were harvested that year. In 1977, the quota was reduced to 4 500 kg, and the average catch for 1977-78 was reported to be 5 179 kg. The quota was increased in 1979 to 6 800 kg, and catches averaged 6 850 kg for the period 1979-93. The quota was reduced to 5 000 kg in 1994, and 3 859 kg were harvested by weir during the fall upstream run. No fishing took place in 1995, but 4 909 kg were reported taken by the weir in 1996, 4 995 kg in 1997, and 5 143 kg in 1998. Average annual harvest for the period 1999 to 2002 inclusive was 5 130 kg.

Lauchlan River (Byron Bay)

The Lauchlan River was first fished for commercial purposes in 1970, although a harvest of 2 270 kg was reported in 1963 with no quota assigned. This site was also included under the Wellington Bay area quota of 45 400 kg, and during the years 1970-71, an average of 10 736 kg of Arctic char was taken there. This fishery also took place in spring, and it was assigned a site-specific quota of 18 160 kg in 1972. Average harvest for 1972-73 was 15 326 kg. The quota was reduced to 11 350 kg in 1974, and harvest fell to 8 125 kg that year. As a consequence, the fishery was closed during 1975 and 1976. It opened again in 1977 under a reduced quota of 6 800 kg, and average harvest for 1977-78 was 5 028 kg. The quota was increased to 9 100 kg in 1979, and average catch from 1979-93 was 9 230 kg. This site was not fished in 1994 but was opened in 1995 under a reduced quota of 2 400 kg. Harvest for 1995 to 1999 inclusive averaged 1 772 kg. No fishing took place in 2000 but 436 kg were harvested in 2001. No fishing took place in 2002.

Ellice River

Commercial fishing began at this mainland site in the fall of 1971. The quota that year was set at 22 700 kg and a harvest of 12 820 kg was reported. The quota was reduced to 11 350 kg for 1972, and catches for 1972-75 averaged 9 269 kg. In 1976, the quota was increased to 13 600 kg. and the average catch from 1976-78 was 14 199 kg. The quota was reduced to 9 100 kg in 1979, due to a decline in the size of Arctic char in the catch. The average harvest from 1979-84 was 7 736 kg. The quota was further reduced to 4 500 kg in 1985 and the average catch from 1985-87 was 4 768 kg. The quota was then increased to 6 000 kg in 1988 and average annual catch for 1988-90 was 6 295 kg. The quota was increased again in 1991, to 8 000 kg and average harvest from 1991-96 was 7 040 kg, although no fishing took place there in 1992. With the exception of 1999, when 4 497 kg of char were harvested, there has been no fishing at this site since 1997.

Perry River

Perry River, located on the mainland east of Ellice River, was first fished commercially in fall of 1977. Average harvest from 1977-1980 was 6 724 kg, under a quota of 11 350 kg. In 1981, the quota was reduced to 6 800 kg, due to declining size of Arctic char in the catch. Harvest that year was reported to be 2 836 kg. The quota was further reduced to 4 500 kg in 1985 but no fishing took place under that quota. In 1991, the

quota was increased to 6 500 kg and a harvest of 600 kg was reported. The site has not been fished since, primarily due to the cost of transporting the catch to the community of Cambridge Bay, and inclement weather often experienced there in fall.

Jayco River

Jayco River was first fished commercially in 1975. Average catch from 1975-77 was 8 410 kg, under a quota of 6 800 kg. The quota was increased in 1978 to 11 350 kg and harvest that year was reported to be 13 414 kg. The quota was increased to13 600 kg in 1979, and catches averaged 12 045 kg from 1979-90. This location was occasionally fished in spring and fall, with the quota being shared between the fishing seasons. However, in 1980, the harvest was taken by experimental weir (Kristofferson *et al*.1986) during the fall upstream run, and, for the most part, harvest since then has been by weir. In 1991, the quota was increased to 15 600, but harvest, by gillnet that year, was only 2 226 kg. Ice forming on the weir caused it to collapse. No fishing took place in 1992 due to low prices, but resumed in 1993 with 15 411 kg harvested. The quota was increased to 17 000 kg in 1994, during which time 16 290 kg were harvested. The average annual harvest at this site over the years 1994 to 2002 inclusive was 15 656 kg.

Other Fishing Sites

Over the years, other sites were periodically fished, including Dease Point (Kulgayuk River) on the mainland for 8 890 kg (9 100 kg quota) in 1972, 3 020 kg (22 700 kg quota) in 1974, and 1 170 kg (20 400 kg quota) in 1976. A harvest of 3 853 kg was reported in 1991 under a 4 000 kg quota and a harvest of 3 120 kg was reported in 1993. Padliak Inlet was fished in 1977 for 880 kg (2 270 kg quota). Elu Inlet, on the mainland, was fished for 2 620 kg in 1977 and 260 kg in 1978, under a quota of 2 270 kg. Starvation Cove, on the south coast of Victoria Island, west of Cambridge Bay, was fished for 6 370 kg of Arctic char in 1977, although no quota was assigned for that location. More recently, an experimental fishery has taken place for a number of years at a site called HTA Lake (Takyoknitok), on the southeast coast of Victoria Island. A weir is used there and the average harvest for the period 1988 to 1991 inclusive was 1 558 kg under a quota of 1 500 kg. This quota was increased to 2 500 kg in 1993, and 3 000 kg in 1999. No fishing was reported for 1992 but the average harvest for 1993 and 1994 was 2 302 kg. No fishing was reported in 1995 but the harvest in 1996 was 2 685 kg. No fishing was reported for 1997 or 1998, but the 1999 harvest was 2 847 kg. No fishing was reported for 2000 but the 2001 harvest was 2 988 kg. Fishing did not take place there in 2002.

Current Harvest

Six sites were fished in 2003. Harvest at the Ekalluk River (20 000 kg quota) was reported to be 15 842 kg. Harvest at Halovik River (5 000 kg quota) was 5 478 kg. The harvest at Lauchlan River (2 400 kg quota) was 1 519 kg. At Jayco River (17 000 kg quota) the harvest was reported to be 17 174 kg. Kulgayuk River harvest (4 000 kg

quota) was reported to be 1 842 kg. The harvest at HTA Lake (Takyoknitok) (3 000 kg quota) was 1 278 kg. No fishing took place at Paliryuak, Ellice and Perry rivers in 2003.

METHODS

Sampling

The information presented in this document is based primarily on data obtained from the plant sampling program for 6 Cambridge Bay fisheries for which long term data bases were available (Ekalluk, Lauchlan, Halovik, Paliryuak, Ellice and Jayco Rivers). The fishery is being evaluated to determine the effects of fishing on stocks of arctic char in this area. Commercially harvested char are sampled annually at the Cambridge Bay fish plant for fork length (± 1 mm), dressed weight (± 50 grams) and saggital otolith age. Signals of the response of char to the effects of fishing are therefore, trend analyses of age, round weight and fork length. All aging of char otoliths was done by the same person by the method of Nordeng (1961).

Plant sampling protocol is described by Kristofferson and Carder (1980). Sampling dates of the plant sampling program and type of commercial fishing gear used for each year of the fishery in which plant sampling was conducted are given in table 2. Sample sizes obtained by the plant sampling program, stratified by age class, are given in tables 3 to 8.

Experimental nets of commercial mesh size (140 mm stretched mesh) were used for data collection on occasion when plant sampling data could not be collected because fisheries have not always occurred at each fishery location in each year of study (table 1). Similarly, in some years when fisheries did in fact occur, it was not always possible to obtain a plant or experimental sample, therefore there are some gaps in the data base (tables 3 to 8).The experimental gillnet sampling was conducted at the Ekalluk River in 1972, 1978, 1988, 1991, and 1992, at the Jayco River in 1975 and at the Paliryuak River in 1980. Sampling for sex and maturity stage was conducted on occasion but not annually because char are dressed (viscera and gills removed) prior to shipment to the fish plant where biological sampling occurs. Sex and maturity stage were assigned via visual observation of the gonads and a numerical grading system (table 10).

Other methods of assessment have been used for research throughout the history of this fishery. These include 1) weir enumerations of fall upstream migrations, 2) tagging and 3) research on genetic stock structure and homing to natal spawning grounds.

Sampling Uncertainty

There are three sources of uncertaintly associated with the plant sampling program which may bias the analyses of this report.

Firstly, arctic char migrations are often temporally stratified by size. For upstream migrations of Labrador char, Dempson et al. (2004) reported a change in the size distribution throughout the run, with larger char often coming in first. Johnson (1980 and 1989) found that larger char were found at the onsets of both upstream and downstream migrations of Nauyuk Lake char with mean size declining throughout both of these migratory periods. Dempson (pers. com.) also found that Labrador char migrations are temporally stratified by maturity status, with maturing fish entering first, followed by mature non-spawning fish (resting) and lastly by immature fish (smolts). The timing of sampling of Cambridge Bay fisheries has likely been unbalanced throughout the years of the fishery because it has been determined solely by the timing of the fisheries themselves. Sampling periods have 1) often occurred over a very short period of time, 2) have occurred during July upstream and or August and September downstream migratory periods and 3) have varied among years with regards to the dates of sampling (table 2). The unbalanced timing of sampling and the observation that char migrations are temporally stratified by size and maturity status suggests that trend analyses of age, length, weight and condition and analysis of maturity presented in this report may be biased. For example, downstream char migrants are in poorer condition than are upstream migrants which suggests that this unbalanced component of the sampling program may have clouded trend analyses of weight and condition.

Secondly, the fishery has harvested fish by both gillnets and weirs (table 2) and differences between the size selectivity of these gear types has not been assessed. Therefore, gear changes may have also clouded trend analyses of weight, length, age and condition.

Thirdly, sample sizes have been relatively small. In most cases, mean sample sizes have ranged among sampling years between 142 and 170 char per location but periodically they have been much less in size, with mean sample sizes ranging among sampling years between 63 and 91 char per location (table 9). Small sample sizes may have introduced bias into the analyses or reduced their statistical power (the probability of correctly rejecting the null hypothesis).

Fishing dates have traditionally been chosen by the commercial fishery at times when migrations are at their peak of abundance or when ‘the fishing is best’. This may mitigate, to some extent, the potential bias associated with the variability observed in the timing of sampling. If both fishing and the surrogate sampling of the harvest have occurred during periods of peak migration strength.throughout the years of the fishery, then similar compononents of the temporally stratified runs may have been sampled among the years of this study. It is difficult to attribute the similar trends observed in relative year class or birth year strengths among many of the Cambridge Bay fisheries (see below – Trends in Relative Year Class Strength) to the interaction of the timing of sampling and temporal stratification of char migrations. If such was the case, then the same components of the stratified runs would have had to been sampled in the same biased manner for all fishing locations and years of the fishery and this seems unlikely.

Statistical Methods

The General Linear models (GLM) procedure in SAS (Statistical Analysis System, Sas Institute Inc. 1989) was used for all linear models, correlations and solutions of linear models.

Round Weight Estimation

When round weights were not measured in the field or fish plant, they were estimated from dressed weights using the following regression equations.

Ekalluk River

rndwght = (drsdwght x 1.179) + 38.271
R-square = .98
Sample Size = 357

Ellice River

rndwght = (drsdwght x 1.258) - 110.713
R-square = .99
Sample Size = 267

Halovik River

rndwght = (drsdwght x 1.183) - 50.500
R-square = .98
Sample Size = 309

Jayco River

rndwght = (drsdwght x 1.156) - 2.640
R-square = .99
Sample Size = 162

Lauchlan River

rndwght = (drsdwght x 1.210) - 71.782
R-square = .97
Sample Size = 345

Paliryuak River

rndwght = (drsdwght x 1.128) + 11.412;
R-square = .99
Sample Size = 77

Year Class Trend Analysis

The following fixed effect model was used to describe the effects of class variables 1) age, 2) birth year and 3) location on the percentages found in annual plant samples taken from the harvests of 6 Cambridge Bay commercial fishery locations.

$$p_{ijk} = a_i*\text{age} + b_j*\text{birthyear} + c_{ij}*\text{age}*\text{birthyear} + d_{ik}*\text{birthyear(location)} + e_{jk}*\text{age(location)} + \varepsilon_{ijk}$$

The response p_{ijk} is the observed percentage of the i^{th} age class in the j^{th} birth year at the k^{th} location; a_i is the covariate describing the effects of the i^{th} age class; b_j is the effect of the j^{th} birth year; c_{ij} is the effect of the age_i by $birthyear_j$ interaction; d_{ik} *is the effect of the* j^{th} birth year nested within the k^{th} location; e_{jk} is the effect of the i^{th} age class nested within the j^{th} location, and ε_{ijk} is the residual error. The variation of p_{ijk} about the model predicted values was sufficiently close to $(p_{ijk}) \times (100 - p_{ijk})$ that the inverse of this term was used as a weighting factor for the error variance of the above model using the WEIGHT option of GLM in SAS (Statistical Analysis System, Sas Institute Inc. 1989).

Sampling year and location effects could not be tested as single variables by the model because p_{ijk} was standardized by sampling year and location by expressing it as a percentage. This was necessary because sample sizes varied among locations and sampling years. However, location effect was examined by running the model on each of 5 data sets which each contained a different combination of proximate and or distant locations and then comparing the results of the 5 analyses. The location groups compared were the Ellice and Jayco River locations, the 4 Wellington Bay locations, all 6 locations, all Wellington Bay location data combined and the Jayco River and all Wellington Bay location data combined and the Ellice River. Age and birthyear nested within sample year effects could not be tested because the three variables are confounded. Age and birthyear nested within location effects were tested for pairs of locations using pairwise comparisons.

In addition to the above model, three dimensional contour plots of percentage year class abundance were produced using the G3GRID and GCONTOUR procedures of SAS Graph (SAS/GRAPH Software, Vol. 2, 1990). For these figures, year class percentage occurs on the z axis, year class occurs on the x axis and sampling year occurs on the y axis. The figures can be interpreted in the same manner as would be used to interpret a topographical map. Grid shades in these figures correspond to various percentage categories which vary from white for 0 percentage through darkening shades of grey to black for higher percentages. Consequently, darker areas in these figures correspond to sampling years when relatively high year class abundances were observed and lighter areas correspond to sampling years when relatively low year class abundances were observed.

Other Graphic Analyses

For char from each location, length at age plots, mean age, mean weight, mean length and mean condition factor trend plots and plots of the passage of 6 specific birth year classes through years of the fishery were all produced using the GPLOT procedure of SAS Graph (SAS/GRAPH Software, Vol. 2, 1990). Three dimensional plots of percentage age class abundance were produced using the G3D and G3GRID procedures of SAS Graph (SAS/GRAPH Software, Vol. 2, 1990). For these figures, age class percentage occurs on the z axis, age class occurs on the x axis and sampling year occurs on the y axis.

Environment

Cambridge Bay (69^{o} 6' N, 105^{o} 8' W) is located in Nunavut on the southwest corner of Victoria Island approximately 100 km north of the arctic coastline. Climatic conditions of the Cambridge Bay area are largely influenced by the geographic position of Victoria Island and the cold currents of the Arctic Ocean. The climate is classified as arctic (Abrahamson 1964) with a mean annual temperature of -14.4^{o} C and a mean annual precipitation of 138.8 mm of which 58 % occurs as snow on average (Environment Canada Climate Normals, 1971 to 2003). Average daily air temperatures exceed 0^{o} C only for the months of June, July and August (table 11).

Information available on ice duration for freshwater lakes in the area of Cambridge Bay is limited but some data were obtained for a lake on the Lauchlan River system (68^{o} 45' N, 109^{o} 04' W) for the period of 1962 to 1991 from the Canadian Cryosheric Information Network (www.socc.ca). For this lake, dates of complete freeze up varied from Sept. 15 to Oct. 19 and ice free dates varied from June 29 to July 19. The range in length of the open water season for this lake was 54 to 95 days. Meteorological conditions which influence ice duration (rainfall, snow depth, and temperature) are highly variable among years for Cambridge Bay (table 11) and this variability likely underlies the large range observed for the duration of the open water season of the aforementioned lake. Probably, all freshwater systems in the Cambridge Bay area are highly variable from year to year with regards to their thermal regimes and duration of the open water period.

Abrahamson (1964) reported that average dates of sea ice break up and freeze up for Cambridge Bay were July 20 and September 15 respectively but cautioned that there is a high degree of variability among years for these dates. This variability was noted for sea ice data which were obtained for Dease Strait (68^{o} 45' N, 109^{o} 04' W) for the period of 1963 to 1991 from a location very close to where lake ice data were collected from the Lauchlan River system (Canadian Cryospheric Information Network, www.socc.ca). At this station, the sea was ice free as early as mid July and as late as mid August but usually by late July to early August. For the same station, the sea was completely frozen as early as the beginning of October and as late as mid November but usually by late October to early November. Based on the limited data available, in the Cambridge Bay area, ice break up and freeze up seems to occur earlier for lake ice than for sea

ice. Recent changes in the timing of sea ice freeze up and break up may have occurred in the Cambridge Bay area as a result of climate change. Nichols et al. (2004) reported that during the 1990's in the Sachs Harbour area, located approximately 600 kms northwest of Cambridge Bay on Banks Island, a traditional knowledge survey indicated that sea ice break up was now occurring earlier and that sea ice freeze up was now occurring later.

RESULTS AND DISCUSSION

Abundance

Catch per unit of effort (CPUE) data is not available for Cambridge Bay char fisheries. This is unfortunate because it limits the amount of information that could be generated from modeling exercises where such data are often used as a measure of abundance from which to calibrate Virtual Population Analyses. It may be possible to obtain information from records of the Cambridge Bay fish plant, if they exist, on the number of days each fishery was prosecuted to fill its quota. This information may serve as an index of abundance (CPUE) and its availability and quality should, therefore, be investigated.

Abundance information is at present limited to single year weir enumerations of the upstream migration of 4 commercially fished Cambridge Bay sites (Ekalluk, Jayco, Halovik and Lauchlan Rivers) and 3 upstream weir enumerations of Freshwater Creek which has not been commercially fished since 1961 (table 12). Given that there is significant annual variation in year class strength of Cambridge Bay char (see below - Trends in Relative Year Class Strength), it is likely that there is also significant annual variation in upstream weir counts. However, consecutive annual assessments at one or more fishing sites via weir enumeration have not been done and should be considered for future assessment of annual variation in abundance.

Abundance estimates combined with information on size and age distributions of char sampled in upstream weir enumerations were used to estimate exploitation rate for the Ekalluk River. Based on the 1979 weir count on the Ekalluk River, the current quota of 14 500 kg equates to a harvest of about 6.4% of the exploitable biomass (fish greater or equal to 60 cm) or 3.5 % of the biomass of all length intervals of char which passed through the weir. The 1979 catch (15 806 kg) was equivalent to about 7.0% of the exploitable biomass or 3.8 % of the biomass of all length intervals of char which passed through the weir. If the point estimate of abundance derived from the 1979 weir assessment was representative of the run size and if annual variation in run size is relatively low, then this estimate of sustainable harvest rate may represent the only information available for Arctic coast char populations. The actual effect of fishing on individual stocks, because these are, for the most part, mixed stock fisheries is unknown. It is possible that smaller more vulnerable populations of char may have been extirpated by Cambridge Bay char fisheries.

Age Trends

Age class percentages in annual samples are given for each location in tables 13 to 18. Mean ages were variable among sampling years and did not show consistent trends of increase or decrease through sampling years (figure 2). Peaks and troughs in mean age plots are very similar for the Wellington Bay fisheries with regards to which sampling years they occur in but much less so for the Ellice and Jayco River fisheries.

The representation of age trends as means does place limits on the usefulness of interpreting age data as a response to harvest because it does not allow for examination of the response of specific year and or age classes to harvest or other variables such as climate.

Figures 3a and 3b present trends for specific age classes for all fisheries through sampling years. The figure is composed of age class frequencies expressed as percentages within each annual sample for all sampling years at each of 6 fishing locations or sampling sites. It was necessary to express age class frequencies as percentages because sample sizes varied among locations and sampling years (tables 3 to 8). The 3 dimensional plots illustrate age class percentage on the z axis, age class on the y axis and sampling year on the x axis. The plots were generated using the GRID procedure of SAS Graph (SAS/GRAPH Software, Vol. 2, 1990) combined with a spline interpolation or smoothing function (Harder and Desmarais 1972, Meinguet 1979).

With respect to figures 3a and 3b, percentage age class representation was highly variable among sampling years and locations and bimodal in some instances. Modal age class representation was highly variable with respect to relative abundance (height on the z axis) and age class for all locations.

With respect to the Ekalluk River plant samples, between 1972 and 2003, the number of age classes increased slightly from 11 (7 -17) to 13 (7 -19) with the greater number observed between 1990 and 2003. However, the centre of distribution has remained stable around ages 12 -13 throughout the time series and most catches are dominated by four age classes (ages 10 to 13, or ages 11 to 14). Between 2000 and 2002 there was a bimodal distribution centered around ages 10 -11 and 13 -14 (table13, figure 3a).

In the Ellice River plant samples, the number of age classes has remained constant but the modal age has declined steadily from11 and 12 in 1971 to 8 in 1999 (table14, figure 3a).

In the Halovik River, the catch was composed of a broad range of age classes with no pronounced mode evident. Two anomalies were the strong modal representation of 15-17 year old char which occurred between 1985 and 1990 and the strong representation of 5 - 10 year old char which occurred in 1972 (table15, figure 3a).

In the Jayco River there was a strong mode (14 -16 years) which persisted from 1976 to 1991. In recent years, modal age has shifted to ages 11 - 13. There appears to be a slight reduction in the number of age classes from 1976 to 2002 (table16, figure 3b).

In 1972, the Lauchlan River was characterized by a broad age distribution with good representation of older fish (13-18 years). No samples were available in 1975 and 1976 and between 1994 and 1996. Between 1977 and 1983 a much narrower distribution, centered around ages 11 - 15, was evident. Between 1984 and 1993, modal ages increased from previous years and were centered around 13 – 16. In 1997 samples, modal ages had decreased and were centered around 12 – 14 (table17, figure 3b).

The Paliryuak River age distribution was broad and stable between 1977 and 1993 and centered around ages 12-15 throughout the time series (table18, figure 3b).

Based soley on age trends and the age of maturity of Cambridge Bay char, a level of risk of overexploitation was assigned to 6 Cambridge Bay fisheries (table 19). Risk levels were assigned based on the assumption that trends in age class frequency distributions (figures 3a and 3b) would continue if future harvests were similar to historical harvests. Risk levels were deemed higher for locations in which harvests of char were composed of a relatively high percentage of age classes which were considered to be less than the age of maturity. This subjective risk assessment was done by the Regional Assessment Procedure Committee at a meeting held in Cambridge Bay in March, 2004. Risk levels assigned to all fisheries were low to moderate with the exception of the Ellice River. This fishery was assigned a moderate to high level of risk based on its consistent decline in modal age to a point where plant samples taken during the 1990's were composed almost entirely of fish which were younger than the mean age of maturity of Cambridge Bay char (see below - Sex and Maturity). The relatively high Ellice River level of risk is somewhat mitigated by the fact that it has been fished only once since 1997.

Length at Age

Population growth rates were examined as plots of mean fork length on age (Figure 4). Growth of char from Wellington Bay samples was similar among locations. Growth of char in Ellice River samples differed from other locations in that growth during the first 10 years of life was more rapid with 5 year old fish attaining fork lengths of approximately 500 mm compared to fork lengths of approximately 300 to 400 mm for 5 year old fish from other locations. Growth of char in Jayco River samples differed from other locations in that maximum size was approximately 700 mm compared to a maximum size of approximately 800 mm for other locations. For all locations, growth started to become asymptotic at approximately age 16 except for Ellice River samples where growth plots were linear without a pronounced asymptotic phase. Approximately 75 % of char growth in fork length occurred prior to the mean age of maturity (female - 10.7 years, male - 11.7 years).

Trends in Relative Year Class Strength

Year class or year of birth was calculated for each char in the plant samples as sample year – age (Tables 19 to 24). It was necessary to express year class frequencies as percentages because sample sizes varied among locations and sampling years.

Graphic Analysis

Examination of year class or birth year trends revealed that there were pulses of relatively strong and weak recruitment of specific year classes into the fisheries of all 6 river systems examined (figure 5). The pulses were somewhat synchronous among all 6 fishing locations with regards to which sampling years they occurred in and which specific year classes were relatively strong or weak. However, birth year pulses in the Ellice River harvests differed somewhat from the more synchronous pulses noted in other locations in that they were strong from the mid 1970's through to the late 1980's. Birth year percentages were relatively strong in all fisheries for birth years of the late 1960's and early 1970's, the late 1970's and and early 1980's. Birth year pulses were noted for the Ekalluk, Halovik, Ellice and Jayco River fisheries for birth years 1989 to 1991. Relative strengths of birthyears 1989 to 1991 of the Paliryuak and Lauchlan River fisheries could not be compared to those of other fisheries because sampling of these fisheries was not conducted in later years of the study (figure 5).

For any given birth year, the year of entry into the fishery and number of years present in the fishery was similar among all Wellington Bay fisheries but these same birth years entered the Ellice River fishery earlier and remained in the fishery for fewer years. Conversely, these same birth years entered the Jayco River fishery later and remained in the fishery for a greater number of years (figures 6 to 11). These observations can be explained by 1) differences among fishing locations in char size at age which affects how soon after birth char become vulnerable to the fishing gear and 2) differences among fishing locations in char longevity which affects how long char remain in the fishery (figure 4). For any given birth year, fast growing and relatively short lived Ellice River char, entered the fishery approximately 2 to 4 years earlier and remained in the fishery for approximately 2 years less than did char harvested by Wellington Bay fisheries. Relatively slow growing and long lived Jayco River char entered the fishery approximately 2 years later and remained in the fishery for approximately 4 years more than did char harvested by Wellington Bay fisheries (figures 6 to 11).

