Fisheries and Oceans Canada | Pêches et Océans Canada
Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Central and Arctic Region

Canadian Science Advisory Secretariat
Science Advisory Report 2016/038

ASSESSMENT OF ARCTIC CHAR *(Salvelinus alpinus)* IN THE ULUKHAKTOK AREA OF THE NORTHWEST TERRITORIES

*Arctic Char (*Salvelinus alpinus*) photo by E. Lea*

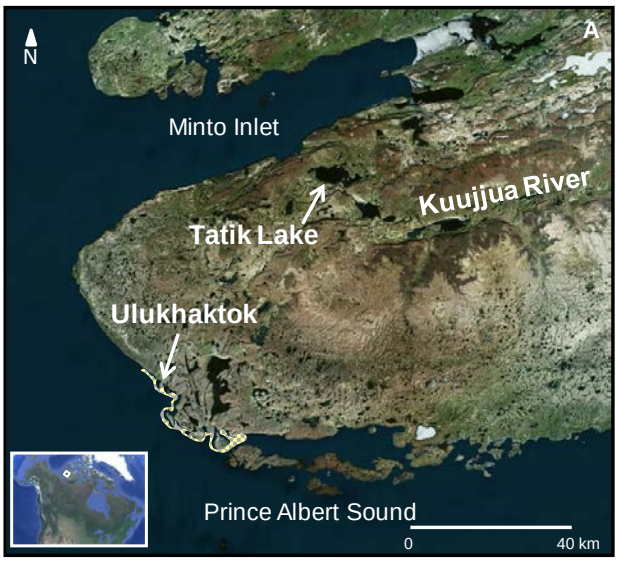

Figure 1. Map of Ulukhaktok area showing location of Tatik Lake (Kuujjua River). Highlighted area shows location where majority of coastal summer fishing occurs.

Context:

*Anadromous Arctic Char (*Salvelinus alpinus*) are an important subsistence resource for the residents of Ulukhaktok, NT, with the majority of the harvest occurring in the marine waters of Amundsen Gulf in proximity to the community during the summer. Arctic Char from the Kuujjua River are the most important stock. The stock is harvested during the summer when feeding/ migrating along the coast in a mixed-stock fishery and during the winter (under-ice) while overwintering in Tatik Lake. Arctic Char are co-managed by Fisheries and Oceans Canada (DFO), Fisheries Joint Management Committee, and Olokhaktokmiut Hunters and Trappers Committee (OHTC) via the Ulukhaktok Char Working Group (UCWG). Currently, there is an annual harvest guideline of 1,000 anadromous Arctic Char in Tatik Lake.*

DFO Resource Management has requested Science advice on the current stock status and sustainable harvest level of Arctic Char from the Kuujjua River. Data available for the assessment were collected from a subsistence harvest monitoring program (1991–2015), the summer coastal fishery subsistence harvest monitoring program (1993–1997 and 2011–2015) and a Stage I (Feasibility) fishery (2010–2015).

SUMMARY

- The number of Arctic Char harvested directly from the Kuujjua River was relatively stable at high levels (approx. 3,500 fish) in the 1960s and 1970s. A decline in stock status was reported by harvesters in the late 1980s and since the mid-1990s, there has been a harvest guideline of 1,000 char for Tatik Lake (Kuujjua River) set by the OHTC. Currently, the reported harvest is <1,000 fish annually. The total number of Kuujjua River char harvested is unknown due to the uncertainty regarding how many contribute to the mixed-stock coastal harvest.
- Char sampled during the Tatik Lake subsistence winter fishery covered a wide distribution in size (mainly 500–750 mm; 1,000–5,000 g) and age (mainly distributed between 8 and 12 years). Median length and weight increased from 525 to 630 mm and 1,675 to 3,100 g, respectively, between 2008 and 2012, and have been relatively stable since then at levels similar to those observed in the early 2000s. Median age increased from 8 to 10 years between 2010 and 2012 and has been stable since then. Catch-per-unit-effort (CPUE) has been variable without trend with an increase in the frequency of relatively high values since 2006.
- The summer subsistence and Stage I fishery near Ulukhaktok also harvest a wide range in size (mainly 550–850 mm; 1,000–6,000 g) and age (predominantly distributed between 8 and 13 years). Median length and weight values have been stable at approximately 690 mm and 3,900 g since 2011, with sizes greater than what had been observed between 1993 and 1997. CPUE has also varied without trend although confidence is low for estimates in some of the recent years due to low sample size.
- Data collected between 1995 and 2015 from community harvest surveys and the monitoring program in Tatik Lake were incorporated into a statistical catch-at-age (SCA) model. Preliminary results looked promising, however there were questions raised concerning model inputs and parameterization. Further work is required before results could be used to provide management advice. However, it was noted that the maximum sustainable yield estimate was within range of the current harvest.
- Biological and catch indices indicate that the Kuujjua River population is not experiencing overfishing and the current stock status is healthy. Additionally, local fishers have not reported declines in stock status in recent years. The current level of harvest experienced by the stock appears to be sustainable.

