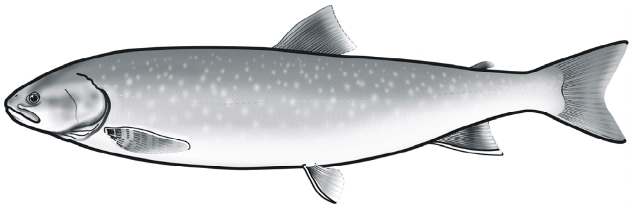

Hornaday River Arctic Charr

Background

Anadromous Arctic charr, Salvelinus alpinus (Linnaeus), occur in the Hornaday River downstream of La Roncière Falls (Reist et. al. 1997). Non-anadromous Arctic charr are also found in lakes draining to the Hornaday mainstream, such as Seven Islands Lake and Rummy Lake (Figure 1).

This stock provides an important source of charr for the residents of Paulatuk, an Inuvialuit community located 350 km northeast of Inuvik, NT. Charr have been harvested by residents of Paulatuk since the community was first settled in the 1940's, and continue to be harvested for food to the present day. Commercial fishing at the Hornaday began in 1968 and continued through 1986. Declines in the commercial catches and a reduction in catch-per-unit-effort led to the closure of the fishery in 1987. There was a small sport fishery at the Hornaday in 1977 and 1978, but catches were in the ten's or low hundreds, and the operation lasted only two years (Harwood 1999).

Much of the drainage of the Hornaday River lies within the newly established (1998) Tuktut Nogait National Park, although lower reaches of the river and its tributaries to the west are outside the Park and within the private lands of the Inuvialuit. Some of these areas are presently being considered for their mineral development potential.

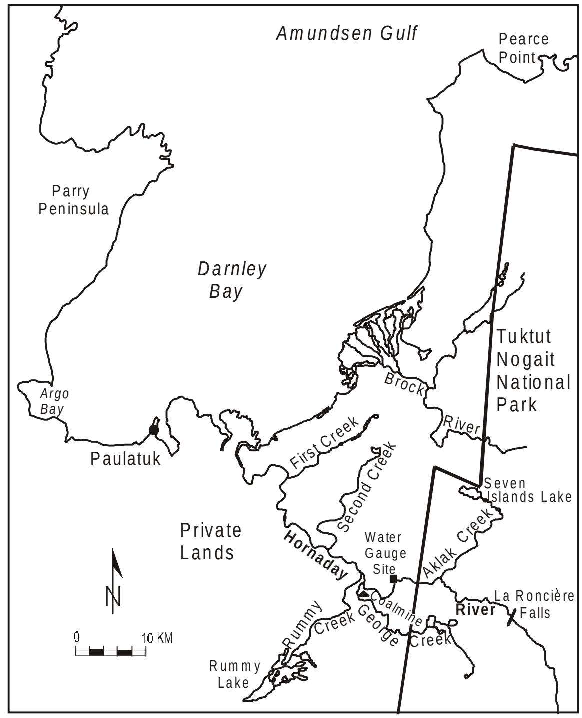

Figure 1. The lower Hornaday River.

Summary

- In the early 1980's, fishers noticed a change in their catch of Arctic charr at the Hornaday River, and this was supported by the available biological data. There was indication of a reduction in the average age and length of the charr caught and a reduction in the catch-per-unit-effort (CPUE) of the fishery.
- Commercial fishing ceased in 1986.
- Removals through sport fishing have been, and continue to be, negligible.
- The present day fishery is exclusively a food fishery, and has been monitored by the community since 1990. Biological data from the 1990's indicate the stock is still subject to a high level of exploitation, with the food fishery averaging 2400 charr per year over the last decade.
- With the support of the Fisheries Joint Management Committee (FJMC) and the Department of Fisheries and Oceans

(DFO), the Paulatuk Hunters and Trappers Committee (PHTC) prepared and implemented their Paulatuk Charr Management Plan 1998-2002 (PHTC 1999). The Plan calls for a reduction of the overall catch to 1700 charr per year for a period of not less than five years, and the closure to all fishing of certain spawning and overwintering habitats. These measures were put in place to conserve the stock and ensure its long-term well being.

- The community fishers have been in full compliance with the Plan since its implementation and biological monitoring data collected to date have been encouraging.
- The integrity of the Hornaday River watershed must be preserved, to ensure that the charr stock remains viable. Water quality and quantity are presently being monitored at the Hornaday River. The upper Hornaday River lies within Tuktut Nogait National Park.

Species Biology

Arctic charr have a salmon-like shape, with a dark back and silvery colour on their sides. They have small, deeply embedded scales which give the skin a smooth and slippery texture. Arctic charr caught at the Hornaday River between 1990 and 1998 averaged 55.8 cm in length (about 22”), 7 years of age, and 2.3 kg (5 lbs.) in weight.