Statistical Analysis

The variation and synchronicity of birth year trends, described above via graphic analysis, were tested using the fixed effect model outlined in the 'Methods' section. The model was run on 5 different combinations of locations with overall R^2 's for these analyses ranging from 0.82 to 0.94. A summary of the results of the analyses are given in table 20.

For all 5 analyses, age had the most significant effect on the percentages of char found in annual samples with all probabilities < .0001 and F values ranging from 13.99 to 122.21.

This finding is expected because the gear is size and, therefore, age selective which results in samples for which the highest percentages are associated with a narrow age range. The “SOLUTION” option in SAS GLM (1989) showed that 11 to 13 year old fish were most commonly sampled with a peak of 12 years. In all 5 location combinations, there was a significant age nested within location effect which indicated that age distributions differed significantly among locations. Location combinations which contained the Jayco and or Ellice Rivers had the stongest age nested within location effects. This result is expected in light of the observation that Jayco River harvests contained relatively old and long lived char and Ellice River harvests contained relatively young and short lived char.

Pairwise location comparisons of the age nested within location effect were used to further examine the effect of location on age. The results of these pairwise comparisons (table 21) were consistent with the results of the location combination analysis approach (table 20) in that 12 of the 15 possible pairwise comparisons were significantly different indicating that most of the locations had significantly different age distributions. However, in contrast with results of the location combination analysis, the pairwise analysis indicated that age distributions were not significantly different among the Ekalluk, Paliryuak and Lauchlan Rivers or between the Halovik and Lauchlan Rivers. Geographic proximity of the Ekalluk, Paliryuak and Lauchlan Rivers and of the Halovik and Lauchlan Rivers (figure 1) may explain these among location similarities in age distributions since tagging studies have indicated that there is significant exchange of char among the Wellington Bay fisheries (see below - Migration and Spawning Site Fidelity).

Birth year had a significant effect on the percentage of char in the samples for all location combinations with all probabilities < .0001 and F values ranging from 2.77 to 5.49. The significant birth year effect was consistent with the graphic analysis and demonstrated that temporal patterns in birth year strength were significant and non random. Location combinations with the strongest birth year effects were those combinations which did not include the Ellice River (table 20) which is geographically atypical in that it is the only mainland fishery. This indicates that the relative abundances of specific birth years in Ellice River char harvests differed from those of other fisheries which in turn suggests that the dynamics of recruitment of Ellice River char are atypical in comparison to those of other fishery locations.

The birth year nested within location effect was not significant when only the 4 Wellington Bay locations were tested ($p = 0.2825$, $F = 1.09$), indicating that temporal patterns in char birth year relative abundance and recruitment were synchronous among the closely located Wellington Bay fishery locations. Synchronicity of birth year relative abundance of char from Wellington Bay fisheries is also evident in figure 5. Significant birth year nested within location effects were found for all other location combinations analised, indicating that temporal patterns in char birth year relative abundance and recruitment were not synchronous among at least one of the locations within these location combinations. The strongest birth year nested within location effects were noted for the comparison of Ellice River sampling data to sampling data combined for the 4 Wellington Bay locations ($p < .0001$, $F = 3.66$), the comparison of Ellice River sampling data to sampling data from the Jayco River ($p = .0004$, $F = 2.55$) and the comparison of the Jayco River sampling data

to sampling data combined for the 4 Wellington Bay locations ($p < .0001$, $F = 2.46$). These results suggest that compared to Wellington Bay fishery locations, the temporal pattern of char recruitment for Ellice and Jayco River char were significantly different from each other and and that the patterns of both locations were significantly different from those of Wellington Bay fisheries.

Synchronicity among locations, with regards to the temporal pattern of char recruitment, was further examined by pairwise location comparisons of the birth year within location effect (table 21). The results of the pairwise comparisons were similar to those of the 5 location combination analyses described above but some differences between the 2 analysis approaches were found. In comparison to and in contrast with the location combination analysis, the pairwise analysis indicated that the Lauchlan River was significantly different from one other Wellington Bay fishery (the Halovik River) but was not significantly different from the more remote Jayco and Ellice rivers. It is interesting to note that the Lauchlan River is more remote in proximity in comparison to the other Wellington Bay fisheries which may suggest, as noted for the Jayco and Ellice River fisheries, that there is a location proximity effect (geographic effect) which underlies the absense or presence of synchronous recruitment apparent in many of the Cambridge Bay char fisheries.

In summary, the location combination, pairwise and graphic analyses indicate that recruitment of char in the Cambridge Bay area is highly variable among years and locations and that the temporal patterns of variability are similar or synchronous among the closely located Wellington Bay fisheries but different for the more remote Jayco and Ellice River fisheries. These results strongly suggest that 1) the abundances of Cambridge Bay char stocks and, therefore, their intrinsic abilities to sustain harvest, are also variable among years and locations and 2) that char recruitment in the Cambridge Bay area is effected by a large scale influence, perhaps meteorological in nature. However, recruitment patterns of Cambridge Bay fisheries were not the same among all fisheries as demonstrated by different patterns noted for the more remote Ellice River. Smaller scale geographic variation in meteorological conditions may underlie the geographic variation in temporal recruitment patterns demonstrated by Cambridge Bay char.

Other researchers have found that climate has a significant effect on char population parameters. Power et al. (2000) found that weather conditions prevailing during the first winter and sea migration life-stages, exerted significant influence on measured age and weight characteristics of arctic char at Nain, Labrador. Dutil (1986) describes the extreme energy demands of maturation and spawning for arctic char and suggests that there maybe a threshold in body condition above which the process of maturation is released. Dutil states that “Knowing the threshold body condition likely to trigger the production of gametes could provide a tool to predict the number of spawners to be expected 12 months later.” It follows then that a greater frequency of spawning should be expected when the condition of char is relatively good. If Dutil’s threshold hypothesis is true, then periods when condition is relatively high should also be characterised by relatively strong year classes if the strength of a year class is determined largely by the number of eggs layed. Evidence of this is apparent in figures 5 and 14 since year class strength is closely associated with

condition trends, with periods of higher condition being characterized by relatively strong year class strength. We suggest that the obseved and significant recruitment variation of Cambridge Bay char stocks is influenced by the effects of weather on 1) the quality and length of the marine feeding environment of anadromous char and 2) limnological regimes of inland lakes, where spawning occurs and pre-smolt char reside for the first 4 to 5 years of their lives. If our postulate is true, that environmental variability of inland lakes and the marine feeding environment underlies the observed recruitment variability of Cambridge Bay char, then it is expected that the environments of arctic inland lakes and the sea must also be highly variable among years. Indeed, this seems to be the case. For example, one lake in the study area had an ice free season which varied among years from 54 to 95 days in duration, which is not surprising in light of the high variability observed for meteorological conditions in the Cambridge Bay area (table 11). Similarily, Dease Strait was ice free as early as mid July and as late as mid August and was completely frozen as early as the beginning of October and as late as mid November (see above - Environment).

Annual variation in ice cover duration and open water temperature regimes of arctic inland lakes likely has a profound effect on the annual variability in productivity and density of the benthic and plankton communities of these lakes. Therefore, the growth environment of pre-smolt char (prey abundance and water temperature) is expected to also be strongly influenced by ice cover duration and open water temperature regimes. Welsh (1976) found that the abundance of chironomid larvae, a dominant prey item in the diets of char (Johnson 1980), varied among years in Char Lake by several orders of magnitude. Welsh concluded that the most important control of Char Lake chironomid production was probably the summer environmental conditions for emergence and egg laying. He tentatively concluded that in Char Lake, chironomid production provides most of the energy ingested by char and that about 75 % of chironomid production went to char.

It is not known which influence, environmental variability of inland freshwater rearing environments or marine feeding environments, has a predominant effect on recruitment variability and year class strengths. It is possible that a model could be developed to predict year class strength and therefore, relative abundance and sustainable harvest rate, from past environmental conditions and ice conditions. Such a model would enhance management of this fishery because at present, quotas are fixed and assume that sustainable harvest rates are also fixed but, in fact, sustainable harvest rates probably vary among years and are likely synchronous with varying year class strengths.

The results of the year class model are also highly relevant in regards to correct interpretation of the signal variables (size and age) responses to harvest and this relevance is discussed below in the section on Size and Condition Trends.

Size and Condition Trends

Length

Mean fork length at age was highly variable among sampling years for all age classes and sampling locations (tables 22 to 27).

Mean fork lengths for all ages combined were variable throughout sampling years for all locations and did not demonstrate consistent declines or increases (figure 12). The trends were characterized by peaks and troughs which occurred during similar sampling years among the Wellington Bay and Jayco River fisheries but in this respect, were much less similar for the Ellice River fishery (figure 12). A comparison of figures 5 and 12 indicates that trends in mean fork length were highly correlated with trends in relative year class strength. The correlation exists because as stong year classes passed through each fishery, mean lengths of char increased as the fish became older and longer in each successive sampling year. The influence of year class passage through time on mean length is pronounced because, although annual samples contained many year classes, any given strong year class could contribute up to 40 % of the fish in one annual sample. For example, strong year class representation occurred in the Ekalluk River samples between 1981 and 1987 (figure 5) during which time mean fork length increased and then fell of sharply after 1987 as the strong year classes left the fishery (figure 12). A close examination of figures 5 and 12 reveals that almost all of the noted peaks and troughs in mean length for all fisheries can be attributed to the passage of relatively strong and weak year classes through the fishery.

Recruitment variation expressed in the data as trends in year class strength, must be assessed prior to using mean fork length trends as indicators of char response to harvest. Ironically, a practice in fisheries management is to restrict fisheries when mean lengths are relatively low but in fact this maybe when the fisheries are most capable of supporting harvest because a strong and abundant year class of young and relatively small fish has just entered the fishery. Unfortunately, the feed back to this management practice supports the managers' advice because after restriction of the harvest of the fishery, mean lengths become progressively longer as fish of the strong year class grow in length and the year class passes through the fishery. Conversely, mean lengths are highest when a strong year class is sampled just prior to its exit from the fishery when fish of this year class are at their oldest age and greatest length. Management responses to large fish are often the removal of harvest restrictions but in fact this maybe when the fisheries are least capable of supporting harvest because a strong and abundant year class of relatively old and long fish has just left the fishery and is followed by weaker year classes which entered the fishery in subsequent years. An example of this management practice occurred for the Ekalluk River. In this instance, sampled char had high mean ages and lengths in 1987 followed by a significant decline in mean ages and lengths between 1988 and 1991 (figures 2 and 12). Under the assumption that this was a response to over exploitation, managers recommended a closure of the fishery in 1991 at which time a small harvest of only 1500 kgs round weight was taken for sampling purposes. In 1992 and 1993 the fishery was reopened with a 50 % reduction in quota (table 1). We argue that the decline in mean age

and length which occurred between 1987 and 1991 was unrelated to exploitation rate and was simply a product of naturally induced variable recruitment of strong and weak year classes which is characteristic of all fisheries in the Cambridge Bay area. Our argument is supported by the observation that trends in relative year class strength (figure 5) seem to be uncorrelated to harvest size for all locations (table 1).

Weight

Mean round weight at age was highly variable among sampling years for all age classes and sampling locations (tables 28 to 33).

As noted above for mean fork length trends, mean round weight trends were also variable throughout sampling years for all fisheries. Unlike mean fork length trends, mean round weights of char increased throughout sampling years in the Halovik River and increased from 1987 onward in the Ellice River (figure 13). Mean round weight trends of the Ekalluk, Paliryuak, Lauchlan and Jayco River char samples did not demonstrate consistent declines or increases. As for mean fork length trends, the mean round weight trends in all fisheries were characterized by peaks and troughs which occurred during similar sampling years among the Wellington Bay and Jayco River fisheries but in this respect, were much less similar for the Ellice River fishery.

As noted for mean fork length trends, a close examination of figures 5 and 13 reveals that almost all of the noted peaks and troughs in mean round weight for all fisheries can be attributed to the passage of relatively strong and weak year classes through the fishery. The same rational offered as explanation for the synchronous occurrence among fisheries of peaks and troughs in mean fork length trends, is also offered as explanation for the synchronous occurrence among fisheries of peaks and troughs in mean round weight trends.

Finally and as also noted for mean fork length trends, recruitment variation expressed in the data as trends in year class strength, should be assessed prior to using mean round weight trends as indicators of char response to harvest.

Condition

Condition factors were calculated for each sampled char as;

$$\text{Round Weight (grams)} \times 10^5 / \text{Fork Length}^3 \text{ (mm)}.$$

Condition trends (figure 14) closely mirrored trends for mean fork length, mean age and mean weight (figures 2,12 and 13) and were characterized by the same peaks and troughs as were trends in age, fork length and round weight. This similarity suggests that char condition is positively correlated with age, length and weight. For example, condition, age, length and weight were all relatively high around 1983 and relatively low around 1989 in most locations. observed when figures 5 and 14 are compared. When graphed trends in birth year strength (figure 5) and condition (figure 14) are compared, birth years of relatively

high abundance (eg. 1983) are characterised by relatively high condition and birth years of relatively low abundance (eg. 1989) are characterised by relatively low condition.

Mean round weight increases of Ellice char samples, which occurred during a period when mean ages and fork lengths did not show a pronounced increase (figures 2,12 and 13), implied that condition had increased and this is evident in figure 14. Mean condition factor increases of Halovik River char observed between 1994 and 2003 (figure 14) are attributed to a change in the timing of the fishery. Prior to 1994, the Halovik River fishery occurred primarily in spring (table 2) and harvested downstream migrants which are characteristically in poorer condition than are upstream migrants harvested from fall fisheries. Although variable, condition trends of Wellington Bay fisheries did not show a pronounced increase or decrease throughout the sampling years.

Weight Increase in the Sea

For the Jayco, Lauchlan and Paliryuak locations, samples of char were obtained from both the spring downstream and fall upstream fisheries between 1980 and 1985. This sampling allowed for the assessment of weight increases in the sea for Cambridge Bay char. Data from all locations was combined and analysis of covariance was then used to assess annual weight increase in the sea between spring and fall migratory periods for the years of 1980 to 1985. The General Linear Model procedure of SAS (Statistical Analysis System, Sas Institute Inc. 1989) was used for the analysis.

The regression model used log 10 round weight as the response variable, log 10 fork length as the covariate and also included the independent variables of year, sampling period (upstream or downstream) and the year by sampling period interaction. It was not possible to include location as an independent variable in the model because the sampling design was unbalanced in that all sampling years were not represented in all locations. Therefore, the analysis was done separately for each location which invalidated between location comparisons of weight increase in the sea. The analysis also generated least square means of log 10 weight (mean weights adjusted to a common fork length).

For each location, all independent variables had a highly significant effect on log 10 adjusted mean weight ($pr < .0001$). As expected, log 10 fork length had the strongest effect on log 10 adjusted mean weight with F values ranging from 2719.31 to 8241.76. Sampling period had the second strongest effect with F values ranging from 335.46 to 523.04. The effects of sampling year (F values ranging from 17.75 to 69.36) and the sampling year by sampling period interaction (F values ranging from 8.76 to 27.63) had the least influence on log 10 adjusted mean weight. These results indicated that for each location, there was a marked and significant weight increase while at sea but the increase varied significantly among years. Anti logs of log 10 weights were then used to estimate predicted upstream and downstream weights and % weight increase while at sea. Among year weight increases while at sea ranged from 13.62 to 32.04 % for the Paliryuak, 11.86 to 26.07 % for the Jayco and 11.60 to 34.04 for the Lauchlan (table 34). Johnson (1989) reported similar findings for Nauyuk Lake char and stated that weight increase in the sea is rapid

but variable from year to year, being as high as 42 % in a “good” year and as low as 12 % in a “poor” year.

Sex and Maturity

For each of the 6 Cambridge Bay char fisheries described above, gonads of char were assessed for sex and maturity stage (table 35). These assessments were not done annually but rather, opportunistically when experimental netting and or weir assessment or the rare delivery of undressed char to the fish plant allowed for the examination of gonads. Almost all char delivered to the fish plant are eviscerated; therefore sex and maturity stage assessment could not be done for each year of the plant sampling program.

Mean ages of immature char were 10.7 and 11.7 for females and males respectively. Mean ages of mature stages (resting, ripe and spent) of char were similar for males and females and ranged from approximately 12 to 14 years. These mean ages suggest that on average females mature at approximately 12 years of age and males slightly earlier at 11 years. However, the 95 % confidence intervals associated with mean ages, lengths and weights of maturity stages were extreme for both male and female char (table 35) suggesting that the maturation process is poorly correlated with age and size and can occur very early or very late in life for some char. It is noted that a significant proportion of relatively old char were classified as immature and that maturity occurred as early as 5 and 7 years of age for female and male char respectively (table 35).

Sex and maturity stage assessments suggest that approximately 3/4 of commercial Cambridge Bay char harvests are composed of immature fish. Given that char migrations are temporally stratified by maturity status (Dempson, pers. com.), this relatively high proportion of immature fish may be an artifact of sampling bias caused by the short periods in which samples were taken, often in only a few days. The noted absence of recruitment failure observed for all six fisheries during the 33 year study period indicates that the harvest of char prior to maturity or an age at which they are capable of spawning, has not adversely affected the reproductive potential of Cambridge Bay char stocks. It may also indicate that 1) present harvests are at or below sustainable rates and or 2) that there is little correlation between char recruitment and brood stock abundance and harvest and that other factors, perhaps meteorological influences, underlie variance in Cambridge Bay char recruitment.

Migration and Spawning Site Fidelity

Anadromous arctic char exhibit annual downstream and upstream feeding migrations to the sea although some individuals in some systems may not migrate to sea the year that they spawn (Johnson 1989). Feeding migations, the target of the Cambridge Bay commercial fishery, are composed largely of char which will not spawn in the current year as reported for Nauyuk Lake char by Johnson (1980). Gyselman (1994) reported that Nauyuk Lake upstream feeding migrations were composed of between 2 to 8 % of char which would spawn the following year. Non spawning char demonstrate a low

fidelity, about 30 to 50 %, to their natal streams (Gyselman 1994). Gyselman reported that char tagged in Nauyuk lake were recaptured in virtually every fishery in the area including those fisheries of Cambridge Bay. Conversely, spawning char demonstrate high fidelity to their natal spawning grounds (Alm 1951, LeCren and Kipling 1963, Frost 1963, Glova and McCart 1974, Gyselman 1994, Kristofferson 2002). These findings suggest that char which will spawn in the current year have a very low vulnerability to harvest in that year.

Tagging studies conducted at the Ekalluk River in 1978 and 1979 and Starvation Cove in 1979, located approximately 25 km south of the Ekalluk River mouth on the southwest corner of Victoria Island, have been summarized by Kristofferson et al. (1984). They reported that recaptures occurred at all fishing sites in subsequent years, which included the Ekalluk, Paliryuak, Lauchlan and Halovik rivers. The results of tagging research done by Kristofferson et al. (1984) are consistent with the findings of other authors who reported low fidelity of non spawning char to natal spawning grounds.

In a general sense, migratory routes are predictable and occur along coastal areas and in rivers which drain into the sea from large freshwater inland lakes which provide over wintering, spawning and rearing habitat. In regards to char from any given stock, migratory routes are not predictable because, as mentioned above, fidelity of non spawning char is low. During open-water periods, fish may travel long distances. Up to 550 km have been documented from tag returns but this distance may not have been traveled in a single year (Gyselman 1994). Dempson and Kristofferson (1987) found that ocean migrations of both Labrador and Cambridge Bay char were influenced by many factors including local marine environmental conditions, availability of marine food resources, fish size, fish sex and maturation state and proximity to other river systems.

Stock Structure

Recent studies in the Cambridge Bay area have revealed that discrete stocks of arctic char exist not only between river systems, but also within river systems and that these discrete stocks of char home with a high degree of fidelity to natal spawning grounds (Kristofferson 2002). Although analyses presented in this report are grouped by fishing site or ‘Geographic Stock’, each annual sample from each geographic stock is probably composed of several discrete stocks. It is also likely that the proportional contribution of discrete stocks to annual geographic stock samples varies among years and fishing sites. This proportional contribution may have varied between 0 and 100 % for any combination of stock identity, fishing site and sampling year. If discrete stocks vary in abundance, then the vulnerability to over harvest will also be highly variable among stocks of different sizes. It is possible that some smaller more vulnerable char stocks in the Cambridge Bay area have been extirpated by the commercial and/or subsistence fishery. Unfortunately, improvement of fisheries management through the practical application of the results of stock delineation research seems limited when there is an absence of information on the size and vulnerabilities of discrete stocks. The logistic and financial costs of delineating discrete stocks, of tracking the contribution of discrete

stocks to the harvest, of assessing discrete stock migratory patterns and vulnerability to harvest and of estimating the abundance of discrete stocks are prohibitive.

Gyselman (1994) concluded from his research on anadromous Nauyuk Lake char that arctic char seem to be a good example of a “metapopulation”. Hanski and Gilpin (1991, p. 7) define a metapopulation as “a set of local populations which interact via individuals moving among populations”. Indeed, there seems to be a great deal of movement of individuals among populations of both Nauyuk Lake and Cambridge char as indicated by Gyselman’s (1994) findings that 30 to 50 % of post spawning Nauyuk Lake char never returned to the system and by Kristofferson’s (1984) tagging research which demonstrated that there was extensive movement of tagged char between river systems of Cambridge Bay. In regards to Labrador char, Dempson et al. (2004) reported that there was little intermixing of populations from widely distributed areas along 300 miles of coastline from Antos to Saglek Fiord. Perhaps low site fidelity of non-spawning char and extensive population intermixing are characteristics unique to high arctic char populations. Cambridge Bay char populations also demonstrate greater annual variability in size, age and year class strength than do Labrador char populations described by Dempson et al. (2004). Information presented in this report indicates that although the Cambridge Bay char fishery is supported by a complicated mosaic of discrete char stocks, their annual variation in population parameters is very uniform among the widely separated fishing and sampling sites. This uniformity seems to suggest that Cambridge Bay char, like Nauyuk Lake char, are also a good example of a “metapopulation”.

SUMMARY AND CONCLUSIONS

Over a 43 year period between 1960 and 2003, total commercial landings from 6 primary stock complexes in the Cambridge Bay area have averaged 41,000 kgs round weight per year with total landings for this period equal to 1,799,099 kgs round weight. The primary stock complexes are harvested at the Ekalluk, Ellice, Halovik, Lauchlan, Jayco and Paliryuak Rivers. Other areas have been fished sporadically for a few years with comparatively smaller harvests of a few thousand kilograms per year with the exception of HTA Lake which has been fished frequently since 1988 and is currently assigned an annual quota of 3000 kgs. The subsistence harvest of char is substantial, estimated to equal approximately 1/2 the size of the commercial harvest.

Effects of the Cambridge Bay fishery on the primary stock complexes were examined in this report. An absence of decreasing trends in mean size and age suggests that the stock complexes are currently harvested at or below their sustainable rates. One exception is noted for the Ellice River fishery for which sampled char have demonstrated a consistent decline in age, increase in mean weight and condition, different trends in year class or cohort strengths when compared to char from other stock complexes and faster growth during the first 5 to 10 years of life when compared to the growth rates of char from other stock complexes. This fishery is considered to have a moderate to high risk of over exploitation if it is fished to full quota over the next

ten years. The Ellice River fishery is also an anomally because it is the only mainland location and char from this fishery have a unique white coloured oily flesh. Consequently, there is a poor market for Ellice River char and the fishery has been harvested only once between 1997 and 2003.

In comparison to Labrador char (Dempson et al. 2004), char from Cambridge Bay are typically older and larger and exhibit much greater annual variability with regards to length, weight, condition and age. A proportion of this greater annual variability may be caused by differences in the char sampling programs of Labrador and Cambridge Bay because the Labrador program is more rigorous in nature than is the Cambridge Bay program.

Trends in the relative abundances of specific year classes and the years during which these year classes were either strong or weak were the same for all of the Cambridge Bay primary stock complexes except for the Ellice River. This finding is highly relevent to interpretation of size, age and condition trends as responses to harvest because much of the annual variabitly in population parameters of Cambridge Bay char is highly correlated with annual fluctuations in the recruitment of specific year classes or cohorts into this fishery. We suggest that the synchronous recruitment variability of Cambridge Bay char is a natural characteristic of these high arctic populations and is probably the product of a relatively severe and fluctuating environment. We note that under relatively stable harvest rates (table 1), Cambridge Bay char have demonstrated variable but non random trends in age, size, condition and year class strength and suggest that, for the most part, this variation has been independent of the effects of harvest.

It is recommended 1) that more weir enumerations be conducted as estimates of stock complex abundance, 2) that annual and site specific assessment of the subsistence harvest be conducted, 3) that the underlying causes of recruitment variation be determined through further field studies and or modelling, 4) that annual plant sample sizes be increased and the potential for bias, caused by the timing of this sampling, be assessed and 5) that differences in size selectivity between gillnets and weirs be assessed.

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Table 1. Quota and harvest (kilograms (kg) round weight) history of the Cambridge Bay commercial Arctic char (*Salvelinus alpinus*) fishery.