INTRODUCTION

Anadromous Arctic Char from the Kuujjua River are an important subsistence resource for residents of Ulukhaktok, NT. The stock is harvested during the summer when feeding/ migrating along the coast in a mixed-stock fishery and during the winter (under-ice) while overwintering in Tatik Lake (Figure 1).

The majority of the total reported subsistence harvest occurs between July and August along the coast near the community and in Prince Albert Sound (Figure 1). This gillnet fishery has been monitored periodically since 1978. Methods for the collection of catch-effort and biological data (e.g., size/ age structure, condition factor, length-at-age) have been standardized for the periods 1993–1997 and 2011–2015.

Subsistence and commercial fisheries have occurred concurrently during the summer. Arctic Char were commercially harvested periodically from 1979 to 1991 and since 2000 a Stage I fishery has taken place with a small quota of 500 char recommended by the UCWG and

licenced under DFO's New Emerging Fisheries Policy. The catch is sold within the community or territory. Monitoring data (length, weight, catch-effort, and total harvest) were collected from the Stage I fishery in 2010 and 2012–2015. These data are used to evaluate the feasibility of a commercial fishery and determine if harvestable quantities of the target species are located in the area.

The winter fishery occurs primarily in the months of October and November using gill nets set under the ice. Community concerns about reduced catches and sizes of Arctic Char in Tatik Lake, expressed as early as 1987, prompted the initiation of an annual community-based monitoring program in 1991 to collect standardized fisheries information (harvest, catch-effort, and biological data) from the Tatik Lake subsistence fishery. In order to provide opportunity for the stock to improve, Tatik Lake was voluntarily closed to fishing between 1993 and 1995 (inclusive), following a decision by the OHTC. Prior to 1993, the reported harvest from Tatik Lake was between 3,100 and nearly 4,400 char in some years. After the closure a harvest guideline of 1,000 char was recommended for the Tatik Lake winter fishery by the OHTC. Harvest has been at or below this level in most years since 1996.

The total number of Kuujjua River char harvested during both winter and summer fisheries is unknown due to the uncertainty regarding how many char from the Kuujjua River stock contribute to the mixed-stock coastal harvest.

ASSESSMENT

The assessment examined harvest information obtained mainly from an annual community harvest survey, and catch-effort and biological data (length, weight, age, sex and maturity) collected via monitoring programs conducted on Tatik Lake (winter) and along the coast (summer). Information was available for Tatik Lake for 1978, 1987, 1991, 1992 and 1994–2015. The harvest, catch-effort, and biological data (1995–2015) were incorporated into a Statistical Catch at Age (SCA) population model to examine the current stock status and sustainable harvest level of the Kuujjua River population. Trends in data collected from the summer coastal monitoring program near Ulukhaktok (2011–2015) were assessed and compared to data collected in the 1990s. Additional data collected in 2010 and 2012–2015 as part of the requirements of the Stage I licence were evaluated.

Subsistence harvest of Arctic Char from the Kuujjua River (i.e., Tatik Lake) is available for 1966 to 1975 (Lewis et al. 1989) and 1988 to present (Figure 2a). Based on these reports it is likely that catches varied between 1,986 and 4,000 fish during the late 1960s to late 1980s. Between 1988 and 1992 (prior to the voluntary closure) harvest declined from 4,386 to <2,500. The fishery was voluntarily closed by the community of Ulukhaktok between 1993 and 1995, and between 1996 and 2002 harvest ranged from 1,000 to 1,800 fish. Since 2003 harvest has been at or below the 1,000 fish guideline (Figure 2a). A small commercial quota was available and occasionally fished on the Kuujjua River (Minto Inlet) between 1979 and 1991 (Bodaly et al. 1992, Cosens et al. 1993 and 1998). Quotas were set at 680 kg for 1979–1981 and 600 kg for 1982–1991 and fished coincident with the summer and fall/ winter subsistence fishery (Lewis et al. 1989). Catches were reported for 1980 (454 kg) and 1982–1984 (600 kg) (Yaremchuck et al. 1989), however Lewis et al. (1989) state "(the quota) has been reported to have been taken each year since its inception in 1979". An average weight of 2.3 kg was used to estimate number of fish (Figure 2a). Total removals for the stock will be higher given that Kuujjua River fish comprise an unknown proportion of the summer coastal mixed-stock fishery (Figure 2b).

In Tatik Lake, the CPUE for gillnets (114 mm mesh) have varied in a sinusoidal pattern between 1991 and 2015. Median values increased between 2005 and 2012 and have varied between 20

and 50 fish/100 m/24 hours since then (Figure 3). Since 2006, there has been an increase in the frequency of relatively high CPUE values (>125 Arctic Char/100 m/24 hours).

