A Review of the Status and Harvests of Fish Stocks in the Gwich'In Settlement Area

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PREFACE

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Stewart, D.B. 1996. A review of the status and harvests of fish stocks in the Gwich'in Settlement Area. Can. Manuscr. Rep. Fish. Aquat. Sci. 2336: iv + 41 p.

This document was prepared to assist the Department of Fisheries and Oceans (DFO) and the Gwich'in Renewable Resource Board to co-manage fisheries in the Gwich'in Settlement Area (GSA). It reviews information on stocks of fishes that are harvested for subsistence, commercial sale, and sport in the GSA. The information is current to February 1995. It is summarized in tables that are organized hierarchically by community, waterbody, and then species. Recent recommendations by DFO concerning management of the fisheries or stocks are summarized, with a list of pertinent references. Information is also provided on Scientific Licences issued by DFO since 1985 for research in the Gwich'in Settlement Area.

Key words: Arctic zone; Mackenzie River; Mackenzie Delta; Northwest Territories; fishery management; subsistence fishing; commercial fishing; sport fishing; catch statistics.

RÉSUMÉ

Stewart, D.B. 1996. A review of the status and harvests of fish stocks in the Gwich'in Settlement Area. Can. Manuscr. Rep. Fish. Aquat. Sci. 2336: iv + 41 p.

Ce document a pour objet d'aider le ministère des Pêches et des Océans (MPO) et le Conseil des ressources renouvelables des Gwich'in à gérer conjointement la pêche dans la région visée par l'entente conclue avec les Gwich'in. Il contient des renseignements sur l'état des stocks de poissons capturés à des fins sportives, commerciales et de subsistance, dans cette région. Ces donées sont valides jusqu'en février 1995. Au moyen de tableaux, on en fait la synthèse de manière hiérarchique, selon la localité, le cours d'eau, puis l'espèce visée. De plus, on présente un résumé des dernières recommandations du MPO concernant la gestion de la pêche et des stocks, accompagné d'une liste de références. Enfin, on donne des renseignements sur les permis délivrés à des fins scientifiques dans la région par le MPO, et ce, depuis 1985.

Mots clés: Arctique; fleuve Mackenzie; delta du Mackenzie; Territoires du Nord-Ouest; gestion de la pêche; pêche de subsistance; pêche commerciale; pêche sportive; statistiques sur les prises.

INTRODUCTION

One of the provisions of the Gwich'in Comprehensive Land Claim Agreement, which was passed into law on 22 December 1992 (Bill C-94), was the establishment of the Gwich'in Renewable Resource Board (hereafter "the Board"). This seven-member board, with equal representation of the Gwich'in Tribal Council and the Government, plus a chairperson, was appointed and operating as of February 1994 (D. Moshenko, pers. comm.). It is charged with making decisions about wildlife management in the Gwich'in Settlement Area (GSA) which lies within the Northwest Territories (Fig. 1), including those on many matters formerly the mandate of the federal Department of Fisheries and Oceans (DFO), the Canadian Wildlife Service, and the territorial Department of Renewable Resources. These decisions remain subject to review by the appropriate Minister of the Government of Canada or Minister of the Government of the Northwest Territories.

The purpose of this report is to provide the Board and DFO with a summary of the status of fish stocks harvested in the GSA (Fig. 1). These stocks are harvested primarily for subsistence but also for commerce and sport, mostly by Gwich'in beneficiaries of the land claim agreement. Prior to appointment of the Board, these fisheries were managed by DFO. They are now managed cooperatively by DFO and the Board. This report describes the status and management of the fisheries prior to appointment of the Board; it does not address subsequent changes to the fisheries management.

The published and unpublished sources of information in this summary were identified by searches of bibliographic databases and published bibliographies, and by discussions with fishery managers and scientists knowledgeable of fisheries resources in the region. The bibliographic databases searched were the Aquatic Sciences and Fisheries Abstracts (ASFA), Arctic Science and Technology Information System (ASTIS), and the DFO libraries database, WAVES. DFO files were also searched for unpublished information.

FORMAT

The summary is presented in tabular form, with the fishery data organized hierarchically first by community and then by waterbody and taxa. The objective of this is to enable the Board and DFO to quickly review the data on a community or species basis.

FISH HARVESTS (TABLES 1 and 2)

Information on the harvest of freshwater fishes from waterbodies in the GSA is summarized in Table 1. The communities, in order of discussion, are: Aklavik, Fort McPherson, Inuvik, and Tsiigehtchic (Arctic Red River). Waterbodies fished by their residents, or in the vicinity, are listed alphabetically for each community. Where several species are harvested at a waterbody, they are listed alphabetically by common name. The Latin scientific name for each species is given in Table 2.

Where a waterbody is fished by more than one community, cross references have been included to avoid repetition. Cross references to waterbodies within the same community section are indicated by "see above" or "see below"; those to waterbodies within another community section are indicated by the community name and waterbody (e.g. see AKLAVIK--Mackenzie Delta Area 1).

Included in Table 1 are those waterbodies that have a record of commercial, subsistence or sport harvest, or are listed in Schedule V of the Northwest Territories Fishery Regulations. Commercial harvests refer to fish taken by licenced commercial fishermen for local or export sale. Subsistence, or domestic, harvests refer to the capture of fish for local, or non-commercial purposes. Sport harvests refer to fish caught for personal use by licenced sport fishermen.

Within the GSA commercial fisheries for export sale have been confined mostly to the Mackenzie Delta, so relatively few GSA waterbodies have a record of harvest or stock assessment. This is in contrast to the Nunavut Settlement Area, where many stocks of anadromous Arctic charr have been harvested for commercial export since the 1950's, and for which there are detailed harvest records and ongoing stock assessments (Stewart 1994). However, many of the waterbodies for which no harvest data were found do play a vital role in the regional fisheries. They provide critical spawning and nursery habitats for fishes, and support important subsistence harvests. Studies to predict the potential impacts of pipeline and highway developments have documented the importance of a number of these waterbodies. Where such information exists, the waterbody has been

included together with a brief summary of the study results.

Each fishing location is identified by its proper geographical name (Canada 1980; NLUIS), and a latitude and longitude. In some cases, a local name or geographical feature is also included in brackets. The map coordinates were taken from Schedule V, from the source of the data, or determined from 1:250,000 scale topographical maps.

For each waterbody with harvest data, Table 1 identifies the species harvested and provides the harvest quota(s), the most recent harvest data, a summary of stock status if available, and a list of pertinent references. Species are treated separately if they have separate quotas. For each waterbody without harvest data, the table summarizes and references the results of pertinent fisheries research. The number of species reported by these studies precludes listing them individually for each waterbody. Species reported by the studies examined are listed in Table 2 for selected waterbodies. This listing is intended to support the comments in Table 1. It is not the result of an exhaustive review of the literature on species' occurrences.

All site specific harvest data located during this work are summarized in Table 1. Non-site specific community harvest data from 1988 to 1994 have been included where available. Treble (1996) has summarized the pre-1988 community harvest data in detail for subsistence and commercial fisheries of the lower Mackenzie River.

The harvest quotas are from various sources, and some more closely reflect the stock status than others. The quotas of active commercial fisheries are reassessed annually by DFO. If information from the harvesters or from sampling suggests that the fishery is not sustainable then the quota is adjusted downward. If that information suggests under-utilization then it may be adjusted upward. The experimental quotas, in square brackets, are interim quotas assigned for the purpose of obtaining samples from a fishery. In the past, experimental fisheries were known as exploratory or test fisheries. Abbreviations are used to indicate years when a harvest may have taken place but that no data are available "(NA)". "No quota", or a blank quota cell in the table, indicates that DFO has not assigned a commercial quota to the waterbody, either as a whole or for a particular species. This does not necessarily mean that there are no commercial fishing opportunities in the waterbody or for a species. "No quota applicable" indicates harvest statistics that have been reported on a community basis. While the actual harvest site is unknown, most of these fish will have been taken from a waterbody or Mackenzie Delta management area that has an established commercial quota.

The quota and harvest years are the same as the federal government fiscal year (e.g. the 1996 quota extends from 1 April 1996 to 31 March 1997).

Unless otherwise indicated, the harvest statistics are for commercial fisheries and in kilograms round weight. A "round" weight is that of a whole fish, while a "dressed" weight is that of a fish with the viscera and gills removed. It was not always possible to separate the harvests by species for mixed species fisheries, or to determine how the data were collected. In some instances the commercial harvest data are from export or local sales records, in others from survey questionnaires. The former tend to be conservative as they do not estimate culls and personal use. The latter are prone to survey biases that can lead to over or under estimates of the harvests, and to double counting of fish harvested for sale or subsistence. In most years these data are incomplete as not all active fishermen reported their harvests (L. Anderson, pers. comm.). Likewise, species may not always be correctly identified, particularly the whitefishes and ciscos. Care, then, must be taken when interpreting these data.

The general comments column of the tables provides a brief summary of the information available for each waterbody. It tells whether there is an established or experimental fishery, active or inactive and if it is in conflict with other fisheries; when it was last sampled for, or by, DFO; what is known of the stock status; whether spawning or nursery habitats have been identified in the system; and recent recommendations by DFO concerning management of the fishery. The discussions of stock status, and any management recommendations, are based on assessments of the Arctic Fisheries Science Advisory Committee (Clarke et al. 1989; Cosens et al. 1990, 1993; Bodaly et al. 1992) and discussions with fishery managers. Comments on habitat use and subsistence harvests are summaries of site-specific aquatic resource assessment research. Reference material pertinent to each fishery is listed in brackets and cited in full in the bibliography.

General information for communities is discussed under community headings (e.g. Aklavik general area), whereas site-specific harvest data are discussed under the appropriate waterbody or Mackenzie Delta management area. Changes to the latter are illustrated in Figures 2 and 3. Between 1979 and 1989, much of the harvest data were summarized by community rather than waterbody or management area (Treble 1996). These data are of limited use to fishery managers since the location of the harvest is unknown. But, representative, recent community harvest data have been included for comparison.

There are few data available on subsistence harvests in the GSA. Indeed, many of those described here were documented in the late 1960's to mid-1970's, and their present status and extent have not been documented. The Gwich'in Harvest Study, which was initiated in September 1995 and will continue for five years, should remedy this situation by providing comprehensive data on subsistence harvesting activities in the GSA (I. MacDonald, pers. comm.).

Descriptions of subsistence fisheries in the GSA can be found in Wynne-Edwards 1947; Bissett 1967, 1972; Jessop et al. 1974; Hunter 1975; Corkum and McCart 1981; Sparling and Stewart 1986; Nelson et al. 1987; Sparling and Sparling 1988a+b; Lutra Associates Ltd. 1989; Rawson Academy of Aquatic Sciences 1990; Sekerak et al. 1992; Treble 1996; and Treble and Reist 1996.

Wide fluctuations have been observed in the subsistence harvests, particularly at Tsiigehtchic where they have been documented since the 1800's (Hunter 1975; Treble 1996). Years of low catches may have been related to poor weather, which can prevent fishermen from setting nets or landing catches when migratory fishes are passing through an area. Varying methods of harvest estimation also contribute to the fluctuations apparent in the subsistence harvest data. The extent to which changes in fish populations have effected these fluctuations is unknown.

Prior to settlement of the Gwich'in land claim, non-natives who fished for subsistence in the GSA required a Domestic Fishing Licence and had to report their catch to DFO on request. Data from these fisheries have typically been reported separately from the native subsistence harvest. Treble (1996) summarized harvest data reported by domestic licence holders for the period 1978 through 1989. This task was complicated by the fact that these data have often been reported with commercial harvest data, or vice versa. Because they are not site specific, only the 1988 and 1989 domestic licence data are reported in Table 1. No data are available for the period 1990-94 (C. Craig, pers. comm.).

At writing, the sport fishing daily catch and possession limits in the GSA were the same as those elsewhere in the Northwest Territories where special limitations are not in force. Few harvest data were found for recreational fisheries in the GSA.

Table 1 summarizes information from studies directed towards the assessment and management of commercial, subsistence, and sport fisheries. It does not summarize other scientific research directed towards a more general understanding of the aquatic environment. Useful in this regard are the:

aquatic resource assessments of: Shotton 1971, 1973; Hatfield et al. 1972; Brunskill et al. 1973 a+b; Dryden et al. 1973; Stein et al. 1973; Dryden and Jessop 1974; Jessop et al. 1974; McCart et al. 1974; Schultz International Ltd. 1974; and Jessop and Lilley 1975;

species accounts of: McPhail and Lindsey 1970; Bodaly and Lindsey 1977; Reist and Bond 1988; Reist and Chang-Kue 1996; and,

reviews of: Doran 1974; Brunskill 1986; McCart 1986; Rosenberg 1986; Bodaly et al. 1989; and Sekerak et al. 1992.

Resource maps in the Northern Land Use Information Series (NLUIS) which were produced between 1974 and 1976, by the Lands Directorate of the Department of Fisheries and Environment, are also useful. They are referred to in text by number and are available from the Surveys and Mapping Branch of the Department of Energy, Mines, and Resources in Ottawa.

FISHERIES RESEARCH LICENCES (TABLE 3)

Table 3 summarizes information on the Scientific Licences that DFO has issued to its personnel or to non-DFO personnel since 1985 for work in the GSA (J.T. Strong, pers. comm.). These licences permit researchers to take fish for scientific purposes. This information is organized alphabetically by licence holder. The area where

the research was to take place, its purpose, and the year for which the licence was issued are shown for each licence holder. The years refer to the federal government fiscal year (see above). The outcome of the research is not discussed, but documents located are referenced.

In 1994, DFO began to distinguish between studies that take fish for scientific, educational, and public display purposes (J.T. Strong, pers. comm.) Since then, separate licences have been issued for each type of study, and studies that do not take fish (e.g. behavioural observations) no longer require a Scientific Licence. Scientific licences are now issued under Section 52 of the Fishery (General) Regulations.

