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T.C. Anderson

THE RIVERS OF LABRADOR

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The Rivers of Labrador

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CONTENTS

ABSTRACT

ANDERSON, T. C. 1985. The rivers of Labrador. Can. Spec. Publ. Fish. Aquat. Sci. 81: 389 p.

Physical and biological data are presented for 120 river systems in Labrador. Based on bio-physical parameters, Labrador has been divided into six regions. A general description of each region is followed by a detailed summary of information from each individual river in that region, proceeding south to north. Past and present developments within the watersheds are documented. Physical data presented include characteristics of each drainage system, and locations and descriptions of obstructions to fish passage. Results of water quality analyses, where available, are also included. The size and location of salmonid rearing and spawning habitat are presented for 82 rivers. The distribution within Labrador of 24 freshwater, anadromous and catadromous fishes is summarized. Emphasis is placed on the production and freshwater exploitation of Atlantic salmon. Production estimates, based on available rearing habitat for salmon parr, are presented for 60 rivers. Data on Atlantic salmon angling are reported from 19 rivers and the biological characteristics of the catch, where available, are included. Data collected at counting fences on five rivers are summarized. Catch/effort data from the commercial fishery for Arctic char in northern Labrador are tabulated. Data available from the freshwater exploitation of species other than Atlantic salmon are also included.

RÉSUMÉ

ANDERSON, T. C. 1985. The rivers of Labrador. Can. Spec. Publ. Fish. Aquat. Sci. 81: 389 p.

On présente les données physiques et biologiques pour 120 bassins fluviaux situés au Labrador. À partir de paramètres bio-physiques, le Labrador a été divisé en six régions. Après une description générale de chaque région, vient un résumé détaillé de l'information provenant de chaque cours d'eau dans cette région, en allant du sud vers le nord. Les réalisations actuelles et passées à l'intérieur des bassins-versants sont passées en revue. Les données physiques présentées comprennent les caractéristiques de chaque bassin de drainage de même que l'emplacement et la description des obstacles au passage des poissons. Les résultats des analyses de la qualité de l'eau sont mentionnés lorqu'ils sont connus. On donne pour 82 cours d'eau les dimensions et l'emplacement des aires de fraie et de croissance des salmonidés. On résume ensuite la distribution au Labrador de 24 espèces de poissons d'eau douce anadromes et catadromes. L'accent est mis sur la production et l'exploitation en eau douce du saumon de l'Atlantique. Des estimations de production, basées sur les aires de croissance que peuvent utiliser les tacons de saumon, sont données pour 60 cours d'eau. Les statistiques sur la pêche à la ligne du saumon de l'Atlantique dans 19 cours d'eau sont mentionnées et les caractéristiques biologiques des prises sont incluses lorsqu'elles sont disponibles. On résume les données recueillies à des barrages de dénombrement dans cinq cours d'eau. Les données sur les prises et l'effort de pêche provenant de la pêche commerciale de l'omble chevalier au nord du Labrador sont présentées sous forme de tableaux. On a inclus également les données existantes provenant de l'exploitation en eau douce d'espèces autres que le saumon de l'Atlantique.

RIVER INDEX

RIVER INDEX *(concluded)*

EXPLANATION OF FIGURES

Coloured maps are used to illustrate the known accessibility of individual rivers to migrating Atlantic salmon. Areas in blue are normally accessible to migrating fishes; areas in red are inaccessible to these fish due to barriers such as rapids, falls, dams, or dry riverbeds; rivers of unknown accessibility are not coloured. On the individual river maps, circled numbers indicate partial barriers which cause delays in migration; numbers in squares represent complete barriers to migration. The number enclosed in the circles or squares is a key to the table of obstructions for that particular river; this table usually gives a detailed description (height, width, slope) of each obstruction. The circular graphs on the maps indicate rivers that have been surveyed by the Department of Fisheries and Oceans (DFO) and illustrate the percentage of accessible and inaccessible rearing, spawning, and non-productive areas. Amounts of rearing and spawning area (in m^2) are presented in tabular form in individual river sections. Lakes and ponds that have map names and/or have been the location of some activity mentioned in the text are distinguished by the letter "L" followed by a number. Similarly, selected tributaries are denoted by the letter "T" followed by the number assigned to that tributary. Other locations cited in the text (electrofishing stations, angling camps), are pinpointed on the maps and keyed to a legend. At the beginning of each region a figure is provided which outlines the boundaries of that region and shows locations of major centres and activities. This figure also serves as a location map for individual rivers. In the text, numbers are assigned to each river and these numbers have been placed on the region map to show the location of the river mouth.

INTRODUCTION

This publication is a catalogue of all the major rivers in Labrador, one of the last great wilderness regions in North America. Because of its isolated geographic location, harsh climate, and low population, investigation and recording of the natural resources of Labrador have proceeded at a slower rate than in more hospitable southern climes. Until recently, the few studies on its rivers were based solely on descriptions of fish populations with little or no reference to the physical characteristics of drainage basins. Descriptions of specific rivers did appear in accounts of travels in the interior of Labrador by explorers such as Wallace (1905) and Scott (1933). Brief descriptions of the major Labrador rivers were published by Blair (1943) and preliminary surveys of the rivers and commercial salmon fisheries of Labrador were reported by Sollows et al. (1953, 1954). Surveys of the physical characteristics and fish populations of several southern Labrador rivers were conducted in 1966 and 1967 by Peet (1968, 1971). Detailed surveys of southern (Murphy 1971, 1972a, 1973) and northern (Murphy and Porter 1974a, b) Labrador rivers included river characteristics such as bottom composition, degree of obstruction to fish migration and river channel width for over 100 rivers. Collins et al. (1972a, b, c, d) surveyed four rivers and provided descriptive reports. Work by the author in 1975 included the survey of 11 rivers in southern Labrador. Jamieson (1979) published a surface freshwater quality atlas for Labrador based on 357 samples collected (1972–78) and the results of analyses of samples from individual watersheds are included. These results are often the extent of the information reported on a particular watershed in a recognized DFO report series. Singularly, the results of analysis of a sample may have little meaning but, when combined with results from other rivers in the area, they may indicate an overall trend in water quality.

This publication presents a summary of relevant data from the aforementioned sources plus other unpublished information from DFO files on physical characteristics of the rivers and their fish populations (with emphasis on Atlantic salmon). Emphasis is placed on rivers with watershed areas greater than 50 km^2 although other rivers for which information has been collected are included.

For the purposes of this catalogue Labrador has been divided into six regions (Fig. 1) on the basis of geology, vegetation, and fish distributions. A general description of each region is followed in the text by specific information on each watershed in that region.

In 1975, the author finished the final stream surveys of Labrador rivers, thus completing the river survey program in Labrador that was initiated by DFO in 1966. The completion of this program represented a milestone in the inventory of freshwater habitat in Canada. Although the bulk of data collected had been published, often the distribution was limited and the number of copies inadequate. Therefore, it was deemed justifiable, based on the value of the data and the enormous time, effort, and expense involved in its collection, to compile all the results within one publication. As the publication was being prepared, other relevant information dealing with the rivers was added. It is hoped that the result is a valuable source document for a wide variety of interests.

Historical Background

Labrador forms the northeastern section of the North American continent and, covering an area of 293 000 km^2, it comprises 3% of Canada's total land mass. Although the distance from the Quebec border at Blanc Sablon to the most northern point at Cape Chidley is only 1125 km, the coastline is made up of thousands of inlets and islands and stretches for more than 8000 km (Parsons 1970).

The earliest inhabitants of Labrador were Algonquin Indians and Inuit who, for hundreds of years, had the region to themselves. According to one theory, the Norsemen, after deviating from their course on a voyage between Iceland and Greenland in the year 986, were the first non-native people to have visited the coastline. Other Viking expeditions were undertaken but attempts to colonize the area failed (Parsons 1970). John Cabot visited the coast of Labrador in 1498 followed by the Portuguese navigator Gaspar Corte-Real in 1501. In 1534, Jacques Cartier sailed through what is now called the Strait of Belle Isle. After the discovery of abundant cod stocks, several European countries sent fishing fleets in the 1500s and 1600s and small settlements were established along the shores of the Strait of Belle Isle and southern Labrador. These early fishermen and explorers were the first white settlers of Labrador.

Three important events that aided survival of the coastal population were the establishment of the Moravian Mission in 1772, the Hudson Bay Company in 1834, and the International Grenfell Association in 1912. All of these institutions are active in Labrador as of this writing. Today, the coast of Labrador is dotted by small, isolated fishing communities, with larger centres located around the airport at Goose Bay, the hydroelectric site at Churchill Falls, and the mining industries at Labrador City and Wabush.

Labrador was controlled by the French until the Treaty of Paris in 1763, when it came under the jurisdiction of the Governor of Newfoundland. However, in 1774, control of Labrador was transferred to Quebec where it remained until Acts by the British Parliament in 1809 and 1825 returned it to Newfoundland. In 1927, the Judicial Committee of His Majesty's Privy Council

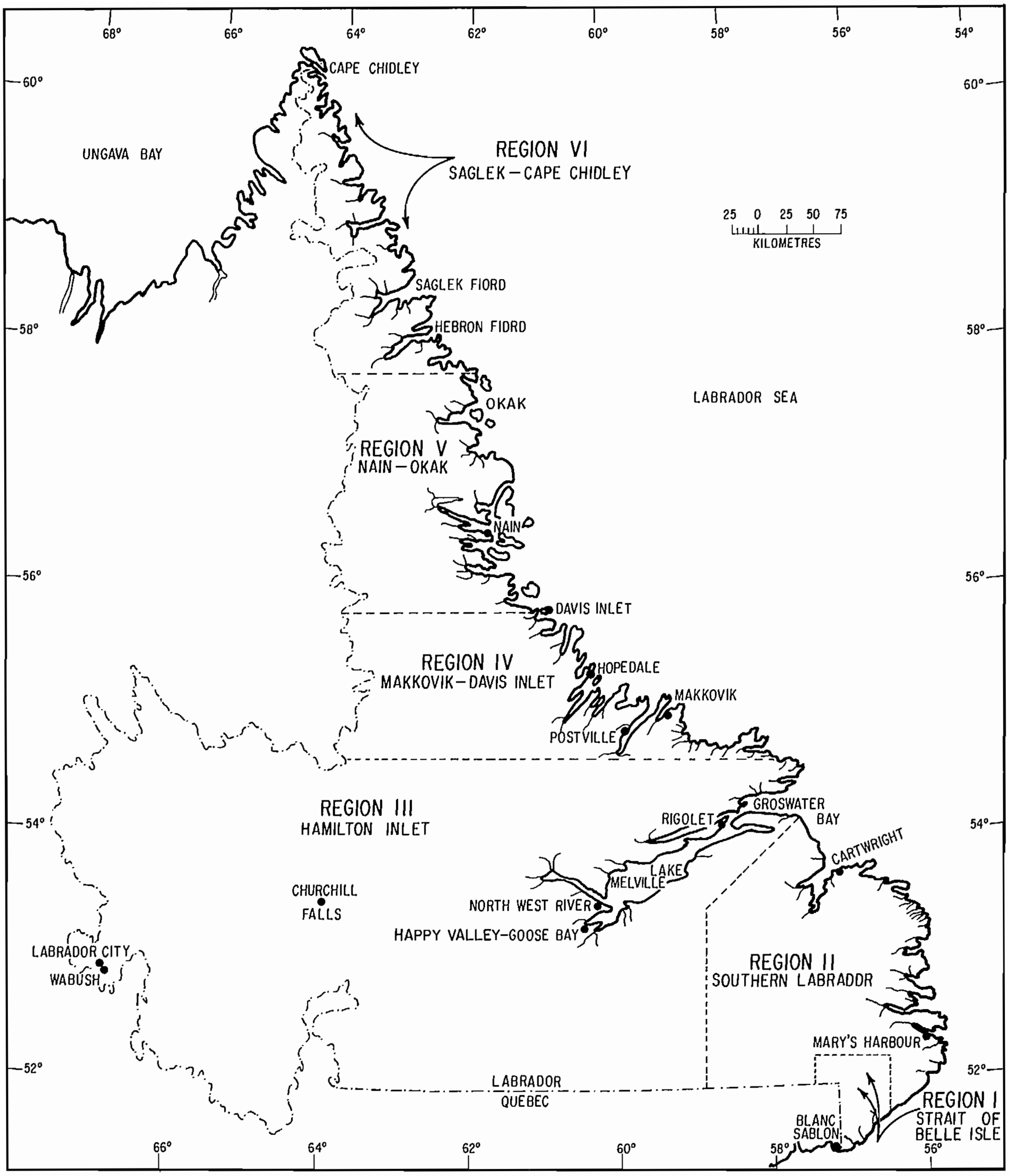

FIG. 1. Map of Labrador showing Regions I-VI described in the text.

reaffirmed Newfoundland's ownership of Labrador, stating:

> "The boundary between Canada and Newfoundland in the Labrador peninsula is a line drawn due north from the eastern boundary of the bay or harbour of Blanc Sablon as far as the fifty-second degree parallel until it reaches the Romaine River and then northward along the left or east bank of that river and its headwaters to their source, and from thence due north to the crest of the watershed of the rivers flowing into the Atlantic Ocean until it reaches Cape Chidley".

Population

The largest concentration of the 31 300 residents of Labrador is the Labrador City–Wabush area, where nearly half the population resides. Other relatively large communities are Happy Valley–Goose Bay (pop. 7103) and Churchill Falls (pop. 936). The largest coastal community is Nain (pop. 938) (Statistics Canada 1981). Today, the native population of Labrador numbers less than 2000, made up of a small group of coastal Inuit (less than 1000) and two branches of the Algonquin Indian Tribe, the Montagnais at Sheshatshit and the Naskaupi at Davis Inlet.

Geology

Labrador represents the eastern limit of the Canadian Shield, a vast area underlain by Precambrian rocks (Sutton 1972). Cambrian deposits are situated in the Strait of Belle Isle area and granite and associated rocks, which are covered by large masses of glacial debris, are found throughout the remainder of southern Labrador. The Mealy Mountains, situated on the southern side of Lake Melville, are composed of anorthosites (igneous rocks) while the remainder of the southern Lake Melville area consists of geologically young sandstones. Located west of Lake Melville is the mineral rich Labrador Trough, a band of sedimentary rocks containing ore deposits stretching from western Labrador into Quebec. Iron ore mined from this trough in western Labrador represents 85% of the province of Newfoundland's mineral production. Stretching inland from the community of Makkovik is another band of sedimentary rock, known as the Central Ore Belt. In 1958, uranium was discovered in this deposit. Large masses of anorthosite are located inland around Harp Lake and further north in the vicinity of Nain where they form the beginning of the mountain ranges of northern Labrador. The northern mountain ranges consist of Precambrian sediments and volcanics with some of the oldest rocks on earth (2.5–3.0 billion years old) situated around Saglek Fiord. Just south of Cape Chidley are the Torngat Mountains which, with elevations up to 1450 m, are the highest mountain range east of the Rocky Mountains. More detailed accounts of the geology and topography of Labrador can be obtained from the Geological Map of Labrador[1] and the Ecological (Bio-Physical) Land Classification of Labrador (1977).[2]

Vegetation

Forest growth occurs mainly in the southern and central inland portion of Labrador. The softwoods, black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*) are dominant, with some white spruce (*Picea glauca*) scattered throughout the forest region. Hardwood stands of white birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*) occur in areas of good forest growth (Wilton 1965).

The best forest growth in Labrador occurs along the lower sections of Churchill River and around the western shores of Lake Melville and consists of large stands of mature softwoods. Around the remainder of Lake Melville, in the river valleys of the Kanairiktok and Adlatok rivers and upon the rolling hills created by glacial deposits in southern Labrador, softwood forests of pulpwood size dominate. Marginal forest growth, consisting of scattered stands of black spruce alternating with lichen-covered barrens, occurs throughout much of southern Labrador in the vicinity of the headwaters of Eagle River, throughout the midsections of the Churchill River and inland from the coast between Cape Harrison and Davis Inlet. Submarginal forest, of scattered stunted trees and shrub, is found throughout western Labrador and coastal tundra parallels the entire coastline. Arctic tundra appears on the Mealy Mountain Range and covers the entire area inland from Hopedale to Nain and from Okak to Cape Chidley.

Rivers

Labrador contains vast areas of fresh water. Historically, the rivers were important not only as the basis for much of the Quebec–Newfoundland border but also as a means of transportation. Trappers followed the rivers as avenues to the valuable furs found in the interior and early explorers such as Low (1896) and Wallace (1905) used the larger rivers to gain access inland.

The rivers in the southern coastal section of Labrador flow over a gentle slope through productive forest. The six largest rivers in this section, Pinware, St. Lewis, Alexis, Paradise, Eagle, and North each have

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[1]Available from Dept. of Mines and Energy, Province of Newfoundland.

[2]Available from Lands Directorate (Atlantic Region), Environmental Management Service, Environment Canada.

drainage areas greater than 2000 km². Flowing into Lake Melville in central Labrador are the largest rivers in Labrador, the Churchill and the Naskaupi. The headwaters of both have been diverted to Smallwood Reservoir for hydroelectrical production. Other large rivers entering Lake Melville are the Crooked, Beaver, and Goose, all of which drain the huge, barren plateau of western Labrador. The Kenamu, Kenemich, and English rivers drain the Mealy Mountains which lie south of Lake Melville. North of Lake Melville, the Kanairiktok, Adlatok, and Kogaluk rivers all have drainage areas greater than 5000 km². This combined with sharp drops in land elevations occurring near the mouths of these rivers produces high water velocities with numerous falls and rapids. The headwaters of Kanairiktok River have also been diverted into the Smallwood Reservoir. The rivers north of Nain flow through steep valleys or gorges, some with vertical cliffs over 300 m high. Most of these rivers are typical of mountain streams being small and swift flowing with rapid fluctuations in discharge.

The vast majority of the rivers of Labrador still lie in a pristine state, due mainly to the remoteness and low population density of Labrador. As noted above, portions of three watersheds have been diverted for hydroelectrical purposes; surveys of the hydroelectrical potential of 19 other sites have been completed (Millan 1974). No doubt the increased use of the fresh water of Labrador is inevitable.

Fish Populations

A total of 24 freshwater, anadromous and catadromous fish species have been reported in Labrador. Stearns (1883) recorded the presence of threespine and ninespine sticklebacks, rainbow smelt, brook trout, and Atlantic salmon. Kendall (1909) listed 10 species collected from an expedition in 1891 and included in his report a chronological bibliography and list of fish collections from eastern North America. Weed (1934) studied the trouts of Labrador, differentiating between the lake trout, brook trout, and Arctic char on the basis of sea migration, distribution in rivers and meristic characteristics. Twenty-two different species were described by Backus (1957) based primarily on collections from the *Blue Dolphin* Labrador expeditions in 1949, 1950, and 1951. Bruce et al. (1979) documented the distributions of 14 species during his survey of the mercury content of Labrador fishes, 1977–78. An updated list of status and distribution of Labrador fishes is provided in Table 1; much of the information is from Scott and Crossman (1973), however, additions and variations are noted.

TABLE 1. List, status, and distribution of fish species reported in the rivers of Labrador (A, abundant; C, common; R, rare). Variations from Scott and Crossman (1973) are referenced at the end of the table.

	Region					
Species	I Strait of Belle Isle	II Southern Labrador	III Hamilton Inlet	IV Makkovik–Davis Inlet	V Nain–Okak	VI Saglek–Cape Chidley
Petromyzon marinus (sea lamprey)		R[a]				
Acipenser oxyrhynchus (Atlantic sturgeon)			R			
Alosa pseudoharengus (Alewife)	R[b]	R				
Alosa sapidissima (American shad)		R[c]				
Salmo salar (Atlantic salmon)	C	C	C	C	C	R
Salmo salar (ouananiche)	C	C	C	C		
Salvelinus alpinus (Arctic char)	R	A	A	A	A	A
Salvelinus fontinalis (eastern brook trout)	A	A	A	A	A	R[d]
Salvelinus namaycush (lake trout)			A	A	A	

TABLE 1. (*Concluded*)

Species	Region					
	I Strait of Belle Isle	II Southern Labrador	III Hamilton Inlet	IV Makkovik–Davis Inlet	V Nain–Okak	VI Saglek–Cape Chidley
Coregonis clupeaformis (lake whitefish)			A	A		
Prospium cylindraceum (round whitefish)			R		R[e]	
Osmerus mordax (rainbow smelt)	C	C	C	R[f]		
Esox lucius (northern pike)	C	C	C	C		
Couesius plumbeus (lake chub)			R			
Rhinichthys cataractae (longnose dace)			R			
Semotilus margarita (pearl dace)			R			
Catostomus catostomus (longnose sucker)		A	A	A		
Catostomus commersoni (white sucker)		A	A	A[e]		
Anguilla rostrata (American eel)	C	R	R			
Lota lota (burbot)			R	R		
Microgadus tomcod (Atlantic tomcod)	R	R	R			
Gasterosteus aculeatus (threespine stickleback)	C	C	C	C	C	C
Pungitius pungitius (ninespine stickleback)	C	C	C	C	C	C
Cottus bairdi (mottled sculpin)			R			
Cottus cognatus (slimy sculpin)			R		C[g]	

[a] Murphy (1972b).
[b] Backus (1957).
[c] Hare and Murphy (1974).
[d] Kendall (1910).
[e] Bruce et al. (1979).
[f] Labrador Inuit Association (1977).
[g] J. B. Dempson, pers. comm.

Exploitation of Fish Populations

Exploitation of both anadromous and freshwater fish stocks is an important source of income and food for Labrador residents. Coastal residents harvest Atlantic salmon, Arctic char, and brook trout in the marine environment and, in some cases, income from these fisheries represents the major cash flow into the communities. Angling camps, operated as commercial enterprises throughout Labrador, provide income and employment for owners, operators, and guides. Angling and specially licensed nets allow Labrador residents to fill some of their food requirements with fish.

Licensed Atlantic salmon fishermen are permitted to harvest salmon in a set net coastal marine fishery during the open season. In 1980, the season extended from 15 May to 31 December. The actual starting date varies and is contingent on spring ice conditions. During most years, the bulk of the catch is taken during July and August and nets are removed by September. Gear is restricted to gill nets or trap nets with a minimum mesh size of 127 mm. Moores and Dawe (1980) reported that the mean annual landings from this fishery, from 1969 to 1979, were 580.5 t (Table 2). Pratt et al. (1974) estimated that 25–50% of the grilse from Labrador rivers are taken by the homewater commercial fishery and 82–98% of the large salmon are harvested in the combined fisheries of Labrador, Newfoundland, and Greenland. The commercial fishery for Arctic char is concentrated around the communities north of Hamilton Inlet and, in 1980, extended from 1 July to 30 September. North and south of Davis Inlet the legal minimum mesh sizes for gill nets were 127 and 114 mm, respectively, in 1979. An average of 170.7 t/yr of char was landed in this fishery from 1974 to 1979 (Table 3). Both the Atlantic salmon and Arctic char commercial fisheries are controlled by DFO and catch and effort are determined from duplicates of purchase slips supplied by fish buyers. Not accounted for in these purchase slips are the catches of northern Labrador residents who have licences to fish char for domestic consumption (there were 37 food fishing permits issued in northern Labrador in 1979). Also, data from the southern Labrador 'trout' fishery are not accurately broken down into Arctic char or sea-run brook trout landings. Gillnets with mesh sizes ranging from 51 to 89 mm were used in this fishery during 1979 by the 268 commercial

TABLE 2. Summary of landings from the Atlantic salmon commercial fishery, Labrador, 1969–79 (Moores and Dawe 1980).

	Catch (kg round weight)			
Year	Grilse <2.7 kg	Large salmon ≥2.7 kg	Total salmon	Effort (gear units)[a]
1969	71 896	389 481	461 377	2208
1970	95 409	362 806	458 215	3052
1971	124 311	516 988	641 299	2720
1972	93 044	444 410	537 454	2795
1973	20 313	618 600	638 913	2976
1974	108 836	605 531	714 367	2742
1975	212 654	492 246	704 900	3154
1976	162 510	593 761	756 271	3558
1977	138 241	574 186	712 427	3408
1978	53 999	381 159	435 158	3725
1979	96 686	228 627	325 313	3795
Mean	107 082	473 436	580 518	3103

[a] 1 gear unit = 50 fathoms net.

TABLE 3. Summary of landings from the commercial fishery for Arctic char, northern Labrador, 1974–79.

Year	Total catch (kg round weight)	Man-weeks fished
1974	148 546	655
1975	53 661	376
1976	150 543	566
1977	210 406	986
1978	248 334	1090
1979	212 985	914
Mean	170 746	765

licence holders and 360 food-only permit holders.

Freshwater exploitation of fish stocks in Labrador is also controlled by DFO. A total of 17 rivers are 'scheduled' for salmon angling, meaning that anglers must be licensed and only artifical fly can be used to angle in those waters. The angling season in 1980 on scheduled rivers extended from 20 June to 15 September and the daily bag limit for salmon was two fish. Enforcement of these regulations is carried out by the Resource Management Division of DFO who, along with angling camp operators, report catch and effort from individual river systems. From 1965 to 1980 the mean catch per rod day of Atlantic salmon in Labrador rivers was 0.86 (Table 4), more than double the 1964–77 mean catch per rod day for rivers in insular Newfoundland (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981). Except for rivers that are relatively accessible to anglers such as those in the Strait of Belle Isle area, the Atlantic salmon populations in Labrador rivers receive very low exploitation from anglers. Pratt et al. (1974), for example, estimated the sports fishery exploitation at Sandhill River in southern Labrador to be 2–3% of the grilse production.

Other fish species taken by anglers include resident and sea-run brook trout, Arctic char, lake trout, landlocked salmon (ouananiche), northern pike, and whitefish (Table 5). Several camps are operated annually to

TABLE 4. Summary of Atlantic salmon angling data, Labrador, 1965–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Large salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1965	2345	627	2972	3422	0.87
1966	3315	706	4021	4619	0.87
1967	2206	589	2795	3337	0.84
1968	3776	665	4441	4054	1.10
1969	2877	393	3270	3646	0.90
1970	4013	562	4575	5308	0.86
1971	3934	486	4420	4898	0.90
1972	2947	424	3371	5165	0.65
1973	7492	1009	8501	8271	1.03
1974	2501	803	3304	5492	0.60
1975	3972	327	4299	4209	1.02
1976	5726	830	6556	7155	0.92
1977	4594	1286	5880	7234	0.81
1978	2691	767	3458	6248	0.55
1979	4118	609	4727	5333	0.89
1980	3800	889	4689	4948	0.95
Mean	3769	686	4455	5209	0.86

TABLE 5. Summary of recreational angling catch (excluding Atlantic salmon), Labrador, 1965–77 (DFO, unpubl. data).

Year	Resident brook trout	Sea-run brook trout	Arctic char	Lake trout	Landlocked salmon	Northern pike	Whitefish
1965	9 049	7 000	0	612	654	984	0
1966	9 649	4 000	62	975	796	909	0
1967	28 836	7 750	175	5 211	5 022	2 051	991
1968	115 191	9 925	242	12 759	7 190	2 013	2 715
1969	93 459	16 106	395	9 905	5 688	1 580	2 000
1970	82 597	13 763	1 119	8 127	4 848	1 346	2 000
1971	84 415	10 433	352	7 765	8 560	2 577	2 500
1972	74 387	10 109	822	10 316	5 373	4 255	1 275
1973	66 205	13 406	103	7 698	4 281	4 409	950
1974	25 711	9 439	604	3 928	2 107	3 434	549
1975[a]	5 105	4 675	—	—	—	1 180	—
1976[a]	1 018	1 173	—	—	—	110	—
1977[a]	1 554	757	14	—	111	522	—
Mean (1965–74)	58 950	10 193	387	6 730	4 452	2 356	1 298

[a] Partial count.

accommodate anglers for these species. Brook trout and Arctic char angling, in particular, lure sportsmen from all over the world.

Survey Methods

Surveys of the rivers of Labrador date back to Blair (1943) who obtained information directly from fur trappers for his report on obstructions of Labrador rivers. Sollows et al. (1953, 1954) visited several major salmon rivers by boat or canoe and walked the lower sections of many rivers, recording stream velocity, bottom type, surrounding vegetation, and sightings of fish, insects, and mammals. Surveys in 1967 and 1968 by Peet (1968, 1971) were conducted from a fisheries patrol boat and a helicopter to categorize different watersheds and pinpoint obstructions. Although Peet did not record bottom substrate compositions other than to indicate probable spawning areas, his use of temporary counting fences on four rivers provided data on major fish species and the magnitude of fish migrations.

The methods for surveying streams and estimating Atlantic salmon production are outlined in Riche (1972) and were used as the basis of the surveys by Murphy (1971, 1972a, 1973), Murphy and Porter (1974a, b), and myself. This method requires the estimating and recording of stream widths and bottom substrate compositions on a map while flying over the river at low altitude in a helicopter. Riche (1972) estimated that the results recorded by an experienced surveyor were 70–80% accurate. Barriers to fish migration are examined and photographed from the ground to ensure an accurate assessment of the degree of obstruction of each barrier. Often, tentative recommendations for alleviating fish holdups at barriers can be derived at the site. As a result of the information collected, areas of rearing and/or spawning within a watershed are identified. The amount of rearing habitat is generally summarized in units (100 m^2 of rearing habitat). On the basis of counting fence operations and tagging studies in Labrador, Riche (1972) estimated smolt production in Labrador rivers to be two per rearing unit and adult salmon production to be 15% of the smolt production. These estimates are used in calculations throughout this publication. It should be noted that as many of the earlier results were recorded in imperial measurements, due to metric conversion some variation between estimates previously reported and those in this publication may be observed.

REGION I
STRAIT OF BELLE ISLE

The Strait of Belle Isle Region is the most southerly section of Labrador, its coastal boundary extending from the Quebec border to a point 20 km north of the community of Red Bay (Fig. 2). It is the most densely populated coastal region of Labrador and most of the 2243 residents (Statistics Canada 1981) are concentrated in the six incorporated communities in the area. All communities in the region are connected by the only coastal road system in Labrador. Access to insular Newfoundland is provided during ice-free months by daily ferry service between the Quebec border community of Blanc Sablon and St. Barbe, Newfoundland. The commercial cod fishery is the major source of employment with commercial salmon fishing providing a secondary source of income. Additional employment directly related to the salmon resource includes patrolling of salmon rivers and guiding of anglers.

Geologically, the region is atypical of other regions in Labrador as it contains large amounts of Cambrian deposits (Sutton 1972). The area is rich in limestone and sandstone deposits that result in a high mineral content in some rivers in the region. Granite and granitic gneiss are found throughout the northern part of this region, with exposed rock often illustrating the lack of glacial deposits.

Vegetative growth is sparse throughout most of the region. Fog produced by cold ocean currents, coupled with onshore salt spray, results in an almost treeless coastal area (Wilton 1965). Stunted forests of black and white spruce occur farther inland where some protection is afforded by river valleys. In the most northerly inland area, black spruce is dominant, with white spruce and balsam fir occurring only on better drained sites.

The most common fish species reported in the three major rivers of the region are ouananiche, anadromous Atlantic salmon, sea-run and resident brook trout, rainbow smelt, northern pike, American eel, and both threespine and ninespine sticklebacks. Rarer species are alewife (Backus 1957), Arctic char, and Atlantic tomcod (Scott and Crossman 1973). Large sea-run brook trout (up to 2.5 kg) and the high proportion of large salmon to grilse provide excellent angling. The accessibility of the area has led to a sharp rise in angling pressure over the past few years, but catch per rod day for Atlantic salmon has remained constant.

The earliest survey of rivers in this region was carried out by Sollows (1953). More recent investigations were undertaken by Peet (1968) and the author in 1975.

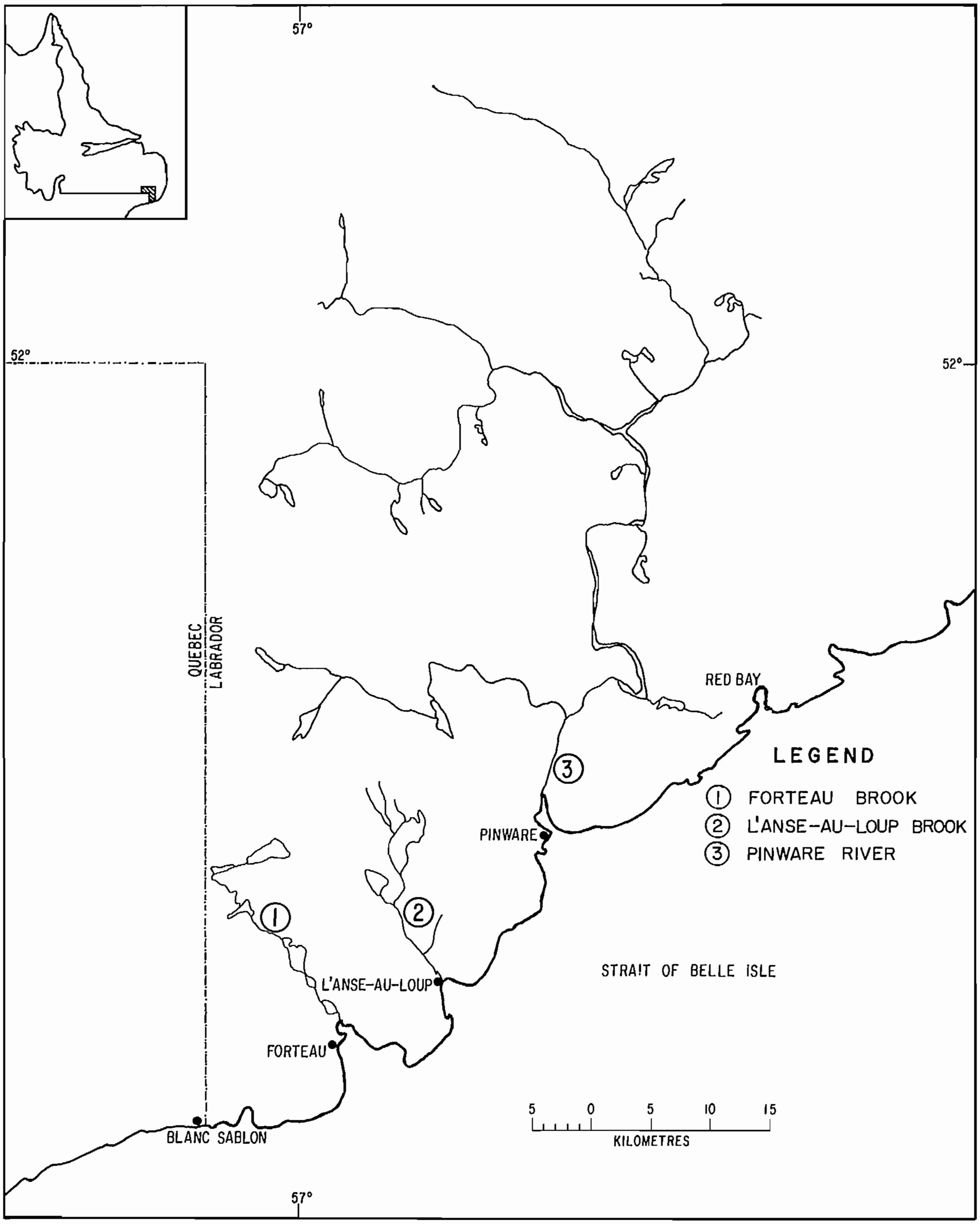

FIG. 2. Map of Region I, Strait of Belle Isle. Rivers are numbered for convenient location in the text.

Forteau Brook flows into Forteau Bay in the Strait of Belle Isle (Fig. 3). Near its mouth lies the community of Forteau, a fishing settlement with a population of 520 residents (Statistics Canada 1981).

Forteau Brook has a drainage basin of 389 km^2 and is fed by 35 tributaries (Table 6). The entire system contains numerous areas of standing water, with the first pond (L1), known as Hospital Pond, being a seaplane base. Upstream from Hospital Pond is Forteau Falls, the first barrier to fish migration on the river. Although this falls is over 12 m high, Peet (1968) reported that the gentle slope of 30° results in only a partial barrier to migrating fish (Table 7). Complete barriers are found at km 10.8 and km 13.4 of the main stem and on Tributary 7 (T7). Two water samples were collected from Forteau Brook in 1978 and results of the subsequent analyses are presented in Table 8 (Jamieson 1979).

Brook trout and Atlantic salmon are the most numerous fish species in Forteau Brook. Over 1300 sea-run brook trout were angled in 1969; in 1974, of the trout angled, five weighed more than 1.8 kg each (Table 9). Atlantic salmon from the anglers' catch were sampled in 1974, 1979, and 1980. The majority of these samples were grilse that had spent 4 years in freshwater before smoltification (Table 10). The salmon angling catch is summarized in Table 11. The mean catch per rod day of 0.50 for the years 1964–80 is relatively high when compared to the insular Newfoundland mean of 0.40 for the same period (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

The estimated potential production of adult salmon in accessible areas is 428 fish and in inaccessible areas, 329 (Table 12). However, the angling data indicate that production must be considerably higher (Table 11). As was pointed out in the Survey Methods section, the model used to estimate production was based on evaluating "classical" rearing area (boulder-rubble riffle only). A study by Pepper (1976), however, has shown that rearing habitat in ponds and lakes as well as in rivers may be used by salmon parr. The Forteau River system includes numerous ponds, and this, coupled with the high mineral content of the water, could explain the higher production not accounted for in the model. Studies on heavily fished Newfoundland rivers revealed an estimated harvest by anglers of greater than 25% of the upstream migrating adults. If 25% angler exploitation is applied to Forteau Brook, the calculated escapement to the river is about 2000 adult salmon. Thus, a more realistic estimate of production would be 5000 adult salmon.

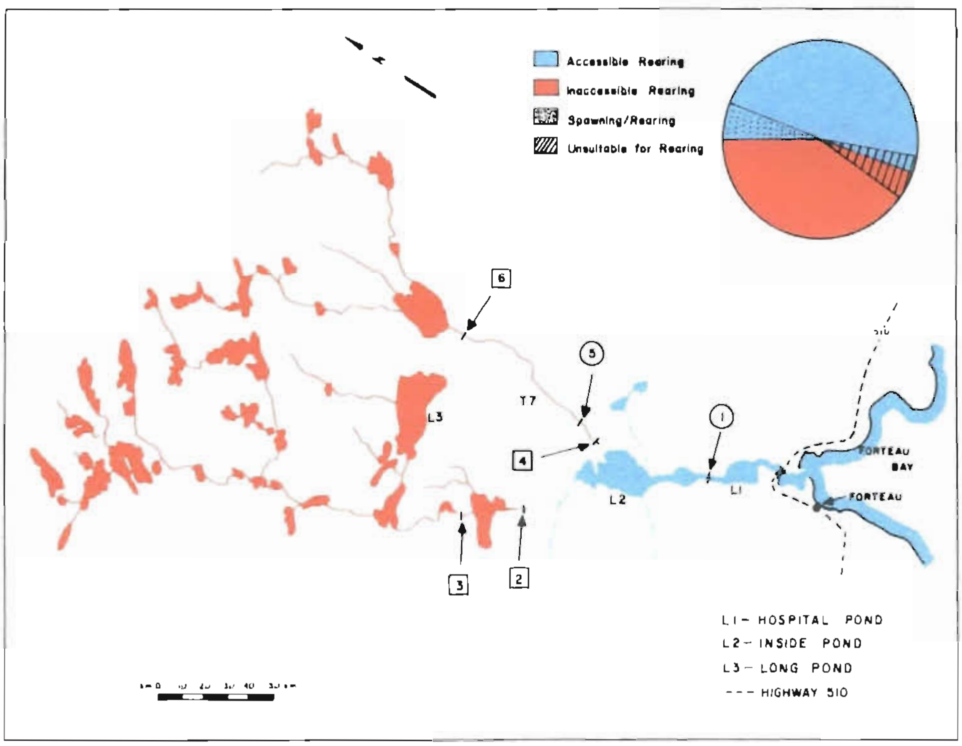

FIG. 3. Map of Forteau Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 6. Physical characteristics of Forteau Brook.

Map reference:	Blanc Sablon 12P 1 : 250 000	Maximum basin relief:	336 m
Mouth latitude:	51°29′N	Length by meander (main stem):	37 km
Mouth longitude:	56°58′W	Total length including tributaries:	198 km
General direction of flow:	Southeast	No. of tributaries:	35
Drainage area:	389 km²	Geological formation:	Cambrian sedimentary
Mean width	11 km		
Axial length	33 km		
Basin perimeter	93 km		

TABLE 7. Obstructions on Forteau Brook.

Fig. 3 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	3.6	Falls	12.1	—	30	Partial
2	Main stem	10.8	Falls	12.1	4.6	60	Complete
3	Main stem	13.4	Falls	6.1	—	90	Complete
4	T7	0.8	Falls	6.1	—	60	Complete
5	T7	1.4	Falls	2.4	—	—	Partial
6	T7	8.4	Falls	3.1	—	90	Complete

TABLE 8. Results of analyses of two water samples collected on Forteau Brook, 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1978	6.5	16.0	33.0	0.4	14.0	1.7	4.0	17.1
1978	6.6	20.0	39.0	0.4	16.0	2.5	4.5	18.5

TABLE 9. Summary of angling catches of sea-run and resident brook trout, Forteau Brook, 1969–75 (DFO, unpubl. data).

Year	Trout <0.9 kg	Trout 0.9–1.8 kg	Trout >1.8 kg	Total trout
1969	1315	15	0	1330
1970	966	12	0	978
1971	689	33	0	722
1972	520	13	1	534
1973	693	26	0	719
1974	824	20	5	849
1975	724	31	0	755
Mean	819	21	1	841

TABLE 10. Sex ratio (%F), age composition, weight, and fork length of Atlantic salmon collected from anglers' catch, 1974, 1979, and 1980, on Forteau Brook (DFO, unpubl. data).

	1-sea-winter								2-sea-winter							
	Female		Freshwater age		Weight (g)		Fork length (cm)		Female		Freshwater age		Weight (g)		Fork length (cm)	
Collection period	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*
July, Aug. 1974	60.0	5	3	5												
	89.7	39	4	39												
	91.7	24	5	24												
	0.0	1	6	1												
		69		69												
Mean	86.9		4.3													
July, Aug. 1979	66.7	3	3	3	1557	3	52.5	3			3					
	38.1	21	4	21	1774	21	54.2	21	0.0	1	4	1	4100	1	74.9	1
	50.0	4	5	4	1890	4	54.8	4			5					
		28		28		28		28		1		1		1		1
Mean	42.9		4.0		1769		54.1		0.0		4.0		4100		74.9	
July 1980	50.0	2	3	2	2000	2	57.5	2	100	2	3	2	4200	2	76.5	2
	78.7	47	4	47	1897	47	54.9	47	62.5	8	4	8	4000	8	71.9	8
	70.6	17	5	17	1903	17	55.0	17			5					
	100	2	6	2	1500	2	51.5	2			6					
		68		68		68		68		10		10		10		10
Mean	76.5		4.3		1890		54.9		70.0		3.8		4040		72.8	

TABLE 11. Summary of Atlantic salmon angling data, Forteau Brook, 1964–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Large salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1964	391	129	520	534	0.97
1965	336	84	420	737	0.57
1966	466	137	603	1065	0.57
1967	459	153	612	937	0.65
1968	568	118	686	898	0.76
1969	525	83	608	873	0.70
1970	629	13	642	1351	0.48
1971	342	24	366	703	0.52
1972	178	5	183	886	0.21
1973	472	20	492	1151	0.43
1974	258	14	272	785	0.35
1975	284	7	291	748	0.39
1976	818	19	837	1482	0.56
1977	612	32	644	1367	0.47
1978	164	19	183	925	0.20
1979	394	27	421	996	0.42
1980	339	31	370	799	0.46
Mean	426	54	479	955	0.50

TABLE 12. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Forteau Brook.

Location	Accessible areas		Inaccessible areas	
	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	124	1242	0	111
T7	37	184	0	986
Total	161	1426	0	1097
Estimated production[a]				
Smolt	2852		2194	
Adult	428		329	

[a]Underestimate; see text.

L'Anse-au-Loup Brook

This river flows into L'Anse-au-Loup Bay in the Strait of Belle Isle (Fig. 4). At the mouth of the river is the community of L'Anse-au-Loup, a fishing settlement of 589 people (Statistics Canada 1981).

The river flows through a valley bordered by rocky barren hills and has a drainage area of 130 km^2 (Table 13). The lower section meanders over gravel and sand substrate. At km 1.0, it narrows into a rapids that is a barrier to migrating fishes during periods of low water (Table 14). Complete barriers on the main stem are located at km 9.6 and km 10.6. Results of the analyses of a water sample taken in 1978 are presented in Table 15 (Jamieson 1979). Local DFO personnel reported that in 1969, a total of 1200 sea-run brook trout were angled in L'Anse-au-Loup Brook; in 1974 and 1975, catches of large trout were substantial (Table 16). This river is not scheduled for Atlantic salmon angling although there are a number of unpublished reports of a small run; in 1973, two grilse were angled (Moores et al. 1978). Illegal netting in the river has been curtailed since a seasonal fisheries warden was assigned to the area in the early 1960s. Subsequently, relatively large numbers of Atlantic salmon smolts have been reported each spring (Peet 1968). Based on a survey of the rearing area conducted by the author in 1975, L'Anse-au-Loup Brook should produce 281 adult salmon annually (Table 17).

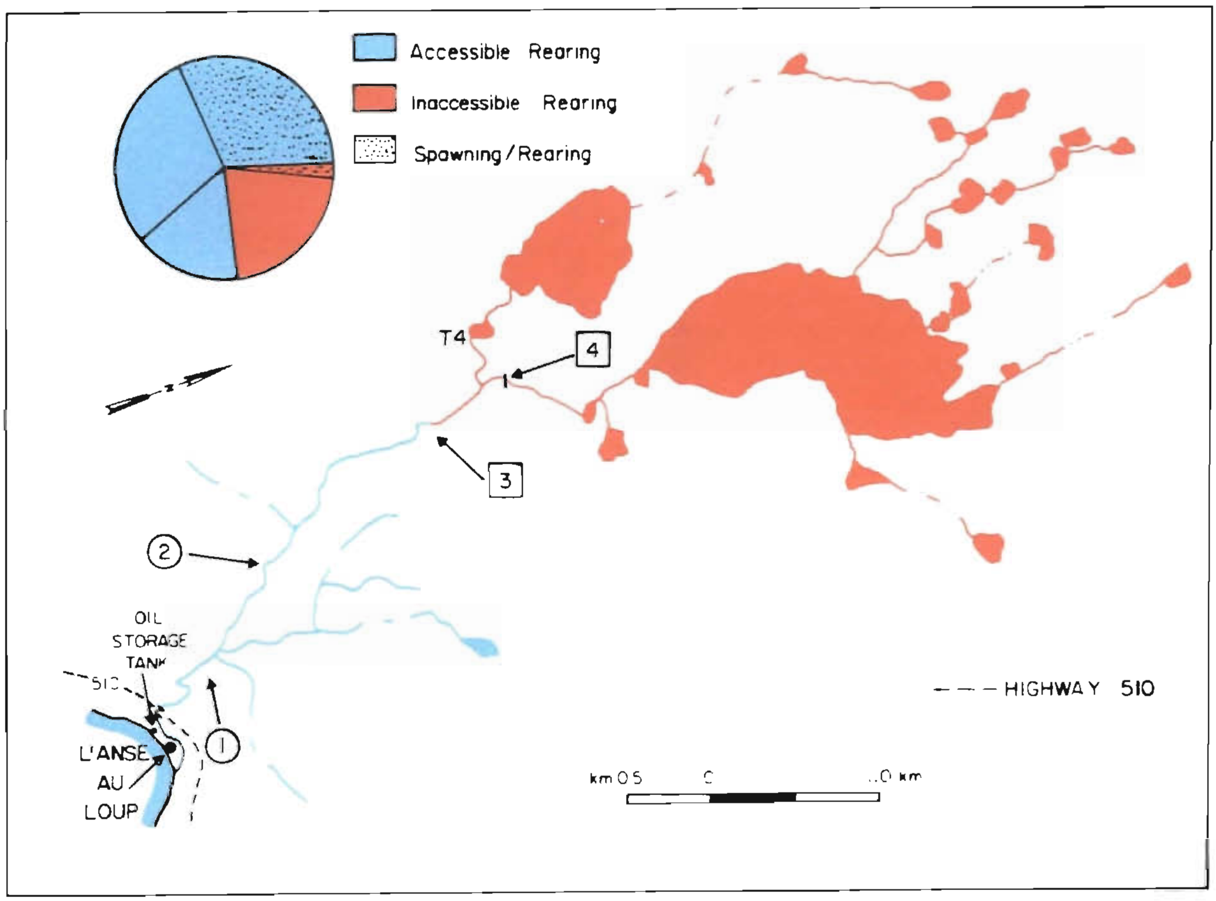

FIG. 4. Map of L'Anse-au-Loup Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 13. Physical characteristics of L'Anse-au-Loup Brook.

Map reference:	Blanc Sablon 12P 1 : 250 000	Maximum basin relief:	305 m
Mouth latitude:	51°32′N	Length by meander (main stem):	13 km
Mouth longitude:	56°49′W	Total length including tributaries:	37
General direction of flow:	Southeast	No. of tributaries:	11
Drainage area:	130 km²	Geological formation:	Cambrian and precambrian sedimentary
Mean width	7 km		
Axial length	23 km		
Basin perimeter	55 km		

TABLE 14. Obstructions on L'Anse-au-Loup Brook.

Fig. 4 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	1.0	Rapids	15.2	70.0	30	Partial
2	Main stem	5.8	Falls	4.9	—	55	Partial
3	Main stem	9.6	Falls	4.6	6.1	90	Complete
4	Main stem	10.6	Falls	15.2	—	90	Complete

TABLE 15. Results of analyses of a water sample collected on L'Anse-au-Loup Brook, 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1978	6.7	26.0	49.0	0.6	20.0	3.0	6.0	24.4

TABLE 16. Summary of angling catches of sea-run and resident brook trout, L'Anse-au-Loup Brook, 1969–75 (DFO, unpubl. data).

Year	Trout <0.9 kg	Trout 0.9–1.8 kg	Trout >1.8 kg	Total trout
1969	1000	200	0	1200
1970	—	—	—	—
1971	238	0	0	238
1972	292	14	0	306
1973	390	115	0	505
1974	439	223	25	687
1975	615	280	78	973
Mean	496	139	17	652

TABLE 17. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in L'Anse-au-Loup Brook.

Location	Accessible areas		Inaccessible areas	
	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	484	936	19	290
T4	0	0	0	69
Total	484	936	19	359
Estimated production				
Smolt	1872		718	
Adult	281		108	

This river flows through Pinware, a fishing settlement of 201 residents (Statistics Canada 1981) and enters Pinware Bay in the Strait of Belle Isle (Fig. 5). Hydroelectric surveys have identified the potential of Pinware River to be 120 MW, equivalent to either Piper's Hole or Cat Arm rivers in insular Newfoundland (Millan 1974).

Pinware River is the largest river in the region, having a drainage basin of 2486 km^2 (Table 18). The results of the analyses of 11 water samples collected in 1978 (Jamieson 1979) are presented in Table 19. The lower river is wide and swift-flowing, emptying into a shallow estuary at the mouth. The first tributary (T1), Trout Stream, flows into this estuary and is reported to have a small run of salmon (Peet 1968). A bridge crosses the river 9 km from the mouth, and 1 km above the bridge, Western Waters (T8) enters the river. Western Waters is obstructed near its mouth by a 9.1 m high falls, with additional obstructions occurring farther upstream (Table 20). The main stem of the river, upstream from its confluence with Western Waters, is known locally as County Cat River and is accessible to migrating fish as far as km 49.0. At that point a waterfalls, 6.1 m in height, blocks further upstream migration. Peet (1971) located potential spawning areas for Atlantic salmon above this falls and a survey of rearing area by the author in 1975 indicated the accessible areas had an estimated adult production of about 14 000 fish (Table 21). Inaccessible areas were estimated to have the potential to produce about 3200 adult fish.

Atlantic salmon, brook trout, and American eels are the most common indigenous fish species reported in Pinware River by local DFO personnel. In 1974 and 1980, the Atlantic salmon angling catches were sampled. Also, in 1980, a DFO angling survey for juvenile salmon was conducted. The majority of grilse sampled were male and over 80% of large salmon sampled were female (Table 22). Captured juvenile salmon ranged in age from 1 to 4 years with a mean age of 2.5 years. Returning adults enter the river from mid-June to early September, with the main run occurring in July. Due to the large number of fish taken and the high ratio of large salmon to grilse in the catch, the river is world-famous for its salmon angling. The best angling occurs in the lower gorge area near the bridge where several sports angling camps are located. The mean Atlantic salmon angling catch for the years 1964–80 is 985 fish, of which 25% are large salmon (Table 23). Catch and effort increased steadily from 1964 to 1977, but since 1978, there have been decreases in catch and effort. These decreases could be due to either the reduced length of the fishing season imposed in 1978 (Chadwick et al. 1978), a poor year-class or overexploitation of the stock. Angling for both sea-run and resident brook trout is good in May and June with total catches exceeding 1500 fish in recent years (Table 24).

TABLE 18. Physical characteristics of Pinware River.

Map reference:	Blanc Sablon 12P 1 : 250 000	Maximum basin relief:	427 m
Mouth latitude:	51°39′N	Length by meander (main stem):	97 km
Mouth longitude:	56°42′W		
General direction of flow:	South	Total length including tributaries:	579 km
Drainage area:	2486 km^2	No. of tributaries:	50
Mean width	36 km	Geological formation:	Precambrian and metamorphic rock
Axial length	71 km		
Basin perimeter	274 km		

TABLE 19. Results of analyses of 11 water samples collected on Pinware River, 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm^{-1} at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1978[a]	6.8	6.0	16.0	0.6	2.0	2.0	0.7	2.4
1978[b]	6.7	5.0	14.0	0.6	1.0	2.0	0.5	1.2

[a]One sample.
[b]Mean of 10 samples.

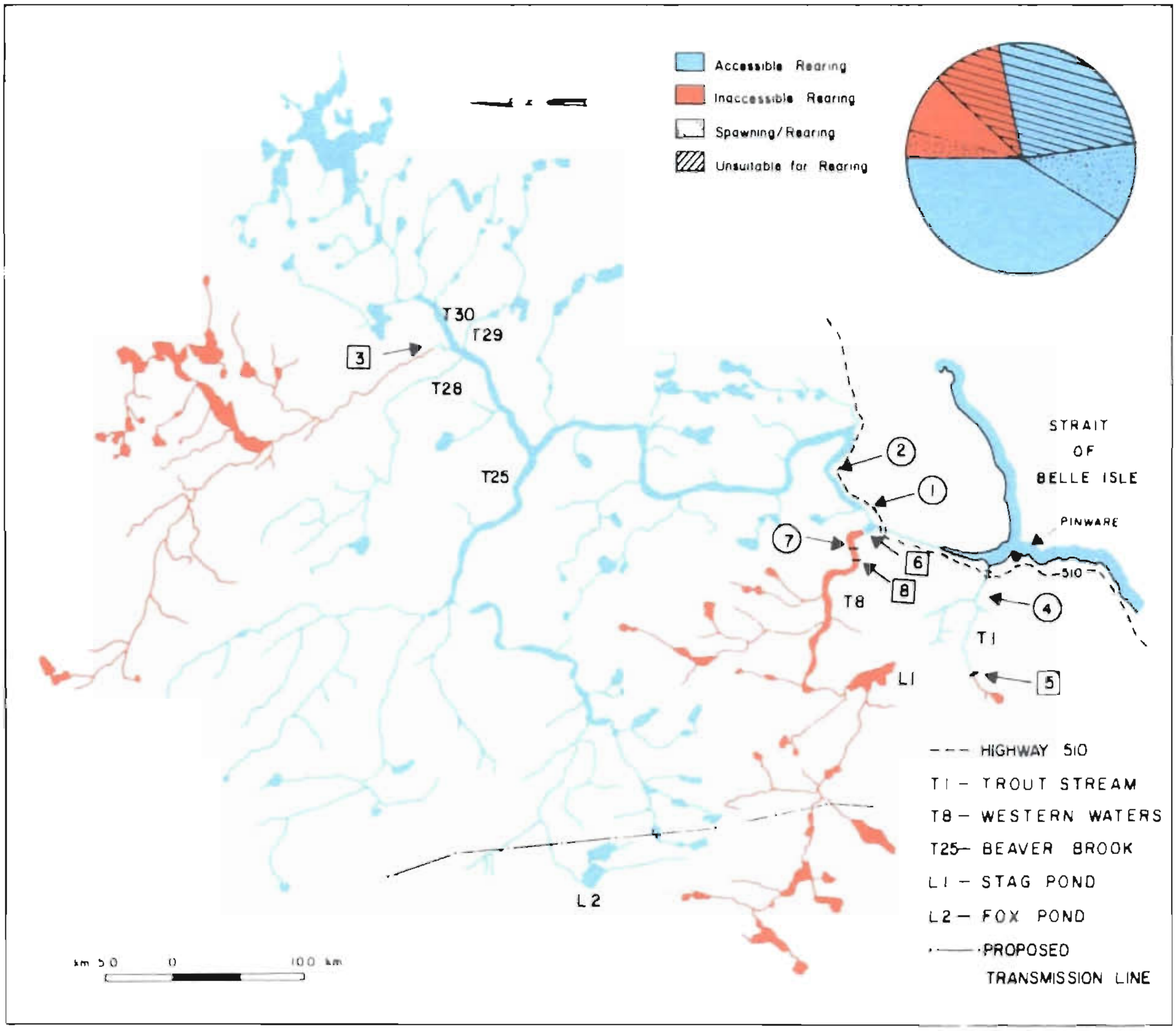

FIG. 5. Map of Pinware River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 20. Obstructions on Pinware River.

Fig. 5 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Description: Width (m)	Description: Slope (°)	Barrier to fish passage
1	Main stem	3.8	Falls	2.7	—	90	Partial
2	Main stem	7.9	Rapids	—	3.0	—	Partial
3	Main stem	49.0	Falls	6.1	6.1	90	Complete
4	T1	1.4	Falls	2.4	—	90	Partial
5	T1	7.0	Falls	7.6	—	90	Complete
6	T8	0.7	Falls	9.1	6.1	90	Complete
7	T8	2.8	Rapids	—	—	—	Partial
8	T8	3.5	Falls	9.1	—	90	Complete

TABLE 21. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Pinware River.

Location	Accessible areas		Inaccessible areas	
	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	4 642	23 246	0	385
T1	361	529	0	0
T8	42	210	3 499	10 423
T25	2 443	17 358	0	0
T28	322	1 022	0	0
T29	0	504	0	0
T30	1 915	3 822	0	0
Total	9 725	46 691	3 499	10 808
Estimated production				
Smolt	93 382		21 616	
Adult	14 007		3 242	

TABLE 22. Sex ratio (%F), age composition, weight, and fork length of Atlantic salmon collected from anglers' catch July and August 1974 and July 1980 and from DFO juvenile salmon angling survey August 1980 on Pinware River (DFO, unpubl. data).

	Juveniles								1-sea-winter								≧2-sea-winter							
	Female		Fresh-water age		Weight (g)		Fork length (cm)		Female		Fresh-water age		Weight (g)		Fork length (cm)		Female		Fresh-water age		Weight (g)		Fork length (cm)	
Collection period	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*
July, Aug. 1974									0.0	3	3	3					75.0	4	3	4				
									4.4	45	4	45					82.4	34	4	34				
									15.6	64	5	64					76.0	25	5	25				
									12.5	8	6	8					100	4	6	4				
										120		120						67		67				
Mean									10.8		4.6						80.6		4.4					
July 1980									42.9	7	3	7	1819	11	53.0	10	71.4	7	3	7	4894	8	77.4	8
									47.1	53	4	53	1846	77	54.6	76	88.2	17	4	17	4517	21	72.3	21
									55.6	9	5	9	2147	13	56.3	12	71.4	7	5	7	4810	7	72.4	5
										69		69		101		98		31		31		36		34
Mean									47.8		4.0		1882		54.6		80.6		4.0		4658		73.5	
Aug. 1980	0.0	1	1	1	6.0	1	8.2	1																
	54.6	44	2	44	16.0	44	10.9	44																
	38.1	21	3	21	34.8	21	14.3	21																
	62.5	8	4	8	49.3	8	16.0	8																
		74		74		74		74																
Mean	50.0		2.5		24.8		12.4																	

TABLE 23. Summary of Atlantic salmon angling data, Pinware River, 1964–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Large salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1964	443	206	649	672	0.97
1965	465	307	772	859	0.90
1966	871	207	1078	1274	0.85
1967	662	241	903	964	0.94
1968	1077	238	1315	1335	0.99
1969	740	190	930	1154	0.81
1970	937	308	1245	1207	1.03
1971	585	223	808	1556	0.52
1972	245	75	320	1471	0.22
1973	957	412	1369	1738	0.79
1974	482	277	759	1928	0.39
1975	785	147	932	1432	0.65
1976	1680	291	1971	2414	0.82
1977	1050	561	1611	2551	0.63
1978	409	164	573	1488	0.39
1979	507	92	599	1153	0.52
1980	599	306	905	1677	0.54
Mean	735	250	985	1463	0.67

TABLE 24. Summary of angling catches of sea-run and resident brook trout in Pinware River, 1969–75 (DFO, unpubl. data).

Year	Trout <0.9 kg	Trout 0.9–1.8 kg	Trout >1.8 kg	Total trout
1969	584	74	0	658
1970	456	137	0	593
1971	576	41	1	618
1972	519	22	0	541
1973	483	273	10	766
1974	775	576	262	1613
1975	2274	445	192	2911
Mean	810	224	66	1100

REGION II
SOUTHERN REGION

The coastal boundary of the Southern Labrador Region stretches from a point 20 km north of the community of Red Bay to Groswater Bay, a distance of approximately 300 km (Fig. 6). The mainstay of the region has always been fishing, and small settlements are scattered throughout the hundreds of bays and islands. Many of these settlements are seasonal, with residents returning to the larger centres such as Mary's Harbour, Black Tickle, and Cartwright after the fall fishing season. The tremendous cod fishery in this region from the 18th to the early 20th century attracted fishermen from all over insular Newfoundland but, today, after repeated failures, only a handful of fishing boats sail to the area. The failures in the cod fishery resulted in increased fishing effort toward salmon, which has proved to be a very lucrative venture. The catch per year in the region, from 1975 to 1977 was approximately 475 000 kg. With the increase in value ($3.50/kg in 1977), both the coastal residents and the seasonal fishermen from insular Newfoundland earn relatively high wages over the short fishing season.

The rocks of the region are principally granite with gneiss and paragneiss scattered throughout (Sutton 1972). These slow-weathering rocks are covered by extensive glacial deposits which form the rolling hills in this generally low-lying region. These mineral-rich deposits produce excellent growing conditions for balsam fir and black spruce in the interior of the region (Wilton 1965). Lichens predominate where forest fires have occurred (Lopoukhine et al. 1978). The coastline is barren, with bedrock outcrops alternating with stunted shrub growth.

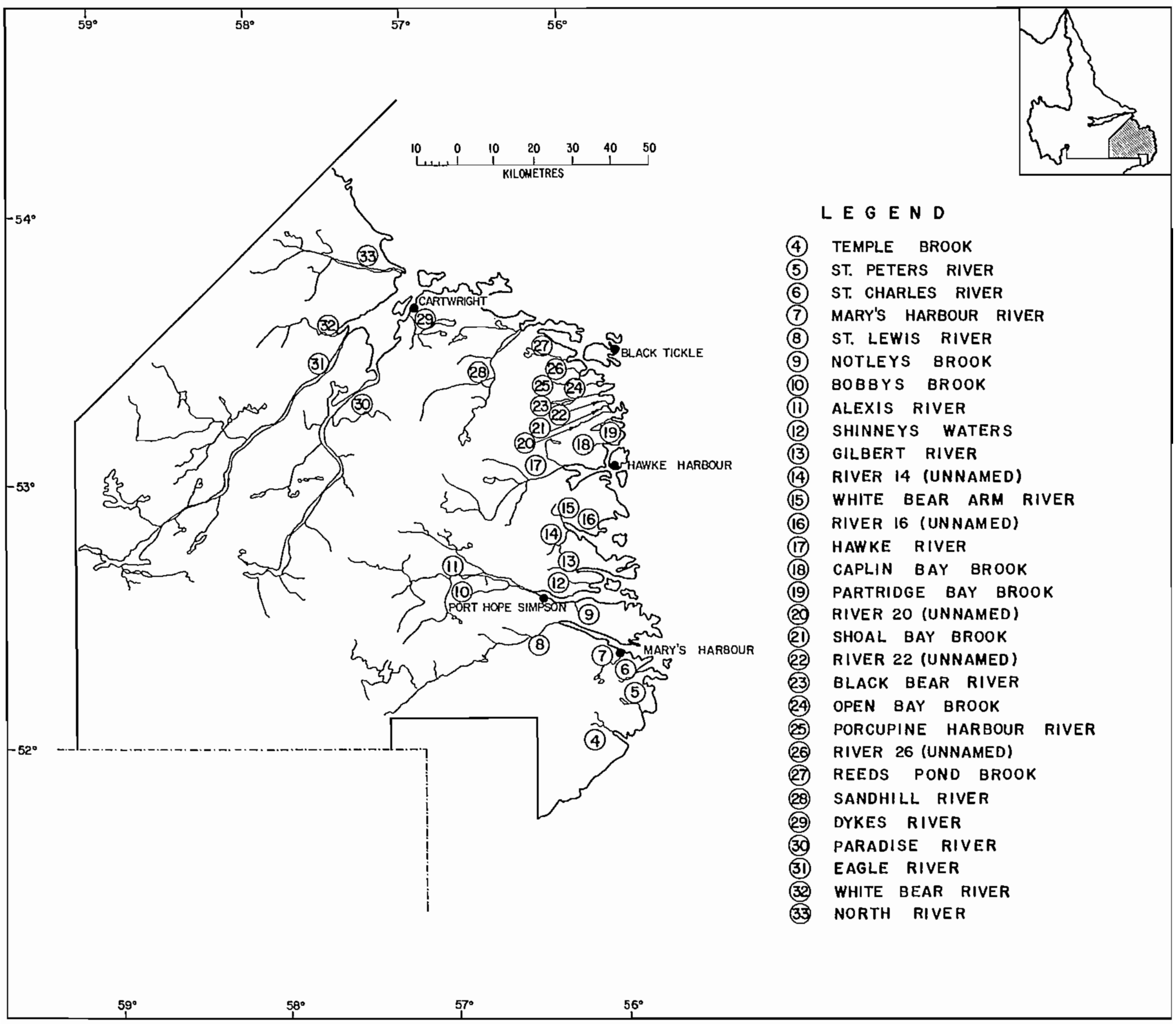

FIG. 6. Map of Region II, Southern Labrador. Rivers are numbered for convenient location in the text.

This region contains several of the larger rivers in Labrador; the hydroelectric potential of five of these has been assessed (Millan 1974). Altantic salmon and brook trout are the major species present, although Arctic char is plentiful in some areas. Other species reported include longnose sucker, white sucker, threespine and ninespine stickleback, American eel, northern pike, American shad, alewife, rainbow smelt, and Atlantic tomcod. A sea lamprey was collected in the region in 1971. Sports angling camps for Atlantic salmon and brook trout, accessible only by float plane, are located throughout the region. These camps usually offer excellent angling and often provide the only reports on catch and effort for isolated rivers.

Temple Brook

No. 4, Fig. 6

Temple Brook flows in a southeasterly direction and empties into Temple Bay (Fig. 7). The isolated fishing settlement of Henley Harbour is located 6 km from the mouth of the brook. Temple Brook has a drainage area of 181 km^2 (Table 25), and except for the evergreen trees lining the riverbanks, flows over a barren plateau. Partial barriers to fish migration are found throughout the main stem and second tributary. The only complete barrier is located on a branch of the second tributary (Table 26).

Brook trout and landlocked Atlantic salmon (ouananiche) are reported in Temple Brook. There is an excellent commercial salmon fishery in Chateau Bay; however, Peet (1968) suggested that most of these salmon probably come from rivers north or south of Temple Brook. This fact is further substantiated by T. Curran (pers. comm.) who points out that this fishery is mainly a "headland" fishery which may take not only salmon produced by Labrador rivers but also fish migrating to the rivers of other Canadian provinces. There are no reports of angling on Temple Brook; it is suspected that that river supports a small run of salmon. From a survey by the author in 1975, it was estimated that Temple Brook has the potential to produce 4622 smolts; subsequent sea survival should allow 693 adults to return (Table 27).

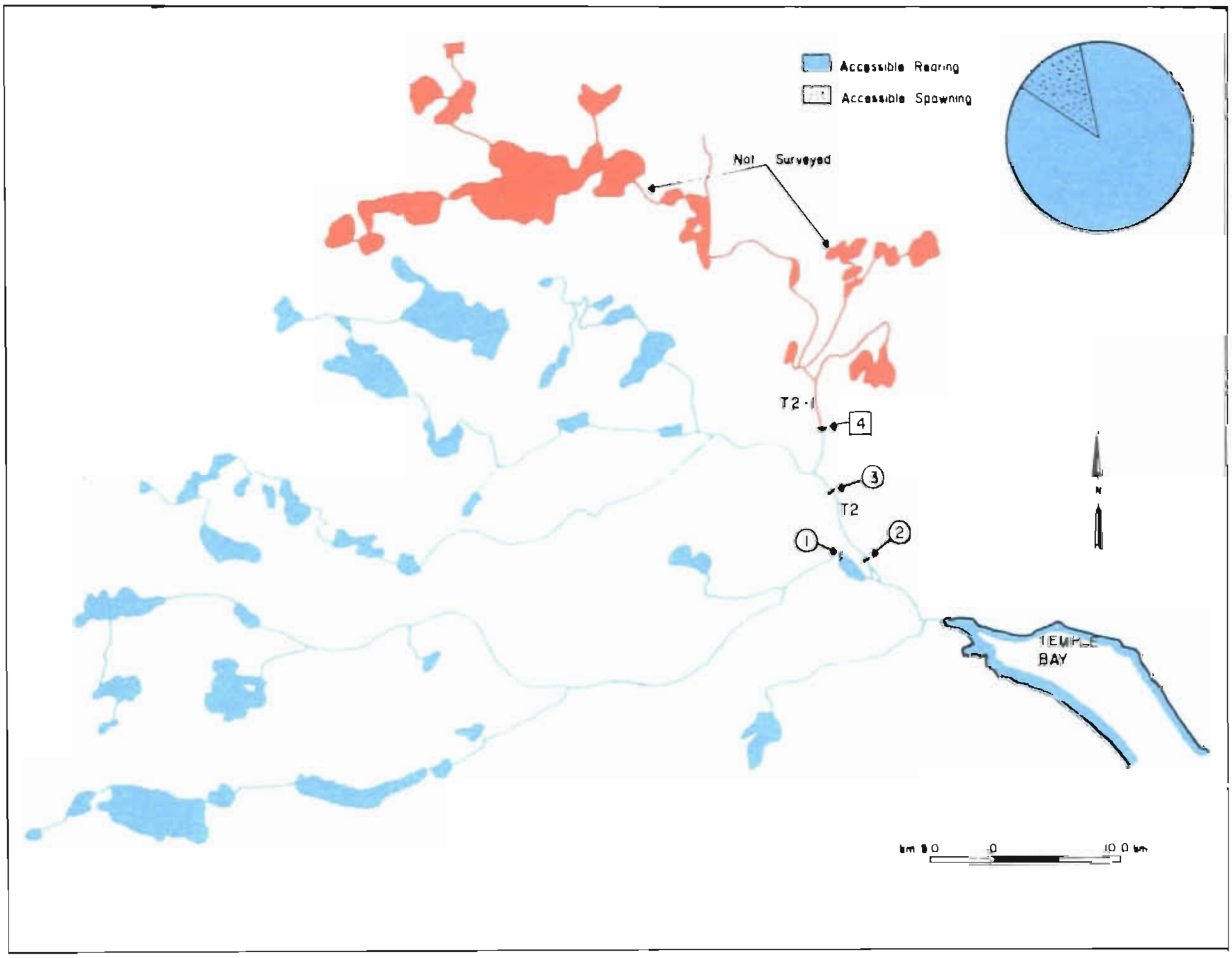

FIG. 7. Map of Temple Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 25. Physical characteristics of Temple Brook.

Map reference:	Battle Harbour 13A, 3D 1 : 250 000	Maximum basin relief:	305 m
		Length by meander (main stem):	19 km
Mouth latitude:	52°02′N		
Mouth longitude:	55°59′W	Total length including tributaries:	55 km
General direction of flow:	Southeast	No. of tributaries:	7
Drainage area:	181 km²		
Mean width	11 km	Geological formation:	Precambrian metamorphic
Axial length	19 km		
Basin perimeter	61 km		

TABLE 26. Obstructions on Temple Brook.

Fig. 7 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	2.3	Falls	2.4	1.2	80	Partial
2	T2	0.2	Falls	6.1	—	30	Partial
3	T2	1.7	Rapids(2)	—	—	—	Partial
4	T2-1	1.1	Falls	6.1	—	90	Complete

TABLE 27. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Temple Brook.

Location	Accessible areas: Spawning units	Rearing units
Main stem	207	1249
T2	86	1062
Total	293	2311
Estimated production		
Smolt	4622	
Adult	693	

St. Peters River flows easterly, emptying into St. Peters Bay (Fig. 8). The headwaters of the river flow through mature stands of black spruce and balsam fir; in the lower sections coastal tundra dominates. The drainage area of 140 km^2 contains one relatively large area of standing water (L1) known as St. Peters Pond (Table 28). Complete barriers to fish migration are located on the main stem at km 2.2 and km 8.6 (Table 29); there are no obstructions on any of the eight tributaries. The results of the analyses of a water sample collected in 1976 by Jamieson (1979) are presented in Table 30.

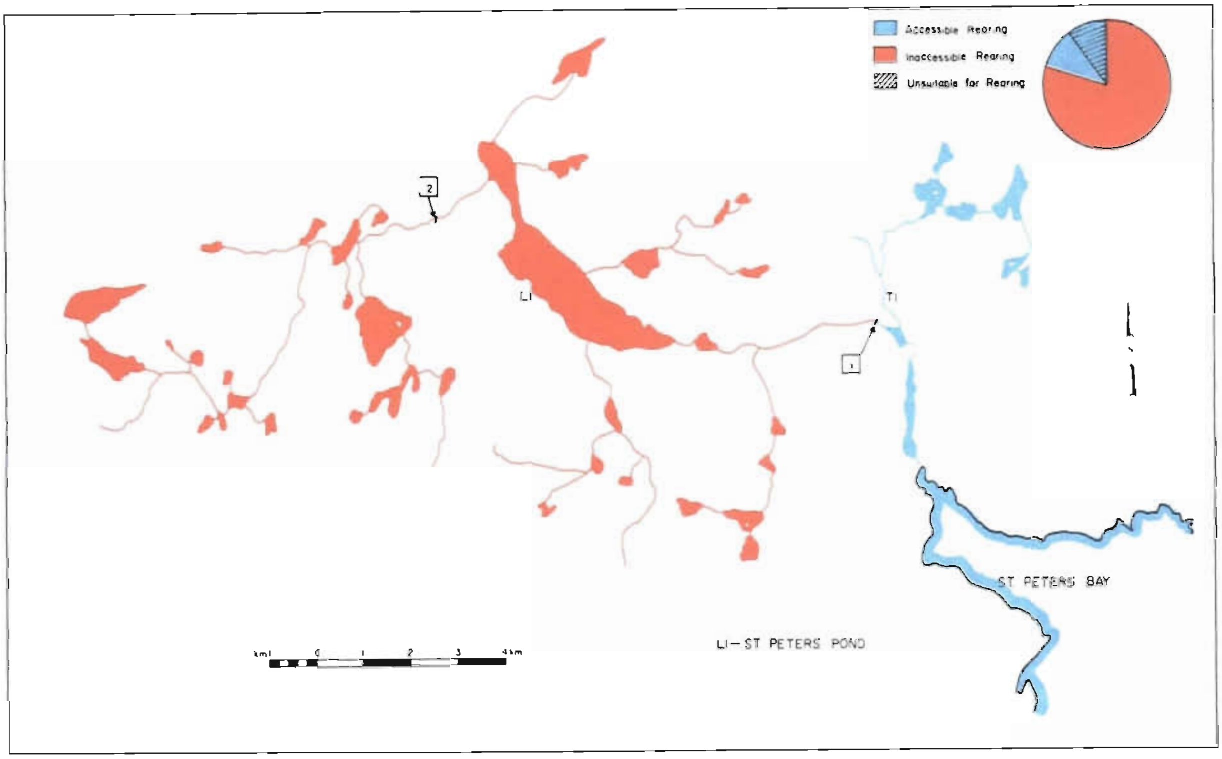

FIG. 8. Map of St. Peters River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 28. Physical characteristics of St. Peters River.

Map reference:	Battle Harbour 13A, 3D 1 : 250 000	Maximum basin relief:	214 m
		Length by meander (main stem):	23 km
Mouth latitude:	52°06′N		
Mouth longitude:	55°48′W	Total length including tributaries:	61 km
General direction of flow:	Southeast	No. of tributaries:	8
Drainage area:	140 km^2	Area of lakes > 100 ha:	
Mean width	7 km	L1 St. Peters Pond	360 ha
Axial length	18 km		
Basin perimeter	52 km	Geological formation:	Gneiss

No fish species have been reported in St. Peters River, although brook trout are almost certain to occur there. This system could possibly support a small run of Atlantic salmon. From a survey conducted by the author in 1975, the annual potential production of adult salmon from the accessible areas was estimated to be 20 fish (Table 31).

TABLE 29. Obstructions on St. Peters River.

Fig. 8 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Description: Width (m)	Description: Slope (°)	Barrier to fish passage
1	Main stem	2.2	Falls	4.6	—	90	Complete
2	Main stem	8.6	Falls	6.1	—	90	Complete

TABLE 30. Results of analyses of one water sample collected on St. Peters River, 1976 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1976	6.3	6.0	22.0	0.7	4.0	1.1	2.0	4.9

TABLE 31. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in St. Peters River.

Location	Accessible areas: Spawning units	Accessible areas: Rearing units	Inaccessible areas: Spawning units	Inaccessible areas: Rearing units
Main stem	0	30	0	510
T1	0	35	0	0
Total	0	65	0	510
Estimated production				
Smolt	130		1020	
Adult	20		153	

St. Charles River flows easterly, emptying into Lodge Inlet (Fig. 9). At the river mouth is the community of Lodge, a small settlement used as a winter residence by fishermen and their families. An 8-km trail connects the community of Lodge with Mary's Harbour.

Several lakes have been formed among the densely-forested, rolling hills in the headwaters. The lower river is wide and from Lodge Pond (L1) to the mouth the riverbanks have good tree cover although fires have partially destroyed some of the forest in this area. The watershed covers an area of 311 km^2 and is drained by the main stem and 13 tributaries (Table 32). Only one partial obstruction to migrating fishes, a rapids at km 15.2 on the main stem, is present (Table 33).

Because of its isolation and abandonment during the summer months very little angling occurs on St. Charles River, although in 1966, five Arctic char, three sea-run brook trout, and one Atlantic salmon were caught (Peet 1968). Peet (1968) provided a list of species based on results from a counting fence operation in 1966 (see Table 34). The fence, situated 100 m from the river mouth, was operated during June and July. Sixty-four fish were trapped moving downstream (Table 35) and 1002 were trapped moving upstream (Table 36). The distribution of fork length (cm), round weight (g), and age (years) of a sample of 24 upstream migrating Atlantic salmon is given in Table 37 Distributions of fork length (cm), round weight (g), and age (years) of upstream migrating Arctic char are found in Tables 38 and 39. This counting fence operation was the first monitoring of fish migrations reported in southern Labrador. The author completed an aerial survey of a juvenile salmon rearing area in 1975; Table 40 shows the estimated annual salmon production based on that survey.

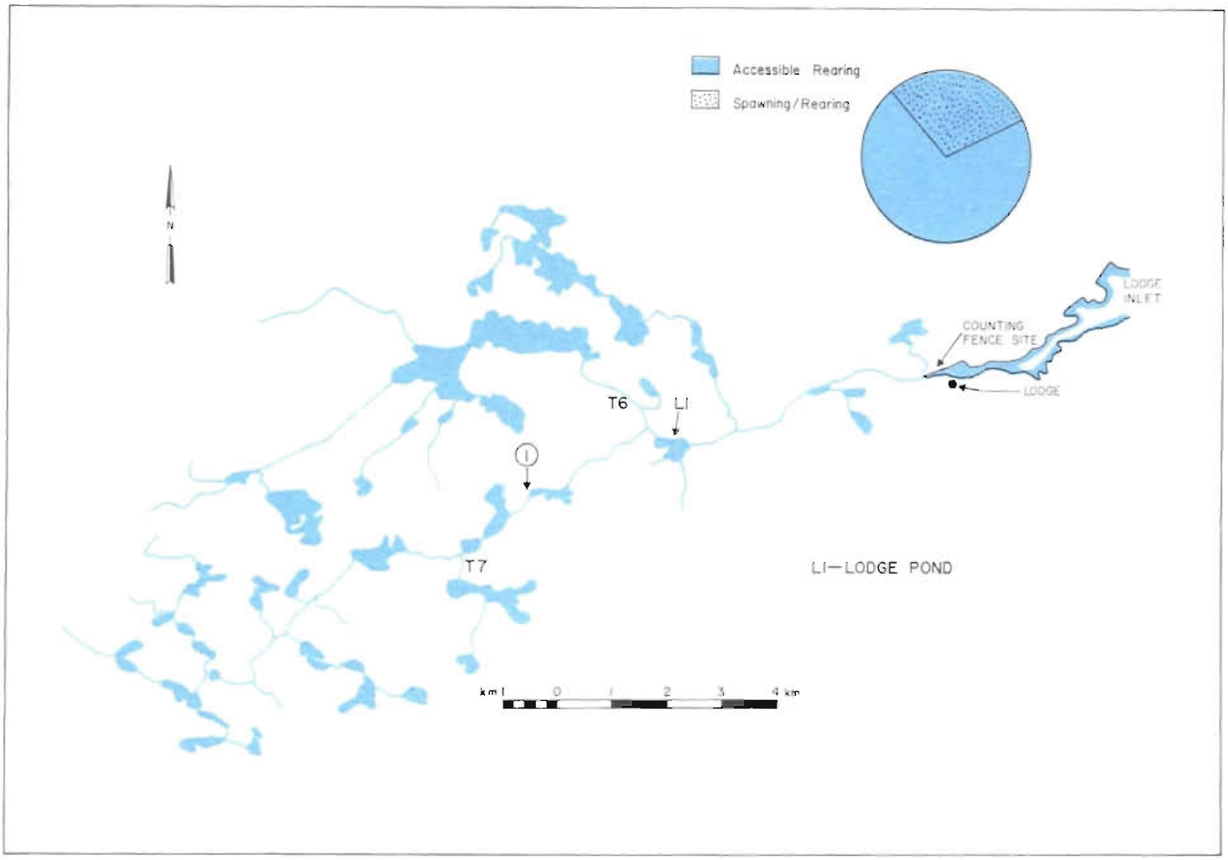

FIG. 9. Map of St. Charles River showing accessible Atlantic salmon parr rearing areas.

TABLE 32. Physical characteristics of St. Charles River.

Map reference:	Battle Harbour 13A, 3D 1 : 250 000	Maximum basin relief:	305 m
		Length by meander (main stem):	45 km
Mouth latitude:	52°15′N		
Mouth longitude:	55°46′W	Total length including tributaries:	145 km
General direction of flow:	East	No. of tributaries:	13
Drainage area:	311 km²	Geological formation:	Precambrian metamorphic
Mean width	9 km		
Axial length	32 km		
Basin perimeter	101 km		

TABLE 33. Obstructions on St. Charles River.

Fig. 9 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	15.2	Rapids	—	—	—	Partial

TABLE 34. List and status[a] of fish species present in St. Charles River (Peet 1968).

Fish species	Common name	Status in system
Alosa pseudoharengus	Alewife	RU
Salmo salar	Atlantic salmon	CI
Salvelinus alpinus	Arctic char	CI
Salvelinus fontinalis	Brook trout	CI
Anguilla rostrata	American eel	CI
Gasterosteus aculeatus	Threespine stickleback	CI

[a] Status in system refers to presence i.e. rare (R) or common (C), and natal origin, i.e. indigenous (I) or of unknown origin (U).

TABLE 35. Weekly counts of downstream fish migration, St. Charles River, 1966. Trap located 100 m from mouth (Peet 1968).

Week ending	Atlantic salmon Smolt	Atlantic salmon Parr	Brook trout	Arctic char	Alewife	Threespine stickleback	Total fish	Mean water temp. (°C)	Mean water height (m)
26 June	14	4	2	0	0	17	37	12.5	—
03 July[a]	8	2	0	0	1	0	11	18.4	0.79
10 July	8	6	0	0	0	0	14	16.4	0.77
17 July	0	0	0	2	0	0	2	19.0	0.73
24 July	0	0	0	0	0	0	0	17.5	0.70
Total	30	12	2	2	1	17	64		

[a]Fence completed 28 June.

TABLE 36. Weekly counts of upstream fish migration, St. Charles River, 1966. Trap located 100 m from mouth (Peet 1968).

Week ending	Atlantic salmon <2.7 kg	Atlantic salmon ≥2.7 kg	Arctic char	Brook trout	Alewife	American eel	Total fish	Mean water temp. (°C)	Mean water height (m)
03 July[a]	0	0	1	16	2	0	19	18.4	0.79
10 July	5	4	156	26	0	1	192	16.4	0.77
17 July	7	1	426	25	0	0	459	19.0	0.73
24 July	13	0	291	28	0	0	332	17.5	0.70
Total	25	5	874	95	2	1	1002		

[a] Fence completed 28 June.

TABLE 37. Distribution of fork length, round weight, and age of upstream migrating Atlantic salmon, St. Charles River, 1966 (Peet 1968).

Fork length (cm)	Round weight (g)	Age (yr)[a]
48.2	1406.2	5:1
48.9	1451.5	5:1
49.8	1134.0	—
49.8	1451.5	5:1
50.1	1496.9	5:1
50.5	1678.3	5:1
50.5	1723.7	5:1
50.6	1587.6	5:1
51.1	1406.2	—
51.2	1587.6	5:1
51.3	1769.0	5:1
51.5	1270.1	5:1
52.0	1859.8	5:1
52.5	1587.6	5:1
52.5	2041.2	5:1
53.5	1633.0	5:1
53.5	1723.7	5:1
53.5	1769.0	—
53.5	1859.8	5:1
54.3	1678.3	—
55.4	2540.2	—
70.2	3492.7	5:1,1
70.2	3855.6	4:1,1
71.1	4581.4	5:1,1
No. = 21 grilse, 3 large salmon	Mean round weight = 1941.0 g	
Mean fork length = 54.0 cm	Mean age = 5:1	

[a] For explanation of notation see Glossary.

TABLE 38. Distribution of fork length and weight of upstream migrating Arctic char, St. Charles River, 1966 (Peet 1968).

Length		Round weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
23.95–26.94	3	0.00–324.94	2
26.95–29.94	12	324.95–649.94	101
29.95–32.94	36	649.95–974.94	138
32.95–35.94	51	974.95–1299.94	108
35.95–38.94	74	1299.95–1624.94	78
38.95–41.94	99	1624.95–1949.94	74
41.95–44.94	73	1949.95–2274.94	70
44.95–47.94	74	2274.95–2599.94	47
47.95–50.94	94	2599.95–2924.94	35
50.95–53.94	74	2924.95–3249.94	18
53.95–56.94	58	3249.95–3574.94	7
56.95–59.94	19	3574.95–3899.94	9
59.95–62.94	17	3899.95–4224.94	3
62.95–65.94	7	4224.95–4549.94	3
65.95–68.94	2	4549.95–4874.94	0
68.95–71.94	1	4874.95–5199.94	1
Total	694		694

TABLE 39. Distribution of age by fork length of upstream migrating Arctic char, St. Charles River, 1966 (Peet 1968).

Class boundaries	Age (yr)									
fork length (cm)	2+	3+	4+	5+	6+	7+	8+	9+	10+	Total
23.95–26.94			1	1						2
26.95–29.94			1	1	3					5
29.95–32.94			2	12	3					17
32.95–35.94			2	12	8	1				23
35.95–38.94				6	6	3				15
38.95–41.94				1	9	1				11
41.95–44.94				4	5	6	1			16
44.95–47.94					5	3				8
47.95–50.94					2	9	3			14
50.95–53.94					2	6	5			13
53.95–56.94						4	2			6
56.95–59.94						2	3			5
59.95–62.94						1		1		2
62.95–65.94							1			1
65.95–68.94										0
68.95–71.94								1		1
Total			6	37	43	36	15	2		139
Mean age (yr) = 6.2										

TABLE 40. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in St. Charles River. No inaccessible areas were identified.

Location	Accessible areas: Spawning units	Accessible areas: Rearing units
Main stem	1 802	5 265
T6	0	912
T7	0	60
Total	1 802	6 237
Estimated production		
Smolt	12 474	
Adult	1 871	

Mary's Harbour River (St. Mary's River, Trout River), flows easterly and empties into St. Lewis Sound (Fig. 10). This river has a drainage area of 414 km^2 (Table 41) and Peet (1968, 1971) classified it in two different sections: the upper area containing large lakes lying in well-wooded basins surrounded by low rolling hills, and the lower section flowing through barren hills that have been completely denuded of trees and scrub by fires. A rapids at the river mouth, known as Steeles Rapids, is a partial barrier to migrating fish; obstructions at km 2.6 (White Rock Falls) and km 10.0 cause lengthy delays in migration during periods of low water (Table 42).

Atlantic salmon, Arctic char, brook trout, and threespine sticklebacks are reported in Mary's Harbour River. Backus (1957) reported that each of these species was collected during the *Blue Dolphin* Labrador expeditions of 1949 and 1950 (Table 43). Blair (1943) stated that the salmon run, composed mainly of grilse, occurred from late July to the end of August. Angling pressure is light as the river is not accessible by road; anglers using aircraft charters usually fly to the larger rivers north of Mary's Harbour. The mean catch of Atlantic salmon per rod day, from 1970 to 1980, was 0.83 (Table 44). This is high even when compared to other Labrador rivers. Sollows et al. (1953) also reported excellent trout fishing, with 10 rods reported to have landed 145 sea-run brook trout in 4 hours. Based on the angling data, Peet (1968) estimated the annual Atlantic salmon escapement to Mary's Harbour River to be between 2700 and 4000 fish. A later survey of available rearing area by the author in 1975 estimated the potential adult production at about 1950 fish (Table 45). Both estimates indicate that this relatively unexploited river either has or should have a substantial Atlantic salmon population.

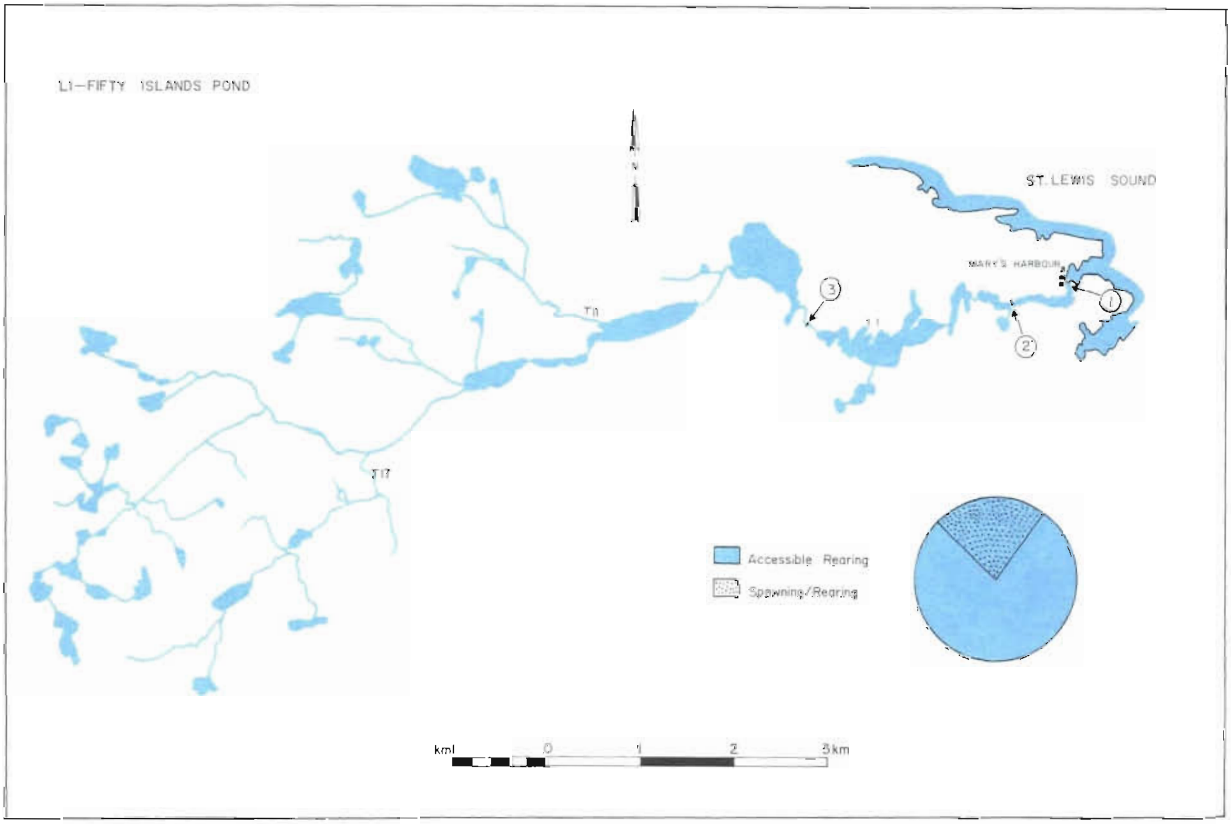

FIG. 10. Map of Mary's Harbour River showing accessible Atlantic salmon parr rearing areas.

TABLE 41. Physical characteristics of Mary's Harbour River (St. Mary's River, Trout River).

Map reference:	Battle Harbour 13A, 3D 1 : 250 000	Maximum basin relief:	305 m
Mouth latitude:	52°18′N	Length by meander (main stem):	48 km
Mouth longitude:	55°50′W	Total length including tributaries:	87 km
General direction of flow:	Northeast	No. of tributaries:	27
Drainage area:	414 km²		
Mean width	10 km	Geological formation:	Precambrian metamorphic
Axial length	48 km		
Basin perimeter	135 km		

TABLE 42. Obstructions on Mary's Harbour River.

Fig. 10 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	0.0	Rapids	—	—	—	Partial
2	Main stem	2.6	Falls	6.1	3.0	45	Partial
3	Main stem	10.0	Falls	2.4	—	45	Partial

TABLE 43. Summary of the *Blue Dolphin* Labrador Expedition collections, Mary's Harbour River, 1949 and 1950 (Backus 1957).

Date of collection	Species	Capture technique	No. of samples	Length (mm)
12 July 1949	Atlantic salmon	18.6-m seine	9	102–168
12 July 1949	Brook trout	18.6-m seine	4	168–215
12 July 1949	Threespine stickleback	18.6-m seine	2	58, 66
31 Aug. 1950	Arctic char	Rod and reel	1	184

TABLE 44. Summary of Atlantic salmon angling data, Mary's Harbour River, 1964–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Large salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1964	161	32	193	160	1.21
1965	130	29	159	259	0.61
1966	88	7	95	50	1.90
1967	78	0	78	48	1.63
1968	23	0	23	27	0.85
1969	—	—	—	—	—
1970	201	5	206	109	1.89
1971	104	6	110	78	1.41
1972	58	2	60	52	1.15
1973	170	0	170	43	3.95
1974	45	0	45	99	0.45
1975	56	1	57	169	0.34
1976	81	11	92	183	0.50
1977	144	1	145	217	0.67
1978	74	0	74	140	0.53
1979	206	0	206	232	0.89
1980	49	5	54	142	0.38
Mean					
1964-68	96	14	110	109	1.01
1970-80	108	3	111	133	0.83

TABLE 45. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Mary's Harbour River. No inaccessible areas were identified.

Location	Accessible areas	
	Spawning units	Rearing units
Main stem	1 478	5 974
T11	0	300
T17	0	252
Total	1 478	6 526
Estimated production		
Smolt	13 052	
Adult	1 958	

St. Lewis River (North East River), flows into St. Lewis Inlet, a 30 km long estuary that is dotted with islands and sand shoals (Fig. 11). The closest settlements are Mary's Harbour, Battle Harbour, and Fox Harbour, which are all located outside the inlet in St. Lewis Sound. Blair (1943) reported that pit props (used as mine shores) and pulpwood were cut 8 km from the mouth of the river and at the head of St. Lewis Inlet during the early 1930s and 1940s. The river's hydroelectric potential was estimated by Millan (1974) to be 200 MW, ranking twelfth among all Labrador rivers surveyed.

St. Lewis River has a drainage area of 2590 km^2, consisting of the main stem, 145 km in length, and 45 tributaries (Table 46). The lower main stem is characterized by narrow gorges and canyons surrounded by steep, burnt-over hills. Three falls are situated in this section, with the uppermost forming a complete barrier to migrating fish at km 26.8 (Table 47). Above this area, the river alternates between gorges and wide, well-wooded valleys, and it contains three additional complete obstructions. At km 80, the river divides into two branches, and Peet (1968) reported excellent spawning shoals on the left-hand branch, tributary 39 (T39). Except for one complete barrier the river gradient above the branch is low, and the headwaters consist of a mass of small ponds and steadies.

Sollows et al. (1953) reported that, in 1953, Atlantic salmon and trout parr were plentiful in the lower sections of St. Lewis River. Large quantities of smelt occur in St. Lewis Inlet and were once caught during the winter for dog food and human consumption. Because of the river's inaccessibility and its steep banks in the lower sections, angling activity is limited. Moores et al. (1978) recorded eight grilse angled in 1977. A further catch of 12 Atlantic salmon in 1977 is reported by T. Curran (pers. comm.). These 12 fish ranged in weight from 1.8 to 3.2 kg and were taken by 3 rods in 2 hours from a pool located 8 km from the river mouth. Based on a survey in 1975 by the author, the accessible areas of St. Lewis River have the potential to produce 4117 adult Atlantic salmon annually (Table 48). The inaccessible areas have a potential to produce nearly 11 000 adult salmon, but the number, severity, and inaccessibility of the obstructions would make any remedial project technically difficult and expensive.

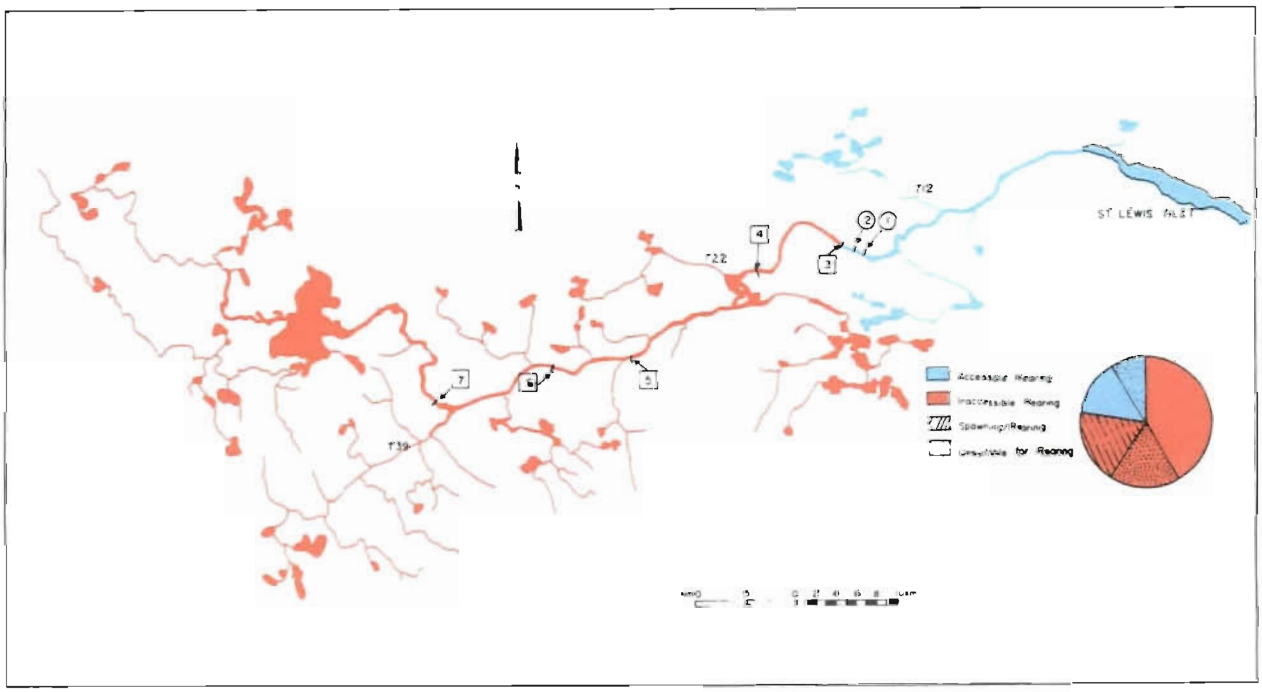

FIG. 11. Map of St. Lewis River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 46. Physical characteristics of St. Lewis River (North East River).

Map reference:	Battle Harbour 13A, 3D 1 : 250 000	Maximum basin relief:	427 m
		Length by meander (main stem):	145 km
Mouth latitude:	52°26′N		
		Total length including tributaries:	579 km
Mouth longitude:	56°11′W		
General direction of flow:	Northeast	No. of tributaries:	45
Drainage area:	2590 km²		
Mean width	24 km	Geological formation:	Precambrian metamorphic
Axial length	99 km		
Basin perimeter	335 km		

TABLE 47. Obstructions on St. Lewis River.

Fig. 11 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	25.4	Falls	12.2	—	55	Partial
2	Main stem	25.9	Falls	3.0	—	75	Partial
3	Main stem	26.8	Falls	6.1	15.2	45	Complete
4	Main stem	41.5	Falls	7.6	15.2	70	Partial
5	Main stem	60.1	Falls	6.1	15.2	90	Complete
6	Main stem	70.0	Falls (3)	9.1	—	90	Complete
7	Main stem	82.3	Falls	6.1	15.2	90	Complete

TABLE 48. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in St. Lewis River.

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	5 613	13 603	6 333	28 076
T12	0	120	0	0
T22	0	0	55	380
T39	0	0	4 069	7 358
Total	5 613	13 723	10 457	35 814
Estimated production				
Smolt	27 446		71 628	
Adult	4 117		10 744	

Notleys Brook

Notleys Brook is a small stream that flows north into Alexis Bay, 8 km from the community of Port Hope Simpson (Fig. 12). The system has a drainage area of 46 km^2, with seven tributaries feeding the main stem. Table 49 summarizes the physical characteristics of the watershed; no other information about the stream and its fish populations is available.

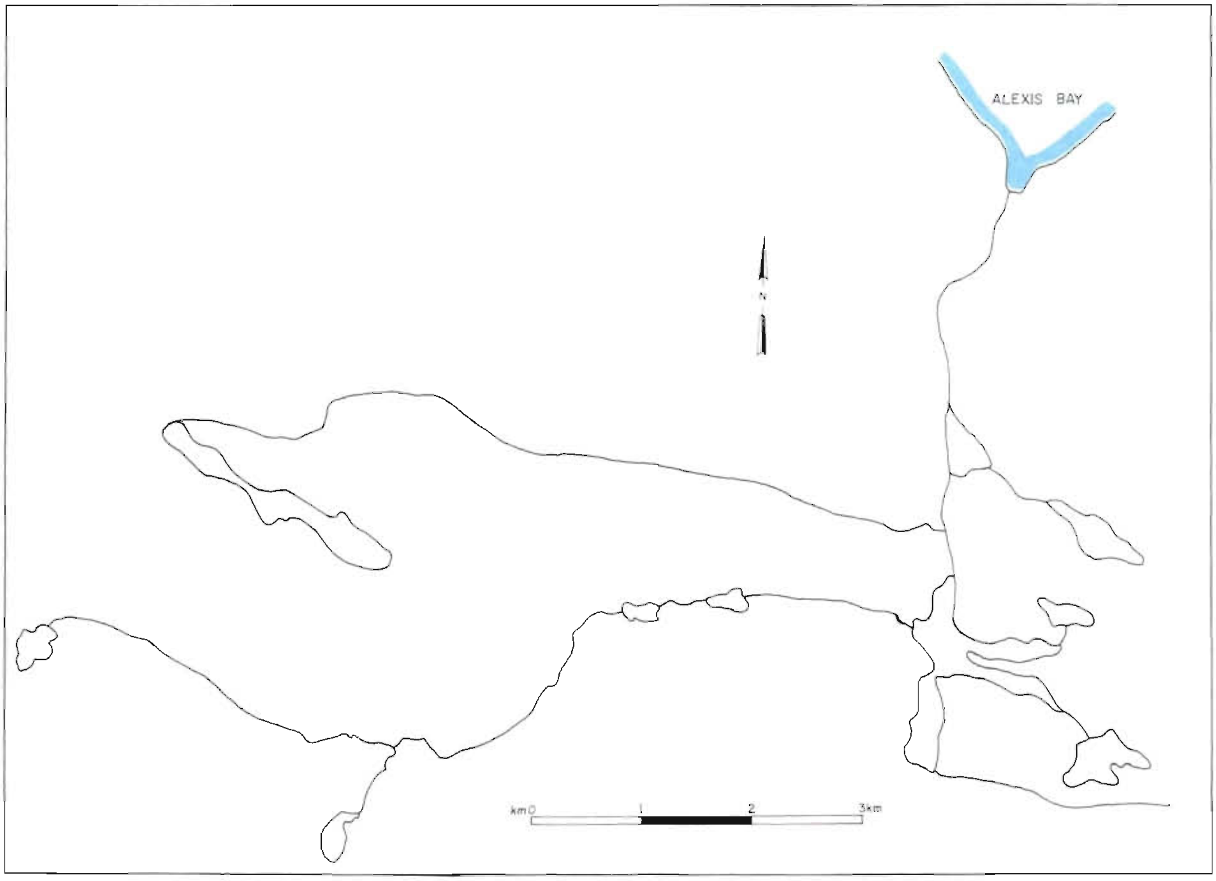

FIG. 12. Map of Notleys Brook (not surveyed).

TABLE 49. Physical characteristics of Notleys Brook.

Map reference:	Battle Harbour 13A, 3D 1 : 250 000	Maximum basin relief:	183 m
		Length by meander (main stem):	6 km
Mouth latitude:	52°32′N		
Mouth longitude:	56°10′W	Total length including tributaries:	29 km
General direction of flow:	North	No. of tributaries:	7
Drainage area:	$46\ km^2$		
Mean width	18 km	Geological formation:	Gneiss
Axial length	11 km		
Basin perimeter	32 km		

Flowing northeasterly, Bobbys Brook enters Alexis Bay 5 km west of Port Hope Simpson, a permanent settlement on the southern shore of the inlet (Fig. 13). Logs were once driven on Bobbys Brook but, more recently, access roads to the river around Bobbys Big Pond (L2) are used to transport the logs to Port Hope Simpson. In 1975, much of the timber was burned by a large forest fire which forced partial evacuation of the community. In 1967, the first Newfoundland experiment to evaluate DDT larviciding of black flies was initiated on Bobbys Brook by Bowaters (Nfld.) Ltd. and the effects on aquatic life in the brook were monitored by the DFO. Kills of brook trout occurred rapidly, and the experiment was terminated after 2 weeks (Hatfield 1968).

Bobbys Brook has a drainage area of 245 km^2 (Table 50), much of which was logged until a forest fire in1975 burnt over all but the upper reaches above Bobbys Big Pond (L2). Two partial barriers to fish migration occur on the river, the first at the mouth, the other at km 5.2. The river is completely barred just below Bobbys Feeder Pond (L1) at km 7.5 by 6.1-m vertical falls (Table 51).

The only resident fish species reported by Hatfield (1968) was brook trout. The section below the first complete obstruction, not sampled by Hatfield, may support a small population of Atlantic salmon although the 1975 forest fire left the banks completely denuded and the riverbed covered by ashes and cinders. Estimates from the survey by the author in 1975 indicated that the potential Atlantic salmon smolt production for the accessible areas is 2720, and for the inaccessible areas, 1282 (Table 52). The adult salmon production is estimated to be 408.

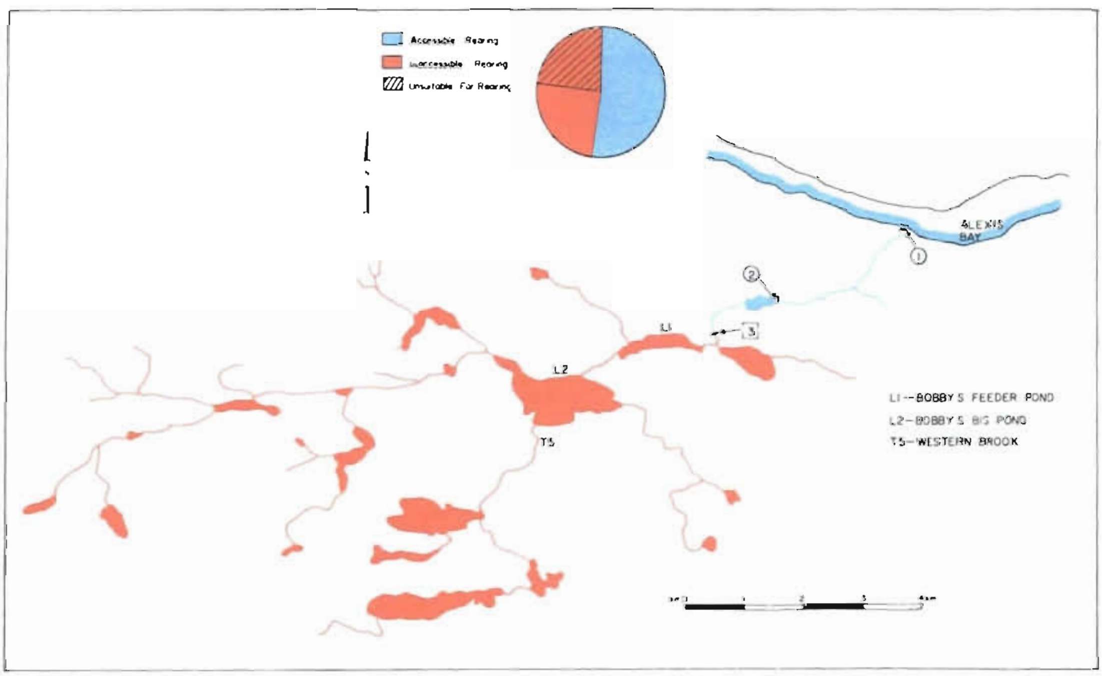

FIG. 13. Map of Bobbys Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 50. Physical characteristics of Bobbys Brook.

Map reference:	Battle Harbour 13A, 3D 1 : 250 000	Maximum basin relief:	214 m
		Length by meander (main stem):	31 km
Mouth latitude:	52°34′N		
Mouth longitude:	56°25′W	Total length including tributaries:	92 km
General direction of flow:	Northeast	No. of tributaries:	54
Drainage area:	245 km²		
Mean width	9 km	Geological formation:	Gneiss
Axial length	30 km		
Basin perimeter	79 km		

TABLE 51. Obstructions on Bobbys Brook.

Fig. 13 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	0.0	Falls	3.0	15.2	65	Partial
2	Main stem	5.2	Falls	1.5	—	60	Partial
3	Main stem	7.5	Falls	6.1	6.1	90	Complete

TABLE 52. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Bobbys Brook.

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	0	1360	0	407
T5	0	0	0	234
Total	0	1360	0	641
Estimated production				
Smolt	2720		1282	
Adult	408		192	

Alexis River, the third largest river in southern Labrador, flows easterly for nearly 100 km from its source to Alexis Bay, an inlet stretching 37 km to the Labrador Sea (Fig. 14). Located on the southern side of Alexis Bay is Port Hope Simpson, a community of 581 residents (Statistics Canada 1981), who depend on the fishery in the summertime and a small logging operation in the winter. Millan (1974), from a survey of potential hydroelectric development sites, reported that the available potential for the Alexis River was 143 MW, ranking it sixteenth among the major Labrador rivers he surveyed. Wildlife in the headwaters is plentiful, and in the past the river was used by trappers as an avenue to the valuable furs in the upper reaches.

The main stem of Alexis River is 97 km long. It is fed by 40 tributaries, and drains an area of over 3100 km^2 (Table 53). At the mouth of Alexis River there are mud and sand shoals among several scattered islands. Upstream from the mouth, the river flows through a wide valley for about 30 km at which point the channel narrows. Partial barriers to fish migration are found at km 30.0 and km 32.8. A 3.0 m vertical falls prevents further fish migration at km 38.3 (Table 54). Blair (1943) and Peet (1968) both described this upper falls and concluded that fish could possibly surmount it with great difficulty although, after a survey in 1975, the author has classified it as a complete barrier. Additional complete barriers are located at the mouth and in the upper reaches of tributary 17 (T17), and on tributary 37 (T37). The remainder of the Alexis River flows over a gentle, rolling plateau that alternates between mature forest stands and flat areas of swamp and lichen. Peet (1971) reported potential spawning areas in the headwaters of tributaries 15, 17, 27, and 29 (T15, T17, T27, and T29).

The fish species reported in Alexis River are Atlantic salmon and sea-run and resident brook trout. In the 1930s and 1940s, employees with the Labrador Development Company Ltd. angled large numbers of sea-run brook trout and salmon (T. Curran, pers. comm.). In contrast, Sollows et al. (1953) considered this river totally unsuitable for angling. Only partial records of Atlantic salmon angling catch and effort are available (Moores et al. 1978), and these records are combined with those for Shinneys Waters and Gilbert River. T. Curran (pers. comm.) has reported that most of the angling catch and effort shown in Table 55 occurred on these two latter rivers. Peet (1968) reported that one resident of Port Hope Simpson fished trout commercially and several others netted trout for domestic consumption. Based on a survey by the author in 1975, the accessible areas of Alexis River have the potential to produce 2676 adult Atlantic salmon annually (Table 56). The inaccessible areas have a potential annual production of 6457 adult Atlantic salmon.