Year	Wellington Bay Area									Queen Maud Gulf Area					Albert Edward Bay Area	
	Ekalluk R.		*Paliryuak R.*		*Halovik R.*		*Lauchlan R.*		Harvest Area Total	*Ellice R.*		*Perry R.*		Harvest Area Total	*Jayco R.*	
	Quota	Harvest	Quota	Harvest	Quota	Harvest	Quota	Harvest		Quota	Harvest	Quota	Harvest		Quota	Harvest
1960	NQ	15876	NQ	NF	NQ	NF	NQ	NF	15876	NQ	NF	NQ	NF	0	NQ	NF
1961	NQ	NF	NQ	NF	NQ	NF	NQ	NF	0	NQ	NF	NQ	NF	0	NQ	NF
1962	18160	5765	NQ	NF	NQ	NF	NQ	NF	5765	NQ	NF	NQ	NF	0	NQ	NF
1963	18160	13875	NQ	NF	NQ	NF	NQ	2270	16145	NQ	NF	NQ	NF	0	NQ	NF
1964	18160	15504	NQ	NF	NQ	NF	NQ	NF	15504	NQ	NF	NQ	NF	0	NQ	NF
1965	18160	20865	NQ	NF	NQ	NF	NQ	NF	20865	NQ	NF	NQ	NF	0	NQ	NF
1966	18160	16783	NQ	NF	NQ	NF	NQ	NF	16783	NQ	NF	NQ	NF	0	NQ	NF
1967	AQ	27700	AQ	NF	AQ	NF	AQ	NF	27700	NQ	NF	NQ	NF	0	NQ	NF
1968	AQ	34300	AQ	6470	AQ	2614	AQ	NF	43384	NQ	NF	NQ	NF	0	NQ	NF
1969	AQ	22700	AQ	NF	AQ	25855	AQ	NF	48555	NQ	NF	NQ	NF	0	NQ	NF
1970	Closed	0	AQ	5880	AQ	26203	AQ	2420	34503	NQ	NF	NQ	NF	0	NQ	NF
1971	Closed	0	AQ	NF	AQ	10433	AQ	19051	29484	22700	12820	NQ	NF	12820	NQ	NF
1972	Closed	0	NQ	NF	9100	6477	18160	20994	27471	11350	12524	NQ	NF	12524	NQ	NF
1973	18160	9630	NQ	NF	9100	1918	18160	9657	21205	11350	7239	NQ	NF	7239	NQ	NF
1974	11350	12540	NQ	NF	Closed	0	11350	8125	20665	11350	6956	NQ	NF	6956	NQ	NF
1975	11350	12261	NQ	NF	Closed	0	Closed	0	12261	11350	10357	NQ	NF	10357	6800	8231
1976	11350	13628	NQ	NF	9100	2780	Closed	0	16408	13600	12679	NQ	NF	12679	6800	9437
1977	11350	15897	4500	3260	4500	4624	6800	1519	25300	13600	20796	11350	13649	34445	6800	7563
1978	11350	14585	6800	8420	4500	5734	6800	8536	37275	13600	9118	11350	8135	17253	11350	13414
1979	14500	15806	9100	11816	6800	7316	9100	10845	45783	9100	7177	11350	1736	8913	13600	12235
1980	14500	10519	9100	7497	6800	7481	9100	9151	34648	9100	6629	11350	3377	10006	13600	14471
1981	14500	14283	9100	8638	6800	7009	9100	8724	38654	9100	5744	6800	2836	8580	13600	13320
1982	14500	14234	9100	9045	6800	6848	9100	8918	39045	9100	8864	6800	NF	8864	13600	5711
1983	14500	14840	9100	8831	6800	6825	9100	9106	39602	9100	9046	6800	NF	9046	13600	12966
1984	14500	14500	9100	8814	6800	7306	9100	9876	40496	9100	8953	6800	NF	8953	13600	13515

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Key
NQ = No Quota
AQ = Wellington Bay Area Quota (45 400 kg)
NF = Not Fished
E = Experimental
(s) = Shared quota with Ekalluk River

Table 1 (continued). Quota and harvest (kilograms (kg) round weight) history of the Cambridge Bay commercial Arctic char (*Salvelinus alpinus*) fishery.

Year	Wellington Bay Area									Queen Maud Gulf Area					Albert Edward Bay Area	
	Ekalluk R.		*Paliryuak R.*		*Halovik R.*		*Lauchlan R.*		Harvest Area Total	*Ellice R.*		*Perry R.*		Harvest Area Total	*Jayco R.*	
	Quota	Harvest	Quota	Harvest	Quota	Harvest	Quota	Harvest		Quota	Harvest	Quota	Harvest		Quota	Harvest
1985	14500	14524	9100	9286	6800	6448	9100	9056	39314	4500	5598	4500	NF	5598	13600	11584
1986	14500	14349	9100	9123	6800	6830	9100	8243	38545	4500	4180	4500	NF	4180	13600	12076
1987	14500	14661	9100	8668	6800	6875	9100	9553	39757	4500	4525	4500	NF	4525	13600	13686
1988	14500	14834	9100	8570	6800	6808	9100	9425	39637	6000	6544	4500	NF	6544	13600	11820
1989	14500	13565	9100	9176	6800	6858	9100	9184	38783	6000	5969	4500	NF	5969	13600	10293
1990	14500	15294	9100	9318	6800	6971	9100	8938	40521	6000	6371	4500	NF	6371	13600	12865
1991	1500 E	NF	9100	8953	6800	6354	9100	8807	24114	8000	7971	6500	600	8571	15600	2226
1992	7500	NF	9100	8884	6800	6872	9100	9320	25076	8000	NF	6500	NF	0	15600	NF
1993	7500	1480	9100	6579	6800	5939	9100	9306	23304	8000	8016	6500	NF	8016	15600	15411
1994	20000	1640	(s)	NF	5000	3859	9100	NF	5499	8000	7175	6500	NF	7175	17000	16290
1995	20000	4665	(s)	NF	5000	4269	2400	1439	10373	8000	7536	6500	NF	7536	17000	12556
1996	20000	10210	(s)	NF	5000	4909	2400	2352	17471	8000	4502	6500	NF	4502	17000	16914
1997	20000	14328	(s)	NF	5000	4995	2400	900	20223	8000	NF	6500	NF	0	17000	10585
1998	20000	19825	(s)	NF	5000	5143	2400	1430	26389	8000	NF	6500	NF	0	17000	17070
1999	20000	14581	(s)	5677	5000	5120	2400	2740	28118	8000	4497	6500	NF	4497	17000	17094
2000	20000	16932	(s)	5808	5000	5205	2400	NF	27948	8000	NF	6500	NF	0	17000	17312
2001	20000	16548	(s)	5766	5000	5428	2400	436	28178	8000	NF	6500	NF	0	17000	16374
2002	20000	16225	(s)	7618	5000	4769	2400	NF	28612	8000	NF	6500	NF	0	17000	16709
2003	20000	15842	(s)	NF	5000	5478	2400	1519	22839	8000	NF	6500	NF	0	17000	17174

Key
NQ = No Quota
AQ = Wellington Bay Area Quota (45 400 kg)
NF = Not Fished
E = Experimental
(s) = Shared quota with Ekalluk River

Table 2. Experimental sampling dates of commercially caught anadromous arctic char and type of fishing gear used (G=Gillnets, W=Weirs) for 6 Cambridge Bay fisheries, Nunavut.

Sampling Dates and Fishing Gear	LOCATION																	
	Ekalluk			Ellice			Halovik			Jayco			Lauchlan			Paliryuak		
Gillnets=G Weirs=W	Month			Month			Month			Month			Month			Month		
	July	Aug.	Sept.	July	Aug.	Sept.	July	Aug.	Sept.	July	Aug.	Sept.	July	Aug.	Sept.	July	Aug.	Sept.
	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates
Year																		
1971	.	.	.	.	G 24	.	.	.	.	.	.	.	.	.	.	.	.	.
1972	.	G 30	.	.	G 24-27	.	.	G 14-23	.	.	.	.	G 15	G 2-11	.	.	.	.
1973	.	.	.	.	.	.	.	.	.	.	.	.	.	G 27-28	G 2-3	.	.	.
1974	.	G 22-24	.	.	G 24	.	.	.	.	.	.	.	.	G 22-25	.	.	.	.
1975	.	.	.	.	.	.	.	.	.	G 5			.	.	.	.	.	.
1976	.	G 28-30	.	.	G 26-29	G 1-2	.	G 28	.	.	G 26-31	G 1	.	.	.	.	.	.
1977	.	G 22-24	.	.	G 22-29	.	G 6-13	.	.	.	.	.	G 7-9	.	.	G 6-15	.	.
1978	.	G 20-29	.	.	G 24-31	G 3-5	G 22-28	.	.	.	G 4-7	G 1-5	G 28-30	.	.	.	.	.
1979	.	G 26-27		.	G 24-30	G 4	G 15-22	.	.	G 23=28	G 2	.	G 15-24	.	.	G 15-20	.	.
1980	.	G 25-29	.	.	G 31	G 1-4	G 10-18	.	.	G 10-20		G 1-8	G 10-20	.	.	G 10-23	G 26-31	G 1-8
1981	.	G 25-29	.	.	G 31	G 1-6	G 8-19			G 11-19		G 5-9	G 9-26	G 25-27	.	G 8-18	.	.
1982	.	G 22-29	.	.	G 17-30	.	G 10-16	.	.	.	.	G 5-10	G 10-17	G 23-27	.	G 10-14	.	.
1983	.	G 21-26	.	.	G 20-26	.	G 7-20	.	.	G 7-18	.	W 2-4	.	G 17-30		G 7-20	G 27	.
1984	.	G 21-25	.	.	G 22-29	G 1	G 10-16	.	.	G 9-17	G 30	G 4-5	G 10-14	G 20	.	G 9-14	G 23-30	.
1985	.	G 24-31	.	.	G 24-25	.	G 9-13	.	.	G 8-17	.	.	G 8-19	.	.	G 9-23	G 31	.
1986	.	G 21-27	.	.	G 27-31	.	G 14-15	.	.	.	G 30-31	.	G 14-19	.	.	G 14-15	.	.
1987	.	G 20-26	.	.	G 26-29	G 3	G 14-25	.	.	.	.	G 2-3	G 14-26	.	.	G 13-23	.	.
1988	.	G 22-29	.	.	G 25-30	G 1	G 13-21	.	.	.	.	G 10-17	G 10-16	.	.	G 12-22	.	.
1989	.	G 20-25	.	.	G 23-26	.	G 10-16	.	.	.	G 30-31	G 2-4	G 10-17	.	.	G 10-12	.	.
1990	.	G 16-22	.	.	G 24-27	.	.	.	.	.	G 31	G 1-10	G 18-19	.	.	G 18-21	.	.
1991	.	G 24-25	.	.	G 23-30	G 1	G 14-17	.	.	.	.	G 8-9	G 14-17	.	.	G 13-17	.	.

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Table 2 (continued). Experimental sampling dates of commercially caught anadromous arctic char and type of fishing gear used (G=Gillnets, W=Weirs) for 6 Cambridge Bay fisheries, Nunavut.

Sampling Dates and Fishing Gear Gillnets=G Weirs=W	LOCATION																	
	Ekalluk			Ellice			Halovik			Jayco			Lauchlan			Paliryuak		
	Month			Month			Month			Month			Month			Month		
	July	Aug.	Sept.	July	Aug.	Sept.	July	Aug.	Sept.	July	Aug.	Sept.	July	Aug.	Sept.	July	Aug.	Sept.
	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates	Dates
Year																		
1992	.	G 27-28	.	.	.	.	G 17-20	.	.	.	.	.	G 15-18	.	.	G 17-19	.	.
1993	.	G 26-29	.	.	G 20-29	.	G 12-17	.	.	.	G 1,31	G 1-8	G 11-13	.	.	G 11-17	.	.
1994	.	W 27	W 4	.	G 21-27	.	.	W 28-31	W 1-5	.	.	W 1-8	.	.	.	.	.	.
1995	.	W 30-31	W 1	.	G 21-25	.	.	G 26-28	.	.	.	G 5-10	.	.	.	.	.	.
1996	.	G 25-30	.	.	G 18-24	.	.	W 18-24	.	.	.	W 2-7	.	.	.	.	.	.
1997	.	G 15-22	G 3-5	.	.	.	.	W ?	.	.	.	W 3-8	.	G ?	.	.	.	.
1998	.	G 21-28	.	.	.	.	.	W 24-27	.	.	.	W 1-12	.	.	.	.	.	.
1999	.	G 26-31	1	.	G 25-27	.	.	W 23-25	.	.	.	W 3-8	.	.	.	.	.	.
2000	.	G ? .		.	.	.	.	W ?	.	.	.	W ?	.	.	.	.	.	.
2001	.	G ?	.	.	.	.	.	G ?	.	.	.	W ?	.	.	.	.	.	.
2002	.	G 23		.	.	.	.	.	.	.	.	W 5	.	.	.	.	.	.
2003	.	G ?		.	.	.	.	W ?	.	.	.	.	.	.	.	.	.	.

Table 3. Annual sample sizes for age classes of anadromous arctic char sampled from the Ekalluk River commercial fishery, Cambridge Bay Nunavut.

Ekalluk River - Sample Sizes by Age Class and Sampling Year	Year																																	
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Age																																		
6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	1	.	.	.	2	1	.	.	.	2	7	.	1	.	.	.	.	.	.	.	.	.	2	.	.	.
8	.	.	2	.	1	1	1	.	1	.	7	4	3	.	.	.	9	10	1	3	.	.	.	.	.	1	.	2	4	7	.	1
9	4	.	8	.	7	4	8	7	1	5	9	9	3	7	2	1	7	10	7	13	1	5	1	.	2	4	6	15	14	14	1	2
10	16	.	13	.	12	13	13	4	19	18	24	20	12	13	18	10	23	22	28	20	8	19	8	10	1	10	14	12	38	26	5	18
11	36	.	21	.	17	22	26	16	25	35	30	25	22	15	13	26	26	29	30	14	10	29	18	12	22	17	23	15	33	42	6	24
12	45	.	27	.	14	20	29	10	36	24	44	27	45	27	33	22	53	31	40	18	6	25	26	32	22	45	36	17	27	35	6	31
13	23	.	4	.	23	12	40	17	21	14	26	12	25	22	30	25	24	30	32	17	11	12	20	20	33	47	49	24	19	18	1	29
14	7	.	1	.	18	26	16	8	11	9	10	14	22	16	26	12	17	10	29	6	8	11	12	11	31	58	35	18	28	21	6	16
15	1	.	.	.	26	6	22	6	6	4	7	5	7	10	14	25	12	6	21	5	7	7	10	5	15	22	20	14	23	31	.	10
16	1	.	1	.	1	4	8	1	2	1	2	1	7	9	4	14	1	6	12	2	1	7	5	1	10	9	12	8	22	12	2	4
17	.	.	1	.	4	1	7	2	2	.	.	1	1	1	5	3	2	2	6	3	3	3	5	1	3	3	1	2	5	13	1	3
18	.	.	.	.	1	.	3	.	1	.	1	1	2	3	1	3	1	1	2	.	1	2	4	.	1	2	.	1	2	4	.	3
19	.	.	.	.	1	1	.	.	.	.	.	.	.	1	2	1	1	1	.	.	.	1	.	.	1	.	.	.	2	4	.	1
20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	2	.	1	1	.	.	.	.	.	.	1	1	.	.
21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
22	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
24	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.

Table 4. Annual sample sizes for age classes of anadromous arctic char sampled from the Ellice River commercial fishery, Cambridge Bay, Nunavut.

Ellice River - Sample Sizes by Age Class and Sampling Year	Year																												
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1993	1994	1995	1996	1997	1998	1999
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Age																													
4	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	1	.	2	4	2	1	1	.	2	4	9	1	.	.	.	.	.	1	.	.	.	.	.	.	.	1
6	.	.	.	5	.	9	5	5	1	1	1	7	11	60	14	5	3	3	5	.	.	.	.	.	.	.	.	.	1
7	1	1	.	6	.	24	27	23	6	.	11	9	28	36	53	27	31	26	24	.	8	3	2	16	4	.	.	.	12
8	.	.	.	2	.	23	20	45	26	25	15	19	21	29	25	71	44	67	32	3	19	32	21	31	27	.	.	.	28
9	.	6	.	11	.	21	19	32	43	32	29	39	24	6	15	25	59	56	41	14	37	40	54	40	42	.	.	.	33
10	2	30	.	8	.	18	14	24	20	30	31	33	16	5	11	9	20	41	38	51	40	47	33	33	39	.	.	.	13
11	42	37	.	9	.	17	9	5	10	14	12	26	10	11	1	6	7	6	13	52	34	40	26	18	15	.	.	.	5
12	27	19	.	3	.	11	4	10	4	3	3	10	2	5	4	.	1	1	5	35	11	25	18	12	10	.	.	.	7
13	16	12	.	.	.	8	9	4	5	2	.	7	1	6	4	2	4	1	4	10	1	5	9	9	5	.	.	.	4
14	3	10	.	1	.	3	3	2	3	.	1	1	.	4	2	5	.	.	.	5	.	4	7	2	7	.	.	.	.
15	3	3	.	.	.	1	1	.	.	.	.	.	.	1	1	1	.	1	1	2	1	1	7	1	2	.	.	.	1
16	1	5	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.	.	2	.	.	.	1	.	.	.	.	.	.
17	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
18	.	1	.	.	.	.	.	.	.	.	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
19	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 5. Annual sample sizes for age classes of anadromous arctic char sampled from the Halovik River commercial fishery, Cambridge Bay, Nunavut.

Halovik River - Sample Sizes by Age Class and Sampling Year	Year																																
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Age																																	
5	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	10	.	.	.	.	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	12	.	.	.	1	1	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
8	8	.	.	.	1	6	.	6	.	.	4	4	.	.	.	1	.	2	.	.	3	.	2	.	.	.	1	1	1	4	.	.
9	6	.	.	.	3	9	2	13	2	3	5	6	1	2	.	1	2	3	.	3	1	.	1	3	.	1	3	2	8	9	.	6
10	8	.	.	.	10	11	9	10	11	8	11	9	1	1	2	6	5	13	.	19	19	.	9	7	1	4	10	8	19	30	.	11
11	8	.	.	.	4	10	11	19	16	21	10	21	7	16	6	9	18	30	.	18	19	6	39	24	6	13	17	8	24	39	.	23
12	3	.	.	.	4	9	31	21	28	41	25	26	18	18	8	13	22	33	.	35	29	30	40	76	25	34	27	13	29	28	.	20
13	10	.	.	.	5	20	25	23	23	16	15	18	36	24	9	22	20	36	.	31	32	30	22	33	31	31	44	20	38	30	.	13
14	3	.	.	.	4	18	25	20	14	17	12	12	44	20	26	28	16	13	.	21	18	27	14	17	28	42	47	20	29	28	.	14
15	3	.	.	.	1	10	12	15	11	8	6	9	35	13	31	18	15	9	.	10	29	23	8	5	13	19	37	22	26	32	.	8
16	4	.	.	.	.	2	6	6	3	2	3	2	9	6	26	16	15	4	.	14	17	18	6	.	10	9	7	11	14	16	.	5
17	1	.	.	.	.	3	.	2	4	2	3	2	7	5	9	5	7	5	.	1	5	9	4	1	2	1	4	2	7	9	.	2
18	.	.	.	.	.	.	1	.	2	2	1	.	1	2	4	4	6	4	.	3	2	3	2	1	1	.	1	1	1	4	.	.
19	.	.	.	.	.	.	.	.	.	.	.	.	2	.	3	1	.	1	.	.	3	2	1	.	.	1	.	1	1	.	.	1
20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1
21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1	.	.	.	.	.	.	.
22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
23	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.

Table 6. Annual sample sizes for age classes of anadromous arctic char sampled from the Jayco River commercial fishery, Cambridge Bay, Nunavut.

Jayco River - Sample Sizes by Age Class and Sampling Year	Year																													
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Age																												
6	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	2	.
8	3	1	.	.	1	.	4	.	7	.	.	.	.	.	1	.	.	.	.	.	.	.	8	1	1	4	1	1
9	2	3	.	.	8	3	8	3	14	1	.	.	.	.	2	.	.	.	2	3	.	.	11	9	4	12	5	7
10	1	4	.	2	9	23	15	12	31	9	5	.	1	3	2	1	2	.	1	2	2	1	19	5	7	52	22	19
11	4	8	.	4	14	14	29	11	31	17	9	.	3	12	5	1	.	.	2	18	.	4	20	5	4	57	49	21
12	2	9	.	8	10	26	29	16	20	47	25	4	6	21	26	7	4	.	5	23	13	5	34	6	15	21	51	58
13	.	15	.	13	16	23	27	18	22	71	25	19	24	15	30	8	6	.	8	13	23	14	20	13	12	19	23	42
14	2	17	.	28	9	30	26	18	20	42	28	34	29	24	16	14	14	.	10	12	10	22	38	24	22	16	11	16
15	.	24	.	22	21	16	15	7	8	25	12	41	27	20	26	26	15	.	25	12	10	11	15	24	16	14	18	11
16	.	7	.	18	18	9	16	7	4	15	14	14	15	23	8	28	13	.	27	21	7	21	12	17	14	13	11	20
17	1	5	.	15	3	6	5	4	3	7	2	9	5	9	8	17	8	.	19	17	6	16	10	9	5	6	7	12
18	.	4	.	8	5	8	10	6	1	2	.	2	2	10	10	14	3	.	22	14	10	8	1	16	3	4	2	7
19	1	7	.	2	3	5	3	.	1	.	1	2	2	5	7	4	2	.	11	1	4	13	1	6	1	2	4	3
20	.	1	.	4	5	.	1	.	.	.	2	.	.	2	5	5	.	.	9	5	3	8	3	12	1	2	.	5
21	.	1	.	2	3	2	1	1	.	.	.	.	1	.	2	6	.	.	6	1	4	5	2	8	2	2	1	2
22	.	1	.	1	1	.	.	.	.	.	.	.	.	1	.	1	.	.	2	.	.	2	.	2	1	.	1	.
23	.	1	.	1	.	.	1	.	1	1	.	.	.	.	.	2	.	.	2	1	.	1	.	3	.	.	.	2
24	.	1	.	1	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	.	.	.	.	2	.	.	.	.
25	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
28	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.
30	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 7. Annual sample sizes for age classes of anadromous arctic char sampled from the Lauchlan River commercial fishery, Cambridge Bay, Nunavut.

Lauchlan River - Sample Sizes by Age Class and Sampling Year	Year																										
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Age																										
4	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	7	8	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8	2	17	12	.	.	1	.	1	.	.	.	5	1	.	.	.	.	.	.	2	.	.	.	.	.	1
9	4	8	19	.	.	1	2	3	2	4	4	8	4	.	.	1	.	1	.	13	2	1	.	.	.	1
10	1	3	13	.	.	5	8	3	.	9	15	9	5	3	.	3	.	2	3	31	10	3	.	.	.	1
11	4	9	12	.	.	11	11	24	16	23	35	25	14	1	2	4	2	14	3	23	31	15	.	.	.	3
12	5	7	16	.	.	11	21	33	16	37	41	30	17	16	2	5	20	35	14	25	19	30	.	.	.	13
13	19	5	15	.	.	13	30	26	28	51	35	35	33	27	9	12	20	32	15	24	28	31	.	.	.	12
14	14	4	3	.	.	15	26	33	27	15	17	12	44	28	14	14	22	30	11	19	25	24	.	.	.	5
15	23	.	7	.	.	9	19	20	19	8	9	6	52	32	23	35	31	17	11	14	25	30	.	.	.	1
16	25	1	2	.	.	5	12	13	11	2	4	3	34	19	29	25	23	8	3	10	16	19	.	.	.	1
17	18	.	4	.	.	3	3	3	3	2	1	2	14	8	22	15	23	7	5	1	8	10	.	.	.	2
18	8	.	1	.	.	.	2	4	5	2	.	1	4	2	6	6	8	5	1	1	6	4	.	.	.	.
19	4	1	.	.	.	.	.	1	3	.	.	.	1	.	3	2	8	1	1	1	1	2	.	.	.	.
20	2	.	.	.	.	.	2	.	1	1	.	1	.	.	2	1	2	1	1	.	.	1	.	.	.	.
21	1	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	1	.	1	.	.	.	.	.
22	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
23	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.

Table 8. Annual sample sizes for age classes of anadromous arctic char sampled from the Paliryuak River commercial fishery, Cambridge Bay, Nunavut.

Paliryuak River - Sample Sizes by Age Class and Sampling Year	Year																
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Age																	
4	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	5	.	.	.	1	1	.	.	.	.	.	.	.	.
7	1	.	.	4	.	.	3	.	1	.	.	.	.	.	.	.	.
8	8	.	1	9	2	1	2	8	4	.	.	.	1	.	3	.	.
9	10	.	14	11	2	5	6	11	16	.	4	.	2	.	10	3	1
10	8	.	18	28	16	6	31	23	18	9	25	9	15	9	20	4	8
11	10	.	24	27	21	19	40	27	35	8	25	44	23	22	29	26	13
12	11	.	24	32	42	31	44	42	31	24	24	57	35	16	32	32	27
13	11	.	16	37	23	20	30	59	29	19	32	29	39	33	34	37	27
14	15	.	19	13	11	8	24	44	26	24	23	12	24	37	22	28	25
15	2	.	9	12	5	5	8	36	20	16	14	19	8	19	6	21	23
16	5	.	6	8	3	3	5	6	10	8	11	5	1	4	6	14	17
17	1	.	5	6	1	.	4	7	3	6	3	2	4	3	1	6	9
18	.	.	1	.	3	1	.	4	2	.	1	2	1	4	.	1	.
19	.	.	.	.	3	.	.	3	2	.	.	1	.	.	1	2	2
20	.	.	.	.	.	.	.	1	1	.	1	1	.	.	.	.	.
21	.	.	.	.	.	.	.	.	.	2	.	.	1	.	.	.	.
22	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.

