

# **Research on the Arctic Char Fishery of Northern Labrador**

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## ABSTRACT

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This manuscript is directed to the people of Labrador involved in the coastal Arctic char and salmon fishery. The general biology and life history of Arctic char in northern Labrador is discussed. Research projects carried out by the Department of Fisheries and Oceans are summarized. These include commercial sampling, counting fence operation, tagging and research sampling. The commercial char fishery is discussed in view of past and present trends, and management recommendations have encouraged a redistribution of fishing effort into more northern areas.

Key words: Arctic char, commercial sampling, counting fence, tagging, Labrador

## RÉSUMÉ

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Le présent manuscrit est destiné aux gens du Labrador qui participent à la pêche côtière du saumon et de l'omble chevalier. On y étudie la biologie générale et le cycle historique de l'omble chevalier au nord du Labrador. On y résume également les projets de recherche réalisés par le ministère des Pêches et des Océans. Parmi ceux-ci, notons l'échantillonnage commercial, le fonctionnement des barrières de décompte, le marquage et l'échantillonnage à des fins de recherche. La pêche commerciale de l'omble est étudiée en fonction des tendances passées et actuelles et les recommandations pour la gestion favorisent une redistribution de l'effort de pêche dans les régions situées plus au nord.

## INTRODUCTION

The Department of Fisheries and Oceans has been conducting research on Arctic char in northern Labrador since 1973. The objective of this research is the preservation of the species thus ensuring Arctic char will always be available to the local fishermen of Labrador. To achieve this goal a large amount of information is required as well as the co-operation of the local fishermen. The information required is collected in a variety of ways; sampling at fish plants; counting fence operation on the Fraser River; tagging studies at the Fraser River and along the coast; and the collection of specimens either from a research vessel or by netting inshore in the Nain area. The information obtained from these studies aids in understanding the basic biology and habits of Arctic char in northern Labrador. Therefore the biology of char will be discussed first so that the relevance of these studies will become clear.

This manuscript is directed to the people of Labrador involved in the coastal Arctic char and salmon fishery. Therefore the metric system and direct references are not used.

## GENERAL BIOLOGY AND LIFE HISTORY

Usually young Arctic char stay in the rivers for the first four to five years of their life (this may range from 3-7 years). They then migrate to sea for the first time and are usually 5-10 inches in length. Seaward migration takes place at the time of ice breakup in the spring, usually in May. Char spend the summer in the sea where they feed actively on capelin, sand lance, and small marine animals. Most of the time char remain close to the river mouths and rarely stray more than 40 miles from their home rivers. Most char return to the rivers in August and usually to the same river they left in the spring. Our work on the Fraser River has shown that larger char enter the river first with smaller fish returning later in August and early September. Char have not been found to stay in the sea during winter.

Not all char returning to the river are going to spawn. Char usually spawn for the first time when they are 7-9 years old and are approximately 15 inches in length. Some char may spawn every fall while others may spawn every second or third year. Therefore, some char return to the rivers to find a suitable area in which to spawn, while other char return to spend the winter in a deep part of the river or move into the ponds and lakes. Spawning usually takes place in October. During spawning the female digs a "redd" or nest in the gravel using her tail fin and deposits her eggs in it. The male fertilizes the eggs, then the female covers in the redd with gravel. The eggs develop over winter buried in the gravel, and hatch the following spring. All the char hatched in a particular river are referred to as that river's "stock".