DISCUSSION

A number of the fish species harvested in the Gwich'in Settlement Area (GSA) migrate long distances on a seasonal basis each year. These movements have important implications for the interpretation of Table 1 and for fishery management in the GSA. Long distance migrants such as Arctic cisco, broad whitefish, Dolly Varden, inconnu, lake whitefish and least cisco may be vulnerable to harvest by Inuvialuit, Gwich'in, Sahtu, and Deh Cho fisheries. These fishes are predictably available to harvesters on a seasonal basis at known locations. Some of them, perhaps all, also have discrete spawning stocks. Consequently, fishermen at a given location and season may be harvesting fish from a number of different stocks.

In terms of Table 1, this means that the harvest data for fisheries in the Mackenzie River and its larger tributaries do not relate to a single local population. Rather, they relate to a number of spawning stocks which may be distant from the harvest site. Fisheries in the lower reaches of the Mackenzie Basin, then, directly affect those in the upper reaches, and vice versa. This is also true, but to a lesser extent, for species that undertake shorter seasonal migrations such as Arctic grayling, longnose sucker, and walleye. This makes it very difficult for fishery managers to determine the level of harvest that can be sustained at a particular location by a particular species, and to estimate the harvest pressure on a given fish stock. It also makes it increasingly important that managers understand stock dynamics and estimate stock size (Tallman 1996).

The complexities of identifying the individual stocks, estimating stock size, and determining the extent to which each is harvested by the various fisheries makes management of this resource in the Mackenzie basin extremely difficult. It emphasizes the need for close cooperation between resource management boards in the Inuvialuit, Gwich'in, and Sahtu settlement areas.

DFO and others have undertaken a number of genetic studies of fishes in the GSA for the purpose of stock identification. Reist (1989) and Reist et al. (1996) studied the genetics of migratory Dolly Varden in the Rat River; Bickham et al. (1989), Lockwood and Bickham (1989), Morales et al. (1989), Troy (1989), and Dillinger et al. (1992) studied the genetics of migratory Arctic cisco in the Peel and Arctic Red rivers; and Reist (1996a) studied broad whitefish in the Mackenzie Delta and Mackenzie, Peel and Arctic Red rivers.

Movements of migratory coregonids, Dolly Varden, burbot, longnose sucker, northern pike, walleye, and other fish species have been studied in the Mackenzie Basin using mark-recapture tagging experiments (e.g. Hatfield et al. 1972; Stein et al. 1973; Jessop et al. 1974; Jessop and Lilley 1975; Babaluk et al. 1996). Radio tags have also been used to follow the seasonal movements of broad and lake whitefish in the Mackenzie delta and basin (Jessop and Chang-Kue 1993; Chang-Kue and Jessop 1983, 1992, 1996a+b), and of inconnu in the Arctic Red River (R. Tallman, pers. comm.). Inconnu tagged near Tsiigehtchic, for example, have been captured a year later 1,104 km upstream in the Liard River (Jessop and Lilley 1975), and broad whitefish tagged at Kukjuktuk Creek on the Tuktoyaktuk Peninsula have been recaptured at The Ramparts upstream from Fort Good Hope (Chang-Kue and Jessop 1992).

Radio telemetry, sonar, and fish capture and sampling techniques have also been used together to identify spawning areas for broad whitefish on the Arctic Red, Peel, and Mackenzie rivers (Chang-Kue and Jessop 1996a).

At present, Dolly Varden and broad whitefish present perhaps the most important stock management challenges in the GSA. The Dolly Varden stock is relatively local and is discussed in Table 1 (AKLAVIK--Rat River). Broad whitefish constitute a wider and more complex management issue (Reist 1996b; Tallman and Reist 1996a). They migrate between the Inuvialuit and Gwich'in and/or Sahtu settlement areas where they are an important part of the subsistence harvests.

Because they are anadromous, the migrants are relatively free of the parasite Triaenophorus crassus, which infects whitefish and lowers their commercial value (Choudhury and Dick 1996; Dick 1996).

Their predictable availability in large numbers and relatively parasite-free flesh, has made broad whitefish a target for many economic development initiatives over the past 30 years. None of these has proven to be economically viable (Stewart et al. 1993; Anderson 1995). The most recent of these, an experimental fishery by the Uummarmiut Development Corporation in the Inuvialuit Settlement Region, began in 1989 and operated through 1993 (Treble and Dahlke 1994; Treble and Tallman 1996; G. Fricke pers. comm.). This fishery and its future development is of particular importance to the management of broad whitefish stocks in the GSA, since it is likely targeting many of the same stocks that support the Gwich'in subsistence harvest.

Recent work by DFO under the Inuvialuit Final Agreement (Tallman and Reist 1996b) has significantly improved the understanding of these stocks by fishery managers, but the scale and complexity of the problem is such that it will require many years of research before the stock dynamics are clearly understood.

A revisiting of data from the aquatic resource assessments conducted for the Mackenzie Valley pipeline and Dempster highway, directed toward fishery management should be considered. A wealth of information was collected by these large-scale studies, much of which has never been analysed or presented in detail. Such a review might provide data useful for the management of broad whitefish and other fishes in the Mackenzie River drainage of the Settlement Area.

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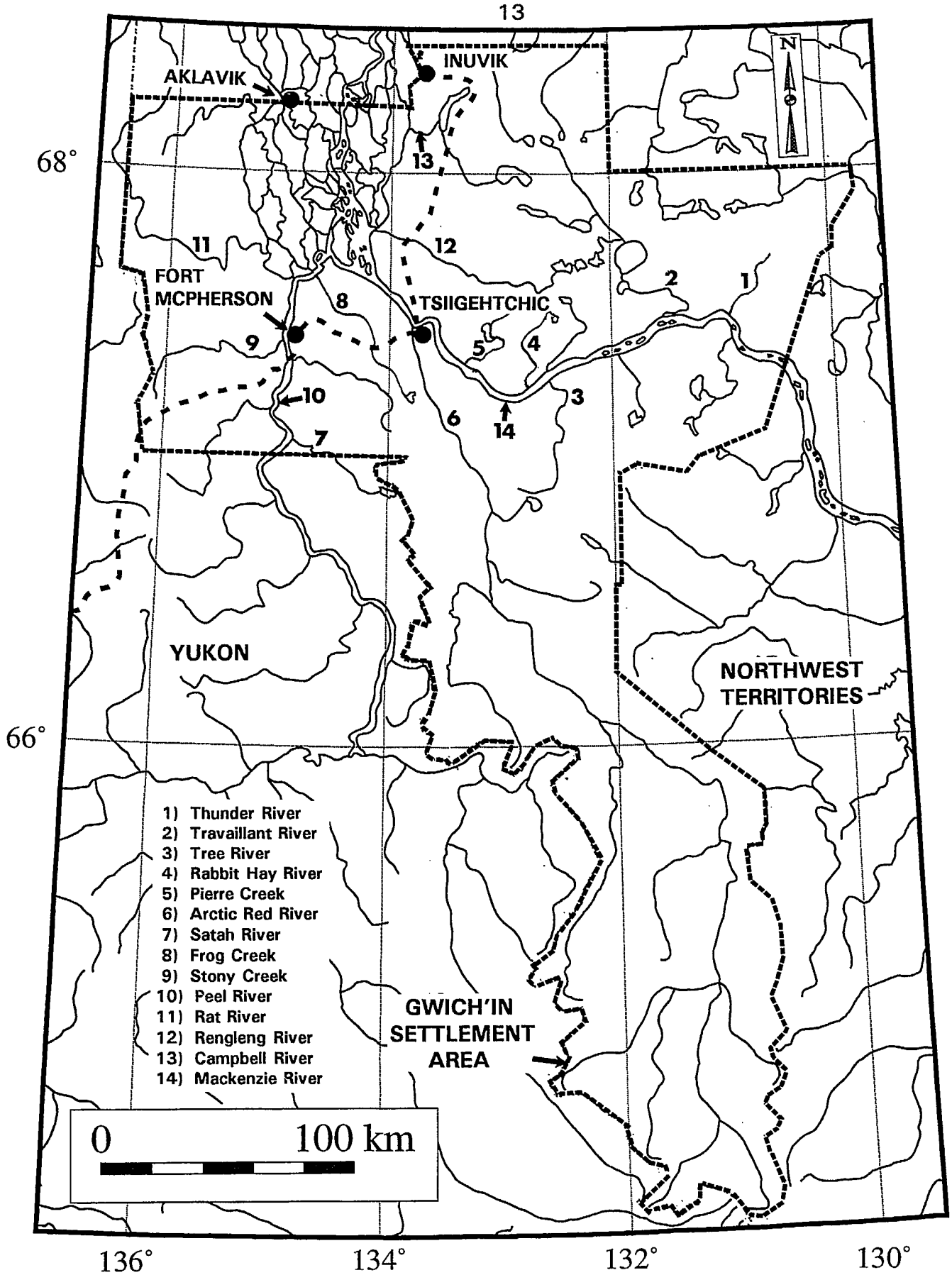

Figure 1. Map of the Gwich'in Settlement Area showing major rivers and communities.

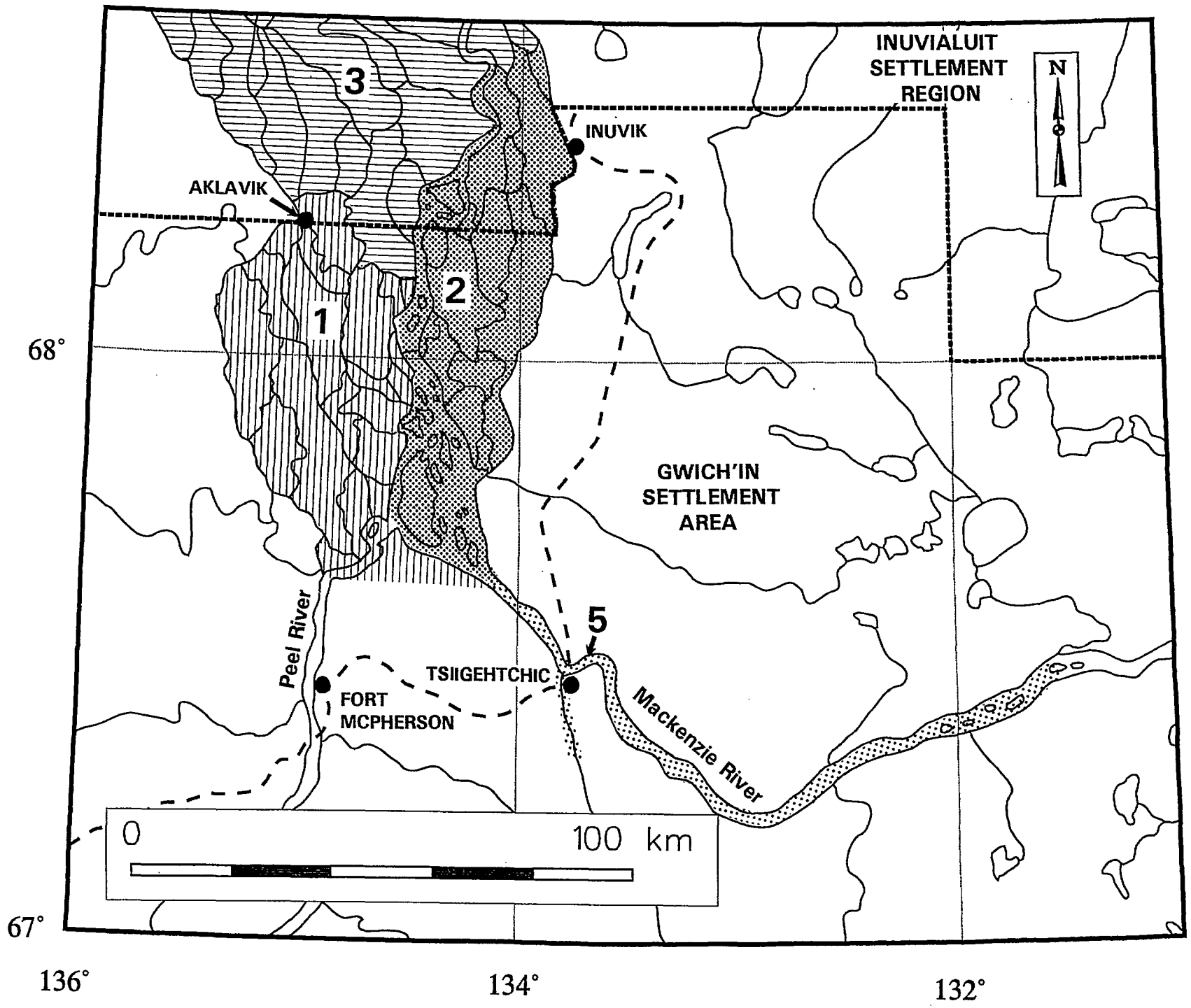

Figure 2. Fishery management areas (1, 2, 3, 5) in the Mackenzie Delta region of the Gwich'in Settlement Area (1976-91)