Spawning occurs in freshwater during late September and early October, at about the same time that the winter ice forms. At spawning time the adults take on their characteristic spawning features and colours. Spawners are easily recognized because they change from silver to orange, red, and often to deep vermilion. Also, the leading edges of the lower fins turn white, and males develop a protruding hook called a ‘kype’ on their lower jaw. Adult charr do not spawn each year, taking one or two resting years in between spawning years. The Inuvialuktun terms in the Siglit dialect are *Iqalukpik* for charr (Lowe 1984), and *Paiqluk* for big red charr (‘spawning charr’; R. Kirby, pers. comm.).

Age at first spawning, based on the youngest confirmed post-spawner caught to date, is thought to be 7 years (Harwood 1999). In the Hornaday River where fishing mortality is high, few charr are found that are older than 10 years of age.

At ice-out in spring, the adult charr leave their overwintering areas and make their annual migration to the sea. The exception to this is during a spawning year. Individuals may remain in freshwater, perhaps as far downstream as the estuary, throughout the summer of their spawning year. Adult charr from the Hornaday appear to spawn every second year (Babaluk *et. al.* 1998; J. Babaluk, unpubl. data), although this is likely variable depending on individual condition, environmental condition and age of the fish (Johnson 1980; Dutil 1984, 1986). After attaining a size of about 15-20 cm, the young pre-smolt charr begin their annual migration to the ocean in spring. The modal age of first time to sea appears to be age 3, and within the range from age 2 – 7 years (J. Babaluk, unpubl. data; n = 20).

Charr at the Hornaday appear to first go to sea, and become sexually mature, at younger ages than their counterparts to the east. For example, in the Holman area (Papst *et. al.* unpubl. data), charr from the Kuujjua River were found to mature and be recruited to the fishery at age 10.

Critical Habitats

Hornaday charr overwinter and/or spawn in at least four of the deep holes in the mainstream Hornaday River between Coalmine and Aklak Creek (MacDonell 1996, 1997; Harwood, unpubl. data), and at the pool at the base of La Roncière Falls (MacDonell 1996, 1997). This 23 metre waterfall blocks the migration of fish to areas further upstream. Flows in the major creeks draining into the Hornaday River downstream of the falls are too low during summer and fall to permit the passage of adult charr. Passage to Seven Islands Lake and Rummy Lake appears to be possible in spring, although charr caught in these lakes to date (n = 10) have proven to be non-anadromous.

Rearing areas for juvenile charr in the mainstream Hornaday River are not known, but based on knowledge from other similar systems, are most likely located in the lower reaches of tributary streams of the lower Hornaday and along the shallows of the main river channel (L. Johnson, D. Dowler, pers. comm.).

Feeding

Arctic charr are carnivorous, feeding mainly on small fishes and benthic organisms. Community fishers from Paulatuk report that capelin (*Mallotus villosus*) appear to be the most common marine prey of Hornaday River charr in coastal marine areas (C. Ruben, pers. comm). Charr with stomachs full of capelin were found at Pearce Point in July 1997 (Harwood, unpubl. data) and at the mouth of the river in August. Clearly, the capelin plays an important role in the prey used by Hornaday River charr in the ocean off the Hornaday in the summer months. Other prey items chosen in years of variable capelin abundance are not known for this stock, but would most likely include other types of small fish.

The Fishery

The estimated annual harvest averaged 1800 charr (4200 kg) between 1968-1974 (includes food, commercial and sport fisheries), 3800 charr (8700 kg) between 1975-1986 (includes food, commercial and sport fisheries), and 2400 charr (5600 kg) between 1987-1998 (food fishery only) (Figure 2; Kristofferson *et. al*. 1989; Harwood 1999). The food fishery take of 3860 charr in 1995 was unusually high. The catch of charr from the Hornaday by sport fishers has been less than 0.01% of the take in the last three decades.

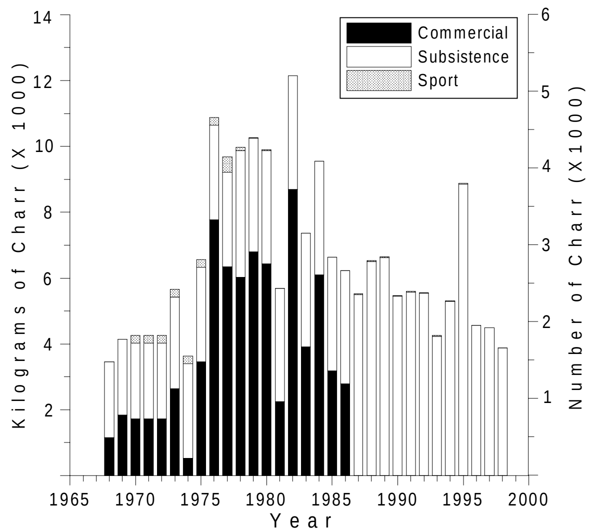

Figure 2. Hornaday River harvest data from 1968 to 1998 (Inuvialuit Harvest Study, unpubl. data, Box 2120, Inuvik, NT Canada X0E 0T0).

