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WESTERN ARCTIC RESOURCE EVALUATION

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INUVIALUIT DEVELOPMENT CORPORATION

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Chapter 1

ORIENTATION

AREA DELINEATION

The purpose of this study is to collect, in usable form, information relating to the resources of the specified area, and to make feasibility estimates based on this data for the more obvious projects. Of particular interest at this time is the possibility of a Mackenzie Delta based fishery. Other or subsidiary enterprises may be suggested by the data collected and evaluated on a cursory basis, but the nucleus of this report will be the fishery project.

The boundaries chosen for the study area are mainly a function of the political jurisdictional boundaries of the Western Arctic Inuit as delineated by COPE. The study area extends from Holman, on Victoria Island in Amundsen Gulf to Herschel Island in the Yukon Territory, and from Aklavik in the Mackenzie River Delta to Sachs Harbour on Banks Island. The basis of the fishery, however, will be concentrated in a more restricted area due to difficulty in access and transportation costs. The Mackenzie Delta region around Inuvik and Aklavik form the core fishery area, possibly extending down the delta to the Arctic Red - Fort McPherson locale. Although not within the described delta area the settlements of Tuk and Paulatuk could function peripherally in the proposed fishery.

Inuvik functions as the administrative and transportation centre of this region. It is the focal point for wage employment and the service industries and the influence of Inuvik's industrial and commercial activities is felt throughout the economy of the entire area. There is virtually no industrial activity located in the outlying regions, and consequently the economy of these outlying regions is dwarfed by the size of the delta economy. The basis of the outlying regions' economy is their natural resources, the harvesting of seals, fox (white and other), polar bear and some char fishing.

AREA DESCRIPTION

The Mackenzie River runs 4,321 kilometers from the Great Slave Lake and headwaters in the Yukon Territory, northern British Columbia, Alberta and Saskatchewan to its northern exit to the Arctic Ocean through the Beaufort Sea (Figure 1). The Mackenzie is navigable by river tugs and barges from June to October, and has thus far provided the primary shipping route for the towns of Fort Simpson, Wrigley, Fort Norman, Norman Wells, Fort Good Hope, Arctic Red River, Aklavik and Inuvik. The completion of the Dempster Highway is bound to have some effect on shipments to the more northern points along the river, as will be discussed later in this report, but what exactly it will be is, as yet, unclear.

North of Fort Simpson, where the Liard River enters the Mackenzie system, the river is characterized by a heavy silt load. There are numerous other tributaries entering the system, however, many of these are seasonal streams which have peak discharge in late May or early June and dry up over the summer or freeze to the bottom in winter. Only 12 to 15 watersheds contribute significantly to the total flow of the river. During spring run-off, the river may increase 3 to 6 meters in depth. This increase will subside somewhat during summer, but heavy rains in the mountains may maintain a 1.5 meter increase in water depth for both the Mackenzie itself and its tributaries. During these periods of peak discharges there also occurs large quantities of drifting debris.

In winter, ice up to 2.5 meters thick covers the main channels of the Mackenzie. Permafrost is continuous from Arctic Red River north. Boreal forest lines the river to the Beaufort Sea. The Delta has a sub-arctic climate and experiences an ice-free period of about four months. The ice on the rivers breaks up about the beginning of June and freeze up does not occur until near mid October. Coastal water in the vicinity of Mackenzie Bay becomes open about mid-July and remains ice-free until late October.

The Mackenzie River Delta begins about 160 km. from the coast at Fort McPherson on the Peel River tributary and at Arctic Red River on the Mackenzie itself (See Figure 2). Nearly 80 km. wide, the Delta region is a maze of land and water covering some 19,782 sq.km. It is comprised of a complex system of channels, islands, lakes and muskeg. The boreal forest in the Delta area is composed of stands of willow and spruce.

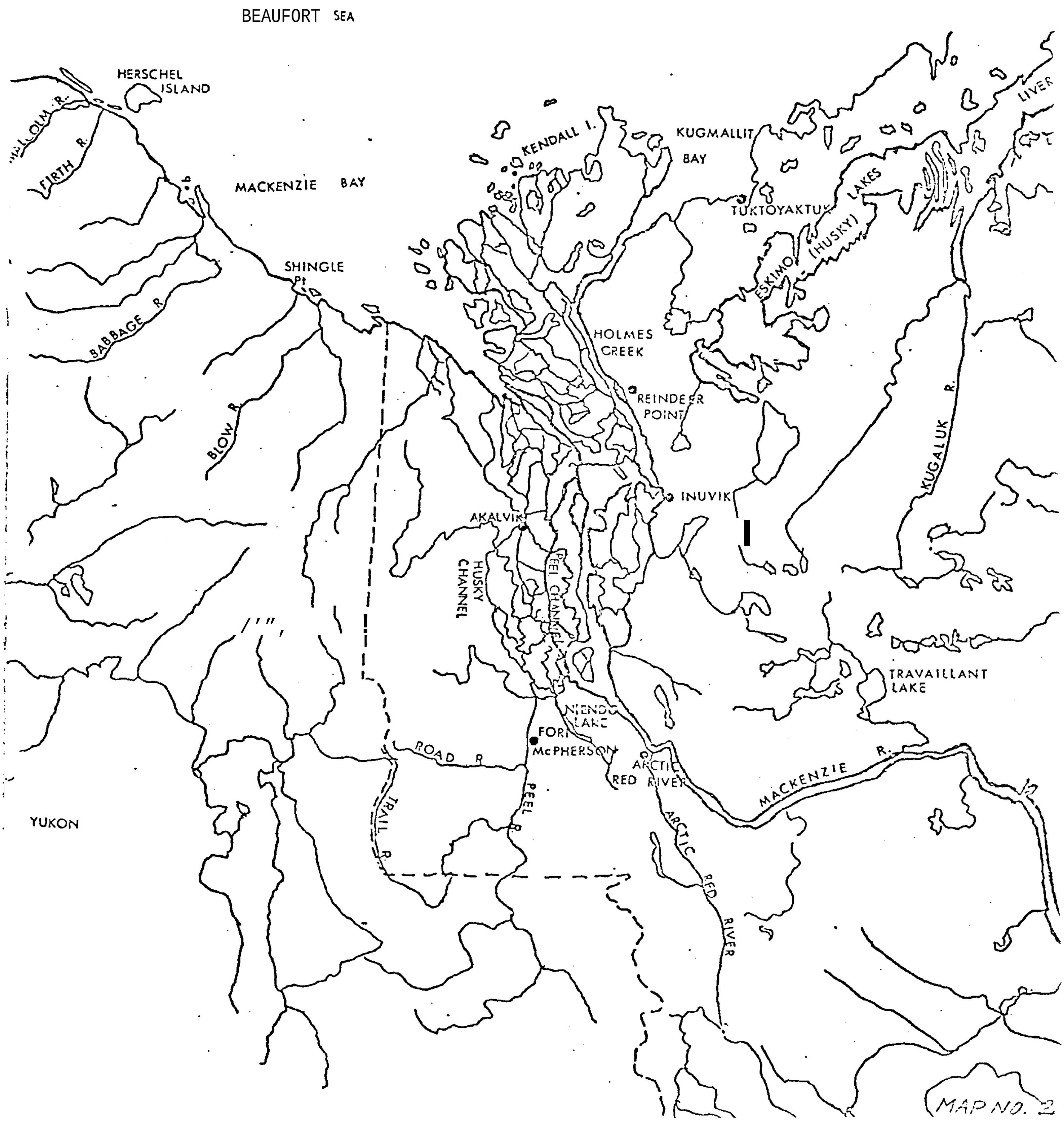
The Anderson River has its headwaters in Colville Lake, which lies approximately 250 km. east of the Mackenzie River. Flowing by way of Wood Bay into the Beaufort Sea, the Anderson runs for 400 km. While not clear, it does not carry as large a silt load as the Mackenzie, nor is the delta as large. The forest line stops about 80 km. from the coast. South of the tree line, willow and spruce are common; northward the terrain changes to tundra.

The Horton River, located east of the Anderson, is about 325 km. in length. The river meanders through a low valley for the last 100 km. before emptying into Amundsen Gulf through Franklin Bay on the east side of Cape Bathurst. Forest vegetation along the river's course changes to tundra about 80 km. from the river's mouth.

The Eskimo Lakes, situated to the east of Tuktoyaktuk peninsula between the Anderson and Mackenzie Rivers, are a series of connected but distinct bodies of water connecting Sitidgi Lake to Liverpool Bay. There are three lakes in this connecting system; the inner two lakes closest to Sitidgi are broad shallow and of a fresh-water nature, the outer lake becomes brackish due to the intrusion of sea water from the bay. Forestation is prevalent as far as the head of the innermost lake, thereafter tundra interspersed with occasional willows is the dominant landscape.

Banks Island, lying about 20 km. north of the mainland across the Amundsen Gulf, is a trapezoidal shaped piece of land roughly 350 km. by 200 km. There are approximately nine large river systems on the island which run to the west and north coasts. Along the east and south coasts, however, there are also several minor rivers. There is a single settlement, Sachs Harbour, which is on the west coast by Cape Kellett. The only lake systems of note are the Fish Lakes on

MACKENZIE DELTA AREA



the coast south of Sachs Harbour and a couple of large unnamed lakes in the northeast corner of the island. Most of the island consists of a low, rolling plain covered with tundra type vegetation. The northeastern part of the island, however, is hillier and rougher. No more than 25 km. off of the northwest corner of Banks Island is the permanent ice pack.

50 km. east of Banks Island across the Prince of Wales Strait is Victoria Island. The area of concern on Victoria Island consists mainly of that part of the land mass north of Prince Albert sound. This includes Diamond Jenness Peninsula and Prince Albert Peninsula. Most of this land is similar in nature to Banks Island, although the eastern sections have large sections of open shale with sparse or no tundra covering. There are also many small lake and river systems, the larger of which are connected to the Arctic Ocean at some point, on this part of the island. Both Banks and Victoria Islands have an arctic climate.

The Firth River drains out of the mountains to the south of Herschel Island in the northern tip of the Yukon Territory. The last 40 km. of the river cut through a series of raised beaches terminating at the sea in the form of a heavily braided stream. The river flows clear until it passes through the raised beaches where it becomes moderately clouded with fine silt. There are occasional stands of willow along the river banks, but tundra is predominant.

The inshore marine area along the coastal regions is generally very shallow with bottom types ranging from soft muck to sand, gravel and rock. Salinities range from O to 33 percent and temperatures from less than 0° C. to 10° c. depending upon the nearness of major rivers. Coastal lagoons are generally quite shallow and seldom exceed 4 meters in depth. Coastal waters generally ice over from the end of September in the northern island areas to mid-October in the mainland coastal areas; these waters become open from the end of July to mid-July respectively. The open water areas of sea, gulf and straits connecting this area are solidly iced over by mid-November. Tundra is the prevalent vegetation along the coastal parts of this area and shallow inshore waters with mud and silt bottoms are often littered with tundra hummocks washed into the sea by wave action.

Chapter 2

FISHERY HISTORY

DOMESTIC FISHERIES

Fish are not particularly abundant on either Banks Island or the western part of Victoria Island. Although there is a small domestic fishery catching char, trout and whitefish, there has never been a commercial fishery operating in the area. The cooperative run char fishery in Cambridge Bay (see Appendix A) is presently considering utilizing the Holman region as part of its supply area. To date, however, little has been done in realizing this project. Most domestic fishing has been done in the fall during trapping and during the spring before break up.

On the mainland there is a greater abundance of fish stocks and fishing plays a more important role in the native lifestyle. The domestic fisheries are divided by season into roughly three major kinds: summer, fall and winter fisheries. The summer fishery begins about the beginning of July shortly after break-up, and continues through until mid-September. The fall fishery is quite short, centered around freeze up in October, and focused on the "runs" or concentrated schools of migratory species. The winter fishery starts when river and lake ice is strong enough to support travel and ends in January when the ice gets too thick to fish through without such expensive pieces of equipment as ice augers.

Domestic fishing activities tend to be concentrated in the vicinity of the settlements, but summer and fall fishing camps may be established at considerable distances from settlements. In winter, distan"t lakes may be fished by hunters while trapping. Much of the present fish catch is taken during or immediately following freeze-up and break-up when the major fish runs occur.

Occasionally traps are constructed in headwater spawning streams. For certain species "jiggling" or jigging through holes in the ice is practised. Seining and set-line fishing are known, but gill nets provide the greatest proportion of the catch. Trap nets are not yet used in this area.

COMMERCIAL FISHERIES, 1960 TO 1967

Several commercial fisheries have, over the years, attempted to utilize this greater abundance of fish stocks on the mainland. In 1960, the NA and NR Welfare Project started a fishery at Shingle Point on the Yukon Coast. 18,000 pounds of unspecified species were taken using sweep nets in the first year. In 1961, 12,000 pounds were taken and the project was discontinued after that.

In 1963, the Department of Indian Affairs and Northern Development set up a small fishery at Holmes Creek which is about 105 km. north of Inuvik on the East Channel. A barge mounted freezer, capable of freezing and holding 12,000 pounds of fish was brought in to expedite the project. The barge unit was so placed that the three fishermen who were engaged for the project could operate within a 12 km. radius of the freezer. This meant that no ice was required as the fish were delivered straight to the freezer. About 20,000 pounds of dressed, frozen whitefish and a small quantity of inconnu was brought into Inuvik for storage. The product passed inspection by Inspection Services, Fisheries Branch.

The fishermen were paid 15¢/lb. for whitefish and inconnu in the round, and 30¢/lb. for trout in the round. The costs of the operation officially amounted to approximately 28$/lb. However, this did not include a return on the capital cost of the project or its operating cost. It is estimated that had the product borne all legitimate costs, the cost price would be close to 75¢/lb., and not the 28¢/lb. that was officially attached to the project. The selling price of the fish was put at 40¢/lb. for trout and 25¢/lb. for whitefish. Unfortunately, the local market proved to be inadequate to absorb the product and the fish did not sell. Estimates of the total costs of initiating the project vary upwards from $40,000. The return was negligible.

The next summer about 30,000 pounds of whitefish were taken from the Holmes Creek location. Six fishermen were employed, and in about a month's time fishing, they earned approximately $4,500. The fishermen received 15¢/lb. for whitefish and 3¢/lb. for culls. These prices were comparable to those being paid at Great Slave Lake during the summer of 1962 and 1963, as reported by the Department of Fisheries. But, because of the low production, 1,000 to 3,500 pounds per day, costs were very high.

The product was filleted and frozen in small blocks. A large percentage of the whitefish take was condemned because of the poor handling techniques and the inefficient freezer being used. Due to inexperience, filleting was slow with no provision on the barge to ice the catch. Most of the product did not pass inspection and was withdrawn and destroyed. Although the blocks aroused some interest by the hotel and institutions, the demand at Inuvik was unable to absorb the fish that did manage to arrive there. Filleted whitefish was sold at 35.5¢/lb. while dressed whitefish sold at 22¢/lb. There does not appear to be any record of the sales that did transpire.

In the summer of 1965, Menzies Fisheries of Edmonton began a commercial fishery operating out of the Inuvik region. The central area of the Delta between Aklavik and Inuvik was fished for whitefish and a char fishery was established at Pauline Cove on Herschel Island as well as at Ptarmigan Bay on the Yukon Coast. The fishery began in late July and came to an end in September. Local fishermen were involved in catching the fish for sale to the company. A collection boat made a weekly circuit to collect the fish which were iced and packed in plastic bags for air shipment to Edmonton. In mid-September the collection boat, valued at $10,000, was lost in drift ice off Herschel Island. This put an end to the commercial fishery for the year. The take was: 550 pounds of arctic char at Pauline Cove; 35,000 pounds of arctic char at Ptarmigan Bay; and about 20,000 pounds of whitefish in the Central Delta.

The return to the commercial fishery was low in respect to costs. Total reported variable costs amounted to $37,990.79 with a return of $14,166.10 from fish sales. High costs were involved as a result of air transportation, particularly in respect to the Arctic coast. The loss of the fish collection boat and the radio added to the fisheries' financial burdens.

In 1966, there was another attempt at commercial fishing, made by Menzies. The fishermen used their own boats and motors to reach the fishing sites, but, received advances for nets, gasoline and food. They were allowed to fish those places where they knew from experience that the fishing was good . The method that the fishermen used involved placing short gill nets set from shore at stream mouths and eddies. The fishermen realized about $24,000 from the commercial operation. This money was divided amongst 33 fishermen whose earnings ranged from a high of $1,200 to a low of $12.48, according to their effort and the length of time spent fishing. Their average earnings were about $150, but, for good fishermen about $1,000. The fishermen at this time expressed interest in forming a commercial fishing co-op, however, strong reservations were held against this type of development from government officials as they felt that the fishermen were hardly at the stage where they could 90 it alone.

There was also a char fishery set up at Ptarmigan Bay. Six fishermen and their families participated in the project. The results were disappointing with only 800 pounds of char taken. The collection of the fish was carried out by a plane from Inuvik and this proved to be costly, especially in view of the low volume.

COMMERCIAL FISHERIES, 1967 TO PRESENT

From 1967 to 1971, no attempt was made to organize a commercial fishery. Although there were some discussions held and proposals put forward by various government officials, no action was taken.

During the summer of 1972, the Territorial Government again decided to establish a commercial fishery in the Delta. This time the fishery was aimed specifically at supplying only the local market, and the sales effort was focused at Inuvik. The plant was located at Holmes Creek in order to remove it from the Inuvik domestic fishery restriction area. Holmes Creek is only 105 km. from Inuvik and is accessible by both boat and airplane.

Capital equipment for this project included two small portable buildings, a refrigeration unit, cleaning and packing tables, two scales, and other equipment, all of which inventoried at about $17,000. However, because of the late arrival of the equipment and other technical difficulties, the fishery only operated for the first part of September in 1972 and few fish were processed.

In 1973, with all preparations completed, the fishery began operations immediately after breakup in July. Three fishermen were employed and their families engaged in the processing plant. Fishermen received 20¢ per pound and plant workers received up to $2.50 per hour. There was approximately 15 people in total employed through the project. The total quota for the area, 50,000 pounds, was reached by mid-August. The catch consisted of mainly broad whitefish with a few inconnu. The fish were flown to Inuvik and sold in pan-ready and fillet, frozen form at 85¢/lb. The demand was not particularly great due to the high price that was an attempt to redeem the previous year's losses.

July 1974 saw the fishery re-open with the same management and employees, but a change in marketing direction. Most of the fish caught, which was mainly whitefish with a few inconnu, trout and pike, were sent to the Freshwater Fish Marketing Corporation (FFMC) in Winnipeg, Manitoba. Only the last shipment remained in Inuvik for local distribution. Due to managerial problems the fishery closed down operations in August with only 33,000 pounds of the 50,000 pound quota caught.

In 1975 the fishery management concepts were further re-evaluated and several changes made. The plant itself, now including both a blast freezer and a storage freezer, was moved to Inuvik and hooked up to the power and utilidor systems. A large river scow was bought to provide daily transportation of the catch from the fish camps to the plant. The transportation boat also carried ice made in the plant out to the camps for storage of the next day's catch.

During this season fishermen were paid 25¢/lb. and plant employees were paid up to $6 per hour. All fish were intended to be sent to the FFMC. operating costs included about 3¢/lb. transport costs from camps to plant, 22¢/lb. processing through the plant, and 16¢/lb. shipping costs to FFMC, making a total of 66¢/lb. Unfortunately, the FFMC paid on the following scale at that time: 65¢/lb. f.o.b. Winnipeg for jumbo whitefish, 43¢/lb. f.o.b. Winnipeg for large whitefish, and 23¢/lb. f.o.b. Winnipeg for medium whitefish.

By August the fishery had caught its quota of 50,000 pounds (almost entirely broad whitefish, other species were used locally or for dog food and humpback whitefish, although able to be sold through FFMC whitefish market, had a cyst problem and was never passed by Health Inspection) , but only 15 percent of the catch were jumbos which approximated the break even price. The current manager attempted to resolve the marketing problem by shipping only jumbo and large whitefish to Winnipeg, keeping the mediums for sale locally. This resulted in a freezer full of medium whitefish at the end of the season as local interest is not particularly large at that time of year. Not wishing to hold an inventory that would sell piecemeal through the winter, the manager took upon himself to find another market. Consequently, he sold the entire stock of medium whitefish to Woodward's Stores in Vancouver for 85¢/lb. f.o.b. Inuvik. The result of this was that the manager was disciplined for selling "illegally", i.e. not through the FFMC, and the fishery was closed down as being uneconomical.

From 1975 to present, there has been little interest expressed in the establishment of a commercial fishing enterprise. However, it has been learned that the Inuvik Fish and Wildlife Projects Officer, Sam Ransom, is planning early next year to use the Economic Development owned scow from the old fishery to establish the feasibility of a herring fishery along the coastal waters. There has been little traditional or historical use of this resource. Herring runs, when they appear along the Tuk peninsula, occur in late summer and early fall and usually form only a part of the general fishery. No special effort is devoted to their capture. Herring become more plentiful east of the Tuk peninsula and a small herring fishery was started in 1963 in the Baillie Islands area. This fishery gathered 18,000 lbs. by means of a shore-based gill net operation, but it was not repeated in subsequent years. There is presently a quota of 1.5 million pounds established along the Western Arctic coastal region. Nevertheless, there is the possibility that parts of this assumed population of herring may be the anadromous specie, least cisco, also referred to locally as herring. It also is unknown what part the herring species play in the food chain of the Beaufort Sea, particularly beluga whales. Mr. Ransom's work in clarifying any of these points will be greatly appreciated.

Chapter 3

THE MAJOR SETTLEMENTS AND COMMUNITIES .

INTRODUCTION

In the Western Arctic there is a definite dichotomy, separating it into two distinct economies. The Delta economy and the much lesser developed outer-rim economy. An indication of how the balance of this situation lies is reflected in the fact that the total populations of all the outer-rim economy settlements of Paulatuk, Sachs Harbour and Holman do not equal the population of any one of the Delta economy settlements. The Delta economy is, to a large extent, a reflection of Inuvik, the dominant community in the area. Inuvik is the primary source of wage employment and is the centre of the industrial, commercial and service sectors in the Western Arctic region. Tuk and Aklavik share in the wealth of development activity radiating from Inuvik. Very little of this activity, however, filters into the outer-rim economy, which is supported mainly on a hunting and trapping basis. The following tables, though dated, give some indication of this situation.

INUVIK

The construction of Inuvik began in 1955 and was completed in 1961. The town site, on the East Channel of the Delta, was selected for its convenience of location. Inuvik has become the administrative centre and distribution point for the Delta and Western Arctic settlements and a major base for

TABLE I

Employment for Individuals, 14 years of age and over

DELTA:	Wages	*H-T-F	Self-Employed	Ratio of jobs to potential labour force
Aklavik	121	37	6	164/350
per cent **	(41)	(13)	(2)	
Inuvik	181	31	8	220/292
per cent **	(52)	(9)	(3)	
Tuk	139	18	3	160/260
per cent **	(53)	(7)	(3)	
TOTAL	441	86	17	544/902
per cent ** . (average)	(49)	(9)	(2)	

* Hunting, Trapping and Fishing.

** Percentage of potential labour force in settlement.

OUTER RIM:

	Holman		Paulatuk		Sachs Hbr.		Rim	
	Number	%	Number	%	Number	%	Number	%
Wage and Salary	46	49	12	36	12	27	70	41
Hunting, Trapping, Fishing	24	26	15	45	11	25	50	29
Self-employed	7	7	4	12	0	-	11	6
Potential Labour Force :	94	-	33	"	44	-	171	-

Source : DIAND, Mackenzie and Arctic Coast Manpower Surveys, 1969-70.

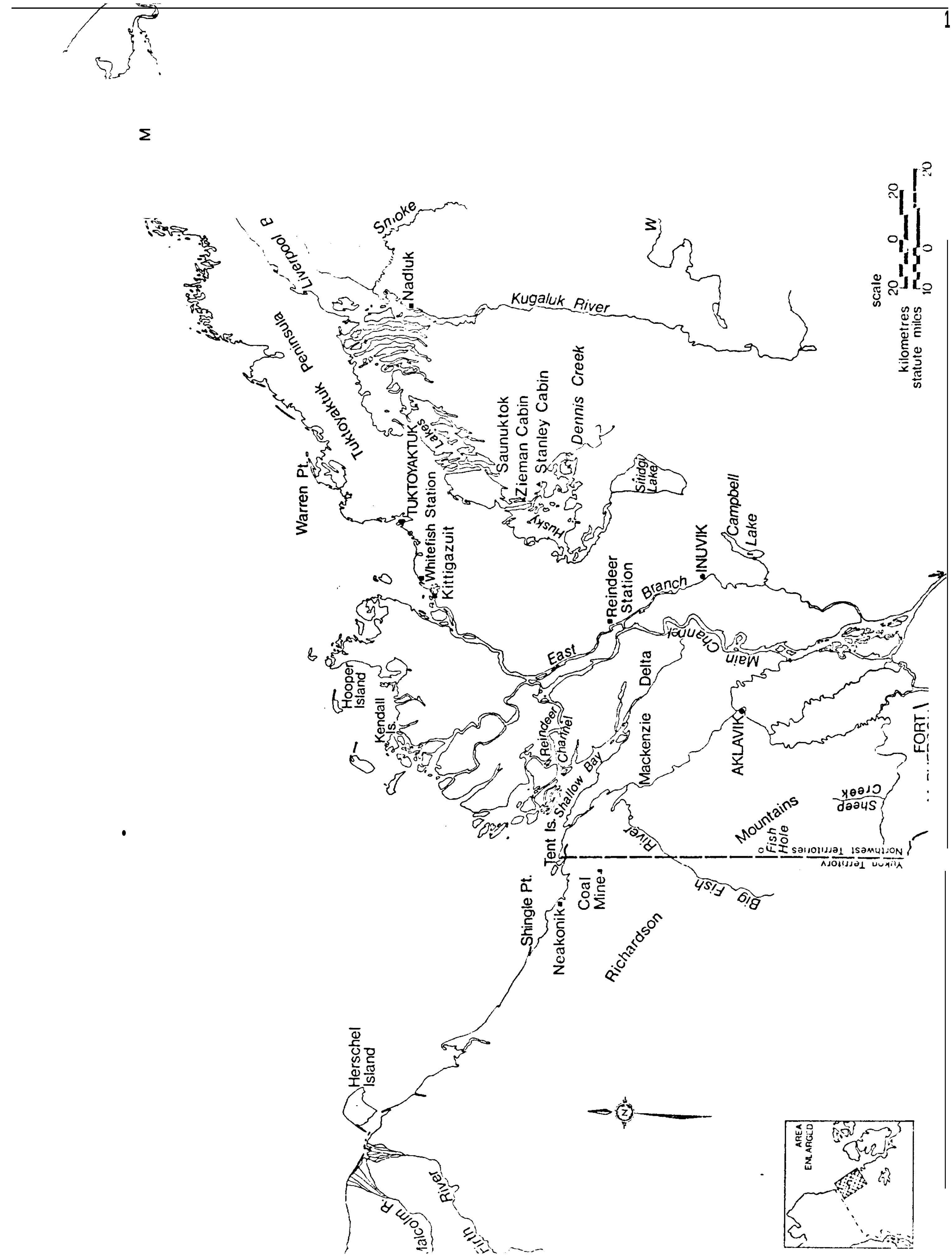
petroleum exploration in the vicinity. Among the numerous administrative facilities in Inuvik are the regional offices of many federal departments. The town has scheduled air service from southern centres, primary and secondary residential schools, a hospital, a post office, two banks, three hotels, a liquor store, several denominational churches, three general and many specialty stores, a scientific research laboratory, a public library, a radio station and two television stations, two newspapers, extensive recreation facilities and a variety of general services. It is also the base for the Canadian Armed Forces.

In 1961, the census registered 1,248 residents of Inuvik; in 1965 the population was estimated to be 2,744, of which 916 were Inuit, 359 were Indian and 1,469 were non-Native. In 1974, the population had increased to 4,150. However, by 1978 the population declined to 3,065, of which 552 were Inuit, 337 were Indian and Metis, and 2,176 were non-Native. The non-Native segment of the population exists largely of itinerant labourers and craftsmen, civil servants, schoolteachers, policemen, rivermen, shopkeepers, airplane personnel, mining exploration crews and C.A.F. servicemen. Most of these are highly transient and leave in 2-3 years, if not sooner.

Reception of the I.D.C. fish plant proposal was quite good in this settlement despite a diminished reliance on the traditional hunting and trapping economy and the abundance of alternate job opportunities. There remain 6 or 7 families in Inuvik (more possibly from ouside the town proper) that have continued to fish regularly. There is excellent access to and maintenance of the necessary facilities for the plant itself.

AKLAVI K

Aklavik is situated on one of the main channels of the Delta, south of the treeline, about 110 km. south of the Beaufort Sea and 55 km. west of Inuvik by air or 110 km. by river. The settlement began about 1910 with the establishment of a small trading post. Gradually, the settlement grew to include several churches, the Hudson's Bay Company, and a R.C.M.P. post. In the late 1920's the Herschel Island settlements were abandoned and most of the people from that area moved to Aklavik as it was the major settlement within their traditional land-use pattern.


Tuktoyaktuk Peninsula
Liverpool Bay
Smoke
Nadluk
Kugaluk River
Warren Pt.
TUKTOYAKTUK
Lakes
Saunuktok
Zieman Cabin
Stanley Cabin
Dennis Creek
Husky
Sitidgi Lake
Whitefish Station
Kittigazuit
Campbell Lake
INUVIK
Reindeer Station
East Branch
Main Channel
Mackenzie Delta
Hooper Island
Kendall Is.
Reindeer Channel
Shallow Bay
AKLAVIK
FORT
Sheep Creek
Mountains
Fish Hole
Northwest Territories
Yukon Territory
Big Fish River
Tent Is.
Shingle Pt.
Neakonik
Coal Mine
Richardson
Herschel Island
Malcolm R.
River
scale
kilometres
statute miles
AREA ENLARGED

By this time, Aklavik had become the administrative and trading centre of the Delta and the distribution point for river borne traffic in the Western Arctic. In 1931, the population stood at 411, of which 140 were Inuit, 180 were Indian and 91 were non-Native. By 1952, Aklavik and its vicinity had a population of about 1,556. At this point in time, the settlement had extended itself to its maximum possible limit; all ground suitable for building had been utilized, and the airstrip was unable to obtain the necessary adjacent land to be extended for accommodation of larger aircraft. This situation prompted the federal and territorial governments to establish Inuvik, to which all administrative services were removed. When Inuvik was established it was assumed that Aklavik would shortly be a ghost town, but this was not to be so. This ramshackle disordered community that grew up haphazardly over the years has refused to die. In fact, after the initial depletion of civil servants and administrators the population has shown a steady increase. It now boasts a population of 797, including 335 Indians, 375 Inuit and 87 non-Native residents.

The one thing that Inuvik is not convenient to, is the hunting and trapping lifestyle that is the raison d'etre of Aklavik. Those Natives, both Indian and Inuit, strongly interested in such a lifestyle have tended to gravitate back to Aklavik. It remains the centre of the Delta domestic fisheries. The combined Inuvik-Aklavik traditional fishing area covers the Delta from the Peel and Husky Channels to Whitefish Station and Shingle Point on the coast. The residents of Aklavik were enthusiastic about the proposed fish plant. Most of the fishermen likely to be involved in supplying such a plant would be from the Aklavik area. Aklavik residents would also like to see the plant itself established in Aklavik, arguing that besides being the centre of fishing activity the amount of available labour for the plant is greatest in Aklavik due to the large population concentration with little development of the wage economy.

FORT MCPHERSON AND ARCTIC RED RIVER

These two communities, each about 120 km. south of Inuvik, Fort McPherson on the Peel River and Arctic Red River on the junction of the Mackenzie and the river it is named after, mark the beginning of the Delta. Fort McPherson has a population of 790 and Arctic Red River, a population of 119. With the opening of the Depmster Highway, it is thought that the residents of Arctic Red River will gradually move to Fort

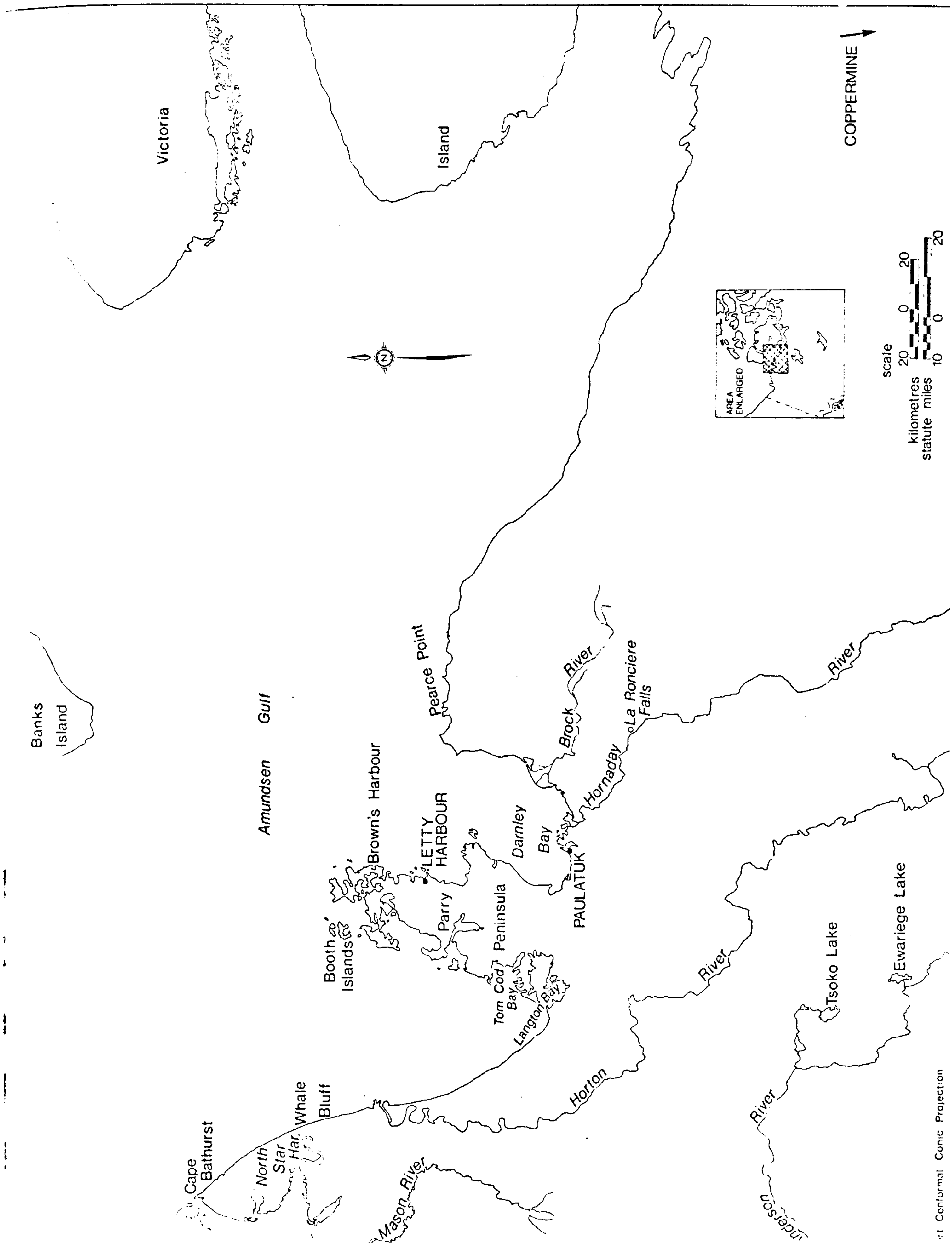
McPherson with its larger offering of amenities and opportunities while still being able to drive to their traditional hunting, trapping and fishing areas.

The Arctic Red River people customarily fish close to the Arctic Red River during the summer, and use Modeste Lake and the Northeast side of Travaillant Lake in the autumn and early winter. From Fort McPherson the people use Neyand Lake, to the east, and the lakes along the edge of the Peel Plateau for summer fishing; during winter and fall, they use Trail Creek and Red River. Although these points are quite removed from the main part of the Delta, they are definitely accessible as demonstrated by the fact that Arctic Red River residents have offered to sell fish on their own initiative to I.D.C.'s Country Foods Store (See Chapter VI).

