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Central and Arctic Region
Canadian Science Advisory Secretariat
Science Advisory Report 2013/043

ASSESSMENT OF ARCTIC CHAR (*Salvelinus alpinus*) IN THE SYLVIA GRINNELL RIVER, NUNAVUT, 2009-2011

Photo of a Sylvia Grinnell Arctic Char by Zoya Martin, Fisheries and Oceans Canada (DFO).

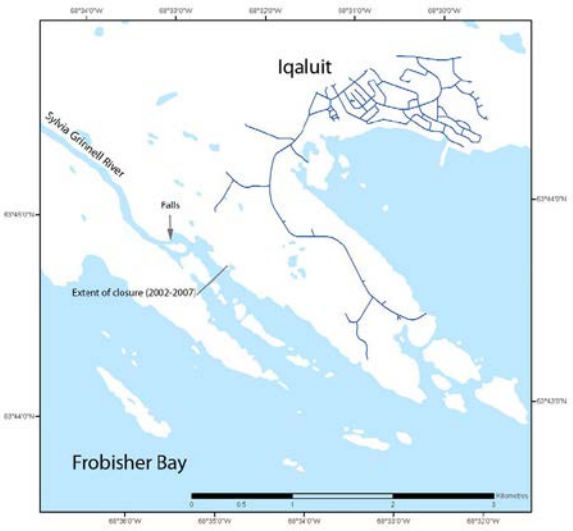

Figure 1. Map of Frobisher Bay with the Sylvia Grinnell River and community of Iqaluit identified.

Context:

The Sylvia Grinnell River is an important Arctic Char fishing site for the people of Iqaluit. Two attempts were made to develop a commercial fishery for Arctic Char from the Sylvia Grinnell River, from 1947 to 1951, and again from 1959 to 1966. Both ceased due to decreasing catch-per-unit-effort (CPUE). While some improvement in the stock status has occurred since then, biological parameters have not returned to pre-commercial levels (Gallagher and Dick 2010). A subsistence fishery and a small recreational fishery have persisted in the river and in the adjacent marine areas of Frobisher Bay due to the proximity to Iqaluit.

Local residents and the Amaruq Hunters and Trappers Association have expressed concern for the stock due to the large number of char targeted during the upstream migration in the area below the falls on the river. Many char caught here suffer mortal injuries incurred from snagging (a fishing method used during this time), or are discarded on the river bank. An earlier assessment of the issue (DFO 2008) concluded there was insufficient information to determine if snagging posed a conservation concern for the stock. This was in part due to the lack of total harvest data and the lack of population abundance and trend data.

In an effort to estimate abundance of the Sylvia Grinnell Arctic Char stock, a mark-recapture study was undertaken from 2009 to 2011.

A Science Advisory meeting was held March 18, 2013 to address Resource Management's request for advice on stock status and to determine whether the current (and recent) removal rate of this fishery (including the snagged and discarded char) would affect sustainable harvest of Sylvia Grinnell Arctic Char.

SUMMARY

- Data were insufficient to estimate the abundance of Sylvia Grinnell Arctic Char. As a result, a sustainable harvest level could not be determined for the stock. Age data suggests sufficient recruitment is occurring, indicating that the stock is not likely overharvested.
- Based on the current age structure and the estimated age-at-maturity (age 8-9), there are more fish of reproductive age in the population now than in the 1980s. While encouraging, the age structure has not yet returned to that of 1948-1951 when a large portion of the population was between age 12 and 23.
- There are insufficient data to evaluate subsistence and recreational harvests. A current estimate of subsistence harvest is required to fully determine the impact of various harvest methods on the sustainability of the Arctic Char stock.

INTRODUCTION

The anadromous Arctic Char, *Salvelinus alpinus*, in the Sylvia Grinnell River, Nunavut (Figure 1), is an important resource for the people of Iqaluit. Sustainability of the stock has been a recurring concern following two attempts at a commercial fishery (1947-1966) which negatively impacted the status of the stock. A subsistence fishery and a small recreational fishery have persisted in the river and in the adjacent marine areas of Frobisher Bay. Gallagher and Dick (2010) evaluated data collected in 2002 and 2004 from this system and, based on increased length-at-age and mean weight, longer and older char, decreased mortality rate, and improved catch indices from experimental gillnet sets and angling, concluded that the stock, while still relatively reduced, may have been showing signs of improvement. DFO (2008) concluded the Sylvia Grinnell Arctic Char population was still depleted in comparison to the historical state but suggested the decline may have stabilized at a lower level and may have even begun to show some limited recovery.