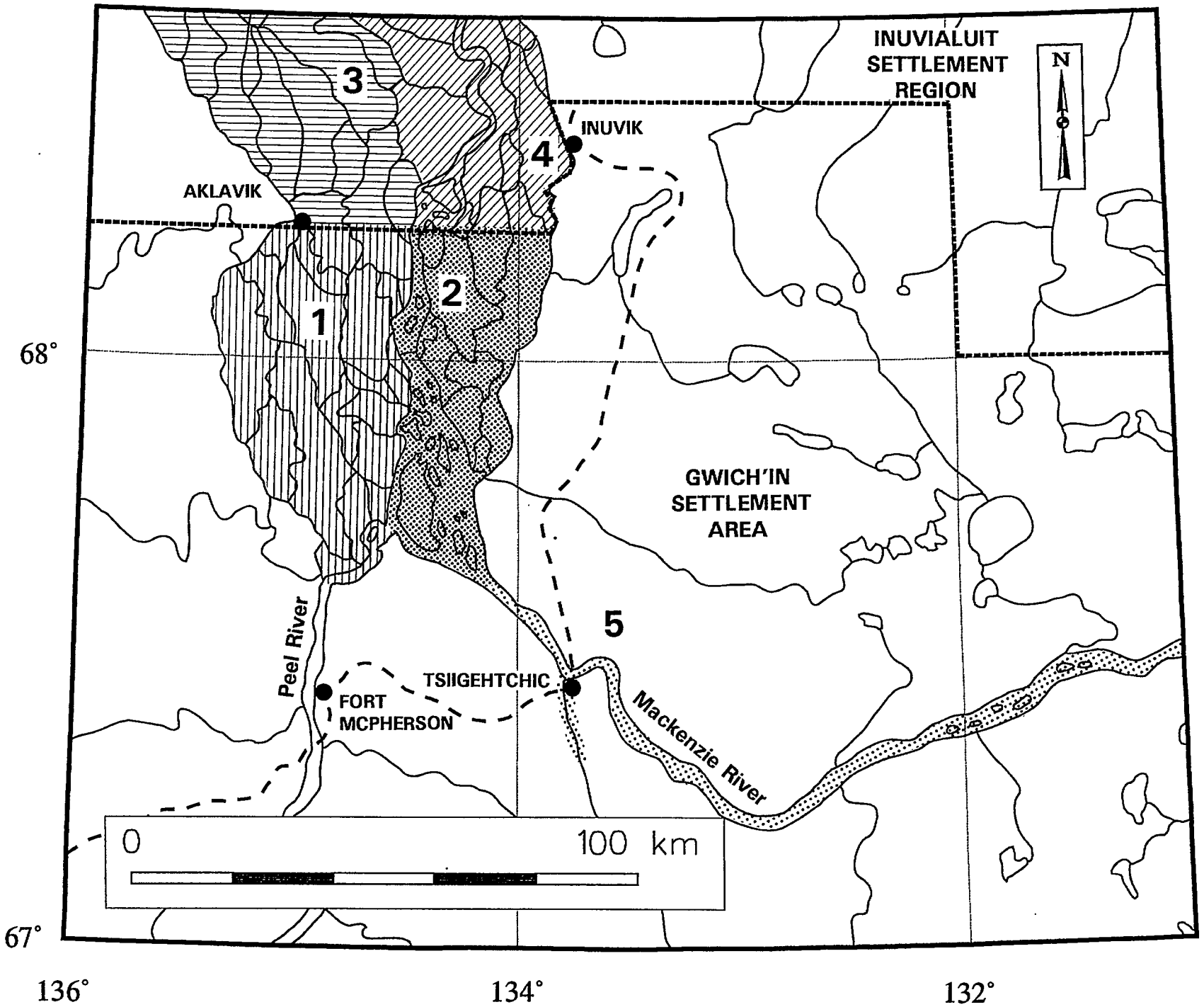

Figure 3. Fishery management areas (1-5) in the Mackenzie Delta region of the Gwich'in Settlement Area (1991-present). Note: management area 5 extends upstream to the confluence of the Mountain and Mackenzie rivers.

Table 1. Harvests of fishes from the Gwich'in Settlement area by community area and waterbody.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
AKLAVIK			
Aklavik general area	Dolly Varden (listed as Arctic charr) --quota not applicable	1988--742 fish (965 kg); 1989--559 fish (727 kg); 1990--NA;	Much of the subsistence harvest data for the community of Aklavik has been reported on a community basis. These data are of limited use for management purposes since they do not tell fishery managers where the fish were caught. Indeed, a substantial portion of these annual harvests were taken by Inuvialuit fishermen from the community fishing in the Inuvialuit Settlement Region. The total annual subsistence harvest of fish by residents of Aklavik was estimated at 227,272 kg in 1965, and 451,967 kg in 1973. In 1973, DFO also interviewed 50 subsistence fishermen from Aklavik, and estimated the total harvest by Aklavik subsistence fishermen at 134,055 kg (294,923 lbs). DFO also interviewed subsistence fishermen in the Aklavik area in July and August 1981, and sampled their catches for biological data. Based on this survey, the summer subsistence harvest of broad and lake whitefish and inconnu by Aklavik fishermen was an estimated 14,480 kg. These estimates should be considered rough approximations of the harvests. The Inuvialuit Harvest Study has reported recent subsistence harvest data for the Inuvialuit members of the community but similar comprehensive data have yet to be gathered for the Gwich'in. Most fishing takes place in channels of the Mackenzie Delta, or at the Big Fish River in the Inuvialuit Settlement Region. The main species taken are broad and lake whitefish. The broad whitefish, inconnu, Dolly Varden, and burbot are used for human consumption, while lake whitefish, Arctic cisco, and northern pike are fed to the dogs. DFO issued a single domestic fishing licence in Aklavik in 1988, and two in 1989--only one of the 1989 licence holders reported their harvest. The Big Fish River was closed to all fishing between 1987-91. In 1992, there was a small fishery at the river mouth, where a Gwich'in beneficiary fished and less than 50 charr were taken by all persons (Gwich'in and Inuvialuit) fishing there. Since then, there has been no fishing at this location. See also Mackenzie Delta Area 1, below, and INUVIK--Mackenzie Delta Area 2. (Bissett 1967; Stein et al. 1973; Jessop et al. 1974; Jessop and Lilley 1975; Sparling and Sparling 1988a+b; Sekerak et al. 1992; Treble 1996; L. Harwood, pers. comm.) Like the subsistence fisheries, most commercial harvest data collected from Aklavik fishermen between 1981 and 1989 were recorded on a community basis rather than by the appropriate Mackenzie Delta management area. These data are also of limited use for management purposes, since they do not tell where the fish were harvested. They are included here only because they are some of the most recent data available. The 1988-90 commercial harvest figures are based on a DFO survey of the licenced commercial fishermen in the western Arctic. The main species harvested and sold were broad whitefish and inconnu, with lesser amounts of lake whitefish, burbot, and charr (Dolly Varden). Comparison of the harvest and sales figures suggests that sales figures were incomplete, or that a significant proportion of the harvest was either used for subsistence or unmarketable. The 1988-89 catches were reported as numbers of fish, so the weight of the harvest was estimated. These data are incomplete and likely underestimate the harvests since only 70%, 58% and 38% of the fishermen responded to the survey, in the respective years. Some of these fish were taken in Area 1 of the Mackenzie Delta and others in Area 2. It is not known what proportion of the harvests was taken from
	broad whitefish --quota not applicable	1988--4,654 fish (10,704 kg); 1989--2,909 fish (6,691 kg); 1990--2,953 kg; <u>Subsistence harvest (DL):</u> 1988--700 fish (1,610 kg); 1989--200 fish (460 kg);	
	burbot --quota not applicable	1988--2,512 fish (7,536 kg); 1989--2,679 fish (8,037 kg); 1990--NA;	
	cisco spp. --quota not applicable	1988--800 fish (320 kg); 1989--900 fish (360 kg); 1990--1,440 kg;	
	herring --quota not applicable	1988--950 fish (360 kg); 1989--15 fish (6 kg); 1990--NA; <u>Subsistence harvest (DL):</u> 1988--150 fish (60 kg); 1989--NA;	
	inconnu --quota not applicable	1988--1,052 fish (4,734 kg); 1989--2,360 fish (10,620 kg); 1990--828 kg; <u>Subsistence harvest (DL):</u> 1988--75 fish (338 kg); 1989--25 fish (113 kg);	

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Aklavik general area, continued.	lake whitefish --quota not applicable	1988--2,738 fish (3,559 kg); 1989--2,209 fish (2,872 kg); 1990--806 kg; Subsistence harvest (DL): 1988--500 fish (650 kg); 1989--100 fish (130 kg);	the portion of Areas 1 and 2 within the Inuvialuit Settlement Region (Fig. 2), nor whether the charr harvested were included in the 1988-89 subsistence harvests from the Rat River (see below). Since 1982, DFO has typically licenced between 10 and 20 commercial fishermen from Aklavik. See also Mackenzie Delta Area 1 below and INUVIK--Mackenzie Delta Area 2. (Barlishen and Webber 1973; DFO 1991, 1992a+b; Treble 1996)
	northern pike --quota not applicable	1988--1,810 fish (4,163 kg); 1989--2,335 fish (5,371 kg); 1990--NA;	
	suckers --quota not applicable	1988--79 fish (79 kg); 1989--19 fish (19 kg); 1990--NA;	
	other species --quota not applicable	Subsistence harvest (DL): 1988--1,829 fish (994 kg); 1989--379 fish (138 kg);	
Canoe Lake 68°13'N, 135°54'W			This lake in the Richardson Mountains supports Arctic grayling and northern pike. It has been fished for subsistence in winter and spring (November through mid-June) by residents of Aklavik. (Sekerak et al. 1992; NLUIS 107B)
Fish Creek 67°46'N,136°16'W			A baseline fisheries study of this tributary of the Rat River was conducted in 1971-74 for the Mackenzie Valley pipeline. During August and September Arctic grayling migrate into Fish Creek to overwinter in the deep spring fed pools or "fish holes". While grayling spawning has not been documented, the creek is a nursery area for immature grayling. Local reports of chum salmon spawning in the fish holes during September have not been confirmed. See AKLAVIK--Rat River for information on the Dolly Varden. (Hatfield et al. 1972; Dryden et al. 1973; Jessop et al. 1973; Stein et al. 1973; Jessop and Lilley 1975)
Long Lake 67°43'N, 135°25'W			Broad whitefish, lake whitefish, and northern pike were collected from this lake on the Rat River system in October and November 1986, for genetic analysis by DFO. (Reist 1987)
Mackenzie Delta (Area 1)--see Fig. 3	Arctic grayling --no quota	Subsistence harvest: 1979--45 kg; 1980--45 kg;	This management area was established in 1976, but commercial harvest records for the area extend back to at least 1960. Prior to 1991, it extended further north into the Inuvialuit Settlement Region (Fig. 2). In 1991, the areas' northern boundary was changed to follow the boundary between the Gwich'in and Inuvialuit settlement areas. It now lies entirely within the Gwich'in Settlement area (Fig. 3). Most commercial fishing in Area 1 is conducted by residents of Aklavik and, to a lesser extent, Fort McPherson.

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Mackenzie Delta (Area 1) continued.	broad whitefish [3,000]	1979--705 kg (L); 1980--146 kg (L); 1990--191 kg; 1991-3--NA; <u>Subsistence harvest:</u> 1979--4,421 kg; 1980--6,920 kg;	From 1978-80, DFO sent survey request forms to licenced commercial fishermen, and conducted interviews to obtain estimates of the quantity of fish harvested for local sale. These data are denoted with an "(L)" to distinguish them from fish harvested for export sale. Due to low response rates to the survey in 1977, only the 1979-80 data are included here. The 1990-93 data are based on DFO surveys of the licenced commercial fishermen. The response rates to those questionnaires in the western Arctic were 38% in 1990; 27% in 1991, nil in 1992, and 55% in 1993, so the quality of the harvest estimate is not known. Between 1981 and 1989, data from the commercial fishery were recorded primarily by community. The main species harvested and sold are broad whitefish and inconnu, with lesser amounts of lake whitefish, burbot, and charr (Dolly Varden). Comparison of the harvest and sales figures suggests that sales figures were incomplete, or that a significant proportion of the harvest was either used for subsistence or unmarketable. The 1988-89 harvests are reported above under Aklavik general area and under FORT MCPHERSON--Fort McPherson general area, since they also include fish harvested outside Area 1. It is not known what proportion of the pre-1991 commercial harvests were taken from the portion of Area 1 that extended into the Inuvialuit Settlement Region (Fig. 2). (Corkum and McCart 1981; Yaremchuk et al. 1989; DFO 1991, 1992a+b, 1993, 1994, 1995; Treble and Read 1994; Treble 1996) Anadromous Dolly Varden from the Big Fish and Rat rivers are taken by this fishery. Concern over stock depletion led to closure of the Big Fish River to all charr fishing in 1987, and closure of the Rat River and Mackenzie Delta Area I to the commercial harvest of Dolly Varden in 1989. (Cosens et al. 1990, 1993) DFO sampled a few fish from the winter subsistence fishery at the mouth of Aklavik Channel in 1971. In 1972-74, for the Mackenzie Valley Pipeline studies, they tagged 14,625 fish of a variety of species in the Akalvik area of the Mackenzie Delta to follow their movements, and collected biological data. Species reported from the lower Mackenzie River mainstem are listed in Table 2. From 1978-80, DFO sent survey request forms to fishermen, and hired local interviewers to obtain subsistence harvest estimates for this area. Due to low response rates to the survey in 1977, only the 1979-80 data are included here. DFO obtained samples from the subsistence harvests at Husky Channel in October and November 1990, and from Peel Channel in late September and early October 1993. Biological data were collected from broad whitefish, inconnu, lake whitefish, least cisco, and northern pike. (Hatfield et al. 1972; Stein et al. 1973; Jessop et al. 1974; Jessop and Lilley 1975; Corkum and McCart 1981; Treble and Read 1994; Treble 1996. Rystephanuk, pers. comm.)
	burbot + northern pike 4,600	1990--burbot 0 kg, northern pike 448 kg; 1991-3--NA; <u>Subsistence harvest:</u> 1979--burbot 1,149 kg, northern pike 2,763 kg; 1980--burbot 2,416 kg, northern pike 2,333 kg;	
	chum salmon --no quota	<u>Subsistence harvest:</u> 1979--27 kg; 1980--87 kg;	
	cisco spp. 2,300	1990--0 kg; 1991-3--NA; <u>Subsistence harvest:</u> 1979--2,955 kg; 1980--2,675 kg;	
	Dolly Varden (listed as Arctic charr) --closed	1979--683 kg (L), 638 kg; <u>Subsistence harvest:</u> 1979--3,060 kg; 1980--402 kg;	
	inconnu --no quota	1990--238 kg; 1991-3--NA; <u>Subsistence harvest:</u> 1979--832 kg; 1980--1,080 kg;	