## CURRENT RESEARCH

## COMMERCIAL SAMPLING

Commercial sampling in the fish plants is carried out during the fishing season to provide information on the catches, such as amount of fish caught each week in each area, average weight and length of fish, and age. The sampling procedure includes the measurement of length and weight and the taking out of otoliths from each fish. The otolith (Fig. 1) is a small bone found in the head of a fish. It has lines on it similar to the rings seen on a tree trunk (Fig. 2). By counting the dark rings which represent one years growth, the age of the fish can be determined. Knowing the age of fish caught is important in determining whether overfishing is taking place and the present condition of the fish stock. If for example, most of the fish being caught are 8 years old, then the char population could be in trouble since the age at which they spawn for the first time is 7-9 years old. If char are caught before they get a chance to reproduce there would be few char left for spawning and eventually few left to catch. When the average age of fish caught is 11 or 12 years old, then most have spawned at least once and the future of the fishery looks good. Therefore, commercial sampling and the subsequent aging of fish is one way to find out if the fishery is in good condition.

## FRASER RIVER COUNTING FENCE

A counting fence has been installed and operated in the Fraser River each summer from July to September since 1975 (Fig. 3 and 4). This structure is designed as a temporary trap for the purpose of counting fish returning from the sea. Fish caught at the counting fence are counted, measured for length and weight and are released to continue their upstream migration. We can then find out the number and size of the char coming back to the Fraser River each year and compare this to the same information from other years. This is very important now since Nain Bay was closed to all commercial fishing in 1978. A summary of the Fraser River counting fence for the years 1975-79, is presented in Table 1. As can be seen from the table the total number of char that passed through the counting fence has increased significantly from the first three years of its operation. Again it should be noted here that Nain Bay was closed to fishing in 1978. The other characteristics listed have remained relatively constant through the years.

## TAGGING AND RESEARCH SAMPLING

Tagging studies have been carried out in northern Labrador in order to find out where fish from different areas are caught and to determine growth rates of Arctic char. Since 1975 approximately 200 tagged char have been returned either in the commercial fishery or at the Fraser River counting fence. It is very important that fishermen return tagged fish to fisheries personnel in Nain. The tagging results show that char generally stay within 40-50 miles of their home river while at sea, and that fish grow faster during their first 3 or 4 years at sea and slow down as they get older. On the average, char increase in length 1.5 inches each year while at sea.



In the summers of 1978 and '79 research cruises were conducted aboard departmental research vessels in northern Labrador. The purpose of these trips was to investigate aspects of the biology of char in these areas, and to conduct tagging studies to determine the overlap of char stocks in the Okak, Napartok, Hebron and Saglek regions.

#### THE COMMERCIAL FISHERY

Since the decline of the Labrador cod fishery in the late 1960's, more fishermen have been fishing for Arctic char. Average annual exports have increased from 300,000 lb in the period 1960-69 to 450,000 during the past four years.

Prior to 1969 most fishing was done along the northern Labrador coast, however, several factors led to a change in this distribution. Emphasis shifted from a salted product to a higher priced frozen product with the installation of freezing facilities in Nain in 1970. Also the market acceptability of pink and white fleshed char (more common in the Nain area), and the availability of Atlantic salmon on the outer islands of the Nain and Okak areas led to the concentration of fishing effort in the immediate Nain region. This concentration of effort has led to a dramatic decrease in the number of large char (Fig. 5) and has also led to overfishing in at least two bays in the Nain area especially Tikkoatokak. However, it appears that stocks in the more northern bays of Okak, Napartok and Hebron are possibly underfished.

Total commercial catch of Arctic char in Labrador during 1979 was approximately 470,000 lb of which 82% were caught in the Nain fishery. In comparison with the Northwest Territories, Labrador has produced approximately 60% of the total Canadian commercial char landings during the past four years. In 1978, Nain Bay was closed to fishing for a period of five years by the Federal Department of Fisheries and Oceans in conjunction with the fishing council of Nain. The total catch (and quota if applicable) of each area in the Nain fishery for the past three years is presented in Table 2.

The resulting management recommendations encourage redistribution of fishing into more northern areas to reduce heavy fishing pressure on localized Nain stocks.

#### ACKNOWLEDGMENTS

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## ADDITIONAL READING

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Table 1. Summary of Fraser River counting fence results of Arctic char, 1975-79.