Since 2006, the residents of Iqaluit have expressed concerns with the number of char being snagged and discarded at the falls area of the Sylvia Grinnell River (DFO 2008). DFO (2008) indicated although there were insufficient data to conclude that the practice of snagging fish posed a “conservation concern” for the stock, banning the practice would reduce fishing pressure on pre-spawners thereby benefitting the population. Data needed to fully address the issue are estimates of abundance and total fishing mortality for the stock. The current study was undertaken in an effort to estimate population abundance of Sylvia Grinnell Arctic Char.

ASSESSMENT

Stock Status

Estimate of Population Abundance

From 2009 through 2011, Arctic Char were marked and recaptured in the Sylvia Grinnell River. A total of 895 Arctic Char were marked, but only two char were recaptured in the study nets set at the mouth of the river. This number of recaptures did not provide sufficient data to calculate a reliable estimate of abundance. There were additional recaptures made by subsistence and recreational fishers both in Frobisher Bay and in the river system; these data were examined for their potential use in determining an abundance estimate. Due to incomplete reporting of harvest (marked and unmarked), mixing of char from adjacent river systems, and not meeting key assumptions of the mark-recapture model, these additional data could not be used to estimate abundance.

Biological Characteristics

Biological characteristics of Arctic Char caught in this study were examined but direct comparison with historic values was interpreted with caution since different gear types were used. Small mesh gillnets were used to catch Arctic Char for tagging to reduce mortality while multi-mesh gillnets or hoop nets were used in previous years.

The age-frequency distribution of Arctic Char caught from 2009-2011(Figure 2) indicates adequate recruitment is occurring; suggesting the stock is not currently overharvested. Further, the proportion of fish of reproductive age (8+ years) is relatively high (approximately 65% in 2009-2011) compared to samples from the 1980s and 1990s although still lower than levels observed during the earliest commercial fishery (1948-1951) and from the 1970s. Caution must also be used when comparing ages from 2009-2011 to earlier years because methodological improvements were made in the current study.