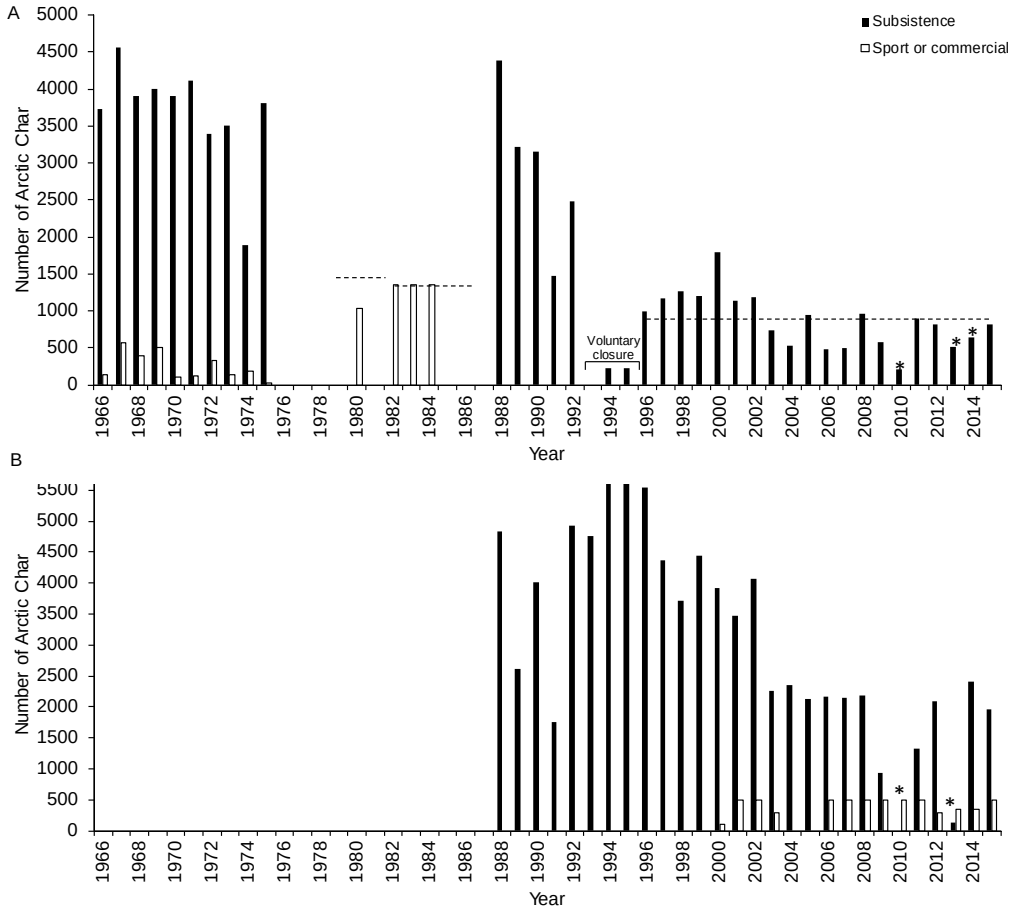

Figure 2. Arctic Char harvest reported for the A) Kuujjua River (i.e., Tatik Lake) and B) the coastal area near Ulukhaktok. A sport fishery occurred on the river between 1966 and 1975. Asterisks indicate years with incomplete subsistence harvest surveys. Dashed line (black): 1979–1981 and 1982–1986 is the commercial quota for the stock (680 kg and 600 kg, respectively, based on 2.3 kg/fish), and 1995–2015 is the harvest guideline for the winter fishery. Subsistence harvest likely occurred but data are not available for 1976–1987. Harvest was also not consistently reported during the period of the commercial fishery. The total number of char harvested from the Kuujjua River stock is unknown due to the uncertainty regarding how many char from the stock contribute to the mixed-stock coastal harvest.

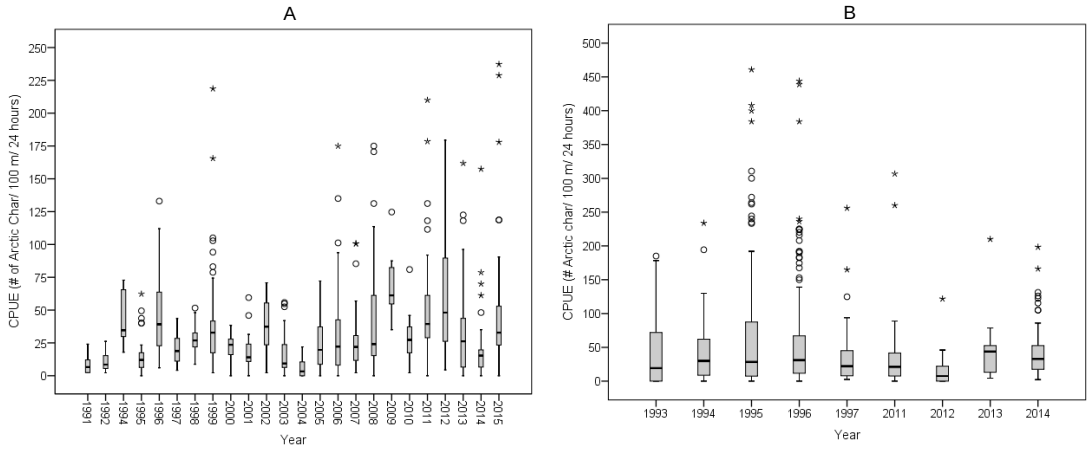

Figure 3. Catch-per-unit-effort (median, quartiles and outliers (○, ✶; values ≥1.5 x and 3 x interquartile range (IQR), respectively) of Arctic Char captured in 114 mm mesh gill nets used by subsistence harvesters A) in Tatik Lake 1991–2015, and B) along the coast in proximity to Ulukhaktok 1993–1997 and 2011–2014. Note: one outlier in 2012 in Tatik Lake had a CPUE equal to 293 (not shown).