TUKTOYAKTUK

The settlement of Tuktoyaktuk is at the northern end of the Tuktoyaktuk peninsula which extends into Kugmallit Bay, just east of the Mackenzie Delta. It was formerly called Port Brabant. Tuk , as it is commonly called, is 120 km. by air or 180 km. by water north of Inuvik and is the transshipment point for all freight barged down the Mackenzie. Such freight is shifted into deeper-draught coastal vessels for distribution along the Arctic coast. Tuk is also the site of one of the DEW-Line stations. The settlement has good air and water transport facilities, a nursing station, a primary school , several churches, a library, a post office, a hotel, a general store, a cooperative for making fur garments and a research station of the Polar Continental Shelf Project. Several of the Beaufort Sea oil exploration companies also maintain bases in Tuk. In 1972 the settlement's population was 600; in 1974 it was 585 but by 1978 it had risen to 746, 86 percent of which is Inuit.

Despite the availability of jobs in the wage economy from the oil exploration groups, hunting and trapping has remained an integral part of the society in Tuk. Most families fish in the harbour during the major fish runs, but the professional hunters and trappers evinced an interest in providing fish commercially from both the harbour and from the Eskimo Lakes, should this be shown to be feasible in terms of transportation. Currently, most of the fishing in the latter area is limited to a few main spots , the most important being Saunuktok, Zieman Cabin and Stanley Cabin (see previous map of Delta area) . There is also some fishing done on Wolverine River and in lakes on Cape Bathurst, north of Horton River.


Victoria
Island
COPPERMINE
Banks
Island
Amundsen
Gulf
Pearce Point
Brown's Harbour
LETTY
HARBOUR
Darnley
Bay
PAULATUK
Parry
Peninsula
Booth
Islands
Tom Cod
Bay
Langton Bay
Brock
River
La Ronciere
Falls
Hornaday
River
Horton
River
Tsoko Lake
Ewariege Lake
Anderson
River
Cape
Bathurst
North
Star
Har.
Whale
Bluff
Mason River
AREA
ENLARGED
scale
kilometres
statute miles
20
0
20
10
0
20
Conformal Conic Projection

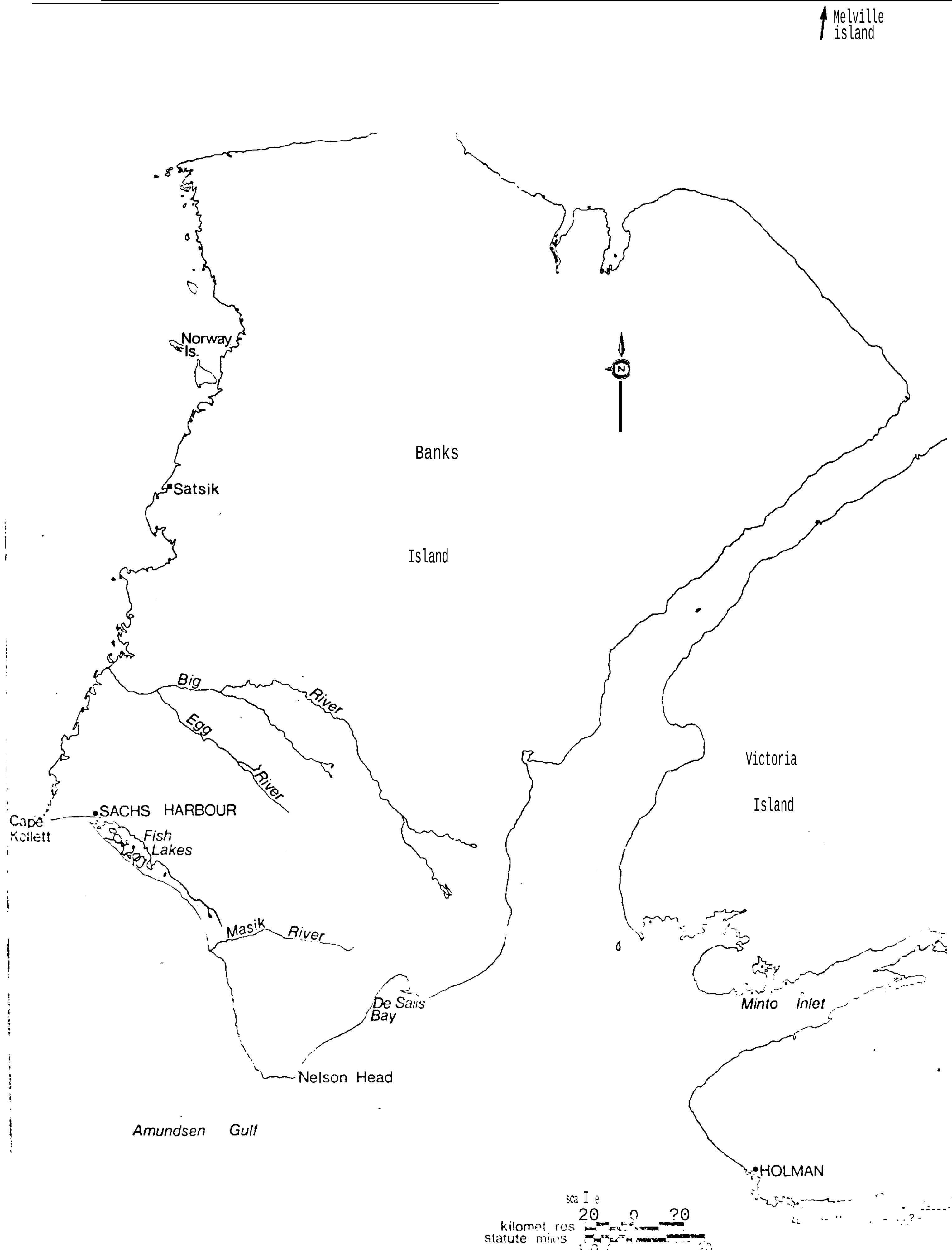
PAULATUK

Paulatuk was established at the south end of Darnley Bay 400 km. by air from Inuvik around a small trading post. When the trading post was closed in 1954, most of the population moved elsewhere. In 1974, the population was 112, and their commercial needs were met by the Paulatuk Cooperative. In 1978, the population was 160, and despite going bankrupt several times in the interim the Paulatuk Cooperative continues to provide what commercial service is available. The settlement has few of the services and facilities common in the other major Western Arctic centres, but there is electricity, a primary school and a church.

One of the major sources of income for this area is the char fishery on the Hornaday River, which has a 15,000 pound quota. This quota is sold through the Paulatuk Cooperative, and, since the inception of I.D.C.'s Country Foods Store, has been bought entirely by that organization. The main fishing for this area is done on the Hornaday, catching mainly the char and whitefish but also some other species. The char run is at the mouth of the river in August, and in October many people fish in the deep holes some miles upstream. The char winter in various deep holes below La Ronciere Falls (see following map). A number of small lakes in the area have also been fished in the past, and Tom Cod Bay has traditionally been a plentiful source of the fish after which it is named.

BANKS ISLAND

Sachs Harbour, 515 km. by air from Inuvik, is on the south-western coast of Banks Island, the most western of the Northwest Territories' arctic islands. Inuit do not seem to have lived permanently on Banks Island until recently, although they have always hunted there, and house ruins indicate earlier permanent occupation. The settlement takes its name from "Mary Sachs", one of the vessels of the Canadian Arctic Expedition, which occupied the island from 1914 to 1917. Permanent occupation of the settlement began in 1928, when some Mackenzie Delta families wintered there to trap white foxes. White fox trapping remains to this day the economic mainstay of this community. In 1953, the R.C.M.P. established a post a Sachs Harbour and, in 1955, the Department of Transport established a weather station. The general store, a co-op, was opened in 1958. In 1974, the population was 143; by 1978 the population had increased slightly to


Melville
Island
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Satsik
Big
River
Egg
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Kellett
SACHS HARBOUR
Fish
Lakes
Masik
River
De Salis
Bay
Nelson Head
Amundsen Gulf
Victoria
Island
Minto Inlet
HOLMAN
scale
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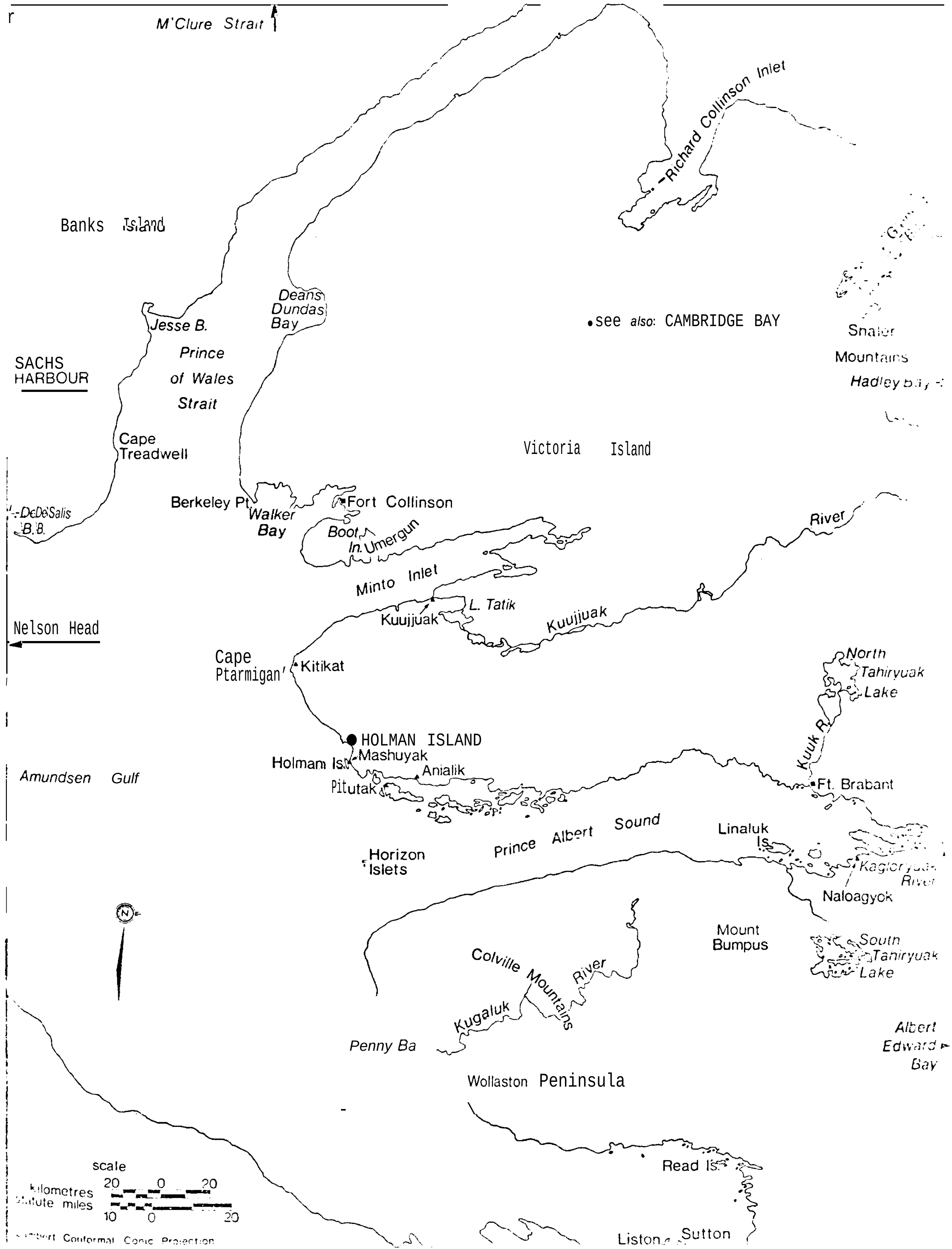
173. Sachs Harbour has water , sewage , and garbage services, electricity, three scheduled flights weekly from Inuvik, regular mail service , a primary school , a community hall and a library. The settlement is also the base of extensive petroleum exploration on the island and in the Beaufort Sea.

Besides brief sojourns into the wage economy with the oil companies the main economic activity, · as mentioned earlier, is Arctic fox trapping. The island has a quota for both polar bear and musk oxen. The polar bear quota cannot be directed toward sports hunting due to the lack of dog teams, but the Sachs Harbour Hunters and Trappers Association is organizing the first Canadian musk ox sports hunt in 1980 (see Appendix C) . Most hunters and trappers also fish, although only for domestic purposes, and catch about 5,000 pounds of char, whitefish and lake-trout species throughout the year. Fish are not particularly abundant on Banks Island. A few lakes near Kellett River are fished for char and trout in the fall while trapping, and there is a small char run at the mouth of Sachs River. Fish Lakes, southeast of Sachs Harbour, provides excellent spring fishing. Char and whitefish inhabit the Thomson River system and some of the large lakes in the northeast part of the island, which drain into the Prince of Wales Strait.

WESTERN VICTORIA ISLAND

The major settlement' in this area is Holman, located on the west coast of Victoria Island on the north side of Prince Albert Sound, about 675 km. by air from Inuvik. The settlement is often called Holman Island, although it is in fact on Victoria Island and Holman Island lies nearby to the southeast (see following map) . Holman was established by a Hudson's Bay Company trading post in 1923. This post was moved twice before being located close to its present site in 1939. In 1962, Hudson's Bay Company abandoned its post at Read Island, an event that led to the immigration of many Inuit families to Holman. The settlement was again moved a short distance in 1965. In 1974, the population was 241; in 1978 the population of 306 was 89 percent Inuit. Holman has twice-weekly scheduled air service from Yellowknife, fairly frequent charter flights from Inuvik, a nursing station, a primary school, a library, weekly mail service, several churches , a general store, the Holman Eskimo Cooperative and the Cooperative-run four room hotel and community meeting centre.


M'Clure Strait
Richard Collinson Inlet
Banks Island
Deans Dundas Bay
Jesse B.
Prince of Wales Strait
SACHS HARBOUR
see also: CAMBRIDGE BAY
Cape Treadwell
Victoria Island
Berkeley Pt
Walker Bay
Fort Collinson
Boot In.
Umergun
B.B.
River
Minto Inlet
L. Tatik
Kuujjuak
Kuujjuak
Nelson Head
Cape Ptarmigan
Kitikat
North Tahiryuak Lake
HOLMAN ISLAND
Mashuyak
Holmam Is.
Anialik
Kuuk R.
Amundsen Gulf
Pitutak
Ft. Brabant
Prince Albert Sound
Linaluk Is.
Horizon Islets
Naloagyok
Mount Bumpus
Colville Mountains
River
South Tahiryuak Lake
Kugaluk
Penny Ba
Wollaston Peninsula
Read Is.
scale
kilometres
20 0 20
miles
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Sutton

Like Sachs Harbour, the economy of Holman is centered around trapping. Traplines begin at Holman, mainly going north, either across the land or around the shoreline or even out on the sea ice. The entire coastal area of Minto Inlet, Walker Bay and Prince Albert Peninsula is fully trapped. From Minto Inlet trap lines fan out to extend north and east deep inland. The north coast of Prince Albert Sound, east from Holman to Kagloryuak River, and parts of Wollaston Peninsula are also trapped. As well, some trappers request permission from Sachs Harbour to cross the ice and trap along the east coast of Banks Island. Many of the present residents in Holman were originally Bankslanders.

The Holman Islanders have retained some of their dog teams and, thus, have been able to cash in on some of the big money paid out by sports hunters for some of the polar bear quota in this area. There has been a small musk ox quota issued in this area and four of these have been slated for a commercial sports hunt. There are no local oil company bases to provide a secondary wage economy in this area, but the Eskimo Cooperative has capitalized on the amount of artistic talent in the area and is well established in the arts and crafts industry. Residents put a good deal of effort into fishing but it has so far been entirely for domestic purposes. There has been some talk with the Cambridge Bay char fishery (see Appendix A) regarding the sale of locally caught char - there does not seem to be any action proceeding on this inquiry. The major fishing in this area is centered on Lake Tatik on the Kuujjuak River during the fall. In spring during trapping season, many of the northern lakes are fished; in the summer the sea and lakes near the mouth of the Kuujjuak are the site of runs of several species. It is estimated that the annual catch at Holman is about 30,000 pounds. There is also a substantial seal harvest in Holman that might be able to be further utilized in some manner (see Appendix D).

Chapter 4

I. D.C. FISHERY, GENERAL DATA

CONCEPT FORMULATION

Since the Berger Report was published in 1977, and perhaps a little earlier, there has been a continually growing renewed interest in the Delta fish resources. This interest was metamorphosized into action when early in 1979 I.D.C. attempted to contact a consulting firm to do a feasibility study on a fishery project. Eventually, a suitable firm, Foodwest Resource Consultants in Vancouver, was located and a proposal regarding multi-use food processing activities, was received (see Appendix B). It was hoped to finance this study through Special ARDA; however, at the time of this writing the application is still being processed and its future uncertain.

The concept in the proposal was, as mentioned above, to establish a multi-use food processing plant at some location in the Delta, adaptable to a number of alternatives and complementary uses. The major economic basis of the plant was to be a fishery organized from the local fishermen exploiting the major species found in the Delta, whitefish, cisco, inconnu, pike and burbot. The product would be marketed locally by I.D.C.' s Country Food Store project (see Chapter V). Outside the Northwest Territories, some negotiations with the Freshwater Fish Marketing Corporation (FFMC) in Winnipeg would be necessary to determine rational marketing methods.

There are also a variety of other local items that could be processed through the plant on a marginal basis. These include whitefish and burbot roe, herring, reindeer and seal products. Most of these need a great deal of further study before any attempt is made to utilize them.

FEDERAL QUOTAS ON FISH RESOURCES

It has been verified by many sources that northern fish species are much slower growing than their southern cousins. Total populations are, for the most part, unknown and hence a very real danger of over-exploiting this limited resource exists. Thus far, such a situation has not occurred and the existing fisheries come nowhere near using the areas full potential.

Nevertheless, some doubts have been expressed as to whether the current domestic fishery and a large commercial fishery can comfortably co-exist. In order to help conserve a self renewing fish population, the federal Department of Fisheries has set quotas for many of the fish species in many of the Western Arctic waterways. If a lake or river without a quota proves accessible to commercial fishermen, a quota can be applied for and will be granted based on several years provisional fishing. In those areas where quotas are already set on some species but not on other species, a commercial fishing licence allows unlimited fishing of those species without quotas. However, with the occurrence of such an event, it is likely that quotas on those species would quickly be placed. Table II following, indicates some of the federally set quotas for this area.

The quotas listed are taken from the Variation Notice from the Department of Fisheries and therefore represent only total quotas for the year 1979-80 in areas Federal Fisheries would like to see fished. For instance, there is another 500,000 pounds of herring quota available in the Cape Perry area - it is not listed in this year’s Variation Notice, but would be granted if requested. It also is not indicated whether the quota listed in the Variation Notice is annual or for a specified span of years, usually 5 to 7. Several of the outlying areas around Yellowknife have been issued such quotas for biological reasons. There are at present, no such areas around the Delta. Information regarding quotas will be found in Fishery Regulations through the Department of Fisheries.

TABLE II

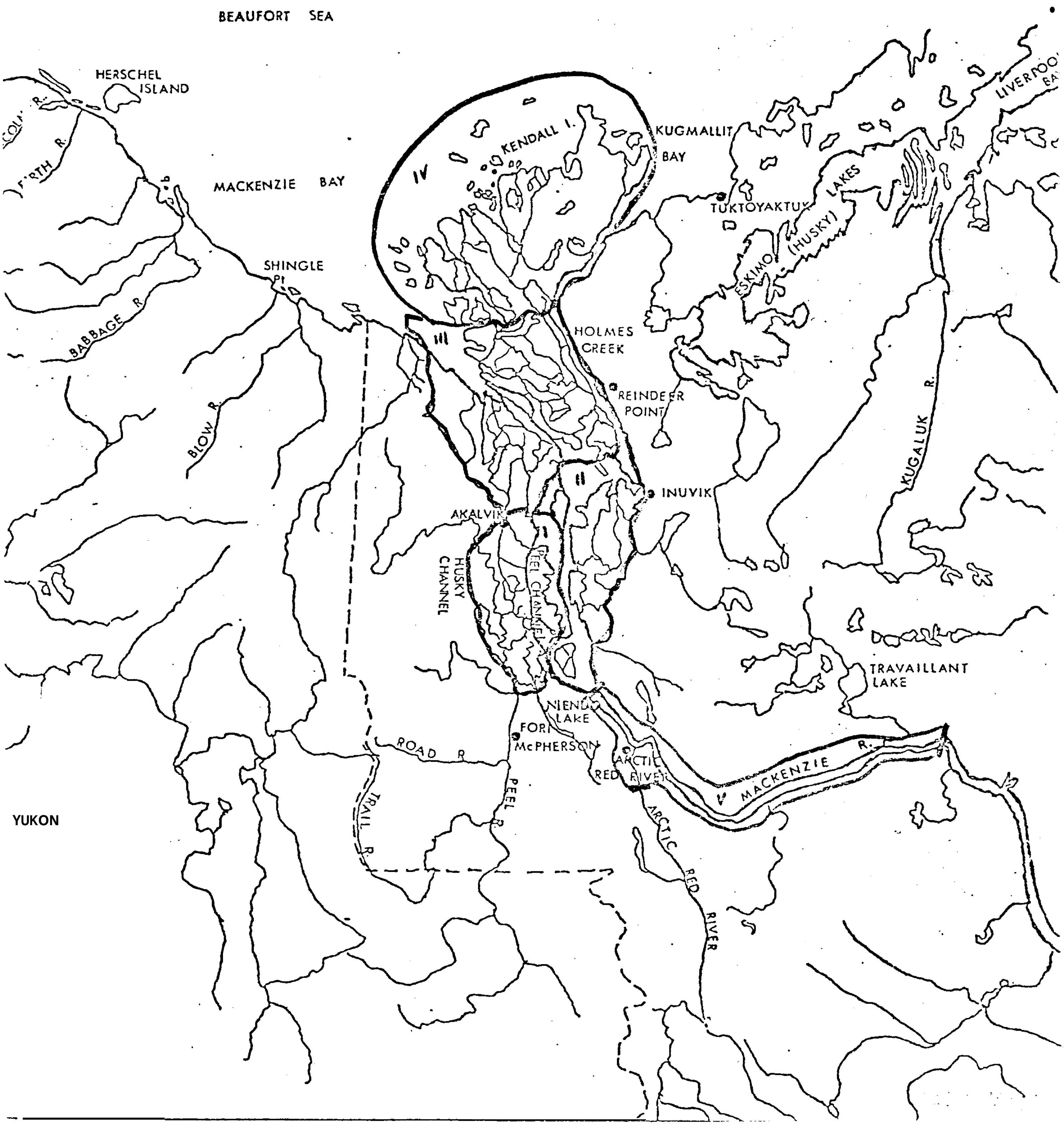
Effective Quotas in Western Arctic Region, 1979/80

COLUMN I Waters	COLUMN II Species	COLUMN III Legal Mesh Size in Inches	COLUMN IV Quota - in Pounds Round Weight	COLUMN V Approximate Distance From Inuvik (km.)
Hornaday River (69-20N, 123-45W)	Arctic char (searun)	5.5	15,000	400
Liverpool Bay (69-45N, 130-00W)	Herring	2.5	500,000	190
	Cisco	2.5	25,000	
	Inconnu	5.5	2,500	
Mackenzie River Delta Area I (See following map)	Whitefish	5.5	5,000	70
	Arctic char	5.5	2,000	
	Lake trout	5.5	5,000	
	Cisco	2.5	5,000	
	Burbot and Northern pike	5.5	10,000	
Mackenzie Delta Area II) (See following map)	Burbot and Northern pike	5.5	10,000	
	Cisco	2.5	5,000	
	Whitefish	5.5	50,000	
	Lake trout	5*5	5,000	
Mackenzie Delta Area III (See following map)	Lake trout	5.5	5,000	85
	Cisco	2.5	5,000	
	Whitefish	5.5	100,000	
	Burbot and Northern pike	5.5	10,000	

T/l

Mackenzie Delta Area IV (See following map)	Herring	2.5	500,000	110
	Lake trout	5.5	5,000	
	Inconnu	5.5	10,000	
	Whitefish	5.5	10,000	
Mackenzie Delta Area V (See following map)	Whitefish	5.5	10,000	125
Peel River (67-37N, 134-52W to junction of Satah R.)	Whitefish	5.5	5,000	125
Sitidgi Lake (68-30N, 132-40W)	Trout and Whitefish	5.5	3,000	50

MACKENZIE DELTA AREA



Due to the lack of information on fish stocks, spawning areas, populations and runs, the current view of all quotas issued by the Department of Fisheries in the Northwest Territories is that these quotas represent a provisional estimate and should be verified by any potential user. Even without this admonition it is only common sense to include a monitoring function in any commercial fishing enterprise. Because many of the important Delta fish populations have circular runs, one of the concerns expressed by the local Fishery Officer is that the same population of fish is being fished in different areas. To a certain extent this is being taken into account; however, it still may have led to an exaggerated estimate of the total resource.

IDENTIFICATION OF SPECIES

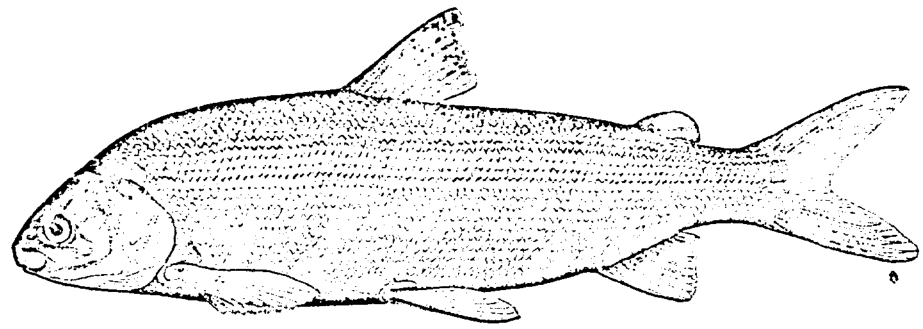
In order to avoid the confusion generated by the differences among local, common and scientific names of the various species, all available species from this area have been described. Some indication of the relative abundance based on previous studies may also be given in this section, although the only quotas available are those listed in the previous section.

Corregonidae

The most common and important of the families of species in the Western Arctic are in the whitefish or Corregonidae family. Whitefish are related to the salmonids (salmon, char and trout) and the graylings, which also possess a single soft dorsal fin plus an adipose fin, and have a scaly process at the base of each pelvic fin. Whitefish, however, do not have stronq teeth in the jaws, and their scales are rather large. Some can grow to quite a large size. They inhabit both lakes and rivers, and a few venture into the sea. They spawn in autumn or winter, shedding small pale eggs over gravel or rocks.

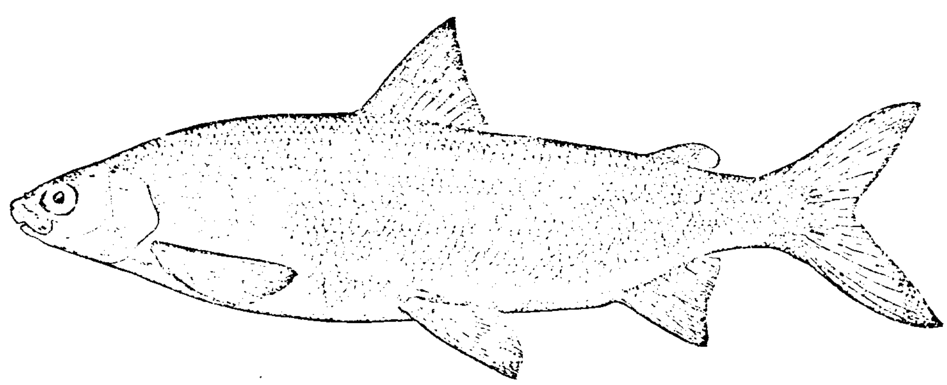
There are six species of the whitefish family commonly found in the Western Arctic:

Latin Name	Common Name	Local Name
Coregonus nasus	Broad whitefish	Whitefish
Coregunus clupeaformis	Humpback whitefish	Crooked back
Prosopium cylindraceum	Round whitefish	
Stenodus leucichthys	Inconnu	Coney
Coregonus autumnalis	Arctic cisco }	Herring or
Coregonus sardinella	Least cisco }	Lake Herring



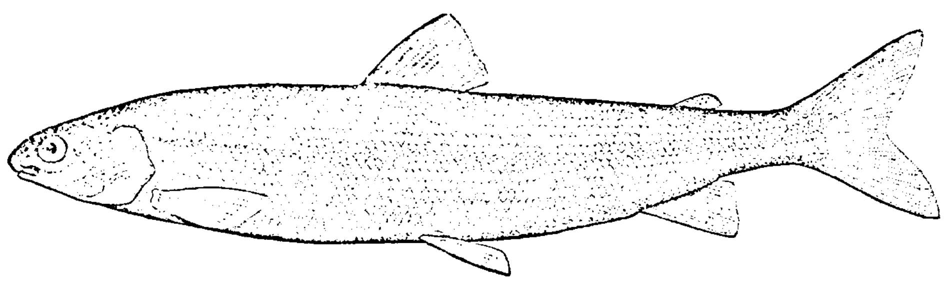
The broad whitefish occurs mostly in rivers, sometimes in lakes. In the Delta area it is anadromous, moving into the brackish water along the coast at the river mouths during periods of heavy river flow. It is a bottom feeder, eating molluscs and aquatic insect larvae.

The average size is over 4 lbs. (2 kg.) and occasionally as large as 35 lbs. (16 kg.); the average length is 18 in. (46 cm.). It is silvery brown or blackish in colour with a yellowish belly; the fins are dark without distinct patterns. An upstream spawning run of broad whitefish occurs in July and August in the Mackenzie River. Broad whitefish will be found in most of the larger river and lake systems in the Western Arctic.

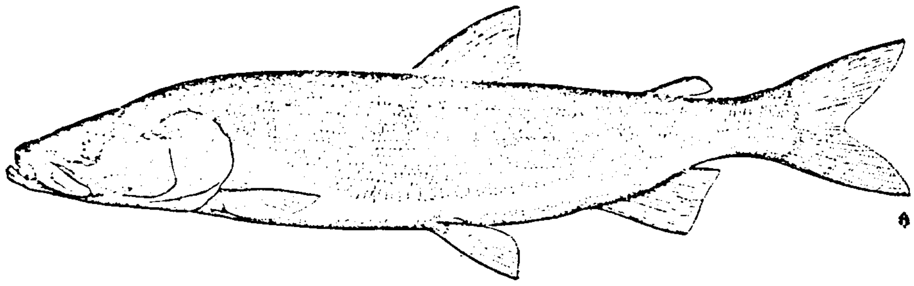


Crooked backs live in the same conditions and areas as does the broad whitefish. Their feeding habits are also similar to the broad whitefish, although the humpback whitefish may also prey on forage fishes to some extent. During spawning, the female deposits 10,000 to 12,000 eggs per pound of body weight. Spawning usually occurs from mid-September to mid-November. This species grows slowly, attaining an average mature length and weight slightly less than that of the broad whitefish. The general coloration is silvery with a faint olive-green cast along the back. The fins are dark edged.

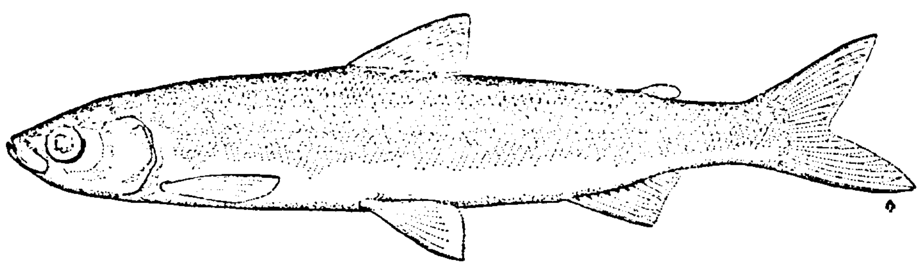
In the Western Arctic the crooked back tends to carry cysts of the tapeworm "Triaenophorus crassus" which, although harmless to human beings, are unsightly and destroy the fish's market value. The adult tapeworm lives in the intestine of the northern pike, where it matures and releases its eggs in the spring. The eggs hatch and infect the minute crustacean "Cyclops". The infected crustaceans are eaten by crooked backs, ciscos and lake trout where the cysts develop. The life cycle is completed when a pike swallows a fish containing these cysts. There is a system of government inspection, based on candling the flesh against a bright light, to control the sale of infected fish.



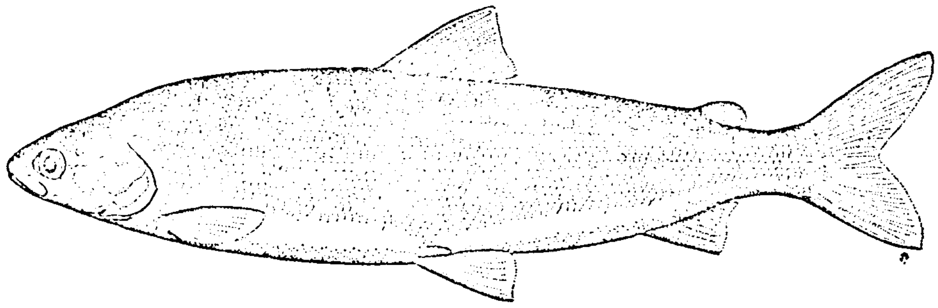
Round whitefish inhabit many of the lakes and rivers in the Western Arctic. They are widespread and prevalent in the area but are never particularly concentrated. The round whitefish is silvery in colour, with the dorsal surface and head a bronze tinged with green. Spawning takes place around late November. Roe is similar to that of other whitefish, but bright orange in colour. The round whitefish is small, not normally exceeding 15 in. (38 cm.). Food consists of bottom organisms in shallow water areas.



Inconnu are most abundant in large muddy rivers and associated lakes. The Mackenzie Delta is an ideal environment. The coney is greenish-brown above and silvery below. It is usually anadromous. Migration up river occurs in June and July and spawning takes place in the fall, although it is occasionally non-migratory, living in lakes. Females carry from 125,000 to 325,000 eggs but have an interval of 3 to 4 years between spawning periods. The inconnu is unique in being the only predatory member of the whitefish group. It has been known to reach 55 lbs. (121.5 kg.) and 55 in. (141 cm.) although it is normally somewhat smaller. The flesh has a high oil content.



The least cisco grows to about 12 in. (31 cm.) in length and is silvery in colour with brown on top. It has both anadromous and non-migratory varieties. The anadromous form has large dark spots on the back and head.



The arctic cisco is entirely anadromous and ascend the Mackenzie, Arctic Red and Peel Rivers in early spring. Spawning occurs in late summer and early autumn. After spawning, a distinct downstream migration occurs; on the Mackenzie, this is in November and December.

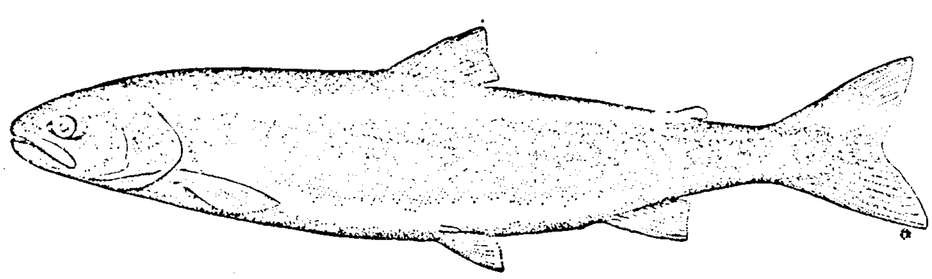
All of the lake herring are plankton feeders and normally maintain a school or aggregate formation. The anadromous forms from the Delta area are found along the coast to Herschel Island. They play a role in the food supply of beluga whales in that area, although the full extent of that role is unknown.

Salmonidae

Related to the whitefish family, the salmonidae family also has an important position in the Western Arctic species. The species in this family have strong teeth in the jaws, small scales, and a short or moderate soft dorsal fin. Their eggs are large, yellowish or pinkish, and nonadhesive, and are laid in shallow depressions constructed in gravel-bottomed streams. These fish are generally large and highly edible and, thus, of considerable importance.