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Mackenzie Delta (Area 1) Continued.	lake trout 2,300	1979--181 kg; 1980--346 kg (L); 1991-3--NA; Subsistence harvest: 1979--773 kg; 1980--1,923 kg;	
	lake whitefish 2,300	1990--26 kg; 1991-3--NA; Subsistence harvest: 1979--1,463 kg; 1980--8,820 kg;	
	longnose sucker --no quota	Subsistence harvest: 1979--115 kg; 1980--113 kg;	
Ogilvie Lake 67°43'N, 136°26'W			Broad whitefish, lake whitefish, and northern pike were collected from this lake on the Rat River system in October and November 1986, for genetic analysis by DFO. (Reist 1987)
Rat River 67°37'N, 135°52'W	Dolly Varden (SR + LL)--closed	Combined commercial and subsistence harvest: 1972--6,500 fish; 1973--2,600 fish; 1975--2,100 fish; The 1983-6 harvest records which follow are based on incomplete data: 1983-->500 fish; 1984-->400 fish; 1985-->200 fish; 1986-->1,050 fish; Subsistence harvest: 1988--2,100 fish--combined Aklavik and Fort McPherson; 1989--2,100 fish; 1994--2,700 fish--combined Gwich'in and Inuvialuit harvest;	Baseline studies of the Rat River system were conducted in 1971-74 for the Mackenzie Valley pipeline studies. Species reported from this system are listed in Table 2. Dolly Varden, broad whitefish, northern pike, and round whitefish were captured in the greatest numbers and many were tagged. Tag recaptures indicate that individuals of these species move between the Mackenzie and Rat rivers. Arctic grayling, broad and round whitefish, Dolly Varden, northern pike, and ninespine stickleback spawn in the river and use it as a nursery area. Broad and round whitefish appear to run into the system from the Mackenzie in the fall to spawn. DFO collected samples of Arctic grayling and dolly varden from the Rat River system for genetic analyses in September 1986. (Hatfield et al. 1972; Dryden et al. 1973; Jessop et al. 1973, 1974; Shotton 1973; Stein et al. 1973; McCart et al. 1974; Jessop and Lilley 1975; Reist 1987) A genetically distinct stock of anadromous charr of the western Arctic-Bering Sea form, commonly known as Dolly Varden, inhabit this system. Their only known spawning and overwintering area is in the spring-fed "fish holes" of Fish Creek (see above), a tributary of the Rat River. Fish from this stock migrate downstream through western channels of the Mackenzie River Delta in the spring to feed in the Beaufort Sea. They return upstream in August and early September, some via the Husky and Peel channels, to their overwintering and spawning habitat. The timing of these runs can vary by a month from one year to the next, depending upon the environmental conditions. During this migration the charr are vulnerable to fishing by residents of Aklavik and Fort McPherson. Historically, the anadromous charr stock in the Rat River has been exploited by an important subsistence fishery and lesser commercial and sport fisheries. They are caught in gillnets by mixed fisheries at Destruction City, the mouth of

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Rat River, continued.		Sport harvest: --unknown but probably light.	the Rat River at Husky Channel and at Big Eddy, the mouth of Husky Channel, Aklavik, and Shingle Point. In the past, subsistence fishermen from both communities, using sweep nets and /or beach seines, also took large harvests of charr from the fish hole on Fish Creek in early October, apparently this no longer occurs. The harvest of this stock downstream of Aklavik is probably <100 fish per year. DFO conducted a detailed baseline study of the Rat River charr population in 1972, for the Mackenzie Valley pipeline. Concern for the health and status Rat River charr stock by residents of Fort McPherson in the early 1980's prompted DFO to conduct studies of the population and harvests in 1983, 1986, and 1989. In 1989, a Peterson estimate was made from a recapture study at the overwintering fish holes. This estimate was 11,191 fish (95% CI 8,532-15,020), of which about 25% were current year spawners. Current year spawners concentrate in the upper, deeper pools of Fish Creek. In 1989, DFO estimated that subsistence fishermen harvested about 18% of the Rat River migratory stock. This prompted concern for the stock, resulting in annual monitoring of the subsistence harvest since 1989. The proportions of spawning and non-spawning adults in the 1989-94 subsistence harvests have varied widely, possibly as a result of differences in the timing of the fishery. A higher proportion of females (59-80%) were caught each year than males. DFO's AFSAC recommended that there be no commercial fishing for charr in the Mackenzie River during 1991, and that the subsistence harvest be reduced to 600 charr annually to allow stock recovery. An annual removal rate of 10% of the standing stock may be the upper limit for sustainability of an anadromous charr population. The 1994 harvest rate may have been 24%. Because these charr are harvested by fishermen in the Inuvialuit and Gwich'in settlement areas a cooperative fishing plan is being preprared for the management of this stock. DFO has recommended against commercial fishing of the Rat River charr stock until production in excess of subsistence needs has been demonstrated, and against fishing at the Fish Creek fish holes. They have also recommended that harvest monitoring continue and suggested that this stock presents unique opportunities for scientific research. There is also a resident population of small, dark-coloured charr in the Rat River. These fish are not at the same risk of overharvesting since they are non-migratory and less desirable as food fish. (Bissett 1967; Hatfield et al. 1972; Dryden et al. 1973; Jessop et al. 1973, 1974; Shotton 1973; Stein et al. 1973; Jessop and Lilley 1975; Gillman and Sparling 1985; Gillman et al. 1985; Sparling and Stewart 1986; Sparling and Sparling 1988b; Clarke et al. 1989; Reist 1987, 1989; Stephenson and Lemieux 1990; Bodaly et al. 1992; Reist et al. 1996; B. de March, L. Harwood, A.H. Kristofferson, P. Lemieux, S. Sandstrom, pers. comm.) The IPN virus, which causes infectious pancreatic necrosis in salmonids, occurs naturally in the Rat River charr. While the impact of this virus on the population is unknown, it is highly pathogenic to young charr. Consequently, Rat River charr and their gametes should not be used for laboratory research or transplanted to other areas. (Souter et al. 1984, 1986; Yamamoto 1989)
Twin Lake (south) 67°44'N, 136°24'W			Broad whitefish, lake whitefish, and northern pike were collected from this lake on the Rat River system in October and November 1986, for genetic analysis by DFO. (Reist 1987)

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Willow River 68°00'N, 135°34'W			A baseline fisheries study of Willow River was conducted in 1971 and 1972 for the Mackenzie Valley pipeline. The river is a spawning and nursery area for Arctic grayling. (Dryden et al. 1973; NLUIS 106M+107B)
FORT MCPHERSON			
Dark Water Lake 67°26'N, 134°39'W			Lake trout and whitefish have been harvested from this lake by residents of Fort McPherson in November through April for subsistence. (Sekerak et al. 1992)
Deep Water Lake (Niggar Lake) 67°24'W, 134°25'W			This lake is accessible from the Dempster Highway. It is fished for sport and subsistence through the ice from mid-April through mid-June for lake trout and whitefish by residents of Fort McPherson. (Sekerak et al. 1992; DFO unpubl. data)
Fort McPherson general area	broad whitefish --quota not applicable	1988--914 fish (2,102 kg); <u>Subsistence harvest:</u> 1988--4,905 fish (11,282 kg); 1989--12,353 fish (28,412 kg)	Much of the subsistence harvest data for the community of Fort McPherson has been reported on a community basis. These data are of limited use for management purposes since they do not tell fishery managers where the fish were caught. An estimated 230,020 kg of fish were harvested for subsistence by residents of Fort McPherson in 1961-62, and 252,270 kg in 1965. DFO interviewed subsistence fishermen in the Fort McPherson area in July through November 1981, and sampled their catches for biological data. Based on this survey, the summer and fall subsistence harvest of broad and lake whitefish and inconnu by Fort McPherson fishermen was an estimated 25,694 kg. Arctic cisco, broad whitefish, inconnu, and lake whitefish were the main species taken. About 34% of the catch was used for human consumption, 64% for dogfood, and 2% was culled. In 1988-89, DFO again surveyed area fishermen for data on their subsistence harvests. These data were reported as the number of fish. McLaren Plansearch Corp. monitored the subsistence harvest from 15 September through 25 October 1985, for the Endicott Environmental Monitoring Program and, in 1988, Lutra Associates Ltd. also surveyed community residents for information on their subsistence harvests. Neither firm estimated the annual harvest. DFO issued a single domestic fishing licence in Ft. McPherson in 1989. The last harvest reported by a domestic licence holder was in 1986. See also AKLAVIK--Mackenzie Delta Area 1. (Woolforth 1966; Sinclair et al. 1967; Bissett 1972; Corkum and McCart 1981; Nelson et al. 1987; Sparling and Sparling 1988a+b; Lutra Associates Ltd. 1989; Treble 1996) The 1988 commercial harvests presented here were taken from the Peel River and from Mackenzie Delta Area 1. Other data for these areas are presented below for the Peel River and under AKLAVIK--Mackenzie Delta Area 1. The 1988 harvest figures are based on a DFO survey of the licenced commercial fishermen. These data are incomplete and likely underestimate the harvests since only 70% of the western Arctic fishermen responded to the survey. Catches were reported as numbers of fish so the weight of the harvest was estimated. Broad whitefish, inconnu, charr, and lake whitefish were the species sold. Since 1982, DFO has typically licenced from 3 to 9 commercial fishermen annually for the Fort McPherson area. (DFO 1991; Treble 1996)
	burbot --quota not applicable	1988--83 fish (249 kg);	
	cisco sp. --quota not applicable	1988--63 fish (25 kg); <u>Subsistence harvest:</u> 1988--544 fish (218 kg); 1989--1,380 fish (552 kg);	
	Dolly Varden (listed as Arctic charr) --quota not applicable	1988--102 fish (134 kg);	
	inconnu --quota not applicable	1988--337 fish (1,517 kg); <u>Subsistence harvest:</u> 1988--2,235 fish (10,058 kg); 1989--3,598 fish (16,191 kg);	
	lake whitefish --quota not applicable	1988--305 fish (397 kg); <u>Subsistence harvest:</u> 1988--415 fish (540 kg); 1989--2,661 fish (3,459 kg);	

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Fort McPherson general area--continued.	northern pike --quota not applicable	1988--134 fish (308 kg);	
	suckers --quota not applicable	1988--108 fish (108 kg);	
	other --quota not applicable	Subsistence harvest: 1988--1,987 fish (2,967 kg); 1989--2,704 fish (5,614 kg);	
Frog Creek (67°31'N, 134°30'W)			Baseline fisheries studies of this tributary of the Peel River were conducted in 1971-73 for the Mackenzie Valley pipeline. Detailed fisheries studies of the creek at crossings of the Dempster highway were also undertaken in 1973. Species reported from this system are listed in Table 2. Frog Creek below Niendo Lake (see below) is a nursery area for Arctic cisco, broad whitefish, longnose sucker, and inconnu. In spring, there is a spawning run of northern pike into the upper reaches of the creek from Niendo Lake. Residents of Fort McPherson fish for subsistence at the creek mouth in summer and fall, and in lakes on the system in winter. (Hatfield et al. 1972; Dryden et al. 1973; Stein et al. 1973; Dryden and Jessop 1974; McCart et al. 1974; Sekerak et al. 1992; NLUIS 106M)
Husky Lake 67°31'N, 135°06'W			Burbot, inconnu, northern pike, and whitefish have been harvested from this delta lake by residents of Fort McPherson in November through June for subsistence. (Sekerak et al. 1992)
James Creek 67°07'N, 135°55'W			Residents of Fort McPherson have harvested Arctic grayling from this tributary of the Vittrekwa in November through June, and lake trout in May and June, for subsistence. (Sekerak et al. 1992)
Mackenzie Delta (Area 1)			See AKLAVIK--Mackenzie Delta Area 1.
Niendo Lake 67°29'N, 134°25'W			This lake on Frog Creek has been fished for subsistence in winter by residents of Fort McPherson. (NLUIS 106M)
Nerejo Lake 67°18'N, 134°06'W			This lake has been fished in November through June by residents of Fort McPherson and Tsiigehtchic who catch inconnu, northern pike, and lake whitefish for subsistence. (Sekerak et al. 1992; NLUIS 106M)
Peel River 67°37'N, 134°52'W	broad whitefish [1,500]	1961--5,514 kg; 1978--1,201 kg (L); 1990--1,218 kg; 1991--802 kg; 1992--NA; 1993--2,300 kg;	There is a substantial subsistence fishery for Arctic cisco, lake whitefish, broad whitefish, and inconnu in the summer and fall at camps located on the lower 100 km of the Peel River. From 1978-80, DFO sent survey request forms to fishermen, and hired local interviewers to obtain subsistence harvest estimates for this area. But, data for the Peel River were only compiled in 1978. DFO also monitored the subsistence harvest at the Peel River in 1990-93. Samples of broad whitefish were taken from the fisheries between mid-July and early November, and

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Peel River, continued.	broad whitefish -- cont'd	Subsistence harvest: 1978--6,527 kg; 1978--55 kg (L)	harvest records were kept for the other species. (Bissett 1972; Corkum and McCart 1981; Sparling and Sparling 1988a+b; Sekerak et al. 1992; Treble and Read 1994; Treble 1996; D. Rystephanuk, pers. comm.) Commercial harvests have been reported from this area, which includes the mainstem of the Peel River from 67°37'N upstream to about 67°09'N, sporadically since 1957 by residents of Fort McPherson. From 1978-80, DFO sent survey request forms to licenced commercial fishermen, and conducted interviews to obtain estimates of the quantity of fish harvested for local sale. These data are denoted with an "(L)" to distinguish them from fish harvested for export sale. Data for the Peel River were only compiled in 1978. Between 1979 and 1989, data from the commercial fishery were recorded primarily by community. The 1990, 1991, and 1993 harvest figures are based on a DFO survey of the licenced commercial fishermen. These data are incomplete and likely underestimate the harvests since only 38%, 27%, and 55% of the fishermen responded to the survey in the respective years. Specific harvest locations for individual species were not reported, although Dolly Varden were taken from the Peel River 3 km upstream from Hornby Channel. (Bissett 1972; Barlishen and Webber 1973; Hunter 1975; Corkum and McCart 1981; Yaremchuk et al. 1989; DFO 1992b, 1993, 1995; Treble 1996; N. Robinson and M. Treble, pers. comm.) Baseline fisheries studies of the Peel River system were conducted in 1971-74 for the Mackenzie Valley pipeline. Species reported from this system are listed in Table 2. Broad and lake whitefish were sampled from the river in 1983-84 for genetic analyses by DFO. Burbot were collected in 1985-86, and their livers were analyzed for chlorinated hydrocarbon contamination. The concentrations of chlorinated hydrocarbons found were lower than those of fish taken at more southerly locations. The river is a migration route to spawning areas for a number of fish species. Arctic cisco, inconnu, least cisco, and whitefish spp. run up the Peel River in July and August, where they are reported to spawn in the vicinities of the Road, Trail, Snake, and Caribou rivers of the Yukon Territory. Downstream migrations of Arctic cisco and inconnu occur at freeze-up in early October. (Shotton 1971; Hatfield et al. 1972; Dryden et al. 1973; Stein et al. 1973; Jessop et al. 1974; Reist 1987; Muir et al. 1990; Dillinger et al. 1992; Chang-Kue and Jessop 1996a)
	burbot --no quota	1990--693 kg; 1991-2--NA; 1993--300 kg; Subsistence harvest: 1978--418 kg;	
	cisco spp. --no quota	1957--1,606 kg; Subsistence harvest: 1978--409 kg;	
	Dolly Varden (listed as Arctic charr (SR + LL)--no quota	1978--109 kg (L); 1990--250 kg; 1991-3--NA; Subsistence harvest: 1978--618 kg;	
	inconnu --no quota	1961--966 kg; 1978--46 kg (L); 1990--500 kg; 1991-2--NA; 1993--650 kg; Subsistence harvest: 1978--564 kg;	
	lake whitefish 2,300	1960--5,443 kg; 1961--523 kg; 1978--182 kg (L); 1983--2,560 kg; 1990--30 kg; 1991-2--NA; 1993--450 kg; Subsistence harvest: 1978--4,000 kg;	
	lake trout --no quota	1990--3 kg; 1991-3--NA;	