The Tatik Lake fishery uses primarily 114 mm mesh gillnets and catches have included a broad distribution of sizes, mainly between 500–750 mm (1,000–3,500 g) (Figure 4). Median length and weight increased from 525 to 630 mm and 1,675 to 3,100 g, respectively, between 2008 and 2012 and have been relatively stable since then at levels similar to those observed in the early 2000s. The proportion of large-size char (≥700 mm) in the sample has increased from 0.5% in 2010 to 37% in 2015. Condition factor, which is correlated with spring breakup of sea ice (Harwood et al. 2013), has been relatively high (≥1.2) and stable over most of the past ten years. Age data between 2010 and 2015 were mainly distributed between 8 and 12 years. The proportion of fish ≥15 years of age ranged from 1 to 15% and the median age increased from 8 to 10 years between 2010 and 2012, and has been stable since. Growth (length and weight-at-age) (emphasis on ages 8 to 11 years) does not appear to have changed since 2011. Robson-Chapman annual mortality estimates using age data for 2010–2015 indicate the current rate of mortality is low and stable (~0.3).

In the summer coastal fishery CPUE (114 mm mesh) was similar (approx. 10–20 fish/100m/24 hours) for years 1993–1997 and 2011–2014 (Figure 3), although confidence in the values for some of the recent sampling years is limited due to low sample size. A wide range of sizes was present with most distributed between 550 and 850 mm (1,000–6,000 g) (Figure 4). The proportion of large-size char (≥700 mm) averaged 43% (range = 34–54%) between 2011 and 2015. Median length and weight values have been stable at 690 and 3,900, respectively, since 2011 at sizes greater than what had been observed between 1993 and 1997. Ages were predominantly distributed between 8 and 13 years (Figure 4) with a high proportion of fish ≥15 years (range = 22–36% in years with suitable sample size). A higher proportion of larger sizes and older ages were observed in the coastal mixed-stock fishery compared to Tatik Lake. Annual mortality in recent years was also low and stable (~0.2).

The Stage I fishery monitoring data were consistent with the results from the summer coastal monitoring program, although the catch was comprised of a greater proportion of large-size char (≥700 mm) (range = 41–70%) which is expected given two mesh sizes (114 and 140 mm) were used in most years. Between 2010 and 2015 median length ranged from 670–777 mm and median weight ranged from 3,800–4,900 g.