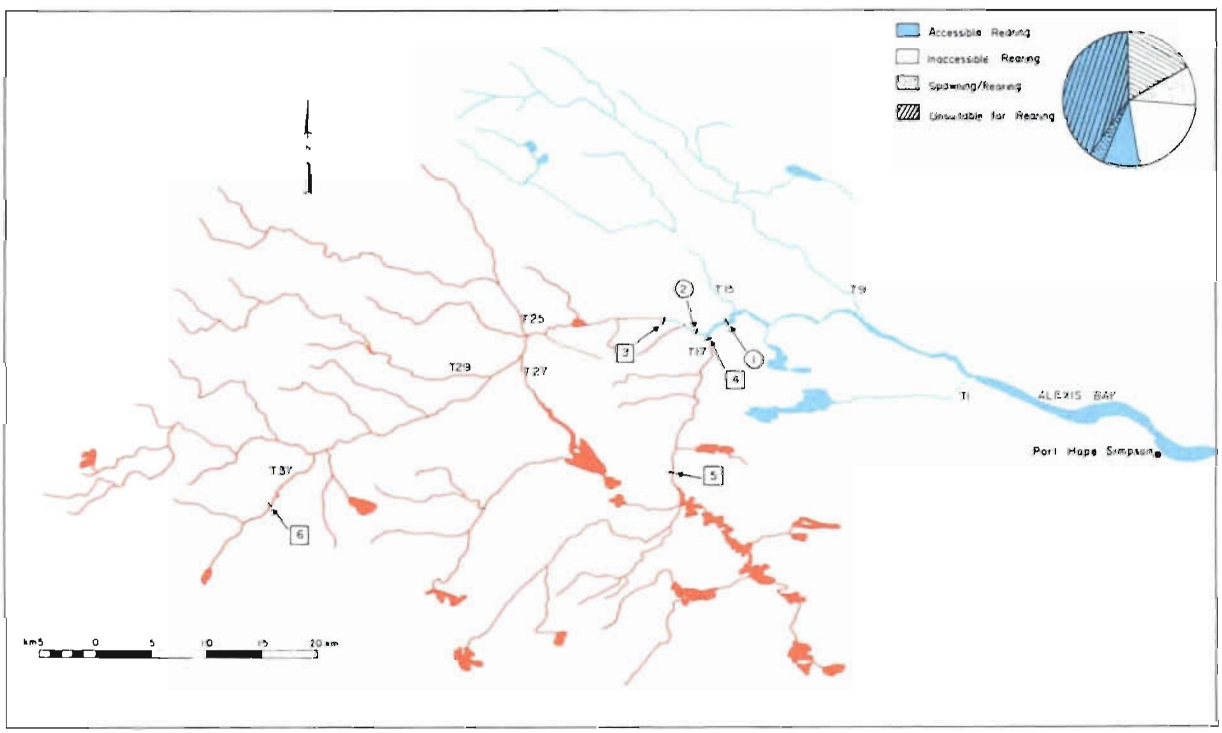

FIG. 14. Map of Alexis River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 53. Physical characteristics of Alexis River.

Map reference:	Battle Harbour 13A, 3D 1 : 250 000	Maximum basin relief:	485 m
		Length by meander (main stem):	97 km
Mouth latitude:	52°33′N		
Mouth longitude:	56°08′W	Total length including tributaries:	611 km
General direction of flow:	East	No. of tributaries:	40
Drainage area:	3160 km²		
Mean width	35 km	Geological formation:	Precambrian metamorphic
Axial length	95 km		
Basin perimeter	335 km		

TABLE 54. Obstructions on Alexis River.

Fig. 14 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	30.0	Falls	6.1	—	45	Partial
2	Main stem	32.8	Falls	2.4	15.2	90	Partial
3	Main stem	38.3	Falls	3.0	6.1	90	Complete
4	T17	0.6	Falls (2)	12.2	15.2	75	Complete
5	T17	12.7	Falls	9.1	3.0	90	Complete
6	T37	4.4	Falls	4.6	—	90	Complete

TABLE 55. Summary of all data on Atlantic salmon angling in Alexis River, Shinneys Waters, and Gilbert River, 1964–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Large salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1964	41	0	41	15	2.73
1965	10	0	10	18	0.56
1966	—	—	—	—	—
1967	—	—	—	—	—
1968	23	0	23	23	1.00
1969	—	—	—	—	—
1970	—	—	—	—	—
1971	—	—	—	—	—
1972	—	—	—	—	—
1973	109	0	109	85	1.28
1974	187	2	189	178	1.06
1975	12	0	12	27	0.44
1976	63	0	63	110	0.57
1977	61	8	69	78	0.88
1978	22	0	22	82	0.27
1979	9	0	9	42	0.21
1980	43	0	43	46	0.93
Mean	53	1	54	64	0.84

TABLE 56. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Alexis River.

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	0	4 578	2 890	11 581
T1	66	366	0	0
T9	2 218	2 970	0	0
T15	202	915	0	0
T17	0	90	3 163	5 864
T25	0	0	0	204
T27	0	0	466	2 124
T29	0	0	79	1 353
T37	0	0	0	396
Total	2 486	8 919	6 598	21 522
Estimated production				
Smolt	17 838		43 044	
Adult	2 676		6 457	

Shinneys Waters
(Shinneys Brook)

Shinneys Waters flows southeasterly into a shallow channel known as "The Pass" between Alexis and Gilbert Bays (Fig. 15). Port Hope Simpson, located 20 km to the southwest, is the closest settlement to this isolated river.

The watershed of Shinneys Waters is well wooded and covers an area of 313 km^2 (Table 57). The headwaters of the river are narrow and well shaded by alders. Although Blair (1943) reported that the headwaters join the upper sections of Gilbert River, both the author and T. Curran (pers. comm.) agree that this is not the case. From its headwaters, the river flows slowly through a narrow, densely wooded river valley. The waters are frequently blocked by beaver dams. Four large lakes are situated in the middle and lower sections of the river and are connected by wide sections of boulder and rubble-strewn stream. Below the largest lake is a section of rapid water that leads to the ocean. This section contains the only barrier to fish migration, a 4.6-m falls that causes delays in upstream migration during periods of low water (Table 58).

Fish species reported in Shinneys Waters are Atlantic salmon, sea-run and resident brook trout, Arctic char, and threespine stickleback. Although Peet (1968) felt that the fish population consisted primarily of Arctic char, and smaller populations of brook trout and Atlantic salmon grilse, T. Curran (pers. comm.) reported sea-run brook trout to be the most abundant fish present. An Arctic char, 54 cm in length and weighing about 1.8 km, was picked up in 1967 on the bank of the river near the mouth. Examination showed the fish to be an immature female and the age, determined from scales, was 6+ years.

Intermittent angling catch and effort records for Shinneys waters have been collected since 1964 (Table 59). These records are combined with returns from the Alexis and Gilbert rivers although the bulk of the information is reported to be from Shinneys Waters and Gilbert River (T. Curran, pers. comm.). Because of its inaccessibility and the barrier at the mouth, this river is highly susceptible to poaching. Sollows et al. (1953) reported that one man took

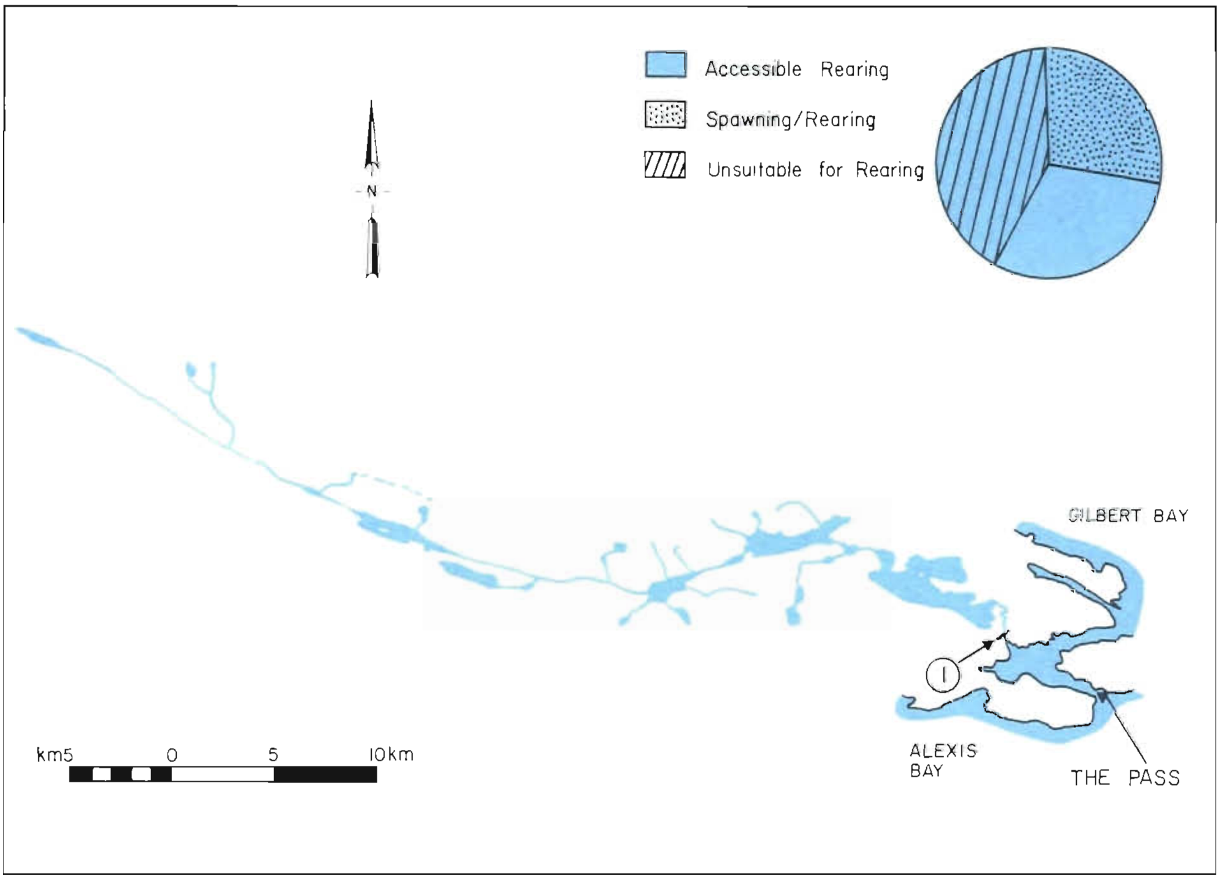

FIG. 15. Map of Shinneys Waters showing accessible Atlantic salmon parr rearing areas.

28 barrels (1 barrel contains approximately 100 kg) of brook trout and grilse with a casting net from a pool below the obstruction in 1952. Peet (1968) noted that caution notices have been posted to protect the pool and a regular protection service has been established; however, the inaccessibility of the river prevents adequate surveillance.

Based on accessible rearing area, the author estimated from a survey in 1975 that the potential annual adult salmon production of Shinneys Waters was 306 fish (Table 60). Based on information from the field staff of the Resource Management Division of DFO, this is a conservative estimate.

TABLE 57. Physical characteristics of Shinneys Waters (Shinneys Brook).

Map reference:	Battle Harbour 13A, 3D 1 : 250 000	Maximum basin relief:	214 m
		Length by meander (main stem):	56 km
Mouth latitude:	52°35′N		
Mouth longitude:	56°03′W	Total length including tributaries:	76 km
General direction of flow:	Southeast	No. of tributaries:	14
Drainage area:	313 km²		
Mean width	4 km	Geological formation:	Precambrian metamorphic
Axial length	52 km		
Basin perimeter	116 km		

TABLE 58. Obstructions on Shinneys Waters.

Fig. 15 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	0.9	Falls	4.6	—	45	Partial

TABLE 59. Summary of all data on Atlantic salmon angling in Shinneys Waters, Alexis River, and Gilbert River, 1964–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Large salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1964	41	0	41	15	2.73
1965	10	0	10	18	0.56
1966	—	—	—	—	—
1967	—	—	—	—	—
1968	23	0	23	23	1.00
1969	—	—	—	—	—
1970	—	—	—	—	—
1971	—	—	—	—	—
1972	—	—	—	—	—
1973	109	0	109	85	1.28
1974	187	2	189	178	1.06
1975	12	0	12	27	0.44
1976	63	0	63	110	0.57
1977	61	8	69	78	0.88
1978	22	0	22	82	0.27
1979	9	0	9	42	0.21
1980	43	0	43	46	0.93
Mean	53	1	54	64	0.84

TABLE 60. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Shinneys Waters. No inaccessible areas were identified.

Location	Accessible areas	
	Spawning units	Rearing units
Main stem	390	1020
Total	390	1020
Estimated production		
Smolt	2040	
Adult	306	

Gilbert River

Gilbert River flows southeasterly into Gilbert Bay, a narrow inlet stretching 30 km to the Labrador Sea (Fig. 16). A sports fishing camp is located at the mouth. The river is characterized by long, narrow lakes and numerous short tributaries and has a drainage area of 642 km^2 (Table 61). The first lake, Gilbert Lake (L1), is situated 3 km above the mouth, and has an area of nearly 1300 ha. The second lake (L2) has an area of 648 ha and flows directly into Gilbert Lake. Between the second lake and Jefferies Pond (L3), a distance of 15 km, the river contains numerous areas characterized by steadies and spawning grounds (Murphy 1972a). Above Jefferies Pond the river is composed of steadies and swamps; the headwaters are made up of numerous small tributaries feeding the narrow main stream. The river and lakes of the middle and lower sections are surrounded by dense forests of black spruce and balsam fir while the area upstream from Jefferies Pond is covered by swamp and shrub growth; the forest in this area has been destroyed by forest fires (Peet 1968).

The only barrier to fish migration is a 6.1-m vertical falls, located at the mouth of Gilbert River (Table 62). The degree of obstruction by this falls has long been disputed. Blair (1943) received reports that both salmon and trout jumped over the falls; Sollows et al. (1953) stated that all local people interviewed reported that salmon could not surmount the falls; Peet (1968) considered the falls to be a complete barrier to fish migration; Murphy (1972a) classified the falls as a complete obstruction but was uncertain of the possibility of fish ascending the falls during very high tides. Until conclusive evidence of the presence of anadromous fish above the obstruction is collected, the falls

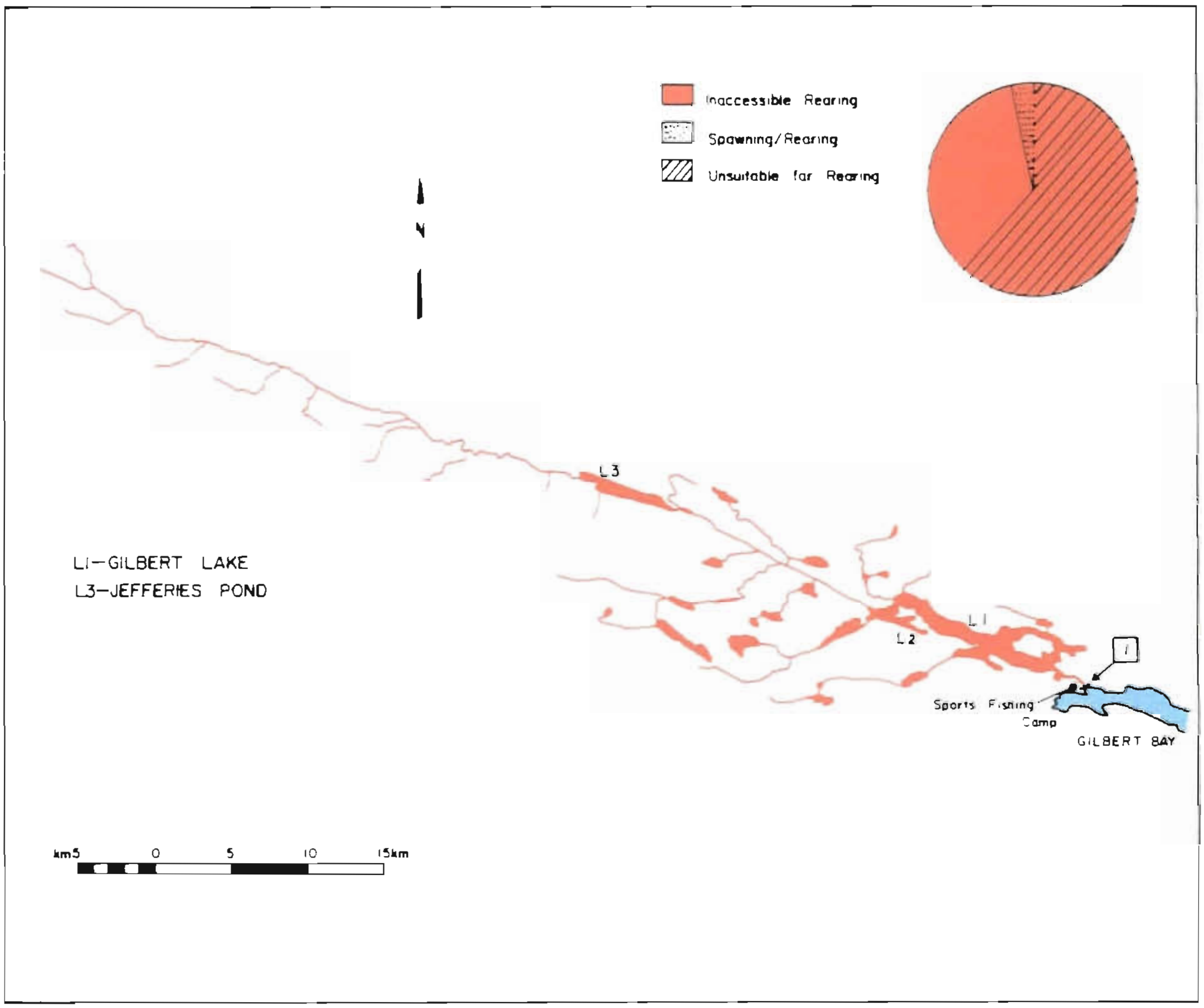

FIG. 16. Map of Gilbert River showing inaccessible Atlantic salmon parr rearing areas.

will be considered a complete barrier. From an engineering survey by DFO personnel in 1973, it was estimated that the falls could be made accessible by blasting at a cost of $10,000, while the more desirable method of constructing a fishway would cost $200,000.

Blair (1943) reported that both salmon and grilse were present in Gilbert River. The river has been a scheduled salmon river since 1974 although all angling for Atlantic salmon occurs below the falls in estuarine waters. Angling catch and effort is combined with Alexis River and Shinneys Waters, although the bulk of the information is from Shinneys Waters and Gilbert River (T. Curran, pers. comm.). Table 63 shows the information from years reported. A sample of 27 grilse and one large salmon was collected from the angler's catch in 1974; age determination by scales indicated that smoltification occurred in 67% of these fish after the fifth year in freshwater, 26% after the fourth year, and 7% after the sixth year (Table 64). Murphy (1972a) estimated that Gilbert River has a potential annual production of nearly 6500 Atlantic salmon smolts which could result in the production of 971 adult salmon (Table 65).

TABLE 61. Physical characteristics of Gilbert River.

Map reference:	Battle Harbour 13A, 3D 1 : 250 000	Maximum basin relief:	366 m
Mouth latitude:	52°39′N	Length by meander (main stem):	81 km
Mouth longitude:	56°06′W	Total length including tributaries:	132 km
General direction of flow:	Southeast	No. of tributaries:	30
Drainage area:	642 km²	Area of lakes >100 ha:	
Mean width	8 km	L1 Gilbert Lake	1296 ha
Axial length	76 km	L2	648 ha
Basin perimeter	167 km	L3 Jefferies Lake	829 ha
		Geological formation:	Precambrian metamorphic

TABLE 62. Obstructions on Gilbert River (Murphy 1972a).

Fig. 16 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	0.0	Falls	6.1	—	90	Complete

TABLE 63. Summary of all data on Atlantic salmon angling in Gilbert River, Alexis River, and Shinneys Waters, 1964–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Large salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1964	41	0	41	15	2.73
1965	10	0	10	18	0.56
1966	—	—	—	—	—
1967	—	—	—	—	—
1968	23	0	23	23	1.00
1969	—	—	—	—	—
1970	—	—	—	—	—
1971	—	—	—	—	—
1972	—	—	—	—	—
1973	109	0	109	85	1.28
1974	187	2	189	178	1.06
1975	12	0	12	27	0.44
1976	63	0	63	110	0.57
1977	61	8	69	78	0.88
1978	22	0	22	82	0.27
1979	9	0	9	42	0.21
1980	43	0	43	46	0.93
Mean	53	1	54	64	0.84

TABLE 64. Sex ratio (%F), age composition, and weight of Atlantic salmon collected from anglers' catch, July and August 1974, on Gilbert River estuary (DFO, unpubl. data).

	1-sea-winter						2-sea-winter			
	Female		Freshwater age		Weight (g)		Female		Freshwater age	
	%	*n*	yr	*n*	$\bar{x}$	*n*	%	*n*	yr	*n*
	57.1	7	4	7	2173	7				
	61.1	18	5	18	2194	3	0.0	1	5	1
	50.0	2	6	2						
		27		27		10		1		1
Mean	59.2		4.8		2179		0.0		5	

TABLE 65. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Gilbert River (Murphy 1972a).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	0	0	283	3238
Total	0	0	283	3238
Estimated production				
Smolt	0		6476	
Adult	0		971	

River 14 (Unnamed)

This river flows northeasterly and empties into White Bear Arm (Fig. 17). The watershed is forested with black spruce and in the past a small sawmill operated at the mouth. The watershed covers nearly 100 km^2 (Table 66) and contains several lakes and ponds, the largest being Seven Mile Pond (L1) which is located on the upper main stem.

Two falls are located in the lower section of the main stem but neither is considered a serious obstruction to fish migration (Table 67). Murphy (1972a) considered the rearing habitat to be good for brook trout although a small run of Atlantic salmon may exist. From his river survey, Murphy estimated the annual production of Atlantic salmon smolts to be 4256. Subsequent sea survival should allow the production of 638 adult salmon (Table 68).

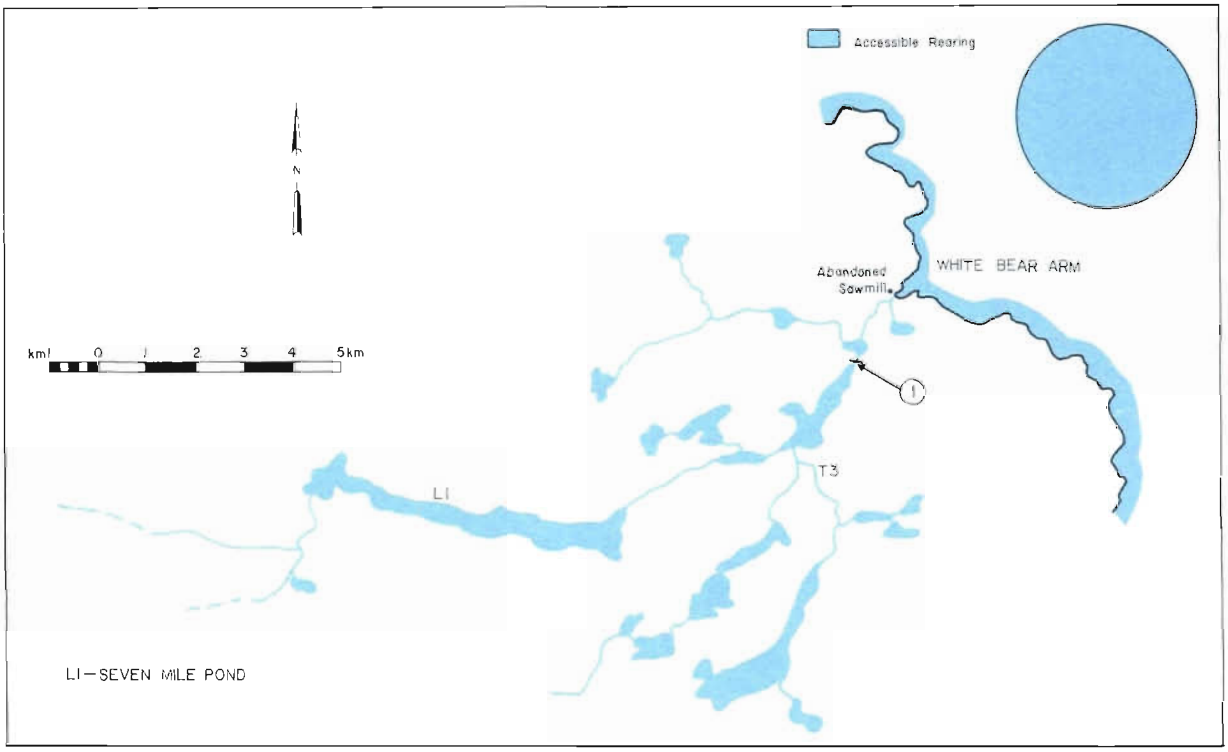

FIG. 17. Map of River 14 (Unnamed) showing accessible Atlantic salmon parr rearing areas.

TABLE 66. Physical characteristics of River 14.

Map reference:	Battle Harbour 13A, 3D 1 . 250 000	Maximum basin relief:	153 m
		Length by meander (main stem):	16 km
Mouth latitude:	52°48′N		
Mouth longitude:	55°12′W	Total length including tributaries:	42 km
General direction of flow:	Northeast	No. of tributaries:	5
Drainage area:	98 km^2		
Mean width	5 km	Geological formation:	Precambrian acid intrusive rocks
Axial length	11 km		
Basin perimeter	52 km		

TABLE 67. Obstructions on River 14 (Murphy 1972a).

Fig. 17 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Description: Width (m)	Description: Slope (°)	Barrier to fish passage
1	Main stem	1.6	Falls (2)	—	—	—	Partial

TABLE 68. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in River 14 (Murphy 1972a). No inaccessible areas were identified.

Location	Accessible areas: Spawning units	Accessible areas: Rearing units
Main stem	0	1104
T3	0	1024
Total	0	2128
Estimated production		
Smolt	4256	
Adult	638	

This river flows southeasterly and empties into White Bear Arm (Fig. 18). The surrounding vegetation is mainly black spruce, that is utilized by a small sawmilling operation near the river mouth.

The drainage area of 233 km^2 (Table 69) is characterized by numerous small ponds and lakes connected by swift-flowing sections of river. There are no obstructions to fish migration in this watershed (Murphy 1972a). No information on fish species has been reported although brook trout and Atlantic salmon are probably present. Murphy (1972a) estimated that White Bear Arm River has the potential to produce more than 8000 smolts annually; the sea survival of these smolt should allow the production of 1216 adult Atlantic salmon (Table 70).

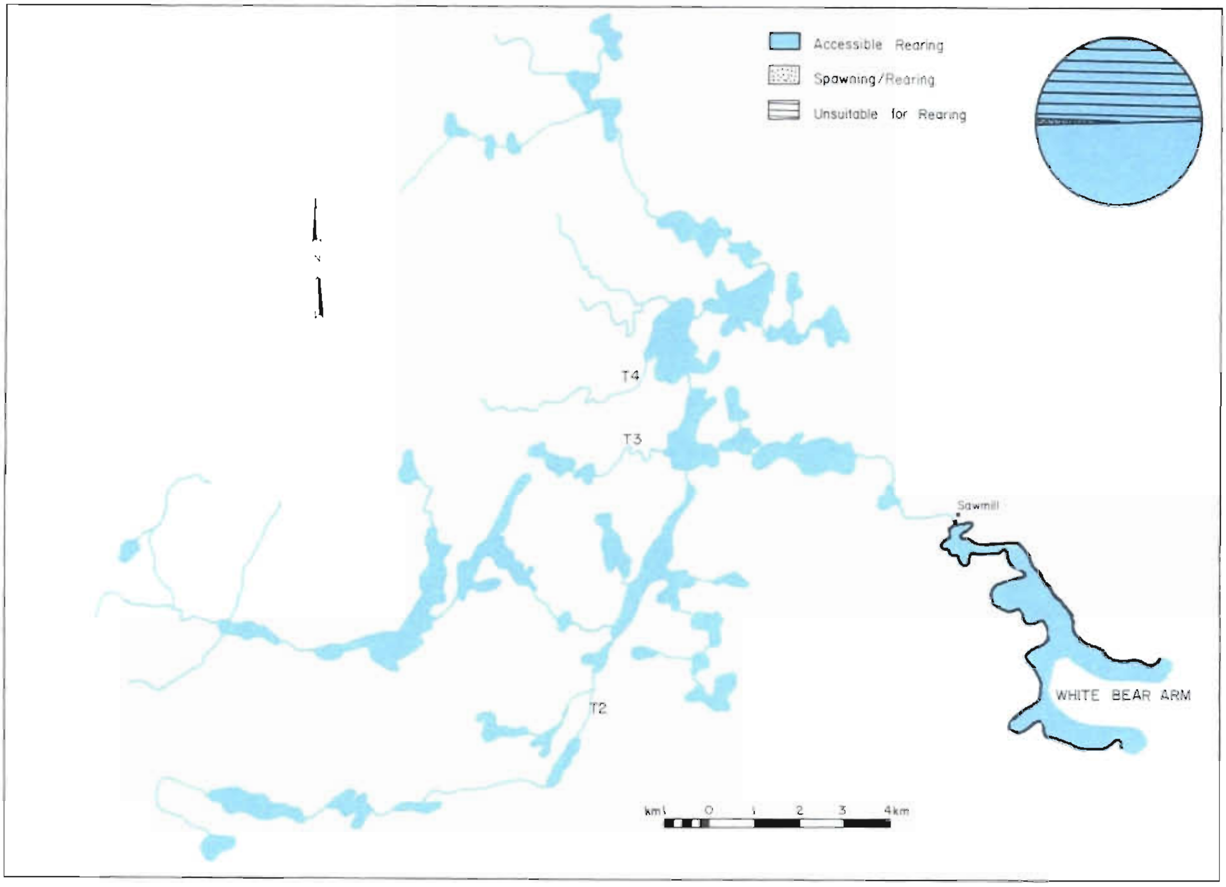

FIG. 18. Map of White Bear Arm River showing accessible Atlantic salmon parr rearing areas.

TABLE 69. Physical characteristics of White Bear Arm River.

Map reference:	Battle Harbour 13A, 3D 1 : 250 000	Maximum basin relief:	275 m
Mouth latitude:	52°51′N	Length by meander (main stem):	64 km
Mouth longitude:	56°12′W	Total length including tributaries:	83 km
General direction of flow:	Southeast	No. of tributaries:	8
Drainage area:	233 km^2	Geological formation:	Precambrian acid intrusive rocks
Mean width	13 km		
Axial length	19 km		
Basin perimeter	63 km		

TABLE 70. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in White Bear Arm River (Murphy 1972a). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	86	2631
T2	0	1158
T3	0	96
T4	0	168
Total	86	4053
Estimated production		
Smolt	8106	
Adult	1216	

This small river flows southeasterly and empties into the northern side of White Bear Arm (Fig. 19). It has a drainage area of 45 km^2 (Table 71), a large part of which consists of lakes and ponds. Murphy (1972a) reported that there are no obstructions to fish migration on the river and that the one relatively large tributary (T2), contained good spawning and rearing areas. A sports fishing camp is located at the mouth. In the author's opinion, there are brook trout and salmon in this river. Murphy (1972a) estimated that this river had the potential to produce 250 adult Atlantic salmon annually (Table 72).

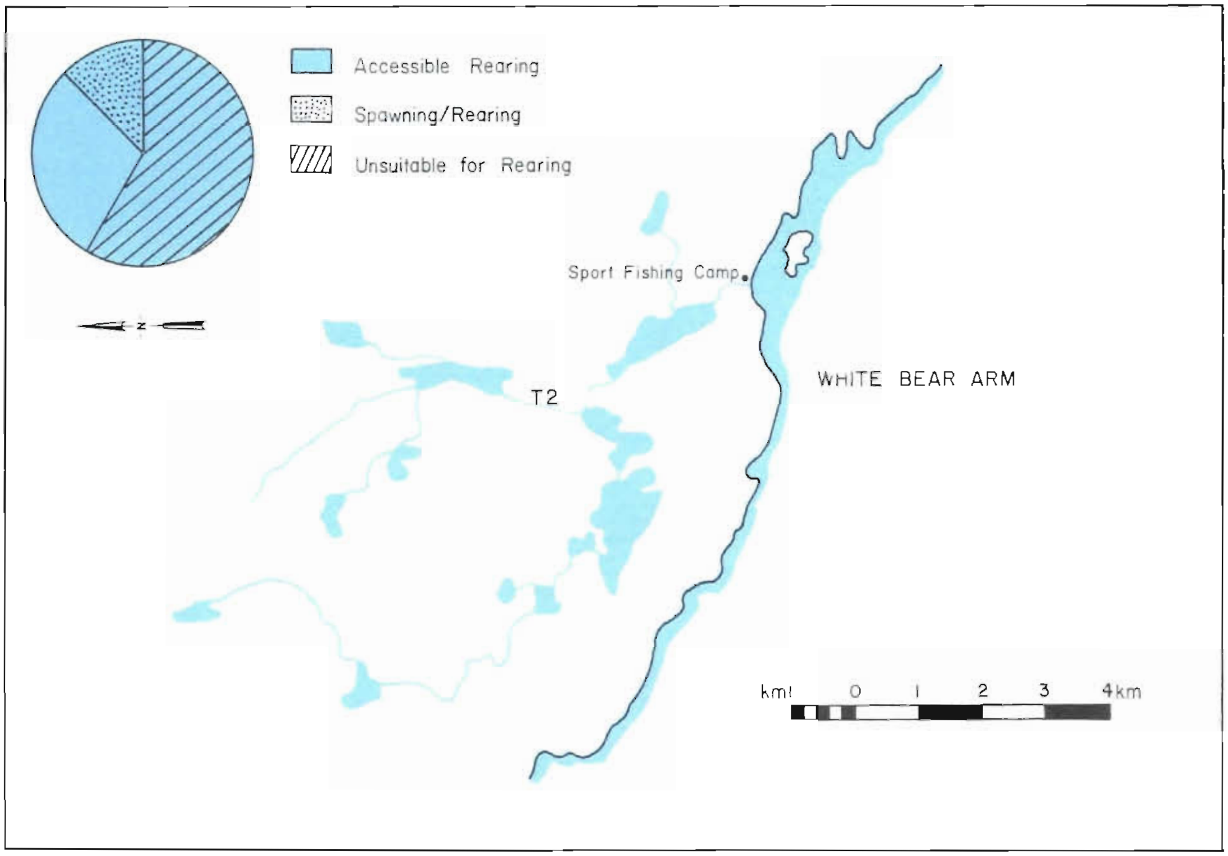

FIG. 19. Map of River 16 (Unnamed) showing accessible Atlantic salmon parr rearing areas.

TABLE 71. Physical characteristics of River 16.

Map reference:	Battle Harbour 13A, 3D 1 : 250 000	Maximum basin relief:	122 m
		Length by meander (main stem):	14 km
Mouth latitude:	52°48′N		
Mouth longitude:	56°04′W	Total length including tributaries:	26 km
General direction of flow:	Southeast	No. of tributaries:	3
Drainage area:	45 km²		
Mean width	5 km	Geological formation:	Precambrian acid intrusive rocks
Axial length	11 km		
Basin perimeter	36 km		

TABLE 72. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in River 16 (Murphy 1972a). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	0	430
T2	58	403
Total	58	833
Estimated production		
Smolt	1666	
Adult	250	

Hawke River is approximately 84 km long and flows eastward into the northern arm of Hawke Bay (Fig. 20). The hydroelectric potential of this river was estimated by Millan (1974) to be 45 MW, the lowest of the 19 sites surveyed in Labrador. A small sports fishing camp is operated annually at the river mouth. The closest settlement is Hawke Harbour, a small fishing community situated 20 km east of the river at the entrance to Hawke Bay.

High rolling hills separated by rounded river valleys are typical of the watershed, which drains an area of nearly 1900 km^2 (Table 73). The main stem is fed by 39 tributaries. Medium to dense growths of black spruce and balsam fir cover the hills and parallel the river except in middle and lower sections of the main stem where forest fires have denuded the countryside. The watershed contains many small lakes and wide, slow-flowing sections of river. Murphy (1972a) reported two partial barriers to fish migration (Table 74) on Northwest Feeder (T13). The presence of a complete barrier on the main stem, reported by Blair (1943), was not verified in surveys conducted by either Sollows et al. (1953) or Murphy (1972a).

The fish species reported in Hawke River are Atlantic salmon and sea-run and resident brook trout. The river is scheduled for salmon angling. Murphy (1972a) suggested that salmon angling is poor in the lower areas due to the lack of pools. However, the limited angling activity recorded from 1973 to 1980 (average annual effort = 54 rod days) shows a catch per rod day of 1.14, which indicates exceptional angling (Table 75). Twenty-two grilse and four large salmon were sampled from the angling catch in 1975; 77% of the grilse and 75% of the large salmon had smoltified after 4 years in freshwater (Table 76).

Sollows et al. (1953) reported that since the early 1950s, most of the commercial salmon fishing effort has moved outside Hawke Bay as the fishermen must now meet the collection boats to sell their catch fresh. Previous to this the fishery was prosecuted close to the mouth of Hawke River, with the catch being salted and transported in barrels at the end of the season. From his survey, Murphy (1972a) estimated that Hawke River has the potential to produce nearly 93 000 Atlantic salmon smolts annually; subsequent sea survival should allow 13 910 adult Atlantic salmon to return (Table 77).

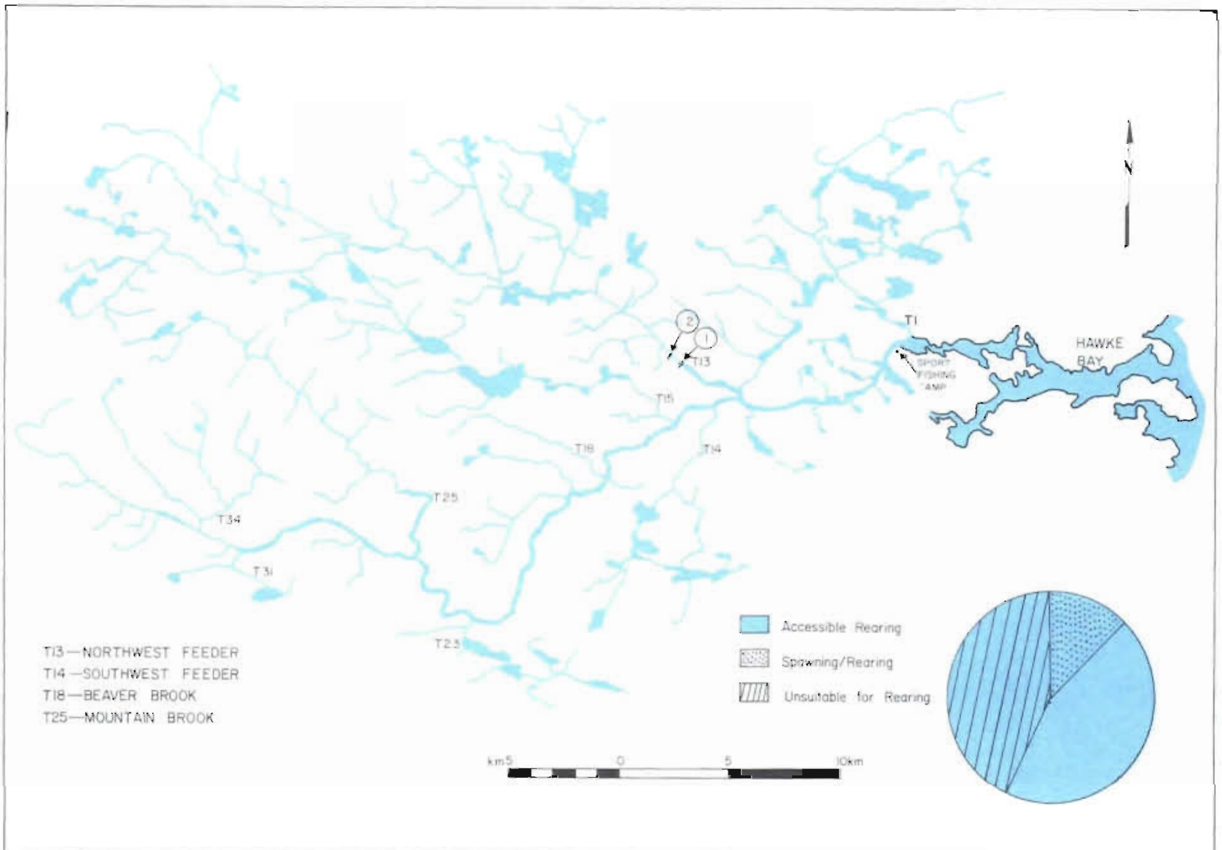

FIG. 20. Map of Hawke River showing accessible Atlantic salmon parr rearing areas.

TABLE 73. Physical characteristics of Hawke River.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	366 m
		Length by meander (main stem):	84 km
Mouth latitude:	53°02′N		
Mouth longitude:	56°04′W	Total length including tributaries:	649 km
General direction of flow:	East	No. of tributaries:	39
Drainage area:	1891 km²		
Mean width	32 km	Geological formation:	Precambrian acid intrusive rocks
Axial length	68 km		
Basin perimeter	222 km		

TABLE 74. Obstructions on Hawke River (Murphy 1972a).

Fig. 20 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Description: Width (m)	Description: Slope (°)	Barrier to fish passage
1	T13	4.8	Falls	2.0	22.9	—	Partial
2	T13	8.0	Falls	1.7	15.3	90	Partial

TABLE 75. Summary of Atlantic salmon angling data, Hawke River, 1973–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Large salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1973	22	2	24	70	0.34
1974	0	1	1	35	0.03
1975	23	8	31	14	2.21
1976	35	0	35	31	1.13
1977	44	29	73	75	0.97
1978	58	26	84	79	1.06
1979	84	18	102	79	1.29
1980	106	40	146	52	2.81
Mean	47	16	62	54	1.14

TABLE 76. Sex ratio (%F), age composition, and weight of Atlantic salmon collected from anglers' catch, July and August 1975, on Hawke River (DFO, unpubl. data).

	1-sea-winter						2-sea-winter					
	Female		Freshwater age		Weight (g)		Female		Freshwater age		Weight (g)	
	%	*n*	yr	*n*	$\bar{x}$	*n*	%	*n*	yr	*n*	$\bar{x}$	*n*
	100	1	3	1	1589	1	100	1	3	1	3632	1
	41.2	17	4	17	1676	17	66.7	3	4	3	5599	3
	0.0	4	5	4	1703	4		–	5	–		–
		22		22		22		4		4		4
Mean	36.4		4.1		1677		75.0		3.8		5107	

TABLE 77. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Hawke River (Murphy 1972a). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	8 846	26 239
T1	77	904
T13	433	7 501
T13-1	38	653
T13-2	192	1 864
T13-3	0	1 355
T13-4	131	1 312
T14	165	1 447
T15	0	1 045
T18	0	240
T23	0	564
T25	0	1 960
T31	360	136
T34	0	1 146
Total	10 242	46 366
Estimated production		
Smolt	92 732	
Adult	13 910	

Caplin Bay Brook flows easterly, emptying into Caplin Bay, a narrow inlet that extends 5 km to the Labrador Sea (Fig. 21). The closest community to the river, Hawke Harbour, is on Hawke Island which is located at the entrance to Caplin Bay.

The river's drainage area of 150 km^2 (Table 78) is well wooded and contains several lakes and ponds. There are no barriers to fish migration on the system and it is an excellent trout stream, with large migrations of sea-run trout (T. Curran, pers. comm.). From his survey, Murphy (1972a) estimated that Caplin Bay Brook has the potential to produce 3182 Atlantic salmon smolts annually; subsequent sea survival would allow the production of 477 adult salmon (Table 79).

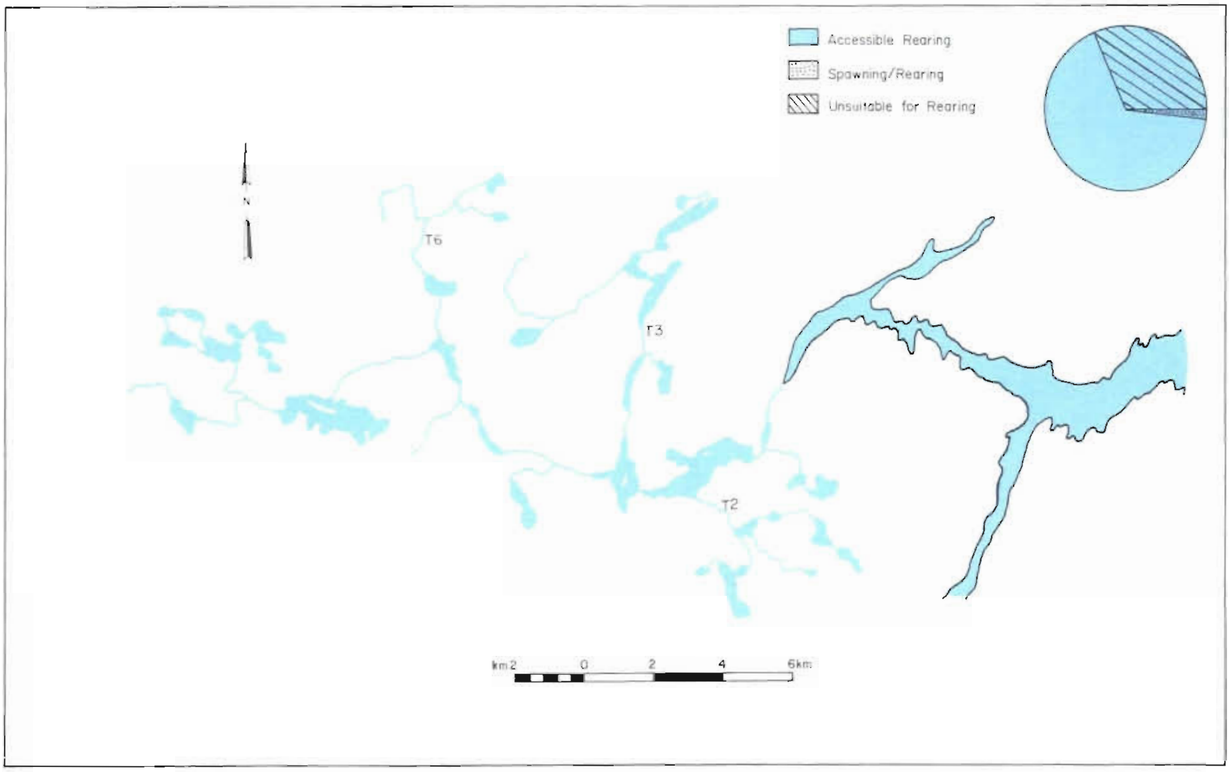

FIG. 21 Map of Caplin Bay Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 78. Physical characteristics of Caplin Bay Brook.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	31 m
Mouth latitude:	52°06′N	Length by meander (main stem):	18 km
Mouth longitude:	56°58′W	Total length including tributaries:	64 km
General direction of flow:	East	No. of tributaries:	9
Drainage area:	150 km²		
Mean width	8 km	Geological formation:	Precambrian acid intrusive rocks
Axial length	19 km		
Basin perimeter	61 km		

TABLE 79. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Caplin Bay Brook (Murphy 1972a). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	10	811
T2	0	96
T3	32	160
T6	0	524
Total	42	1591
Estimated production		
Smolt	3182	
Adult	477	

Partridge Bay Brook

Partridge Bay Brook flows northeasterly through sparse patches of black spruce for a total distance of about 10 km, and empties into the head of Partridge Bay (Fig. 22). Although the river has a drainage area of 70 km^2, the main stem is only 10 km long (Table 80). The middle section of this river consists of a large lake fed by six of the nine tributaries on the system. One falls, reported by Murphy (1972a) to be at least a partial barrier to fish migration, is located 0.5 km upstream from the river mouth (Table 81). Murphy considered the river to be a good rearing habitat for brook trout. By comparison, his estimate for the annual potential Atlantic salmon adult production was quite low at 262 fish (Table 82).

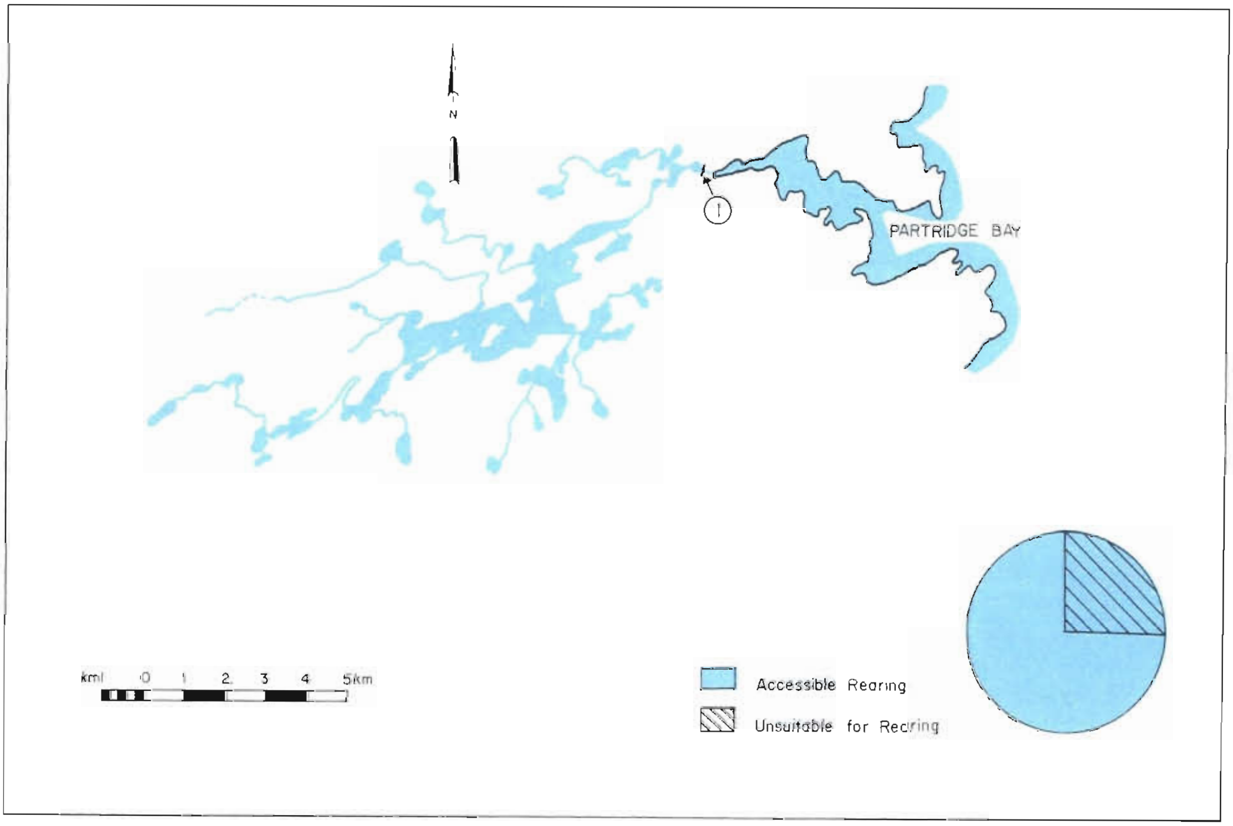

FIG. 22. Map of Partridge Bay Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 80. Physical characteristics of Partridge Bay Brook.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	61 m
		Length by meander (main stem):	10 km
Mouth latitude:	53°12′N		
Mouth longitude:	55°52′W	Total length including tributaries:	49 km
General direction of flow:	Northeast	No. of tributaries:	9
Drainage area:	70 km^2		
Mean width	7 km	Geological formation:	Precambrian intrusive rocks and helikian granitic gneiss
Axial length	9 km		
Basin perimeter	39 km		

TABLE 81. Obstructions on Partridge Bay Brook (Murphy 1972a).

Fig. 22 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	0.5	Falls	6.1	—	—	Partial

TABLE 82. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Partridge Bay Brook (Murphy 1972a). No inaccessible areas were identified.

Location	Accessible areas Spawning units	Rearing units
Main stem	0	224
T9	0	648
Total	0	872
Estimated production		
Smolt	1744	
Adult	262	

This river flows in an easterly direction and empties into Shoal Bay (Fig. 23). Summer fishing stations, occupied seasonally by "stationers" from insular Newfoundland are located on several islands at the entrance of Shoal Bay (Parsons 1970).

The river has a drainage area of 119 km² (Table 83). The lower sections contain large steadies and ponds connected by swift-flowing water. The upper watershed meanders through bogland. The surrounding country is mostly barren with occasional patches of black spruce. Murphy (1972a) reported two partial barriers to fish migration (Table 84), on tributary 5 (T5). From his survey, Murphy concluded that the lower water velocities and large areas of standing water provided good habitat for brook trout; he also estimated that the river had the potential to produce 320 adult salmon annually (Table 85).

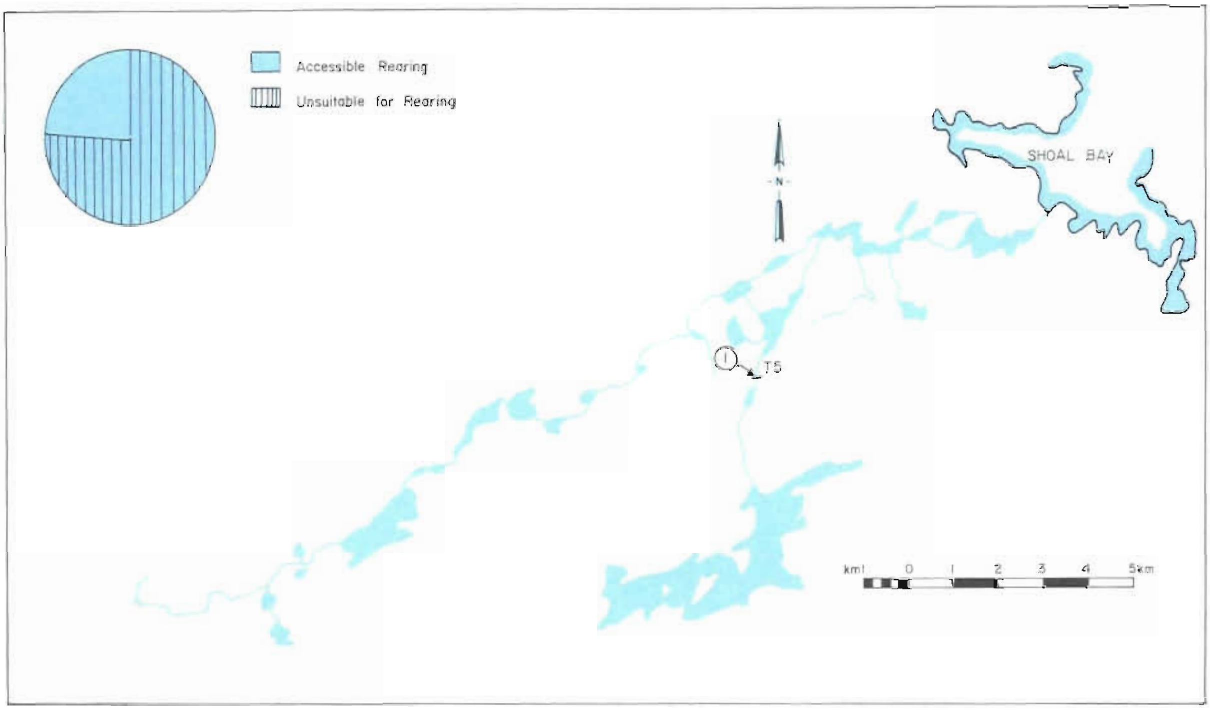

FIG. 23. Map of River 20 (Unnamed) showing accessible Atlantic salmon parr rearing areas.

TABLE 83. Physical characteristics of River 20.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	92 m
Mouth latitude:	53°14′N	Length by meander (main stem):	35 km
Mouth longitude:	55°50′W	Total length including tributaries:	57 km
General direction of flow:	Northeast	No. of tributaries:	16
Drainage area:	119 km²	Geological formation:	Cambrian intrusive rocks and helikian granitic gneiss
Mean width	4 km		
Axial length	32 km		
Basin perimeter	74 km		

TABLE 84. Obstructions on River 20 (Murphy 1972a).

Fig. 23 reference	Location	Distance from mouth (km)	Type	Description			Barrier to fish passage
				Height (m)	Width (m)	Slope (°)	
1	T5	0.2	Falls (2)	—	—	—	Partial

TABLE 85. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in River 20 (Murphy 1972a). No inaccessible areas were identified.

Location	Accessible areas	
	Spawning units	Rearing units
Main stem	0	955
T5	0	112
Total	0	1067
Estimated production		
Smolt	2134	
Adult	320	

This small stream flows northeasterly through barren countryside to its mouth in Shoal Bay (Fig. 24). There are no barriers to fish migration in the watershed. The drainage area covers 18 km^2 (Table 86) and Murphy (1972a) considered it to be a good habitat for brook trout. He also estimated that the river had the potential to produce 174 adult Atlantic salmon annually (Table 87).

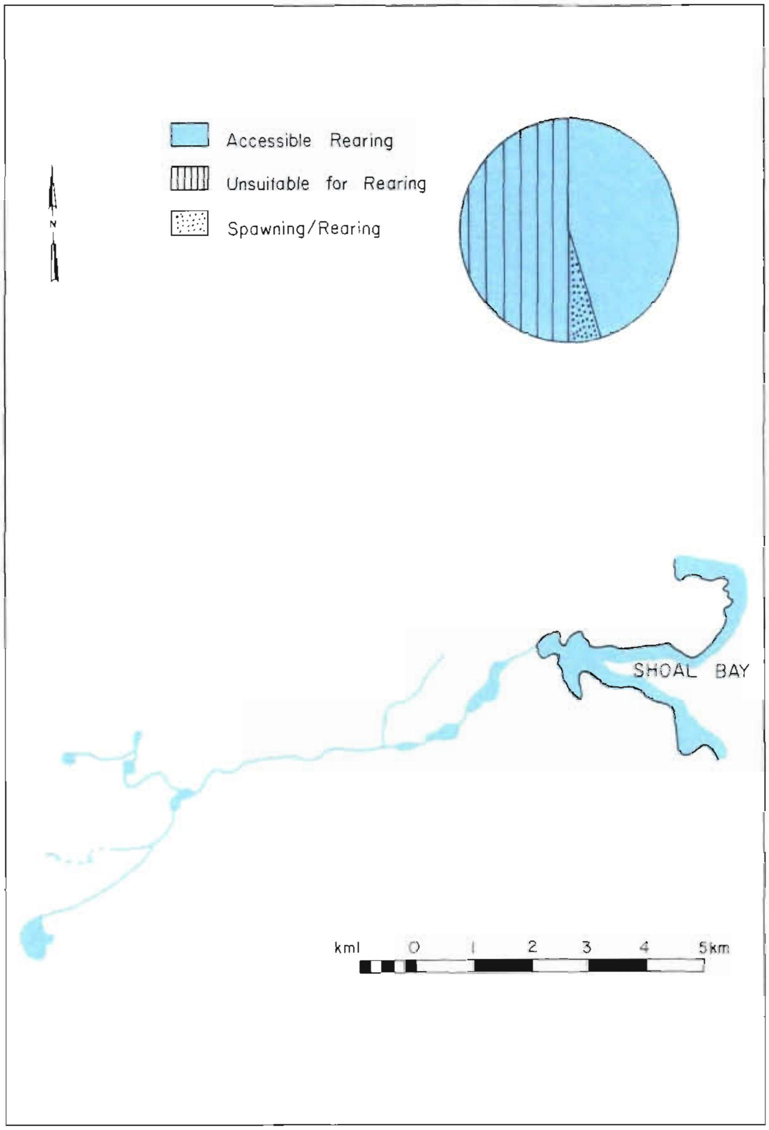

FIG. 24. Map of Shoal Bay Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 86. Physical characteristics of Shoal Bay Brook.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	61 m
Mouth latitude:	53°15′N	Length by meander (main stem):	11 km
Mouth longitude:	55°53′W	Total length including tributaries:	16 km
General direction of flow:	Northeast	No. of tributaries:	3
Drainage area:	18 km²	Geological formation:	Cambrian intrusive rocks and helikian granitic gneiss
Mean width	2 km		
Axial length	11 km		
Basin perimeter	17 km		

TABLE 87. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Shoal Bay Brook (Murphy 1972a). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	58	581
Total	58	581
Estimated production		
Smolt	1162	
Adult	174	

This small brook flows over barren countryside and through small patches of scrub spruce to its mouth in Shoal Bay (Fig. 25). There are no barriers to fish migration on this river. Based on its small drainage area of 13 km^2 (Table 88), Murphy (1972a) was of the opinion that brook trout were probably the major species present. He also estimated the annual potential production of Atlantic salmon adults to be 102 fish (Table 89).

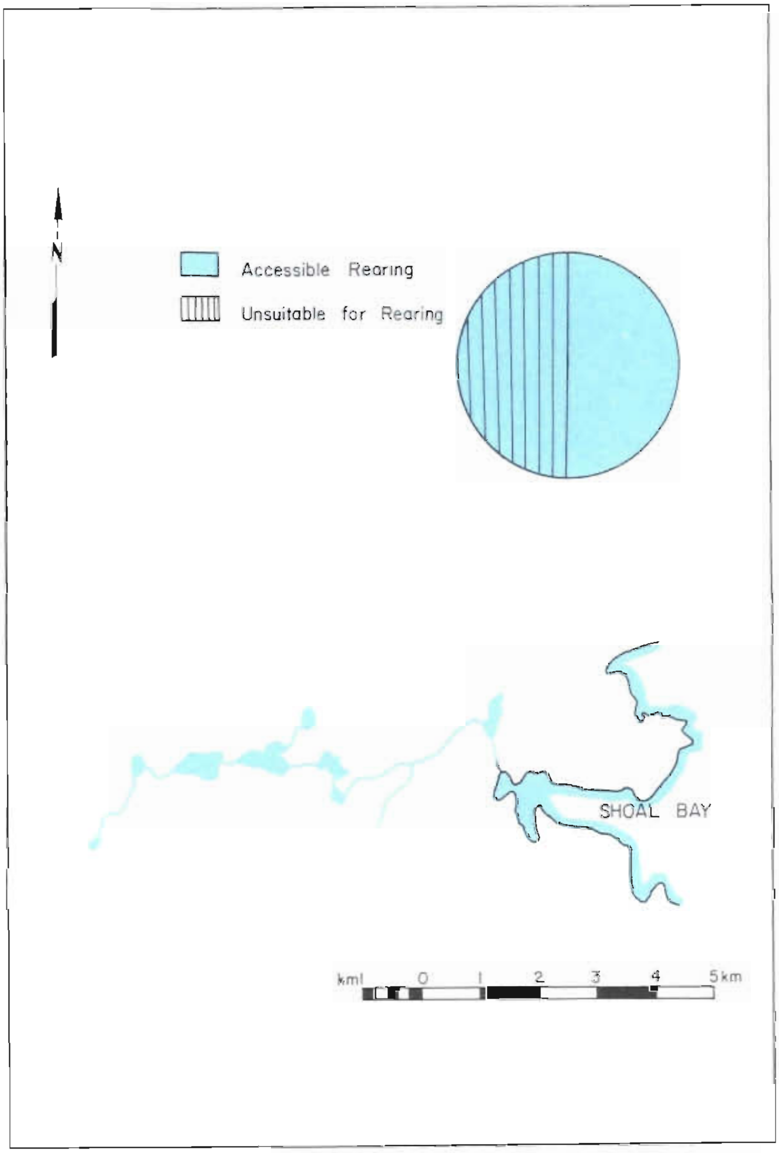

FIG. 25. Map of River 22 (Unnamed) showing accessible Atlantic salmon parr rearing areas.

TABLE 88. Physical characteristics of River 22.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	31 m
Mouth latitude:	53°15′N	Length by meander (main stem):	9 km
Mouth longitude:	55°52′W	Total length including tributaries:	10 km
General direction of flow:	East	No. of tributaries:	2
Drainage area:	13 km²	Geological formation:	Cambrian intrusive rocks and helikian granitic gneiss
Mean width	1 km		
Axial length	7 km		
Basin perimeter	16 km		

TABLE 89. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in River 22 (Murphy 1972a). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	0	340
Total	0	340
Estimated production		
Smolt	680	
Adult	102	

Black Bear River flows northeasterly and empties into Black Bear Bay (Fig. 26) where some commercial salmon fishing is reported to take place.

The entire watershed of this river, over 600 km^2 in area (Table 90), is accessible to migrating fish. The lower sections near the mouth flow through a gorge. There are steady areas in much of the middle and upper sections of the river (Murphy 1972a). Black spruce, alternating with patches of barrens and bogland, is found throughout the watershed. The only barrier to fish migration on the main stem is located 35.4 km upstream from the mouth (Table 91). A natural "runaround" exists by which fish can circumvent the obstacle. The undergound section of stream reported at km 16.1 by Sollows et al. (1953) was not noted by Murphy (1972a). Another minor obstruction is located in the lower area of the first tributary (T1).

Local residents report runs of Atlantic salmon and brook trout to this river. In the author's opinion, other fishes such as the sticklebacks, American eels, and white suckers are present. Due to the absence of angling camps on this river, Murphy (1972a) assumed that very little angling activity occurred. Sollows et al. (1953) assumed that the stakes and ring bolts which he observed on both sides of the narrow gorge at the mouth were used to stretch nets across the river, a practice that may have caused the reported decline in the run of fish to Black Bear River in the early 1950s. From his survey in 1971, Murphy (1972a) estimated the annual potential smolt production of the river to be over 15 000 fish; assuming a 15% survival at sea the adult return would be 2376 fish (Table 92).

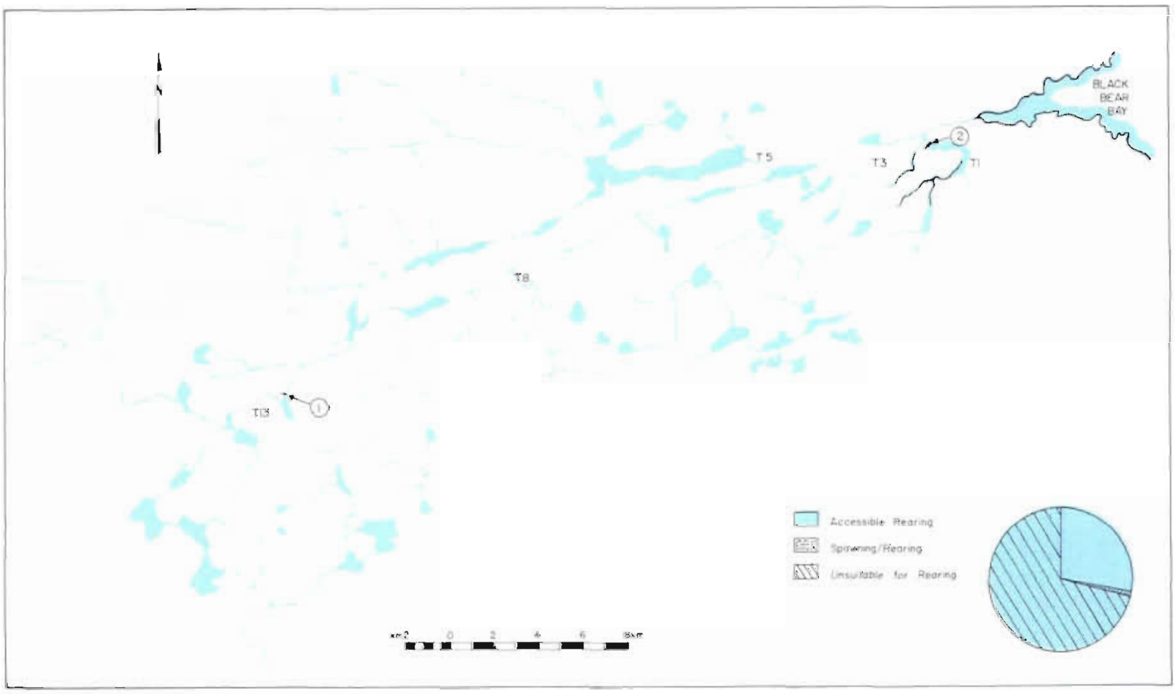

FIG. 26. Map of Black Bear River showing accessible Atlantic salmon parr rearing areas.

TABLE 90. Physical characteristics of Black Bear River.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	122 m
		Length by meander (main stem):	42 km
Mouth latitude:	53°18′N		
		Total length including tributaries:	302 km
Mouth longitude:	55°56′W		
General direction of flow:	Northeast	No. of tributaries:	20
Drainage area:	645 km²		
Mean width	13 km	Geological formation:	Helikian granitic gneiss
Axial length	46 km		
Basin perimeter	207 km		

TABLE 91. Obstructions on Black Bear River (Murphy 1972a).

Fig. 26 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Description Width (m)	Description Slope (°)	Barrier to fish passage
1	Main stem	35.4	Falls	2.1	—	90	Partial
2	T1	0.8	Falls	2.0	—	80	Partial

TABLE 92. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Black Bear River (Murphy 1972a). No inaccessible areas were identified.

Location	Accessible areas: Spawning units	Accessible areas: Rearing units
Main stem	126	5 385
T1	97	587
T3	0	160
T5	39	1 680
T8	0	32
T13	0	77
Total	262	7 921
Estimated production		
Smolt	15 842	
Adult	2 376	

Open Bay Brook

This small brook flows easterly and empties into Open Bay (Fig. 27). Made up primarily of small lakes and ponds, the drainage area of 39 km^2 (Table 93) is covered by black spruce with patches of barrens in the upper reaches (Murphy 1972a). There are no barriers to fish migration on the system. Murphy (1972a), estimated the potential annual production of adult Atlantic salmon to be 108 fish (Table 94).

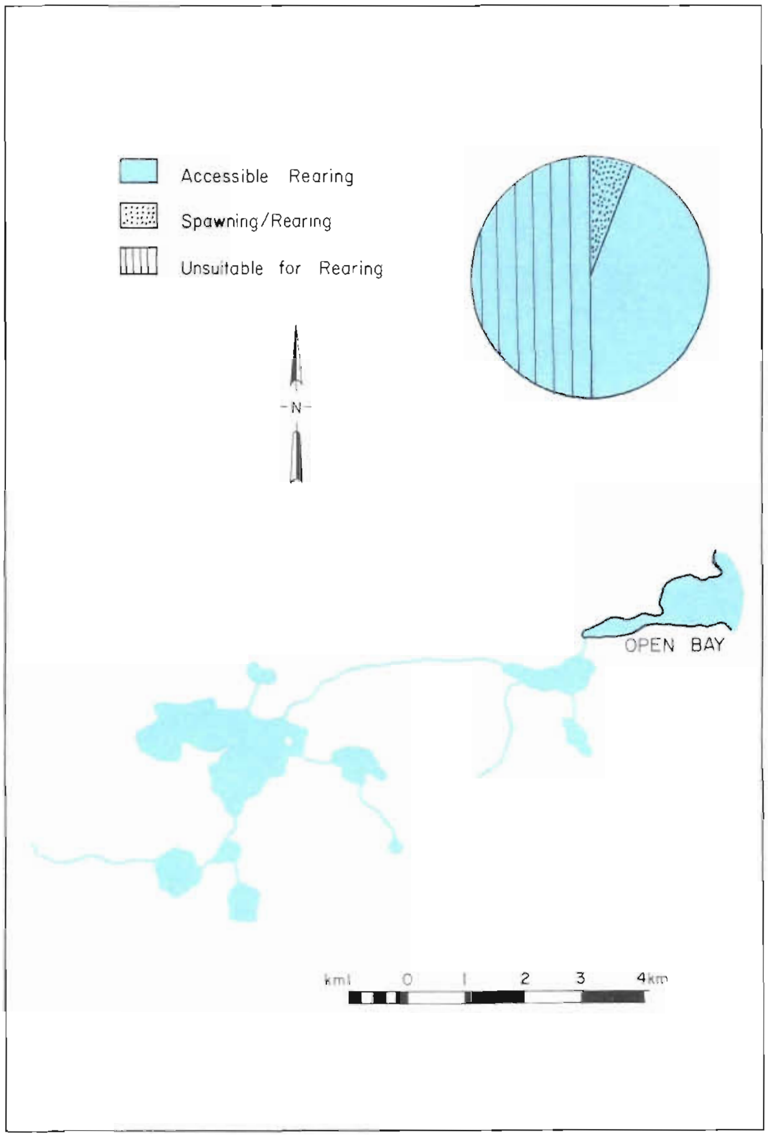

FIG. 27. Map of Open Bay Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 93. Physical characteristics of Open Bay Brook.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	61 m
Mouth latitude:	53°20′N	Length by meander (main stem):	6 km
Mouth longitude:	55°55′W	Total length including tributaries:	16 km
General direction of flow:	East	No. of tributaries:	5
Drainage area:	39 km²		
Mean width	4 km	Geological formation:	Helikian granitic gneiss
Axial length	10 km		
Basin perimeter	23 km		

TABLE 94. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Open Bay Brook (Murphy 1972a). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	43	360
Total	43	360
Estimated production		
Smolt	720	
Adult	108	

Porcupine Harbour River flows easterly, emptying into Porcupine Harbour (Fig. 28). An abandoned settlement is located at the river mouth.

The drainage area of the river is relatively small (155 km^2) (Table 95). Ten tributaries feed the main stem. The vegetation is typical of the area, with black spruce stands alternating with bogland and barrens. A 2.4-m falls on the main stem at km 1.6 was considered to be a complete barrier to fish migration by Murphy (1972a); he also reported the first tributary (T1) to be inaccessible above km 0.8 (Table 96). No information on the fish species present has been reported, but, in the author's opinion, the river probably supports small populations of Atlantic salmon and brook trout. The annual potential production of Atlantic salmon adults in both the accessible and inaccessible areas reported by Murphy (1972a) is relatively small, totalling 524 fish (Table 97).

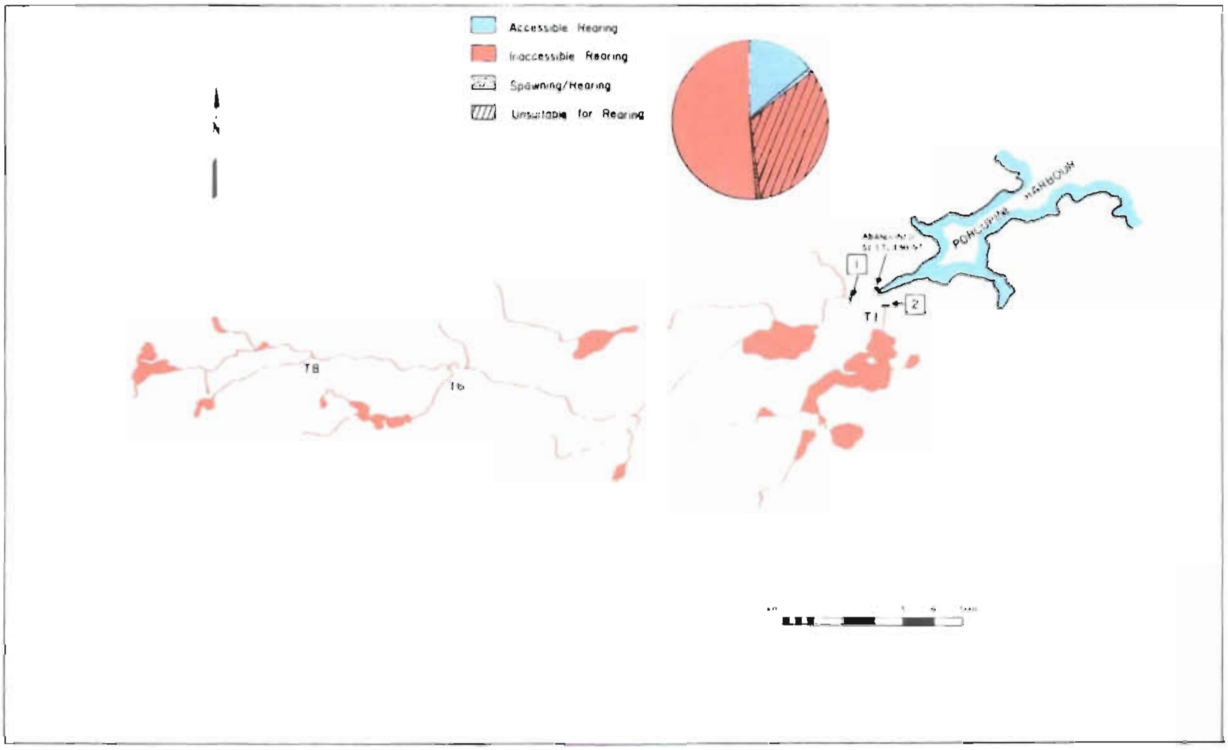

FIG. 28. Map of Porcupine Harbour River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 95. Physical characteristics of Porcupine Harbour River.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	122 m
		Length by meander (main stem):	29 km
Mouth latitude:	53°22′N		
Mouth longitude:	56°01′W	Total length including tributaries:	68 km
General direction of flow:	East	No. of tributaries:	10
Drainage area:	155 km^2		
Mean width	6 km	Geological formation:	Helikian granitic gneiss and neohelikian intrusive rocks
Axial length	27 km		
Basin perimeter	64 km		

TABLE 96. Obstructions on Porcupine Harbour River (Murphy 1972a).

Fig. 28 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	1.6	Falls	2.4	3.1	—	Complete
2	T1	0.8	Falls	—	—	—	Complete

TABLE 97. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Porcupine Harbour River (Murphy 1972a).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	18	368	18	1141
T6	0	0	0	144
T8	0	0	0	96
Total	18	368	18	1381
Estimated production				
Smolt	736		2762	
Adult	110		414	

This small brook empties into the northern side of Porcupine Harbour (Fig. 29). Coastal tundra and scrub spruce characterize the 70 km^2 of drainage area (Table 98). There are no barriers to fish migration on the system, which, according to Murphy (1972a), has the potential to produce 76 adult salmon annually (Table 99).

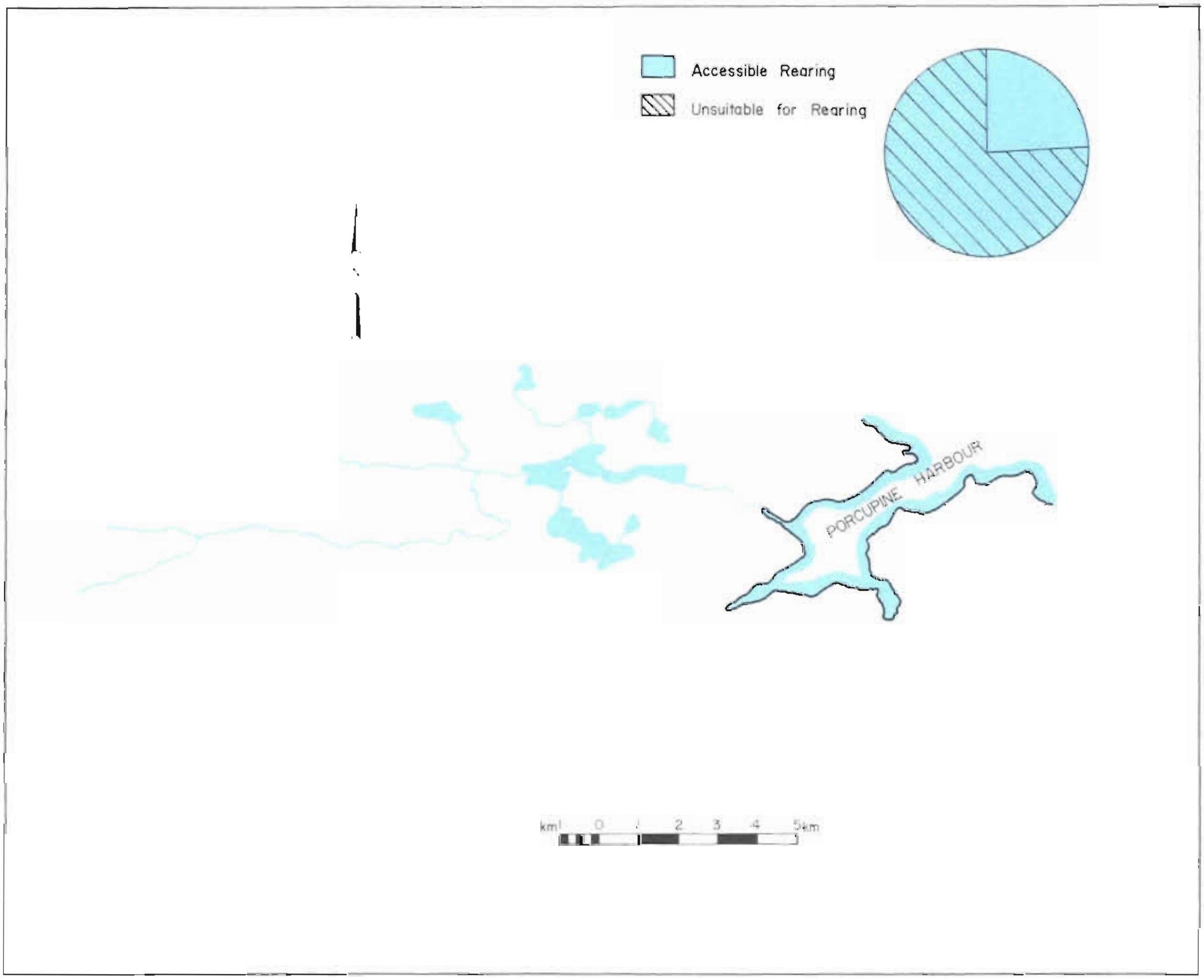

FIG. 29. Map of River 26 (Unnamed) showing accessible Atlantic salmon parr rearing areas.

TABLE 98. Physical characteristics of River 26.

Map reference:	Cartwright 13H, 3E 1 250 000	Maximum basin relief:	122 m
		Length by meander (main stem):	26 km
Mouth latitude:	53°23′N		
Mouth longitude:	56°01′W	Total length including tributaries:	34 km
General direction of flow:	East	No. of tributaries:	4
Drainage area:	70 km^2		
Mean width	5 km	Geological formation:	Granitic gneiss and intrusive rocks
Axial length	22 km		
Basin perimeter	50 km		

TABLE 99. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in River 26 (Murphy 1972a). No inaccessible areas were identified.

Location	Accessible areas	
	Spawning units	Rearing units
Main stem	0	252
Total	0	252
Estimated production		
Smolt	504	
Adult	76	

Reeds Pond Brook

Reeds Pond Brook meanders easterly over a level plateau and empties into Porcupine Bay (Fig. 30). Numerous lakes and ponds interrupt the flow of the river. Murphy (1972a) reported that there was only 6.4 km of running water throughout the entire drainage area of 233 km² (Table 100). The watershed is totally accessible to migrating fishes. Reeds Pond Brook is scheduled for Atlantic salmon angling although Murphy (1972a), on the basis of the quantity of standing water, considered the river to be best suited for brook trout and/or Arctic char. A sports fishing camp is located near the mouth. In 1967, a total of 200 sea-run brook trout, each weighing more than 1.5 kg, were reported angled. From his survey in 1971, Murphy estimated the annual adult Atlantic salmon production of this brook to be 953 fish (Table 101).

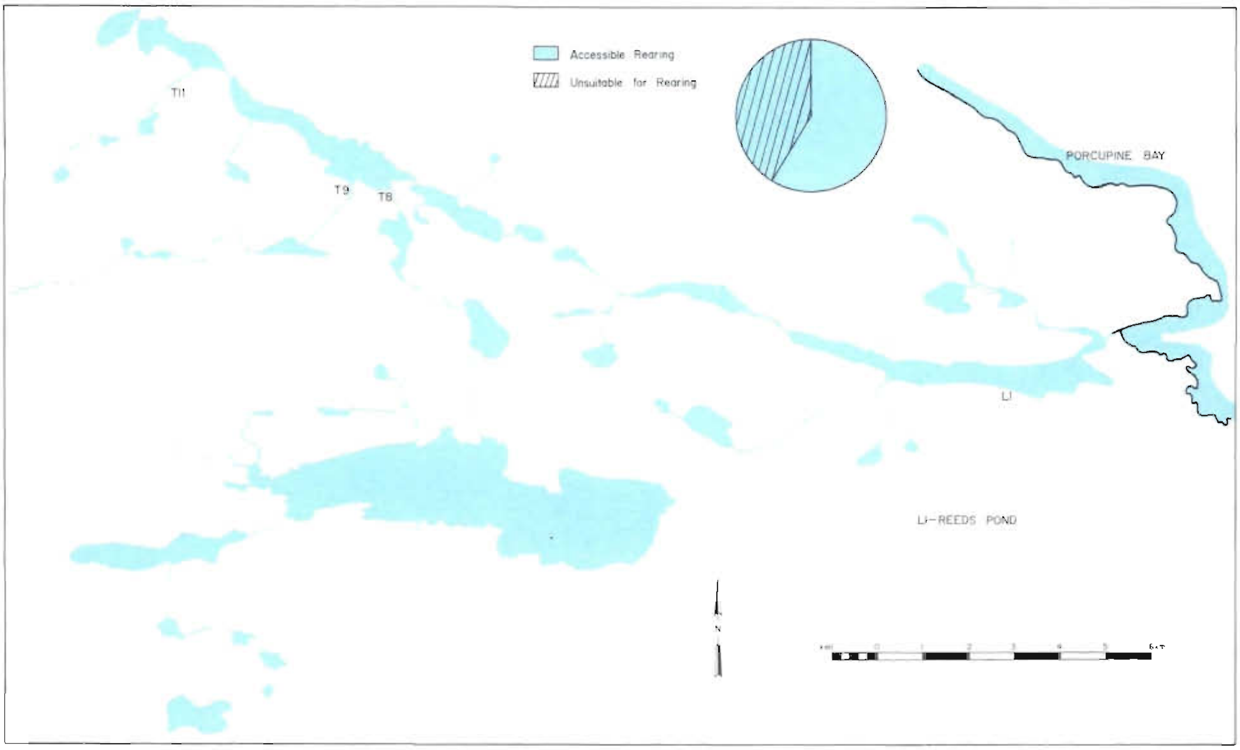

FIG. 30. Map of Reeds Pond Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 100. Physical characteristics of Reeds Pond Brook.

Map reference:	Cartwright 13H, 3E 1 250 000	Maximum basin relief:	122 m
Mouth latitude:	53°27′N	Length by meander (main stem):	26 km
Mouth longitude:	56°02′W	Total length including tributaries:	68 km
General direction of flow:	East	No. of tributaries:	11
Drainage area:	233 km²	Geological formation:	Helikian granitic gneiss, small area of intermediate to basic gneiss
Mean width	10 km		
Axial length	26 km		
Basin perimeter	74 km		

TABLE 101. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Reeds Pond Brook (Murphy 1972a). No inaccessible areas were identified.

Location	Accessible areas	
	Spawning units	Rearing units
Main stem	0	1399
T8	0	984
T9	0	648
T11	0	144
Total	0	3175
Estimated production		
Smolt	6350	
Adult	953	

Sandhill River (Sand Hill River)

Sandhill River flows northeasterly and empties into Sandhill Cove, a shallow inlet of Table Bay (Fig. 31). A seasonal fishing station owned by the Burdett family of Cartwright is located at the mouth where there is suitable anchorage for boats up to trap skiff size. The narrow channels and sandbars of Sandhill Cove prevent passage of larger boats and ships to the river mouth. The closest settlements to the river are the summer fishing communities of Indian Tickle (24 km to the east) and Gready (32 km to the north). The largest permanent settlement in the area, Cartwright (population 658, Statistics Canada 1981), lies 47 km to the northeast. Early investigations on Sandhill River were undertaken by Blair (1943) followed by Sollows et al. (1953). A temporary fish counting facility was operated on this river in 1967. On the basis of the results of that investigation, Sandhill River was selected as the site of a 5-year study on the exploitation of salmon of Labrador origin by the West Greenland fishery. Permanent fish counting facilities were constructed in 1968 and upstream and downstream fish migrations were monitored from 1969 to 1973. Results of this study were reported by Peet (1971), Peet and Pratt (1972), Murphy (1972b, 1974), and Pratt et al. (1974). Peet (1971) recorded stream characteristics in his initial reconnaissance of the river; the following description is based largely on his survey.

Sandhill River has a drainage area of nearly 1150 km^2; the total length of the main stem and tributaries is 611 km (Table 102). Much of the drainage basin is covered by stands of mature evergreen forest. Lakes, ponds, and steadies surrounded by rolling hills characterize the terrain which is typical of the region. Float planes used the lake located 1 km upstream from the river mouth to land supplies for the camp at the fish counting facility. The river above this lake narrows from a wide (300 m) steady to a boulder/rubble riffle (150 m). It was at this site, 5.6 km from the river mouth, that a permanent fish counting facility was established. The remainder of the main stem (approximately 75 km) alternates between pools and short sections of rapids flowing over coarse substrate. Northwest Tributary (T1) is one of the most important tributaries of Sandhill River as it supports the only relatively large population of anadromous Arctic char in the system. The tributary is largely a series of lakes and roughly parallels the coastline of Table Bay for 25 km before entering the main river at the lake located 1 km upstream from the mouth. Two of the largest tributaries, T13 and T21, flow southeastward and enter the main river in its mid and upper sections, respectively.

No complete barriers to fish migration were reported by Peet (1971). Partial barriers were noted on the main stem at km 0.4, km 11.2, km 24.2, and km 45.1 (Table 103). The partial barrier at km 11.2 may be the falls reported by Blair (1943) as being a complete barrier. Two partial barriers on T13 and one partial barrier on T21 between Check Pond (L1) and Big Tilt Pond (L2) were also noted by Peet. The water quality of Sandhill River has been analyzed from samples collected in 1971, 1973, and 1977 (Table 104).

Abundant fish species recorded in Sandhill River include Atlantic salmon, Arctic char, American eel, and white sucker. Threespine and ninespine sticklebacks, alewife, and rainbow smelt are also present. Hare and Murphy (1974) reported the presence of American shad and the author collected one sea lamprey in 1971. Although Sollows et al. (1953) considered the river to be poor for salmon angling, it is scheduled for Atlantic salmon angling. The mean catch per rod day of 1.34 for the period 1964–80 is high in relation to values for Newfoundland and Labrador (Table 105). Most angling is done by members of a private sports camp on the second lake and by guests at the Gander Aviation camp located between the first and second lakes. At Sandhill Cove, the Burdett family have prosecuted the commercial salmon fishery for over a century. In the past the family maintained a residence on Northwest Tribuary (T1) and netted the tributary until new fishery regulations prohibited netting in inland waters.

Samples of Atlantic salmon at Sandhill River have been obtained from the commercial fishery, the anglers' catch, and the fish counting facility. Table 106 presents a composite of these samples for the period 1969–73 that shows a predominance of males among 1-sea-winter male fish and a predominance of females among two-sea-winter fish. Investigations on migrating upstream fish commenced in 1967 at a temporary counting facility located 4.8 km from the river mouth. Five hundred and fifty-three grilse and 87 large salmon were trapped from July to September 1967 (Table 107). Permanent counting facilities were constructed at km 5.6 in 1968. Upstream salmon migrations from 1969 to 1973 ranged from 947 to 5040 fish per year (Tables 108–112). Detailed summaries of fork length, weight, sex, and age distributions of samples collected in 1967 and 1969–73 are presented in Tables 113–126. Sources of these data are indicated in the table headings; more detailed information is contained in those reports.

A partial enumeration of Atlantic salmon smolt migrants was obtained on the main stem of Sandhill River in 1969 (Table 127). In subsequent years (1970–73), total counts ranged from 37 007 to 52 607 (Tables 128–131). Analysis of samples of smolts taken during these migrations from 1969 to 1973 showed that the annual mean fork

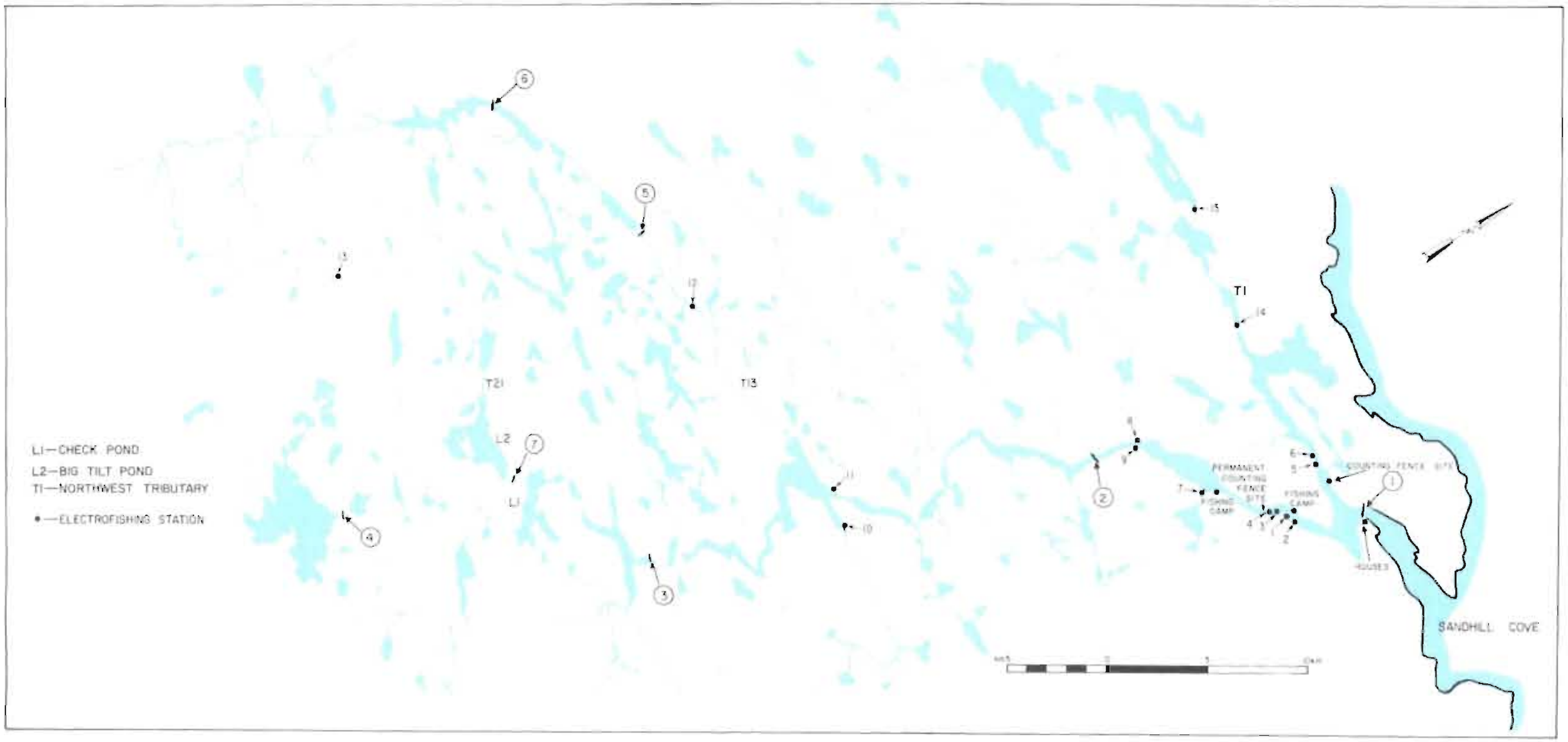

FIG. 31. Map of Sandhill River showing accessible Atlantic salmon parr rearing areas.

lengths varied from 15.6 to 16.4 cm and the annual mean weights varied from 32.3 to 39.7 g. Age 4 smolts predominated throughout the 5-year study (Tables 132–141).

During the initial reconnaissance on Sandhill River in 1967, a temporary fish counting facility to monitor upstream migrants was installed on Northwest Tributary (T1). This facility was also operated in 1969 and from 1971 to 1973. Arctic char were found to be the major fish species with total catches per year ranging from 524 to 5220 (Tables 142–146). A sample of 80 char taken in 1967 had a mean age of 5.2 years (Table 147). Samples of char taken in 1967, 1971, and 1973 showed mean fork lengths of 39.9, 39.6, and 43.0 cm, respectively, and mean weights of 1356.3, 950.8, and 1449.4 g respectively (Tables 148–150).

The Atlantic salmon migrating upstream in the Northwest tributary in 1967 had a mean fork length of 56.2 cm and a mean weight of 1954.6 g (Table 151). Over 90% were one-sea-winter fish and of those more than 50% had spent 4 years in fresh water (Table 152). Downstream migration was monitored on Northwest Tributary in 1973 only when more than 1014 Atlantic salmon smolts were enumerated (Table 153).

The commercial salmon catch was sampled at Sandhill Cove from 1971 to 1973. The catch was predominantly grilse, and data on fork length, weight, sex, and age are presented in Tables 154–159. In 1971 and 1973, there were 112 and 80 Arctic char, respectively, sampled from the commercial fishery in Sandhill Cove (Tables 160 and 161).

In 1971, an electrofishing survey of 15 sites on Sandhill River was conducted to determine the standing crop of juvenile salmon. Physical characteristics of these sites are listed in Table 162. Estimated densities of juvenile salmon, brook trout, white sucker, threespine stickleback, and American eel, calculated using the least-squares method (Ricker 1958), are presented in Table 163. A wide range of juvenile salmon densities was encountered which is probably the result of the different habitats sampled and the various distances of the sites from the mouth of the river.

The effects on homewater stocks of Atlantic salmon by the exploitation of salmon of Labrador origin at West Greenland became of increasing concern in the mid-1960s when catches at West Greenland increased to nearly 3000 t.

Thus, a smolt and adult tagging program was conducted at Sandhill River from 1969 to 1972 under the assumption that the Sandhill River stock was representative of most salmon stocks in southern Labrador. Recaptures from the home river, the Canadian commercial fishery, and the West Greenland fishery are presented in Tables 164–168 and illustrated in Fig. 32–40. It was concluded that 82–98% of the large salmon produced by Sandhill River were taken by the West Greenland and Canadian commercial fisheries; 25–50% of the grilse were harvested by the home water commercial fishery and 2–3% by the sports fishery (Pratt et al. 1974).

Since 1973, information on the fish species in Sandhill River has been limited to annual salmon angling reports and, in 1977, the results of a gillnet set, 14 August, (Bruce et al. 1979) when specimens of brook trout, Arctic char, and white sucker were caught (Table 169).

TABLE 102. Physical characteristics of Sandhill River.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	632 m
Mouth latitude:	53°34′N	Length by meander (main stem):	80 km
Mouth longitude:	56°21′W	Total length including tributaries:	611 km
General direction of flow:	Northeast	No. of tributaries:	30
Drainage area:	1142 km²	Geological formation:	Gneiss
Mean width	31 km		
Axial length	66 km		
Basin perimeter	213 km		

TABLE 103. Obstructions on Sandhill River (Peet 1971).

Fig. 31 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	0.4	Rapids	—	—	—	Partial
2	Main stem	11.2	Falls	—	—	—	Partial
3	Main stem	24.2	Falls (2)	—	—	—	Partial
4	Main stem	45.1	Gorge and rapids	—	—	—	Partial
5	T13	12.9	Falls	—	—	—	Partial
6	T13	19.3	Falls	—	—	—	Partial
7	T21	0.8	Rapids and falls	—	—	—	Partial

TABLE 104. Water quality data, Sandhill River, 1971, 1973, and 1977.

(a) Main river

Collection	Temp. at test (°C)	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)
03 Nov. 1971	—	6.5	12.0	25.0	—	8.0	—	—
14 Aug. 1977	13.9	5.6	6.0	25.0	0.7	2.0	0.6	5.5

(b) Northwest tributary, sample collected 07 Aug. 1973

Turbidity	0.65	Alkalinity phenolphthalein $CaCO_3$ (ppm)	0.0
Colour (Hazen units)	50.0	Alkalinity total $CaCO_3$ (ppm)	3.2
pH	6.3	Total hardness $CaCO_3$ (ppm)	4.7
Dissolved chloride (ppm)	3.4	Dissolved calcium (ppm)	0.9
Extractable copper (ppm)	0.011	Dissolved sulphate (ppm)	5.0
Dissolved fluoride (ppm)	<0.10	Reactive silica (ppm)	<0.10
Extractable lead (ppm)	0.005	Dissolved sodium (ppm)	2.6
Dissolved magnesium (ppm)	0.6	Extractable zinc (ppm)	<0.002
Extractable magnesium (ppm)	<0.01	Extractable cadmium (ppm)	0.001
Dissolved nitrogen, nitrite, nitrate (ppm)	<0.01	Noncarb. hardness (ppm)	1.50
Dissolved ammonia (ppm)	<0.05	Sum const. (ppm)	14.72
Phosphorous, dissolved inorganic phosphate (ppm)	0.01	SAR	0.52
Dissolved potassium	0.03	Saturation index	4.63
% sodium	52.68	Stability index	15.56
Specific conductance (μmho·cm⁻¹)	23.8		

TABLE 105. Summary of Atlantic salmon angling data, Sandhill River, 1964–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Large salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1964	44	0	44	87	0.51
1965	24	32	56	116	0.48
1966	31	12	43	87	0.49
1967	14	5	19	90	0.21
1968	10	26	36	100	0.36
1969	—	—	—	—	—
1970	111	2	113	115	0.98
1971	112	0	112	74	1.51
1972	219	10	229	148	1.55
1973	519	0	519	272	1.91
1974	311	10	321	219	1.47
1975	—	—	—	—	—
1976	165	7	172	66	2.61
1977	—	—	—	—	—
1978	100	29	129	127	1.02
1979	650	5	655	351	1.87
1980	691	94	785	561	1.40
Mean	214	17	231	172	1.34

TABLE 106. Sea age and sex ratio (%F) of Atlantic salmon, Sandhill River, and Sandhill Cove, 1969–73 (DFO, unpubl. data).

Year	Location	Method of capture	1-sea-winter		2-sea-winter		3-sea-winter	
			Male	Female	Male	Female	Male	Female
1969	Sandhill River	Angling	20	2	0	5	0	0
1970	Sandhill River	Angling	53	7	0	0	0	0
1971	Sandhill River	Angling	27	3	0	0	0	0
	Sandhill Cove	Net	63	9	5	23	1	2
1972	Sandhill River	Angling	47	6	2	2	0	0
	Sandhill Cove	Net	114	17	7	44	5	0
1973	Sandhill River	Counting fence	49	11	57	147	0	0
	Sandhill River	Angling	102	59	1	10	0	0
	Sandhill Cove	Net	76	25	20	84	0	0
Total			551	139	92	315	6	2
Sex ratio (%F)			20.1		77.4		25.0	

TABLE 107. Weekly total of upstream fish migrations, Sandhill River, 1967. Trap located 4.8 km upstream from mouth (DFO, unpubl. data).

Week ending	Salmon <2.7 kg	Salmon ≥2.7 kg	Brook trout	Arctic char	White sucker	American eel	Alewife	Total fish	Mean water temp. (°C)	Mean water height (m)
02 July[a]	0	0	5	0	26	0	0	31	18.3	0.66
09 July	62	7	12	0	78	1	0	160	14.5	0.61
16 July	175	21	18	0	37	0	2	253	12.6	0.57
23 July	199	42	11	1	23	0	0	276	14.2	0.55
30 July[b]	116	15	6	2	9	0	0	148	10.5	0.92
06 Aug.	0	0	0	0	0	0	0	0	—	—
13 Aug.	0	0	0	0	0	0	0	0	—	—
20 Aug.	1	1	0	0	1	0	0	3	15.5	0.60
27 Aug.	0	1	2	0	11	0	0	14	13.6	0.55
03 Sept.[c]	0	0	1	0	8	0	0	9	13.9	0.53
Total	553	87	55	3	193	1	2	894		

[a]Fence completed 02 July.
[b]Fence washed out 26 July – 16 Aug.
[c]Fence removed 29 Aug.

TABLE 108. Weekly total of upstream fish migrations, Sandhill River, 1969. Trap located 5.6 km upstream from mouth (Murphy 1972b).

Week ending	Salmon <2.7 kg	Salmon ≥2.7 kg	Brook trout	Arctic char	White sucker	Total fish	Mean water temp. (°C)	Mean water height (m)
20 July[a]	2	1	9	0	8	20	16.9	0.42
27 July	111	5	9	0	10	135	15.7	0.45
03 Aug.	297	7	7	14	28	353	16.8	0.32
10 Aug.	328	13	10	6	20	377	15.1	0.38
17 Aug.	114	5	11	20	1	151	16.7	0.58
24 Aug.	46	4	21	11	27	109	15.7	0.69
31 Aug.	13	1	3	2	21	40	13.9	0.69
Total	911	36	70	53	115	1185		

[a]Fence completed 17 July.

TABLE 109. Weekly total of upstream fish migrations, Sandhill River, 1970. Trap located 5.6 km upstream from mouth (Murphy 1972b).

Week ending	Salmon <2.7 kg	Salmon ≥2.7 kg	Brook trout	Arctic char	White sucker	Total fish	No. salmon tagged	Mean water temp. (°C)	Mean water height (m)
05 July[a]	4	1	3	0	5	13	0	14.2	0.46
12 July	111	14	27	0	67	219	41	16.9	0.43
19 July	556	21	26	2	46	651	151	15.3	0.34
26 July	588	26	11	6	17	648	92	15.0	0.59
02 Aug.	1063	27	11	18	20	1139	48	17.5	0.57
09 Aug.	761	20	15	21	8	825	0	19.6	0.56
16 Aug.	238	7	15	14	13	287	88	17.4	0.33
23 Aug.	124	4	11	4	31	174	38	15.3	0.28
30 Aug.	40	5	5	5	47	102	25	12.3	0.24
06 Sept.	75	8	14	0	191	288	15	9.1	0.44
13 Sept.	44	2	10	1	415	472	8	12.8	0.40
20 Sept.	3	1	3	0	4	11	0	9.7	0.24
27 Sept.	3	3	0	0	1	7	0	6.7	0.19
04 Oct.	10	0	0	0	0	10	0	6.5	0.18
11 Oct.	13	0	1	0	0	14	0	7.0	0.19
18 Oct.[b]	7	0	5	0	5	17	0	6.5	0.21
Total	3640	139	157	71	870	4877	506		

[a]Fence completed 04 July.
[b]Fence removed 16 Oct.

TABLE 110. Weekly total of upstream fish migrations, Sandhill River, 1971. Trap located 5.6 km upstream from mouth (Murphy 1972b).

Week ending	Salmon <2.7 kg	Salmon ≥2.7 kg	Brook trout	Arctic char	White sucker	Total fish	No. salmon tagged	Mean water temp. (°C)	Mean water height (m)
04 July	55	78	2	0	2	137	0	9.4	0.53
11 July	280	71	5	0	24	380	90	12.1	0.31
18 July[a]	603	35	18	0	13	669	67	14.7	0.28
25 July	978	30	9	2	79	1098	55	18.8	0.24
01 Aug.	642	21	9	1	32	705	20	17.8	0.20
08 Aug.	385	9	12	9	18	433	20	14.9	0.11
15 Aug.	249	4	8	3	27	291	54	16.6	0.15
22 Aug.	77	3	7	3	0	90	42	11.7	0.14
29 Aug.	82	8	7	6	29	132	20	11.2	0.17
05 Sept.	64	4	6	2	36	112	10	10.1	0.43
12 Sept.	25	2	5	1	49	82	2	9.6	0.37
19 Sept.	29	0	5	1	109	144	0	10.3	0.38
26 Sept.	6	0	1	0	20	27	2	9.0	0.27
03 Oct.	12	0	0	0	0	12	1	2.9	0.27
Total	3487	265	94	28	438	4312	383		

[a]Fence completed 12 July.

TABLE 111. Weekly total of upstream fish migrations, Sandhill River, 1972. Trap located 5.6 km upstream from mouth (Murphy 1974).

Week ending	Salmon <2.7 kg	Salmon ≥2.7 kg	Brook trout	Arctic char	White sucker	Total fish	Mean water temp. (°C)	Mean water height (m)
02 July[a]	0	0	0	0	0	0	15.6	0.54
09 July	1	7	4	0	6	18	18.2	0.34
16 July	43	51	2	0	26	122	16.3	0.33
23 July	226	32	3	0	1	262	16.3	0.32
30 July	465	24	8	0	0	497	15.5	0.36
06 Aug.	444	10	6	5	3	468	16.4	0.31
13 Aug.	417	21	5	7	2	452	14.3	0.43
20 Aug.	132	4	5	9	6	156	12.8	0.54
27 Aug.	97	6	12	13	28	156	14.1	0.38
03 Sept.	31	4	1	11	25	72	13.9	0.27
10 Sept.	16	3	0	6	28	53	11.5	0.31
17 Sept.	5	3	0	2	0	10	7.5	—
24 Sept.[b]	0	0	0	0	0	0	6.5	—
Total	1877	165	46	53	125	2266		

[a]Fence completed 28 June.
[b]Fence removed 21 Sept.

TABLE 112. Weekly total of upstream fish migrations, Sandhill River, 1973. Trap located 5.6 km upstream from mouth (Murphy 1972b).

Week ending	Salmon <2.7 kg	Salmon ≥2.7 kg	Brook trout	Arctic char	White sucker	Shad	Total fish	Mean water temp. (°C)	Mean water height (m)
17 June	0	7	0	0	0	0	7	8.5	0.90
24 June	7	134	0	0	0	0	141	10.7	0.71
01 July	68	64	10	0	20	0	162	15.4	0.57
08 July[a]	514	100	21	0	84	0	719	18.5	0.52
15 July	911	94	8	1	13	1	1028	17.0	0.76
22 July	1367	40	14	1	0	0	1422	18.9	0.58
29 July	317	1	3	5	0	0	326	14.6	0.49
05 Aug.	488	10	6	1	1	0	506	16.9	0.50
12 Aug.	571	12	7	4	0	0	594	16.7	0.51
19 Aug.	145	11	2	0	0	0	158	15.8	0.51
26 Aug.	41	1	0	1	0	0	43	13.6	0.46
02 Sept.	34	5	1	0	1	0	41	11.7	0.49
09 Sept.	42	3	2	0	5	0	52	9.2	0.52
16 Sept.	17	4	0	0	1	0	22	8.1	0.50
23 Sept.[b]	29	3	0	0	0	0	32	7.9	0.53
Total	4551	489	74	13	125	1	5253		

[a]Fence completed 08 July.
[b]Fence removed 18 Sept.

TABLE 113. Fork length, age, and sex of adult Atlantic salmon, Sandhill River, 1967 (Peet 1971).

Class boundaries of fork length (cm)	Age (yr)														Total		%
	4+				5+				6+				7+				
	3:1+		2:1,1+		4:1+		3:1,1+		5:1+		4:1,1+		4:1,1,1+				
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
44.95–47.94	0	0	0	0	2	6	0	0	0	0	0	0	0	0	2	6	1.6
47.95–50.94	15	7	0	0	25	23	0	0	1	0	0	0	0	0	41	30	13.9
50.95–53.94	36	22	0	0	60	62	0	0	5	5	1	0	0	0	102	89	37.3
53.95–56.94	26	8	0	0	59	40	0	0	8	3	1	0	0	0	93	51	28.1
56.95–59.94	2	1	0	0	16	8	0	0	0	0	0	0	0	0	19	9	5.5
59.95–62.94	1	0	0	0	2	2	0	0	0	0	0	0	0	0	3	2	1.0
62.95–65.94	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2	0	0.4
65.95–68.94	0	0	0	0	1	1	4	0	0	0	2	0	0	0	7	1	1.6
68.95–71.94	0	0	0	0	1	0	1	2	0	0	7	2	0	0	9	4	2.5
71.95–74.94	0	0	0	0	0	0	4	2	0	0	6	5	0	0	10	7	3.3
74.95–77.94	0	0	0	0	0	0	2	2	0	0	7	6	0	0	9	8	3.3
77.95–80.94	0	0	0	0	0	0	1	0	0	0	2	1	0	0	3	1	0.8
80.95–83.94	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2	0	0.4
83.95–86.94	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	0.4
Subtotal	80	38	1	0	166	142	14	6	14	8	28	14	1	0	304	208	
Total	118		1		308		20		22		42		1		512		
%	23.0		0.2		60.2		3.9		4.3		8.2		0.2		100		100

TABLE 114. Fork length, weight, and sex of adult Atlantic salmon, Sandhill River, 1967 (Peet 1971).

Fork length				Weight	
Class boundaries (cm)	Frequency			Class boundaries (g)	Frequency
	Male	Female	Total		
44.95–47.94	2	6	8	899–1298	28
47.95–50.94	41	30	71	1299–1698	186
50.95–53.94	102	89	191	1699–2098	194
53.95–56.94	93	51	144	2099–2498	30
56.95–59.94	19	9	28	2499–2898	9
59.95–62.94	3	2	5	2899–3298	2
62.95–65.94	2	0	2	3299–3698	5
65.95–68.94	7	1	8	3699–4098	11
68.95–71.94	9	4	13	4099–4498	12
71.95–74.94	10	7	17	4499–4898	11
74.95–77.94	9	8	17	4899–5298	9
77.95–80.94	3	1	4	5299–5698	5
80.95–83.94	2	0	2	5699–6098	2
83.95–86.94	2	0	2	6099–6498	2
86.95–89.94	0	1	1	6499–6898	2
Total	304	209	513		508
Mean fork length = 55.95 cm				Mean weight = 2071 g	

TABLE 115. Age and sex of adult Atlantic salmon, Sandhill River, 1967 (Peet 1971).

	Years in freshwater								Years in salt water								
	2		3		4		5		1		2		3		Frequency		%
Age	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	of total
4+	1	0	80	38	0	0	0	0	80	38	1	0	0	0	81	38	23.2
5+	0	0	14	6	166	142	0	0	166	142	14	6	0	0	180	148	64.1
6+	0	0	0	0	28	14	14	8	14	8	28	14	0	0	42	22	12.5
7+	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0.2
Subtotal	1	0	94	44	195	156	14	8	260	188	43	20	1	0	304	208	
Total	1		138		351		22		448		63		1				
%	0.2		27.0		68.6		4.3		87.5		12.3		0.2				100

TABLE 116. Fork length and age of adult Atlantic salmon, Sandhill River, 1969 (Murphy 1972b).

Class boundaries of fork length (cm)	1-sea-winter				2-sea-winter			3-sea-winter			
	3:1+	4:1+	5:1+	6:1+	3:1,1+	4:1,1+	5:1,1+	3:1,S,1+	4:1,1,S+	4:1,1,S+	Total
42.49–45.48	0	2	0	0	0	0	0	0	0	0	2
45.49–48.48	1	4	2	0	0	0	0	0	0	0	7
48.49–51.48	18	55	14	0	0	0	0	0	0	0	87
51.49–54.48	40	124	20	3	0	0	0	0	0	0	187
54.49–57.48	16	80	13	1	0	0	0	0	0	0	110
57.49–60.48	3	10	7	1	0	0	0	0	0	0	21
60.49–63.48	0	0	0	0	0	3	0	0	0	0	3
63.49–66.48	0	0	0	0	0	3	0	0	0	0	3
66.49–69.48	0	0	0	0	2	4	1	0	0	0	7
69.49–72.48	0	0	0	0	2	2	0	0	0	0	4
72.49–75.48	0	0	0	0	1	2	0	0	0	0	3
75.49–78.48	0	0	0	0	0	2	0	1	1	0	4
78.49–81.48	0	0	0	0	0	0	0	0	0	1	1
Total	78	275	56	5	5	16	1	1	1	1	439

TABLE 117. Fork length and weight of adult Atlantic salmon, Sandhill River, 1969 (Murphy 1972b).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
42.49–45.48	2	499–898	1
45.49–48.48	7	899–1298	19
48.49–51.48	88	1299–1698	215
51.49–54.48	190	1699–2098	134
54.49–57.48	111	2099–2498	16
57.49–60.48	22	2499–2898	5
60.49–63.48	3	2899–3298	5
63.49–66.48	3	3299–3698	6
66.49–69.48	7	3699–4098	3
69.49–72.48	4	4099–4498	4
72.49–75.48	4	4499–4898	1
75.49–78.48	4	4899–5298	2
78.49–81.48	0	5299–5698	0
81.49–84.48	0	—	—
84.49–87.48	0	—	—
87.49–90.48	0	—	—
90.49–93.48	1	8899–9298	1
Total	446		412
Mean fork length = 54.34 cm		Mean weight = 1791 g	

TABLE 118. Fork length and age of adult Atlantic salmon, Sandhill River, 1970 (Murphy 1972b).