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Peel River, continued.	northern pike --no quota	1978--100 kg (L); 1990--496 kg; 1991-2--NA; 1993--230 kg; <u>Subsistence harvest:</u> 1978--1,091 kg;	
	others --no quota	1990--168 kg; 1991-2--NA; 1993--22 kg; <u>Subsistence harvest:</u> 1978--chum salmon 5 kg, longnose sucker 76 kg;	
Satah River 67°02'N, 134°46'W			Baseline fisheries studies of this tributary of the Peel River were conducted in 1971-72 for the Mackenzie Valley pipeline. Species reported from this system are listed in Table 2. The river appears to be a nursery area for Arctic cisco and other coregonids. The river mouth area is fished for subsistence by residents of Fort McPherson from July through September. (Shotton 1971; Bissett 1972; Hatfield et al. 1972; Dryden et al. 1973; Stein et al. 1973)
Small Frog Lake 67°22'N, 134°11'W			This lake on Frog Creek has been fished for subsistence in winter by residents of Fort McPherson. (NLUIS 106M)
Stolen Nets Lake (Narrow Lake) 67°25'N, 134°35'W			This lake has been fished for subsistence in winter (November-April) by residents of Fort McPherson. They caught lake trout and whitefish. (Sekerak et al. 1992; NLUIS 106M)
Stony Creek 67°10'N, 135°05'W			Baseline fisheries studies of this tributary of the Peel River were conducted in 1971-72 for the Mackenzie Valley pipeline. Species reported from this system are listed in Table 2. Stoney Creek is a spawning and nursery area for Arctic grayling, least cisco, longnose sucker, and round whitefish. Residents of Fort McPherson have harvested Arctic grayling and cisco from the creek in November through April for subsistence. (Shotton 1971, 1973; Hatfield et al. 1973; Dryden et al. 1972; McCart et al. 1974; Sekerak et al. 1992)
unnamed creek (Dzee Creek) 66°55'N, 134°50'W			Residents of Fort McPherson have harvested cisco from the creek in May and June for subsistence. (Sekerak et al. 1992)
unnamed lake 67°35'N, 135°12'W			Residents of Fort McPherson have harvested burbot, inconnu, northern pike, and whitefish from this inner delta lake in November through April for subsistence. (Sekerak et al. 1992)
unnamed lake 67°34'N, 134°37'W			Residents of Fort McPherson have harvested northern pike and whitefish from this lake on the Frog Creek system in November through April for subsistence. (Sekerak et al. 1992)

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
unnamed lake (Moonshine Lake) 67°44.5'N,134°45'W			Residents of Fort McPherson have harvested cisco, inconnu, and whitefish from this inner delta lake in May and June for subsistence. (Sekerak et al. 1992)
Vittrekwa River (67°10'N, 135°01'W)			Baseline fisheries studies of this tributary of the Peel River were conducted in 1971 for the Mackenzie Valley pipeline. Vittrekwa River is a spawning and nursery area for Arctic grayling. Residents of Fort McPherson have harvested cisco from the river system in November through April for subsistence, and have reported charr (Dolly Varden) in the river. (Hatfield et al. 1972; Shotton 1973; McCart et al. 1974; Sekerak et al. 1992; R. Alexie Sr., pers. comm.)
INUVIK			
Bathing Lake 67°40'N, 132°25'W			Residents of Inuvik have harvested burbot, inconnu, lake trout, and northern pike from this lake on the Travaillant River system (see TSIIGEHTCHIC--Travaillant River) in winter and spring for subsistence. (Sekerak et al. 1992)
Cabin Creek 68°15'N, 133°14'W			This tributary of Campbell Lake, on the Campbell River system (see below), is accessible from the Dempster Highway. Residents of Inuvik and tourists angle at the creek for northern pike and Arctic grayling in late June and early July (DFO, unpubl. data).
Campbell River 68°07'N, 133°40'W	Arctic grayling --no quota	1983 sport harvest--anglers caught and kept 1 fish.	The Dempster Highway crosses the Campbell River, about 1.5 km upstream from Campbell Lake at "Campbell Creek" (68°18'N, 133°15'W). At that site there is a Territorial picnic site with a boat launch. A baseline fisheries study of this system, with tagging, was conducted in 1974 for the Mackenzie Valley pipeline. DFO also conducted a partial creel census of sport fishermen at this site from 4 June to 17 July 1983. The 547 anglers interviewed (22 not interviewed) had fished a total of 966 hours. Most of them were local and fished from shore near the road. They were targeting mainly northern pike which move upstream past this site in June to spawn in the headwaters. Some whitefish are caught by snagging. Growth and maturity data were collected from a subsample of the fishermen's northern pike and whitefish catches. DFO also tagged 100 northern pike. Between 1984 and 1988 there were 7 tag returns, all from Campbell Creek. Species reported from this system are listed in Table 2. (Jessop and Lilley 1975; Read and Roberge 1986; C. Read, pers. comm.)
	burbot --no quota	1983 sport harvest--anglers caught and released 1 fish.	
	inconnu --no quota	1983 sport harvest--anglers caught and kept 11 fish.	
	lake and broad whitefish combined --no quota	1983 sport harvest--anglers caught 242 fish, of these they kept 206 and released 36.	
	northern pike --no quota	1983 sport harvest--anglers caught 728 fish, of these they kept 483 and released 245.	
Campbell Lake 68°12'N, 133°48'W		1983 experimental sample	Campbell Lake is fished for lake trout by residents of Inuvik, mainly through the ice in early spring. During an experimental gillnet fishery at Campbell Lake in 1983, DFO caught and sampled broad whitefish, inconnu, lake whitefish, northern pike and other species to obtain baseline data on their growth and maturity. They also tagged 45 northern pike but to date none of the tags have been returned. Whitefish are reported to run in an unnamed tributary (68°17'N, 133°14'W) of Campbell Lake. Broad and lake whitefish, inconnu, least cisco, and northern pike were collected in 1985 for genetic analyses by DFO. (McCart et al. 1974; Read and Roberge 1986; Reist 1987; NLUIS 107B; C. Read, pers. comm.; DFO unpubl. data)

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Caribou Creek 68°03'N, 133°26'W			This tributary of Campbell Lake, on the Campbell River system (see above), is accessible from the Dempster Highway. Residents of Inuvik and tourists angle at the creek for northern pike and Arctic grayling in late June and early July. Baseline fisheries studies of the creek were conducted in 1973 for the Mackenzie Valley pipeline and at the highway crossing. The creek is a spawning and nursery area for Arctic grayling. It is also a migration route for Arctic grayling, broad whitefish, and northern pike. The creek drains Caribou Lake (see below) which was also sampled. (Schultz International Ltd. 1973; McCart et al. 1974; DFO, unpubl. data)
Caribou Lake 67 59'N, 132°51'W			A baseline fisheries study of Caribou Lake was conducted in 1973 for the Mackenzie Valley pipeline. Residents of Inuvik and Tsiigehtchic have harvested broad and lake whitefish, burbot, inconnu, lake trout, and northern pike from the lake in November through June for subsistence. (McCart et al. 1974; Sekerak et al. 1992)
Deep Lake			See TSIIGEHTCHIC--Deep Lake.
Dolomite Lake (Airport Lake) 68°17'N, 133°33'W	inconnu, lake trout, lake whitefish, northern pike --no quota	1973--inconnu 9 kg; lake trout 23 kg; lake whitefish 68 kg; northern pike 5 kg.	This lake is accessible by boat and road. It is visited by sport anglers who fish for lake trout. Cabins on the lake are well used in July and August. A small commercial harvest was taken from the lake in 1973. Burbot, inconnu, lake trout, lake whitefish, and least cisco were collected from this lake in November 1985 for genetic analyses by DFO. (Reist 1987; Yaremchuk 1989; DFO unpubl. data)
Inuvik general area			Much of the subsistence harvest data for the community of Inuvik has been reported on a community basis. These data are of limited use for management purposes since they do not tell fishery managers where the fish were caught. Indeed, a substantial portion of these annual harvests was taken by Inuvialuit fishermen from the community fishing in Mackenzie Delta Area 4, in the Inuvialuit Settlement Region (Fig. 3). Several studies have estimated the total annual subsistence harvest of fish by residents of Inuvik. Wolforth (1966) estimated the 1965 harvest at 159,090 kg, and Olesh (1979) the 1973 harvest at 45,340 kg. DFO interviewed subsistence fishermen in the Inuvik area in July and August 1981, and sampled their catches for biological data. Based on this survey, the summer subsistence harvest of broad and lake whitefish and inconnu by Inuvik fishermen was an estimated 36,562 kg. Lake whitefish, broad whitefish, inconnu, and northern pike were the main species taken. About 28% of the catch was used for human consumption, 50% for dogfood, and 22% was culled. The Inuvialuit Harvest Study has reported recent subsistence harvest data for the Inuvialuit members of the community. Similar data are not yet available for the Gwich'in, but will be gathered by the Gwich'in Harvest Study beginning in September 1995. Since 1983, DFO has typically issued from 3 to 10 domestic fishing licences in Inuvik, annually. (Wolforth 1966; Olesh 1979; Sparling and Sparling 1988a+b; Treble and Read 1994; Treble 1996; L. Harwood, pers.comm.) Commercial fishermen from Inuvik harvest fish from at least two areas of the Mackenzie Delta (2 and 4), only one of which (Area 2) lies within the Gwich'in Settlement Area, and from Sitidgi Lake, part of which lies within the Settlement Area (Fig. 3). In 1988-90, DFO combined these data to present harvest statistics for the community. These data are not presented here as it is not clear what portion of the catch was taken within the Gwich'in Settlement Area. Harvest data for Mackenzie Delta Area 2 are presented below. Since 1982, DFO has typically licenced from 15 to 35 commercial fishermen from Inuvik., annually. (DFO 1994, 1995; Treble 1996)

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Mackenzie Delta (Area 2)--see Fig. 3	broad whitefish [3,000]	1979--4,213 kg (L); 1980--591 kg (L); 1981--16,773 kg; 1990--6,776 kg; 1991--767 kg; 1992--NA; 1993--3,128 kg. <u>Subsistence harvest:</u> 1979--9,588 kg; 1980--2,053 kg;	This management area was established in 1976, but commercial harvest records for the area extend back to at least 1966. Prior to 1991, it extended further north into the Inuvialuit Settlement Region (Fig. 2). In 1991, the areas' northern boundary was changed to follow the boundary between the Gwich'in and Inuvialuit settlement areas. It now lies entirely within the Gwich'in Settlement area (Fig. 3). Most commercial fishing in Area 2 is conducted by residents of Inuvik and, to a lesser extent, Aklavik. From 1978-80, DFO sent survey request forms to licenced commercial fishermen, and conducted interviews to obtain estimates of the quantity of fish harvested for local sale. These data are denoted with an "(L)" to distinguish them from fish harvested for export sale. Due to low response rates to the survey in 1977, only the 1979-80 data are included here. The 1990-93 harvest data are also based on DFO surveys of the licenced commercial fishermen. The response rates to those questionnaires in the western Arctic was 38% in 1990, 27% in 1991, nil in 1992, and 55% in 1993, so the quality of the harvest estimate is not known. The main species harvested and sold are broad whitefish and inconnu, with lesser amounts of burbot, lake whitefish, and northern pike. Comparison of the harvest and sales figures suggests that sales figures were incomplete, or that a significant proportion of the harvest was either used for subsistence or unmarketable. It is not known what proportion of the pre-1991 commercial harvests were taken from the portion of Area 2 that extended into the Inuvialuit Settlement Region. (Corkum and McCart 1981; DFO 1993, 1994, 1995; Anderson 1995; Treble 1996; M. Treble, pers. comm.) In 1989 through 1993, the Inuvik Exploratory Fishery took large harvests of fish from the Mackenzie Delta immediately downstream of the Gwich'in Settlement Area. Data from these harvests are not included in Table 1, as they are from the Inuvialuit Settlement Region. However, over the 5 year period the fishery harvested 67,734 kg of broad whitefish, 6,987 kg of inconnu, 6,451 kg of lake whitefish, and 26,688 kg of northern pike. Its future development is of particular importance to the management of broad whitefish stocks in the Gwich'in Settlement Area. (DFO 1992a+b; 1993, 1994, 1995; Anderson 1995; Treble and Tallman 1996) From 1978-80, DFO sent survey request forms to fishermen, and hired local interviewers to obtain subsistence harvest estimates for this area. Due to low response rates to the survey in 1977, only the 1979-80 data are included here. DFO obtained samples from the subsistence harvests at Husky Channel in October and November 1990, and from Peel Channel in late September and early October 1993. Biological data were collected from broad whitefish, inconnu, lake whitefish, least cisco, and northern pike. Species reported from the lower Mackenzie River mainstem are listed in Table 2. (Corkum and McCart 1981; Treble and Read 1994; D. Rystephanuk, pers. comm.) Radio-tagging studies conducted by DFO from 1982-93 have located broad whitefish spawning sites in the Middle Channel immediately downstream from Point Separation. (Chang-Kue and Jessop, in prep a).
	burbot and northern pike 4,600	1979--pike 364 kg (L); 1990--burbot 165 kg, pike 257 kg; 1991--15 kg burbot, 45 kg pike; 1992--NA; 1993--burbot 600 kg, pike 283 kg; <u>Subsistence harvest:</u> 1979--burbot 1,858 kg, pike 4,493 kg; 1980--burbot 1,132 kg, pike 1,203 kg;	
	cisco spp. 2,300	1990-1--0 kg; 1992--NA; 1993--0 kg <u>Subsistence harvest:</u> 1979--1,066 kg; 1980--1,591 kg;	