The present day food fishery takes place at three different times of the year. The majority (60%) of the take comes from the mouth of the river during August when the charr are moving upstream, while an additional 20% comes from the downstream migration in spring and another 20% from the under-ice fishing at the overwintering holes after freeze-up (Harwood, 1999). Monofilament gillnets (4 ½", 5" and 5 ½" mesh size), 30-50 yards in length were used in this fishery.

View of the Fishers

In 1996 and 1997, the community prepared their Paulatuk Charr Management Plan

1998-2002 (PHTC 1999). It was put in place for a trial year in 1997, and then signed-off in 1998 for a period of five years. The Plan recommends that the total take of charr in the food fishery not exceed 1700 charr per year, and that the portion of the mainstream between Coalmine and Aklak Creek (the location of the most important spawning and overwintering sites) be closed to under-ice fishing. The community has complied fully with all aspects of the Plan since it was first implemented.

Resource Status

The Hornaday River originates approximately 100 km due north of Dease Arm on Great Bear Lake, NT. It then flows northwest through the Melville Hills, before emptying into Darnley Bay in Amundsen Gulf. In its upper reaches, the river flows through a broad bedrock valley, followed by a stretch of bedrock canyons, and finally flows through a broad valley cut into poorly consolidated sediments and out through a delta to the ocean.

The tundra is characterized by a permafrost layer, approximately two metres below the surface. The permafrost minimizes groundwater flow and storage. As a consequence, rainstorms and summer snowfall events can cause pulses of high water flow in the river and its tributaries. The Hornaday River watershed has typical tundra vegetation. Sedge and lupine meadows, and scattered patches of willows, are found along the lower Hornaday River (A. Fehr, pers. comm.).

Stock Delineation

Anadromous Arctic charr that spawn and overwinter in the Hornaday River system are assumed to comprise a discrete stock, geographically isolated and thus confined to the Hornaday system. This assumption is based on tag returns to date. A total of 156 upstream migrant charr were tagged at the Hornaday River between August 21-24, 1987 (MacDonell 1987). Tagged charr were only recaptured at the Hornaday River. Fourteen of the tags (8.9%) were caught in 1988 and a further four (2.8%) were caught in 1989 (FJMC and DFO, unpubl. data).

Of 21 radio tags applied to upstream migrant charr in August 1995, eight were caught during the winter fishery in October and November 1995, six of these from the same hole where the fish were concentrated (R. Ruben, pers. comm.). A further two of the radio tagged charr were caught at the mouth of the river in spring 1996 during the charr's out migration. All major neighbouring systems (within 200 km) were checked in August 1996. Aerial and ground tracking efforts were conducted at the nearby Brock River and all five of the tributary streams and major lakes adjoining the Hornaday River downstream of La Roncière Falls (Harwood, unpubl. data). None of the charr with radio tags were recaptured or relocated in these river systems.

Between 12 July and 6 August 1997, Floy tags were attached to 239 charr at Pearce Point, approximately 100 km northeast of the mouth of the Hornaday River. This area is an important feeding area for charr during summer. The tagging study showed that charr summering in this area originated from the Hornaday River. They were recaptured migrating upstream at the Hornaday in August 1997 (n = 34), in August 1998 (n = 15), and at coastal feeding areas near the Hornaday in July 1999, and not elsewhere (Harwood, unpubl. data). Finally, it should be noted that none of the 4,000+ Arctic charr tagged 400-500 km to the east at Holman area rivers have ever been recovered at the Hornaday, nor have any of the Dolly Varden charr (n = 2500+) tagged at the Yukon North Slope rivers 600 km to the west of the Hornaday (DFO Area Office, tag recapture records, unpubl. data). Together these data suggest that the stock or stocks of charr within the Hornaday system likely restrict themselves to the Hornaday River and surrounding coastal areas.