Class boundaries of fork length (cm)	1-sea-winter				2-sea-winter				3-sea-winter		Total
	3:1+	4:1+	5:1+	6:1+	3:1,1+	4:1,1+	5:1,1+	5:1,S+	4:1,S,1+	3:1,1,1+	
42.49–45.48	0	1	0	0	0	0	0	0	0	0	1
45.49–48.48	0	9	2	0	0	0	0	0	0	0	11
48.49–51.48	6	49	22	2	0	0	1	0	0	0	80
51.49–54.48	14	130	71	13	0	0	0	0	0	0	228
54.49–57.48	6	107	70	7	0	0	0	0	0	0	190
57.49–60.48	1	33	29	1	0	0	0	0	0	0	64
60.49–63.48	0	5	1	0	0	0	0	0	0	0	6
63.49–66.48	0	1	0	0	0	0	0	0	0	0	1
66.49–69.48	0	0	0	0	1	6	1	0	0	0	8
69.49–72.48	0	0	0	0	1	6	1	1	0	0	9
72.49–75.48	0	0	0	0	0	8	1	1	0	0	10
75.49–78.48	0	0	0	0	0	1	3	0	1	0	5
78.49–81.48	0	0	0	0	0	0	0	0	0	1	1
Total	27	335	195	23	2	21	7	2	1	1	614

TABLE 119. Fork length and weight of adult Atlantic salmon, Sandhill River, 1970 (Murphy 1972b).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
42.49–45.48	1	899–1298	12
45.49–48.48	11	1299–1698	165
48.49–51.48	84	1699–2098	234
51.49–54.48	234	2099–2498	64
54.49–57.48	194	2499–2898	4
57.49–60.48	68	2899–3298	3
60.49–63.48	6	3299–3698	8
63.49–66.48	1	3699–4098	5
66.49–69.48	8	4099–4498	7
69.49–72.48	10	4499–4898	3
72.49–75.48	9	4899–5298	2
75.49–78.48	6	5299–5698	2
78.49–81.48	1		
Total	633		509
Mean fork length = 55.18 cm		Mean weight = 1902.26 g	

TABLE 120. Fork length and age of adult Atlantic salmon, Sandhill River, 1971 (Murphy 1972b).

Class boundaries of fork length (cm)	1-sea-winter					2-sea-winter				3-sea-winter				
	2:1+	3:1+	4:1+	5:1+	6:1+	3:1,1+	4:1,1+	4:1,S+	5:1,1+	3:1,S,1+	4:1,S,1+	4:1,1,1+	4:1,1,S+	Total
42.49–45.48	0	0	1	0	0	0	0	0	0	0	0	0	0	1
45.49–48.48	0	0	3	0	0	0	0	0	0	0	0	0	0	3
48.49–51.48	0	8	20	5	0	0	0	0	0	0	0	0	0	33
51.49–54.48	1	44	116	12	0	0	0	0	0	0	0	0	0	173
54.49–57.48	0	27	96	12	1	0	0	1	0	0	0	0	0	137
57.49–60.48	0	7	29	5	0	2	1	0	0	0	0	0	0	44
60.49–63.48	0	0	1	1	0	0	0	0	0	0	0	0	0	2
63.49–66.48	0	0	0	0	0	1	3	0	0	0	0	0	0	4
66.49–69.48	0	0	0	0	0	2	8	0	1	0	0	0	0	11
69.49–72.48	0	0	0	0	0	10	15	0	2	0	1	0	0	28
72.49–75.48	0	0	0	0	0	3	12	0	1	0	2	0	0	18
75.49–78.48	0	0	0	0	0	2	3	0	0	0	2	1	0	8
78.49–81.48	0	0	0	0	0	0	1	0	0	1	3	0	0	5
81.49–84.48	0	0	0	0	0	0	0	0	1	0	1	0	1	3
Total	1	86	266	35	1	20	43	1	5	1	9	1	1	470

TABLE 121. Fork length, weight, and sex of adult Atlantic salmon, Sandhill River, 1971 (Murphy 1972b).

Fork length				Weight			
Class boundaries (cm)	Frequency	Sex[a] M	Sex[a] F	Class boundaries (g)	Frequency	Sex[a] M	Sex[a] F
42.49–45.48	1	0	1	899–1298	14	6	7
45.49–48.48	5	2	1	1299–1698	197	126	70
48.49–51.48	60	29	28	1699–2098	197	143	52
51.49–54.48	210	138	66	2099–2498	32	22	10
54.49–57.48	151	114	36	2499–2898	9	1	5
57.49–60.48	47	31	15	2899–3298	4	1	3
60.49–63.48	3	2	1	3299–3698	5	2	3
63.49–66.48	4	0	4	3699–4098	17	8	9
66.49–69.48	12	5	6	4099–4498	9	7	2
69.49–72.48	30	14	14	4499–4898	8	3	4
72.49–75.48	18	9	9	4899–5298	8	3	3
75.49–78.48	8	5	3	5299–5698	4	2	2
78.49–81.48	5	3	2	5699–6098	2	1	1
81.49–84.48	3	0	3	6099–6498	1	1	0
				6499–6898	1	0	1
				6899–7298	1	0	1
Total	557	352	189		509	326	173
Mean fork length = 56.77 cm				Mean weight = 2062.45 g			

[a]Not all samples sexed.

TABLE 122. Fork length and age of adult Atlantic salmon, Sandhill River, 1972 (Murphy 1974).

Class boundaries of fork length (cm)	1-sea-winter				2-sea-winter				3-sea-winter				
	3:1+	4:1+	5:1+	6:1+	3:1,1+	4:1,1+	5:1,1+	6:1,1+	3:1,1,1+	4:1,1,1+	5:1,1,1+	6:1,1,1+	Total
45.49–48.48	0	1	0	0	0	0	0	0	0	0	0	0	1
48.49–51.48	2	19	3	0	0	0	0	0	0	0	0	0	24
51.49–54.48	9	83	18	1	0	0	0	0	0	0	0	0	111
54.49–57.48	11	109	35	3	0	0	0	0	0	0	0	0	158
57.49–60.48	6	30	11	0	0	0	0	0	0	0	0	0	47
60.49–63.48	0	5	5	0	0	2	0	0	0	0	0	0	12
63.49–66.48	0	0	0	0	0	0	0	0	0	0	0	0	0
66.49–69.48	0	0	0	0	0	1	0	0	0	0	0	0	1
69.49–72.48	0	2	0	0	0	4	1	1	0	1	1	0	10
72.49–75.48	0	0	0	0	1	11	6	0	0	1	0	0	19
75.49–78.48	0	0	0	0	1	8	3	0	1	3	0	0	16
78.49–81.48	0	0	0	0	0	6	1	0	0	0	0	1	8
81.49–84.48	0	0	0	0	0	1	0	0	0	0	0	0	1
84.49–87.48	0	0	0	0	0	0	0	1	0	0	0	0	1
Total	28	249	72	4	2	33	11	2	1	5	1	1	409

TABLE 123. Fork length and weight of 1-sea-winter Atlantic salmon, Sandhill River, 1972 (Murphy 1974).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
46.49–47.48	1	1099–1198	2
47.49–48.48	3	1199–1298	7
48.49–49.48	9	1299–1398	8
49.49–50.48	24	1399–1498	27
50.49–51.48	26	1499–1598	33
51.49–52.48	59	1599–1698	29
52.49–53.48	58	1699–1798	23
53.49–54.48	53	1799–1898	23
54.49–55.48	52	1899–1998	11
55.49–56.48	30	1999–2098	10
56.49–57.48	26	2099–2198	5
57.49–58.48	7	2199–2298	1
58.49–59.48	11	2299–2398	0
59.49–60.48	2	2399–2498	2
60.49–61.48	4	2499–2598	0
61.49–62.48	1	2599–2698	1
Total	366		182
Mean fork length = 53.72 cm		Mean weight = 1676 g	

TABLE 124. Fork length and weight of multi-sea-winter Atlantic salmon, Sandhill River, 1972 (Murphy 1974).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
57.49–60.48	1	3099–3298	2
60.49–63.48	1	3299–3498	0
63.49–66.48	1	3499–3698	2
66.49–69.48	4	3699–3898	4
69.49–72.48	17	3899–4098	4
72.49–75.48	20	4099–4298	1
75.49–78.48	10	4299–4498	4
78.49–81.48	3	4499–4698	5
81.49–84.48	2	4699–4898	3
		4899–5098	4
		5099–5298	2
		5299–5498	1
		5499–5698	0
		5699–5898	1
		5899–6098	0
		6099–6298	0
		6299–6498	0
		6499–6698	1
Total	59		34
Mean fork length = 73.22 cm		Mean weight = 4786.36 g	

TABLE 125. Fork length and age of adult Atlantic salmon, Sandhill River, 1973 (Murphy 1974).

Class boundaries of fork length (cm)	1-sea-winter					2-sea-winter				3-sea-winter					4-sea-winter	Total
	3:1+	4:1+	5:1+	6:1+	7:1+	3:1,1+	4:1,1+	5:1,1+	6:1,1+	3:1,S,1+	4:1,1,1+	4:1,S,1+	5:1,S,1+	6:1,S,1+	4:1,1,S,1+	
45.49–48.48	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	4
48.49–51.48	0	27	7	0	0	0	0	0	0	0	0	0	0	0	0	34
51.49–54.48	7	139	77	11	1	0	0	0	0	0	0	0	0	0	0	235
54.49–57.48	17	205	178	30	0	0	0	0	0	0	0	0	0	0	0	430
57.49–60.48	6	97	93	7	0	0	0	0	0	0	0	0	0	0	0	203
60.49–63.48	1	12	20	2	0	0	0	0	0	0	0	0	0	0	0	35
63.49–66.48	0	0	2	1	0	0	1	0	0	0	0	0	0	0	0	4
66.49–69.48	0	0	1	0	0	0	2	1	0	0	0	0	0	0	0	4
69.49–72.48	0	0	1	0	0	2	5	5	1	0	0	0	0	0	0	14
72.49–75.48	0	0	0	0	0	7	19	13	0	1	0	7	2	0	0	49
75.49–78.48	0	0	0	0	0	7	36	21	1	2	0	6	0	0	0	73
78.49–81.48	0	0	0	0	0	1	12	12	3	3	0	7	5	0	0	43
81.49–84.48	0	0	0	0	0	0	6	4	1	0	0	11	3	0	0	25
84.49–87.48	0	0	0	0	0	0	1	0	0	0	0	2	3	0	0	6
87.49–90.48	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	3
90.49–93.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
93.49–96.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
96.49–99.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99.49–102.48	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Total	32	480	382	51	1	17	83	57	6	6	1	33	13	1	1	1164

TABLE 126. Fork length of adult Atlantic salmon, Sandhill River, 1973 (Murphy 1974).

Fork length: Class boundaries (cm)	Frequency
44.49–46.48	4
46.49–48.48	9
48.49–50.48	49
50.49–52.48	161
52.49–54.48	282
54.49–56.48	283
56.49–58.48	144
58.49–60.48	44
60.49–62.48	9
62.49–64.48	2
64.49–66.48	0
66.49–68.48	2
68.49–70.48	11
70.49–72.48	24
72.49–74.48	49
74.49–76.48	51
76.49–78.48	38
78.49–80.48	35
80.49–82.48	17
82.49–84.48	7
84.49–86.48	3
86.49–88.48	3
88.49–90.48	2
90.49–92.48	0
92.49–94.48	0
94.49–96.48	0
96.49–98.48	1
Total	1230

TABLE 127. Weekly totals of downstream fish migrations, Sandhill River, 1969. Combined counts from fyke nets located 6.0 km from river mouth and trap located 5.6 km upstream from mouth. Totals represent only partial counts (Murphy 1972b).

Week ending	Atlantic salmon			Brook trout	American eel	White sucker	Shad	Total fish	No. smolt tagged	Mean water temp. (°C)	Mean water height (m)
	Smolt	Parr	Kelt								
29 June	3 453	47	0	30	23	661	0	4 214	2 403	11.8	1.03
06 July	2 752	279	0	48	48	46	0	3 173	2 672	12.4	0.71
13 July	1 492	994	0	185	33	63	1	2 768	1 273	12.7	0.48
20 July	885	885	0	244	26	85	0	2 125	512	16.9	0.42
27 July[a]	49	9	0	13	0	33	1	105	0	15.7	0.45
03 Aug.	16	2	0	8	0	0	0	26	0	16.8	0.32
10 Aug.	0	7	0	3	0	2	0	12	0	15.1	0.38
17 Aug.	6	26	0	8	8	14	0	62	0	16.7	0.58
24 Aug.	0	0	0	2	0	0	0	2	0	15.7	0.69
31 Aug.	0	0	0	1	0	0	0	1	0	13.9	0.69
Total	8 653	2 249	0	542	138	904	2	12 488	6 860		

[a]Fence completed 23 July.

TABLE 128. Weekly totals of downstream fish migrations, Sandhill River, 1970. Trap located 5.6 km upstream from mouth (Murphy 1972b).

Week ending	Atlantic salmon			Brook trout	American eel	White sucker	Total fish	No. smolt tagged	Mean water temp. (°C)	Mean water height (m)
	Smolt	Parr	Kelt							
14 June	34	67	7	59	15	13	195	0	8.9	0.97
21 June	1 967	154	4	68	13	2 068	4 274	722	11.1	0.83
28 June	42 886	149	0	48	9	1 122	44 214	4 540	12.4	0.77
05 July[a]	4 087	89	0	20	6	62	4 264	2 653	14.2	0.46
12 July	1 499	136	0	21	5	45	1 706	223	16.9	0.43
19 July	21	1	0	5	3	7	37	0	15.3	0.34
26 July	219	71	0	29	16	368	703	0	15.0	0.59
02 Aug.	64	53	0	17	9	276	419	0	17.5	0.57
09 Aug.	14	60	0	5	1	55	135	0	19.6	0.56
Total	50 791	780	11	272	77	4 016	55 947	8 138		

[a]Fence completed 30 June.

TABLE 129. Weekly totals of downstream fish migrations, Sandhill River, 1971. Trap located 5.6 km upstream from mouth (Murphy 1972b).

Week ending	Atlantic salmon			Brook trout	American eel	White sucker	Shad	Total fish	No. smolt tagged	Mean water temp. (°C)	Mean water height (m)
	Smolt	Parr	Kelt								
06 June	0	0	0	0	0	0	0	0	0	5.3	0.89
13 June	4	4	0	1	0	0	0	9	0	7.9	0.76
20 June	65	51	0	10	2	51	0	179	0	7.8	0.69
27 June[a]	27 256	316	1	47	2	1 209	0	28 831	4 418	9.4	0.70
04 July	18 301	234	0	24	2	151	1	18 713	5 609	9.4	0.53
11 July	6 447	178	0	37	1	82	1	6 746	673	12.1	0.31
18 July	531	33	0	23	0	28	0	615	0	14.7	0.28
25 July[b]	3	2	0	3	0	4	1	13	0	18.8	0.24
01 Aug.	0	0	0	0	0	0	0	0	0	17.8	0.20
08 Aug.	0	0	0	0	0	0	0	0	0	14.9	0.11
15 Aug.	0	0	0	0	0	0	0	0	0	16.6	0.15
22 Aug.	0	0	0	0	0	0	0	0	0	11.7	0.14
29 Aug.	0	0	0	0	0	0	0	0	0	11.2	0.17
05 Sept.	0	0	0	0	0	0	0	0	0	10.3	0.43
12 Sept.	0	3	0	10	36	10	0	59	0	9.0	0.37
Total	52 607	821	1	155	43	1 535	3	55 165	10 700		

[a]Fence completed 22 June.
[b]1 lamprey 25 July.

TABLE 130. Weekly totals of downstream fish migrations, Sandhill River, 1972. Trap located 5.6 km upstream from mouth (Murphy 1974).

Week ending	Atlantic salmon Smolt	Atlantic salmon Parr	Atlantic salmon Kelt	Brook trout	American eel	White sucker	Threespine stickleback	Total fish	No. smolt tagged	Mean water temp. (°C)	Mean water height (m)
25 June	127	100	0	39	0	68	1	335	73	11.9	0.85
02 July[a]	32 736	99	0	50	2	8 385	1	41 273	5 946	15.6	0.54
09 July	3 870	55	0	24	1	39	1	3 990	2 196	18.2	0.34
16 July	204	10	0	3	0	3	0	220	0	16.3	0.33
23 July	60	1	0	2	0	0	0	63	0	16.3	0.32
30 July	7	2	1	2	4	2	0	18	0	15.5	0.36
06 Aug.	0	0	0	0	0	0	0	0	0	16.4	0.31
13 Aug.	0	0	0	4	44	119	0	167	0	14.3	0.43
20 Aug.	3	3	3	6	78	76	0	169	0	12.8	0.54
27 Aug.	0	0	0	0	1	0	0	1	0	14.1	0.38
03 Sept.	0	0	0	0	0	0	0	0	0	13.9	0.27
10 Sept.	0	0	0	0	0	0	0	0	0	11.5	0.31
17 Sept.	0	0	0	0	0	0	0	0	0	7.5	—
24 Sept.[b]	0	0	0	0	0	0	0	0	0	6.5	—
Total	37 007	270	4	130	130	8 692	3	46 236	8 215		

[a]Fence completed 26 June.
[b]Fence removed 21 Sept.

TABLE 131. Weekly totals of downstream fish migrations, Sandhill River, 1973. Trap located 5.6 km upstream from river mouth (Murphy 1974).

Week ending	Atlantic salmon Smolt	Atlantic salmon Parr	Atlantic salmon Kelt	Brook trout	American eel	White sucker	Shad	Total fish	No. smolt tagged	Mean water temp. (°C)	Mean water height (m)
10 June[a]	407	101	0	96	1	1 883	0	2 488	0	11.6	1.03
17 June	2 974	94	30	93	1	11 200	0	14 392	0	8.5	0.90
24 June	28 655	68	6	35	1	1 631	0	30 396	3 682	10.7	0.71
01 July	13 785	240	3	60	2	54	0	14 144	2 418	15.4	0.57
08 July	1 313	117	3	74	0	22	0	1 529	108	18.5	0.52
15 July	482	7	6	11	0	79	0	585	0	17.0	0.76
22 July	100	3	1	11	0	2	0	117	0	18.9	0.58
29 July	3	2	2	1	0	0	0	8	0	14.6	0.49
05 Aug.	48	2	2	4	0	0	0	56	0	16.9	0.50
12 Aug.	4	1	3	1	0	0	1	10	0	16.7	0.51
19 Aug.	0	0	0	0	0	0	0	0	0	15.8	0.51
26 Aug.	0	0	1	0	0	0	0	1	0	13.6	0.46
Total	47 771	635	57	386	5	14 871	1	63 726	6 208		

[a]Fence completed 09 June.

TABLE 132. Fork length and age of Atlantic salmon parr and smolts, Sandhill River, 1969 (Murphy 1972b).

Class boundaries of fork length (cm)	Age (yr)						Mean age (yr)	Total
	1+	2+	3+	4+	5+	6+		
4.49–5.48	7	0	0	0	0	0	1.0	7
5.49–6.48	4	0	0	0	0	0	1.0	4
6.49–7.48	0	2	0	0	0	0	2.0	2
7.49–8.48	0	2	0	0	0	0	2.0	2
8.49–9.48	0	1	0	0	0	0	2.0	1
9.49–10.48	0	0	0	0	0	0	—	0
10.49–11.48	0	0	0	0	0	0	—	0
11.49–12.48	0	0	0	1	0	0	4.0	1
12.49–13.48	0	0	1	0	1	0	4.0	2
13.49–14.48	0	1	2	7	8	1	4.3	19
14.49–15.48	0	0	7	12	12	5	4.4	36
15.49–16.48	0	0	6	25	12	7	4.4	50
16.49–17.48	0	0	1	14	10	2	4.5	27
17.49–18.48	0	0	0	6	4	1	4.5	11
18.49–19.48	0	0	0	4	1	1	4.5	6
Total	11	6	17	69	48	17	4.1	168

TABLE 133. Fork length and weight of Atlantic salmon smolts, Sandhill River, 1969 (Murphy 1972b).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
11.49–12.48	1	16.99–20.98	7
12.49–13.48	2	20.99–24.98	11
13.49–14.48	19	24.99–28.98	18
14.49–15.48	41	28.99–32.98	30
15.49–16.48	51	32.99–36.98	32
16.49–17.48	30	36.99–40.98	27
17.49–18.48	11	40.99–44.98	12
18.49–19.48	6	44.99–48.98	11
		48.99–52.98	7
		52.99–56.98	4
		56.99–60.98	1
Total	161		160
Mean fork length = 15.87 cm		Mean weight = 32.27 g	

TABLE 134. Fork length and age of Atlantic salmon smolts, Sandhill River, 1969 (Murphy 1972b).

Class boundaries of fork length (cm)	Age (yr)					Mean age (yr)	Total
	3+	4+	5+	6+	7+		
12.49–13.48	0	1	0	0	0	4.0	1
13.49–14.48	2	6	0	0	0	3.8	8
14.49–15.48	3	36	21	1	0	4.3	61
15.49–16.48	3	41	26	2	0	4.4	72
16.49–17.48	3	21	24	3	0	4.5	51
17.49–18.48	0	6	7	0	1	4.7	14
18.49–19.48	0	5	4	1	0	4.6	10
19.49–20.48	0	1	4	0	0	4.2	5
Total	11	117	86	7	1	4.4	222

TABLE 135. Fork length and weight of Atlantic salmon smolts, Sandhill River, 1970 (Murphy 1972b).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
12.49–13.48	1	20.99–24.98	4
13.49–14.48	8	24.99–28.98	16
14.49–15.48	61	28.99–32.98	43
15.49–16.48	70	32.99–36.98	42
16.49–17.48	49	36.99–40.98	40
17.49–18.48	14	40.99–44.98	29
18.49–19.48	10	44.99–48.98	16
19.49–20.48	5	48.99–52.98	10
		52.99–56.98	6
		56.99–60.98	7
		60.99–64.98	2
		64.99–68.98	3
Total	218		218
Mean fork length = 16.20 cm		Mean weight = 34.79 g	

TABLE 136. Fork length and age of Atlantic salmon smolts, Sandhill River, 1971 (Murphy 1972b).

Class boundaries of fork length (cm)	Age (yr)				Mean age (yr)	Total
	3+	4+	5+	6+		
12.49–13.48	1	2	1	0	4.0	4
13.49–14.48	4	19	6	0	4.1	29
14.49–15.48	8	49	10	0	4.0	67
15.49–16.48	8	50	20	1	4.2	79
16.49–17.48	2	16	8	1	4.3	27
17.49–18.48	0	8	6	2	4.6	16
18.49–19.48	0	2	2	0	4.5	4
19.49–20.48	0	0	0	0	—	0
Total	23	146	53	4	4.2	226

TABLE 137. Fork length and weight of Atlantic salmon smolts, Sandhill River, 1971 (Murphy 1972b).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
12.49–13.48	4	16.99–20.98	2
13.49–14.48	30	20.99–24.98	10
14.49–15.48	66	24.99–28.98	25
15.49–16.48	80	28.99–32.98	34
16.49–17.48	28	32.99–36.98	55
17.49–18.48	16	36.99–40.98	41
18.49–19.48	4	40.99–44.98	26
		44.99–48.98	14
		48.99–52.98	11
		52.99–56.98	4
		56.99–60.98	3
		60.99–64.98	1
Total	228		226
Mean fork length = 15.70 cm		Mean weight = 36.80 g	

TABLE 138. Fork length and age of Atlantic salmon smolts, Sandhill River, 1972 (Murphy 1974).

Class boundaries of fork length (cm)	Age (yr)					Mean age (yr)	Total
	2+	3+	4+	5+	6+		
12.49–13.48	0	1	1	0	0	3.5	2
13.49–14.48	1	1	10	2	0	3.9	14
14.49–15.48	1	9	38	7	1	4.0	56
15.49–16.48	0	7	41	6	1	4.0	55
16.49–17.48	0	1	5	8	0	4.5	14
17.49–18.48	0	0	6	1	1	4.4	8
18.49–19.48	0	0	0	0	1	6.0	1
Total	2	19	101	24	4	4.1	150

TABLE 139. Fork length and weight of Atlantic salmon smolts, Sandhill River, 1972 (Murphy 1974).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
12.49–13.48	2	20.99–24.98	1
13.49–14.48	14	24.99–28.98	7
14.49–15.48	56	28.99–32.98	28
15.49–16.48	55	32.99–36.98	42
16.49–17.48	14	36.99–40.98	34
17.49–18.48	8	40.99–44.98	17
18.49–19.48	1	44.99–48.98	10
		48.99–52.98	4
		52.99–56.98	3
		56.99–60.98	3
Total	150		149
Mean fork length = 15.61 cm		Mean weight = 37.71 g	

TABLE 140. Fork length and age of Atlantic salmon smolts, Sandhill River, 1973 (Murphy 1974).

Class boundaries of fork length (cm)	Age (yr)					Mean age (yr)	Total
	3+	4+	5+	6+	7+		
12.49–13.48	1	2	0	0	0	3.7	3
13.49–14.48	1	18	11	1	0	4.4	31
14.49–15.48	3	45	48	2	1	4.5	99
15.49–16.48	1	88	87	16	0	4.6	192
16.49–17.48	11	97	107	21	0	4.6	236
17.49–18.48	3	51	67	12	0	4.7	133
18.49–19.48	1	27	49	8	1	4.8	86
19.49–20.48	0	7	19	1	0	4.8	27
20.49–21.48	0	2	9	0	0	4.8	11
21.49–22.48	0	0	1	0	0	5.0	1
Total	21	337	398	61	2	4.6	819

TABLE 141. Fork length and weight of Atlantic salmon smolts, Sandhill River, 1973 (Murphy 1974).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
12.49–13.48	15	16.99–20.98	1
13.49–14.48	50	20.99–24.98	17
14.49–15.48	176	24.99–28.98	59
15.49–16.48	203	28.99–32.98	116
16.49–17.48	191	32.99–36.98	153
17.49–18.48	128	36.99–40.98	171
18.49–19.48	52	40.99–44.98	99
19.49–20.48	16	44.99–48.98	82
20.49–21.48	4	48.99–52.98	52
21.49–22.48	1	52.99–56.98	29
		56.99–60.98	18
		60.99–64.98	11
		64.99–68.98	6
		68.99–72.98	4
		72.99–76.98	0
		76.99–80.98	1
Total	836		819
Mean fork length = 16.44 cm		Mean weight = 39.67 g	

TABLE 142. Weekly totals of upstream fish migrations, Northwest Tributary, Sandhill River, 1967.

Week ending	Salmon		Brook trout	Arctic char	White sucker	Total fish	Trap mortality			Mean water temp. (°C)	Mean water height (m)
	<2.7 kg	≥2.7 kg					Brook trout	Arctic char	White sucker		
09 July[a]	0	0	56	34	19	109	0	0	4	16.4	—
16 July	8	2	398	984	38	1430	22	6	14	15.1	0.53
23 July	9	1	231	267	128	636	11	0	21	16.5	0.53
30 July[b]	15	2	119	1345	264	1745	8	6	46	12.1	0.82
06 Aug.[b]	23	5	157	1198	183	1566	7	43	25	15.1	0.85
13 Aug.	28	0	26	662	32	748	5	50	25	17.0	0.71
20 Aug.	14	2	23	389	4	432	7	44	4	16.6	0.62
27 Aug.	8	1	18	287	2	316	3	59	1	14.4	0.59
03 Sept.[c]	6	1	9	54	2	72	1	8	2	13.8	0.64
Total	111	14	1037	5220	672	7054	64	216	142		

[a] Fence completed 08 July.
[b] Trap closed 29 July and 02 Aug. due to high water.
[c] Fence removed 01 Sept.

TABLE 143. Weekly totals of upstream fish migrations, Northwest Tributary, Sandhill River, 1969 (Murphy 1972b).

Week ending	Salmon <2.7 kg	Salmon ≥2.7 kg	Brook trout	Arctic char	White sucker	Smelt	Total fish	Mean water temp. (°C)	Mean water height (m)
20 July[a]	1	0	6	25	11	0	43	—	—
27 July	6	1	55	65	45	0	172	—	—
03 Aug.	3	0	83	416	10	0	512	—	—
10 Aug.	5	0	28	322	0	0	355	—	—
17 Aug.	1	0	10	336	5	0	352	—	—
24 Aug.	0	0	3	190	2	92	287	—	—
31 Aug.[b]	0	0	0	5	0	107	112	—	—
Total	16	1	185	1359	73	199	1833		

[a]Fence completed 19 July. [b]Fence removed 30 Aug.

TABLE 144. Weekly totals of upstream fish migrations, Northwest Tributary, Sandhill River, 1971 (Murphy 1972b).

Week ending	Salmon <2.7 kg	Salmon ≥2.7 kg	Brook trout	Arctic char	White sucker	Smelt	Total fish	Mean water temp. (°C)
11 July[a]	4	1	2	0	92	0	99	13.6
18 July	24	0	14	1	111	0	150	15.1
25 July	23	0	25	12	126	0	186	18.1
01 Aug.	8	0	15	15	13	0	51	19.6
08 Aug.	5	0	62	203	4	0	274	18.4
15 Aug.	3	0	10	121	15	0	149	18.8
22 Aug.	0	0	6	73	4	0	83	16.0
29 Aug.	26	0	27	74	8	0	135	14.0
05 Sept.	5	0	5	21	1	19	51	13.2
12 Sept.	0	0	1	1	0	154	156	12.4
19 Sept.	2	0	2	3	0	52	59	12.1
26 Sept.	0	0	1	0	0	11	12	11.3
03 Oct.	0	0	0	0	0	6	6	3.7
Total	100	1	170	524	374	242	1411	

[a]Fence completed 08 July.

TABLE 145. Weekly totals of upstream fish migrations, Northwest Tributary, Sandhill River, 1972 (Murphy 1974).

Week ending	Salmon <2.7 kg	Salmon ≥2.7 kg	Brook trout	Arctic char	White sucker	Total fish	Mean water temp. (°C)
16 July[a]	0	1	7	0	0	8	15.8
23 July	2	0	15	21	6	44	15.5
30 July	13	0	63	119	3	198	13.5
06 Aug.	2	0	30	119	0	151	15.5
13 Aug.	9	2	37	274	4	326	13.8
20 Aug.[b]	3	0	5	29	0	37	11.6
27 Aug.[c]	0	0	3	19	0	22	12.6
03 Sept.	0	0	10	27	0	37	10.9
10 Sept.[d]	0	0	3	4	0	7	12.8
Total	29	3	173	612	13	830	

[a]Fence completed 13 July. [c]Fence repaired 25 Aug.
[b]Partial washout 15 Aug. [d]Fence removed 06 Sept.

TABLE 146. Weekly totals of upstream fish migrations, Northwest Tributary, Sandhill River, 1973 (Murphy 1974).

Week ending	Salmon <2.7 kg	Salmon ≥2.7 kg	Brook trout	Arctic char	White sucker	Smelt	Total fish	Mean water temp. (°C)
24 June[a]	0	7	1	0	448	0	456	10.9
01 July	6	9	5	0	303	0	323	15.2
08 July	46	12	2	1	171	0	232	18.8
15 July	89	15	4	11	115	0	234	18.1
22 July	63	2	17	194	31	0	307	19.6
29 July	40	2	13	263	1	0	319	17.4
05 Aug.	46	2	15	78	5	0	146	18.8
12 Aug.	43	3	11	55	6	0	118	17.1
19 Aug.	28	1	7	18	4	0	58	17.5
26 Aug.	15	0	9	6	4	18	52	14.2
02 Sept.	8	1	7	0	0	58	74	12.3
09 Sept.	5	0	6	0	1	829	841	12.4
16 Sept.	0	0	3	0	0	485	488	11.1
Total	389	54	100	626	1089	1390	3648	

[a]Fence completed 21 June.

TABLE 147. Fork length and age of Arctic char, Northwest Tributary, Sandhill River, 1967 (Peet 1971).

Class boundaries of fork length (cm)	Age (yr) 2+	3+	4+	5+	6+	7+	8+	9+	10+	Total
17.95–20.94	3	2	0	0	0	0	0	0	0	5
20.95–23.94	0	2	3	2	0	0	0	0	0	7
23.95–26.94	0	2	9	2	1	0	0	0	0	14
26.95–29.94	0	0	4	3	0	0	0	0	0	7
29.95–32.94	0	1	1	7	0	0	0	0	0	9
32.95–35.94	0	0	0	5	0	0	0	0	0	5
35.95–38.94	0	0	0	2	1	0	0	0	0	3
38.95–41.94	0	0	0	0	2	1	0	0	0	3
41.95–44.94	0	0	0	1	1	0	0	0	0	2
44.95–47.94	0	0	0	0	3	3	1	0	0	7
47.95–50.94	0	0	0	0	0	1	0	1	1	3
50.95–53.94	0	0	0	0	4	2	2	0	0	8
53.95–56.94	0	0	0	0	1	2	0	1	0	4
56.95–59.94	0	0	0	0	1	1	1	0	0	3
Total	3	7	17	22	14	10	4	2	1	80
%	3.8	8.8	21.3	27.5	17.5	12.5	5.0	2.5	1.3	100

Mean age = 5.2 yr

TABLE 148. Fork length and weight of Arctic char, Northwest Tributary, Sandhill River, 1967 (Peet 1971).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
17.95–20.94	19	0–258	189
20.95–23.94	80	259–518	60
23.95–26.94	165	519–778	32
26.95–29.94	90	779–1038	42
29.95–32.94	49	1039–1298	60
32.95–35.94	26	1299–1558	52
35.95–38.94	22	1559–1818	61
38.95–41.94	60	1819–2078	84
41.95–44.94	63	2079–2338	80
44.95–47.94	77	2339–2598	51
47.95–50.94	116	2599–2858	54
50.95–53.94	126	2859–3118	24
53.95–56.94	90	3119–3378	10
56.95–59.94	43	3379–3638	3
59.95–62.94	2	3639–3898	1
62.95–65.94	1	3899–4158	1
Total	1029		804
Mean fork length = 39.90 cm		Mean weight = 1356.25 g	

TABLE 149. Fork length and weight of Arctic char, Northwest Tributary, Sandhill River, 1971 (Murphy 1972b).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
23.95–26.94	7	0–258	7
26.95–29.94	22	259–518	40
29.95–32.94	16	519–778	18
32.95–35.94	12	779–1038	16
35.95–38.94	15	1039–1298	8
38.95–41.94	11	1299–1558	10
41.95–44.94	9	1559–1818	8
44.95–47.94	7	1819–2078	11
47.95–50.94	12	2079–2338	7
50.95–53.94	12	2339–2598	1
53.95–56.94	5	2599–2858	3
56.95–59.94	4		
59.95–62.94	2		
Total	134		129
Mean fork length = 39.55 cm		Mean weight = 950.75 g	

TABLE 150. Fork length and weight of Arctic char, Northwest Tributary, Sandhill River, 1973 (Murphy 1974).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
22.49–24.48	1	199–298	2
24.49–26.48	1	299–398	5
26.49–28.48	0	399–498	6
28.49–30.48	7	499–598	5
30.49–32.48	5	599–698	8
32.49–34.48	3	699–798	4
34.49–36.48	17	799–898	2
36.49–38.48	6	899–998	5
38.49–40.48	24	999–1098	7
40.49–42.48	31	1099–1198	8
42.49–44.48	46	1199–1298	9
44.49–46.48	41	1299–1398	22
46.49–48.48	29	1399–1498	26
48.49–50.48	19	1499–1598	17
50.49–52.48	6	1599–1698	24
52.49–54.48	3	1699–1798	30
54.49–56.48	3	1799–1898	15
		1899–1998	9
		1999–2098	3
		2099–2198	2
		2199–2298	4
		2299–2398	0
		2399–2498	2
Total	242		215
Mean fork length = 42.95 cm		Mean weight = 1449.35 g	

TABLE 151. Fork length and sex of adult Atlantic salmon, Northwest Tributary, Sandhill River, 1967 (Peet 1971).

Fork length				Weight	
Class boundaries (cm)	Frequency			Class boundaries (g)	Frequency
	Male	Female	Total		
42.95–46.44	0	1	1	0699–1248	11
46.45–49.94	0	2	2	1249–1798	49
49.95–53.44	12	16	28	1799–2348	33
53.45–56.94	39	16	55	2349–2898	3
56.95–60.44	6	3	9	2899–3448	3
60.45–63.94	1	1	2	3449–3998	2
63.95–67.44	0	2	2	3999–4548	2
67.45–70.94	1	1	2	4549–5098	1
70.95–74.44	0	1	1	5099–5648	0
74.45–79.94	2	0	2	5649–6198	0
77.95–81.44	0	0	0	6199–6748	1
81.45–84.94	0	0	0	6749–7298	0
84.95–88.44	1	0	1	7299–7848	0
88.45–91.94	0	0	0	7849–8398	0
91.95–95.44	1	0	1	8399–8948	1
Total	63	43	106		106
Mean fork length = 56.15 cm				Mean weight = 1954.60 g	

TABLE 152. Fork length, age, and sex of adult Atlantic salmon, Northwest Tributary, Sandhill River, 1967 (Peet 1971).

Class boundaries of fork length (cm)	Age (yr)																
	4+		5+				6+				7+						
	3:1		4:1		3:2		5:1		4:2		6:1		5:2		Total		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	%
42.95–46.44	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.9
46.45–49.94	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	1.9
49.95–53.44	2	3	7	10	0	0	3	3	0	0	0	0	0	0	12	16	26.4
53.45–56.94	5	3	25	6	0	0	9	7	0	0	0	0	0	0	39	16	51.9
56.95–60.44	0	0	5	2	0	0	1	1	0	0	0	0	0	0	6	3	8.5
60.45–63.94	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	1	1.9
63.95–67.44	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	1.9
67.45–70.94	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	1	1.9
70.95–74.44	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.9
74.45–77.94	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	0	1.9
77.95–81.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
81.45–84.94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
84.95–88.44	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0.9
88.45–91.94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
91.95–95.44	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0.9
Total by sex	7	6	38	21	0	1	13	12	4	2	0	0	1	1	63	43	
Total	13		59		1		25		6		0		2		106		
%	12.3		55.7		0.9		23.6		5.7		0.0		1.9				100.0

TABLE 153. Weekly totals of downstream fish migrations, Northwest Tributary, Sandhill River, 1973 (Murphy 1974).

Week ending	Atlantic salmon			Brook trout	American eel	White sucker	Smelt	Arctic char	Threespine stickleback	Total fish	Mean water temp. (°C)
	Smolt	Parr	Kelt								
17 June	50	13	0	41	4	57	26	390	7	588	—
24 June	555	25	1	77	8	126	20	139	28	979	10.9
01 July	294	97	0	138	5	302	3	39	40	918	15.2
08 July	47	107	0	129	3	79	58	18	46	487	18.8
15 July	48	69	0	75	12	67	2	18	27	318	18.1
22 July	18	13	0	32	2	9	1	10	1	86	19.6
29 July	0	2	0	4	0	0	0	0	1	7	17.4
05 Aug.	0	1	0	0	0	13	0	0	5	19	18.8
12 Aug.	0	2	0	6	1	6	1	0	24	40	17.1
19 Aug.	1	5	0	4	2	4	0	0	10	26	17.5
26 Aug.	1	3	0	2	0	5	0	0	2	13	14.2
02 Sept.	0	6	0	5	5	1	0	0	8	25	12.3
Total	1014	343	1	513	42	669	111	614	199	3506	

TABLE 154. Fork length and age of commercial salmon catch, Sandhill Cove, 1971 (Murphy 1972b).

Class boundaries of fork length (cm)	1-sea-winter			2-sea-winter				3-sea-winter	
	3:1+	4:1+	5:1+	3:1,1+	4:1,1+	4:1,S+	5:1,1+	3:1,S,1+	Total
48.49–51.48	3	8	0	0	0	0	0	0	11
51.49–54.48	7	20	1	0	0	0	0	0	28
54.49–57.48	4	25	1	0	0	0	0	0	30
57.49–60.48	2	2	1	0	0	0	0	0	5
60.49–63.48	0	0	0	0	0	1	0	0	1
63.49–66.48	0	0	0	1	2	0	1	0	4
66.49–69.48	0	0	0	0	4	0	1	0	5
69.49–72.48	0	0	0	1	2	0	0	0	3
72.49–75.48	0	0	0	2	5	0	1	1	9
75.49–78.48	0	0	0	2	3	0	1	0	6
78.49–81.48	0	0	0	0	1	0	0	1	2
81.49–84.48	0	0	0	0	0	0	0	1	1
Total	16	55	3	6	17	1	4	3	105

TABLE 155. Weekly records of sex (%F), fork length, and weight of commercial salmon catch, Sandhill Cove, 1971 (Murphy 1972b).

Week ending	No. sampled						Mean fork length (cm)				Mean weight (kg)				
	1-sea-winter			≧2-sea-winter			1-sea-winter		≧2-sea-winter		1-sea-winter		≧2-sea-winter		
	M	F	%F	M	F	%F	M	F	M	F	M	F	M	F	Total
20 June	0	0	—	0	1	100	—	—	—	71.0	—	—	—	3.9	1
27 June	0	0	—	1	1	50.0	—	—	68.9	75.4	—	—	3.4	5.2	2
04 July	5	0	0.0	3	8	72.7	54.7	—	74.7	73.8	1.9	—	4.7	4.2	16
11 July	18	4	18.2	0	9	100	53.5	54.0	—	70.1	1.8	1.8	—	3.8	31
18 July	25	3	10.7	0	6	100	54.8	54.9	—	75.0	2.0	1.9	—	4.6	34
25 July	12	2	14.3	1	0	0.0	54.0	54.5	62.6	—	1.8	1.7	2.4	—	15
01 Aug.	1	0	0.0	1	0	0.0	50.8	—	60.3	—	1.5	—	2.3	—	2
Total	61	9		6	25										101
Mean			12.9			80.6	54.2	54.4	69.3	72.7	1.9	1.8	3.6	4.2	

TABLE 156. Fork length and weight of 1-sea-winter salmon in the commercial catch, Sandhill Cove, 1972 (Murphy 1974).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
48.49–49.48	2	1199–1298	1
49.49–50.48	1	1299–1398	3
50.49–51.48	5	1399–1498	4
51.49–52.48	11	1499–1598	16
52.49–53.48	17	1599–1698	14
53.49–54.48	14	1699–1798	24
54.49–55.48	24	1799–1898	24
55.49–56.48	19	1899–1998	16
56.49–57.48	10	1999–2098	16
57.49–58.48	17	2099–2198	3
58.49–59.48	6	2199–2298	5
59.49–60.48	1	2299–2398	2
60.49–61.48	2	2399–2498	2
61.49–62.48	2	2499–2598	0
		2599–2698	1
Total	131		131
Mean fork length = 55.37 cm		Mean weight = 1750.27 g	

TABLE 157. Fork length and weight of multi-sea-winter salmon in the commercial catch, Sandhill Cove, 1972 (Murphy 1974).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
64.49–65.48	1	2899–3098	2
65.49–66.48	0	3099–3298	1
66.49–67.48	1	3299–3498	3
67.49–68.48	2	3499–3698	4
68.49–69.48	4	3699–3898	6
69.49–70.48	8	3899–4098	7
70.49–71.48	2	4099–4298	8
71.49–72.48	4	4299–4498	7
72.49–73.48	5	4499–4698	7
73.49–74.48	8	4699–4898	5
74.49–75.48	10	4899–5098	2
75.49–76.48	2	5099–5298	7
76.49–77.48	5	5299–5498	2
77.49–78.48	6	5499–5698	2
78.49–79.48	2	5699–5898	1
79.49–80.48	1		
80.49–81.48	3		
Total	64		64
Mean fork length = 75.81 cm		Mean weight = 4198.66 g	

TABLE 158. Fork length and weight of salmon in the commercial catch, Sandhill Cove, 1973 (Murphy 1974).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
48.49–50.48	1	1299–1498	5
50.49–52.48	6	1499–1698	8
52.49–54.48	25	1699–1898	25
54.49–56.48	32	1899–2098	27
56.49–58.48	23	2099–2298	19
58.49–60.48	10	2299–2498	9
60.49–62.48	0	2499–2698	3
62.49–64.48	1	2699–2898	1
64.49–66.48	1	2899–3098	2
66.49–68.48	1	3099–3298	0
68.49–70.48	10	3299–3498	1
70.49–72.48	15	3499–3698	1
72.49–74.48	17	3699–3898	5
74.49–76.48	20	3899–4098	9
76.49–78.48	24	4099–4298	14
78.49–80.48	10	4299–4498	10
80.49–82.48	6	4499–4698	14
82.49–84.48	2	4699–4898	8
		4899–5098	9
		5099–5298	10
		5299–5498	11
		5499–5698	5
		5699–5898	3
		5899–6098	3
		6099–6298	1
Total	204		203

TABLE 159. Fork length and age of salmon in the commercial catch, Sandhill Cove, 1973 (Murphy 1974).

Class boundaries of fork length (cm)	1-sea-winter				2-sea-winter				3-sea-winter			Total
	3:1+	4:1+	5:1+	6:1+	3:1,1+	4:1,1+	5:1,1+	6:1,1+	3:1,S,1+	4:1,S,1+	5:1,S,1+	
48.49–51.48	1	0	0	0	0	0	0	0	0	0	0	1
51.49–54.48	0	6	6	0	0	0	0	0	0	0	0	12
54.49–57.48	2	22	13	2	0	0	0	0	0	0	0	39
57.49–60.48	0	14	16	4	0	0	0	0	0	0	0	34
60.49–63.48	0	2	3	1	0	0	0	0	0	0	0	6
63.49–66.48	0	1	0	0	0	0	0	0	0	0	0	1
66.49–69.48	0	1	0	0	0	1	0	0	0	0	0	2
69.49–72.48	0	0	0	0	1	9	5	1	0	1	0	17
72.49–75.48	0	0	0	0	2	8	10	2	0	0	0	22
75.49–78.48	0	0	0	0	0	18	9	0	0	0	1	28
78.49–81.48	0	0	0	0	2	5	10	1	1	4	2	25
81.49–84.48	0	0	0	0	0	2	3	0	0	4	0	9
84.49–87.48	0	0	0	0	0	0	0	0	0	1	0	1
Total	3	46	38	7	5	43	37	4	1	10	3	197

TABLE 160. Fork length, weight, and sex of Arctic char in the commercial catch, Sandhill Cove, 1971 (Murphy 1972b).

Fork length				Weight			
Class boundaries (cm)	Frequency (*f*)			Class boundaries (g)	Frequency (*f*)		
	f	Male	Female		*f*	Male	Female
29.95–32.94	2	1	1	259–518	3	1	2
32.95–35.94	0	0	0	519–778	14	8	6
35.95–38.94	9	3	6	779–1038	36	20	15
38.95–41.94	16	10	6	1039–1298	23	9	14
41.95–44.94	21	9	11	1299–1558	20	10	10
44.95–47.94	27	16	11	1559–1818	10	5	5
47.95–50.94	20	9	11	1819–2078	4	1	3
50.95–53.94	11	5	6	2079–2338	1	1	0
53.95–56.94	3	1	2	2339–2598	0	0	0
56.95–59.94	0	0	0	2599–2858	0	0	0
59.95–62.94	3	1	2	2859–3118	1	0	1
Total	112[a]	55	56		112[a]	55	56
Mean fork length = 45.81 cm				Mean weight = 1145.78 g			

[a] 1 fish not sexed.

TABLE 161. Fork length and weight of Arctic char in the commercial catch, Sandhill Cove, 1973 (Murphy 1974).

Fork length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
36.49–38.48	1	799–898	1
38.49–40.48	2	899–998	3
40.49–42.48	0	999–1098	2
42.49–44.48	4	1099–1198	2
44.49–46.48	11	1199–1298	6
46.49–48.48	19	1299–1398	6
48.49–50.48	14	1399–1498	14
50.49–52.48	12	1499–1598	4
52.49–54.48	10	1599–1698	8
54.49–56.48	4	1699–1798	10
56.49–58.48	2	1799–1898	10
58.49–60.48	1	1899–1998	3
		1999–2098	6
		2099–2198	2
		2199–2298	1
		2299–2398	1
		2399–2498	1
Total	80		80
Mean fork length = 49.15 cm		Mean weight = 1649.37 g	

TABLE 162. Physical characteristics of electrofishing stations, Sandhill River, 1971 (B, boulder; M, mud; R, rubble; G, gravel).

Station reference (Fig. 31)	Area (m^2)	Mean depth (m)	Mean velocity ($m \cdot s^{-1}$)	Air temp. (°C)	Water temp. (°C)	Shoreline cover	Bottom type
1	159	0.4	0.4	18	13	Forest	B/M
2	239	0.5	0.5	19	14	Forest	B/M
3	109	0.4	0.2	11	13	Forest	B
4	139	0.4	0.3	20	16	Forest	R/B
5	464	0.5	0.6	16	18	Forest	R
6	464	0.3	0.3	14	16	Forest	R/B
7	406	0.3	0.9	22	19	Forest	R/G
8	696	0.4	0.5	24	23	Alders	R/B
9	464	0.3	0.5	23	22	Forest	G
10	724	0.2	0.3	20	22	Scrub	B
11	546	0.4	0.6	21	22	Barren	B
12	334	0.2	0.2	10	12	Low scrub	M/B/R
13	882	0.2	0.2	21	12	Low scrub	G/B/R
14	562	0.3	0.1	12	11	Low scrub	R/B
15	495	0.2	0.3	12	12	Low scrub	R/B
Total area	6683						

TABLE 163. Estimates of number of fish per 100 m² derived from electrofishing study, Sandhill River, 1971 (least squares method, Ricker (1958)).

Station (Fig. 31)	Date	Salmon (juvenile)	Brook trout	White sucker	Threespine stickleback	American eel
1	10 July	10.49	—	—	1.24	—
2	10 July	7.49	1.73	—	—	—
3	13 July	22.57	1.83	—	—	1.38
4	13 July	4.26	2.50	—	—	—
5	15 July	28.91	18.16	—	—	3.40
6	16 July	27.03	10.47	—	—	—
7	22 July	8.09	28.43	—	36.47	—
8	23 July	2.63	2.99	0.14	—	—
9	24 July	0.89	2.80	—	0.22	—
10	29 July	19.48	10.62	—	8.22	0.73
11	30 July	6.08	0.18	—	0.18	0.45
12	26 Aug.	5.23	—	—	—	—
13	27 Aug.	1.09	6.77	—	—	—
14	30 Aug.	50.96	3.98	—	—	0.38
15	01 Sept.	3.68	27.51	—	—	—

TABLE 164. Results from Atlantic salmon smolt and adult tagging, Sandhill River, 1969.

					Canadian waters						
					Home river		Commercial fishery				
Tag	Stock	Year of tagging	No. released	Year of return	Fence count[a]	Angled	Home[b]	Distant	Not known	Foreign: West Greenland	Total return
Blue Atkins	Ascending adult	1969	399	1969	0	0	0	0	0	0	0
				1970	2[c]	0	11[c]	1[c]	0	3	17
				1971	1	0	2	2	0	0	5
					3	0	13	3	0	3	22
Green Carlin	Native smolt	1969	6736	1969	0	0	14	1	0	0	15
				1970	32	0	0	15	0	4	51
				1971	4	0	3	30	2	2	41
				1972	0	0	0	3	1	0	4
				1973	0	0	0	1	0	0	1
					36	0	17	50	3	6	112

[a]Fence not operated after 1973.
[b]Home waters is that area inside a line drawn from 53°46′00″N, 56°29′00″W and 53°32′00″N, 55°57′00″W.
[c]Recaptured as kelt.

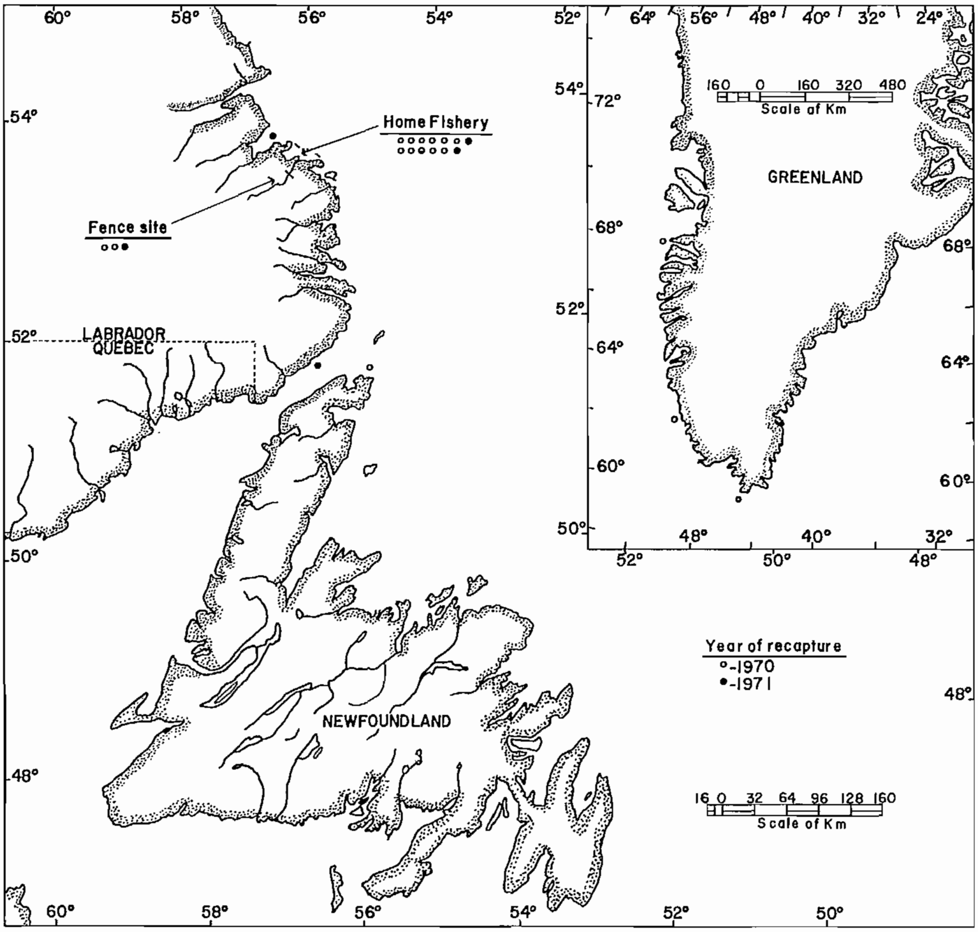

FIG. 32. Map of returns from 1969 Atlantic salmon adult tagging, Sandhill River.

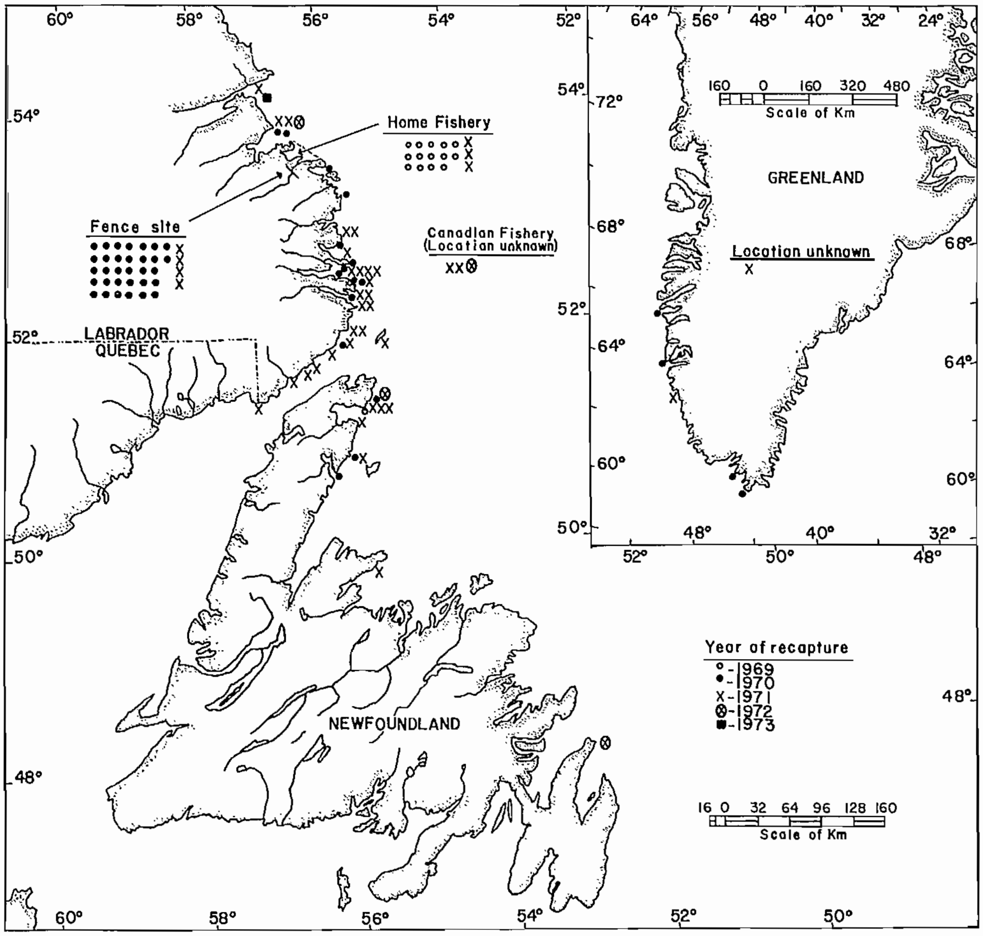

FIG. 33. Map of returns from 1969 Atlantic salmon smolt tagging, Sandhill River.

TABLE 165. Results from Atlantic salmon smolt and adult tagging, Sandhill River, 1970.

					Canadian waters						
					Home river		Commercial fishery				
Tag	Stock	Year of tagging	No. released	Year of return	Fence count[a]	Angled	Home[b]	Distant	Not known	Foreign: West Greenland	Total return
Blue Atkins	Ascending adult	1970	516	1970	0	0	0	0	0	0	0
				1971	0	0	11[c]	7[c]	0	16	34
				1972	2	0	0	13	0	1	16
					2	0	11	20	0	17	50
Green Carlin	Native smolt	1970	7997	1970	0	0	38	1	1	0	40
				1971	72	2	5	26	4	45	154
				1972	2	0	3	41	4	3	53
				1973	1	0	3	6	0	2	12
					75	2	49	74	9	50	259

[a]Fence not operated after 1973.
[b]Home waters is that area inside a line drawn from 53°46′00″N, 56°29′00″W and 53°32′00″N, 55°57′00″W.
[c]Recaptured as kelt.

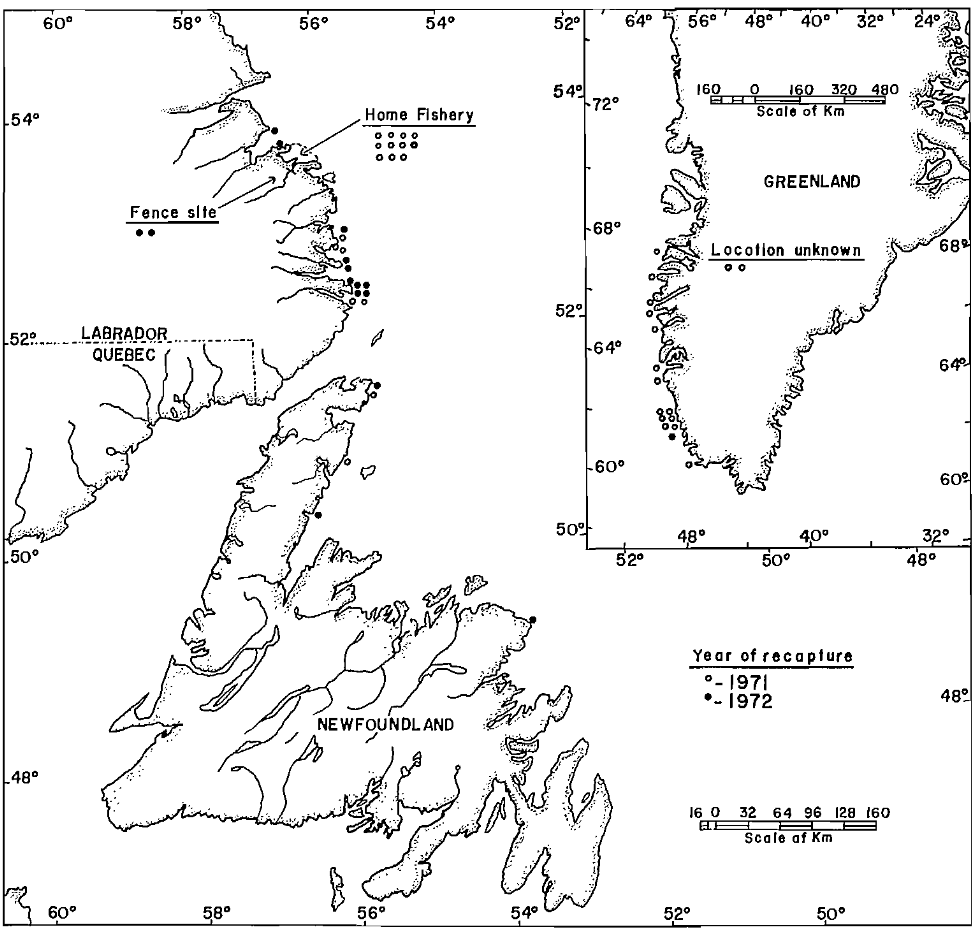

FIG. 34. Map of returns from 1970 Atlantic salmon adult tagging, Sandhill River.

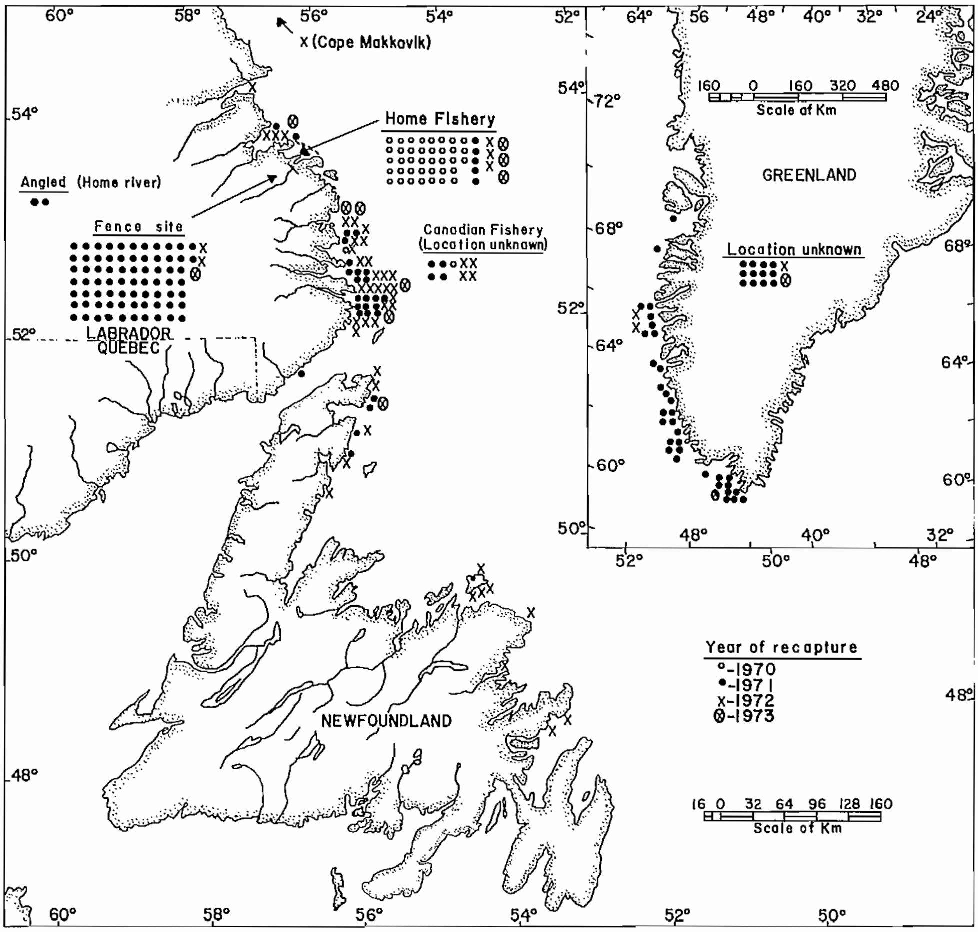

FIG. 35. Map of returns from 1970 Atlantic salmon smolt tagging, Sandhill River.

TABLE 166. Results from Atlantic salmon smolt and adult tagging, Sandhill River, 1971.

					Canadian waters						
					Home river		Commercial fishery				
Tag	Stock	Year of tagging	No. released	Year of return	Fence count[a]	Angled	Home[b]	Distant	Not known	Foreign: West Greenland	Total return
Blue Atkins	Ascending adult	1971	391	1971	0	0	0	0	0	0	0
				1972	0	0	6	2	0	7	15
				1973	11	0	7	19	0	0	37
				1974	—	0	0	1	0	0	1
					11	0	13	22	0	7	53
Green Carlin	Native smolt	1971	10 511	1971	0	0	190	1	0	0	191
				1972	15	1	0	14	1	7	38
				1973	8	0	4	25	2	0	39
				1974	—	0	0	1	0	0	1
				Unknown	0	0	0	0	0	1	1
					23	1	194	41	3	8	270

[a] Fence not operated after 1973.
[b] Home waters is that area inside a line drawn from 53°46′00″N, 56°29′00″W and 53°32′00″N, 55°57′00″W.

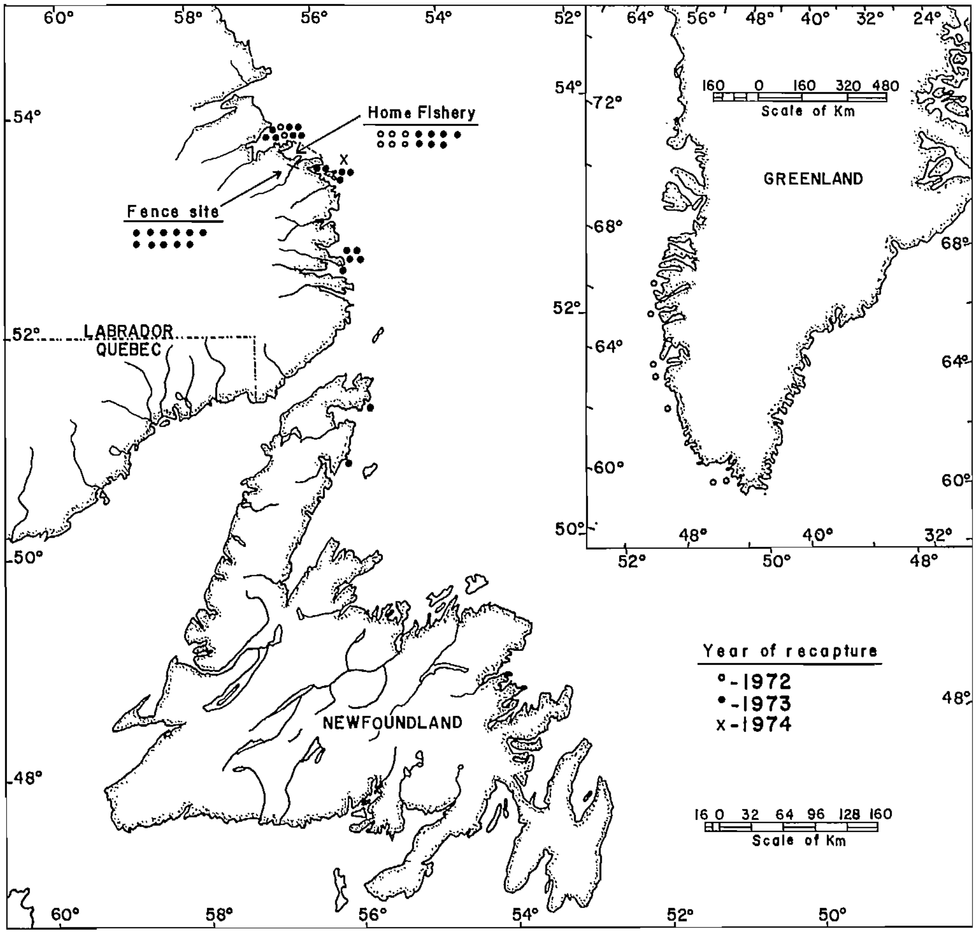

FIG. 36. Map of returns from 1971 Atlantic salmon adult tagging, Sandhill River.

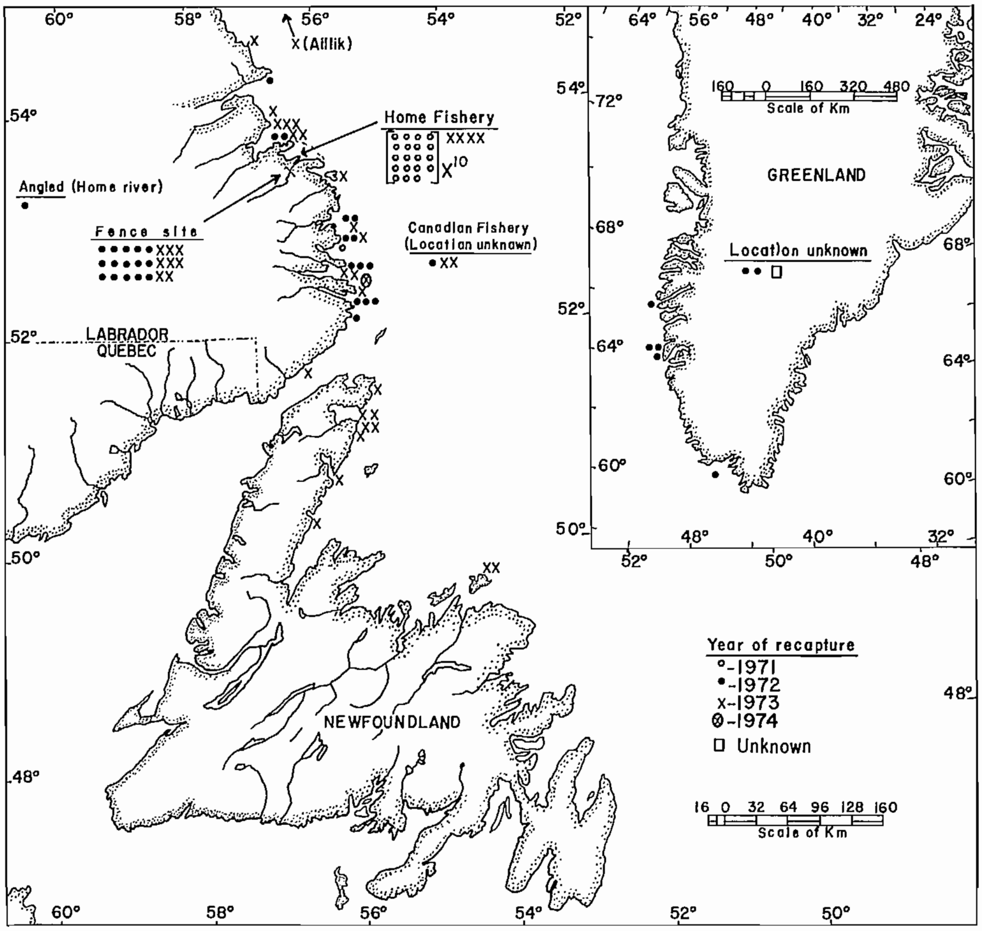

FIG. 37. Map of returns from 1971 Atlantic salmon smolt tagging, Sandhill River.

TABLE 167. Results from Atlantic salmon smolt and adult tagging, Sandhill River, 1972.

					Canadian waters						
					Home river		Commercial fishery			Foreign:	
Tag	Stock	Year of tagging	No. released	Year of return	Fence count[a]	Angled	Home[b]	Distant	Not known	West Greenland	Total return
Green Carlin	Ascending adult	1972	361	1972	0	2	0	0	0	0	2
				1973	7[c]	0	4[c]	0	0	9	20
				1974	—	0	1	9	1	0	11
					7	2	5	9	1	9	33
Green Carlin	Native smolt	1972	8149	1972	0	0	18	1	0	0	19
				1973	24	1	1	8	0	3	37
				1974	—	0	1	7	3	0	11
				1975	—	0	0	2	0	0	2
					24	1	20	18	3	3	69

[a]Fence not operated after 1973.
[b]Home waters is that area inside a line drawn from 53°46′00″N, 56°29′00″W and 53°32′00″N, 55°57′00″W.
[c]Recaptured as kelt.

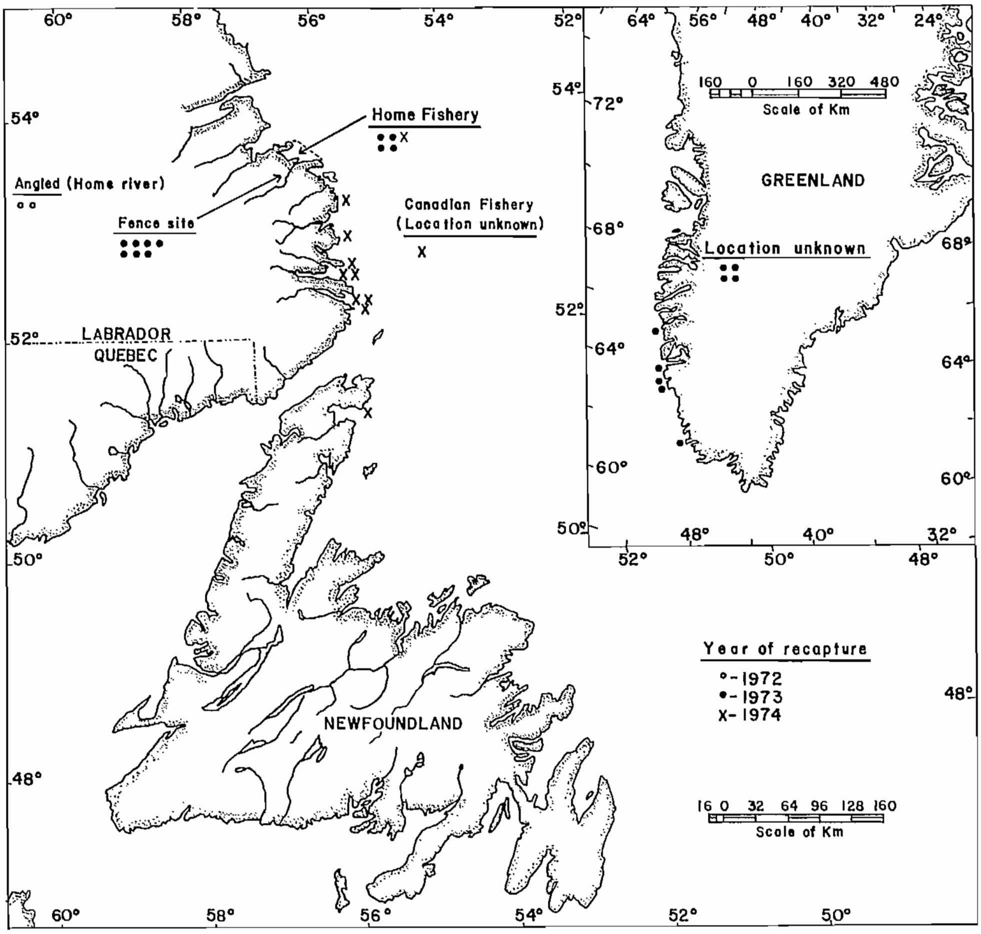

FIG. 38. Map of returns from 1972 Atlantic salmon adult tagging, Sandhill River.

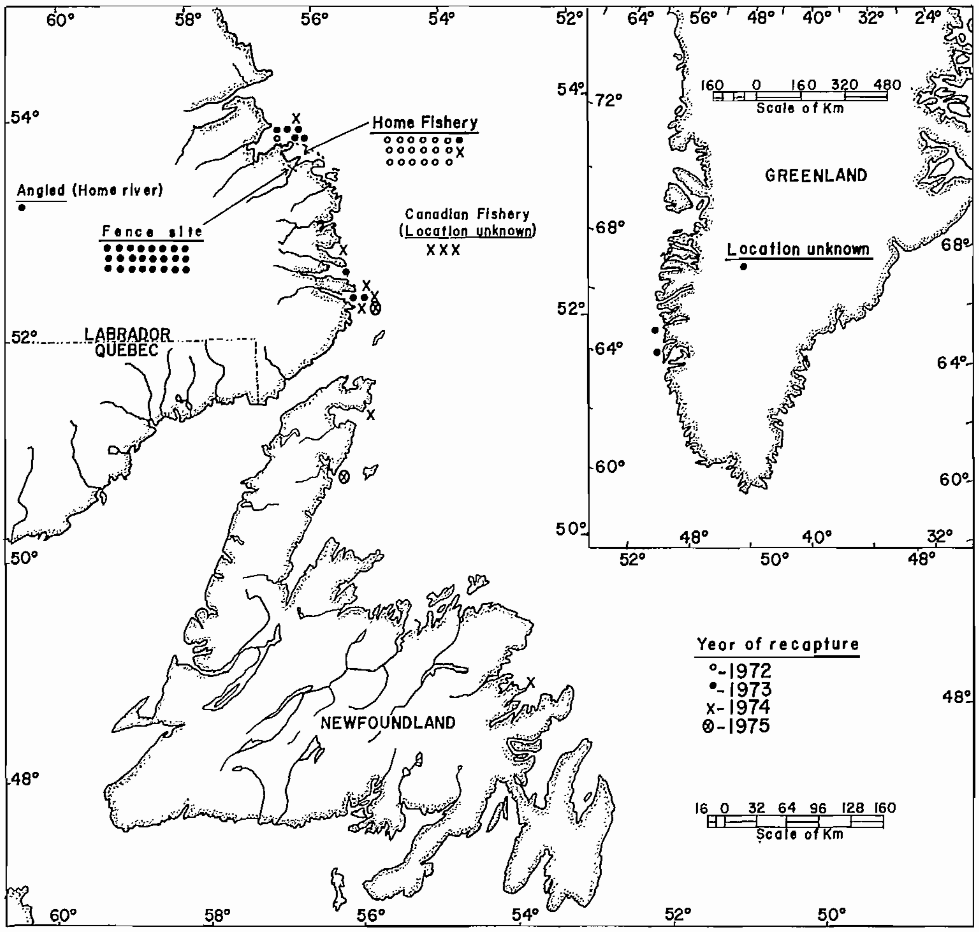

FIG. 39. Map of returns from 1972 Atlantic salmon smolt tagging, Sandhill River.

TABLE 168. Results from Atlantic salmon smolt tagging, Sandhill River, 1973.

					Canadian waters						
					Home river		Commercial fishery				
Tag	Stock	Year of tagging	No. released	Year of return	Fence count[a]	Angled	Home[b]	Distant	Not known	Foreign: West Greenland	Total return
Green Carlin	Native smolt	1973	6204	1973	0	0	32	0	0	0	32
				1974	—	1	3	28	2	10	44
				1975	—	0	1	23	2	1	27
				1976	—	0	0	2	0	0	2
					0	1	36	53	4	11	105

[a]Fence not operated after 1973.
[b]Home waters is that area inside a line drawn from 53°46'00"N, 56°29'00"W and 53°32'00"N, 55°57'00"W.

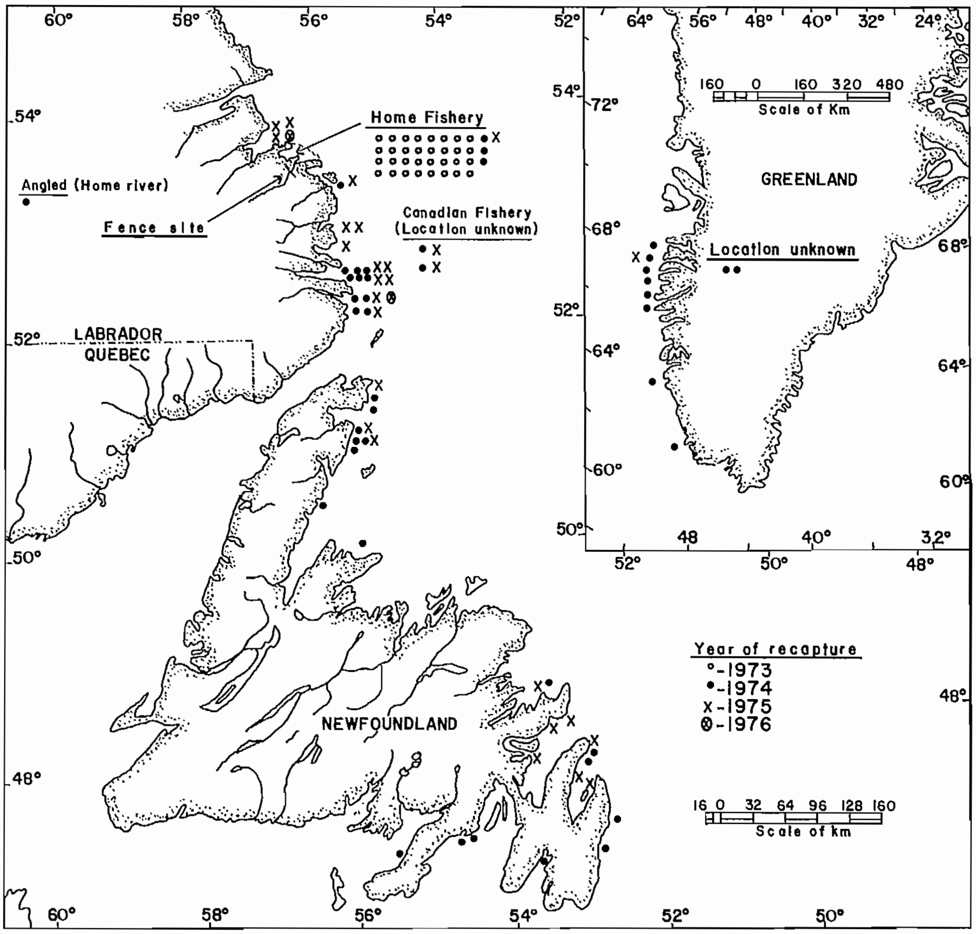

FIG. 40. Map of returns from 1973 Atlantic salmon smolt tagging, Sandhill River.

TABLE 169. Summary of data on sex, fork length, whole weight, age, and mercury content of brook trout, Arctic char, and white sucker captured in Sandhill River, 14 August 1977 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Brook trout	M	1	24.3	0.20	4.0	0.03	—
	F	8	24.2	0.21	3.4	0.09	0.05–0.16
Total		9	24.2	0.21	3.4	0.08	0.03–0.16
Arctic char	M	7	45.1	1.11	8.3	0.05	0.02–0.07
	F	4	36.9	0.62	8.0	0.06	0.05–0.06
Total		11	42.1	0.94	8.2	0.05	0.02–0.07
White sucker	M	14	33.5	0.30	8.7	0.13	0.07–0.21
	F	10	31.8	0.30	7.9	0.10	0.04–0.20
Total		24	32.8	0.30	8.4	0.12	0.04–0.21

Dykes River flows northwesterly, entering Sandwich Bay 8 km south of Cartwright (Fig. 41). Cartwright has a population of 658 (Statistics Canada 1981) and is generally considered to be the hub of the southern Labrador coast. In 1974, a cut line for a road between Cartwright and the community of Paradise River was completed. This road will provide easy access to the river because it will cross the lower sections and parallel the watershed for 13 km.

Dykes River, with a drainage area of 337 km^2, is fed by 11 tributaries and the entire system is dotted with small ponds and lakes (Table 170). The lower sections of the river meander through a flat, barren plain onto a muddy tidal flat at its mouth. Although there is an increase in the gradient beginning at a point 6 km from the mouth, no barriers to fish migration are found throughout the system. Peet (1971) reported that the upper river flows through a hilly, well-wooded area and that sections of excellent spawning gravel are located 10 km from the mouth. The upper reaches of the main stem consist of an 18 km-long string of lakes that border on the Northwest Tributary watershed of Sandhill River.

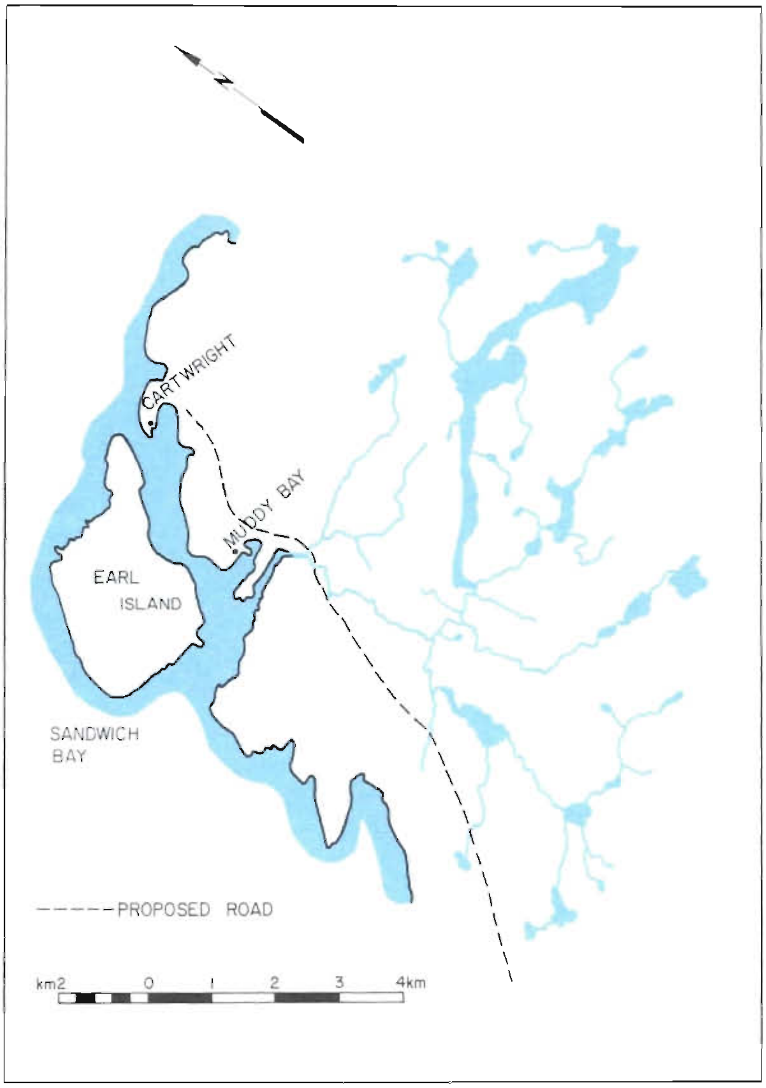

FIG. 41 Map of Dykes River showing accessible Atlantic salmon parr rearing areas.

The common indigenous fish species reported in Dykes River by Peet (1971) are Atlantic salmon, brook trout, and Arctic char. Peet also reported that several commercial salmon fishing berths were located near the river mouth and that in former years, the river was netted to catch fish for dog food. Although no records of angling have been kept, residents of Cartwright visit the mouth of the river to catch sea-run trout. The river is not a scheduled Atlantic salmon angling river, although an occasional grilse is caught. The amount of rearing and spawning area in Dykes River has not been recorded, and the potential Atlantic salmon smolt production has not been estimated. Peet (1971) stated that the river probably supports a good run of fish, most probably sea-run brook trout and Arctic char, with a smaller run of Atlantic salmon (mainly grilse).

TABLE 170. Physical characteristics of Dykes River.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	183 m
		Length by meander (main stem):	13 km
Mouth latitude:	53°38′N		
Mouth longitude:	57°04′W	Total length including tributaries:	167 km
General direction of flow:	Northwest	No. of tributaries:	11
Drainage area:	337 km²	Geological formation:	Granite and associated rocks and some gneiss
Mean width	15 km		
Axial length	19 km		
Basin perimeter	87 km		

Paradise River flows northeasterly, entering Sandwich Bay approximately 20 km south of the community of Cartwright (Fig. 42). The community of Paradise River is located at the mouth of the river and the cut line for a road to connect this settlement with Cartwright was completed in 1974. A hydroelectric survey conducted on Paradise River by Millan (1974) indicated the available potential to be 292 MW, about half the present output of the entire Bay d'Espoir Development in insular Newfoundland.

Paradise River has a drainage area of 5276 km^2; the total length of the main stem and tributaries is 3373 km (Table 171). The headwaters, located over 129 km from the river mouth, are a maze of small ponds and bogland (Murphy 1971). Downstream from the headwaters for 75 km the river has a low gradient, an average width of 100 m, and provides good salmonid rearing habitat. Much of the surrounding vegetation of once mature black spruce and balsam fir has been destroyed by forest fires. The river gradient is a steep 35 km from the river mouth where there are a series of rapids. The river below the rapids is made up of a series of wide (300 m) steadies and one lake and is generally considered poor juvenile salmon habitat. Mature stands of black spruce and balsam fir line the river banks and cover the gentle rolling hills of the lower watershed. Although Blair (1943) and Sollows et al. (1953) reported no falls on Paradise River, Murphy (1971) did report two partial barriers on Tributary 14 (T14) and Tributary 24 (T24) (Table 172). A water sample was collected in August 1976 (Jamieson 1979) and results of the analyses of this sample are found in Table 173.

Reported fish species indigenous to Paradise River are Atlantic salmon and both anadromous and resident brook trout. Other species such as threespine and ninespine stickleback, American eel, and white sucker almost certainly occur; an unconfirmed report of northern pike has also been received. Sollows et al. (1953) and Murphy (1971)

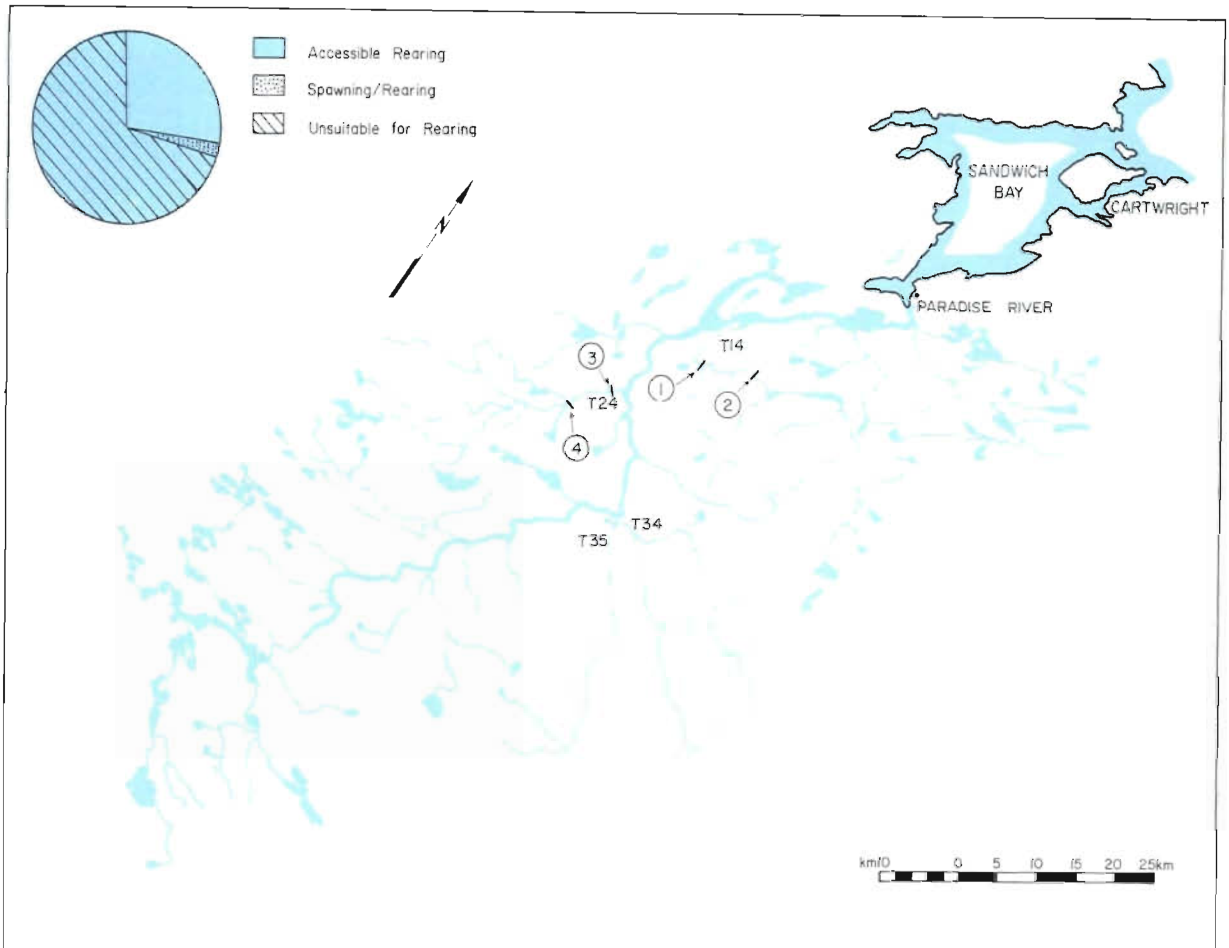

FIG. 42. Map of Paradise River showing accessible Atlantic salmon parr rearing areas.

reported that the river was not suitable for salmon angling due to the lack of pools. No records of angling catches have been submitted.

The estimated annual Atlantic salmon smolt production of Paradise River is 112 850 (Table 174). However,this relatively high figure is due mainly to the size of the watershed rather than a high percentage of parr rearing habitat. The estimated production of adult salmon is about 17 000 fish. The Paradise River salmon stock is believed to make a significant contribution to the excellent commercial salmon fishery of Sandwich Bay.

TABLE 171. Physical characteristics of Paradise River.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	485 m
Mouth latitude:	53°27′N	Length by meander (main stem):	129 km
Mouth longitude:	57°19′W	Total length including tributaries:	3373 km
General direction of flow:	Northeast	No. of tributaries:	94
Drainage area:	5276 km²	Geological formation:	Granitic gneiss
Mean width	38 km		
Axial length	122 km		
Basin perimeter	359 km		

TABLE 172. Obstructions on Paradise River (Murphy 1971).

Fig. 42 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	T14	9.7	Falls	2.4	30.5	—	Partial
2	T14	12.9	Falls	1.8	6.1	—	Partial
3	T24	3.2	Falls	2.4	15.3	—	Partial
4	T24	8.1	Falls	1.8	3.1	—	Partial

TABLE 173. Results of analyses of a water sample collected on Paradise River, 1976 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1976	6.3	9.0	22.0	3.0	5.0	1.3	1.5	6.1

TABLE 174. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Paradise River (Murphy 1971). No inaccessible areas were identified.

Location	Accessible areas Spawning units	Rearing units
Main stem	1 581	38 287
T14	740	4 094
T24	259	2 136
T34	721	5 493
T35	892	6 415
Total	4 193	56 425
Estimated production		
Smolt	112 850	
Adult	16 928	

Eagle River, the fifth largest river in Labrador, flows northeasterly emptying into Sandwich Bay at Separation Point (Fig. 43). It is one of the largest salmon producing rivers in North America. No harvesting of the watershed's mature coniferous forest has yet been undertaken and the hydroelectric potential, estimated by Millan (1974) to be 983 MW (third highest in Labrador), has not yet been developed.

Eagle River is fed by 81 tributaries and drains an area of 10 824 km^2 (Table 175). The river has its source in a maze of string bogs and steadies located on a barren plateau south of the Mealy Mountains. No potential parr rearing estimates for this area have been made as most of the waterways are comprised of lakes, steadies, and slow-moving streams. This habitat is considered more suitable for brook trout (Murphy 1972a). The headwaters of the Kenemich River are adjacent to the upper Eagle River. Indians claim kelts leaving the Kenemich in the spring originate in Eagle River (Murphy 1972a).

Tributary 73 (T73) enters the main stem at km 135. This tributary contains large areas of parr rearing habitat that are accessible to migrating Atlantic salmon. From its confluence with tributary 73 to its mouth, Eagle River is a wide, swift-flowing river that flows through densely forested rolling hills. In narrower sections, the main river runs deep and is obstructed at only one location, km 6.4, where a falls forms a minor barrier to migrating fish (Table 176). The pool below this falls is the most popular angling site on the river. There are three salmon angling camps established in close proximity to it. Owl Brook (T39), located at km 64, is made up chiefly of a network of ponds and steadies and two complete barriers to fish migration occur in the upper reaches (Table 176); little potential rearing area is located above these falls. Water samples were collected in 1975 and 1977 (Jamieson 1979). Results of the analyses of these samples are shown in Table 177.

Fish species reported in Eagle River include Atlantic salmon, sea-run and resident brook trout, white sucker, longnose sucker, and northern pike. It is suspected that threespine and ninespine sticklebacks, American eels, and rainbow smelt also occur in this system as they are common in most rivers in southern Labrador.

The adult salmon production of Eagle River was estimated by Murphy (1971, 1972a) to be in the order of 33 000 fish annually (Table 178). Blair (1943) described the Eagle River as the best salmon river in Sandwich Bay and Sollows et al. (1953) considered it an excellent angling river, verified by the fact that their survey crew (5 men) caught and released 100 salmon in 1 day's angling. The river is scheduled for Atlantic salmon angling. The salmon migration begins in early July and ends in September. Salmon angling occurs at the mouth of Owl Brook (T39) as well as in the pool below the falls in the lower section; a few salmon have been caught in the Parke Lake area (Murphy 1972a). The high mean catch per rod day of 1.12 during 1964–80 (Table 179) has attracted anglers from all over the world. To accommodate these anglers, four salmon angling camps have been established on the river. Samples were collected from the anglers' catch in 1971, 1973–75, and 1979 and sex ratio, age composition, mean weights, and mean fork lengths of these samples are presented in Table 180. These samples were composed of mainly male grilse that had spent 4–5 years in the river before smoltification.

Four stations were electrofished on tributary 73 (T73) during 1971 (Fig. 43). Estimated mean numbers per 100 m^2 were 4.9 juvenile Atlantic salmon, 9.4 brook trout, and 1.9 white sucker, calculated by the least squares method (Ricker 1958). Densities at each station are presented in Table 181 (Murphy 1972a). A breakdown of the density of juvenile Atlantic salmon by age is found in Table 182. Over 55% of the estimated densities were made up of 1+ juvenile salmon. The low catches of 0+ juveniles may reflect their low catchability. The small numbers of 2+ and 3+ juveniles encountered may indicate migration from these areas by these age groups.

During the 1940s, heavy pressure was placed on the brook trout resource of Eagle River by both American and Canadian Air Force personnel stationed in Goose Bay (T. Curran, pers. comm.). The brook trout angling is still exceptional and rivals the sports salmon fishery in luring anglers to the river. Figure 43 shows the location of eight brook trout angling camps which reported the catch of over 66 000 trout from 1965 to 1977 (Table 183). These figures have been reported by camp operators and DFO personnel who checked catches from planes returning from these camps. As these methods of data collection are unreliable, the catch data are considered incomplete and should be used only as indicators of the number and size of fish taken. Anadromous (sea-run) brook trout are angled in the lower Eagle River and, of the 5667 reported caught between 1969 and 1977, a total of 1609 weighed over 0.9 kg or more (Table 184). Northern pike, usually angled as a secondary species at the brook trout camps, are reported from three different areas with 5758 being recorded from 1965 to 1977 (Table 185).

In 1977, Bruce et al. (1979) carried out gillnet sets on the main stem, Eagle River, and in No Name Lake (L6). Northern pike and brook trout were captured at each site (Tables 186, 187).

Eagle River appears to be one of the last great reserves for both Atlantic salmon and brook trout in North America. Careful planning and monitoring of any attempts to utilize the hydroelectric or forest resources of this watershed are required to avert loss of this valuable habitat.

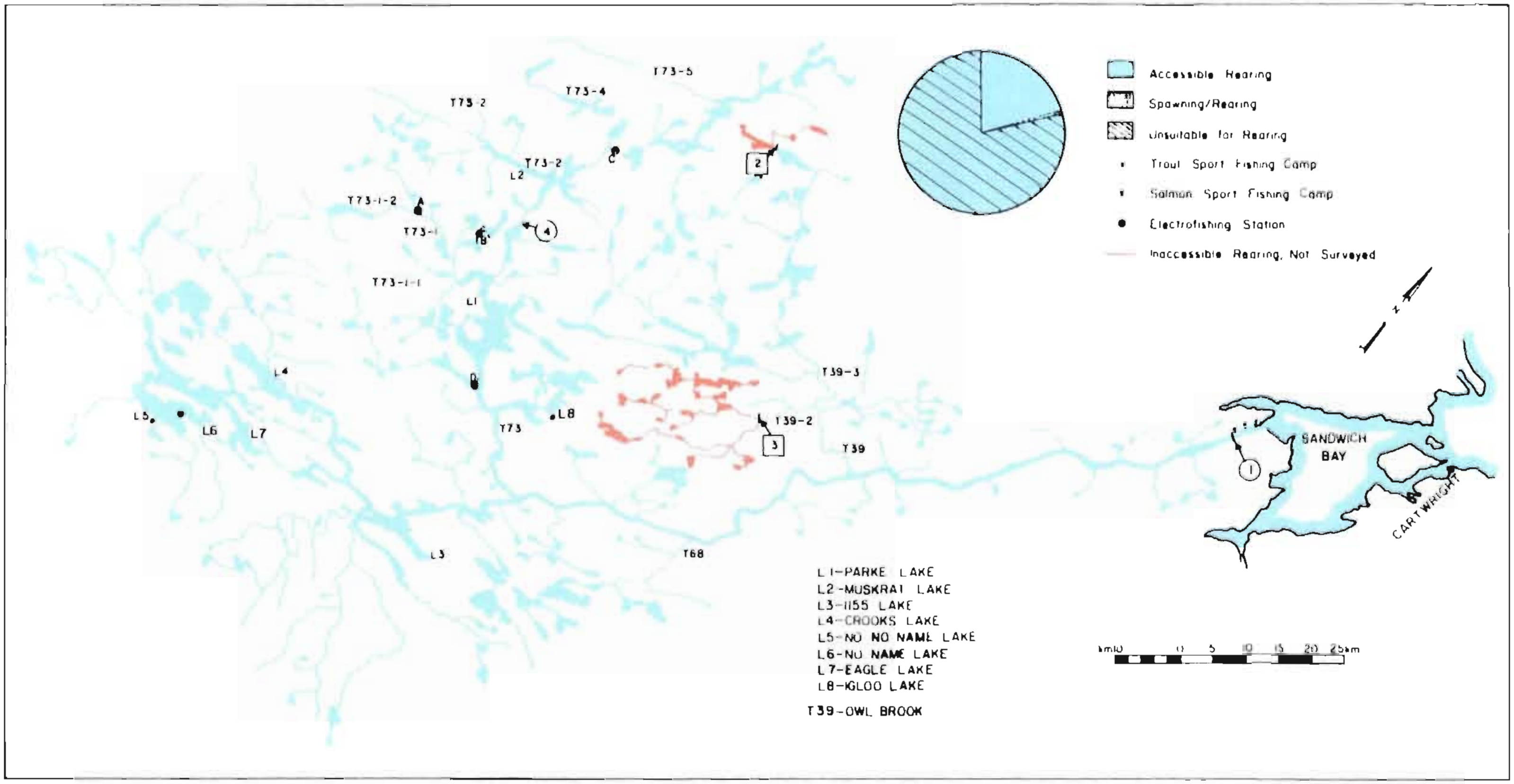

FIG. 43. Map of Eagle River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 175. Physical characteristics of Eagle River.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	610 m
Mouth latitude:	53°36′N	Length by meander (main stem):	135 km
Mouth longitude:	57°26′W	Total length including tributaries:	3548 km
General direction of flow:	Northeast	No. of tributaries:	81
Drainage area:	10 824 km²	Geological formation:	Granitic gneiss
Mean width	58 km		
Axial length	139 km		
Basin perimeter	605 km		

TABLE 176. Obstructions on Eagle River (Murphy 1971).

Fig. 43 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	6.4	Falls	—	—	—	Partial
2	T39	45.1	Falls	—	—	—	Complete
3	T39-2	9.7	Falls	—	—	—	Complete
4	T73	69.2	Falls	—	—	—	Partial

TABLE 177. Results of analyses of five water samples collected on Eagle River, 1975 and 1977 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1975[a]	6.7	5.0	11.0	1.1	4.0	0.5	0.5	5.3
1975	6.3	5.0	11.0	1.5	3.0	0.7	0.8	3.7
1977	6.7	6.0	17.0	3.1	4.0	1.6	1.0	4.9

[a]Mean of three samples.

TABLE 178. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Eagle River (Murphy 1971, 1972a). No inaccessible areas were surveyed.

Location	Accessible areas	
	Spawning units	Rearing units
Main stem	0	34 774
T39	1 333	6 824
T39-2	129	605
T39-3	404	6 934
T73	336	37 486
T73-1	581	4 682
T73-1-1	217	869
T73-1-2	0	5 497
T73-2	0	5 809
T73-2-1	456	3 245
T73-3	0	1 116
T73-4	0	3 095
T73-5	290	580
Total	3 746	111 516
Estimated production		
Smolt	223 032	
Adult	33 455	

TABLE 179. Summary of Atlantic salmon angling data, Eagle River, 1964–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Large salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1964	1652	86	1738	1277	1.36
1965	1323	100	1423	1155	1.23
1966	1473	89	1562	1713	0.91
1967	869	77	946	809	1.17
1968	1882	59	1941	916	2.12
1969	1612	120	1732	1619	1.07
1970	1676	59	1735	1762	0.98
1971	2241	95	2336	1692	1.38
1972	1317	99	1416	1475	0.96
1973	4209	435	4644	3598	1.29
1974	855	177	1032	1420	0.73
1975	2433	47	2480	1574	1.58
1976	1940	124	2064	1897	1.09
1977	1904	81	1985	1991	1.00
1978	955	83	1038	2595	0.40
1979	1363	37	1400	1113	1.26
1980	1269	181	1450	891	1.63
Mean	1704	115	1819	1618	1.12

TABLE 180. Sex ratio (%F), age composition, weight, and fork length of Atlantic salmon collected from anglers' catch, 1971, 1973, 1974, 1975, and 1979, on Eagle River (DFO, unpubl. data).

Collection period	1-sea-winter								≥2-sea-winter							
	Female		Freshwater age		Weight (g)		Fork length (cm)		Female		Freshwater age		Weight (g)		Fork length (cm)	
	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*
1–3 Aug. 1971	0.0	21	3	21	1852	21	55.2	21								
	3.1	65	4	65	1857	65	55.1	65								
	0.0	23	5	23	1940	23	55.8	23								
	0.0	4	6	4	1955	4	56.5	4								
		113		113		113		113								
Mean	1.8		4.1		1876		55.3									
July 1973	0.0	1	2	1							2					
	0.0	1	3	1					66.7	3	3	3				
	5.0	40	4	40							4					
	0.0	8	5	8					100	2	5	2				
	0.0	3	6	3					50.0	2	6	2				
		53		53						7		7				
Mean	3.8		4.2						71.4		4.4					
July, Aug. 1974	6.7	15	4	15	1876	15			100	8	4	8	5429	8		
	16.7	24	5	24	1873	24			100	8	5	8	5789	8		
	33.3	6	6	6	1778	6					6					
		45		45		45				16		16		16		
Mean	15.6		4.8		1861				100		4.5		5609			
Aug. 1975	10.0	10	3	10	2043	10			100	1	3	1	5335	1		
	1.0	97	4	97	1855	97			80.0	5	4	5	3632	5		
	0.0	67	5	67	1826	67			100	3	5	3	4654	3		
	0.0	17	6	17	1989	17										
		191		191		191				9		9		9		
Mean	1.0		4.5		1867				88.9		4.2		4162			
15–19 July 1979	0.0	8	3	8	1769	8	54.0	20			3				76.5	1
	3.9	77	4	77	1734	77	53.8	146	60.0	5	4	5	4096	5	74.4	7
	0.0	14	5	14	1746	14	54.1	23			5					
		99		99		99		189		5		5		5		8
Mean	3.0		4.1		1739		53.9		60.0		4.0		4096		74.7	

TABLE 181. Estimated number of fish per unit (100 m²) from electrofishing study, Eagle River, 1971 (Murphy 1972a).

Station reference (Fig. 43)	Date	Atlantic salmon (juvenile)	Brook trout	White sucker
A	4 Sept.	7.81	3.03	0.00
B	5 Sept.	0.71	24.11	7.58
C	5 Sept.	2.00	7.12	0.00
D	6 Sept.	10.17	3.49	0.00
Mean		5.17	9.44	1.90

TABLE 182. Estimated numbers of juvenile Atlantic salmon per unit (100 m²), prorated by age from electrofishing study, Eagle River, 1971 (Murphy 1972a). Not all fish were aged.

Station reference (Fig. 43)	Age (yr) 0+	1+	2+	3+	4+	Total
A	0.43	5.65	0.86	0.00	0.87	7.81
B	0.00	0.00	0.29	0.29	0.00	0.58
C	0.00	0.60	0.80	0.40	0.20	2.00
D	0.00	4.72	1.57	3.04	0.00	9.33

TABLE 183. Summary of angling catches of resident brook trout, Eagle River, 1965–77 (DFO, unpubl. data).

	1965 trout		1966 trout		1967 trout		1968 trout		1969 trout		1970 trout		1971 trout	
	<0.5 kg	≥0.5 kg	<0.5 kg	≥0.5 kg	<0.5 kg	≥0.5 kg	<0.5 kg	≥0.5 kg	<0.5 kg	≥0.5 kg	<0.5 kg	≥0.5 kg	<0.5 kg	≥0.5 kg
Parke Lake	0	2052	0	850	0	791	0	1047	0	773	100	932	119	1280
1155 Lake	0	190	0	24	0	400	0	60	0	100	50	124	0	35
No Name Lake	0	1804	0	1603	1081	1437	1509	1839	2464	1705	3440	1757	1585	3550
Crooks Lake	0	770	0	932	0	542	53	903	142	950	112	460	46	849
No No Name Lake	—	—	—	—	—	—	—	—	—	—	—	—	64	257
Igloo Lake	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Eagle Lake	—	—	—	—	—	—	0	213	0	322	0	54	17	207
Owl Brook	—	—	0	170	—	—	—	—	—	—	—	—	—	—
Eagle Brook	0	267	0	250	0	400	0	125	100	50	100	50	150	75
Total	0	5083	0	3829	1081	3570	1562	4187	2706	3900	3802	3377	1981	6253

	1972 trout		1973 trout		1974 trout		1975 trout		1976 trout		1977 trout		Total trout	
	<0.5 kg	≥0.5 kg	<0.5 kg	≥0.5 kg	<0.5 kg	≥0.5 kg	<0.5 kg	≥0.5 kg	<0.5 kg	≥0.5 kg	<0.5 kg	≥0.5 kg	<0.5 kg	≥0.5 kg
Parke Lake	200	748	260	803	120	906	—	—	—	—	—	—	799	10 182
1155 Lake	13	43	0	100	0	85	—	—	—	—	—	—	63	1 161
No Name Lake	821	3197	527	1936	403	1039	257	1793	147	790	105	785	12 339	23 235
Crooks Lake	22	1082	108	1246	214	1296	174	646	—	—	—	—	871	9 676
No No Name Lake	0	394	47	889	13	190	—	—	—	—	—	—	124	1 730
Igloo Lake	—	—	0	22	0	97	—	—	0	34	—	—	0	153
Eagle Lake	0	108	0	1881	2	10	—	—	—	—	—	—	19	2 795
Owl Brook	—	—	—	—	—	—	—	—	—	—	—	—	0	170
Eagle Brook	200	50	631	303	426	230	—	—	—	—	—	—	1 607	1 800
Total	1256	5622	1573	7180	1178	3853	431	2439	147	824	105	785	15 822	50 902

TABLE 184. Summary of angling catches of sea-run brook trout, lower Eagle River, 1969–77 (DFO, unpubl. data).

	Weight (kg)			
Year	<0.9	0.9–1.8	>1.8	Total
1969	580	359	0	939
1970	404	85	3	492
1971	221	438	1	660
1972	647	105	1	753
1973	631	303	0	934
1974	302	127	0	429
1975	367	77	1	445
1976	381	67	0	448
1977	525	42	0	567
Total	4058	1603	6	5667

TABLE 185. Summary of the angling catch of northern pike, Eagle River, 1965–77 (DFO, unpubl. data).

		Weight (kg)			
Location	Year	<2.3	≥2.3	Weight unknown	Total
Parke Lake	1966	—	—	50	50
Crooks Lake	1965	247	30	0	277
	1966	—	—	53	53
	1967	—	—	50	50
	1968	—	—	109	109
	1969	—	—	154	154
	1970	38	18	0	56
	1971	208	22	0	230
	1972	143	77	0	220
	1973	231	46	0	277
	1974	441	133	0	574
	1975	495	180	0	675
No Name Lake	1965	60	19	0	79
	1966	—	—	121	121
	1967	—	—	146	146
	1968	—	—	191	191
	1969	—	—	148	148
	1970	111	55	0	166
	1971	217	246	0	463
	1972	189	122	0	311
	1973	195	177	0	372
	1974	115	120	0	235
	1975	140	183	0	323
	1976	56	46	0	102
	1977	202	174	0	376
Total		3088	1648	1022	5758

TABLE 186. Summary of data on sex, whole weight, age, and mercury content of northern pike and brook trout captured in Eagle River, 9 August 1977 (Bruce et al. 1979).

Species	Sex	*N*	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Northern pike	M	7	0.16	4.3	0.03	0.01–0.07
	F	1	2.30	8.0	0.12	—
Total		8	0.43	4.8	0.04	0.01–0.12
Brook trout	M	2	1.10	5.5	0.05	—
	F	6	1.28	5.5	0.06	0.03–0.11
Total		8	1.24	5.5	0.06	0.03–0.11

TABLE 187. Summary of data on sex, fork length, whole weight, age, and mercury content of northern pike and brook trout captured in No Name Lake, Eagle River, 17 August 1977 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Northern pike	M	4	49.6	1.14	4.3	0.11	0.06–0.14
Brook trout	M	3	31.8	0.44	4.3	0.05	0.03–0.07
	F	4	32.4	0.44	3.3	0.04	0.03–0.06
Total		7	32.1	0.44	3.8	0.05	0.03–0.07

White Bear River enters Sandwich Bay west of Separation Point (Fig. 44). This river drains 1075 km^2, is fed by 50 tributaries (Table 188), and is noted for its many rapids and falls, three of which partially obstruct fish migration on the main stem (Table 189). The first falls, located at the mouth, has previously been described by Blair (1943), Sollows et al. (1953), Peet (1971), and Murphy (1971) as a serious partial obstruction. A detailed engineering survey of this falls was conducted by DFO in 1973 and it was considered feasible to construct a fishway for a preliminary estimate of $400,000–$500,000. An alternate solution for improving fish passage would be the blasting of pools and the installation of baffles in a runaround on the left side (looking upstream) of the falls. Although this alternative would probably be less effective than a fishway, it is more attractive economically (estimated cost $20,000). The river upstream from the first falls contains 22 228 parr rearing units (Table 190).