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Mackenzie Delta (Area 2)--continued.	inconnu --quota not applicable	1979--1,320 kg (L); 1980--63 kg (L); 1981--434 kg; 1990--469 kg; 1991--0 kg; 1992--NA; 1993--545 kg; <u>Subsistence harvest:</u> 1979--2,081 kg; 1980--840 kg;	
	lake trout 1,000	<u>Subsistence harvest:</u> 1979--25 kg;	
	lake whitefish 3,000	1978--910 kg (L); 1990--789 kg; 1991--0 kg; 1992--NA; 1993--73 kg; <u>Subsistence harvest:</u> 1979--19,393 kg; 1980--3,328 kg;	
	other species --quota not applicable	1990--herring 2 kg, sucker 10 kg; 1991--0 kg; 1992--NA; 1993--23 kg; <u>Subsistence harvest:</u> 1979--Arctic grayling 7 kg, chum salmon 5 kg, Dolly Varden 7 kg, longnose sucker 182 kg; 1980--longnose sucker 4 kg;	
Sandy Lake 67°49'N, 132°15'W			This lake is visited by fly-in sport anglers, and there are a number of cabins on its shores. Residents of Inuvik have harvested burbot, inconnu, lake trout, and northern pike from Sandy Lake in winter and spring for subsistence. (Sekerak et al. 1992; DFO unpubl. data)
Sitidgi Lake 68°30'N, 132°40'W	broad whitefish --no quota	1981--61 kg; 1990--136 kg; 1993--58 kg;	Residents of Inuvik and Tuktoyaktuk harvest burbot, inconnu, lake trout, and northern pike from Sitidgi Lake for subsistence. Small commercial harvests have been taken sporadically from the lake, which lies within both the Inuvialuit and Gwich'in settlement areas, since the

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Sitidgi Lake, continued.	lake trout + lake whitefish 300	1983--360 kg; 1990--lake trout 454 kg; 1991--300 kg; 1992--NA; 1993--lake trout 60 kg, lake whitefish 39 kg;	mid-1970's. The 1990's harvest figures are based on a DFO survey of the licenced commercial fishermen. These data are incomplete and likely underestimate the harvests since only 38%, 27%, 55% of the fishermen responded to the survey in the respective years. A sport fishing lodge operates at the north end of the lake, in the Inuvialuit Settlement Region. (Yaremchuk et al. 1989; DFO 1992b, 1993, 1995; Sekerak et al. 1992; NLUIS 107B)
	others --no quota	1993--3 kg;	
Tenlen Lake 67°51'N, 131°06'W			This lake on the Kugaluk River system has been fished for subsistence by residents of Inuvik in the winter and spring, and by residents of Tsiigehtchic in May and June. Species caught include burbot, inconnu, lake trout, and northern pike. (Sekerak et al. 1992)
Travaillant Lake			See TSIIGEHTCHIC--Travaillant Lake.
Tregnantchiez Lake			See TSIIGEHTCHIC--Tregnantchiez Lake.
unnamed lake 67°52'N, 130°50'W			This headwater lake of the Anderson River has been fished for subsistence in spring by residents of Inuvik. Burbot, inconnu, lake trout, and northern pike were the fish species caught. (Sekerak et al. 1992)
unnamed lake 67°55'N, 130°16'W			This headwater lake of the Anderson River has been fished for subsistence in November and December by residents of Inuvik. Inconnu, lake trout, and whitefish were the fish species caught. (Sekerak et al. 1992)
unnamed lake (Trout Lake)			See TSIIGEHTCHIC--unnamed lake (Trout Lake).
Wood Bridge Lake			See TSIIGEHTCHIC--Wood Bridge Lake.
TSIIGEHTCHIC (ARCTIC RED RIVER)			
Attoe Lake 67°25'N, 133°09'W			This lake on the Pierre Creek system has been fished for subsistence in winter and spring by residents of Tsiigehtchic. Inconnu, lake whitefish, and northern pike were the fish species caught. Broad and lake whitefish, least cisco, and northern pike were collected from the lake in September 1986, for genetic analyses by DFO. (Reist 1987; Sekerak et al. 1992; NLUIS 106N)
Arctic Red River 67°00'N, 133°20'W	Arctic grayling --no quota	Subsistence harvest: 1979--127 kg;	Residents of Tsiigehtchic fish for subsistence in the Arctic Red River from May through December. From 1978-80, DFO sent survey request forms to fishermen, and hired local interviewers to obtain subsistence harvest estimates for the Arctic Red River. It is not known whether any Mackenzie River data are included in these estimates, but the 1979-80 data do include fish taken from the Tree River (see below). DFO monitored the subsistence harvest of broad whitefish at the Arctic Red River in late October through early November of 1990 and

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Arctic Red River, continued.	broad whitefish --quota not applicable	1978--910 kg (L); 1979--855 kg (L); 1980--1,300 kg (L); Subsistence harvest: 1979--3,873 kg; 1980--4,482 kg;	1993. Biological data were taken from the broad whitefish and, in 1993, catch data were also recorded for inconnu and lake whitefish. (Bissett 1967, 1972; Corkum and McCart 1981; Sparling and Sparling 1988a+b; Sekerak et al. 1992; Treble and Read 1994; D. Rystephanuk, pers. comm.) Commercial harvest records for the area extend back to at least 1966, when subsistence fishermen sold a portion of their catch. From 1978-80, DFO sent survey request forms to licenced commercial fishermen, and conducted interviews to obtain estimates of the quantity of fish harvested for local sale from the Arctic Red River. These data are denoted with an "(L)" to distinguish them from fish harvested for export sale. The 1979-80 data also include fish taken from the Tree River. See Mackenzie Delta Area 5 (below) for commercial harvest data. (Bissett 1967, 1972; Corkum and McCart 1981; Treble 1996) Baseline fisheries studies of the Arctic Red River system were conducted in 1971-74 for the Mackenzie Valley pipeline. Species reported from this system are listed in Table 2. Tagging studies of a number of species were undertaken in 1972-74. DFO sampled broad and lake whitefish from the winter subsistence fishery at the river mouth in 1971, and analysed liver and muscle tissue of a variety of species for heavy metal and hydrocarbon contamination. Inconnu tagged in the the Mackenzie River vicinity of Arctic Red River in July and August were recaptured at Fort Good Hope between mid-August and mid-October. In summer, large numbers of Arctic cisco ascend the river and its tributaries to reach spawning areas. There is a return downstream migration of post-spawners in October. The downstream fish runs are particularly heavy between early October and mid-November. They are fished through the ice until mid-November, when nets are removed. Fishing is resumed in the spring. Using radio tags, DFO identified a spawning location for broad whitefish in the Arctic Red River, in November 1993, just below the Welden Creek inflow (66°26'N, 132°45'W). The river's headwaters provide nursery habitat for Arctic grayling, creek chub, and longnose sucker. Its upstream tributaries are suspected spawning areas for Arctic cisco, inconnu, and longnose sucker. Broad whitefish, burbot, lake whitefish, and longnose sucker were collected in 1984-85 for genetic analyses by DFO. (Bissett 1967, 1972; Shotton 1971, 1973; Hatfield et al. 1972; Stein et al. 1973; Jessop et al. 1974; Jessop and Lilley 1975; Reist 1987; Sparling and Sparling 1988a+b; Dillinger et al. 1992; Sekerak et al. 1992; Chang-Kue and Jessop 1996a; Treble 1996; NLUIS 106G+J)
	burbot --quota not applicable	Subsistence harvest: 1978--73 kg; 1979--82 kg; 1980--602 kg;	
	chum salmon --quota not applicable	Subsistence harvest: 1978--7 kg; 1980--29 kg;	
	cisco spp. --quota not applicable	Subsistence harvest: 1978--45 kg; 1979--91 kg; 1980--364 kg;	
	Dolly Varden --quota not applicable	Subsistence harvest: 1980--364 kg;	
	inconnu --quota not applicable	1979--455 kg (L); 1980--57 kg (L); Subsistence harvest: 1978--118 kg; 1979--609 kg; 1980--2,349 kg;	
	lake whitefish --quota not applicable	1978--546 kg (L); 1980--637 kg (L); Subsistence harvest: 1978--1,091 kg; 1979--1,136 kg; 1980--4,473 kg;	
	longnose sucker --quota not applicable	Subsistence harvest: 1979--400 kg; 1980--291 kg;	

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Arctic Red River, continued.	northern pike --quota not applicable	Subsistence harvest: 1978--22 kg; 1979--473 kg; 1980--1,545 kg;	
Big Lake 67°27.5'N,132°00'W			Residents of Tsiigehtchic have harvested northern pike and sucker from this lake in May and June for subsistence. (Sekerak et al. 1992)
Caribou Lake			see INUVIK--Caribou Lake.
Clearwater Lake 67°33'N, 133°36'W			Residents of Tsiigehtchic have harvested northern pike from this lake in November through April for subsistence. (Sekerak et al. 1992; NLUIS 106N)
Crossing Lake 67°48'N, 132°01'W			Residents of Tsiigehtchic have harvested whitefish from this lake on the Travaillant River system in May and June for subsistence. (Sekerak et al. 1992)
David Lake 67°50'N,132°08.5'W			Residents of Tsiigehtchic have harvested burbot from this lake on the Travaillant River system in May and June for subsistence. (Sekerak et al. 1992)
Deep Lake 67°40'N, 132°15'W			Residents of Tsiigehtchic and Inuvik have harvested burbot, inconnu, lake trout, lake whitefish, and northern pike from this lake on the Rengleng River system (see below), in November through June, for subsistence. (Sekerak et al. 1992)
Fish Trap Lake 67°56'N, 132°12'W			Residents of Tsiigehtchic have harvested burbot and whitefish from this lake on the Travaillant River system in May and June for subsistence. (Sekerak et al. 1992)
Fishing Bear Lake 67°31'N, 133°17'W			Residents of Tsiigehtchic have harvested burbot, northern pike, and whitefish from this lake in December through June for subsistence. (Sekerak et al. 1992; NLUIS 106N)
Hill Lake 67°58'N, 132°33'W			Residents of Tsiigehtchic have harvested lake whitefish from this lake on the Travaillant River system in May and June for subsistence. (Sekerak et al. 1992)
Jiggle Lake 67°41'N, 132°06'W			Residents of Tsiigehtchic have harvested burbot, inconnu, lake trout, and northern pike from this lake on the Travaillant River system in winter and spring for subsistence. See also Travaillant River, below. (Sekerak et al. 1992)
Loche Lake 67°36'N, 132°21'W			Residents of Tsiigehtchic have harvested burbot and lake whitefish from this lake on the Travaillant River system in November through April for subsistence. See also Travaillant River, below. (Sekerak et al. 1992)
Mackenzie Delta (Area 5)--see Fig. 3	broad whitefish [2,300]	1988--1,700 fish (3,910 kg); 1989--1,700 fish (3,910 kg); 1990--1,150 kg; 1991-2--NA; 1993--2,300 kg;	This management area was established in 1976. Prior to 1991, it extended from Point Separation to just upstream of Tsiigehtchic on the Mackenzie and Arctic Red Rivers (Fig. 2). Since 1991, this quota area has extended upstream from Point Separation to the confluence of the Mountain and Mackenzie rivers in the Sahtu Dene and Metis settlement area (Fig. 3). Prior to 1991 the area was fished almost exclusively by residents of Tesiigehtchic, its subsequent

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Mackenzie Delta (Area 5), continued.	burbot --no quota	1988--1,100 fish (3,300 kg); 1989--180 fish (540 kg); 1990--60 kg; 1991-2--NA; 1993--90 kg;	extension upstream means that the area now encompasses waters fished commercially by residents of Tsiigehtchic (Gwich'in) and Fort Good Hope (Sahtu Dene and Metis). Species reported from the lower Mackenzie River mainstem are listed in Table 2. The harvest data presented here are based on DFO surveys of the licenced commercial fishermen. The main species harvested and sold are broad whitefish and inconnu, with lesser amounts of lake whitefish, cisco sp., and other fishes having occasionally been sold. Comparison of the harvest and sales figures suggests that sales figures were incomplete, or that a significant portion of the catch is either used for subsistence or unmarketable. The 1988-90 harvests were likely made exclusively by fishermen from Tsiigehtchic. The 1988-89 catches were reported as numbers of fish, so the weight of the harvest was estimated. It is not known what proportion of the 1991-93 commercial harvests were taken by Gwich'in fishermen. Likewise, the response rates to those questionnaires in the western Arctic were 70% in 1988, 58% in 1989, 38% in 1990; 27% in 1991, nil in 1992, and 55% in 1993, so the quality of the harvest estimate is not known. (DFO 1991, 1992a+b, 1993, 1994, 1995; Treble 1996) Subsistence harvest data are not available for this area specifically, but have been collected for the Arctic Red River (see above), and for the community of Tsiigehtchic (see below). DFO has used radio tagging studies to identify a number of spawning sites for broad whitefish in this area--perhaps the most important of which is located upstream from the Settlement Area at the Ramparts. (Chang-Kue and Jessop 1996a)
	cisco spp. 500		
	herring 600	1988--NA; 1989--160 fish (64 kg); 1990--0 kg; 1991-2--NA; 1993--0 kg;	
	inconnu [2,300]	1988--1,400 fish (6,300 kg); 1989--980 fish (4,410 kg); 1990--225 kg; 1991-2--NA; 1993--720 kg;	
	lake whitefish 2,300	1988--2,500 fish (3,250 kg); 1989--3,400 fish (4,420 kg); 1990-2--NA; 1993--871 kg;	
	northern pike --no quota	1988--50 fish (115 kg); 1989--65 fish (150 kg); 1990-2--NA; 1993--230 kg;	
	other species --no quota	1979--363 kg; 1988--250 suckers (250 kg); 1989--60 suckers (60 kg); 1990-2--NA; 1993--60 kg;	
Nerego Lake			see FORT MCPHERSON--Nerejo Lake.
North Caribou Lake 68°06'N, 132°43'W			This lake drains into Sitidgi Lake (see above). Residents of Tsiigehtchic have harvested whitefish from North Caribou Lake in May and June for subsistence. (Sekerak et al. 1992)
Odizen Lake 6745'N, 132°45'W			Residents of Tsiigehtchic have harvested broad and lake whitefish, burbot, lake trout, and northern pike from this lake on the Travaillant River system in October and November for subsistence. (Sekerak et al. 1992)

