NWRT Final Project Report
Submitted September 30, 2018

1. NWRT Project Number: #3-17-07

2. Project Title: Seasonal patterns of growth in anadromous and resident Arctic Char

3. Project Leader:

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4. Summary:

Arctic Charr have a very interesting biology as many individuals spend their summers at sea (sea run or anadromous) while some individuals never leave the freshwater their whole life (resident). Sea run Charr are critical to fisheries as they become much larger than freshwater residents. The reason why some fish go to sea and others do not is unknown. Previous work accomplished with funds allocated from the NWRT (3-15-08 and 03-16-09) has found that juvenile growth is an important factor in whether a fish goes to sea or not. The proposed work will look further into Arctic Charr juvenile growth characteristics to help increase our understanding of why some Charr go to sea where they become of good size for harvest, while some Charr stay smaller and never leave freshwater. An improved understanding of Arctic Charr growth is essential to managing stocks. By using a combination of archived and newly collected otoliths for a back-calculation study we will be able to collect data that covers a longer period of time. The resulting data will allow us to compare Arctic Charr growth among stocks, determine if growth patterns have changed with time, and if these growth patterns influence whether an individual contributes to the harvested stock or not.

5. Project Objectives:

i. Meet with the communities to gather TEK regarding sea run (anadromous) and resident Arctic Charr – complete
ii. Create a method validation for the use of otolith increment measurements – Added since the interim report due to uncertainties, final write up is underway
iii. Determine if seasonal growth patterns in populations of wild Arctic Charr are changing through time – completing statistical analyses
iv. Compare seasonal growth patterns among Canadian populations of Arctic Charr - completing statistical analyses
v. Determine whether seasonal growth patterns in Arctic Charr differ between life-histories (i.e. anadromous and resident) – results presented

6. Materials and Methods:

Study area and Methods

The technical part of the study will collect field samples and use other otoliths from the archived collection at the Freshwater Institute. Otoliths were sampled from two waterbodies (Ikpit and Avituajuit) with the archived otoliths coming from two other waterbodies (Qasigiyat and Iqalugarjuit) in the Cumberland Sound area of Southern Baffin Island. In 2017 Fish were sampled using gill nets (multi-mesh), 58 fish and 49 fish were collected from Arvituajuk and Ikpit, respectively, mid-August to late- August. Four locals from Pangnirtung were hired to assist with the field work.

In the lab one otolith from each individual sampled is being prepared for analysis by embedding the structure in epoxy and sectioning it through the nucleus using a low speed saw. The otolith cross-sections will then be used to age each fish. Photographs of each otolith cross-section will be taken with a camera mounted to a stereo microscope. These images will then be used to measure the distance from the nucleus to the outer edge (radius) and the width of each ring on the otolith. All these measurements will be done using a standard transect on the ventral lobe of the otolith that crosses each ring and extends from the nucleus to the outer edge.

Data analysis

First, we will use a regression to validate the use of back calculation as a method to estimate the length of a fish based on measurements of the otolith. The predictor variable will be total otolith radius (distance from nucleus to outer edge) and the response variable will be the fish length. We will plot the residuals to test for the assumptions of a linear regression. The linear regression equation describing the relationship between fish length and otolith radius will be used to estimate the length of each fish at each seasonal ring previously measured. The difference in estimated length will then be calculated and used for seasonal growth data. We will then find the proportion of summer to winter growth for each year of life for each fish.

To test that growth varies among the stocks (lakes), life history (anadromous or resident) and years, respectively, will be tested using a multi-factor ANOVA (factors: lake, life history, year, and age) with ID set as a random variable in order to control for variation among individuals and to control for the repeated measures of growth on the same individual for each age.

7. Results:

G. Grenier's MSc Thesis was defended in August 2018. Final edits are being added now and the final results document will be submitted to the NWMB for reference to this funding.

8. Discussion/Management Implications

Discussion and Management Implications will be included in an email to the NWMB once the final document of G. Grenier's MSc Thesis is complete.

9. Report by Inuit participants:

Questionnaires have been sent to the community for the HTO and fishers to provide feedback. We will continue to work with the community to receive this feedback for the project and pass it along to the NWMB as soon as possible. No reports have been received as of yet.

10. Reporting to communities/resource users:

The report has not been provided yet, we anticipate providing the community with a report once G. Grenier's thesis is finalized.