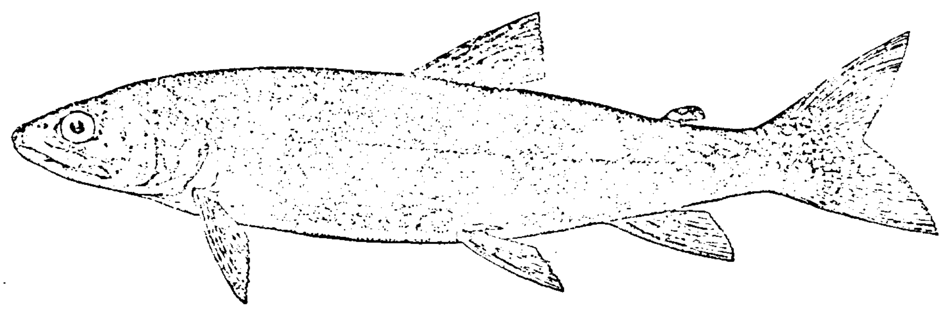
There are four species of the salmonidae family found in the Western Arctic:

Latin Name	Common Name	Local Name
Salvelinus alpinus	Arctic char	Char
Salvelinus namaycush	Lake trout	Gray trout
Oncorhynchus keta	Chum salmon	Salmon
Oncorhynchus gorbuscha	Pink salmon	Salmon

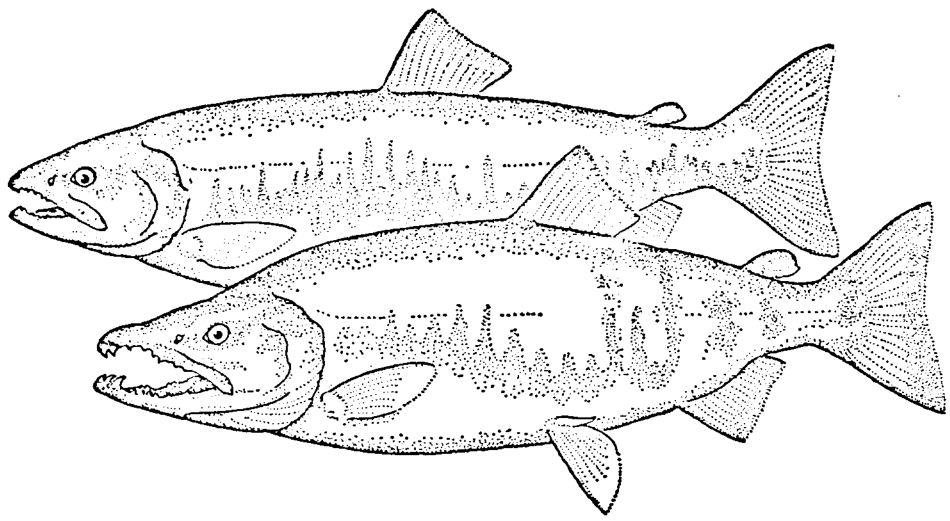


The arctic char is the object of several commercial fisheries outside the Western Arctic, but the Western Arctic populations are too widespread and limited to be the sole object of a commercial fishery. The species is mainly anadromous, but may exist in land locked forms. The colour is extremely variable; the dorsal surface is usually olive-green or blue-brown, the sizes may be pale or bright red or orange. The fish is not usually spotted but when present spots are large cream, pale pink or orange markings. Sea-run char are almost entirely silver when they first arrive in the river. Char inhabit most streams and rivers along the coast and have been reported in the tributary lakes and streams on the west side of the Mackenzie River as far south as Norman Wells. There seems to be substantial runs fished in Paulatuk from the Hornaday River and at the Firth River. Banks Island also seems to have a good size population in its lakes and surrounding sea area.

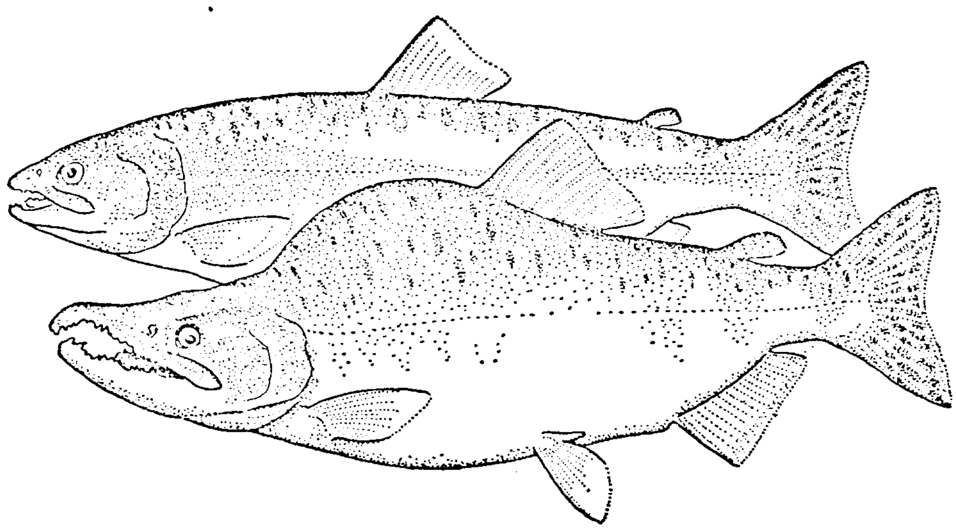
The spawning runs occur in August and September. Spawning takes place in the autumn, and the seaward migration of spawning adults occurs the next spring just before breakup. Char roe are quite large (3-4 mm. in diameter) and a large female may contain as many as 7200. The individual female does not spawn annually. Char is a particularly slow growing species, requiring about 10 years to reach 5 lbs. (11 kg.) .



The lake trout is usually considered an inhabitant of deep cold lakes. However, in the Western Arctic it is also found in shallow tundra lakes and large clear rivers sometimes venturing into the muddy waters of the Mackenzie and Anderson Rivers and the brackish waters at their mouths, it really prefers clear fresh water. Several populations of lake trout can be found on Banks Island. There is considerable variation in colour, but the body is generally blue-gray or bronze-green shading into pale underparts, with pale spots on sides and back. The flesh colour varies from almost white to red. Their diet consists of other fishes, bottom organisms, plankton and insects. Lake "trout" is of course a misnomer, as it is a char species not a trout. They spawn in October\ November and, like the char that they are, exhibit a particularly slow growth rate.



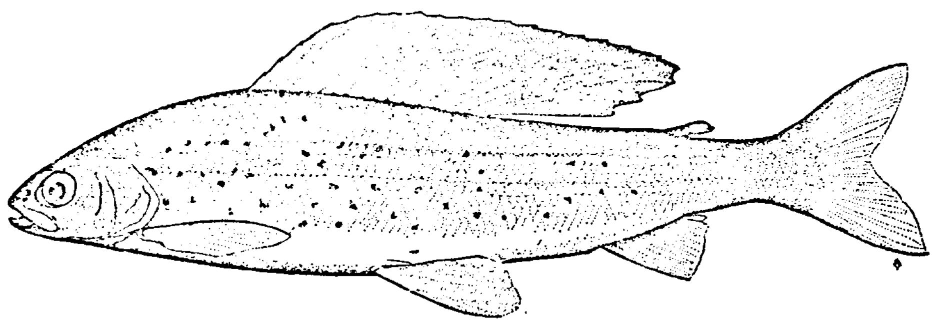
The chum salmon spends very little time in fresh water. The first chums appear at the mouth of the Mackenzie in August and reach Great Slave Lake to spawn in late September or October. Chum salmon, also known as dog salmon, are of considerable importance commercially; however, the runs in the Mackenzie system are too small to support a fishery. The few that are taken each year get caught incidentally in nets set for the whitefish runs.



The pink salmon, smallest of the salmon species, although known to spawn along some of the Western Arctic river systems, particularly the Mackenzie, is even rarer than the chum. They are also fall spawners and have been caught in the Mackenzie, migrating up the Peel and Rat, and in the Anderson Rivers. Migration to sea as small fish is obligatory for both chum and pinks.

Thymallidae

The only member of this family found in the Western Arctic is Thymallus arcticus, the arctic grayling.

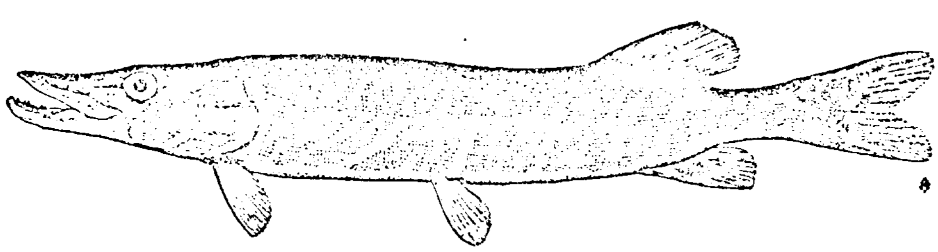


Grayling have much the same mainland distribution as lake trout except that they rarely occur in brackish water and prefer clear waters even more than lake trout. They can be found in the muddier waters of the Mackenzie, but usually where clear tributaries enter. They are trout-like fish with small but toothed jaws, large scales, and a large colourful flaglike dorsal fin.

The male of the species has an iridescent peacock colouraion. They average 14 in. (35.6 cm.) and 3.5 lb. (1.6 kg.). Spawning usually takes place about mid-July, during breakup. Eggs are amber coloured and about 2.5 mm. in diameter. The average female will contain 4,000 to 7,000 eggs.

Esocidae

There is also only one member of this family to be found in the Western Arctic. It is Esoxlucius, the northern pike. It also goes by the local name of jackfish.



Jackfish are ubiquitous in all freshwater areas; and indications seem to be that they are also able to tolerate low salinities and thus are found along the coast at river mouths. The back and sides are dark green to dark brown in colour, the sides have irregular light yellow spots roughly arranged in vertical rows, and the underside is usually a yellow-white. Pike spawn in early spring in the grassy margins of lakes and streams. Females carry tens of thousands of eggs. The young hatch in two to three weeks and commence feed ing upon plankton. The pike is a voracious feeder and has been described as the "freshwater wolf". In adult life its principal food is other fish of all available species (including its own kind) but also insects, leeches, small birds and small mammals. In the Mackenzie area one year old pike do not exceed 4 in. (10 cm.) in length, and mature at 5 to 6 years of age. It can take nearly 25 years for a jackfish to reach 25 lbs. (11.5 kg.), but the abundance of natural prey and protective shelter of the Mackenzie Delta allows this to be an average size.

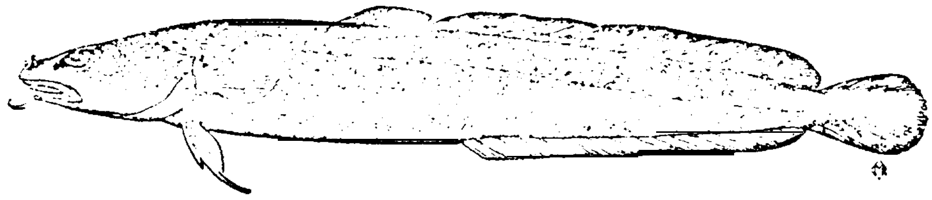
Although used only for dog food in the North, pike has potential as a fishery object. It occurs in large numbers and its flesh is firm with good flavour. There is an established market in Europe and a growing market in North America for this fish.

Gadidae

The codfish, or Gadidae family, is mainly a marine type of fish although there is one species adapted to a purely freshwater existence. The marine cods are of commercial importance world-wide, but in the Western Arctic there is little or no effort directed toward utilization of the existing marine codfish populations.

There is, however, some local consumption of the freshwater specie . The species found in the Western Arctic are:

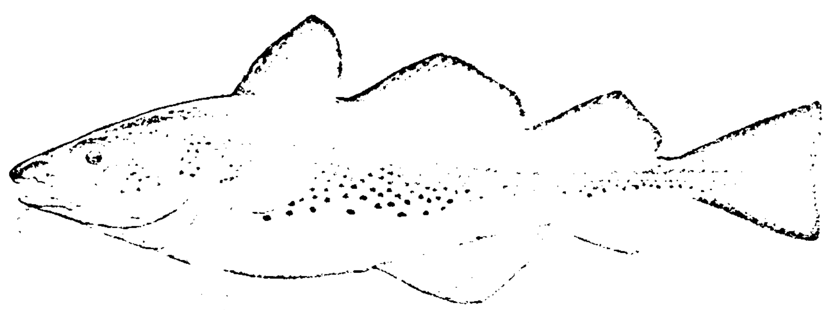
Latin Name	Common Name	Local Name
Lota iota	Burbot	Losche
Boreogadus saida	Polar cod	Cod
Eleginus navaga	Saffron cod	Cod
Arctogadus borosovi	Arctic cod	Cod
Gadus ogae	Greenland cod	Cod



Burbot are found in all freshwater habitats of the Western Arctic. They are the successful codfish invader of fresh waters. As well, they are able to tolerate very low salinities and are to be found in the mouths of the larger rivers and the adjoining coastal areas. The losche has a heavy skin, which is coloured dark olive above with chainlike blackish or yellowish markings on the sides. The average size is about 17 in. (430 mm.) at about six years of age.

Spawning occurs in late winter to early spring. One female may carry over a million eggs, which are deposited in streams and lake shallows under ice in from 1 to 4 ft. (0.3 to 1.3 m.) of water. Lasche prey on most of the other species of fish in this area, only the jackfish prey on losche.

Besides the names mentioned previously, burbot has received several other local names in other areas; it has been called ling, eelpout, freshwater tusk, maria, metling, methye, lush, dogfish, mother-of-eels, sawyer and lake lawyer. There has been a small but increasing market for this fish developed in Ontario. The flesh is very palatable and the liver, like all cods, is high in vitamin A and D content. There is also the possibility of the development of a market for burbot roe. Although the traditional means of catching burbot is jigging through the ice if the species is included in a commercial enterprise it may be worthwhile to introduce trap nets.

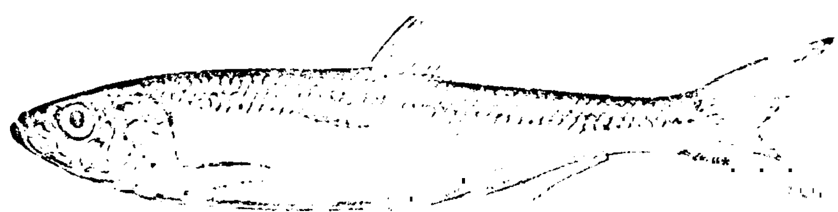


The remaining species of marine cod are fairly similar. The arctic and polar codfishes are circumpolar species that readily stay in the vicinity of ice and occasionally enters rivers . The saffron cod is a yellow-sided fish occurring in the Arctic Ocean apparently breeding in the sea but also entering the lower sections of rivers. Spawning is thought to occur during later winter to early spring; cod, in general, produce great quantities of eggs. The most plentiful species of. cod seems to be the greenland cod, the majority of which are found east of Tuktoyaktuk peninsula. However, distribution is patchy and they are mainly restricted to bays. Cod are fished by jigging through the ice but no appreciable catch is known to have ever occurred. Stocks of cod in this area are almost totally dependent upon a single successful year class and therefore capable of supporting only a minor yield.

Clupeidae

As has been noted previously, there is one member of this very important family to be found in the Beaufort Sea:

Latin Name	Common Name	Local Name
Clumpea harengus pallasi	Pacific herring	Blue herring

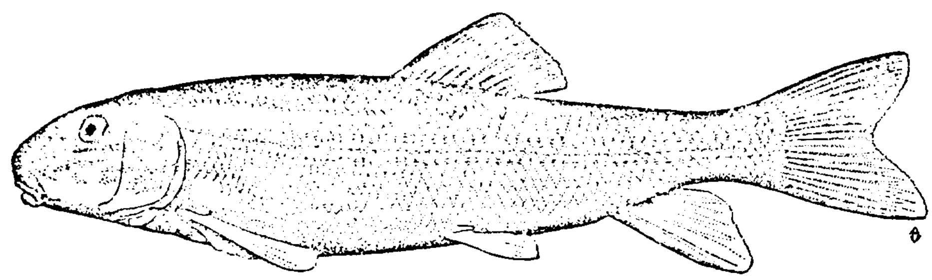


Herring average less than 12 in. (30 cm.) in length and 1 pound (.5 kg.) in weight. They are silvery in colour with a deep steel-blue back. Spawning time depends heavily on locality, but all available evidence suggests early spring - possibly early May. In the coastal regions, herring have been reported as far east as Bathurst Inlet, but are most plentiful around Tuk , Liverpool Bay and Cape Bathurst. Herring in the Western Arctic are anadromous and a substantial run is fished domestically as far up the Mackenzie as Aklavik. There is a definite potential for a successful fishery utilizing this species; however, further research is indicated before any capital investments are made.

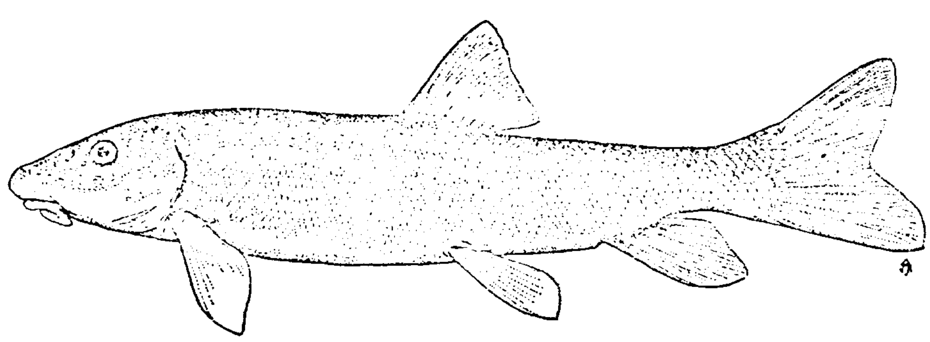
Catostomidae

There are two members of the sucker family found in this area. Suckers do not form part of the local fishery, are only caught incidental to other species and even then are only used as dog food. Nevertheless, both of the suckers found in the Western Arctic are good to eat, and are particularly amenable to canning. It only remains to establish total population figures in order to make an assessment of the potential.

Latin Name	Common Name	Local Name
Catostomus commersoni	White sucker	Sucker
Catostomus catostumus	Longnose sucker	Sucker



Although preferring warmer waters, the white sucker has been found in the Mackenzie Delta. They have brassy-brown backs and silvery-white sides and underparts. The average fish is about 15 in. (381 mm.) and 5 lbs. (2.3 kg.). White suckers spawn along lake margins or in inlet or outlet streams during late spring, in the same areas as, but later than, longnose suckers.



The longnose, also called northern sucker, is found in all the mainland freshwater regions of this area and sometimes even ventures into the brackish water at the river mouths. It is the same average size as the white sucker but slightly different in colouring. The back and sides are dark gray to black and the underparts, white. It is much more abundant than the white sucker. Spawning occurs in the spring at breakup.

Petromyzontidae

All lampreys found in the Western Arctic are probably of the same species:

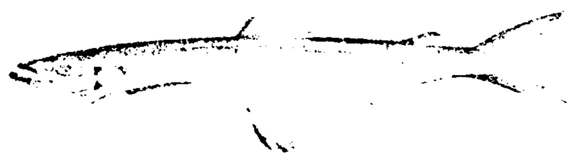
Latin Name	Common Name	Local Name
Lampetra japonica	Arctic lamprey	Lamprey

No use is made of this species locally and any caught are attached to other fish. As a result of non-use, little is known of the lamprey's habits and numbers in this area. However, catches of scarred whitefish and herring give a preliminary estimate of a moderately large sized population in the Delta. It is reported to occur in both fresh and salt water, and all the way down the Mackenzie to Great Slave Lake. The average size is 7 to 12 in. (177 to 305 mm.) and under .5 lb. (229 g.). Spawning probably takes place in July. It is interesting to note that this is the same species that is extensively marketed in Japan. If either the lamprey or sucker species are going to be pursued commercially, the introduction of trap nets will probably improve the effective catch for these particular fish.

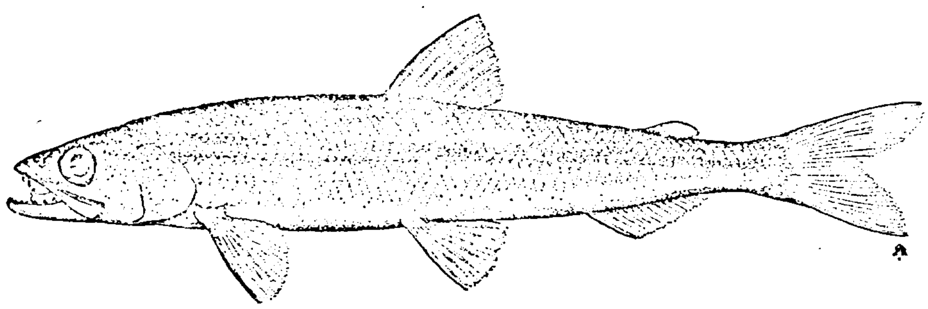
Osmeridae

Smelts are small, elongate, silvery fishes. All species found in the Arctic are anadromous. Although commercially used in other areas, all catches in the Western Arctic are incidental.

Latin Name	Common Name
Osmerus mordax	Rainbow smelt
Osmerus eperlanus	Boreal smelt



The average size of the rainbow smelt is 7 to 9 in. (178 to 228 mm.). In saltwater it is confined to the coastal area and is seldom found more than 2.3 km. from shore or at depths greater than 6 meters. It is mainly found in harbours and estuaries, as well as in tidal rivers.



The boreal smelt, also anadromous, is quite common in the Mackenzie Delta had has been seen as far as Arctic Red River. It is about the same size and colouring as the rainbow smelt, that is under 10 in. (254 mm.) , and light green on the back with an iridescent silver below. Spawning takes place in freshwater in the fall when large concentrations move in from the sea.

Other Species

The following listing, Table III, contains all remaining species of fish known to exist in the Western Arctic. Of these, there is a minimal potential for use of arctic sole and starry flounder. Relatively little is known about these species. Greater potential exists for processing the marine species, capelin, into a marketable product. Again, relatively little is known regarding the species; in fact, capelin only appeared in abundance for the first time in the memory of local residents in 1959.

TABLE III

Incidental Arctic Species

A. Western Arctic species found in both marine and freshwater environments:

Myoxocephalus quadricornis (Linnaeus)	four-horned sculpin
Liopsetta glacialis (Pallas)	arctic sole
Platichthys stellatus (Pallas)	starry flounder
Pungitius pungitius	Ninespine sticklebacks

B. Western Arctic species found in marine waters:

Mallotus villosus (Muller)	capelin
Anarrhichas orientalis	wolffish
Stichaeus punctatus	arctic shanny
Leptoclinus maculatus	shanny
Eumesogrammus praecisus	four lined snakeblenny
Lumpenus fabricii Reinhardt	Greenland blenny
Pholis fasciata Bloch and Schneider	tissy, banded gunnel
L. medius (Reinhardt)	stout eelblenny
Acantholumpenus mackayi (Gilbert)	blackline prickle back
Gymnetis viridis (Fabricius)	unerak, fish doctor
Lycodes mucosus Richardson	(Richardson's eelpout)
L. jugoricus Knipowitsch	schlupaoluk
L. polaris Gilbert	wattled eelpout
L. palidus Collett	Arctic pale eelpout
L. 'turneri Bean	polar eelpout

L. rossi Malmgreri	threespot eelpout
Ammodytes hexapterus	sand lance
Artedeilis scaber Knipowitsch	hamecon
Gvmnocanthus tricuspis (Reinhardt)	staghorn sculpin
Icelus bicornis (Reinhardt)	two-horned sculpin
I. spatula Gilbert and Burke	spatulate sculpin
M. scorpius (Linnaeus)	seascorpion
M. scorpioides (Fabricius)	false seascorpion
Triglops pingelii (Reinhardt)	ribbed sculpin
T. nybleni Jensen	mailed sculpin
Aspidophoroides olriki Lutken	arctic sea poacher
Leptagonus decagonus (Block & Schneider	northern alligator fish
Eumicrotremus derjugini Popov	leatherfin lumpsucker
E. spinosus (Fabricius)	Atlantic spiny lumpsucker
Careproctus reinhardti Kryer	sea tadpole
Liparis cyclostigma Gilbert	polka-dot snailfish
L. koefoedi Parr	gelatinous seasnail
L. liparis Linnaeus	stripped seasnail
L. herschelinus Scofield	bartail snailfish
Paraliparis copei	blacksnout seasnail
Hippoglossoides robustus Gill & Townsend	northern flathead flounder

C. Western Arctic species found only in freshwater areas:

Hypomesus olidus (Girard)	pond smelt
Chrosomus neogaeus (Cope)	finescale date
Couesius plumbeus (Agassiz)	lake chub
Rhinichthys cataractae (Valenciennese)	longnose date
Notropis husonius (Clinton)	spottail shiner
Platygobio gracilis (Richardson)	flathead chub
Percopsis omiscomaycus (Walbaum)	trout-perch
Stizostedion vitreum (Mitchell)	yellow walleye
Cottus ricei (Nelson)	spoonhead sculpin
Cottus cognatus [Richardson)	slimy sculpin
Pungitius pungitius (Linnaeus)	nine-spined sticklebacks

PREVIOUS FISHERIES, TOTAL CATCH INFORMATION

The purpose of this section of the report is to collate the available catch information from previous fisheries in table form. Some effort has also been made to estimate local usage

TABLE IV-A

Commercial Fishery Catch Date

Year	Species	Harvest	Estimated Income	Area Fished
1960	Unspecified	18,000	N.A.	Shingle Point
1961	Unspecified	12,000	N.A.	Shingle Point
1963	Whitefish, inconnu and trout	20,000	5,000	Holmes Creek
1964	Whitefish, inconnu and trout	30,000	None sold	Holmes Creek
1965	Char	36,000	18,000	Herschel Island
	Whitefish	20,000	4,000	Aklavik-Inuvik Delta Area
1966	Char	800	400	Herschel Island
	Whitefish	120,000	24,000	Aklavik-Inuvik Delta Area
1973	Whitefish & inconnu	50,000	12,000	Holmes Creek
1974	Whitefish, inconnu trout and pike	33,000	8,000	Holmes Creek
1975	Whitefish	50,000	N.A.	Aklavik-Inuvik Delta Area

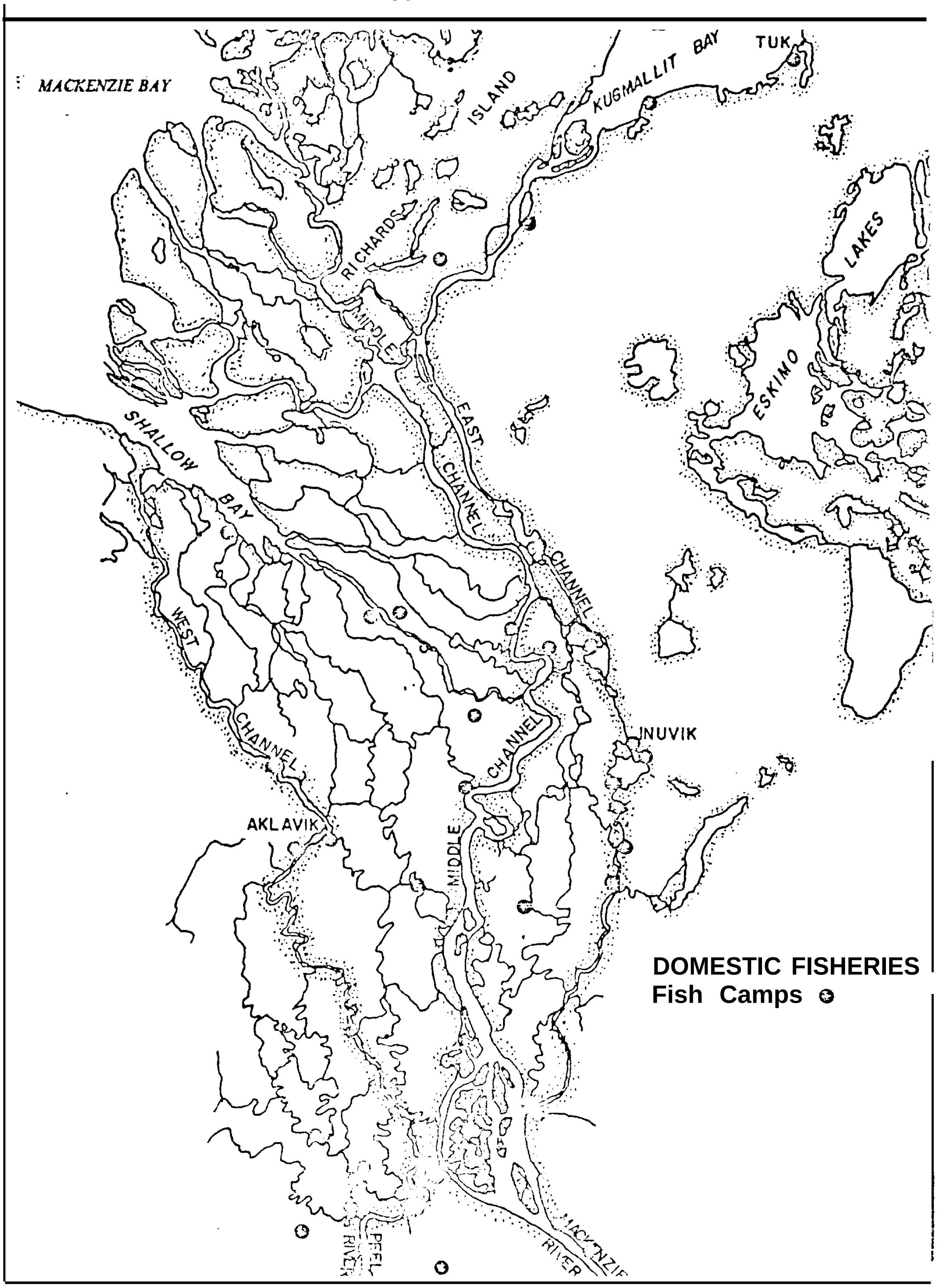
T/3

TABLE IV-B

Domestic Fishery Catch Data

Year	Catch/Utilization (lb.)	Area Included in Estimate
1962	2,700,000	Delta area (not including Tuk)
1963	1,750,000	Delta area (not including Tuk)
1964	2,000,000	Delta area (not including Tuk)
1965	350,000	Inuvik
	500,000	Aklavik
	550,000	Fort McPherson
	110,000	Arctic Red River
	600,000	Tuktoyaktuk
	2,660,000	Total Delta
1973	295,000	Aklavik
	129,500	Arctic Red River
	99,750	Inuvik
	172,900	Tuktoyaktuk
	697,150	Total Delta
1975	690,400	Delta area (not including Tuk)
	189,000	Tuk, Paulatuk, Banks Island, and Holman

T/4



Locations of traditional sites for domestic fishing.

and domestic catches, but it must be emphasized that such information is based solely on rule-of-thumb guesses.

UTILIZATION OF EXISTING CAPITAL RESOURCES

It has been suggested that I.D.C. can minimize its capital investment for the fishery project by renting from the Territorial government the equipment remaining from the previous Economic Development - run operations. This suggestion, unfortunately, has proven to be unviable. Extensive questioning of both the local Department of Economic Development and the Territorial Fish and Wildlife Service failed to turn up any kind of inventory for this equipment. The only two items that can be identified are:

1. The river scow used to transport fish from the camps to the plant, and

2. The trailers that comprised the plant premises (includes a freezer and an unspecified amount of other equipment) .

Neither of these identified items are available to I.D.C., however; the scow is earmarked for use in the Fish and Wildlife's upcoming project to establish the viability of a herring fishery, and the trailer is already leased out by Dome Petroleum.

ESTIMATION OF TRANSPORT COSTS

There are two types of transportation costs to be considered in the study of a possible fish plant in the Delta area. The first is the cost of getting the fish from the area of harvest to the plant. The second is the cost of moving the finished product to the markets. There would be three distinct categories in this latter type; the local market, the Yellowknife market and out-of-province markets.

In considering the first question, the cost of transporting fish to the plant, there are three means available: air transport, transport by barge or boat and, in the event of winter fishing, trucking over ice roads. In 1975, the estimated cost of buying and operating a single scow capable of transporting 3 to 4,000 pounds of fish within the Delta area was about 3¢ per pound. There is not, at present, anyone offering such a service on a commercial basis and, thus, would have to be operated by the fishery company. There is,

TABLE V

Air Rates in Western

COMPANY	RATES				
	Craft	Payload min. (lbs.)	Payload max. (lbs.)	Rate/mi.	A
Ram Air	Cessna 172		1000	$1.00	S
	185	800	1150	1.25	
	206	800	1150	1.25	
	207	900	1200	1.30	
	337	950	1350	1.35	
	Piper Aztec	900	1200	1.40	
	Cessna Beech Queen Air	1200	1600	1.75	
Aklavik Flying Service	Cessna 185	800	1150	1.30	
	337	950	1350	1.35	
	Airstar	1000	1400	1.40	
Aklak Air	Cessna 185	800	1150	1.30	
	Piper Aztec	900	1200	1.35	
	Navaho	1000	1400	1.75	
ean Borek Air	Beech 99	2500	3000	2.00	
	Twin Otter 300 Series	3500	4000	2.80	
	DC3	6000	6500	3.35	
Inuvik Coastal Airways	Twin Otter 200 Series	3000	4000	2.65	

TABL

Frequency

Company	Aklavik	T uk
Ram Air	5-6/day	l-2/da
Aklavik Flying Service	4/day	4/day
Aklak Air	l/day	10/wee
Kenn Borek Air	20/mo.	50/mo

T/6

of course, a limited area that can be served by this means; however, that is not to say that such an area might not be entirely sufficient to supply the operation of a small, economical fish plant. As mentioned, if a winter fishery is established, ice roads from the main settlements can be used. Rates, however, would have to be negotiated with individuals. Air rates are more standardized, as there are established charter companies operating on a regular basis. Table V indicates air rates from the companies based in Inuvik as of October 1979.

All of the rates represented in Table V are round-trip rates; that is, the cost is figured from Inuvik to the point of destination and return. It is possible to arrange to ship by backhauls from the major settlements, if one is willing to wait for the opportunity. The cost of the backhaul is a straightforward splitting of the charter cost among the parties involved. An indication of the frequency which each company flies to the major settlements is put forth in Table VI.

The cost per pound for any of these companies will be variable, but can be determined on the following basis: total cost of charter divided by total payload. Northward Airlines, the Western Arctic's local scheduled airline, has published general freight rates. These rates, of course, tend to be higher than a full capacity charter; they are listed in Table VII for reference.

TABLE VII

Northward General Freight Rates

INUVIK TO:	Under 100 lbs.	100 to 500 lbs. (¢/lb.)	Over 500 lbs.
Aklavik	18	15	14
Dawson	53	50	46
Ft. Franklin	123	107	95
Ft. Good Hope	74	63	54
Ft. McPherson	28	24	20
Ft. Norman	113	98	88
Norman Wells	97	85	74
Old Crow	28	26	20
Sachs Harbour	51	48	35
Tuktoyaktuk	32	28	22
Whitehorse	58	52	47

In considering the second type of transportation costs, the local market situation is affected by much the same structural organization as has been previously discussed. For the Yellowknife and export markets, the alternate methods are the same, air, river or overland, but the organizations involved and rate structure is different. The cheapest method seems to be rail and barge or truck and barge combination. However, barge service on the Mackenzie River is only available during the summer, the first saling from Hay River to Inuvik is approximately June 1st, with a final acceptance date for shipping of September 5th, The next alternative, overland, also has associated seasonal delays, as the Dempster Highway will be annually closed for several weeks in both the spring and fall for caribou migrations.

TABLE VIII-A

Transportation Rates Outside the Western Arctic

INUVIK TO:	Barge(2)	Air(3)	Overland(1)
		($/cwt)	
Yellowknife	6.01	20.00	N.A.
Whitehorse	N.A.	61.50	14.00
Edmonton	7.50 to 8.00	24.95	24.00
Vancouver	N.A.	38.10	13.00
Hay River	4.79	N.A.	N.A.

(1) Estimated rates by the White Pass and Yukon Route companies.

(2) All river transportation done by Northern Tra.nsportation CO. Ltd., Hay River.

(3) P.W.A.

TABLE VIII-B

Hay River Trucklines Freight Rates

INUVIK TO:	Rate	
Edmonton	$ 9.12/cwt.	40,000 lb. min.; $100 per load surcharge for refrigeration unit.
Yellowknife	$14.22/cwt.	40,000 lb. min.; $100 per load surcharge for refrigeration unit.
Whitehorse	$ 5.10/cwt.	Estimate only.
Vancouver	$12.12/cwt.	Estimate only, no existing run.