Above the falls at the mouth, the river is 50–75 m wide, flowing through a narrow U-shaped valley, the slopes of which are wooded to their summits. Ten kilometres from its mouth, White Bear River widens. In this section are found several islands and several areas of good spawning gravel (Peet 1971; Murphy 1971). The river narrows again 16 km from the mouth. The coarse bottom substrate (boulder and rubble) of the next 15 km provides excellent parr-rearing habitat. One of the major tributaries (T10) enters the river 22 km from the river mouth, however, a series of falls from km 4.8 to km 8.1 on the tributary render it inaccessible to migrating fishes. The second partial barrier on the main stem is located at km 37.0. An engineering survey of the third falls, a serious partial obstruction located at km 49.9, was conducted in 1973 by DFO. It was estimated that the extensive blasting required to construct a high discharge runaround would cost $25,000–$30,000. Murphy (1971) reported that tributary 27 (T27), entering White

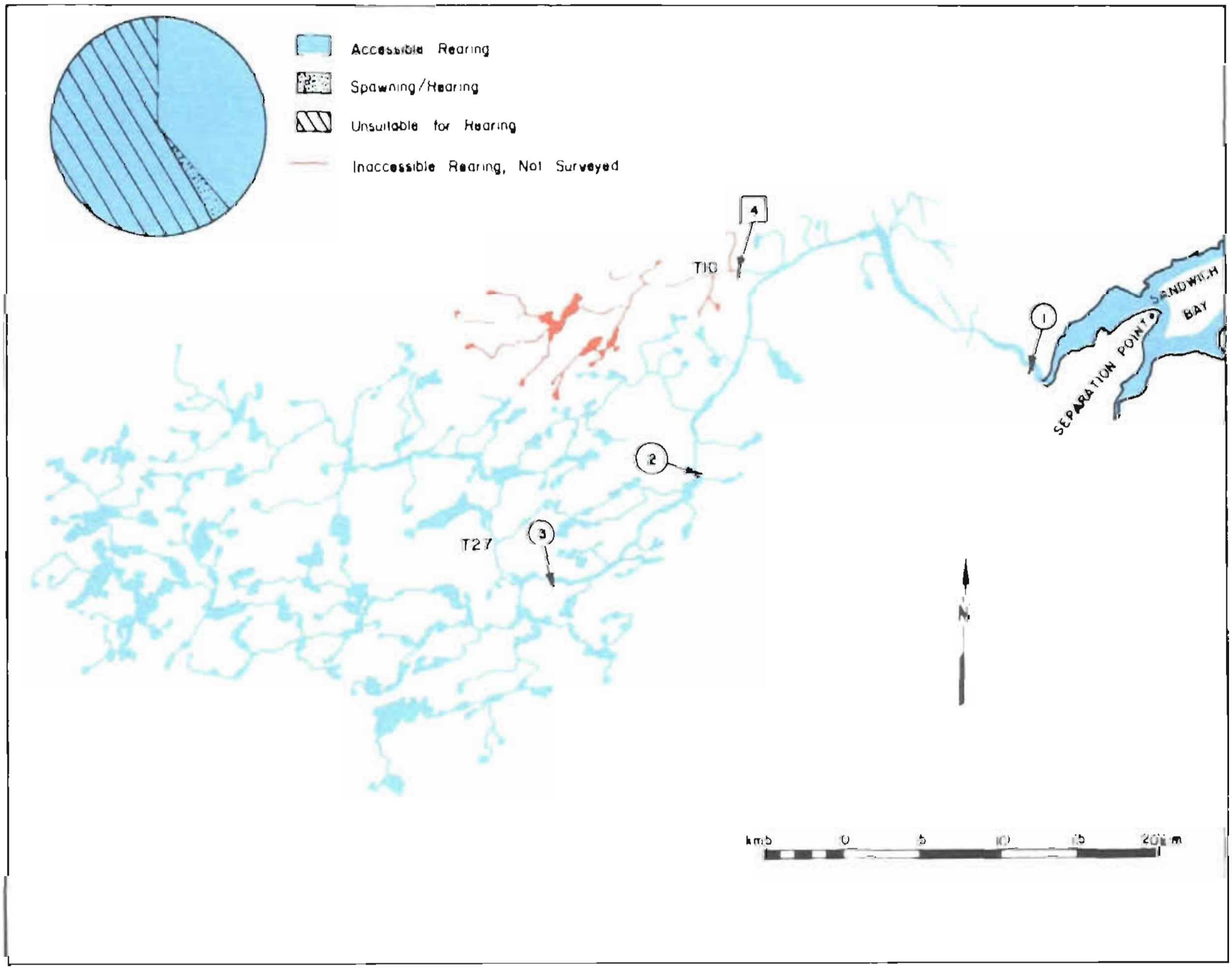

FIG. 44. Map of White Bear River showing accessible and inaccessible Atlantic salmon parr rearing areas.

Bear River at km 50 contained several areas of spawning gravel and over 5500 rearing units (Table 190). Water samples were collected from this river in 1973, 1976, and 1978; results of the analyses of these samples are found in Table 191 (Jamieson 1979).

Atlantic salmon and brook trout are the most common fish species reported in White Bear River. Angling, which is confined to the pools below the first falls, is conducted on a small scale, as indicated by the mean annual catch of 40 Atlantic salmon and mean annual effort of 63 rod days reported for 11 of the last 15 years (Table 192). Catches of sea-run brook trout, which are usually taken by salmon anglers, have been reported for the years 1972–74 and 1977 (Table 193). Both Sollows et al. (1953) and Peet (1971) reported that salmon angled below the falls are usually in poor condition (i.e. dark and not full bodied) indicating that the fish have been there for considerable time. It is believed that the falls at the river mouth causes a long delay in salmon migrations.

TABLE 188. Physical characteristics of White Bear River.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	458 m
Mouth latitude:	53°37′N	Length by meander (main stem):	52 km
Mouth longitude:	57°30′W	Total length including tributaries:	399 km
General direction of flow:	East	No. of tributaries:	50
Drainage area:	1075 km²	Geological formation:	Granitic gneiss
Mean width	22 km		
Axial length	66 km		
Basin perimeter	206 km		

TABLE 189. Obstructions on White Bear River (Murphy 1971).

Fig. 44 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	0.0	Falls	7.6	45.8	—	Partial
2	Main stem	37.0	Falls	3.1	15.3	—	Partial
3	Main stem	49.9	Falls	8.5	91.5	—	Partial
4	T10	4.8–8.1	Falls	—	—	—	Complete

TABLE 190. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in White Bear River (Murphy 1971). No inaccessible areas were surveyed.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	708	15 557
T10	0	1 116
T27	926	5 555
Total	1634	22 228
Estimated production		
Smolt	44 456	
Adult	6 668	

TABLE 191. Results of analyses of three water samples collected on White Bear River, 1973, 1976, and 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973, 1976[a]	6.2	8.0	15.0	3.2	4.5	1.1	1.0	5.5
1978	6.6	6.0	13.0	0.8	1.0	0.4	1.5	1.2

[a]Mean.

TABLE 192. Summary of Atlantic salmon angling data, White Bear River, 1966–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1966	19	2	21	33	0.64
1967	5	7	12	21	0.57
1968	1	2	3	7	0.43
1969	—	—	—	—	—
1970	17	5	22	29	0.76
1971	32	18	50	56	0.89
1972	21	24	45	130	0.35
1973	17	12	29	96	0.30
1974	16	11	27	27	1.00
1975	—	—	—	—	—
1976	53	10	63	44	1.43
1977	83	41	124	144	0.86
1978	34	14	48	108	0.44
1979	—	—	—	—	—
1980	—	—	—	—	—
Mean	27	13	40	63	0.64

TABLE 193. Summary of angling catches of sea-run brook trout, White Bear River, 1972–74 and 1977 (DFO, unpubl. data).

Year	Weight (kg) <0.9	Weight (kg) 0.9–1.8	Total
1972	79	0	79
1973	40	0	40
1974	50	0	50
1977	185	5	190
Total	354	5	359

North River flows easterly from its source in the Mealy Mountains to its mouth at Sandy Point on the northern side of Sandwich Bay (Fig. 45). The river has a drainage area of 2234 km^2 and is fed by 60 tributaries (Table 194). Millan (1974) estimated the hydroelectric potential of the river to be 160 MW which is larger than any potential sites in insular Newfoundland.

The mouth of the river is wide and dotted with sandy shoals and small islands. The river narrows at a rapids at km 10.5, which, like the other falls and rapids on the river system, causes little or no delay in fish migrations (Table 195). Between the first rapids and the second rapids which is located at km 37.0, the river is a wide steady. At km 37.0, the river valley narrows and the gradient increases. Further rapids are reported at km 39.6 and km 40.4. Above this series of rapids the river becomes wide and steady for 10 km, flowing through a well-wooded valley. The gradient again increases 52.8 km from the mouth and the river flows swiftly for 1.9 km. Beyond this area the river again widens and is dotted with islands. The numerous gravel shoals in this area were considered by Peet (1971) to be suitable spawning substrate for Atlantic salmon. At km 74.8, the river narrows and several small falls and rapids occur up to km 104.7 where the relatively flat, rolling terrain of the headwaters begins. The upper reaches consist of numerous lakes and ponds with only one falls, at km 120.8. All the tributaries are accessible to migrating fish although a small rapids occurs on Murphy River (T21), 1.0 km upstream from its mouth.

Both Atlantic salmon and brook trout are reported in North River. Blair (1943) stated that Atlantic salmon ascended all the falls and moved into the headwaters; Sollows et al. (1953) reported that North River was a 'good' salmon river. Peet (1971) noted in his survey of 1967 that the angling exploitation of salmon is probably low due to the lack of pools. The river is best known for the excellent angling for sea-run brook trout at the mouth; records show that over 2100 were taken from 1969 to 1974 (Table 196).

TABLE 194. Physical characteristics of North River.

Map reference:	Cartwright 13H, 3E 1 : 250 000	Maximum basin relief:	732 m
Mouth latitude:	53°49′N	Length by meander (main stem):	143 km
Mouth longitude:	57°06′W	Total length including tributaries:	1399 km
General direction of flow:	East	No. of tributaries:	60
Drainage area:	2234 km^2	Geological formation:	Gneiss with some granite
Mean width	21 km		
Axial length	113 km		
Basin perimeter	328 km		

TABLE 195. Obstructions on North River (Peet 1971).

Fig. 45 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	10.5	Rapids	—	—	—	Partial
2	Main stem	37.0	Rapids	—	—	—	Partial
3	Main stem	39.6	Rapids	—	—	—	Partial
4	Main stem	40.4	Rapids	—	—	—	Partial
5	Main stem	52.8	Rapids	—	—	—	Partial
6	Main stem	74.8–104.7	Rapids and falls	—	—	—	Partial
7	Main stem	120.8	Falls	—	—	—	Partial
8	T21	1.0	Rapids	—	—	—	Partial

TABLE 196. Summary of angling catches of sea-run brook trout, North River, 1969–74 (DFO, unpubl. data).

Year	Weight (kg)		Total
	<0.9	0.9–1.8	
1969	27	427	454
1970	300	100	400
1971	200	50	250
1972	150	25	175
1973	100	25	125
1974	700	0	700
Total	1477	627	2104

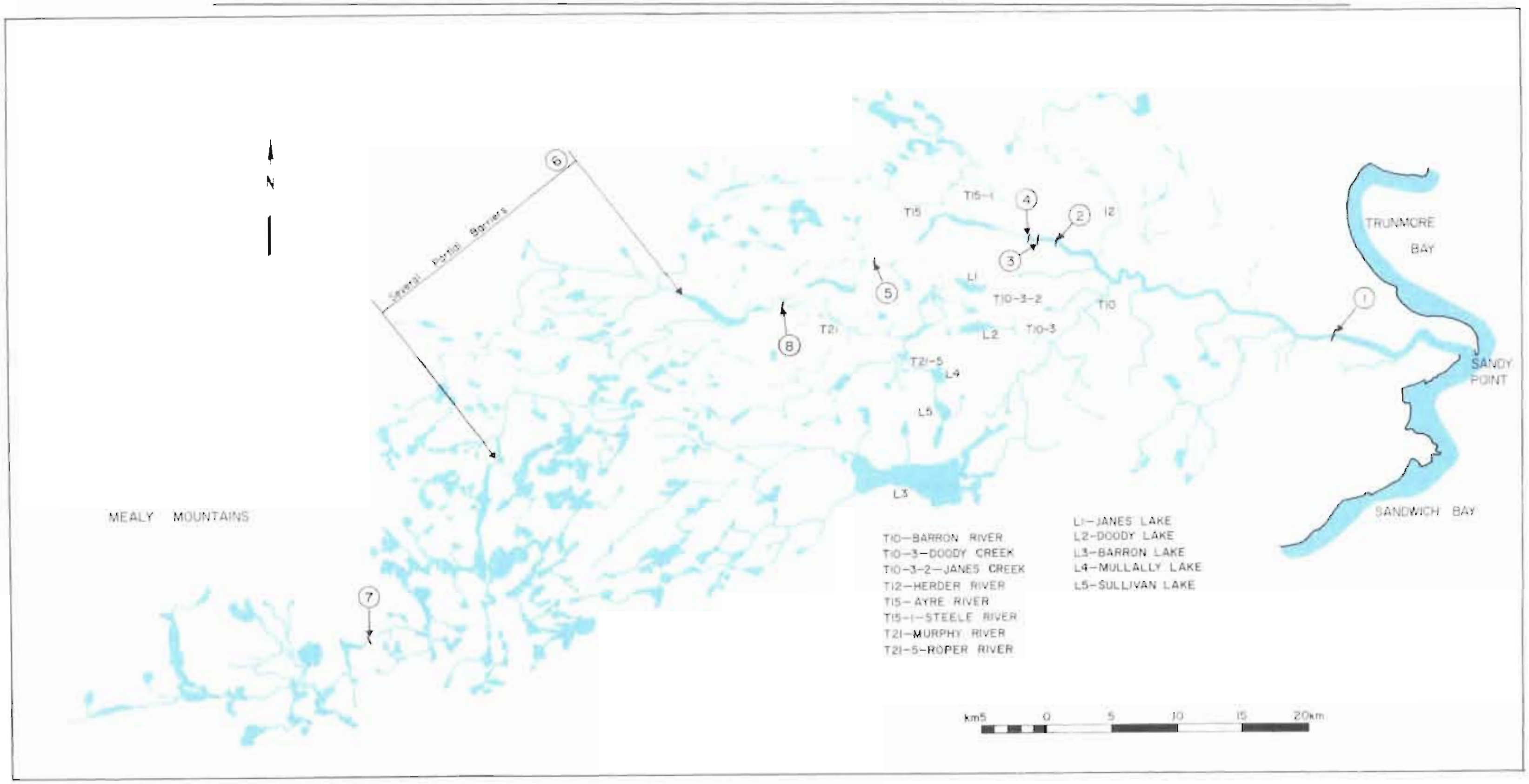

FIG. 45. Map of North River showing accessible Atlantic salmon parr rearing areas.

REGION III
HAMILTON INLET

Hamilton Inlet Region includes the area drained by rivers entering Groswater Bay and Lake Melville (Fig. 46). Due to the large area encompassed by many of these rivers' watersheds, this region is largest of the six regions of Labrador. Groswater Bay forms the outer portion of Hamilton Inlet and is over 25 km wide at its mouth. Lake Melville, a long, narrow body of brackish water, stretches from Rigolet to Goose Bay, a distance of approximately 160 km. Cargo and passenger ships pass through this narrow body of water during the ice-free months only with the aid of pilots. Conditions are made even more treacherous by the buildup of alluvial deposits carried down by the large rivers.

Hamilton Inlet bears the historical name of Invuckotoke and Lake Melville was formerly known as Esquimaux Bay after its early inhabitants. Today, the last remnants of the great Eskimo band that once stretched to the Strait of Belle Isle are found at Rigolet (Low 1896; Parsons 1970). Further west, in the interior, Naskaupi Indians hunted huge caribou herds for centuries. The Naskaupi have since settled in Davis Inlet on the coast while the Montagnais Indian Band have established themselves at Sheshatshit at the western end of Lake Melville.

Groswater Bay was for centuries a prime cod fishing berth for both English and French fishermen, and the name reflects visitations by the latter. The inner Lake Melville has been associated with explorers throughout the 19th and 20th centuries. John MacLean, a factor of the Hudson Bay Company, crossed the Labrador peninsula from Ungava Bay to Hamilton Inlet in the early 1800s and is credited with being the first non-native individual to see the great falls of Labrador, Churchill Falls. Holmes (1888) investigated the Kenemich, Kenamu, Traverspine and Churchill rivers during his journey into the Labrador interior in 1887. Low (1896) described Hamilton Inlet, journeyed up the Churchill River and explored three other rivers in northern Quebec. Both Wallace (1905, 1907) and Hubbard (1908) left from Grand Lake, a narrow body of water adjoining western Lake Melville, in their explorations of the Susan, Beaver, Crooked and Naskaupi rivers. Scott (1933), in his preliminary mapping survey of Labrador, visited the Kenemich, Kenamu, Traverspine, Churchill and Crooked rivers. Surveys on the physical characteristics and fish populations of the rivers of this region were conducted by Blair (1943), Sollows et al. (1953), Backus (1957), Peet (1971), Murphy (1972a), Murphy and Porter (1974a), Jamieson (1979), Bruce and Spencer (1979), and Bruce et al. (1979). Also, several investigators have conducted studies on the Churchill River, Smallwood Reservoir and its fish fauna.

Although Groswater Bay has always been a prime fishing area, few permanent settlements were established. Parsons (1970) reported that the whole bay is seasonally occupied by stationers (Newfoundland fishermen who live on the Labrador coast during the summer months) from the east coast of Newfoundland. Since the collapse of the cod fishery in this area during the 1960s commercial fishing effort has turned increasingly to salmon especially along the northern side of Groswater Bay and at Rigolet. Farther inland, in Lake Melville, neither the cod nor salmon fishery has ever been as important as the fur trapping industry.

The geology of the region is diverse. The area south of Hamilton Inlet, including the Mealy Mountains, is composed of anorthosites or igneous rocks approximately 1400 million years old (Sutton 1972). The area extending to the Quebec–Labrador border contains Precambrian sediments and volcanics. This area includes the Labrador Trough, a mineral-rich belt from which the Iron Ore Company of Canada (I.O.C.), Quebec–Cartier Mining Company, and Wabush Mines Limited mine 75% of Canada's iron ore production. The remainder of the Lake Melville region is made up of gneiss and associated rocks. British Newfoundland Exploration Limited (Brinex) in exploration since 1954 has detected uranium in shoreline exposures in the Back Way area south of Groswater Bay and in a 3500 km^2 area of sedimentary and volcanic rocks around Seal Lake, but to date the extent and potential of these discoveries remain unknown (Brinco Ltd. 1975). Glaciers have scoured much of the Lake Melville region depositing the debris farther south in Labrador.

The vegetation of this region can be divided into two sharply contrasting types. The first type, consisting of the most productive forest in Labrador, is found along the western edge of Lake Melville and the lower Churchill River. These mature evergreen forest stands were harvested in the past by small sawmill operations; from 1969 to 1977, nearly 15 000 ha have underwent large-scale cutting of pulpwood. The second type of vegetation consists essentially of scrub growth separating stands of stunted black spruce and encompasses most of the remainder of the region.

The major rivers of this region empty into the western end of Lake Melville. Included among these rivers are the two largest in Labrador, the Churchill and Naskaupi. During 1971, about 50% of the Naskaupi River, including Lake Michikamau, was diverted into the Churchill River system for generation of hydroelectricity. Most rivers in this region, with the exception of those draining the Mealy Mountains, flow over a flat topography which produces low water velocities and few natural barriers to fish migration. High turbidity and the presence of large amounts of silt, sand, and gravel in the lower sections of several of these rivers have been noted by several investigators.

There are 21 fish species reported in the region (Table 1). Four of these species, the lake chub, longnose dace, pearl dace, and mottled sculpin, are unique to this region of Labrador. Also, the Atlantic sturgeon, has been reported in Lake Melville where the muddy bottom provides a good habitat for this bottom-feeding anadromous fish. The potential for anadromous Altantic salmon in this region, determined by Riche (1965), Peet (1971), LeDrew (1972), Murphy (1972a) and Murphy and Porter (1974a) is excellent, but reports from both the commercial and recreational fisheries indicate a small salmon migration. Only two rivers in the region are scheduled for Atlantic salmon angling. The apparent under-utilization of the rivers is probably related to lack of good spawning areas, low winter discharges, high turbidity which reduces the quality of parr-rearing habitat, and the impact of past fisheries. The distance from the narrow outlet of Lake Melville to its western shore, approximately 160 km, may also limit production as it may disrupt the homing response of salmon. In some areas of western Labrador high standing crops of brook trout, lake trout, northern pike, and lake whitefish occur. The size and abundance of these fish are probably related to food availability and lack of exploitation.

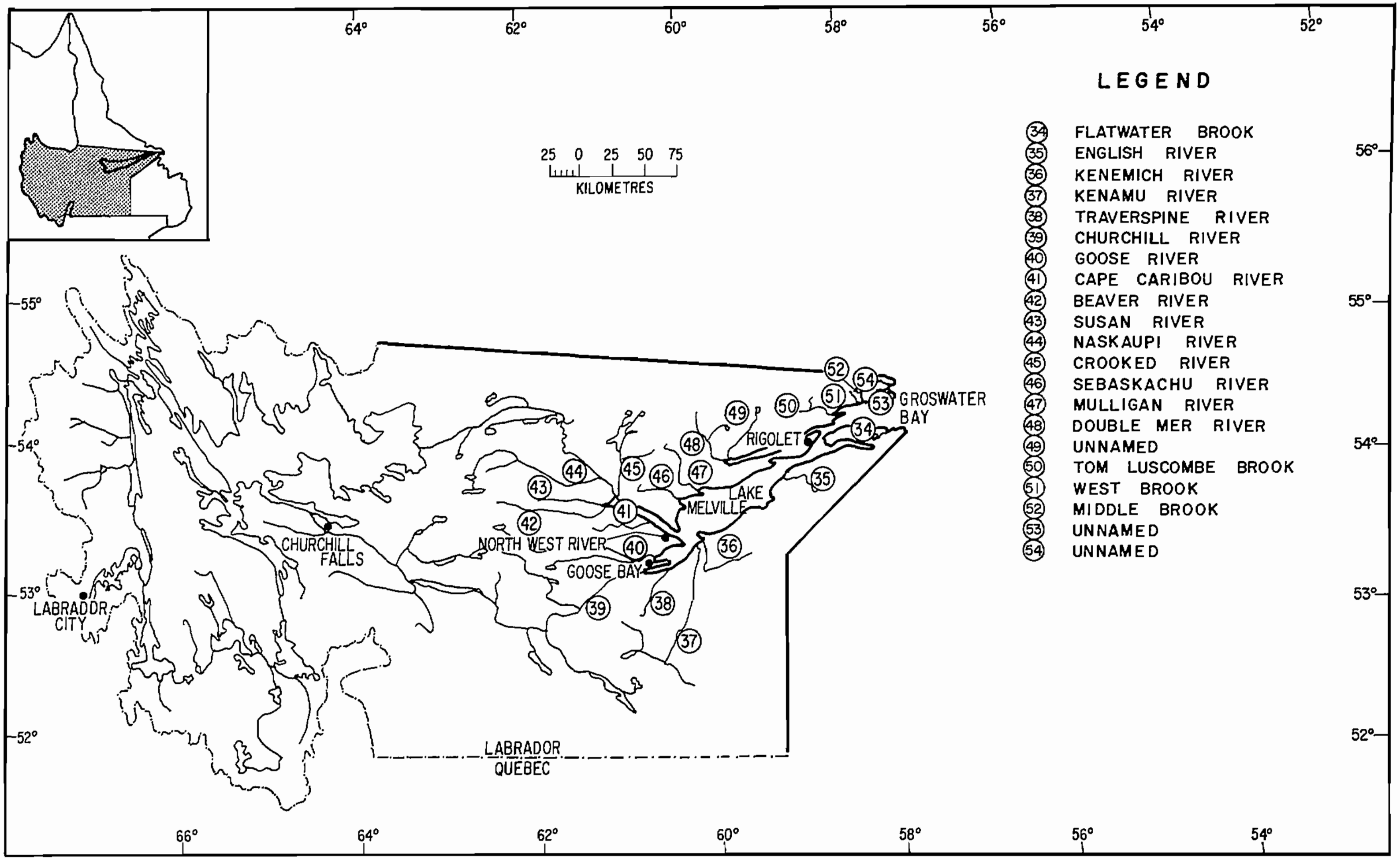

FIG. 46. Map of Region III, Hamilton Inlet. Rivers are numbered for convenient location in the text.

Flatwater Brook No. 34, Fig. 46

Flatwater Brook is an isolated stream emptying into Groswater Bay (Fig. 47). The watershed has an area of 299 km^2 (Table 197) and drains a barren basin that is surrounded by low hills. The main stem is essentially a system of small ponds which act as catchments for the nine tributaries. Peet (1971) reported the bottom substrate to be primarily mud, sand, and silt with scattered shoals of coarse gravel, rubble, and boulder. Peet noted no barriers to fish migration on the system.

Atlantic salmon, Arctic char, and brook trout have been reported in Flatwater Brook. In 1967, Peet (1971) seized two nets that were illegally set at the mouth of the brook. These nets contained one Atlantic salmon, three Arctic char, and one brook trout. The length, weight, and sex of these fish are presented in Table 198. Further evidence of extensive poaching is reported by T. Curran (pers. comm.) who noted that 13 small nets were seized in 1977 at the mouth of the brook. These nets also contained Atlantic salmon grilse, Arctic char, and brook trout. Local residents report that 'a fair run of grilse' migrate to the river (T. Curran, pers. comm.). Peet (1971) suggested that a large percentage of the anadromous fish using this watershed are probably salmon, as poachers would not risk their nets for less valuable species. No estimate of the extent of the juvenile rearing habitat in this river is available. Based on the descriptive report of Peet, it appears that the rearing capacity is limited, and extensive poaching could significantly reduce the anadromous fish populations.

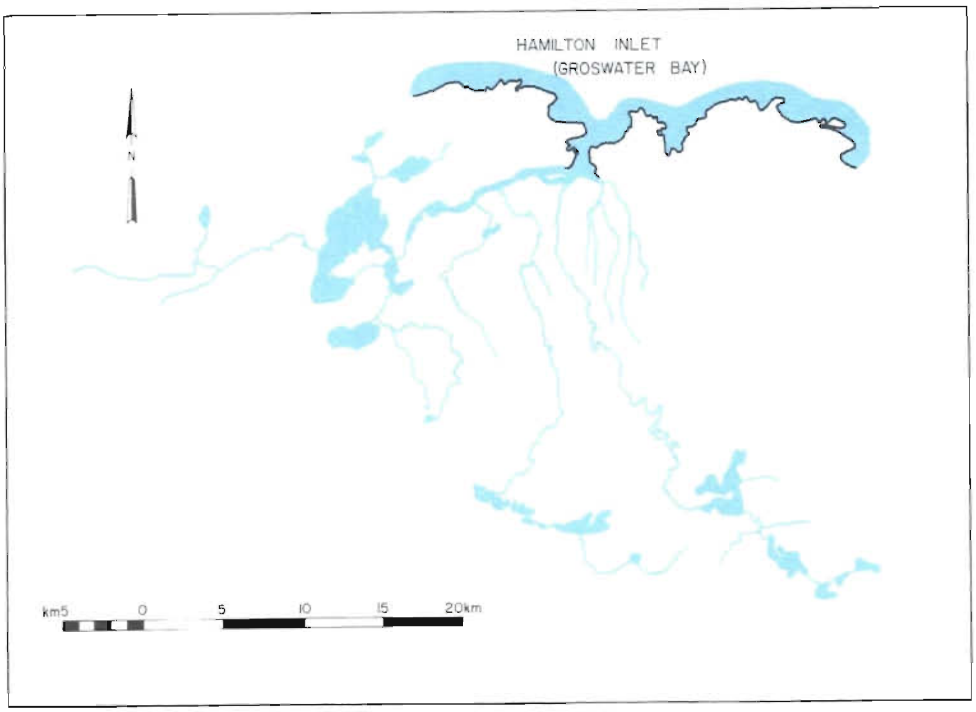

FIG. 47 Map of Flatwater Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 197. Physical characteristics of Flatwater Brook.

Map reference:	Groswater Bay 13-I 1 : 250 000	Maximum basin relief:	183 m
Mouth latitude:	54°10′N	Length by meander (main stem):	12 km
Mouth longitude:	57°37′W	Total length including tributaries:	166 km
General direction of flow:	North	No. of tributaries:	9
Drainage area:	299 km²		
Mean width	12 km	Geological formation:	Paragneiss
Axial length	58 km		
Basin perimeter	130 km		

TABLE 198. Fork length, weight, and sex of fish taken by net, Flatwater Brook, August 1967 (Peet 1971).

Species	Fork length (cm)	Weight (g)	Sex
Atlantic salmon	54.3	1928	M
Arctic char	55.5	2495	M
Arctic char	50.5	1701	M
Arctic char	43.4	1075	M
Brook trout	48.6	1588	M

English River flows northwesterly from the northeastern edge of the Mealy Mountains to its mouth in Lake Melville (Fig. 48). The lower sections of the watershed flow through a coastal plain of marshes and shrub growth alternating with patches of coniferous forest. The upper watershed is barren of vegetation and has a steep gradient as it flows from the Mealy Mountains. Throughout the watershed of 640 km^2 (Table 199), Murphy and Porter (1974a) reported only one barrier to fish migration, a 6.1-m vertical falls at km 1.6 on the main stem (Table 200). This falls prevents further migration upstream and renders 12 286 rearing units inaccessible to anadromous fishes (Table 201). The estimated salmon production from the inaccessible area is 3686 adult fish, and from the accessible area, 199. A water sample was collected from the lower river in 1973 and results of the analyses of this sample are recorded in Table 202 (Jamieson 1979).

This river was visited by the *Blue Dolphin* Labrador Expedition in 1951 (Backus 1957). Samples of Atlantic salmon, brook trout, longnose suckers, and round whitefish were obtained. The dates of capture, types of sampling gear, and catches are recorded in Table 203. Sollows et al. (1953) considered English River to be one of the best rivers for angling in the area. At present most angling activity is confined to the lower river where brook trout are taken (T. Curran, pers. comm.).

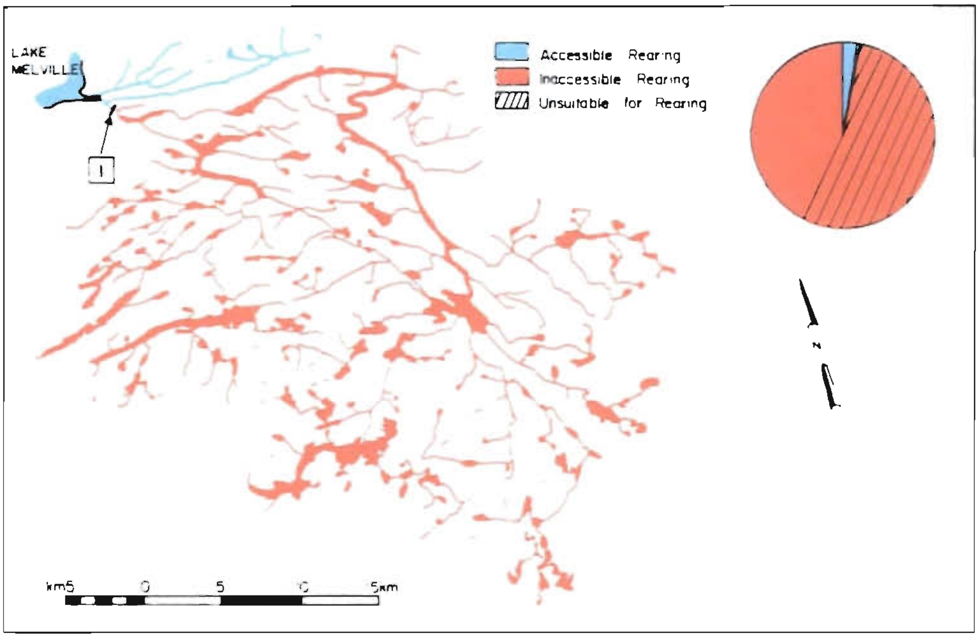

FIG. 48. Map of English River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 199. Physical characteristics of English River.

Map reference:	Lake Melville 13G 1 : 250 000	Maximum basin relief:	1037 m
Mouth latitude:	53°54′N	Length by meander (main stem):	48 km
Mouth longitude:	58°52′W	Total length including tributaries:	417 km
General direction of flow:	Northwest	No. of tributaries:	29
Drainage area:	640 km²		
Mean width	23 km	Geological formation:	Granitic gneiss
Axial length	44 km		
Basin perimeter	161 km		

TABLE 200. Obstructions on English River (Murphy and Porter 1974a).

Fig. 48 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	1.6	Falls	6.1	12.2	90	Complete

TABLE 201. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in English River (Murphy and Porter 1974a).

Location	Accessible areas: Spawning units	Rearing units	Inaccessible areas: Spawning units	Rearing units
Main stem	0	662	0	12 286
Total	0	662	0	12 286
Estimated production				
Smolt	1324		24 572	
Adult	199		3 686	

TABLE 202. Results of analyses of a water sample collected on English River, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.5	6.0	14.0	5.7	4.0	2.0	0.8	4.9

TABLE 203. Summary of fish collections from the *Blue Dolphin* Expedition, English River, 1951 (Backus 1957).

Date	Species	Method of capture	No. of samples	Length (mm)
25 July	Atlantic salmon	Gill net	1	156
31 Aug.	Brook trout	18.6-m seine, rod and reel	8	38–176
25 July	Longnose sucker	Gill net	1	197
13 Aug.	Round whitefish	18.6-m seine	4	46–57

Kenemich River flows westerly along the southern edge of the Mealy Mountains, makes an abrupt 90° turn and then flows north over a wide plain, emptying into Lake Melville at Carter Basin (Fig. 49). The lower river was examined in 1928 by Scott (1933) who reported that the river meandered aimlessly and that the banks were soft mud. Farther inland the banks are covered by black spruce forest and in the upper watershed the banks rise steeply from the river. At the mouth of this river, Wallace (1905, 1907) visited a lumber camp which has since been abandoned. Both Blair (1943) and Murphy (1972a) reported that the upper watershed is connected to the Eagle River system and that adult Atlantic salmon can enter one system and leave as kelt from the other. The watershed drains an area of 699 km^2, and contains 58 tributaries (Table 204); although Low (1896) contended that the river descended the steep sides of hills to its mouth in a succession of high and beautiful waterfalls, Murphy (1972a) reported no barriers to fish migration. Sollows et al. (1953) reported the water to be very dark, heavily silted, and turbid.

Atlantic salmon, resident and sea-run brook trout, and unidentified minnows (Cyprinidae) have been reported in Kenemich River. No angling catches have been recorded and angling is believed to be very limited. Sollows et al. (1953) and Murphy (1972a) reported that local Indians net the lower river for brook trout. Based on his survey in 1971, Murphy (1972a) estimated the annual production of Kenemich River to be 3471 adult salmon (Table 205). The impact of the turbid and silty water conditions upon spawning success may reduce this estimate significantly.

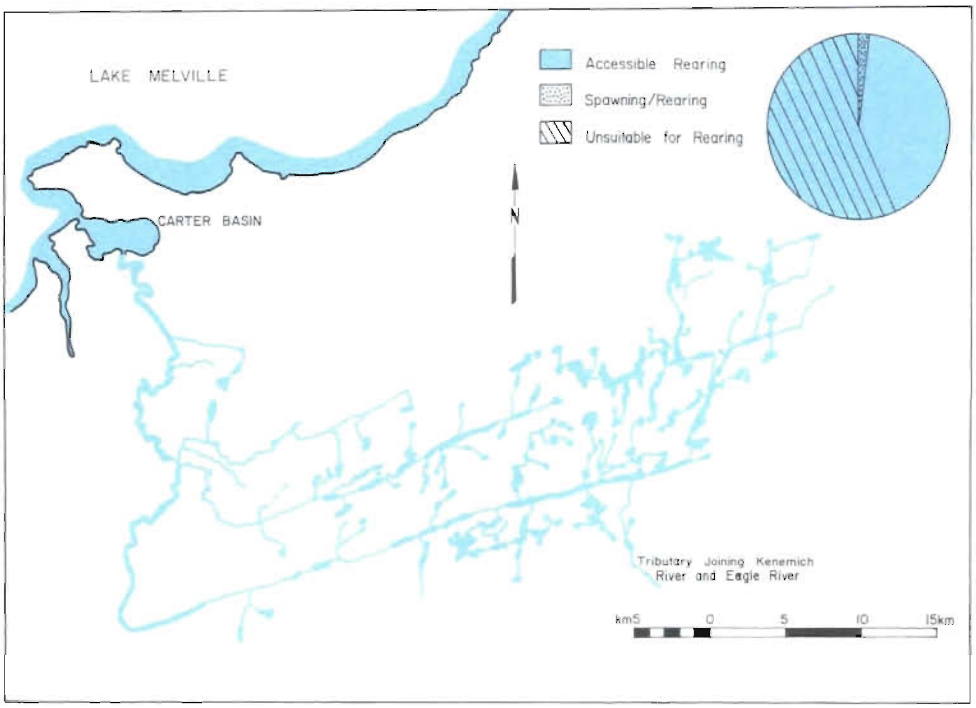

FIG. 49. Map of Kenemich River showing accessible Atlantic salmon parr rearing areas.

TABLE 204. Physical characteristics of Kenemich River.

Map reference:	Lake Melville 13G 1 : 250 000	Maximum basin relief:	732 m
Mouth latitude:	53°29′N	Length by meander (main stem):	101 km
Mouth longitude:	59°50′W	Total length including tributaries:	517 km
General direction of flow:	Northwest	No. of tributaries:	58
Drainage area:	699 km²	Geological formation:	Anorthosite with small areas of paragneisses
Mean width	47 km		
Axial length	48 km		
Basin perimeter	172 km		

TABLE 205. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Kenemich River (Murphy and Porter 1974a). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	450	11 570
Total	450	11 570
Estimated production		
Smolt	23 140	
Adult	3 471	

Kenamu River, the third largest river entering Lake Melville, originates in the interior of southern Labrador, near the headwaters of the Minipi River (Fig. 50). The river flows north through a valley in the southwestern corner of the Mealy Mountains to its mouth in Lake Melville. Both Holmes (1888) and Low (1896) pointed out that due to the lack of serious rapids and falls, the river was an important canoe route to the southern interior of Labrador. The large drainage area (4403 km^2) has prompted surveys of the hydroelectric potential which was estimated by Millan (1974) to be 313 MW, the fifth largest potential site in Labrador. The proposed route for the transmission line from the lower Churchill hydroelectric development crosses several sections of Kenamu River in the upper watershed. The lower and mid-sections of the river flow through dense forest, made up of 71% black spruce, 21% birch, 5% white spruce, and 3% other hardwoods. The approximate total harvestable forest resource is 13 million cords (Riche 1965). In the upper watershed the forest regresses to dense matted lichen and scrub spruce.

The total length, including tributaries, of Kenamu River is 613 km (Table 206). Scott (1933) canoed the entire length of the main stem (150 km) in 1928 as part of his survey of Labrador rivers. The upper river is a vast system of lakes and ponds that flow easterly. Entering the river 100 km from its mouth is Little Drunken River (T56), a large tributary that has a 4.6-m falls located 8.1 km from its mouth (Table 207). This falls is a partial barrier to migrating fish. At its confluence with Little Drunken River, the Kenamu turns north and passes through the Mealy Mountains. Surprisingly, the river is obstructed at only one location, 48.3 km from the mouth. The long rapids at this point would probably cause only a minor delay in salmon migration. Except for this one rapid section, most of the river is 50–75 m wide and the bottom composition, which ranges from gravel to large boulders, is excellent for salmon parr-rearing and adult salmon spawning. Near its mouth, the decrease in water velocity causes the deposition of sand and other suspended materials picked up farther upstream. At its mouth, the river is 450 m wide. Besides Little Drunken River, two other major tributaries, Tributary 31 (T31) and Salmon River (T40), were surveyed by Riche (1965). Both are completely accessible to migrating fish and contain excellent spawning areas.

The 10 fish species present in Kenamu River are listed in Table 208. Riche (1965) has also reported the occurrence of the northern redhorse *Moxostoma aureolum*; however, Scott and Crossman (1973) placed the eastern limit of this species in western Quebec, and its presence in Labrador has not yet been confirmed. The mouth of the river was visited by the *Blue Dolphin* Labrador Expedition on 25 August 1951; using an 18.6-m seine, they obtained three specimens of longnose sucker, 27–147 mm in length, and three specimens of round whitefish, 119–144 mm in length (Backus 1957). A 2.7-kg Atlantic sturgeon was caught at the mouth of the river (Riche 1965), and although this is the first capture reported in Lake Melville, Backus (1957) reported a specimen from outer Hamilton Inlet. Table 209 summarizes the catches by gill nets from a survey conducted by Riche (1965) in July–August 1964.

According to Blair (1943), the salmon migration on Kenamu River extends from about 25 June to the end of July. Angling activity is almost non-existent in the lower river due to the slow water velocity that creates poor angling conditions. This is illustrated by the fact that three members of Sollow's survey party of 1953 fished for I hour in this area and caught only two small trout and one salmon parr. Sollows et al. (1953) believed the river to be suitable for angling beyond the first 16 km. Riche (1965) estimated the salmon production of Kenamu River by extrapolating from the catches of commercial fishermen who set nets near the mouth. His production estimate of 15 000–18 000 salmon is certainly within reason when the size of the river, its accessibility and the availability of rearing and spawning area are taken into account. Assuming a commercial exploitation rate of 50%, Riche calculated the river escapement of Atlantic salmon to Kenamu River to be approximately 9000 fish.

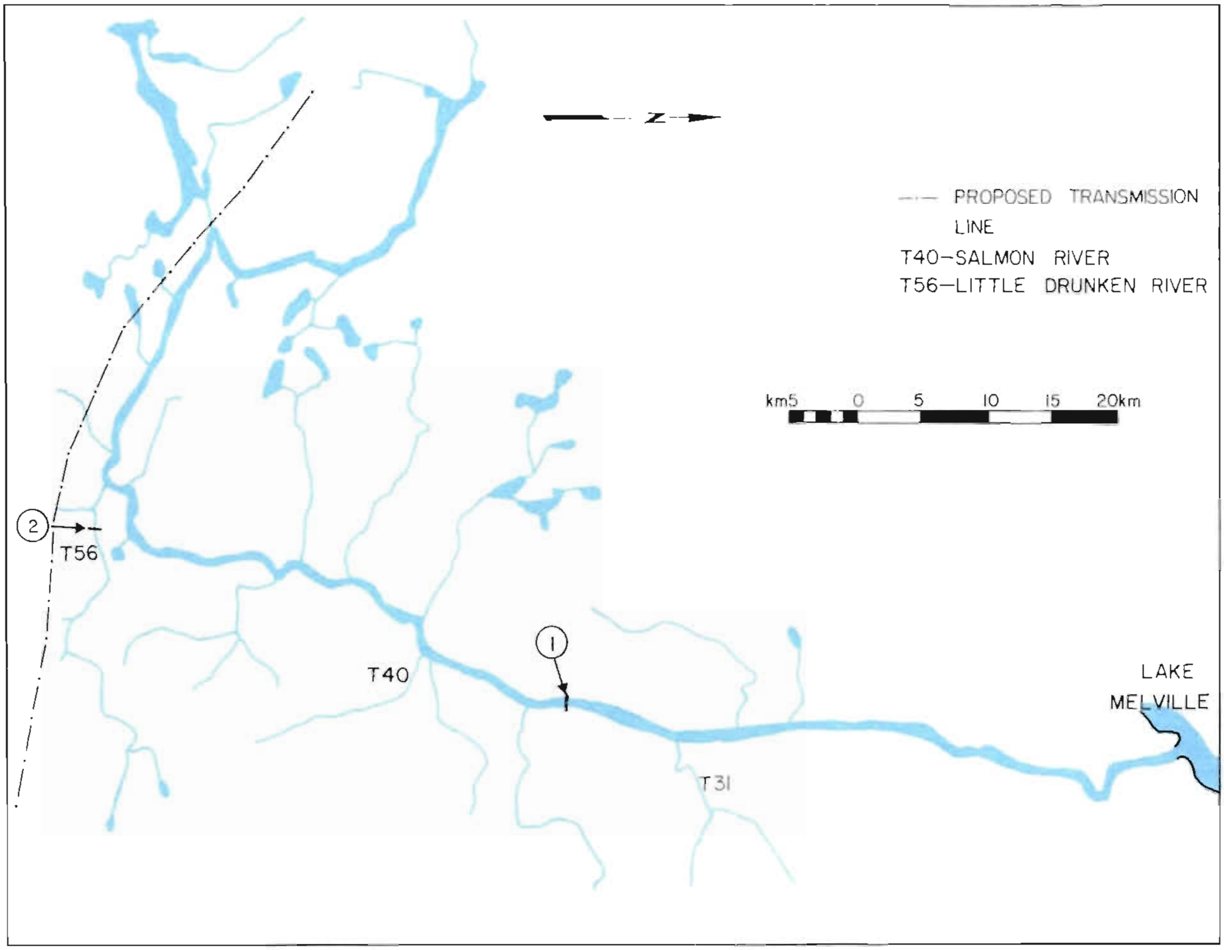

FIG. 50. Map of Kenamu River showing accessible Atlantic salmon parr rearing areas.

TABLE 206. Physical characteristics of Kenamu River.

Map reference:	Lake Melville 13G 1 : 250 000	Maximum basin relief:	305 m
Mouth latitude:	53°28′N	Length by meander (main stem):	150 km
Mouth longitude:	59°54′W	Total length including tributaries:	613 km
General direction of flow:	North	No. of tributaries:	77
Drainage area:	4403 km²	Geological formation:	Granite and granitic gneiss
Mean width	32 km		
Axial length	119 km		
Basin perimeter	502 km		

TABLE 207. Obstructions on Kenamu River (Riche 1965).

Fig. 50 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	48.3	Rapids	—	—	—	Partial
2	T56	8.1	Falls	4.6	—	—	Partial

TABLE 208. List of fish species and relative abundance in Kenamu River (A, abundant; C, common; R, rare) (Riche 1965).

Fish species	Common name	Abundance
Salmo salar	Atlantic salmon	C
Salvelinus fontinalis	Eastern brook trout (anadromous and resident)	C
Gasterosteus aculeatus	Threespine stickleback	C
Lota lota	Burbot	R
Coregonus clupeaformis	Lake whitefish	C
Prosopium cylindraceum	Round whitefish	C
Catostomus commersoni	White sucker	C
Catostomus catostomus	Longnose sucker	C
Osmerus mordax	Rainbow smelt	C
Acipenser oxyrhynchus	Atlantic sturgeon	R

TABLE 209. Summary of gillnetting catch, Kenamu River, July–August 1964 (Riche 1965).

Species	Catch per mesh size (cm) 3.8	5.1	7.6	10.2	12.7	16.5	Total
Eastern brook trout (resident)	0	2	2	1	0	0	5
Eastern brook trout (sea-run)	0	1	0	0	0	0	1
Longnose sucker	0	60	16	0	0	0	76
White sucker	0	22	35	0	0	0	57
Lake whitefish	0	0	1	0	0	0	1
Rainbow smelt	0	0	4	0	0	0	4
Atlantic salmon (adult)	0	0	0	1	0	0	1
Atlantic salmon (smolt)	0	2	0	0	0	0	2
Total	0	87	58	2	0	0	147

Traverspine River empties into the southern side of the lower Churchill river, 10 km from its mouth (Fig. 51). The incorporated town of Happy Valley-Goose Bay (population 7103), is located 2 km from the mouth of the river (Statistics Canada 1981). The upper Traverspine River, which borders on the Kenamu River headwaters, flows through the western Mealy Mountains. Scott (1933) after reaching the headwaters of the Kenamu, canoed down the Traverspine River and reported a rough trip in the upper watershed due to rapids and falls. Holmes (1888) noted during his exploration of the Labrador interior that the lower river was navigable by boat for 8 km while the remainder of the river was a rapid, narrow stream. The lower river flows through flat, well-wooded countryside.

Traverspine River has a drainage area of 728 km^2 (Table 210) and the accessibility of the watershed to anadromous fish has been discussed by several investigators. Blair (1943) reported a 9.1-m falls located 40 km from the mouth. Riche (1965) recorded no falls at this point but noted that 48 km from the mouth was an area characterized by shallow water depths, high water velocities, and a very steep gradient that formed a barrier to further upstream migration by fish. Murphy and Porter (1974a) reported a series of small falls from km 51.2 to km 56.6 that they considered a partial barrier to fish migration and a 3.7-m falls at km 60.8 that is a complete barrier to fish migration (Table 211).

The bottom substrate in the first 8 km is primarily sand and mud and is considered poor habitat for salmon parr-rearing and adult spawning. Above this section, Riche (1965) and Murphy and Porter (1974a) reported boulder and rubble substrate interspersed with patches of gravel. Based on the amount of accessible rearing area, Murphy and Porter estimated the adult salmon production of Traverspine River to be 5925 fish (Tablea 212). Although the cost of providing access to the area above the falls at km 60.8 would probably be prohibitive due to the remote location of the obstruction, this inaccessible area has the potential to produce 1114 adult salmon annually.

Fish species in Traverspine River as reported by Riche (1965) are Atlantic salmon, resident and sea-run brook trout, rainbow smelt, and burbot. A report of a lake chub caught by a local resident is unconfirmed. There are no records of recreational fish catches on Traverspine River and Sollows et al. (1953) stated that the river had no possibilities for angling. In the past, nets were set in the Traverspine River and Riche (1965) has attributed the drop in salmon production to this adverse fishing pressure.

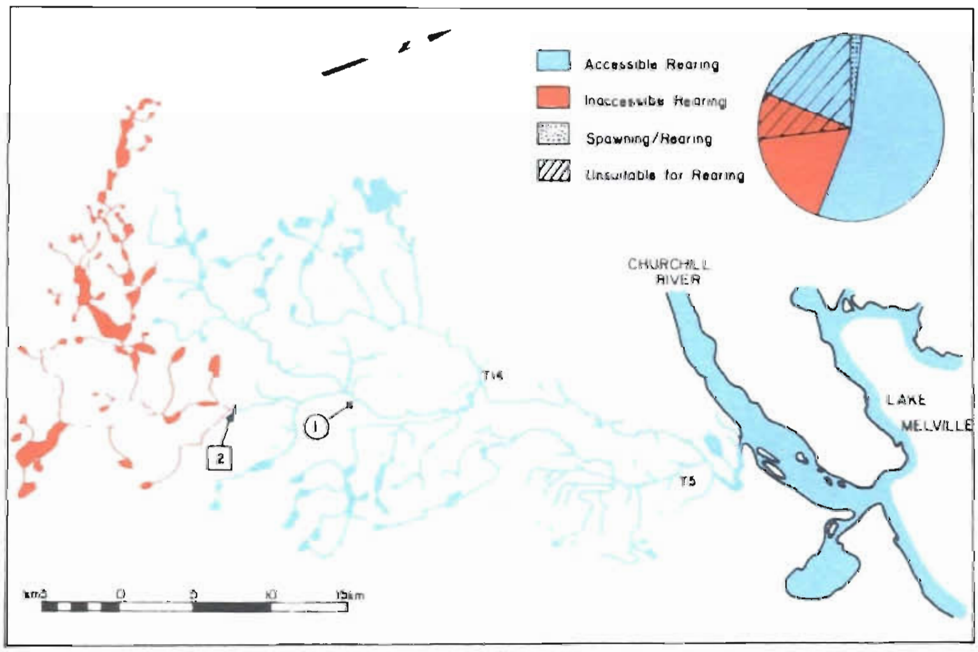

FIG. 51. Map of Traverspine River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 210. Physical characteristics of Traverspine River.

Map reference:	Minipi 13C Goose Bay 13F 1 : 250 000	Maximum basin relief:	518 m
Mouth latitude:	53°17′N	Length by meander (main stem):	95 km
Mouth longitude:	60°17′W	Total length including tributaries:	464 km
General direction of flow:	North	No. of tributaries:	26
Drainage area:	728 km²	Geological formation:	Gneiss, anorthosite and associated rocks
Mean width	18 km		
Axial length	48 km		
Basin perimeter	148 km		

TABLE 211. Obstructions on Traverspine River (Murphy and Porter 1974a).

Fig. 51 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	51.2–56.6	Falls	—	—	—	Partial
2	Main stem	60.8	Falls	3.7	6.1	—	Complete

TABLE 212. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Traverspine River (Murphy and Porter 1974a).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	618	19 749	0	3 714
Total	618	19 749	0	3 714
Estimated production				
Smolt	39 498		7 428	
Adult	5 925		1 114	

Churchill River, formerly the Hamilton River, is the largest river in Labrador (Fig. 52). The boundary of its watershed delineates a substantial portion of the Quebec–Labrador border. The drainage area of the Churchill River is 93 415 km^2 (Table 213) which includes nearly 12 000 km^2 diverted from the upper Naskaupi and Kanairiktok rivers for use in the Churchill Falls Hydroelectric Project. This project was completed in 1971 and provides 5225 MW of power. Further hydroelectric development in the watershed is planned at Gull Island and Muskrat Falls. It is estimated that these sites will provide 1700 and 600 MW, respectively.

The drainage area of the upper Churchill River (above Churchill Falls) is 69 266 km^2, equal to 24% of the Labrador land mass. This upper section, located on a huge plateau, is composed of Smallwood Reservoir (formerly Lake Michikamau and upper Naskaupi and Kanairiktok rivers), West Forebay, and East Forebay. Water that has been diverted from the 76-m Churchill Falls to the power house now enters the original river channel 30 km downstream from the falls. From this point the lower Churchill River (below Churchill Falls) flows in an easterly direction towards the Atlantic Ocean. The river cuts through a well-defined river valley, and, although rapids occur occasionally, it is navigable by small boat or canoe. Winokapau Lake, located in the mid-section, stretches for approximately 50 km. Gull Island, located 110 km upstream from the river mouth, is the site of a proposed hydroelectric development which will utilize 75% of the estimated 121 m head available below Churchill Falls. There is also a proposal to develop a hydroelectric generation site at Muskrat Falls, 40 km upstream from the mouth. This falls has an overall height of approximately 8 m and is a complete barrier to fish migrating upstream. Downstream of the falls, the river flows over a flat, sandy delta and is over 1 km wide at its mouth. Water samples have been collected at approximately 4-km intervals along the river from its mouth to Churchill Falls trailrace. Results of the analyses of these samples are presented in Table 214 (Jamieson 1979).

In 1973, DFO initiated a long-term program designed to compile an inventory of the fish resources of the natural lakes and the Smallwood Reservoir in western Labrador. Results of this investigation have been reported by the following authors for specified areas: Bruce (1974), Jacopie Lake; Bruce (1975), Lobstick and Sandgirt lakes; Bruce (1979), Lobstick Control Structure; Bruce and Parsons (1979), Ossokmanuan Reservoir; Bruce and Parsons (1976), Parsons (1975), Ten Mile Lake and Wheeler (1977), Valley River. In anticipation of hydroelectric development at either Gull Island and/or Muskrat Falls, surveys were conducted in 1975 and 1976 to determine the relative abundance and investigate the biology of fish species in the lower Churchill River. Results of these surveys were reported by Ryan (1980).

A total of 20 fish species have been reported in Churchill River (Table 215). Of this total, 19 were reported in the lower Churchill River by Ryan (1980). The pearl dace is reported in western Labrador by Scott and Crossman (1973). Results of studies on these species are summarized below.

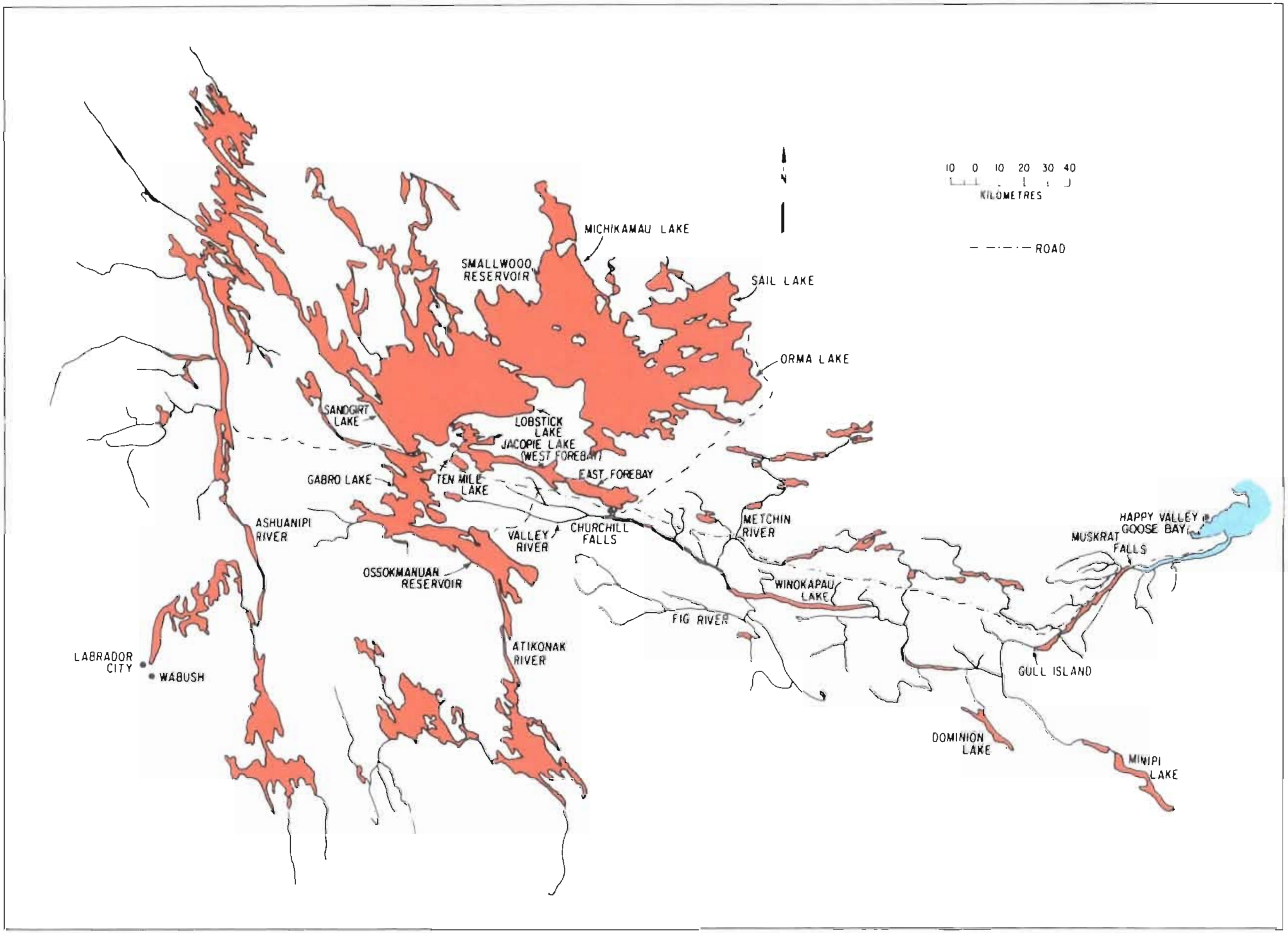

FIG. 52. Map of Churchill River showing accessible and inaccessible Atlantic salmon parr rearing areas.

Northern pike (*Esox lucius*)

Northern pike have a circumpolar distribution in the northern hemisphere and usually inhabit ponds and warm slow-moving water in heavily vegetated areas (Scott and Crossman 1973). In the Churchill River, the range of growth rates of northern pike in the lower river is greater than the range in the upper river (Fig. 53). Throughout the river, pike mature at approximately 40 cm, the average length attained by fish in their fourth to fifth year (Parsons 1975; Ryan 1980).

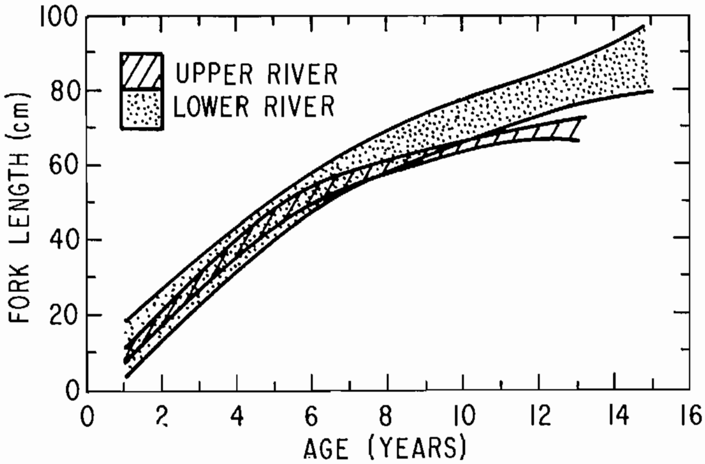

FIG. 53. Range of growth of northern pike in upper and lower Churchill River. Data sources: Bruce (1974), Parsons (1975), and Ryan (1980).

Lake whitefish (*Coregonis clupeaformis*)

Lake whitefish prefer cool, deep water (Scott and Crossman 1973) and are abundant throughout the Churchill River system. The range of growth rates is greater in the upper river (Fig. 54) where large bodies of standing water occur. Age at maturity ranged from 3 to 9 years (Bruce 1974; Ryan 1980).

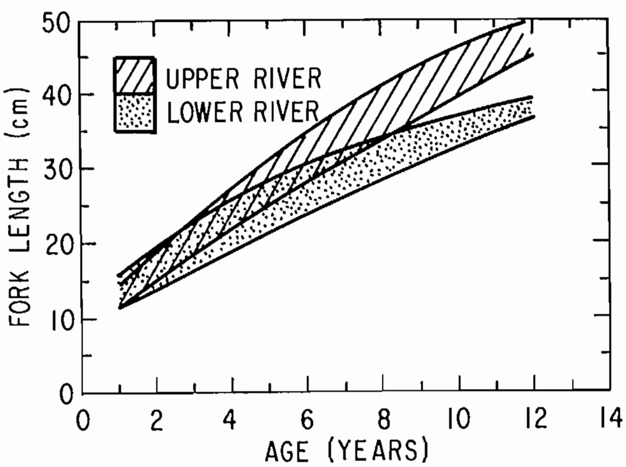

FIG. 54. Range of growth of lake whitefish in upper and lower Churchill River. Data sources: Bruce (1974, 1975), Parsons (1975), and Ryan (1980).

Longnose sucker (*Catostomus catostomus*)

Longnose suckers inhabit cold freshwater lakes and their tributaries (Scott and Crossman 1973) and are relatively abundant throughout the Churchill River system. The range of growth rates is higher in the upper river (Fig. 55) where large bodies of standing water occur. Ryan (1980) reported that longnose suckers in the lower Churchill River matured at about 20 cm, the length attained by fish in their sixth or seventh year.

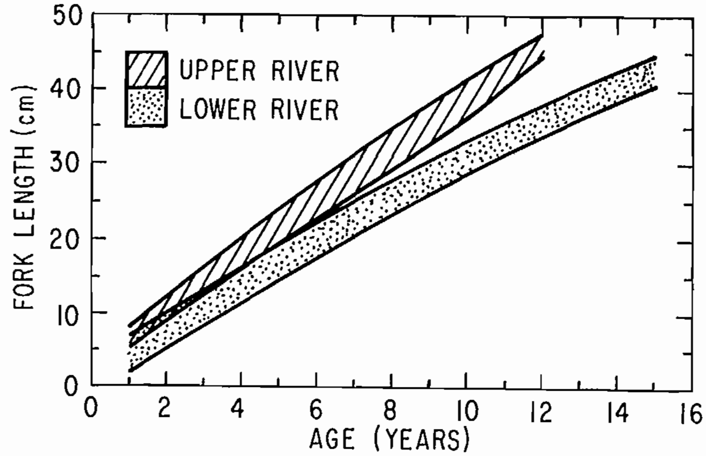

FIG. 55. Range of growth of longnose suckers in upper and lower Churchill River. Data sources: Bruce (1974), and Ryan (1980).

White sucker (*Catostomus commersoni*)

White suckers are usually found in warm, shallow lakes, and tributaries of larger lakes (Scott and Crossman 1973). In the Churchill River, the range of growth rates is slightly higher in the upper sections (Fig. 56). On average, white suckers in the lower river matured at 22 cm, the length attained by fish in their fifth or sixth year (Ryan 1980).

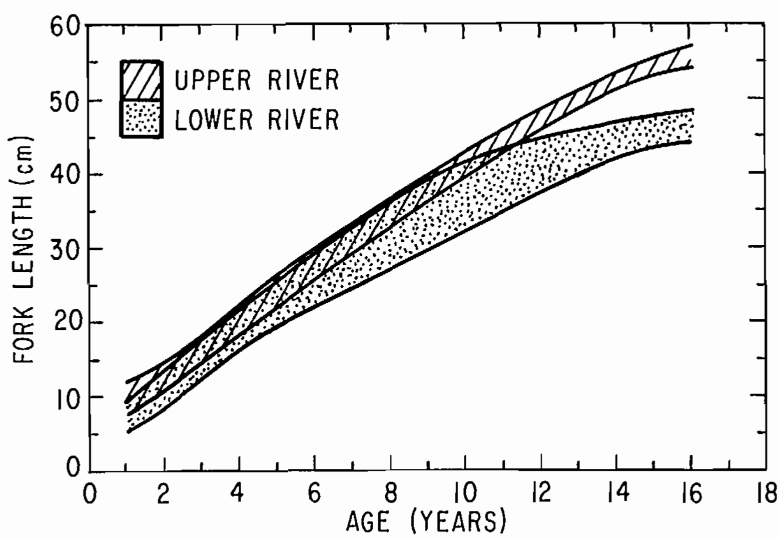

FIG. 56. Range of growth of white suckers in upper and lower Churchill River. Data sources: Parsons (1975), and Ryan (1980).

Brook trout (*Salvelinus fontinalis*)

Brook trout occur in clear, cool, well-oxygenated streams and lakes (Scott and Crossman 1973). Sea-run brook trout are found in the lower Churchill River upstream to Muskrat Falls and resident trout are found throughout the system. The growth rates in the upper river have a wide range and, on the average, are greater than rates in the lower river (Fig. 57). Wheeler (1977) found that both male and female trout in Valley River were all predominantly mature at age 2+; brook trout in the lower Churchill River matured in their third or fourth year (Ryan 1980.)

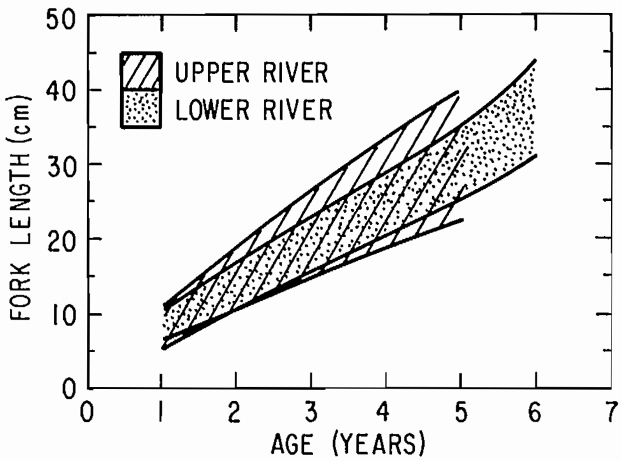

FIG. 57. Range of growth of brook trout in upper and lower Churchill River. Data sources: Bruce (1974), Parsons (1975), Ryan (1980), and Wheeler (1977).

Burbot (*Lota lota*)

Burbot usually inhabit deep lakes and large rivers (Scott and Crossman 1973). In the Churchill River system, burbot appear to be relatively rare; a combined total of 39 were reported captured by Bruce (1974, 1975), Bruce and Parsons (1976), and Parsons (1975). Ryan (1980) reported a total of 85 burbot captured in the lower river. Growth rates of these fish are presented in Fig. 58. Ryan also reported that burbot matured at approximately 33 cm, the average length attained by fish in their fifth year.

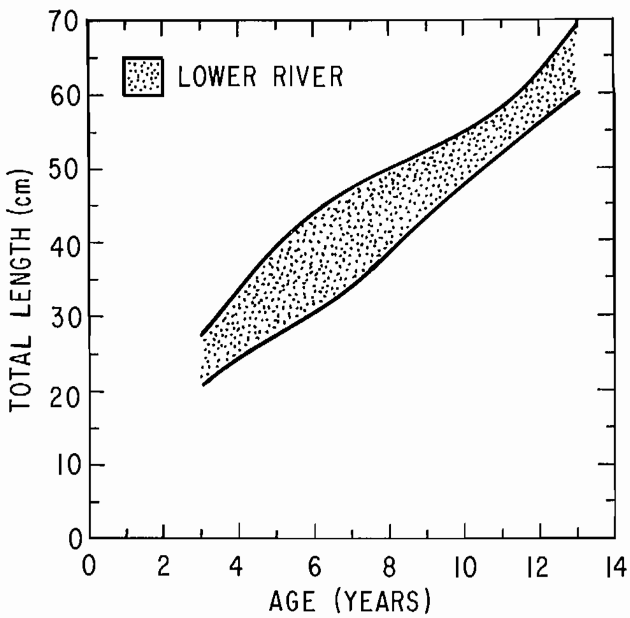

FIG. 58. Range of growth of burbot in lower Churchill River. Data source: Ryan (1980).

Lake trout (*Salvelinus namaycush*)

Lake trout occur in shallow lakes and rivers but prefer deep lakes (Scott and Crossman 1973). They occur throughout the Churchill River system but are most abundant in the upper river. The range of growth rates presented in Fig. 59 indicates that rates in the lower river are higher although this may be a result of the small sample size (15) collected in the lower section. Ages of lake trout collected by Ryan (1980) ranged from 6 to 15 years; Bruce and Parsons (1979) captured lake trout ranging in age from 3 to 37 years in Ossokmanuan Reservoir.

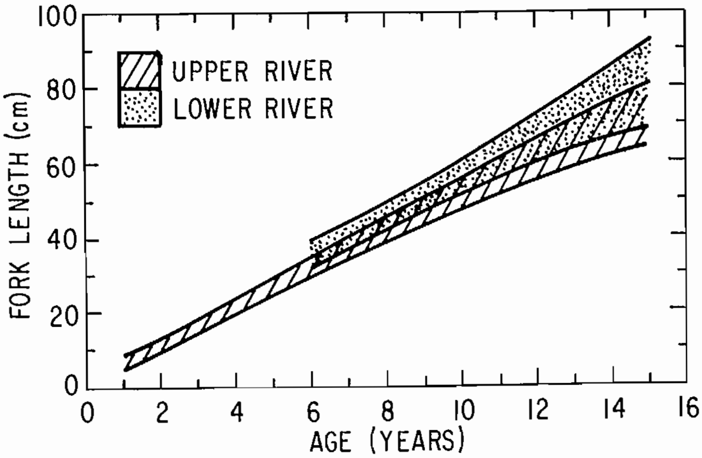

FIG. 59. Range of growth of lake trout in upper and lower Churchill River. Data sources: Bruce (1974, 1975), Parsons (1975), and Ryan (1980).

Atlantic salmon (*Salmo salar*)

Atlantic salmon are present in the Churchill River in both the anadromous and landlocked form (ouananiche). Anadromous salmon are restricted to the area below Muskrat Falls. Based on catches from past surveys ouananiche appear relatively rare as a total of only 11 were taken by Bruce (1974, 1975), Bruce and Parsons (1976), and Parsons (1975) in the upper region; a total of only 30 were caught by Ryan (1980) in the lower river. The range of growth rates of ouananiche in the upper and lower rivers derived from these small sample sizes is illustrated in Fig. 60. Ouananiche captured in the lower river ranged in age from 3 to 9 years; in the upper river ages ranged from 4 to 9 years.

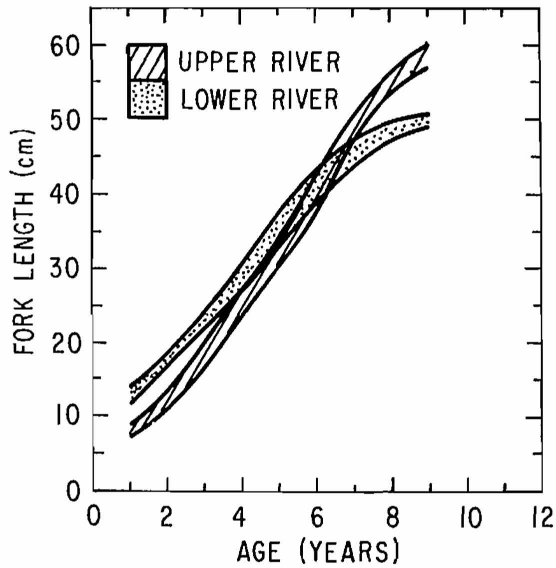

FIG. 60. Range of growth of landlocked Atlantic salmon in upper and lower Churchill River. Data sources: Bruce (1974, 1975), Bruce and Parsons (1976), Parsons (1975), and Ryan (1980)

Round whitefish (*Prospium cylindraceum*)

Round whitefish is a cold water species and is found in ponds, streams, and rivers in western Labrador (Scott and Crossman 1973). Based on the surveys conducted on the Churchill River system, round whitefish are relatively rare, ranking sixth in order of abundance in the lower river (Ryan 1980), and fourth in the upper river (Bruce 1975). The range of growth rates appears slightly higher in the upper river (Fig. 61).

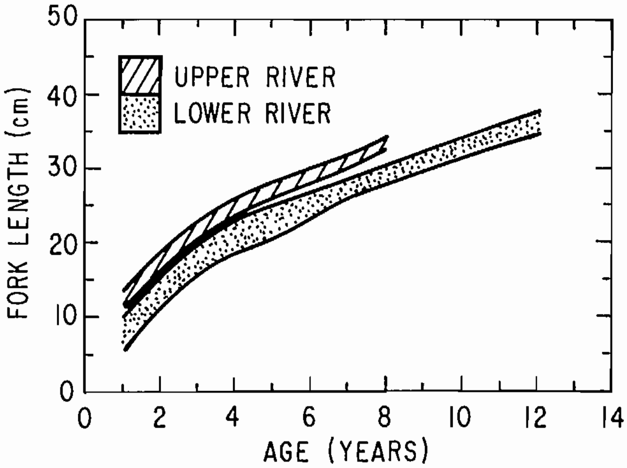

FIG. 61. Range of growth of round whitefish in upper and lower Churchill River. Data sources: Bruce (1975), Parsons (1975), and Ryan (1980).

Rainbow smelt (*Osmerus mordax*)

Rainbow smelt are rare in the Churchill River system; two smelt were reported captured in the lower river and none in the upper river (Ryan 1980). The fork lengths of the two smelt captured in the lower river were 17.8 and 19.4 cm; the weights were 53 and 61 g, respectively. Both fish were mature three-year-old females.

Arctic char (*Salvelinus alpinus*)

No Arctic char were captured during the DFO surveys on the fish populations of Churchill River although Scott and Crossman (1973) included the lower river in the distribution of Arctic char. Anadromous char, if they occur, would be confined to the waters below Muskrat Falls.

American eel (*Anguilla rostrata*)

No American eels were captured during the DFO surveys on the fish populations of Churchill River. Scott and Crossman (1973) included the lower river in the distribution of American eel.

Lake chub (*Couesius plumbeus*)

The lake chub inhabits clear, cold lakes, ponds and streams and ascends tributary streams for spring spawning (Scott and Crossman 1973). Ryan (1980) reported only three specimens captured in the lower Churchill River and these fish ranged from 5 to 8 years of age and were mature females. In the upper river at Ten Mile Lake, Bruce and Parsons (1976) collected a total of 150 specimens on June 10 and 11, 1975. These fish ranged from 2 to 4 years of age and 37.3% were female.

Threespine stickleback (*Gasterosteus aculeatus*)
Ninespine stickleback (*Pungitius pungitius*)

The threespine stickleback and ninespine stickleback are important forage fish and are found throughout the Churchill River system (Scott and Crossman 1973). DFO surveys on fish populations in the lower river have identified remains of threespine sticklebacks in stomachs of northern pike, lake whitefish, brook trout, burbot, lake trout, and ouananiche (Ryan 1980). Remains identified as *Gasterosteus* sp. were reported in the stomach of one ouananiche captured in Smallwood Reservoir in 1974 (Bruce 1975).

Mottled sculpin (*Cottus bairdi*)
Slimy sculpin (*Cottus cognatus*)

The mottled and slimy sculpins are important forage fish and are found throughout the Churchill River system (Scott and Crossman 1973). In the lower river, remains of *Cottus* sp. have been identified in stomachs of burbot, brook trout, lake whitefish, and northern pike (Ryan 1980). In the upper river, remains of *Cottus* sp. have been identified in stomachs of northern pike and lake trout (Bruce 1974; Bruce and Parsons 1979).

Longnose dace (*Rhinichthys cataractae*)

Longnose dace generally inhabit clean, swift-flowing streams. Scott and Crossman (1973) included the Churchill River system in the distribution of longnose dace. No specimens were captured during DFO surveys of fish populations.

Pearl dace (*Semotilus margarita*)

Pearl dace are usually found in cool, clear headwater streams and ponds. Scott and Crossman (1973) reported the presence of pearl dace in Labrador. No specimens were collected during DFO surveys.

Atlantic sturgeon (*Acipenser oxyrhynchus*)

This bottom-feeding, anadromous fish is limited to the Atlantic coast of North America (Scott and Crossman 1973). Although Ryan (1980) included this fish in the species list for Churchill River, no records of its capture in the river are available. Backus (1957) reported one specimen taken in Hamilton Inlet.

Additional Information

As previously mentioned, Churchill River, the largest river in Labrador, has undergone hydroelectric development, and further development is planned. In addition to DFO surveys, several other investigations and agencies have conducted research on fish populations and other aspects of the watershed. Due to this plethora of available information, a detailed summary of each investigation is not practical. A list of the major references for additional information includes:

Early Exploration
Grenfell (1909); Hubbard (1908); Low (1896); Wallace (1905).

Bio-physical Characteristics of the Watershed
Blair (1943); Jamieson (1979); Lopoukhine et al. (1978); Riche (1965); Sollows et al. (1953); Sutton (1972); Wilton (1965).

Limnology/Planktology
Duthie and Ostrofsky (1974, 1985); Ostrofsky (1978); Ostrofsky and Duthie (1975).

Hydroelectric Development
Smith (1975)

Fish Populations

Backus (1957); Bruce (1974, 1975, and 1979); Bruce and Parsons (1976, 1979); Bruce and Spencer (1979); Bruce et al. (1975, 1979); Flick (1977); Kendall (1909, 1910); Munroe (1949); Parsons (1975); Ryan (1980); Scott and Crossman (1973); Sollows et al. (1953); Wheeler (1977, 1980).

Also, numerous reports and submissions on fish populations and environmental impact of development within the watershed have been published by the following:

Beak Consultants Ltd
6870 Goreway Drive
Mississauga, Ontario
L4V 1L9

Newfoundland and Labrador Hydro
Lower Churchill Development Corporation Ltd.
P.O. Box 9800
St. John's, Newfoundland
A1A 3W3

Sheppard T. Powell Associated (Canada) Ltd.
1245 Martingrove Road
Toronto 603
Ontario

Thurlow and Associates
Environmental Control Consultants Ltd.
P.O. Box 2728
Station D, Ottawa
Ontario

TABLE 213. Physical characteristics of Churchill River.

Map reference:	Minipi Lake 13C		La Brûle 13D
	Winokapau Lake 13E		Goose Bay 13F
	Kasheshibaw Lake 13L		Lac Joseph 23A
	Opocopa Lake 23B		Shabogamo Lake 23G
	Ossokmanuan Lake 23H		Michikamau Lake 23-I
	Schefferville 23J		
	1 : 250 000		
Mouth latitude:	53°19′N		
Mouth longitude:	60°10′W		
Drainage area:	Below Muskrat Falls	1 062 km²	
	Below Gull Island	4 318 km²	
	Below Churchill Falls	24 149 km²	
	Above Churchill Falls	69 266 km²	
	Entire system	93 415 km²	
Length by meander (main stem below Churchill Falls): 564 km			
No. of tributaries (below Churchill Falls): 241			
Geological formation: Precambrian gneiss with sandstone and shale outcroppings			

TABLE 214. Individual measurements of water quality, Lower Churchill River. Sampling sites are located at 4-km intervals, commencing at the mouth and moving upstream (Jamieson 1979).

Sample date	Sample site	pH	Total hardness (ppm)	Conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)
28 6 75	W 1	6.6	5	14.3	3.5	4	0.8	1.0
30 6 75	W 2	6.8	5	15.4	4.0	5	0.9	1.0
3 6 75	W 3	6.4	8	15.4	4.0	4	0.9	1.0
5 6 75	W 4	6.3	6	16.5	5.0	5	1.0	1.0
7 6 75	W 6	6.6	7	17.4	20.0	5	1.0	1.0
10 6 75	W 7	6.1	6	18.0	11.0	5	1.0	1.0
11 6 75	W 8	6.0	10	18.3	16.5	5	1.0	1.0
13 6 75	W 9	6.3	7	19.1	20.0	6	1.1	1.0
14 7 75	W 10	6.2	8	18.8	10.0	6	1.4	1.0
3 8 75	W 11	6.2	8	18.0	6.0	3	1.1	1.0
5 8 75	W 12	6.0	8	19.1	3.5	5	1.4	1.0
6 8 75	W 13	6.1	8	19.7	9.0	4	1.4	1.0
7 8 75	W 14	6.2	6	20.9	4.0	5	1.1	2.0
9 8 75	W 15	6.2	7	18.6	4.5	6	1.4	1.0
10 8 75	W 16	6.1	8	18.1	4.5	6	1.3	1.0
14 8 75	W 17	6.1	7	18.1	5.5	6	1.4	1.0
15 8 75	W 18	6.1	7	18.7	9.0	6	1.4	1.0
17 8 75	W 19	6.1	7	18.7	6.0	5	1.2	1.0
18 8 75	W 20	6.2	8	19.2	3.5	6	1.5	1.0
21 8 75	W 21	6.0	9	20.3	5.5	5	1.1	1.0
21 8 75	W 22	6.5	8	18.7	4.0	7	1.4	1.0
22 8 75	W 23	6.4	8	18.7	5.0	7	1.2	1.0
23 8 75	W 24	6.3	8	18.7	9.0	6	1.1	1.0
20 6 76	W 25	6.3	8	17.0	1.0	5	1.2	0.6
20 6 76	W 26	6.2	7	17.0	0.8	4	1.3	0.7
23 6 76	W 27	6.4	8	18.0	0.8	5	1.3	0.6
22 6 76	W 28	6.3	8	18.0	0.8	5	1.3	0.6
24 6 76	W 29	6.3	8	18.0	0.6	5	1.3	0.6
24 6 76	W 30	6.3	8	19.0	1.2	5	1.2	0.6
27 6 76	W 31	6.4	8	17.0	1.4	5	1.1	0.6
27 7 76	W 32	6.2	8	17.0	0.5	5	1.3	0.6
27 7 76	W 33	6.4	7	17.0	0.6	5	1.3	0.6
27 7 76	W 34	6.3	8	19.0	2.0	5	1.3	0.6
21 7 76	W 35	6.2	10	22.0	1.0	6	2.0	0.6
21 7 76	W 36	6.3	10	20.0	0.7	5	1.6	0.7
23 7 76	W 37	6.5	10	20.0	2.5	7	1.8	0.7
23 7 76	W 38	6.5	10	20.0	1.2	8	1.8	0.6
24 7 76	W 39	6.2	10	19.0	1.0	6	2.0	0.7
24 7 76	W 40	6.3	10	19.0	1.0	6	1.6	0.6
29 7 76	W 41	6.3	10	20.0	0.5	5	1.7	0.7
25 7 76	W 42	6.4	10	19.0	1.1	6	1.6	0.8
26 7 76	W 43	6.2	9	21.0	0.8	7	1.6	0.6
26 7 76	W 44	6.3	10	18.0	1.5	6	1.3	0.8
27 7 76	W 45	6.5	10	18.0	0.5	5	1.4	0.8
27 7 76	W 46	6.5	8	20.0	0.8	8	2.0	0.6
28 7 76	W 47	6.6	8	20.0	0.7	8	2.0	0.6
28 7 76	W 48	6.3	8	19.0	1.5	7	2.0	0.6
29 7 76	W 49	6.4	10	18.0	4.0	5	1.8	0.8
29 7 76	W 50	6.3	10	19.0	0.5	6	1.7	0.7
31 7 76	W 51	6.4	9	21.0	2.2	7	1.8	0.6
31 7 76	W 52	6.4	9	20.0	1.5	7	1.5	0.6
1 8 76	W 53	6.3	8	18.0	1.2	5	1.4	0.6
1 8 76	W 54	6.4	9	21.0	0.7	6	1.7	0.6
2 8 76	W 55	6.5	9	22.0	1.5	6	1.6	0.7
2 8 76	W 56	6.2	10	21.0	0.9	6	1.6	0.6
3 8 76	W 57	6.3	9	19.0	1.0	6	1.3	0.6
3 8 76	W 58	6.3	10	19.0	1.2	7	1.4	0.6
4 8 76	W 59	6.3	7	18.0	0.6	6	1.3	0.6
4 8 76	W 60	6.3	8	18.0	1.4	5	1.3	0.6
5 8 76	W 61	6.4	8	19.0	1.0	6	1.5	0.6
5 8 76	W 62	6.3	8	18.0	0.8	6	1.6	0.7

TABLE 214. (*Concluded*)

Sample date	Sample site	pH	Total hardness (ppm)	Conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)
6 8 75	W 63	6.4	10	20.9	1.5	6	1.1	0.5
5 8 75	W 64	6.4	8	17.1	0.7	6	1.1	0.5
5 8 75	W 65	6.1	6	13.2	0.3	4	0.8	0.5
27 7 75	W 66	6.4	10	20.9	0.9	8	1.1	0.5
30 7 75	W 67	6.5	12	26.4	1.5	8	2.3	0.5
27 7 75	W 68	6.4	10	20.4	1.6	8	1.7	1.0
27 7 75	W 69	6.5	10	20.4	1.7	8	1.3	1.0
25 7 75	W 70	6.5	10	22.0	3.7	8	1.7	1.5
20 7 75	W 71	6.4	8	22.0	1.5	6	1.3	0.5

TABLE 215. Fish species reported in lower Churchill River.

Species	Scientific Name
Northern pike	*Esox lucius*
Lake whitefish	*Coregonis clupeaformis*
Longnose sucker	*Catostomus catostomus*
White sucker	*Catostomus commersoni*
Brook trout (sea-run and resident)	*Salvelinus fontinalis*
Burbot	*Lota lota*
Lake trout	*Salvelinus namaycush*
Atlantic salmon (sea-run and resident ouananiche)	*Salmo salar*
Round whitefish	*Prospium cylindraceum*
Rainbow smelt (sea-run)	*Osmerus mordax*
Arctic char	*Salvelinus alpinus*
Threespine stickleback	*Gasterosteus aculeatus*
Ninespine stickleback	*Pungitius pungitius*
Mottled sculpin	*Cottus bairdi*
Slimy sculpin	*Cottus cognatus*
American eel	*Anguilla rostrata*
Longnose dace	*Rhinichthys cataractae*
Pearl dace	*Semotilus margarita*
Lake chub	*Couesius plumbeus*
Atlantic sturgeon (sea-run)	*Acipenser oxyrhynchus*

Goose River flows easterly draining the Hamilton and Mecatina plateaus and emptying into Goose Bay in Lake Melville (Fig. 62). The town of Happy Valley–Goose Bay is located 5 km south of the river's mouth and the road to the communities of North West River and Sheshatshit crosses the lower river. A survey conducted by Millan (1974) estimated the hydroelectric potential of Goose River to be 246 MW, the eighth largest potential site in Labrador and nearly twice as large as any proposed sites in insular Newfoundland. A large logging operation was carried out in the lower watershed from 1969 to 1977. All areas were clear-cut and are delineated on Fig. 62; Table 216 shows the size of the areas harvested.

Goose River has a drainage area of 3432 km^2 (Table 217). From its mouth up to km 30, the river is wide and shallow and meanders among small islands, deltas, and sand bars. The "V"-shaped valley of this lower section is well forested except where the logging operations have been conducted. Above km 30, the gently flowing river is broken by a scattered rapid section. A boulder/rubble bottom substrate predominates (Murphy 1973). Collins et al. (1972a) noted that the riverbed around km 130 is strewn with huge boulders which result in the occurrence of rapids and chutes. Little Goose Falls, located at km 130.4, is 5.4 m high and effectively prevents further fish migration upstream (Table 218). Located 8.1 km above this obstruction is Goose Falls which, due to its height of 15.3 m, practically eliminates the possibility of constructing facilities for fish passage. The headwaters of Goose River are a conglomeration of small lakes on a glaciated plateau known as the Hamilton Upland. Tributary 13 (T13) is the largest tributary entering Goose River and is accessible to anadromous fish. Tributary 13 contains 4778 rearing units (Table 219). The remainder of the tributaries are small and many have falls near their outlets that are barriers to migrating fishes (Table 218).

Local residents have reported the presence of Atlantic salmon, brook trout, northern pike, and suckers in Goose River (Sollows et al. 1953). On 27 August 1951 the *Blue Dolphin* Labrador Expedition set a gill net 100 m upstream from the mouth of the river and captured one brook trout 282 mm in length (Backus 1957). In a gill net set on 12 August 1977, Bruce et al. (1979) captured one lake whitefish, four longnose suckers, one brook trout, and one white sucker. A summary of data on fork length, weight, sex, and age of these samples is presented in Table 220.

There are no angling statistics available for Goose River. Sollows et al. (1953) noted that the commercial fishery at the mouth of the river consisted of two nets that averaged only one salmon a day at the height of the salmon migration. The poor commercial salmon fishery in the immediate area indicates that present production is far less than the potential adult production of 10 068 fish (Table 219), estimated by Murphy (1973). Siltation, caused by the fine bottom substrate in the lower river, may be a limiting factor to fish production.

TABLE 216. Yearly logging harvests, Goose River watershed, 1969–77.

Fig. 62 reference	Year	Area harvested (ha)
A	1969	273
B	1970	1 439
C	1971	1 620
D	1972	2 146
E	1973	2 208
F	1974	2 346
G	1975	3 011
H	1976	1 303
I	1977	300
Total		14 646

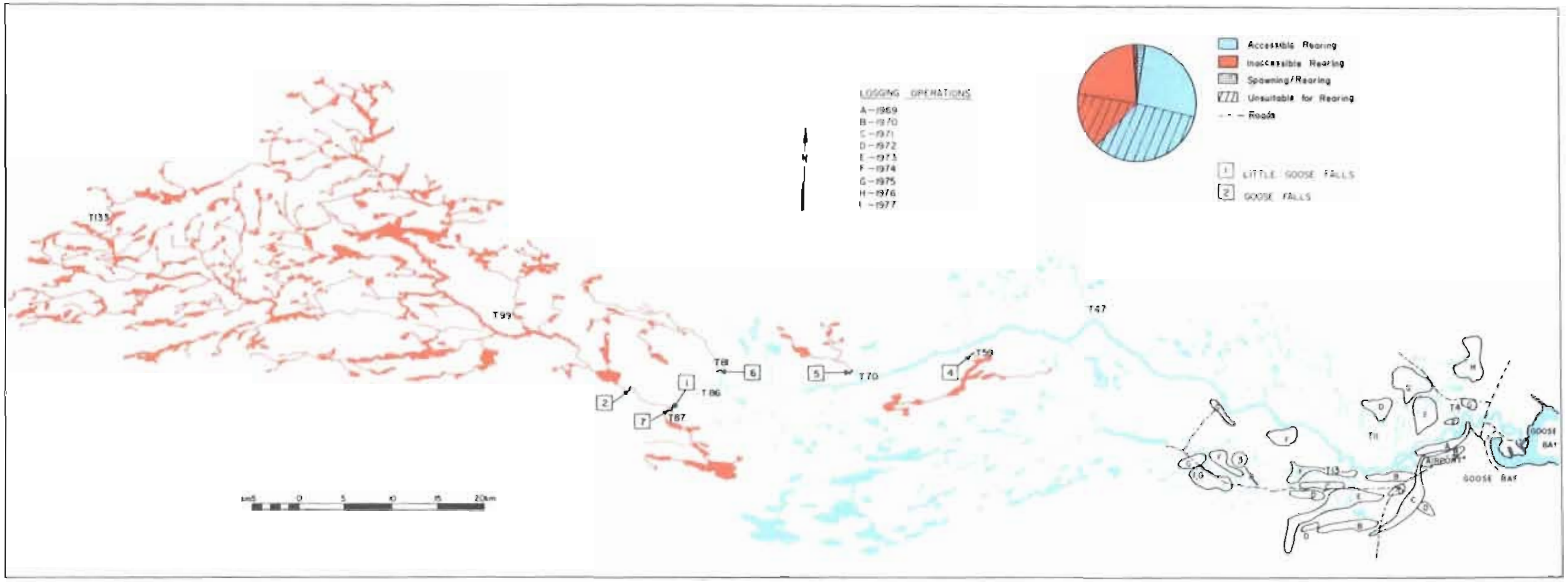

FIG. 62. Map of Goose River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 217. Physical characteristics of Goose River.

Map reference:	Goose Bay 13F 1 : 250 000	Maximum basin relief:	610 m
Mouth latitude:	53°22′N	Length by meander (main stem):	213 km
Mouth longitude:	60°22′W		
General direction of flow:	East	Total length including tributaries:	1356 km
		No. of tributaries:	133
Drainage area:	3432 km²	Geological formation:	Anorthosite and associated rocks, and gneiss
Mean width	20 km		
Axial length	165 km		
Basin perimeter	477 km		

TABLE 218. Obstructions on Goose River (Murphy 1973).

Fig. 62 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	130.4	Falls	5.4	30.5	80	Complete
2	Main stem	138.5	Falls	15.3	22.9	90	Complete
3	T13	16.1	Falls	2.4	15.3	45	Partial
4	T59	1.6	Falls	22.9	6.1	90	Complete
5	T70	3.2	Falls	7.6	6.1	80	Complete
6	T81	1.6	Falls	7.6	7.6	90	Complete
7	T87	0.0	Falls	6.1	15.3	90	Complete

TABLE 219. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Goose River (Murphy 1973).

Location	Accessible areas: Spawning units	Accessible areas: Rearing units	Inaccessible areas: Spawning units	Inaccessible areas: Rearing units
Main stem	2 308	20 425	0	19 565
T4	0	1 207	0	0
T11	0	850	0	0
T13	0	4 778	0	0
T47–T86	630	6 300	0	0
T87–T133	0	0	630	6 300
Total	2 938	33 560	630	25 865
Estimated production				
Smolt	67 120		51 730	
Adult	10 068		7 760	

TABLE 220. Summary of data on sex, fork length, whole weight, age, and mercury content of lake whitefish, longnose sucker, brook trout, and white sucker captured in Goose River, 12 July 1977 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Lake whitefish	F	1	26.0	0.70	4.0	0.18	—
Longnose sucker	F	4	21.6	0.22	5.8	0.08	0.05–0.11
Brook trout	M	1	30.6	0.50	4.0	0.17	—
White sucker	M	1	27.0	0.50	4.0	0.10	—

Cape Caribou River is one of five major rivers that empty into Grand Lake, a long, narrow body of water that enters Lake Melville at North West River (Fig. 63). Wallace (1905) cited the name of Cape Corbeau (Raven) for this river and added that a French missionary put this name on the cape due to ravens ever-present near the river mouth. Since 1971, logging operations have taken place in the watershed; an access road crosses the river at several points (Fig. 63).

Cape Caribou River drains an area of 546 km^2 and flows through mature timber stands throughout its entire length (Table 221). The watershed is accessible to anadromous fish although a falls at km 12.9 is a partial barrier to fish migration (Table 222). Good rearing area for salmon parr is found throughout the river system. Salmon parr and smolts were recorded by DFO staff in 1976 and 1977 (T. Curran, pers. comm.). Murphy and Porter (1974a) estimated the annual adult salmon production of this river to be 4477 fish (Table 223).

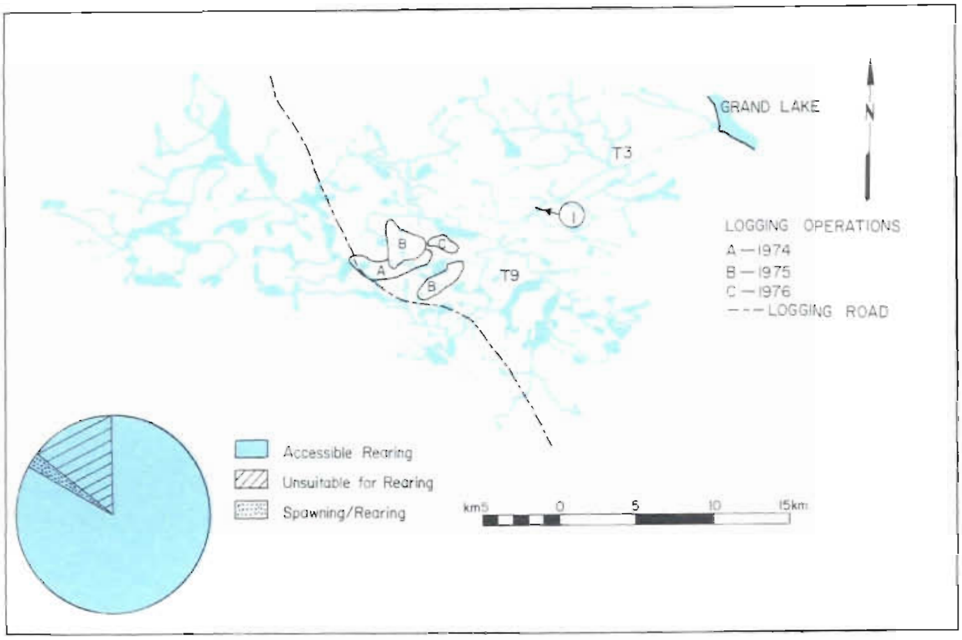

FIG. 63. Map of Cape Caribou River showing accessible Atlantic salmon parr rearing areas.

TABLE 221. Physical characteristics of Cape Caribou River.

Map reference:	Goose Bay 13F 1 : 250 000	Maximum basin relief:	397 m
Mouth latitude:	53°37′N	Length by meander (main stem):	55 km
Mouth longitude:	60°25′W	Total length including tributaries:	338 km
General direction of flow:	Northeast	No. of tributaries:	30
Drainage area:	546 km^2	Geological formation:	Anorthosite and associated rocks, and gneiss
Mean width	12 km		
Axial length	43 km		
Basin perimeter	126 km		

TABLE 222. Obstructions on Cape Caribou River (Murphy and Porter 1974a).

Fig. 63 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	12.9	Falls	4.6	18.3	60	Partial

TABLE 223. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Cape Caribou River (Murphy and Porter 1974a). No inaccessible areas were identified.

Location	Accessible areas Spawning units	Rearing units
Main stem	407	12 373
T3	0	929
T9	0	1 620
Total	407	14 922
Estimated production		
Smolt	29 844	
Adult	4 477	

Beaver River flows easterly over the barren central Labrador plateau and empties into the western tip of Grand Lake (Fig. 64). It has a drainage area of 1878 km², and is fed by 64 tributaries (Table 224). From a survey carried out by Millan (1974), available hydroelectric potential was estimated to be 126 MW, roughly equal to that of the Pipers Hole site in insular Newfoundland.

Over the lower 8 km, Beaver River averages 30 m in width and meanders around sand shoals and small islands. This section of river is only a half metre deep and surrounded by thick alder growth. A feature of the first 3 km is the prevalence of old sticks (dead alders?) embedded in the river bottom. The water is turbid and the muddy bottom is of a very thick, sticky consistency. The mid-sections of the river average 50 m in width. The bottom is of rubble/boulder composition. A minor obstruction to fish migration, a 2.7 m falls, occurs at km 61.2 (Table 225). This may be the same falls reported by Blair (1943). Eighty kilometres from the mouth the river consists of wide steadies and lakes that are dotted with sand and gravel shoals. The only major tributary on the system, T22, contains 11 789 accessible rearing units; a 4.6 m falls at the mouth of T22-9 renders 7245 rearing units inaccessible to fish migrating upstream (Table 226). A water sample was collected in August 1973; results of the analyses of this sample are presented in Table 227 (Jamieson 1979).

Wallace (1905) reported catching brook trout, lake trout, and northern pike in the upper river. Both salmon parr and smolt have been sighted by local trappers and DFO field staff (T. Curran, pers. comm.). The absence of a sport fishery and the small landings by the commercial fishery in Grand Lake indicate that present salmon production is considerably less than the 13 875 adult salmon (Table 226) estimated by Murphy and Porter (1974a). The high turbidity in the lower river may significantly reduce the suitability of Beaver River for salmon production.

TABLE 224. Physical characteristics of Beaver River.

Map reference:	Winokapau Lake 13E Goose Bay 13F 1 : 250 000	Maximum basin relief:	671 m
Mouth latitude:	53°44′N	Length by meander (main stem):	103 km
Mouth longitude:	60°57′W	Total length including tributaries:	853 km
General direction of flow:	East	No. of tributaries:	64
Drainage area:	1878 km²	Geological formation:	Gneiss
Mean width	22 km		
Axial length	89 km		
Basin perimeter	270 km		

TABLE 225. Obstructions on Beaver River (Murphy and Porter 1974a).

Fig. 64 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	61.2	Falls	2.7	30.4	60	Partial
2	T22	19.3	Falls	2.4	15.2	80	Partial
3	T22-9	0.0	Falls	4.6	30.4	90	Complete

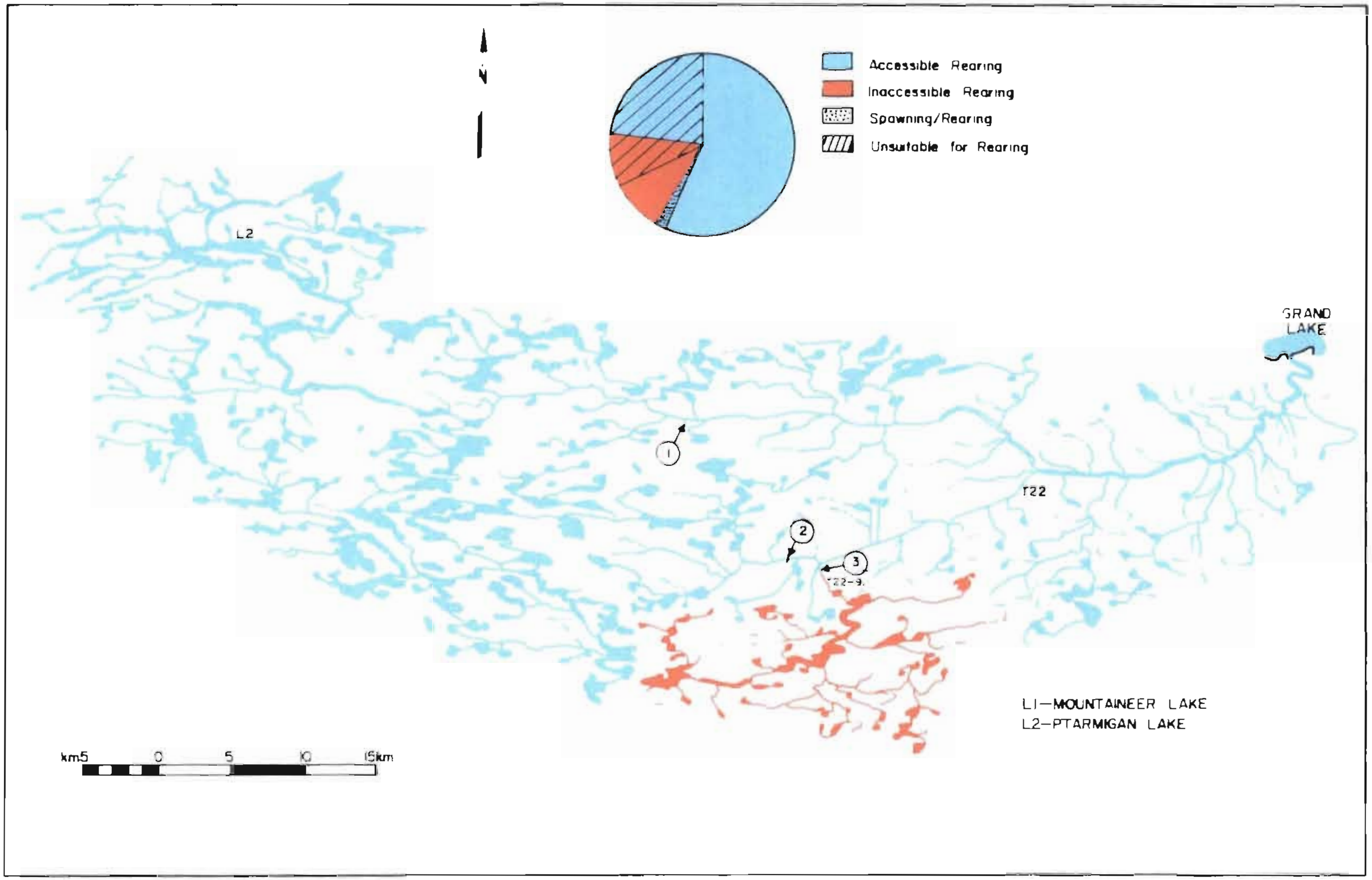

FIG. 64. Map of Beaver River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 226. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Beaver River (Murphy and Porter 1974a).

Location	Accessible areas: Spawning units	Accessible areas: Rearing units	Inaccessible areas: Spawning units	Inaccessible areas: Rearing units
Main stem	667	34 462	0	0
T22	892	11 789	0	7 245
Total	1 559	46 251	0	7 245
Estimated production				
Smolt	92 502		14 490	
Adult	13 875		2 174	

TABLE 227. Results of analyses of a water sample collected on Beaver River, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm^{-1} at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.6	8.0	15.0	3.8	8.0	2.0	1.1	9.8

Susan River is the smallest of the five major rivers entering Grand Lake (Fig. 65). The river has a watershed area of 363 km^2 (Table 228) and its headwaters are on a flat, barren plateau, 58 km from its mouth. From this source of meandering steadies and small ponds, the river flows in an easterly direction. Twenty-five kilometres from the mouth it enters a steep valley that is lined with coniferous forest. Probably the best description of this section of river was given by Wallace (1905) who had considerable difficulty canoeing through the shallow, swift-flowing, boulder-strewn river and called it "that awful valley". Ten kilometres from the mouth, the river widens to 50 m and the bottom substrate alternates between fine gravel and sand. Blair (1943) reported that there were no barriers to fish migration and this was verified by Murphy and Porter (1974a).

Fish species reported in Susan River are Atlantic salmon (Blair 1943) and brook trout (Wallace 1905). Like other rivers in the area, Susan River probably supports populations of suckers, sticklebacks, smelt, and whitefish as well. The potential annual production of adult Atlantic salmon, estimated by Murphy and Porter (1974a), is 3350 fish (Table 229). The present production appears to be somewhat less than this as indicated by the absence of a sport fishery and the small landings of salmon by the commercial fishery in Grand Lake.

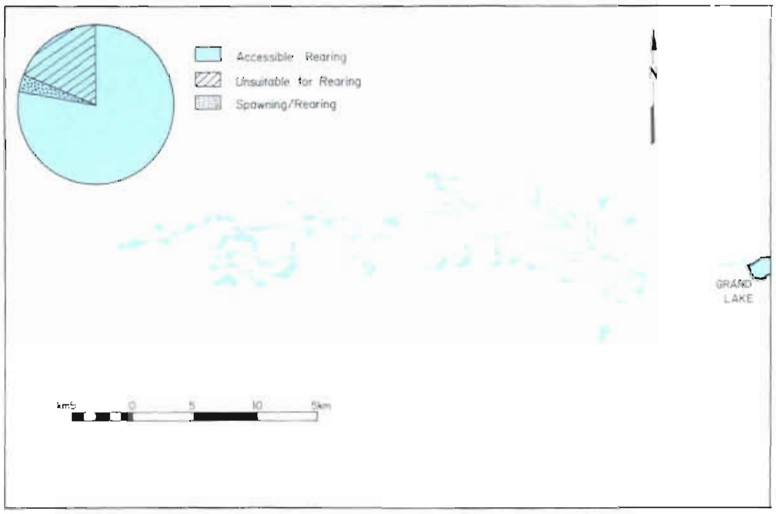

FIG. 65. Map of Susan River showing accessible Atlantic salmon parr rearing areas.

TABLE 228. Physical characteristics of Susan River.

Map reference:	Goose Bay 13F 1 250 000	Maximum basin relief:	488 m
Mouth latitude:	53°44′N	Length by meander (main stem):	58 km
Mouth longitude:	60°58′W	Total length including tributaries:	230 km
General direction of flow:	East	No. of tributaries:	27
Drainage area:	363 km^2	Geological formation:	Gneiss
Mean width	8 km		
Axial length	52 km		
Basin perimeter	119 km		

TABLE 229. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Susan River (Murphy and Porter 1974a). No inaccessible areas were identified.

Location	Accessible areas: Spawning units	Accessible areas: Rearing units
Main stem	488	11 166
Total	488	11 166
Estimated production		
Smolt	22 332	
Adult	3 350	

Naskaupi River, the second largest river in Labrador, flows southeasterly and empties into the northern tip of Grand Lake (Fig. 66). Historically, this river has been one of the principal routes into the interior of Labrador and derives its name from the Naskaupi Indian Tribe who used it to gain access to the caribou herds in the interior around Lake Michikamau.

On 28 April 1971, by closing a system of dykes, the Churchill Falls power development diverted Lake Michikamau, at the headwaters of Naskaupi River, into the Churchill River system. This diversion does not provide for water release into Naskaupi River, and has decreased the drainage area of the river from 23 310 km^2 to 12 691 km^2 (Table 230). The hydroelectric potential of the remaining portion of Naskaupi River has been estimated by Millan (1974) to be 1933 MW, the second highest potential in Labrador next to the lower Churchill (2400 MW).

Riche (1965) undertook a preliminary biological survey of Naskaupi River and also provided details of the physical characteristics of the river. Since the 1971 diversion, Riche's description of the watershed has become obsolete. Post-diversion information has been provided by LeDrew (1972) and Collins et al. (1972b).

From its mouth to km 30, Naskaupi River flows through a wide river valley. The forest cover is predominantly black spruce and white birch and the river bottom substrate is sand and mud. At km 30, the river narrows. Located at km 35 is Aigeau Rapids, a long stretch of white water that is easily traversed by migrating fishes (LeDrew 1972). The bottom substrate of the river from km 35 to km 125 is comprised of boulder and rubble. LeDrew (1972) reported minor rapids at km 55, km 60 (North Pole Rapids), and km 96. Wuchusk Lake (L6) is located at km 125 and from its inlet at km 128 to "the gorge" at km 188 the river bottom composition alternates between mud flats (km 125–167) and large areas of gravel (km 168–188). LeDrew (1972) reported that the river is up to 100 m wide in the section characterized by mud flats. The forest growth in this section is primarily black spruce although there is no overhanging vegetation on the river banks. At km 188, the river narrows to less than 10 m at the gorge and from this point to Marie Lake (approximately 35 km) a total of 15 barriers to fish migration (Table 231) have been reported (Riche 1965). The exact locations of these obstructions were not reported; however, it was noted that several, such as Gritwood, Isabella, and Maid Marion falls, are complete barriers to migrating fishes. Collins et al. (1972b) reported that the flows in this canyon-like terrain have been reduced to a "trickle" by the Churchill Falls diversion, negating any possibility or need to provide fish passage over the obstructions.

A total of 105 tributaries feed Naskaupi River (Table 230). The most important of these tributaries is Red Wine River (T7), which has no flow reduction due to the diversion. It was described by Riche (1965) as being ideal for the maintenance of Atlantic salmon stocks due to the well-interspersed pools, riffle areas, small rapids, and spawning areas in the first 100 km. Wallace (1907) noted that the waters of this tributary, although not turbid, were reddish-brown in contrast to the clear waters of the main stem. Other tributaries such as North Pole River (T22), Wapustan River (T23), and Thomas River (T35) were classified by Riche (1965) as offering comparatively good nursery area for juvenile fish. Water samples were collected in 1974 and 1978 and the results of the analyses are presented in Table 232 (Jamieson 1979).

A total of fifteen species of fish have been reported in Naskaupi River (Table 233). Earliest reports came from explorers who used fish as a supplement to their often bland diet. Lakes such as Namaycush Lake (L4) were named after catches in these waters (Wallace 1907). Predators were also mentioned by these early explorers who named Seal Lake (L5) after the seal populations sighted by both Wallace (1907) and Hubbard (1908). Blair (1943) reported the presence of anadromous Atlantic salmon up as far as the gorge at km 188.

Investigations into the fish populations were undertaken and reported by Backus (1957), Riche (1965), LeDrew (1972), and Bruce et al. (1979).

Seven species were collected during the 1951 *Blue Dolphin* Labrador Expedition (Backus 1957). Sampling locations were 1.6 and 12.8 km upstream from the river mouth. The numbers and lengths of species captured are presented in Table 234. Riche (1965) reported results of a gillnetting survey in 1964 (Table 235). Longnose sucker, white sucker, and northern pike made up 482 of the 640 fish taken. Catches in the 1.8, 5.1, and 7.6 cm mesh sizes totalled 550, although 30 of the 31 adult Atlantic salmon caught were taken in mesh sizes of 12.7 and 14.0 cm. Data on length, weight, age, and sex of a sample of 21 adult salmon are presented in Table 236. The mean freshwater age was 3.8 years; the grilse were 95% male and the two large salmon were both females. Seven species were represented in the catch of 96 fish taken in a gillnet set on 18 August 1971, in Wuchush Lake (L6) by LeDrew (1972) (Table 237).