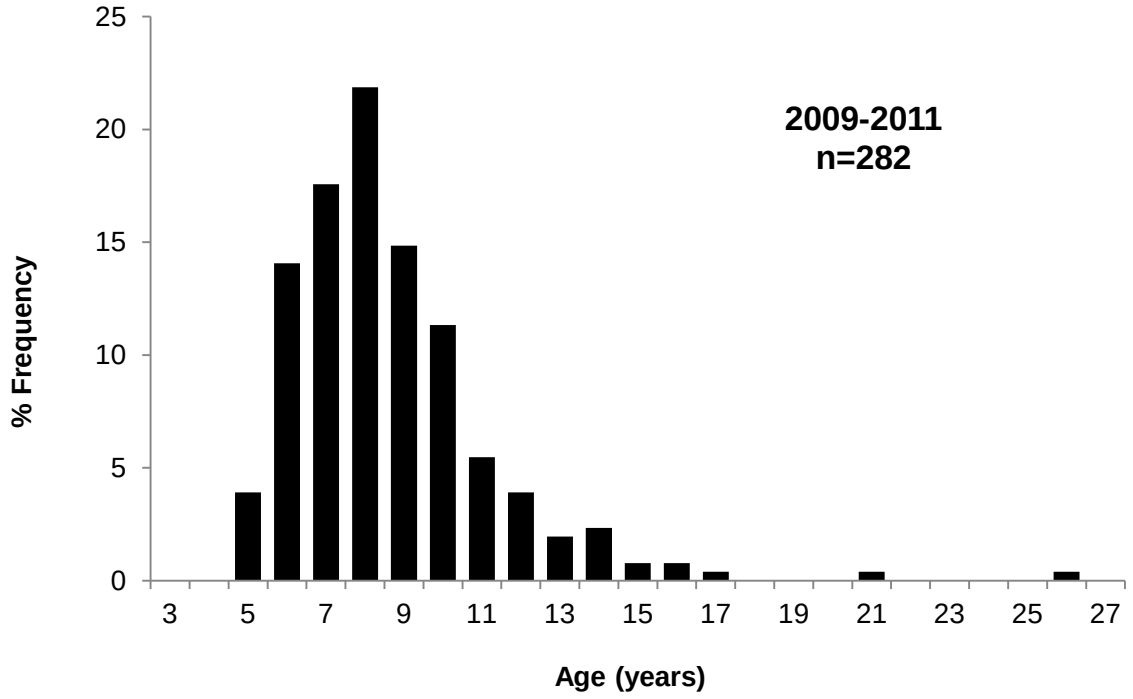

Figure 2. Age-frequency distribution for Arctic Char caught in the Sylvia Grinnell River/estuary from 2009 to 2011 in gillnets with mesh size ranging from 13 mm to 102 mm (predominantly 51 mm and 64 mm).

Sources of Uncertainty

Stock relationships and the amount of mixing between Arctic Char from the river systems in the Frobisher Bay area are unknown. Without this clarification, it is uncertain if a char marked in Sylvia Grinnell River is from the rivers' natal stock or a migrant from a nearby stock.

Total harvest from all sources is unknown. Without this information it is difficult to interpret the potential impact of removals.

Reporting of total Arctic Char caught (marked and unmarked) by local fishers during the mark-recapture experiment is uncertain, which can skew the resulting estimate of abundance.

Gear type and mesh sizes used to sample fish have not been consistent across years. This makes it hard to determine if biological and CPUE trends are a true reflection of the stock, or an artifact of methodology.

Age determination methodology has improved in the current study. This may make it appear as though the char are living longer and thus the stock is healthier; which may be inaccurate.

CONCLUSIONS AND ADVICE

Population abundance of Sylvia Grinnell Arctic Char could not be reliably estimated due to insufficient data. As a result, a sustainable harvest level could not be determined. However, age-frequency data suggest that the stock is not currently overharvested; as there is a reasonable recruitment of juveniles and presence of mature fish in the sample (age 8-26 years).

There were insufficient data to estimate the total fishery (subsistence and recreational) harvest or to evaluate the impact of various harvest methods (gillnetting, angling, snagging) on the sustainability of the stock.

OTHER CONSIDERATIONS

A discussion of various research activities and potential mitigation measures to address stock status and conservation concerns include the following.

1) Future determination of population abundance should consider other approaches to mark-recapture experiments (e.g., single event recapture – mark then recaptured later in the same year, weir counts) or an alternative approach such as DIDSON Sonar estimates. In either case the approaches should be complemented with biological sampling.
2) A five-year experimental gillnet survey collecting biological and CPUE data would allow a more accurate comparison of current stock status with historic levels. This dataset may also be useful in estimating population abundance via an age-based model such as Virtual Population Analysis (VPA).
3) A creel survey undertaken consistently from July through September to update estimates of subsistence harvest and method would be useful. This may require daily monitoring including weekends and evenings (creel survey for angling and snagging). Gillnetting (i.e., subsistence catch and effort) in the intertidal zone should also be monitored (e.g., logbook or low tide monitoring).
4) The public awareness campaign and increased presence by Fishery Officers in the falls area of Sylvia Grinnell River during the summer months was shown to be effective at reducing snagging/discarding of Arctic Char and should be encouraged. Joint effort between co-managers is needed; including, Fisheries and Oceans Canada, Amaruq Hunters and Trappers Association, Qikiqtaaluq Wildlife Board, Nunavut Wildlife Management Board and Nunavut Tunngavik Incorporated to address this issue.

SOURCES OF INFORMATION

This Science Advisory Report is from the March 18, 2013 Assessment of Arctic Char in the Sylvia Grinnell River, Nunavut, 2009-2011. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

DFO. 2008. Assessment of the impact of snagging on the Sylvia Grinnell River Arctic Char population. DFO Can. Sci. Advis. Sec. Sci. Resp. 2008/016.

Gallagher, C.P., and Dick, T.A. 2010. Historical and current population characteristics and subsistence harvest of Arctic Char from the Sylvia Grinnell River, Nunavut, Canada. N. Am. J. Fish. Manag. 30:126-141.

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MPO. 2013. Évaluation de l'omble chevalier (Salvelinus alpinus) dans la rivière Sylvia Grinnell, au Nunavut, en 2009-2011. Secr. can. de consult. sci. du MPO, Avis sci. 2013/043.

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