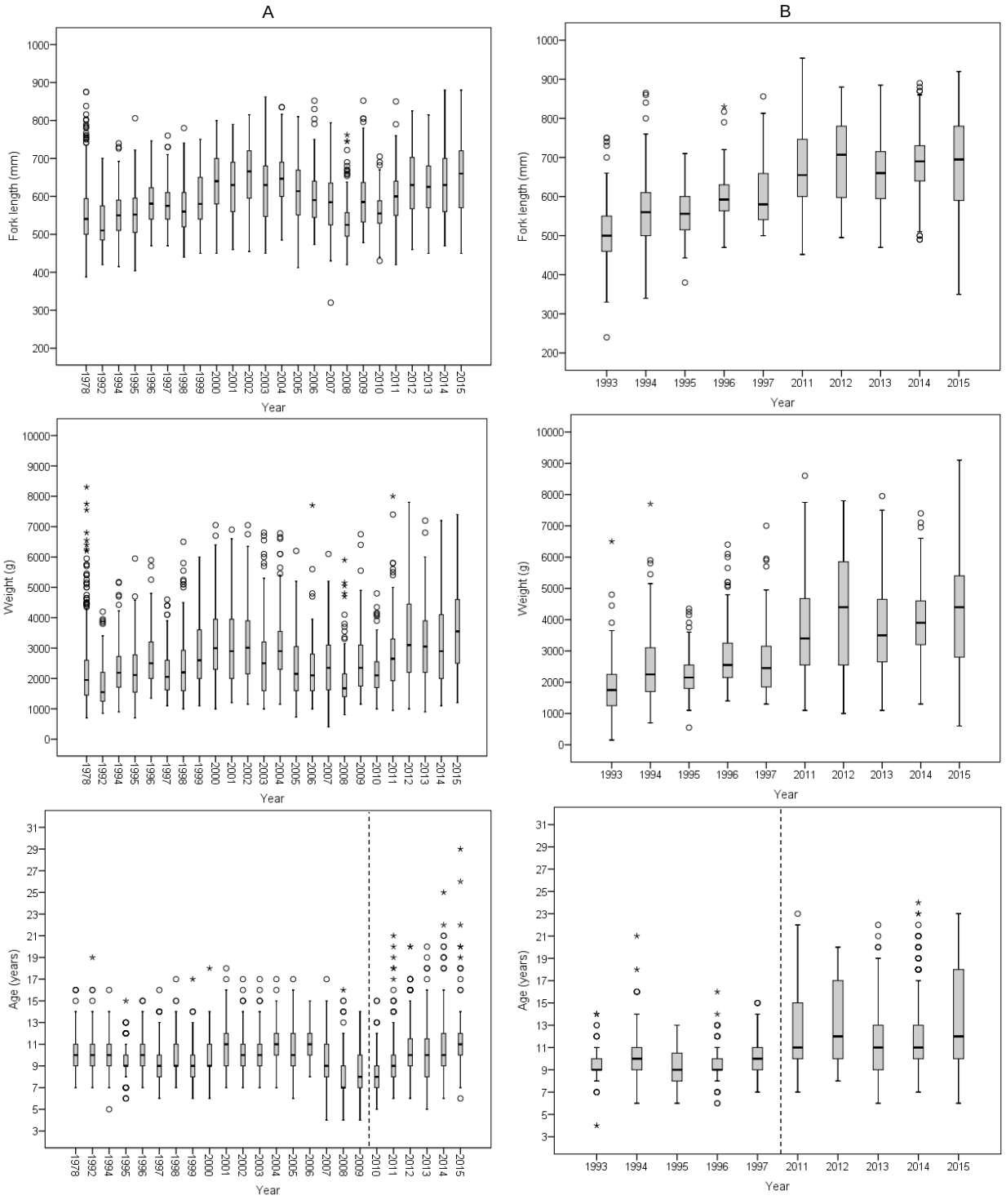

Figure 4. Fork length, weight and age of Arctic Char (median, quartiles and outliers (○, ✶; values ≥1.5 x and 3 x IQR, respectively)) harvested from the subsistence fishery A) Tatik Lake in 1978 and 1992– 2015, and B) along the coast in proximity to Ulukhaktok 1993–1997 and 2011–2015. Vertical dotted line separates the periods where different age readers and ageing protocols were used to estimate age. Note: a sample taken in 1987 had a mean length, weight and age equal to 640 mm, 2,260 g, and 11.4 years, respectively (Lewis et al. 1989).

A SCA model was used to estimate total abundance and biomass, maximum sustainable yield (MSY), abundance at MSY (N_{MSY}), biomass at MSY (B_{MSY}), fishing mortality at MSY (F_{MSY}), and exploitation rate at MSY (U_{MSY}) for the combined summer and winter harvest of char from the Kuujjua River (Table 1). Due to the unknown contribution of the Kuujjua stock to the coastal mixed-stock fishery, MSY was estimated under three scenarios where it was assumed the stock contributed 25%, 50%, and 75% of reported coastal harvest. The model required parameterization using life-history invariant relationships to estimate instantaneous natural mortality using a von Bertalanffy growth curve which did not account for likely changes in population density. The results of the model indicated that the current stock status was healthy (B_t/B_{MSY} and SSB_t/SSB_{MSY} were >1, and F_t/F_{MSY} was <1) (Figure 5). Additionally, current harvest was within range or lower than MSY. While outputs looked promising there were questions raised concerning model inputs, parameterization, sensitivity testing and general model validation, and meeting participants agreed that it was currently pre-mature to use the model outputs for stock assessment purposes in an absolute sense, but rather more informative for a relative perspective of the status of the stock.

Table 1. Mean (standard error in brackets) maximum sustainable yield (MSY), abundance (N_{MSY}), biomass (B_{MSY}), fishing mortality (F_{MSY}), and exploitation rate (U_{MSY}) at MSY estimated for Kuujjua River Arctic Char using a statistical catch-at-age model assuming the stock contributed 25%, 50%, and 75% of reported coastal harvest.

	25%	50%	75%
MSY	1962 (21)	2752 (38)	3543 (42)
N_{msy}	12273 (272)	17631 (342)	23053 (685)
B_{msy}	31651 (704)	45471 (412)	59453 (523)
F_{msy}	0.16	0.16	0.15
U_{msy}	0.15	0.14	0.14