The dimensions and physical characteristics of ten stations electrofished in 1971 by LeDrew (1972) are shown in Table 238 and the analyses of water samples taken at nine of these stations are listed in Table 239. Data from electrofishing were analyzed using the Delury regression method (Ricker 1958) and Table 240 gives standing crop estimates of fish, broken down by station and species. Brook trout made up 60% of the overall estimate and LeDrew

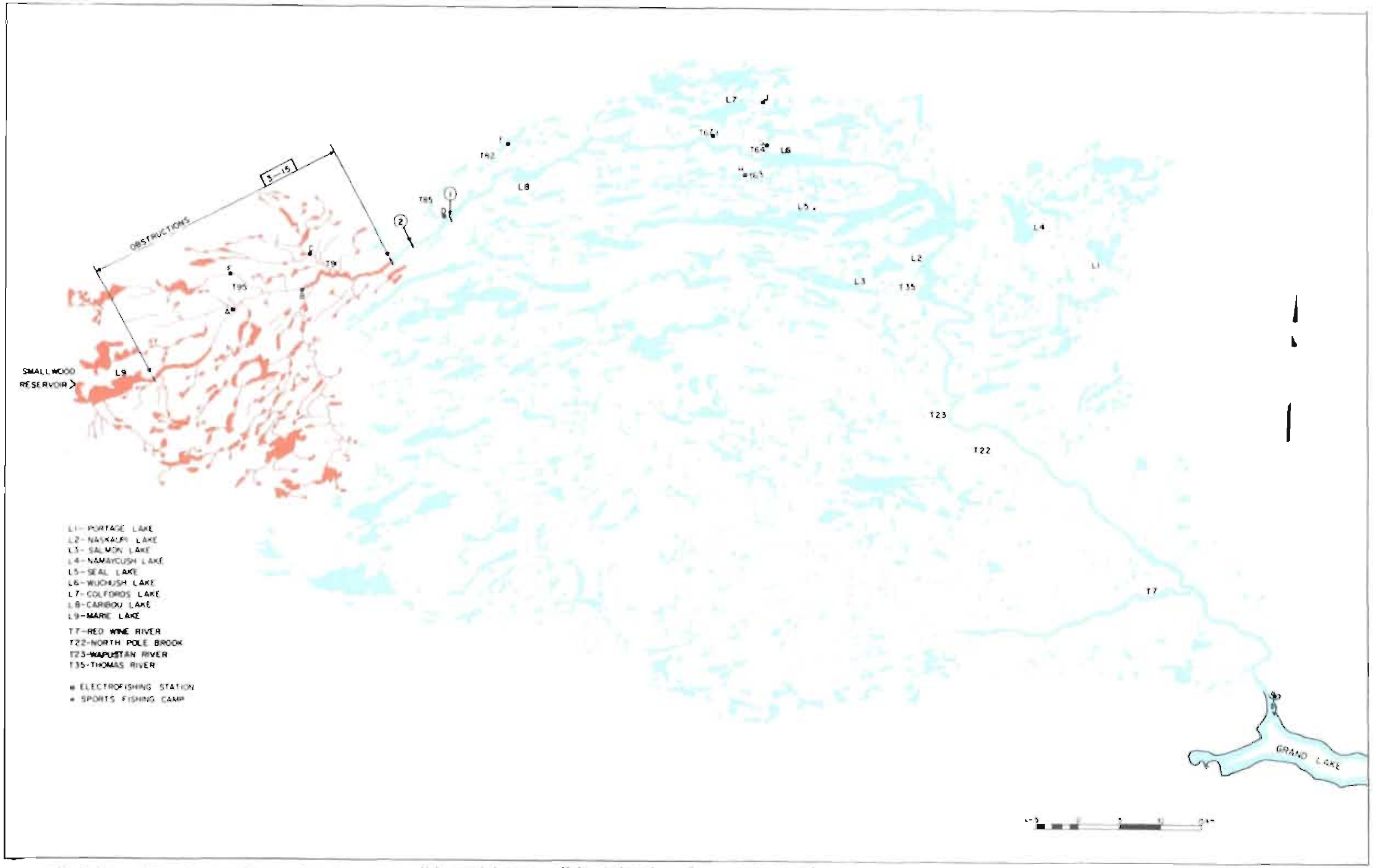

FIG. 66. Map of Naskaupi River showing accessible and inaccessible Atlantic salmon parr rearing areas.

(1972) reported that Atlantic salmon parr made a negligible contribution to the standing crop. Salmon parr were found only at the mouths of tributaries and in the main stem. Because parr in stations A, B, and C were captured above complete barriers on the main stem of the river they were undoubtedly landlocked in origin. LeDrew considered that the lack of spawning gravel in the headwaters and low winter discharges accounted for the apparent underutilization by anadromous Atlantic salmon of the accessible upper Naskaupi River. On 10 July 1978, a total of 13 lake trout, 5 lake whitefish, and 3 longnose suckers were netted in Seal Lake (L5) (Bruce et al. 1979). A summary of data on length, weight, sex, and age from these samples is presented in Table 241.

Based on the accessible portion of Naskaupi River, Riche (1965) using a method derived by O'Reilly (1959), estimated the potential production of adult salmon to be 41 000 fish. Riche stated that the salmon population of the river is much lower than this figure and an estimate of something less than 5000 fish would be more realistic. He cited no apparent reason for this discrepancy but indicated that some physical or chemical characteristics of the river or overexploitation in past commercial fisheries may be the underlying cause.

TABLE 230. Physical characteristics of Naskaupi River subsequent to the diversion of its headwaters in 1971.

Map reference:	Winokapau Lake 13E Goose Bay 13F Michikamau Lake 23-I 1 : 250 000	Maximum basin relief:	610 m
Mouth latitude:	53°47′N	Length by meander (main stem):	271 km
Mouth longitude:	60°51′W	Total length including tributaries:	1237 km
General direction of flow:	Southeast	No. of tributaries:	105
Drainage area:	12 691 km²	Geological formation:	Precambrian sediment, volcanics and gneiss
Mean width	51 km		
Axial length	197 km		
Basin perimeter	493 km		

TABLE 231. Obstructions on the main stem of Naskaupi River (all obstructions between km 188 and km 223).

Fig. 66 reference	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Falls	1.2	15.2	45	Partial
2	Falls	2.1	61.0	90	Partial
3	Rapids	—	—	—	Complete
4	Rapids and falls	—	91.4	—	Partial
5	Falls (Gritwood)	15.2	18.3	90	Complete
6	Falls	9.1	24.4	—	Partial
7	Rapids and falls	6.1	45.7	—	Partial
8	Falls	4.6	12.2	—	Complete
9	Falls (Isabella)	30.1	36.6	—	Complete
10	Falls (Maid Marion)	24.4	137.2	90	Complete
11	Rapids and falls	3.1	—	90	Partial
12	Rapids and falls	4.6	18.3	90	Partial
13	Falls	3.1	70.0	90	Partial
14	Rapids and falls	1.5	137.2	90	Partial
15	Rapids	—	121.9	—	Partial

TABLE 232. Results of analyses of two water samples collected on Naskaupi River, 1974 and 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1974	6.7	12.0	30.0	2.1	10.0	2.0	3.5	12.2
1978	6.7	12.0	26.0	0.3	9.0	1.5	1.0	11.0

TABLE 233. List of fish species in Naskaupi River.

Fish species	Common name	
Salmo salar	Atlantic salmon	(anadromous and landlocked)
Salvelinus alpinus	Arctic char	
Salvelinus fontinalis	Eastern brook trout	(anadromous and landlocked)
Salvelinus namaycush	Lake trout	
Coregonus clupeaformis	Lake whitefish	
Prosopium cylindraceum	Round whitefish	
Osmerus mordax	Rainbow smelt	
Esox lucius	Northern pike	
Couesius plumbeus	Lake chub	
Catostomus commersoni	White sucker	
Catostomus catostomus	Longnose sucker	
Lota lota	Burbot	
Gasterosteus aculeatus	Threespine stickleback	
Rhinichthys cataractae	Longnose dace	
Cottus cognatus	Slimy sculpin	

TABLE 234. Summary of fish collections from the *Blue Dolphin* Expedition, Naskaupi River, 1951 (Backus 1957).

Date	Location (above mouth) (km)	Species	Capture technique	No. of samples	Length (mm)
22 July	1.6	Atlantic salmon	18.6-m seine	1	181
22 July	12.8	Atlantic salmon	Rod and reel	1	89
23 July	12.8	Brook trout	Rod and reel	1	129
22 July	1.6	Longnose sucker	18.6-m seine	20	57–205
23 July	12.8	Longnose sucker	3.0-m seine	1	233
22 July	1.6	Round whitefish	18.6-m seine	14	27–34
				6	66–125
23 July	12.8	Round whitefish	3.0-m seine	4	27–36
22 July	1.6	Threespine stickleback	18.6-m seine	4	51–62
23 July	12.8	Threespine stickleback	3.0-m seine	2	60, 67
22 July	1.6	Lake chub	18.6-m seine	8	39–76
23 July	12.8	Lake chub	3.0-m seine	4	79–105
22 July	1.6	Longnose dace	18.6-m seine	3	32–39

TABLE 235. Summary of catches from gillnetting, Naskaupi River, July–August 1964 (Riche 1965).

Species	Catch per mesh size (cm) 1.8	5.1	7.6	10.2	12.7	14.0	Total
Atlantic salmon (adult)	0	1	0	0	26	4	31
Atlantic salmon (smolt)	0	1	0	0	0	0	1
Arctic char	0	1	0	0	0	0	1
Eastern brook trout (resident)	12	15	1	1	3	0	32
Eastern brook trout (sea-run)	6	2	3	0	1	0	12
Lake trout	0	4	2	3	0	0	9
Lake whitefish	10	35	4	2	1	0	52
Rainbow smelt	2	0	0	0	0	0	2
Northern pike	0	46	13	20	21	2	102
Lake chub	2	0	0	0	0	0	2
White sucker	15	90	137	6	0	0	248
Longnose sucker	14	62	56	0	0	0	132
Suckers (unidentified)	7	7	0	0	0	0	14
Burbot	2	0	0	0	0	0	2
Total	70	264	216	32	52	6	640

TABLE 236. Length, weight, sex, and age composition of adult Atlantic salmon taken by gill net, Naskaupi River, 1964 (Riche 1965).

Location	Fork length (cm)	Weight (kg)	Age (yr) Freshwater	Sea	Sex
Main stem (24.0 km)	59.0	2.0	3	1+	M
	56.0	2.0	4	1+	M
	58.0	1.8	5	1+	M
	75.0	5.0	4	2+	F
	77.0	5.4	4	2+	F
Red Wine River	53.0	1.8	3	1+	M
	54.0	1.8	3	1+	M
	55.0	1.8	3	1+	M
	55.0	1.8	3	1+	M
	56.0	2.0	3	1+	M
	57.0	1.8	3	1+	M
	58.0	2.0	3	1+	M
	51.0	1.4	4	1+	F
	52.0	1.8	4	1+	M
	52.5	1.8	4	1+	M
	55.0	1.8	4	1+	M
	55.0	1.8	4	1+	M
	56.0	2.0	4	1+	M
	57.0	1.8	4	1+	M
	58.0	2.3	4	1+	M
	54.0	1.6	6	1+	M
Mean	57.31	2.17	3.8	1.1	

TABLE 237. Number and species of fish caught in a gill net set, Wuchush Lake, 18 August 1971 (LeDrew 1972).

Species	Catch per mesh size (cm)					Total
	1.8	5.1	6.9	7.2	Unknown	
Eastern brook trout	0	0	1	0	0	1
Lake trout	1	3	5	4	0	13
Lake whitefish	—	—	—	—	35	35
Round whitefish	—	—	—	—	3	3
Suckers (white and longnose)	4	14	11	13	0	42
Burbot	2	0	0	0	0	2
Total	7	17	17	17	38	96

TABLE 238. Description of electrofishing stations, Naskaupi River, 1971 (LeDrew 1972).

		Dimensions					Water flow		Temp. (°C)		Bottom composition (%)				
Station	Location	Length (m)	Mean Width (m)	Depth (cm)	Area (units)[a]	Bank cover	Velocity ($m \cdot s^{-1}$)	Vol. ($m^3 \cdot s^{-1}$)	Water	Air	Bedrock	Boulder	Rubble	Coarse gravel	Med.–fine gravel
A	T98	48	16	38	7.7	Partial	0.85	4.13	15	18	0	0	50	50	0
B	Main stem	44	16	25	7.0	Open	0.91	2.91	15	17	0	10	20	20	50
C	T91	43	16	28	6.9	Complete	0.67	2.40	17	19	10	70	20	0	0
D	T85	46	13	32	6.0	Partial	0.82	2.73	18	18	0	0	80	20	0
E	T82	24	5	18	1.2	Complete	0.73	0.53	19	21	30	15	15	40	0
F	T95	37	12	26	4.4	Complete	1.00	2.50	17	14	0	50	50	0	0
G	T64	24	16	20	3.8	Complete	1.04	2.66	15	18	10	65	25	0	0
H	T63	50	6	46	3.0	Partial	0.73	1.61	16	19	10	0	0	0	90
I	T67	46	8	22	3.7	Partial	0.79	1.11	14	16	0	35	65	0	0
J	T67	33	8	25	2.6	Open	0.61	0.98	15	9	40	40	20	0	0

[a] 1 unit = 100 m^2 area.

TABLE 239. Analyses of water samples taken at electrofishing stations, Naskaupi River, 1971 (LeDrew 1972).

Station	A	B	C	D	E	F	G	H	J	Mean	Range
ph	7.25	7.24	7.26	7.26	7.25	6.90	6.82	6.51	6.91	7.04	6.51–7.26
Total hardness (ppm as $CaCO_3$)	10.00	11.00	11.00	21.00	12.00	6.00	8.00	9.00	10.00	10.89	6.00–21.00
Turbidity (J.T.U.)	0.70	0.65	0.73	0.52	1.30	0.90	0.71	2.50	0.69	0.97	0.52–2.50
Total alkalinity (ppm as $CaCO_3$)	10.00	11.00	10.00	11.00	10.00	6.50	5.00	6.00	7.00	8.50	5.00–11.00
Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	20.40	19.30	20.90	21.50	19.30	8.60	12.90	23.60	14.00	17.83	8.60–23.60
Specific resistance ($ohms \cdot cm^{-1} \times 10^3$)	49.00	52.00	48.00	46.50	52.00	116.50	77.50	42.50	71.00	61.67	42.50–116.50
Total dissolved solids (ppm)	21.70	20.90	22.00	22.50	21.00	13.20	16.30	24.00	17.10	19.86	13.20–24.00

TABLE 240. Fish population estimates derived from electrofishing, Naskaupi River, 1971 (LeDrew 1972). 1 unit = 100 m^2.

	Atlantic salmon		Brook trout		Longnose dace		Slimy sculpin		Burbot		Longnose sucker		Round whitefish		White sucker		Total	
Station	$g \cdot unit^{-1}$	$No. \cdot unit^{-1}$	$g \cdot unit^{-1}$	$No. \cdot unit^{-1}$	$g \cdot unit^{-1}$	$No. \cdot unit^{-1}$	$g \cdot unit^{-1}$	$No. \cdot unit^{-1}$	$g \cdot unit^{-1}$	$No. \cdot unit^{-1}$	$g \cdot unit^{-1}$	$No. \cdot unit^{-1}$	$g \cdot unit^{-1}$	$No. \cdot unit^{-1}$	$g \cdot unit^{-1}$	$No. \cdot unit^{-1}$	$g \cdot unit^{-1}$	$No. \cdot unit^{-1}$
A	0.6	0.1	10.8	2.4	33.5	8.4	9.6	4.8	0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	55.2	15.8
B	10.8	1.2	0.0	0.0	39.4	6.0	16.7	7.2	3.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	69.9	14.5
C	13.1	0.5	229.4	16.7	104.0	10.8	17.9	8.4	0.0	0.0	2.4	0.1	32.3	1.0	0.0	0.0	399.1	37.5
D	0.0	0.0	135.0	3.6	19.1	3.6	9.6	4.8	15.5	0.8	26.3	0.7	1.2	0.4	6.7	0.5	213.4	14.4
E	0.0	0.0	358.5	34.7	58.6	9.6	0.0	0.0	13.1	0.8	0.0	0.0	0.0	0.0	0.0	0.0	430.2	45.1
F	0.0	0.0	107.6	7.2	8.4	1.2	0.0	0.0	0.0	0.0	38.2	9.6	0.0	0.0	0.0	0.0	154.2	18.0
G	0.0	0.0	104.0	6.0	0.0	0.0	17.9	12.0	6.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	127.9	18.2
H	0.0	0.0	39.4	7.2	47.8	8.4	32.3	20.3	153.0	4.8	8.4	5.4	8.4	1.3	0.0	0.0	289.3	47.4
I	2.4	0.2	31.1	4.8	21.5	3.6	17.9	7.2	22.7	1.2	0.0	0.0	0.0	0.0	0.0	0.0	95.6	17.0
J	0.0	0.0	389.6	22.7	133.8	25.1	0.0	0.0	0.0	0.0	3.6	0.4	0.0	0.0	0.0	0.0	527.0	48.2
Total	26.9	2.0	1405.4	105.3	466.1	76.7	121.9	64.7	214.0	8.0	78.9	16.2	41.9	2.7	6.7	0.5	2361.8	276.1
Mean	2.7	0.2	140.5	10.5	46.6	7.7	12.2	6.5	21.4	0.8	7.9	1.6	4.2	0.3	0.7	0.1	236.2	27.6

TABLE 241. Summary of data on sex, fork length, whole weight, age, and mercury content of lake whitefish, longnose sucker, and lake trout captured in Seal Lake, Naskaupi River, 10 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Lake whitefish	M	4	41.6	1.04	11.3	0.10	0.09–0.12
	F	1	40.5	0.72	10.0	0.13	—
Total		5	41.4	0.98	11.0	0.11	0.09–0.13
Longnose sucker	M	3	33.8	0.40	9.7	0.08	0.07–0.23
Lake trout	M	5	46.3	0.99	12.0	0.35	0.24–0.46
	F	8	63.9	3.12	15.7	0.61	0.31–1.06
Total		13	57.1	2.31	14.2	0.51	0.24–1.06

Crooked River has a drainage area of 2391 km^2 (Table 242) and flows southerly, emptying into the northwest end of Grand Lake (Fig. 67). The lower river is wide and shallow and was canoed by Wallace (1907) and Scott (1933) on their respective trips to the interior of Labrador. The hydroelectric potential of the river, estimated by Millan (1974) to be 153 MW, is larger than any of the potential sites in insular Newfoundland. Blair (1943) reported a 15 m falls at km 11.2 on Crooked River. The survey by Murphy and Porter (1974a) found no falls at this point and reported that the only series of falls on the system, located at km 30.6, was readily surmountable by anadromous fish (Table 243). A water sample was collected in 1977 and the results of the analyses of this sample are presented in Table 244 (Jamieson 1979).

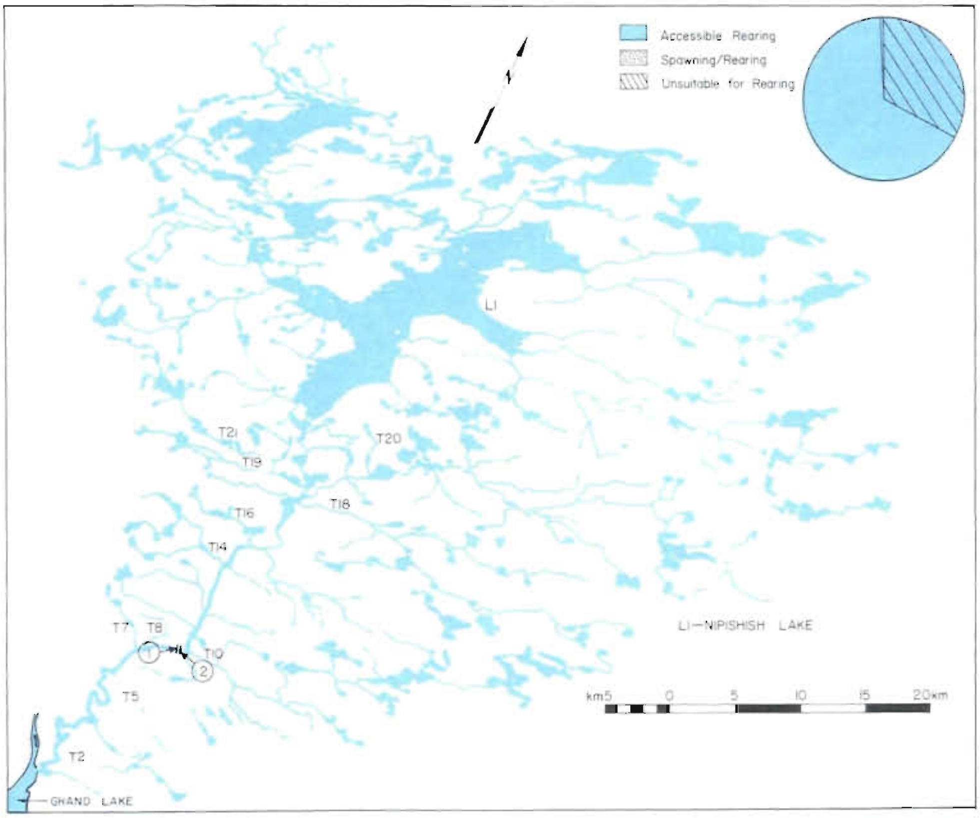

FIG. 67. Map of Crooked River showing accessible Atlantic salmon parr rearing areas.

Murphy and Porter (1974a) reported that the lower Crooked River, from its mouth to km 23, was wide (59 m) and shallow with a primarily sandy substrate. From km 23 to the outlet of Lake Nipishish at km 55 the bottom composition alternates between boulder and rubble. Scattered glacial deposits have produced a hummocky terrain in this first 55 km which is covered by stands of black spruce and balsam fir. Bogs and lichens occur in poorly drained areas. Lake Nipishish, with an area of 10 100 ha (Table 242), is located on a barren plateau, characterized by bedrock outcrops and stunted forest growth.

Murphy and Porter (1974a) estimated that the area from the river mouth to km 55 contained nearly 16 000 rearing units for juvenile Atlantic salmon (Table 245). The tributaries of Lake Nipishish were reported to contain 10 868 parr rearing units. Twenty thousand additional parr rearing units were identified on other tributaries of the system.

Due to its proximity to the Naskaupi River, Murphy and Porter (1974a) listed a similar fish fauna for the Crooked River. An early report on angling in 1905 by Wallace (1907) showed an abundance of large brook trout and landlocked salmon (Table 246). Angling records, 1964–68, included catches of brook trout, lake trout, and landlocked salmon

(Table 247). From a gillnet set in Nipishish Lake on 4 August 1977, a sample of 4 white suckers, 18 longnose suckers, 14 ouananiche, 14 brook trout, and 7 Arctic char was obtained (Bruce et al. 1979). A summary of data on length, weight, sex, and age of these fish is presented in Table 248.

The reported poor salmon angling and small commercial salmon harvest in Grand Lake suggests Crooked River is presently not producing salmon to the potential estimated by Murphy and Porter (1974a). The distance inland and high silt content of the lower river could be a deterrent to salmon production.

TABLE 242. Physical characteristics of Crooked River.

Map reference:	Goose Bay 13F Snegamook Lake 13K 1 : 250 000	Maximum basin relief:	427 m
Mouth latitude:	53°48′N	Length by meander (main stem):	48 km
Mouth longitude:	60°50′W	Total length including tributaries:	551 km
General direction of flow:	South	No. of tributaries:	25
Drainage area:	2391 km²	Area of lakes >100 ha:	
Mean width	31 km	L1 Lake Nipishish	10 100 ha
Axial length	76 km		
Basin perimeter	264 km	Geological formation:	Gneiss

TABLE 243. Obstructions on Crooked River (Murphy and Porter 1974a).

Fig. 67 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	30.6	Falls	3.7	30.5	45	Partial
2	Main stem	30.6	Falls	3.7	30.5	45	Partial

TABLE 244. Results of analyses of a water sample collected on Crooked River, 1977 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1977	6.5	20.0	123.0	0.8	8.0	0.9	33.0	9.8

TABLE 245. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Crooked River (Murphy and Porter 1974a). No inaccessible areas were identified.

Location	Accessible areas: Spawning units	Accessible areas: Rearing units
Main stem	99	15 967
T2	0	915
T5	0	915
T7	0	389
T8	0	1 045
T10	34	2 718
T14	0	436
T16	0	364
T18	0	4 016
T19	0	1 037
T20	0	5 558
T21	0	2 608
Tributaries of Nipishish Lake	0	10 868
Total	133	46 836
Estimated production		
Smolt	93 672	
Adult	14 051	

TABLE 246. Fish species caught in Crooked River in 1905 (Wallace 1907).

Location	Species	Length (cm)	Weight (kg)	Girth (cm)
Lower River	Landlocked salmon	69.9	—	29.2
	Landlocked salmon	55.9	—	—
	Landlocked salmon	50.8	—	—
	Brook trout	57.8	—	—
Tributary of Lake Nipishish	Brook trout (87)	—	0.1–1.8	—

TABLE 247. Summary of angling catch, Lake Nipishish, Crooked River, 1964–68 (DFO, unpubl. data).

Year	Brook trout <0.5 kg	Lake trout	Landlocked salmon
1964	136	10	60
1965	194	25	50
1966	26	0	0
1967	0	0	0
1968	30	0	0
Total	386	35	110

TABLE 248. Summary of data on sex, fork length, whole weight, age, and mercury content of longnose sucker, brook trout, Arctic char, white sucker, and ouananiche captured in Nipishish Lake, Crooked River, 4 August 1977 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Longnose sucker	M	6	23.2	0.16	8.5	0.12	0.07–0.23
	F	12	23.4	0.17	9.3	0.12	0.08–0.17
Total		18	23.3	0.17	9.0	0.12	0.07–0.23
Brook trout	M	8	29.0	0.44	3.6	0.12	0.03–0.41
	F	6	26.0	0.27	3.6	0.07	0.03–0.20
Total		14	27.7	0.37	3.6	0.10	0.03–0.41
Arctic char	M	4	27.6	0.21	7.5	0.36	0.28–0.46
	F	3	33.5	0.49	8.5	0.33	0.28–0.39
Total		7	30.1	0.33	8.0	0.35	0.28–0.46
White sucker	M	3	31.7	0.43	6.7	0.09	0.08–0.10
	F	1	24.0	0.52	7.0	0.08	—
Total		4	29.8	0.45	6.8	0.09	0.08–0.10
Ouananiche	M	8	27.1	0.26	5.9	0.13	0.03–0.31
	F	6	30.3	0.33	6.7	0.20	0.12–0.26
Total		14	28.5	0.29	6.2	0.16	0.03–0.31

Sebaskachu River flows southeast, emptying into Sebaskachu Bay in Lake Melville (Fig. 68). It has a drainage area of 580 km^2 and a total stream length of 211 km (Table 249). Due to the flat topography of the lower sections, the river breaks into several meandering channels near its mouth. Sand and gravel are the predominant bottom types up to km 32. The water velocity increases upstream from this point and the bottom substrate changes to boulder and rubble. The surrounding countryside is covered with dense forest except in the headwaters area where the shallow ponds and lakes are situated on a barren plateau.

There has been a conflict in the reports on obstructions to fish migration in this system. Blair (1943) noted a falls, at km 6.4, which he classified as a complete barrier to migrating salmon. Blair included an in-depth description of this falls, noting that it was 122 m long, and was divided into three channels around two islands. Due to the large number of drops and slopes, the swiftness of the water, and the lack of resting pools, Blair believed it would be extremely difficult for salmon to ascend this falls. He also noted that both grilse and salmon had been seen jumping at the falls and believed that the presence of dead kelt below it indicated that salmon spawned below the falls. Sollows et al. (1953) reported a heavy rapid at km 6.4 which presented little or no difficulty to salmon. His survey crew, while wading up the river, actually chased salmon over the top of the rapids. Murphy and Porter (1974a) sighted no rapids or falls throughout the river and stated that the only barrier to fish migration may be the slow, meandering, muddy stream which could discourage salmon from ascending to the more suitable upper area. T. Curran (pers. comm.) reported a partial obstruction at km 6.4. Based on this information the author feels that a minor rapids, which was viewed by Blair during exceptionally low water conditions, is present at km 6.4. Also, erosion may have since lowered the gradient of the river at this point. The survey by Murphy and Porter (1974a) was conducted from a helicopter and the obstruction was possibly overlooked.

Atlantic salmon and brook trout are reported in Sebaskachu River. The run of large salmon extends from early to late July while the grilse migration commences in the middle of July and ends in the middle of August (Blair 1943). Estimates, based on the rearing capacity of the main stem and tributary 1 (T1), indicate the river has the capacity to produce 568 adult Atlantic salmon annually (Table 250).

FIG. 68. Map of Sebaskachu River showing accessible Atlantic salmon parr rearing areas.

TABLE 249. Physical characteristics of Sebaskachu River.

Map reference:	Goose Bay 13F 1 : 250 000	Maximum basin relief:	336 m
Mouth latitude:	53°46′N	Length by meander (main stem):	56 km
Mouth longitude:	60°07′W	Total length including tributaries:	211 km
General direction of flow:	Southeast	No. of tributaries:	36
Drainage area:	580 km^2	Geological formation:	Gneiss
Mean width	13 km		
Axial length	41 km		
Basin perimeter	122 km		

TABLE 250. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Sebaskachu River (Murphy and Porter 1974a). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	235	1781
T1	22	112
Total	257	1893
Estimated production		
Smolt	3786	
Adult	568	

Mulligan River empties into Mulligan Bay on the north side of Lake Melville (Fig. 69). Sollows et al. (1953) noted the presence of a small settlement, which has since been abandoned, at the mouth of the river. The river flows southeasterly, draining an area of 1062 km^2 (Table 251).

The lower river averages about 25 m in width, meandering over a level plain and flowing over sand and mud deposits. Except for trees lining the riverbank, much of the vegetation in this area has been burned. Beginning at km 13, the bottom substrate changes to boulder/rubble and the water velocity increases. Tributary 7 (T7) known as West Branch, enters the main stem at km 19; the remainder of the main stem is known locally as North Branch. Two falls, one on West Branch at km 4.8 and one on North Branch at km 25.8, were reported by Murphy (1972a). Although neither falls is a complete barrier to fish migration, Blair (1943), Sollows et al. (1953), and Murphy (1972a) have all noted the falls on North Branch to be a serious obstruction (Table 252). Above the falls at km 25.8, the river flows among steadies and small lakes. The headwaters, located on a barren plateau north of Lake Melville, consist of several large lakes.

Fish species reported in Mulligan River are Atlantic salmon and brook trout. Blair (1943) cited reports from Indians of catches of salmon up as far as the falls on North Branch. Sollows et al. (1953) reported sightings of brook trout and Atlantic salmon parr and fingerlings. His survey crew angled several brook trout weighing about 0.9 kg each in the lower river. Murphy (1972a) estimated that one-third of the 9902 rearing units available to juvenile Atlantic salmon was in tributaries 7 and 14, with the remainder occurring in the main stem (Table 253). There are no indications that the present annual production of adult Atlantic salmon is as great as the potential production of 2971 estimated by Murphy (1972a). The falls on the main stem may be a limiting factor to anadromous fish populations in this river.

FIG. 69. Map of Mulligan River showing accessible Atlantic salmon parr rearing areas.

TABLE 251. Physical characteristics of Mulligan River.

Map reference:	Goose Bay 13F Lake Melville 13G Rigolet 13J Snegamook Lake 13K 1 : 250 000	Maximum basin relief:	366 m
Mouth latitude:	53°49′N	Length by meander (main stem):	68 km
Mouth longitude:	59°54′W	Total length including tributaries:	229 km
General direction of flow:	Southeast	No. of tributaries:	30
Drainage area:	1062 km²	Geological formation:	Precambrian sediments, volcanics and gneiss
Mean width	20 km		
Axial length	45 km		
Basin perimeter	143 km		

TABLE 252. Obstructions on Mulligan River (Murphy 1972a).

Fig. 69 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	25.8	Falls	4.6	6.1	—	Partial
2	T7	4.8	Falls	1.8	—	—	Partial

TABLE 253. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Mulligan River (Murphy 1972a). No inaccessible areas were identified.

Location	Accessible areas: Spawning units	Rearing units
Main stem	286	6 316
T7	283	2 822
T7-1	0	240
T14	0	524
Total	569	9 902
Estimated production		
Smolt	19 804	
Adult	2 971	

Double Mer River empties into the western tip of a long, narrow inlet of Lake Melville known as Double Mer (Fig. 70). The area is relatively isolated; the closest community, Rigolet, is located 75 km to the east.

Twenty-three tributaries feed the main stem of Double Mer River and the total length of the main stem and tributaries is 225 km (Table 254). The drainage area is 1425 km². A large island is located in the middle of the estuary and the lower river, which averages 60 m in width, is dotted with sandbars. The riverbanks are covered mainly by alder and willow, much of the evergreen flora having been destroyed in 1967 by a severe forest fire. The riverbanks rise steeply 6 km from the mouth. The first of two minor obstructions occurs at km 9.7 (Table 255). The second barrier occurs at km 22.5. Upstream from this point, the gradient decreases and the river flows through gentle, rolling country. The headwaters are a maze of steadies and narrow lakes interspersed among string bogs and eskers.

The lower river was traditionally fished for brook trout which were used both for human consumption and dog food (Labrador Inuit Association 1977). The river is scheduled for Atlantic salmon angling, although brook trout appear to be the major species sought. Angling for sea-run brook trout from the sandy shoals at the outlet of Double Mer River is excellent and DFO personnel from Goose Bay report that it is usually a case of "a strike on every cast". Table 256 summarizes the known angling catch of sea-run brook trout (1967–76) from Doube Mer inlet. The actual catches may be several times these figures as there is a large number of anglers who fly in to the area from whom catch records are unavailable (T. Curran, pers. comm.). A gill net (10.2 cm mesh) and angling survey by DFO field staff in early October 1968, on lower Double Mer River indicated that the predominant species present was sea-run brook trout. Only one salmon was captured (Table 257). A gillnet set in Double Mer inlet on 3 August 1977 caught 4 lake whitefish, 66 brook trout, and 11 Arctic char (Bruce et al. 1979). A summary of data on length, weight, sex, and age of these fish is presented in Table 258. The only record of salmon angling was submitted in 1978 when an effort of 10 rod days was reported. No salmon were caught (Moores and Tucker 1979).

Rearing and spawning areas suitable for Atlantic salmon, as recorded by Murphy (1972a), are distributed on the main stem and seven tributaries (Fig. 70). Table 259 summarizes the rearing potential, and based on a total of 19 502 rearing units, the estimated annual production of adult Atlantic salmon would be 5851 fish. The limited number of salmon angled suggests that present production may be lower than that estimated by Murphy (1972a).

TABLE 254. Physical characteristics of Double Mer River.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	366 m
Mouth latitude:	54°03′N	Length by meander (main stem):	64 km
Mouth longitude:	59°40′W		
General direction of flow:	Southeast	Total length including tributaries:	225 km
		No. of tributaries:	23
Drainage area:	1425 km²	Geological formation:	Gneiss
Mean width	22 km		
Axial length	53 km		
Basin perimeter	216 km		

TABLE 255. Obstructions on Double Mer River (Murphy 1972a).

Fig. 70 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Description: Width (m)	Description: Slope (°)	Barrier to fish passage
1	Main stem	9.7	Falls	—	—	—	Partial
2	Main stem	22.5	Falls	—	—	—	Partial

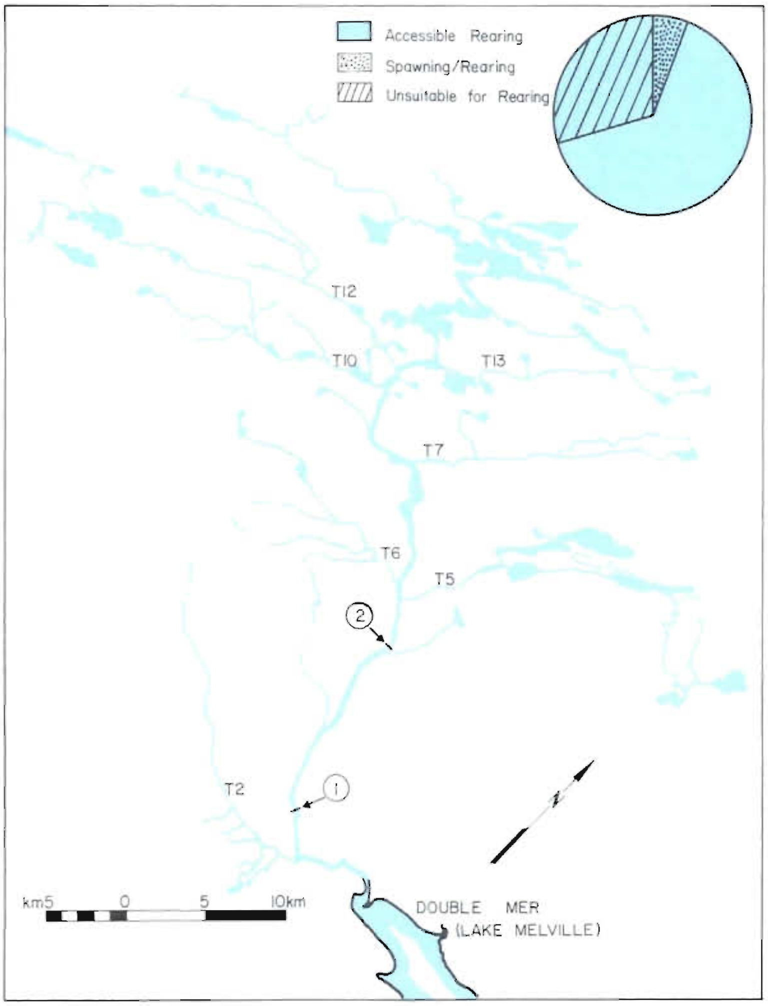

FIG. 70. Map of Double Mer River showing accessible Atlantic salmon parr rearing areas.

TABLE 256. Summary of angling catches of sea-run brook trout, Double Mer, 1967–76 (DFO, unpubl. data). Data represent only known catches and may be underestimates (see text).

Year	Weight (kg)				Weight unknown	Total
	<0.5	>0.5	<0.9	0.9–1.8		
1967	200	150	—	—	0	350
1968	250	200	—	—	0	450
1969	—	—	2500	0	0	2500
1970	—	—	1500	0	0	1500
1971	—	—	300	0	0	300
1972	—	—	100	25	0	125
1973	—	—	100	25	0	125
1974	—	—	150	50	0	200
1975	—	—	—	—	—	—
1976	—	—	—	—	57	57
Total	450	350	4650	100	57	5607

TABLE 257. Sample of the catch from a 10.2-cm-mesh gill net and angling survey conducted 7–9 October 1968, Double Mer River (DFO, unpubl. data).

Date	Sampling method	Species	Length (cm)	Weight (kg)
7 October	Angling	Sea-run brook trout (6)	—	0.2–0.9
	Gillnet	Sea-run brook trout (3)	—	0.9–1.1
	Gillnet	Sea-run brook trout (1)	55.9	—
8 October	Gillnet	Sea-run brook trout (1)	—	1.1
	Gillnet	Sea-run brook trout (1)	—	1.6
	Gillnet	Atlantic salmon (1)	—	2.0
9 October	?	Sea-run brook trout (1)	53.3	1.6
	?	Sea-run brook trout (1)	44.5	0.9
	Angling	Sea-run brook trout (24)	—	—
	Angling	Sea-run brook trout (6)	—	0.5–1.5

TABLE 258. Summary of data on sex, fork length, age, and mercury content of lake whitefish, brook trout, and Arctic char captured at Double Mer, 3 August 1977 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Lake whitefish	M	2	37.7	8.5	0.08	0.07–0.08
	F	2	38.0	7.5	0.11	0.06–0.15
Total		4	37.8	8.0	0.09	0.06–0.15
Brook trout	M	34	25.0	3.7	0.03	0.01–0.09
	F	32	27.2	3.8	0.04	0.01–0.10
Total		66	26.0	3.7	0.04	0.01–0.10
Arctic char	M	7	28.0	7.3	0.04	0.02–0.08
	F	4	25.6	6.0	0.02	0.01–0.04
Total		11	27.1	6.8	0.04	0.01–0.08

TABLE 259. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Double Mer River (Murphy 1972a). No inaccessible areas were identified.

Location	Accessible areas	
	Spawning units	Rearing units
Main stem	1 039	11 903
T2	157	466
T5	0	576
T6	0	407
T7	97	483
T10	290	2 608
T12	0	1 610
T13	0	1 449
Total	1 583	19 502
Estimated production		
Smolt	39 004	
Adult	5 851	

This river flows southwesterly, emptying into the western tip of Double Mer inlet (Fig. 71). Murphy (1972a) reported that the lower watershed is densely forested and that the barren headwaters region is dotted with eskers and patches of forest.

The river is fed by 17 tributaries and drains an area of 855 km^2 (Table 260). Barriers to fish migration at km 4.8 and km 25.8 were reported by Murphy (1972a) to have little effect on anadromous fish migration (Table 261). The rearing capacity of the main stem and seven tributaries was estimated by Murphy (1972a) to be 18 635 rearing units (Table 262). The potential annual production of adult salmon is estimated to be 5591 fish (Murphy 1972a). As with Double Mer River (River No. 48), this estimate appears high considering the lack of reports of salmon angling. The author believes that this river, like Double Mer River, supports a large number of brook trout with Atlantic salmon forming only a small component of the fish population.

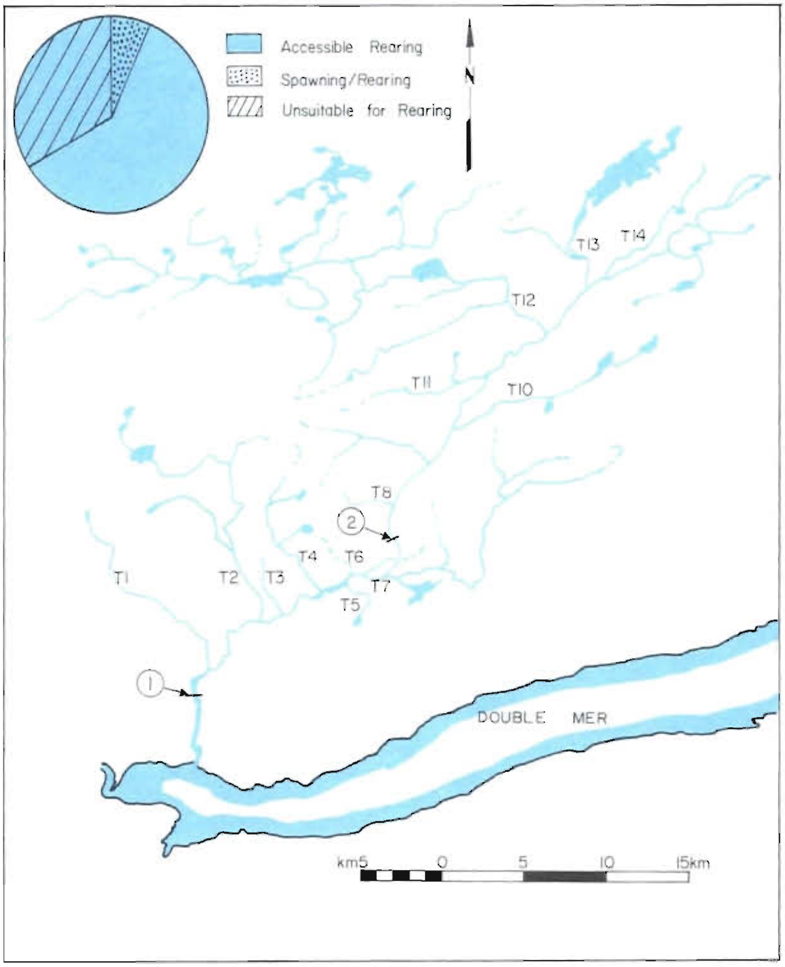

FIG. 71. Map of River 49 (Unnamed) showing accessible Atlantic salmon parr rearing areas.

TABLE 260. Physical characteristics of River 49.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	488 m
Mouth latitude:	54°03′N	Length by meander (main stem):	64 km
Mouth longitude:	59°35′W	Total length including tributaries:	209 km
General direction of flow:	Southwest	No. of tributaries:	17
Drainage area:	855 km^2	Geological formation:	Precambrian volcanics and gneiss
Mean width	16 km		
Axial length	51 km		
Basin perimeter	184 km		

TABLE 261. Obstructions on River 49 (Murphy 1972a).

Fig. 71 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	4.8	Falls	—	—	—	Partial
2	Main stem	25.8	Falls	—	—	—	Partial

TABLE 262. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in River 49 (Murphy 1972a). No inaccessible areas were identified.

Location	Accessible areas: Spawning units	Rearing units
Main stem	838	13 567
T1, T2, T10, T11, T12, T13, T14	1 014	5 068
Total	1 852	18 635
Estimated production		
Smolt	37 270	
Adult	5 591	

Tom Luscombe Brook flows easterly, emptying into a shallow inlet on the northern side of Groswater Bay (Fig. 72). The nearest settlement is Rigolet, which lies 35 km to the east. Access to the river by boat and aircraft is difficult because of the tidal flat at the river mouth that extends seaward for about 8 km.

Tom Luscombe has a drainage area of 1010 km^2 and a total stream length of 359 km (Table 263). At its mouth the river is wide, shallow, and steady. Peet (1971) reported that tidal influences reach several kilometres upstream and that, at high tide, a small boat can travel 8 km up the river. The river width is 60–90 m in this section and both the river banks and bottom substrate are composed of sand, mud, and gravel. The first barrier to fish migration, a small rapids, occurs at km 8.0 (Table 264). Above this point the river narrows to 30–60 m and the bottom type changes to boulder/rubble substrate.

At km 12.1, a second rapids forms a minor partial barrier. Above this obstruction, the river flows over a fairly level area with many steadies and small islands. The river branches at km 21 and drains the system of small ponds and steadies to the west. Tributary 6 (T6) enters the main river at km 21 and drains most of the northern watershed. At km 1.3 on T6, there are several small falls and rapids but Peet (1971) did not consider these to be complete barriers to migrating fishes (Table 264). A water sample was collected from this river in 1976; results of the analyses are presented in Table 265 (Jamieson 1979).

Although Tom Luscombe Brook is scheduled for Atlantic salmon angling, little is known of the size or species composition of the fish population. Peet (1971), after analysis of data from a counting fence on Middle Brook (River No. 52), speculated that due to the close proximity and similarities of their watersheds, fish species composition may be similar in the two rivers. Under this assumption, Arctic char, sea-run brook trout, and some Atlantic salmon grilse may occur in Tom Luscombe Brook. No angling data are available.

The Labrador Inuit Association (1977) reported that the lower sections of the river were traditional winter fishing locations for Arctic char and brook trout. Peet (1971) also noted that Groswater Bay is a good commercial salmon fishing area, and in 1967 several fishermen had berths in the shallow bay at the river mouth. Evidence of poaching, such as stakes for mooring nets at the mouth of the river, was observed by Peet, who also cited reports from DFO personnel about poaching problems in this river. Ranger seals (*Phoca vitulina*) overwinter and breed in the lower sections of this river and are undoubtedly predators on the fish population (Labrador Inuit Association 1977).

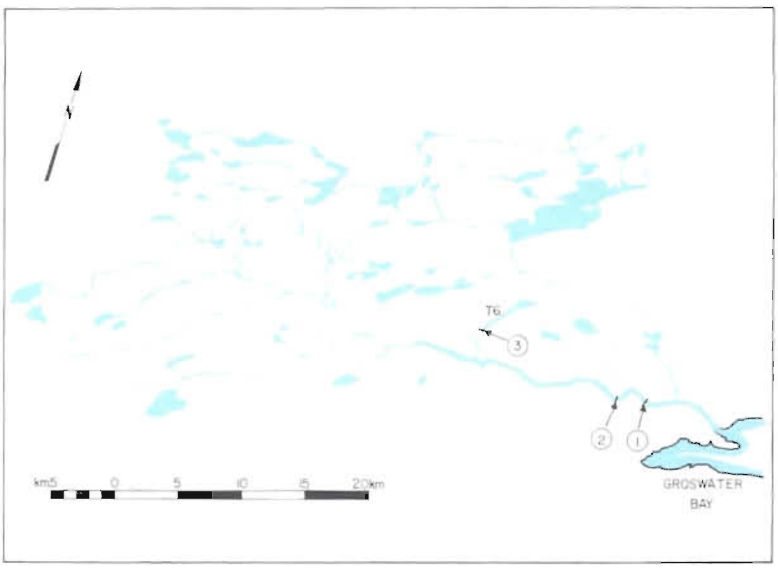

FIG. 72. Map of Tom Luscombe Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 263. Physical characteristics of Tom Luscombe Brook.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	336 m
Mouth latitude:	54°21′N	Length by meander (main stem):	63 km
Mouth longitude:	58°14′W		
General direction of flow:	East	Total length including tributaries:	359 km
		No. of tributaries:	16
Drainage area:	1010 km²	Geological formation:	Gneiss
Mean width	17 km		
Axial length	56 km		
Basin perimeter	164 km		

TABLE 264. Obstructions on Tom Luscombe Brook (Peet 1971).

Fig. 72 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	8.0	Rapids	—	—	—	Partial
2	Main stem	12.1	Rapids	—	—	—	Partial
3	T6	1.3	Rapids and falls	—	—	—	Partial

TABLE 265. Results of analyses of a water sample collected on Tom Luscombe Brook, 1976 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1976	6.1	6.0	20.0	1.0	2.0	1.0	3.0	2.4

West Brook

West Brook flows southeast, emptying into a shallow inlet on the northern side of Groswater Bay (Fig. 73). This river and Middle Brook (River No. 52), are known locally as the Double Brook system, although the rivers have separate watersheds and outlets.

West Brook has a drainage area of 149 km^2 with a total length, including the main stem and tributaries, of 66 km (Table 266). At the mouth, the river is approximately 25 m wide. The lower section meanders through a flat, marshy plain, and has a bottom substrate consisting of boulder, rubble, and coarse gravel (Peet 1971). Eight kilometres upstream, the terrain becomes hilly and water velocities increase significantly. There are, however, no serious barriers to fish migration. Tree growth in the watershed is scanty except around the river margin where alder and willow growth provide cover.

The Labrador Inuit Association (1977) reported that Arctic char were traditionally fished in the lower sections of West Brook for dog food. An abandoned house is situated at the river mouth indicating that the area may have been the site of a salmon or char fishing berth.

In 1967, Peet (1971) installed a counting fence on West Brook to trap fish migrating upstream. The fence, located 0.5 km from the river mouth, was operated from 24 July to 27 August 1967. During this period, 14 Atlantic salmon grilse, 1 large salmon, 34 Arctic char, and 219 sea-run brook trout were captured (Table 267). Sampling of sea-run brook trout indicated a mean fork length of 36.50 cm and a mean weight of 701.40 g (Table 268). Twenty-six Arctic char had a mean fork length of 31.68 cm and eight char ranging from 33.0 to 62.8 cm had a mean weight of 1143.75 g (Table 269). The distribution of fork length, weight, and age of Atlantic salmon captured at the facility is presented in Table 270.

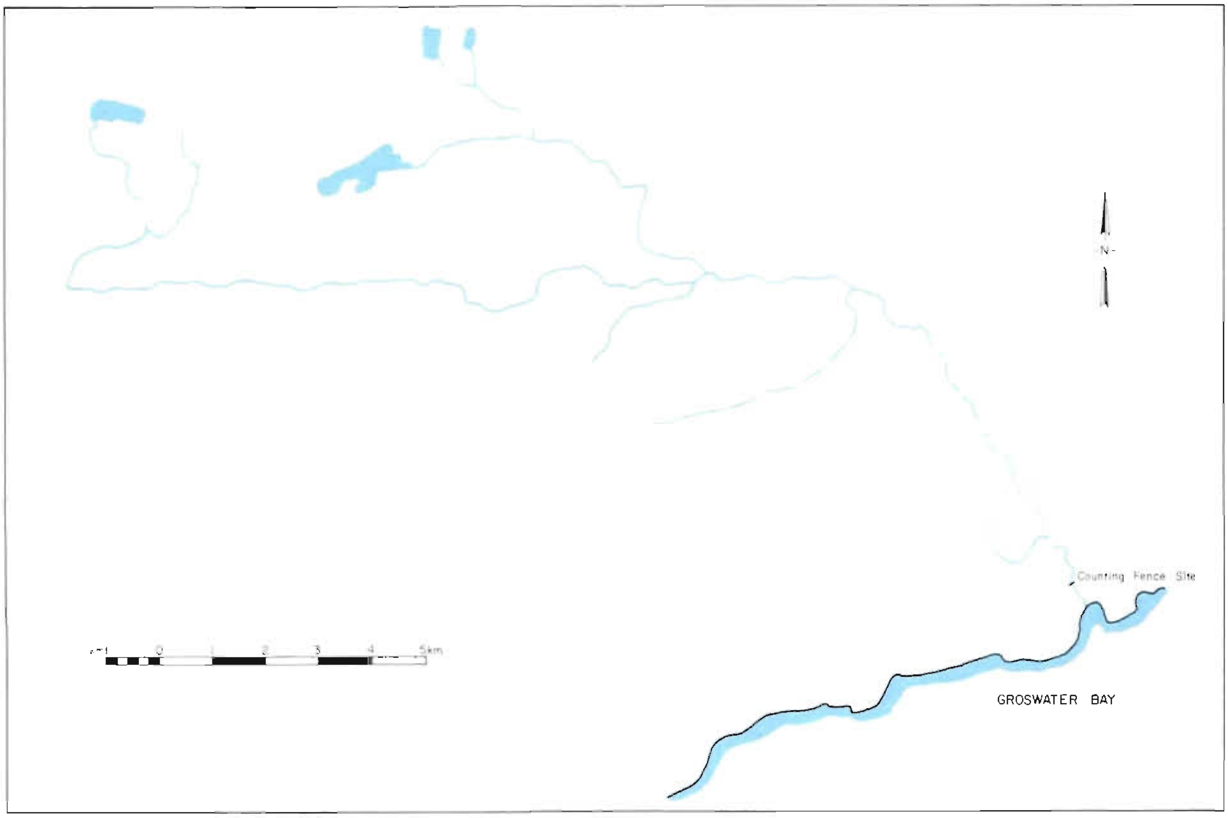

FIG. 73. Map of West Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 266. Physical characteristics of West Brook.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	214 m
Mouth latitude:	54°23′N	Length by meander (main stem):	26 km
Mouth longitude:	58°06′W		
General direction of flow:	Southeast	Total length including tributaries:	66 km
		No. of tributaries:	5
Drainage area:	149 km²	Geological formation:	Gneiss
Mean width	6 km		
Axial length	22 km		
Basin perimeter	55 km		

TABLE 267. Weekly counts of upstream fish migrations, West Brook, 1967. Trap located 0.5 km from mouth. Mortalities in parentheses (Peet 1971).

Week ending	Grilse <2.7 kg	Salmon ≥2.7 kg	Arctic char	Sea-run brook trout	Total fish
30 July	0	0	0	4(1)	4(1)
06 Aug.	8	0	6	109	123
13 Aug.[a]	1	1(1)	1	29	32(1)
20 Aug.	2	0	1	25	28
27 Aug.	3	0	26(5)	52(8)	81(13)
Total	14	1(1)	34(5)	219(9)	268(15)

[a]Trap closed 13 Aug.

TABLE 268. Distribution of fork length and weight of brook trout migrating upstream, West Brook, 1967 (Peet 1971).

Length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
17.95–20.44	2	5–144	2
20.45–22.94	7	145–284	16
22.95–25.44	20	285–424	14
25.45–27.94	6	425–564	21
27.95–30.44	15	565–704	17
30.45–32.94	14	705–844	23
32.95–35.44	17	845–984	17
35.45–37.94	15	985–1124	10
37.95–40.44	39	1125–1264	8
40.45–42.94	22	1265–1404	2
42.95–45.44	14	1405–1544	1
45.45–47.94	13	1545–1684	0
47.95–50.44	5	1685–1824	2
50.45–52.94	4	1825–1964	2
52.95–55.44	2		
Total	195		135
Mean length = 36.50 cm		Mean weight = 701.40 g	
Standard deviation = 7.96 cm		Standard deviation = 363 g	

TABLE 269. Distribution of fork length and weight of Arctic char migrating upstream, West Brook, 1967 (Peet 1971).

Fork length (cm)	Frequency	Weight (g)	Frequency
20.3	2	—	—
22.7	2	—	—
23.3	1	—	—
23.7	2	—	—
25.4	1	—	—
25.6	1	—	—
26.3	1	—	—
26.5	1	—	—
27.2	1	—	—
27.9	3	—	—
29.4	1	—	—
29.7	1	—	—
33.0	1	440	1
37.5	1	560	1
38.4	1	740	1
39.1	1	680	1
43.3	1	950	1
43.4	1	1110	1
46.5	1	1400	1
49.2	1	—	—
62.8	1	3270	1
Total	26		8
Mean fork length = 31.68 cm Standard deviation = 10.44 cm		Mean weight = 1143.75 g Standard deviation = 913.34 g	

TABLE 270. Distribution of fork length, weight, and age of Atlantic salmon migrating upstream, West Brook, 1967 (Peet 1971).

Fork length (cm)	Frequency (*f*)	Weight (g)	*f*	Total age (yr)	Freshwater (yr)	Sea (yr)	*f*
41.3	1	—	—	5+	4	1	1
48.0	1	—	—	6+	5	1	1
48.7	1	1210	1	—	—	—	—
49.4	1	1240	1	—	—	—	—
50.6	1	1380	1	—	—	—	—
50.9	1	1310	1	—	—	—	—
51.1	1	1530	1	4+	3	1	1
52.4	1	—	—	6+	5	1	1
53.1	1	1630	1	5+	4	1	1
53.8	1	1540	1	—	—	—	—
54.3	1	—	—	4+	3	1	1
54.9	1	1710	1	—	—	—	—
56.6	1	1880	1	—	—	—	—
56.9	1	—	—	5+	4	1	1
57.2	1	1990	1	4+	3	1	1
71.7	1	3440	1	7+	5	2	1
Total	16		11				9

Middle Brook flows southerly and empties into the northern side of Groswater Bay (Fig. 74). One kilometre west lies West Brook (River No. 51), the other river of the Double Brook system. Both rivers drain a similar terrain, which has been described in the West Brook section.

The mouth of Middle Brook is divided by a large island. The eastern channel, approximately 35 m wide, is considered to be the main stem as the western channel becomes nearly dry in July and August. The bottom composition up to km 10 is mainly boulder, rubble, and coarse gravel (Peet 1971). Several falls and rapids were sighted in this section by Peet but none was judged to be a serious barrier to fish migration. Above km 10, the river is 9–15 m wide, with beds of spawning gravel located at km 15. The main river is fed by 11 tributaries (Table 271), but none contains large areas of spawning or nursery area suitable for Atlantic salmon.

Due to its isolation and difficult access, this river is not visited frequently by anglers (T. Curran, pers. comm.). No records of angling are available. Peet (1971) reported that commercial salmon nets were fished illegally in 1967 near the mouth. He removed two nets. Before the advent of the snowmobile, Arctic char were fished in the lower river for dog food (Labrador Inuit Association 1977).

A counting fence for enumerating fish migrating upstream was installed in 1967 at km 0.5 (Peet 1971). The fence was operated from 17 July to 27 August with 115 Atlantic salmon grilse, 9 large salmon, 10 resident brook trout, 1148 sea-run brook trout, and 664 Arctic char counted (Table 272). A sample of over 850 sea-run brook trout had a mean fork length of 39.5 cm and a mean weight of 689 g (Table 273). A sample of 574 Arctic char had a mean fork length of 41.9 cm and a mean weight of 1161 g (Table 274). The ages of 182 Arctic char ranged from 2 to 10 years, with 44.5% being 5–6 years old (Table 275). A sample of 83 adult Atlantic salmon had fork lengths between 43.95 and 73.94 cm, and a sex ratio of 54 M:29 F (Table 276).

TABLE 271. Physical characteristics of Middle Brook.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	275 m
Mouth latitude:	54°23′N	Length by meander (main stem):	40 km
Mouth longitude:	58°05′W	Total length including tributaries:	156 km
General direction of flow:	South	No. of tributaries:	11
Drainage area:	323 km²	Geological formation:	Gneiss
Mean width	14 km		
Axial length	27 km		
Basin perimeter	97 km		

TABLE 272. Weekly counts of upstream fish migrations, Middle Brook, 1967. Trap located 0.5 km from mouth. Mortalities in parentheses (Peet 1971).

Week ending	Grilse <2.7 kg	Salmon ≥2.7 kg	Brook trout Resident	Brook trout Sea-run	Arctic char	Total fish
23 July	7	1	3	9	32(1)	52(1)
30 July[a]	4	0	6	27	35	72
06 Aug.	45	5	1	383(6)	195(2)	629(8)
13 Aug.[b]	41	3	0	269(19)	144(4)	457(23)
20 Aug.	13	0	0	215(77)	179(24)	407(101)
27 Aug.	5	0	0	245(91)	79(40)	329(131)
Total	115	9	10	1148(193)	664(71)	1946(264)

[a]Partial fence washout, 24–27 July.
[b]Trap closed 13 Aug.

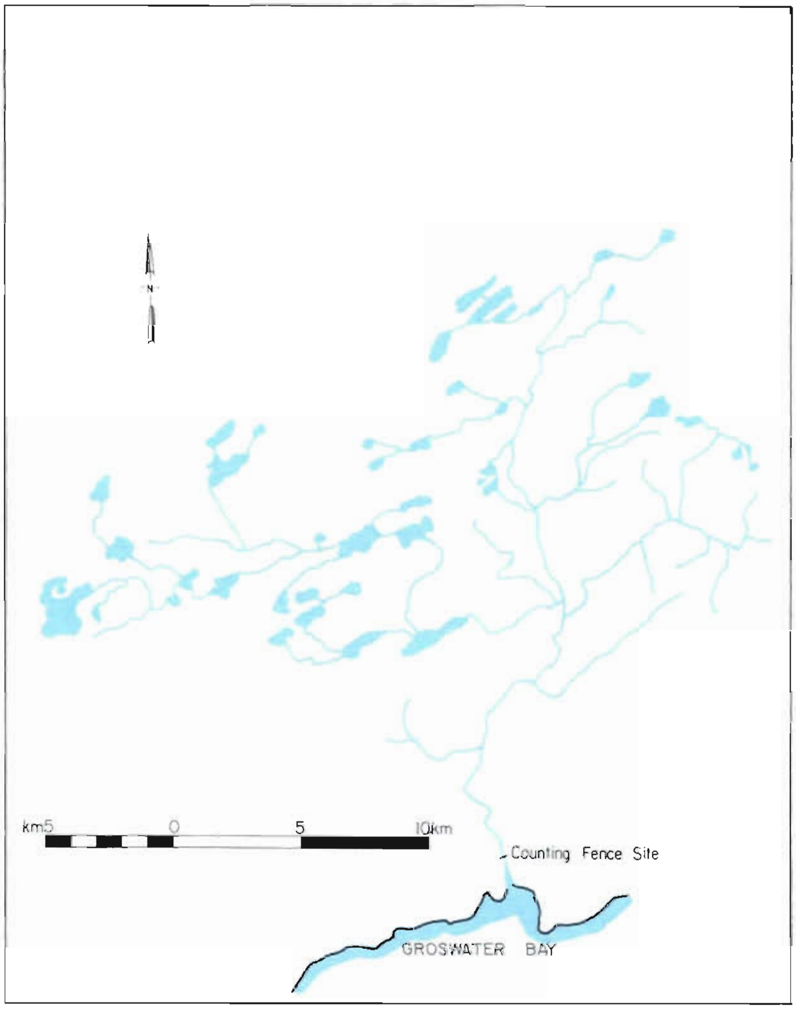

FIG. 74. Map of Middle Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 273. Distribution of fork length and weight of brook trout migrating upstream, Middle Brook, 1967 (Peet 1971).

Length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
17.95–20.44	12	5–144	53
20.45–22.94	31	145–284	133
22.95–25.44	39	285–424	111
25.45–27.94	66	425–564	100
27.95–30.44	63	565–704	87
30.45–32.94	77	705–844	73
32.95–35.44	76	845–984	81
35.45–37.94	69	985–1124	57
37.95–40.44	99	1125–1264	55
40.45–42.94	92	1265–1404	35
42.95–45.44	72	1405–1544	32
45.45–47.94	78	1545–1684	22
47.95–50.44	49	1685–1824	8
50.45–52.94	16	1825–1964	1
52.95–55.44	9	1965–2104	2
55.45–57.94	3	2105–2244	2
Total	851		852
Mean length = 39.50 cm Standard deviation = 8.34 cm		Mean weight = 689.0 g Standard deviation = 439.4 g	

TABLE 274. Distribution of fork length and weight of Arctic char migrating upstream, Middle Brook, 1967 (Peet 1971).

Length		Weight	
Class boundaries (cm)	Frequency	Class boundaries (g)	Frequency
17.95–21.94	22	0– 324.94	127
21.95–25.94	29	324.95– 649.94	137
25.95–29.94	77	649.95– 974.94	61
29.95–33.94	73	974.95–1299.94	39
33.95–37.94	60	1299.95–1624.94	39
37.95–41.94	53	1624.95–1949.94	37
41.95–45.94	36	1949.95–2274.94	38
45.95–49.94	40	2274.95–2599.94	40
49.95–53.94	55	2599.95–2924.94	20
53.95–57.94	50	2924.95–3249.94	17
57.95–61.94	41	3249.95–3574.94	6
61.95–65.94	22	3574.95–3899.94	4
65.95–69.94	8	3899.95–4224.94	3
69.95–73.94	6	4224.95–4549.94	3
73.95–77.94	2	4549.95–4874.94	0
		4874.95–5199.94	3
Total	574		574
Mean length = 41.9 cm Standard deviation = 13.1 cm		Mean weight = 1161 g Standard deviation = 1011 g	

TABLE 275. Distribution of age versus range of fork length of Arctic char migrating upstream, Middle Brook, 1967 (Peet 1971).

Class boundaries fork length (cm)	Year-class 2+	3+	4+	5+	6+	7+	8+	9+	10+	Total
17.95–21.94	2	13	0	0	0	0	0	0	0	15
21.95–25.94	0	8	2	0	0	0	0	0	0	10
25.95–29.94	0	6	16	0	0	0	0	0	0	22
29.95–33.94	0	1	8	13	4	0	0	0	0	26
33.95–37.94	0	0	0	17	1	0	0	0	0	18
37.95–41.94	0	0	0	2	13	5	0	0	0	20
41.95–45.94	0	0	1	2	7	3	1	0	0	14
45.95–49.94	0	0	0	2	5	2	2	0	0	11
49.95–53.94	0	0	0	2	7	9	2	2	0	22
53.95–57.94	0	0	0	0	2	10	1	0	0	13
57.95–61.94	0	0	0	0	3	2	1	1	1	8
61.95–65.94	0	0	0	0	1	0	2	0	0	3
Total	2	28	27	38	43	31	9	3	1	182

TABLE 276. Distribution of age by sex versus range in fork length of Atlantic salmon migrating upstream, Middle Brook, 1967 (Peet 1971).

Class boundaries		Age (yr) 4		5		6				7				Total	
		3:1		4:1		5:1		4:2		6:1		5:2			
Fork length (cm)	Class mark	M	F	M	F	M	F	M	F	M	F	M	F	M	F
43.95–46.94	45.45	0	0	1	1	0	0	0	0	0	0	0	0	1	1
46.95–49.94	48.45	3	3	9	2	1	2	0	0	0	0	0	0	13	7
49.95–52.94	51.45	5	3	8	7	5	1	0	0	0	0	0	0	18	11
52.95–55.94	54.45	1	1	6	3	5	2	0	0	1	0	0	0	13	6
55.95–58.94	57.45	1	0	3	2	1	0	1	0	0	0	0	0	6	2
58.95–61.94	60.45	0	0	1	0	0	0	0	0	0	0	0	0	1	0
61.95–64.94	63.45	0	1	0	0	0	0	0	0	0	0	0	0	0	1
64.95–67.94	66.45	0	0	0	0	0	0	1	1	0	0	0	0	1	1
67.95–70.94	69.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70.95–73.94	72.45	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Total by sex		10	8	28	15	12	5	2	1	1	1	0	0	54	29
Total		18		43		17		3		2		0		83	

Rivers 53 and 54 are both unnamed rivers with outlets into Pottles Bay (Fig. 75, 76). This bay was once the site of a small settlement whose residents were dependent on the cod and salmon fisheries in Groswater Bay.

River 53 has a drainage area of 135 km^2, is fed by 12 tributaries, and flows in an easterly direction (Table 277). In 1976, a water sample was collected and results of the analyses of this sample are presented in Table 278 (Jamieson 1979).

River 54 has a drainage area of 78 km^2, is fed by four tributaries, and flows in a southerly direction (Table 279).

Large numbers of Atlantic salmon (mainly grilse) were sighted in these rivers by hunters in September 1977. These fish were seen several kilometres upstream. Reports from former residents indicate an excellent run of salmon, Arctic char, and sea-run brook trout (T. Curran, pers. comm.).

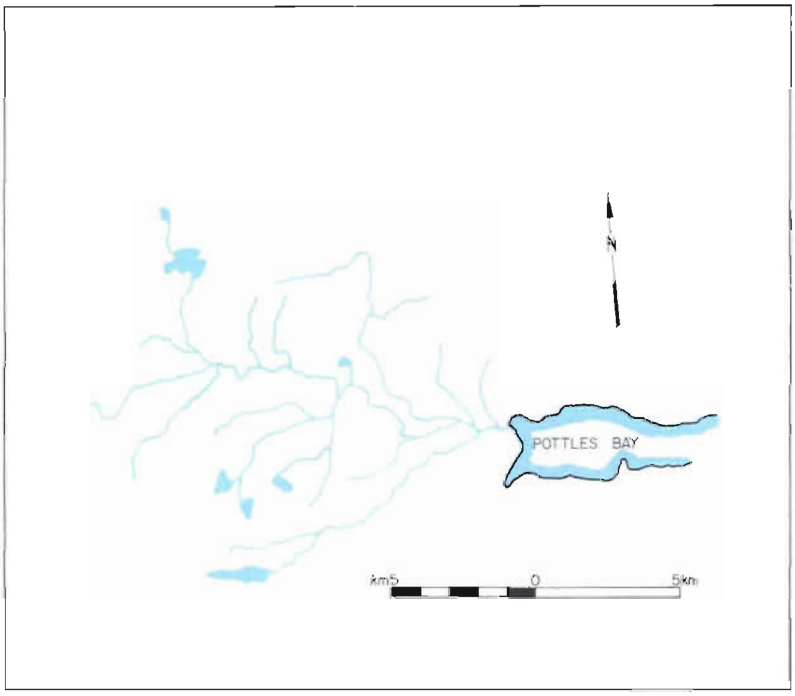

FIG. 75. Map of River 53 (Unnamed) showing accessible Atlantic salmon parr rearing areas.

TABLE 277. Physical characteristics of River 53.

Map reference:	Groswater Bay 13–I 1 : 250 000	Maximum basin relief:	214 m
Mouth latitude:	54°29′N	Length by meander (*main stem*):	16 km
Mouth longitude:	57°43′W	Total length including tributaries:	84 km
General direction of flow:	East	No. of tributaries:	12
Drainage area:	135 km^2	Geological formation:	Gneiss
Mean width	9 km		
Axial length	15 km		
Basin perimeter	45 km		

TABLE 278. Results of analyses of a water sample collected on River 53, 1976 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1976	5.7	6.0	24.0	7.0	1.0	0.6	5.0	1.2

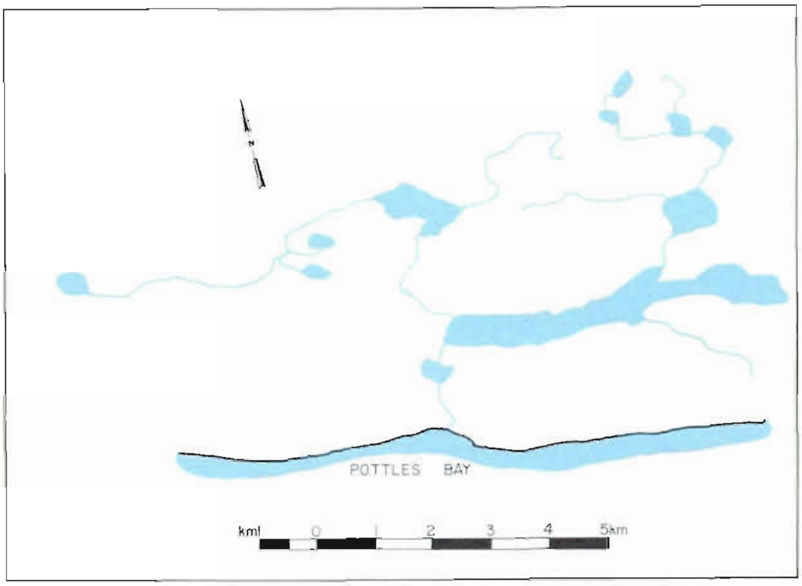

FIG. 76. Map of River 54 (Unnamed) showing accessible Atlantic salmon parr rearing areas.

TABLE 279. Physical characteristics of River 54.

Map reference:	Groswater Bay 13-I 1 : 250 000	Maximum basin relief:	92 m
Mouth latitude:	54°29′N	Length by meander (main stem):	10 km
Mouth longitude:	57°35′W	Total length including tributaries:	24 km
General direction of flow:	South	No. of tributaries:	4
Drainage area:	78 km²	Geological formation:	Gneiss
Mean width	9 km		
Axial length	11 km		
Basin perimeter	39 km		

REGION IV
MAKKOVIK–DAVIS INLET

Makkovik–Davis Inlet Region includes the area drained by the rivers entering the Labrador Sea immediately north of Groswater Bay, from Holton Harbour to Davis Inlet (Fig. 77). The region is bordered on the south by the watersheds of the rivers entering Hamilton Inlet, on the west by the Naskaupi River watershed and the Quebec–Labrador border, and on the north by the Notakwanon River watershed. Presently there are four communities in the region and a brief description of each follows:

Makkovik

This community of 347 (Statistics Canada 1981) is made up of white settlers, Inuit, and people of mixed origin. Traditionally, the mainstay of the economy was the cod fishery. However, after failures in the cod fishery in the 1960s, the fishing effort shifted to Atlantic salmon. Since the establishment in 1972 of a fish plant with freezer facilities, the Atlantic salmon fishery has become an important industry.

Postville

This settlement of 223 residents (Statistics Canada 1981) derives its name from the Hudson Bay Company Trading Post which operated in Kaipokok Bay until 1879. The cod fishery was prosecuted until the decline of the 1960s when the commercial fishing effort was switched to Atlantic salmon. However, the Labrador Inuit Association (1977) estimated that less than one-third of the residents now fish salmon commercially. The Arctic char fishery is not actively prosecuted.

Hopedale

This settlement of 425 residents (Statistics Canada 1981), is made up of white settlers, Inuit, and people of mixed origin. Trapping, hunting, and the cod fishery were traditionally the mainstay of the economy. Atlantic salmon were actually considered a nuisance fish as they would mesh in leaders of codtraps, causing them to sink. Effort directed at the cod fishery slowed during the construction of radar sites at the community in the late 1950s and ended during the mid-1960s after repeated failures in the fishery. Commercial fishing effort then turned to Atlantic salmon which were pickled until 1973 when freezer facilities were constructed at Hopedale.

Davis Inlet

Over 90% of the 240 residents (Statistics Canada 1981) of this community are members of the Naskaupi Indian Tribe. These people were traditionally hunters and trappers who moved into the interior in the fall. It is felt that there is the potential to undertake a commercial fishery for both Atlantic salmon and Arctic char although attempts have been met with only mediocre success (Northern Labrador Services Division Annual Reports 1967, 1969, 1974).

The major geological component found throughout the region is gneiss, a laminated or foliated metamorphic rock (Sutton 1972). Areas of granite and associated rocks are found along the coast and along the northern sector of the Quebec–Labrador border. A band of Precambrian sediments and deposits, known as the Central Ore Belt, stretches inland from Makkovik and, in 1958, the British Newfoundland Exploration Limited (Brinex) discovered uranium within this deposit.

Mature stands of conifers line the three long, narrow bays (Kaipokok, Kanairiktok, and Adlatok/Ugjoktok) that dominate this region. The remainder of the coastline is dotted with islands and small inlets. Exposed bedrock strewn with boulders is common. Inland from the coastal fringe, glacial deposits provide a good basis for vegetative growth but the harsh climate and short growing season limit the flora to slow-growing black spruce and balsam fir interspersed with lichens. On the uplands of the Benedict Mountains and the Harp Lake area, exposed bedrock alternates with sparse lichen growth. Along the Quebec–Labrador border, abundant lichens separate the scattered coniferous trees.

This region is dominated by two large river systems, Kanairiktok and Adtalok/Ugjoktok, each of which has a drainage area greater than 10 000 km^2, and extends to the Quebec–Labrador border. These and many other rivers flow from the huge plateau in the interior and are characterized by slow to medium flows as they meander through the substantial sand and gravel deposits that cover the plateau. Many large lakes are surrounded by small mountain ranges and high bedrock outcroppings on the plateau. Near the coastline, the plateau ends abruptly and the lower sections of many rivers are obstructed by rapids and falls. Investigations of the physical characteristics of rivers of this region have been carried out by Sollows et al. (1954), Peet (1971), Murphy (1973), and Murphy and Porter (1974a). Water samples from many rivers have been collected and analyzed (Jamieson 1979). Because of their remote locations, the vast majority or rivers in this region are in a near-pristine state. Traditional use of the rivers for fishing, hunting, and trapping has been well documented by the Labrador Inuit Association (1977).

Early investigations of fish species of this region were conducted by the *Blue Dolphin* Labrador expeditions of 1949, 1950, and 1951 (Backus 1957). Other authors, such as Sollows et al. (1954), Peet (1971), Murphy (1973), Murphy and Porter (1974a), and Bruce et al. (1979), have also contributed information on fish species. Scott and Crossman (1973) was used as the basis for Table 1 which reports 12 species present.

Although Atlantic salmon occur throughout Labrador, Region IV is generally considered to be the northern limit of abundant anadromous salmon stocks. Further north, Arctic char replace salmon in numbers as well as commercial and recreational value. There are seven rivers scheduled for Atlantic salmon angling in this region and much of the angling occurs from sports camps located on six rivers. Arctic char are common in many of the rivers and are distinguished by their pale flesh colour as compared to the deep red flesh of char stocks north of Nain. In this region, there is no extensive recreational fishery for char; also, the commercial catch of 15 645 kg (round weight) in 1976 represented only 10.4% of the total Labrador char catch (B. Dempson, pers. comm.).

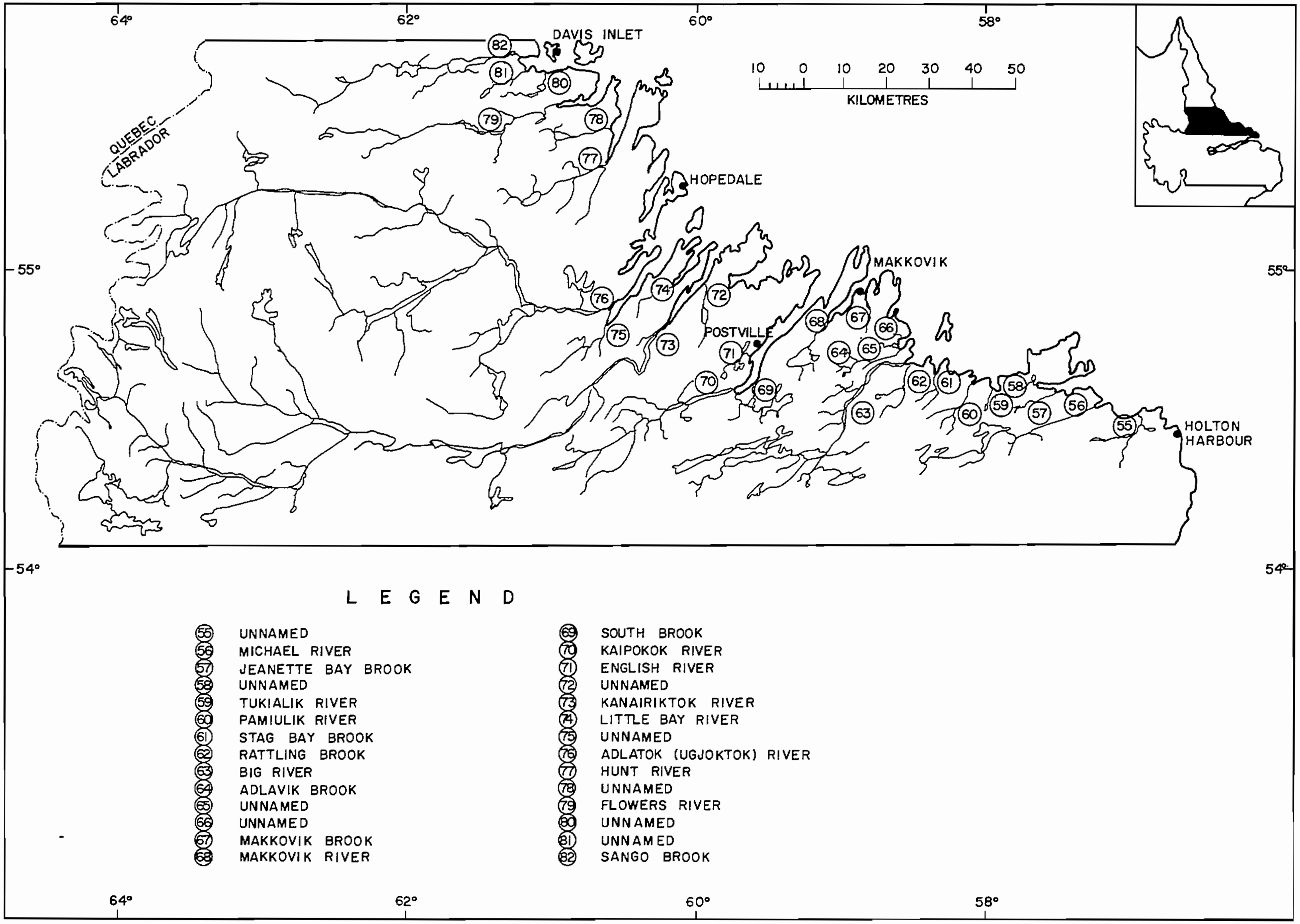

FIG. 77. Map of Region IV, Makkovik–Davis Inlet. Rivers are numbered for convenient location in the text.

This river flows northeasterly, emptying into Byron Bay (Fig. 78). The shores of Byron Bay are sandy, and along the head of the bay Parsons (1970) sighted stands of mature black spruce. This river has a drainage area of 163 km²; total length of the main stem and 12 tributaries is 77 km (Table 280). The Labrador Inuit Association (1977) reported that the lower river was traditionally fished for Arctic char which were used mainly as dog food. Other information on the physical characteristics and fish populations of this river is not available.

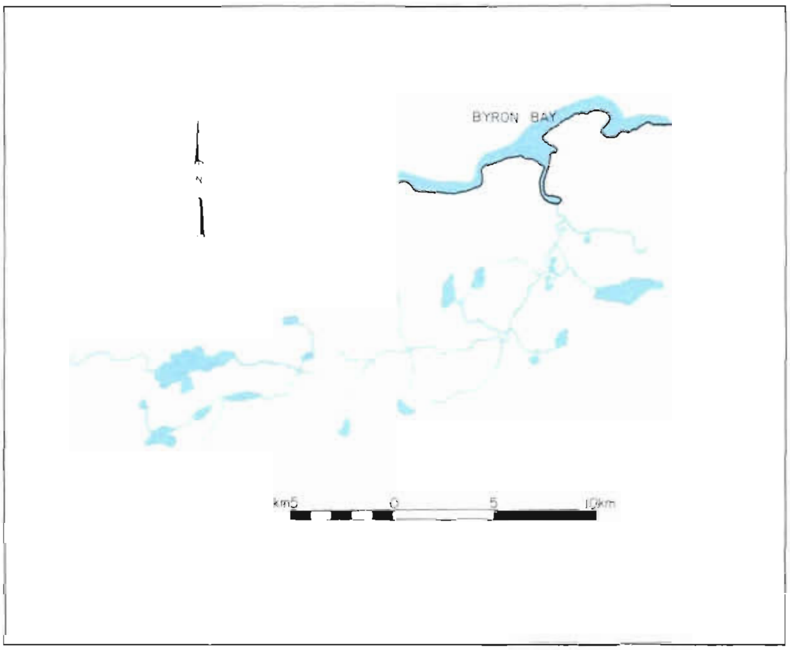

FIG. 78. Map of River 55 (Unnamed) showing accessible Atlantic salmon parr rearing areas.

TABLE 280. Physical characteristics of River 55.

Map reference:	Groswater Bay 13-I 1 : 250 000	Maximum basin relief:	244 m
Mouth latitude:	54°38′N	Length by meander (main stem):	32 km
Mouth longitude:	57°35′W		
General direction of flow:	Northeast	Total length including tributaries:	77 km
Drainage area:	163 km²	No. of tributaries:	12
Mean width	6 km	Geological formation:	Gneiss
Axial length	27 km		
Basin perimeter	74 km		

Michael River
(St. Michaels River, Shellbird River)

No. 56, Fig. 77

Michael River flows northeasterly along the southern border of the Benedict Mountains, emptying into Byron Bay, 4 km north of Red Rock Point (Fig.79). The mouth of the river is protected by a high, sandy beach which forms a lagoon that is approximately 1.5 km long. Two sports fishing camps, one located at the mouth and the other at Lake Michael (L1), are operated from mid-June to mid-September.

Michael River has a drainage area of 285 km^2 (Table 281) which, for descriptive purposes, was divided, by Peet (1971), into three sections. The first section, from the mouth to Lake Michael, includes the lower 40 km of the river. Channel widths in this section range from 25 to 50 m, and bottom substrates vary among boulder, rubble, and gravel. Four important tributaries, T7, T10, T11, and T12, enter this section; Sollows et al. (1954) considered the habitat of these tributaries to be ideal for juvenile salmon rearing. Ranger seals are known to overwinter and breed in the lower 10 km of this river and are likely predators on the fish populations (Labrador Inuit Association 1977). The second section referred to by Peet (1971) stretches from km 40 to km 53 and is made up of Lake Michael (L1) and its tributaries. Due to their small size, none of these tributaries were surveyed by Murphy (1973). The river above Lake Michael, the third section referred to by Peet (1971), averages 18 m in width and meanders over flat, barren terrain. A water sample was obtained from Michael River in 1976; results of the analyses of this sample are presented in Table 282 (Jamieson 1979).

The entire watershed of Michael River is accessible to migrating fish. Anadromous Atlantic salmon, Arctic char, and both sea-run and resident brook trout have all been reported in the system. In 1967, 25 resident brook trout weighing more than 0.5 kg each were angled. Yearly angling catches of sea-run brook trout and Arctic char are listed in Table 283. The reliability of these figures is unknown.

Sollows et al. (1954) stated that "the river could not be considered a good angling river nor could the bay outside be considered an ideal spot for commercial fishing". However, from recent reports, it appears that angling for Atlantic salmon is excellent. Also, Peet (1971) reported that the area near the mouth has long been known as a good commercial fishing station. The mean angling catches reported from the sports fishing camps for the eight years recorded is 244 grilse and 39 large salmon per year (Table 284). The majority of the salmon and char are angled during a 3–4 week period in late July and August (T. Curran, pers. comm.).

From his survey in 1972, Murphy (1973) recorded a total of 22 059 rearing units on the main stem and tributaries of Michael River (Table 285). It is not known if the present population size is as large as the potential annual Atlantic salmon production of 6618 fish estimated by Murphy (1973); however, angling catches appear to indicate a large run of salmon to the river.

TABLE 281. Physical characteristics of Michael River (St. Michaels River, Shellbird River).

Map reference:	Groswater Bay 13-I Rigolet 13J 1 : 250 000	Maximum basin relief:	305 m
		Length by meander (main stem):	95 km
Mouth latitude:	54°41′N		
Mouth longitude:	57°47′W	Total length including tributaries:	427 km
General direction of flow:	Northeast	No. of tributaries:	35
Drainage area:	285 km^2	Area of lakes >100 ha:	
Mean width	10 km	L1 Lake Michael	2589 ha
Axial length	84 km		
Basin perimeter	190 km	Geological formation:	Gneiss

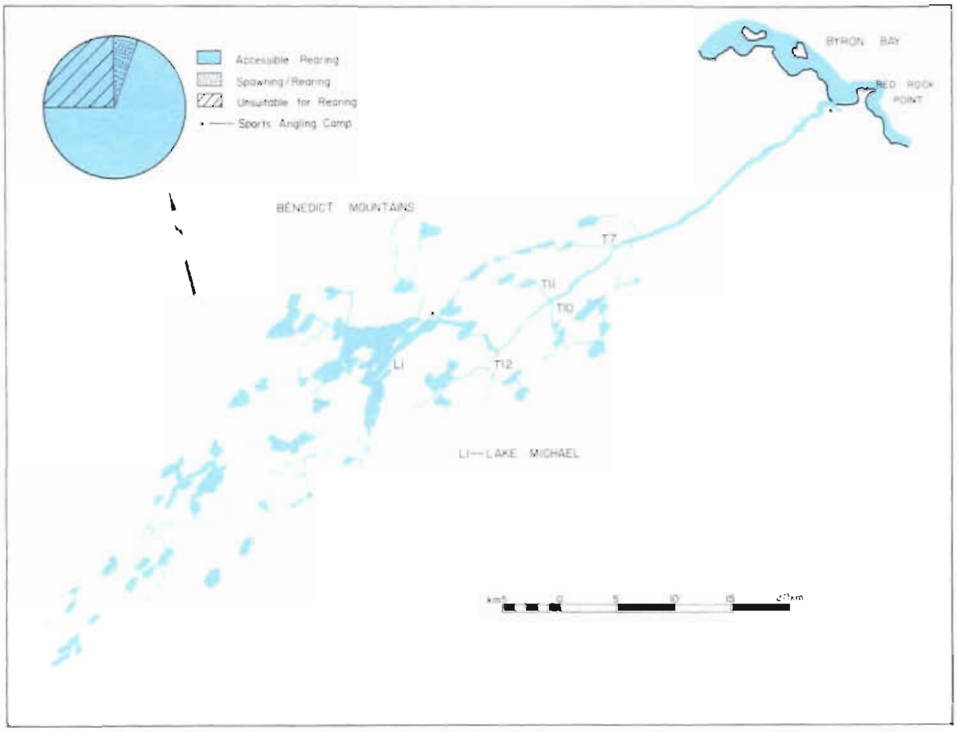

FIG. 79. Map of Michael River showing accessible Atlantic salmon parr rearing areas.

TABLE 282. Results of analyses of a water sample collected on Michael River, 1976 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (µS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1976	5.9	6.0	21.0	1.0	2.0	0.6	4.0	2.4

TABLE 283. Summary of sea-run brook trout and Arctic char angled at sport camps on Michael River, 1968–74 (DFO, unpubl. data).

Year	Brook trout weight (kg) <0.5	0.5–0.9	1.0–1.8	>1.8	Unknown	Total	Arctic char (weight unknown)
1968	0	31	0	0	127[a]	158	881[b]
1969	0	0	23	0	0	23	79
1970	0	0	9	239	0	248	454
1971	0	0	96	0	0	96	110
1972	0	43	335	4	0	382	386
1973	0	30	220	0	0	250	0
1974	0	0	481	0	0	481	295
Total	0	104	1164	243	127	1638	2205

[a]96 released.
[b]265 released.

TABLE 284. Summary of Atlantic salmon angling data, Michael River, 1967–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1967	27	34	61	90	0.68
1968	129	47	176	131	1.34
1969	—	—	—	—	—
1970	167	41	208	315	0.66
1971	347	38	385	216	1.78
1972	459	39	498	313	1.59
1973	482	0	482	364	1.32
1974	246	43	289	332	0.87
1975	—	—	—	—	—
1976	—	—	—	—	—
1977	—	—	—	—	—
1978	—	—	—	—	—
1979	310	107	417	266	1.57
1980	27	1	28	69	0.41
Mean	244	39	283	233	1.21

TABLE 285. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Michael River (Murphy 1973). No inaccessible areas were identified.

Location	Accessible areas	
	Spawning units	Rearing units
Main stem	1 473	18 374
T7	175	1 746
T10	0	485
T11	0	96
T12	0	1 358
Total	1 648	22 059
Estimated production		
Smolt	44 118	
Adult	6 618	

Jeanette Bay Brook is a small brook that flows northeasterly from the eastern tip of the Benedict Mountains to its mouth in Jeanette Bay (Fig. 80). This brook, which has a drainage area of 67 km^2, flows for only 19 km from its source to its mouth (Table 286). The lower watershed is forested and the bottom substrate of the river is primarily gravel; vegetation in the upper watershed is sparse and bottom substrate is boulder and rubble. Murphy (1973) reported two barriers to anadromous fishes, a partial obstruction at km 5.6 on the main stem and a complete obstruction at km 4.8 on tributary 3 (Table 287).

Very little is known about the fish populations in Jeanette Bay Brook. The outer area of the bay has long been an excellent location for commercial salmon fishing (Labrador Inuit Association 1977) although the catch is thought to consist largely of salmon migrating to rivers farther north (T. Curran, pers. comm.). Because of its geographic location and the lack of obstructions to fish passage, Atlantic salmon, brook trout, and Arctic char are likely present in this river. Murphy (1973) estimated the river had the potential to produce 457 adult Atlantic salmon annually (Table 288).

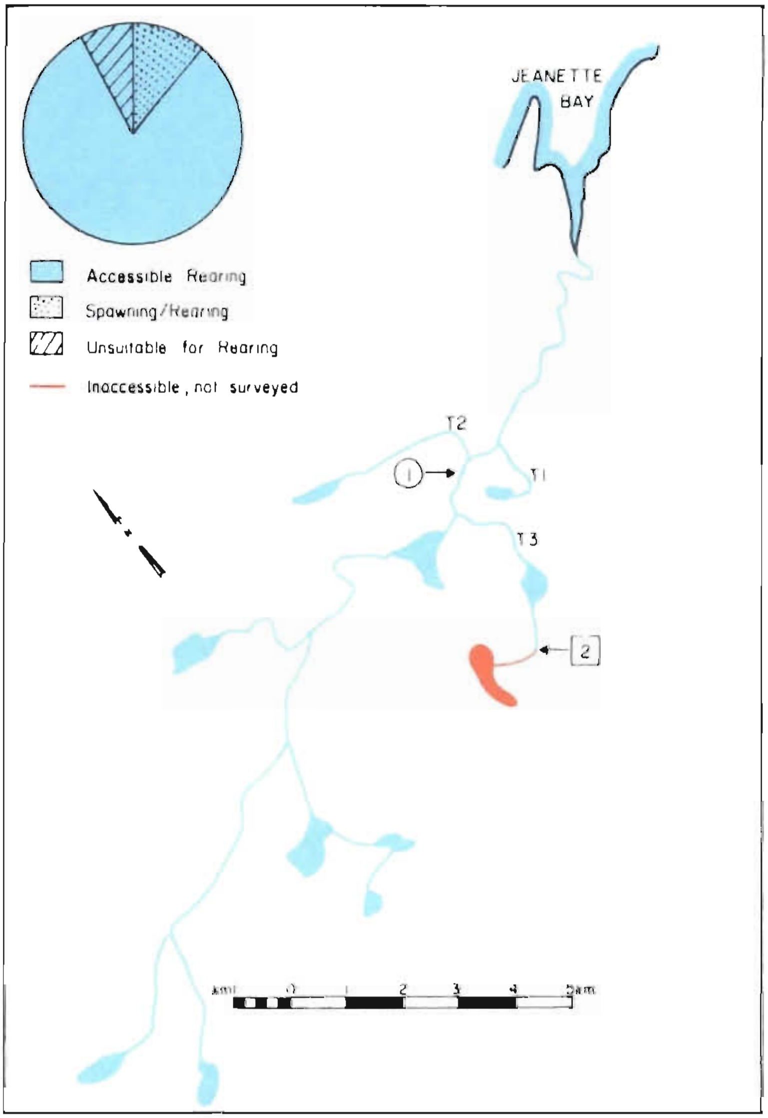

FIG. 80. Map of Jeanette Bay Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 286. Physical characteristics of Jeanette Bay Brook.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	305 m
Mouth latitude:	54°43′N	Length by meander (main stem):	19 km
Mouth longitude:	58°05′W	Total length including tributaries:	13 km
General direction of flow:	Northeast	No. of tributaries:	6
Drainage area:	67 km^2	Geological formation:	Gneiss
Mean width	4 km		
Axial length	19 km		
Basin perimeter	39 km		

TABLE 287. Obstructions on Jeanette Bay Brook (Murphy 1973).

Fig. 80 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	5.6	Falls	1.8	3.1	90	Partial
2	T3	4.8	Falls	3.1	3.1	90	Complete

TABLE 288. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Jeanette Bay Brook (Murphy 1973). No inaccessible areas were surveyed.

Location	Accessible areas Spawning units	Rearing units
Main stem	176	1307
T3	0	216
Total	176	1523
Estimated production		
Smolt	3046	
Adult	457	

River 58 (Unnamed)

River 58 flows northeast from the Benedict Mountains to its mouth at the bottom of Jeanette Bay (Fig. 81). It has a drainage area of 13 km^2 and the main stem and two tributaries have a total length of 16 km (Table 289). The mouth of the river is reported to be 6 m wide and overgrown by trees. No information is available on the fish populations.

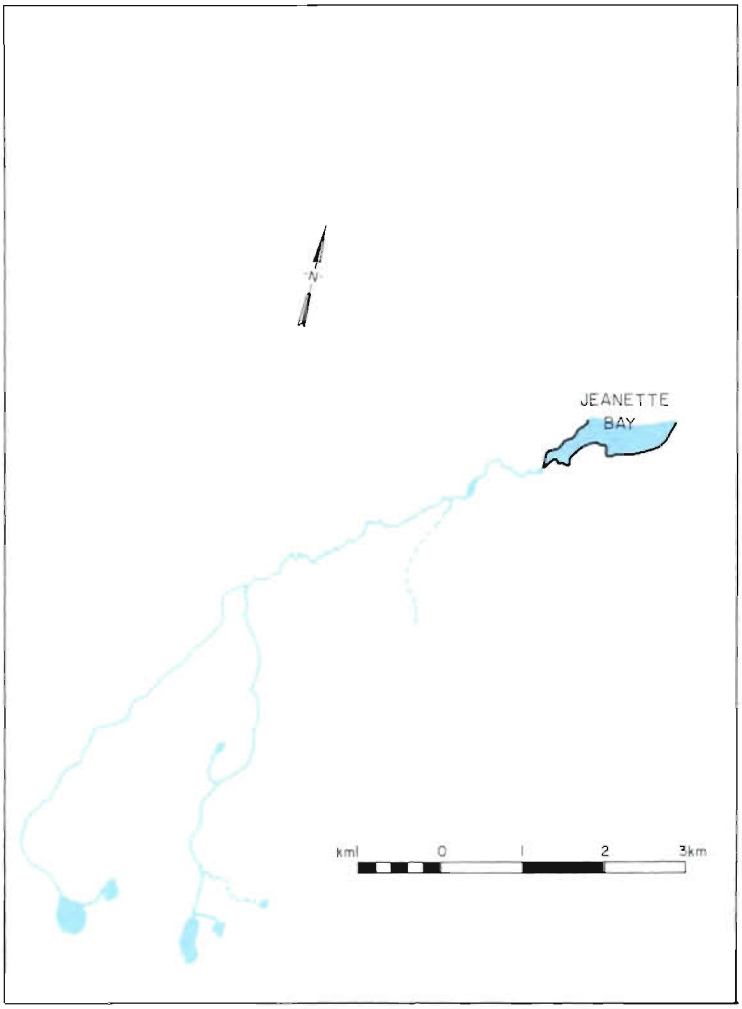

FIG. 81. Map of River 58 (Unnamed) showing accessible Atlantic salmon parr rearing areas.

TABLE 289. Physical characteristics of River 58.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	244 m
Mouth latitude:	54°44′N	Length by meander (main stem):	13 km
Mouth longitude:	58°12′W	Total length including tributaries:	16 km
General direction of flow:	Northeast	No. of tributaries:	2
Drainage area:	13 km²	Geological formation:	Gneiss
Mean width	3 km		
Axial length	10 km		
Basin perimeter	19 km		

Tukialik River
(Tuchialic River)

No. 59, Fig. 77

Tukialik River flows northerly from the Benedict Mountains and empties into Tukialik Bay (Fig. 82). There are abandoned houses at the mouth, indicating that a small commercial fishery may have been carried out in the well-protected bay.

The river has a drainage area of 47 km^2 and the main stem is fed by five tributaries (Table 290). Murphy (1973) reported that the river at its mouth is 9 m wide. Up to km 2, it flows swiftly over a rubble/boulder substrate. From km 2 to km 6, the river narrows to 6 m and the bottom composition alternates between rubble and bedrock. At km 6, a long lake, situated in the Benedict Mountains, forms the bulk of the headwaters of this river. The lower watershed is forested with black spruce; the upper reaches are barren. No barriers to migrating fishes are found throughout the system.

Based on the relatively small size of the stream, Murphy (1973) considered it to be a mainly brook trout and Arctic char habitat with a possible run of salmon. Based on the amount of rearing habitat for juvenile fish, Murphy (1973) estimated the annual adult Atlantic salmon production to be 205 fish (Table 291).

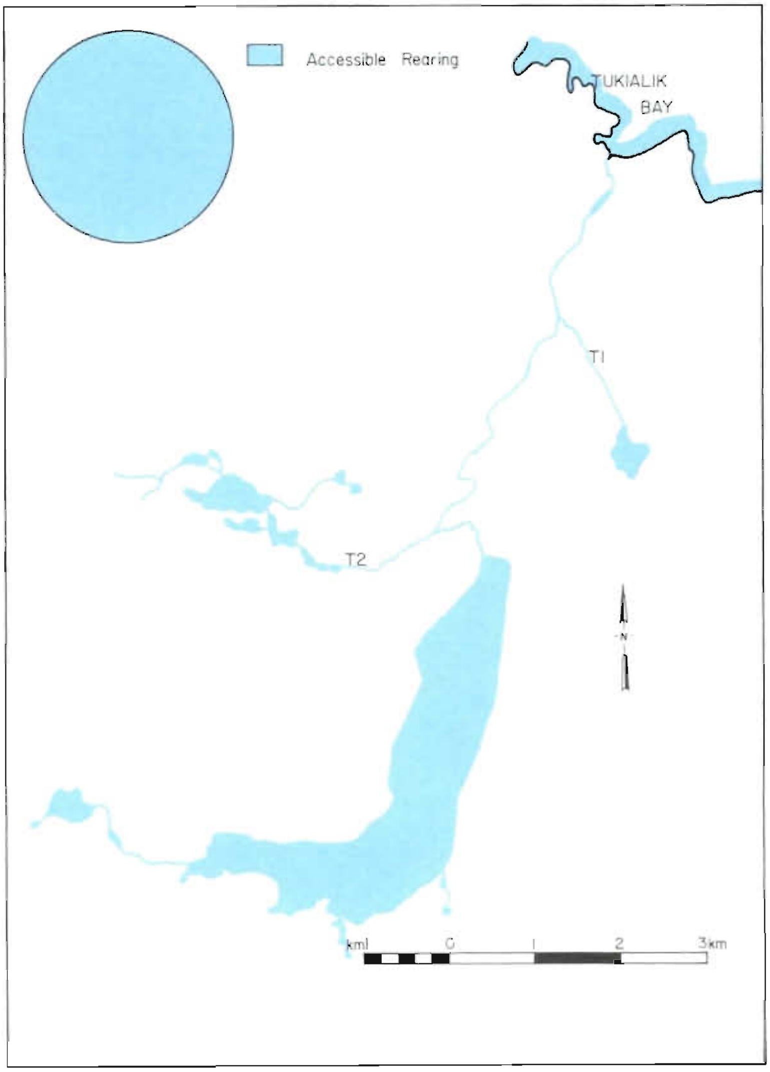

FIG. 82. Map of Tukialik River showing accessible Atlantic salmon parr rearing areas.

TABLE 290. Physical characteristics of Tukialik River (Tuchialic River).

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	275 m
Mouth latitude:	54°44′N	Length by meander (main stem):	6 km
Mouth longitude:	58°26′W	Total length including tributaries:	13 km
General direction of flow:	North	No. of tributaries:	5
Drainage area:	47 km^2	Geological formation:	Gneiss
Mean width	4 km		
Axial length	11 km		
Basin perimeter	29 km		

TABLE 291. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Tukialik River (Murphy 1973). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	0	432
T1, T2	0	252[a]
Total	0	684
Estimated production		
Smolt	1368	
Adult	205	

[a]Estimated from topographic map.

Pamiulik River
(Pamialic River)

No. 60, Fig. 77

Pamiulik River flows northeasterly over a barren plateau to its mouth in Pamiulik Bay (Fig. 83). This bay is shallow and exposed and extends about 5 km inland. The closest settlement, Makkovik, is 72 km away by sea.

The watershed, which drains an area of 493 km^2 (Table 292), can be divided into three sections: the lower meandering section, the middle swift-flowing section, and the ponds and lakes of the headwaters. The lower section, which stretches for 4 km, is 50–75 m wide. The bottom substrate is predominantly sand and gravel with scattered boulders (Peet 1971). At km 4, the river gradient increases and between this point and km 25 there are two partial barriers to fish migration (Table 293). In this section, the river narrows from 45 to 18 m and the bottom substrate is primarily rubble and boulder. The headwaters consist of several long, narrow lakes that are joined by 10–20 m wide streams that were reported by Murphy (1973) to contain gravel suitable for fish spawning. A water sample was collected from Pamiulik River in August 1976; results of the analyses of this sample are presented in Table 294 (Jamieson 1979).

The Labrador Inuit Association (1977) reported that Atlantic salmon and Arctic char spawn in the lower section of the river. Both Peet (1971) and Murphy (1973) considered it likely that the river supported populations of Atlantic salmon, Arctic char, and brook trout. Although the two falls on the main stem restrict Atlantic salmon only partially, they may completely obstruct further upstream migration of less vigorous fish such as Arctic char and brook trout. Murphy (1973) estimated the potential annual adult Atlantic salmon production of Pamiulik River to be 4465 fish (Table 295). The present population size is unknown.

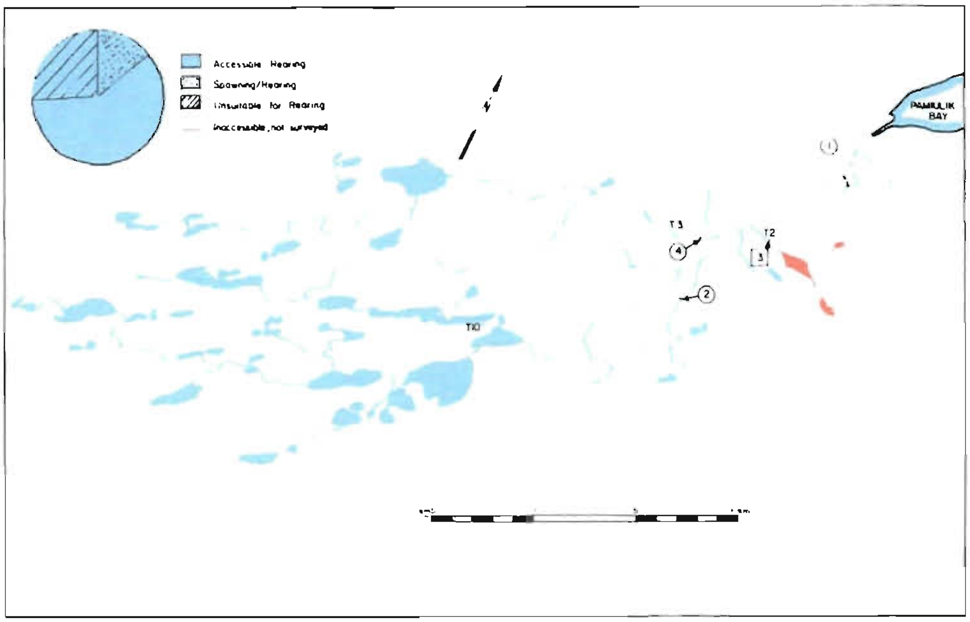

FIG. 83. Map of Pamiulik River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 292. Physical characteristics of Pamiulik River (Pamialic River).

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	37 m
Mouth latitude:	54°46′N	Length by meander (main stem):	56 km
Mouth longitude:	58°34′W		
General direction of flow:	Northeast	Total length including tributaries:	188 km
		No. of tributaries:	19
Drainage area:	493 km²	Geological formation:	Gneiss
Mean width	10 km		
Axial length	45 km		
Basin perimeter	103 km		

TABLE 293. Obstructions on Pamiulik River (Murphy 1973).

Fig. 83 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	4.8	Falls	2.4	27.2	45	Partial
2	Main stem	17.7	Falls	1.8	15.3	75	Partial
3	T2	0.8	Falls	3.7	—	—	Complete
4	T3	1.6	Falls	3.1	15.3	45	Partial

TABLE 294. Results of analyses of a water sample collected on Pamiulik River, 1976 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1976	6.3	4.0	8.0	1.2	2.0	1.8	0.7	2.4

TABLE 295. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Pamiulik River (Murphy 1973). No inaccessible areas were surveyed.

Location	Accessible areas Spawning units	Rearing units
Main stem	2 386	9 208
T2	0	72
T3	185	3 861
T10	232	1 741
Total	2 803	14 882
Estimated production		
Smolt	29 764	
Adult	4 465	

Stag Bay Brook flows northeasterly and empties into Stag Bay (Fig. 84). The watershed, which covers an area of 155 km^2, and includes seven tributaries (Table 296) is densely forested with black spruce. Murphy (1973) reported that the lower river is 25 m wide and flows swiftly over boulder and rubble substrate. Good spawning gravel was sighted at km 8 where the water velocity decreases. At km 11.3, a series of three falls was reported by Murphy, who classified them as partial barriers to fish migration (Table 297). Above the falls the river averages 15 m in width, flowing gently over rubble, boulder and gravel substrates. Two major tributaries, T1 and T2, enter the lower river and both provide good rearing habitat for juvenile fish. Results from the analyses of a water sample collected from Stag Bay Brook in August 1972 are presented in Table 298 (Jamieson 1979).

No information is available on the fish populations inhabiting this river, although Atlantic salmon, Arctic char, and brook trout may be present. Murphy (1973) estimated that the river had the capacity to produce 1428 adult Atlantic salmon annually (Table 299). Ranger seals frequent the lower river and estuary and undoubtedly prey on the fish species present (Labrador Inuit Association 1977).

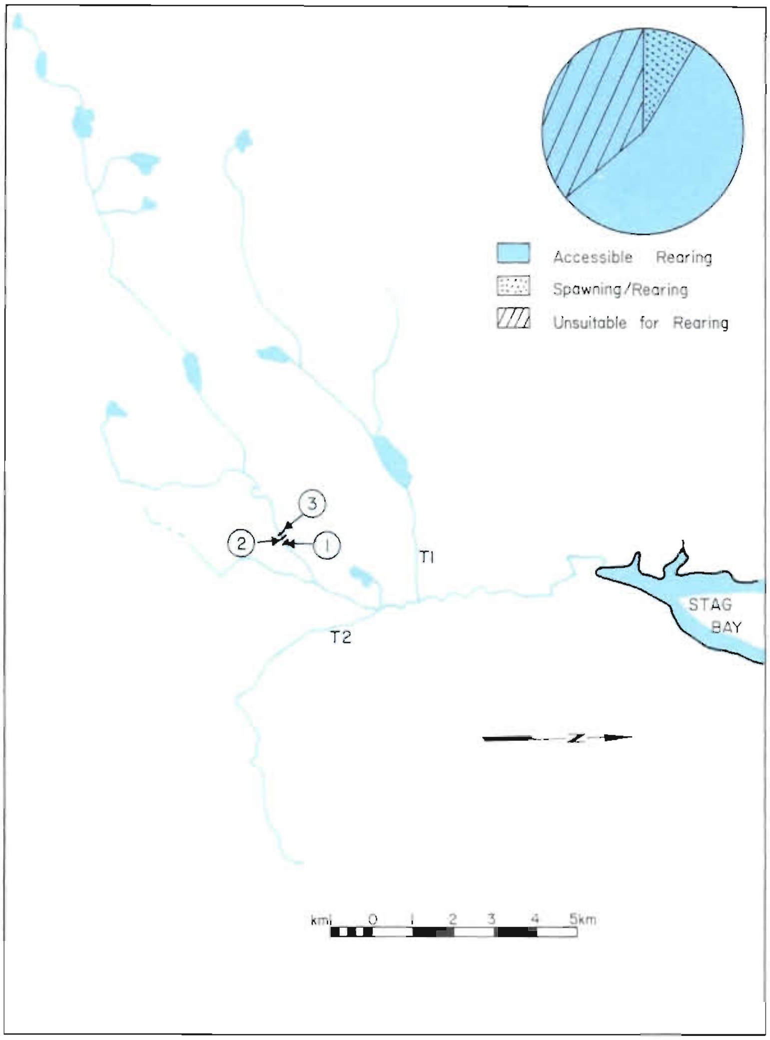

FIG. 84. Map of Stag Bay Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 296. Physical characteristics of Stag Bay Brook.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	336 m
Mouth latitude:	54°48′N	Length by meander (main stem):	26 km
Mouth longitude:	58°46′W	Total length including tributaries:	61 km
General direction of flow:	Northeast	No. of tributaries:	7
Drainage area:	155 km²	Geological formation:	Gneiss
Mean width	8 km		
Axial length	20 km		
Basin perimeter	58 km		

TABLE 297. Obstructions on Stag Bay Brook (Murphy 1973).

Fig. 84 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	11.3	Falls	1.8	15.3	90	Partial
2	Main stem	11.3	Falls	1.8	15.3	90	Partial
3	Main stem	11.3	Falls	2.4	9.2	90	Partial

TABLE 298. Results of analyses of a water sample collected on Stag Bay Brook, 1972 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1972	6.2	4.0	8.0	0.6	2.0	1.5	0.6	2.4

TABLE 299. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Stag Bay Brook (Murphy 1973). No inaccessible areas were identified.

Location	Accessible areas Spawning units	Rearing units
Main stem	484	3326
T1	44	786
T2	36	648
Total	564	4760
Estimated production		
Smolt	9520	
Adult	1428	

Rattling Brook flows northerly for 29 km, emptying into the Labrador Sea (Fig. 85). From the mouth to km 6, the river averages 50 m in width and meanders over gravel and rubble substrate (Murphy 1973). The water velocity is swift from km 6 to its headwaters. Numerous pools are formed between the rubble/boulder riverbed and scattered bedrock ledges. The rounded river valley in the lower and mid-sections is covered with scrub spruce. The headwater area is barren. The drainage area is 285 km^2 and there are 10 tributaries which have a total length of 71 km (Table 300); neither of the tributaries was considered by Murphy (1973) to be large enough to warrant investigation.

Partial barriers to fish migration occur at the mouth and at km 16.1 on the main stem of Rattling Brook (Table 301). Atlantic salmon, sea-run brook trout, and Arctic char congregate below the first falls where anglers frequently report catching grilse. It is not known whether the river has attained its potential annual production which was estimated by Murphy (1973) to be 3392 adult Atlantic salmon (Table 302).