Table 9. Sample sizes of arctic char sampled from 6 Cambridge Bay commercial fisheries between 1972 and 2003.

	Sample Size Greater Than or Equal to 100				Sample Size Less Than 100			
Location	Mean Sample Size	Minimum Sample Size	Maximum Sample Size	Number of Occasions	Mean Sample Size	Minimum Sample Size	Maximum Sample Size	Number of Occasions
Ekalluk	151	102	228	25	65	28	92	5
Ellice	147	104	202	22	71	47	95	2
Halovik	142	100	229	24	69	33	95	3
Jayco	155	103	238	23	80	67	92	2
Lauchlan	150	112	223	17	63	40	74	4
Paliryuak	170	116	272	14	91	82	99	2

Table 10. Numerical grading system used for visual assessment of maturity stage and sex of arctic char from Cambridge Bay, Nunavut.

Maturity Code	Maturity Stage	Sex	Gonad Description
0	Unknown (Virgin)	Unknown	cannot be sexed, gonads long or short and thin, transparent or translucent
1	Immature	Female	ovaries granular in texture, hard and triangular in shape, up to full length of body cavity, membrane firm, eggs distinguishable
2	Mature	Female	current year spawner, ovary fills body cavity, eggs near full size but not loose, eggs not expelled by pressure
3	Ripe	Female	ovaries greatly extended and fill body cavity, eggs full size and transparent, expelled by slight pressure
4	Spent	Female	spawning complete, ovaries ruptured and flaccid, seed eggs visible, some retained eggs in body cavity
5	Resting	Female	ovary fills 40 to 50% of body cavity, membrane thin, loose, semi-transparent, and healed from spawning, seed eggs apparent with few atritic eggs, some eggs may be retained in body cavity
6	Immature	Male	testes long and thin, tubular and scalloped shaped, up to full body length, putty like firmness
7	Mature	Male	current year spawner, testes large and lobate, white to purplish in colour, centers may contain fluid, milt not expelled by pressure
8	Ripe	Male	testes full size, white and lobate, milt expelled by pressure
9	Spent	Male	spawning complete, testes flaccid with some milt remaining, blood vessels obvious, testes violet-pink in colour
10	Resting	Male	testes tubular, less lobate, healed from spawning, no fluid in center, usually full length of body cavity, mottled and purplish in colour
11	Unknown (Non-Virgin)	Unknown	resting fish, has spawned but gonads have not regenerated, sexing not possible

Table 11. Summary of mean monthly and annual temperature (^{o} C) and precipitation data for Cambridge Bay, Nunavut for the period of 1970 to 2003.

By Month	Max. Temp (^{o} C)			Min. Temp (^{o} C)			Temp (^{o} C)			Rainfall (mm)			Snowfall (cm)			Total Precipitation (mm)		
	Mean	High	Low	Mean	High	Low	Mean	High	Low	Average	High	Low	Average	High	Low	Average	High	Low
Jan.	-27.0	-20.5	-33.2	-36.0	-28.7	-40.5	-32.5	-24.6	-36.9	Trace	0.2	0.2	5.9	16.4	1.0	4.9	12.2	0.9
Feb.	-29.4	-21.2	-35.4	-36.7	-29.8	-42.1	-33.1	-25.5	-38.8	Trace	Trace	0.0	5.8	24.8	Trace	4.6	15.0	Trace
Mar.	-25.6	-19.2	-29.8	-33.6	-26.8	-38.3	-29.6	-23.0	-33.7	Trace	Trace	0.0	7.4	30.8	0.4	6.0	24.2	Trace
April	-16.8	-11.1	-21.7	-26..0	-20.6	-31.8	-21.4	-16.0	-26.7	0.1	3.8	0.0	7.6	19.9	Trace	6.4	19.1	Trace
May	-5.3	-1.3	-10.5	-11.0	-6.6	-19.3	-9.2	-4.0	-14.9	1.5	7.0	0.0	9.4	32.0	Trace	9.3	22.7	Trace
June	5.5	11.2	-0.5	-0.7	2.8	-4.9	2.4	7.0	-2.7	9.6	31.2	1.8	3.1	18.2	Trace	12.6	33.2	2.1
July	12.4	16.4	7.5	4.6	8.0	1.5	8.5	12.3	4.5	21.9	73.6	5.1	Trace	0.2	0.0	21.9	73.6	5.1
Aug.	9.4	12.8	6.1	3.4	6.5	0.6	6.4	9.6	3.4	25.5	72.6	6.0	1.9	19.0	0.0	27.4	74.1	7.4
Sept.	2.1	5.9	-2.7	-2.3	1.6	-7.6	-0.1	3.4	-5.2	11.3	40.0	0.3	8.3	23.7	0.6	18.8	42.8	3.6
Oct.	-6.0	-3.0	-15.3	-14.7	-9.5	-23.0	-11.4	-6.5	-19.2	0.5	4.4	0.0	15.7	49.6	4.4	14.2	39.0	3.2
Nov.	-19.3	-11.7	-24.5	-26.5	-19.3	-31.6	-22.9	-15.5	-27.8	Trace	0.2	0.0	9.1	24.8	1.8	7.0	17.5	1.4
Dec.	-25.9	-18.8	-31.8	-32.8	-25.6	-37.2	-29.4	-22.2	-34.5	Trace	Trace	0.0	6.3	15.2	0.4	5.2	14.2	0.2
By Year	-10.8	-8.1	-14.1	-17.9	-14.7	-21.6	-14.4	-11.4	-17.8	70.4	152.9	26.6	80.0	138.4	41.0	138.8	208.6	96.0

Climate normal data obtained from:
http://climate.weatheroffice.ec.gc.ca/index.html

Table 12. Weir enumerations of fall upstream Arctic char (*Salvelinus alpinus*) migrations in the Cambridge Bay area, Nunavut.

Year	Location				
	Ekalluk [a] River	**Jayco [a] River**	**Halovik [a] River**	**Lauchlan [a] River**	**Freshwater [b] Creek**
1979	183,203	.	.	.	.
1980	.	33,388 [c]	.	.	.
1981	.	138,795	21,214	.	.
1982	.	.	.	.	9,961
1983	.	.	.	10,850	.
1984	.	.	.	.	.
1985	.	.	.	.	.
1986	.	.	.	.	.
1987	.	.	.	.	.
1988	.	.	.	.	*36,933*
1989	.	.	.	.	.
1990	.	.	.	.	.
1991	.	.	.	.	39,559

[a] from McGowan (1990), [b] from McGowan and Low (1992), [c] incomplete count

Table 13. Annual age class percentages of anadromous arctic char sampled from the Ekalluk River commercial fishery, Cambridge Bay, Nunavut.

Ekalluk River - Age Class % By Sampling Year	Year																																
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Age																																	
6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.56	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	1.39	.	.	.	1.65	0.66	.	.	.	1.12	4.24	.	0.98	.	.	.	.	.	.	.	.	0.91	.	.	.
8	.	.	2.56	.	0.80	0.91	0.58	.	0.80	.	4.38	3.31	1.99	.	.	.	5.03	6.06	0.48	2.94	.	.	.	.	.	0.46	.	1.56	1.81	3.07	.	0.70
9	3.01	.	10.3	.	5.60	3.64	4.62	9.72	0.80	4.55	5.63	7.44	1.99	5.65	1.34	0.70	3.91	6.06	3.33	12.7	1.75	4.10	0.92	.	1.42	1.83	3.05	11.7	6.33	6.14	3.57	1.41
10	12.0	.	16.7	.	9.60	11.8	7.51	5.56	15.2	16.4	15.0	16.5	7.95	10.5	12.1	7.04	12.8	13.3	13.3	19.6	14.0	15.6	7.34	10.9	0.71	4.59	7.11	9.38	17.2	11.4	17.9	12.7
11	27.1	.	26.9	.	13.6	20.0	15.0	22.2	20.0	31.8	18.8	20.7	14.6	12.1	8.72	18.3	14.5	17.6	14.3	13.7	17.5	23.8	16.5	13.0	15.6	7.80	11.7	11.7	14.9	18.4	21.4	16.9
12	33.8	.	34.6	.	11.2	18.2	16.8	13.9	28.8	21.8	27.5	22.3	29.8	21.8	22.1	15.5	29.6	18.8	19.0	17.6	10.5	20.5	23.9	34.8	15.6	20.6	18.3	13.3	12.2	15.4	21.4	21.8
13	17.3	.	5.13	.	18.4	10.9	23.1	23.6	16.8	12.7	16.3	9.92	16.6	17.7	20.1	17.6	13.4	18.2	15.2	16.7	19.3	9.84	18.3	21.7	23.4	21.6	24.9	18.8	8.60	7.89	3.57	20.4
14	5.26	.	1.28	.	14.4	23.6	9.25	11.1	8.80	8.18	6.25	11.6	14.6	12.9	17.4	8.45	9.50	6.06	13.8	5.88	14.0	9.02	11.0	12.0	22.0	26.6	17.8	14.1	12.7	9.21	21.4	11.3
15	0.75	.	.	.	20.8	5.45	12.7	8.33	4.80	3.64	4.38	4.13	4.64	8.06	9.40	17.6	6.70	3.64	10.0	4.90	12.3	5.74	9.17	5.43	10.6	10.1	10.2	10.9	10.4	13.6	.	7.04
16	0.75	.	1.28	.	0.80	3.64	4.62	1.39	1.60	0.91	1.25	0.83	4.64	7.26	2.68	9.86	0.56	3.64	5.71	1.96	1.75	5.74	4.59	1.09	7.09	4.13	6.09	6.25	9.95	5.26	7.14	2.82
17	.	.	1.28	.	3.20	0.91	4.05	2.78	1.60	.	.	0.83	0.66	0.81	3.36	2.11	1.12	1.21	2.86	2.94	5.26	2.46	4.59	1.09	2.13	1.38	0.51	1.56	2.26	5.70	3.57	2.11
18	.	.	.	.	0.80	.	1.73	.	0.80	.	0.63	0.83	1.32	2.42	0.67	2.11	0.56	0.61	0.95	.	1.75	1.64	3.67	.	0.71	0.92	.	0.78	0.91	1.75	.	2.11
19	.	.	.	.	0.80	0.91	.	.	.	.	.	.	.	0.81	1.34	0.70	0.56	0.61	.	.	.	0.82	.	.	0.71	.	.	.	0.91	1.75	.	0.70
20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.67	.	.	.	0.95	.	1.75	0.82	.	.	.	.	.	.	0.45	0.44	.	.
21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.45	.	.	.
22	.	.	.	.	.	.	.	.	.	.	.	.	0.66	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
24	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.51	.	.	.	.	.

Table 14. Annual age class percentages of anadromous arctic char sampled from the Ellice River commercial fishery, Cambridge Bay, Nunavut.

Ellice River - Age Class % By Sampling Year	Year																													
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1993	1994	1995	1996	1997	1998	1999
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Age																														
4	.	.	.	2.13	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	2.13	.	1.46	3.45	1.30	0.84	0.93	.	1.31	3.42	5.20	0.76	.	.	.	.	.	0.66	.	.	.	.	.	.	0.95
6	.	.	.	10.6	.	6.57	4.31	3.25	0.84	0.93	0.96	4.58	9.40	34.7	10.6	3.29	1.78	1.49	3.03	.	.	.	.	.	.	.	.	.	0.95
7	1.05	0.81	.	12.8	.	17.5	23.3	14.9	5.04	.	10.6	5.88	23.9	20.8	40.2	17.8	18.3	12.9	14.5	.	5.26	1.52	1.12	9.88	2.65	.	.	11.4
8	.	.	.	4.26	.	16.8	17.2	29.2	21.8	23.1	14.4	12.4	17.9	16.8	18.9	46.7	26.0	33.2	19.4	1.74	12.5	16.2	11.8	19.1	17.9	.	.	26.7
9	.	4.84	.	23.4	.	15.3	16.4	20.8	36.1	29.6	27.9	25.5	20.5	3.47	11.4	16.4	34.9	27.7	24.8	8.14	24.3	20.3	30.3	24.7	27.8	.	.	31.4
10	2.11	24.2	.	17.0	.	13.1	12.1	15.6	16.8	27.8	29.8	21.6	13.7	2.89	8.33	5.92	11.8	20.3	23.0	29.7	26.3	23.9	18.5	20.4	25.8	.	.	12.4
11	44.2	29.8	.	19.1	.	12.4	7.76	3.25	8.40	13.0	11.5	17.0	8.55	6.36	0.76	3.95	4.14	2.97	7.88	30.2	22.4	20.3	14.6	11.1	9.93	.	.	4.76
12	28.4	15.3	.	6.38	.	8.03	3.45	6.49	3.36	2.78	2.88	6.54	1.71	2.89	3.03	.	0.59	0.50	3.03	20.3	7.24	12.7	10.1	7.41	6.62	.	.	6.67
13	16.8	9.68	.	.	.	5.84	7.76	2.60	4.20	1.85	.	4.58	0.85	3.47	3.03	1.32	2.37	0.50	2.42	5.81	0.66	2.54	5.06	5.56	3.31	.	.	3.81
14	3.16	8.06	.	2.13	.	2.19	2.59	1.30	2.52	.	0.96	0.65	.	2.31	1.52	3.29	.	.	.	2.91	.	2.03	3.93	1.23	4.64	.	.	.
15	3.16	2.42	.	.	.	0.73	0.86	.	.	.	.	.	.	0.58	0.76	0.66	.	0.50	0.61	1.16	0.66	0.51	3.93	0.62	1.32	.	.	0.95
16	1.05	4.03	.	.	.	.	0.86	.	.	.	.	.	.	.	.	0.66	.	.	1.21	.	.	.	0.56	.	.	.	.	.
17	.	.	.	.	.	.	.	0.65	.	.	.	.	.	.	0.76	.	.	.	.	.	.	.	.	.	.	.	.	.
18	.	0.81	.	.	.	.	.	.	.	.	0.96	.	.	0.58	.	.	.	.	.	.	.	.	.	.	.	.	.	.
19	.	.	.	.	.	.	.	0.65	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 15. Annual age class percentages of anadromous arctic char sampled from the Halovik River commercial fishery, Cambridge Bay, Nunavut.

Halovik River - Age Class % By Sampling Year	Year																																
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Age																																	
5	3.80	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	12.7	.	.	.	.	1.00	.	.	.	.	.	.	.	0.93	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	15.2	.	.	.	3.03	1.00	.	2.88	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.91	.	.	.	.
8	10.1	.	.	.	3.03	6.00	.	4.32	.	.	4.21	3.67	.	.	.	0.81	.	1.31	.	.	1.69	.	1.35	.	.	.	0.51	0.91	0.51	1.75	.	.
9	7.59	.	.	.	9.09	9.00	1.64	9.35	1.75	2.50	5.26	5.50	0.62	1.85	.	0.81	1.57	1.96	.	1.94	0.57	.	0.68	1.80	.	0.65	1.52	1.82	4.06	3.93	.	5.77
10	10.1	.	.	.	30.3	11.0	7.38	7.19	9.65	6.67	11.6	8.26	0.62	0.93	1.61	4.84	3.94	8.50	.	12.3	10.7	.	6.08	4.19	0.84	2.58	5.05	7.27	9.64	13.1	.	10.6
11	10.1	.	.	.	12.1	10.0	9.02	13.7	14.0	17.5	10.5	19.3	4.35	14.8	4.84	7.26	14.2	19.6	.	11.6	10.7	3.97	26.4	14.4	5.04	8.39	8.59	7.27	12.2	17.0	.	22.1
12	3.80	.	.	.	12.1	9.00	25.4	15.1	24.6	34.2	26.3	23.9	11.2	16.7	6.45	10.5	17.3	21.6	.	22.6	16.4	19.9	27.0	45.5	21.0	21.9	13.6	11.8	14.7	12.2	.	19.2
13	12.7	.	.	.	15.2	20.0	20.5	16.5	20.2	13.3	15.8	16.5	22.4	22.2	7.26	17.7	15.7	23.5	.	20.0	18.1	19.9	14.9	19.8	26.1	20.0	22.2	18.2	19.3	13.1	.	12.5
14	3.80	.	.	.	12.1	18.0	20.5	14.4	12.3	14.2	12.6	11.0	27.3	18.5	21.0	22.6	12.6	8.50	.	13.5	10.2	17.9	9.46	10.2	23.5	27.1	23.7	18.2	14.7	12.2	.	13.5
15	3.80	.	.	.	3.03	10.0	9.84	10.8	9.65	6.67	6.32	8.26	21.7	12.0	25.0	14.5	11.8	5.88	.	6.45	16.4	15.2	5.41	2.99	10.9	12.3	18.7	20.0	13.2	14.0	.	7.69
16	5.06	.	.	.	.	2.00	4.92	4.32	2.63	1.67	3.16	1.83	5.59	5.56	21.0	12.9	11.8	2.61	.	9.03	9.60	11.9	4.05	.	8.40	5.81	3.54	10.0	7.11	6.99	.	4.81
17	1.27	.	.	.	.	3.00	.	1.44	3.51	1.67	3.16	1.83	4.35	4.63	7.26	4.03	5.51	3.27	.	0.65	2.82	5.96	2.70	0.60	1.68	0.65	2.02	1.82	3.55	3.93	.	1.92
18	.	.	.	.	.	.	0.82	.	1.75	1.67	1.05	.	0.62	1.85	3.23	3.23	4.72	2.61	.	1.94	1.13	1.99	1.35	0.60	0.84	.	0.51	0.91	0.51	1.75	.	.
19	.	.	.	.	.	.	.	.	.	.	.	.	1.24	.	2.42	0.81	.	0.65	.	.	1.69	1.32	0.68	.	.	0.65	.	0.91	0.51	.	.	0.96
20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.79	.	.	.	.	0.66	.	.	.	.	.	.	.	.	.	0.96
21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.66	.	.	0.84	.	.	.	.	.	.	.
22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.66	.	.	.	.	.	.	.	.	.	.
23	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.84	.	.	.	.	.	.	.

Table 16. Annual age class percentages of anadromous arctic char sampled from the Jayco River commercial fishery, Cambridge Bay, Nunavut.

Jayco River - Age Class % By Sampling Year	Year																											
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Age																												
6	.	.	.	.	.	.	.	.	0.61	0.42	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	15.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.51	0.61	.	.	0.96	.
8	15.8	0.92	.	.	0.79	.	2.11	.	4.27	.	.	.	.	.	0.67	.	.	.	.	.	.	.	4.10	0.61	0.93	1.78	0.48	0.44
9	10.5	2.75	.	.	6.30	1.82	4.21	2.91	8.54	0.42	.	.	.	.	1.34	.	.	.	1.32	2.08	.	.	5.64	5.52	3.70	5.33	2.40	3.10
10	5.26	3.67	.	1.54	7.09	13.9	7.89	11.7	18.9	3.78	4.07	.	0.87	2.07	1.34	0.75	2.99	.	0.66	1.39	2.17	0.76	9.74	3.07	6.48	23.1	10.6	8.41
11	21.1	7.34	.	3.08	11.0	8.48	15.3	10.7	18.9	7.14	7.32	.	2.61	8.28	3.36	0.75	.	.	1.32	12.5	.	3.05	10.3	3.07	3.70	25.3	23.6	9.29
12	10.5	8.26	.	6.15	7.87	15.8	15.3	15.5	12.2	19.7	20.3	3.20	5.22	14.5	17.4	5.22	5.97	.	3.29	16.0	14.1	3.82	17.4	3.68	13.9	9.33	24.5	25.7
13	.	13.8	.	10.0	12.6	13.9	14.2	17.5	13.4	29.8	20.3	15.2	20.9	10.3	20.1	5.97	8.96	.	5.26	9.03	25.0	10.7	10.3	7.98	11.1	8.44	11.1	18.6
14	10.5	15.6	.	21.5	7.09	18.2	13.7	17.5	12.2	17.6	22.8	27.2	25.2	16.6	10.7	10.4	20.9	.	6.58	8.33	10.9	16.8	19.5	14.7	20.4	7.11	5.29	7.08
15	.	22.0	.	16.9	16.5	9.70	7.89	6.80	4.88	10.5	9.76	32.8	23.5	13.8	17.4	19.4	22.4	.	16.4	8.33	10.9	8.40	7.69	14.7	14.8	6.22	8.65	4.87
16	.	6.42	.	13.8	14.2	5.45	8.42	6.80	2.44	6.30	11.4	11.2	13.0	15.9	5.37	20.9	19.4	.	17.8	14.6	7.61	16.0	6.15	10.4	13.0	5.78	5.29	8.85
17	5.26	4.59	.	11.5	2.36	3.64	2.63	3.88	1.83	2.94	1.63	7.20	4.35	6.21	5.37	12.7	11.9	.	12.5	11.8	6.52	12.2	5.13	5.52	4.63	2.67	3.37	5.31
18	.	3.67	.	6.15	3.94	4.85	5.26	5.83	0.61	0.84	.	1.60	1.74	6.90	6.71	10.4	4.48	.	14.5	9.72	10.9	6.11	0.51	9.82	2.78	1.78	0.96	3.10
19	5.26	6.42	.	1.54	2.36	3.03	1.58	.	0.61	.	0.81	1.60	1.74	3.45	4.70	2.99	2.99	.	7.24	0.69	4.35	9.92	0.51	3.68	0.93	0.89	1.92	1.33
20	.	0.92	.	3.08	3.94	.	0.53	.	.	.	1.63	.	.	1.38	3.36	3.73	.	.	5.92	3.47	3.26	6.11	1.54	7.36	0.93	0.89	.	2.21
21	.	0.92	.	1.54	2.36	1.21	0.53	0.97	.	.	.	.	0.87	.	1.34	4.48	.	.	3.95	0.69	4.35	3.82	1.03	4.91	1.85	0.89	0.48	0.89
22	.	0.92	.	0.77	0.79	.	.	.	.	.	.	.	.	0.69	.	0.75	.	.	1.32	.	.	1.53	.	1.23	0.93	.	0.48	.
23	.	0.92	.	0.77	.	.	0.53	.	0.61	0.42	.	.	.	.	.	1.49	.	.	1.32	0.69	.	0.76	.	1.84	.	.	.	0.89
24	.	0.92	.	0.77	.	.	.	.	.	.	.	.	.	.	0.67	.	.	.	0.66	.	.	.	.	1.23	.	.	.	.
25	.	.	.	.	0.79	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.69	.	.	.	.	.	.	.	.
28	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.44	.	.
30	.	.	.	0.77	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 17. Annual age class percentages of anadromous arctic char sampled from the Lauchlan River commercial fishery, Cambridge Bay, Nunavut.

Lauchlan River - Age Class % By Sampling Year	Year																										
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Age																											
4	.	2.94	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5	.	2.94	2.54	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	2.94	2.54	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	10.3	6.78	.	.	.	.	.	.	.	.	1.44	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8	1.54	25.0	10.2	.	.	1.35	.	0.61	.	.	.	3.60	0.45	.	.	.	.	.	.	1.22	.	.	.	.	.	2.50
9	3.08	11.8	16.1	.	.	1.35	1.47	1.82	1.53	2.60	2.48	5.76	1.79	.	.	0.81	.	0.65	.	7.93	1.16	0.58	.	.	.	2.50
10	0.77	4.41	11.0	.	.	6.76	5.88	1.82	.	5.84	9.32	6.47	2.24	2.19	.	2.44	.	1.30	4.35	18.9	5.78	1.75	.	.	.	2.50
11	3.08	13.2	10.2	.	.	14.9	8.09	14.5	12.2	14.9	21.7	18.0	6.28	0.73	1.79	3.25	1.26	9.09	4.35	14.0	17.9	8.77	.	.	.	7.50
12	3.85	10.3	13.6	.	.	14.9	15.4	20.0	12.2	24.0	25.5	21.6	7.62	11.7	1.79	4.07	12.6	22.7	20.3	15.2	11.0	17.5	.	.	.	32.5
13	14.6	7.35	12.7	.	.	17.6	22.1	15.8	21.4	33.1	21.7	25.2	14.8	19.7	8.04	9.76	12.6	20.8	21.7	14.6	16.2	18.1	.	.	.	30.0
14	10.8	5.88	2.54	.	.	20.3	19.1	20.0	20.6	9.74	10.6	8.63	19.7	20.4	12.5	11.4	13.8	19.5	15.9	11.6	14.5	14.0	.	.	.	12.5
15	17.7	.	5.93	.	.	12.2	14.0	12.1	14.5	5.19	5.59	4.32	23.3	23.4	20.5	28.5	19.5	11.0	15.9	8.54	14.5	17.5	.	.	.	2.50
16	19.2	1.47	1.69	.	.	6.76	8.82	7.88	8.40	1.30	2.48	2.16	15.2	13.9	25.9	20.3	14.5	5.19	4.35	6.10	9.25	11.1	.	.	.	2.50
17	13.8	.	3.39	.	.	4.05	2.21	1.82	2.29	1.30	0.62	1.44	6.28	5.84	19.6	12.2	14.5	4.55	7.25	0.61	4.62	5.85	.	.	.	5.00
18	6.15	.	0.85	.	.	.	1.47	2.42	3.82	1.30	.	0.72	1.79	1.46	5.36	4.88	5.03	3.25	1.45	0.61	3.47	2.34	.	.	.	.
19	3.08	1.47	.	.	.	.	.	0.61	2.29	.	.	.	0.45	.	2.68	1.63	5.03	0.65	1.45	0.61	0.58	1.17	.	.	.	.
20	1.54	.	.	.	.	.	1.47	.	0.76	0.65	.	0.72	.	.	1.79	0.81	1.26	0.65	1.45	.	.	0.58	.	.	.	.
21	0.77	.	.	.	.	.	.	.	.	.	.	.	.	0.73	.	.	.	0.65	1.45	.	0.58	.	.	.	.	.
22	.	.	.	.	.	.	.	0.61	.	.	.	.	.	.	.	.	.	.	.	.	.	0.58	.	.	.	.
23	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.58	.	.	.	.	.