TABLE VIII-C

Points North Transportation Group Freight Rates

INUVIK TO:	Volumes[1] 1,000 lbs.	5,000 lbs.	10,000 lbs.	20,000 lbs.
Calgary	28.64	23.62	20.21	18.76
Edmonton	25.10	21.00	18.20	17.25
White horse	12.80	10.90	9.30	8.00
Vancouver	28.72	23.33	21.17	19.97
Backhaul Rates:				
INUVIK TO:				
Calgary	28.64	13.69	11.58	10.24
Edmonton	25.10	11.07	9.57	8.72
Whitehorse	12.80	5.45	4.65	4.00
Vancouver	28.72	13.58	11.68	9.54

(1) Full load rates (40,000 lbs.) can be negotiated.

ESTIMATION OF CAPITAL COSTS

The following, Table IX, gives some indication of the construction, operation, and maintenance costs in the various communities. Construction and maintenance costs are probably adequate approximations, but the operation costs in the table will be low as they represent approximations for standard commercial use. Food processing plants are particularly heavy users of not only energy and water but also important in the North, sewage disposal. To help estimate such costs, the following commercial rates were obtained in Inuvik: electricity - 9.5¢ for 40 kilowatts, with a $5 per month minimum charge; water and sewage - $1.52 for 1,000 gallons metered flow, with a $15.20 per month minimum charge.

To further evaluate the initial costs of setting up a fish processing plant, Table X lists several types of plants and estimates costs. As these estimates come from R.H. McLeod's A Fish Marketing Study published in 1972, a rough rule of thumb would be to double them for present costs. It would also be well to bear in mind that these estimates are for a single, specific type of fish process that is not necessarily the type that I.D.C. will want to consider.

TABLE IX

BUILDING [illegible] MAINTENANCE COSTS - 1979/8[illegible]

EXPERIENCE BY THE GOVERNMENT OF THE NORTHWEST TERRITORIES

SETTLEMENT	POPULATION '78	CONSTRUCTION COSTS (1) Y. K. = 1.00	OPERATION COSTS (2)	BUILDING MAINTENANCE COSTS
		index	—($ Per Sq. Ft.)	
Aklavik	797	1.39	3.00	1.2]
Arctic Bay	415	1.67	5.36	1.3
Arctic Red River	119	1.36	4.88	1.2(
Baker Lake	1021	1.59	4.02	1.3
Bathurst	28	1.60	5.20	1.3]
Broughton Island	348	1.62	4.62	1.3(
Bay Chimo	65	1.60	5'20	1.3]
Cambridge Bay	859	1.45	4.98	1.2
Cape Dorset	684	1.52	3.85	1.27
Cape Dyer	1.1	1.62	5.30	1.3(
Chesterfield Inlet	256	1..58	5.27	1.27
Clyde River	412	1.68	3.68	1.3(
Coppermine	801	1.53	4.27	1.21
Coral Harbour	423	1.56	3.51	1.2
Detah	161	1.01	1.62	1.0
Eskimo Point	891	1.52	3.80	1.2
Enterprise	40	0.99	1.81	0.9
Fort Franklin	463	1.40	3.35	1.2
Fort Good Hope	446	1.36	3.48	1.2
Fort Liard	325	1.47	3.99	1.2
Fort McPherson	790	1.37	3.40	1.2(
Fort Norman	290	1.35	2.93	1.1

SETTLEMENT	POPULATION '78	CONSTRUCTION COSTS (1) Y. K.= 1.00	BUILDING OPERATION COSTS (2)	BUILDING MAINTENANCE COSTS (3)
		index	($ Per Sq. Ft.)	
Fort providence	566	1.01	1.93	1.00
Fort Resolution	519	1.09	1.98	1.05
Fort Simpson	1083	1.12	2.41	1.03
Fort Smith	2434	1.01	1.39	1.00
Frobisher Bay	2926	1.42	2.47	1.23
Gjoa Haven	454	1.70	5.33	1.38
Grise Fiord	95	1.80	4.29	1.45
Hall Beach	349	1.68	5*10	1.29
Hay River	3483	0.98	1.79	0.98
Holman Island	306	1.68	5.46	1.33
Igloolik	737	1.65	3.85	1.29
Inuvik	3065	1.25	1.87	1.12
Jean Marie River	49	1*35	3.81	1.16
Kakisa	40	1.03	4.10	1.05
Lac La Martre	224	1.33	4.36	1.17
Lake Harbour	268	1057	3.84	1.32
Nahanni Butte	96	1.51	3.86	1.21
Nanisivik - Strathcona Sound	264	1.61	3.33	1.38
Norman Wells	330	1.21	1.79	1.10
Pangnirtung	872	1.50	3.26	1.27
Paradise Gardens	57	0.98	1.80	0.99
Paulatuk	160	1.62	5.49	1.30

SETTLEMENT	POPULATION '78	CONSTRUCTION COSTS (1) Y. K.= 1.00	BUILDING OPERATION COSTS (2)	MAINTE COSTS
		index	—($ Per	Sq. Ft.
Pelly Bay	258	1.85	6.25	1.
Pine Point	1878	1.01	1.13	0.
Pond Inlet	620	1.68	3.99	1.
Port Radium	132	1.42	3.25	1.
Rankin Inlet	987	1.48	3.72	1.
Rae/Edzo	1239	1.07	1.65	1.
Rae Lakes	171	1.42	4.51	1.
Reliance	9	1.40	4.70	1.
Repulse Bay	296	1.60	4.19	1.
Resolute	1.81	1.72	3.11	1.
Sachs Harbour	173	1.63	4.39	1.
Sanikiluaq	320	1.62	5.41	1.
Snare Lakes	67	1.40	4.50	1.
Snowdrift	258	1.33	3.11	1.
Spence Bay	464	1.65	4.98	1.
Trout Lake	61	1.48	2.04	1.
Tuktoyaktuk	746	1.40	3.39	1.
Tungsten	325	1.50		
Whale Cove	182	1.57	4.45	1.
Wrigley	174	1.36	2.89	1.
Yellowknife	9969	1.00	1.44	1.

FOOTNOTES:

1. All community costs are indexed to a base of 1.00 for Yellowknife . Yellowknife costs can be approximated by equating 1.00 in Yellowknife to 1.20 - 1.40 in Edmonton.

2. Operation costs include power and fuel requirements per square foot of building.

3. Maintenance costs are calculated per square foot of building space.

SOURCE : Department of Public Works
Government of the Northwest Territories.

TABLE X

Alternative i.

(a) A small packing station at Holmes Creek with a holding room capable of handling 6,000 pounds per day.

(40′ x 30′)	$18,000	
ice machine	12,000	
cooling room	6,000	$36,000

(b) A stationary processing anf filleting operation at Inuvik with freezing and cold storage capabilities.

(66′ X30′)	$27,000	
contact freezer	6,000	
cold storage equipment & installation	9,000	$42,000
TOTAL: (a)+(b)		$78,000

Alternative ii.

A small stationary station capable of receiving, filleting, freezing and packaging at Holmes Creek.

(65' x 40')	$35,000	
ice machine	12,000	
contact freezer	6,000	
cold storage equipment & installation	9,000	$62,000

Alternative iii.

(a) A portable fish receiving and packing plant at Holmes Creek.	$11,737	
(b) A stationary processing and filleting operation at Inuvik, with freezing and cold storage capabilities (as given in i.(b) above).	$42,000	$53,737

Alternative iv.

A completely portable receiving, filleting and packaging plant with freezer and holding facilities at Holmes Creek.

1	only portable fish storage unit (no freight)	$6,078.58
1	stainless steel cleaning table	1,008.00
I	Butler RHA Pacemaker building	3,079.00
1	stainless steel packing table	385.00
1	Chatillon hanging scales	377.50
1	gas drive centrifugal pump	91.00
50	polylewton fish boxes	735.00
12	immersion baskets	40.00
3	Uniroyal cutting boards	70.00
1	water storage tank	252.08
	pipes, etc. for water system	44.68
1	generator-portable gasoline operated 5000W	1,052.00
	refrigeration conversion	724.00
		$13,937.84
	Add Estimated Freight	2,500.00
		$16,437.84

Source: R.H. McLeod, A Fish Marketing Study, Northwest Territories, [illegible]

Chapter 5

I. D.C. FISHERY, SPECIFIC DATA

LABOUR SITUATION

The following tables give a rough first look at the labour potential in the Delta; they show total population, potential labour force, employment levels and income levels by communities. This data, while informative and useful as background, does not reflect some of the critical issues in consideration of a fish processing plant. There would be three types of labour involved in such an enterprise. Firstly, there would be the fishermen making up the fishery aspect. There are available, as pointed out in the community descriptions, quite a large number of experienced Delta fishermen.

These fishermen, while possibly not operating on a commercial basis, have continued to fish in this area and, for the most part, own their own equipment. Commercial type nylon nets 45 miles by 1.8 meters deep is the regular gear used. Mesh sizes vary from 3 to 5 1/2 inches according to the species being fished. Floats often consist of tin cans, plastic bottles or pieces of wood, while small stones or bags of mud are used for sinkers. Nets are usually set out from shore at right angles to the beach, one end being tied to the water's edge while a grapnel, rock or sack of gravel as mud served as an anchor for the offshore end. Care of nets is minimal; therefore combined with the floating debris problem of the Delta, nets seldom last for two complete seasons. Also these men probably will own their own boat, usually a large freighter canoe with a small to medium outboard motor. Such

TABLE XI

Population

ETHNIC DISTRIBUTION BY COMMUNITY

FOR INUVIK REGION

COMMUNITY	1978 Total Population	Indian %	Metis %	Eskimo %	Other %
Aklavik	797	42	—	47	11
Arctic Red River	119	87	8	—	5
Colville Lake	73	96	2	—	2
Fort Franklin	463	92	1	—	6
Fort Good Hope	446	80	12	1	7
Fort McPherson	790	77	14	1	8
Fort Norman	290	68	23	—	9
Inuvik	3065	7	4	18	71
Norman Wells	330	14	2	2	82
Paulatuk	160	—	—	100	—
Sachs Harbour	173	2	—	86	12
Tuk toyaktuk	746	2	—	87	11
INUVIK REGION TOTAL:	—	32	5	26	38

SOURCE: Department of Planning and Program Evaluation, Government of the Northwest Territories.

TABLE XII

Total Number of Tax Returns
Percentage of Population 15 Years or Older

Northwest Territories, Regions and Selected Communities
Taxation Year 1976

	Population Total	Number of Returns Total	Number of Returns % of Pop.	Population > 15 Number	Population > 15 % of Pop.	% of Population > 15 Filing Returns
Canada	22992605	12342712	54	17096430	74	72
Northwest Territories	42609	17681	41	25175	61	68
Baffin Region	7480	2456	34	3950	54	64
Frobisher Bay	2320	1067	46	1395	60	76
Pangnirtung	807	247	31	460	57	54
Residual	4353	1232	28	2095	48	59
Fort Smith Region	24268	11266	46	15745	65	72
Fort Simpson/Nahanni Butte	1136	539	47	795	70	68
Fort Smith	2288	1004	44	1485	65	68
Hay River	3268	1727	53	2235	68	77
[illegible]lly Bay	246	39	16	125	51	31
Pine Point	1915	932	49	1240	65	75
Rae/Edzo	1158	237	20	600	52	40
Yellowknife	8256	5372	65	5771	70	93
Residual	6001	1416	24	3494	58	41
Inuvik Region	7183	2750	38	4445	62	62
Aklavik/Cape Parry	781	186	24	450	58	41
Fort Franklin	422	100	24	230	55	43
Inuvik	3116	1637	53	2030	65	81
Tuktoyaktuk	590	234	40	340	58	69
Residual	2274	593	26	1395	61	43
Keewatin Region	3978	1119	28	2085	51	55
Coral Harbour	414	112	29	225	50	55
Residual	3564	1007	31	1860	56	55

[illegible] tribution
[illegible] Income Category

Northwest Territories, Regions and Selected Communities
Taxation Year 1976

	Number Of Returns								
	Category								
	less than 2000	2000-4000	4000-6000	6000-8000	8000-10000	10000-12000	12000-15000	15900-20000	20000+
Baffin Region	334	334	342	280	215	166	210	355	310
Frobisher Bay	136	128	128	93	94	7'3	85	161	163
Pangnirtung	42	41	53	28	19	23	6	23	[illegible]2
Residual Baffin Region	156	165	161	159	102	68	115	171	1[illegible]5
Keewatin Region	221	177	153	131	88	69	88	101	91
Coral Harbour	22	15	17	7	1.2	11	7	10	11
Residual Keewatin Region	199	162	136	124	80	57	78	91	[illegible]0
Fort Smith Region	1258	1327	1155	956	934	853	11901	1698	18[illegible]5
Fort Simpson/Nahanni Butte	89	66	69	52	44	46	61	62	50
Fort Smith	117	158	107	86	87	83	97	139	1[illegible]0
Hay River	159	204	185	175	147	122	193	266	276
[illegible]ay	7	5	12	5	5		5	-	-
Pine Point	77	74	56	54	65	52	111	234	209
Rae/Edzo	64	46	25	24	30	7	9	14	38
Yellowknife	511	580	519	426	468	471	603	825	969
Residual Fort Smith Region	234	194	182	134	88	72	111	158	243
Inuvik Region	351	352	309	272	214	205	287	422	3[illegible]9
Aklavik/Cape Parry	44	38	26	15	9	10	1.3	19	12
Fort Franklin	19	21	18	8	10	6	5	8	5
Inuvik	142	160	148	151	139	140	215	305	2[illegible]7
Tuktoyaktuk	38	40	38	43	22	10	12	16	[illegible]5
Residual Inuvik Region	108	93	79	55	34	39	42	74	69
Northwest Territories	2164	2190	1959	1639	1451	1293	1775	2576	2634

SOURCE: Department of Planning and Program Evaluation
Summary of Personal Income Statistics
Government of the Northwest Territories

TABLE XIV

Labour force participation for individuals
14 years of age and over in the Beaufort Sea economy[1]

	No. of Weeks	Wages and Salary Male	Wages and Salary Female	Wages and Salary Total	Hunting Trapping Fishing Male	Hunting Trapping Fishing Female	Hunting Trapping Fishing Total	Self-Employment Male	Self-Employment Female	Self-Employment Total	Without Work[2] Male	Without Work[2] Female	Without Work[2] Total
Aklavik	1-3	8	2	10	-	-	-	1	1	2	-		-
	4-10	19	13	32	8	2	10	-	1	1	2	-	2
	11-17	10	4	14	6	-	6	2	-	2	3	-	3
	18-24	4	7	11	9	1	10	-	-	-	6	2	8
	25-31	6	4	10							7	-	7
	32-38	3	3	6	-		-				6	3	9
	39-45	-	2	2	3	-	3		-	-	7	3	10
	46-52	17	19	36	7	1	8	i	-	1	10		18
	None	72		171	106	149	255	135	151	286	98	13;	235
	TOTAL[3]	139	1;;	292	139	153	292	139	153	292	1 39	153	292
Inuvik	1-3	2	2	4	-		-	–		-	-	1	1
	4-10	9	7	16	1	-	1	-	-	-	4	1	5
	11-17	14	9	23	4	-	4		1	1	3	-'	3
	18-24	8	7	15	4	-	4	i	2	3	6	-	6
	25-31	13	5	18	1	-	1			.	12	-	12
	32-38	3	1	4	2	-	2				4	1	5
	39-45	7	3	10	2	-	2	-		-	6	1	7
	46-52	63		91	17		17	1	3	4		2	10
	None	52	1:;	169	140	17;	319	169	173	342	12:	173	301
	TOTAL[3]	171	179	350	171	179	350	171	179	350	171	179	350
Tuktoyaktuk	1-3	5	2	7	-	–	-	-	-	-	- 2		- 2
	4-10	15	8	23	3	-	3			-	6	-	6
	11-17	25	6	31	5		5				7	-	7
	18-24	19	-	19	6	i	7	-		-	17	-	1 7
	25-31	12	4	16				1	“-	,19	-	.	19
	32-38	6	1	7									

TABLE XIV (Continued)

Wages and Salary			Hunting Trapping Fishing			Self-Employment			Without Work[3]		
Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
-	1	1	-	-	-				13	2	15
17	18	35	3	-	3	1	-	1	6	3	9
43	78	121	125	117	242	140	117	257	72	113	185
142	118	260	142	118	260	142	118	260	142	118	260
-	-	-	-	-	-	-					-
22	-	22	-	-	-	1	1	2	-	-	-
2	1	3	-	-	-	-	-	-	1	-	1
2	-	2	2	-	2	1	1	2	-	-	-
1	-	1	3	-	3	1	-	1	-	-	-
-	1	1	1	-	1	-	2	2	2	-	2
-	1	1	16	-	16	-	-	-	-	-	-
6	10	16	2	-	2	3	26	29	1	-	1
10	35	45	19	51	70	36	21	57	39	51	90
43	51	94	43	51	94	43	51	94	43	59	94
4	1	5	-	-	-	-	-	-	-	-	-
-	1	1	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	2	2	-	-	-
-	-	-	2	-	2	-	-	-	-	-	-
-	4	4	-	-	-	-	2	2	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
1	1	2	12	1	13	-	-	-	2	-	2
11	10	21	2	16	18	16	13	29	14	17	31
16	17	33	16	17	33	16	17	33	16	17	33

TABLExIv (Continued)

	No. Cf Weeks	Wages and Salary			Hunting Trapping Fishing*			Self-Employment			Without Work[3]		
		Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Sachs Harbour	1-3	-		-									
	4-10	4		4						-	-	-	
	11-17	2	i	3									
	18-24				-								
	25-31				8		8				2	-	2
	32-38				-		-						
	39-45	-	-		1		1		-	-	-	-	-
	46-52	3	2	5	2	-	2	-	1	1	-	-	-
	None	11	21	32	9	24	33	20	23	43	18	24	42
	TOTAL[3]	20	24	44	20	24	44	20	24	44	20	24	44

Source : DIAND, Mackenzie and Arctic Coast Manpower Surveys, 1969-70 : Table 4.

[1] Employment activities are not exclusive. Data include employment in more than one area by' the same individual so long as earnings were at least $200 per month.

[2] This may be interpreted as "not otherwise occupied", i.e. excludes housewives' students, medically unfit, retired and voluntarily idle persons.

[3] Refers to the entire population 14 years of age and over.

equipment is minimal, but entirely sufficient to supply the required amount of fish to a plant equipped with the means of transporting such fish from the more distant camps.

Another factor to be considered in regard to this aspect of the plant's labour force is that most of these men will be members of local Hunter and Trappers Associations. Thus, the monetary returns to the individual fisherman must be directly competitive with potential income earned through trapping. It is also infeasible to expect any type of commercial fishing to be done during the May/June muskrat trapping season. Therefore, succinctly stated: as in all such enterprises, there are plenty of people willing to work at it as long as they are paid enough.

There will also be a requirement for plant workers. These will be fairly minimum-skill type jobs and will mainly necessitate the availability of a large enough labour pool to provide not only the original complement of workers but also sufficient replacements to survive the area's high turnover and no-show rates. Any of the Delta settlements can provide sufficient manpower. The present minimum wage for such work is $3.68 per hour. However, normally in Inuvik one must pay $5 per hour in order to realistically attract manpower. This rate will be less in the other Delta settlements. It must also be kept in mind that Economic Development's trial fishery paid $6 per hour in 1975 (which would translate into 1979 dollars at about $9 per hour).

MANAGERIAL SKILLS

The third and final type of skill needed in the operation of an I.D.C. fish processing enterprise is management capability. The requirements for these delicate positions will be exhaustive and onerous. Marketing of the product will be a major management concern and therefore a sound grasp of marketing principles and local and export markets is necessary.

If, as presently seems necessary, export marketing will be
Fish Marketing Corporation, it would

steady supply system. This last will be particularly delicate as it will entail persuading a group of independent, and at times cantankerous , fishermen to act in a cooperative manner - in the end it may even require the establishment of such a cooperative as a partner in the fishery venture. As can be seen management will require an extensive knowledge of local people and local affairs.

FISH STOCK AVAILABILITY

Establishment of a fishery will be mainly dependent on the existing knowledge of local fish species and habits in the Delta. Besides the previous descriptions , the following documentation is offered as verification of local knowledge.

During early summer some upstream and downstream movements of inconnu, broad and humpback whitefish and Arctic cisco occur in the Delta. Generally, however, they appear to remain in a particular area of the Delta for feeding and show only minor movements during early summer. Major upstream spawning migrations of these species orginate in the lower Delta and coastal areas and more through the East, Middle and Peel channels generally between mid-August and early October, although inconnu and Arctic cisco may begin upstream movements as early as July.

The mouth of the Arctic Red River is a spawning area of broad whitefish, the spawning period being late October or early November. Back eddies of the Mackenzie River at Arctic Red River and Horseshoe Bend are spawning areas for humpback whitefish; the spawning period is from early to late October. Lakes in the Mackenzie Delta are the most important nursery areas for broad whitefish. These same lakes, as well as Delta channels, are also major nursery areas for humpback whitefish. Lakes, streams and channels in the Mackenzie Delta and the Beaufort Sea coast are the most important nursery areas for Arctic and least cisco. Tributaries of the Peel River are also important spawning and nursery areas for Arctic cisco.

Northern pike migrate into suitable streams and lakes for spawning after breakup. As with Arctic grayling and longnose sucker, some populations remain resident in the spawning system throughout the summer, while in other populations adults emigrate from the sytem into the Mackenzie River shortly after spawning. The major nursery areas of northern pike in the Delta area are lakes and channels.

Arctic grayling generally migrate up suitable tributaries for spawning at breakup. Many post-spawning adult grayling from the Norman Wells population move downstream to the Delta and then back upstream to the Great Bear Lake for the summer.

Significant numbers of burbot can be caught in the fall between mid-August and late September as they move out of Delta lakes and creeks (particularly with the use of trap nets) . By late October they gradually move upstream through the Delta to spawning areas. Feeding burbot can be found congregated at creeks mouths during October and November.

The following tables will give some indication of catch spots, catch percentages and average length, weights and age classes for selected areas.

Numerical abundance and percent composition for fish species caught in gill nets and trap nets at each base during 1972 field season.

Species	Aklavik No.	Aklavik (%)	Arctic Red R. No.	Arctic Red R. (%)	Ft. McPherson No.	Ft. McPherson (%)	Norman Wells No.	Norman Wells (%)	Ft. Simpson No.	Ft. Simpson (%)	Total No.	Total (%)
Arctic grayling	125	(1.39)	543	(8.13)	30	(3.91)	1862	(50.21)	299	(6.81)	2859	(11.65)
Lake trout	0		8	(0.12)	0		0		0		8	(0.03)
Arctic char	826	(9.16)	0		1	(0.13)	0		0		827	(3.37)
Chum salmon	0		10	(0.15)	1	(0.13)	1	(0.03)	0		12	(0.05)
Inconnu	502	(5.57)	465	(6.96)	38	(4.95)	267	(7.20)	154	(3.51)	1426	(5.81.)
Humpback whitefish	1266	(14.04)	1391	(20.82)	33	(4.30)	64	(1.73)	637	(14.51)	3391	(13.81)
Broad whitefish	1090	(12.09)	1307	(19.57)	107	(13.95)	42	(1.13)	0		2546	(10.37)
Least cisco	533	(5.91)	755	(11.30)	101	(13.91)	13	(0.35)	22	(0.50)	1424	(5.80)
Arctic cisco	2599	(28.83)	1086	(16.26)	275	(35.85)	202	(5.45)	0		4162	(16.96)
Lake cisco	0		0		0		10	(0.27)	19	(0.39)	27	(0.11)
Round whitefish	23	(0.26)	0		17	(2.22)	23	(0.62)	7	(0.16)	70	(0.28)

Table Continued

Species	Aklavik No. (%)	Arctic Red R. No. (%)	Ft. McPherson No. (%)	Norman Wells No. (%)	Ft. Simpson No. (%)	Total No. (%)
Mountain whitefish	0	0	0	0	75 (1.71)	75 (0.31)
Northern pike	1358 (15.06)	692 (10.36)	54 (7.04)	445 (12.00)	1988 (45.29)	4537 (18.48)
Yellow walleye	1 (0.01)	29 (0.44)	2 (0.26)	121 (3.26)	109 (2.48)	262 (1.07)
Burbot	622 (6.90)	75 (1.12)	18 (2.35)	58 (1.56)	34 (0.78)	807 (3.29)
Flathead chub	1 (0.01)	71 (1.06)	6 (0.78)	179 (4.83)	240 (5.45)	497 (2.03)
Longnose sucker	64 (0.71)	210 (3.14)	70 (9.13)	390 (10.52)	687 (15.65)	1421 (5.79)
White sucker	0	0	0	3 (0.08)	67 (1.53)	70 (0.28)
Boreal smelt	1 (0.01)	37 (0.55)	0	0	0	38 (0.16)
Goldeye	0	0	0	1 (0.03)	44 (1.00)	45 (0018)
Other	5 (0.05)	1 (0.02)	0	27 (0.73)	8 (0.18)	41 (0.17)
Total	9016 (100.00)	6680 (100.00)	753 (100.00)	3708 (100.00)	4390 (100.00)	24547 (100.00)

Estimated species composition by weight and by number and total estimated numbers of fish consumed in Aklavik, 1973.

Species	Human Food Percent	Human Food Annual Consumption Pounds	Human Food Annual Consumption Number	Dog Food Percent	Dog Food Annual Consumption Pounds	Dog Food Annual Consumption Number	Total Annual Consumption Pounds	Total Annual Consumption Number
Broad whitefish	40	27,379	8,173	20	45,295	13,521	72,674	21,694
Humpback whitefish	0	0	0	50	113,238	39,047	113,238	39,047
inconnu	25	17,111	3,641	5	1),324	2,409	28,435	6,050
Arctic cisco	0	0	0	15	33,972	37,747	33,972	37,747
Arctic char	15	10,267	6,845	0	0	0	10,267	6,845
Northern pike	0	0	0	5	11,324	3,775	11,324	3,775
Burbot	15	10,267	2,053	5	11,324	2,265	21,591	4,318
Other	5	3,422	1,141	0	0	0	3,422	1,141
TOTALS		68,446	21,853		226,477	98,764	294,923	120,617

Species composition of monitored catches and estimated species composition by weight of totai catch in the Arctic Red River domestic fishery.

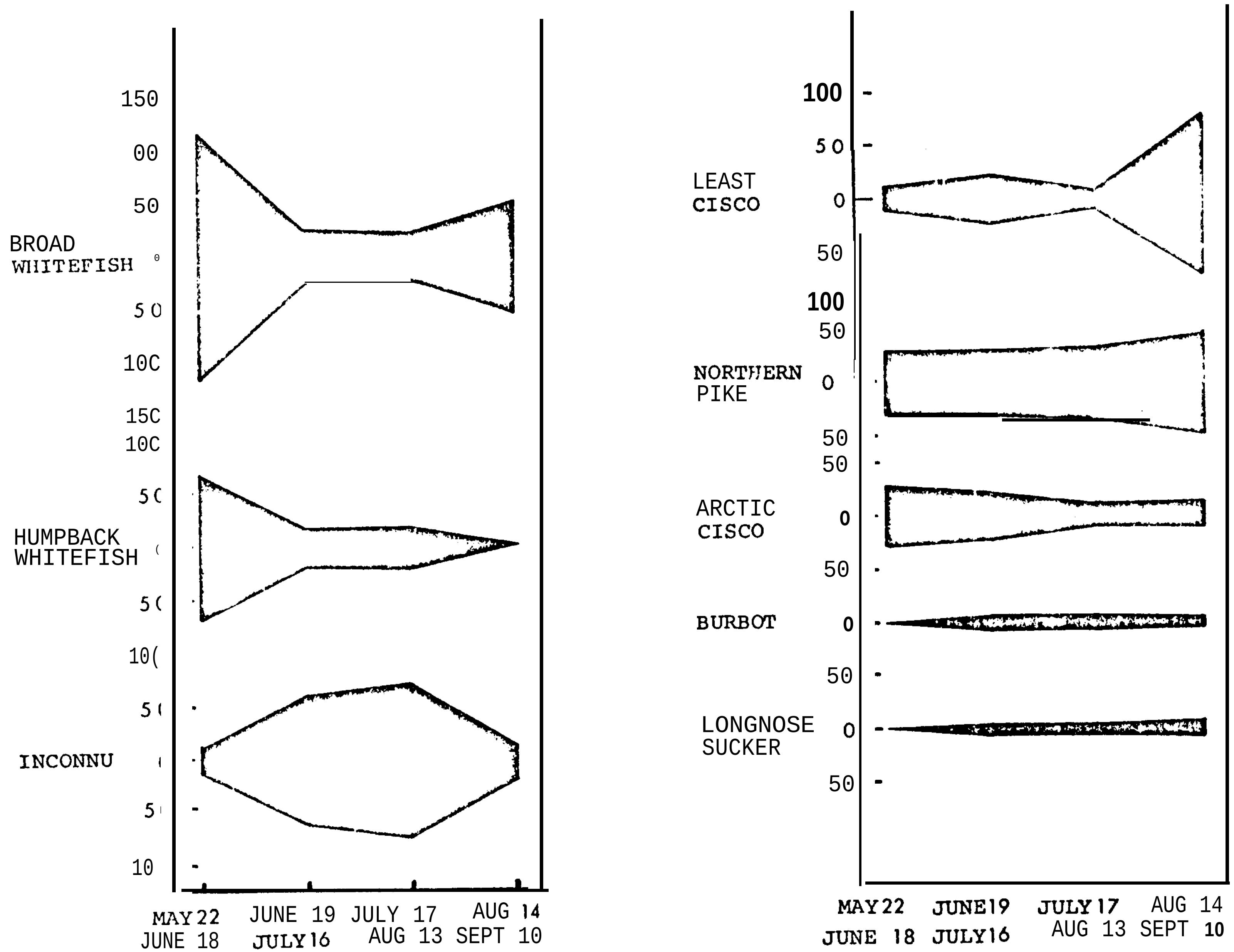
Species	Monitored Catches		Total Estimated Catch	
	Number	Percent	Number	Weight (lb.)
Inconnu	820	21.8	7,785	38,147
Broad whitefish	1,124	29.9	10,678	36,305
Humpback whitefish	1,775	47.2	16,857	53,942
Arctic cisco	20	0.5)		
Longnose sucker	5	0.1)	357	1,071
Burbot	3	0.1)		
Northern pike	14	0.3)		
TOTALS	3,761		35,713	129,465

Numerical abundance and percent composition for fish caugh n gi ness. sweep nets and trap nets at each base during the 1974 field season.

Species	Coastal Survey No.	(%)	Stream Survey No.	(%)	Lakes Survey No.	(%)	Total No.	(%)
Arctic c sco	106	(4.45)	83	5.99	0		89	(4.59
Arctic flounder	51	(2.14)	0		0		51	(1.23)
Arctic .amprey	0		64	(4.62)	0		64	(55)
Boreal smelt	332	(3.52)	3	(0.94)	4	(1.09)	339	(8.20
Broad whitefish	90	(3.78)	240	(17.32)	24	(6.56)	354	(8.56)
Burbot	59	(2.48)	15	(1.08)		(0.27)	75	(1.8)
Four horn sculpin	199	(8.35)	2	(0.14)	0		201	(4.86)
Humpback whitefish	13	5 50)	270	(19.48)	78	(2 .31)	479	(1 .59)
Inconnu	377	(15.83)	152	(10.97)	97	(26.50)	626	(5. 4)
Lake trout	4	(0. 7)	2	(0.14)	6	(4.37)	22	(0.53)
Least c co	931	(39.08)	396	(28.57)	80	(21.86)	407	(34.04)
Longnose sucker	20	(0.84)	20	(1.44)	6	(1.64)	46	(1. 1)
Northern pike	7	(0.29)	21	(8.73)	57	(5.5)	185	(4.48)
Pacific herring	44	(.85)	0		0		44	(1.06)
affron cod	2	0.08	0		0		2	(0.5)
Starry flounder	5	0.2)	0		0		5	(0.12)
Whitef sh (unidentif ed)	15	(0.63)	8	(0.58)	3	(0.82)	26	(0.63)
Tota	2382	(00)	1386	(00)	366	(100)	4134	(100)

Numerical abundance and percent cor
during the 1974 field season.

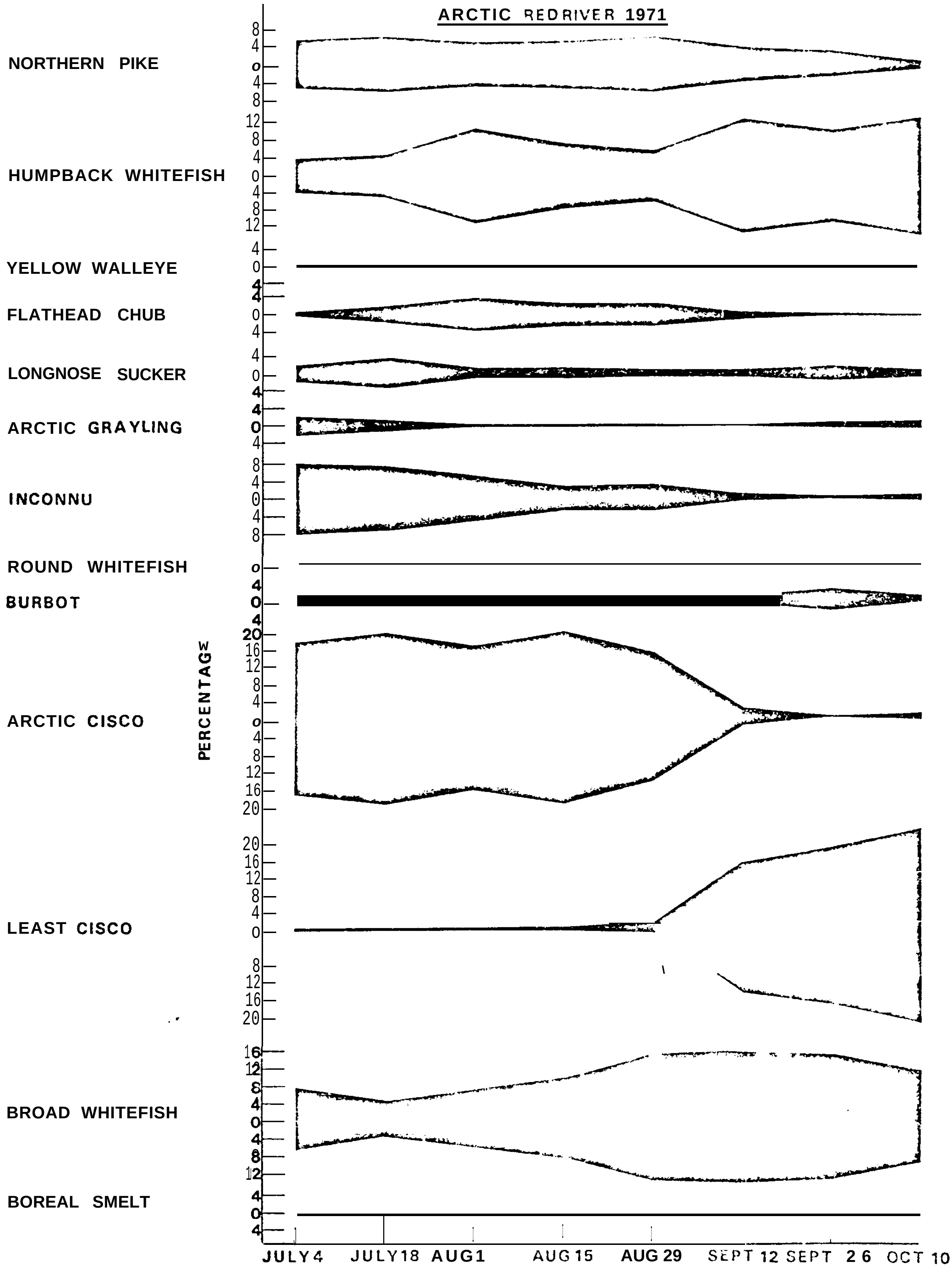
Species	Coastal Survey No.	(%)	Stream No.
Arctic flounder	8	(1.87)	
Arctic grayling	0		8
Boreal smelt	39	(9.12)	17
Broad whitefish	3	(0.70)	[illegible]
Burbot	2	(0.47)	
Cisco (unidentified)	175	(40.89)	14
Four horn sculpin	75	(17.52)	11
Humpback whitefish	7	(1.64)	
Inconnu	1	(0.23)	
Lake chub	0		1
Least cisco	25	(5.84)	
Longnose suckers	10	(2.34)	12
Ninespine sticklebacks	26	(6.07)	38
Northern pike	1	(0.23)	
Pond smelt	3	(0.70)	
Round whitefish	1	(0.23)	
Spoonhead sculpin	0		10
Trout perch	1	(0.23)	4
Whitefish (unidentified)	40	(9.35)	5
Other	11	(2.57)	3
Total	428	(100)	123



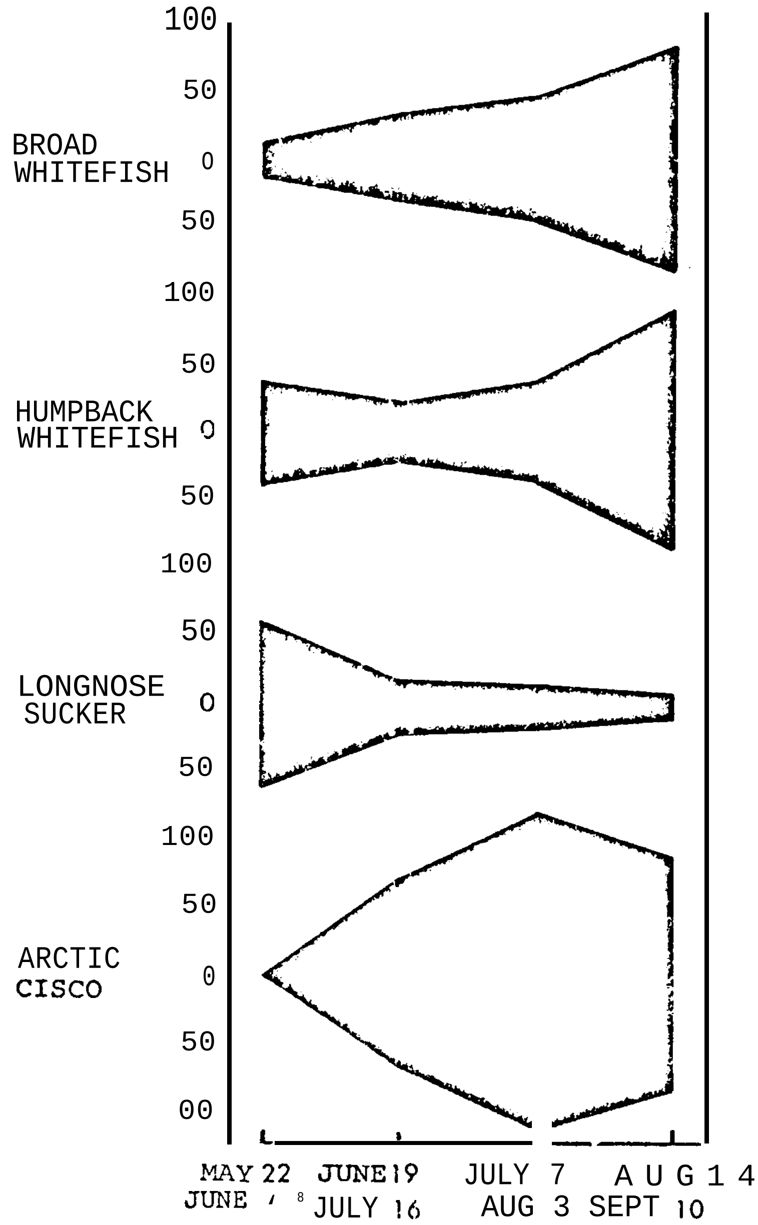
Seasonal change of index gill net catches (catch per unit of effort x 1000) - Aklavik, 1972.