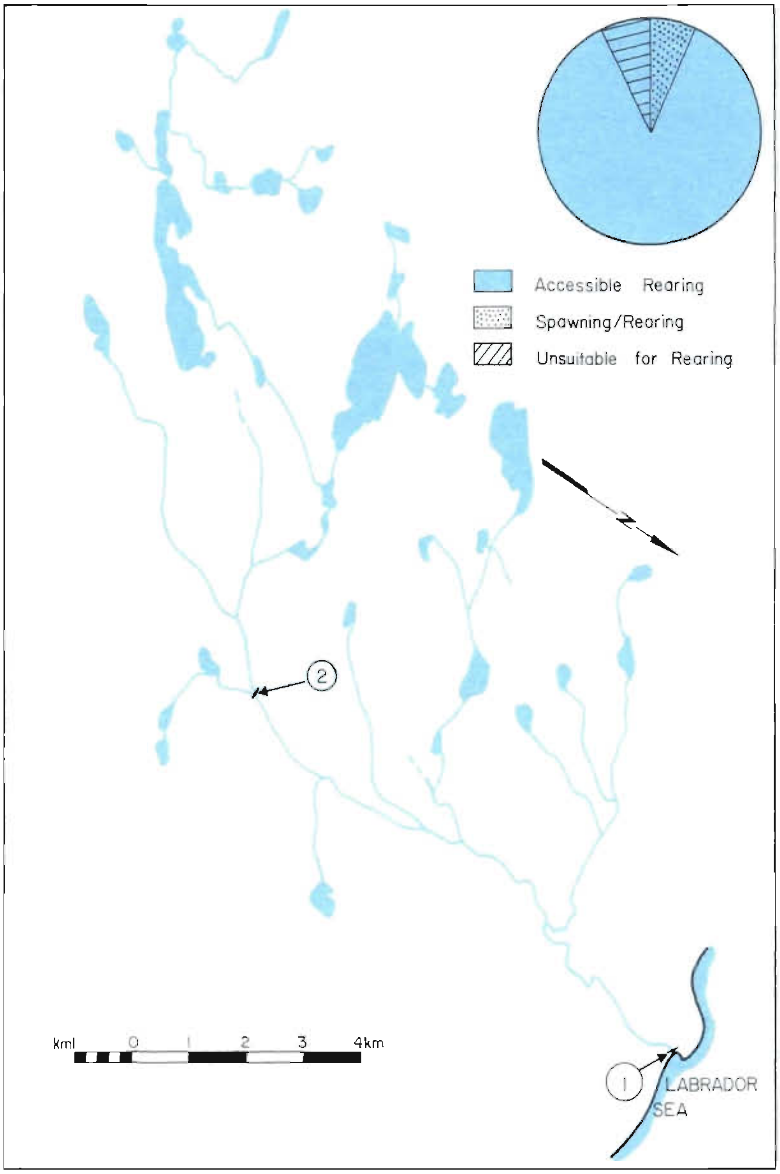

FIG. 85. Map of Rattling Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 300. Physical characteristics of Rattling Brook.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	305 m
Mouth latitude:	54°51′N	Length by meander (main stem):	32 km
Mouth longitude:	58°56′W		
General direction of flow:	North	Total length including tributaries:	103 km
		No. of tributaries:	10
Drainage area:	285 km²	Geological formation:	Gneiss
Mean width	9 km		
Axial length	31 km		
Basin perimeter	77 km		

TABLE 301. Obstructions on Rattling Brook (Murphy 1973).

Fig. 85 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	0.0	Falls	3.1	31.5	60	Partial
2	Main stem	16.1	Falls	3.1	31.5	50	Partial

TABLE 302. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Rattling Brook (Murphy 1973). No inaccessible areas were identified.

Location	Accessible areas Spawning units	Rearing units
Main stem	785	11 308
Total	785	11 308
Estimated production		
Smolt	22 616	
Adult	3 392	

Big River flows for 135 km in a northeast direction from its source of lakes and ponds to its mouth 30 km south of the town of Makkovik (Fig. 86). Recently the river has become prominent due to a uranium discovery, known as the Michelin deposit, near a small tributary in the headwaters. Brinex, the wholly owned exploration arm of Brinco Ltd., has estimated (based on drill core samples) reserves of 2 826 800 t at this site. Millan (1974) estimated the available hydroelectric potential of Big River to be 230 MW, the tenth highest potential of 19 sites surveyed in Labrador. There are no permanent settlers in the watershed area although residents of Makkovik visit the mouth of the river to hunt bay seals, reported by Sollows et al. (1954) to be abundant. The Big River Sport Fishing Camp has been operated seasonally on the lower river since 1967.

The Big River drainage basin covers an area of 2849 km² (Table 303). The lower river ranges from 100 to 350 m in width and flows over a gentle gradient of mud and sand. Ten kilometres from the mouth, the river narrows, water velocities increase, and bottom substrates become coarser (primarily gravel, rubble, and boulder). Several small rapids occur in this section and falls, situated at km 38.6 and km 43.5, form partial barriers to migrating fish (Table 304). White Bear Lake (L1), located at km 52, is the first of a maze of lakes that make up the headwaters.

Several of the tributaries of Big River are important nursery areas for juvenile fish. Murphy (1973) surveyed seven of these streams and recorded 8796 rearing units, with tributaries T3, T15, and T16 (Stanfords River) providing the largest potential (Table 305). Fish passage is partially obstructed on two tributaries, T3 and T6 (Table 304). Except for the barren headwaters, the watershed of Big River is densely forested with black spruce. A water sample, collected in September 1976, was analyzed, and results are presented in Table 306 (Jamieson 1979).

On 9 July 1978, a total of 48 fish (16 longnose suckers, 12 brook trout, 5 white suckers, and 15 ouananiche), were netted in White Bear Lake. A summary of data on length, weight, sex, and age of these fish is presented in Table 307 (Bruce et al. 1979). Records show that brook trout and Atlantic salmon have been angled in Big River and Murphy (1973) and the Labrador Inuit Association (1977) have suggested that Arctic char may also be present. Angling catches of resident brook trout weighing more than 0.5 kg each were: 75 in 1965, 100 in 1966, and 75 in 1967. Catches of sea-run brook trout, taken as a secondary species at the angling camp near the mouth, totalled 743 fish from 1968 to 1975, with 68 of these fish weighing 1.8 kg each or more (Table 308). The reliability of these records is unknown.

Big River is scheduled for Atlantic salmon angling which is reported to be excellent. For the 15 years reported, the mean catch per rod day was 1.43 (Table 309). Most of these fish are taken within 1 mile of a tourist camp on the lower river during a four to five week period in late July and August (T. Curran, pers. comm.). In 1975, a sample of 75 salmon was collected from the anglers' catch. Data on sex ratio, age composition, weight, and fork length are presented in Table 310. Salmon migration is thought to begin with an early run of large female fish in late June and early July, followed by a grilse run and then by a run of large male fish in late August and early September (W. Anderson, pers. comm.). Based on the rearing units recorded in his survey, in 1972, Murphy (1973) estimated the potential annual production of Atlantic salmon to be 3264 fish (Table 305). Angling catches indicate that this river supports a substantial population of salmon. Production may be higher than estimated by Murphy due to the contribution to rearing of the large areas of standing water.

TABLE 303. Physical characteristics of Big River.

Map reference:	Rigolet 13J Snegamook Lake 13K 1 : 250 000	Maximum basin relief:	366 m
		Length by meander (main stem):	52 km
Mouth latitude:	54°50′N	No. of tributaries:	17
Mouth longitude:	58°55′W	Geological formation:	Gneiss
General direction of flow:	Northeast		
Drainage area:	2849 km²		
Mean width	26 km		
Axial length	110 km		
Basin perimeter	343 km		

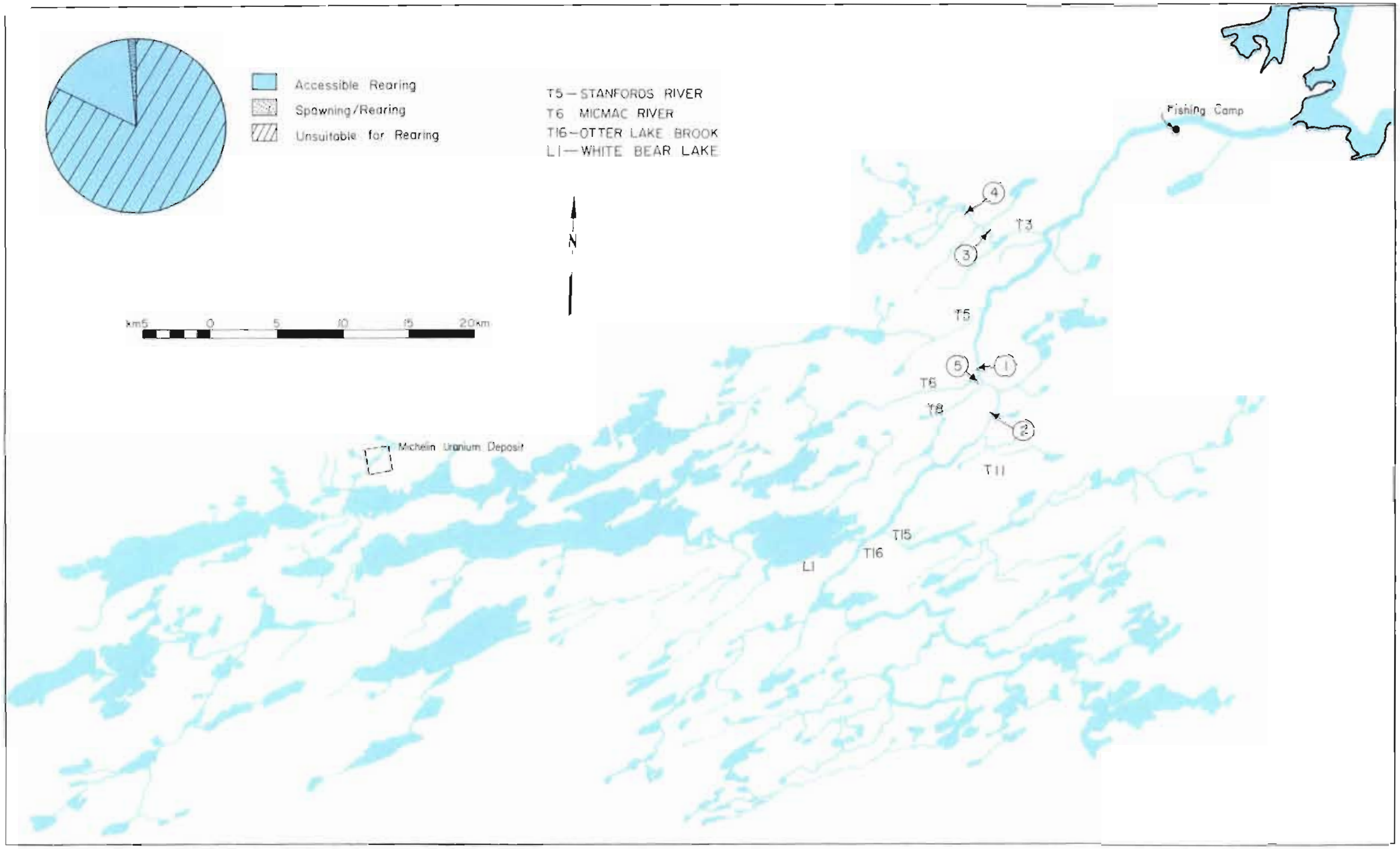

FIG. 86. Map of Big River showing accessible Atlantic salmon parr rearing areas.

TABLE 304. Obstructions on Big River (Murphy 1973).

Fig. 86 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	38.6	Falls	3.1	45.6	45	Partial
2	Main stem	43.5	Falls	4.6	45.6	30	Partial
3	T3	6.4	Falls	3.1	22.9	45	Partial
4	T3	9.7	Falls	2.4	7.6	45	Partial
5	T6	0.0	Falls	2.4	9.2	60	Partial

TABLE 305. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Big River (Murphy 1973). No inaccessible areas were identified.

Location	Accessible areas: Spawning units		Rearing units
Main stem	429		2 083
T3	130		2 552
T5	461		1 334
T6	225		914
T8	0		388
T11	29		248
T15	0		1 680
T16	0		1 680
Total	1 274		10 879
Estimated production			
Smolt		21 758	
Adult		3 264	

TABLE 306. Results of analyses of a water sample collected on Big River, 1976 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (µS·cm^{-1} at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1976	5.5	4.0	16.0	2.5	1.0	0.7	1.7	1.2

TABLE 307. Summary of data on sex, fork length, whole weight, age, and mercury content of longnose sucker, brook trout, and white sucker captured in White Bear Lake, 9 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Longnose sucker	M	8	35.7	0.49	10.4	0.21	0.14–0.30
	F	8	37.3	0.59	11.3	0.12	0.06–0.17
Total		16	36.5	0.54	10.8	0.17	0.06–0.30
Brook trout	M	10	37.0	0.51	5.1	0.09	0.02–0.31
	F	2	33.8	0.41	4.5	0.04	0.04–0.05
Total		12	36.4	0.50	5.0	0.08	0.02–0.31
White sucker	M	2	35.0	0.53	7.5	0.12	0.08–0.16
	F	3	39.4	0.81	7.7	0.22	0.08–0.38
Total		5	37.6	0.70	7.6	0.18	0.08–0.38
Ouananiche	M	9	37.6	0.50	8.2	0.36	0.23–0.61
	F	6	37.1	0.65	7.5	0.41	0.07–1.03
Total		15	37.4	0.56	7.9	0.38	0.07–1.03

TABLE 308. Summary of angling catches of sea-run brook trout, Big River, 1968–75 (DFO, unpubl. data).

	Weight (kg)				
Year	<0.5	≥0.5 to <0.9 kg	≥0.9 to <1.8 kg	≥1.8	Total
1968	0	75	0	0	75
1969	0	0	300	0	300
1970	0	0	79	0	79
1971	0	2	50	0	52
1972	0	3	26	43	72
1973	0	0	25	25	50
1974	0	0	26	0	26
1975	—	—	—	—	89[a]
Total	0	80	506	68	743

[a] Whole weight unknown.

TABLE 309. Summary of Atlantic salmon angling data, Big River, 1964–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1964	5	0	5	12	0.42
1965	20	5	25	65	0.38
1966	70	15	85	45	1.89
1967	10	28	38	140	0.27
1968	68	99	167	243	0.69
1969	—	—	—	—	—
1970	73	32	105	95	1.11
1971	93	25	118	190	0.62
1972	263	57	320	193	1.66
1973	325	0	325	200	1.63
1974	54	3	57	75	0.76
1975	—	—	—	—	—
1976	199	75	274	129	2.12
1977	215	120	335	121	2.77
1978	399	62	461	198	2.33
1979	274	49	323	293	1.10
1980	570	130	700	343	2.04
Mean	176	47	223	156	1.43

TABLE 310. Sex ratio (%F), age composition, weight, and fork length of Atlantic salmon collected from anglers' catch, July and August 1975, Big River (DFO, unpubl. data).

	1-sea-winter								2-sea-winter							
	Female		Freshwater age		Weight (g)		Fork length (cm)		Female		Freshwater age		Weight (g)		Fork length (cm)	
	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*
	50.0	12	3	12	1963	12	55.4	12	0.0	2	3	2	4470	2	74.5	2
	72.9	48	4	48	1942	48	54.9	48	60.0	5	4	5	4150	5	67.4	5
	57.1	7	5	7	1954	7	54.1	7	100	1	5	1	4540	1	75.0	1
		67		67		67		67		8		8		8		8
Mean	67.2		3.9		1947		54.9		50.0		3.9		4279		70.1	

Adlavik Brook (South Brook), is a relatively small stream that empties into Adlavik Bay (Fig.87). The stream flows easterly through a densely wooded valley. The drainage area of the river is 233 km^2; its physical characteristics are listed in Table 311.

This river was surveyed in 1972 by Murphy (1973) who reported that although the entire system is accessible to anadromous fishes, falls at km 22.5 on the main stem and on tributaries T3 and T4 are partial barriers to migration (Table 312). From the mouth to km 2, the river is 61 m wide and flows gently over sand and mud substrate. Further upstream, the river narrows to 30 m. The stream remains slow and meandering with muddy sediments causing the water to be brownish in colour. From km 10 to km 16, the water velocity increases and the bottom composition changes to a combination of boulder and rubble. Above km 16, the river is 18 m wide. Due to the flat terrain, water velocity decreases. Murphy (1973) reported that four of the six tributaries on this system contain good spawning and/ or rearing areas for Atlantic salmon (Table 313). Two water samples were collected from this river in 1972; results of the analyses of these samples are presented in Table 314 (Jamieson 1979).

Murphy (1973) reported that this river system supported populations of Atlantic salmon, Arctic char, and brook trout. Local residents once travelled to the river in the springtime to catch the large seaward migration of brook trout and Arctic char (W. Anderson, pers. comm.). From his survey, Murphy estimated the potential annual production of Atlantic salmon in Adlavik Brook to be 2156 fish (Table 313).

TABLE 311. Physical characteristics of Adlavik Brook.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	244 m
Mouth latitude:	54°52′N	Length by meander (main stem):	32 km
Mouth longitude:	58°58′W	Total length including tributaries:	73 km
General direction of flow:	East	No. of tributaries:	6
Drainage area:	233 km^2	Geological formation:	Precambrian sediments, volcanics, and gneiss
Mean width	7 km		
Axial length	29 km		
Basin perimeter	103 km		

TABLE 312. Obstructions on Adlavik Brook (Murphy 1973).

				Description			
Fig. 87 reference	Location	Distance from mouth (km)	Type	Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	22.5	Falls	—	—	—	Partial
2	T3	—	Falls (2)	—	—	—	Partial
3	T4	—	Falls	—	—	—	Partial

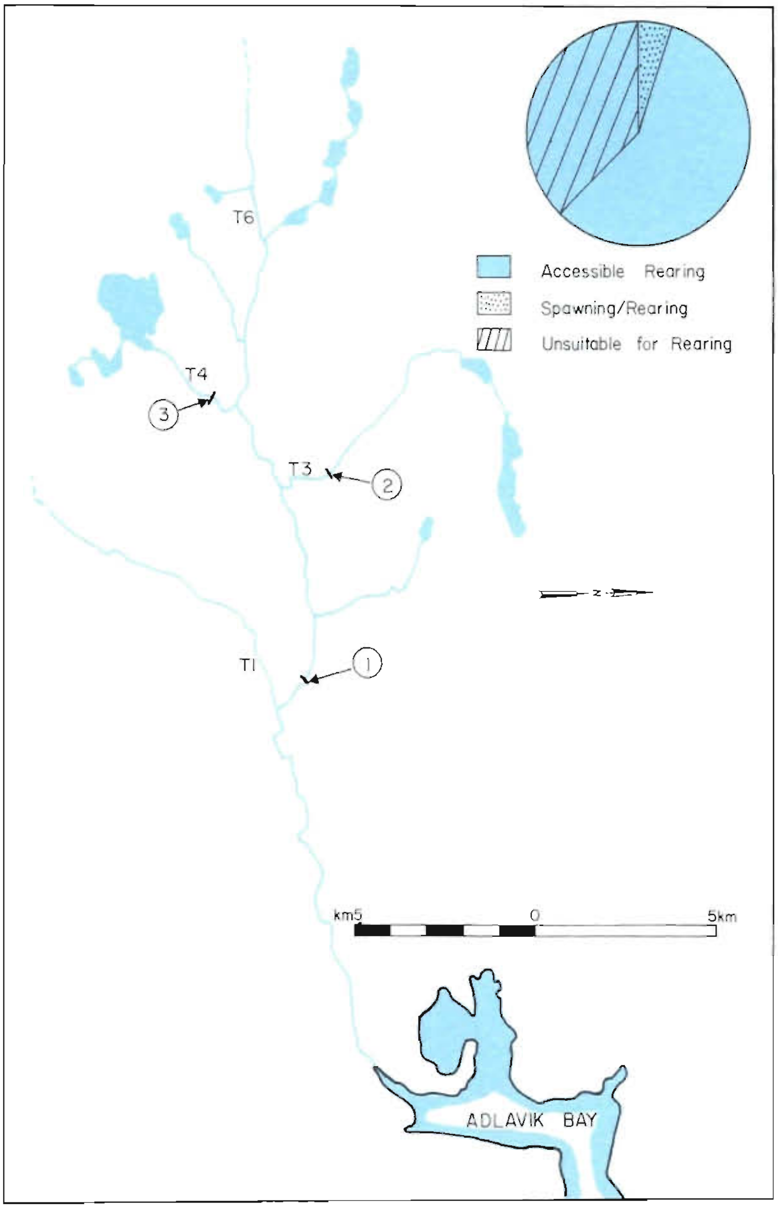

FIG. 87. Map of Adlavik Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 313. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Adlavik River (Murphy 1973). No inaccessible areas were identified.

Location	Accessible areas: Spawning units	Accessible areas: Rearing units
Main stem	546	4 765
T1	0	876
T3	58	969
T4	0	288
T6	0	288
Total	604	7 186
Estimated production		
Smolt	14 372	
Adult	2 156	

TABLE 314. Mean results of analyses of two water samples collected on Adlavik Brook, 1972 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (µS·cm^{-1} at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1972	6.5	5.0	13.0	0.7	2.0	2.5	0.8	2.4

This small stream flows easterly and empties into Adlavik Bay (Fig. 88). It has a drainage area of 39 km^2 (Table 315). Murphy (1973) reported that the river narrows from 9 m in the lower 3 km, to 5 m in the remaining 6 km which he surveyed. There are no barriers to fish migration throughout the system; the lower 8 km of the river flow over rubble and boulder substrate and gravel areas occur in the upper reaches. The watershed is densely forested with black spruce, typical vegetation of this section of coastline.

Little is known of the fish population in this river. Murphy (1973) stated that the river was mainly a "trout stream" and supported a very limited Atlantic salmon population. From his survey, he estimated the annual potential production of adult Atlantic salmon to be 160 fish (Table 316).

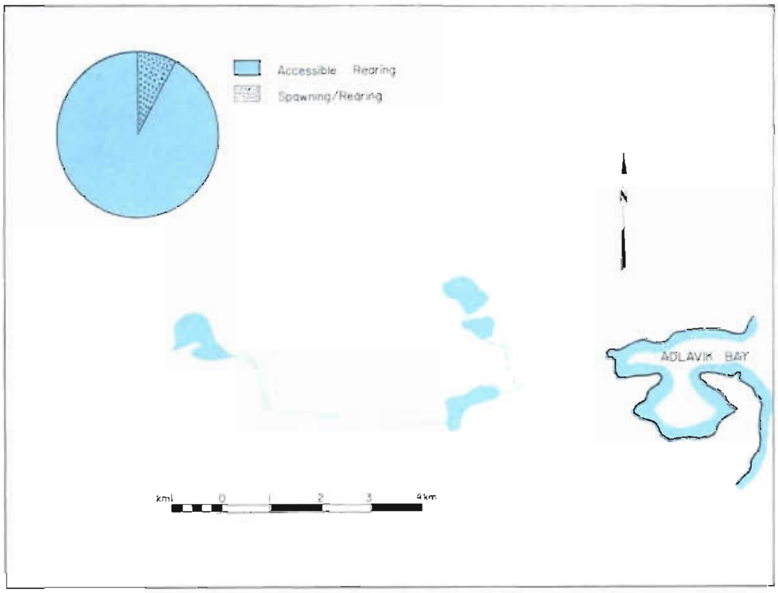

FIG. 88. Map of River 65 (Unnamed) showing accessible Atlantic salmon parr rearing areas.

TABLE 315. Physical characteristics of River 65.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	214 m
Mouth latitude:	54°52′N	Length by meander (main stem):	10 km
Mouth longitude:	59°02′W	Total length including tributaries:	10 km
General direction of flow:	East	No. of tributaries:	1
Drainage area:	39 km^2	Geological formation:	Gneiss
Mean width	5 km		
Axial length	11 km		
Basin perimeter	26 km		

TABLE 316. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in River 65 (Murphy 1973). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	42	533
Total	42	533
Estimated production		
Smolt	1066	
Adult	160	

River 66 (Unnamed)

This brook flows easterly emptying into the northern side of Adlavik Bay (Fig. 89). Its small drainage area (29 km^2) is dominated by several ponds and one lake in the headwaters. The length of meander of the main stem and its one tributary is 8 km (Table 317).

Two falls, one at the mouth and another above the first pond on the main stem, have been reported (Table 318), but their degree of obstruction to migrating fish has not been determined (Murphy, unpublished information). The river is 15 m wide at the mouth, narrowing to 6 m above the third pond, where the substrate has a high percentage of gravel. No information is available on fish species present in this river; however, due to its size and location, populations of brook trout and Arctic char would be expected.

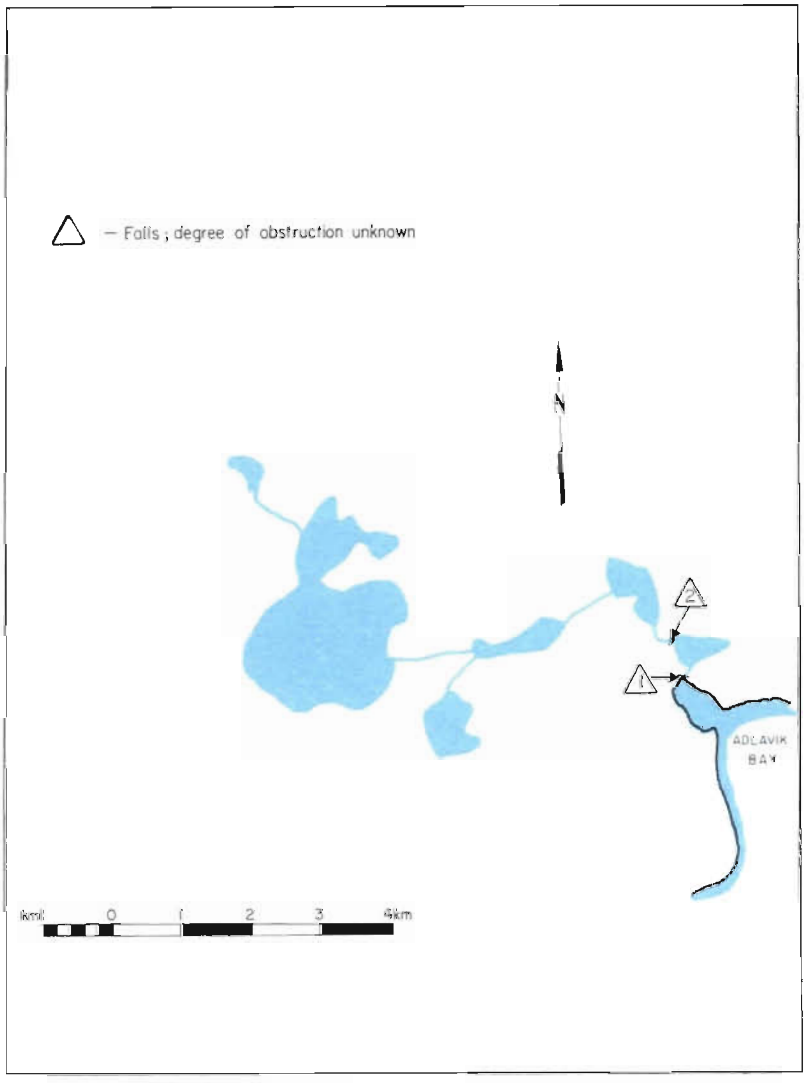

FIG. 89. Map of River 66 (Unnamed) showing accessible and/or inaccessible Atlantic salmon parr rearing areas.

TABLE 317. Physical characteristics of River 66.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	122 m
Mouth latitude:	54°54′N	Length by meander (main stem):	6 km
Mouth longitude:	58°59′W	Total length including tributaries:	8 km
General direction of flow:	East	No. of tributaries:	1
Drainage area:	29 km^2	Geological formation:	Precambrian sediments and volcanics
Mean width	5 km		
Axial length	8 km		
Basin perimeter	23 km		

TABLE 318. Obstructions on River 66 (H. P. Murphy, unpubl. information).

Fig. 89 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	0.0	Falls	2.4	—	—	Unknown
2	Main stem	—	Falls	—	—	—	Unknown

Makkovik Brook empties into Makkovik Harbour 2 km from the community of Makkovik (Fig. 90). The river has a drainage area of 111 km^2 and the main stem flows in a northerly direction for 21 km (Table 319). The mouth of the river is 46 m wide, narrowing to 30 m at km 1. Between km 3 and km 16, the river is broken up by a series of four small lakes. Between the first and second lakes, the gradient is steep and partial obstructions to fish migration occur at km 6.4 and km 8.1; at km 9.7, a 4.6-m vertical falls completely blocks further fish migration (Table 320). The six tributaries in the system are relatively small and are often dry during the summer. The river flows through mountains and the surrounding vegetation consists of scrub black spruce in the lower watershed and lichen and moss in the headwaters. A water sample was collected in 1972: results of the analyses of this sample are presented in Table 321 (Jamieson 1979).

Residents of Makkovik report a run of Atlantic salmon and trout (either Arctic char, brook trout, or both) to Makkovik Brook (Murphy 1973). Information on the size of the populations and timing of the migrations is not available. From his survey in 1972, Murphy (1973) estimated the potential annual production of adult Atlantic salmon in the accessible areas of Makkovik Brook to be 654 fish (Table 322). Inaccessible areas were estimated to be capable of producing only 156 fish.

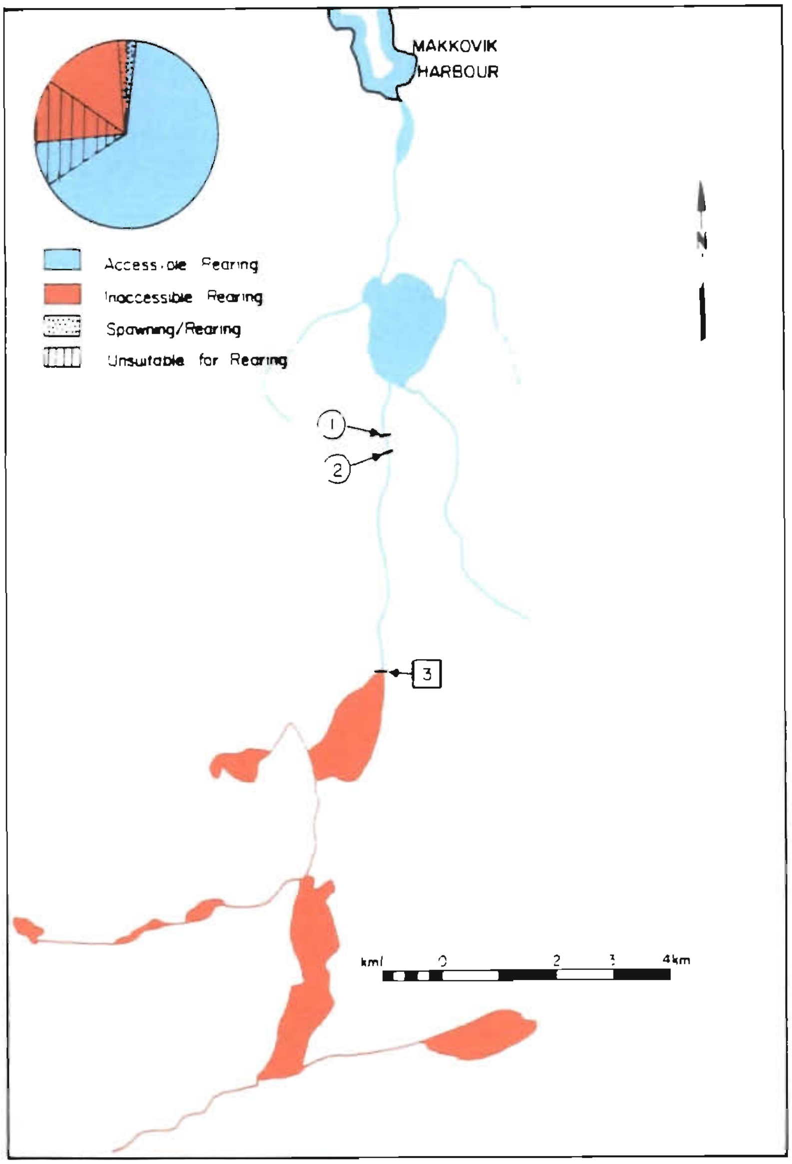

FIG. 90. Map of Makkovik Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 319. Physical characteristics of Makkovik Brook.

Map reference:	Rigolet 13J Makkovik 13-O 1 : 250 000	Maximum basin relief:	275 m
Mouth latitude:	55°04′N	Length by meander (main stem):	21 km
Mouth longitude:	59°10′W	Total length including tributaries:	34 km
		No. of tributaries:	6
General direction of flow:	North	Geological formation:	Precambrian sediments and volcanics
Drainage area:	111 km²		
Mean width	7 km		
Axial length	17 km		
Basin perimeter	48 km		

TABLE 320. Obstructions on Makkovik Brook (Murphy 1973).

				Description			
Fig. 90 reference	Location	Distance from mouth (km)	Type	Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	6.4	Falls	2.4	30.5	45	Partial
2	Main stem	8.1	Falls	2.4	22.9	90	Partial
3	Main stem	9.7	Falls	4.6	3.1	90	Complete

TABLE 321. Results of analyses of a water sample collected on Makkovik Brook, 1972 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1972	6.3	5.0	15.0	0.8	3.0	2.5	0.6	3.7

TABLE 322. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Makkovik Brook (Murphy 1973).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	63	2179	44	520
Total	63	2179	44	520
Estimated production				
Smolt	4358		1040	
Adult	654		156	

Makkovik River flows northeasterly, emptying into Makkovik Bay 25 km southwest of the community of Makkovik (Fig. 91). This river has a drainage area of 259 km^2; the total length of the main stem and its seven tributaries is 92 km (Table 323). The mouth is 36 m wide; the first 3 km are shallow and flow over a rubble and boulder substrate. A lake stretches from km 3 to km 6. The Labrador Inuit Association (1977) reported that ranger seals frequent the lower river, often overwintering and breeding there. From km 8 to its headwaters, the river is frequently interrupted by steadies and small ponds. The one falls on the system, located at km 11.3, is a partial barrier to migrating fish (Table 324). Three tributaries on the system, T4, T5, and T6, are large enough to be used by Atlantic salmon and contain nearly 50% of the river's total rearing area for juvenile fish (Table 325). Murphy (1973) reported that the surrounding vegetation in the lower watershed once consisted of dense black spruce but recently was destroyed by fire. In the headwaters, barren land vegetation predominates. A water sample was collected in 1976; results of the analyses are presented in Table 326 (Jamieson 1979).

Residents of Makkovik report a run of Atlantic salmon and eastern brook trout to this river (Murphy 1973); Arctic char spawn throughout most of the headwaters area (Labrador Inuit Association 1977). Sollows et al. (1954) reported that large salmon, grilse, salmon parr, and brook trout were numerous. Makkovik River is not scheduled for Atlantic salmon angling although a sports angling camp has been operated on the river since 1974. The only official recorded catch of Atlantic salmon was in 1976 when, with an effort of 6 rod days, one large salmon was angled. In 1974, a total of 37 resident brook trout were reported taken by rod and reel. In 1954, trappers reported to Sollows et al (1954) that large numbers of salmon were observed in this river in the early autumn. Murphy (1973) estimated the annual production of adult Atlantic salmon of be 1569 fish (Table 325). Based on information from earlier surveys and the angling fishery, this may be a reasonable estimate.

TABLE 323. Physical characteristics of Makkovik River.

Map reference:	Rigolet 13J 1 : 250 000	Maximum basin relief:	275 m
		Length by meander (main stem):	35 km
Mouth latitude:	54°58′N		
Mouth longitude:	59°25′W	Total length including tributaries:	92 km
		No. of tributaries:	7
General direction of flow:	Northeast	Geological formation:	Precambrian sediments and volcanics
Drainage area:	259 km^2		
Mean width	9 km		
Axial length	32 km		
Basin perimeter	77 km		

TABLE 324. Obstructions on Makkovik River (Murphy 1973).

Fig. 91 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	11.3	Falls	2.1	15.3	45	Partial

FIG. 91 Map of Makkovik River showing accessible Atlantic salmon parr rearing areas.

TABLE 325. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Makkovik River (Murphy 1973). No inaccessible areas were identified.

Location	Accessible areas	
	Spawning units	Rearing units
Main stem	44	2 761
T4	0	679
T5	24	168
T6	36	1 623
Total	104	5 231
Estimated production		
Smolt	10 462	
Adult	1 569	

TABLE 326. Results of analyses of a water sample collected on Makkovik River, 1976 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1976	5.9	6.0	21.0	1.0	2.0	0.6	4.0	2.4

South Brook flows northwesterly, emptying into Kaipokok Bay approximately 2 km south of the mouth of Kaipokok River (Fig. 92). This watershed contains several lakes and ponds and two of the largest lakes, indicated on Fig. 92 as L1 and L2, have areas of 1040 and 3370 ha, respectively (Table 327). The drainage area of the river is 399 km^2; Murphy (1973) reported that although the river lies in a mountainous region there are no obstructions to migration. The vegetation in the river valley is black spruce and the higher areas of the watershed are barren.

The lakes and ponds of this river are connected by swift-flowing streams that afford good nursery area for juvenile Atlantic salmon. Murphy (1973) reported that the only tributary on the system with good habitat for juvenile salmon was tributary 2 (T2), which contained 2090 rearing units and 232 spawning units (Table 328). The sections of main stem surveyed by Murphy contained 1180 rearing units and, based on available rearing area, he estimated the potential annual production of adult Atlantic salmon to be 981 fish (Table 328).

The Labrador Inuit Association (1977) reported that Atlantic salmon enter this river in early July and are referred to locally as grey-backed, green-backed, or hooked-bill salmon. These fish are considered different from the salmon caught outside Kaipokok Bay. Both Arctic char and brook trout also frequent this river, although their population sizes are unknown.

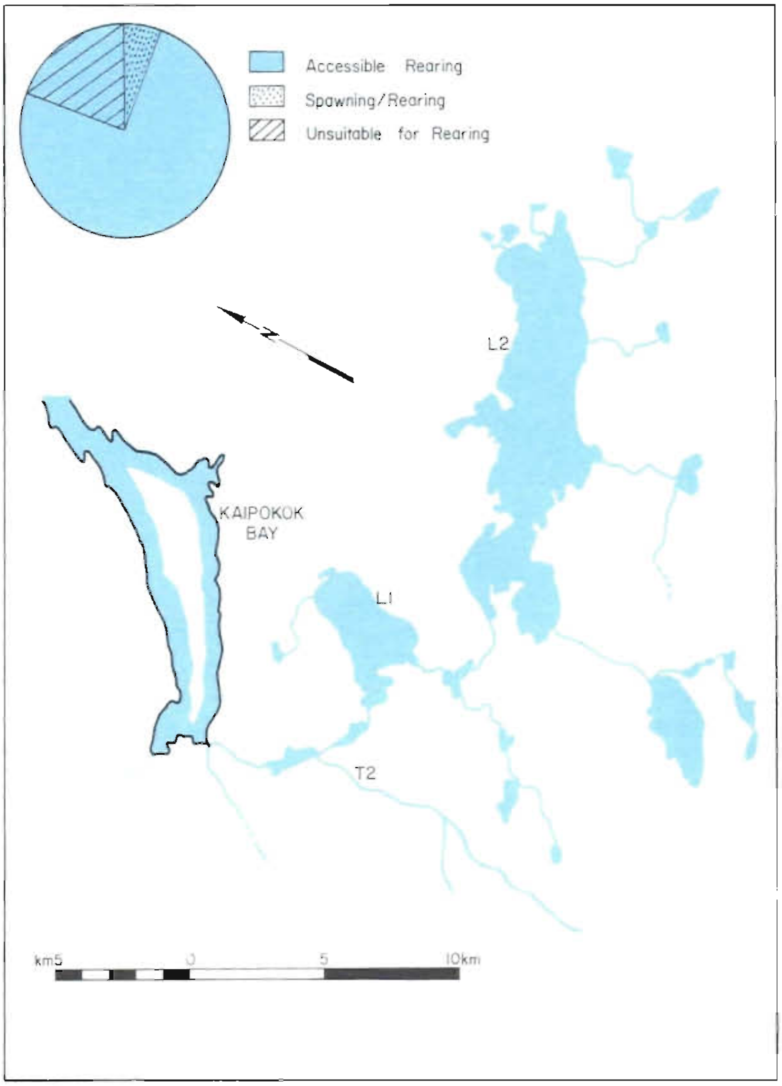

FIG. 92. Map of South Brook showing accessible Atlantic salmon parr rearing areas.

TABLE 327. Physical characteristics of South Brook.

Map reference:	Rigolet 13J Snegamook Lake 13K 1 : 250 000	Maximum basin relief:	397 m
		Length by meander (main stem):	15 km
Mouth latitude:	54°45′N	Total length including tributaries:	40 km
Mouth longitude:	59°56′W	No. of tributaries:	9
General direction of flow:	Northwest	Area of lakes >100 ha:	
		L1	1040 ha
Drainage area:	399 km²	L2	3370 ha
Mean width	12 km		
Axial length	31 km	Geological formation:	Precambrian sediments and volcanics
Basin perimeter	100 km		

TABLE 328. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in South Brook (Murphy 1973). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	0	1180
T2	232	2090
Total	232	3270
Estimated production		
Smolt	6540	
Adult	981	

Kaipokok River is a relatively large river with a drainage area of 2499 km^2 (Table 329). It flows northeasterly, emptying into the Kaipokok Bay, 23 km northwest of the community of Postville (Fig. 93). Sawmills have been the mainstay of the economy of this community since it was established in 1941. The Labrador Inuit Association (1977) has estimated that less than one-third of the 233 residents (Statistics Canada 1981) fish Atlantic salmon commercially.

From its mouth to km 3, Kaipokok River is 45 m wide and flows over rubble/boulder substrate. East Micmac Lake (L1) is located at km 3 and is fed by West Micmac Lake (L2); the areas of these lakes are 700 and 910 ha, respectively (Table 329). Sollows et al. (1954) and Murphy (1973) reported that these lakes are very shallow and muddy which results in silty conditions in the lower river. Residents of Postville have traditionally used this area for hunting migratory birds, fur trapping, and smelt fishing. Ranger seals frequent both lakes and are hunted there in the summer (Labrador Inuit Association 1977). From the inlet of West Micmac Lake at km 19 to km 60, the river narrows from 119 to 23 m and flows slowly over predominantly sand substrate. From km 60 to its headwaters at km 106, the bottom composition of the river becomes coarser with gravel areas alternating with boulders and rubble. A falls at km 67.6, estimated to be from 1.8 to 2.4 m in height, is not a complete barrier to migrating fish but, at km 96.6, further fish migration is halted by a 3.1 m vertical falls (Table 330). Moran Lake (L3) is situated at km 76, and is the location of a mining camp. During his survey in 1972, Murphy (1973) investigated 12 of the 51 tributaries of this river to determine their accessibility and potential for rearing juvenile fish. Seven of these tributaries had either partial or complete barriers to fish migration (Table 330). Accessible and inaccessible rearing and spawning units are presented in Table 331. A water sample was collected on 21 August 1972; results of the analyses of this sample are found in Table 332 (Jamieson 1979).

Residents of Postville have reported to DFO personnel that Atlantic salmon, brook trout, Arctic char, and rainbow smelt are present in Kaipokok River. The salmon migration consists of two runs, one extending from mid-July to mid-August, and the other in October. In past years, the river was netted to obtain Atlantic salmon for domestic use (Labrador Inuit Association 1977). Due to the silty, slow-moving waters, Sollows et al. (1954) considered angling possibilities in the lower river to be practically nil. Murphy (1973) noted that the lack of fishing camps on the system suggested little or no angling activity. Sollows et al. (1954) reported sighting a few Atlantic salmon in the lower river and trappers have seen large salmon in the lower sections late in the fall. From his 1972 survey, Murphy (1973) estimated the annual production of adult Atlantic salmon in the accessible areas of Kaipokok River to be 7202 fish (Table 331). Silt could be a major deterrent to salmon production (T. Curran, pers. comm.).

TABLE 329. Physical characteristics of Kaipokok River.

Map reference:	Rigolet 13J Snegamook 13K 1 : 250 000	Maximum basin relief:	397 m
		Length by meander (main stem):	110 km
Mouth latitude:	54°45′N	Total length including tributaries:	673 km
Mouth longitude:	60°04′W		
		No. of tributaries:	51
General direction of flow:	Northeast	Area of lakes >100 ha:	
		L1 East Micmac	700 ha
Drainage area:	2499 km^2	L2 West Micmac	910 ha
Mean width	27 km	L3 Moran Lake	830 ha
Axial length	95 km		
Basin perimeter	287 km	Geological formation:	Precambrian sediments, gneiss, and volcanics

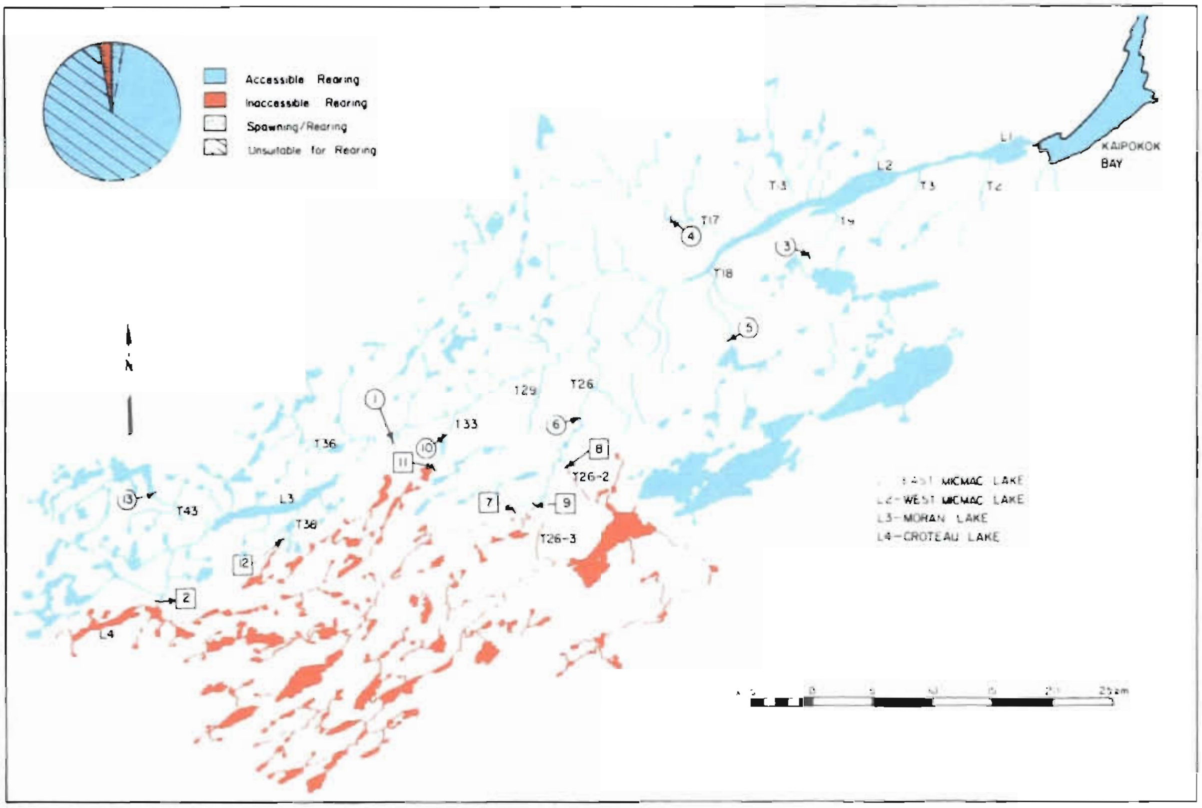

FIG. 93. Map of Kaipokok River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 330. Obstructions on Kaipokok River (Murphy 1973).

Fig. 93 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Description: Width (m)	Description: Slope (°)	Barrier to fish passage
1	Main stem	67.6	Falls	1.8–2.4	31.5	45	Partial
2	Main stem	96.6	Falls	3.1	—	90	Complete
3	T9	4.8	Falls	1.5	6.1	—	Partial
4	T17	6.4	Falls	1.8	6.1	45	Partial
5	T18	6.4	Falls	—	—	—	Partial
6	T26	9.7	Falls	2.4–3.1	15.4	45	Partial
7	T26	20.9	Falls	3.1–3.7	15.4	90	Complete
8	T26-2	3.2	Falls	2.4	3.1	75	Complete
9	T26-3	1.6	Falls	2.4	3.1	45	Complete
10	T33	3.2	Falls	1.8	4.6	60	Partial
11	T33	6.4	Falls	4.6	6.1	90	Complete
12	T38	3.2	Falls	6.1	—	90	Complete
13	T43	6.4	Falls (3)	1.2–1.8	—	—	Partial

TABLE 331. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Kaipokok River (Murphy 1973).

Location	Accessible areas: Spawning units	Accessible areas: Rearing units	Inaccessible areas: Spawning units	Inaccessible areas: Rearing units
Main stem	490	10 598	87	436
T2	80	402	0	0
T3	0	96	0	0
T9	161	1 610	0	0
T13	0	604	0	0
T17	0	685	0	0
T18	0	793	0	0
T26	0	6 409	0	2 320
T29	0	241	0	0
T33	0	448	0	0
T36	138	688	0	0
T38	48	480	0	0
T43	756[a]	952[a]	0	0
Total	1 673	24 006	87	2 756
Estimated production				
Smolt	48 012		5 512	
Adult	7 202		827	

[a]Estimated from topographic map.

TABLE 332. Results of analyses of a water sample collected on Kaipokok River, 1972 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm^{-1} at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1972	6.7	10.0	19.0	24.0	6.0	2.5	1.8	7.3

English River flows easterly, emptying into Kaipokok Bay, approximately 8 km southwest of Postville (Fig. 94). This river has a drainage area of 326 km^2 and is fed by eight tributaries (Table 333). At the mouth, the river is broken up by islands and contains areas of gravel suitable for salmon spawning (Murphy 1973). Above the mouth to km 1, the river is rapid and flows from a 13 km long lake (L1). Upstream from L1, the river consists of a network of small ponds connected by stretches of river with boulder and rubble substrate. Four falls are found throughout the system (Table 334) of which only one is a complete barrier. There was no salmon parr habitat identified above the total obstruction.

Atlantic salmon enter English River in July and local residents claim that a second run occurs in October (Labrador Inuit Association 1977). Brook trout are also reported in this river and Murphy (1973) suggested that, due to the network of ponds and lakes, it may support a sizable population of Arctic char as well. Murphy (1973) also reported that much of the fish rearing capacity of this river system is located in the tributaries. From the total rearing area available to juvenile Atlantic salmon, he estimated the potential annual adult production to be 3032 fish (Table 335). This estimate may vary due to competition with other fish and the amount of rearing that occurs in the standing waters of the system.

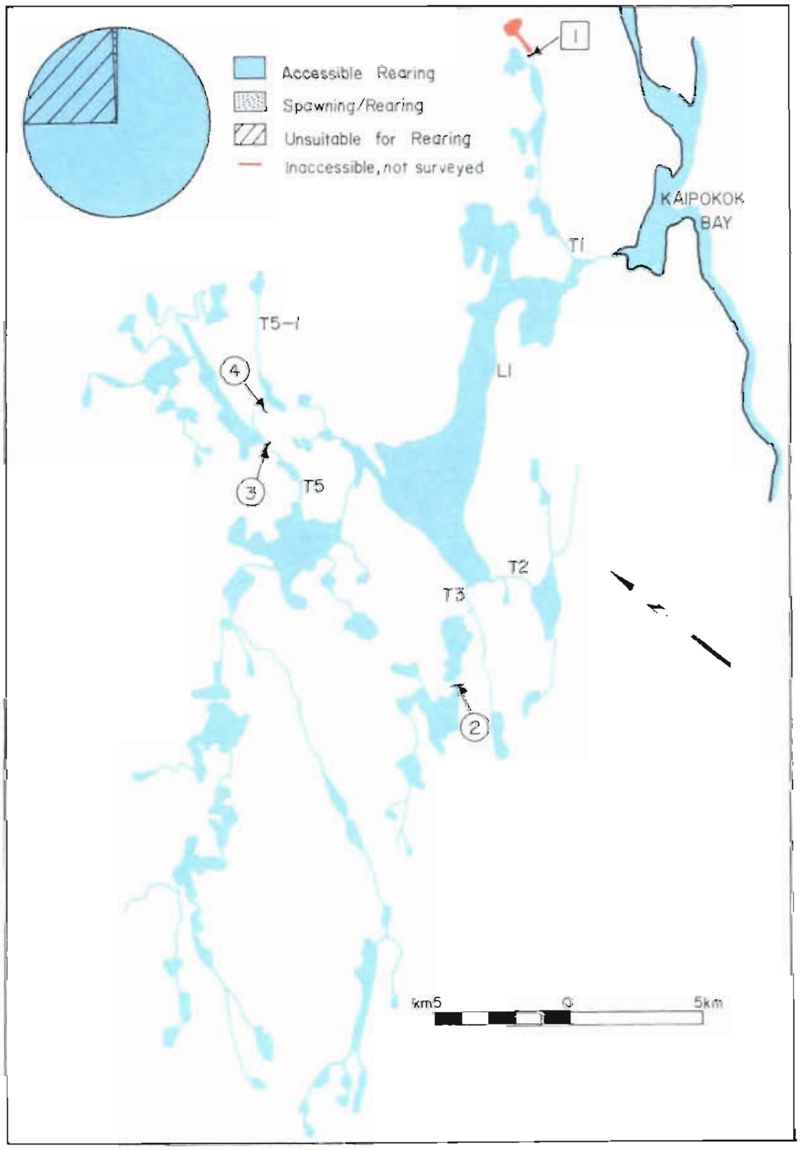

FIG. 94. Map of English River showing accessible Atlantic salmon parr rearing areas.

TABLE 333. Physical characteristics of English River.

Map reference:	Rigolet 13J Snegamook Lake 13K Hopedale 13N Makkovik 13-O 1 : 250 000	Maximum basin relief:	275 m
		Length by meander (main stem):	56 km
Mouth latitude:	54°58′N	Total length including tributaries:	131 km
Mouth longitude:	59°45′W	No. of tributaries:	8
General direction of flow:	East	Geological formation:	Gneiss
Drainage area:	326 km²		
Mean width	12 km		
Axial length	40 km		
Basin perimeter	129 km		

TABLE 334. Obstructions on English River (Murphy 1973).

Fig. 94 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	T1	3.1	Falls	6.1	3.1	90	Complete
2	T3	8.0	Falls	—	—	—	Partial
3	T5	6.4	Falls	2.1	15.2	—	Partial
4	T5-1	1.6	Falls	—	—	—	Partial

TABLE 335. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in English River (Murphy 1973). No inaccessible areas were surveyed.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	15	3 240
T1	0	140
T2	0	80
T3	0	2 100
T5	0	4 545
Total	15	10 105
Estimated production		
Smolt	20 210	
Adult	3 032	

This river flows northerly, emptying into Kanairiktok Bay, (Fig. 95). The drainage area of this river is 399 km^2 (Table 336) and is comprised mainly of lakes and ponds. Good nursery area for juvenile fish is found in the lower 3 km which are 15–20 m wide and swift flowing. Small patches of gravel suitable for spawning were sighted between the lakes on the main stem (Murphy 1973). The entire system is accessible to anadromous fish; Murphy (1973) concluded that the eight tributaries on the system collectively provided 168 rearing units for juvenile salmon (Table 337). The watershed is barren except for a strip of mature forest found along the riverbanks.

This river is known to support populations of both Atlantic salmon and Arctic char and, although both fish overwinter in the river, it is believed they remain in different ponds and lakes (Labrador Inuit Association 1977). Murphy (1973) suggested that the river contained a small population of Atlantic salmon and estimated the potential annual production of adult Atlantic salmon to be 252 fish (Table 337).

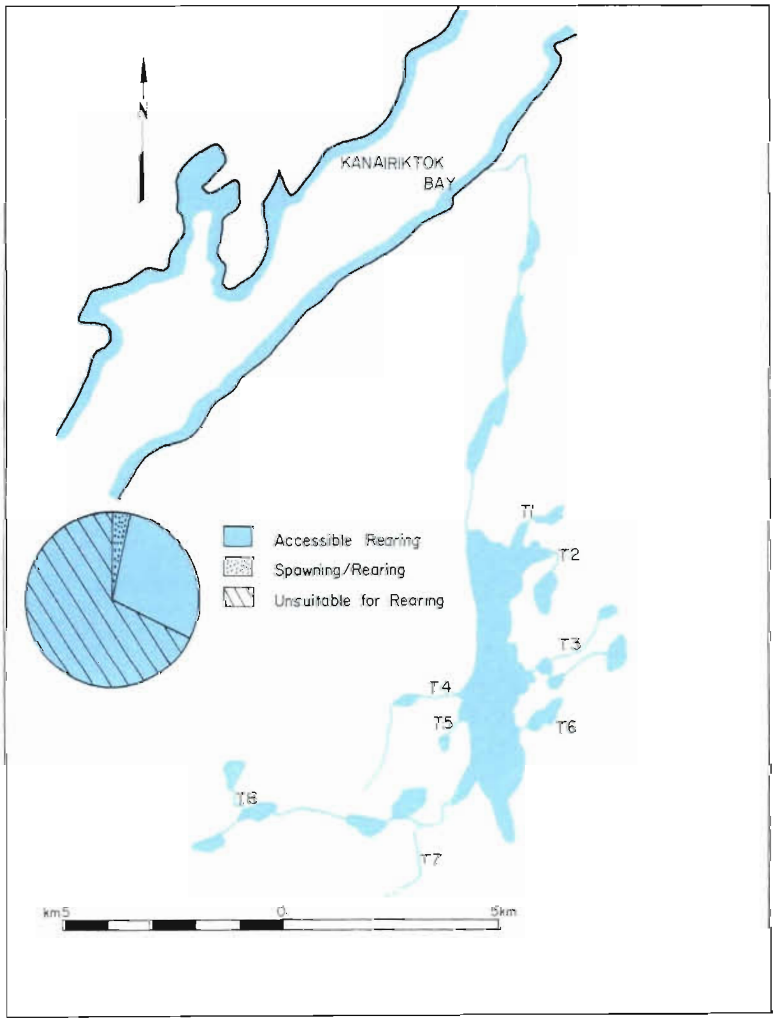

FIG. 95. Map of River 72 (Unnamed) showing accessible Atlantic salmon parr rearing areas.

TABLE 336. Physical characteristics of River 72.

Map reference:	Hopedale 13N 1 : 250 000	Maximum basin relief:	224 m
Mouth latitude:	54°44′N	Length by meander (main stem):	15 km
Mouth longitude:	59°56′W	Total length including tributaries:	40 km
General direction of flow:	North	No. of tributaries:	9
Drainage area:	399 km²		
Mean width	6 km		
Axial length	19 km		
Basin perimeter	40 km		

TABLE 337. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in River 72 (Murphy 1973). No inaccessible areas were identified.

	Accessible areas	
Location	Spawning units	Rearing units
Main stem	84	672
T1, T2, T3, T4, T5, T6, T7, T8	0	168
Total	84	840
Estimated production		
Smolt	1680	
Adult	252	

Kanairiktok River, the third largest river in Labrador, flows northeasterly for 322 km from the Smallwood Reservoir area in western Labrador to Kanairiktok Bay (Fig. 96). Ten percent of its drainage area was diverted in 1971 into Smallwood Reservoir as part of the Churchill Falls hydroelectric development; however, Murphy (1973) reported that the diversion caused no noticeable difference in flow levels in the main river. Millan (1974) estimated the hydroelectric potential of this river to be 817 MW, fourth highest of the 19 sites surveyed in Labrador. With the exception of the hydroelectric diversion and the operation of a sports angling camp on Snegamook Lake (L1), little development has taken place in this vast, isolated watershed. The river formed part of the overland winter route from North West River near Lake Melville to the community of Hopedale, situated 72 km northeast of the river mouth. Scott (1933) took this route in 1929 during his preliminary mapping of Labrador, following the river from Pocketknife Lake (L19) to a point approximately 30 km upstream from the mouth. Ranger seals are reported to frequent the lower river (Labrador Inuit Association 1977).

The watershed covers an area of 12 274 km^2 (Table 338), and flows mainly over sand and gravel through flat country. It was reported by Collins et al. (1972c) to offer very little challenge to the experienced canoeist. The river is totally inaccessible to migrating fishes due to a 9.1-m falls at the mouth (Table 339). This falls was first reported by Sollows et al. (1954) and was surveyed by DFO personnel in 1973 who, at that time, estimated the cost of a fishway to be \$500,000–\$700,000. A second complete obstruction, a 7.6-m falls, is located at km 1.6, and in 1973 it was estimated that by blasting and baffling the natural runaround, this falls could be remedied at a cost of \$50,000–\$75,000. From the second falls to km 27.4, the river is 140–190 m wide, smooth-flowing over a sand and gravel substrate and broken by several rapid sections. At km 27.4, there is a third falls, 4.6 m in height, that was classified by Murphy (1973) as a partial barrier to migrating fish. The 1973 DFO obstruction survey estimated the cost of construction of a fishway at this site to be \$500,000–\$600,000. From the third falls to Snegamook Lake (L1) at km 89, the river bed consists of sand and gravel substrate with occasional patches of rubble. Channel widths vary from 50 to 190 m. Snegamook Lake is 26 km long and covers an area of 8290 ha. Beyond it the river meanders through level terrain over sand and gravel. At km 201, the gradient increases, flows become swifter, and the bottom substrate changes to a mixture of boulder, rubble, and gravel for the next 81 km. At km 282, the beginning of the headwaters, the gradient decreases and a network of steadies and small ponds characterize the area. Murphy (1973) reported that the lower portion of the river valley is forested and the headwaters area is barren.

Several of the tributaries of Kanairiktok River make important contributions to its potential fish rearing capacity (Table 340). The most important of these tributaries are T89 and T90 which have a combined juvenile fish rearing area of over 35 000 units. Twelve obstructions occur on the tributaries of Kanairiktok River, nine of which are complete barriers to fish migration. Water samples were collected in 1972 and 1978; results of the analyses of these samples are presented in Table 341 (Jamieson 1979).

The reported fish population of Kanairiktok River is limited to landlocked or resident populations of Atlantic salmon (ouananiche), brook trout, lake trout, northern pike, lake whitefish, longnose sucker, and burbot. In July 1965, a survey by DFO personnel from Goose Bay was conducted on the 16-km section of river directly below Snegamook Lake. A total of 84 fish were angled (Table 342); a report mentioned that several larger fish were lost due to the light tackle used. Also in 1965, an angled catch of 60 brook trout weighing greater than 0.5 kg each and 60 lake trout (weight unknown) was recorded from Pocketknife Lake (L19). Records of angling catches from Snegamook Lake were received in 1964, 1965, and 1973–75; the total number of fish taken was 509 (Table 343). On 13 July 1978, 52 lake whitefish, 3 longnose suckers, 15 lake trout, and 2 burbot were netted in Snegamook Lake. A summary of data on sex, fork length, weight, and age of these samples is presented in Table 344 (Bruce et al. 1979).

The potential for anadromous Atlantic salmon in Kanairiktok River is tremendous. During his survey in 1972, Murphy (1973) recorded 133 109 rearing units and 80 071 spawning units. If the obstructions on the lower main stem were bypassed, the river could produce as many as 39 933 adult Atlantic salmon annually. This river appears to represent an ideal opportunity for Atlantic salmon enhancement in Labrador.

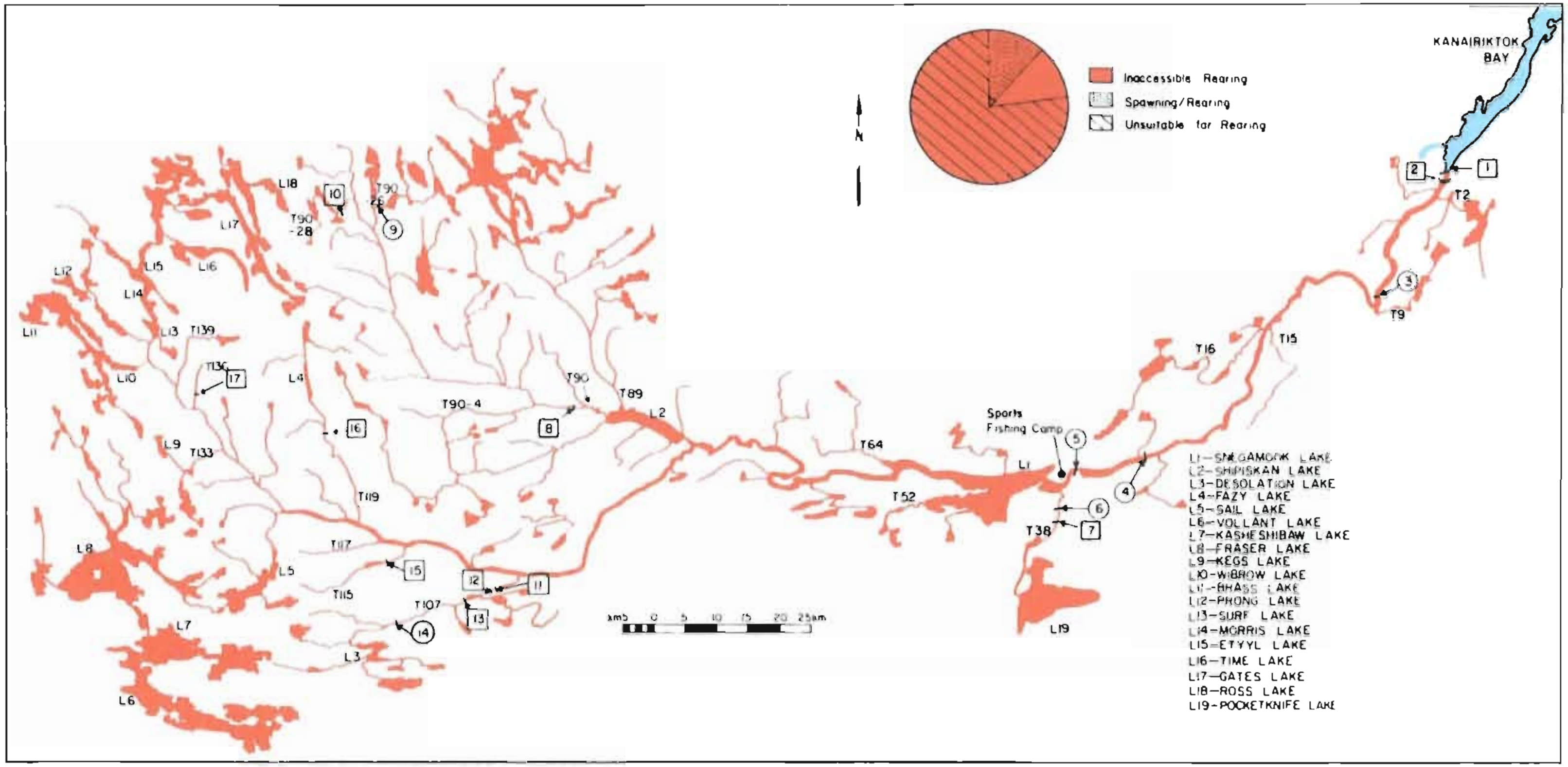

FIG. 96. Map of Kanairiktok River showing inaccessible Atlantic salmon parr rearing areas.

TABLE 338. Physical characteristics of Kanairiktok River.

Map reference:	Snegamook Lake 13K Kasheshibaw Lake 13L Hopedale 13N 1 : 250 000	Maximum basin relief:	168 m
		Length by meander (main stem):	322 km
Mouth latitude:	55°02′N	Total length including tributaries:	1449 km
Mouth longitude:	60°18′W	No. of tributaries:	153
General direction of flow:	Northeast	Area of lakes >100 ha:	
		L1 Snegamook Lake	8290 ha
Drainage area:	12 274 km²	L2 Shipiskan Lake	2330 ha
Mean width	48 km		
Axial length	263 km	Geological formation:	Precambrian sediments, and volcanics; anorthosite and associated rocks; gneiss
Basin perimeter	948 km		

TABLE 339. Obstructions on Kanairiktok River (Murphy 1973).

Fig. 96 reference	Location	Distance from mouth (km)	Type	Description			Barrier to fish passage
				Height (m)	Width (m)	Slope (°)	
1	Main stem	0.0	Falls	9.1	91.4	60	Complete
2	Main stem	1.6	Falls	7.6	61.0	45	Complete
3	Main stem	27.4	Falls	4.6	61.0	40	Partial
4	Main stem	66.0	Rapids	3.1	15.2	45	Partial
5	Main stem	82.1	Falls	1.8	61.0	45	Partial
6	T38	4.8	Falls	1.8	15.2	45	Partial
7	T38	16.1	Falls	3.1	30.5	75	Complete
8	T90	40.2	Falls	6.1	15.2	90	Complete
9	T90-26	3.2	Falls	2.4	22.9	45	Partial
10	T90-28	4.8	Falls	6.1	7.6	90	Complete
11	T107	3.2	Falls	2.8	15.2	90	Complete
12	T107	6.4	Falls	3.0	15.2	75	Complete
13	T107	9.7	Falls	4.6	9.1	90	Complete
14	T107	17.7	Falls	2.4	15.2	45	Partial
15	T115	6.4	Falls	—	—	—	Complete
16	T119	17.7	Falls	3.9	9.2	90	Complete
17	T136	1.6	Falls	—	—	—	Complete

TABLE 340. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Kanairiktok River (Murphy 1973).

Location	Accessible areas		Inaccessible areas	
	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	0	0	76 098	76 098
T2	0	0	348	1 741
T9	0	0	0	496
T15	0	0	0	774
T16	0	0	904	1 278
T38	0	0	0	2 970
T52	0	0	0	46
T64	0	0	0	232
T89	0	0	580	10 444
T90	0	0	1 461	24 690
T107	0	0	298	3 284
T117	0	0	0	644
T119	0	0	382	8 983
T133	0	0	0	1 205
T139	0	0	0	224
Total	0	0	80 071	133 109
Estimated production				
Smolt			266 218	
Adult			39 933	

TABLE 341. Results of analyses of three water samples collected on Kanairiktok River, 1972 and 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (µS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1972[a]	7.3	13.0	24.0	0.4	10.5	1.0	2.3	12.8
1978	6.7	14.0	32.0	0.6	9.0	3.8	2.0	11.0

[a]Mean of two samples.

TABLE 342. Summary of angling catch, Kanairiktok River, 11–16 July 1965 (DFO, unpubl. data).

Species	Number angled	Average weight (kg)	Remarks
Lake trout	30	6.8	Spawning (?); feeding on ouananiche
Brook trout	4	0.2	Spawning(?); silvery; free of parasites
Northern pike	15	4.5	Completed spawning
Ouananiche (adult)	25	0.9	Spawning; feeding on aerial insects
Parr	10	0.2	Believed to be young ouananiche
Total	84		

TABLE 343. Summary of sports angling catch, Snegamook Lake, Kanairiktok River, 1964, 1965, 1973–75 (DFO, unpubl. data).

Year	Brook trout <0.5 kg	Brook trout ≥0.5 kg	Lake trout <2.3 kg	Lake trout ≥2.3 to <4.5 kg	Lake trout ≥4.5 to <6.8 kg	Lake trout Weight unknown	Northern Pike >0.5 kg	Landlocked salmon <0.5 kg	Landlocked salmon ≥0.5 kg	Landlocked salmon Weight unknown	Total
1964	0	10	—	—	—	20	—	—	—	50	80
1965	0	50	—	—	—	50	—	—	—	60	160
1973	11	5	0	97	0	0	32	38	29	0	212
1974	20	10	0	0	0	0	20	0	0	0	50
1975	—	—	0	3	1	0	0	3	0	0	7
Total	31	75	0	100	1	70	52	41	29	110	509

TABLE 344. Summary of data on sex, fork length, whole weight, age, and mercury content of lake whitefish, longnose sucker, lake trout, and burbot captured in Snegamook Lake, Kanairiktok River, 13 July 1977 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Lake whitefish	M	28	44.9	1.23	12.2	0.17	0.08–0.31
	F	24	47.1	1.44	13.2	0.20	0.08–0.33
Total		52	45.9	1.33	12.7	0.19	0.08–0.33
Longnose sucker	M	1	30.5	0.32	10.0	0.06	—
	F	2	30.8	0.33	9.5	0.07	0.05–0.10
Total		3	30.7	0.33	9.7	0.07	0.05–0.10
Lake trout	M	5	46.2	1.06	10.8	0.34	0.22–0.42
	F	10	56.4	2.17	15.0	0.47	0.30–0.79
Total		15	53.0	1.80	13.6	0.43	0.22–0.79
Burbot	M	2	56.8	1.09	9.5	0.18	0.13–0.23

Little Bay River flows northeasterly and empties into Little Bay, a long narrow inlet between Kanairiktok Bay and Ugjoktok Bay (Fig. 97). This river has a drainage area of 244 km^2 (Table 345). The main stem flows along the side of a range of hills that face Ugjoktok Bay. No falls have been reported.

Residents of Hopedale (48 km to the north) have reported a good run of Atlantic salmon and Arctic char to the river. They claim that the different species overwinter separately in different ponds and lakes (Labrador Inuit Association 1977). This river is scheduled for Atlantic salmon angling. Although no catch or effort data have been recorded, visitors to the river have reported salmon angling to be excellent. Most angling takes place in the pools below and above the first pond. Commercial salmon fishing in Little Bay is limited due to its distance from Hopedale. Ranger seals are known to frequent the entire lower river, often overwintering and breeding in freshwater (Labrador Inuit Association 1977). No surveys have been conducted on the rearing capacity of the river, but all reports indicate it is a good producer of both Atlantic salmon and Arctic char.

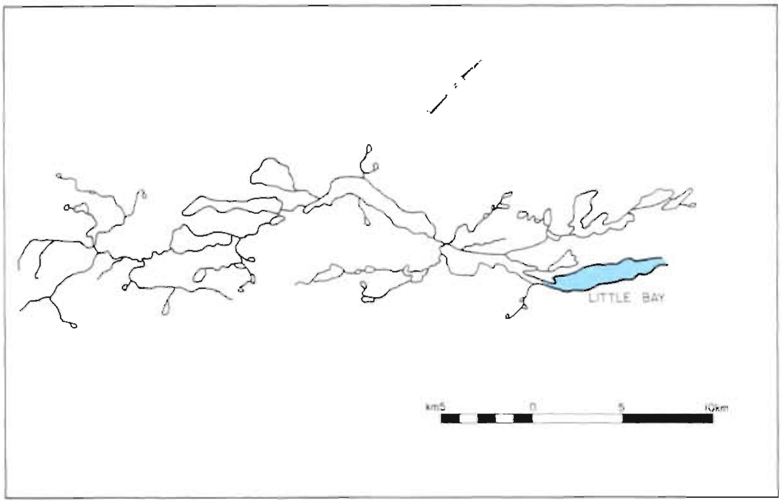

FIG. 97. Map of Little Bay River (not surveyed).

TABLE 345. Physical characteristics of Little Bay River.

Map reference:	Hopedale 13N Snegamook Lake 13K 1 : 250 000	Maximum basin relief:	183 m
		Length by meander (main stem):	35 km
Mouth latitude:	55°06′N	Total length including tributaries:	113 km
Mouth longitude:	60°18′W	Geological formation:	Gneiss
General direction of flow:	Northeast		
Drainage area:	244 km^2		
Mean width	7 km		
Axial length	31 km		
Basin perimeter	97 km		

River 75 (Unnamed)

This river flows northeasterly and empties into Ugjoktok Bay (Fig. 98). It has a drainage area of 475 km² and is fed by 23 tributaries (Table 346). No information other than that listed in Table 346 is available on this relatively large river system.

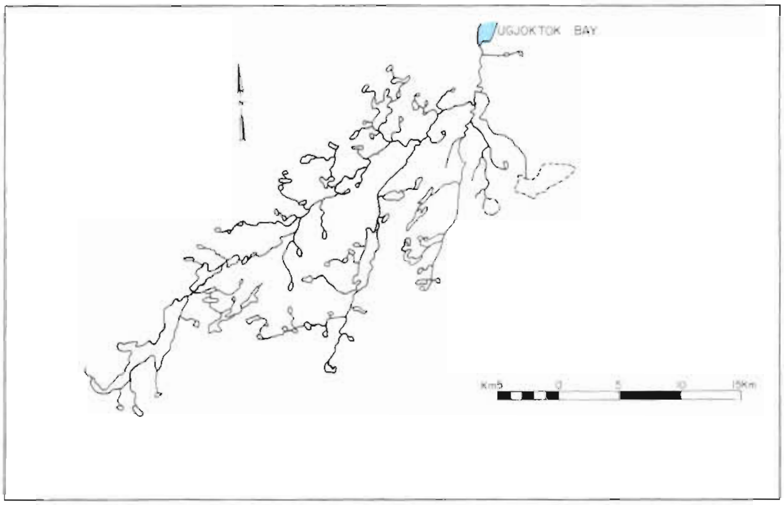

FIG. 98. Map of River 75 (Unnamed) (not surveyed).

TABLE 346. Physical characteristics of River 75.

Map reference:	Snegamook Lake 13K 1 : 250 000	Maximum basin relief:	336 m
Mouth latitude:	54°59′N	Length by meander (main stem):	52 km
Mouth longitude:	60°41′W	Total length including tributaries:	171 km
General direction of flow:	Northeast	No. of tributaries:	23
Drainage area:	475 km²	Geological formation:	Gneiss
Mean width	10 km		
Axial length	47 km		
Basin perimeter	129 km		

This river, the fourth largest in Labrador, has its source at the Quebec–Labrador border and flows easterly for 258 km to the sea (Fig. 99). A unique feature of this river is that it branches 15 km from salt water and has two mouths, one at Ugjoktok Bay and the other at Adlatok Bay. The river below the branch flowing into Ugjoktok Bay is known as Ugjoktok River; the remainder of the system is known as Adlatok River. The area of the watershed is relatively large (111 106 km^2) and the only development documented has been the establishment of sports fishing camps at the mouth of Adlatok River. Hopedale, a community of 425 (Statistics Canada 1981), lies 48 km to the northeast of the river. Murphy and Porter (1974a) reported that the main river flows smoothly through a deep channel and the surrounding countryside is scrub forest except in the barren headwaters area. Ninety-eight tributaries, with a total overall length of 4694 km, have been recorded (Table 347).

Sollows et al. (1954) cited reports that the Ugjoktok River was blocked by a high falls. Although Murphy and Porter (1974a) did not survey the Ugjoktok River, they reported that it was inaccessible to anadromous fish due to a complete falls at the mouth. T. Curran (pers. comm.) has verified the presence of this obstruction. For its first 2 km, Adlatok River flows through a narrow (22 m) gorge which is bordered by foot trails used by anglers. From km 2 to km 37, Collins et al. (1972d) reported that large sand bars were encountered on the river banks, the current is slow (minimum of 0.3 m/s), and relief is gentle. Murphy and Porter (1974a) recorded 2639 spawning units in this section. From km 37 to km 79, the river width varies from 24 to 31 m and the large stretches of boulder and rubble provide good rearing habitat for juvenile fish. Collins et al. (1972d) found this section to have moderate flow rates, interrupted by small rapids and falls. Murphy and Porter (1974a) reported two falls in this section although neither was considered a serious barrier to fish migration (Table 348). In the section from km 79 to km 114, the river channel cuts through steep gravel banks and in some areas reaches 120 m in width. Above km 114, the river narrows to 47 m, the gradient becomes steeper, and the bottom composition becomes coarser. Collins et al. (1972d) reported several rapids and falls in this section although Murphy and Porter (1974a) recorded only one falls, a partial barrier at km 133.6 (Table 348). The river then widens to 274 m for 25 km upstream of this obstruction. From this wide steady to km 209.2, widths range from 37 to 91 m and the bottom composition includes gravel, rubble, and boulders. At km 209.2, a 3.7-m falls is a complete barrier to fish migration (Table 348).

Nine of the tributaries to the Adlatok River were surveyed by Murphy and Porter (1974a) to determine spawning and rearing potential. Seven of these tributaries are either partially or totally inaccessible to migrating fishes although the largest, the Shapio Lake system (T14), contains over 19 000 rearing units that are completely accessible to anadromous fish (Table 349). Water samples were taken from Adlatok River in 1975 and 1978; results of the analyses of these samples are found in Table 350 (Jamieson 1979).

Fish species reported in Adlatok River include both anadromous Atlantic salmon and ouananiche, brook trout, Arctic char, northern pike, and longnose sucker. Weed (1934) reported lake trout taken in Adlatok Bay, which may indicate their presence in the system. In August 1977, 26 Arctic char and 12 ouananiche were netted in Shapio Lake (L1). In July 1978, 13 Arctic char and 1 ouananiche were netted in Mistinippi Lake (L2). A summary of data on fork length, weight, age, and sex of these fish is presented in Tables 351 and 352 (Bruce et al. 1979).

Some data on angling have been reported for brook trout, Arctic char, and Atlantic salmon. A total angling catch of 1552 sea-run brook trout and 983 Arctic char was reported for 1967–74 (Table 353); however, it is suspected that these data are gross underestimates (T. Curran, pers. comm.). Both Adlatok River and the branch known as Ugjoktok River are scheduled for Atlantic salmon angling and the river is noted for its high percentage of large salmon in the catch. Most angling occurs in the area of the sports angling camps near the mouth. For the 10 years during which data were collected, the mean salmon angling catch was 71 fish and the mean effort 191 rod days (Table 354). Samples were collected from the salmon angling catch in 1973 and 1974; data on sex ratio, age composition, weight, and fork length of these fish are presented in Table 355.

From a survey in 1973, Murphy and Porter (1974a) estimated the annual production of adult Atlantic salmon in the accessible areas of Adlatok River to be 39 000 fish (Table 349). There are 48 918 units of juvenile rearing area inaccessible to anadromous fish.

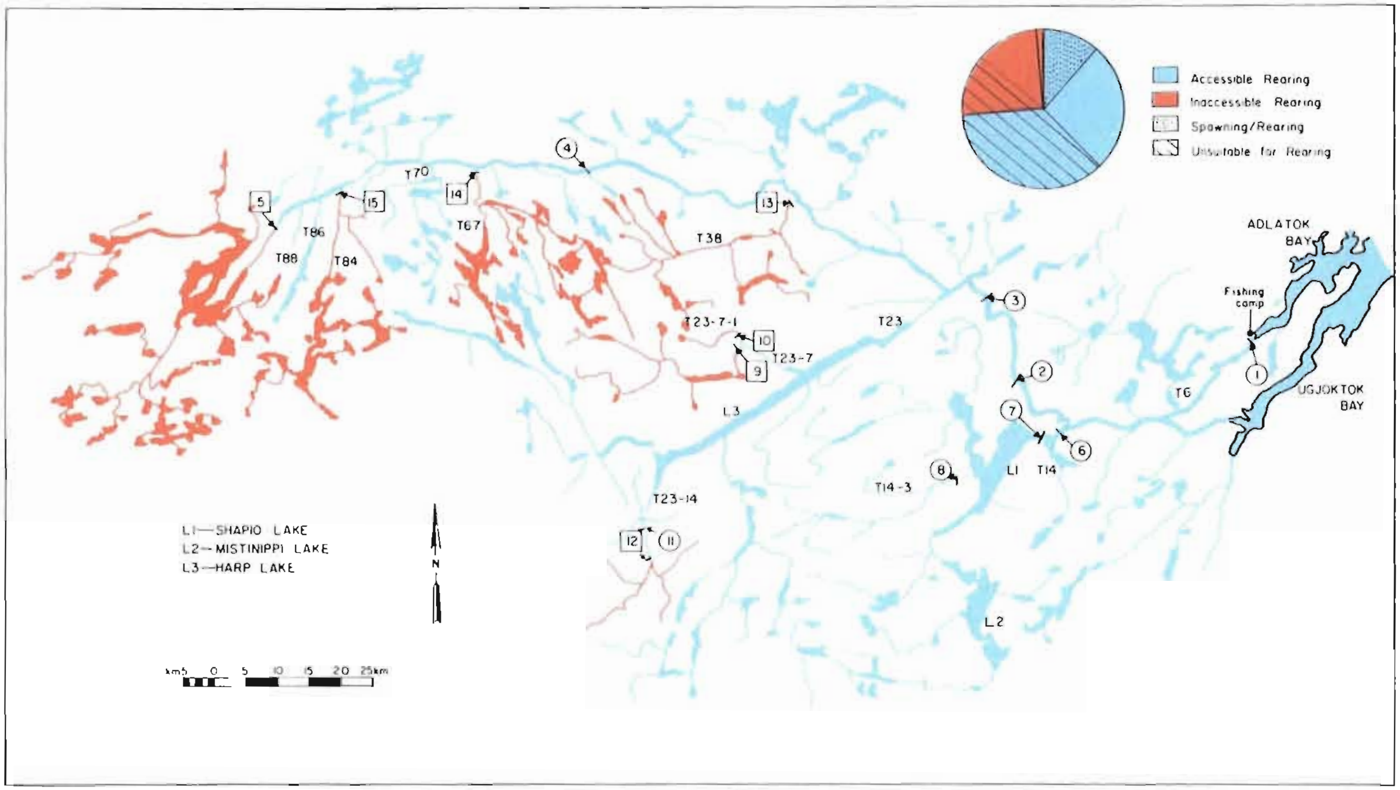

FIG. 99. Map of Adlatok (Ugjoktok) River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 347. Physical characteristics of Adlatok (Ugjoktok) River.

Map reference:	Mistastin Lake 13M Snegamook Lake 13K Hopedale 13N Kasheshibaw Lake 13L 1 : 250 000	Maximum basin relief:	671 m
		Length by meander (main stem):	258 km
Mouth latitude:	55°09′N	Total length including tributaries:	4952 km
Mouth longitude:	60°35′W	No. of tributaries:	98
General direction of flow:	East	Geological formation:	Gneiss, anorthosite and associated rocks; granite and associated rocks
Drainage area:	11 106 km²		
Mean width	53 km		
Axial length	196 km		
Basin perimeter	774 km		

TABLE 348. Obstructions on Adlatok River (Murphy 1973).

Fig. 99 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	1.6	Gorge	—	—	—	Partial
2	Main stem	53.1	Falls	2.4	30.5	60	Partial
3	Main stem	70.8	Falls	3.1	91.5	60	Partial
4	Main stem	133.6	Falls	2.1	—	—	Partial
5	Main stem	209.2	Falls	3.7	9.1	80	Complete
6	T14	1.6	Falls	4.6	61.0	60	Partial
7	T14	8.1	Falls	2.1	9.1	80	Partial
8	T14-3	8.1	Falls	1.8	15.2	90	Partial
9	T23-7	9.7	Falls	3.1	3.1	90	Complete
10	T23-7-1	0.5	Falls	—	—	—	Complete
11	T23-14	6.4	Falls	3.1	6.1	45	Partial
12	T23-14	9.7	Falls	3.8	6.1	90	Complete
13	T38	0.0	Falls	4.6	4.6	60	Complete
14	T67	0.0	Falls	—	—	—	Complete
15	T84	0.0	Falls	—	—	—	Complete

TABLE 349. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Adlatok River (Murphy 1973).

Location	Accessible areas: Spawning units	Accessible areas: Rearing units	Inaccessible areas: Spawning units	Inaccessible areas: Rearing units
Main stem	38 049	97 488	0	20 870
T6	102	7 689	0	0
T14	662	19 109	0	0
T23	115	5 714	1 066	8 780
T38	0	0	531	8 237
T67	0	0	0	3 000[a]
T70	0	0	0	3 448[a]
T84	0	0	0	2 000[a]
T86	0	0	0	1 424
T88	0	0	0	1 159
Total	38 928	130 000	1 597	48 918
Estimated production				
Smolt	260 000		97 836	
Adult	39 000		14 675	

[a]Estimated from topographic map.

TABLE 350. Results of analyses of three water samples collected on Adlatok River, 1973 and 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm-1 at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.7	12.0	25.0	3.6	12.0	0.5	2.2	14.6
1978	6.6	10.0	16.0	0.2	6.0	0.7	1.0	7.3
1978	6.5	4.0	17.0	0.7	4.0	0.5	1.5	4.9

TABLE 351. Summary of data on sex, fork length, age, and mercury content of Arctic char and ouananiche captured in Shapio Lake, Adlatok River, 21 August 1977 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Arctic char	M	15	44.5	9.9	0.66	0.09–1.75
	F	11	30.9	8.6	0.29	0.08–1.71
Total		26	38.3	9.1	0.49	0.08–1.75
Ouananiche	M	9	33.3	6.3	0.13	0.02–0.52
	F	3	30.3	6.3	0.06	0.02–0.10
Total		12	32.5	6.3	0.11	0.02–0.52

TABLE 352. Summary of data on sex, fork length, whole weight, age, and mercury content of Arctic char and ouananiche captured in Mistinippi Lake, Adlatok River, 4 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Arctic char	M	4	41.0	0.69	10.0	0.45	0.24–0.67
	F	9	40.4	0.62	11.0	0.52	0.13–0.96
Total		13	40.6	0.64	10.7	0.50	0.13–0.96
Ouananiche	F	1	26.0	0.10	5.0	0.50	—
Total		1	26.0	0.10	5.0	0.50	—

TABLE 353. Summary of angling catches of sea-run brook trout and Arctic char, Adlatok River, 1967–74 (DFO, unpubl. data).

Year	Sea-run brook trout			Arctic char (weight unknown)
	<0.5 kg	0.5–0.9 kg	1.0–1.8 kg	
1967	0	400	0	—
1968	89	80	0	—
1969	0	172	19	—
1970	0	150	50	500
1971	0	236	28	92
1972	0	149	25	191
1973	0	99	0	70
1974	0	55	0	130
Total	89	1341	122	983

TABLE 354. Summary of Atlantic salmon angling data, Adlatok River, 1965–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1965	20	7	27	78	0.35
1966	125	67	192	200	0.96
1967	22	4	26	154	0.17
1968	34	19	53	220	0.24
1969	—	—	—	—	—
1970	29	0	29	65	0.45
1971	25	12	37	171	0.22
1972	56	15	71	363	0.20
1973	56	28	84	285	0.29
1974	17	5	22	169	0.13
1975	—	—	—	—	—
1976	—	—	—	—	—
1977	—	—	—	—	—
1978	—	—	—	—	—
1979	104	60	164	201	0.82
1980	—	—	—	—	—
Mean	49	22	71	191	0.37

TABLE 355. Sex ratio (%F), age composition, weight, and fork length of Atlantic salmon collected from anglers' catch, July 1973 and July 1974, Adlatok River (DFO, unpubl. data).

	1-sea-winter								2-sea-winter							
	Female		Freshwater age		Weight (g)		Fork length (cm)		Female		Freshwater age		Weight (g)		Fork length (cm)	
	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*
1973			3						50.0	2	3	2	5221	2	78.5	2
	0.0	5	4	5	1793	5	55.1	5	57.1	7	4	7	5156	7	79.0	7
	0.0	1	5	1	1816	2	54.6	2	100	1	5	1	4540	1	77.5	1
		6		6		7		7		10		10		10		10
Mean	0.0		4.2		1800		55.0		60.0		3.9		5107		78.8	
1974	14.3	7	4	7					75.0	4	4	4				
	0.0	2	5	2					0.0	1	5	1				
	0.0	1	6	1					33.3	3	6	3				
		10		10						8		8				
Mean	10.0		4.4						50.0		4.9					

Hunt River flows northeasterly from its source in a series of small ponds and lakes to its mouth at the bottom of Big Bay (Jack Lane Bay), 35 km northwest of the community of Hopedale (Fig. 100). Due to the low relief of the countryside, steadies and small ponds are found throughout the main stem and 23 tributaries. The entire drainage area of 1344 km^2 is accessible to migrating fish (Table 356). Murphy and Porter (1974a) reported that the river is 91 m wide at its mouth and the bottom substrate of the lower 16 km is a mixture of rubble and boulder. Ranger seals overwinter in the lower section of river (Labrador Inuit Association 1977). A long narrow lake (L1) stretches from km 16 to km 31. The first and second lakes are connected by a 46-m wide stream that flows over rubble and boulder substrate. The second lake extends from km 34 to km 47. Above it Murphy and Porter (1974a) surveyed 11 km of the main stem and recorded a channel width of 27 m and a bottom comprised mainly of gravel. Six of the tributaries were surveyed by Murphy and Porter and rearing areas ranged from 167 to 2759 rearing units (Table 357). Angling camps are located near the mouth and at the lower end of the first lake. Results of the analyses of a water sample collected in 1973 are presented in Table 358 (Jamieson 1979).

Hunt River is one of the most northerly rivers in Labrador to contain a substantial Atlantic salmon population. The river is scheduled for Atlantic salmon angling. In the past it has been noted that operators of the two angling camps have been co-operative in submitting accurate records of angling catch and effort to DFO and the figures presented in Table 359 are considered correct (T. Curran, pers. comm.). The high catch per rod day of 1.31 and the proportion of large salmon in the catch are indicative of a healthy salmon stock. Samples were collected from the anglers' catch from 1973 to 1975 and 1980, and data on sex ratio, age composition, length, and weight of salmon are presented in Table 360. From their 1973 survey, Murphy and Porter (1974a) estimated the annual adult Atlantic salmon production of Hunt River to be 7397 fish (Table 357); the angling data tend to support this estimate.

Other fish species reported in Hunt River include both sea-run and resident brook trout and Arctic char. These fish are taken as a secondary species to Atlantic salmon and the annual catches for the years reported, 1966–74, are found in Table 361.

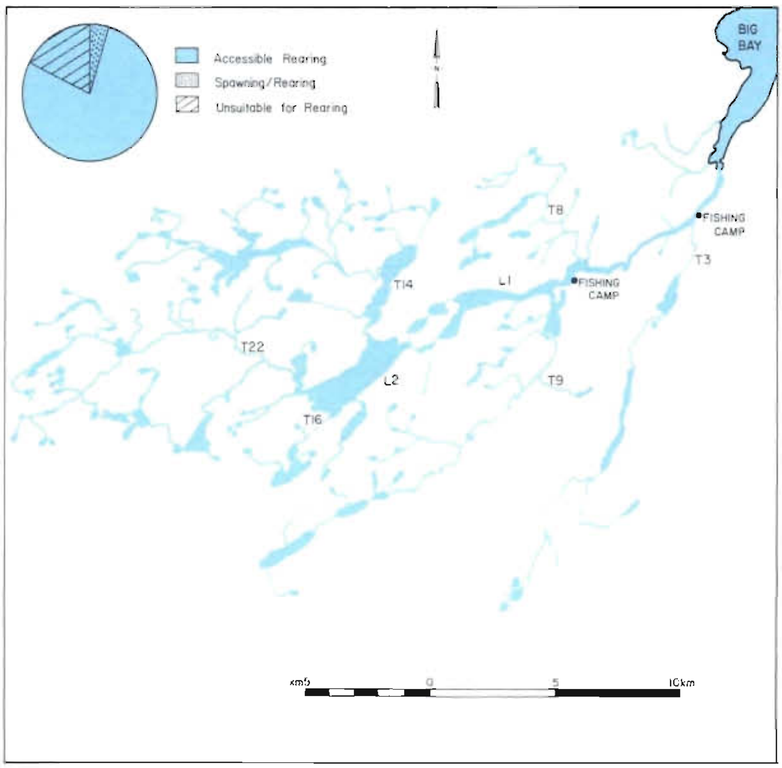

FIG. 100. Map of Hunt River showing accessible Atlantic salmon parr rearing areas.

TABLE 356. Physical characteristics of Hunt River.

Map reference:	Hopedale 13N 1 : 250 000	Maximum basin relief:	366 m
Mouth latitude:	55°31′N	Length by meander (main stem):	258 km
Mouth longitude:	60°42′W	Total length including tributaries:	454 km
General direction of flow:	Northeast	No. of tributaries:	23
Drainage area:	1344 km²	Geological formation:	Gneiss, anorthosite, granite, and associated rocks
Mean width	23 km		
Axial length	63 km		
Basin perimeter	209 km		

TABLE 357. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Hunt River (Murphy and Porter 1974a). No inaccessible areas were identified.

Location	Accessible areas	
	Spawning units	Rearing units
Main stem	605	15 461
T3	743	2 759
T8	0	1 254
T9	0	1 672
T14	0	1 672
T16	0	167
T22	0	1 672
Total	1 348	24 657
Estimated production		
Smolt	49 314	
Adult	7 397	

TABLE 358. Results of analyses of a water sample collected on Hunt River, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.9	12.0	31.0	3.6	12.0	3.0	2.0	14.6

TABLE 359. Summary of Atlantic salmon angling data, Hunt River, 1964–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1964	13	3	16	32	0.50
1965	17	63	80	135	0.59
1966	172	170	342	152	2.25
1967	87	74	161	174	0.93
1968	90	104	194	285	0.68
1969	—	—	—	—	—
1970	173	97	270	260	1.04
1971	50	45	95	150	0.63
1972	98	91	189	113	1.67
1973	132	46	178	169	1.05
1974	0	254	254	112	2.27
1975	379	117	496	245	2.02
1976	655	285	940	701	1.34
1977	398	384	782	477	1.64
1978	450	365	815	471	1.73
1979	180	200	380	399	0.95
1980	51	89	140	181	0.77
Mean	184	149	333	254	1.31

TABLE 360. Sex ratio (%F), age composition, weight, and fork length of Atlantic salmon collected from anglers' catch, July and August 1973–75 and July 1980 on Hunt River (DFO, unpubl. data).

	1-sea-winter								2-sea-winter							
	Female		Freshwater age		Weight (g)		Fork length (cm)		Female		Freshwater age		Weight (g)		Fork length (cm)	
	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*
1973	40.0	5	3	5					66.7	3	3	3				
	25.0	12	4	12					70.0	10	4	10				
	9.1	11	5	11					50.0	6	5	6				
	0.0	1	6	1					100	1	6	1				
		29		29						20		20				
Mean	20.7		4.3						65.0		4.3					
1974	0.0	1	3	1	1816	1					3					
	70.2	47	4	47	1983	47			100	6	4	6	3820	6		
	63.3	30	5	30	2095	30			20.0	5	5	5	4062	5		
	0.0	1	6	1	2270	1					6					
		79		79		79				11		11		11		
Mean	65.8		4.4		2027				63.6		4.5		3930			
1975	28.6	21	4	21	2054	21			75.0	12	4	12	4436	12		
	46.5	43	5	43	2006	43			81.3	16	5	16	4741	16		
	40.0	5	6	5	1907	5			100	2	6	2	5448	2		
		69		69		69				30		30		30		
Mean	40.6		4.8		2013				80.0		4.7		4666			
1980	0.0	1	3	1	2270	1	58.4	1	100	2	3	2	4770	2	78.8	2
	0.0	2	4	2	1935	2	56.5	2	100	2	4	2	4660	2	78.8	2
		3		3		3		3		4		4		4		4
Mean	0.0		3.7		2047		57.1		100		3.5		4715		78.8	

TABLE 361. Summary of angling catches of sea-run and resident brook trout and Arctic char, Hunt River, 1966–74 (DFO, unpubl. data).

Year	Sea-run brook trout <0.5 kg	Resident brook trout 0.9–1.8 kg	Arctic char (weight unknown)
1966	—	100	—
1967	—	150	—
1968	—	100	17
1969	211	—	62
1970	273	—	20
1971	—	—	25
1972	—	—	31
1973	195	—	—
1974	8	—	16
Total	687	350	171

This river flows easterly and empties into the east side of Big Bay (Fig. 101). The river has a drainage area of 338 km^2 and the total length of main stem and tributaries is 103 km (Table 362). Both Atlantic salmon and Arctic char have been reported in this system (Labrador Inuit Association 1977). Indications from information received by DFO personnel are that this river has an excellent run of Arctic char that are angled by guests from the sports camp on Hunt River (T. Curran, pers. comm.). The salmon population of this river is believed to be small.

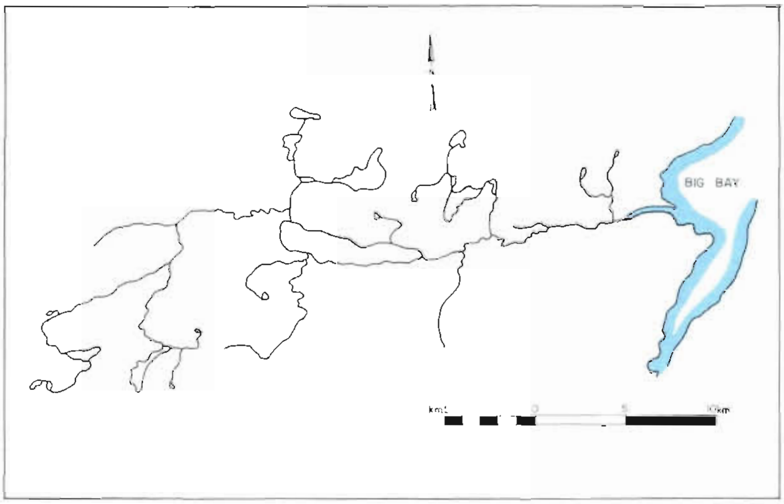

FIG. 101. Map of River 78 (Unnamed) (not surveyed).

TABLE 362. Physical characteristics of River 78.

Map reference:	Hopedale 13N 1 : 250 000	Maximum basin relief:	549 m
Mouth latitude:	55°38′N	Length by meander (main stem):	45 km
Mouth longitude:	60°38′W	Total length including tributaries:	103 km
General direction of flow:	East	No. of tributaries:	10
Drainage area:	338 km^2	Geological formation:	Gneiss
Mean width	45 km		
Axial length	38 km		
Basin perimeter	93 km		

Flowers River flows northeasterly, emptying into Flowers Bay (Jem Lane Bay), approximately 20 km south of the community of Davis Inlet (Fig. 102). Two sports fishing camps are operated seasonally on this river.

Flowers River has a drainage area of 1443 km^2; the total length of the main stem and 37 tributaries is 705 km (Table 363). From its mouth to km 24 the water velocity is slow to moderate, the channel width ranges from 46 to 59 m and the bottom composition is mainly sand and gravel. Steadies interrupt the flow of water between km 24 and km 31 and between km 34 and km 35. From km 35 to km 48 the water velocity increases and the bottom composition changes to boulder and rubble. At km 46.7, a 4.3-m falls forms a partial barrier to upstream fish migration (Table 364). Murphy and Porter (1974a) reported the falls to be a serious barrier during periods of low water. A system of steadies forms the main stem from km 48 to km 71; from km 71 to km 114, the channel width varies from 22 to 37 m and the bottom composition is boulder/rubble. The seven tributaries surveyed by Murphy and Porter (1974a) contain a total of 4777 rearing units (Table 365). A water sample was collected in 1973; results of the analyses of this sample are presented in Table 366 (Jamieson 1979).

Atlantic salmon, brook trout, and Arctic char are reported in Flowers River. Numbers of sea-run brook trout weighing between 0.9 and 1.8 kg each reported angled in 1973 and 1974 were 38 and 11, respectively. Arctic char catches (weight unknown) reported in 1971, 1972, and 1974 were 25, 44, and 96, respectively. Both brook trout and Arctic char are probably taken as incidental catches during angling for Atlantic salmon.

Flowers River is the most northern scheduled Atlantic salmon river in Labrador. Sports angling camps are operated at the mouth and at km 24. The Atlantic salmon angling catch has been reported for 1971–80 (excluding 1975), and the mean catch per rod day over this period is 0.49 (Table 367). The reliability of the angling data is unknown. A sample of 27 salmon was collected from the anglers' catch in 1973. Data on sex ratio, age composition, weight, and fork length of these fish are presented in Table 368. Murphy and Porter (1974a) estimated the annual production of adult Atlantic salmon in this river to be 8725 fish. Due to its northern location, this river has a large Arctic char population. The Atlantic salmon population is suspected to be smaller than the estimate of Murphy and Porter (T. Curran, pers. comm.).

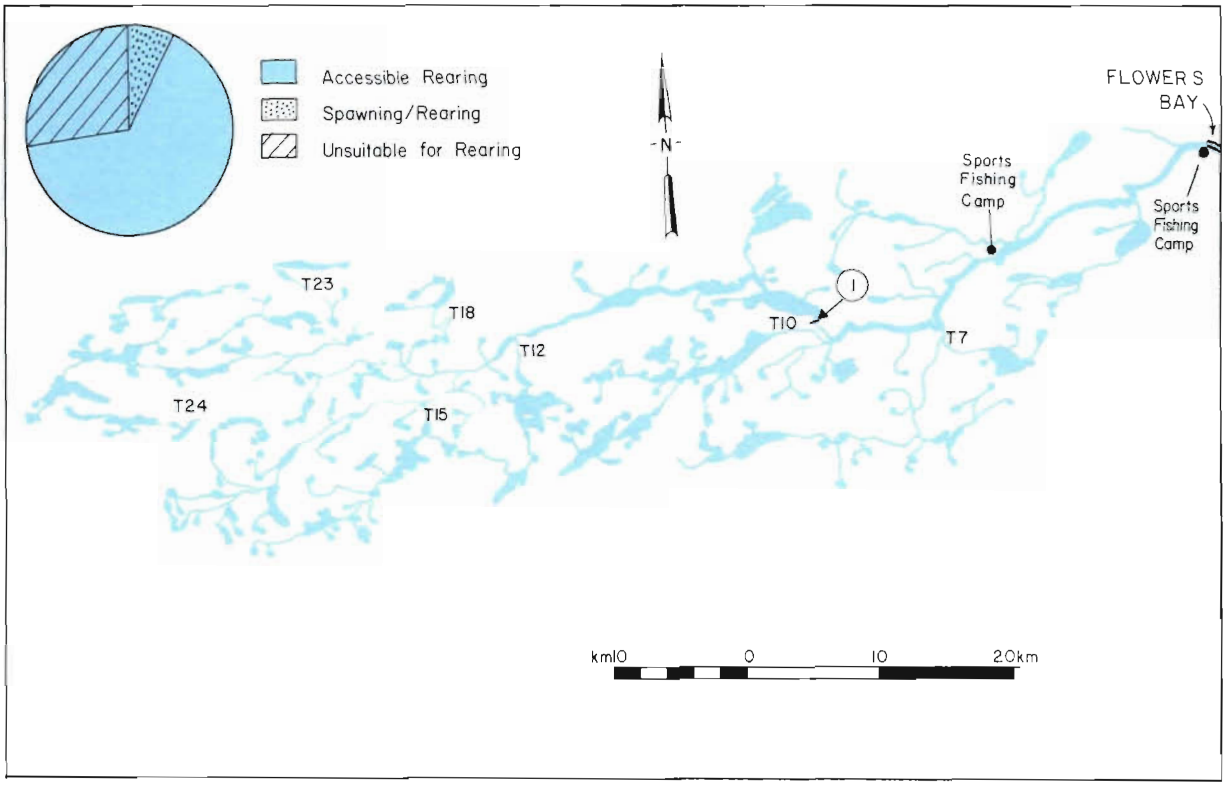

FIG. 102. Map of Flowers River showing accessible Atlantic salmon parr rearing areas.

TABLE 363. Physical characteristics of Flowers River.

Map reference:	Mistastin Lake 13M Hopedale 13N 1 : 250 000	Maximum basin relief:	549 m
Mouth latitude:	55°44′N	Length by meander (main stem):	113 km
Mouth longitude:	60°56′W	Total length including tributaries:	705 km
General direction of flow:	Northeast	No. of tributaries:	37
Drainage area:	1443 km²	Geological formation:	Gneiss, anorthosite, granite, and associated rocks
Mean width	16 km		
Axial length	93 km		
Basin perimeter	235 km		

TABLE 364. Obstructions on Flowers River (Murphy and Porter 1974a).

Fig. 102 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	46.7	Falls	4.3	22.8	—	Partial

TABLE 365. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Flowers River (Murphy and Porter 1974a). No inaccessible areas were identified.

Location	Accessible areas: Spawning units	Rearing units
Main stem	2 208	24 307
T7	724	1 304
T10	0	1 216
T12	0	418
T15	0	836
T18	0	167
T23, T24	0	836
Total	2 932	29 084
Estimated production		
Smolt	58 168	
Adult	8 725	

TABLE 366. Results of analyses of a water sample collected on Flowers River, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.7	8.0	16.0	2.9	8.0	1.0	1.0	9.8

TABLE 367. Summary of Atlantic salmon angling data, Flowers River, 1971–80 (Moores et al. 1978; Moores and Tucker 1979, 1980, 1981).

Year	Grilse <2.7 kg	Salmon ≥2.7 kg	Total salmon	Rod days	Catch per rod day
1971	3	0	3	12	0.25
1972	33	7	40	21	1.90
1973	20	54	74	46	1.61
1974	30	6	36	113	0.32
1975	—	—	—	—	—
1976	37	7	44	92	0.48
1977	75	29	104	211	0.49
1978	26	5	31	25	1.24
1979	37	14	51	208	0.25
1980	56	12	68	187	0.36
Mean	35	15	50	102	0.49

TABLE 368. Sex ratio (%F), age composition, weight, and fork length of Atlantic salmon collected from anglers' catch, July and August 1975, Flowers River (DFO, unpubl. data).

	1-sea-winter								2-sea-winter							
	Female		Freshwater age		Weight (g)		Fork length (cm)		Female		Freshwater age		Weight (g)		Fork length (cm)	
	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*	%	*n*	yr	*n*	$\bar{x}$	*n*	$\bar{x}$	*n*
	0.0	2	4	2	1703	2	54.0	2	87.5	8	4	8	5221	8	76.7	8
	0.0	1	5	1	1476	1	52.1	1	85.6	14	5	14	5133	14	77.0	14
			6						100	2	6	2	4767	2	76.8	2
		3		3		3		3		24		24		24		24
Mean	0.0		4.3		1627		53.4		87.4		4.8		5132		76.9	

Both of these rivers flow northeasterly and empty into Sango Bay (Fig. 103, 104). River 80 has a drainage area of 200 km^2 and has a total stream length, including tributaries, of 58 km (Table 369). River 81 has a drainage area of 310 km^2 and a total stream length, including tributaries, of 145 km (Table 370). No other physical or biological information is available on either of these rivers.

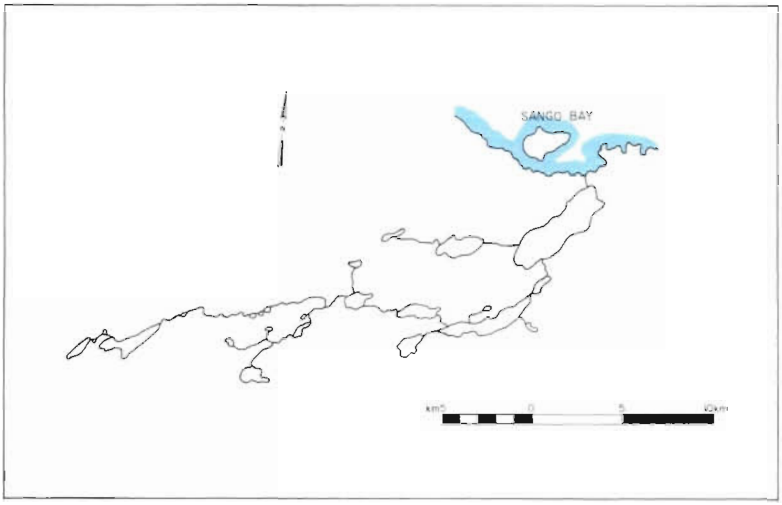

FIG. 103. Map of River 80 (Unnamed) (not surveyed).

TABLE 369. Physical characteristics of River 80.

Map reference:	Hopedale 13N 1 250 000	Maximum basin relief:	305 m
Mouth latitude:	55°51′N	Length by meander (main stem):	35 km
Mouth longitude:	60°03′W	Total length including tributaries:	58 km
General direction of flow:	Northeast	No. of tributaries:	6
Drainage area:	200 km^2	Geological formation:	Anorthosite and associated rocks
Mean width	6 km		
Axial length	314 km		
Basin perimeter	77 km		

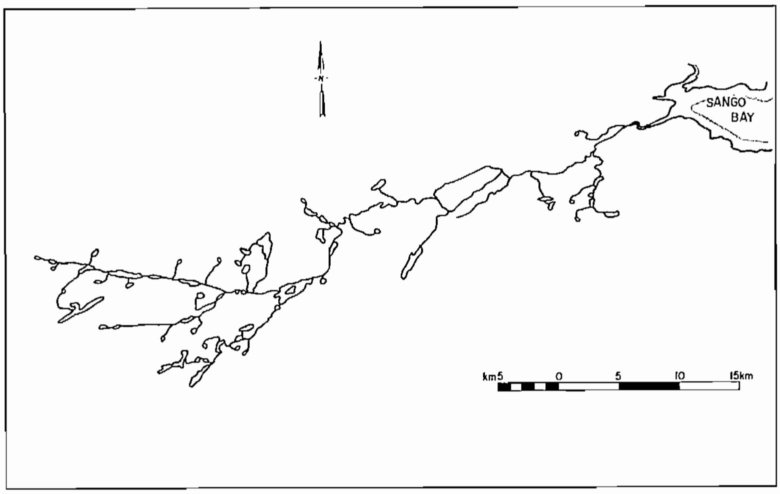

FIG. 104. Map of River 81 (Unnamed) (not surveyed).

TABLE 370. Physical characteristics of River 81.

Map reference:	Hopedale 13N 1 : 250 000	Maximum basin relief:	488 m
Mouth latitude:	55°52′N	Length by meander (main stem):	58 km
Mouth longitude:	61°12′W	Total length including tributaries:	145 km
General direction of flow:	Northeast	No. of tributaries:	19
Drainage area:	310 km^2	Geological formation:	Anorthosite, granite, and associated rocks
Mean width	9 km		
Axial length	55 km		
Basin perimeter	135 km		

Sango Brook flows in an easterly direction, emptying into Sango Bay, approximately 15 km west of the community of Davis Inlet (Fig. 105).

Sango Brook has a drainage area of 806 km^2 (Table 371). From its mouth to km 11, the river is relatively wide (average 90 m) and flows slowly over a low gradient of mud and sand substrate. A long narrow lake (L1) stretches from km 11 to km 29, and from this lake's inlet to km 71, the river ranges from 23 to 46 m in width and flows primarily over gravel and rubble. Another lake (L2) occurs between km 71 and km 77 and, above this lake, the river flows over a combination of boulder, rubble, and gravel for 8 km. A 4.6-m falls at km 85.3 prevents further migration upstream; a second falls, located at km 93.4, is also a complete obstruction (Table 372). The river from km 85 to km 100 is 9 to 27 m wide and flows over boulder/rubble bottom substrate. Because of their small size and limited salmon parr rearing capacity, none of the 16 tributaries were surveyed by Murphy and Porter (1974a). A water sample was collected from this river in August 1973; results of the analyses of the sample are presented in Table 373 (Jamieson 1979).

Little information is available on the fish species in Sango Brook. Murphy and Porter (1974a) reported that both Atlantic salmon and Arctic char are common in the area and from their survey in 1973, estimated the potential annual production of adult Atlantic salmon to be 4668 fish (Table 374). As Sango Brook is near the northern limit of the range of abundant Atlantic salmon stocks in Labrador, the estimated potential production may be high.