Within the Hornaday River itself, there is growing evidence that there may be more than one site of origin of the charr found within the system. This is based on strontium levels in the primordium of the otoliths from anadromous charr caught in the mainstream Hornaday River, suggesting two, perhaps three, origins of the charr that are present (J. Babaluk, pers. comm.; Babaluk *et. al.* 1998). The daily catch records from the 1986 weir study (Figure 3; MacDonell 1987) provide some evidence of two pulses in the upstream migration as well, although it is not known if these pulses are indicative of more than one stock being present, or just segregation of different age/size classes of the same stock during migration.

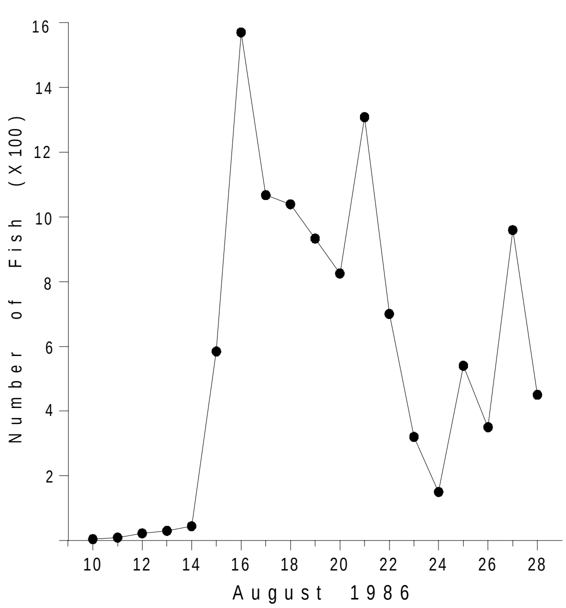

Figure 3. Daily counts of Arctic charr passing through the weir on Hornaday River, August 1986.

Stock Size

A full-span conduit weir was installed and operated at Hornaday River in August 1986 (MacDonell 1987). Daily counts of upstream migrants increased steadily and peaked on August 16, and declined thereafter except for a further peak on August 21. The total count of charr was 10,798 before the weir collapsed on August 28. Since the run did not appear to be over when the weir became inoperable, the stock size exceeds the 10,800 charr counted at that time (MacDonell 1987).

Based on the 1986 weir data and community fishers' observations, and assuming there are two runs or pulses in the migration (Figure 3), a re-examination of the weir data yielded an estimate of stock size of 15,000 charr in 1986 (A. Kristofferson, pers. comm.). This was calculated assuming that the rate of decrease in both runs (not measured due to the weir wash out) were equal to the rate of increase (which was measured) in each run. This represents the sum of the estimated size of the first run (8500 charr), the second run (3800 charr) and the number of fish caught by the community fishers in that year (2700). It should be noted that these data were collected 13 years ago, at a time when the stock had been exposed to a period of particularly heavy fishing.

Stock trend

Between 1990 and 1998, the CPUE for the food fishery averaged 24.7 charr/100 yards/24 hours, but varied considerably among years (range: 13.2 to 39.9 charr/100 yards/24 hours). The duration of the fishery remained remarkably consistent between years, with seven of nine years all within the range from 21 to 26 days in length (Table 1). The years with the highest CPUE were 1990, 1991 and 1992, after which time CPUE decreased in each consecutive year from 1993 through 1997 inclusive. Mean CPUE for the 1998 fishery showed a modest increase compared with all years from 1993-1997. CPUE data for individual fishers were collected for 1996-1998 (Figure 4). The number of fishers was lower in 1998 (n = 9) than in 1996 (n = 16) or 1997 (n = 15). At least some of the fishers had higher CPUE in 1998 than in the other years (Harwood, 1999).

Table 1. Catch-per-unit-effort (CPUE) for the Hornaday River charr fishery, 1990-1998.

Year	No. of Fishers*	Length of fishery (days)	Mean CPUE
1990	nr	22	35.3
1991	nr	23	26.0
1992	nr	26	39.9
1993	nr	23	24.9
1994	nr	21	22.4
1995	18	25	19.8
1996	17	25	13.2
1997	14	27	13.2
1998	9	19	27.2

* nr = not recorded

Of 24 different fishers for which CPUE data were collected, four fished in each of 1996, 1997 and 1998. Three of these four showed an increase in CPUE from 1996 through 1997 and 1998, while the fourth had a CPUE in 1998 equal to that of 1996. These data show that trends for the most "regular" fishers were generally better in 1998 than the two years prior. CPUE information for 1999 and beyond needs to be collected to confirm and monitor this apparent trend.

The fishery removes the larger fish from the upstream run (Figure 5), as shown by a comparison of the size distribution of the catch with that of the charr enumerated through the weir.