GILL NET CATCH COMPOSITION

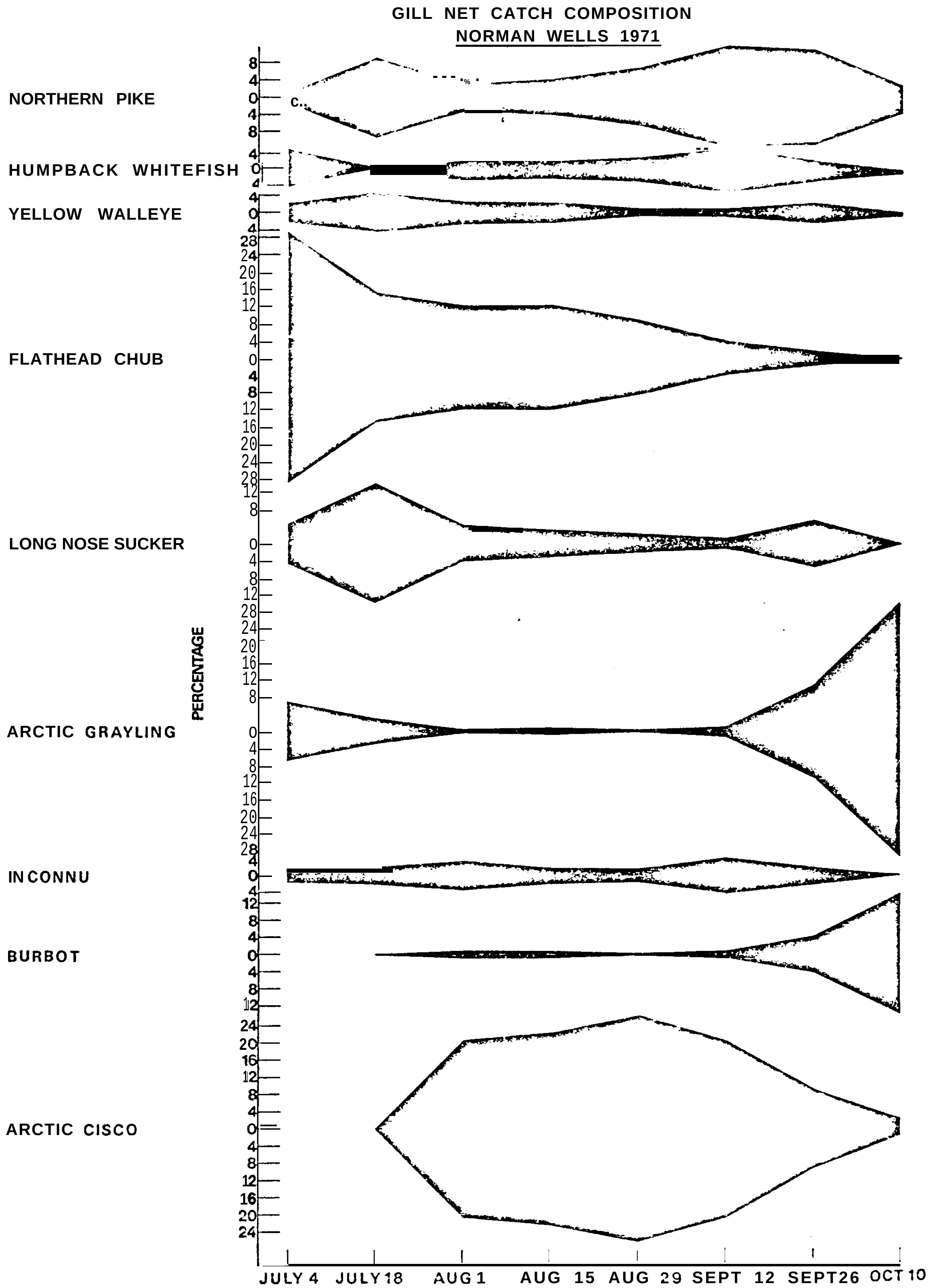
ARCTIC RED RIVER 1971



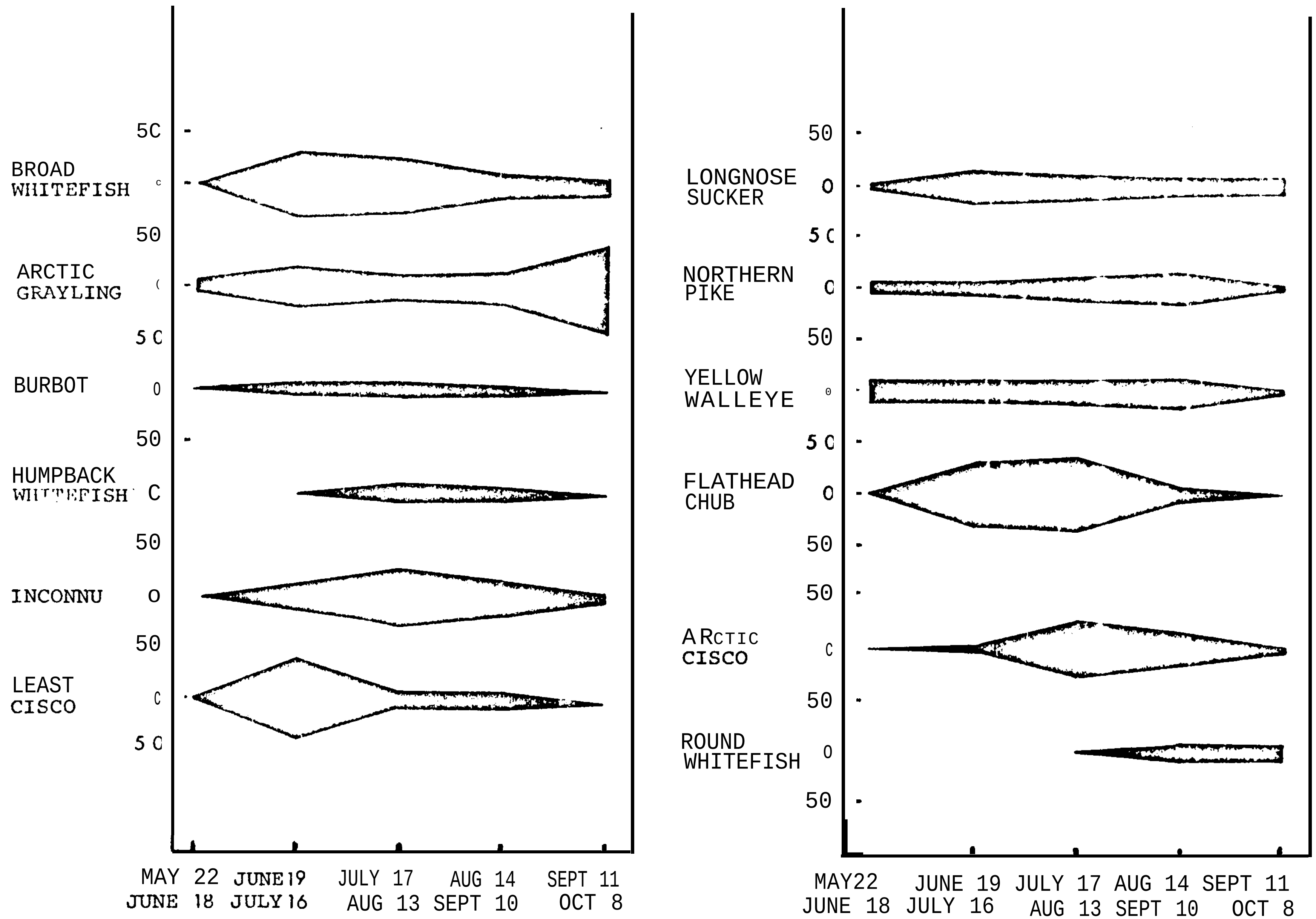
Seasonal change of gill net catch composition Arctic Red River 1971



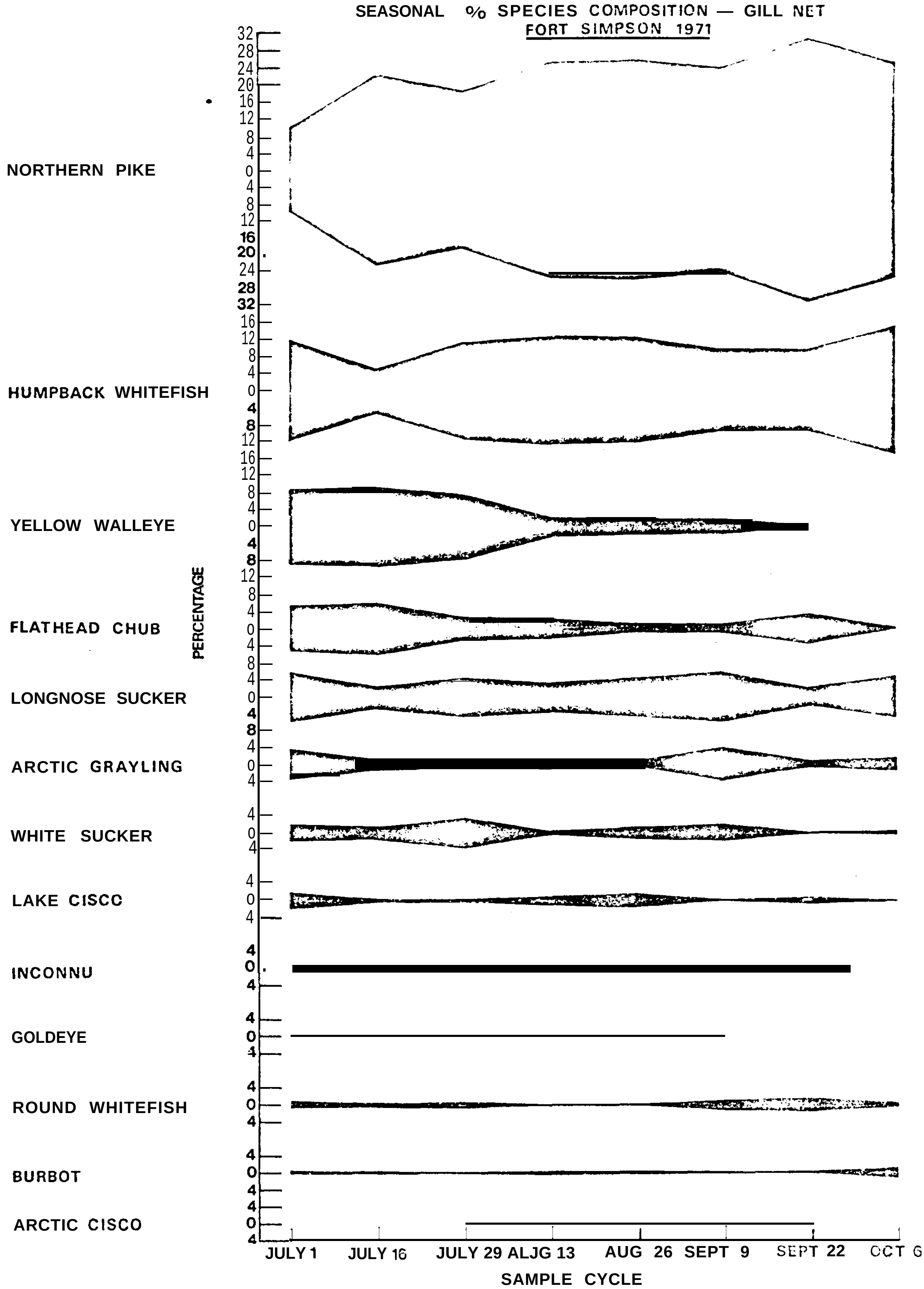
Seasonal change of **inde**
effort x 1000) - Arctic

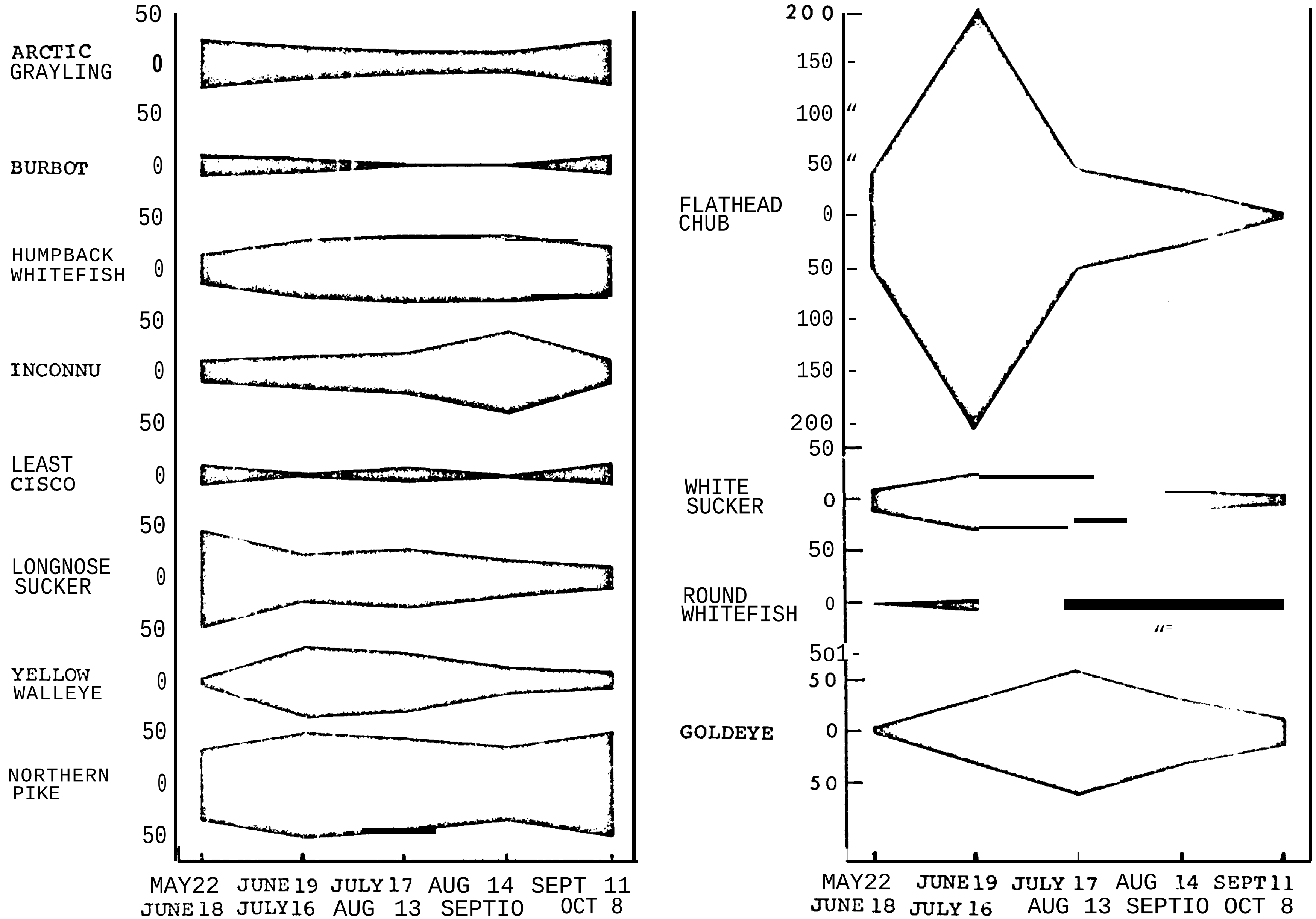


Seasonal change of gill net catch composition —Norman Wells, 1971



Seasonal change of index gill net catches (catch per unit of effort x 1000) - Norman Wells, 1972.

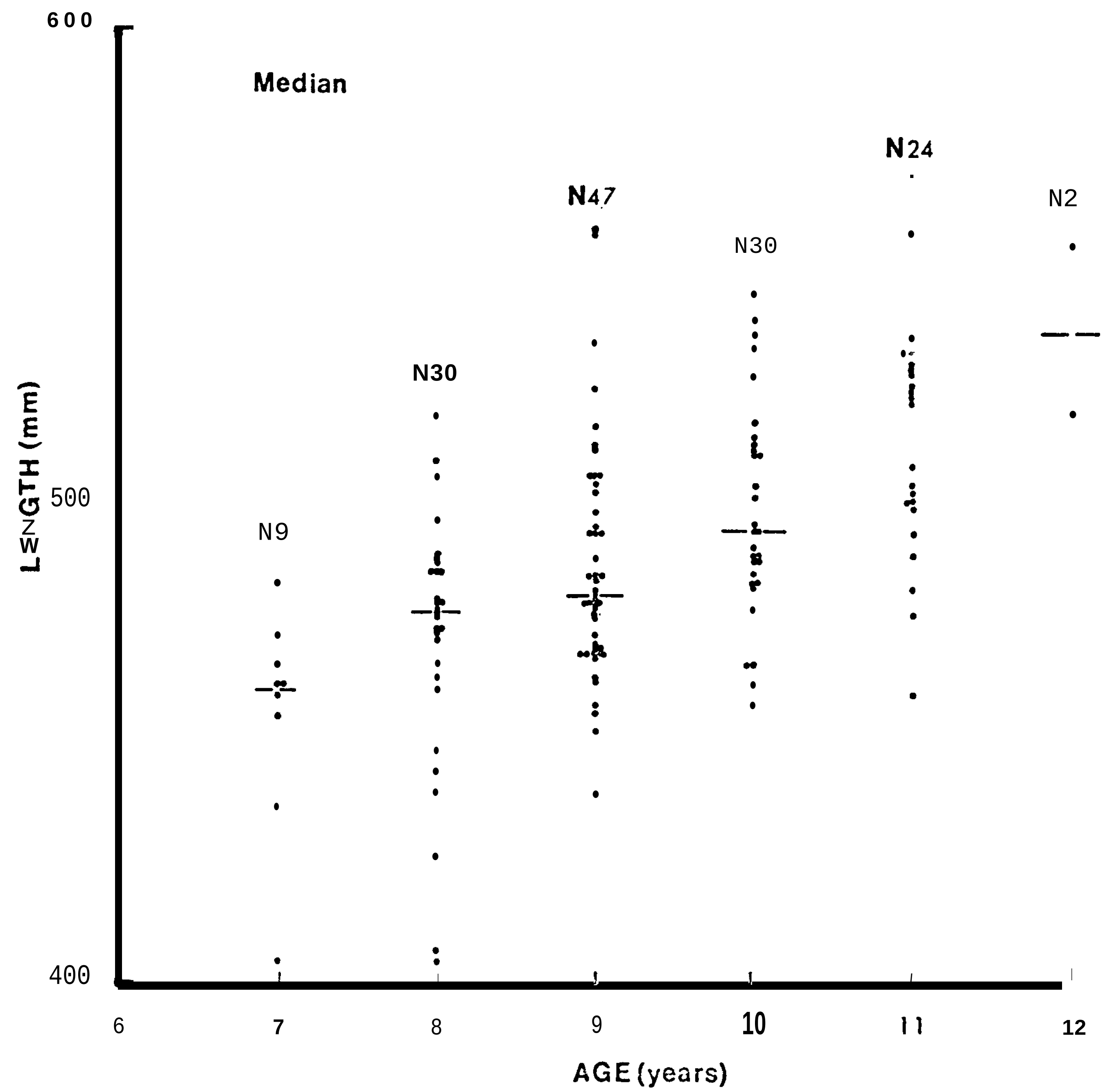

SEASONAL % SPECIES COMPOSITION — GILL NET
FORT SIMPSON 1971
NORTHERN PIKE
HUMPBACK WHITEFISH
YELLOW WALLEYE
FLATHEAD CHUB
LONGNOSE SUCKER
ARCTIC GRAYLING
WHITE SUCKER
LAKE CISCO
INCONNU
GOLDEYE
ROUND WHITEFISH
BURBOT
ARCTIC CISCO
PERCENTAGE
JULY 1
JULY 16
JULY 29
ALJG 13
AUG 26
SEPT 9
SEPT 22
OCT 6
SAMPLE CYCLE



Seasonal change of index **gill** net catches (catch per unit of effort x **1000)** - Fort Simpson, 1972.

Lengths, weights and age classes for 146 broad whitefish caught by the Holmes Creek commercial fishery, 1973.

Age Class	N	Length (mm) Range	Mean	Weight (g) Range	Mean
6	1	462	462	1538	1588
7	9	40s-484	456	1134-2126	1578
8	30	405-519	471	1276-2495	1818
9	49	440-5s8	487	1446-2948	1932
10	30	458-545	499	1503-2605	2080
11	24	464-570	514	1701-2892	2278
12	2	520-555	538	2495-2552	2524
13	1	553	553	3147	3147



Age-length relationship of broad whitefish, Holmes Creek commercial fishery, 1973.

Number (N), range (R) and mean length ($\bar{X}$) by age class for commonly captured species in the outer Mackenzie Delta, 1974.

Age		0+		2	3	4	5	6	7	8	9	0		2	13	14	5	16	17	18	19
Arctic cisco	N	-	-	-	-	-	4	13	17	15	12	5	1	-	-	-	-	-	-	-	-
	$\bar{X}$	-	-	-	-	-	364	337	359	377	405	408	376	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	265	275	285	342	384	385	376	-	-	-	-	-	-	-	-
		-	-	-	-	-	510	433	392	425	430	428	-	-	-	-	-	-	-	-	-
Arctic flounder*	N	7	-	-	-	-	6	2	3	3	-	-	-	1	-	-	-	-	-	-	-
	$\bar{X}$	52	-	-	-	-	213	235	260	234	-	-	-	291	-	-	-	-	-	-	-
	R	46	-	-	-	-	153	214	210	205	-	-	-	291	-	-	-	-	-	-	-
		58	-	-	-	-	276	255	323	251	-	-	-	-	-	-	-	-	-	-	-
Boreal smelt*	N	-	-	-	3	6	36	53	13	5	-	-	-	-	-	-	-	-	-	-	-
	$\bar{X}$	-	-	[illegible]	'11	194	189	230	250	284	-	-	-	-	-	-	-	-	-	-	-
	R	-	-	[illegible]	·00	150	118	118	223	255	-	-	-	-	-	-	-	-	-	-	-
		-	-	[illegible]	.25	286	267	295	294	305	-	-	-	-	-	-	-	-	-	-	-
Broad whitefish	N	-	1	4	10	6	5	5	12	18	14	10	9	6	3	2	1	-	-	-	-
	$\bar{X}$	-	'75	211	302	400	364	408	429	454	468	48⊢	482	490	459	620	585	-	-	-	-
	C	-	.75	149	180	323	305	261	235	241	380	440	420	409	425	584	585	-	-	-	-
		-	-	236	444	445	408	495	495	555	588	573	525	558	514	655	-	-	-	-	-
Fourhorn sculpin*	N	5	10	-	5	3	18	13	7	6	1	2	2	-	-	2	-	-	-	-	-
	$\bar{X}$	40	68	-	210	176	208	226	271	264	322	308	258	-	-	228	-	-	-	-	-
	R	20	56	-	199	164	140	181	235	240	322	295	205	-	-	220	-	-	-	-	-
		59	80	-	22.	186	260	270	324	300	-	321	310	-	-	235	-	-	-	-	-
Humpback whitefish	N	-	2	2	6	6	16	12	14	21	24	13	14	12	9	10	6	4	-	1	-
	$\bar{X}$	-	106	'25	'83	211	217	249	324	279	353	375	383	417	415	431	446	442	-	514	-
	R	-	95	·10	.73	170	178	214	227	208	295	323	302	364	373	393	375	409	-	514	-
		-	116	.40	212	315	286	300	485	373	588	448	461	465	443	489	483	477	-	-	-

Table (Con't'd)

Age		0+	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Inconnu	N	-	-	2	-	5	6	8	10	11	23	15	11	7	7	3	3	1	-	-	1
	$\bar{X}$	-	-	245	-	313	360	450	598	561	558	593	647	678	754	703	744	700	-	-	793
	R	-	-	227	-	257	283	380	460	468	469	437	542	607	650	530	663	700	-	-	793
		-	-	263	-	380	448	604	551	690	612	785	793	788	890	834	827	-	-	-	-
Least cisco	N	1	6	7	3	7	25	22	14	10	5	1	-	-	-	-	-	-	-	-	-
	$\bar{X}$	75	94	117	175	191	224	258	270	298	271	360	-	-	-	-	-	-	-	-	-
	R	75	80	85	160	175	180	180	217	277	192	360	-	-	-	-	-	-	-	-	-
		-	105	156	186	200	260	3.3	306	3.3	3..	-	-	-	-	-	-	-	-	-	-
Saffron cod*	N	-	-	-	-	-	1	4	-	-	-	-	-	-	-	-	4	2	-	-	-
	$\bar{X}$	-	-	-	-	-	370	357	-	-	-	-	-	-	-	-	424	373	-	-	-
	R	-	-	-	-	-	370	310	-	-	-	-	-	-	-	-	403	316	-	-	-
		-	-	-	-	-	-	424	-	-	-	-	-	-	-	-	450	430	-	-	-

* ages determined from otoliths.

Species	Fork Length Interval (mm)																				
	1' to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	91 to .00	101 to .10	111 to 120	12' to 130	131 to 140	141 to 150	'51 to ·60	161 to 170	171 to 180	181 to 190	191 to 200	201. to 210	211 to 220
Arctic flounder				3	4																
Arctic grayling					1	4	3														
Boreal smelt		6	20		4	3															
Burbot																					
Cisco		2	5	35	23	26	0	41	24	3	3		2								
Fourhorn sculpin	3	25	14	6	16	0	3				1						1				
Humpback whitefish													2								
[illegible]onnu																					
Lake chub																					
Least cisco								2				3	3	1	5	1				2	
Longnose sucker		7	3	4	2	1	2		2												
Ninespine stickleback	2	50	9	2																	

Table ' (Cent'd)

Species	Fork Length Interval (mm) 11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	91 to 100	101 to 110	111 to 120	121 to 130	131 to 140	141 to 150	151 to 160	161 to 170	171 to 180	181 to 190	191 to 200	201 to 210	211 to 22o
Northern pike									1												
Pond smelt			1	1	1																
Round whitefish									1												
Spoonhead sculpin		3	44	13	8	1															
Trout-perch		11	11	22	16	12	4														
Whitefish		2	4	10	7	7	11	6	3			1									

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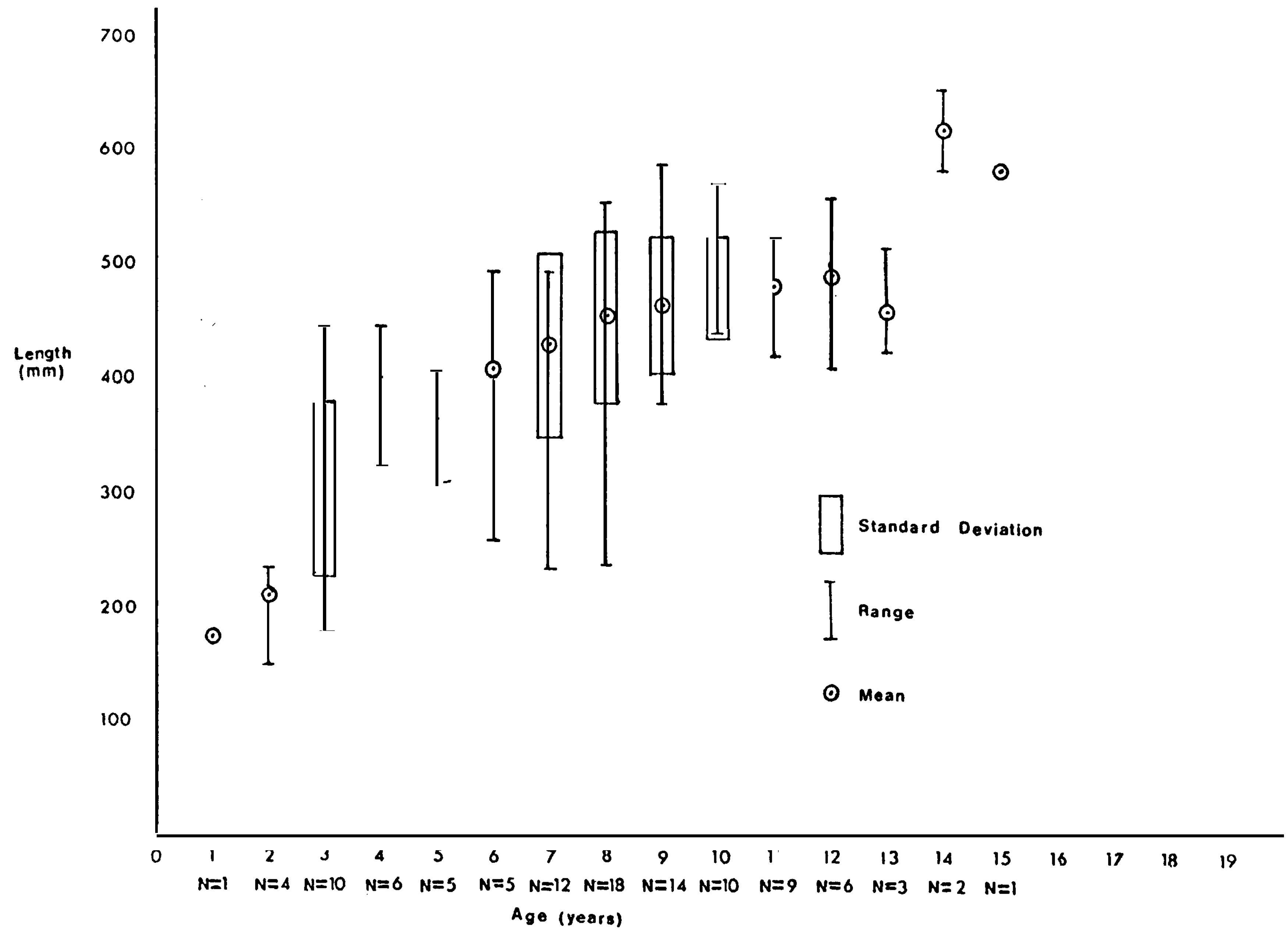
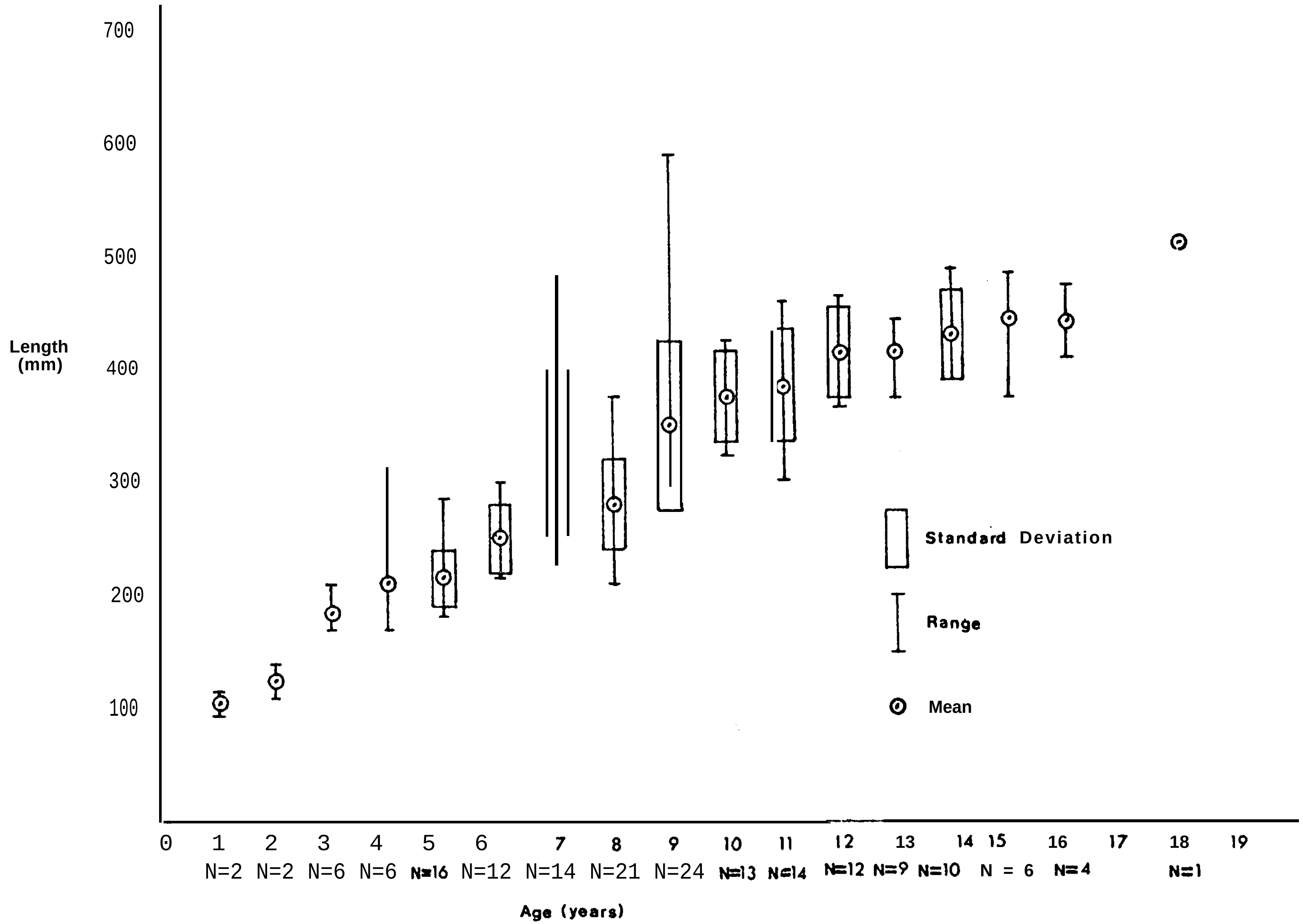
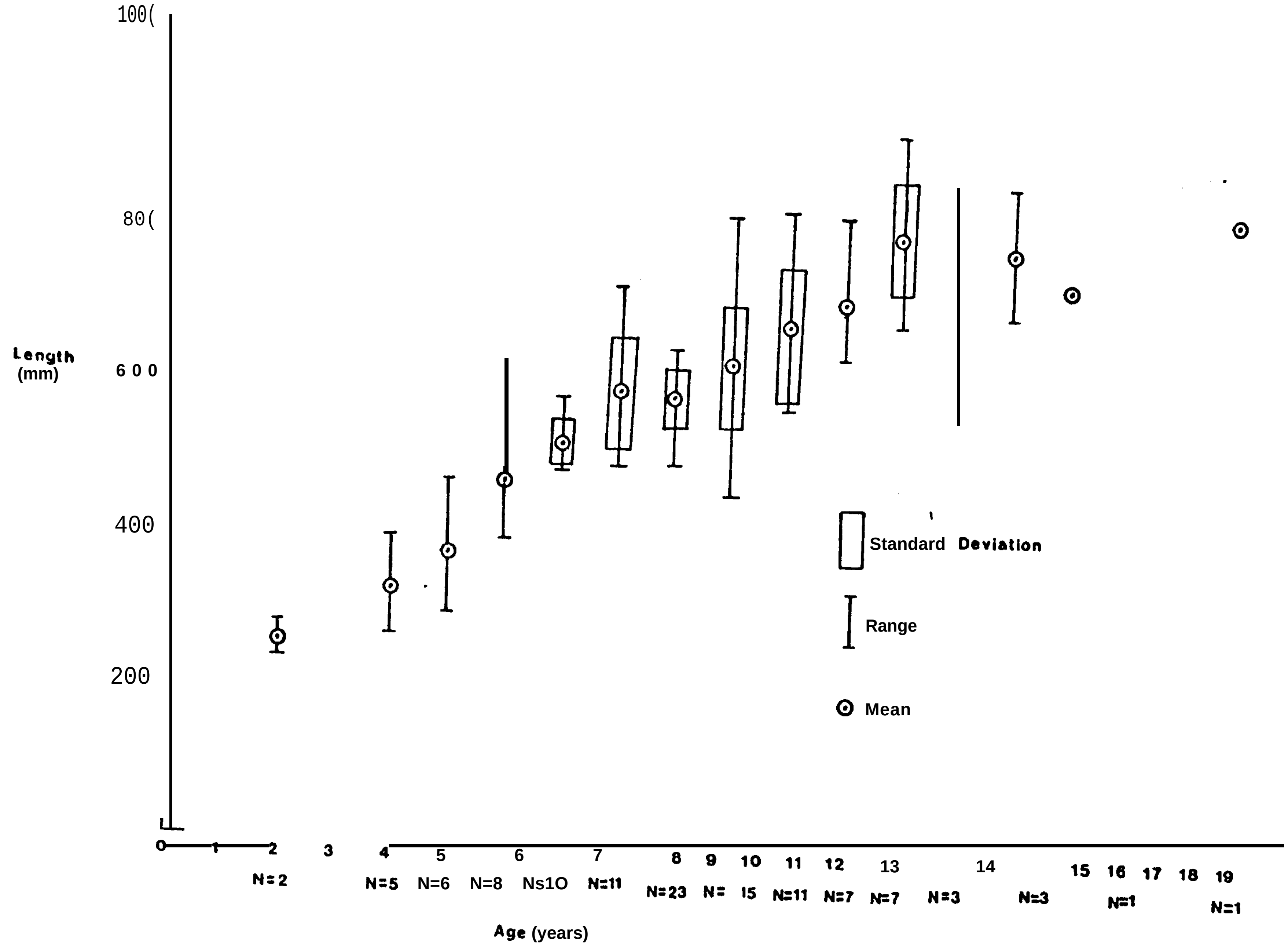