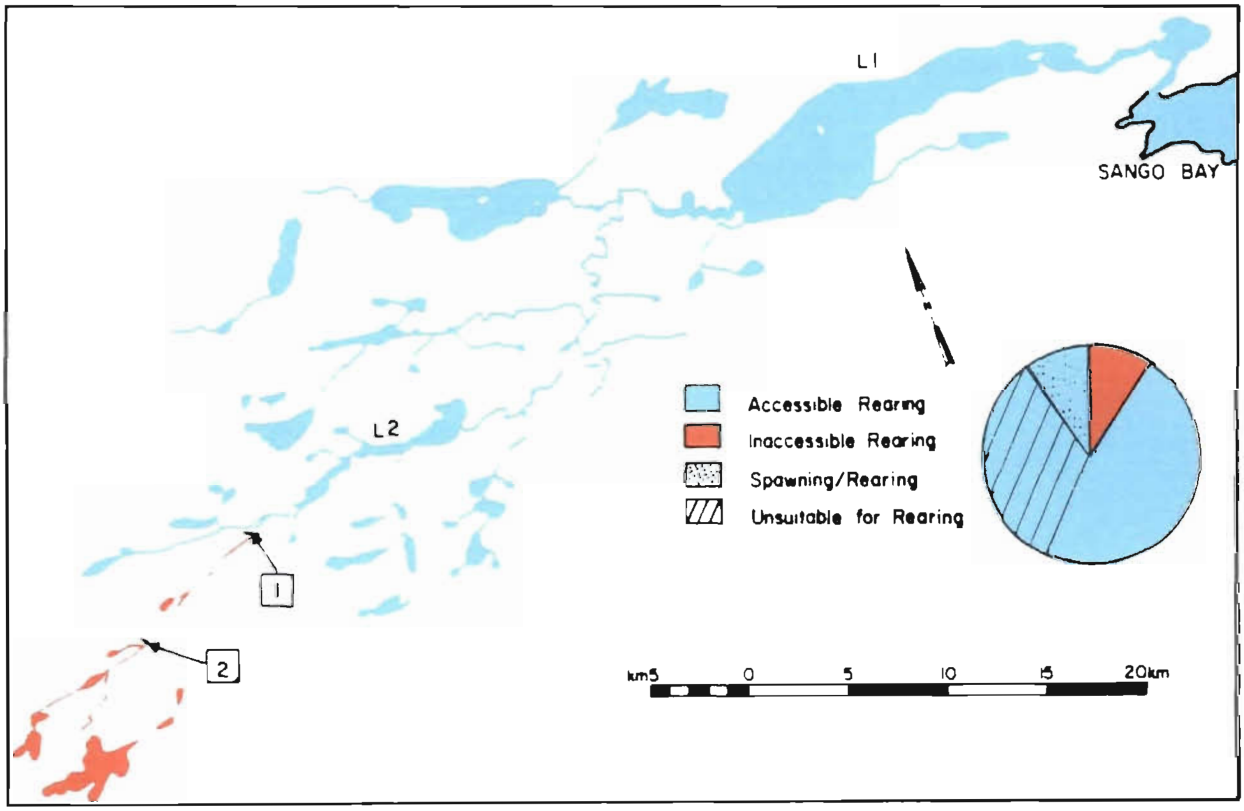

FIG. 105. Map of Sango Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 371. Physical characteristics of Sango Brook.

Map reference:	Hopedale 13N Mistastin Lake 13M 1 : 250 000	Maximum basin relief:	488 m
Mouth latitude:	55°54′N	Length by meander (main stem):	77 km
Mouth longitude:	61°10′W	Total length including tributaries:	238 km
General direction of flow:	East	No. of tributaries:	16
Drainage area:	806 km²	Geological formation:	Granite and associated rocks; anorthosite and associated rocks
Mean width	12 km		
Axial length	68 km		
Basin perimeter	187 km		

TABLE 372. Obstructions on Sango Brook (Murphy and Porter 1974a).

Fig. 105 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	85.3	Falls	4.6	22.9	80	Complete
2	Main stem	93.4	Falls	4.6	15.3	90	Complete

TABLE 373. Results of analyses of a water sample collected on Sango Brook, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.7	12.0	27.0	2.6	12.0	3.5	2.0	14.6

TABLE 374. Summary of rearing and spawning units and estimated potential annual production of Atlantic salmon smolts and adults in Sango Brook (Murphy and Porter 1974a).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	2 562	15 561	0	2 745
Total	2 562	15 561	0	2 745
Estimated production				
Smolt	31 122		5 490	
Adult	4 668		824	

REGION V
NAIN–OKAK

The Nain–Okak Region stretches east from the Quebec–Labrador border to the Labrador Sea and includes the area bordered by the Notakwanon River in the south and the Kaumajet Mountains in the north, a distance of approximately 180 km (Fig. 106). There is only one community within the region. Nain (population 938, Statistics Canada 1981), was established in 1771, and today is the most northerly settlement in Labrador. Three other settlements were occupied in this region and dates of establishment and abandonment are as follows: Okak (1776–1919), Zoar (1865–90), and Nutak (1929–56) (Labrador Inuit Association 1977).

As in most of coastal Labrador, emphasis was placed on the cod fishery during the 20th century until the failure of the fishery in the 1960s. This resulted in increasing effort in the Arctic char fishery. Char were salted or pickled until the early 1970s when a fish plant which provided freezing and smoking facilities was constructed in Nain. Higher prices for Atlantic salmon have also encouraged a salmon fishery that has met with reasonable success (Labrador Inuit Association 1977).

The high mountain ranges of northern Labrador begin in the Nain–Okak Region. Directly north of Nain, the Kiglapait Mountains rise over 600 m directly from sea level and the northern border of the region, the Kaumajet Mountain range, with peaks up to 835 m, juts out on a narrow peninsula into the Labrador Sea.

Geologically, the region is made up of areas of granite, anorthosite, and gneiss (Sutton 1972). Rocks within the region are very old (up to 2000 million years) and glacial action, which moved from west to east, formed steep valleys and pushed most of the debris into the Labrador Sea. The remaining glacial deposits have since been carried into the river valleys by the action of tributaries which drain surrounding hills and mountains.

Lopoukhine et al. (1978) reported that the northern limit of Labrador's continuous forest cover occurs within the large valleys of this region. Although seasonal fluctuations of rivers limit vegetative colonization, relatively large black spruce and white spruce grow in the deeper valleys. In the mid-1960s, a small sawmill operation was conducted in Nain (Northern Labrador Affairs Annual Reports 1965–1967). On the slopes of the river valleys, stunted forms of eastern larch, balsam fir, and spruce are found. Above the treeline willows, alders and shrubs occur. Lichens, mosses, and arctic forbs and herbs appear in exposed areas.

Generally, rivers in this region flow easterly through deep valleys; bottom substrates consist of a high percentage of sand and gravel. Most tributaries are inaccessible to migrating fishes due to steep canyon walls paralleling the main stems. Large lakes, such as Tasialuk, Kingurutik, Cabot, and Tasisuak occur in areas where river valleys widen. Although many rivers extend westward to the Quebec–Labrador border, obstructions on main stems are rare except in headwaters. Due to steep canyon walls and sparse vegetation, spring floods and freshets cause considerable fluctuations above normal water levels in the lower rivers. Detailed descriptions of the physical characteristics of this region are found in Labrador Inuit Association (1977) and Lopoukhine et al. (1978). Descriptions of individual rivers are found in Murphy and Porter (1974a, b). Except for their use as bases for traditional hunting and fishing, the vast majority of rivers in this region lie in a pristine state.

Early accounts of fish populations in this region are provided by Prichard (1911) and Backus (1957) who both noted the presence of Arctic char in the Fraser River. Sollows et al. (1954) conducted preliminary surveys on two rivers, Kogaluk and Fraser, and sighted Arctic char and brook trout. Scott and Crossman (1973) reported six species present within the region, namely Arctic char, brook trout, Atlantic salmon, lake trout, and threespine and ninespine stickleback (Table 1). Bruce et al. (1979) documented the presence of round whitefish in the region during their gillnet survey in 1977–78. During their surveys of nine rivers throughout the region, Murphy and Porter (1974a, b) recorded only two fish species, Arctic char and brook trout. Studies were conducted on Fraser River by DFO from 1975 to 1979. Annual counts of upstream migrants, length and weight composition of the run and catch, effort and sampling statistics from the commercial Arctic char fishery are found in Coady and Best (1976), Dempson (1978), Dempson and Best (1978), and Dempson et al. (1979). Earlier studies of the commercial char fisheries around Nain and Okak were conducted by Andrews and Lear (1956).

As in other regions of Labrador, the river surveys conducted by Murphy and Porter (1974a, b) include estimates of Atlantic salmon rearing and spawning habitat. However, these estimates are of little value in calculating potential populations of salmon in the rivers of this region as Arctic char have replaced salmon as the dominant fish species. Efforts to use these rearing and spawning units to estimate Arctic char production have met with little success and R. F. Peet (pers. comm.) has stated "we don't have rearing units for Arctic char and to relate Arctic char production to rearing units would be a very complex if not impossible task". The reasons for this are probably due to different life cycles combined with different requirements for spawning and juvenile rearing habitats of Atlantic salmon and Arctic char. Arctic char do not normally migrate long distances from rivers of origin and return to freshwater streams to overwinter and not necessarily to spawn. Other methods of estimating Arctic char populations, such as the quantification of accessible watershed size, are unreliable (R. F. Peet, pers. comm.). To allow comparison with other rivers in Labrador, rearing and spawning units, as determined by Murphy and Porter (1974a, b) will be listed in a table following the data on each surveyed river. Potential population estimates will not be attempted for either species.

Several authors have noted that Arctic char remain fairly close to their natal rivers throughout their life cycle (Nielsen 1961; Le Jeune 1967; Moore 1975). Jensen and Berg (1977) reported, from a tagging program on Vardnes River, Norway, that 74% of the 556 marine recaptures of char were within 25 km of the river mouth. At Northwest Tributary, Sandhill River, in southern Labrador, 89 tags were recovered from a total of 205 applied to Arctic char in 1971 and 1972. Ninety-six percent of these tag recoveries were from the immediate vicinity of the river mouth (Sandhill Cove); the remaining 4% were recaptured within 25 km of the tagging site (Dempson 1978). Eighty-six percent of the tags from an Arctic char tagging program at Fraser River in northern Labrador were recovered in the immediate vicinity of the river mouth. The remaining 14% were recaptured within 50 km of the river mouth (Dempson 1978). These examples illustrate that localized commercial fisheries for Arctic char may exclusively exploit stocks from the rivers in the immediate area. Arctic char landings, 1974–80, from areas indicated on Fig. 106, are shown in Table 375.

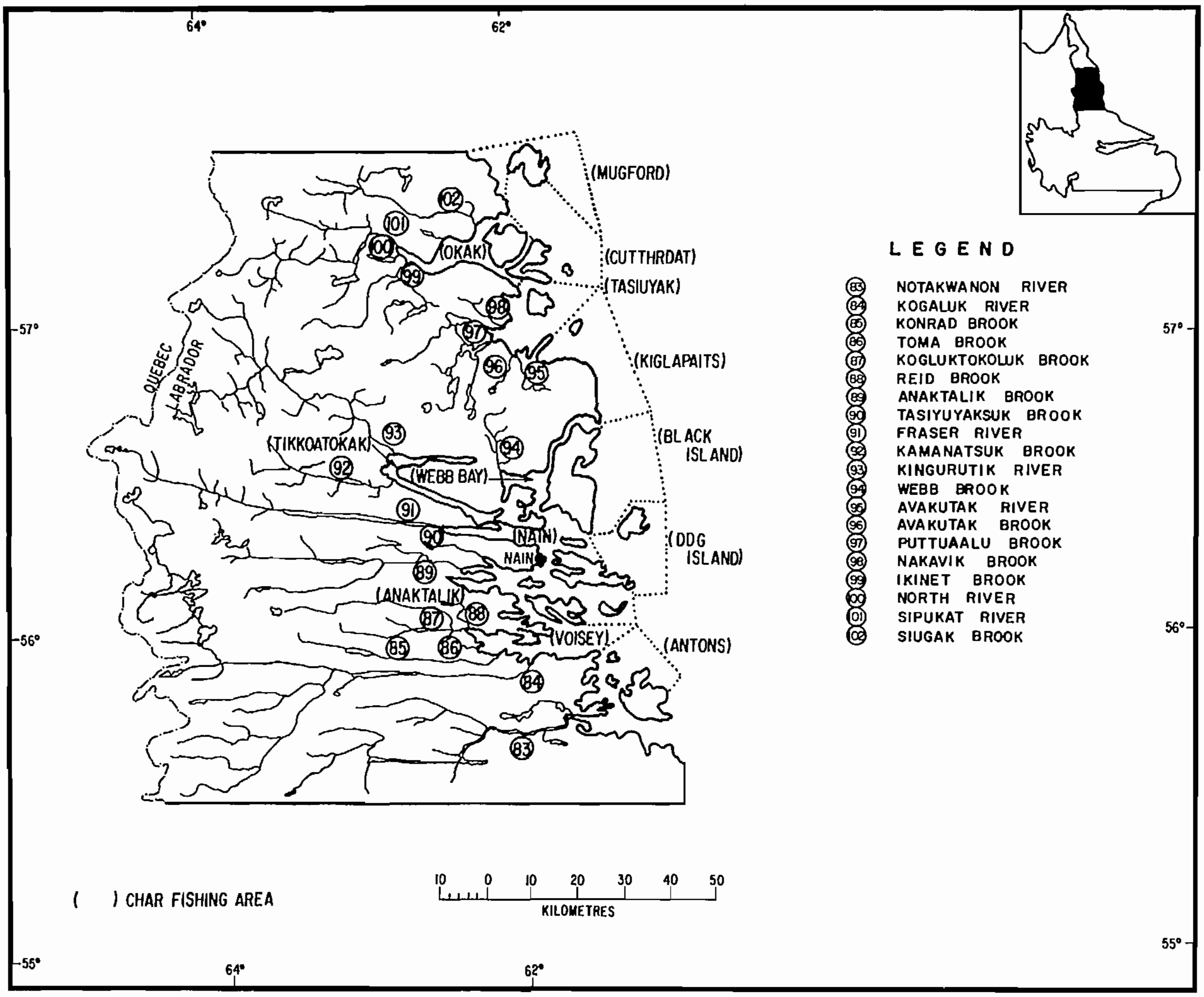

FIG. 106. Map of Region V, Nain–Okak. Rivers are numbered for convenient location in the text.

TABLE 375. Commercial Arctic char fishery landings by area, Nain–Okak Region, 1974–80 (Dempson 1978; Dempson, pers. comm.).

Area	Recorded landings (kg round weight)						
	1974	1975	1976	1977	1978	1979	1980
Antons Point	9 135	3 489	3 172	2 010	4 008	19 376	8 459
Voisey Bay	20 045	238	12 232	22 490	33 594	21 881	11 557
Anaktalik	7 821	2 548	14 670	21 604	13 073	14 914	8 043
Nain Bay	12 461	0	3 119	8 463	Closed	Closed	Closed
Dog Island	2 659	653	212	2 038	386	1 438	3 049
Tikkoatokak	9 960	27 695	31 568	39 489	55 065	37 920	42 138
Webb Bay	580	833	4 550	2 516	3 475	3 036	3 008
Black Island	4 264	2 101	2 725	3 391	2 966	10 638	20 058
Kiglapaits	5 131	1 504	6 089	4 320	12 105	17 615	16 543
Tasiuyak	1 467	0	281	0	2 280	1 838	1 138
Okak	34 250	2 354	17 812	19 099	36 134	26 176	17 434
Cutthroat	12 641	2 703	7 526	13 216	41 161	17 803	32 403
Mugford	0	0	1 970	1 376	1 148	170	513
Total	120 414	44 118	105 926	140 012	205 395	172 805	164 343

Notakwanon River

Notakwanon River flows easterly from its source at the Quebec–Labrador border to its mouth in Merrifield Bay, a distance of over 150 km (Fig. 107). Because of its remote location, little activity has been reported within the watershed; most of the information about the river system comes from Murphy and Porter (1974a).

This river has a drainage area of 4999 km^2 and is fed by 78 tributaries (Table 376). Vegetation within the watershed consists of lichens and shrubs alternating with sparse coniferous growth. From its mouth to km 55, the river width varies from 69 to 137 m and bottom substrate types are fine sand and gravel. Above this section to km 72, the river narrows to 24 m and the bottom substrate becomes coarser with boulder and rubble alternating with patches of gravel. At km 72, the river opens into a series of steadies, 155 m wide, that extend to km 89 where a wide gravel patch, 387 m wide, extends for 3 km. Between km 91 and km 116, the river narrows to 37 m and bottom compositions change to boulder/rubble. Steadies occur between km 116 and km 121, followed by another boulder/rubble section from km 121 to km 130. At km 130.4, a 9.2-m falls completely prevents further fish migration (Table 377); the river above this falls, to km 234, is made up primarily of steadies.

Murphy and Porter (1974a) included major tributaries in their survey; Table 377 lists the obstructions on these streams. Table 378 summarizes the amount of rearing and spawning habitat in each tributary. Two water samples were taken from the river in 1973; results of the analyses of these samples are presented in Table 379 (Jamieson 1979).

Little information is available on fish present in Notakwanon River. Murphy and Porter (1974a) reported sightings of Arctic char during their survey in 1973; both Atlantic salmon and brook trout likely occur also.

A total of 61 280 accessible rearing units were recorded by Murphy and Porter (Table 378), indicating the river has a rearing capacity comparable to Paradise River in southern Labrador.

TABLE 376. Physical characteristics of Notakwanon River.

Map reference:	Nain 14C Tasisuak Lake 14D Mistastin Lake 13M Hopedale 13N 1 : 250 000	Maximum basin relief: Length by meander (main stem):	610 m 255 km
Mouth latitude:	56°01′N	Total length including tributaries:	1895 km
Mouth longitude:	61°31′W	No. of tributaries:	78
General direction of flow:	East	Geological formation:	Gneiss, anorthosite, granite, and associated rocks
Drainage area: Mean width Axial length Basin perimeter	4999 km^2 31 km 155 km 494 km		

TABLE 377. Obstructions on Notakwanon River (Murphy and Porter 1974a).

Fig. 107 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	130.4	Falls	9.2	31.0	70	Complete
2	T9	11.3	Falls	9.2	31.0	80	Complete
3	T25	6.4	Falls	2.1	—	90	Partial
4	T35	0.5	Falls	4.6	22.9	80	Complete
5	T37	0.5	Falls	4.6	—	90	Complete

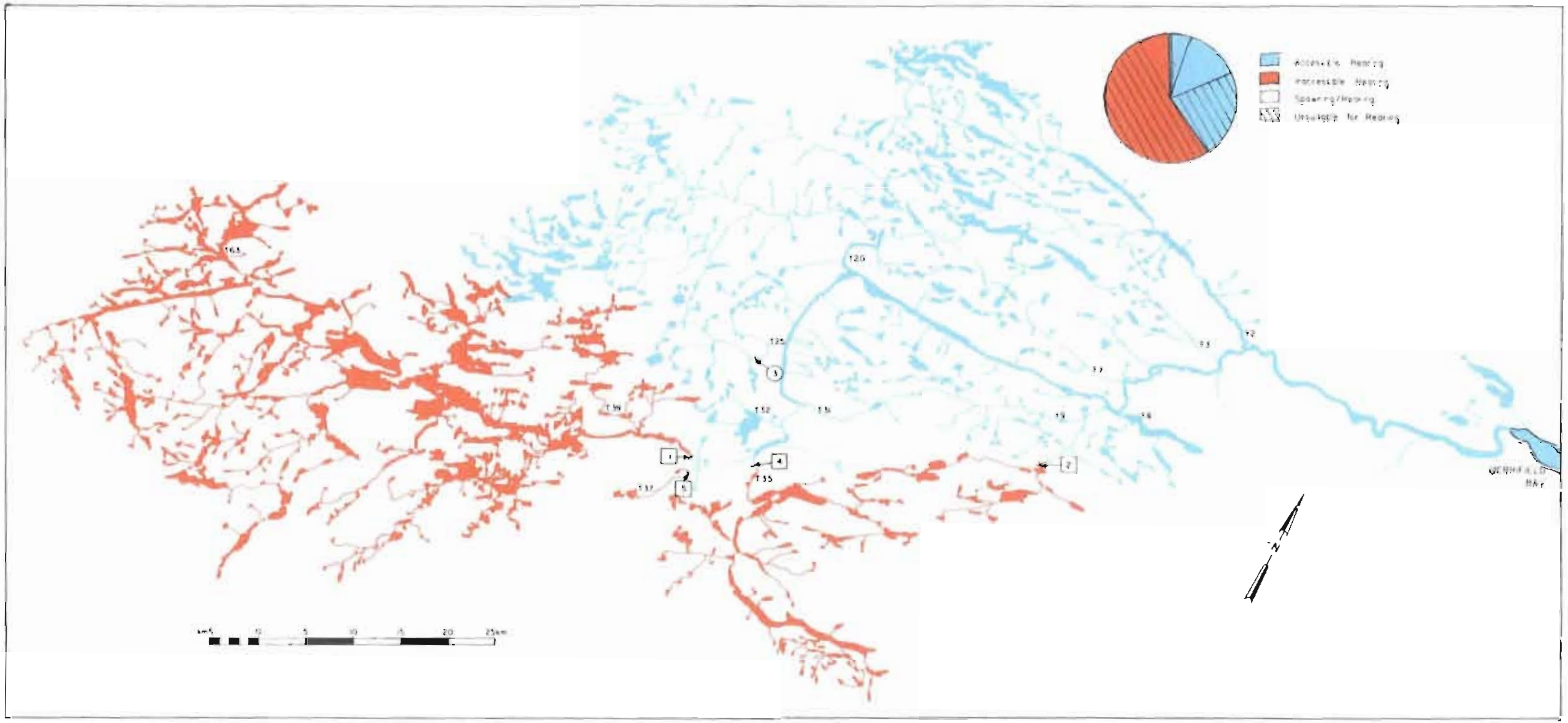

FIG. 107. Map of Notakwanon River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 378. Summary of rearing and spawning units in the accessible and inaccessible areas of Notakwanon River (Murphy and Porter 1974a).

Location	Accessible areas		Inaccessible areas	
	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	16 973	44 881	0	9 403
T2	580	7 006	0	0
T9	216	1 559	888	4 439
T20	0	2 623	0	0
T25	145	2 025	0	0
T31	0	1 737	0	0
T32	0	1 449	0	0
T35	0	0	0	4 180
T37	0	0	0	418
T39-T63	0	0	0	8 360
Total	17 914	61 280	888	26 800

TABLE 379. Mean results of analyses of two water samples collected on Notakwanon River, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.6	7.0	15.0	5.4	5.0	1.3	1.2	6.1

Kogaluk River
(Koraluk River, Frank's Brook)

Kogaluk River flows easterly for over 170 km from its source at the Quebec–Labrador border to its mouth on the southern side of Voisey Bay (Fig. 108). It has a drainage area of 5434 km^2 (Table 380).

An angling camp is located at the mouth where the river is 159 m wide and flows over sand/gravel substrate (Murphy and Porter 1974a). Ranger seals are reported to overwinter in this section of the river (Labrador Inuit Association 1977). At km 6.4, a 9.2-m falls prevents further upstream fish migration (Table 381). Beyond the falls to km 42, the river is deep and slow-flowing and ranges from 101 to 110 m wide. Cabot Lake (L1) stretches from km 42 to km 61 and is surrounded by high hills. This lake covers an area of 2440 ha. Immediately beyond Cabot Lake, the river channel narrows to 46 m with gravel comprising most of the bottom substrate. At km 120.8, a 12.2-m falls occurs; this falls is also a complete barrier to fish migration. From this falls to km 127, the river is 23 m wide and flows over rubble/boulder substrate. Beyond km 127, the river is a network of ponds and steadies. Due to the fact that the main river is bordered by high hills, many of the tributaries are obstructed by major waterfalls. The largest tributary (T36) is fed by Mistastin Lake (L2), area 15 620 ha, and is obstructed by a 5.4-m falls at km 22.5. Coniferous trees occur in the lower watershed and throughout much of the river valley; lichens provide the bulk of flora on the hills. The results of the analyses of water samples collected in 1973 and 1978 are presented in Table 382 (Jamieson 1979).

Arctic char are fished commercially in Voisey Bay (Coady and Best 1976; Dempson 1978; Dempson and Best 1978). The Labrador Inuit Association (1977)reported that char use the lower river and tributary 1 (T1) for spawning. On 14 July 1978, three lake trout and four Arctic char were netted in Mistastin Lake and on 15 July 1978, a total of 12 lake trout, one Arctic char, and one round whitefish were netted in Cabot Lake (Bruce et al. 1979). Summaries of data on the length, weight, sex, and age of these fishes are presented in Tables 383 and 384. The round whitefish captured represents an extension of the northern limit of the range of this species in Labrador. Arctic char and brook trout are the major species angled at the camp on the lower river; some Atlantic salmon are also taken (B. Dempson, pers. comm.). Sollows et al. (1954) sighted an abundance of sea-run brook trout below the falls at km 6.4. Murphy and Porter (1974a) estimated a total of 57 351 inaccessible rearing units in Kogaluk River (Table 385), much of which would be opened to anadromous fish by providing fish passage at the falls at km 6.4.

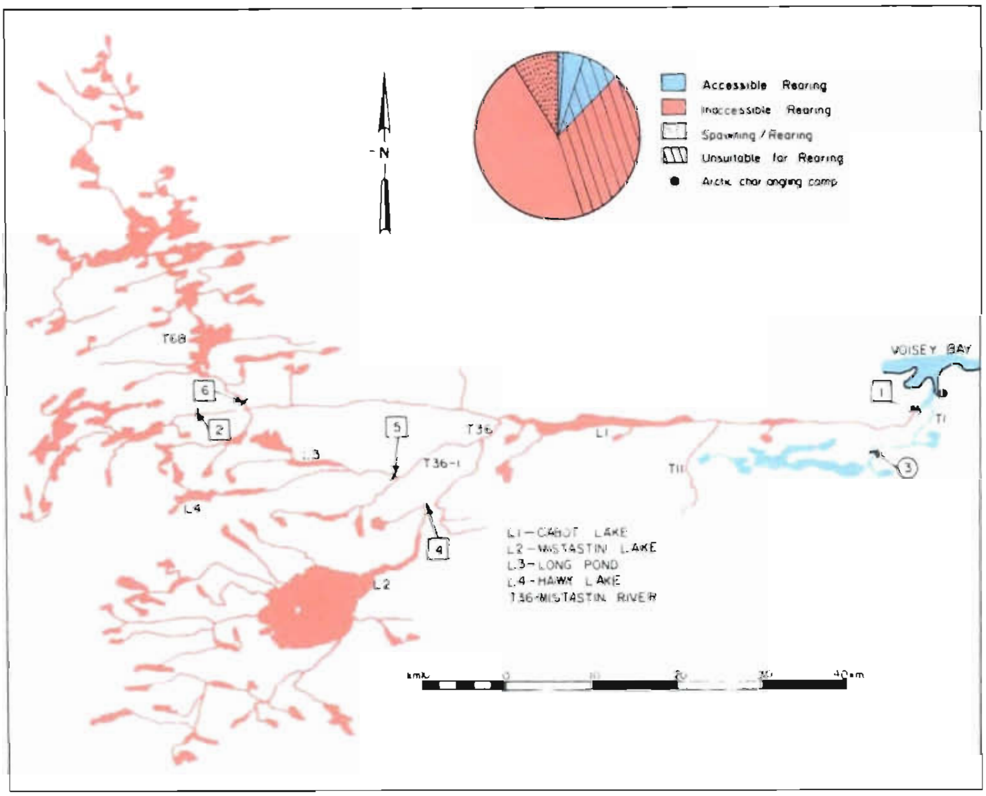

FIG. 108. Map of Kogaluk River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 380. Physical characteristics of Kogaluk River.

Map reference:	Nain 14C Tasisuak Lake 14D Mistastin Lake 13M 1 : 250 000	Maximum basin relief:	549 m
		Length by meander (main stem):	129 km
Mouth latitude:	56°12′N	Total length including tributaries:	2 222 km
Mouth longitude:	61°44′W	No. of tributaries:	83
General direction of flow:	East	Area of lakes >100 ha:	
		L1 Cabot Lake	2 440 ha
Drainage area:	5434 km²	L2 Mistastin Lake	15 620 ha
Mean width	32 km		
Axial length	161 km	Geological formation:	Gneiss, granite, and associated rocks
Basin perimeter	737 km		

TABLE 381. Obstructions on Kogaluk River (Murphy and Porter 1974a).

Fig. 108 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	6.4	Falls	9.2	61.0	60–90	Complete
2	Main stem	120.8	Falls	12.2	45.8	90	Complete
3	T1	24.2	Falls	6.1	9.2	45	Partial
4	T36	22.5	Falls	5.4	15.3	90	Complete
5	T36-1	16.1	Falls	5.4	—	90	Complete
6	T68	1.6	Falls	15.3	—	90	Complete

TABLE 382. Results of analyses of water samples collected on Kogaluk River, 1973 and 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.6	6.0	16.0	0.7	4.0	1.0	1.4	4.9
1978	6.7	6.0	18.0	0.9	6.0	0.8	1.0	7.3

TABLE 383. Summary of data on sex, fork length, whole weight, age, and mercury content of lake trout and Arctic char captured in Mistastin Lake, Kogaluk River, 14 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Lake trout	M	1	62.0	2.40	35.0	0.73	—
	F	2	61.5	2.47	24.5	0.58	0.46–0.71
Total		3	61.7	2.45	28.0	0.63	0.46–0.73
Arctic char	M	3	49.5	1.30	9.7	0.07	0.04–0.09
	F	1	50.5	1.00	12.0	0.22	—
Total		4	49.8	1.23	10.3	0.11	0.04–0.22

TABLE 384. Summary of data on sex, fork length, whole weight, age, and mercury content of lake trout, Arctic char, and round whitefish captured in Cabot Lake, Kogaluk River, 15 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Lake trout	M	9	54.7	2.36	20.6	0.63	0.29–1.25
	F	3	61.5	3.07	26.0	0.66	0.41–0.97
Total		12	56.4	2.45	21.9	0.64	0.29–1.25
Arctic char	M	1	35.0	0.40	7.0	0.07	—
Round whitefish	F	1	41.0	0.65	9.0	0.36	—

TABLE 385. Summary of rearing and spawning units in the accessible and inaccessible areas of Kogaluk River (Murphy and Porter 1974a).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	762	3 808	7 981	34 380
T1	203	1 307	0	0
T11	0	0	0	418
T36	0	0	1 105	20 045
T68	0	0	0	2 508
Total	965	5 115	9 086	57 351

Konrad Brook empties into the southern side of Voisey Bay (Fig. 109). It flows easterly and drains an area of 569 km^2 (Table 386). From its shallow estuary to km 3.2 the river flows slowly over sand and gravel substrate, averaging 46 m in width (Murphy and Porter 1974a). At km 3.2, a 9.2-m falls seriously affects fish migration (Table 387). Although Murphy and Porter stated that Atlantic salmon could possibly ascend this falls under flood conditions, it will be considered a complete obstruction until conclusive evidence has been obtained. Above this falls, for a distance of 48 km, the meandering river is between 18 and 46 m wide and flows over sand and gravel. A narrow lake stretches from km 52 to km 63. Above this lake, the water velocity increases, the river narrows to 9–18 m, and bottom substrates change to boulder and rubble. At km 80.5, another complete barrier, a 3.1-m vertical falls, occurs. As is the case with most rivers in this area, high waterfalls result in many of the tributaries being inaccessible. Two water samples were collected from the river in 1973, and results of analyses of these samples are presented in Table 388 (Jamieson 1979).

Little is known of the fish populations in this river. Coady and Best (1976), Dempson (1978), and Dempson and Best (1978) reported an active Arctic char commercial fishery in Voisey Bay. Murphy and Porter (1974a), based on information on other rivers in the area, suggested that Arctic char frequent the lower river below the falls at km 3.2. The river has a large rearing potential of 15 573 inaccessible units (Table 389).

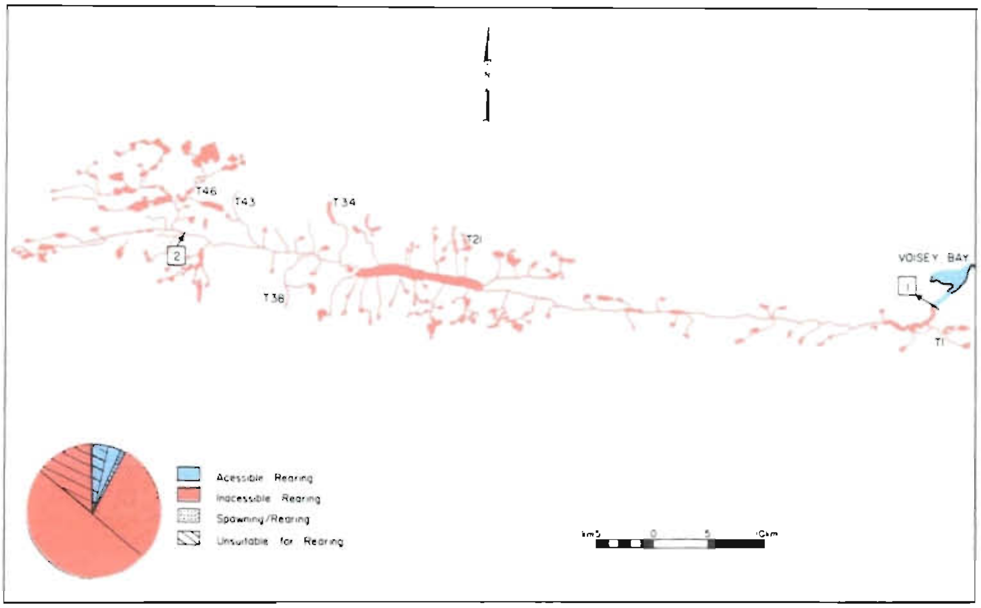

FIG. 109. Map of Konrad River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 386. Physical characteristics of Konrad Brook.

Map reference:	Nain 14C Tasisuak Lake 14D 1 : 250 000	Maximum basin relief:	549 m
Mouth latitude:	56°13′N	Length by meander (main stem):	87 km
Mouth longitude:	61°55′W	Total length including tributaries:	309 km
General direction of flow:	East	No. of tributaries:	50
Drainage area: Mean width Axial length Basin perimeter	569 km² 8 km 85 km 213 km	Geological formation:	Lower areas: granite and associated rocks; upper areas: gneiss

TABLE 387. Obstructions on Konrad Brook (Murphy and Porter 1974a).

Fig. 109 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	3.2	Falls	9.2	—	—	Complete
2	Main stem	80.5	Falls	3.1	—	90	Complete

TABLE 388. Mean results of analyses of two water samples collected on Konrad River, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.5	12.0	24.0	0.5	5.0	1.0	2.0	6.1

TABLE 389. Summary of rearing and spawning units in the accessible and inaccessible areas of Konrad River (Murphy and Porter 1974a).

Location	Accessible areas: Spawning units	Accessible areas: Rearing units	Inaccessible areas: Spawning units	Inaccessible areas: Rearing units
Main stem	147	736	5 781	14 737
T1, T21, T34, T38, T43, T46	0	0	0	836[a]
Total	147	736	5 781	15 573

[a]Estimated from topographic map.

This small brook flows easterly, emptying into the southern side of Voisey Bay (Fig. 110). It has a drainage area of 46 km^2 and is fed by five tributaries. The system is characterized by many small narrow lakes (Table 390). The Labrador Inuit Association (1977) reported that Arctic char migrate up to the first lake on the system. No other information is available on this watershed.

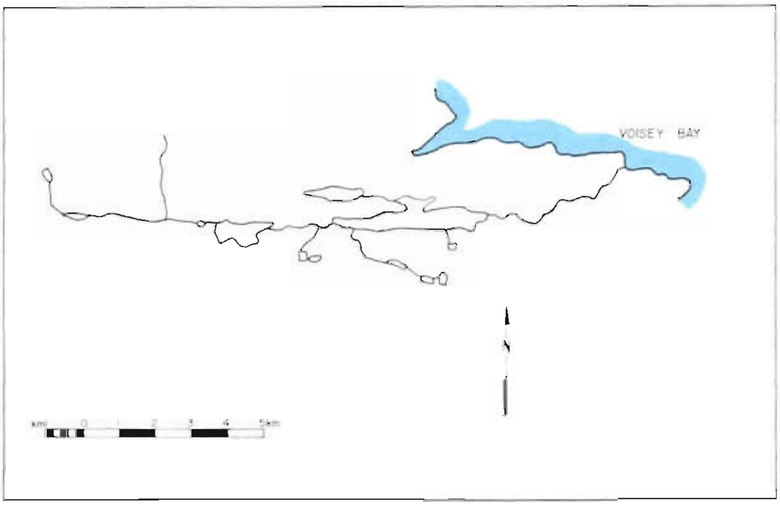

FIG. 110. Map of Toma Brook (not surveyed).

TABLE 390. Physical characteristics of Toma Brook.

Map reference:	Nain 14C 1 : 250 000	Maximum basin relief:	366 m
Mouth latitude:	56°13′N	Length by meander (main stem):	19 km
Mouth longitude:	61°57′W	Total length including tributaries:	27 km
General direction of flow:	East	No. of tributaries:	5
Drainage area:	46 km^2	Geological formation:	Granite and associated rocks
Mean width	2 km		
Axial length	17 km		
Basin perimeter	39 km		

This river flows easterly, emptying into Voisey Bay (Fig. 111). Its drainage area of 1095 km^2 (Table 391) contains two large lakes and 18 tributaries. The second tributary (T2) flows from Makhavinekh Lake (L1), a large body of water west of Makhavinekh Mountain. The third tributary (T3) drains the northern portion of the watershed and is known as Ikadlivik Brook. A water sample was collected from this river in 1973; results of the analyses of this sample are presented in Table 392 (Jamieson 1979). The Labrador Inuit Association (1977) reported that both Atlantic salmon and Arctic char spawn in Ikadlivik Brook and in the main stem of the river up to Trout Pond (L2). Voisey Bay is one of the principal sites of the Arctic char commercial fishery in northern Labrador. Char produced by this river would contribute to this fishery.

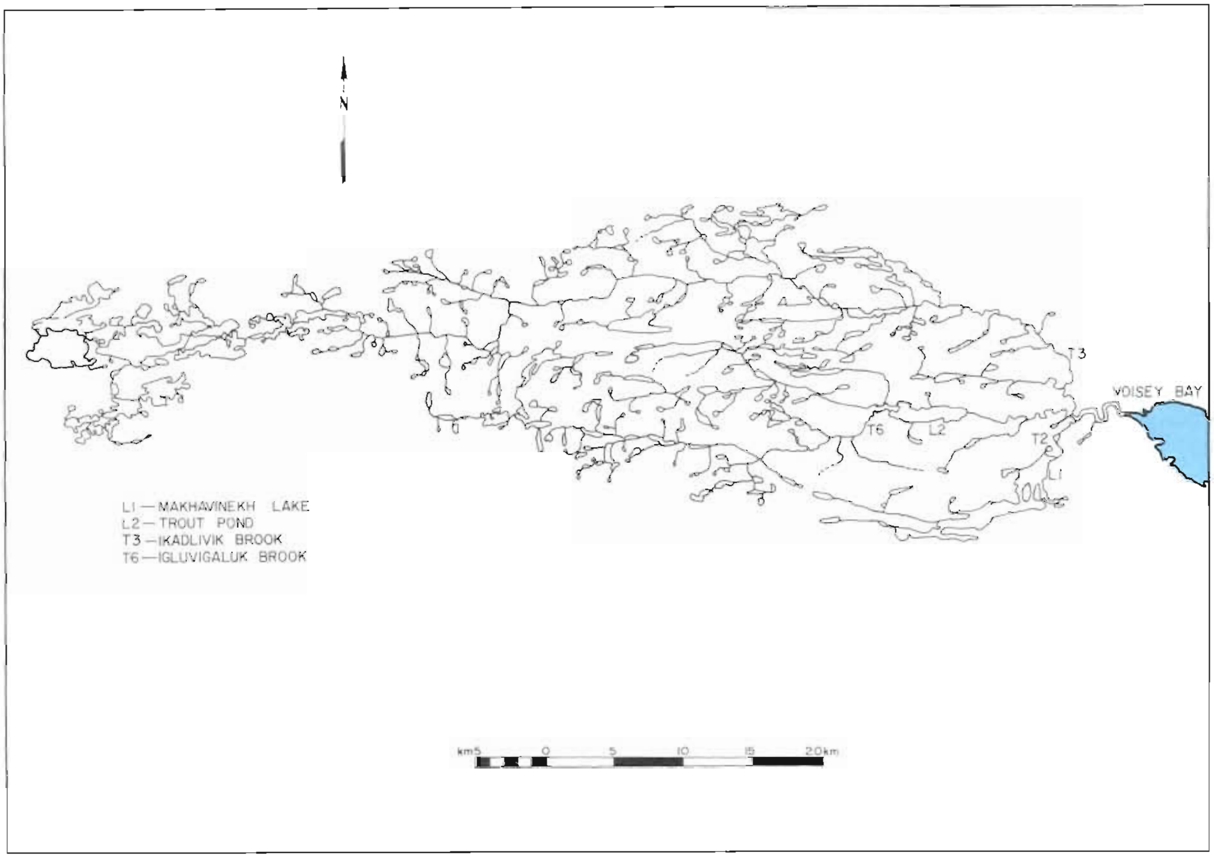

FIG. 111. Map of Kogluktokoluk Brook (not surveyed).

TABLE 391. Physical characteristics of Kogluktokoluk Brook.

Map reference:	Tasisuak 14D 1 : 250 000	Maximum basin relief:	488 m
Mouth latitude:	56°18′N	Length by meander (main stem):	90 km
Mouth longitude:	62°07′W	Total length including tributaries:	554 km
General direction of flow:	East	No. of tributaries:	18
Drainage area:	1095 km^2	Geological formation:	Anorthosite and associated rocks
Mean width	14 km		
Axial length	81 km		
Basin perimeter	209 km		

TABLE 392. Results of analyses of a water sample collected on Kogluktokoluk River, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.9	16.0	34.0	8.4	16.0	1.0	3.4	19.5

Reid Brook

Reid Brook flows southeasterly, emptying into Voisey Bay near Kogluktokoluk River (Fig. 112). The river has a drainage area of 171 km² and 11 tributaries enter the main stem (Table 393). The Labrador Inuit Association (1977) has reported the presence of Arctic char in the lower watershed. These fish are probably exploited in the Voisey Bay commercial char fishery.

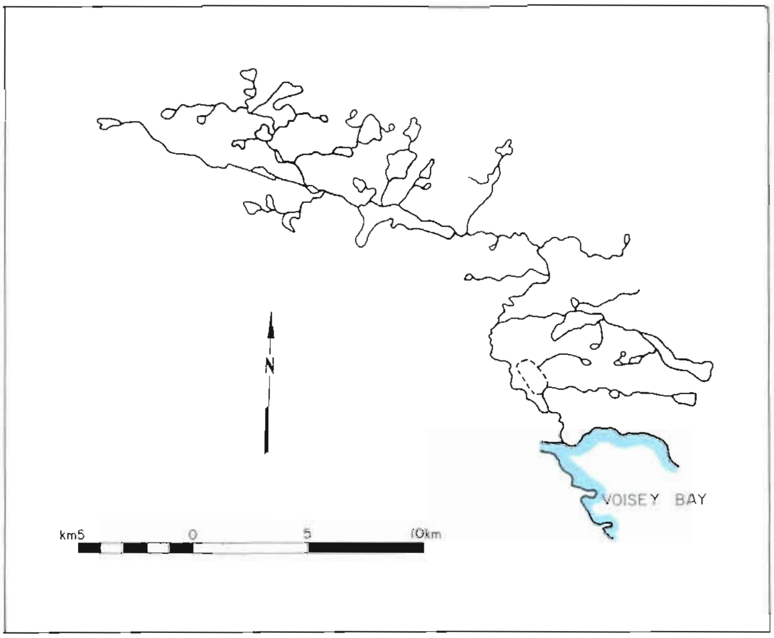

FIG. 112. Map of Reid Brook (not surveyed).

TABLE 393. Physical characteristics of Reid Brook.

Map reference:	Tasisuak Lake 14D 1 : 250 000	Maximum basin relief:	427 m
Mouth latitude:	56°18′N	Length by meander (main stem):	31 km
Mouth longitude:	62°05′W	Total length including tributaries:	98 km
General direction of flow:	Southeast	No. of tributaries:	11
Drainage area:	171 km²	Geological formation:	Anorthosite and associated rocks and gneiss
Mean width	5 km		
Axial length	25 km		
Basin perimeter	71 km		

Anaktalik Brook flows easterly through a narrow river valley and empties into a shallow bay approximately 30 km southwest of Nain (Fig. 113). The river drains an area of 1813 km^2 (Table 394), and at its mouth is 91 m wide. Over the lower 48 km, this river flows over sand and gravel substrate and gradually narrows to 55 m (Murphy and Porter 1974a). A long, narrow lake (L1) stretches from km 48 to km 64. Above this lake, the river flow becomes swift over rubble, boulder, and gravel substrates. A 15.3-m falls is a complete barrier to fish migration at km 99.8 (Table 395). Ten tributaries were surveyed by Murphy and Porter (1974a) and most were found to be inaccessible to migrating fishes. Water samples were collected in 1973, 1974, and 1978; results of analyses of these samples are presented in Table 396 (Jamieson 1979).

Arctic char, Atlantic salmon, and brook trout have been reported in Anaktalik Brook. Murphy and Porter (1974a) documented the netting of one Atlantic salmon in L1 and reported that brook trout spawned in the system. Bruce et al. (1979) reported that seven lake trout and three Arctic char were netted in L1 in July 1978; a summary of data on length, weight, sex, and age of these fish is presented in Table 397. The Labrador Inuit Association (1977) reported that Arctic char spawn in the lower river. From their survey, Murphy and Porter (1974a) recorded 18 326 accessible and 18 744 inaccessible rearing units (Table 398). Accessible units were primarily found in the main stem, and inaccessible units in the tributaries. Commercial fishing for Arctic char takes place near the mouth of this brook.

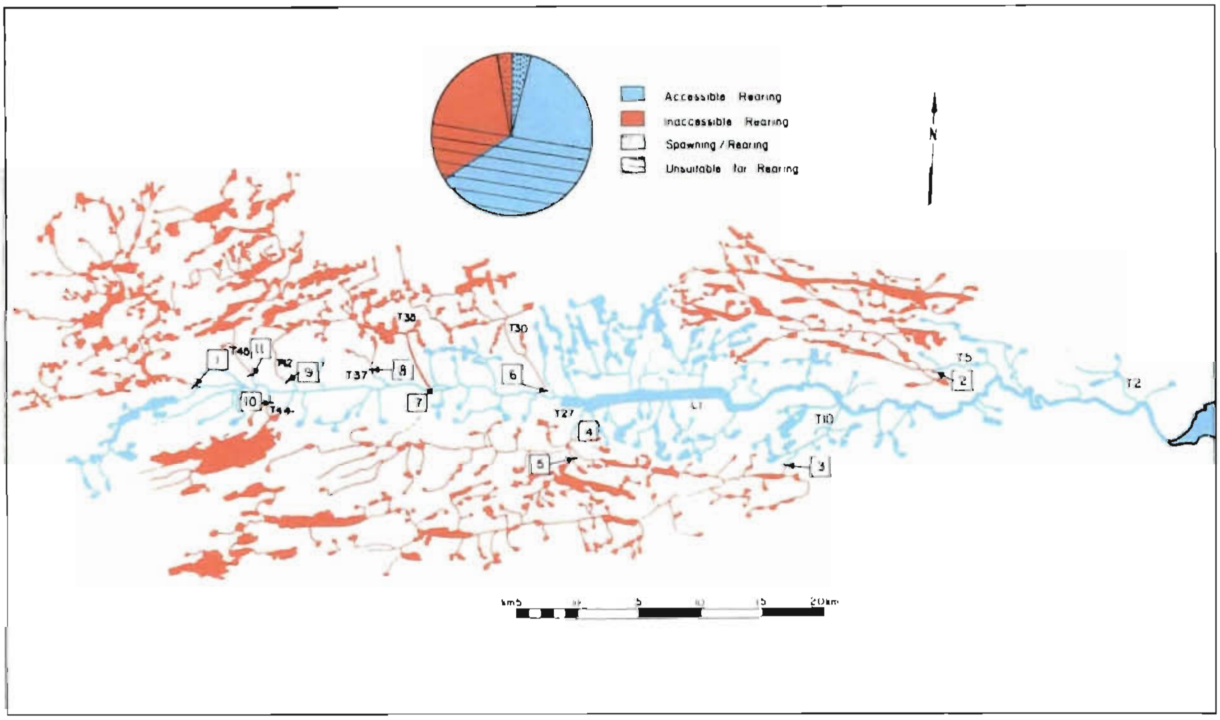

FIG. 113. Map of Anaktalik Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 394. Physical characteristics of Anaktalik Brook.

Map reference:	Tasisuak 14D 1 : 250 000	Maximum basin relief:	549 m
Mouth latitude:	56°29′N	Length by meander (main stem):	124 km
Mouth longitude:	62°09′W	Total length including tributaries:	1129 km
General direction of flow:	East	No. of tributaries:	63
Drainage area:	1813 km^2	Geological formation:	Anorthosite and associated rocks and gneiss
Mean width	20 km		
Axial length	97 km		
Basin perimeter	274 km		

TABLE 395. Obstructions on Anaktalik Brook (Murphy and Porter 1974a).

Fig. 113 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	99.8	Falls	15.3	9.2	90	Complete
2	T5	8.1	Falls	22.9	9.2	60	Complete
3	T10	6.4	Falls	7.6	7.6	—	Complete
4	T27	3.2	Falls	4.6	9.2	—	Complete
5	T27	12.9	Falls	4.6	6.1	90	Complete
6	T30	0.5	Falls	—	—	—	Complete
7	T35	1.0	Falls	—	—	—	Complete
8	T37	1.0	Falls	—	—	—	Complete
9	T42	1.0	Falls	—	—	—	Complete
10	T44	1.0	Falls	—	—	—	Complete
11	T45	1.0	Falls	—	—	—	Complete

TABLE 396. Results of analyses of three water samples collected on Anaktalik Brook, 1973, 1974, and 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm^{-1} at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973,1974[a]	6.7	11.0	25.0	4.5	8.0	3.7	1.8	9.7
1978	6.6	6.0	17.0	0.4	4.0	1.1	1.0	4.9

[a] Mean.

TABLE 397. Summary of data on sex, fork length, whole weight, age, and mercury content of lake trout and Arctic char captured in Anaktalik Brook, 26 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Lake trout	M	4	48.0	1.72	14.8	0.19	0.12–0.31
	F	3	46.7	1.06	14.0	0.23	0.19–0.27
Total		7	47.4	1.44	14.4	0.21	0.12–0.31
Arctic char	M	1	55.5	2.44	8.0	0.05	—
	F	2	50.3	1.75	8.0	0.05	—
Total		3	52.0	1.98	8.0	0.05	—

TABLE 398. Summary of rearing and spawning units in the accessible and inaccessible areas of Anaktalik River (Murphy and Porter 1974a).

Location	Accessible areas		Inaccessible areas	
	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	1 495	14 958	0	836
T2	0	560	0	0
T5	1 080	1 080	0	720
T10	0	1 152	1 783	6 769
T27	0	576	145	4 644
T30	0	0	0	2 169
T35	0	0	0	1 304
T37	0	0	0	1 161
T42	0	0	0	485
T44	0	0	0	224
T45	0	0	0	432
Total	2 575	18 326	1 928	18 744

Tasiyuyaksuk Brook

This small brook flows easterly, emptying into a small bay approximately 15 km southwest of Nain (Fig. 114). The brook has a drainage area of 104 km^2. The total length of main stem and tributaries is 58 km (Table 399). Other physical characteristics are listed in Table 399. There is no information available on fish populations of Tasiyuyaksuk Brook.

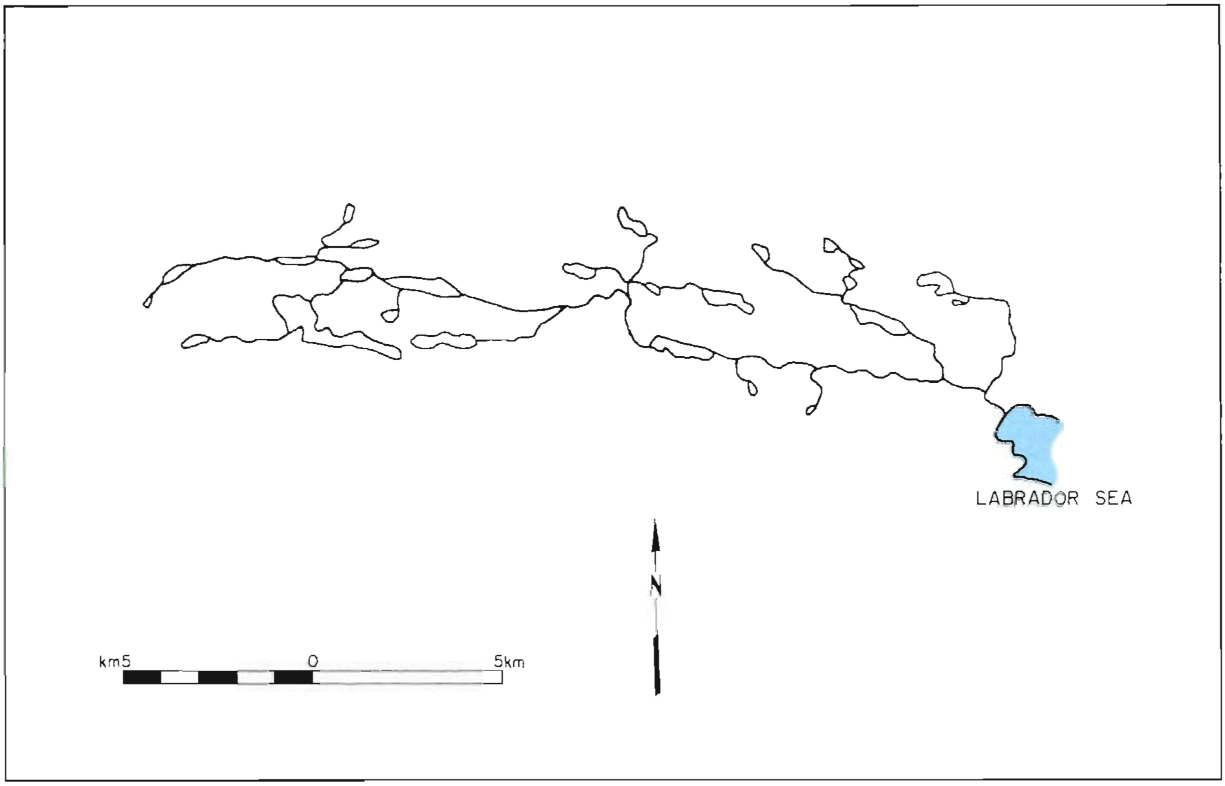

FIG. 114. Map of Tasiyuyaksuk Brook (not surveyed).

TABLE 399. Physical characteristics of Tasiyuyaksuk Brook.

Map reference:	Tasisuak Lake 14D 1 : 250 000	Maximum basin relief:	366 m
Mouth latitude:	56°31′N	Length by meander (main stem):	26 km
Mouth longitude:	62°02′W	Total length including tributaries:	58 km
General direction of flow:	East	No. of tributaries:	9
Drainage area:	104 km^2	Geological formation:	Anorthosite and associated rocks
Mean width	4 km		
Axial length	24 km		
Basin perimeter	58 km		

Fraser River flows easterly from the Quebec–Labrador border to Nain Bay (Fig. 115). A narrow lake, Tasisuak Lake (L1), is 56 km long, and forms the lower section of the river. Prichard (1911) used this river as a route to cross from coastal Labrador to the George River in Quebec. Ranger seals overwinter in the lower river and are hunted by the residents of Nain (Labrador Inuit Association 1977).

At the outlet of Tasisuak Lake into Nain Bay, the water is shallow and rapids appear during low tides. Further inland the lake is deep and bordered on either side by steep mountains. The river has a drainage area of 1606 km^2 (Table 400). At its inlet to Tasisuak Lake, it is approximately 30 m wide and meanders over sand and gravel substrate (Murphy and Porter 1974a). At km 22, water flows become swifter, bottom types change to boulder and rubble, and the river narrows to 10 m. This is probably the area described by Prichard (1911) who stated: "speaking generally I may say that the whole of the upper Fraser is rapid". Large boulders at km 38.6 form an underground river that prevents further fish migration during dry periods (Table 401). Because the river flows through a geological fault, the majority of tributaries cascade over steep canyon walls and are completely inaccessible to migrating fish. Vegetation in the watershed consists of a narrow band of spruce and shrub paralleling the river; sparse lichen growth occurs on the mountains. Water samples were collected in 1973, 1975, and 1978; results of the analyses of these samples are recorded in Table 402 (Jamieson 1979).

Fish species reported in Fraser River include Arctic char, brook trout, lake trout, mottled sculpin, and threespine and ninespine stickleback. Upstream fish migrations were monitored, 1975–79, by DFO at a site 7 km above the inlet to Tasisuak Lake. A description of the type of weir used to trap the fish is found in Anderson and McDonald (1978). Wide fluctuations in water levels in 1976 and 1978 resulted in washouts of the weir. The mean weights and catches by week for each year are presented in Tables 403–407. Weekly or daily fork length distributions of Arctic char that were migrating upstream in 1975–79 are presented in Tables 408–412.

Backus (1957) reported that this river was visited on 9 August 1951, by the "*Blue Dolphin*" Labrador Expedition. Eighty-five specimens of Arctic char, ranging from 60 to 419 mm in length, were collected in the estuary with an 18.3-m seine. Sollows et al. (1954) visited this river on 5 August 1954, and found it "completely devoid of fish". Bruce et al. (1979) captured 51 brook trout in a gill net set in Fraser River. Data on the sex, length, weight, and age of these fish are presented in Table 413. Coady and Best (1976), Dempson (1978), and Dempson and Best (1978) have used information collected from the counting fence in their assessments of the northern Labrador Arctic char stocks and the commercial char fishery. Murphy and Porter (1974a) surveyed the river in 1973 and recorded 8701 accessible rearing units (Table 414).

TABLE 400. Physical characteristics of Fraser River.

Map reference:	Tasisuak Lake 14D 1 : 250 000	Maximum basin relief:	671 m
Mouth latitude:	56°39′N	Length by meander (main stem):	116 km
Mouth longitude:	63°10′W	Total length including tributaries:	921 km
General direction of flow:	East	No. of tributaries:	86
Drainage area:	1606 km^2	Geological formation:	Granitic gneiss
Mean width	13 km		
Axial length	112 km		
Basin perimeter	348 km		

TABLE 401. Obstructions on the main stem, Fraser River (Murphy and Porter 1974a).

Fig. 115 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	38.6	Boulder (river underground)	—	—	—	Partial

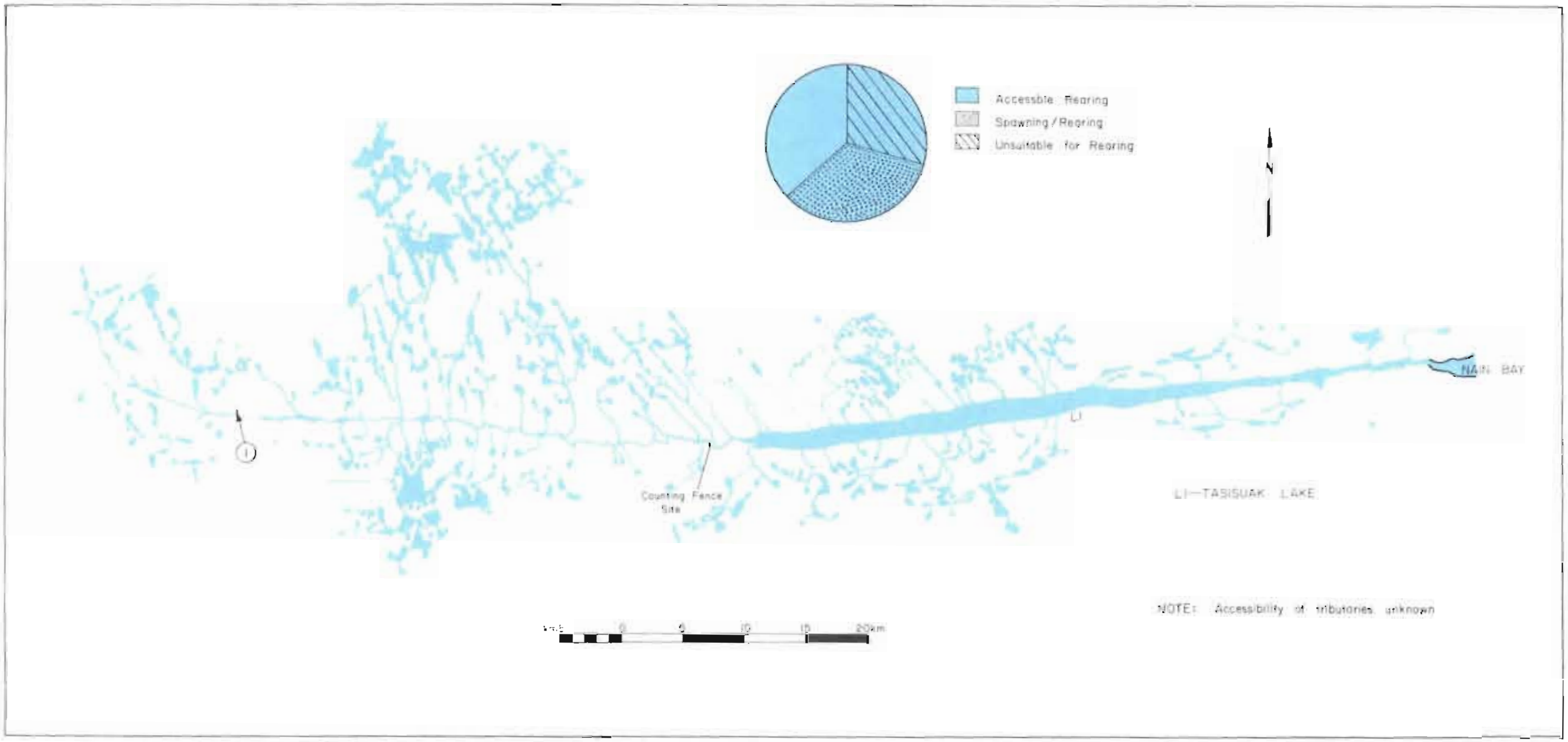

FIG. 115. Map of Fraser River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 402. Mean results of analyses of three water samples collected on Fraser River, 1973, 1975, and 1978 (Jamieson 1979).

pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
6.5	6.7	16.5	0.9	4.3	1.3	1.1	4.9

TABLE 403. Weekly counts of upstream migrating Arctic char, Fraser River, 1975. Trap located 7 km above Tasisuak Lake (DFO, unpubl. data).

Week ending	Weekly catch	Weight (kg)		Mean water temp. (°C)
		No. sampled	Mean	
03 Aug.	537	330	1.97	13.0
10 Aug.	1043	1034	1.61	13.2
17 Aug.	349	290	1.32	10.4
24 Aug.	720	509	1.40	10.3
31 Aug.	921	354	1.16	11.2
07 Sept.	382	278	0.82	11.3
Total	3952	2795	1.45	

TABLE 404. Weekly counts of upstream migrating Arctic char, Fraser River, 1976. Trap located 7 km above Tasisuak Lake (DFO, unpubl. data).

Week ending	Weekly catch	Weight (kg)		Mean water temp. (°C)
		No. sampled	Mean	
11 July	0	0	—	8.6
18 July[a]	1	1	2.00	10.4
25 July[a]	24	23	2.43	11.6
01 Aug.	7	6	2.67	9.4
08 Aug.	356	348	2.10	8.5
15 Aug.	364	355	1.71	9.0
22 Aug.	420	418	1.54	8.9
29 Aug.	1176	489	1.37	9.1
Total	2348	1640	1.66	

[a]Fence washed out 23–27 July inclusive.

TABLE 405. Weekly counts of upstream migrating Arctic char, Fraser River, 1977. Trap located 7 km above Tasisuak Lake (DFO, unpubl. data).

Week ending	Weekly catch	Weight (kg)		Mean water temp. (°C)
		No. sampled	Mean	
03 July	0	0	—	8.9
10 July	0	0	—	7.9
17 July	0	0	—	9.9
24 July	0	0	—	13.5
31 July	0	0	—	10.2
07 Aug.	431	421	1.44	10.8
14 Aug.	656	466	1.34	9.0
21 Aug.	512	209	1.23	8.9
28 Aug.	174	167	1.19	9.3
04 Sept.	287	281	1.22	8.6
11 Sept.	30	28	0.73	7.7
18 Sept.	79	76	0.87	6.4
25 Sept.	165	159	0.87	5.1
Total	2334	1807	1.24	

TABLE 406. Weekly counts of upstream migrating Arctic char, Fraser River, 1978. Trap located 7 km above Tasisuak Lake (DFO, unpubl. data).

Week ending	Weekly catch	Weight (kg)		Mean water temp. (°C)
		No. sampled	Mean	
31 July[a]	283	233	2.47	12.3

[a]Fence washed out 28 July.

TABLE 407. Weekly counts of upstream migrating Arctic char, Fraser River, 1979. Trap located 7 km above Tasisuak Lake (DFO, unpubl. data).

Week ending	Weekly catch	Weight (kg)		Mean water temp. (°C)
		No. sampled	Mean	
22 July[a]	18	18	1.24	10.7
29 July	128	128	1.35	10.3
05 Aug.	1314	270	1.30	10.5
12 Aug.	1296	427	1.35	9.3
19 Aug.	931	569	1.28	9.4
26 Aug.	2171	968	1.07	8.8
02 Sept.[b]	545	271	0.92	7.7
Total	6403	2651	1.20	

[a]Fence completed 20 July.
[b]Fence removed 31 Aug.

TABLE 408. Weekly distribution of fork length of upstream migrating Arctic char, Fraser River, 1975 (DFO, unpubl. data).

Week ending	Fork length (cm) 10.49–20.48	20.49–30.48	30.49–40.48	40.49–50.48	50.49–60.48	60.49–70.48	70.49–80.48	80.49–90.48	Number
03 Aug.	3	1	12	195	180	19	1	1	412
10 Aug.	0	2	110	579	324	21	1	0	1037
17 Aug.	0	5	81	137	60	8	0	0	291
24 Aug.	0	0	112	297	100	7	0	0	516
31 Aug.	0	8	99	196	48	3	0	0	354
07 Sept.	0	29	144	96	16	0	0	0	285
Total	3	45	558	1500	728	58	2	1	2895

TABLE 409. Weekly distribution of fork length of upstream migrating Arctic char, Fraser River, 1976 (DFO, unpubl. data).

Week ending	Fork length (cm) 10.49–20.48	20.49–30.48	30.49–40.48	40.49–50.48	50.49–60.48	60.49–70.48	70.49–80.48	80.49–90.48	90.49–100.48	Number
18 July	0	0	0	0	1	0	0	0	0	1
25 July	0	0	1	8	14	1	0	0	0	24
01 Aug.	0	0	0	2	3	1	0	0	0	6
08 Aug.	0	0	47	185	94	22	0	0	0	348
15 Aug.	0	2	62	198	80	13	0	0	0	355
22 Aug.	5	14	127	201	65	6	0	0	0	418
29 Aug.	0	12	172	246	51	8	0	0	0	489
Total	5	28	409	840	308	51	0	0	0	1641

TABLE 410. Weekly distribution of fork length of upstream migrating Arctic char, Fraser River, 1977 (DFO, unpubl. data).

Week ending	Fork length (cm) 10.49–20.48	20.49–30.48	30.49–40.48	40.49–50.48	50.49–60.48	60.49–70.48	70.49–80.48	Number
07 Aug.	3	4	47	289	65	14	0	422
14 Aug.	0	3	73	325	58	5	2	466
21 Aug.	0	12	60	109	25	3	0	209
28 Aug.	0	2	38	107	17	3	0	167
04 Sept.	0	7	74	155	44	1	0	281
11 Sept.	0	3	11	13	1	0	0	28
18 Sept.	0	0	27	47	2	0	0	76
25 Sept.	0	7	44	100	8	0	0	159
Total	3	38	374	1145	220	26	2	1808

TABLE 411. Daily distribution of fork length of upstream migrating Arctic char, Fraser River, 1978 (DFO, unpubl. data).

Date	Fork length (cm) 10.49–20.48	20.49–30.48	30.49–40.48	40.49–50.48	50.49–60.48	60.49–70.48	70.49–80.48	Number
25 July	0	0	0	1	1	0	0	2
26 July	1	0	5	48	48	8	1	111
27 July	0	0	5	63	62	12	0	142
Total	1	0	10	112	111	20	1	255

TABLE 412. Weekly distribution of fork length of upstream migrating Arctic char, Fraser River, 1979 (DFO, unpubl. data).

Week ending	Fork length (cm) 15.0–24.9	25.0–34.9	35.0–44.9	45.0–54.9	55.0–64.9	65.0–74.9	Number
22 July	0	1	2	11	3	1	18
29 July	1	3	14	81	28	1	128
05 Aug.	0	2	213	292	34	5	546
12 Aug.	1	10	246	377	57	3	694
19 Aug.	0	23	310	306	45	1	685
26 Aug.	1	142	526	288	27	2	986
02 Sept.	2	55	143	80	6	0	286
Total	5	236	1454	1435	200	13	3343

TABLE 413. Summary of data on sex, fork length, whole weight, age, and mercury content of brook trout captured in Fraser River, 1977 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Brook trout	M	29	21.5	0.11	3.6	0.07	0.03–0.11
	F	22	19.8	0.08	3.6	0.06	0.02–0.10
Total		51	20.6	0.10	3.6	0.07	0.02–0.11

TABLE 414. Summary of rearing and spawning units in the accessible and inaccessible areas of Fraser River (Murphy and Porter 1974a).

Location	Accessible areas: Spawning units	Accessible areas: Rearing units	Inaccessible areas: Spawning units	Inaccessible areas: Rearing units
Main stem	4539	8701	—	—
Total	4539	8701	—	—

Kamanatsuk Brook flows easterly, emptying into Tikkoatokak Bay, approximately 50 km northwest of Nain (Fig. 116). It has a drainage area of 829 km^2 and total length of main stem and tributaries is 441 km (Table 415). The lower river, which averages 45 m in width, meanders across a plateau that is wooded with sparse stands of spruce. At km 4.8, a 6.1-m falls forms a complete barrier to further upstream fish migration (Table 416). From this falls to the outlet of Tasialuk Lake (L1), the river is 45 m wide and flows over gravel/rubble substrate. Tasialuk Lake stretches for 10 km, covers an area of 1110 ha, and is bordered by steep mountains on either side. From the inlet of Tasialuk Lake to km 64, the bottom substrate is mainly boulder/rubble and the river ranges from 10 to 30 m wide. A 1.5-m falls forms a partial barrier to fish migration at km 40.3; a 4.6-m falls at km 46.7 is considered a complete obstruction. Steep mountains form the middle and upper sections of the river valley. The majority of tributaries are completely obstructed near their mouths by cascades. Vegetation in the river valley consists of shrub forms of spruce and balsam fir; lichens, sedges, and mosses occur in the mountains. A water sample was collected in 1973; results of analyses of this sample are found in Table 417 (Jamieson 1979).

Arctic char are fished commercially in Tikkoatokak Bay. Murphy and Porter (1974b) reported the presence of both Arctic char and Atlantic salmon in Kamanatsuk Brook. A gill net set in July 1978 at Tasialuk Lake captured 35 lake trout and 24 Arctic char (Bruce et al. 1979). A summary of data on length, weight, sex, and age of these fish is presented in Table 418. During their survey in 1973, Murphy and Porter recorded 2208 accessible and 13 066 inaccessible rearing units (Table 419).

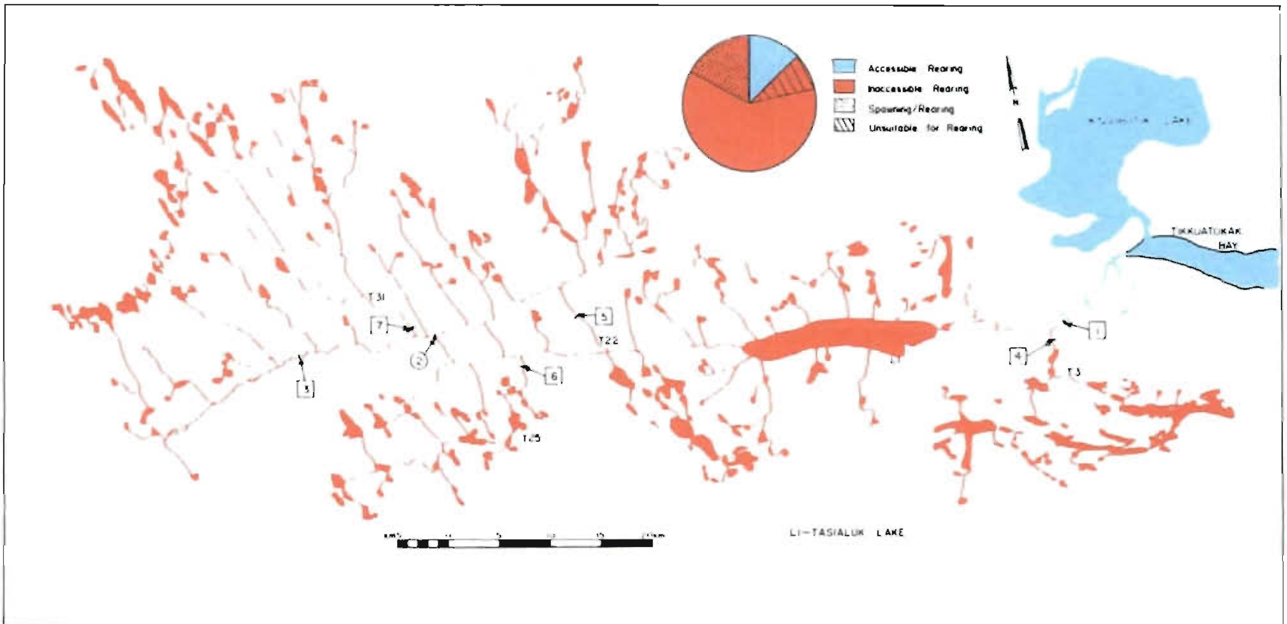

FIG. 116. Map of Kamanatsuk Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 415. Physical characteristics of Kamanatsuk Brook.

Map reference:	Tasisuak Lake 14D 1 : 250 000	Maximum basin relief:	610 m
Mouth latitude:	56°46′N	Length by meander (main stem):	63 km
Mouth longitude:	62°32′W	Total length including tributaries:	441 km
General direction of flow:	East	No. of tributaries:	42
Drainage area:	829 km²	Area of lakes >100 ha:	
Mean width	14 km	L1 Tasialuk Lake	1110 ha
Axial length	55 km		
Basin perimeter	187 km	Geological formation:	Anorthosite and associated rocks

TABLE 416. Obstructions on Kamanatsuk Brook (Murphy and Porter 1974b).

Fig. 116 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	4.8	Falls	6.1	15.3	60	Complete
2	Main stem	40.3	Falls	1.5	15.3	—	Partial
3	Main stem	46.7	Falls	4.6	9.2	90	Complete
4	T3	1.6	Falls	9.2	—	90	Complete
5	T22	3.2	Falls	—	—	—	Complete
6	T25	1.0	Falls	—	—	—	Complete
7	T31	1.0	Falls	—	—	—	Complete

TABLE 417. Results of analyses of a water sample collected on Kamanatsuk Brook, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.3	8.0	14.0	4.5	2.0	1.5	0.8	2.4

TABLE 418. Summary of data on sex, fork length, whole weight, age, and mercury content of lake trout and Arctic char captured in Tasialuk Lake, Kamanatsuk Brook, 26 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Lake trout	M	18	44.1	0.99	18.4	0.39	0.19–1.20
	F	17	44.3	0.87	17.1	0.35	0.16–1.40
Total		35	44.2	0.93	17.8	0.37	0.16–1.40
Arctic char	M	8	37.1	0.50	10.0	0.07	0.06–0.10
	F	16	35.1	0.49	10.6	0.10	0.06–0.14
Total		24	35.8	0.50	10.4	0.09	0.06–0.14

TABLE 419. Summary of rearing and spawning units in the accessible and inaccessible areas of Kamanatsuk River (Murphy and Porter 1974b).

Location	Accessible areas		Inaccessible areas	
	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	0	2 208	2 851	9 255
T31	0	0	0	1 303
Remaining tributaries	0	0	0	2 508[a]
Total	0	2 208	2 851	13 066

[a]Estimated from topographic map.

Kingurutik River, a long, wide river system flows from the Quebec–Labrador border to Tikkoatokak Bay (Fig. 117). It has a drainage area of 4157 km^2 (Table 420). Several lakes are formed between mountains in the watershed, the largest being Kingurutik Lake (L1), located 2 km from the river mouth and covering an area of 8910 ha (Table 420). The Labrador Inuit Association (1977) reported ranger seals overwintering in this lake. Other lakes are situated on the upper main river and tributary 34 (T34).

The lower river between the mouth and Kingurutik Lake is known as Kotannak Brook and is approximately 65 m wide. Widths in the remainder of the river range from 100 m directly above Kingurutik Lake to 18 m in the headwaters, 122 km from the mouth. Bottom substrate types are mainly rubble/boulder interrupted by patches of gravel throughout the system. Falls occur on the upper main stem at km 112.7 and km 115.9 with the first falls being a complete barrier to fish migration. The second falls is a partial obstruction. Obstructions have also been noted on seven tributaries (Table 421). Shrub forms of spruce and balsam fir are located in the river valley and lichens, sedges, and mosses cover the mountains that occur throughout the watershed. A water sample was collected in 1973; results of analyses of this sample are found in Table 422 (Jamieson 1979).

Murphy and Porter (1974b) suggested that this river is populated primarily with Arctic char with a smaller population of Atlantic salmon. In July 1978, a total of 26 Arctic char were netted in Esker Lake (L3). A summary of the data on length, weight, sex, and age of these fish is presented in Table 423 (Bruce et al. 1979). The potential of both the main stem and tributaries of this river is vast; Murphy and Porter recorded a total of 63 966 accessible and 5895 inaccessible rearing units (Table 424). Undoubtedly the large commercial fishery for Arctic char in Tikkoatokak Bay exploits a high percentage of the char produced in this river.

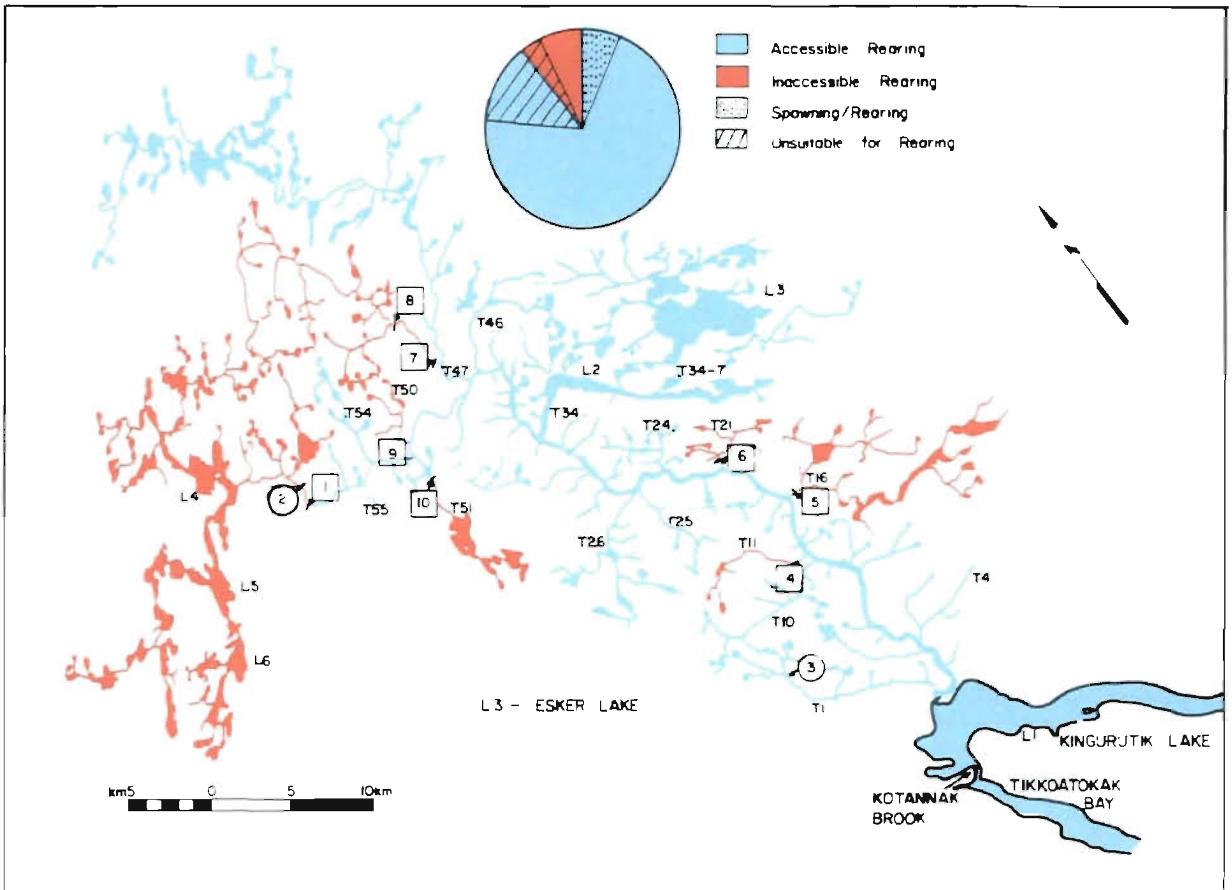

FIG. 117. Map of Kingurutik River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 420. Physical characteristics of Kingurutik River.

Map reference:	Tasisuak Lake 14D North River 14E 1 : 250 000	Maximum basin relief:	671 m
		Length by meander (main stem):	122 km
Mouth latitude:	56°50′N		
Mouth longitude:	62°34′W	Total length including tributaries:	1584 km
General direction of flow:	Southeast	No. of tributaries:	68
Drainage area:	4157 km²	Area of lakes >100 ha:	
Mean width	38 km	L1 Kingurutik Lake	8910 ha
Axial length	106 km	L2	1240 ha
Basin perimeter	543 km	L3 Esker Lake	4320 ha
		L4	1810 ha
		L5	1300 ha
		L6	780 ha
		Geological formation:	Anorthosite, gneiss and granite

TABLE 421. Obstructions on Kingurutik River (Murphy and Porter 1974b).

Fig. 117 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	112.7	Falls	9.1	—	90	Complete
2	Main stem	115.9	Falls	1.8	—	—	Partial
3	T1	16.1	Falls	9.1	—	—	Partial
4	T11	0.0	Falls	16.1	3.1	90	Complete
5	T16	0.0	Falls	—	—	—	Complete
6	T21	1.6	Falls	—	—	—	Complete
7	T47	6.4	Falls	1.8	30.5	45	Complete
8	T47	19.3	Falls	3.1	30.5	—	Complete
9	T50	0.0	Falls	6.1	—	90	Complete
10	T51	0.0	Falls	—	—	—	Complete

TABLE 422. Results of analyses of a water sample collected on Kingurutik River, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.3	6.0	11.0	0.8	4.0	1.0	0.8	4.9

TABLE 423. Summary of data on sex, fork length, whole weight, age, and mercury content of Arctic char captured in Esker Lake, Kingurutik River, 28 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Arctic char	M	17	48.6	1.42	15.7	0.33	0.06–0.51
	F	9	44.2	0.92	13.6	0.33	0.06–0.58
Total		26	47.1	1.25	15.0	0.33	0.06–0.58

TABLE 424. Summary of rearing and spawning units in the accessible and inaccessible areas of Kingurutik River (Murphy and Porter 1974b).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	3 479	43 349	0	1 613
T1	148	2 852	0	0
T4	0	167	0	0
T10	0	810	0	0
T11	0	0	0	1 449
T16	0	0	0	1 127
T21	0	0	0	482
T24	0	242	0	0
T25	0	645	0	0
T26	0	0	0	0
T34	173	4 315	0	0
T46	84	0	0	0
T47	1 224	10 500	0	580
T50	0	0	0	322
T51	0	0	0	322
T54	0	724	0	0
T55	0	362	0	0
Total	5 108	63 966	0	5 895

Webb Brook flows southerly, emptying into Webb Bay, a well-protected inlet, approximately 30 km north of Nain (Fig. 118). The river has a drainage area of 378 km^2 (Table 425) and flows in a wide valley between steep mountains. A water sample was collected in 1976; results of the analyses are presented in Table 426 (Jamieson 1979). The Labrador Inuit Association (1977) reported that both Atlantic salmon and Arctic char spawn throughout the entire main stem. T. Curran (pers. comm.) sighted large numbers of char in the river in late August 1977. A small commercial fishery for Arctic char was prosecuted in Webb Bay in 1977 and 2516 kg (round weight) were taken (Dempson 1978).

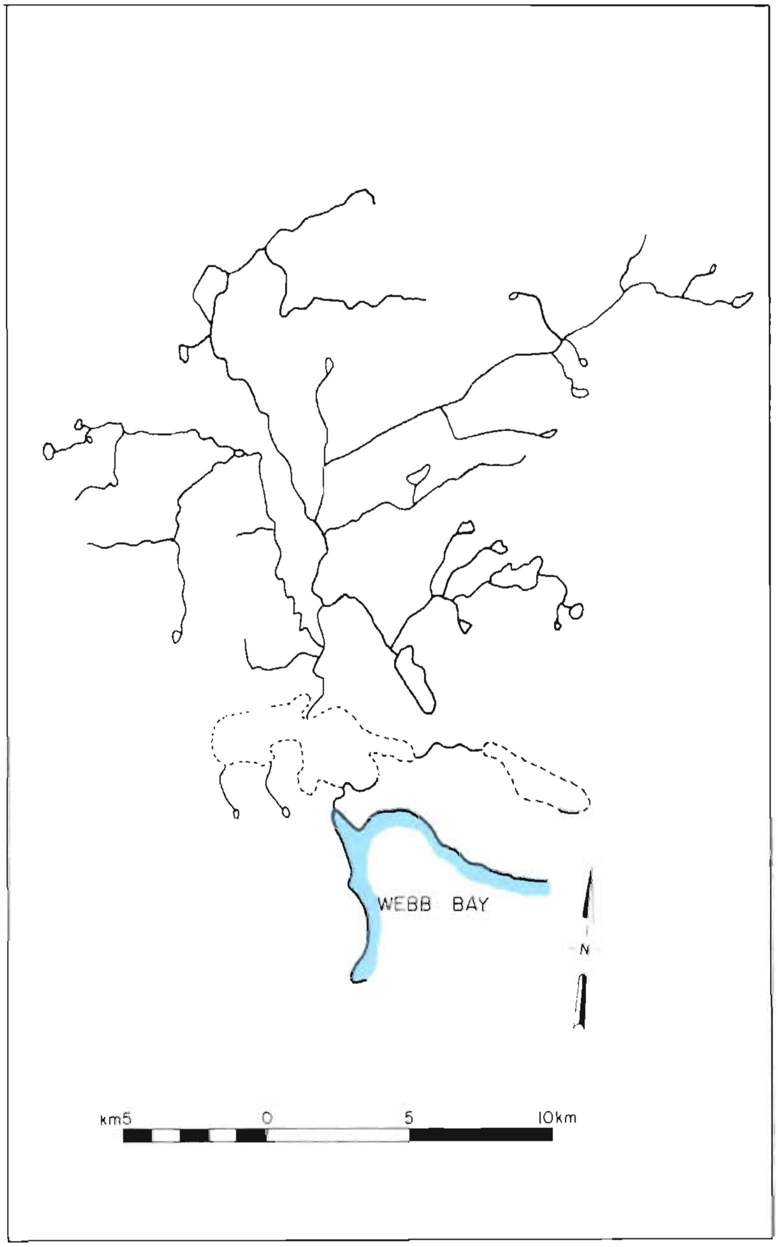

FIG. 118. Map of Webb Brook (not surveyed).

TABLE 425. Physical characteristics of Webb Brook.

Map reference:	Nain 14C Tasisuak Lake 14D North River 14E 1 : 250 000	Maximum basin relief:	427 m
		Length by meander (main stem):	26 km
Mouth latitude:	56°48′N	Total length including tributaries:	139 km
Mouth longitude:	61°56′W	No. of tributaries:	12 km
General direction of flow:	South	Geological formation:	Anorthosite and associated rocks and gneiss
Drainage area:	378 km²		
Mean width	20 km		
Axial length	24 km		
Basin perimeter	87 km		

TABLE 426. Results of analyses of a water sample collected on Webb Brook, 1976 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1976	6.4	8.0	23.0	0.8	8.0	1.6	2.0	9.8

Avakutak River flows northerly, emptying into Avakutak Bay (Fig. 119). The river drains the western slopes of the Kiglapait Mountains and the largest lake in the system, Kiglapait Tasialua Lake (L1), is over 180 m in elevation. This river has a drainage area of 278 km^2 and a total stream length of 106 km (Table 427). No information on fish populations is available.

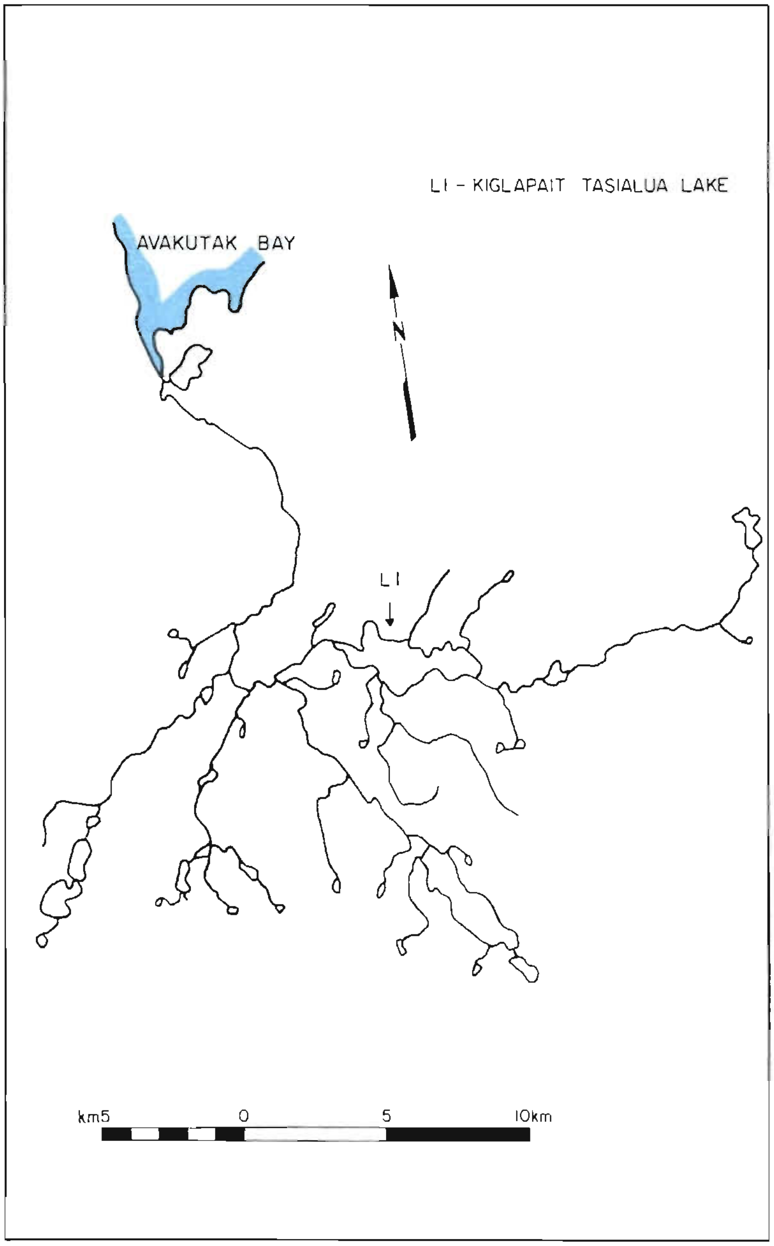

FIG. 119. Map of Avakutak River (not surveyed).

TABLE 427. Physical characteristics of Avakutak River.

Map reference:	Nain 14C Nutak 14F 1 : 250 000	Maximum basin relief:	610 m
		Length by meander (main stem):	29 km
Mouth latitude:	57°09′N		
Mouth longitude:	61°52′W	Total length including tributaries:	106 km
General direction of flow:	Northwest	No. of tributaries:	10
		Area of lakes >100 ha:	
Drainage area:	278 km²	L1 Kiglapait Tasialua Lake	710 ha
Mean width	11 km		
Axial length	26 km		
Basin perimeter	93 km	Geological formation:	Anorthosite and associated rocks

Avakutak Brook

This brook flows in a northeasterly direction, and empties into Avakutak Bay (Fig. 120). It has a drainage area of 166 km^2 and a total stream length of 58 km (Table 428). Information on fish populations is unavailable.

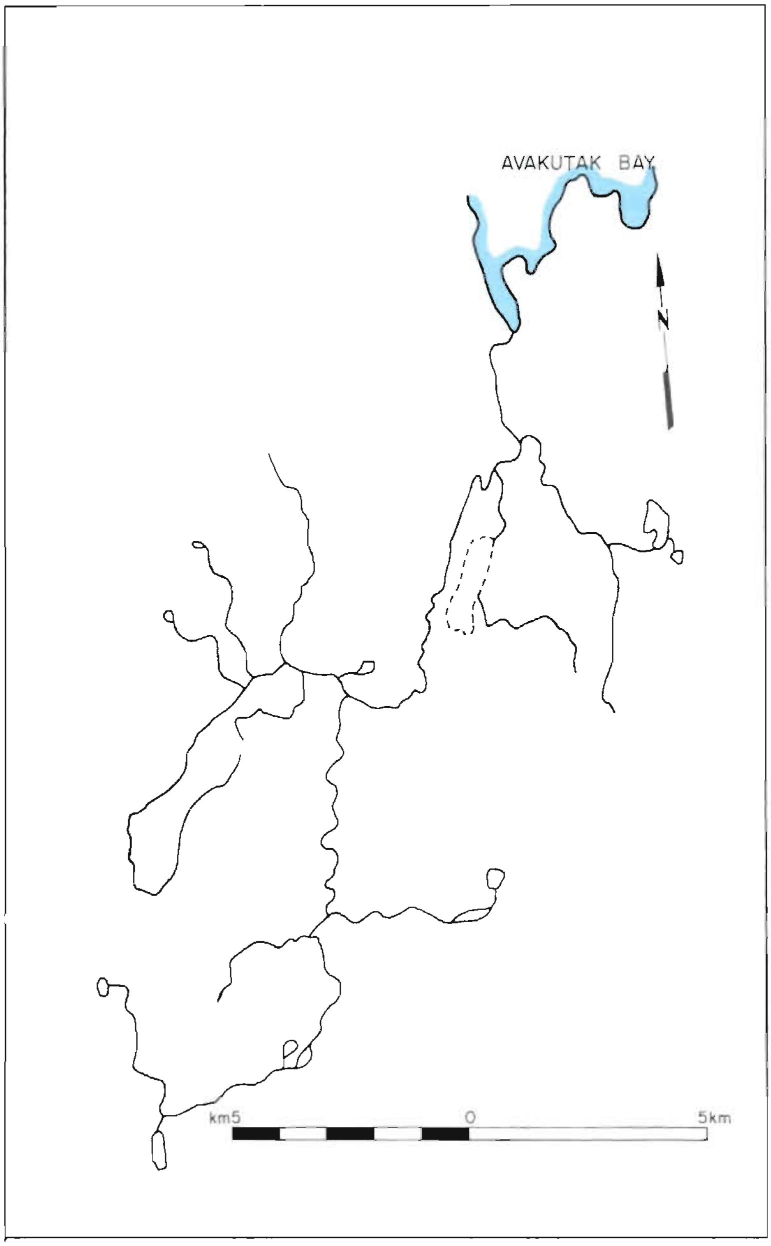

FIG. 120. Map of Avakutak Brook (not surveyed).

TABLE 428. Physical characteristics of Avakutak Brook.

Map reference:	Nutak 14F Nain 14C North River 14E Tasisuak Lake 14D 1 : 250 000	Maximum basin relief:	366 m
		Length by meander (main stem):	23 km
Mouth latitude:	57°09′N	Total length including tributaries:	58 km
Mouth longitude:	61°52′W	No. of tributaries:	8
General direction of flow:	Northeast	Geological formation:	Anorthosite and associated rocks
Drainage area:	166 km²		
Mean width	6 km		
Axial length	20 km		
Basin perimeter	58 km		

This brook, which is characterized by large areas of standing water, flows easterly and empties into Tasiuyak Bay (Fig. 121). The drainage area of the system is 1471 km^2 and area of the various lakes on this system ranges from 470 to 2410 ha (Table 429). Arctic char have been reported in Frank Lake (L1), Laura Lake (L2), and Tasiuyak Tasialua Lake (L3) by the Labrador Inuit Association (1977). A sports angling camp has been operated at the outlet at Tasiuyak Tasialua Lake since 1966; the total reported catch of Arctic char from 1966 to 1974 is 823 fish (Table 430). In addition, during 1970, 100 sea-run brook trout weighing between 0.9 and 1.8 kg and 10 lake trout (weight unknown) were angled.

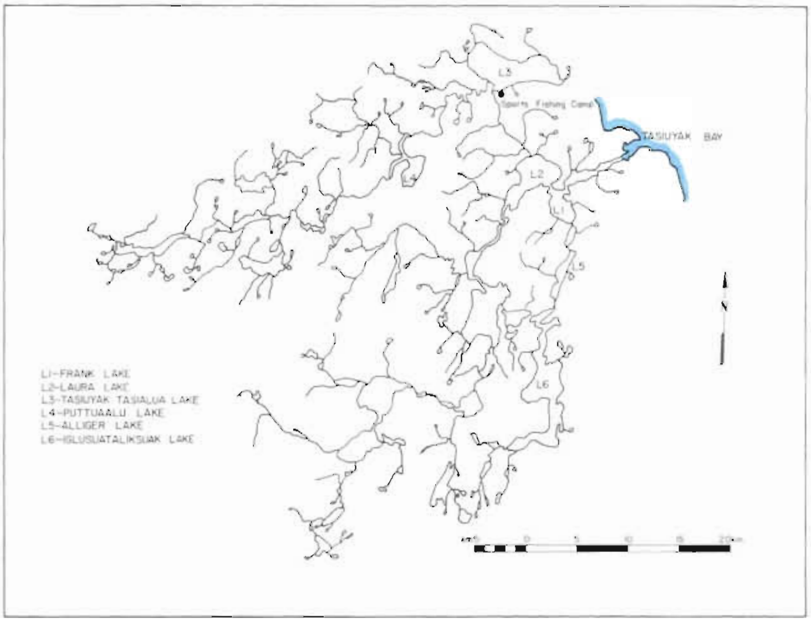

FIG. 121. Map of Puttuaalu Brook (not surveyed).

TABLE 429. Physical characteristics of Puttuaalu Brook.

Map reference:	Nutak 14F Tasisuak Lake 14D North River 14E 1 : 250 000	Maximum basin relief: Length by meander (main stem):	549 m 71 km
Mouth latitude:	57°16′N	Total length including tributaries:	536 km
Mouth longitude:	62°13′W	No. of tributaries:	16
General direction of flow:	Northeast	Area of lakes >100 ha: L1 Frank Lake	 880 ha
Drainage area: Mean width Axial length Basin perimeter	1471 km^2 28 km 54 km 216 km	L2 Laura Lake L3 Tasiuyak Tasialua Lake L4 Puttuaalu Lake L5 Alliger Lake L6 Iglusuataliksuak Lake	1230 ha 2330 ha 470 ha 660 ha 2410 ha
		Geological formation:	Anorthosite and associated rocks and gneiss

TABLE 430. Summary of data on the angling catch of Arctic char, Puttuaalu Brook, 1966–74.

Year	Angling catch
1966	62
1967	175
1968	37
1969	254
1970	115
1971	50
1972	70
1973	30
1974	30
Total	823

This brook flows southeasterly, emptying into a shallow inlet on the northern side of Tasiuyak Bay (Fig. 122). It has a drainage area of 113 km^2 and a total length (including tributaries) of 56 km (Table 431). The Labrador Inuit Association (1977) reported Arctic char in the lower main river.

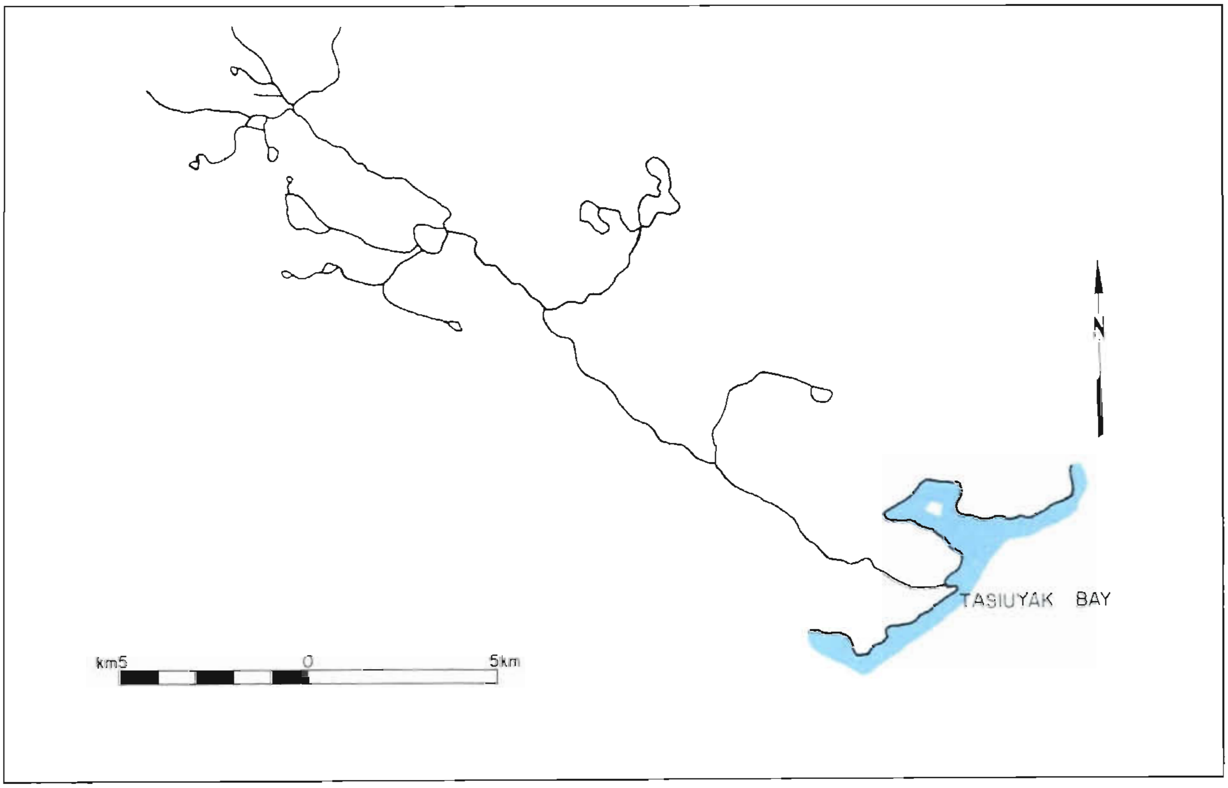

FIG. 122. Map of Nakavik Brook (not surveyed).

TABLE 431 Physical characteristics of Nakavik Brook.

Map reference:	North River 14E 1 250 000	Maximum basin relief:	183 m
Mouth latitude:	57°16′N	Length by meander (main stem):	23 km
Mouth longitude:	61°56′W	Total length including tributaries:	56 km
General direction of flow:	Southeast	No. of tributaries:	8
Drainage area:	113 km^2	Geological formation:	Gneiss
Mean width	5 km		
Axial length	26 km		
Basin perimeter	61 km		

Ikinet Brook flows northeasterly, emptying into the southern side of Okak Bay (Fig. 123). Approximately 5 km from its mouth, this brook separates into two branches, Sikkoyavik Brook and Umiakoviarusek Brook (T3). In the upper reaches of Umiakoviarusek Brook is Umiakoviarusek Lake (L1), which covers an area of 1110 ha. Other physical information is presented in Table 432. Okak Bay has traditionally been a summer station for the Arctic char commercial fishery and the Labrador Inuit Association (1977) have reported the presence of char in Ikinet Brook.

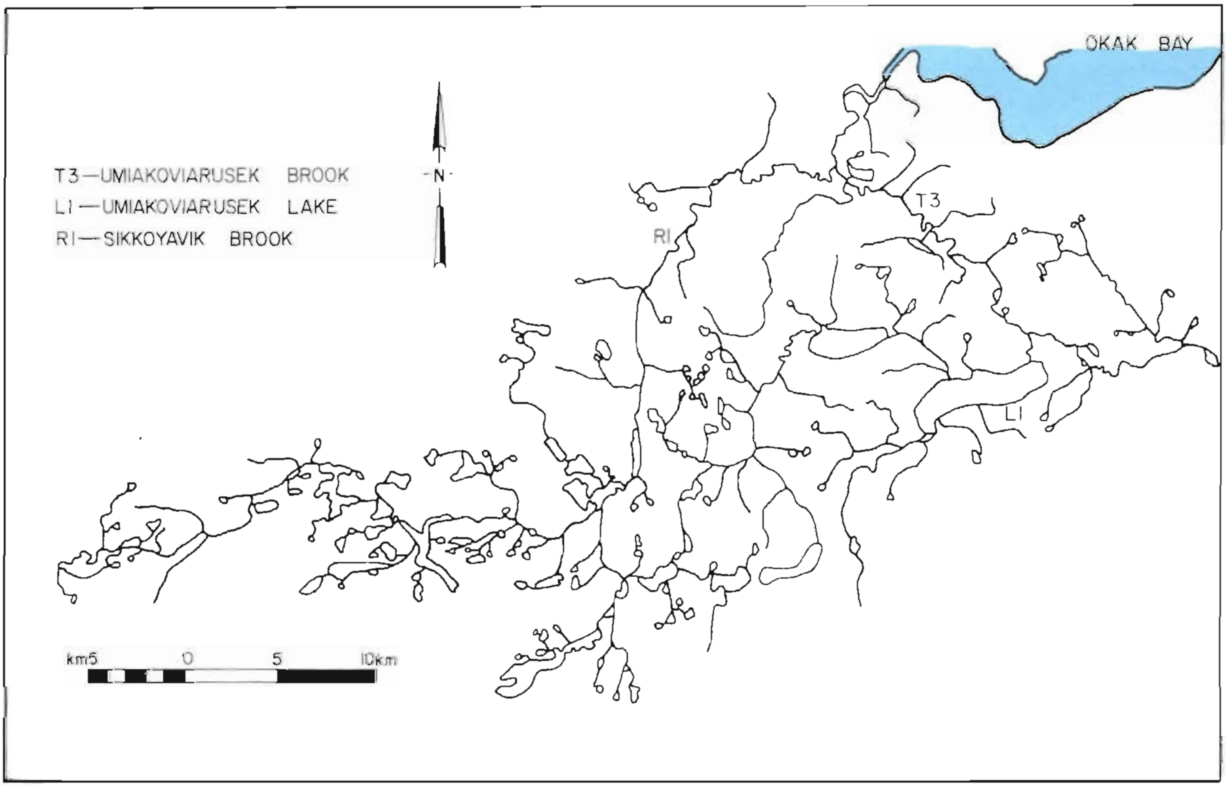

FIG. 123. Map of Ikinet Brook (not surveyed).

TABLE 432. Physical characteristics of Ikinet Brook.

Map reference:	North River 14E 1 : 250 000	Maximum basin relief:	549 m
Mouth latitude:	57°27′N	Length by meander (main stem):	68 km
Mouth longitude:	62°28′W	Total length including tributaries:	385 km
General direction of flow:	Northeast	No. of tributaries:	33
Drainage area:	872 km^2	Area of lakes >100 ha:	
Mean width	17 km	L1 Umiakoviarusek Lake	1110 ha
Axial length	54 km		
Basin perimeter	174 km	Geological formation:	Anorthosite and associated rocks

North River flows from a plateau in the interior of northern Labrador, through a low-lying river valley bounded by steep mountains. Its mouth in Okak Bay is approximately 180 km northeast of Nain (Fig. 124). The river has a drainage area of 1655 km^2; the total length of main stem and tributaries is 515 km (Table 433).

From its mouth to km 13, this river is approximately 55 m wide and flows swiftly over boulder/rubble substrate. At km 13, the bottom substrate changes to sand and gravel, water velocities decrease, and the river narrows to 22 from 27 m. At km 61, water velocities increase and the bottom substrate reverts to boulder/rubble. At km 66.0, a 7.6-m vertical falls forms a complete barrier to fish migration (Table 434). This barrier is followed by a series of four falls between km 67.6 and km 69.2, all of which are complete obstructions. Murphy and Porter (1974b) reported that the area above these falls has only limited potential for juvenile salmon rearing.

Because of the steep sides of the main river valley, all tributaries except T5 and T9 are rendered inaccessible to migrating fishes within 2 km of their confluence with the main river. Both T5 and T9 contain large bodies of standing water in their upper reaches and Umiakovik Lake (L2) on T9 is the site of an Arctic char sports angling camp. Vegetation throughout most of the watershed consists of mosses, sedges, and lichens; scrub spruce lines the river valley although forest fires have denuded some areas.

Both Murphy and Porter (1974b) and the Labrador Inuit Association (1977) have reported the presence of Arctic char in North River. Bruce et al. (1979) netted 49 char in Umiakovik Lake in August 1977 and five char in L1 in July 1978. A summary of data on length, weight, sex, and age of these fish is presented in Tables 435 and 436. Arctic char angling catches reported from the angling camp on Umiakovik Lake are as follows: 50 in 1970, 50 in 1971, 100 in 1972, 3 in 1973, and 25 in 1974. In 1973, an unconfirmed report was received of a pink salmon (*Oncorhynchus gorbuscha*) being angled in Umiakovik Lake. This species was introduced in North Harbour River in insular Newfoundland during the 1960s (Lear 1975).

An active commercial fishery for Arctic char is prosecuted annually in Okak Bay, near the mouth of North River. Yearly catches and data on length, weight, age, and sex of the Okak Bay commercial Arctic char catch are found in Coady and Best (1976), Dempson (1978), and Dempson and Best (1978). Murphy and Porter (1974b) estimated that North River contains 23 787 accessible and 14 964 inaccessible rearing units (Table 437).

TABLE 433. Physical characteristics of North River.

Map reference:	North River 14E 1 : 250 000	Maximum basin relief:	671 m
Mouth latitude:	57°31′N	Length by meander (main stem):	84 km
Mouth longitude:	62°33′W	Total length including tributaries:	515 km
General direction of flow:	East	No. of tributaries:	35
Drainage area:	1655 km^2	Area of lakes >100 ha:	
Mean width	33 km	L1	2070 ha
Axial length	56 km	L2 Umiakovik Lake	1550 ha
Basin perimeter	203 km	L3	390 ha
		L4	780 ha
		Geological formation:	Gneiss with granite and associated rocks

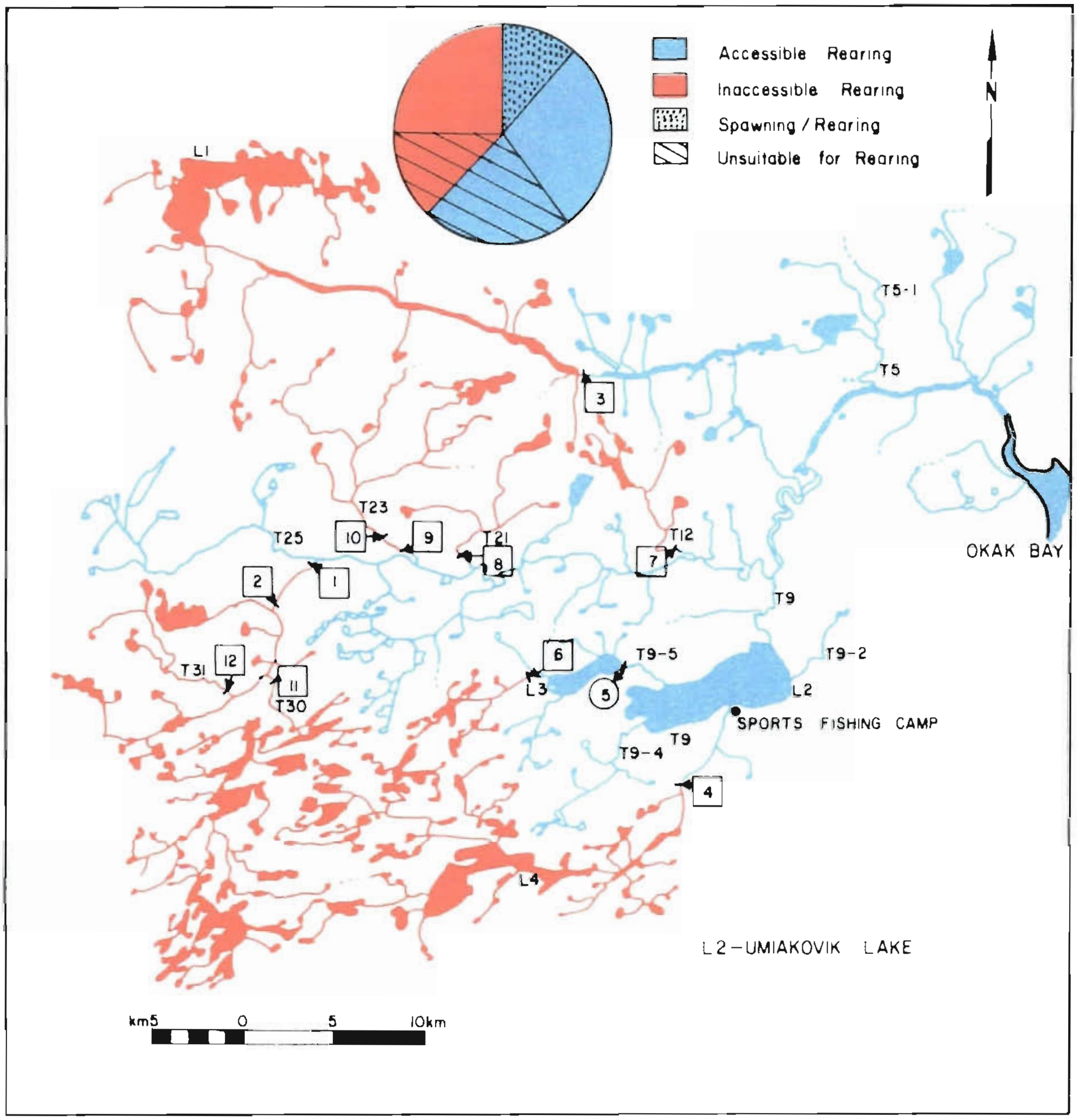

FIG. 124. Map of North River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 434. Obstructions on North River (Murphy and Porter 1974b).

Fig. 124 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Description: Width (m)	Description: Slope (°)	Barrier to fish passage
1	Main stem	66.0	Falls	7.6	9.1	90	Complete
2	Main stem	67.6–69.2	Falls (4)	3.0	15.2	90	Complete
3	T5	24.1	Falls	4.6	—	90	Complete
4	T9-3	6.4	Falls	9.1	9.1	75	Complete
5	T9-5	3.2	Falls	1.8	15.2	30	Partial
6	T9-5	8.1	Falls	7.6	6.1	80	Complete
7	T12	0.0	Falls	9.1	9.1	80	Complete
8	T21	0.0	Falls	7.6	9.1	—	Complete
9	T23	1.6	Falls	7.6	9.1	—	Complete
10	T23	1.6	Falls	15.2	6.1	90	Complete
11	T30	0.0	Falls	—	—	—	Complete
12	T31	0.0	Falls	—	—	—	Complete

TABLE 435. Summary of sex, fork length, age, and mercury content data for Arctic char captured in Umiakovik Lake, North River, 25 August 1977 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Arctic char	M	23	49.3	9.8	0.03	0.01–0.07
	F	26	46.1	10.2	0.03	0.01–0.07
Total		49	47.6	10.0	0.03	0.01–0.07

TABLE 436. Summary of data on sex, fork length, whole weight, age, and mercury content data for Arctic char captured in L1, North River, 28 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Arctic char	F	5	43.7	0.62	12.8	0.33	0.24–0.39

TABLE 437. Summary of rearing and spawning units in the accessible and inaccessible areas of North River (Murphy and Porter 1974b).