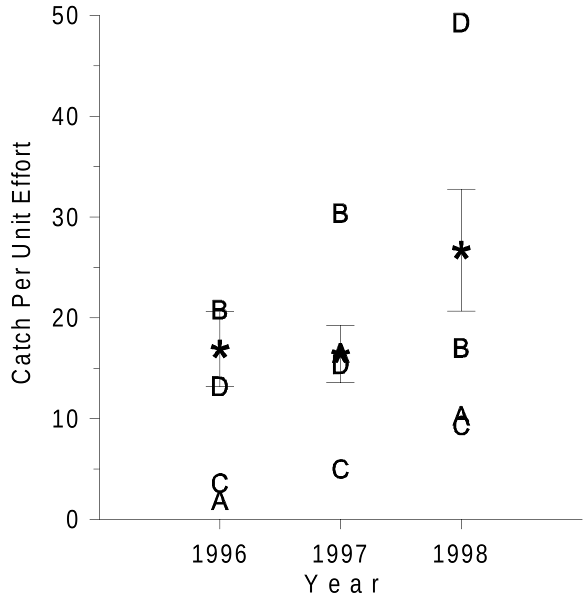

Figure 4. CPUE of four individual charr fishers (each represented by a letter), with the mean (*) and standard error of the mean, Hornaday River, 1996-1998.

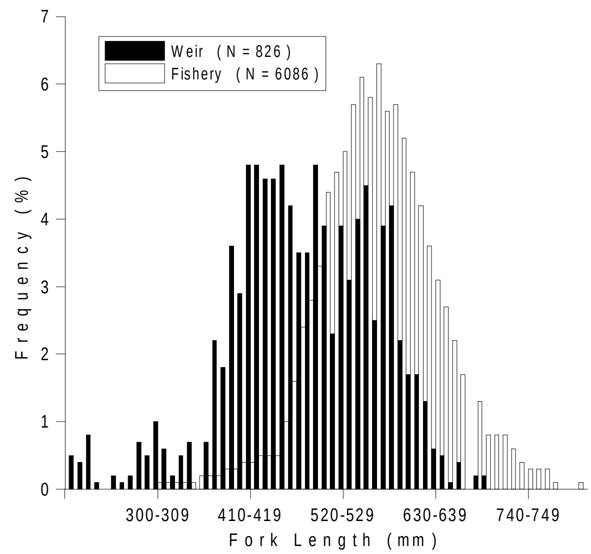

Figure 5. Length frequency of upstream migrant charr at the Hornaday River weir enumeration (1986) and in the food fishery (1990-1997).

Length and age of the charr caught between 1990-1998 showed changes as well. The average fork length and average age of the charr caught in the upstream food fishery remained stable or increased between 1990 and 1994, decreased from 1995 through

1997, and then increased again in 1998 (Harwood 1999; Figure 6). This pattern held true for mean ages of both males and females. Age-frequency distributions were significantly different (Kolmogorov-Smirnov test) in the 1995 – 1998 distributions, compared to 1990 through 1994 (Harwood 1999).

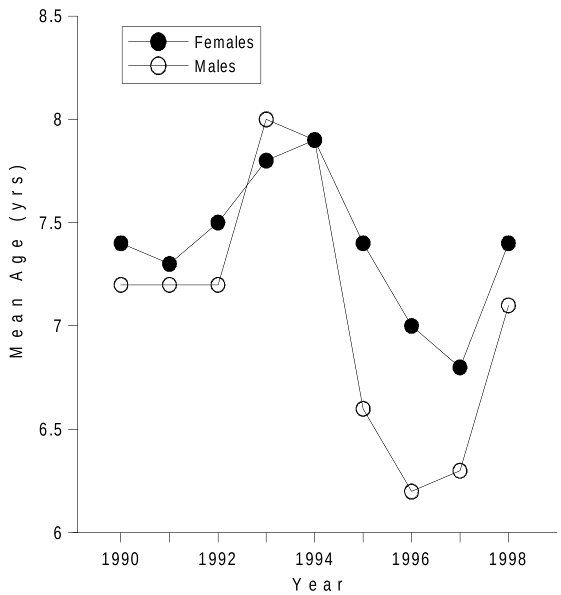

Figure 6. Mean age of male and female charr sampled in the upstream migration food fishery at the Hornaday River, 1990-1998.

Age-frequency distributions of migratory Arctic charr at the Hornaday River show weak representation of the older age classes, particularly in recent years. Figure 7 shows a comparison of the ages of fish caught in 1990 and 1998. The decline in the proportion of charr caught in the older age classes suggests that the stock is not at its optimum level. The reduction in representation by fish aged 2, 3 and 4 years combined with an increase in instantaneous mortality rates for charr aged 7-11 years in recent years, are cause for concern (Harwood 1999). Mortality rates for earlier years tended to be lower within the range from 0.31 (1973) to 0.59 (1981) during the commercial fishing period (Kristofferson *et. al.*, unpubl. data). Recent estimates of mortality rates are as high as 0.97 in 1998 (Harwood 1999).