Table 18. Annual age class percentages of anadromous arctic char sampled from the Paliryuak River commercial fishery, Cambridge Bay, Nunavut.

Paliryuak River - Age Class % By Sampling Year	Year																
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Age																	
4	.	.	.	0.52	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	2.59	.	.	.	0.37	0.50	.	.	.	.	.	.	.	.
7	1.22	.	.	2.07	.	.	1.52	.	0.50	.	.	.	.	.	.	.	.
8	9.76	.	0.73	4.66	1.52	1.01	1.02	2.94	2.00	.	.	.	0.65	.	1.83	.	.
9	12.2	.	10.2	5.70	1.52	5.05	3.05	4.04	8.00	.	2.45	.	1.30	.	6.10	1.72	0.66
10	9.76	.	13.1	14.5	12.1	6.06	15.7	8.46	9.00	7.76	15.3	4.97	9.74	6.12	12.2	2.30	5.26
11	12.2	.	17.5	14.0	15.9	19.2	20.3	9.93	17.5	6.90	15.3	24.3	14.9	15.0	17.7	14.9	8.55
12	13.4	.	17.5	16.6	31.8	31.3	22.3	15.4	15.5	20.7	14.7	31.5	22.7	10.9	19.5	18.4	17.8
13	13.4	.	11.7	19.2	17.4	20.2	15.2	21.7	14.5	16.4	19.6	16.0	25.3	22.4	20.7	21.3	17.8
14	18.3	.	13.9	6.74	8.33	8.08	12.2	16.2	13.0	20.7	14.1	6.63	15.6	25.2	13.4	16.1	16.4
15	2.44	.	6.57	6.22	3.79	5.05	4.06	13.2	10.0	13.8	8.59	10.5	5.19	12.9	3.66	12.1	15.1
16	6.10	.	4.38	4.15	2.27	3.03	2.54	2.21	5.00	6.90	6.75	2.76	0.65	2.72	3.66	8.05	11.2
17	1.22	.	3.65	3.11	0.76	.	2.03	2.57	1.50	5.17	1.84	1.11	2.60	2.04	0.61	3.45	5.92
18	.	.	0.73	.	2.27	1.01	.	1.47	1.00	.	0.61	1.11	0.65	2.72	.	0.57	.
19	.	.	.	.	2.27	.	.	1.10	1.00	.	.	0.55	.	.	0.61	1.15	1.32
20	.	.	.	.	.	.	.	0.37	0.50	.	0.61	0.55	.	.	.	.	.
21	.	.	.	.	.	.	.	.	.	1.72	.	.	0.65	.	.	.	.
22	.	.	.	.	.	.	.	.	0.50	.	.	.	.	.	.	.	.

Table 19 Cambridge Bay Arctic char (*Salvelinus alpinus*) fisheries risk levels. Strong modal ages by year and fishery with a level of risk of overexploitation if harvest rates continue at present levels.

Fishery	**First Sampling Year**	**Strong Modal Age Classes**	**Last Sampling Year**	**Strong Modal Age Class**	**Risk Level (over 10 years)**
Ekalluk River	1972	12, 13	2003	10, 11-13, 14	Low to Moderate
Ellice River	1971	11, 12	1999	7, 8, 9	Moderate to High
Halovik River	1972	7 to 14	2003	9 to 13	Low
Jayco River	1976	13 to16	2002	11 to 13	Moderate
Lauchlan River	1972	13 to 17	1997	12 to 14	Moderate
Paliryuak River	1977	12 to 15	1993	12 to 15	Low

Table 20. Summary of ANOVAS used for analysis of the effects of age, birth year, age by birth year interaction, birth year nested within location and age nested within location on percentage of char in annual samples. Locations compared are Wellington Bay (Ekalluk, Paliryuak, Halovik and Lauchlan Rivers), all Wellington Bay location data combined and the Jayco and Ellice Rivers. Shaded areas indicate a significant effect. The model used is ' $p_{ijk} = a_i$*age + b_j*birthyear +c_{ij}*age*birthyear + $_{ik}$*birthyear(location) + e_{jk}*age(location) + ε_{ijk} ' (see methods for model description and rationale).

Comparisons	Number of ages, locations, birthyears, and sampling years compared	N samples	Age		Birth Year		Age*Birth Year		BirthYear(Location)		Age(Location)
			- pr effect - cumulative R^2 - F value		- pr effect - cumulative R^2 - F value		- pr effect - cumulative R^2 - F value		- pr effect - cumulative R^2 - F value		- pr effect - cumulative R^2 - F value
Between 4 Wellington Bay locations	22, 4, 44, 31	1055	<0.0001 0.6212 122.21		<0.0001 0.6470 5.27		<0.0001 0.8615 2.81		0.2825 0.8823 1.09		<0.0001 0.9013 2.36
Between 4 Wellington Bay locations grouped vs Jayco	25, 2, 45, 31	1396	<0.0001 0.5470 71.09		<0.0001 0.5688 5.49		<0.0001 0.7829 2.74		<0.0001 0.7977 2.46		<0.0001 0.8439 15.16
Between 4 Wellington Bay locations grouped vs Ellice	22, 2, 44, 32	1289	<0.0001 0.2919 44.65		<0.0001 0.3124 4.03		<0.0001 0.5618 2.27		<0.0001 0.6244 3.66		<0.0001 0.8208 57.27
Jayco vs Ellice	24, 2, 44, 29	575	<0.0001 0.1103 13.99		<0.0001 0.1566 2.77		0.0644 0.6604 1.32		0.0004 0.7295 2.55		<0.0001 0.9399 26.73
Between all six locations	25, 6, 45, 32	1630	<0.0001 0.2828 56.03		<0.0001 0.2982 3.84		<0.0001 0.5316 2.15		<0.0001 0.6220 1.82		<0.0001 0.8417 15.39

Table 21. Significance of birth year(location) effects (above diagonal) and age(location) effects (below diagonal) on birth year percentage, in pairwise comparisons of six locations. In addition to values on the table, overall age effects are significant at $p < 0.0001$ and birth year effects at $p < 0.001$ in all comparisons, and the age(birth year) effects at $p < 0.0001$ in 7 cases, $p <= 0.001$ in 2 cases and $p > 0.05$ in 3 cases (Ellice vs Lauchlan, $p = 0.0993$; Ellice vs Halovik, $p = 0.1152$ and Ellice vs Paliryuak, $p = 0.1098$). Shaded areas indicate significant effects.

		Wellington Bay						
		Ekalluk	Lauchlan	Paliryuak	Halovik		Ellice	Jayco
Ekalluk	Wellington Bay		0.2982	0.0491	0.1583		0.0007	0.0001
Lauchlan		0.0001		0.4072	<.0001		0.2672	0.3571
Paliryuak		0.1323	0.3633		0.1045		0.0489	0.0224
Halovik		<.0001	0.2257	<.0001			0.0031	<.0001
Ellice		<.0001	<.0001	<.0001	<.0001			0.0004
Jayco		<.0001	<.0001	0.0224	<.0001		<.0001	

Table 22. Annual mean fork lengths (mm) for age classes of anadromous arctic char sampled from the Ekalluk River commercial fishery, Cambridge Bay, Nunavut.

Ekalluk River - Mean Fork Lengths By Age Class and Sampling Year	Year																																	
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Age																																		
7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	473	.	.	555	.	.	.	.	.	.	.	.	592	.	.	.
8	.	.	.	.	.	.	.	490	.	.	.	564	550	.	.	.	487	535	578	565	.	.	.	.	.	614	.	587	588	572	.	606
9	.	.	598	.	505	719	427	.	624	.	633	574	579	.	.	.	511	550	554	590	570	542	565	.	565	633	597	580	620	586	597	618
10	581	.	636	.	567	603	604	582	630	627	639	607	648	618	560	547	530	590	575	618	634	560	581	596	580	619	626	595	630	613	695	644
11	627	.	705	.	612	630	630	588	626	626	637	653	636	623	652	606	562	591	592	637	632	603	595	645	627	639	653	638	641	623	699	655
12	640	.	693	.	635	638	663	630	620	653	652	669	655	666	672	646	583	640	605	667	642	620	611	641	666	694	669	655	674	660	761	687
13	649	.	685	.	630	644	668	630	642	651	670	708	692	676	683	635	621	646	620	707	697	626	660	672	689	701	699	707	703	678	685	686
14	677	.	693	.	661	685	676	666	653	662	666	709	688	690	705	685	624	664	655	676	709	703	710	675	694	724	718	709	745	717	748	722
15	676	.	695	.	687	673	706	623	664	712	674	708	719	698	708	708	684	723	664	730	743	702	749	713	696	713	720	732	749	717	.	752
16	720	.	.	.	710	708	712	666	651	717	687	696	735	733	719	721	673	670	645	718	825	722	747	595	728	714	741	748	741	755	785	785
17	720	.	675	.	664	714	758	650	680	749	731	624	737	755	779	736	645	746	708	708	691	734	717	852	740	697	746	671	767	734	718	767
18	.	.	725	.	713	755	707	671	694	.	.	677	775	817	744	742	688	810	799	.	860	752	802	.	818	770	.	674	702	756	.	754
19	.	.	.	.	694	.	697	.	714	.	676	800	739	714	789	734	755	782	.	.	.	700	.	.	678	.	.	.	751	797	.	828
20	.	.	.	.	659	644	.	.	.	.	.	.	.	815	765	644	685	805	654	.	800	728	.	.	.	.	.	.	665	839	.	.
21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	775	.	.	.	.	.	.	.	.	.	.	.	.	.	809	.	.	.
23	.	.	.	.	.	.	.	.	.	.	.	.	706	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
24	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	707	.	.	.	.	.

Table 23. Annual mean fork lengths (mm) for age classes of anadromous arctic char sampled from the Ellice River commercial fishery, Cambridge Bay, Nunavut.

Ellice River - Mean Fork Length By Age Class and Sampling Year	Year																													
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Age																													
5	.	.	.	445	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	535	.	.	.	.	.	.	.	537
6	.	.	.	505	.	506	421	448	434	410	.	478	546	511	498	.	.	.	.	.	.	.	.	.	.	.	.	.	573
7	.	.	.	563	.	521	443	481	410	490	530	539	563	560	579	593	599	541	558	.	622	.	564	578	553	535	.	.	560
8	390	500	.	542	.	564	526	522	587	.	587	527	587	585	595	627	598	577	563	547	628	.	572	571	602	582	.	.	592
9	.	.	.	600	.	590	545	579	595	586	594	589	632	600	614	646	633	610	599	602	665	.	596	606	620	621	.	.	650
10	.	625	.	625	.	637	601	606	614	609	595	608	655	635	596	642	645	628	631	623	686	.	637	617	647	643	.	.	684
11	640	676	.	679	.	655	609	635	636	614	614	628	664	606	646	666	663	659	664	662	709	.	655	649	671	689	.	.	755
12	645	713	.	697	.	663	614	672	678	613	640	645	652	651	652	642	665	670	676	704	751	.	658	653	701	709	.	.	758
13	671	728	.	740	.	685	635	677	669	612	687	680	700	681	682	.	675	585	673	698	770	.	753	744	715	714	.	.	715
14	698	773	.	.	.	727	681	658	699	620	.	647	687	712	683	738	725	725	670	728	.	.	729	767	851	801	.	.	.
15	770	843	.	780	.	749	685	765	676	.	769	705	.	709	711	755	.	.	.	748	685	.	769	765	860	803	.	.	843
16	743	807	.	.	.	760	661	.	.	.	.	.	.	670	588	622	.	705	700	.	.	.	.	815	.	.	.	.	.
17	700	797	.	.	.	.	746	.	.	.	.	.	.	.	.	783	.	.	754	.	.	.	.	.	.	.	.	.	.
18	.	.	.	.	.	.	.	723	.	.	.	.	.	.	859	.	.	.	.	.	.	.	.	.	.	.	.	.	.
19	.	810	.	.	.	.	.	.	.	.	676	.	.	766	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
20	.	.	.	.	.	.	.	815	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 24. Annual mean fork lengths (mm) for age classes of anadromous arctic char sampled from the Halovik River commercial fishery, Cambridge Bay, Nunavut.

Halovik River - Mean Fork Lengths By Age Class and Sampling Year	Year																																
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Age																																
6	357	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	441	.	.	.	.	543	.	.	.	.	.	.	.	410	.	.	.	.	.	.	.	.	.	.	.	.	.	565	.	.	.	.
8	433	.	.	.	519	499	.	465	.	.	.	.	.	.	.	.	.	.	.	.	606	.	481	.	.	.	590	613	653	558	.	.
9	490	.	.	.	546	480	.	552	.	.	639	672	.	.	.	580	.	553	.	664	661	.	501	574	.	704	619	623	653	625	.	643
10	543	.	.	.	591	541	579	553	592	561	646	699	458	624	.	570	566	567	.	673	644	.	559	609	615	627	592	626	642	638	.	647
11	639	.	.	.	635	563	640	598	627	634	669	700	581	638	664	632	626	613	.	668	672	665	596	648	652	671	660	653	658	665	.	671
12	663	.	.	.	629	610	677	654	624	646	710	709	639	702	669	700	646	652	.	682	703	669	620	667	678	700	679	707	684	669	.	696
13	717	.	.	.	666	683	682	683	642	655	708	699	692	700	702	694	684	666	.	695	696	704	668	689	709	717	720	708	707	727	.	745
14	744	.	.	.	679	683	676	678	681	672	711	718	697	720	720	709	700	671	.	723	732	724	709	691	732	721	746	736	756	721	.	771
15	825	.	.	.	693	707	702	711	703	684	717	754	710	710	738	750	697	700	.	712	733	734	734	769	743	718	747	719	754	751	.	758
16	768	.	.	.	770	738	696	715	692	681	737	734	732	760	733	767	712	701	.	742	741	745	716	.	755	730	713	763	776	769	.	763
17	820	.	.	.	.	683	681	745	700	733	732	763	755	758	742	760	716	716	.	780	775	749	756	645	804	751	738	718	797	765	.	802
18	845	.	.	.	.	645	.	698	684	698	681	709	725	742	717	787	753	740	.	773	786	705	753	734	753	.	823	772	742	812	.	.
19	.	.	.	.	.	.	748	.	727	727	746	.	788	820	784	744	789	753	.	.	788	803	761	.	.	813	.	765	785	.	.	753
20	.	.	.	.	.	.	.	.	.	.	.	.	729	.	758	800	.	740	.	.	.	815	.	.	.	.	.	.	.	.	.	839
21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	685	.	.	.	.	750	.	.	845	.	.	.	.	.	.	.
22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	766	.	.	.	.	.	.	.	.	.	.
23	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	965	.	.	.	.	.	.	.

Table 25. Annual mean fork lengths (mm) for age classes of anadromous arctic char sampled from the Jayco River commercial fishery.

Jayco River - Mean Fork Lengths By Age Class and Sampling Year	Year																											
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Age																												
7	.	.	.	.	.	.	.	.	580	596	.	.	.	.	.	.	.	.	.	.	.	.	495	523	.	.	543	.
8	465	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	500	523	602	569	583	503
9	489	483	.	.	654	.	510	.	630	.	.	.	.	.	480	.	.	.	605	532	.	.	534	518	572	562	528	555
10	500	537	.	.	613	577	551	615	646	568	.	.	.	.	586	571	599	.	594	561	566	585	537	534	589	588	576	576
11	457	533	.	587	639	559	583	623	631	596	619	.	540	578	554	577	.	.	584	578	.	568	567	628	621	606	612	614
12	571	621	.	636	652	568	636	655	649	635	630	.	634	582	579	617	592	.	606	593	619	655	587	636	644	625	635	619
13	560	636	.	703	666	609	628	669	648	639	664	617	655	602	600	642	624	.	652	610	635	662	616	653	673	672	665	653
14	.	669	.	647	678	626	643	668	649	644	661	645	675	636	617	646	638	.	622	623	655	675	623	701	656	681	654	649
15	598	673	.	688	689	641	672	694	663	648	674	675	681	656	633	649	677	.	660	642	681	705	633	709	674	704	673	687
16	.	705	.	709	728	669	669	705	671	661	707	661	700	663	639	663	667	.	660	667	678	684	642	730	687	716	684	718
17	.	698	.	717	714	688	670	712	729	670	712	669	710	651	645	659	670	.	678	680	661	705	663	697	731	724	697	707
18	712	713	.	706	727	699	641	714	653	708	738	696	711	683	648	691	684	.	661	672	692	726	734	738	686	722	659	730
19	.	736	.	697	712	682	668	700	709	725	.	709	710	701	661	653	708	.	688	696	734	727	697	766	681	677	676	699
20	727	729	.	758	751	698	640	.	652	.	760	699	663	715	675	688	.	.	667	707	710	731	667	762	706	713	.	718
21	.	719	.	728	731	.	715	.	.	.	704	.	.	685	640	674	.	.	699	595	683	724	690	729	677	685	723	749
22	.	842	.	748	721	616	725	665	.	.	.	.	735	.	648	725	.	.	695	.	.	728	.	762	821	.	755	.
23	.	751	.	696	761	.	.	.	.	.	.	.	.	588	.	596	.	.	658	834	.	720	.	728	.	.	.	773
24	.	690	.	778	.	.	710	.	706	701	.	.	.	.	.	.	.	.	742	.	.	.	.	747	.	.	.	.
25	.	728	.	714	.	.	.	.	.	.	.	.	.	.	703	.	.	.	.	768	.	.	.	.	.	.	.	.
26	.	.	.	.	763	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
28	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	804	.	.
31	.	.	.	794	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 26. Annual mean fork lengths (mm) for age classes of anadromous arctic char sampled from the Lauchlan River commercial fishery, Cambridge Bay, Nunavut.

Lauchlan River - Mean Fork Length By Age Class and Sampling Year	Year																									
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Age																										
4	.	369	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5	.	405	410	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	403	376	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	433	516	.	.	.	.	.	.	.	.	476	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8	348	479	571	.	.	505	.	518	.	.	.	586	537	.	.	.	.	.	.	603	.	.	.	.	.	700
9	558	501	573	.	.	665	472	593	657	598	667	577	573	.	.	632	.	528	.	639	651	656	.	.	.	605
10	580	552	606	.	.	644	609	627	.	581	632	637	605	649	.	652	.	626	619	653	625	655	.	.	.	710
11	596	558	682	.	.	626	641	614	625	627	651	671	638	646	634	652	599	622	638	676	657	680	.	.	.	678
12	645	573	684	.	.	668	655	646	661	637	663	649	674	677	706	672	649	637	667	694	711	697	.	.	.	685
13	682	570	698	.	.	715	669	669	674	661	673	680	673	705	713	744	664	662	694	719	714	712	.	.	.	705
14	715	561	703	.	.	684	682	687	683	667	688	682	696	727	746	725	692	655	688	730	714	727	.	.	.	731
15	774	.	767	.	.	683	702	691	686	713	689	720	712	732	754	759	699	687	701	738	738	751	.	.	.	790
16	819	550	733	.	.	748	726	720	684	697	715	704	721	758	766	755	713	735	745	759	760	766	.	.	.	725
17	801	.	803	.	.	727	711	735	671	688	742	738	735	805	780	766	728	747	719	755	757	778	.	.	.	710
18	848	.	830	.	.	.	691	730	686	690	.	788	719	771	759	763	750	730	715	761	765	781	.	.	.	.
19	819	752	.	.	.	.	.	770	679	.	.	.	676	.	746	786	727	770	822	825	778	788	.	.	.	.
20	825	.	.	.	.	.	645	.	672	691	.	825	.	.	778	805	824	709	828	.	.	705	.	.	.	.
21	845	.	.	.	.	.	.	.	.	.	.	.	.	816	.	.	.	742	760	.	785	.	.	.	.	.
22	.	.	.	.	.	.	.	705	.	.	.	.	.	.	.	.	.	.	.	.	.	734	.	.	.	.
23	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	777	.	.	.	.	.

Table 27. Annual mean fork lengths (mm) for age classes of anadromous arctic char sampled from the Paliryuak River commercial fishery, Cambridge Bay, Nunavut.

Paliryuak River - Mean Fork Length By Age Class and Sampling Year	Year																
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Age																	
5	.	.	.	373	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	406	.	.	.	523	470	.	.	.	.	.	.	.	.
8	402	.	.	396	.	.	580	.	563	.	.	.	.	.	599	.	.
9	571	.	588	528	546	650	640	527	632	.	.	.	600	.	614	673	642
10	600	.	582	559	659	681	630	582	608	.	604	.	595	614	627	676	687
11	619	.	651	598	613	654	661	609	618	667	637	611	625	618	661	662	642
12	652	.	656	639	670	694	673	637	675	693	654	633	637	641	666	687	677
13	700	.	679	647	664	692	694	663	678	706	670	638	659	662	699	696	688
14	686	.	721	666	694	704	712	691	707	715	701	657	682	667	703	711	718
15	702	.	708	677	701	729	699	711	732	728	713	662	682	674	693	727	716
16	661	.	694	682	701	705	721	709	736	753	727	661	709	696	767	730	729
17	711	.	737	709	696	719	684	706	753	766	744	625	709	696	766	724	718
18	758	.	745	685	722	.	716	711	734	756	779	672	705	700	.	730	.
19	.	.	735	.	730	810	.	716	736	.	770	718	764	.	703	761	814
20	.	.	.	.	787	.	.	761	711	.	.	700	.	.	.	.	.
21	.	.	.	.	.	.	.	763	803	.	845	707	.	.	.	.	.
22	.	.	.	.	.	.	.	.	.	786	.	.	649	.	.	.	.
23	.	.	.	.	.	.	.	.	700	.	.	.	.	.	.	.	.

Table 28. Annual mean round weights (grams) for age classes of anadromous arctic char sampled from the Ekalluk River commercial fishery, Cambridge Bay, Nunavut.

Ekalluk River - Mean Round Weights By Age Class and Sampling Year	Year																														
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Age																																
7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1512	.	.	2219	.	.	.	.	.	.	.	.	2982	.	.	.
8	.	.	.	.	.	.	.	1200	.	.	.	2249	2102	.	.	.	1541	2186	2155	2475	.	.	.	.	.	2632	.	2544	3160	2568	.	2726
9	.	.	3082	.	1453	5049	700	.	3104	.	3196	2603	2612	.	.	.	1774	2402	2170	2705	2054	2020	2450	.	2638	3304	3001	2553	3199	2529	2715	2384
10	2024	.	3396	.	2169	2765	2350	2464	3457	3646	3208	2966	3516	3019	2043	2043	2000	2950	2456	3260	2935	2279	2625	2987	2891	3072	3503	2947	3454	2978	4212	3243
11	2426	.	4485	.	2789	3217	2735	2475	3287	3513	3290	3507	3428	3126	3189	2679	2299	2871	2649	3563	3143	2805	3032	3867	3771	3480	3941	3500	3743	3163	4424	3287
12	2531	.	4299	.	3093	3248	3160	3082	3224	4077	3339	3865	3795	3921	3512	2972	2630	3616	2817	4083	3205	3031	3271	3724	4463	4349	4193	3926	4270	3620	5356	3805
13	2666	.	4175	.	3150	3384	3241	3002	3474	3968	3690	4259	4566	3999	3641	2792	3287	3748	3088	5101	4061	3163	4062	4289	4750	4638	4827	4923	4722	4165	4153	3814
14	3096	.	4347	.	3552	3890	3331	3482	3831	4097	3677	4283	4323	4106	3923	3413	3374	4145	3574	3850	3969	4266	4711	4388	4903	4897	5096	4854	5288	4678	5299	4617
15	3117	.	3929	.	3964	3523	3750	2888	3827	4957	3670	4207	4926	4334	3945	3890	4130	5574	3926	5049	4534	4250	5611	5056	4829	4703	5260	5187	5478	4764	.	4949
16	3262	.	.	.	4426	4204	3864	3383	3870	5314	3895	4035	5125	4908	3904	3915	4037	4017	3413	5078	7260	4350	5513	4707	5268	4758	5409	5731	5290	5351	5438	5624
17	3375	.	3634	.	3457	3693	4219	3250	4017	4106	5108	3281	5150	4872	4740	4228	3752	5845	4146	4184	3697	5067	5214	6959	5615	4169	5344	4430	4372	4869	3905	4963
18	.	.	5078	.	4180	4636	3400	3375	4460	.	.	3457	6464	7820	4742	4302	4902	5727	5429	.	6841	5000	6444	.	7159	6352	.	4177	4386	4778	.	4566
19	.	.	.	.	3811	.	3317	.	4283	.	2986	5933	4636	4794	3988	3929	5167	5403	.	.	.	3850	.	.	4224	.	.	.	5721	5683	.	6028
20	.	.	.	.	3104	3222	.	.	.	.	.	.	.	5108	4843	2986	3988	7289	3216	.	5332	4050	.	.	.	.	.	.	3868	6252	.	.
21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4401	.	.	.	.	.	.	.	.	.	.	.	.	.	6211	.	.	.
23	.	.	.	.	.	.	.	.	.	.	.	.	4754	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
24	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5356	.	.	.	.	.