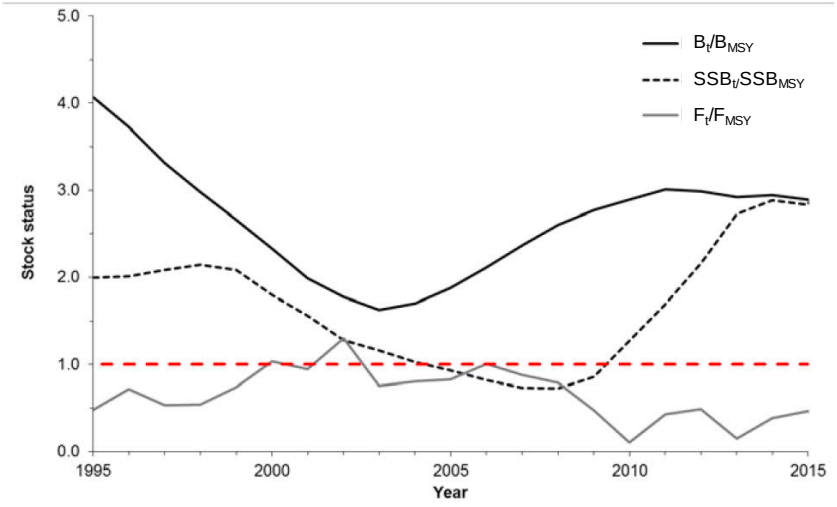

Figure 5. Arctic Char stock exploitation history 1995–2015, shown by posterior median trends in stock status (B_t/B_{MSY} and SSB_t/SSB_{MSY}) and fishing status (F_t/F_{MSY}) from a statistical catch-at-age model. The critical reference to the stock status is delineated by the red line. SSB = spawning stock biomass.

Sources of Uncertainty

The total harvest of Kuujjua River char (all seasons combined) is unknown due to the uncertainty in its contribution to the coastal mixed-stock fishery. One estimate of 55% is based on tagging data from 1969 (Lewis et al. 1989), however results from other more recent tagging projects (1992 and 1993) suggest it could range between 50% and 75% (Lois Harwood, DFO, pers. comm.).

The SCA model used in the assessment assumed that the Arctic Char spawned in consecutive-years after reaching sexual maturity. Although fecundity and spawning frequency of char from the Kuujjua River stock are poorly known, research on other char populations suggests that most adults will not reproduce in the year following spawning in order to invest energy in growth rather than reproduction and will presumably spawn the year after. Additionally, research in other systems suggests that most current-year spawners remain in the Kuujjua River all summer long and are not vulnerable to the summer fishery. The effect of the assumption of consecutive-year spawning on the model would be to overestimate the spawning stock biomass/reproductive potential for the population.

Growth and natural mortality parameters in the model were kept constant, gear selectivity followed a constant logistic function, stock recruitment was best described using the Beverton-Holt model, and harvest was assumed to be reported without error. These assumptions were not tested and may either be somewhat unrealistic or not directly known, adding uncertainty to the modelling results. Sensitivity analyses could assist in determining which parameters the SCA model is most sensitive to and hence focus effort to improve estimates of these parameters.

The same age reader and ageing method (whole) has been used to age char otoliths since the monitoring program began. However, new methods (e.g., thin sectioning) employed in recent years may provide more accurate estimates of ages. An age comparison study was carried out between the previous age reader and the current age reader experienced with both methods. The objective was to determine if differences existed between readers and/or methods and to evaluate the impact that any differences may have on age-related metrics such as growth and mortality. Results indicated that for Arctic Char >11 years of age, the current age reader tended to produce older age estimates, therefore, if the current age reader is more accurate with estimating ages, the proportion of older age classes in the population may have been underestimated and vital rates such as mortality overestimated for the years 1978–2009. It is noted that age estimates >11 years between 1992 and 2015 accounted for an average 20% and 32% of age classes in the Tatik Lake and coastal monitoring programs, respectively. Additionally, there is uncertainty in the ageing information used in the SCA model because the 1995–2009 data were standardized to the expected ages based on the current age-reader's results from 2010–2015.

Additional Considerations

In recent years, the Kuujua River stock appears to have realized a degree of improved fitness (e.g., condition factor) which appear linked to changes in environmental productivity and timing of sea ice clearance in eastern Amundsen Gulf (Harwood et al. 2013) and change in diet (DFO unpublished). These changes may have a beneficial effect on the productivity of the stock.

However, multiple harvesters report that their capture of smaller/younger fish in the coastal summer fishery was high in the 1960s and 1970s and followed by a gradual decline until the 2000s. Possible reasons for the current absence of smaller sized fish include changes in growth

(larger size-at-age), older mean age-at-smoltification, and/or diminishing water levels which could compromise important freshwater habitats.

Residents of Ulukhaktok report the decreased water levels could be a result of the reduction in precipitation and increased melting of the permafrost, both of which could create a barrier to the up- and down-stream passage of char into tributary streams and lakes used for spawning, overwintering, and rearing. Further scientific investigation of this local observation is required to elucidate relationships between habitat and stock dynamics to predict consequences of changes in carrying capacity or fish passage on the Kuujjua River stock.

As noted by traditional knowledge holders, community elders and scientists, fishing prior to the spawning period can negatively impact recruitment. Protection of the spawning stock would be promoted by following the guidelines outlined in the current fishing plan, therefore, fishing on Tatik Lake should be discouraged until after mid-October in order to ensure current-year spawners have had a chance to reproduce prior to the harvest.

The number of char harvested in Tatik Lake is unlikely to increase in the future because fewer families are going out on the land due to the increasing cost of gas and expense of travelling.