	1975	1976	1977	1979
Number of char	3,952	2,348	2,334	6,403
Average length (in.)	17.6	18.4	18.1	17.6
Range in length	7-28	9-28	6-29	8-27
Average weight (lb)	3.2	3.7	2.7	2.6
Range in weight	0.3-12	0.5-12	0.3-13	0.3-9
Average age (yr)	8.4	8.6	8.1	7.9
Range in age	3-14	4-16	4-15	4-18

Table 2. Arctic char landings by area of Nain fishery, 1977-79. (1b round)

Area	1977	1978	1979	(Quotas)
Anton's Point	4,656	8,836	42,716	
Voisey Bay	49,581	74,061	48,239	(49,600)
Anaktalik	47,628	28,821	32,879	(47,120)
Dog Island	4,493	851	3,170	
Nain Bay	18,658	Closed season		
Tikkoatokak	87,057	121,396	83,598	(86,000)
Webb Bay	5,547	7,661	6,693	
Black Island	7,476	6,539	23,453	
Kiglapaits	11,991	26,687	38,834	
Okak	60,843	79,661	57,708	
Cutthroat	34,167	90,744	39,248	
Tasiuyak	-	5,026	4,052	
Mugford	3,032	2,531	375	
Napartok	61,832	18,856	5,481	
Hebron	12,335	-	-	
Total	409,296	471,670	386,446	