Location	Accessible areas: Spawning units	Accessible areas: Rearing units	Inaccessible areas: Spawning units	Inaccessible areas: Rearing units
Main stem	3 515	17 949	29	2 894
T5	3 206	3 877	0	4 858
T9	58	1 529	0	2 174
T12	0	0	0	627
T21	0	0	0	627
T23	0	144	0	1 265
T25	0	288	0	1 265
T30	0	0	0	627
T31	0	0	0	627
Total	6 779	23 787	29	14 964

Sipukat River *No. 101, Fig 106*

Sipukat River flows southeasterly and empties into the northern side of Okak Bay (Fig. 125). The river has a drainage area of 75 km^2; the largest lake in the system, Sipukat Lake (L1), has an area of 360 ha (Table 438). The Labrador Inuit Association (1977) reported that Arctic char spawn in this river. Other information on fish species in this river is unavailable.

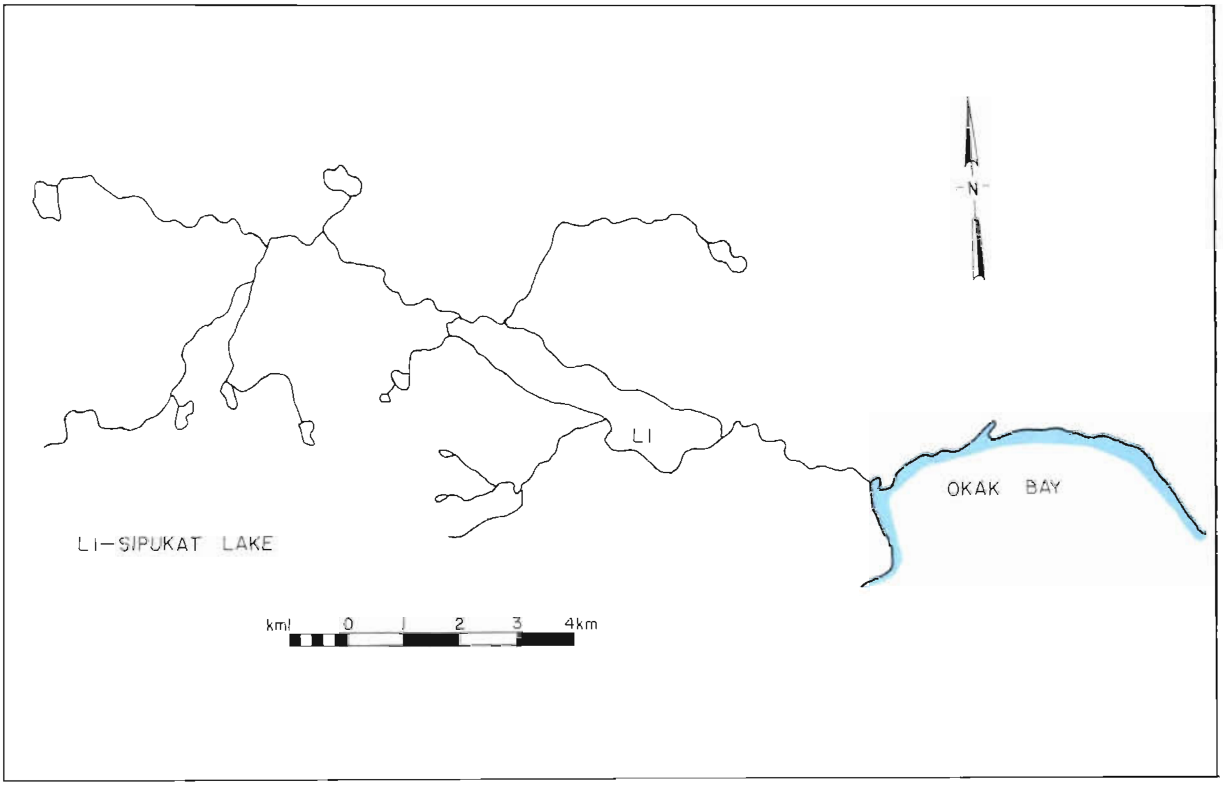

FIG. 125. Map of Sipukat River (not surveyed).

TABLE 438. Physical characteristics of Sipukat River.

Map reference:	North River 14E 1 : 250 000	Maximum basin relief:	366 m
Mouth latitude:	57°32′N	Length by meander (main stem):	16 km
Mouth longitude:	62°17′W	Total length including tributaries:	32 km
General direction of flow:	Southeast	No. of tributaries:	5
Drainage area:	75 km^2	Area of lakes >100 ha:	
Mean width	5 km	L1 Sipukat Lake	360 ha
Axial length	16 km		
Basin perimeter	40 km	Geological formation:	Gneiss

Siugak Brook flows through a wide river valley bounded by low, rolling hills, emptying into the northern side of Okak Bay (Fig. 126). The river has a drainage area of 1072 km^2 (Table 439). At its mouth, the river is shallow with exposed mud and sand flats (Murphy and Porter 1974b). From its mouth to km 48, the river varies from 27 to 55 m in width; the bottom composition is primarily rubble/boulder interspersed with gravel. A 2.1-m falls at km 8.1 partially obstructs fish migrations, and at km 46.7, further fish migration is completely prevented by a 4.6 m vertical falls (Table 440). Above this falls the river is 55 m wide and flows over gravel, rubble, and boulder substrate. Another partial obstruction occurs at km 64.4. Of the three tributaries surveyed by Murphy and Porter (1974b), two (T7 and T11) are accessible to migrating fishes; the third (T16) enters the main river above the falls at km 46.7. Vegetation throughout the watershed is sub-Arctic tundra with sparse patches of scrub forest.

The Labrador Inuit Association (1977) reported that Arctic char overwinter in the lower areas of Siugak Brook. Murphy and Porter (1974b) felt that, although no information was available on the fish populations, it is likely Arctic char use the accessible portion of the system. They estimated that this area contained a total of 16 602 rearing units (Table 441). Okak Bay has traditionally been a prime Arctic char commercial fishing site and, no doubt, the char produced in the accessible area of Siugak Brook made a contribution to this fishery.

TABLE 439. Physical characteristics of Siugak Brook.

Map reference:	North River 14E 1 : 250 000	Maximum basin relief:	549 m
Mouth latitude:	57°35′N	Length by meander (main stem):	81 km
Mouth longitude:	62°06′W	Total length including tributaries:	322 km
General direction of flow:	East	No. of tributaries:	31
Drainage area:	1072 km^2	Geological formation:	Gneiss
Mean width	14 km		
Axial length	73 km		
Basin perimeter	219 km		

TABLE 440. Obstructions on Siugak Brook (Murphy and Porter 1974b).

Fig. 126 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	8.1	Falls	2.1	9.2	80	Partial
2	Main stem	46.7	Falls	4.6	45.8	90	Complete
3	Main stem	64.4	Falls	3.1	15.3	90	Partial
4	T7	9.7	Falls	—	1.6	90	Partial
5	T16	16.1	Falls	1.8	15.3	90	Partial

TABLE 441. Summary of rearing and spawning units in the accessible and inaccessible areas of Siugak Brook (Murphy and Porter 1974b).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	3 742	12 799	2 564	18 408
T7	0	2 967	0	0
T11	0	836	0	0
T16	0	0	1 037	8 046
Total	3 742	16 602	3 601	26 454

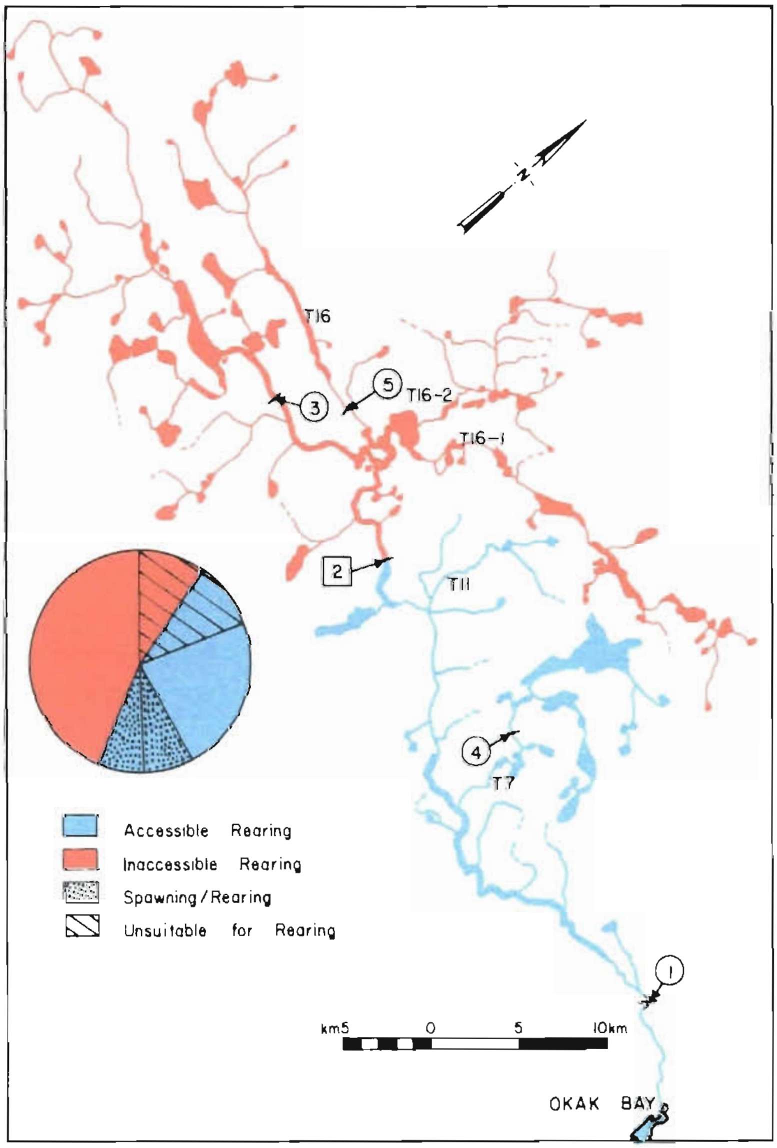

FIG. 126. Map of Siugak Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

REGION VI
SAGLEK–CAPE CHIDLEY

The Saglek–Cape Chidley Region, most northerly of the six Labrador regions, stretches from the Kaumajet Mountains to the most northern tip of Labrador, Cape Chidley (Fig. 127). This region is dominated by the Kaumajet and Torngat mountain ranges both of which give rise to spectacular, rugged scenery. The Kaumajet range juts out on a narrow peninsula into the Labrador Sea; the Torngat range, with peaks as high as 1459 m, is the highest mountain range east of the Rockies (Lopoukhine et al. 1978). The aesthetic appeal of the high mountain ranges and deep fiords of this rugged terrain has been recognized by investigators such as Lopoukhine et al. (1978); preliminary surveys have been undertaken to determine the region's potential as a National Park.

Today this region is uninhabited; two former Inuit communities, Ramah and Hebron, were abandoned in 1907 and 1959, respectively (Labrador Inuit Association 1977). Residents of Nain have travelled as far north as Seven Islands Bay to prosecute the Arctic char commercial fishery, although in 1978 Napartok Bay was the northern limit of the fishery. Lopoukhine et al. (1978) reported that Inuit from as far away as Port Burwell, N.W.T., have utilized the wildlife resources of the extreme northern section of this region.

The entire region is made up of gneiss in many different forms (Sutton 1972). These slow-weathering rocks are exposed and rounded mountains, sharp peaks, and level terrain all occur. Glaciation moved in an easterly and southeasterly direction, carving out sharp peaks and submerged troughs (fiords) and depositing the bulk of the glacial debris in the northern Labrador Sea. The remainder of the debris has been carried into the large river valleys where most of the sparse vegetative growth occurs.

Lopoukhine et al. (1978) reported that the northern limit of coniferous trees (white and black spruce) in Labrador occurs along the shores of Naparktok Bay in the southern section of this region. Willows, alders, and dwarf birch are abundant on the south-facing slopes of the river valleys although extreme fluctuations in water levels are a limiting factor. On exposed hills and slopes, poor soil development, lack of suitable substrate, cold temperatures, and desiccating winds all contribute to the characteristic sparse cover of lichens and mosses.

A typical river of the Saglek–Cape Chidley Region has a level lower section flowing through a steep valley, followed by a transitional stretch of rapids and waterfalls leading to a meandering headwaters on a plateau. The steep valley walls usually render tributaries inaccessible. Generally, bottom substrates in the lower sections are gravel and sand with shoals often channelizing the river mouth. The rapid mid-sections flow over bedrock and boulder; boulder and rubble are the most common bottom substrates found in the headwaters. Most rivers flow in an easterly direction. Descriptions of individual river systems are contained in Murphy and Porter (1974b); traditional use of the watersheds is detailed in the Labrador Inuit Association (1977).

The presence of five fish species has been recorded in the Saglek–Cape Chidley Region (Table 1). Brook trout were reported by Kendall (1910) and Forbes (1938), and samples of Arctic char were taken by the *Blue Dolphin* Labrador Expedition of 1950 (Backus 1957). Scott and Crossman (1973) reported the presence of Arctic char, Atlantic salmon, and threespine and ninespine sticklebacks. Murphy and Porter (1974b) recorded sightings of Arctic char in certain rivers; a gillnet survey in 1978 captured Arctic char at four sites (Bruce et al. 1979).

In the past the commercial fishery for Arctic char extended as far north as Seven Islands Bay. The catch was normally salted over the course of the fishing season. In 1970, a fish plant was constructed at Nain and demand shifted to a fresh char product. Fishermen no longer travelled as far north and concentrated their efforts closer to Nain where a collection boat brought their char to the fish plant.

Data on catch and effort of the commercial fishery for Arctic char within this region have been published by Coady (1974), Coady and Best (1976), Dempson (1978), and Dempson and Best (1978). The Atlantic salmon commercial fishery in this region is much less extensive than the char fishery and, in 1978, was limited to the mouth of Napartok Bay (B. Dempson, pers. comm.).

For reasons stated in the introduction to Nain–Okak Region, estimates of potential production of Arctic char or Atlantic salmon have not been included for rivers in this region. The areas fished commercially for Arctic char are outlined in Fig. 127; catches for the period 1974–80 are given in Table 442.

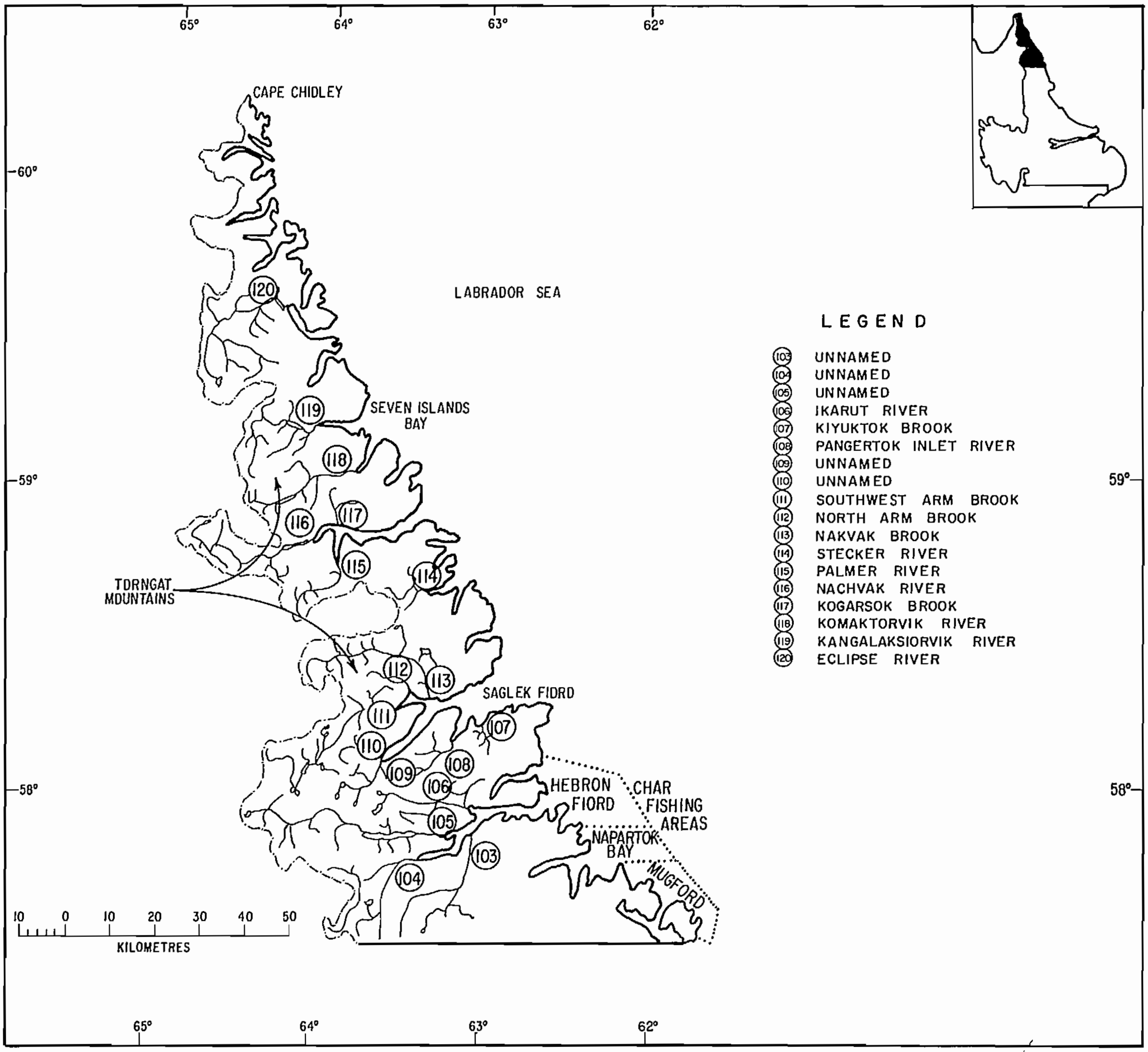

FIG. 127. Map of Region VI, Saglek–Cape Chidley. Rivers are numbered for convenient location in the text.

TABLE 442. Landings of the commercial fishery for Arctic char by area, Saglek–Cape Chidley Region, 1974–80 (Dempson 1978; Dempson, pers. comm.).

	Recorded landings (kg round weight)						
Area	1974	1975	1976	1977	1978	1979	1980
Mugford	0	0	1 970	1 376	1 148	170	513
Napartok	0	0	28 972	19 124	8 553	2 486	752
Hebron	0	0	0	5 595	0	0	2 915
Total	0	0	30 942	26 095	9 701	2 656	4 180

This river flows northeasterly and empties into the southern side of Hebron Fiord mid-way between the head of the fiord and the Labrador Sea (Fig. 128). It has a drainage area of 790 km^2 and the main river is fed by 22 tributaries (Table 443). The Labrador Inuit Association (1977) reported that prior to the 1950s Arctic char were fished and seals hunted from seasonal camps established at the river mouth.

River 103 flows through a wide river valley bounded on either side by steep mountains. From its mouth to km 23, the river ranges from 23 to 30 m in width and flows over rubble/gravel substrate. At km 30.6, a 6.1-m vertical falls forms a complete barrier to fish migration; another complete barrier occurs at km 35.4 (Table 444). From the first falls to km 48, the river averages 18 m in width and flows over rubble and boulder substrate. The only major tributary on the system, T10, was not surveyed by Murphy and Porter (1974b), although they estimated from its length that it could contain as many as 2169 units. The vegetation within this watershed is limited mainly to tundra with shrubs, willows, and alders colonizing the river valley. Water samples were collected in 1973, 1977, and 1978; results of the analyses of these samples are reported in Table 445 (Jamieson 1979).

The Labrador Inuit Association (1977) reported that Arctic char spawn in this river, and Murphy and Porter (1974b) sighted Arctic char several times during their survey. Hebron Fiord has long been an excellent commercial fishing area for Arctic char and fish taken in this area are highly prized for the deep red colour of their flesh. The accessible areas of this river contain 7506 rearing units and 2420 spawning units (Table 446).

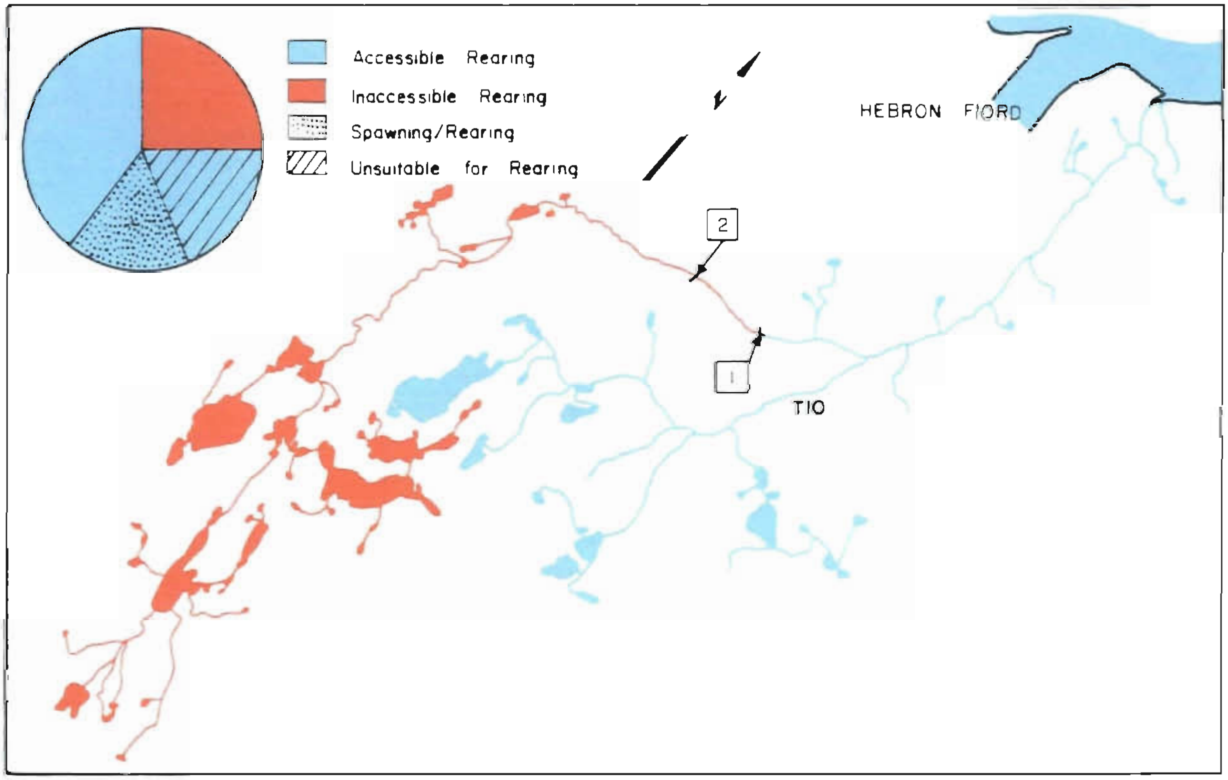

FIG. 128. Map of River 103 (Unnamed) showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 443. Physical characteristics of River 103.

Map reference:	North River 14E Hebron 14L 1 : 250 000	Maximum basin relief:	793 m
		Length by meander (main stem):	81 km
Mouth latitude:	58°04′N		
Mouth longitude:	63°02′W	Total length including tributaries:	269 km
General direction of flow:	Northeast	No. of tributaries:	22
Drainage area:	790 km²	Geological formation:	Gneiss
Mean width	11 km		
Axial length	73 km		
Basin perimeter	187 km		

TABLE 444. Obstructions on River 103 (Murphy and Porter 1974b).

Fig. 128 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	30.6	Falls	6.1	4.6	90	Complete
2	Main stem	35.4	Falls	4.6	4.6	80	Complete

TABLE 445. Results of analyses of three water samples collected on River 103, 1973, 1977, and 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.0	6.0	19.0	0.9	3.0	2.5	0.9	3.7
1977, 1978[a]	6.6	10.0	22.0	1.0	4.5	0.9	2.0	5.5

[a] Mean.

TABLE 446. Summary of rearing and spawning units in the accessible and inaccessible areas of River 103 (Murphy and Porter 1974b).

Location	Accessible areas: Spawning units	Rearing units	Inaccessible areas: Spawning units	Rearing units
Main stem	2420	7506	0	3186
Total	2420	7506	0	3186

This river flows northeasterly, emptying into Hebron Fiord (Fig. 129). It has a drainage area of 1461 km^2 and flows through mountainous terrain with peaks up to 671 m high (Table 447).

At its mouth, this river is divided into several channels by gravel and sand bars (Murphy and Porter 1974b). Gravel makes up the bulk of the bottom substrate for the first 34 km of this river. At km 33.8, a 4.6-m vertical falls is a complete barrier to upstream fish migration; 1.6 km above this obstruction is a 6.1-m falls (Table 448). Above this steep rise, the river flows over a plateau which is the origin of its headwaters. The only tributary surveyed by Murphy and Porter (1974b), tributary 2 (T2) is rendered inaccessible to migrating fishes above km 19.3 due to a 6.1-m falls. A water sample was collected from this river in 1976; results of the analyses of this sample are recorded in Table 449 (Jamieson 1979).

During their survey Murphy and Porter (1974b) reported sighting numerous Arctic char in the accessible areas of River 104. The accessible main river, which stretches for 33.8 km, contains 10 464 rearing units. The accessible portion of T2 contains 10 615 rearing units (Table 450). Excellent spawning area is also found in both sections.

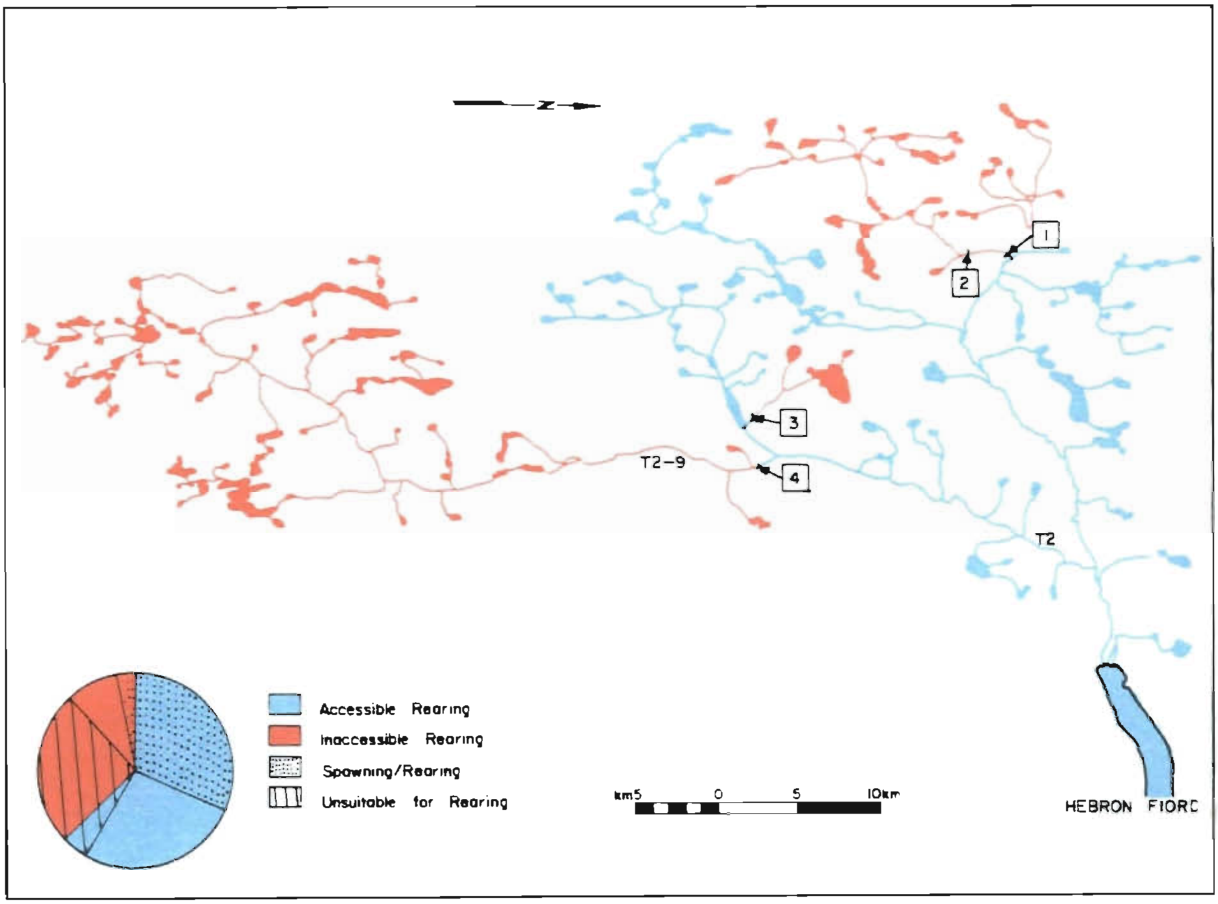

FIG. 129. Map of River 104 (Unnamed) showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 447. Physical characteristics of River 104.

Map reference:	North River 14E 1 : 250 000	Maximum basin relief:	671 m
Mouth latitude:	57°58′N	Length by meander (main stem):	37 km
Mouth longitude:	63°21′W	Total length including tributaries:	444 km
General direction of flow:	Northeast	No. of tributaries:	16
Drainage area:	1461 km^2	Geological formation:	Gneiss
Mean width	16 km		
Axial length	73 km		
Basin perimeter	296 km		

TABLE 448. Obstructions on River 104 (Murphy and Porter 1974b).

Fig. 129 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	33.8	Falls	4.6	6.1	90	Complete
2	Main stem	35.4	Falls	6.1	9.1	80	Complete
3	T2	19.3	Falls	6.1	4.6	70	Complete
4	T2-9	—	Falls	4.6	4.6	90	Complete

TABLE 449. Results of analyses of a water sample collected on River 104, 1976 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm^{-1} at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1976	6.2	8.0	17.0	0.7	3.0	1.1	0.7	3.7

TABLE 450. Summary of rearing and spawning units in the accessible and inaccessible areas of River 104 (Murphy and Porter 1974b).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	9 222	10 464	0	0
T2	2 123	10 615	1104	4122
Total	11 345	21 079	1104	4122

This river flows easterly and empties into Hebron Fiord (Fig. 130). As is typical of most rivers in this region, the river is surrounded by steep mountains over which the tributaries cascade. River 105 has a drainage area of 1347 km^2 (Table 451).

At its mouth, Murphy and Porter (1974b) reported that the river is 61 m wide, and is deep with a steady flow over rubble substrate. A long, narrow lake (L1), stretches from km 10 to km 29 and covers an area of 2560 ha (Table 451). Above L1 to km 43, the river averages 27 m in width and maintains medium flow rates over rubble/gravel bottom substrate. At km 43, the river begins its rise to the headwater plateau. Complete barriers to fish migration occur at km 43.5 and km 64.4 (Table 452). Water velocities are swift and bottom composition coarse (boulder/bedrock) throughout the upper reaches of this river. A water sample was collected in 1973; results of the analyses of this sample are found in Table 453 (Jamieson 1979).

Arctic char migrate to the accessible areas of this river and nets are placed near the river mouth during the commercial fishing season (Labrador Inuit Association 1977). No other information is available on fish populations, although Murphy and Porter (1974b) reported that there are 9638 rearing units and 1556 spawning units available to migrating fish (Table 454).

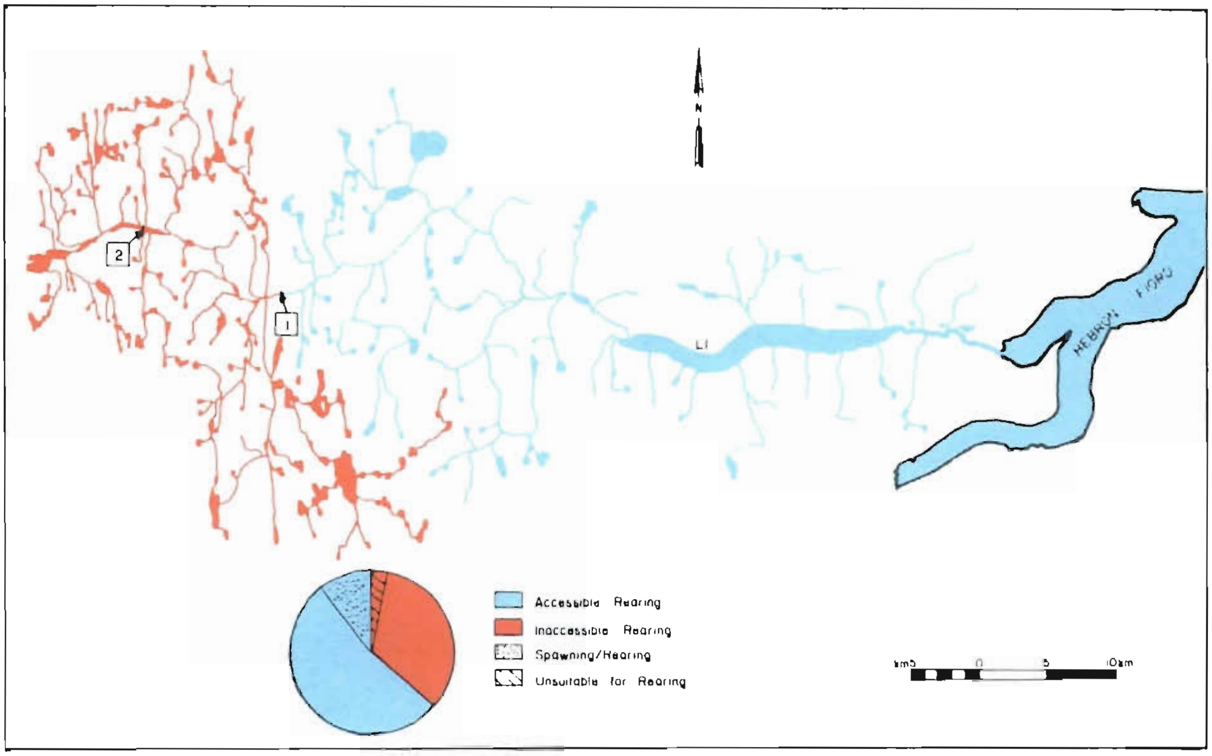

FIG. 130. Map of River 105 (Unnamed) showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 451. Physical characteristics of River 105.

Map reference:	Hebron 14L George River 24-I 1 : 250 000	Maximum basin relief:	763 m
Mouth latitude:	58°03′N	Length by meander (main stem):	76 km
Mouth longitude:	63°13′W	Total length including tributaries:	481 km
General direction of flow:	East	No. of tributaries:	54
Drainage area:	1347 km²	Area of lakes >100 ha:	
Mean width	21 km	L1	2560 ha
Axial length	73 km	Geological formation:	Gneiss
Basin perimeter	232 km		

TABLE 452. Obstructions on River 105 (Murphy and Porter 1974b).

Fig. 130 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	43.5	Falls	9.1	6.1	90	Complete
2	Main stem	64.4	Falls	4.6	3.1	90	Complete

TABLE 453. Results of analyses of a water sample collected on River 105, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.4	8.0	20.0	0.4	4.0	1.5	1.0	4.9

TABLE 454. Summary of rearing and spawning units in the accessible and inaccessible areas of River 105 (Murphy and Porter 1974b).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	1556	9638	0	5130
Total	1556	9638	0	5130

Ikarut River flows easterly, emptying into the north side of Hebron Fiord (Fig. 131). It has a drainage area of 474 km^2 (Table 455) and is similar to other rivers in this area as it flows from a high plateau, dropping sharply into a wide, level river valley.

Murphy and Porter (1974b) reported that the lower river is 32 m wide and flows over gravel and rubble substrate which, in some places, divides the flow into several channels. At km 33.8, a 6.1-m vertical falls forms a complete barrier to upstream fish migration (Table 456). The river above this obstruction has a maximum width of 59 m and a bottom substrate comprised of rubble/boulder. Accessible and inaccessible rearing and spawning units are listed in Table 457.

Murphy and Porter (1974b) sighted Arctic char several times during their helicopter survey of this river, and the Labrador Inuit Association (1977) reported that Arctic char spawn throughout most of the river. On 29 July 1978, a total of 10 Arctic char were netted in Ikarut Lake (L1) (Bruce et al. 1979). A summary of data on length, weight, sex, and age of these fish is presented in Table 458.

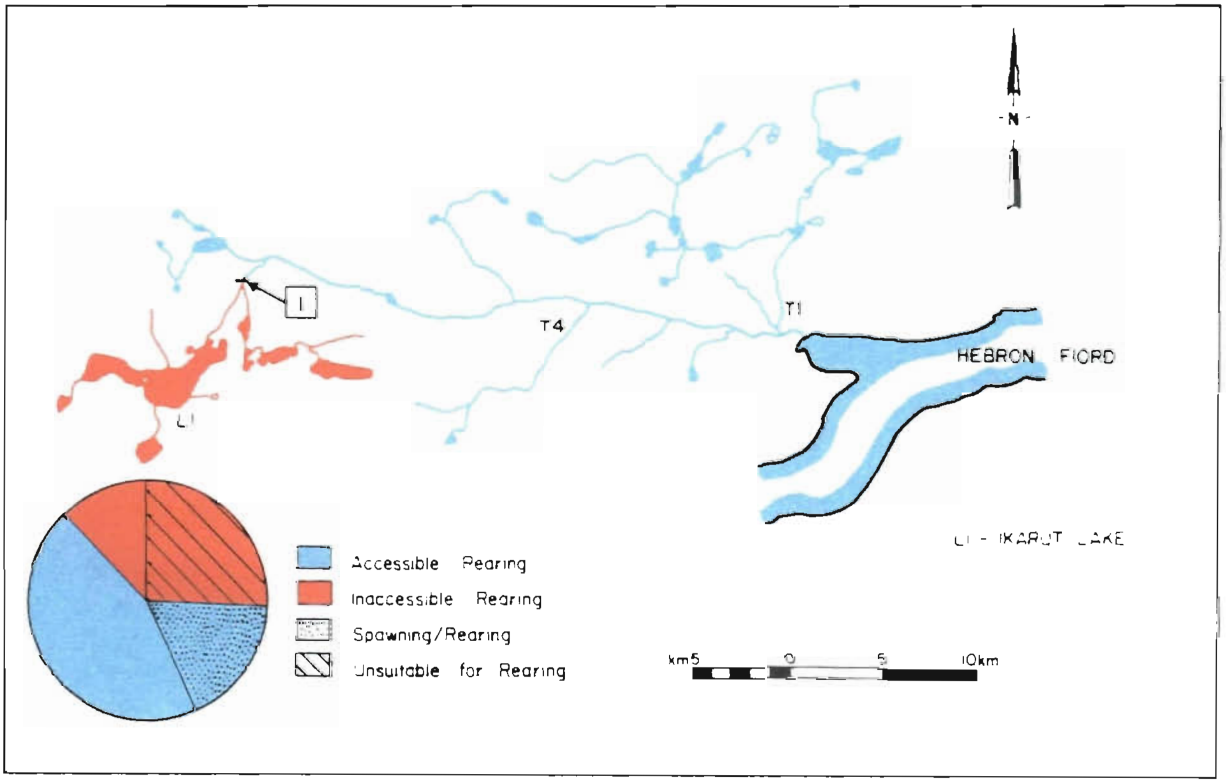

FIG. 131. Map of Ikarut River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 455. Physical characteristics of Ikarut River.

Map reference:	Hebron 14L 1 : 250 000	Maximum basin relief:	458 m
Mouth latitude:	58°09′N	Length by meander (main stem):	37 km
Mouth longitude:	63°05′W	Total length including tributaries:	140 km
General direction of flow:	East	No. of tributaries:	11
Drainage area:	474 km^2	Geological formation:	Gneiss
Mean width	13 km		
Axial length	40 km		
Basin perimeter	113 km		

TABLE 456. Obstructions on Ikarut River (Murphy and Porter 1974b).

Fig. 131 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	33.8	Falls	6.1	6.1	90	Complete

TABLE 457. Summary of rearing and spawning units in the accessible and inaccessible areas of Ikarut River (Murphy and Porter 1974b).

Location	Accessible areas: Spawning units	Accessible areas: Rearing units	Inaccessible areas: Spawning units	Inaccessible areas: Rearing units
Main stem	2675	9367	0	1888
Total	2675	9367	0	1888

TABLE 458. Summary of data on sex, fork length, whole weight, age, and mercury content of Arctic char captured in Ikarut Lake, 29 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Arctic char	M	8	41.6	0.53	13.8	0.17	0.07–0.42
	F	2	43.6	0.67	14.0	0.27	0.15–0.39
Total		10	41.8	0.56	13.8	0.19	0.07–0.42

Kiyuktok Brook

Kiyuktok Brook flows northerly and empties into Kiyuktok Cove on the southern side of Saglek Bay (Fig. 132). It has a drainage area of 86 km^2; the total length of main stem and tributaries is 32 km (Table 459). Other physical characteristics of the watershed are presented in Table 459. No information is available on the fish populations.

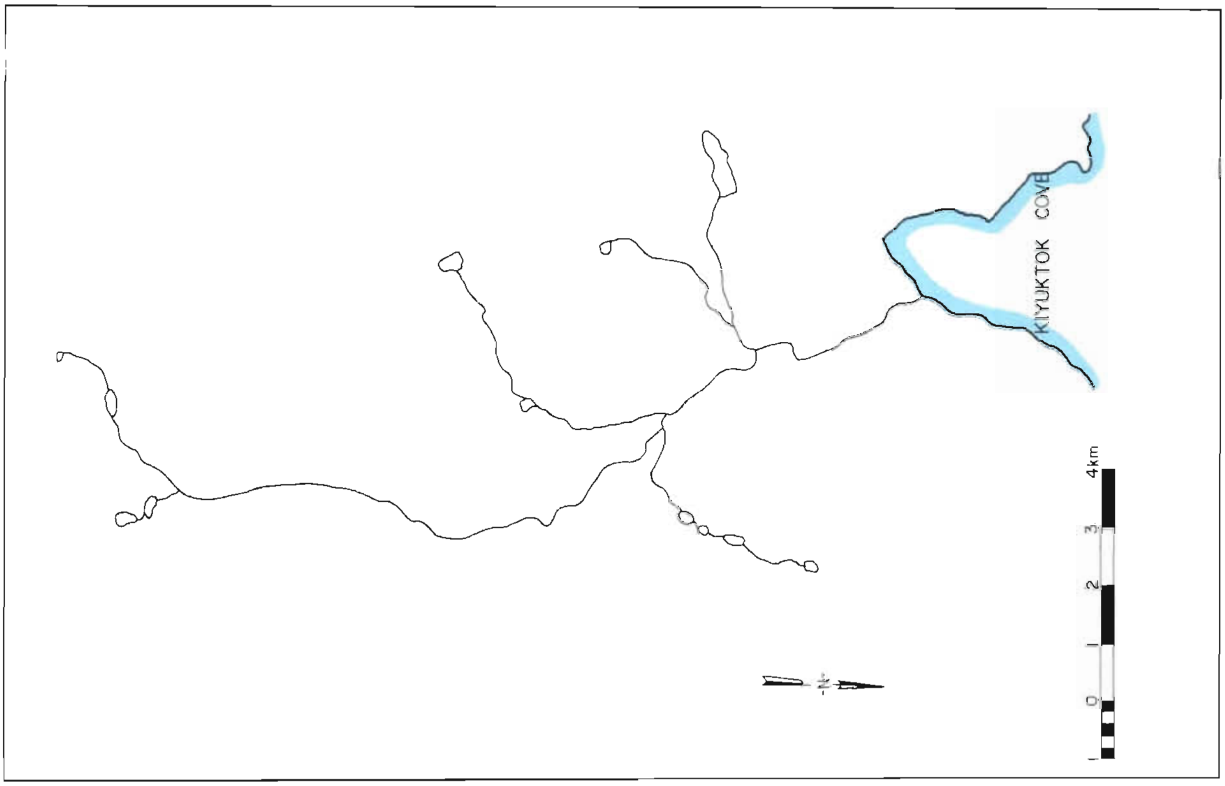

FIG. 132. Map of Kiyuktok Brook (not surveyed).

TABLE 459. Physical characteristics of Kiyuktok Brook.

Map reference:	Hebron 14L 1 : 250 000	Maximum basin relief:	305 m
Mouth latitude:	58°25′N	Length by meander (main stem):	16 km
Mouth longitude:	63°00′W	Total length including tributaries:	32 km
General direction of flow:	North	No. of tributaries:	4
Drainage area:	86 km^2	Geological formation:	Gneiss
Mean width	5 km		
Axial length	16 km		
Basin perimeter	42 km		

Pangertok Inlet River flows northeasterly and empties into Pangertok Inlet, located on the southern side of Saglek Fiord (Fig. 133). Physical characteristics of this river and its drainage area are listed in Table 460. The only information available on fish populations in this river is from the Labrador Inuit Association (1977) who reported that Arctic char spawn in the main river below the first pond.

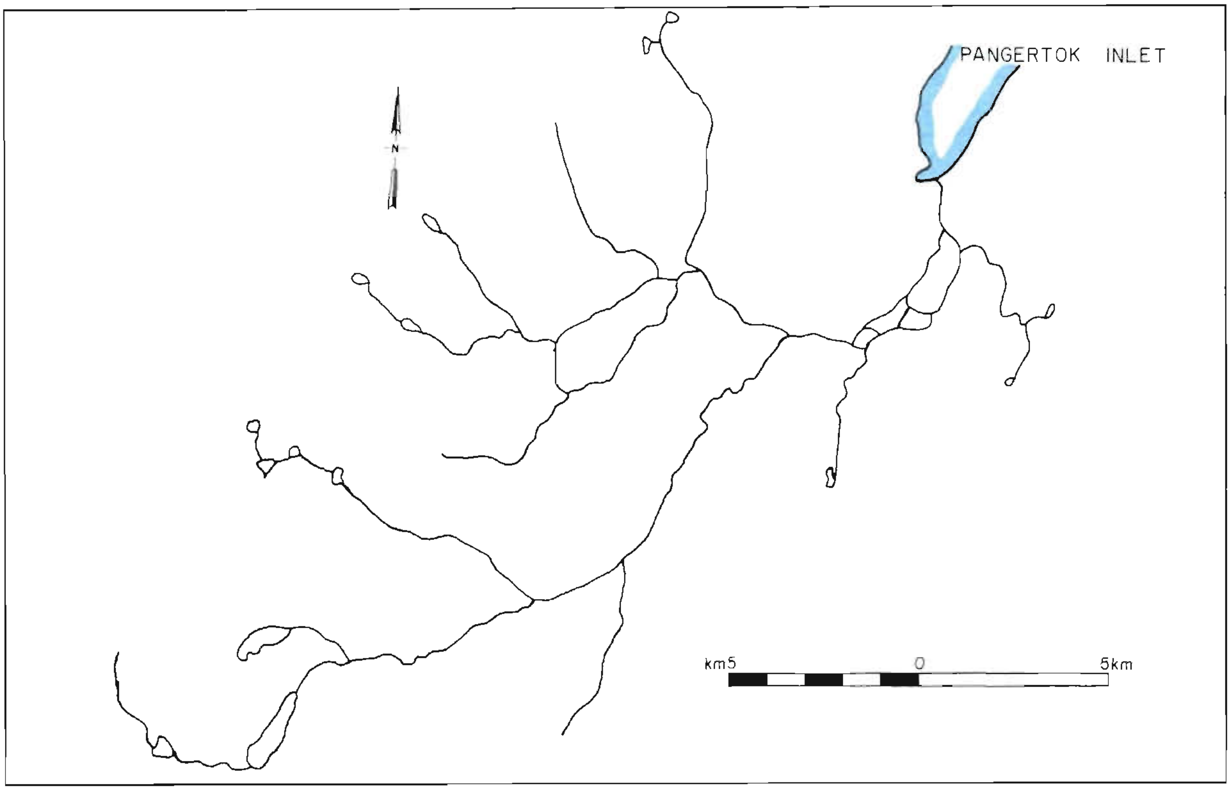

FIG. 133. Map of Pangertok Inlet River (not surveyed).

TABLE 460. Physical characteristics of Pangertok Inlet River.

Map reference:	Hebron 14L 1 : 250 000	Maximum basin relief:	458 m
Mouth latitude:	58°21′N	Length by meander (main stem):	21 km
Mouth longitude:	63°10′W	Total length including tributaries:	71 km
General direction of flow:	Northeast	No. of tributaries:	7
Drainage area:	278 km²	Geological formation:	Precambrian sediments and volcanics at the mouth, gneiss in the interior
Mean width	102 km		
Axial length	27 km		
Basin perimeter	71 km		

This river flows northeasterly and empties into Ugjuktok Fiord which leads into Saglek Fiord (Fig. 134). It has a drainage area of 212 km^2 (Table 461). Murphy and Porter (1974b) described this river as typical of the area, having a wide river valley, surrounded by mountains in its lower sections, followed by a steep gradient leading to a headwaters plateau. Gravel and rubble are the major components of the bottom substrate in the lower sections, where the widths of the river range from 15 to 18 m. A 7.6-m falls at km 20.9 is considered a complete barrier to fish migration (Table 462). The river above this obstruction is 7 km long and was not surveyed. Two water samples were collected from this river in 1973; results of the analyses of these samples are found in Table 463 (Jamieson 1979).

Murphy and Porter (1974b) recorded frequent sightings of Arctic char in the river during their survey in 1973. The Labrador Inuit Association (1977) reported that Arctic char spawn in the accessible sections of the river. In the past, nets for char were placed near the river mouth during the commercial fishing season. The number of rearing and spawning units found in accessible areas of this river are listed in Table 464.

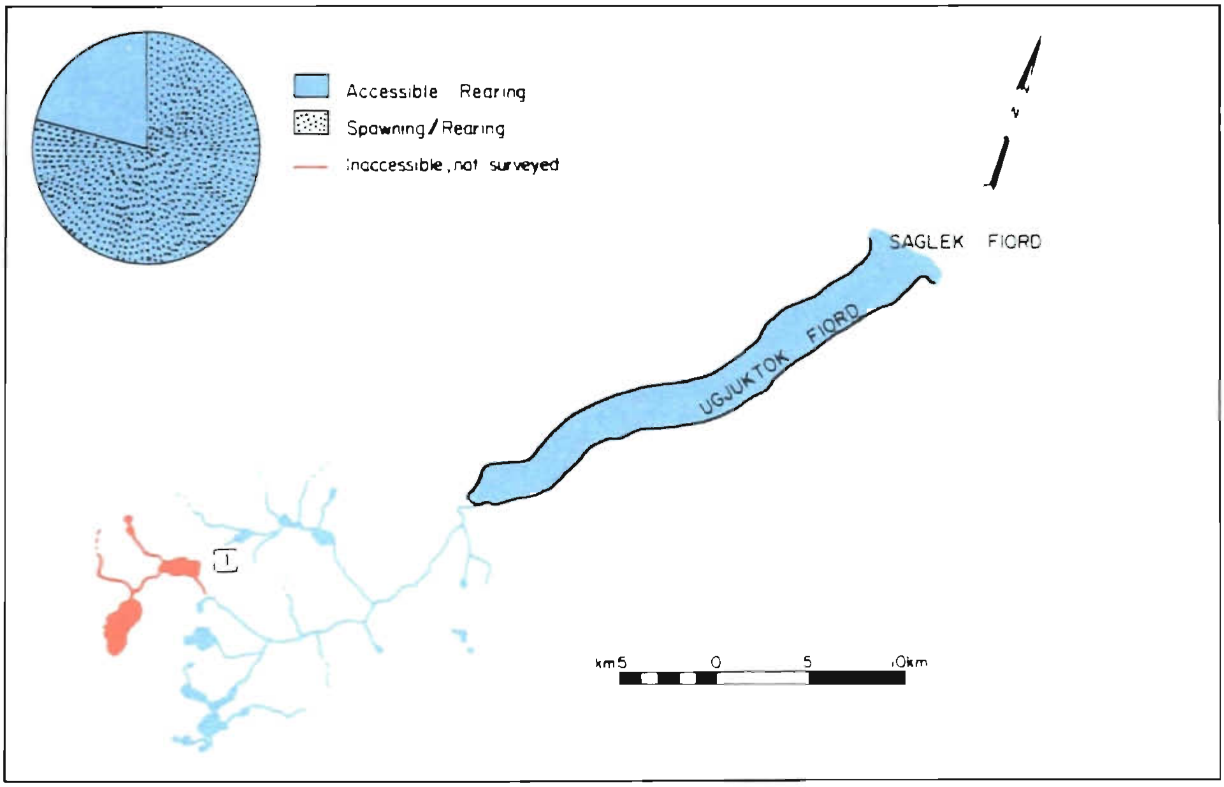

FIG. 134. Map of River 109 showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 461. Physical characteristics of River 109.

Map reference:	Hebron 14L 1 : 250 000	Maximum basin relief:	763 m
Mouth latitude:	58°17′N	Length by meander (main stem):	37 km
Mouth longitude:	63°35′W	Total length including tributaries:	94 km
General direction of flow:	Northeast	No. of tributaries:	9
Drainage area:	212 km^2	Geological formation:	Gneiss
Mean width	11 km		
Axial length	21 km		
Basin perimeter	64 km		

TABLE 462. Obstructions on River 109 (Murphy and Porter 1974b).

Fig. 134 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	20.9	Falls	7.6	4.6	90	Complete

TABLE 463. Mean results of analyses of two water samples collected on River 109, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance (μS·cm^{-1} at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.4	9.0	20.0	0.9	4.0	6.3	1.1	4.3

TABLE 464. Summary of rearing and spawning units in the accessible and inaccessible areas of River 109 (Murphy and Porter 1974b).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	8279	10 487	—	—
Total	8279	10 487	—	—

This river flows easterly, emptying into the northern side of Ugjuktok Fiord (Fig. 135). It has a drainage area of 168 km^2 (Table 465) and flows from a headwater plateau to a wide river valley bounded by high mountains. The bottom substrates in the lower river are gravel, sand and rubble; in the upper reaches rubble and boulder dominate. A 7.6-m vertical falls at km 16.1 on the main stem forms a complete barrier to upstream fish migration (Table 466).

Murphy and Porter (1974b) reported numerous sightings of Arctic char during their survey of the lower accessible river. The Labrador Inuit Association (1977) reported char spawning in the accessible main stem of the river. A summary of the amount of rearing and spawning area found in accessible areas is found in Table 467

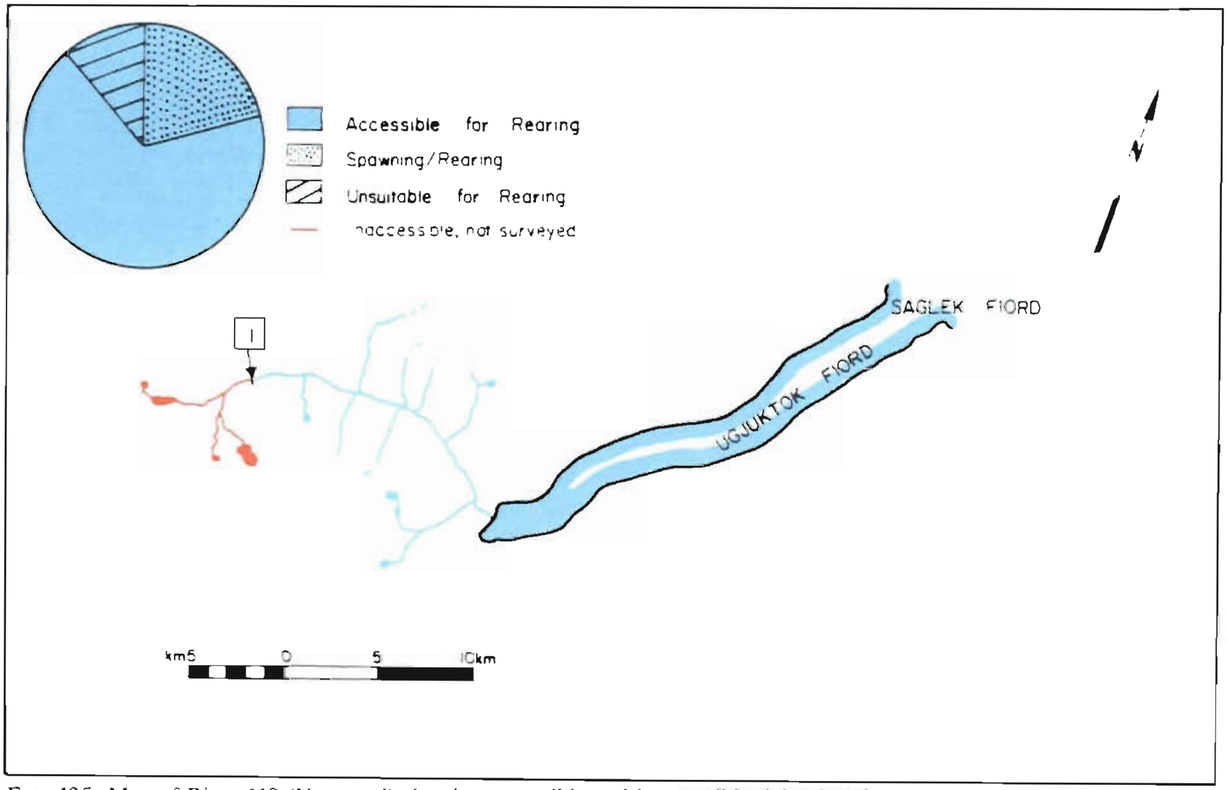

FIG. 135. Map of River 110 (Unnamed) showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 465. Physical characteristics of River 110.

Map reference:	Hebron 14L 1 : 250 000	Maximum basin relief:	763 m
Mouth latitude:	58°18′N	Length by meander (main stem):	26 km
Mouth longitude:	63°35′W	Total length including tributaries:	68 km
General direction of flow:	East	No. of tributaries:	9
Drainage area:	168 km^2	Geological formation:	Gneiss
Mean width	10 km		
Axial length	21 km		
Basin perimeter	52 km		

TABLE 466. Obstructions on River 110 (Murphy and Porter 1974b).

Fig. 135 reference	Location	Distance from mouth (km)	Type	Description			Barrier to fish passage
				Height (m)	Width (m)	Slope (°)	
1	Main stem	16.1	Falls	7.6	4.6	90	Complete

TABLE 467. Summary of rearing and spawning units in the accessible and inaccessible areas of River 110 (Murphy and Porter 1974b).

Location	Accessible areas		Inaccessible areas	
	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	1098	4702	—	—
Total	1098	4702	—	—

This river flows northeasterly, emptying into Southwest Arm, an inlet of Saglek Fiord (Fig. 136). It has a drainage area of 707 km^2 (Table 468) that extends west to the Quebec–Labrador border. This river is typical of those in Region VI, with lower sections being level, followed by a transitional section of waterfalls and rapids leading to meandering headwaters on a plateau. From the mouth to km 26, the river width ranges from 32 to 73 m and the bottom substrate is exclusively gravel. From km 26 to km 35, the bottom substrate is boulder/rubble. At km 35.4, a series of two falls form a complete barrier to upstream fish migration (Table 469). Further upstream, at km 37.0, there is a series of three falls, all complete barriers. Complete obstructions also occur near the outlets of tributaries T2, T3, T16, and T22. The above information is from a survey conducted in 1973 by Murphy and Porter (1974b). The results of the analyses of a water sample collected in 1973 are presented in Table 470 (Jamieson 1979).

Murphy and Porter (1974b) stated that "a large number of Arctic char were seen in the section of main river below the falls", and the Labrador Inuit Association (1977) reported that Arctic char spawn in the river below the falls. A summary of rearing and spawning units in the accessible areas is located in Table 471.

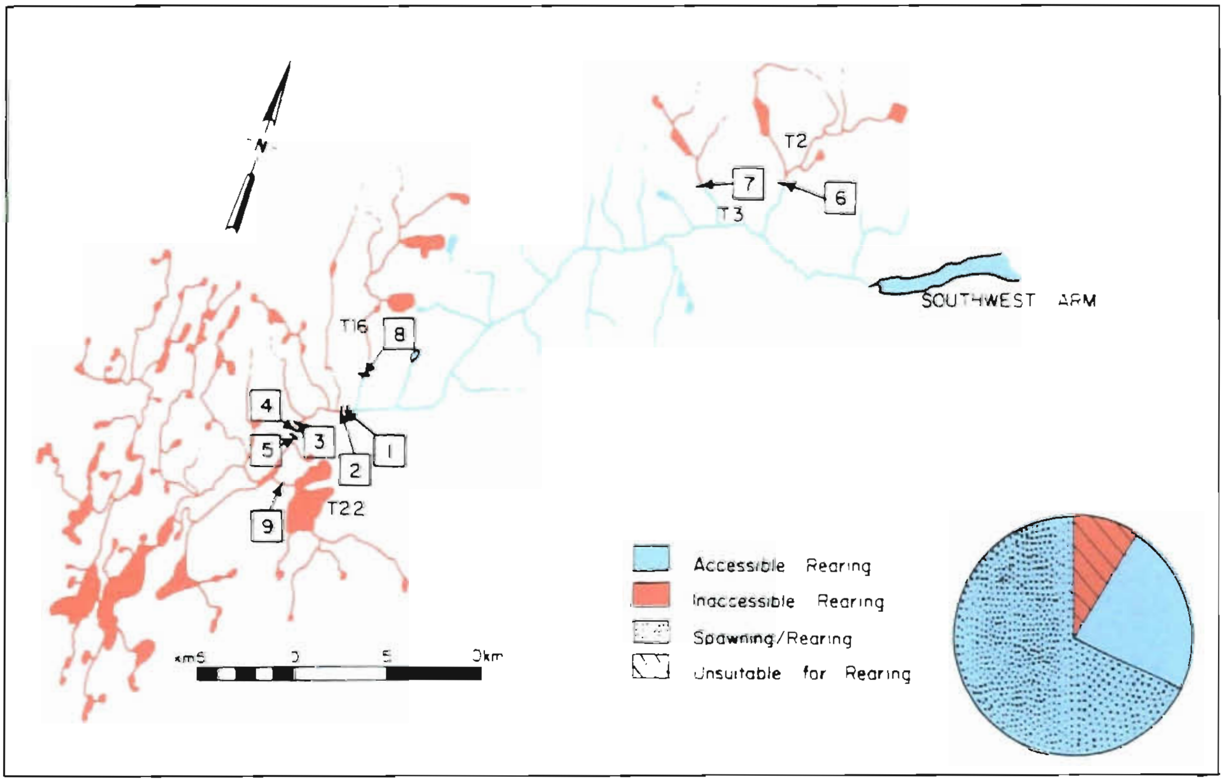

FIG. 136. Map of Southwest Arm Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 468. Physical characteristics of Southwest Arm Brook.

Map reference:	George River 24-I Hebron 14L 1 : 250 000	Maximum basin relief:	915 m
Mouth latitude:	58°28′N	Length by meander (main stem):	58 km
Mouth longitude:	63°32′W	Total length including tributaries:	280 km
General direction of flow:	Northeast	No. of tributaries:	33
Drainage area:	707 km²	Geological formation:	Gneiss
Mean width	11 km		
Axial length	48 km		
Basin perimeter	159 km		

TABLE 469. Obstructions on Southwest Arm Brook (Murphy and Porter 1974b).

Fig. 136 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	35.4	Falls	4.6	4.6	80	Complete
2	Main stem	35.4	Falls	6.1	4.6	80	Complete
3	Main stem	37.0	Falls	6.1	4.6	80	Complete
4	Main stem	37.0	Falls	6.1	6.1	90	Complete
5	Main stem	37.0	Falls	6.1	6.1	80	Complete
6	T2	3.0	Falls	—	—	—	Complete
7	T3	2.0	Falls	—	—	—	Complete
8	T16	1.5	Falls	—	—	—	Complete
9	T22	1.0	Falls	—	—	—	Complete

TABLE 470. Results of analyses of a water sample collected on Southwest Arm Brook, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)
1973	5.6	2.0	5.0	0.4	<1.0	0.5	0.3

TABLE 471. Summary of rearing and spawning units in the accessible and inaccessible areas of Southwest Arm Brook (Murphy and Porter 1974b).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	15 308	18 233	—	—
Total	15 308	18 233	—	—

This river flows northeasterly, emptying into North Arm in Saglek Fiord (Fig. 137). It has a relatively small drainage area of 104 km² (Table 472) and from its mouth to km 3 the average width is 9 m. The bottom substrates in this section are gravel and sand. Rubble and boulder comprise the bottom substrate of the remainder of the river. Upstream fish migration is completely prevented at km 8.0 by a 6.1-m falls (Table 473). Other falls (all complete barriers) are located at km 11.3, km 14.5, and km 19.3. A water sample was collected from this river in 1973; results of the analyses of this sample are presented in Table 474 (Jamieson 1979).

Murphy and Porter (1974b) and the Labrador Inuit Association (1977) reported the presence of Arctic char in accessible areas of this river. The number of rearing and spawning units in both accessible and inaccessible areas of this river is found in Table 475.

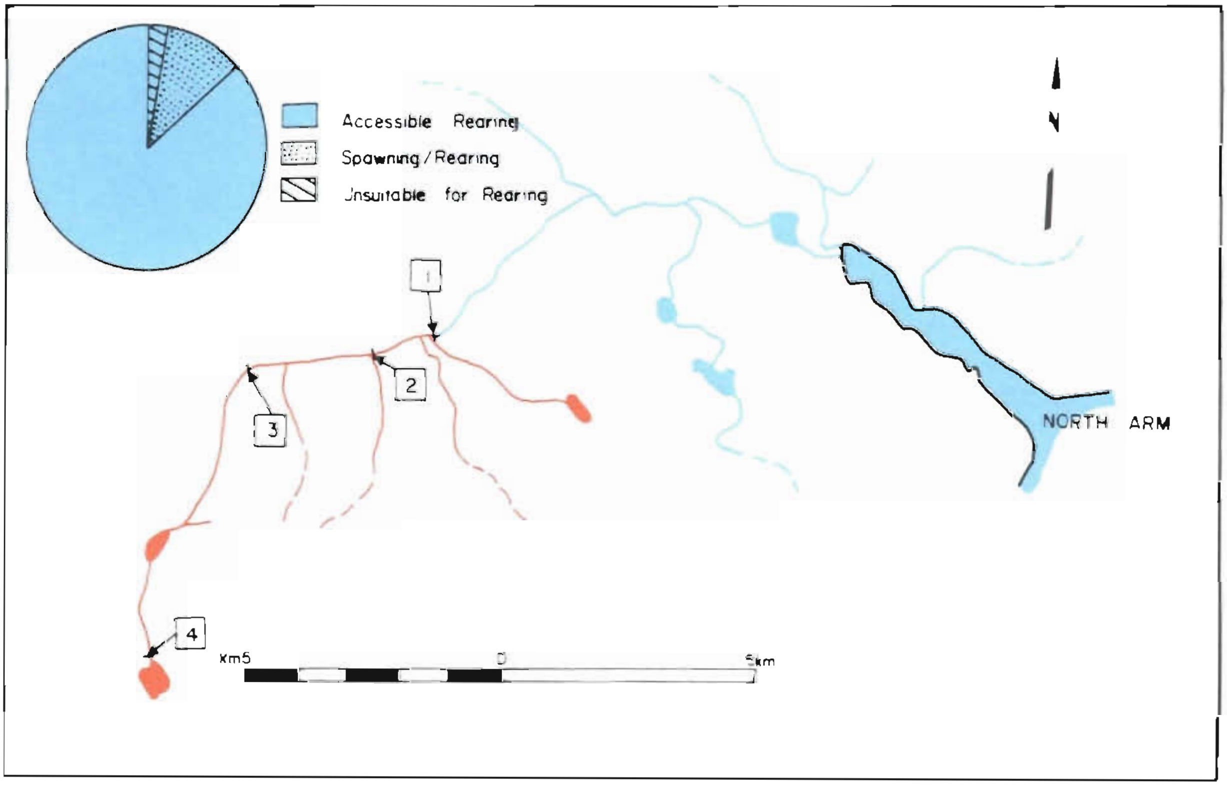

FIG. 137. Map of North Arm Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 472. Physical characteristics of North Arm Brook.

Map reference:	Hebron 14L 1 : 250 000	Maximum basin relief:	763 m
Mouth latitude:	58°33′N	Length by meander (main stem):	19 km
Mouth longitude:	63°28′W	Total length including tributaries:	35 km
General direction of flow:	Northeast	No. of tributaries:	6
Drainage area:	104 km²	Geological formation:	Gneiss
Mean width	6 km		
Axial length	17 km		
Basin perimeter	47 km		

TABLE 473. Obstructions on North Arm Brook (Murphy and Porter 1974b).

Fig. 137 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Description: Width (m)	Description: Slope (°)	Barrier to fish passage
1	Main stem	8.0	Falls	6.1	6.1	70	Complete
2	Main stem	11.3	Falls	7.6	6.1	90	Complete
3	Main stem	14.5	Falls	9.2	6.1	90	Complete
4	Main stem	19.3	Falls	30.5	15.3	70	Complete

TABLE 474. Results of analyses of a water sample collected on North Arm Brook, 1973 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)
1973	4.8	6.0	16.0	0.3	<1.0	0.5	0.7

TABLE 475. Summary of rearing and spawning units in the accessible and inaccessible areas of North Arm Brook (Murphy and Porter 1974b).

Location	Accessible areas: Spawning units	Accessible areas: Rearing units	Inaccessible areas: Spawning units	Inaccessible areas: Rearing units
Main stem	230	662	0	1481
Total	230	662	0	1481

Nakvak Brook flows southeasterly and empties into the northern side of Saglek Fiord (Fig. 138). It has a drainage area of 844 km^2 (Table 476); the upper watershed flows from the southern edge of the Torngat Mountains.

Murphy and Porter (1974b) reported that gravel, rubble, and boulder are distributed throughout the entire length of the main stem. A chute and falls, approximately 3 m high and located 5 km upstream from the mouth, has been reported by Dempson (pers. comm.) to be a complete obstruction. Murphy and Porter (1974b) reported that upstream fish migration in this river is prevented at km 17.7 by a 4.6-m falls; other complete obstructions on the main stem occur at km 37.0, km 38.6, and km 64.4 (Table 477). All tributaries on this system are relatively small and completely obstructed by falls cascading over the steep walls of the river valley. Water samples were collected in 1973, 1977, and 1978; results of the analyses of these samples are presented in Table 478 (Jamieson 1979).

The Labrador Inuit Association (1977) reported that Arctic char spawn in Nakvak Brook. On 29 July 1978, a total of 17 Arctic char were netted in L1, situated on tributary 8 (T8) (Bruce et al. 1979). A summary of data on the length, weight, sex, and age of these fish is presented in Table 479. The number of rearing and spawning units in the accessible and inaccessible areas of the main stem is found in Table 480. These figures were reported by Murphy and Porter (1974b) and do not take into account the complete barrier reported at km 5 by Dempson (pers. comm.).

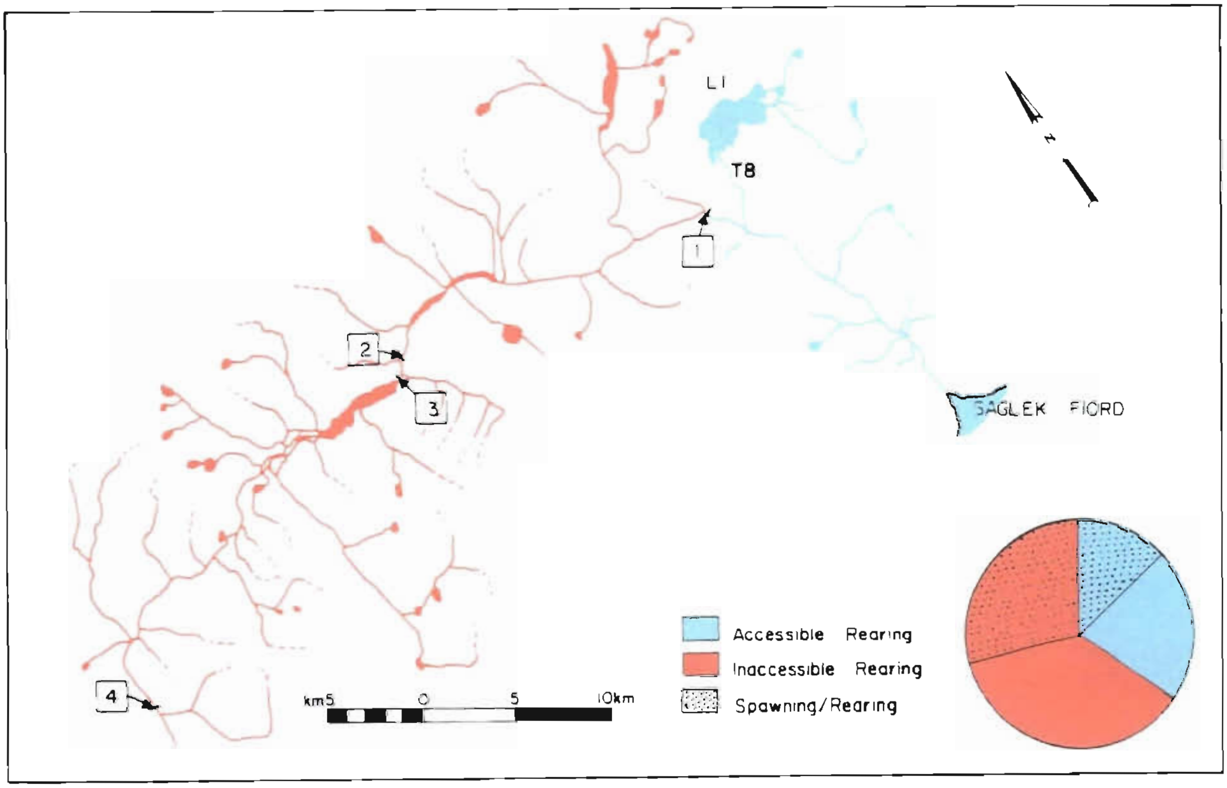

FIG. 138. Map of Nakvak Brook showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 476. Physical characteristics of Nakvak Brook.

Map reference:	George River 24-I Hebron 14L 1 : 250 000	Maximum basin relief:	915 m
Mouth latitude:	53°30′N	Length by meander (main stem):	64 km
Mouth longitude:	63°18′W	Total length including tributaries:	219 km
General direction of flow:	Southeast	No. of tributaries:	39
Drainage area:	844 km²	Geological formation:	Gneiss
Mean width	16 km		
Axial length	48 km		
Basin perimeter	169 km		

TABLE 477. Obstructions on Nakvak Brook[a] (Murphy and Porter 1974b).

Fig. 138 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	17.7	Falls	4.6	4.6	75	Complete
2	Main stem	37.0	Falls	9.2	6.1	90	Complete
3	Main stem	38.6	Falls	15.3	6.1	90	Complete
4	Main stem	64.4	Falls	15.3	6.1	80	Complete

[a]Chute and Falls, 3 m high and located 5 km upstream from the mouth reported by Dempson (pers. comm.) to be complete obstruction.

TABLE 478. Results of analyses of three water samples collected on Nakvak Brook, 1973, 1977, and 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	6.1	6.0	16.0	0.2	2.0	1.0	0.9	2.4
1977	6.6	8.0	26.0	3.0	7.0	0.8	1.5	8.5
1978	6.6	6.0	18.0	0.3	3.0	0.5	1.0	3.7

TABLE 479. Summary of data on sex, fork length, whole weight, age, and mercury content of Arctic char captured in Nakvak Brook, 29 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Arctic char	M	11	49.2	1.08	17.7	0.16	0.11–0.22
	F	6	48.9	1.10	21.2	0.24	0.15–0.34
Total		17	49.1	1.09	18.9	0.19	0.11–0.34

TABLE 480. Summary of rearing and spawning units in the accessible and inaccessible areas of Nakvak Brook (Murphy and Porter 1974b).

Location	Accessible areas		Inaccessible areas	
	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	2 678	7 246	6 065	13 714
Total	2 678	7 246	6 065	13 714

Stecker River flows easterly and empties into Ramah Bay (Fig. 139). The watershed, which has an area of 172 km² (Table 481), drains the eastern side of the Torngat Mountains. The Labrador Inuit Association (1977) reported that Arctic char spawn in this river. No other information about the fish populations is available.

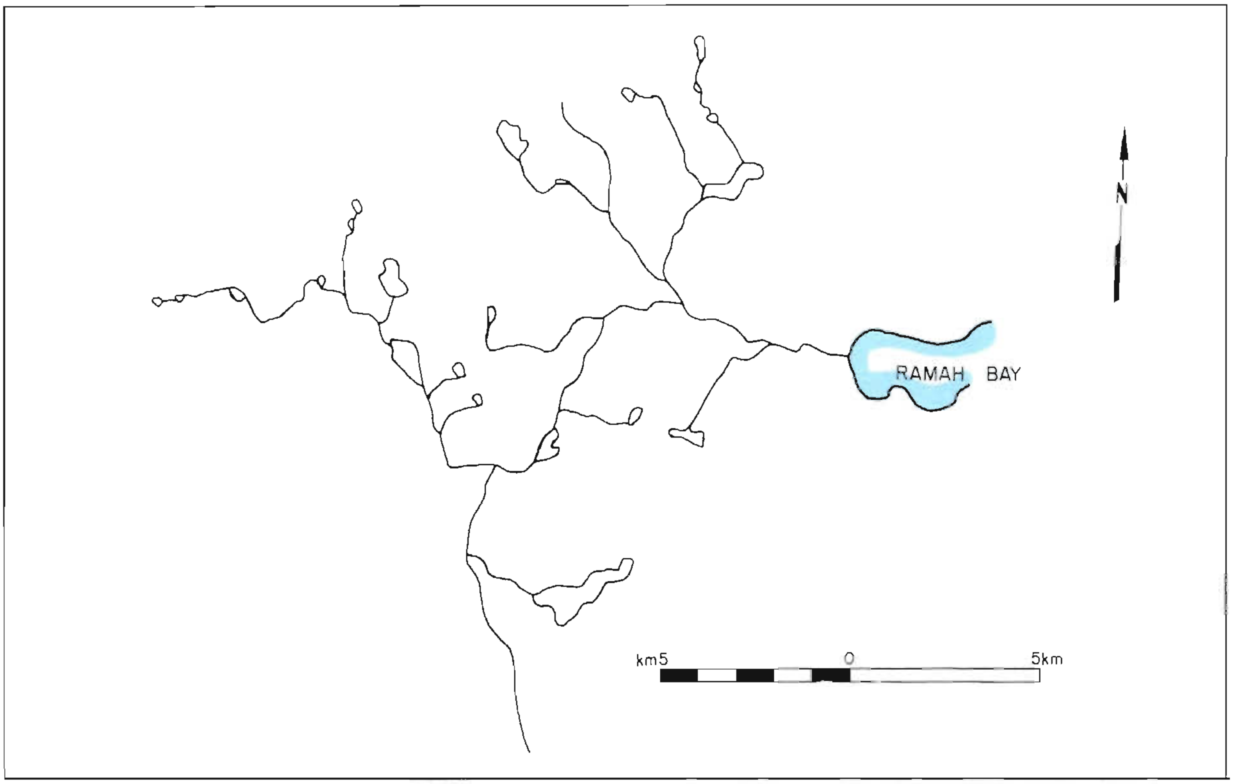

FIG. 139. Map of Stecker River (not surveyed).

TABLE 481 Physical characteristics of Stecker River.

Map reference:	Hebron 14L 1 . 250 000	Maximum basin relief:	915 m
Mouth latitude:	58°52′N	Length by meander (main stem):	23 km
Mouth longitude:	63°20′W	Total length including tributaries:	64 km
General direction of flow:	East	No. of tributaries:	9
Drainage area:	172 km²	Geological formation:	Precambrian sediments and volcanics
Mean width	11 km		
Axial length	19 km		
Basin perimeter	60 km		

Palmer River flows northeasterly through the Torngat Mountains and empties into Tallek Arm, a southern extension of Nachvak Fiord (Fig. 140). The river has a drainage area of 311 km^2 and length by meander of the main stem is 32 km (Table 482). Gravel is the predominant bottom substrate throughout the main stem although both rubble and gravel occur in the mid-sections. The river is accessible to upstream migrating fish up to km 25.8; at that point a series of falls and rapids prevent further upstream migration (Table 483). Murphy and Porter (1974b) reported that all the tributaries are small and completely obstructed by cascades; many dry up in the summer.

The Labrador Inuit Association (1977) reported that Arctic char spawn in this river. Studies on the biology of Arctic char in Nachvak Fiord were conducted in 1978 (Glova and McCart 1978). These authors noted that char were abundant, particularly around the mouths of Palmer and Nachvak rivers and that growth rates were intermediate, between populations in southern Labrador and those in Baffin Island. The number of rearing and spawning units recorded by Murphy and Porter (1974b) in the accessible and inaccessible areas of Palmer River is listed in Table 484.

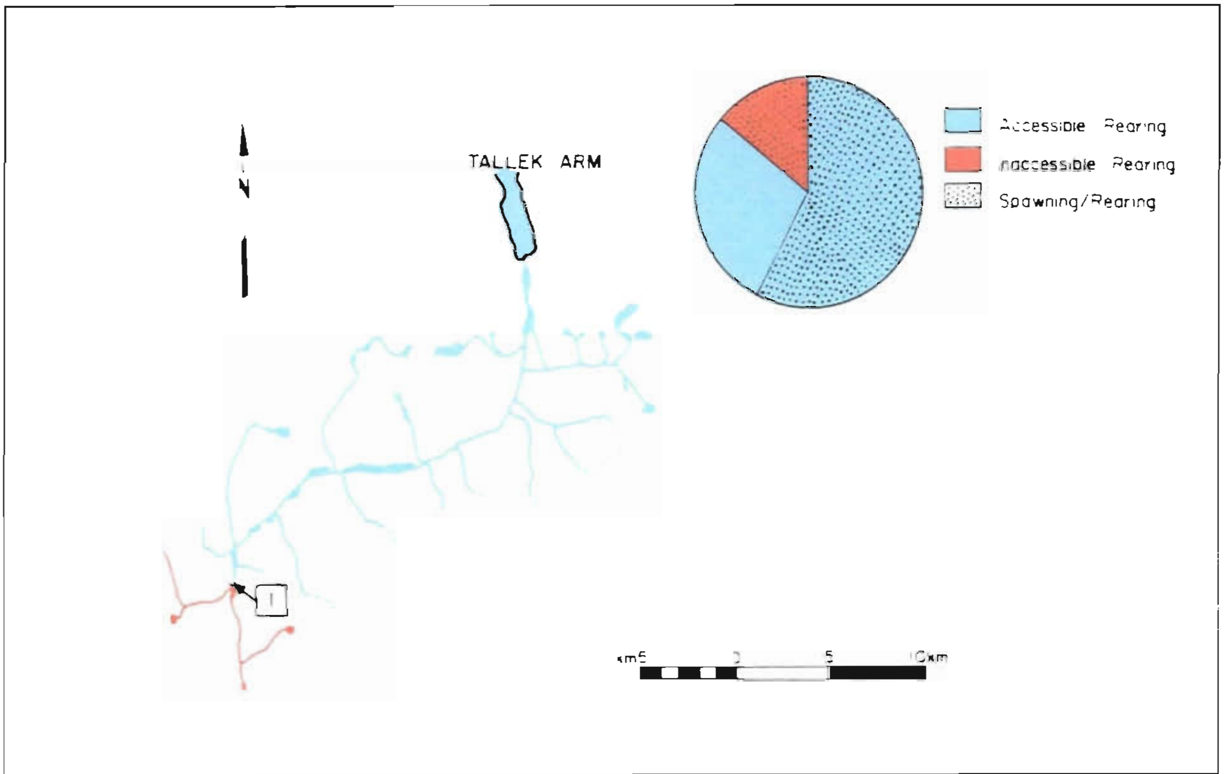

FIG. 140. Map of Palmer River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 482. Physical characteristics of Palmer River.

Map reference:	Hebron 14L George River 24-I 1 : 250 000	Maximum basin relief:	915 m
Mouth latitude:	58°55′N	Length by meander (main stem):	32 km
Mouth longitude:	63°53′W	Total length including tributaries:	110 km
General direction of flow:	Northeast	No. of tributaries:	16
Drainage area:	311 km²	Geological formation:	Gneiss
Mean width	11 km		
Axial length	27 km		
Basin perimeter	90 km		

TABLE 483. Obstructions on Palmer River (Murphy and Porter 1974b).

Fig. 140 reference	Location	Distance from mouth (km)	Type	Description: Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	25.8	Falls and rapids	—	—	—	Complete

TABLE 484. Summary of rearing and spawning units in the accessible and inaccessible areas of Palmer River (Murphy and Porter 1974b).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	4791	7173	1152	1152
Total	4791	7173	1152	1152

Nachvak River flows easterly from the Quebec–Labrador border through the Torngat Mountains, emptying into Tasiuyak Arm in Nachvak Fiord (Fig. 141). This river has a drainage area of 680 km^2. The largest lake on the system, Nachvak Lake (L1), is located at the mouth of the river and has an area of 700 ha (Table 485). Above Nachvak Lake to km 16 the bottom composition is primarily gravel; the remainder of the main stem has rubble/boulder bottom substrate. A 6.1-m vertical falls at km 20.9 prevents further upstream fish migration; five more falls (all complete obstructions) occur above this barrier (Table 486). Due to the mountainous terrain that characterizes the drainage area, all tributaries have steep cascades near their confluences with the main river. A water sample was collected from this river in 1973 and 1978; results of the analyses of these samples are contained in Table 487 (Jamieson 1979).

The Labrador Inuit Association (1977) reported the presence of Arctic char in Nachvak Lake (L1), and on 31 July 1978, an overnight gill net set in this lake caught 20 Arctic char (Bruce et al. 1979). A summary of data on length, weight, sex, and age of these fish is presented in Table 488. Studies on char populations in Nachvak Fiord by Glova and McCart (1978) noted that char were concentrated near the mouth of this river. These authors also reported that the char moved into this river in late August. Samples indicated that growth rates were intermediate between those of char populations in southern Labrador and those in Baffin Island. The number of accessible and inaccessible rearing and spawning units in Nachvak River is listed in Table 489 (Murphy and Porter 1974b).

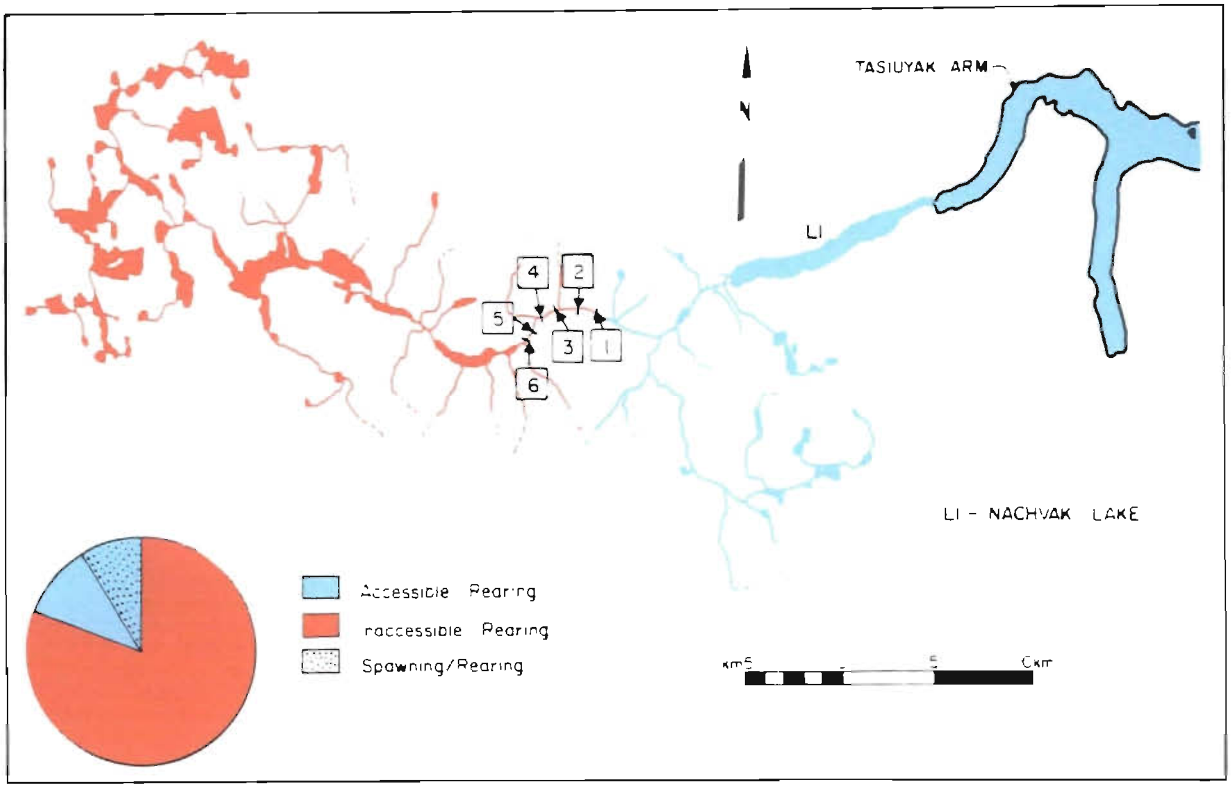

FIG. 141. Map of Nachvak River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 485. Physical characteristics of Nachvak River.

Map reference:	George River 24-I Point Le Droit 24P,O 1 : 250 000	Maximum basin relief:	915 m
		Length by meander (main stem):	64 km
Mouth latitude:	59°01′N		
Mouth longitude:	64°03′W	Total length including tributaries:	238 km
General direction of flow:	East	No. of tributaries:	38
Drainage area:	680 km²	Area of lakes >100 ha:	
Mean width	14 km	L1 Nachvak Lake	700 ha
Axial length	49 km		
Basin perimeter	158 km	Geological formation:	Gneiss

TABLE 486. Obstructions on Nachvak River (Murphy and Porter 1974b).

Fig. 141 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	20.9	Falls	6.1	6.1	90	Complete
2	Main stem	21.7	Falls	7.6	6.1	90	Complete
3	Main stem	22.5	Falls	9.2	6.1	50	Complete
4	Main stem	23.4	Falls	9.2	6.1	90	Complete
5	Main stem	24.2	Falls	9.2	6.1	90	Complete
6	Main stem	25.0	Falls	9.2	6.1	90	Complete

TABLE 487. Results of analyses of two water samples collected on Nachvak River, 1973 and 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1973	4.8	1.0	16.0	1.4	<1.0	1.0	0.6	—
1978	6.8	8.0	20.0	0.4	6.0	0.5	1.5	7.3

TABLE 488. Summary of data on sex, fork length, whole weight, age, and mercury content of Arctic char captured in Nachvak Lake, 31 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Arctic char	M	4	50.3	1.37	10.5	0.01	—
	F	16	49.9	1.40	10.9	0.01	—
Total		20	50.0	1.40	10.8	0.01	—

TABLE 489. Summary of rearing and spawning units in the accessible and inaccessible areas of Nachvak River (Murphy and Porter 1974b).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	1978	4 480	0	18 885
Total	1978	4 480	0	18 885

Kogarsok Brook flows southerly and empties into the northern side of Nachvak Fiord (Fig. 142). The river has a drainage area of 86 km^2; the total length of the main stem and tributaries is 68 km (Table 490). No information is available on the fish populations of this river.

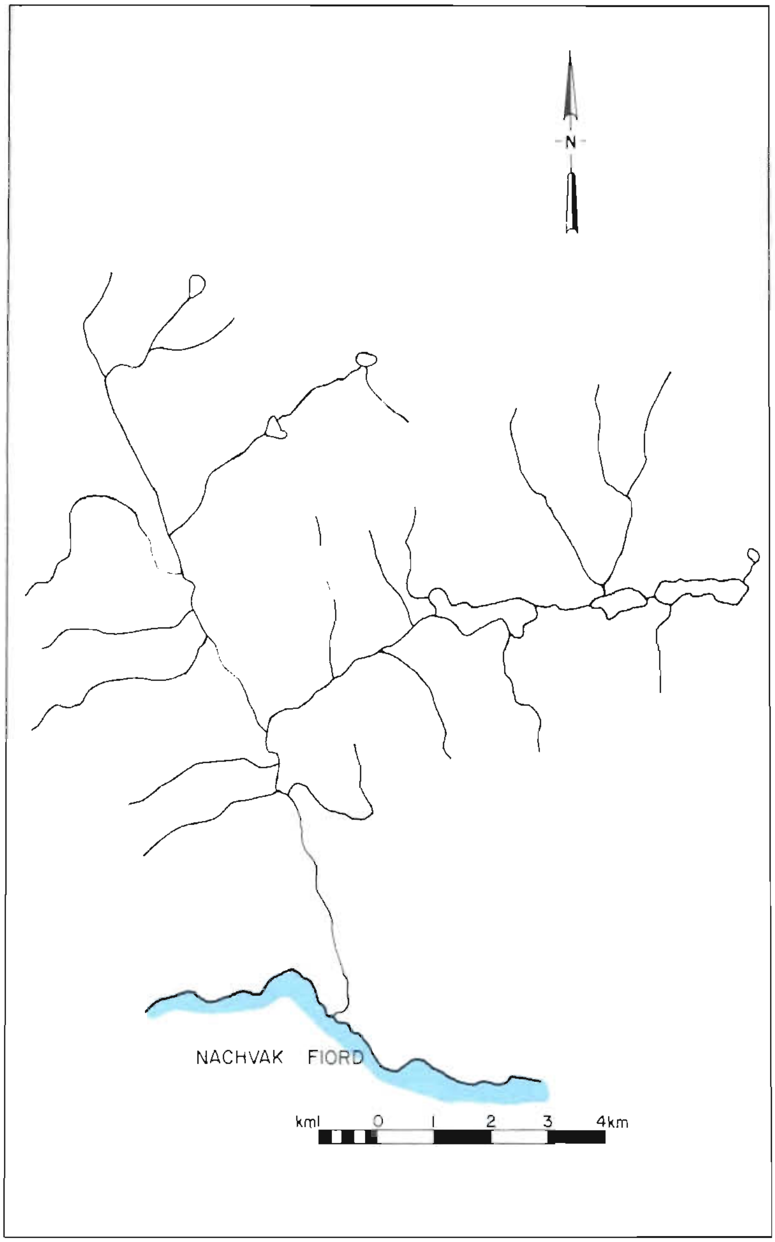

FIG. 142. Map of Kogarsok Brook (not surveyed).

TABLE 490. Physical characteristics of Kogarsok Brook.

Map reference:	Cape White Hankerchief 14M Point Le Droit 24P,O 1 : 250 000	Maximum basin relief:	610 m
Mouth latitude:	59°05′N	Length by meander (main stem):	13 km
Mouth longitude:	63°54′W	Total length including tributaries:	68 km
General direction of flow:	South	No. of tributaries:	9
Drainage area:	86 km²	Geological formation:	Gneiss
Mean width	10 km		
Axial length	14 km		
Basin perimeter	44 km		

Komaktorvik River flows northeasterly and extends for approximately 40 km from the Quebec–Labrador border to its mouth in Komaktorvik Fiord (Fig. 143). It has a drainage area of 699 km^2; the total length of the main stem and tributaries is 261 km (Table 491). In 1978, a water sample was collected; results of the analyses are presented in Table 492 (Jamieson 1979). The major tributary on the system, tributary 9 (T9) is fed by Chasm Lake (L2) which has an area of 360 ha. Komaktorvik Lake (L1) is located on the main stem and has an area of 1000 ha. In 1978, six Arctic char were netted in this lake (Bruce et al. 1979). A summary of data on length, weight, sex, and age of these fish is presented in Table 493. The Labrador Inuit Association (1977) reported that Arctic char migrate as far as Chasm and Komaktorvik lakes.

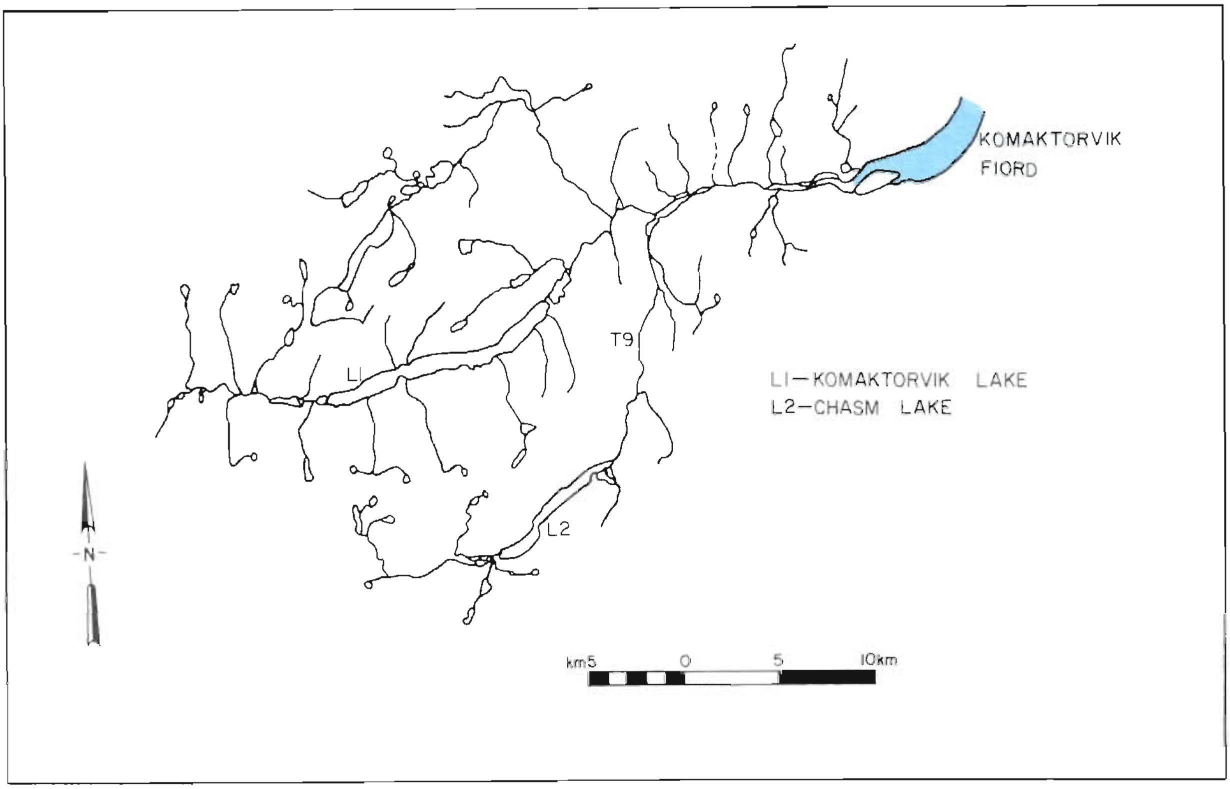

FIG. 143. Map of Komaktorvik River (not surveyed).

TABLE 491. Physical characteristics of Komaktorvik River.

Map reference:	Cape White Hankerchief 14M Point Le Droit 24P,O 1 : 250 000	Maximum basin relief:	915 m
Mouth latitude:	59°15′N	Length by meander (main stem):	47 km
Mouth longitude:	63°50′W		
General direction of flow:	Northeast	Total length including tributaries:	261 km
		No. of tributaries:	25
Drainage area:	699 km²		
Mean width	17 km	Area of lakes > 100 ha:	
Axial length	42 km	L1 Komaktorvik Lake	1000 ha
Basin perimeter	199 km	L2 Chasm Lake	360 ha
		Geological formation:	Gneiss

TABLE 492. Results of analyses of a water sample collected on Komaktorvik River, 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1978	6.6	8.0	15.0	0.4	3.0	0.5	1.0	3.7

TABLE 493. Summary of data on sex, fork length, whole weight, age, and mercury content of Arctic char captured in Komaktorvik Lake, Komaktorvik River, 31 July 1978 (Bruce et al. 1979).

Species	Sex	*N*	Mean fork length (cm)	Mean whole weight (kg)	Mean age (yr)	Mean mercury content (ppm)	Mercury range (ppm)
Arctic char	M	4	44.6	0.78	13.3	0.07	0.06–0.10
	F	2	45.4	0.69	17.0	0.16	0.08–0.25
Total		6	44.9	0.75	14.5	0.11	0.06–0.25

Kangalaksiorvik River flows easterly from the Quebec–Labrador border to its mouth in Kangalaksiorvik Fiord at Seven Islands Bay (Fig. 144). This river has a drainage area of 654 km^2; the total length of the main stem and tributaries is 193 km (Table 494). In 1978, a water sample was collected; results of the analyses are presented in Table 495 (Jamieson 1979). The Labrador Inuit Association (1977) reported that Arctic char migrate to Upper Kangalaksiorvik Lake (L2), a long narrow lake in the mid-section which has an area of 960 ha. In 1950, eight Arctic char, ranging from 18 to 96 mm in length, were taken by hand at the outlet of the first lake (L1) by the *Blue Dolphin* Labrador Expedition (Backus 1957).

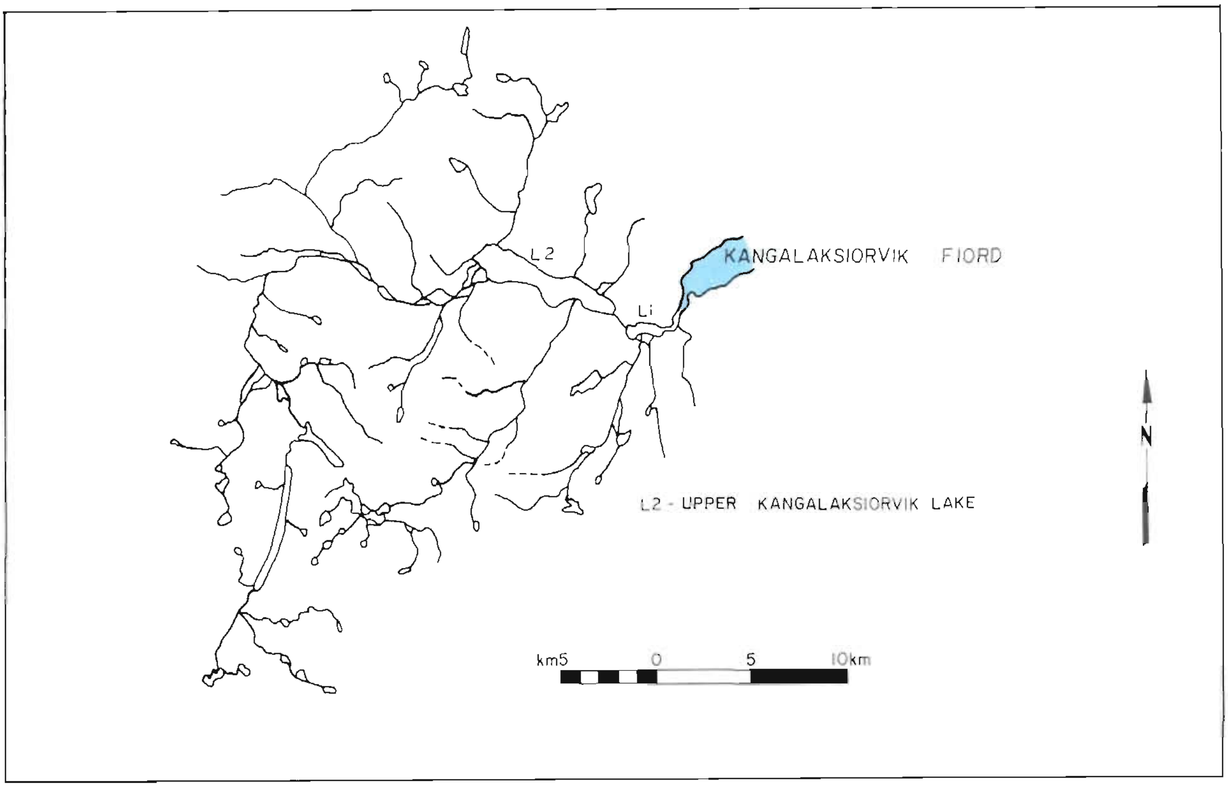

FIG. 144. Map of Kangalaksiorvik River (not surveyed).

TABLE 494. Physical characteristics of Kangalaksiorvik River.

Map reference:	Point Le Droit 24P,O 1 : 250 000	Maximum basin relief:	763 m
Mouth latitude:	59°23′N	Length by meander (main stem):	48 km
Mouth longitude:	63°03′W	Total length including tributaries:	193 km
General direction of flow:	East	No. of tributaries:	26
Drainage area:	654 km²	Area of lakes > 100 ha:	
Mean width	19 km	L2 Upper Kanglaksiorvik Lake	960 ha
Axial length	34 km		
Basin perimeter	119 km		
		Geological formation:	Gneiss

TABLE 495. Results of analyses of a water sample collected on Kangalaksiorvik River, 1978 (Jamieson 1979).

Year	pH	Total hardness (ppm)	Specific conductance ($\mu S \cdot cm^{-1}$ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
1978	6.6	6.0	19.0	0.3	4.0	1.0	2.0	4.9

Eclipse River flows northeasterly from the Quebec–Labrador border through the Torngat Mountains to its mouth in Eclipse Channel (Fig. 145). It drains an area of 1098 km^2 (Table 496). The lower areas of the main stem are swift flowing over boulder and bedrock bottom substrates; the remainder of the main river alternates between medium to high flows over gravel, rubble, and boulder. A 5.4-m falls blocks upstream fish migration at km 1.6; other complete obstructions are located at km 30.6 and km 32.2 on the main river (Table 497). Three large tributaries (T15, T18, and T20) were surveyed by Murphy and Porter (1974b) during their helicopter survey in 1973. Water samples were collected from this river in 1973 and 1978, results of the analyses of these samples are presented in Table 498 (Jamieson 1979).

During their survey, Murphy and Porter (1974b) reported sightings of several large fish (approximately 50 cm in length), but positive identification was impossible. They also reported that their angling efforts on this river were unsuccessful. A list of accessible and inaccessible rearing and spawning units recorded during the survey by Murphy and Porter is found in Table 499.

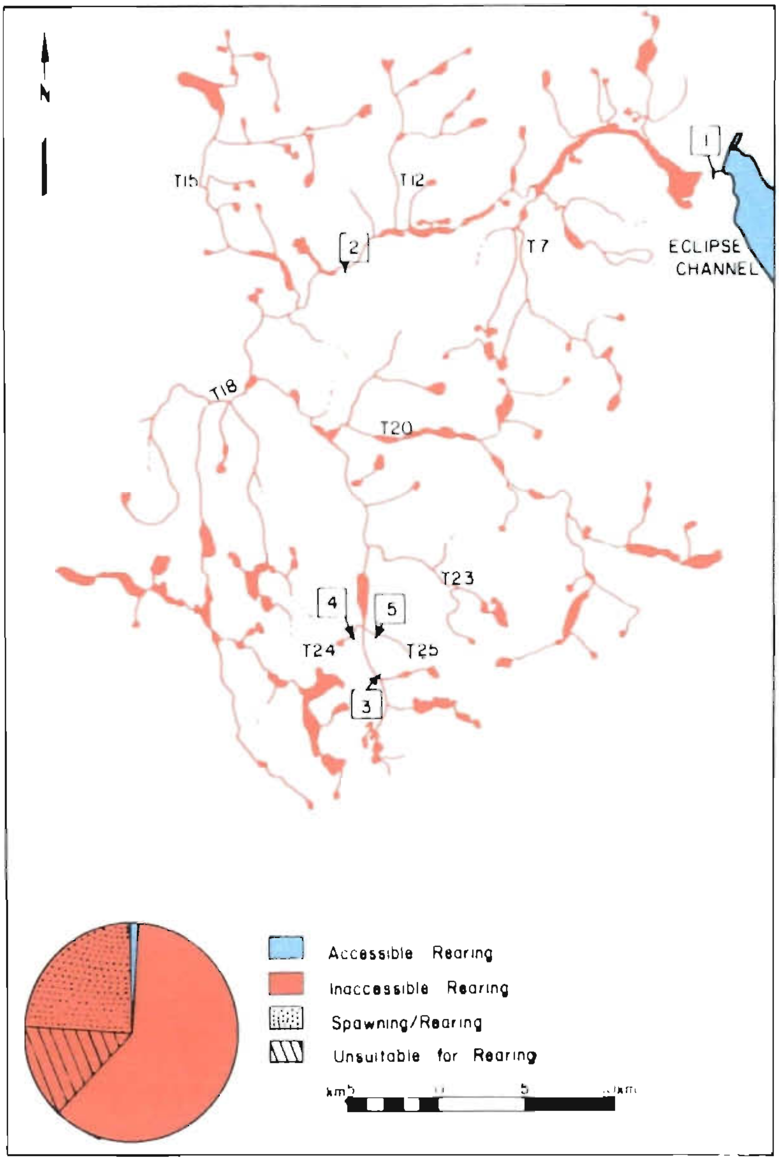

FIG. 145. Map of Eclipse River showing accessible and inaccessible Atlantic salmon parr rearing areas.

TABLE 496. Physical characteristics of Eclipse River.

Map reference:	Point Le Droit 24P,O 1 : 250 000	Maximum basin relief:	762 m
Mouth latitude:	59°47′N	Length by meander (main stem):	64 km
Mouth longitude:	64°17′W	Total length including tributaries:	378 km
General direction of flow:	Northeast	No. of tributaries:	29
Drainage area:	1098 km²	Geological formation:	Gneiss
Mean width	26 km		
Axial length	45 km		
Basin perimeter	179 km		

TABLE 497. Obstructions on Eclipse River (Murphy and Porter 1974b).

Fig. 145 reference	Location	Distance from mouth (km)	Type	Description Height (m)	Width (m)	Slope (°)	Barrier to fish passage
1	Main stem	1.6	Falls	5.4	4.6	80	Complete
2	Main stem	30.6	Falls (2)	5.4	30.5	90	Complete
3	Main stem	32.2	Falls	2.8	4.6	80	Complete
4	T24	0.5	Falls	—	—	—	Complete
5	T25	0.5	Falls	—	—	—	Complete

TABLE 498. Mean results of analyses of two water samples collected on Eclipse River, 1973 and 1978 (Jamieson 1979).

	pH	Total hardness (ppm)	Specific conductance (μS·cm⁻¹ at 25°C)	Turbidity (J.T.U.)	Total alkalinity (ppm)	Calcium (ppm)	Chloride (ppm)	Bicarbonate (ppm)
Mean	6.4	4.0	15.8	0.7	3.0	1.0	1.7	3.7

TABLE 499. Summary of rearing and spawning units in the accessible and inaccessible areas of Eclipse River (Murphy and Porter 1974b).

	Accessible areas		Inaccessible areas	
Location	Spawning units	Rearing units	Spawning units	Rearing units
Main stem	0	512	10 586	25 201
T15	0	0	0	1 129
T18	0	0	0	2 734
T20	0	0	0	8 027
Total	0	512	10 586	37 091

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GLOSSARY

Accessible area — sections of river that can be approached and entered by anadromous Atlantic salmon. Partial obstructions may limit access during certain periods.

Adult salmon production — estimate of the number of smolts that survive at sea and mature into adult salmon prior to any exploitation by commercial or recreational fisheries. Results from investigations at Sandhill River showed a 15% smolt to adult survival.

Age — the number of annuli present on a fish scale. In this publication the numbers of freshwater and sea years of anadromous fishes are shown separately as follows: 3:1,S,1+. The first digit indicates the number of years (3) in freshwater; each digit following the colon indicates a full year in the sea. 'S' denotes a year when the fish entered freshwater and spawned; '+' indicates a partial year's growth at sea.

Complete barrier or obstruction — any obstacle in a river which prevents all upstream migration of Atlantic salmon beyond it under all water conditions including falls, rapids, extreme water velocities, dams, and pollution.

Electrofishing — a sampling technique which is used to capture fish by the passage of electrical current between electrodes. The electrofisher unit produces pulsed AC current which causes a voltage drop along the axial length of the fish. The fish moves toward the anode and is collected by dipnet. This technique is used to collect samples and to estimate the size of fish populations.

Fish counting fence — a man-made weir used to trap fish. Such fences are commonly constructed of wooden or conduit laths and are mounted on either the natural stream bed or concrete platforms (Anderson and McDonald 1978).

Fishway — a structure that permits passage of migrating fishes over barriers in the river. Man-made fishways are usually concrete structures built to provide access to areas where large amounts of rearing habitat have been identified above barriers. Natural fishways occur when steps and pools exist in barriers.

Grilse — Atlantic salmon that return to the river to spawn after one winter at sea. Grilse usually weigh less than 2.7 kg.

Home fishery — the commercial fishery that occurs near the mouth of the home river. The specific home fishery area for each river is determined from geography and fishing patterns.

Home river — the river of origin of an anadromous fish.

Inaccessible area — sections of river that cannot be entered by Atlantic salmon migrating upstream. This may be due to either natural or man-made obstructions.

Large salmon — Atlantic salmon that have spent two or more winters at sea before returning to fresh water to spawn for the first time. Large salmon usually weigh more than 2.7 kg and are also referred to as multi-sea-winter salmon.

Non-productive area — sections of river considered unsuitable for rearing by juvenile Atlantic salmon. These areas are often characterized by bedrock or muddy sediments and may have either very high or very low water velocities.

Ouananiche — Atlantic salmon that are not anadromous; also known as landlocked salmon.

Parr — juvenile stage in the life cycle of the Atlantic salmon from dispersal from redd to migration as a smolt (Allan and Ritter 1977). Parr are distinguishable by dark vertical stripes along the body and a forked tail.

Partial barrier or obstruction — any natural or man-made obstacle that can cause delays in upstream salmon migration. The delays may be related to fluctuations in water levels or water temperatures.

Rearing area — sections of river with habitat suitable for Atlantic salmon parr to carry out their life processes. In this publication, suitable rearing areas consist of portions of rivers with stream beds consisting of either boulder, rubble, or gravel, or combinations thereof.

Rearing unit — 100 m^2 of rearing area for Atlantic salmon parr (see Rearing area). An average production of two smolts per rearing unit is used throughout this publication.

Redd — the gravel nest of salmonid fishes (Scott and Crossman 1973).

Resident brook trout — term applied to brook trout that remain in fresh water throughout their entire life cycle. Also known as native trout, mud trout, or speckled trout.

Rod day — any day or part thereof during which an individual angles. In this publication, effort in the sports fishery is measured in rod days.
Salmon — a collective term for large salmon and grilse of the genus and species *Salmo salar*.
Scheduled river — a river listed in Schedule A of Newfoundland Fisheries Regulations. Fishing seasons, bag limits, and types of gear used are regulated on these rivers.
Sea survival — percent survival of smolts that survive at sea and mature into adult salmon prior to any exploitation by commercial or recreational fisheries. A sea survival of 15 percent is used in this publication.
Sea-run brook trout — anadromous brook trout.
Smolt — fully silvered juvenile salmon migrating to the sea (Allan and Ritter 1977). In Labrador smolt ages range from 3 to 7 years and production is estimated to average two smolts per rearing unit.
Spawning area — sections of river considered suitable for Atlantic salmon spawning. Ideally, this area should contain silt-free gravel substrate, 2–8 cm in diameter (Porter 1975).
Spawning unit — 100 m^2 of spawning area.

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