Table 29. Annual mean round weights (grams) for age classes of anadromous arctic char sampled from the Ellice River commercial fishery, Cambridge Bay, Nunavut.

Ellice River - Mean Round Weights By Age Class and Sampling Year	Year																													
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Age																													
5	.	.	.	1094	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2154	.	.	.	.	.	.	.	2355
6	.	.	.	1813	.	1525	943	1005	770	896	.	1556	2578	2154	1902	.	.	.	.	.	.	.	.	.	.	.	.	.	2581
7	.	.	.	2513	.	1685	1097	1300	770	1525	2217	2342	2817	2751	3012	2921	2510	2426	2720	.	3860	.	2510	3443	2468	2308	.	.	2695
8	1022	1305	.	2068	.	2112	1911	1787	2678	.	3074	2419	3088	3190	3321	3228	2562	2705	2678	2311	3739	.	2743	2980	3443	3229	.	.	3231
9	.	.	.	3126	.	2534	2163	2438	2785	2881	3101	3213	3822	3383	3653	3738	3111	3212	3382	2930	4534	.	3099	3639	3758	3966	.	.	4645
10	.	2507	.	3282	.	3211	2981	2921	3080	3278	3227	3423	4190	3883	3378	3636	3438	3532	4050	3459	4921	.	3776	3644	4279	4461	.	.	4984
11	2955	3630	.	4262	.	3524	2976	3230	3437	3219	3531	3787	4442	3336	4189	3936	3670	4093	4757	4198	5413	.	4300	4580	4863	5526	.	.	6997
12	3076	4020	.	4556	.	3630	2874	3921	3865	3290	4041	4072	4229	4086	4166	3223	3807	4345	5168	5235	6482	.	4280	4579	5586	5886	.	.	6905
13	3400	4420	.	5583	.	3658	3396	3506	3946	3097	4334	4808	4387	4695	4104	.	3412	3349	4858	4805	7311	.	6272	6473	5810	6048	.	.	5928
14	3961	4819	.	.	.	4229	4173	3613	4582	3097	.	3996	4166	5215	4827	4198	4229	4921	4968	5710	.	.	5920	7249	9331	8163	.	.	.
15	5521	6243	.	5563	.	4921	4418	5448	3978	.	6116	4292	.	5330	5173	5475	.	.	.	5516	5110	.	6204	7500	9475	6192	.	.	8381
16	4772	5785	.	.	.	4418	3663	.	.	.	.	.	.	4292	2971	3600	.	4481	4795	.	.	.	.	7626	.	.	.	.	.
17	3863	6257	.	.	.	.	5550	.	.	.	.	.	.	.	.	5424	.	.	6022	.	.	.	.	.	.	.	.	.	.
18	.	.	.	.	.	.	.	5047	.	.	.	.	.	.	5991	.	.	.	.	.	.	.	.	.	.	.	.	.	.
19	.	5267	.	.	.	.	.	.	.	.	4041	.	.	5865	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
20	.	.	.	.	.	.	.	5150	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 30. Annual mean round weights (grams) for age classes of anadromous arctic char sampled from the Halovik River commercial fishery, Cambridge Bay, Nunavut.

Halovik River - Mean Round Weights By Age Class and Sampling Year	Year																															
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Age																																
6	402	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	773	.	.	.	.	1487	.	.	.	.	.	.	.	1014	.	.	.	.	.	.	.	.	.	.	.	.	.	2209	.	.	.	.
8	647	.	.	.	1487	1251	.	925	.	.	.	.	.	.	.	.	.	.	.	.	2345	.	1487	.	.	.	2375	2872	2826	2310	.	.
9	937	.	.	.	1783	1093	.	1517	.	.	3129	3203	.	.	.	1665	.	1665	.	3116	3191	.	1606	2272	.	4634	3069	3173	3575	2987	.	2678
10	1485	.	.	.	2335	1763	2125	1615	2345	1862	3155	3725	896	2877	.	1842	1783	2099	.	3396	2874	.	2460	2738	3167	3433	2868	3213	3591	3273	.	3091
11	2616	.	.	.	3013	1875	2650	2049	2767	2752	3412	3538	1961	3144	3291	2424	2576	2771	.	3420	3425	2886	3063	3457	3885	3749	3883	3652	3666	3625	.	3636
12	3016	.	.	.	3114	2363	3145	2776	2548	3099	4185	3760	2890	3676	3400	3617	2776	3295	.	3499	3624	3035	3280	3865	4209	4258	4187	4621	4319	3798	.	4023
13	4066	.	.	.	3484	3334	3431	3084	2780	3224	4125	3585	3646	3903	3742	3394	3461	3432	.	3685	3616	3502	4140	4165	4864	4619	4917	4804	4567	4674	.	4825
14	3988	.	.	.	3534	3226	3118	3082	3354	3443	3881	3827	3735	3812	3597	3517	3522	3446	.	3924	3970	3846	4825	4190	5143	4789	5432	5210	5584	4574	.	5253
15	5484	.	.	.	3927	3610	3572	3555	3460	3500	3942	4174	3929	4016	4149	3957	3443	3908	.	3688	3966	4107	5206	5585	5098	4687	5529	4817	5505	5051	.	5103
16	4199	.	.	.	4622	4078	3358	3731	3547	3558	4100	4143	4442	4358	4038	4149	3656	4103	.	4056	4026	4120	4958	.	5585	5144	4888	6026	5649	5463	.	4982
17	5449	.	.	.	.	3676	3292	3784	3420	4327	3794	4297	4635	4484	4186	4171	3668	3839	.	4327	4712	4227	5776	3061	5782	5628	5314	4829	6752	5164	.	6089
18	5203	.	.	.	.	2730	.	3410	3306	3617	3459	3853	4352	4007	3696	4599	4073	4386	.	4287	4578	3035	4889	4102	4918	.	7059	4883	4906	5368	.	.
19	.	.	.	.	.	.	3650	.	3706	4120	4386	.	5805	5569	4874	3809	4484	5081	.	.	4189	4687	6101	.	.	6101	.	6137	6305	.	.	4362
20	.	.	.	.	.	.	.	.	.	.	.	.	4504	.	3991	5273	.	4682	.	.	.	4622	.	.	.	.	.	.	.	.	.	6302
21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3203	.	.	.	.	3765	.	.	5592	.	.	.	.	.	.	.
22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4823	.	.	.	.	.	.	.	.	.	.
23	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10305	.	.	.	.	.	.	.

Table 31. Annual mean round weights (grams) for age classes of anadromous arctic char sampled from the Jayco River commercial fishery, Cambridge Bay, Nunavut..

Jayco River - Mean Round Weights By Age Class and Sampling Year	Year																											
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Age																												
7	.	.	.	.	.	.	.	.	2194	2483	.	.	.	.	.	.	.	.	.	.	.	.	1257	1685	.	.	1708	.
8	900	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1444	1801	3153	2321	2286	1373
9	1383	1153	.	.	3408	.	1327	.	2887	.	.	.	.	.	1211	.	.	.	2887	2097	.	.	1735	1812	2468	2326	1859	2135
10	1200	1558	.	.	2237	2097	1948	2791	3226	1789	.	.	.	.	2252	1905	2223	.	2541	2367	2252	2702	1829	2039	2593	2637	2359	2334
11	850	1601	.	1963	2605	1822	2390	2931	2805	2277	2587	.	1616	2463	1991	2373	.	.	2280	2550	.	2546	2280	3375	3260	3026	2789	2937
12	1906	2736	.	2727	2702	2016	2955	3360	2958	3159	2842	.	2367	2724	2136	2570	2454	.	2677	2729	2977	3784	2399	3517	3453	3152	3227	2984
13	1725	3106	.	3483	2957	2369	3113	3682	2934	3189	3211	2541	2608	2865	2576	3455	2955	.	3166	2870	3189	3875	2985	3834	3902	3909	3682	3488
14	.	3670	.	2852	3227	2626	3313	3565	2943	3216	3190	3018	3080	3404	2855	3087	3160	.	3050	3350	3597	4056	3017	4802	3799	4110	3407	3270
15	2050	3598	.	3409	3061	2743	3559	3925	3179	3179	3505	3149	3136	3668	3032	3101	3589	.	3470	3499	3790	4415	3014	5026	4158	4577	3582	4022
16	.	4128	.	3617	3768	3025	3361	4299	3082	3243	3774	3042	3307	3890	2985	3406	3532	.	3516	3708	3829	4006	3352	5216	4111	5030	3928	4647
17	.	3977	.	3841	3481	3337	3514	4002	3668	3404	3841	3176	3381	3644	3097	3382	3588	.	3938	4122	3340	4499	3302	4331	4506	5167	3923	4277
18	4000	4032	.	3522	3716	3369	2910	3913	2714	3870	3668	3286	3569	4088	3292	3691	3523	.	3511	3775	3735	4961	4171	5240	3966	4772	3090	4489
19	.	4390	.	3426	3766	3155	3182	3745	3234	4130	.	3523	3003	4119	3442	3098	3408	.	3808	3581	4503	4663	3997	5791	3569	3558	3436	4109
20	3100	4332	.	4261	4140	3176	4043	.	2772	.	3003	3436	2714	4575	3531	3559	.	.	3255	4460	3793	4968	3858	5558	4575	4552	.	4126
21	.	4101	.	3876	3408	.	3465	.	.	.	3523	.	.	4043	3026	3053	.	.	4144	2541	3980	4762	4217	5000	2743	3991	3604	5269
22	.	7280	.	4101	3523	2223	4448	3234	.	.	.	.	2598	.	3147	4321	.	.	4014	.	.	4419	.	5673	8448	.	4332	.
23	.	4390	.	3408	4159	.	.	.	.	.	.	.	.	2425	.	1911	.	.	3581	8667	.	5107	.	4953	.	.	.	4951
24	.	3639	.	4159	.	.	4506	.	2887	4853	.	.	.	.	.	.	.	.	4506	.	.	.	.	5003	.	.	.	.
25	.	4795	.	3639	.	.	.	.	.	.	.	.	.	.	3176	.	.	.	.	5315	.	.	.	.	.	.	.	.
26	.	.	.	.	4910	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
28	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6575	.	.
31	.	.	.	5250	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 32. Annual mean round weights (grams) for age classes of anadromous arctic char sampled from the Lauchlan River commercial fishery, Cambridge Bay, Nunavut.

Lauchlan River - Mean Round Weights By Age Class and Sampling Year	Year																										
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Age																										
4	.	650	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5	.	930	740	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	800	828	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	1070	1689	.	.	.	.	.	.	.	.	1925	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8	336	1441	2340	.	.	1259	.	1441	.	.	.	2760	2106	.	.	.	.	.	.	2651	.	.	.	.	.	4647
9	2636	1538	2468	.	.	3195	1000	2167	3104	3634	3180	2499	2394	.	.	2469	.	1562	.	3051	2862	3026	.	.	.	2651
10	1562	2042	2930	.	.	2760	2544	2651	.	2637	3042	3209	2784	3215	.	2610	.	2620	2711	3240	2640	2639	.	.	.	3921
11	2242	2297	4322	.	.	2596	2941	2452	2730	3227	3314	3943	3325	2953	2620	2590	2136	2729	3135	3485	3124	3002	.	.	.	3941
12	2732	2705	4162	.	.	3349	3088	2818	2983	3297	3443	3455	3580	3570	3861	2856	2896	3010	3411	3694	3832	3405	.	.	.	3754
13	3443	2367	4596	.	.	3358	3208	3135	3370	3711	3658	3983	3789	3771	3699	3936	2959	3356	3869	4078	3708	3519	.	.	.	4067
14	4028	2485	4438	.	.	3284	3490	3373	3422	3381	3494	3841	4057	4217	4336	3571	3481	3195	3393	4061	3731	3765	.	.	.	4284
15	4716	.	5066	.	.	3188	3658	3337	3453	4942	3558	4163	4260	4095	4163	4129	3482	3508	3751	4129	3872	4034	.	.	.	5615
16	5335	2000	4594	.	.	3958	3954	3782	3426	3951	3982	4466	4080	4689	4295	3832	3621	4186	4062	4472	3997	4157	.	.	.	4284
17	4964	.	5836	.	.	3397	3617	3599	3518	3528	4163	5071	4379	5003	4534	4159	3682	3956	3461	3921	3928	4216	.	.	.	4012
18	6019	.	6375	.	.	.	2925	3709	3437	2923	.	5736	4375	5010	4294	4254	3747	4054	3316	4042	3894	3833	.	.	.	.
19	5562	5313	.	.	.	.	.	4103	3336	.	.	.	3316	.	3800	5131	3861	5071	4889	4466	3770	4054	.	.	.	.
20	5645	.	.	.	.	.	2925	.	3256	3861	.	5978	.	.	3982	4708	4798	2832	4345	.	.	3365	.	.	.	.
21	5645	.	.	.	.	.	.	.	.	.	.	.	.	4587	.	.	.	3921	4405	.	3625	.	.	.	.	.
22	.	.	.	.	.	.	.	2832	.	.	.	.	.	.	.	.	.	.	.	.	.	3111	.	.	.	.
23	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4060	.	.	.	.	.

Table 33. Annual mean round weights (grams) of anadromous arctic char sampled from the Paliryuak River commercial fishery, Cambridge Bay, Nunavut.

Paliryuak River - Mean Round Weights By Age Class and Sampling Year	Year																
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn	Mn
Age																	
5	.	.	.	700	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	813	.	.	.	1929	1027	.	.	.	.	.	.	.	.
8	688	.	.	741	.	.	2173	.	1703	.	.	.	.	.	2643	.	.
9	1851	.	2042	1632	1647	3565	3508	1866	2761	.	.	.	2324	.	2555	3046	2296
10	2200	.	1818	1929	3283	3542	2954	2631	2687	.	2000	.	2267	2553	2820	3144	3282
11	2373	.	2609	2376	2525	3198	3203	2873	2856	3301	2579	2393	2689	2910	3129	3095	2803
12	2860	.	2743	2944	3127	3853	3534	3063	3476	3649	2703	2542	2888	2987	3388	3491	3180
13	3216	.	2930	3204	3288	3808	3672	3485	3423	3666	2829	2606	3197	3249	3784	3654	3277
14	3201	.	3618	3147	3680	3892	4070	3972	3780	3965	3307	2872	3515	3222	3831	3795	3566
15	3527	.	3463	3092	3847	4227	3635	4248	4231	4046	3354	2897	3414	3225	3602	3964	3669
16	2916	.	3192	3273	3407	3790	3988	4149	4320	4139	3589	2882	3882	3811	4646	4002	3677
17	3271	.	3837	3657	3659	4147	3734	3969	4377	4333	3862	2707	2888	3621	5257	3777	3686
18	4129	.	3768	3160	3677	.	3762	3919	4505	4392	4110	2944	3494	3522	.	3948	.
19	.	.	3001	.	4298	4749	.	4016	3621	.	3170	3508	4072	.	3170	3810	5025
20	.	.	.	.	4035	.	.	5087	4580	.	.	3283	.	.	.	.	.
21	.	.	.	.	.	.	.	4467	5933	.	4805	2944	.	.	.	.	.
22	.	.	.	.	.	.	.	.	.	4439	.	.	2944	.	.	.	.
23	.	.	.	.	.	.	.	.	3452	.	.	.	.	.	.	.	.

Table 34. Comparison of adjusted round weights of arctic char sampled from the downstream and upstream migrations of 3 Cambridge Bay fishing locations. All round weights are adjusted to a common fork length.

Location	Year	Downstream LSM Round Weight (grams)	Upstream LSM Round Weight (grams)	Weight Increase (grams)	Percentage Weight Increase
Paliryuak	1980	2880.71	3803.68	922.97	32.04
	1983	2967.39	3406.92	439.53	14.81
	1984	3106.56	3741.19	634.63	20.43
	1985	3054.33	3470.46	416.13	13.62
Jayco	1980	2354.17	2811.61	457.43	19.43
	1981	2675.89	3373.62	697.72	26.07
	1983	2634.21	2946.58	312.35	11.86
	1984	2821.30	3223.91	402.61	14.27
Lauchlan	1981	3298.69	4421.40	1122.71	34.04
	1982	3272.06	3651.70	379.64	11.60
	1984	3208.82	3869.79	660.98	20.60

Table 35. Age and size statistics for maturity stages of arctic char from the Cambridge Bay area, Nunavut. Data is combined for all char sampled by commercial weir, experimental weir and 140 mm stretched mesh gillnets at the Paliryuak River (1070, 1980), Lauchlan River (1974, 1978, 1983), Jayco River (1975, 1978, 1980, 1981), Halovik River (1972, 1978, 1981), Ellice River (1978) and Ekalluk River (1978, 1979, 1993, 1994).

Sex	Maturity Stage	N	Percent	Age			Fork Length		Round Weight	
				Mean	± 95% CI	Range	Mean	± 95% CI	Mean	± 95% CI
F	Immature	518	32.01	10.7	6.22	2 – 31	521	232	1815	2424
F	Resting	169	10.45	13.6	6.24	5 – 21	649	232	3388	2429
F	Ripe	15	0.93	14.1	6.42	11 – 18	593	239	2222	2501
F	Spent	2	0.12	12.5	7.62	11 – 14	643	283	3425	2966
M	Immature	682	42.15	11.7	6.22	3 – 21	587	231	2463	2424
M	Resting	197	12.18	13.4	6.23	7 – 18	687	232	4022	2428
M	Ripe	33	2.04	14.2	6.31	9 – 24	656	235	2913	2458
M	Spent	2	0.12	12.0	7.62	10 – 14	676	283	3500	2966

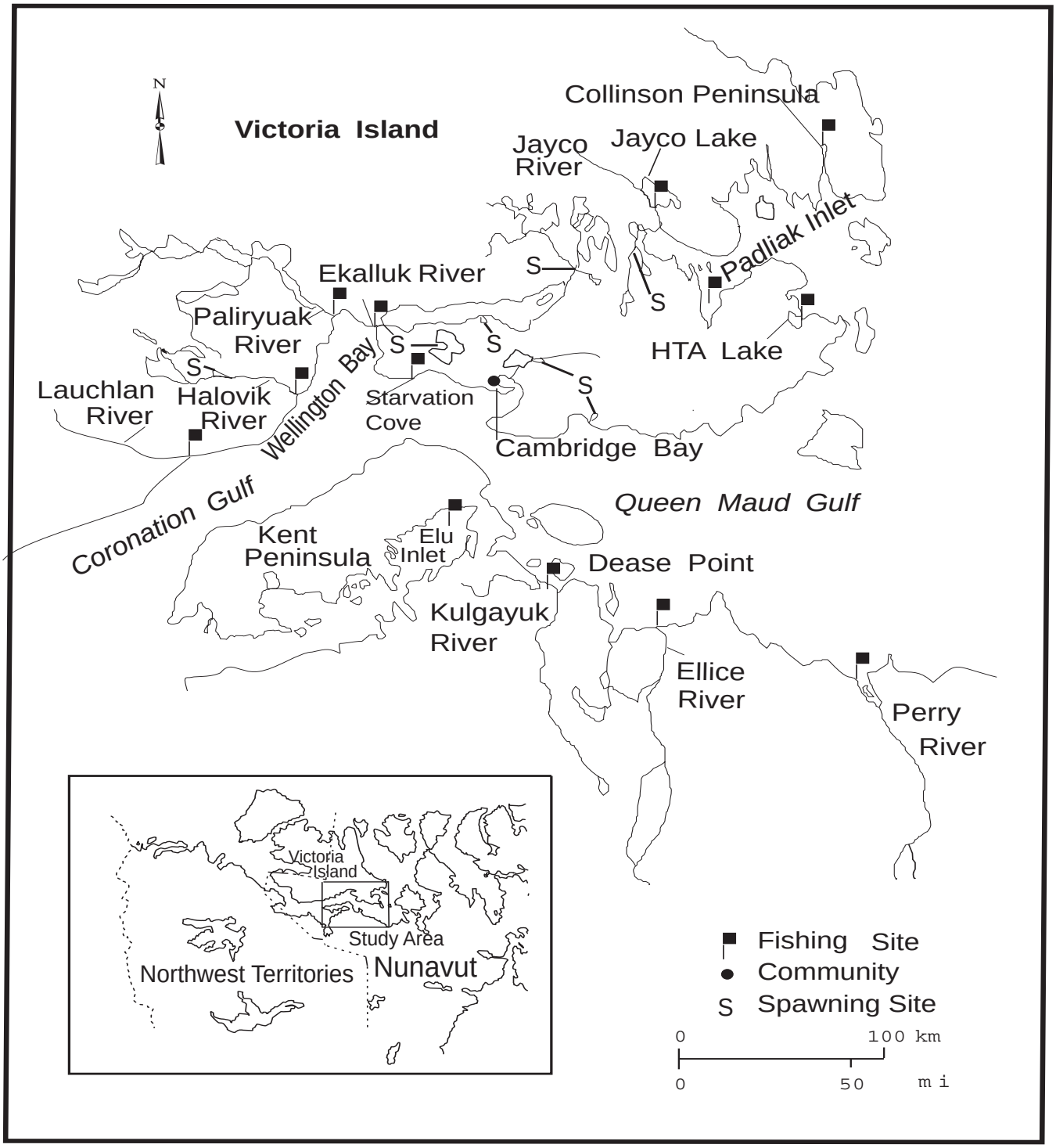

Figure 1. Cambridge Bay area arctic char fishing and spawning sites, Nunavut.

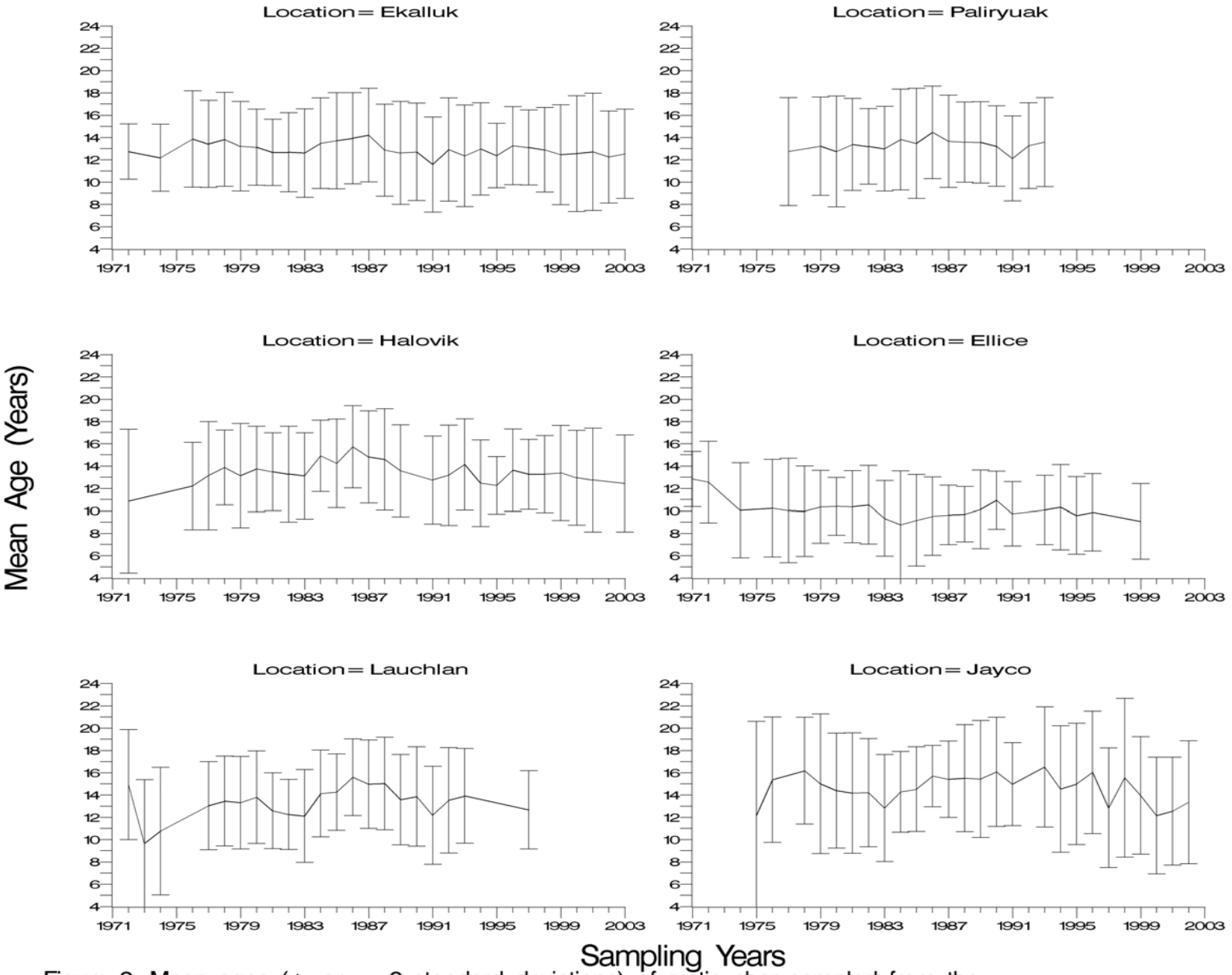

Figure 2. Mean ages (+ or − 2 standard deviations) of arctic char sampled from the commercial fishery harvest, Cambrige Bay, Nunavut.