The biological data examined for the coastal fishery is sufficient if managers wanted to move the current Stage I fishery to a later stage under the DFO's New Emerging Fisheries Policy.

Residents of Ulukhaktok harvest other Arctic Char populations, including the Kuuk, Kagluk, Kagloryuak, and Naloagyok rivers, and Mayoklihok Lake. It is important to continue monitoring the harvests from these water bodies and to develop a biological sampling program which could be prioritized based on their importance to community harvests. Research should be undertaken as necessary to understand the biology and ecology of these stocks.

Additional research or data collection that would be beneficial for future assessment of Arctic Char harvest in Ulukhaktok area include, in no specific order:

- Characterize the genetic stock structure of Arctic Char with a goal of conducting a genetic mixed-stock fishery analysis along the coast. This would require collecting samples from all contributing baseline populations (preferably juveniles or spawning char). Traditional knowledge held by elders in the community could be used to identify source river systems in the Ulukhaktok area (in addition to the Kuujjua and Kuuk Rivers) for the baseline sampling.
- Determine habitats of importance to char, both freshwater and marine, and how these are used among all life stages. Elders from the community have noticed less snow in winter and less snowmelt in spring resulting in lower water levels among many rivers used by char for migration. The decrease in water levels is an important concern for the community due to implications regarding fish passage and its effect on the stock.
- Conduct an age validation study in order to determine if the current otolith preparation methods and interpretation of annuli are accurate. Additionally, conduct multiple reads of the same sample using the same reader in order to examine the level of precision (repeatability) in order to increase confidence in the ageing data.
- Utilize traditional knowledge from the community to assess the levels of past harvest and catch rates (see also the Inuvialuit Regional Committee data on land use), identify critical fish habitats, and provide known fishing locations (historic and contemporary). The community harvest survey for char could include questions relating to local observations on indicators useful for assessing stock/fishery status.

- Re-examine existing data (e.g., mark-recapture data from the 1990s could provide information on growth and population size) which could increase the precision of future assessments.
- Examine life history variation such as the extent of residency versus anadromy, frequency of migration, extent of straying (spawning/overwintering), estimating the relationship between recruitment and spawning stock biomass, spawning timing/frequency, and fecundity.
- Preliminary evidence from Arctic Char stomach contents (DFO, unpubl. data), as well as information obtained from marine mammals and seabirds (Harwood et al., 2015), suggest climate-related changes in ecosystem structure may be occurring in Beaufort Sea and Amundsen Gulf regions which could impact life history or abundance of a variety of species, including char. It is important to consider these shifts when conducting population assessments, and monitor diet variation in conjunction with stock metrics and environmental conditions as this will enhance our understanding of stock productivity and contribute to an ecosystem approach to fisheries management.
- Increase up to 300 the sample size from the Tatik Lake monitoring program given the high number of age classes present in the fishery.
- Examine the age structure from un-harvested or lightly harvested stocks in the area (e.g., Kagluk River) in order to compare to Kuujjua which could help improve parameterization of the SCA model and indicate the level of natural mortality in nearby populations.

CONCLUSIONS AND ADVICE

Kuujjua River supported a significant fishery between 1966 and 1975 (average = 3,682 char, range = 1,891–4,569) and perhaps through to the late 1980's. This sustained level of relatively high harvest may have contributed to a decline in the stock (reduced catches and sizes of fish in Tatik Lake and along the coast) that was first reported by harvesters in 1987. Fishing effort on Tatik Lake has declined considerably since the late 1980s. Reportedly, between 25 and 30 families from Ulukhaktok used to fish at Tatik Lake for up to a month between the 1960s and 1980s, then, starting in the mid-1990s, this has decreased to approximately 10 families who now fish on the lake for approximately one week. Additionally, in recent years the community has relied less on Tatik Lake to meet their subsistence needs by making greater use of alternate winter fishing locations (e.g., Mayoklihok Lake). Since the voluntary closure (1993–1995) and the reduction of effort following implementation of the 1,000 char voluntary harvest guideline for the lake in 1996, catch-effort and biological metrics have improved.

The sampling in Tatik Lake in recent years demonstrated the presence of a wide distribution of size (predominantly 500–750 mm; 1,000–5,000 g) and the proportion of large-size char (≥700 mm) in the sample has increased from 0.5% in 2010 to 37% in 2015. Median length and weight increased from 525 to 630 mm and 1675 to 3100 g, respectively, between 2008 and 2012 and have been relatively stable since then at levels similar to those observed in the early 2000s and greater than observed in the 1990s. Ages were mainly distributed between 8 and 12 years from 2010 to 2015. The proportion of fish ≥15 years of age ranged from 1 to 15% and the median age increased from 8 to 10 years between 2010 and 2012 and has been stable since. Estimates of annual mortality are low (~0.3). The coastal sampling, which was assumed to consist of a high proportion of char from the Kuujjua River stock, produced similar results in terms of size and age range. However, a higher proportion of larger sizes and older ages were observed in the coastal fishery compared to Tatik Lake.