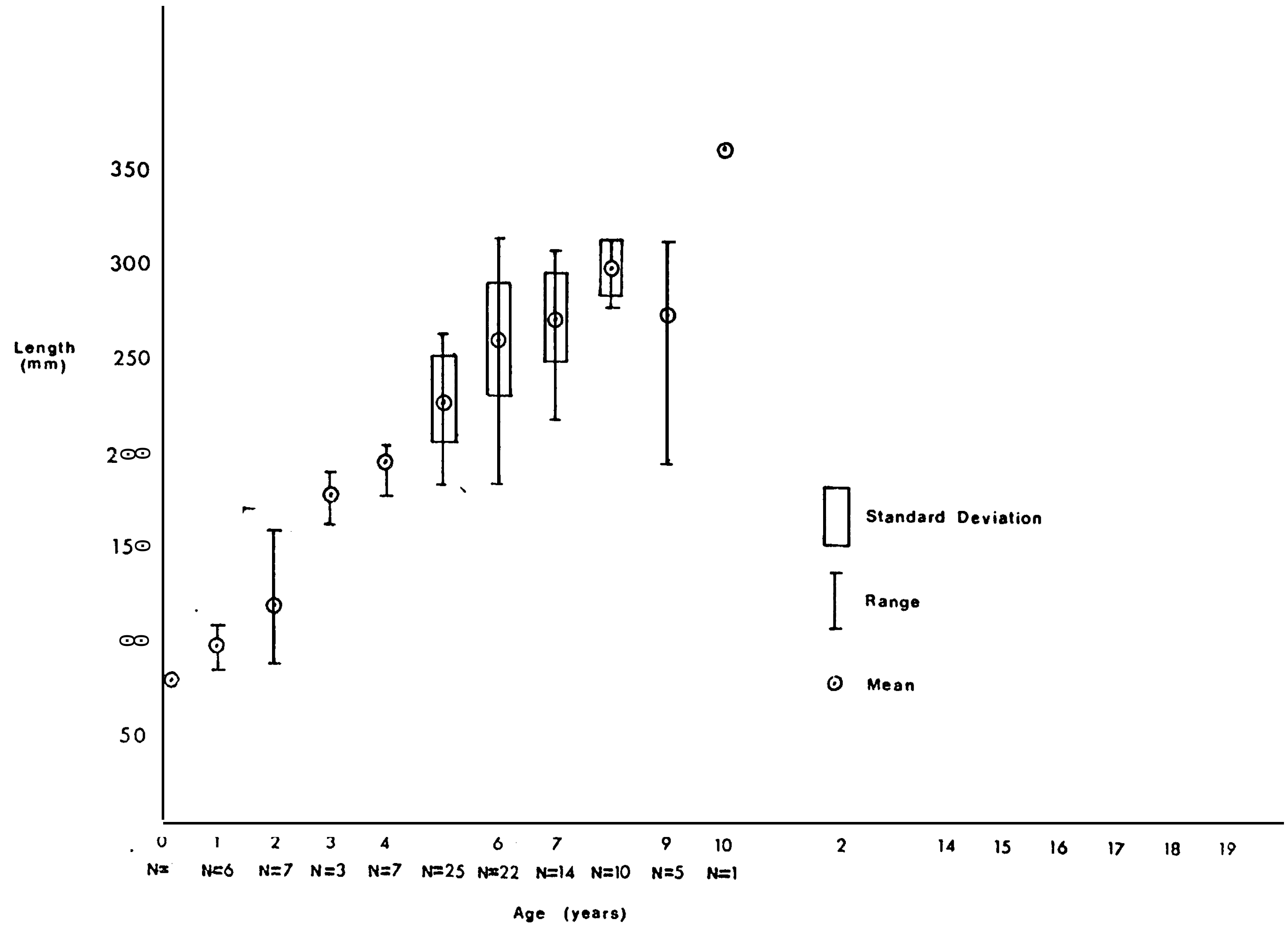
Age-'ength relationship of broad wh tef sh, outer Mackenz e River de =a. 974.



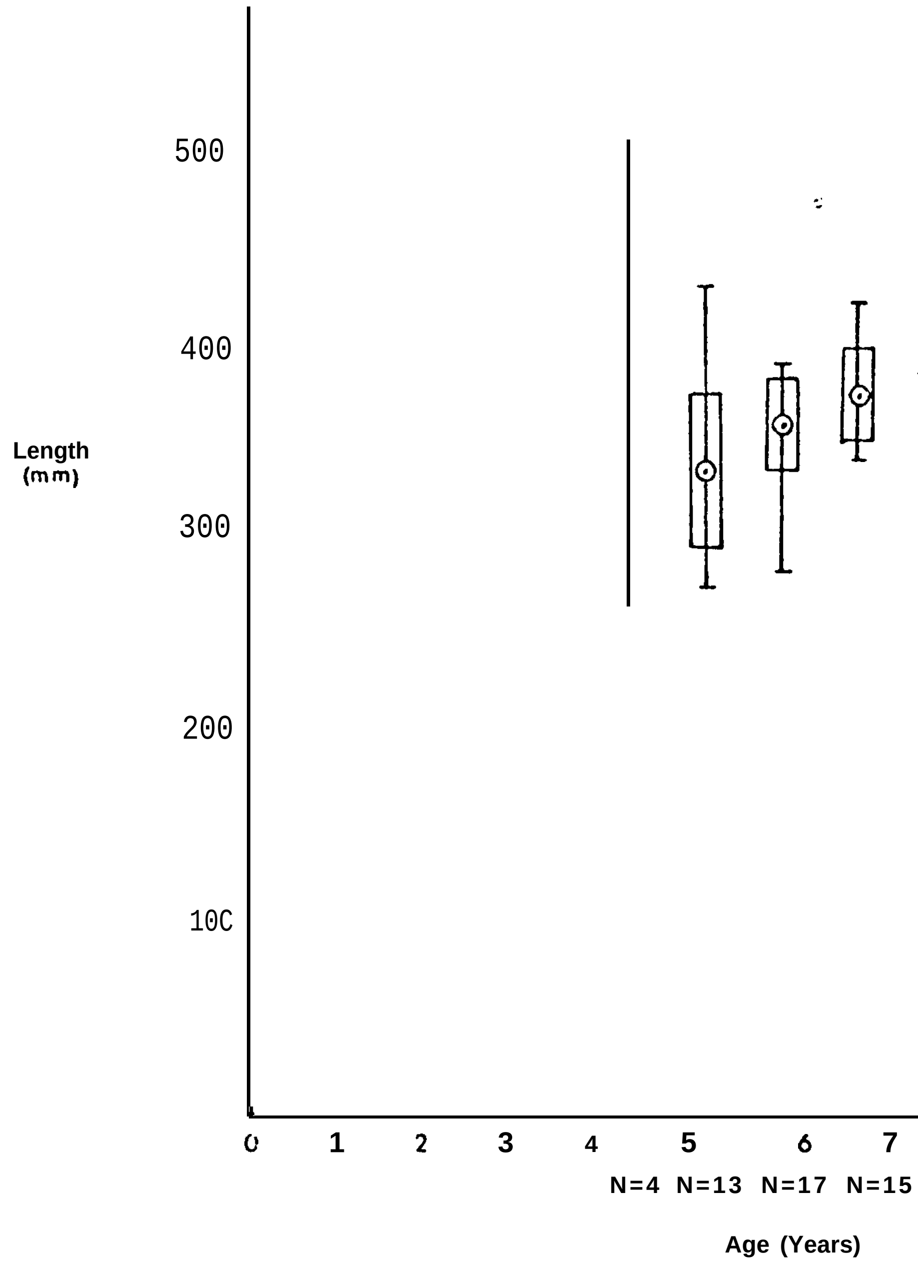
Age-length relationship of humpback whitef sh, outer Mackenzie River delta, 1974.



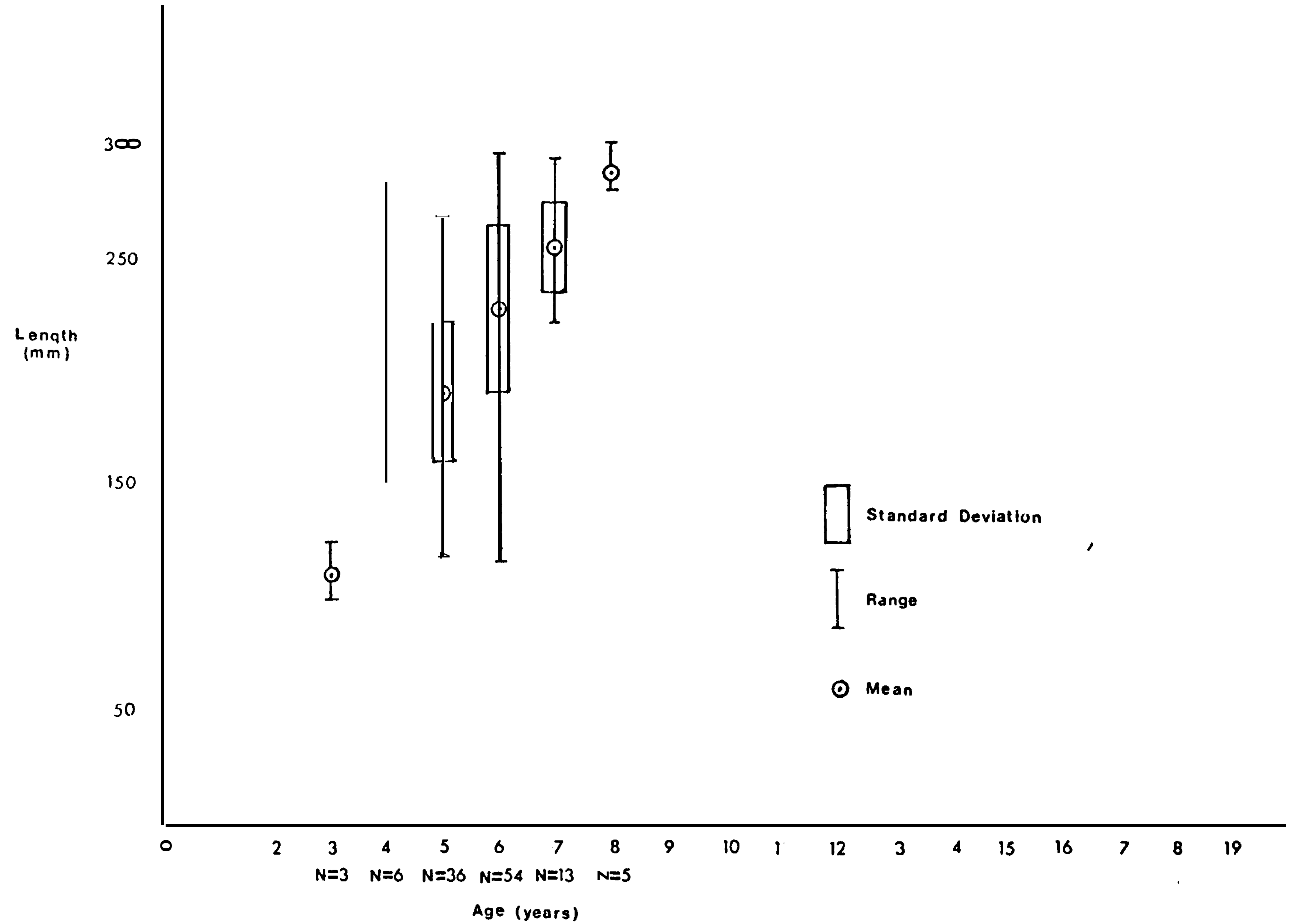
Age-1ength relationship of inconnu, outer Mackenzie River delta, 1974.



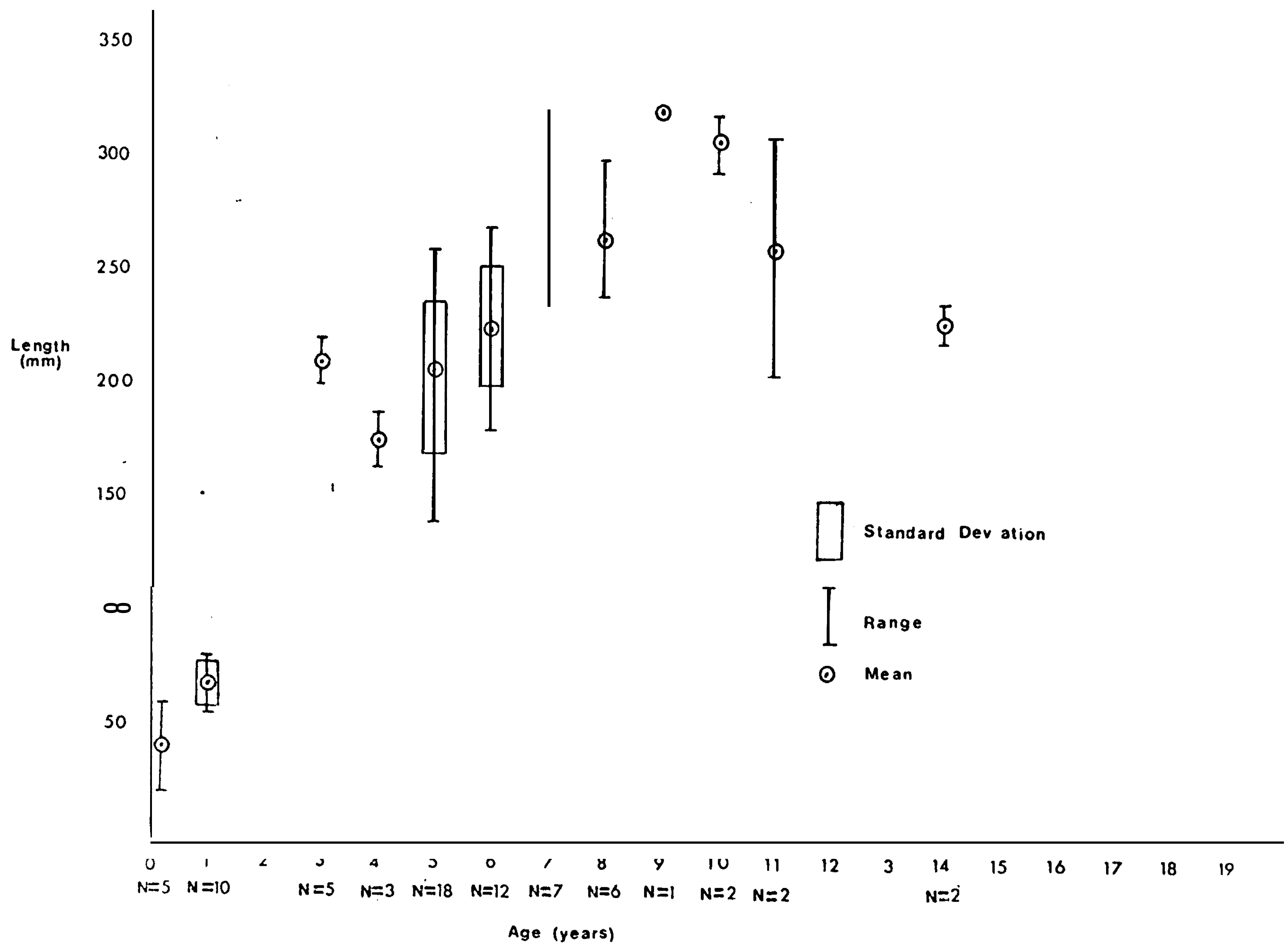
Age-length relationship of least cisco, outer Mackenzie River delta, 1974.



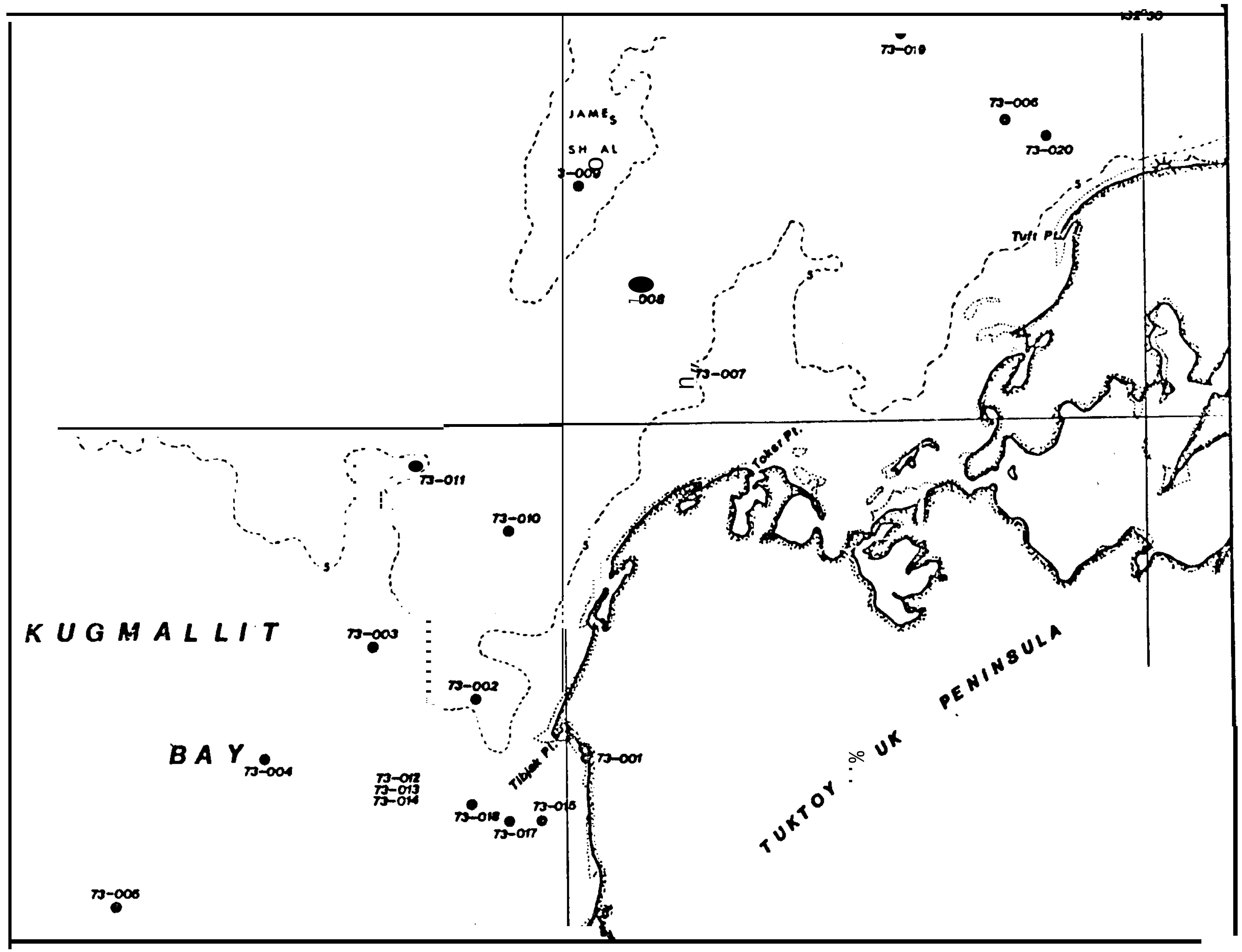
Age-length relationship of Arc



Age-length relationship of boreal smelt, outer Mackenzie River delta, 1974



Age-length relationship of fourhorn sculpin, outer Mackenzie River delta, 1974.



Fishing sites in Kugmallit Bay in 1973.

Number, mean length (mm) and standard error (se.) for each species at each station in 1973.
(M -male. F - female. ? - undetermined)

Coregonus autumnalis

Sta. *	Date	n	Mean Length	-se.
001	16 July	101 M	372	0.2
	"	63 F	393	0.2
002	21 July	1 F	400	
	25 Aug.	5 M	193	0.5
	"	2 F	23S	
	"	1 ?	193	
003	2 Sept	2 M	216	
	"	4 F	209	
	"	1 ?	186	
004	25 July	1 M	318	
	5 Sept.	5 M	258	0.5
	"	1 F	293	
	"	3 ?	199	
007	6 Aug.	14 M	269	0.7
		7 F	272	1.8
		1 ?	254	
008	20 Aug.	1 M	179	
	"	3 F	289	
009	1 Sept.	1 M	192	
010	17 Aug.	8 M	234	2.1
	"	6 F	240	1.0
	"	2 ?	181	
011	9 Sept	4 M	202	
	"	1 F	218	
	"	2 ?	191	

* See preceding map for station location.

Coregonus sardinella

Sta.	Date	n	Mean Length	se.
001	16 July	1 M	216	
002	21 July	3 M	247	
	25 Aug.	19s M	202	0.1
	"	169 F	206	0.2
003	23 July	1 ?	194	
	2 Sept	1 M	203	
	"	3 F	224	
	"	33 ?	202	0.2
004	25 July	13 M	190	2.4
	"	10 F	198	1.0
	"	7 ?	184	0.1
	5 Sept.	22 ?	206	0.5
005	26 July	10 M	206	0.7
	"	12 F	209	1.1
	"	2 ?	203	
006	2 Aug.	13 M	229	0.8
	"	10 F	215	0.8
	"	7 ?	201	0.9
007	6 Aug.	28 M	199	0 . 4
	"	25 F	201	0.5
	"	1 ?		
008	20 Aug.	5 M	193	0.6
	"	4 F	215	
010	17 Aug.	7 M	183	0.2
	"	8 F	188	0.5
	"	2 ?	184	
011	9 Sept.	2 ?	190	

Osmerus mordax

Sta.	Date	n	Mean Length	se.
001	16 July	2.5 M	248	0.6
	"	6 F	257	1.8
002	21 July	5 M	237″	1.4
	"	SF	251	1.6
	25 Aug.	25 M	223	0..5
	"	41 F	227	0.6
	"	7 ?	187	0.7

Osmerus mordax cont'd

Sta.	Date	n	Mean Length	se.
003	23 July	9 M	238	1.1
	"	2 F	233	
	"	7 ?	200	1.1
	2 Sept.	10 M	228	0.6
		10 F	240	0.6
		1 ?	168	
0C4	25 July	34 M	231	0.3
	"	32 F	245	0.8
	"	3 ?	160	
	5 Sept	1 M	242	
	"	63 ?	242	0.3
00s	2 July	28 M	224	0.4
	"	14 F	243	0.4
006	2 Aug.	26 M	240	0.4
	"	13 F	243	0.6
	"	7 ?	228	0.4
007	6 Aug.	2 M	263	
008	20 Aug.	4 M	248	
	"	13 F	239	0.9
	"	1 ?	20s	
009	1 Sept.	1 M	214	
	"	1 F	281	
010	17 Aug.	10 M	229	0.7
		7 F	231	0.9
		1 ?	230	
011	9 Sept.	35 ?	245	0.4

Clupea harengus

Sta.	Date	n	Mean Length	se.
002	2S Aug	2 M	281	
	"	4 F	295	
	"	3 ?	189	
003	2 Sept.	7 M	201	0.3
	"	S F	198	0.6
	"	3 ?	195	
004	5 Sept.	2 M	184	
	"	9 F	227	1.5
	"	3 ?	177	

Clupea harengus cent 'd.

Sta.	Date	n.	Mean Length	se.
007	6 Aug.	5 M	271	1.8
	"	2 F	281	
	11	2 ?	2S8	
008	20 Aug.	1 M	202	
	"	2 F	290	
009	1 Sept.	1 M	221	
	"	1 F	196	
	"	2 ?	203	
010	17 Aug.	1 M	222	
	"	2F	238	
011	9 Sept.	10 M	203	1.0
	"	21 F	198	0.5

Myoxocephalus quadricornis

Sta.	Date	n.	Mean Length	se.
001	16 July	12 F	287	0.8
002	2S Aug.	4 F	23S	
	"	2?	172	
007	6 Aug.	3F	20s	
011	9 Sept.	1 M	162	
	"	SF	214	2.0

Lampetra japonica

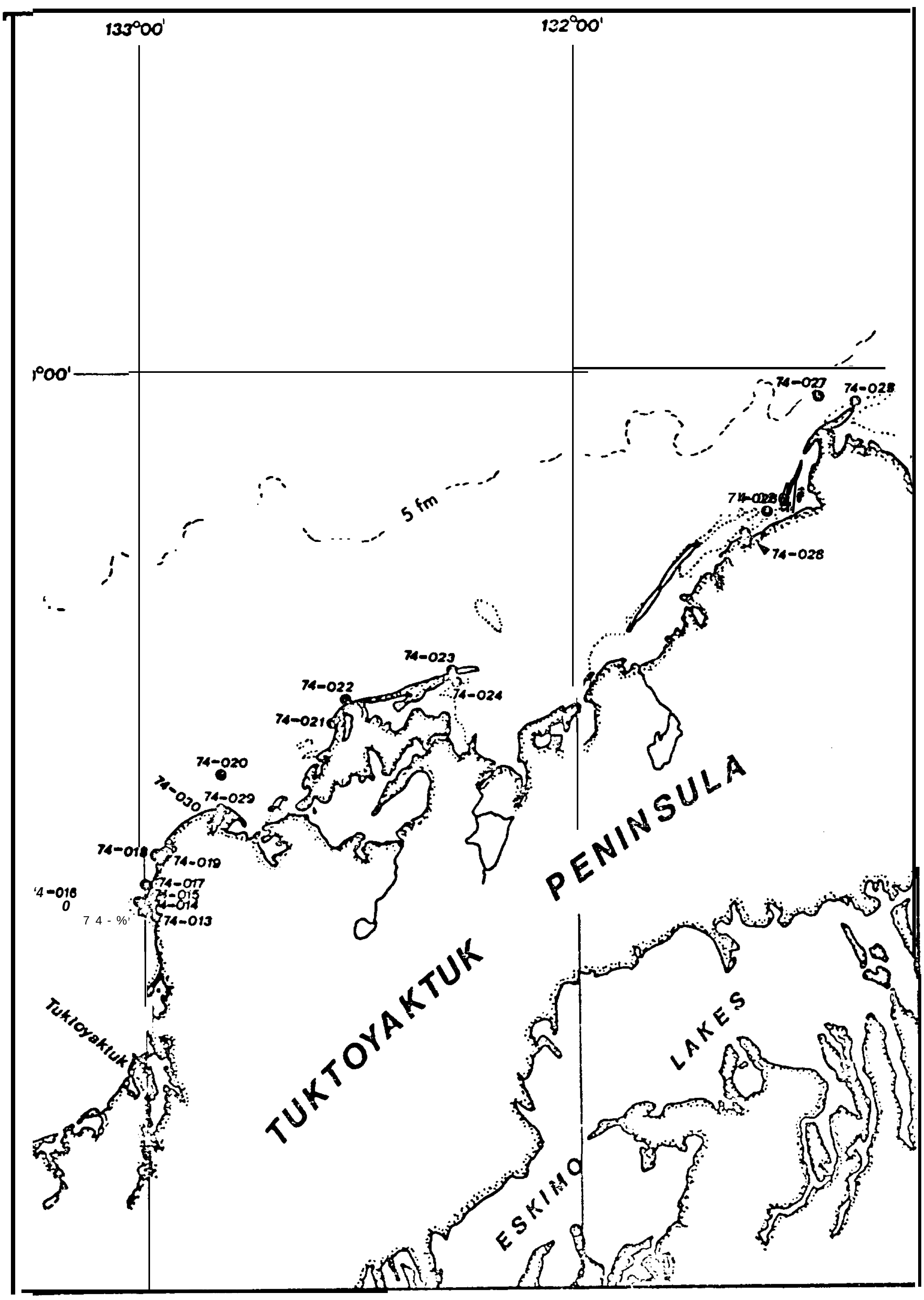
Sta.	Date	n.	Mean Length	se.
002		2 ?	2S9	
	2 Sept.	1?	261	

Boreogadus saida

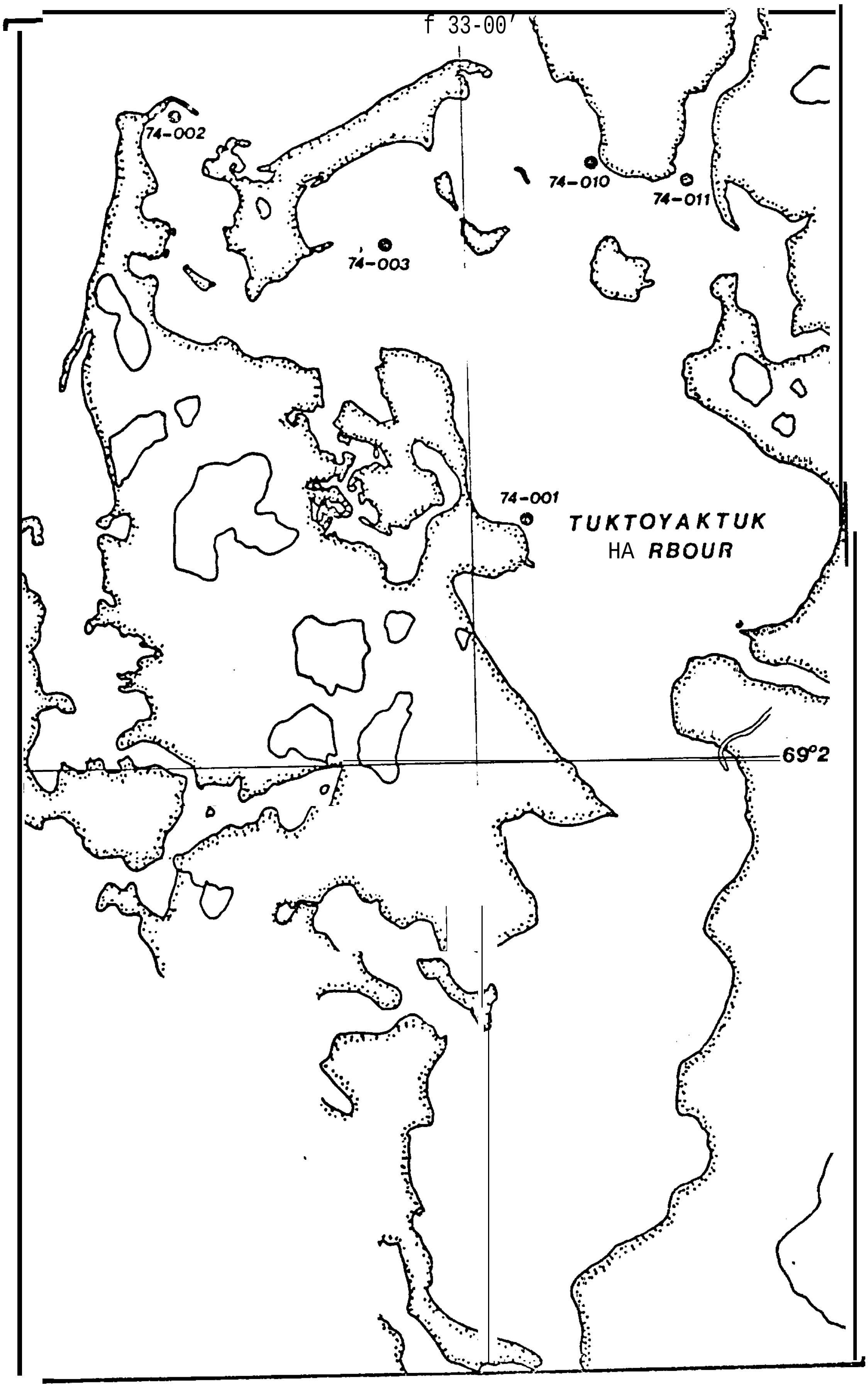
Sta.	Date	n.	Mean Length	se.
001	16 July	1 M	472	
	"	3F	46S	

Liopsetta glacialis

Sta.	Date	n.	Mean Length	se.
008	20 Aug.	1 ?	211	



Fishing sites in eastern coastal Beaufort Sea in 1974.



Fishing sites in the Tuktoyaktuk Harbour in 1974.

Number, mean weight (gin) and mean length (mm) with standard errors (se.) for each species at each station in 1974. (M - male, F - female, U - undetermined).