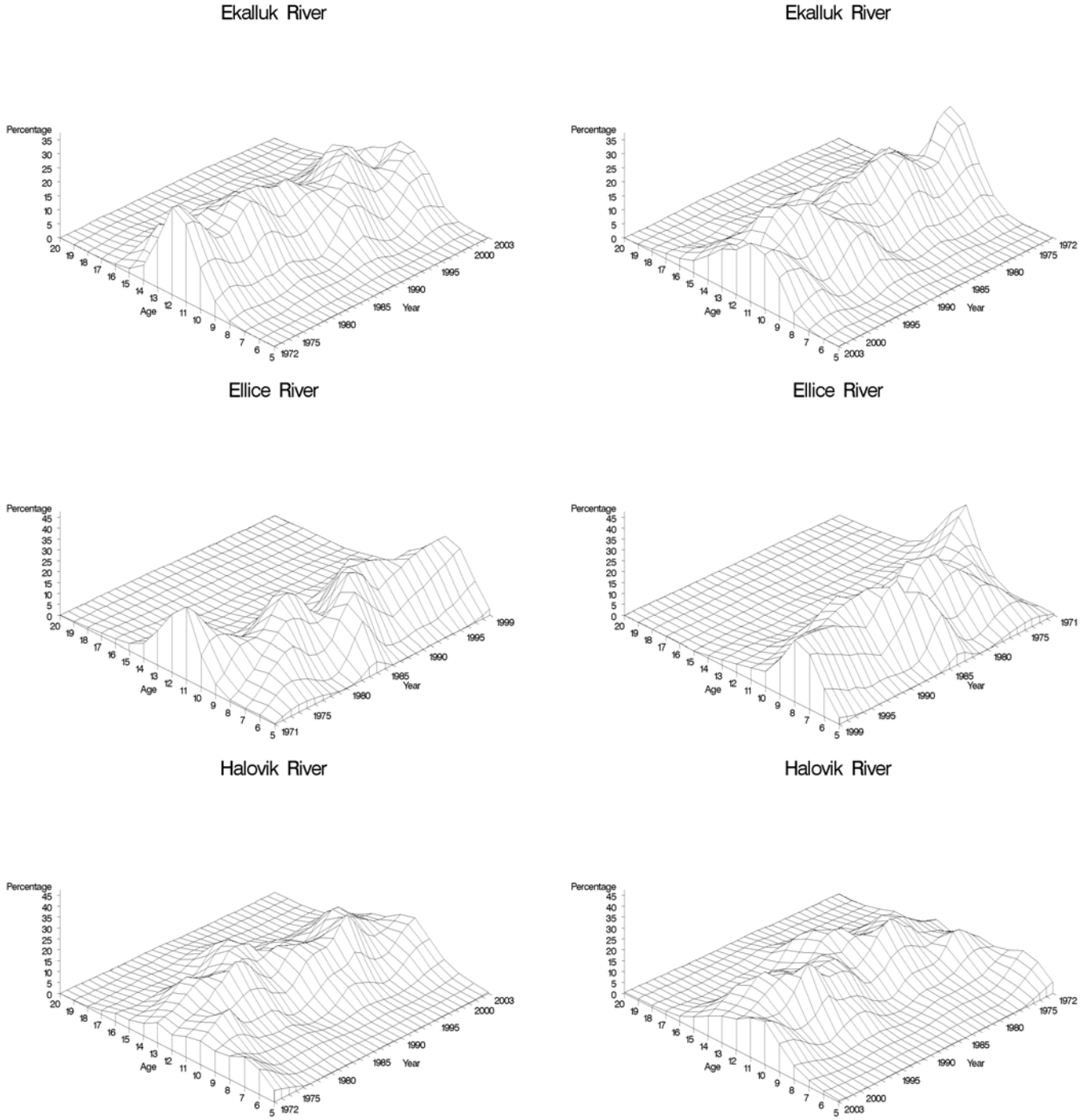

Figure 3a. Percentage distributions for age classes of anadromous arctic char sampled from the commercial fishery, Cambridge Bay, Nunavut. For each location, sampling years are displayed along the x axis from 1) earliest to most recent and 2) most recent to earliest.

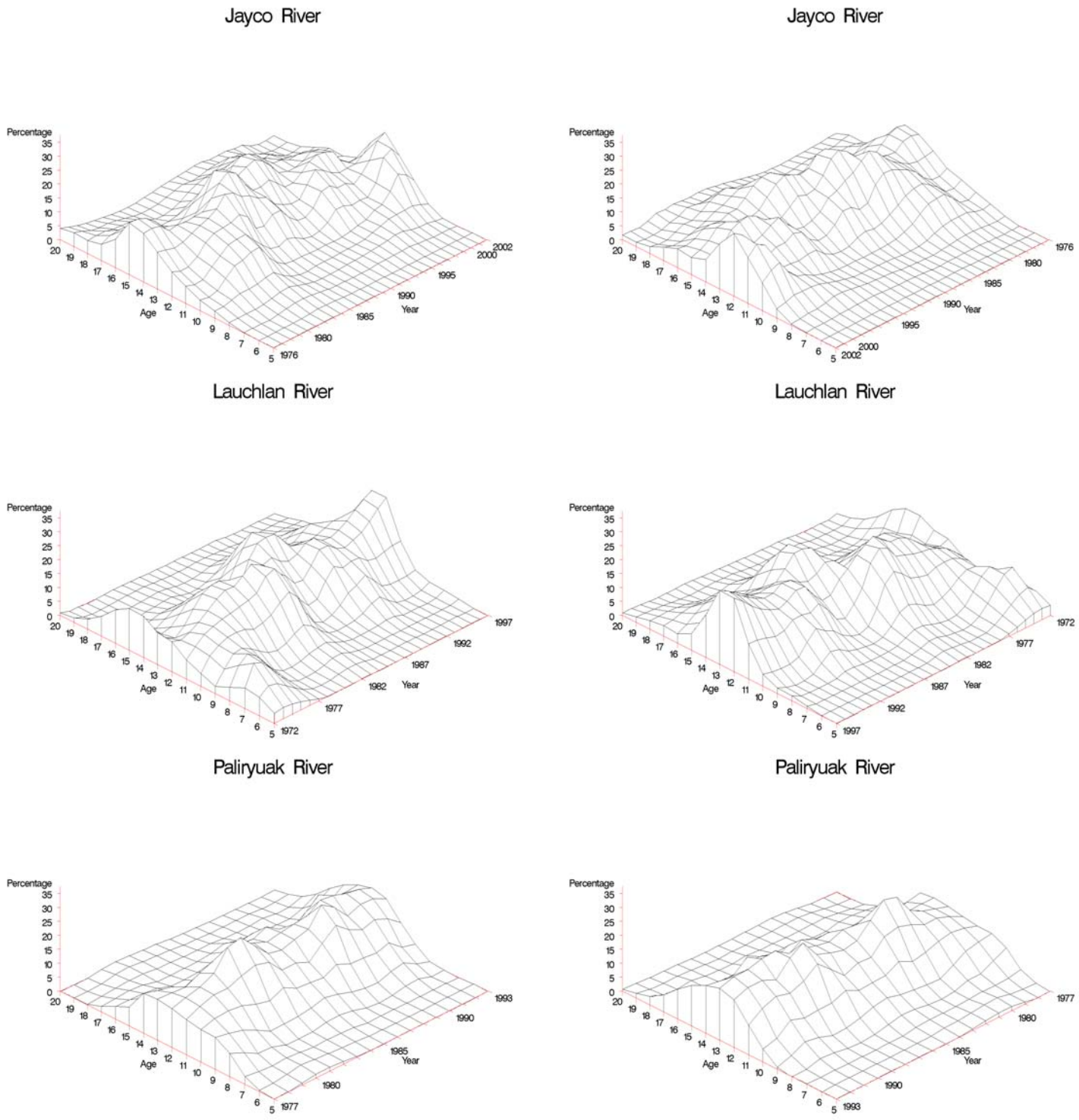

Figure 3b. Percentage distributions for age classes of anadromous arctic char sampled from the commercial fishery, Cambridge Bay, Nunavut. For each location, sampling years are displayed along the x axis from 1) earliest to most recent and 2) most recent to earliest.

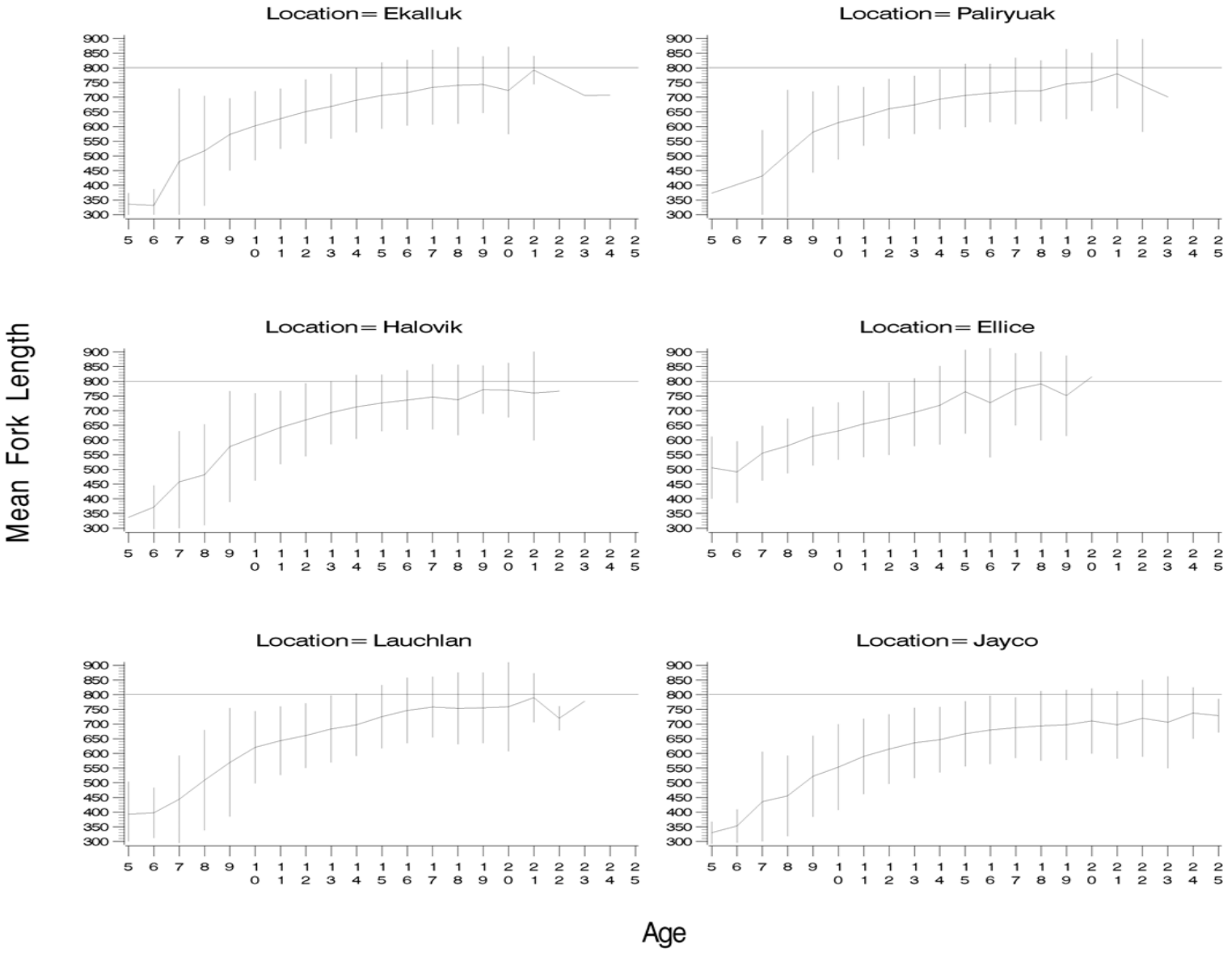

Figure. 4. Plots of mean fork length at age (+ or – 2 standard deviations) for anadromous arctic char sampled from the commercial fishery, Cambridge Bay, Nunavut.

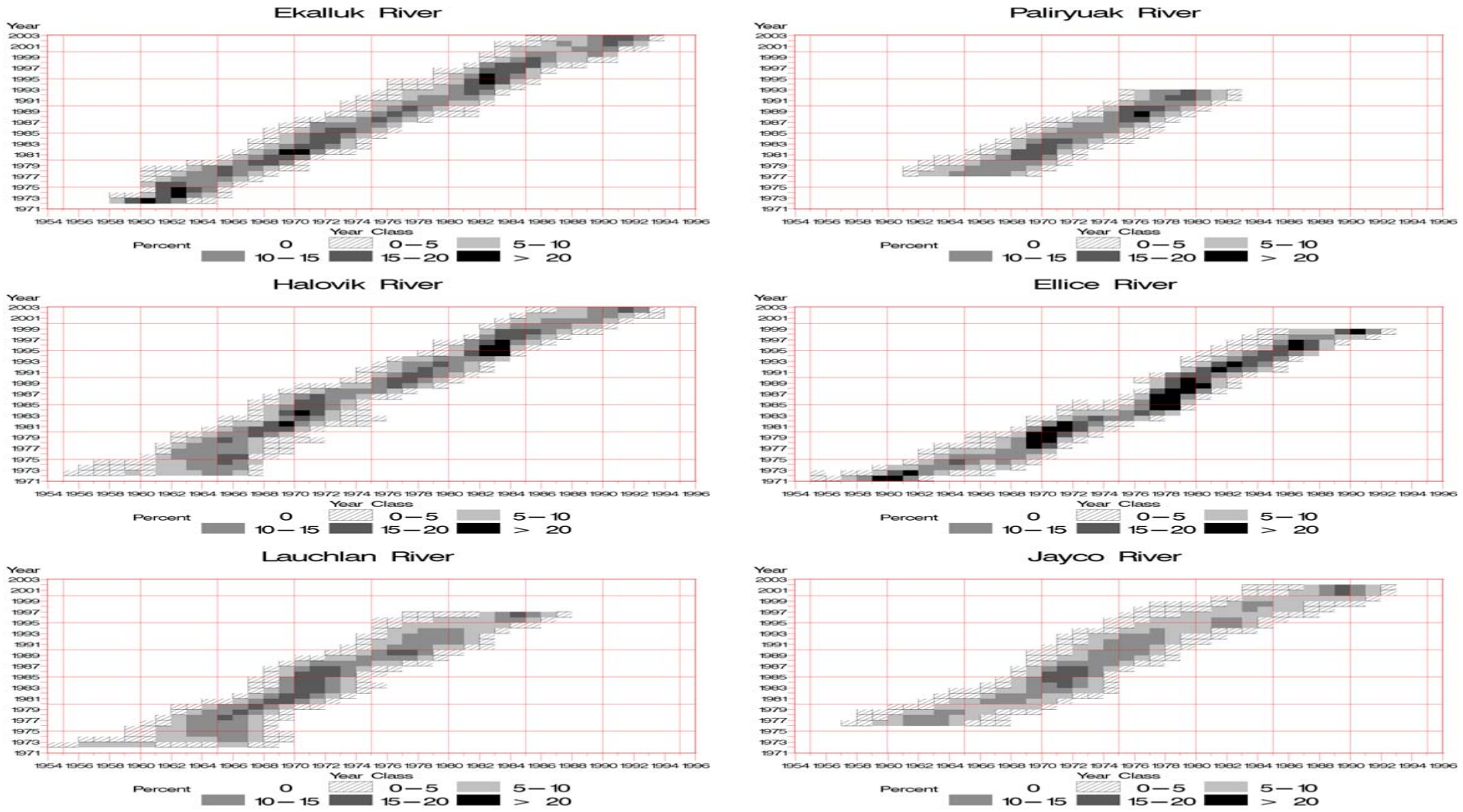

Figure 5. Relative abundance of anadromous arctic char year classes sampled from the Cambridge Bay commercial fishery, Nunavut, expressed as the percentage of a given year class found in a given annual sample taken at a given location.

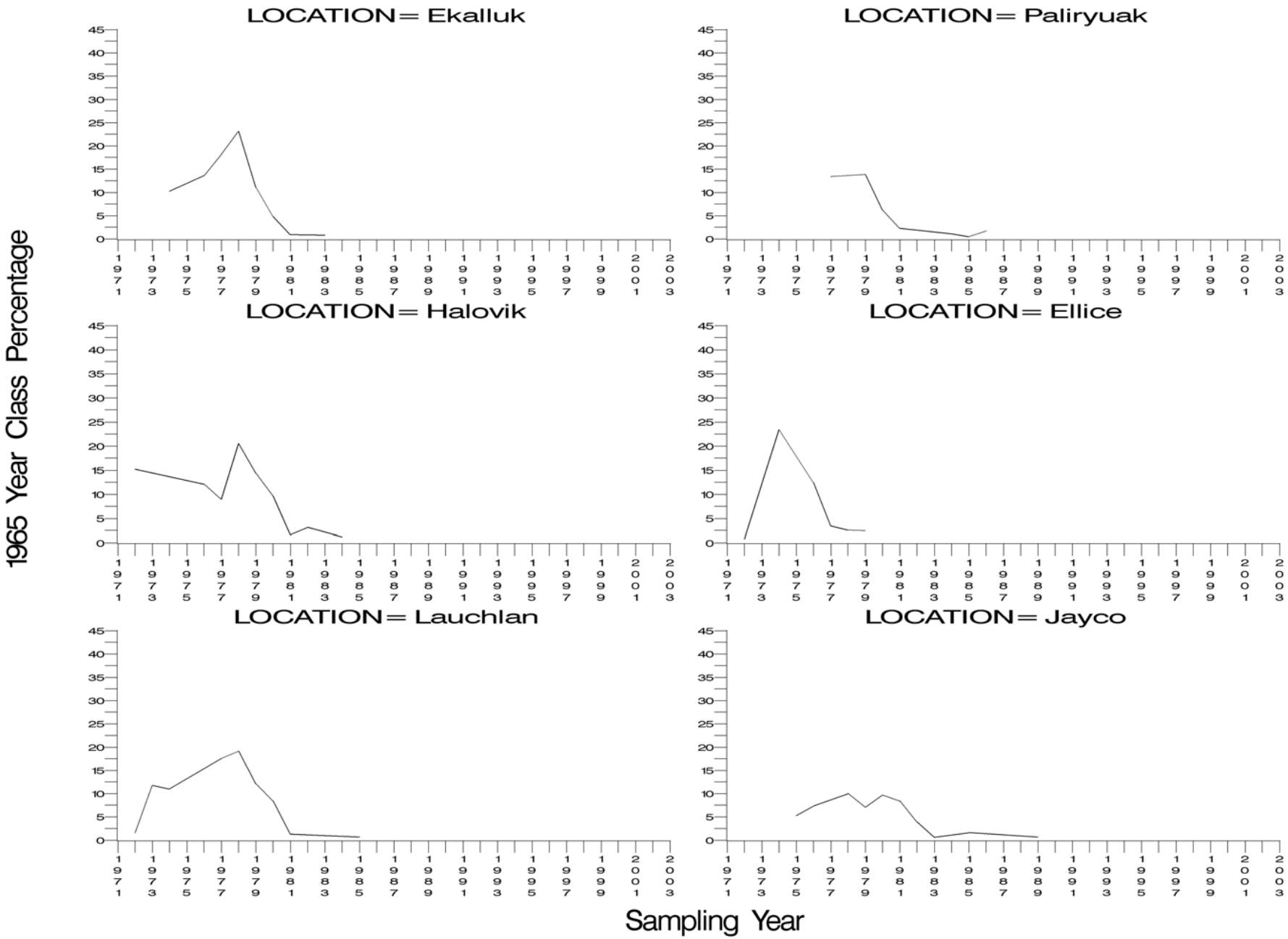

Figure 6.1965 year class percentages in annual commercial samples of anadromous arctic char from Cambridge Bay, Nunavut.

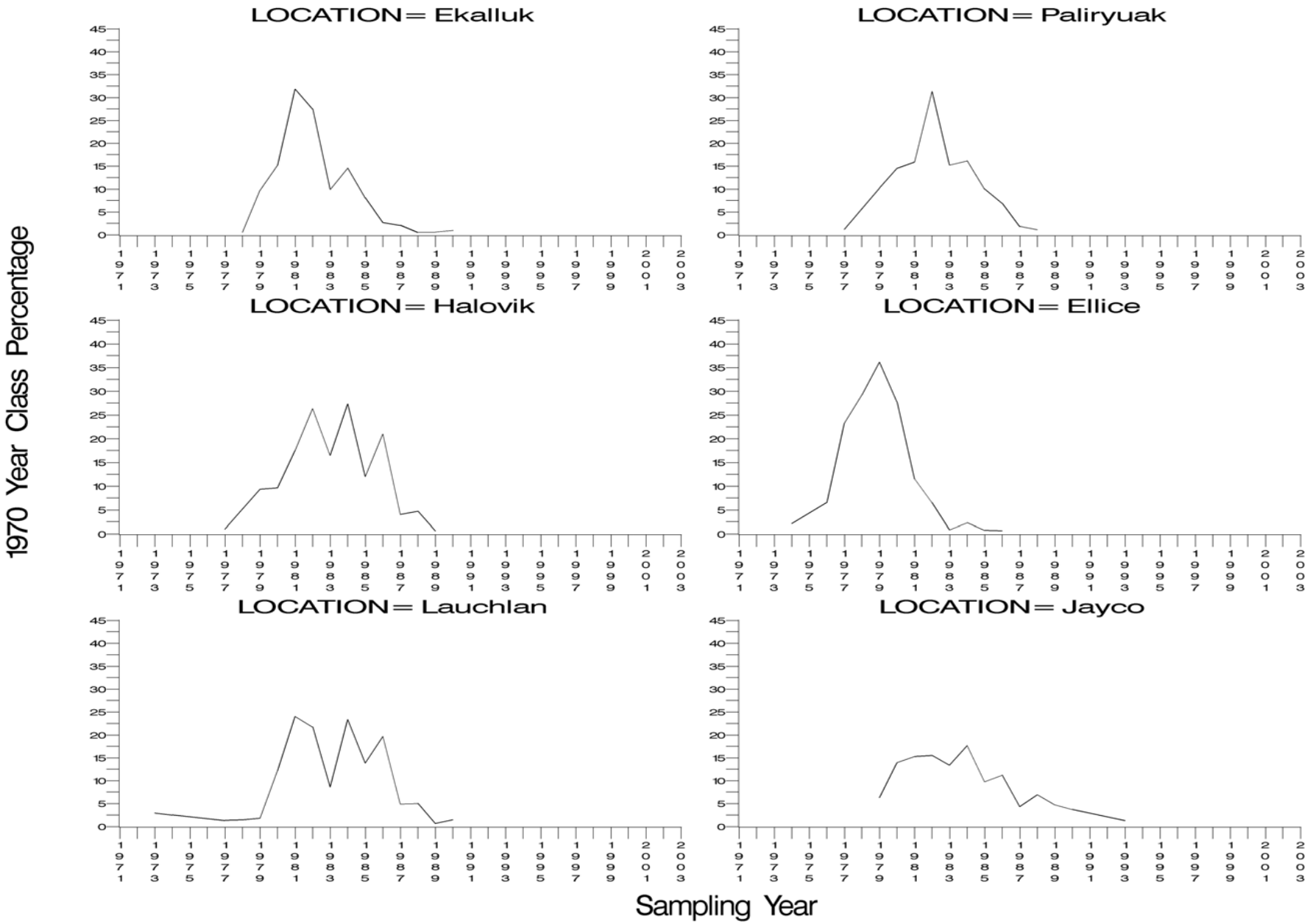

Figure 7.1970 year class percentages in annual commercial samples of anadromous arctic char from Cambridge Bay, Nunavut.