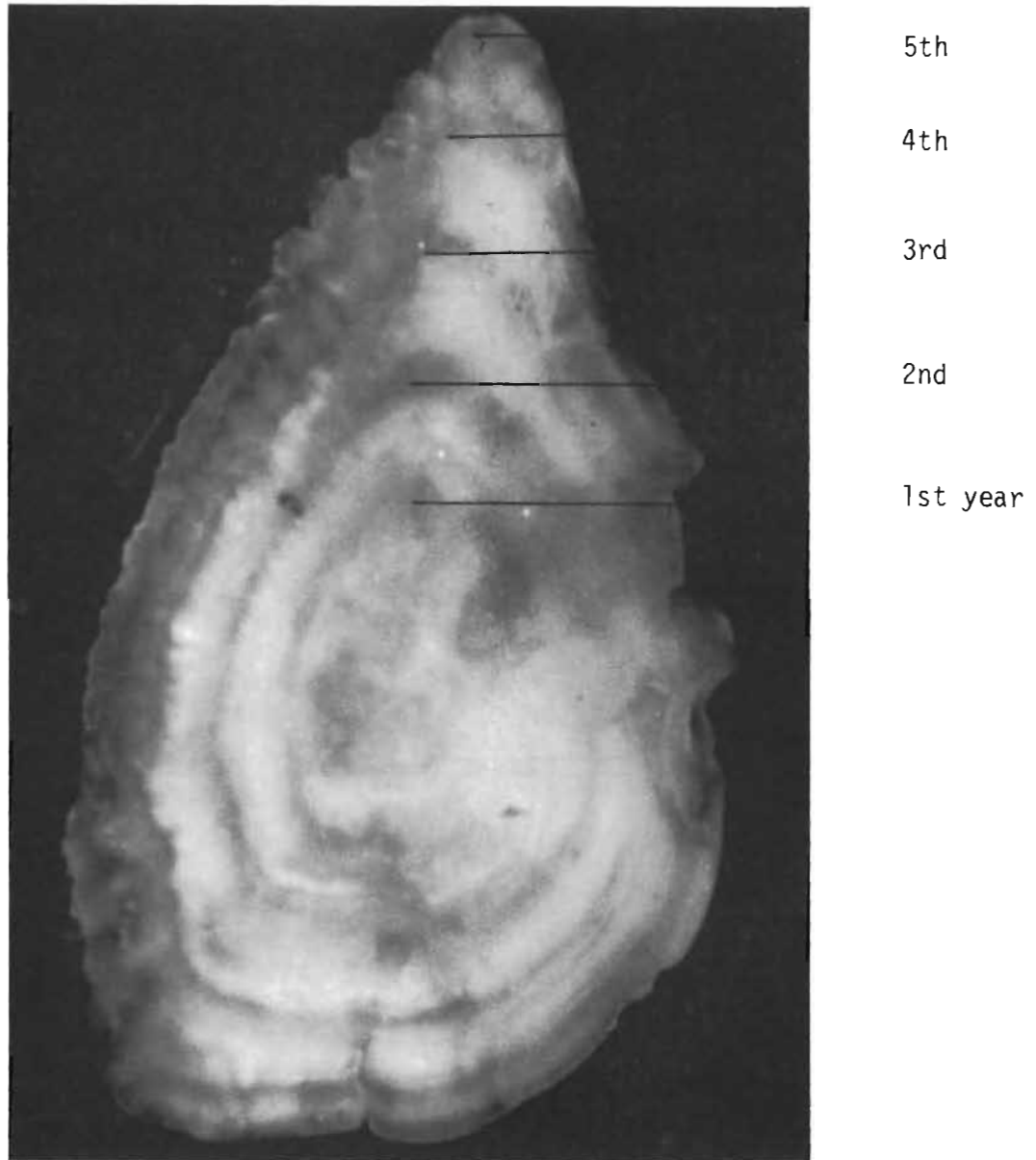


Fig. 1. Enlarged Arctic char otolith.



Fig. 2. Cross section of a tree showing growth rings, which are used for aging.



Fig. 3. Fraser River counting fence; water flow is from bottom of picture to top.