Coregonus autumnalis

Station*	Date	n	Mean Weight	se.	Mean Length	se.
74-002	4-7 July	39 M	566	10.4	375	4.6
		54 F	732	20.3	397	3.9
74-010	24-9 Aug.	1 F	360		344	
74-012	17 July	3 M	93		203	
		3 F	360		294	
		8 U	133	31.3	215	16.7
74-012	1-2 Dec.	1 M	245		277	
		1 F	300		262	
74-013	22 July	75 U			66	2.4
74-014	2"4 July	16 U			83	4.7
74-015	24 July	10 U			82	5.5
74-016	27 July	6 M	72	6.4	192	4.7
		2 F	108		213	
74-019	29 July	2 U			116	
74-020	31 July	3 M	73		189	
74-021	15 Aug.	83 M	157	6.3	233	3.5
		49 F	173	13.6	239	6.1
74-022	20 Aug.	2 M	263		253	
		2 F	30s		553	
74-023	21 Aug.	5 U			135	
74-024	21 Aug.	1 F	60		163	
		3 U			85	
74-025	26 Aug.	2 U			70	
74-026	27 Aug.	10 M	80	33.2	188	22.2
		13 F	65	17.1	183	16.6

* See preceding maps for station location.

Coregonus autumnalis

Station	Date	n	Mean Weight	se.	Mean Length	se.
74-027	30 Aug.	1 M 3 F	150 142		255 221	
74-028	31 Aug.	10 u			55	2.0
74-029	6 Sept.	43 u	399	29.7	322	9.8
74-031	11 Aug.	1 U			108.0	
74-035	1S Aug.	95 u			57.3	0.9
74-036	16 Aug.	5 U			49.9	4.5
74-038	21 Aug.	1 U			61.8	
74-047	23 Aug.	7 U			6S.1	3.3
74-052	24 Aug.	2 U			8s.6	
74-053	2S Aug.	10 u			81.0	7.3
74-055	2S Aug.	14 u			69.3	3.0
Coregonus sardinella						
74-010	24-9 Aug.	3 M S F	163 292		264 313	
74-011	31 Aug.	1 F	170		260	
74-012	17 July	128 M 73 F 16 U	98 99 90	2.2 2.6 4.1	204 207 205	1.7 2.7 3.7
74-012	1-2 Dec.	11 M 14 F	109 145	21.0 15.0	198 254	12.5 8.4
74-013	22 July	33 u			97	10.1
74-013	5 Aug.	11 M 45 u	114	19.4	220 126	16.1 12.4
74-014	24 July	27 U			86	5.0
74-015	24 July	39 u			82	1.9
74-016	27 July	3 M 2 F	75 80		200 196	

Coregonus sardinella

Station	Date	n	Mean Weight	se.	Mean Length	se.
74-017	29 July	21 M 10 F	8S 106	9.8 16.6	200 222	7.9 12.6
74-019	29 July	3 M 1 F 2 U	127 175		228 269 115	
74-020	31 July	4 M 3 F	81 108		191 207	
74-021	15 Aug.	42 M 35 F	88 100	6.2 11.2	191 201	4.9 6.8
74-022	20 Aug.	1S M 10 F	65 8S	5.2 20.0	173 185	6.6 13.6
74-023	21 Aug.	7 u			120	14.7
74-024	21 Aug.	1 M 1 F	80 200		206 270	
7-4-026	27 Aug.	117 M 91 F	18 19	1.1 1.4	144 144	1.1 1.3
74-027	30' Aug.	46 M 36 F	30 31	1.5 1.9	139 139	1.9 2.2
74-028	31 Aug.	10 u			56	2.2
74-029	6 Sept.	141 U	123	6.1	221	4.7
74-030	7 Sept.	8 U			156	19.2
74-035	15 Aug.	26 U			70.9	3.2
74-036	16 Aug.	6 U			6s.6	7.1
74-053	25 Aug.	3 U			7S.2	
74-055	25 Aug.	8 U			93.3	5.4

Coregonus clupeaformis

Station	Date	n	Mean Weight	se.	Mean Length	se.
74-001	27 June	2 F			469	
74-002	4-7 July	46 M 37 F	542 602	27.2 23.5	349 367	4.7 5.7

Coregonus clupeaformis

Station	Date	n	Mean Weight	se.	Mean Length	se.
74-010	24-9 Aug.	29 M	950	40.4	428	14.6
		25 F	1013	74.8	431	13.7
74-011	31 Aug.	1 M	920		410	
		1 F	940		395	
74-012	17 July	1 M	240		275	
74-013	22 July	6 U			94	19.4
74-013	5 Aug.	37 u			64	6.1
74-014	24 July	1 M	60		174	
74-015	24 July	2 U			81	
74-016	27 July	2 M	305		261	
		2 U			79	
74-018	29 July	8 M	591	29.8	365	5.3
		3 F	690		401	
74-019	29 July	1 M	60		183	
		1 F	390		317	
		5 U			91	
74-020	31 July	1 M	60		169	
74-022	20 Aug.	1 M	100		194	
		1 F	60		158	
74-024	21 Aug.	3 U			77	
74-027	30 Aug.	1 M	310		335	
74-028	31 Aug.	8 U			50	1.5
74-029	6 Sept.	4 M	171		227	
		4 F	286		266	
Coregonus nasus						
74-002	4-7 July	18 M	1025	145	418	15.6
		18 F	974	98.8	433	9.4
74-010	24-9 Aug.	38 M	1259	69.5	433	6.3
		27 F	1240	86.1	433	9.1

Coregonus nasus

Station	Date	n	Mean Weight	se.	Mean Length	se.
74-011	31 Aug.	14 M	1269	136	436	12.4
74-013	5 Aug.	4U			6S	
74-014	24 July	3U			109	
74-017	29 July	IF	310		321	
74-018	29 July	1 M	450		332	
		IF	640		362	
74-019	29 July	1 U	40		,132	
74-021	15 Aug.	4U			71	
74-029	6 Sept.	2M	365		302	
		2F	405		299	
74-04s	23 Aug.	1 U			67.8	

Stenodus leucichthys

Station	Date	n	Mean Weight	se.	Mean Length	se.
74-002	4-7 July	56 M	442	70.9	355	16.3
		24 F	97s	227	406	34.0
74-010	24-9 Aug.	5 M	1600		536	
		5 F	860		399	
74-011	31 Aug.	1 M	1400		530	
74-012	17 July	1 F	2910		690	
74-013	5 Aug.	1 M	562		1725	

Osmerus eperlanus

Station	Date	n	Mean Weight	se.	Mean Length	se.
74-002	4-7 July	6 M	137	4.2	264	8.9
		2 F	120		256	
74-010	24-9 Aug.	4 M	103		245	
		9 F	126	8.0	286	16.9
74-011	31 Aug.	1 F	110		244	
74-012	17 July	111 M	124	2.4	238	1.9
		108 F	127	2.7	243	2.6
		5 U	149	40.2	248	20.2

Osmerus eperlanus

Station	Date	n	Mean Weight	se.	Mean Length	se.
74-013	22 July	7 larvae			47	1.3
74-016	27 July	33 M	88	4.5	216	4.7
		33 F	94	5.4	214	6.4
74-017	29 July	7 M	122	11.5	245	8.7
		3 F	93		240	
		13 larvae			47	1.3
74-018	29 July	7 larvae			45	1.8
74-019	29 July	9 larvae			50	3.0
74-020	31 July	18 M	115	8.0	233	5.7
		17 F	119	7.0	242	6.2
74-021	15 Aug.	1 F	160		272	
74-022	20 Aug.	1 larvae			46	
74-023	21 Aug.	1 larvae			44	
74-024	21 Aug.	2 larvae			39	
74-026	27 Aug.	1 M	20		158	
		3 F	123		262	
74-029	6 Sept.	37 u	125	6.5	246	5.6
74-031	11 Aug.	1			62.0	
74-036	16 Aug.	1			67.6	
74-055	2S Aug.	6			52.3	5.4
74-063	2 Sept.	1			32.7	

Clupea harengus

Station	Date	n	Mean Weight	se.	Mean Length	se.
74-026	27 Aug.	28 M	222	5.2	290	2.4
		28 F	223	5.6	288	2.4
74-027	30 Aug.	7 M	226	11. S	265	17.7
		9 F	261	9.2	300	3.1
74-029	6 Sept.	8 U	1050	188.8	523	40.4

Liopsetta glacialis

Station	Date	n	Mean Weight	se.	Mean Length	se.
74-002	4-7 July	2 M	90		191	
74-003	17 July	3 M	160		245	
74-010	24-9 Aug.	1 F	110		250	
74-013	5 Aug.	1 M	160		234	
74-014	24 July	2U	55		160	
74-015	24 July	IF 1 U	115 50		208 51	
74-017	29 July	1 M	100		182	
74-019	29 July	1 M	310		281	
74-022	20 Aug.	2F	53		145	
'/4-025	21 Aug.	3U	117		195	
74-024	21 Aug.	1 U	105		190	
74-02S	26 Aug.	2U			65	

Platichthys stellatus

Station	Date	n	Mean Weight	se.	Mean Length	se.
74-002	4-7 July	6 M	123	23.9	224	19.5
74-003	17 July	2F	270		480	
74-010	24-9 Aug.	18 M SF	201 214	39.6	244 256	13.2
74-011	31 Aug.	1 M	140		218	
74-014	24 July	1 U	460		310	

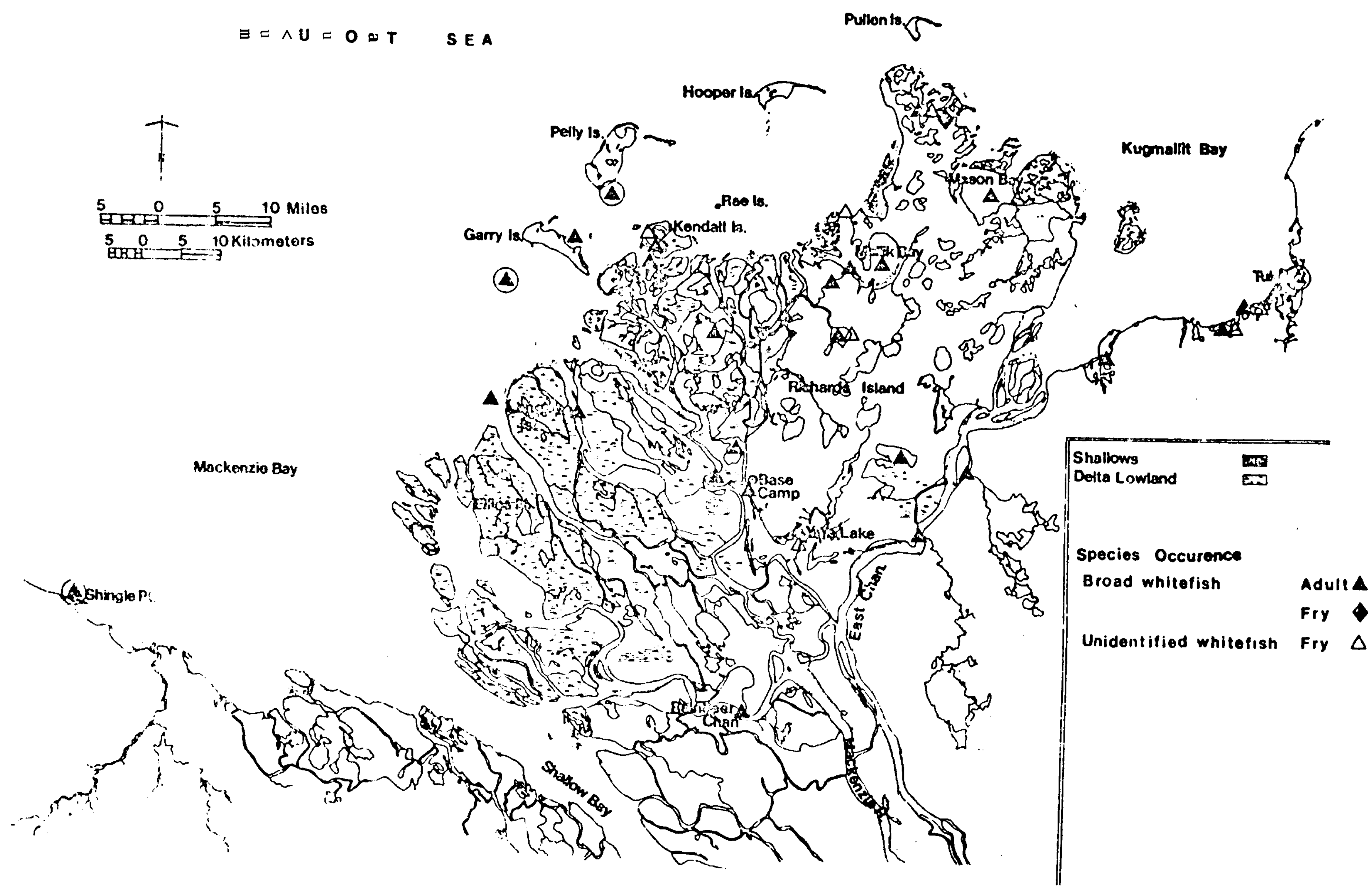
Myoxocephalus quadricornis

Station	Date	n	Mean Weight	se.	Mean Length	se.
74-002	4-7 July	4 F	130		234	
74-003	17 July	1 F 1 U	SO		19s .90	
74-010	24-9 Aug.	2 M " 2 F	60 190		200 289	
74-011	31 Aug.	1 F	200		300	
74-012	1-2 Dec.	3 U	136			

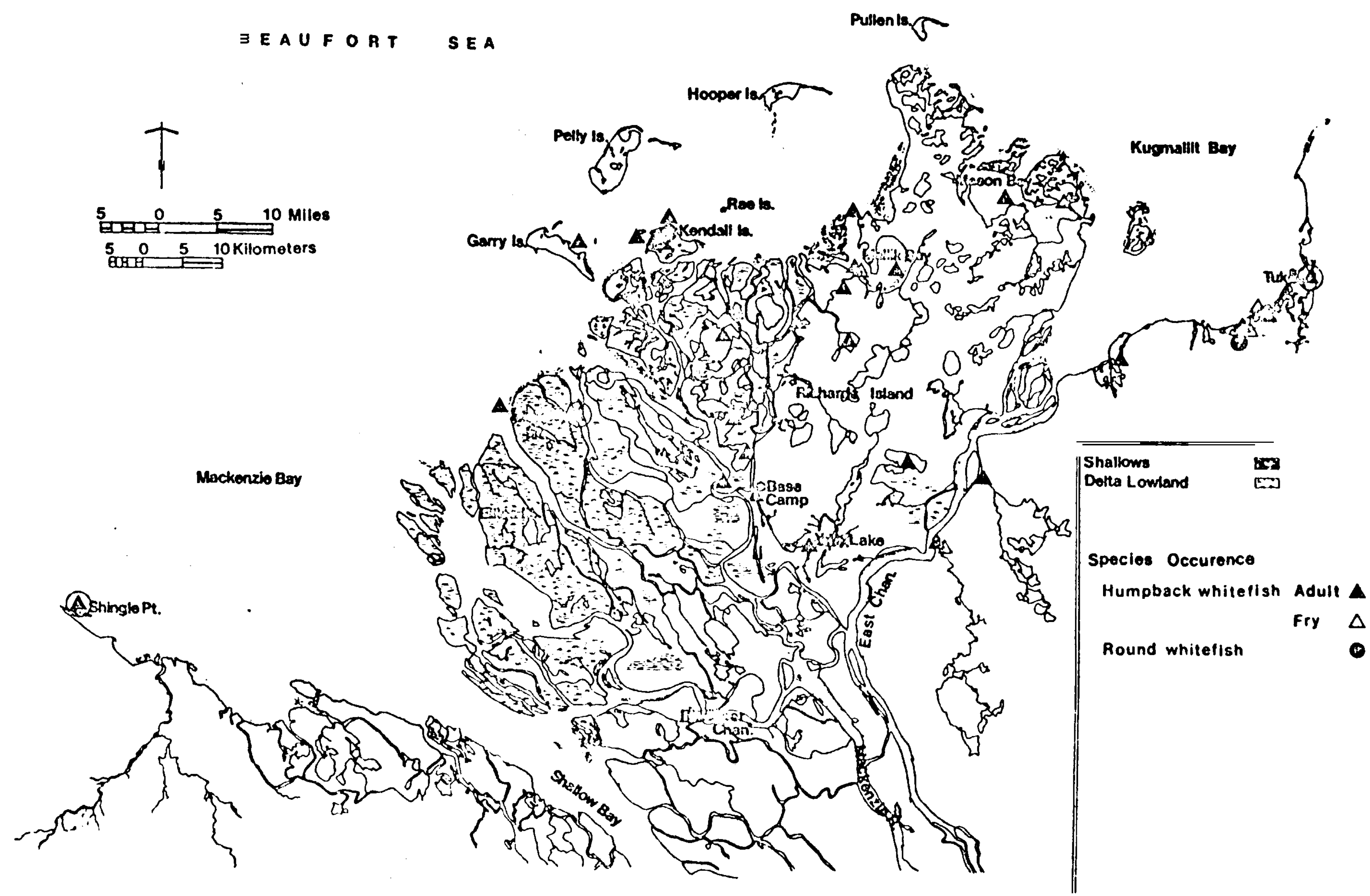
Station	Date	n	Mean Weight	se.	Mean length	se.
Myoxocephalus quadricornis						
74-013	5 Aug.	2 U			182	
74-014	24 July	3 U			70	
74-016	27 July	1 F	280		235	
74-018	29 July	2 U			65	
74-022	20 Aug.	1 U			80	
74-023	21 Aug.	8 U			59	3.4
74-024	21 Aug.	6 U				
74-025	26 Aug.	11 u			39	5.4
74-026	27 Aug.	11 u	48	3.3	158	4.5
74-028	31 Aug.	52 U			27	0.8
74-029	,6 Sept.	13 u	109	11.8	222	8.6
74-030	7 Sept.	1 U			33	
Lota lota						
74-002	4-7 July	3 M	2400		739	
74-010	24-9 Aug.	2 M	974		668	
74-026	27 Aug.	1 U	2s0		311	
Eleginus gracilis						
74-003	17 July	2 M 3 U	800		303 100	
74-033	14 Aug.	3 U			39.0	
74-045	23 Aug.	2 U			61.5	
74-052	24 Aug.	3 U			67.4	
74-055-	25 Aug.	6 U			80.4	4.2
74-061	31 Aug.	3 U			68.1	

Lampetra japonica

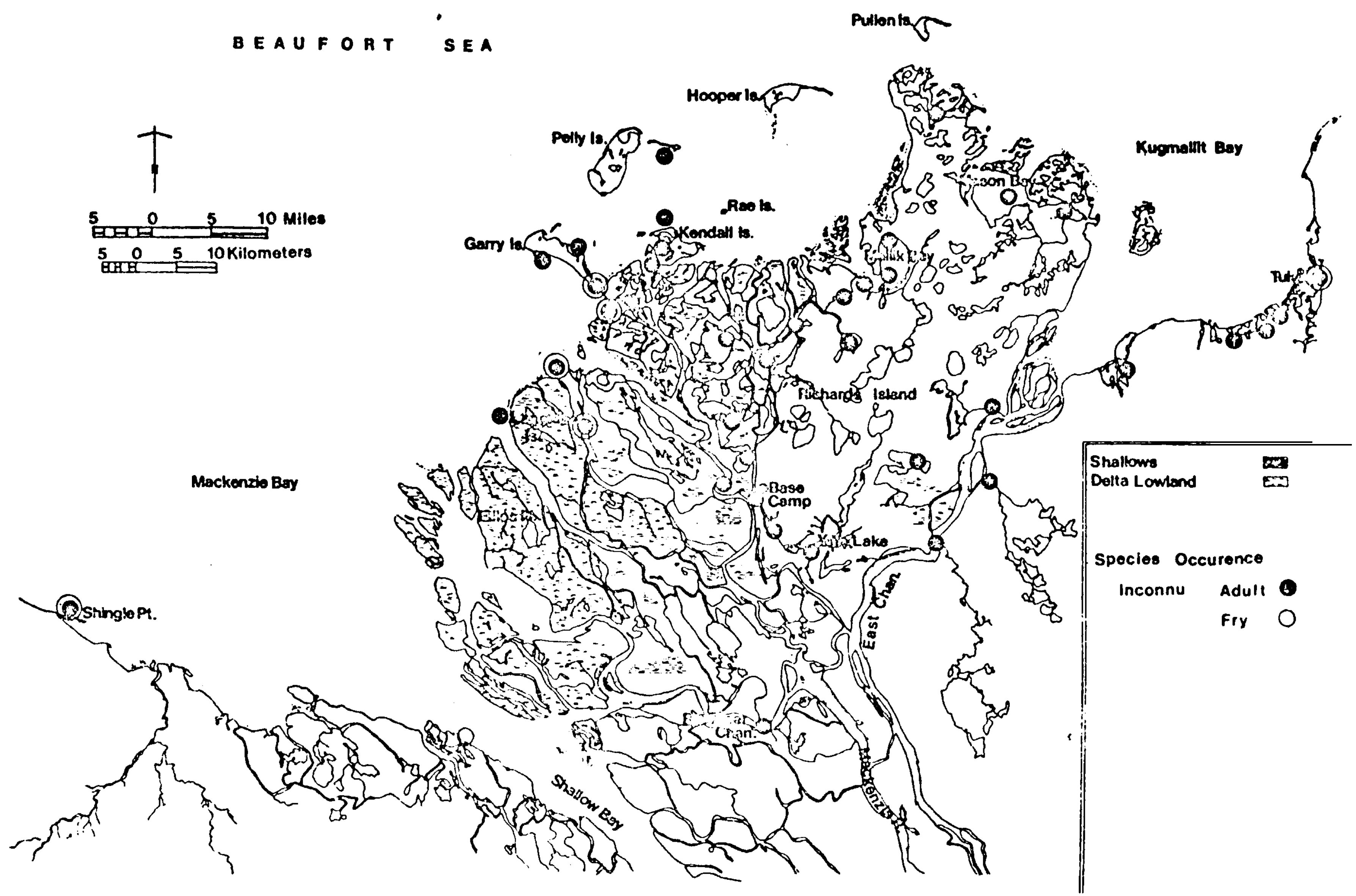
Station	Date	n	Mean Weight	s.e.	Mean Length	s.e.
74-020	31 July	1 U			174	
74-035	15 Aug.	3 U			1S1.8	
74-047	23 Aug.	1 U			170.0	
74-0s3	25 Aug.	1 U			169.1	
Acantholumpenus mackayi						
74-003	17 July	2 U	20		215	
Catastomus catastomus						
74-013		1 U			96	
Pungituis pungituis						
74-045		1 U			29.0	
74-062		1 u			31.5	



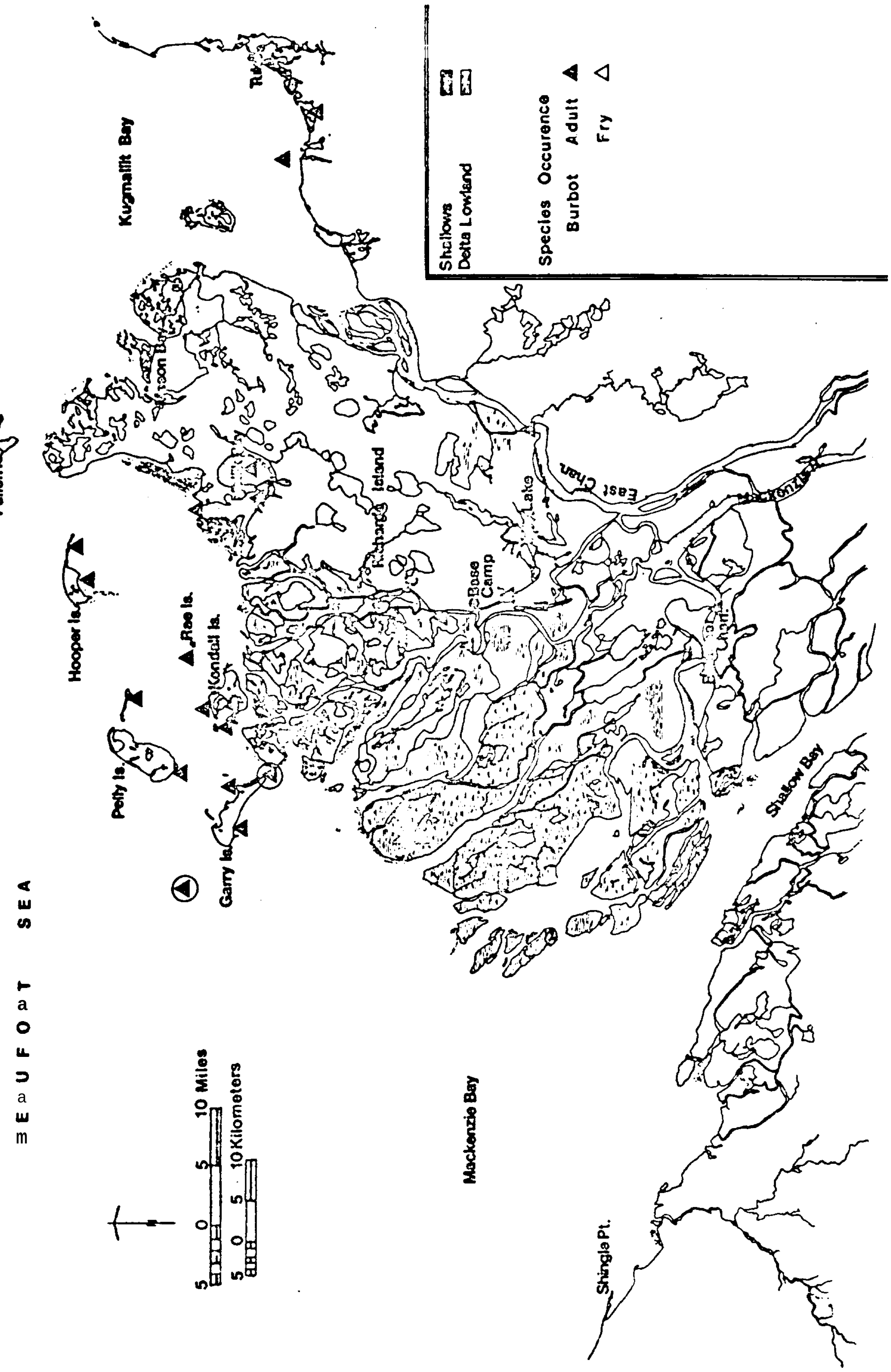
Distribution of broad whitefish, *Coregonus nasus* (Pallas), and unident f ed whitefish fry n the outer Mackenzie River delta, 1974.



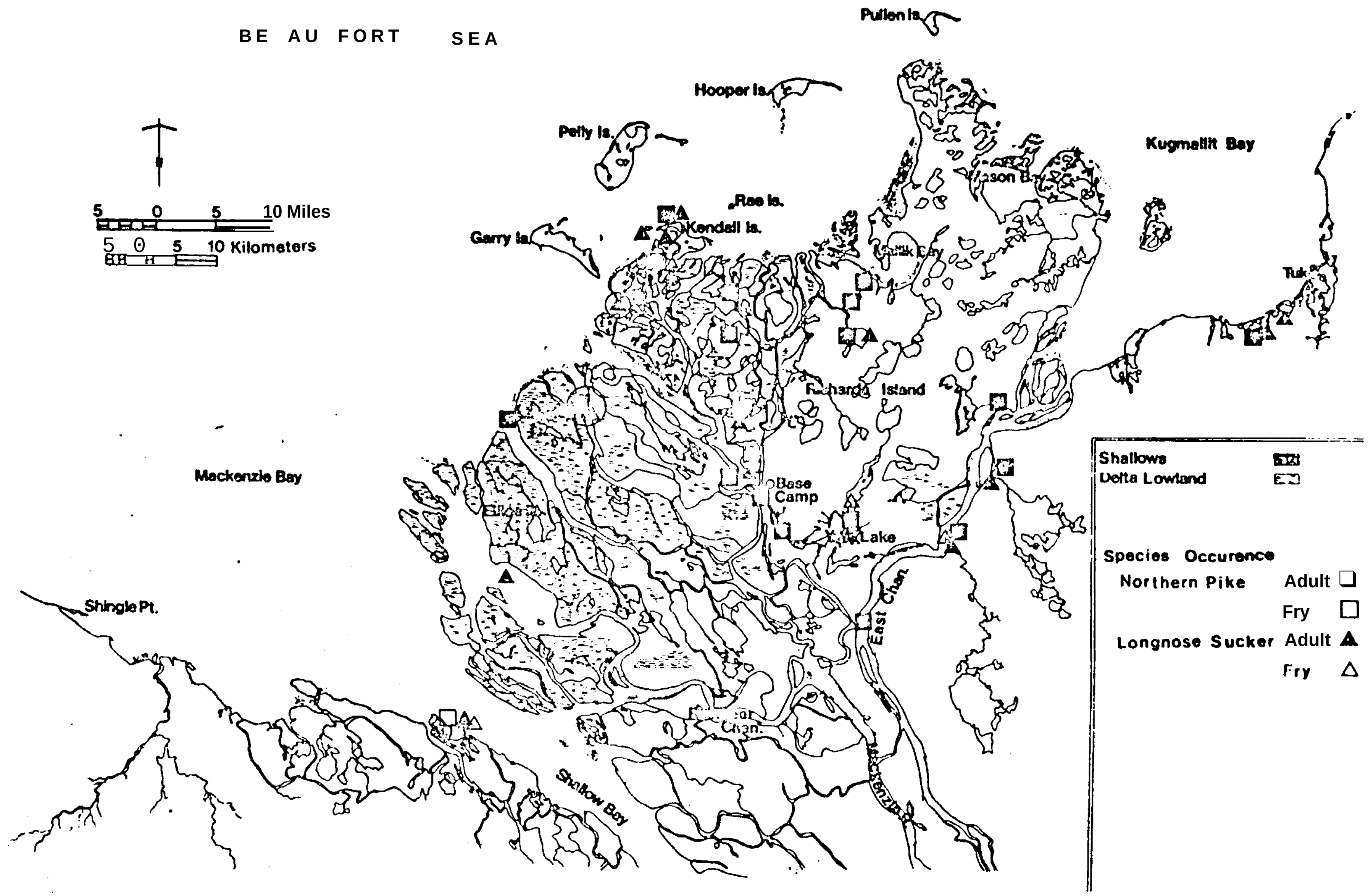
Distribution of humpback whitefish, *Coregonus clupeaformis* (Mitchill), and round wh tefish, *Prosopium cylindraceum* (Pallas), in the outer Mackenzie River delta, 1974.



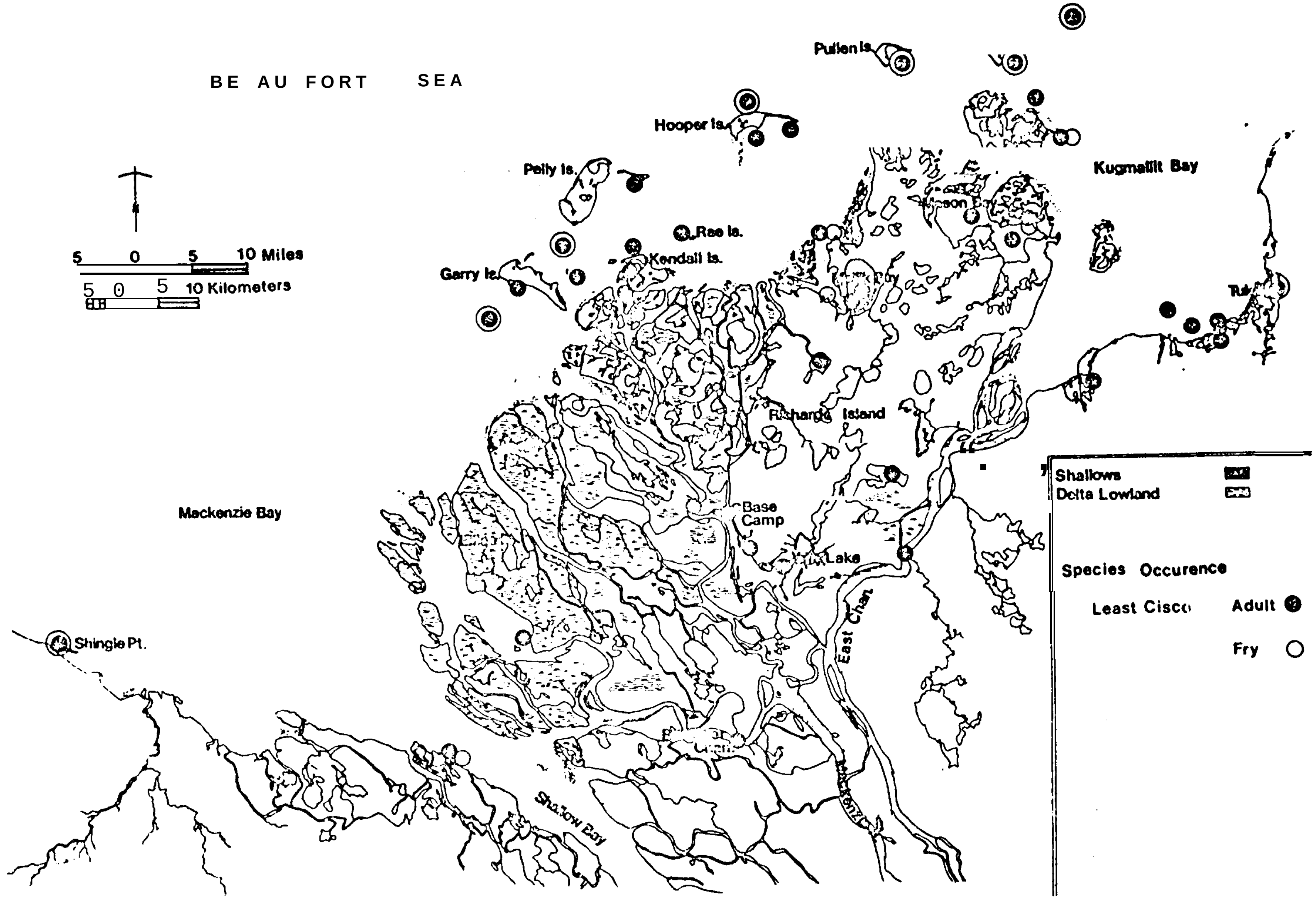
Distribution of inconnu, *Stenodus leucichthys nelma* (Pal as), n the outer Mackenzie River delta, 1974.



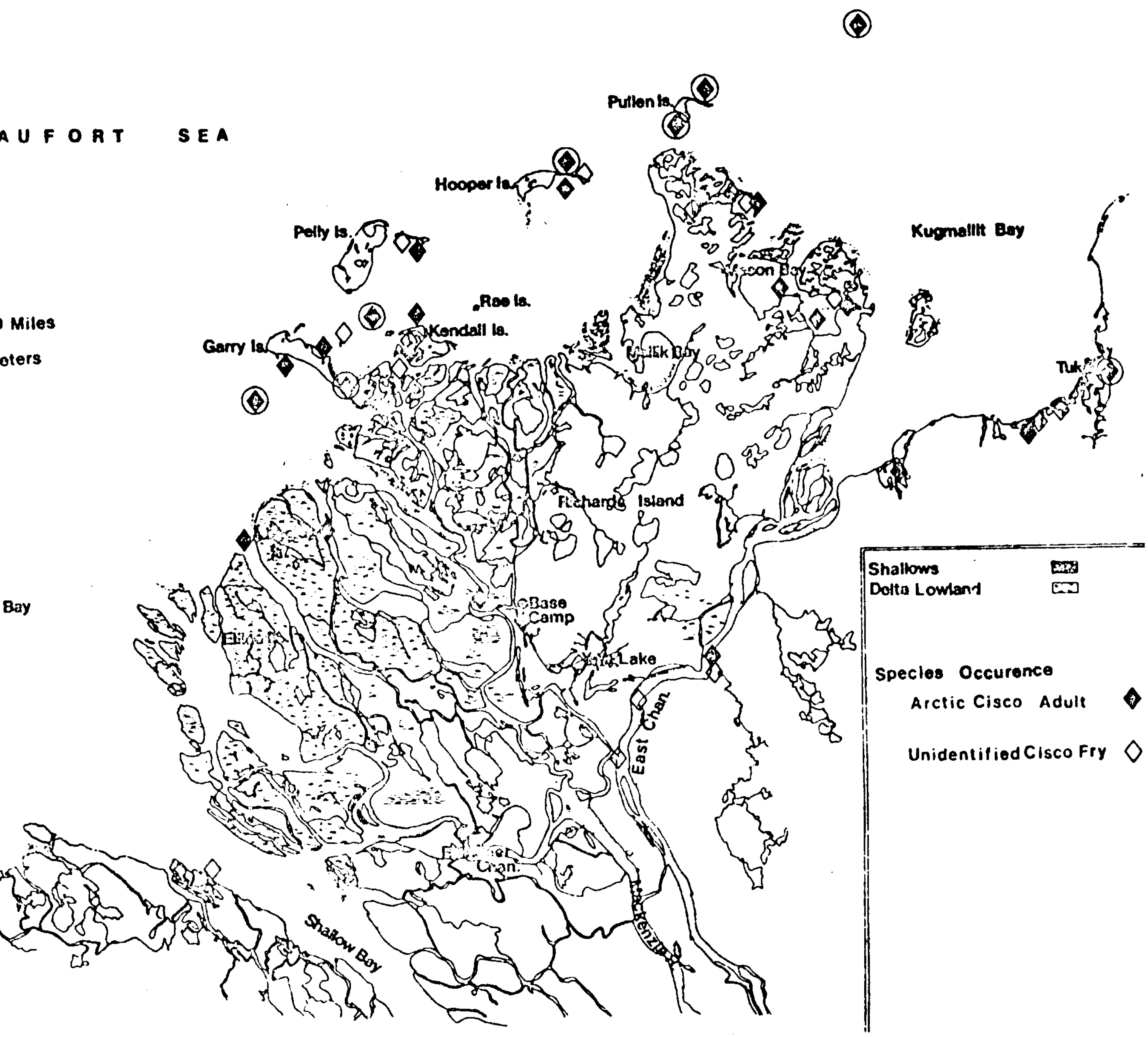
Distribut on of burbot, *Lota lota* (L nnaeus) in the outer Mackenzie River delta, 974.