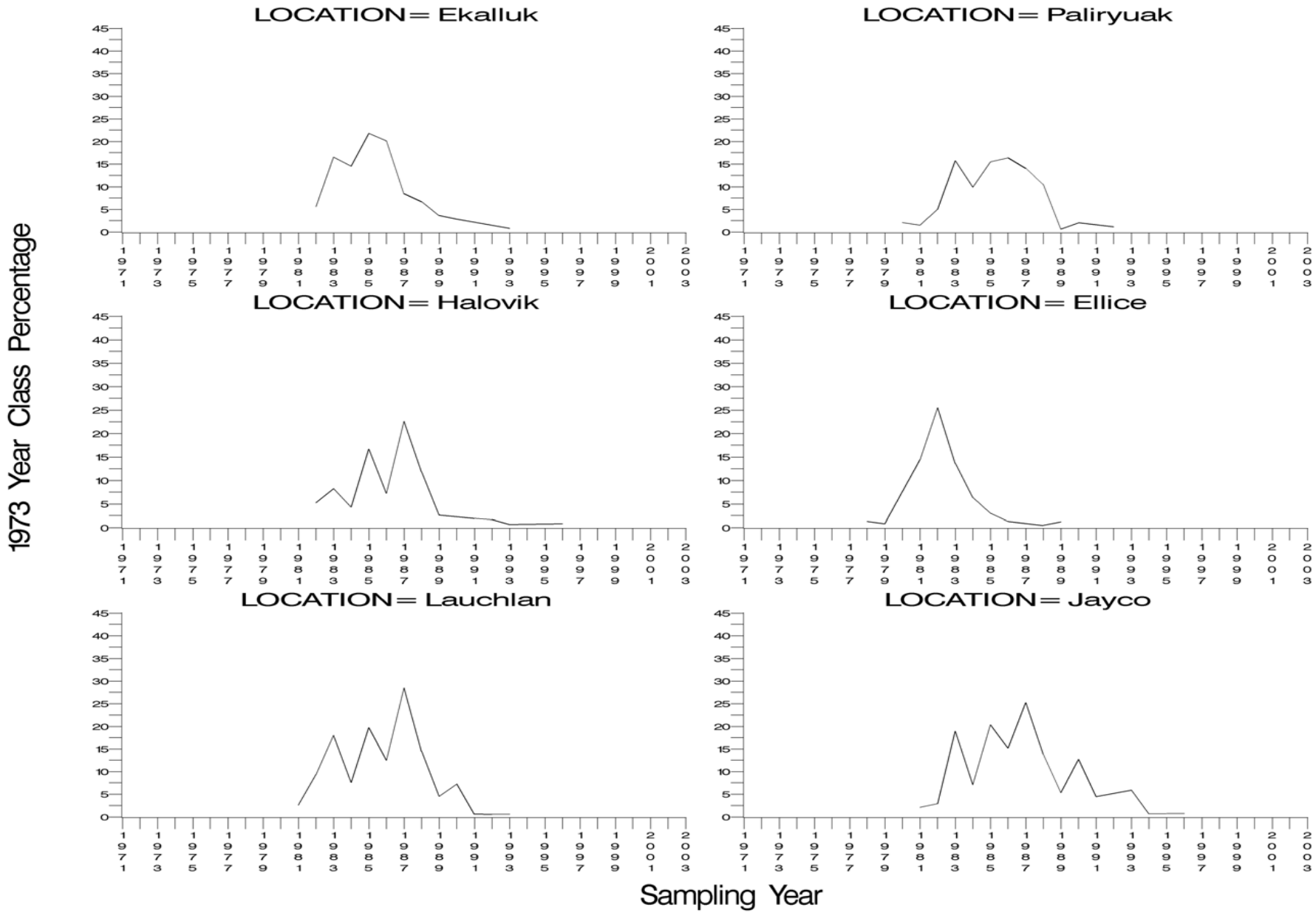

Figure 8.1973 year class percentages in annual commercial samples of anadromous arctic char from Cambridge Bay, Nunavut.

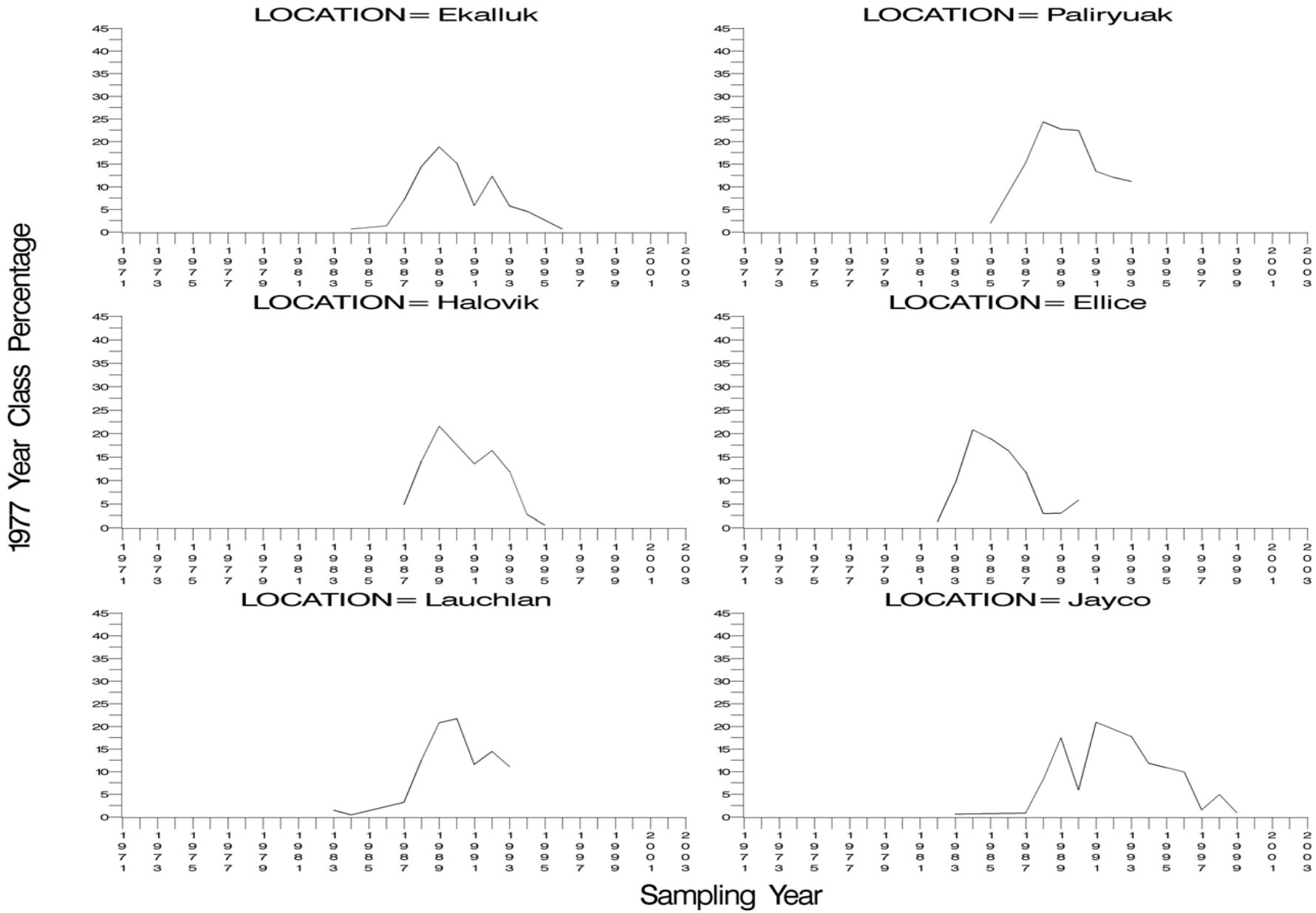

Figure 9.1977 year class percentages in annual commercial samples of anadromous arctic char from Cambridge Bay, Nunavut.

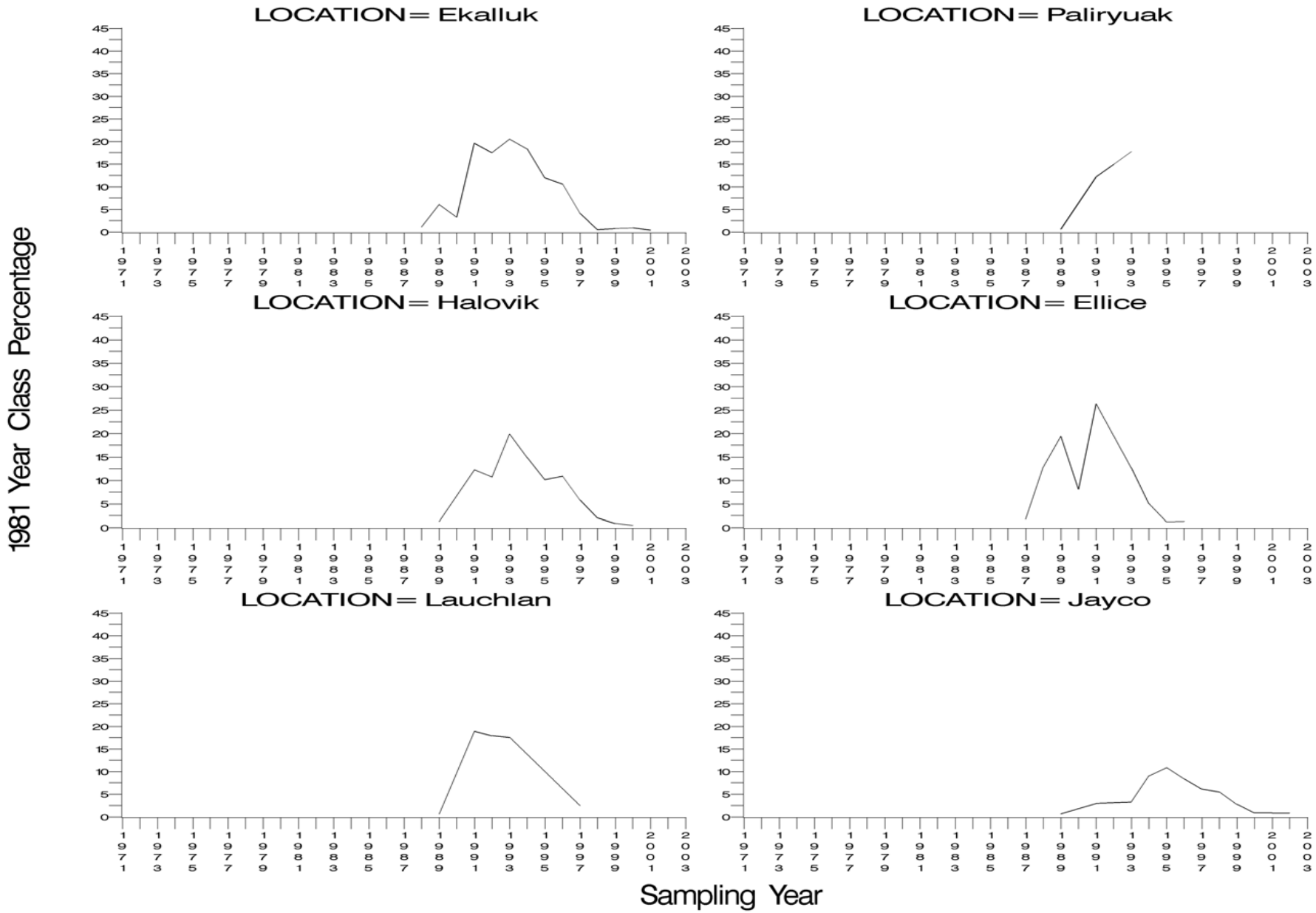

Figure 10.1981 year class percentages in annual commercial samples of anadromous arctic char from Cambridge Bay, Nunavut.

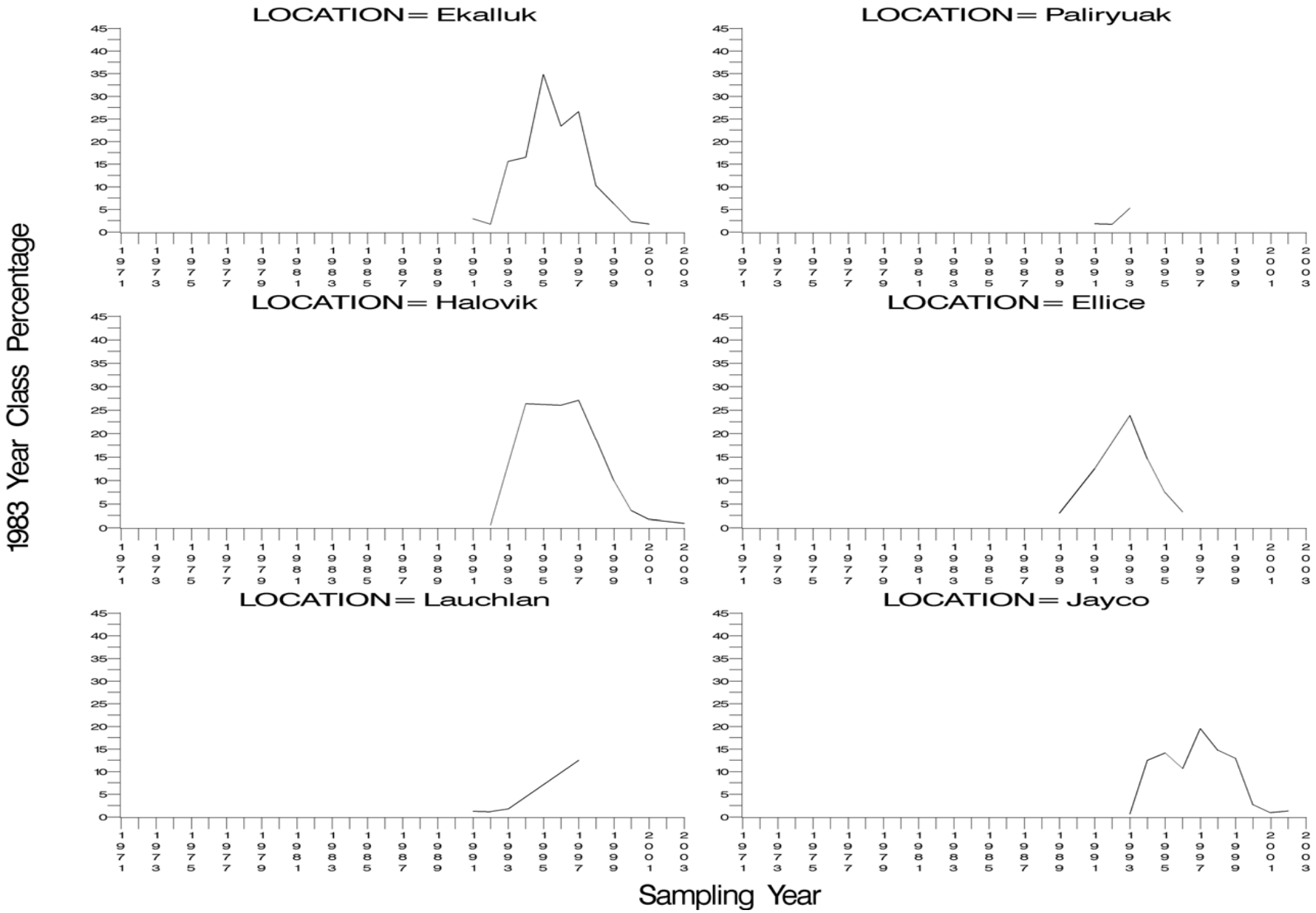

Figure 11. 1983 year class percentages in annual commercial samples of anadromous arctic char from Cambridge Bay, Nunavut.

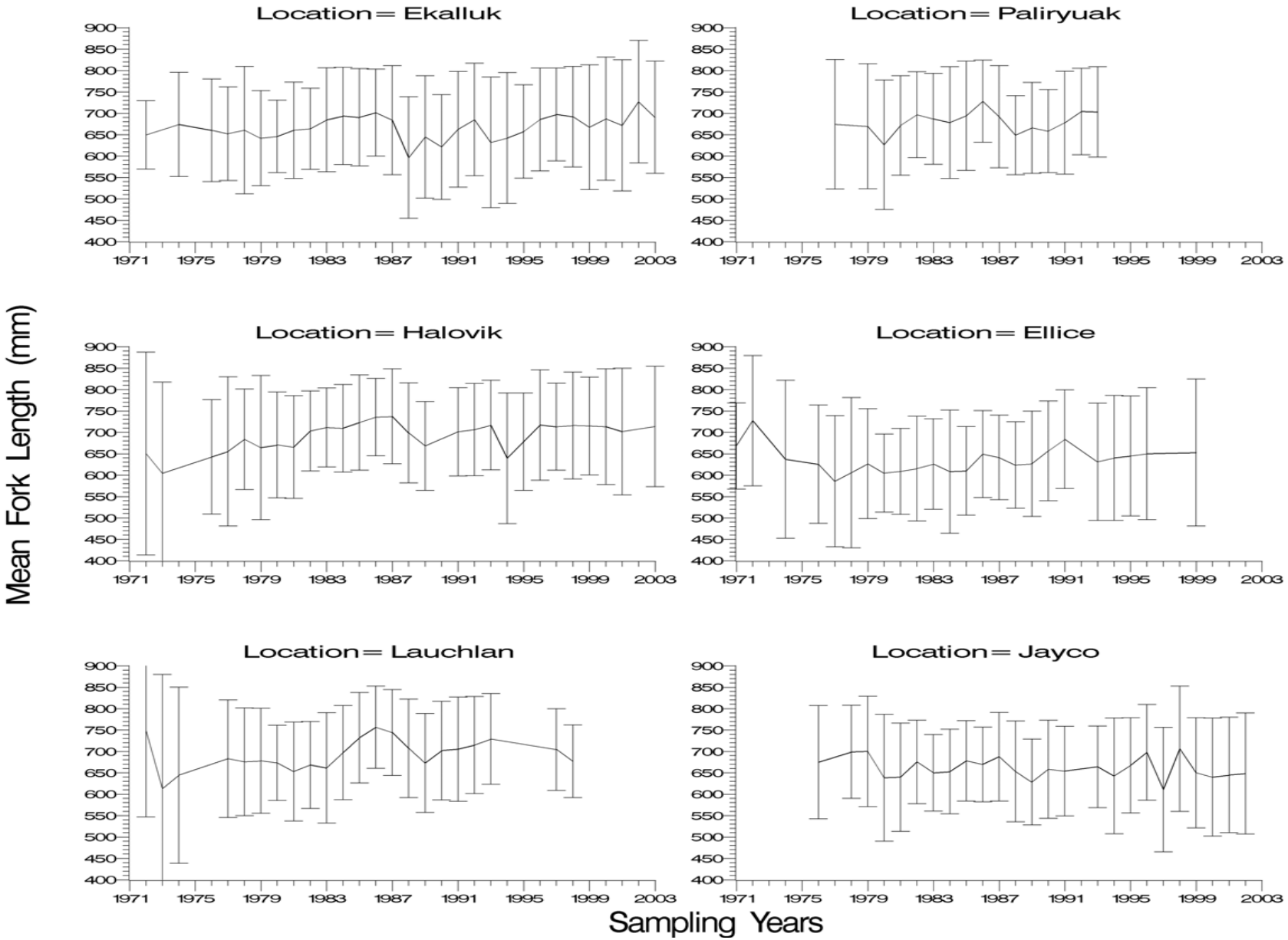

Figure 12. Mean fork lengths (+ or – 2 standard deviations) of anadromous arctic char sampled from the commercial fishery harvest, Cambridge Bay, Nunavut.

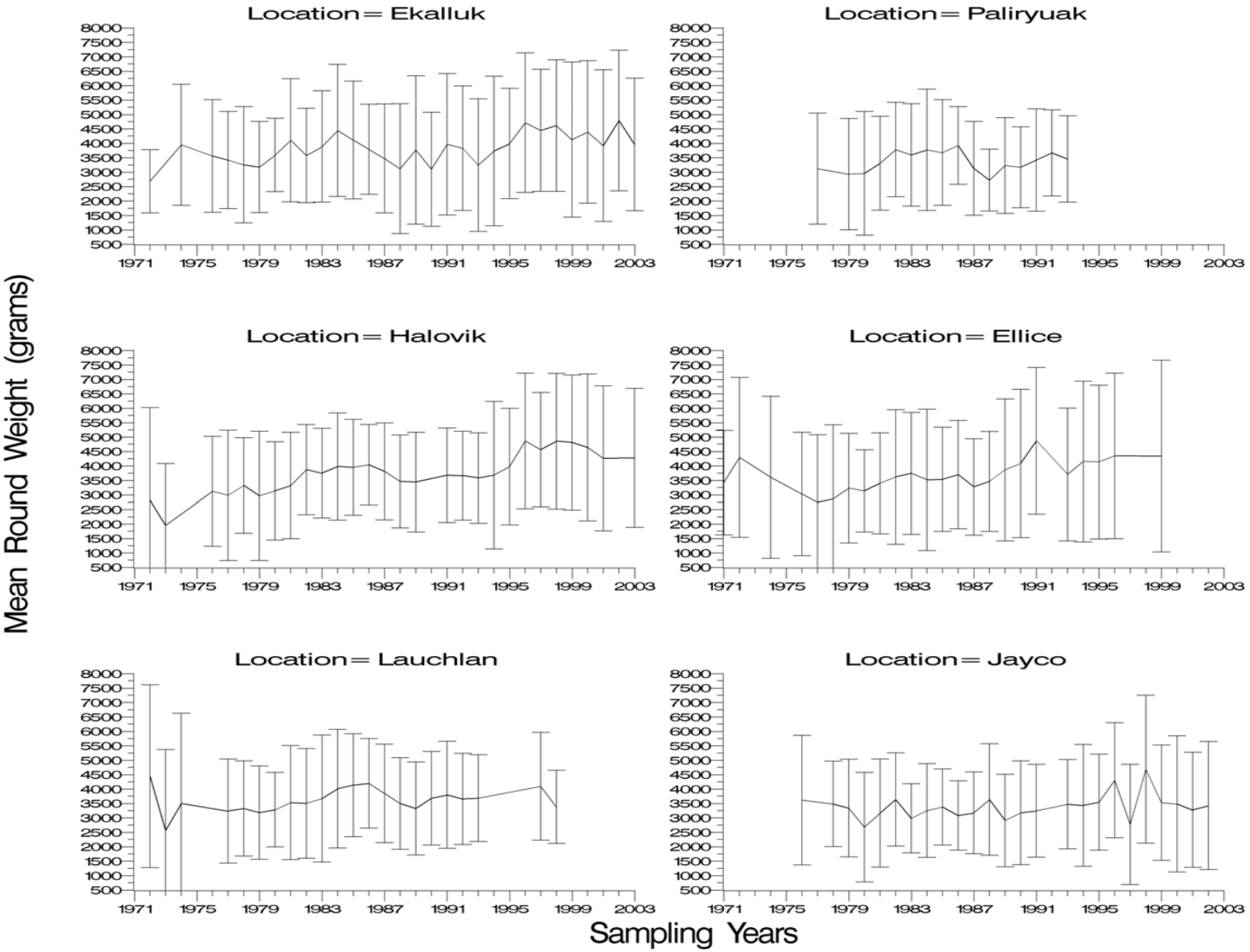

Figure 13. Mean round wights (+ or – 2 standard deviations) of anadromous arctic char sampled from the commercial fishery harvest, Cambridge Bay, Nunavut.

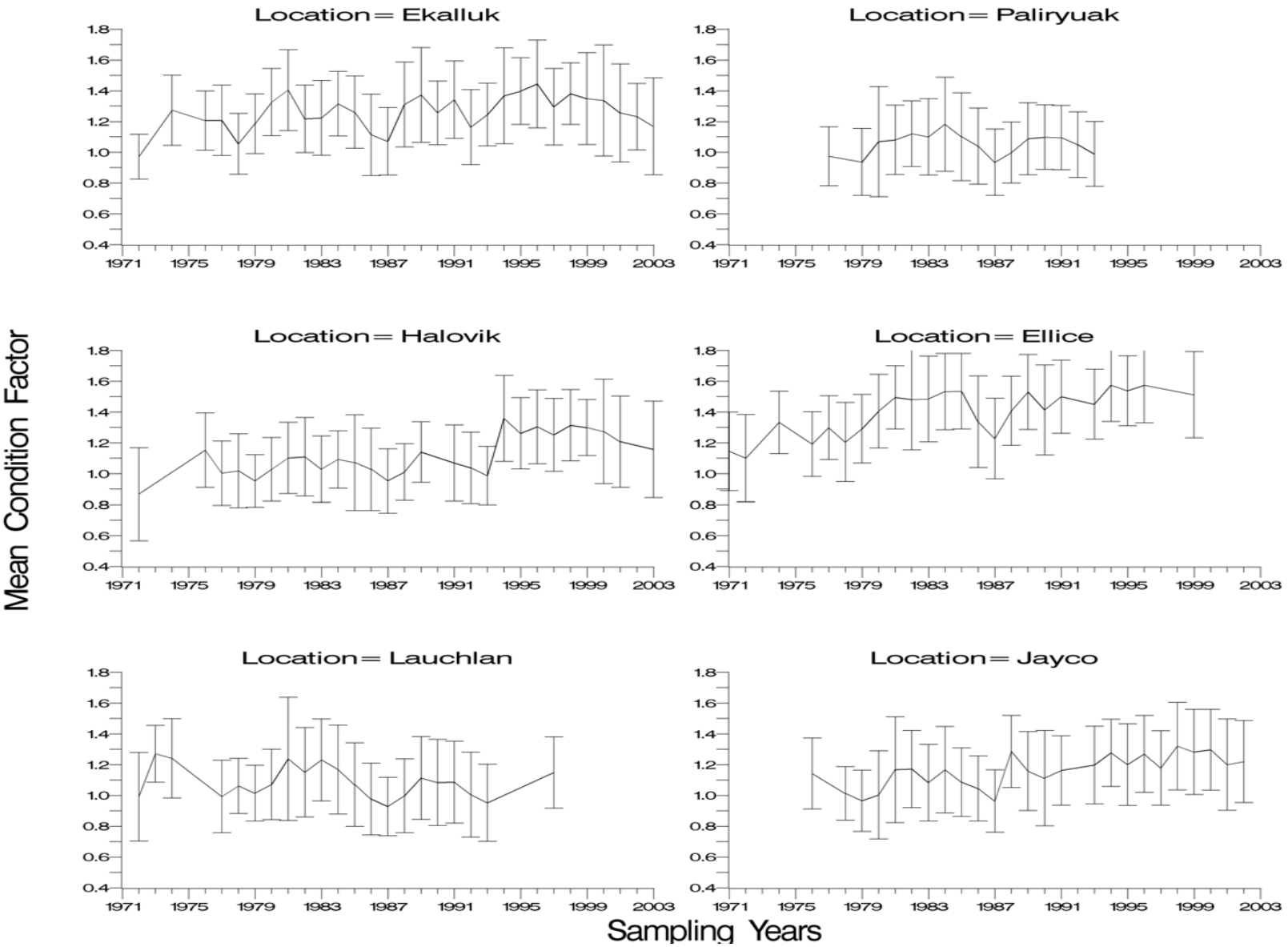

Figure 14. Mean condition factors (+ or – 2 standard deviations) of anadromous arctic char sampled from the commercial fishery harvest, Cambridge Bay, Nunavut.