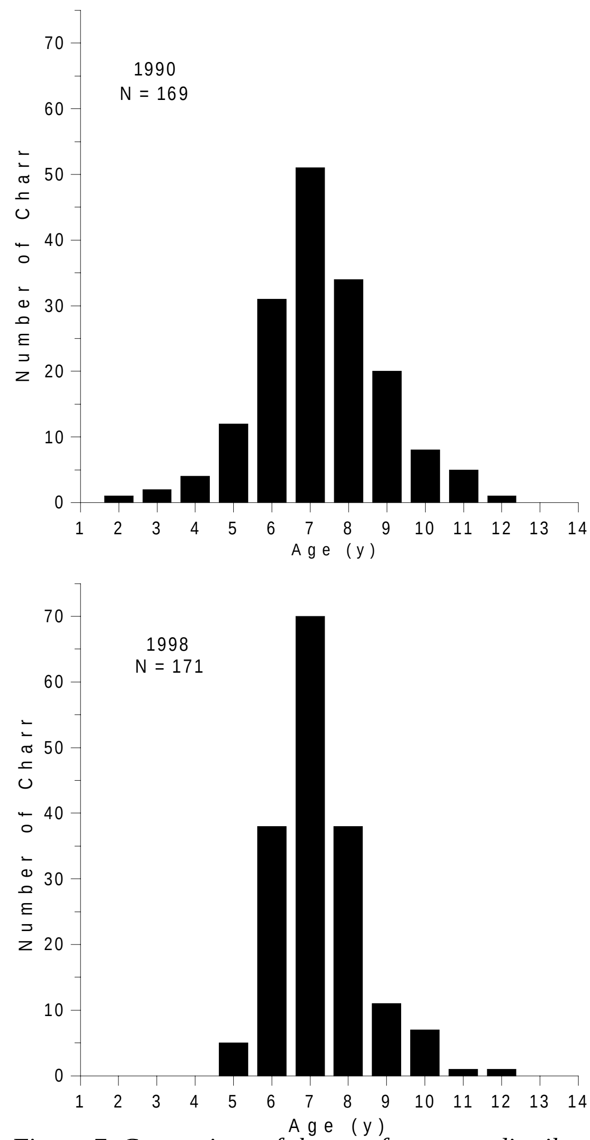

Figure 7. Comparison of the age-frequency distribution of charr caught at the Hornaday River in 1990 and 1998.

Length and age data from charr sampled during the 1979, 1981 and 1983 commercial fisheries were compared with those of charr sampled a decade later during the 1993, 1994 and 1995 food fisheries. Comparisons were done for charr caught using 5.5” mesh gillnets during the upstream migration. Both the length and age distributions differed between these two periods, with the distribution tending toward younger and smaller charr in the earlier (1979, 1981, 1983) dataset than the later (1993, 1994, 1995) dataset (Harwood 1999). This is thought to be a reflection of the heavy commercial fishing during the earlier years when there was both a commercial and a food fishery.

Finally, the condition of the charr (K) (Anderson and Gutreuter, 1983) caught in the food fishery varied among years, with the years of highest condition being 1998 (mean K = 1.37, n = 183)) and 1993 (mean K = 1.31, n = 789), and the year of lowest condition being 1997 (K = 1.15, n = 530). However, the condition of the upstream migrants reflects the quality and quantity of food available to the charr during their summer feeding in the ocean, and as such, changes in condition are not considered to be responses of the stock to harvesting. In both spring 1993 and spring 1998, regional ice conditions were light and break-up was early, and this is thought to have resulted in particularly favourable feeding conditions in those summers. This was particularly noticeable in 1998, when the condition of the fish, timing of the run, and percent of spawners in the upstream run were different from previous years in the dataset (J.M. Kudlak, pers. comm.).

Sustainable Harvesting Rate

The average annual harvest between 1987 and 1998 represents 16% of our best, although dated, estimate of stock size of 15,000 (A. Kristofferson, pers. comm.). The community's Management Plan limit of 1700 charr annually represents 11.3% of this estimate. This guideline represents a 33% reduction in the annual take for all fishers.

The estimated harvest rate at the time of the 1986 weir count was approximately 18% of the estimated stock size at the time. During the commercial fishing period, with the combination of commercial and food fishery catches, the harvest rate may have been as high as 30%. Present harvests are thought to be lower than that of two decades ago.