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Pierre Creek 67°20'N, 133°17'W			A baseline fisheries study of the Pierre Creek system was conducted in 1971-74 for the Mackenzie Valley pipeline. Arctic grayling spawn in the creek and may use it as a migration route. Northern pike may spawn in stretches of the creek near Attoe Lake (see above), which was also sampled. Lower reaches of the creek provide spawning habitat for longnose sucker and may also be a nursery area for broad whitefish. Two inconnu tagged at Pierre Creek in late July were recaptured 530 km upstream at Norman Wells in mid-September. Residents of Tsiigehtchic have harvested lake whitefish from the creek in May and June for subsistence. (Hatfield et al. 1972; Dryden et al. 1973; Stein et al. 1973; Jessop and Lilley 1975; Sekerak et al. 1992).
Rabbit Hay River 67°15'N, 132°44'W			A baseline fisheries study of the Rabbit Hay River was conducted in 1971-74 for the Mackenzie Valley pipeline. Species reported from this system are listed in Table 2. The river's lower reaches may provide spawning habitat in the spring for longnose sucker and northern pike, and in the fall for whitefish spp. (Hatfield et al. 1972; Dryden et al. 1973; Jessop et al. 1974; Jessop and Lilley 1975)
Rengleng River 67°44'N, 133°47'W			The Rengleng River is accessible from the Dempster Highway. Area residents and tourists angle for northern pike and Arctic grayling at the highway crossing from late June through early July. Baseline fisheries studies of the Rengleng River system were conducted in 1971-74 for the Mackenzie Valley pipeline. It was also sampled in 1974, in the vicinity of existing or proposed crossings of the Mackenzie and Dempster highways. Species reported from this system are listed in Table 2. Arctic grayling and northern pike, the main species captured, spawn in the river and use it as a nursery area and migration route between headwater lakes and the Mackenzie River. Longnose sucker also spawn in the system. Inconnu and broad whitefish use the lower Rengleng River as a migratory route. Broad whitefish tagged in the Mackenzie River near Arctic Red River have been recaptured in the upper Rengleng River. The system also provides nursery habitat for burbot, cisco, inconnu, longnose sucker, walleye, and whitefish. Two headwater lakes on the system, Deep (see above) and Old Joe (67°32'N, 133°12'W), were also sampled and provide overwintering habitat for fish. Subsistence fisheries periodically harvest broad and lake whitefish and inconnu at the river mouth. Residents of Tsiigehtchic have also harvested burbot, lake whitefish, and northern pike upstream (67°41.5'N, 133°32'W) in December through March for subsistence. (Hatfield et al. 1972; Dryden et al. 1973; Shotton 1973; Jessop et al. 1974; McCart et al. 1974; Jessop and Lilley 1975; Lilley 1975; Sekerak et al. 1992; DFO unpubl. data)
Sunny Lake 67°51'N, 132°37'W			Residents of Tsiigehtchic have harvested Arctic grayling, broad and lake whitefish, lake trout and northern pike from this lake on the Travaillant River system in winter and spring for subsistence. (Sekerak et al. 1992)
Swan Creek 66°58.5'N,133°26'W			This creek drains a system of four lakes, known collectively as the "Fishing Lakes", into the Arctic Red River. A baseline fisheries study of the creek was conducted in 1971-72 for the Mackenzie Valley pipeline. The creek provides spawning habitat for Arctic grayling, longnose sucker, and northern pike. Arctic grayling migrate upstream in the spring to spawn, and downstream in fall to overwinter in the Arctic Red River. Five grayling tagged at the mouth of Swan Creek on 4 June were recaptured in Swan Lake (see below), 22.5 km upstream between 4 July and September 15. (Hatfield et al. 1972; Stein et al. 1973; NLUIS 106K)

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Swan Lake 67°07'N, 133°40'W			This lake on Swan Creek (see above) has been fished in November through June for subsistence by residents of Tsiigehtchic. (Sekerak et al. 1992; NLUIS 106N)
Thunder River 67°30'N, 130°54'W			Baseline fisheries studies of the Thunder River system were conducted in 1973 for the Mackenzie Valley pipeline. Species reported from this system are listed in Table 2. The river is a spawning and nursery area for Arctic grayling. A variety of species spawn and overwinter in the headwater lakes. (Shotton 1973; McCart et al. 1974; Schultz International Ltd. 1974)
Travaillant Lake 67°41'N, 131°47'W			There is a year-round subsistence fishery for lake trout and lake and broad whitefish at Travaillant Lake, which is visited by residents of all of the Gwich'in communities. Arctic grayling, burbot, inconnu, and northern pike are also taken by these fisheries. Longnose sucker and northern pike spawn on the gravel areas and shallows near shore, and Arctic grayling spawn in some of the small tributary streams which they also use as nursery areas. The lake is a nursery area for Arctic grayling, lake and broad whitefish, least cisco, sucker, and walleye. Baseline fisheries studies of the Travaillant River system were conducted in 1971-4, for the Mackenzie Valley pipeline. Broad and lake whitefish, burbot, lake trout, least cisco, northern pike, and white sucker were collected in 1984-6 for genetic analyses by DFO. In 1993, DFO sampled lake trout from Travaillant Lake for biological data and organic contaminants. (Bissett 1967; Hatfield et al. 1972; Dryden et al. 1973; Shotton 1973; Stein et al. 1973; McCart et al. 1974; Schultz International Ltd. 1974; Lilley 1975; Reist 1987; Sekerak et al. 1992; Muir et al. 1994; NLUIS 106O)
Travaillant River 67°28'N, 131°30'W			Baseline fisheries studies of the Travaillant River system were conducted in 1971-74 for the Mackenzie Valley pipeline. The system was also sampled in 1974 in the vicinity of proposed Mackenzie Highway crossings. Species reported from this system are listed in Table 2. Broad whitefish, burbot, inconnu, and northern pike were collected from the river in 1986 for genetic analyses by DFO. The river is a spawning and nursery area for Arctic grayling, longnose sucker and northern pike upstream to at least Travaillant Lake. It may also be a migration route between the lake and the Mackenzie River for lake and broad whitefish. The river mouth is a nursery area for grayling, cisco, suckers, walleye and whitefish, and reaches of the river upstream of Travaillant Lake provide nursery habitat for grayling. Headwater lakes on the system that were sampled during the pipeline studies, provide overwintering habitat for fish, including High Point (67°53'N, 132°28'W), Jiggle, Loche (see above), Point (67°49'N, 132°14'W), Sandy (67°51'N, 132°40'W), and Travaillant (see above). These and a number of other lakes, including Bathing (See INUVIK--Bathing Lake), Crossing, Odzien, Sunny (see above), Tregnantchiez, and Wood Bridge (see below) have been fished in winter by residents of the Gwich'in communities in support of hunting and trapping activities. Broad whitefish, lake whitefish and northern pike are the main species taken. The present extent of these fisheries is unknown. Lake and broad whitefish and inconnu are harvested for subsistence at the river mouth during the open water season. Lake whitefish are also harvested for subsistence from October through April by residents of Tsiigehtchic, from the Travaillant River immediately up and down stream from Travaillant Lake. (Hatfield et al. 1972; Dryden et al. 1973; Shotton 1973; Stein et al. 1973; McCart et al. 1974; Schultz International Ltd. 1974; Jessop and Lilley 1975; Lilley 1975; Reist 1987; Sekerak et al. 1992; NLUIS 106N; K. Chang-Kue, pers. comm.)

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Tree River 67°13'N, 132°25'W			A baseline fisheries study of the Tree River system was conducted in 1971-73 for the Mackenzie Valley pipeline. Species reported from this system are listed in Table 2. Arctic grayling and burbot spawn just upstream from the river mouth. Arctic grayling migrate upstream into the Tree River in spring and downstream to the Mackenzie River in late September. In summer, residents of Tsiigehtchic fish for subsistence and local sale near the river mouth (see above Arctic Red River). (Bissett 1972; Hatfield et al. 1972; Dryden et al. 1973; Stein et al. 1973; Corkum and McCart 1981; NLUIS 106K+N)
Tregnantchiez Lake 67°46'N, 132°05'W			This lake on the Travaillant River system has been fished for subsistence by residents of Tsiigehtchic and Inuvik. The former have harvested lake whitefish in May and June, and the latter burbot, inconnu, lake trout, and northern pike in winter and spring. (Sekerak et al. 1992)
Tsiigehtchic general area	broad whitefish --quota not applicable	Subsistence harvest: 1988--4,200 fish (9,660 kg); 1989--6,701 fish (15,412 kg);	Much of the subsistence harvest data for the community of Tsiigehtchic has been reported on a community basis. These data are of limited use for management purposes since they do not tell fishery managers where the fish were caught. The total annual subsistence harvest of fish by residents of Tsiigehtchic were estimated at 33,900 kg in 1961-2; 50,000 kg in 1965; 22,750 kg in 1971; and 58,850 kg in 1973--mainly lake whitefish, inconnu, broad whitefish, and longnose sucker. DFO interviewed subsistence fishermen in the Tsiigehtchic area in July through November 1981, and sampled their catches for biological data. Based on this survey, the summer and fall subsistence harvest of broad and lake whitefish and inconnu by Tsiigehtchic fishermen was an estimated 81,759 kg. About 33% of the catch was used for human consumption, 60% for dogfood, and 7% was culled. Most fishing takes place near the community in summer, or a short distance up the Arctic Red River in late spring. In 1988-9, DFO again surveyed area fishermen for data on their subsistence harvests. These data were reported as the number of fish. McLaren Plansearch Corp. monitored the subsistence harvest for 34 days betwen 28 August and 15 November 1985, for the Endicott Environmental Monitoring Program and, in 1988, Lutra Associates Ltd. surveyed community residents for information on their subsistence harvests. Neither firm estimated the annual harvest. There has not been fishing under a domestic fishing licence at Tsiigehtchic since 1982. Since 1982, DFO has typically licenced from 2 to 8 commercial fishermen annually from Tsiigehtchic. (Wolforth 1966; Sinclair et al. 1967; Bissett 1972; Hunt 1972 cited in Corkum and McCart 1981; Jessop et al. 1974; Nelson et al. 1987; Sparling and Sparling 1988a+b; Lutra Associates Ltd. 1989; Sekerak et al. 1992; DFO 1994; Treble and Read 1994; Treble 1996) In 1972-73, as part of the Mackenzie Valley pipeline studies, DFO tagged 7,239 fish of a variety of species in the Tsiigehtchic area to follow their movements. Inconnu were recaptured as far upstream as the Liard River. Broad whitefish tagged in this area moved upstream in the Mackenzie River mainstem from August into October and then returned downstream, entering the delta in early November. Burbot were collected in 1985-86, and their livers were analyzed for chlorinated hydrocarbon contamination. The concentrations of chlorinated hydrocarbons found were lower than those of fish taken at more southerly locations. DFO radio tagging studies in the 1980's and 1990's found that broad whitefish also run upstream into the headwaters of the Arctic Red River. (Stein et al. 1973; Jessop et al. 1974; Jessop and Lilley 1975; Muir et al. 1990; DFO 1995; K. Chang-Kue, pers. comm.)
	cisco spp. --quota not applicable	Subsistence harvest: 1988--380 fish (152 kg); 1989--3 fish (1 kg);	
	inconnu --quota not applicable	Subsistence harvest: 1988--3,166 fish (14,247 kg); 1989--5,228 fish (23,526 kg);	
	lake whitefish --quota not applicable	Subsistence harvest: 1988--11,215 fish(14,580 kg); 1989--6,376 fish (8,289 kg);	
	other --quota not applicable	Subsistence harvest: 1988--1,651 fish (3,180 kg); 1989--834 fish (1,918 kg);	

Table 1. Continued.

LOCATION[1]	QUOTA (kg rd wt)[2]	HARVEST (kg rd wt)[3]	STOCK STATUS (references)
Tsital Trien Creek 67°30'N, 133°32'W			A baseline fisheries study of the Tsital Trien River system was conducted in 1971 for the Mackenzie Valley pipeline. The creek is an important nursery area for Arctic grayling and whitefish spp.. (Hatfield et al. 1972; Stein et al. 1973)
unnamed lake 67°13'N, 131°13'W			This lake has been fished for subsistence by residents of Tsiigehtchic in support of trapping activities. (NLUIS 1060)
unnamed lake 67°51'N, 130°50'W			Residents of Tsiigehtchic have harvested lake trout, lake whitefish, and northern pike from this lake on the Kugaluk River system in winter and spring for subsistence. (Sekerak et al. 1992)
unnamed lake (Trout Lake) 67°51'N, 131°25'W			Residents of Tsiigehtchic and Inuvik have harvested burbot, inconnu, lake trout, lake whitefish, and northern pike from this lake on the Kugaluk River system in winter and spring for subsistence. (Sekerak et al. 1992)
unnamed lake 67°55'N,131°32.5'W			Residents of Tsiigehtchic have harvested lake trout, lake whitefish, and northern pike from this lake on the Kugaluk River system in winter and spring for subsistence. (Sekerak et al. 1992)
Whirl Lake 67°28'N, 133°13'W			Residents of Tsiigehtchic have harvested broad and lake whitefish and northern pike from this lake in May and June for subsistence. (Sekerak et al. 1992)
Wood Bridge Lake 67°52'N, 132°10'W			This lake on the Travaillant River system has been fished for subsistence by residents of Tsiigehtchic and Inuvik. The former have harvested whitefish in May and June, the latter Arctic grayling, burbot, lake trout, lake whitefish, and northern pike in winter and spring. (Sekerak et al. 1992)

[1] Old or alternate names for the fisheries are shown in brackets.