The summer subsistence and Stage I fisheries near Ulukhaktok also harvested a wide range in size (mainly 550–850 mm; 1,000–6,000 g) and age (predominantly distributed between 8 and 13 years). Median length and weight values have been stable at approximately 690 and 3,900, respectively, since 2011. This is an increase in size compared to what had been observed between 1993 and 1997. Median age has also been relatively stable at approximately 11 years between 2011 and 2015.

CPUE (114 mm mesh) in the Tatik Lake winter fishery has been stable (median = 30 char/100 m/24 hours) since 2010 while there has been an increase in the frequency of relatively high values since 2006. CPUE (114 mm mesh) in the summer coastal fishery has also been relatively stable (median = 27 char/100 m/24 hours) since 2011 although confidence in the values for some of these years is limited due to low sample size.

A statistical catch-at-age model was used to estimate abundance, reconstruct population dynamics over time, and determine reference points using the time-series of data from the monitoring program in Tatik Lake between 1995 and 2015. While outputs looked promising there were questions raised concerning model inputs and parameterization. The results of the model should be treated with caution although it was noted that the current harvest level (sum total of summer coastal and Tatik Lake fisheries) was lower than MSY when it was assumed the Kuujjua River stock constituted 75% of the harvest during the summer near Ulukhaktok. The reference points estimated from the model were consistent with trends in biological indicators and CPUE data that suggested stock status was currently healthy. It was recommended that work continue on the SCA model and that other models (e.g., length-based or biomass) be explored to help assess the status of the Kuujjua River population.

All available indices suggest the Kuujjua River population is not experiencing overfishing and the current stock status is healthy. Additionally, local fishers have not reported declines in stock status in recent years. The current level of harvest experienced by the stock is considered sustainable. The conclusions are similar to the assessment in Harwood et al. (2013).

In order to monitor trends in biological and catch-effort data, and conduct future population assessments, it is imperative to continue the monitoring programs in Tatik Lake in the winter and along the coast in the summer.

SOURCES OF INFORMATION

This Science Advisory Report is from the February 15–17, 2016 Assessment of Arctic Char in the Ulukhaktok area of the Northwest Territories. Additional publications from this meeting will be posted on the DFO Science Advisory Schedule as they become available.

Bodaly, R.A., Cosens, S.E., Shortt, T.A., and Stewart, R.E.A. 1992. Report of the Arctic Fisheries Scientific Advisory Committee for 1989/90 and 1990/91. Can. Manuscr. Rep. Fish. Aquat. Sci. 2139: iv + 91 p.

Cosens, S.E., Crawford, R., de March, B.G.E., and Shortt, T.A. 1993. Report of the Arctic Fisheries Scientific Advisory Committee for 1991/92 and 1992/93. Can. Manuscr. Rep. Fish. Aquat. Sci. 2224: iv + 51 p.

Cosens, S.E., de March, B.G.E., Innes, S., Mathias, J., and Shortt, T.A. 1998. Report of the Arctic Fisheries Scientific Advisory Committee for 1993/94, 1994/95 and 1995/96. Can. Manuscr. Rep. Fish. Aquat. Sci. 2473: v + 87 p.

Harwood, L.A., Sandstrom, S.J., Papst, M.H., and Melling, H. 2013. Kuujua River Arctic char: monitoring stock trends using catches from an under-ice subsistence fishery, Victoria Island, Northwest Territories, Canada, 1991–2009. Arctic 66: 291–300.

Harwood, L. A., Smith, T.G., George, J.C., Sandstrom, S.J., Wojciech, W., and Divoky, G. J. 2015. Changes in the Beaufort Sea ecosystem: diverging trends in the body condition of marine mammals, seabirds and anadromous char revealed through long-term monitoring. Prog. Oceanogr. 136: 263–273.

Lewis, P.N.B., Kristofferson, A.H., and Dowler, D.H. 1989. Data from fisheries for Arctic charr, Kuujjua River and Holman areas, Victoria Island, Northwest Territories, 1966–87. Can. Data Rep. Fish. Aquat. Sci. 769. 17 p.

Yaremchuck, G.C.B., Roberge, M.M., McGowan, D.K., Carder, G.W., Wong, B., and Read C.J. 1989. Commercial harvest of major fish species from the Northwest Territories, 1945 to 1987. Can. Data Rep. Fish. Aquat. Sci. 751. 129 p.

THIS REPORT IS AVAILABLE FROM THE:

Centre for Science Advice (CSA)
Central and Arctic Region
Fisheries and Oceans Canada
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Telephone: (204) 983-5131
E-Mail: xnca-csa-cas@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

ISSN 1919-5087

Correct Citation for this Publication:

DFO. 2016. Assessment of Arctic Char *(Salvelinus alpinus)* in the Ulukhaktok area of the Northwest Territories. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2016/038.

Aussi disponible en français :

*MPO. 2016. Évaluation du stock d'ombles chevaliers (*Salvelinus alpinus*) dans la région d'Ulukhaktok, dans les Territoires du Nord-Ouest. Secr. can. de consult. sci. du MPO, Avis sci. 2016/038.*