Johnson (1980) found an annual exploitation rate of 11% to be excessive for charr at Nauyuk Lake in the central Arctic. This rate led to a steady decline in the size of the stock. It is likely that the faster growing Arctic charr of the Hornaday River can sustain a rate of exploitation greater than this. Given that the Hornaday charr stock was harvested beyond 20% for a number of years, and given that charr remained available to a food fishery in the decade following this level of fishing, it appears that the safe harvest level of 10% implicated by Johnson's (1980) work at Nauyuk Lake is not applicable to the Hornaday River charr stock.

At the present time, the sustainable harvest level (SHL) cannot be determined, although with continued monitoring and sampling, this may be possible in the future. Additional information on stock structure, size and life history would be required to determine the SHL.

Outlook

In recent years, biological indicators and reports from the local people that harvest Hornaday charr for food suggest that removals from the Hornaday may have been more than the stock could sustain. It does appear that fishing during the 1970's and 1980's when the commercial fishery was being conducted, and since that time with the ongoing food fishery, has led to the progressive removal of the largest and oldest fish. This led to the development and implementation of the Paulatuk Charr Management Plan 1998-2002 (PHTC 1999). The highlights of the Plan include harvest restrictions and closure of certain critical habitats to fishing. The community has complied with the Plan for three consecutive years, and the results from the 1998 monitoring study are encouraging. The recommendations and initiatives in the Management Plan were endorsed by the experts who participated in the review of this stock.

More stringent harvest restrictions may be necessary in the future. It is recommended that the basic annual monitoring and sampling program continue, to (1) monitor the status of the stock, (2) collect the relevant data to manage the stock, and (3) monitor compliance with the Management Plan.

Further research and management activities which are recommended are: (1) continuation of otolith microchemistry work to examine life history characteristics, (2) tagging and tracking studies to locate and study critical riverine habitats, (3) confirmation of the contribution of progeny from Seven Islands and Rummy Lakes charr to the mainstream Hornaday charr, (4) development of a system to administer and assist fishers with fishing in alternate areas, and (5) continuation of water quality and quantity monitoring at the Hornaday River.

Management Considerations

The Paulatuk Charr Management Plan 1998-2002 (PHTC 1999) is the most important and specific management initiative in place at the present time for Hornaday charr. This Plan was developed and implemented by the community fishers, under the umbrella of the Inuvialuit Final Agreement (IFA 1984), and with the support and assistance of the Fisheries Joint Management Committee (FJMC) established under the IFA. The Paulatuk Charr Working Group, consisting of five fishers, one representative from DFO and one member from the FJMC meet once per year in Paulatuk to review the status of the stock, new data and the fishery. Parks Canada will have representation on this group starting in 1999.

The lower 30 km of the Hornaday River, which includes spawning and overwintering sites for charr, is within the boundaries of the private lands of the Inuvialuit known as 7(1)(a) lands (IFA 1984). The Inuvialuit Land Administration is responsible for administration of these private lands, which includes the land on which the water gauging station is located. Upstream of the private lands, the Hornaday watershed lies within the Tuktut Nogait National Park, and is thus afforded protection under the National Parks Act. If further harvest restrictions are warranted in the future, finding alternate sources of charr will be a high priority for the people of Paulatuk. Despite over four seasons of exploratory fishing effort (e.g. Brock River, Horton River, Balaena Bay, Tom Cod Bay, Pearce Point), an alternative source of searun Arctic charr has not been found (MacDonell 1989).

Other Considerations

The Hornaday River upstream of Coalmine is located within Tuktut Nogait National Park, and this area includes three of five suspected or confirmed spawning areas in the mainstream Hornaday River, as well as Seven Islands Lake and Hornaday Lake which are thought to contribute charr to the mainstream sea-run stock. Other parts of the mainstream, including two other creeks draining the Hornaday (Rummy Creek and Billy's Creek) are within the 7(1)(a) private lands owned by the Inuvialuit and include the "peak anomaly" areas identified by Darnley Bay Resources. Progeny of landlocked charr in Rummy Lake, Seven Islands

Lake and possibly Hornaday Lake may augment the searun stock of Arctic charr in the Hornaday River. These lakes and the mainstream Hornaday River provide critical habitat for Arctic charr during all phases of their life cycle (spawning, rearing, over-wintering). These areas should not be degraded or disturbed, as they are critical to the survival and well-being of the charr resource.

The integrity of the entire Hornaday watershed (water quality and quantity) must be maintained for the well-being of the charr resource, and should not be altered by development or other activities. The role of climate change and its effect on charr habitat, including surface water, groundwater, bank stability and erosion (silting), and changes to the permafrost will need to be evaluated and addressed in the coming years.