[2] A round weight (kg rd wt) is that for a whole fish, while a dressed weight is that of a fish with the viscera and gills removed. Square brackets indicate provisional test quotas. The quota years are the same as the federal government fiscal year (e.g. the 1996 quota extends from 1 April 1996 to 31 March 1997). "NA" indicates that a harvest may have taken place but that no data are available--these notations are only used for the period 1988-93. Fish harvested commercially for local sale are denoted "(L)". Anadromous or searun charr are denoted "SR", non-anadromous or lake-dwelling charr are denoted "LL". "No quota", or a blank quota cell, indicates that DFO has not assigned a commercial quota to the waterbody, either as a whole or for a particular species. This does not necessarily mean that there are no commercial fishing opportunities in the waterbody or for that species. "No quota applicable" indicates harvest statistics that have been reported on a community basis. While the actual harvest site is unknown, most of these fish will have been taken from a waterbody or Mackenzie Management Area that has an established commercial quota.

[3] Unless otherwise noted the harvests were taken by commercial or experimental fisheries. The "subsistence harvests" were taken by residents for their own use, "experimental harvests" were taken for scientific purposes, and the "sport harvests" were taken by anglers. Where "Subsistence harvest" is followed by the letters "DL" (e.g. Subsistence harvest (DL):), the data are from non-native subsistence fisheries as reported by Domestic Fishing Licence holders.

Table 2. Fish species reported from the Mackenzie River and its tributary river systems within the Gwich'in Settlement Area (Figure 1).

	MACKENZIE RIVER TRIBUTARIES													MACKENZIE RIVER MAINSTEM (14)
	Thunder River (1)	Travaillant River (2)	Tree River (3)	Rabbit Hay River (4)	Pierre Creek (5)	Arctic Red River (6)	Peel River Tributaries			Peel River mainstem (10)	Rat River (11)	Rengleng River (12)	Campbell River (13)	
							Satah River (7)	Frog Creek (8)	Stony Creek (9)					
Arctic cisco (Coregonus autumnalis)	-	-	-	-	-	P	P	P	P	P	P	-	-	P
Arctic grayling (Thymallus arcticus)	P[1]	P	P	P	P	P	P	-	P	P	P	P	P	P
Arctic lamprey (Lampetra japonica)	-	P	P	P	-	P	-	-	-	-	-	-	-	P
boreal smelt (Osmerus eperlanus)	-	-	-	-	-	-	-	-	-	-	-	-	-	P
broad whitefish (Coregonus nasus)	P	P	P	P	P	P	P	P	P	P	P	P	P	P
brook stickleback (Culea inconstans)	-	-	-	-	-	-	-	-	-	-	-	-	-	P
burbot (Lota lota)	-	P	P	P	-	P	P	P	P	P	P	P	P	P
chum salmon (Onchorhynchus keta)	-	-	-	-	-	-	-	-	-	P	-	-	-	P
dolly varden[2] (Salvelinus malma)	-	-	-	-	-	-	-	-	-	P	P	-	-	P
emerald shiner (Notropis atheroides)	-	-	-	-	-	-	-	-	-	-	-	-	-	P
flathead chub (Platygobio gracilis)	-	-	-	-	-	P	P	-	-	P	-	-	-	P
goldeye (Hiodon alosoides)	-	-	-	-	-	-	-	-	-	-	-	-	-	P
inconnu (Stenodus leucichthys)	-	P	-	-	P	P	P	P	P	P	P	P	P	P
lake chub (Couesius plumbeus)	P	P	P	-	-	P	P	P	P	P	P	P	-	P
lake cisco (Coregonus artedii)	-	-	-	-	-	-	-	-	-	-	-	-	-	P

Table 2. Continued.

	MACKENZIE RIVER TRIBUTARIES													MACKENZIE RIVER MAINSTEM (14)
	Thunder River (1)	Travaillant River (2)	Tree River (3)	Rabbit Hay River (4)	Pierre Creek (5)	Arctic Red River (6)	Peel River Tributaries			Peel River mainstem (10)	Rat River (11)	Rengleng River (12)	Campbell River (13)	
							Satah River (7)	Frog Creek (8)	Stony Creek (9)					
lake trout (Salvelinus namaycush)	P	P	-	-	-	-	P	P	-	-	-	-	P	-
lake whitefish (Coregonus clupeaformis)	P	P	P	-	P	P	P	-	-	P	P	P	P	P
least cisco (Coregonus sardinella)	-	P	-	-	P	P	P	P	P	P	P	P	P	P
longnose dace (Rhinichthys cataractae)	-	-	-	-	-	P	-	-	-	-	-	-	-	P
longnose sucker (Catostomus catostomus)	P	P	P	P	P	P	P	P	P	P	P	P	-	P
mountain whitefish (Prosopium williamsoni)	-	-	-	-	-	-	-	-	-	-	-	-	-	P
ninespine stickleback (Pungitius pungitius)	-	P	P	-	-	-	-	P	-	P	P	P	P	P
northern pike (Esox lucius)	P	P	-	P	P	P	P	P	P	P	P	P	P	P
northern redbelly dace (Phoxinus eos)	-	-	-	-	-	P	-	-	-	-	-	-	-	P
pond smelt (Hypomesus olidus)	P	P	-	-	-	-	-	P	-	P	P	P	P	P
round whitefish (Prosopium cylindraceum)	P	P	-	-	-	P	-	-	P	P	P	-	-	P
slimy sculpin (Cottus cognatus)	P	P	P	-	P	P	-	-	-	P	P	P	-	P
spoonhead sculpin (Cottus ricei)	-	-	P	-	-	P	P	P	-	P	-	P	-	P
spottail shiner (Notropis hudsonius)	-	-	P	-	P	-	-	-	-	-	-	P	-	P
trout perch (Percopsis omiscomaycus)	-	P	P	-	-	P	-	P	-	P	-	P	P	P

Table 2. Continued.

	MACKENZIE RIVER TRIBUTARIES													MACKENZIE RIVER MAINSTEM (14)
	Thunder River (1)	Travaillant River (2)	Tree River (3)	Rabbit Hay River (4)	Pierre Creek (5)	Arctic Red River (6)	Peel River Tributaries			Peel River mainstem (10)	Rat River (11)	Rengleng River (12)	Campbell River (13)	
							Satah River (7)	Frog Creek (8)	Stony Creek (9)					
walleye (Stizostedion vitreum vitreum)	-	P	P	-	P	P	P	P	-	P	-	P	P	P
white sucker (Catastomus commersoni)	-	-	-	-	-	-	-	-	-	-	-	-	-	P

[1] "P" indicates that a fish species has been reported to occur in a particular river drainage.

[2] Fish identified as Arctic charr (Salvelinus alpinus) are included with Dolly Varden (Salvelinus malma). There is confusion in the literature with respect to the separation of these two species, and many of the identifications have been tentative. Recent genetic studies by Reist et al. (1996) suggest that, with few exceptions, the fish in the Mackenzie River drainage are Dolly Varden.

REFERENCES:

1) **Thunder River:** Shotton 1973; McCart et al. 1974; Schultz International Ltd. 1974;
2) **Travaillant River:** Hatfield et al. 1972; Dryden et al. 1973; Shotton 1973; Stein et al. 1973; McCart et al. 1974; Schultz International Ltd. 1974; Jessop and Lilley 1975; Lilley 1975; Reist 1987;
3) **Tree River:** Hatfield et al. 1972; Dryden et al. 1973; Stein et al. 1973;
4) **Rabbit Hay River:** Hatfield et al. 1972; Dryden et al. 1973; Stein et al. 1973;
5) **Pierre Creek:** Hatfield et al. 1972; Dryden et al. 1973; Shotton 1973; Stein et al. 1973; Reist 1987;
6) **Arctic Red River:** Shotton 1971; Hatfield et al. 1972; Dryden et al. 1973; Stein et al. 1973; Jessop et al. 1974; Jessop and Lilley 1975;
7) **Satah River:** Shotton 1971; Hatfield et al. 1972; Dryden et al. 1973; Stein et al. 1973;
8) **Frog Creek:** Dryden et al. 1973; Shotton 1973; Stein et al. 1973; Dryden and Jessop 1974; McCart et al. 1974;
9) **Stony Creek:** Shotton 1971; Stein et al. 1973;
10) **Peel River:** Shotton 1971; Hatfield et al. 1972; Dryden et al. 1973; Stein et al. 1973; McCart et al. 1974;
11) **Rat River:** Shotton 1971, 1973; Hatfield et al. 1972; Dryden et al. 1973; Jessop et al. 1973; Stein et al. 1973; McCart et al. 1974; Reist 1987;
12) **Rengleng River:** Hatfield et al. 1972; Dryden et al. 1973; Stein et al. 1973; McCart et al. 1974; Jessop and Lilley 1975; Lilley 1975;
13) **Campbell River:** Schultz International Ltd. 1973; Read and Roberge 1986; Reist 1987;
14) **Mackenzie River:** Hatfield et al. 1972; Stein et al. 1973;

Table 3. Licences to take fish for scientific purposes from the Gwich'in Settlement Area issued by the Department of Fisheries and Oceans (DFO), Central and Arctic Region, to DFO (1990-94) and non-DFO (1985-94) researchers. Note: DFO did not begin issuing licences to their own fisheries programs until 1990.

LICENCE HOLDER	AREA	PURPOSE	PERIOD
DFO RESEARCHERS			
J. Babaluk DFO, Winnipeg, MB	Horsehoe Bend, Mackenzie River	Tagging and injection of oxytetracycline into broad whitefish to verify movements, study growth rates, and validation of aging methods. (Babaluk et al. 1996)	1992, 1993
R. Crawford DFO, Winnipeg, MB	Arctic Red River	Hydroacoustic under-ice study of fish movements and collection of coregonids.	1992
L. Dahlke DFO, Inuvik, NT	Peel River	Radio tagging to investigate broad whitefish migration, overwintering, and spawning.	1990
	Inuvik	Biological sampling of local fish species.	1992
E. Gyselman DFO, Winnipeg, MB	Arctic Red River	Collection of broad and lake whitefish, Arctic cisco, and inconnu for validation of hydroacoustic studies of seasonal fish movements.	1993
E. Jessop DFO, Winnipeg, MB	Mackenzie River Delta	Study of migration routes and timing and life history patterns of broad whitefish using radio tags. Fish tissue was also collected for stable isotope analysis and electrophoresis to delineate fish stocks and feeding habits. (Chang-Kue and Jessop 1996a+b; Reist and Chang-Kue 1996)	1991
	Arctic Red River	Radio tagging of broad whitefish to follow their movements. (Chang-Kue and Jessop 1996a+b)	1992, 1993
P. Lemieux DFO, Inuvik, MB	Peel River	Monitoring of the subsistence harvest of broad whitefish and inconnu. Biological samples collected for stock identification and catch per unit effort data recorded.	1990
	Peel, Arctic Red, and Rat rivers	Monitoring subsistence fishery.	1991
J . Reist DFO, Winnipeg, MB	Peel River, Mackenzie River ramparts, Travaillant Lake	Investigation of the longterm fidelity of individual whitefish stocks to specific spawning locations. Collection of fish samples for genetic, stable isotope, and contaminants studies. (Reist 1990, 1996a+b; Reist and Chang-Kue 1996)	1990
R.F. Tallman DFO, Winnipeg, MB	Arctic Red River, Mackenzie River, Peel River	Field sampling of broad whitefish, inconnu, and other fishes at Arctic Red River for studies of seasonal abundance and species composition, spawning biology, life history variations within and between species, and to estimate the abundance of an index stock of broad whitefish. Investigation of broad whitefish tagging and studies of broad whitefish parasites. (Choudhury and Dick 1996; Dick 1996; Tallman and Reist 1996a+b)	1992, 1993
	Waters in the vicinity of Arctic Red River	Collection of up to 200 inconnu using gillnets, and radio-tagging of 20 inconnu to identify spawning sites and follow seasonal fish movements.	1994

Table 3. Continued.

LICENCE HOLDER	AREA	PURPOSE	PERIOD
NON-DFO RESEARCHERS			
R. Dillinger Memorial University, St. John's, Newfoundland	Arctic Red River area	Arctic cisco in spawning condition were collected from the Arctic Red, Peel, Mountain, and Carcajou rivers for genetic analyses and comparison with Alaskan stocks (Bickham et al. 1989; Dillinger et al. 1992; Lockwood et al. 1993).	1985, 1986, 1987
R. Olmsted McLaren Plansearch Corp. Vancouver, BC	Mackenzie River	Fish sampling to monitor fall fish migrations at Fort McPherson and Arctic Red River.	1985
M. Prevost Inland Waters Directorate Regina, SK	Arctic Red River	Sampling of forage fish for chemical analysis.	1985
K. Schwalme University of Alberta Edmonton, AB	Campbell Lake	Collection of northern pike from Campbell Lake (68°12'N, 133°28'W) for a study of the influence of season and latitude on their fatty acid composition.	1988
A. Sekerak LGL Limited, Sidney, BC	Peel and Arctic Red rivers	Collected Arctic cisco for genetic analysis (Bickham et al. 1989; LGL Ltd. 1989; Lockwood and Bickham 1989; Morales et al. 1989; Troy 1989; Dillinger et al. 1992)	1988
G. Smith Hatfield Consulting W. Vancouver, BC	Arctic Red River	Capture of burbot for studies to determine whether their condition is related to hydrocarbon exposure (Lockhart et al. 1989)	1985
B. Stewart Arctic Biological Consultants, Winnipeg, MB	Rat River	Collection of biological and fishing effort data from the subsistence/commercial fishery at the Rat River (Sparling and Stewart 1986).	1986