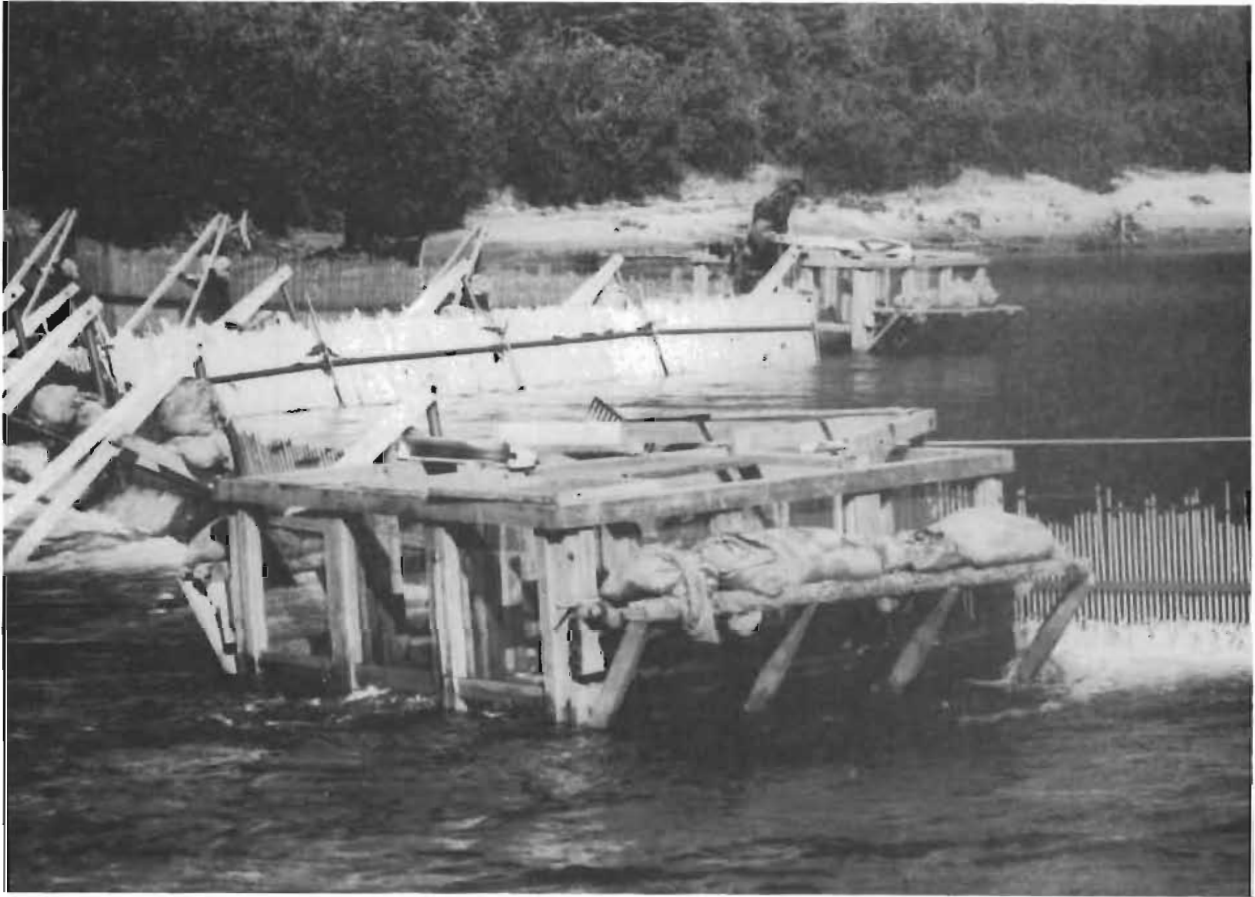


Fig. 4. Fraser River counting fence.

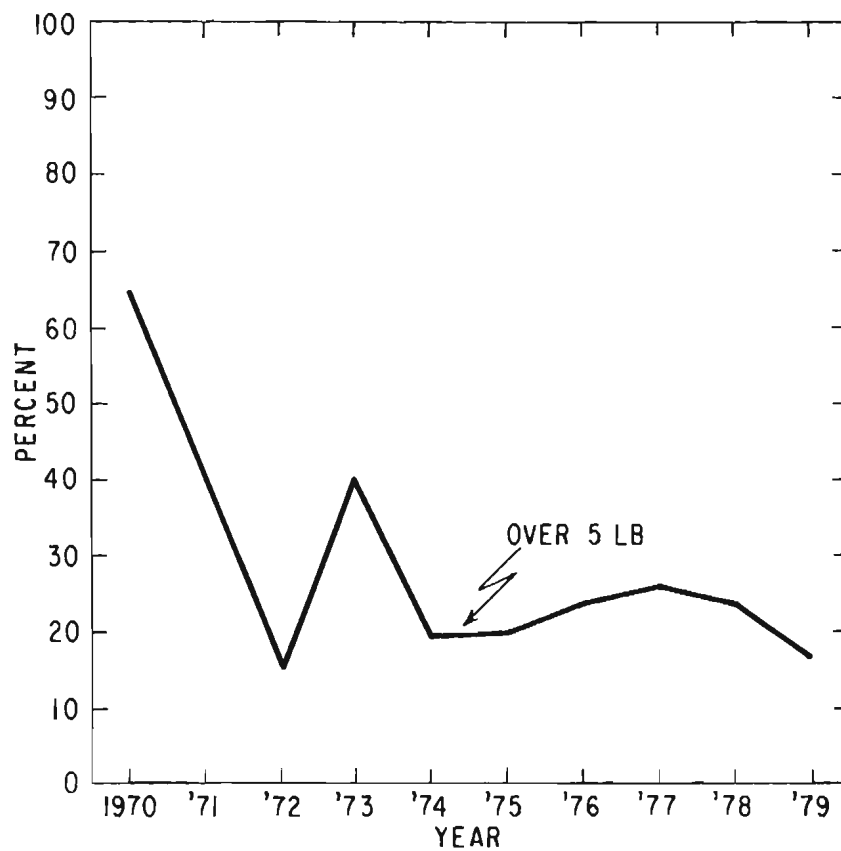


Fig. 5. Relative changes in size of Arctic char caught in Nain fishery from 1970 to 1979.