The Hornaday River is also home to a number of other species of fish, namely the broad whitefish (*Coregonus nasus*), nine-spine stickleback (*Pungitius pungitius*), longnose sucker (*Catostomus catostomus*), Arctic grayling (*Thymallus arcticus*), Arctic cisco (*Coregonus autumnalis*), and burbot (*Lota lota*). Charr outnumbered the combined total of whitefish, cisco and longnose suckers at the 1986 weir enumeration by a factor of ten (MacDonell 1987). Capelin are abundant in marine coastal areas adjacent to the Hornaday River during summer, providing a rich and abundant source of food for the charr. In Seven Islands and Rummy Lakes, non-anadromous charr co-exist with lake trout (*Salvelinus namaycush).*

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References

Anderson, R.O. and S.J. Gutreuter. 1983. Length, weight and associated structural indices. Pages 283-300. *In* Fisheries Techniques. *Edited by* Nielsen, L.A. and D. L. Johnson. Publisher, American Fisheries Society, Bethesda, Maryland.

Babaluk, J., L. Harwood, A. Kristofferson, and J. Reist. 1998. Life history and stock differences in Arctic charr of the Paulatuk-Hornaday River, NT area as determined by strontium distribution in otoliths. Prepared by Department of Fisheries and Oceans, Winnipeg, MB, for Fisheries Joint Management Committee, Inuvik, NT. 37pp.

Dutil, J.D. 1984. Energetic cost associated with the production of anadromous Arctic charr (*Salvelinus alpinus*) of the Nauyak Lake Basin, Canada. Pages 263-276, *In*: Proceedings of the International Symposium on Arctic Charr, Winnipeg, Manitoba, May 1981. *Edited by* Johnson, L. and B. Burns. University of Manitoba Press, MB, Canada.

Dutil, J.-D., 1986. Energetic constraints and spawning interval in the anadromous Arctic charr (*Salvelinus alpinus*). Copeia 4: 945-955.

IFA (Inuvialuit Final Agreement). 1984. The Inuvialuit Final Agreement, Department of Indian and Northern Affairs, Ottawa, Ontario Canada.

Harwood, L. 1999. Status of anadromous Arctic charr (*Salvelinus alpinus*) of the Hornaday River, Northwest Territories, as assessed through community-based sampling of the subsistence fishery, August-September 1990-1998. DFO Can. Stock Assess. Sec. Res. Doc. 99/182. 39 p.

Johnson, L. 1980. The Arctic charr, *Salvelinus alpinus*. pp: 15-98. In: Charrs; Salmonid fishes of the genus *Salvelinus*. *Edited* by E.K. Balon. Publisher, Junk, The Hague, The Netherlands.

Lowe, R. 1984. Basic Siglit Inuvialuit Eskimo Dictionary. Prepared for Committee for Original People's Entitlement, Inuvik, NT, Canada.

MacDonell, D.S. 1987. Report on the enumeration of the 1986 upstream migration of Arctic charr in the Hornaday River, NWT and the evaluation of a weir as a method of capturing fish for commercial harvest. Prepared by North/South Consultants Inc. for the Fisheries Joint Management Committee, Inuvik, NWT, and the Department of Fisheries and Oceans, Winnipeg, Man. 42 pp.

MacDonell, D.S. 1989. Report on the test fisheries conducted at the Hornaday, Brock and Horton rivers in 1987-1988, and an evaluation of the Arctic charr fishery at Paulatuk, NWT. Prepared by North/South Consultants Ltd., for Fisheries Joint Management Committee and the Department of Fisheries and Oceans, Inuvik, NWT. 62pp.

MacDonell, D.S. 1996. Hornaday River – Paulatuk, NT. Arctic charr spawning location study. Prepared by North/South Consultants Inc. for the Department of Fisheries and Oceans, Inuvik, NT, Canada. 21pp.

MacDonell, D.S. 1997. Hornaday River – Paulatuk, NT. Arctic charr spawning location study – August-September 1997. Prepared by North/South Consultants Inc. for the Department of Fisheries and Oceans, Inuvik, NT, Canada. 25pp.

PHTC (Paulatuk Hunters and Trappers Committee) 1999. Paulatuk Charr Management Plan 1998-2002. Prepared by Paulatuk Charr Working Group, Paulatuk, NT. Signed on July 8, 1998 in Paulatuk, NT Canada. Available from: Department of Fisheries and Oceans, Box 1871, Inuvik, NT Canada X0E 0T0.

Reist, J.D., J.D. Johnson, and T.J. Carmichael. 1997. Variation and specific identity of char from northwestern Arctic Canada and Alaska. American Fisheries Society Symposium 19: 250-261.

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