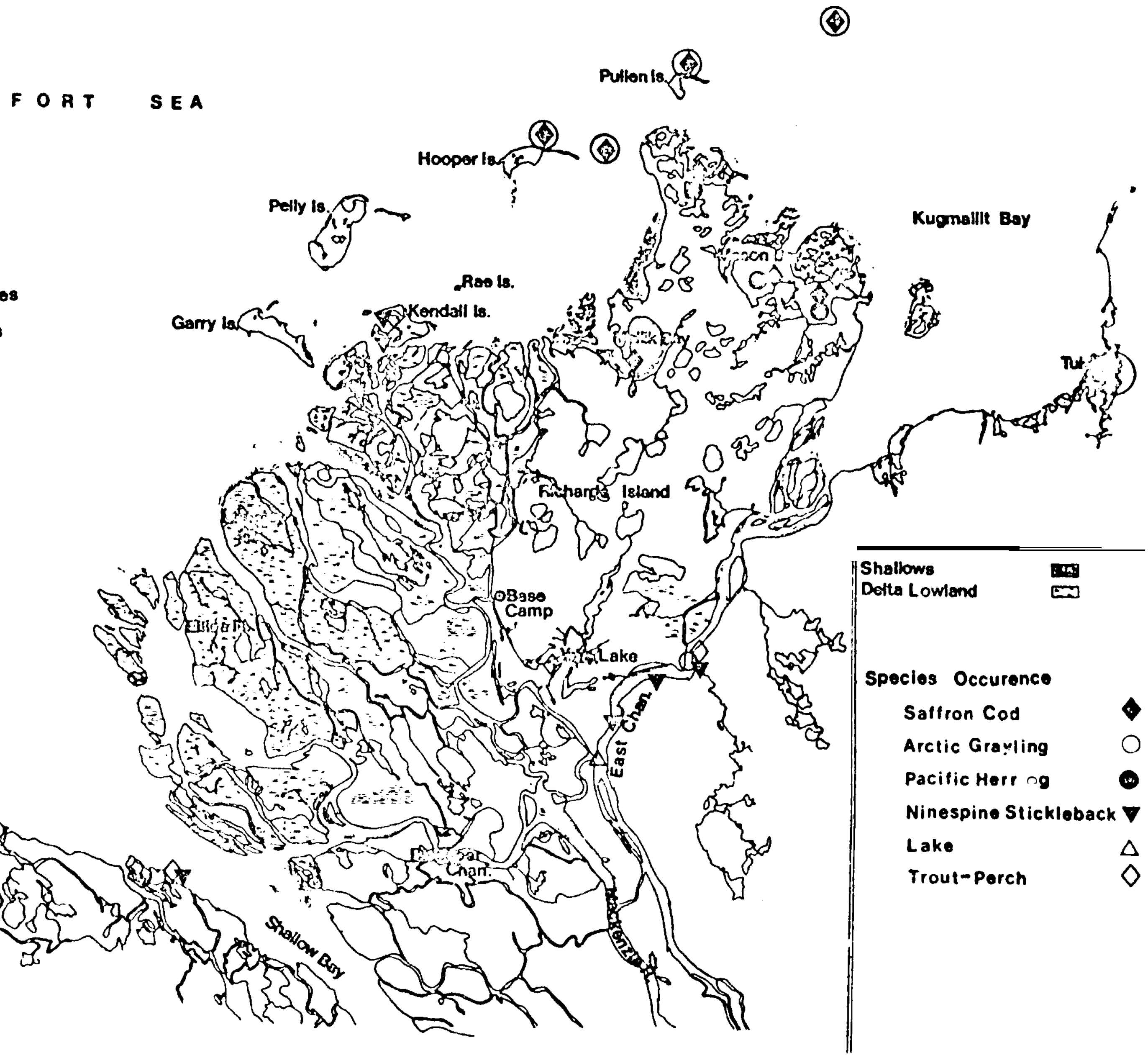
Distribution of northern pike, *Esox lucius* (Linnaeus), and longnose sucker, *Catostomus Catostomus* (Forster), in the outer Mackenzie River delta, 1974.



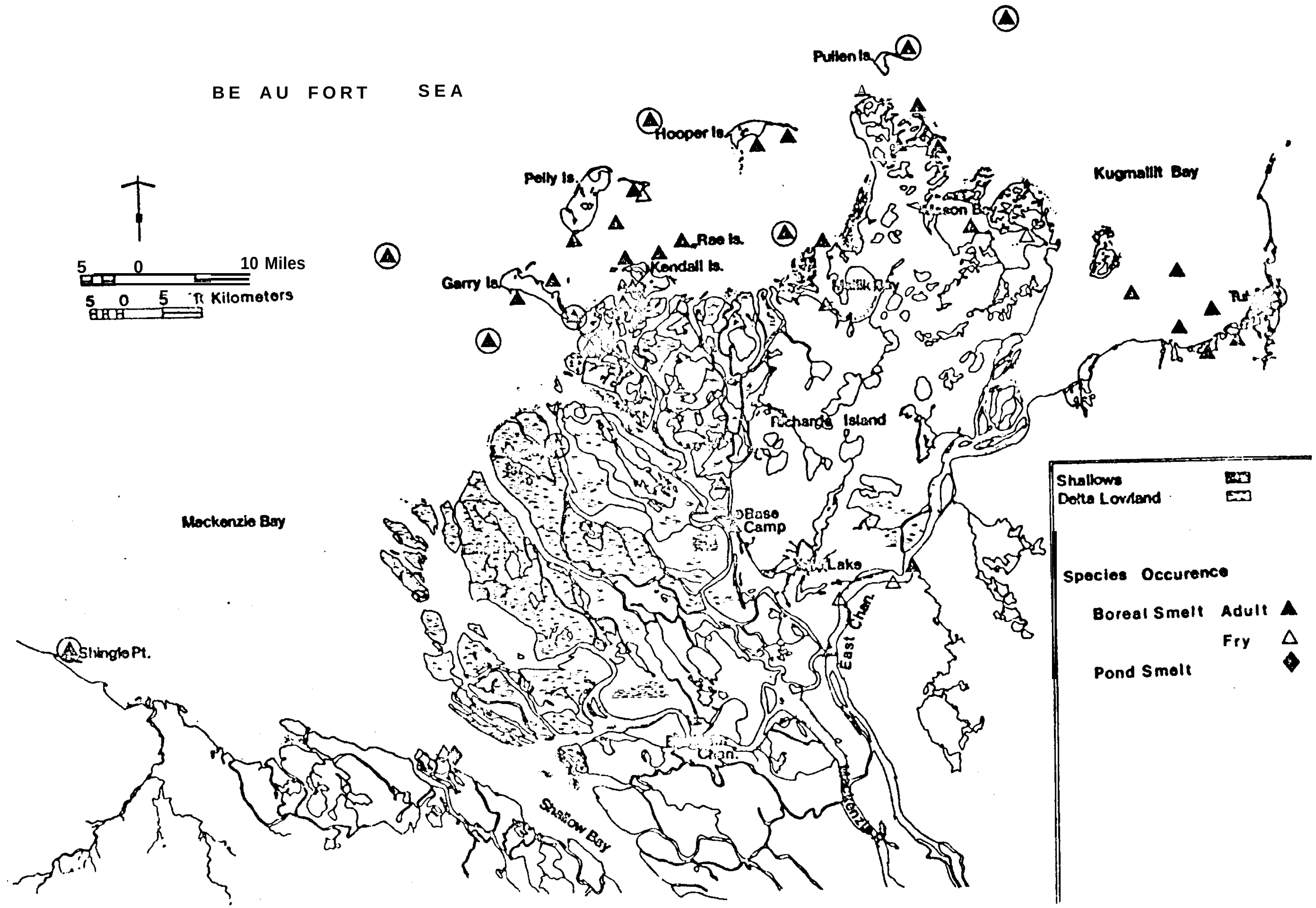
Distribution of least cisco, *Coregonus sardinella* (Valenciennes), in the outer Mackenzie River delta, 1974.



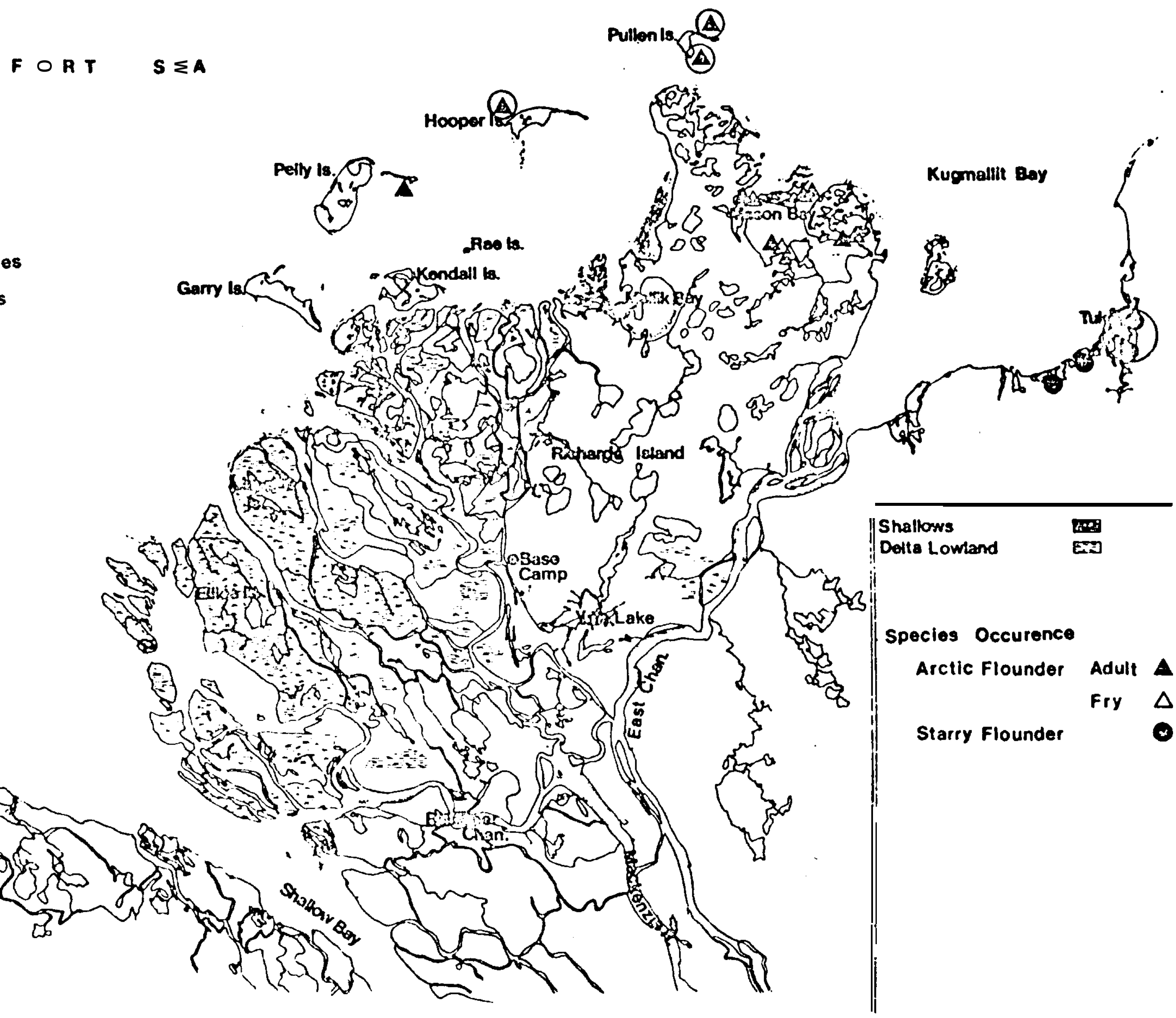
Distribution of Arctic cisco, *Coregonus autumnalis* (Pa as), and un dentified cisco fry in the outer Mackenzie River delta, 1974.



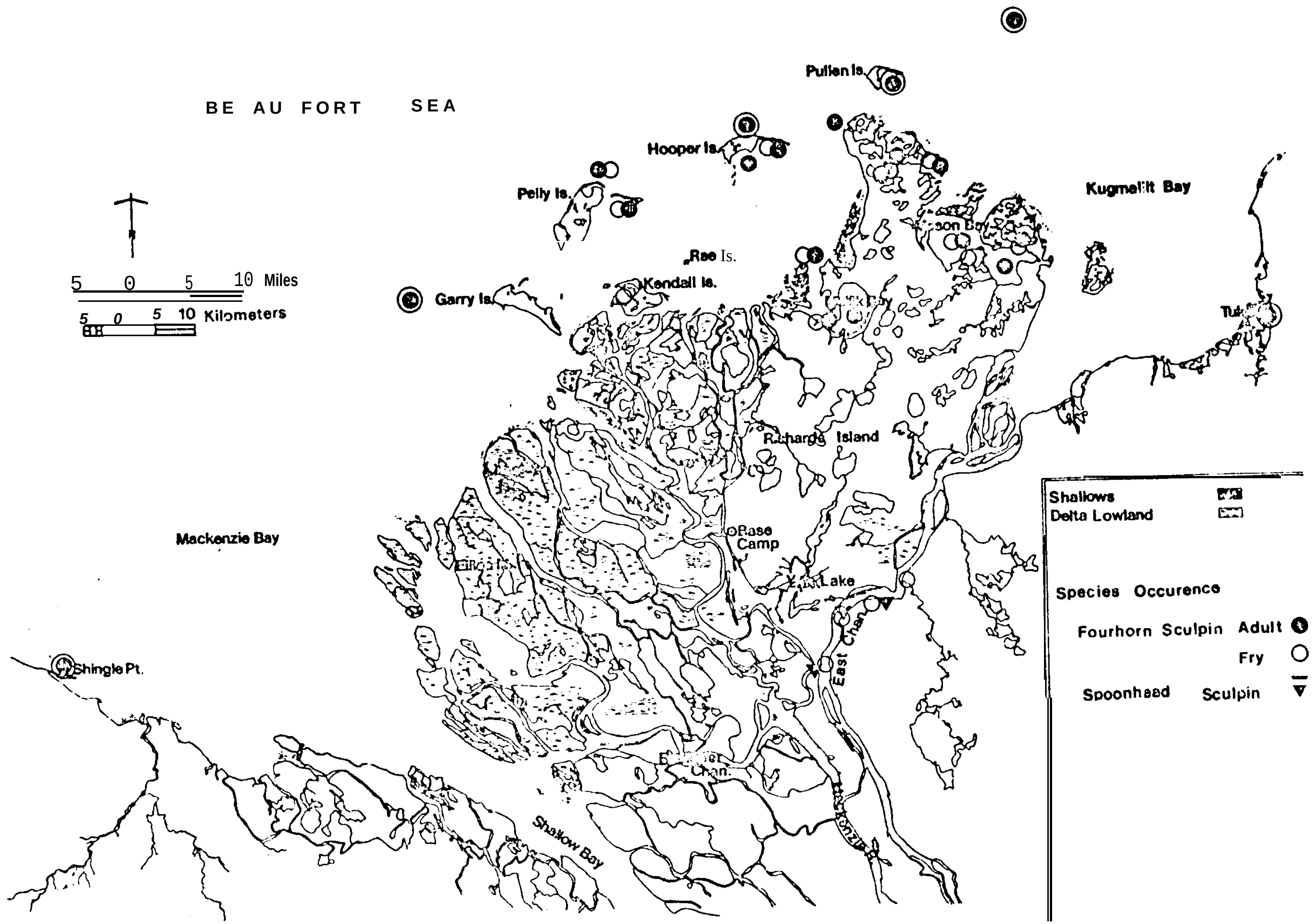
Distribution of saffron cod, *Eleginus navaga* (Pallas), Pacific herring, *Clupeaharengus pallasi* (Valenciennes) and others in the outer Mackenzie Delta, 1974.



Distribution of boreal smelt, *Osmerus eperlanus* (Linnaeus), and pond smelt, *Hypomesus olidus*, in the outer Mackenzie Delta, 1974.



bution of Arctic flounder, *Liopsetta glacialis* (Pallas), and starry f ounder,
hthys stellatus (Pallas), in the outer Mackenzie River delta, 1974.



Distribution of fourhorn sculpin, *Myoxocephalus quadricornis* (Linnaeus), and spoonhead sculpin, *Cottus ricei* (Nelson), in the outer Mackenzie River delta, 1974.

Chapter 6

COUNTRY FOODS PROJECT

There is an obvious tie-in between the fishery and one of I. D. C.'s other projects, the Country Foods enterprise. The philosophy behind an idea such as the Country Foods operation is simple and direct. "As more native people turn to wage earners they will not have time to go hunting and fishing. They themselves create a market for country foods. A problem here is the pricing habits. Traditionally people do not want to pay very much for country foods. Sometimes the price is only one third of what comparable store foods cost. This problem must be overcome by gradual increase in prices by those who do the marketing. There is no reason why the natives who go hunting and fishing should sell their produce for next to nothing to people who work for good wages in other occupations. This is the main reason why country food sales have not been successful in the past. If we are going to succeed in the future then we must establish new price habits where the hunter and fisherman make reasonable money and where there is also some profit for the retailer. No business can be run as a welfare agency. It just will not survive in the longer run. The people who try to live off the country, the hunters and fishermen, are also entitled to a good standard of living and this fact must be strongly considered in our economic planning."

Based on this concept, Country Foods was established and has created an important role for itself in today's society of transition. At least in part, the success of this project can be demonstrated by two indicators. One is the community satisfaction and approbation engendered by the operations as they are presently carried on. The other, more quantifiable, is the sales volumes: last year Country Foods sold over $70,000 worth of products, this year it expects to do better than $100,000. Both the range of products offered and the base of operations is gradually being expanded. This enterprise would provide a perfect local marketing method for the proposed fish plant. Its established procedures and contacts would be invaluable in the initial stages of setting up the fishery, and much of the management procedures could be carried over.

Chapter 7

SUMMARY

FISH STOCKS

Fish can be classified as either spring spawners or fall spawners. In the Mackenzie system, fall spawners constitute 62 percent of the fish population and spring spawners constitute 35 percent. The burbot, or losche, is the only winter spawner in the system. Major spring spawning species are arctic grayling, yellow walleye, northern pike, longnose sucker and flathead chub. Fall spawners are dominated by the whitefish family, the humpback, broad and round whitefish, arctic and least cisco, and the inconnu. With the exception of the more extensive lakes, these fall spawning species have larger populations in the north end of the Mackenzie drainage while the spring spawners stay further south. Well defined spawning migrations of the whitefish family take place in the Mackenzie Delta channels and the Arctic Red, and Peel Rivers. Arctic and least cisco live in the sea during much of their lives. Populations of all these species use the Delta channels and brackish Mackenzie estuary as feeding, nursery and overwintering areas. Lake trout also occur in significant numbers in the deep lakes of the Mackenzie tributaries and Delta, but do not appear to be a major species in the flowing waters of the system.

THE SUPPLY FACTOR

There are two constraints that limit the supply of local fish that will be available to a Delta fishery. These are the natural availability of the fish and the federally imposed commercial fishing quotas.

Although the population of the Western Arctic has increased fairly significantly, the consumption of fish has remained constant. In fact, it has even dropped slightly. This is, to a large extent, due to the simultaneous occurrence of two situations: on the one hand, there has been increased usage and dependence on imported southern foods; on the other hand, the use of skidoos has drastically cut the dog population, especially that of working dogs. Study of the domestic fishery situation, past records of attempted commercial fisheries and various scientific studies of the Delta fish seem to indicate that the present small harvest does not reflect scarcity of the resource, but is an expression of the lack of utilization and fishing effort due to the paucity of incentive creating institutions.

There is, then, a fairly abundant fish resource in the area. However, biologists working in the Delta have been extremely reluctant to make any estimates as to the actual size of the populations of species. Recognizing that Northern fish populations are slow to recover if over-exploited, the Fisheries Service placed a fairly low initial commercial quota on the Delta. The system was roughly based on the criterion of one half pound of fish per acre of water surface. Over the years, as segments of populations have been verified, these quotas have been revised upwards. Given the available funds and manpower currently devoted to this study, progress can only be expected to occur as it does - slowly and erratically.

THE FISHERY

A commercial fishery, on a small scale, as considered by I.D.C. has a strong possibility of success. The resource and the manpower seems to be available in this area. Due to the uncertainty of the exact size of the resource, it is important to emphasize the fact that any such project should begin at a minimally justifiable economic level. This level will ultimately be established during a complete feasibility study of the project.

The question of having a mobile or stationary plant also will be decided during such a feasibility study. The advantage of using stationary buildings lies in their durability and size, but they are also much more expensive than portable buildings. Portable buildings, moreover, can be placed in storage when not in use, thereby reducing the damage caused by the elements or vandalism. However, such operations then cause increased costs of assembling, dismantling and storing the portable stations. The above, though, is a very simplistic discussion of the problem which will involve such factors as the type of processing entailed, the possibility alternate building uses, the scope of the physical fishery, etc.

There was offered by the Special ARDA committee considering I.D.C.'s fishery proposal two significant suggestions. The first, that I.D.C. utilize existing equipment from the old Economic Development fishery, was practical and had already been stated as a potential should the project be approved. Irregardless of that fact, further research showed that no such equipment is available. The second suggestion was that such a fishery be combined with a resource verification program. I would whole-heartedly endorse this suggestion; the establishing of hard and fast quotas will be necessary in any long term planning. Nevertheless, I would suggest that although the two projects have joint management for obvious reasons they be funded and treated as two separate projects. They may well even be funded by different organizations, although special ARDA has provisions within it for the feasibility study, the resource evaluation, the initial establishment of the fishery and even the maintenance of the enterprise during the first couple of years if it operates at a loss until it stabilizes.

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Appendix A

The Cambridge Bay char fishery has been ongoing for 2-3 years and has established itself as one of the major suppliers of Arctic char. The fishery was, however, based to a large extent on previous work d-one by the Department of Economic Development. The plant being used by the fishery and the equipment in the plant was provided by Economic Development. The original cost of the plant was $80,000 (its Present replacement value is somewhere around $200,000) . It is mainly a washing, cleaning and freezing operation, although some filleting takes place. The plant itself consists of a large building on a concrete slab base compartmentalized into a work area, a holding area and a large blast freezer. The fishery, which incidentally is part of a co-op that owns a general store, the arts and crafts store and the only hotel in Cambridge Bay, is repaying the government for the plant on a throughput basis - I believe it to be about 15¢ per pound.

The fishery includes 42 fishermen, who make 8 camps from 30 to 110 miles out of Cambridge Bay - any distance over 120 miles has been determined to be uneconomic. The fishermen's nets are supplied by the Co-op, and the fishermen themselves provide boats and gas (although, last year the Co-op arranged a Special ARDA group of grants for a boat building project) . Before the fishing season begins, a group meeting is held by the Co-op management and the fishermen to determine where each year's fishing camps are going to be located. The fishermen are paid on a poundage basis, also set by the Pre-season meeting, although they receive as well a bonus at the end of the season in the form of a price and quality evaluation that is usually sent each year by the FFMC to the Co-op. The fish are flown from the camps to the plant; a Cessna 185 and a Beaver are on contract for the fishing season. The planes make one trip per day to each camp. Both planes have pontoons and the fish are loaded directly from the boats to the planes.

The plant employs 30 people at its peak period , paying between $4.50 and $5.50 hourly. The total numbers of employees is decided on the day before they are needed and they are called upon from an established labour pool. Most of the employees used in the plant are women. The fishery only lasts for about three months (June to September), but a small amount that is generally kept for local sales keeps coming through the winter.

Most of the fish are sold to FFMC in Winnipeg, although a small amount are sold in Yellowknife and some is sold locally. The Co-op receives **$2.50** per pound in the Yellowknife market and approximately that from FFMC. (The FFMC actually pays less, but they eventually reimburse for shipping costs thereby just about evening the difference.) For shipment to its major market, the FFMC, the Co-op uses a PWA backhaul to Edmonton. Packed in PWA igloo containers that would otherwise be returning empty, the fish are transported from Cambridge Bay to Edmonton for 17-18¢ per pound and are received in Edmonton by a FFMC representative.

The Co-op this year processed 100,000 pounds of char, their full quota for the fishery area. The Co-op fishery utilizes Pelly, Spence and Cambridge Bay to maintain its plant supply. Through the local Economic Development Officer, a 2 year $165,000 grant was obtained to evaluate the char resource of the Gjoa Haven area. When the test period is over, that area will be given a separate quota which can be used by the fishery. Also, although uneconomic due to the distances involved, the Co-op has discussed the possibility of allowing Holman to participate in the fishery (nothing, as yet, has come of this) .

Appendix B

August 27, 1979

Mr. John Matson
Planning Researcher
Inuvialuit Development Corporation
P.O. Box 2000
Inuvik, N.W.T.
XOE OTO

Dear Mr. Matson:

In response to your letter of June 8, 1979 to Phillips Barratt, Consulting Engineers, they requested that my firm contact you to discuss the feasibility of a fish processing operation at Inuvik. Since that time we have spoken on the telephone and met in person in Whitehorse, and discussed in some detail the needs of the Inuvialuit Development Corporation.

Your June 8th letter outlined the interest of the Inuvialuit Development Corporation in developing the market for white fish from the McKenzie/Delta area. You also expressed an interest in value added for the processing of reindeer.

In subsequent meetings, we determined that, not only is there a substantial quota of white fish available to the Inuvialuit Corporation, but also other presently unexploited fish species such as herring, cisco, pike and burbot. We also learned that a considerable quantity of seal meat may be available from the Holman Island sealing operation. Of course, there is the continuing potential of a greater yield from the reindeer herd and perhaps future possibilities of caribou meat. Depending upon the economics, a processing plant in or near Inuvik may be adaptable to a number of alternatives and complementary uses. Certainly, to get the most benefit from any processing operation, it should be

You have suggested the possibility of a portable processing plant, as was described in the 1972 study of the Northwest Territories fish market. This is a possibility. All further processing operations such as canning or smoking of product will be examined.

We have carefully reviewed the various studies and publications on the fishery potential of the McKenzie/Delta. Based on our own experience we believe that a comprehensive feasibility study of establishing food production-processing-distribution business for the Inuvialuit Development Corporation should be based on several things including: possible end products that can be derived, markets (including competitive products, prices, quality, quantity, seasonality, etc.), transportation (to and from plant) , raw product availability, desire to the potential fishermen, plant labour supply, and locational factors.

Our research would be based on utilizing the Research Assistant that you presently have funded by Special ARDA. This would reduce the expense of our travel in the area and could provide a superior source of information close to the people that we certainly would not be able to duplicate. We would, as discussed, provide a detailed research plan for your Research Assistant who could conduct on-the-spot data collection and interviewing.

As mentioned, we would review existing studies and , where possible, update their information to make it usable under 1979/80 conditions. A close liaison would be kept with the Inuvialuit Development Corporation as the study progresses.

This study proposal is phased with the first part a general feasibility of the project. If Part I demonstrates preliminary feasibility, then Part II should be conducted which would include in detail: plant site selection, layout costing, training programs, management system, market strategy, financial analysis such as cash flows, capital requirements, etc.

If a plant is built, we are capable of supplying training in fish or meat processing (canning, freezing, smoking, etc.), management, marketing or other operational procedures.

We have considerable experience in the fishing industry as has been outlined in the attached section on the past experience. We have assisted recently a number of native Indian bands in British Columbia in the fishing industry. We set up the jack sockeye fishery and market for the Burns Lake

Native Development Corporation, we assisted the Chemainus in examining the dogfish processing and market, we evaluated the potentials for fish processing and for salmon aquiculture for the Nimpkish band, and for the American Indian Development Association of Washington we did a number of market evaluations of products that they were producing from seafood.

I find the entire concept of a multiple use processing plant that can be used for both fish and meat products or even for production of items for pet foods such as seal meat to be most exciting. Most of our consultants, as you will see from their resumes, have experience in the food processing industry. We are not only interested in carrying out a feasibility study for your operation but in assisting you setting it up, starting it and getting it going on a business like basis if the feasibility proves positive.

I greatly appreciate the opportunity you have given us to put forth a proposal on this most interesting and challenging subject. I hope that you will find our proposal answers all the questions that you may have and will be satisfying to the Special ARDA committee in their selection process. Please do not hesitate to call if there are any questions in the proposal and we would be most pleased to discuss. I look forward to assisting you in identifying and developing a feasible and useful business for the Inuvialuit Development Corporation.

Yours very truly,

FOODWEST RESOURCE CONSULTANTS

Robin M.R. Smith,
Managing Director

D/87-89

FEASIBILITY STUDY OF FISH AND FOOD PROCESSING OPERATION FOR INUVIK

METHODOLOGY

The study has been divided into two parts. Part I would be Project Feasibility which would assess the overall feasibility of all or part of the processing plant concept. If Part I results demonstrate feasibility then the study should progress to Part II which includes detailed site analysis, layout costing, labour and management planning, financial specifications and the information required to comply with Special ARDA financing to construct and start a plant.

Part I - Project Feasibility

At all times we intend to utilize the services of the Research Assistant of the Inuvialuit Development Corporation who is already funded by Special ARDA.

1. We would meet in Inuvik with the principals of the Inuvialuit Development Corporation to discuss the project, view the area and get an understanding of the physical constraints and dispersion of the people and the products to be processed, an evaluation of the expectations of the people, discuss in detail the research program for the Research Assistant, and to assess in final form what the results of this study should yield.

2. We would need to acquire samples of potential products in order to better evaluate what can be done with them in the marketplace. We would require the samples of the different types of fish available, reindeer meat and some of the reindeer products that have been made from it, and possibly seal meat from the Holman Island operation.

3. We would determine, in cooperation with the Inuvialuit Development Corporation and their Research Assistant, the types of products that could possibly be made from the available raw

materials. This would include an examination of the products and forms that have been used in the past or produced in the past, plus those that we feel could be produced for the marketplace now. We have considerable experience in development and marketing of unusual food products, and we should be able to provide useful information in this area. Product development, for instance, may even take the form of how the product is packaged, in what size or manner it is presented to the potential client. Realizing that the Inuvialuit Development Corporation has done some product development, particularly with reindeer, we would utilize that knowledge and that experience in preparing products for the marketplace.

4. We would undertake a very basic market survey of the types of products that could be in demand from the raw ingredients available and would then discuss those with the Inuvialuit Development Corporation. This would include some discussions with various fish and meat processing and distributing companies and with the appropriate federal and territorial government officials (Fisheries, Wildlife, Economic Development, etc.) . We would also have detailed discussions with the freshwater fish marketing board to better determine their experience under current conditions with various fishery products and the potentials that they see for product from the McKenzie/Delta area.

5. After having some basic market potential discussions, we would then develop packages or types of product from the available fish, reindeer, and seal meat supply that could be available through the Inuvialuit Development Corporation. These products would be developed, packaged and made ready for presentation to make a better market assessment possible. Constant discussion would be held during the development of these products with the Research Assistant of the operation.

6. We would then assess in detail the market for the various products prepared by discussion and interview with a number of industry and government sources such as fishing companies, food wholesalers, major retail chains, meat processors, pet food companies, etc. This detailed

market examination would entail discussion of the actual products that were available and would result not only in some assessment of what the market is, but a fairly good assessment of the true interest and potential sales for those products. This part of the study would also yield a basic marketing strategy for the short and the long term.

7. We would assess the availability and the cost of supply on a seasonal basis from the various areas of the Western Arctic that would supply the Inuvialuit Development Corporation. This work would include examination of the problems of catching, transportation, storage, etc. of the various products available. A majority of this work would have to be carried out by direct interview with the various people who could be involved and in the communities where they live, and thus would be done in a large part by the corporations own Research Assistant.

8. We would evaluate the current experience and interest level of potential fishermen by region. This would provide information on who might fish and the expected quantities of product over a seasonal basis. A documentation of past problems with the fishery would be done at this phase. A large proportion of this work would necessarily be done by the corporation's own Research Assistant under an organized research program that we would present.

9. An evaluation of processing plant, processing alternatives and transportation with some rough locational analysis would be carried out. This would include preliminary capital costs, operational costs, and an assessment of labour requirements and availability.

10. Preliminary financial projections would be prepared.

11. An overall economic feasibility based on the above data would be carried out and an analysis discussed with the corporation's management and Research Assistant.

12. A report would be prepared in draft form and discussed in presentation to the Inuvialuit Development Corporation.

13. The draft report would be finalized and presented.

Part II - Plant Layout, Management and Financing

If Part I shows that any or all of the suggested project is feasible, then the study should continue to Part II where an assessment of specific sites takes place, plant layout and costing in detail is done, labour and management planning is completed, and financial specifications of other information required to comply with Special ARDA financing are completed.

Part A - Plant Site Analysis and Capital Costing

Subcontracted engineering firm, Phillips Barratt of Vancouver, would be retained to conduct the engineering sector of Part A.

1. The engineers would determine the best site location based against the other economic considerations of Part I that would support a processing plant. This would include some basic examination of the bearing structures necessary for a processing plant and all site and development costs that would enter into this.

2. The engineers would provide a site and building plan appropriate to the planned production.

3. The engineers would provide a detailed list of building, machinery, equipment and fixture costs, including installation, taxes, freight, engineering, site development, construction supervision, etc. necessary to give detailed financial costing for this project.

4. The engineers would ensure that various fish inspection acts and pollution control regulations were complied with in the layout and planning of such an operation.

Part B - Management, Employment, Training

1. We would determine the management required for the plant and recommend how and where it could be obtained in the short intermediate run. This would include some assessment of possible management personnel from the Inuvialuit Development Corporation and we would be assisted in this by the Research Assistant.

2. We would provide a schedule of jobs including management that would be created, inclusive of all activities planned. This schedule would show the classification, salary and wage rates through three years of operation in the period of employment that we would anticipate on an annual basis.

3. We would lay out training requirements for the labour and management and outline the costs, duration and source of such training that would be required.

Part C - Financial

In this section we would provide detailed financial schedules which would include:

- working capital requirements in years 1, 2 and 3;
- capital costs and pre-operating costs;
- source and application of funds;
- proforma operating financial position and cash flows through the first three years of operation.

Part D - Other

We would ensure that the studies Part I and Part II constituted satisfactory application for assistance under Special ARDA for plant construction and start-up if everything proved feasible.

STUDY TEAM

The study team used on this project will consist of a number of Foodwest Resource Consultants employees and two outside associates. The team that we have assembled is done so to utilize the talents available that best fit the project. A number of people will be used on this study depending upon the need for their talents at that time. At all times the study will be under the direct research and control of Mr. Robin Smith, the Managing Director of Foodwest. Resumes of the people listed below as major participants and those who may fill in with special information where required are shown at the back of this proposal.

Robin Smith, B.S.A., M.B.A., P.Ag., Managing Director, Foodwest will direct the study. Mr. Smith will be closely involved in the research and direct contact with Inuvialuit Development Corporation. Mr. Smith has directed and researched a number of fishery feasibility studies in British Columbia and has been directly involved in the fish processing and catching industry in Alaska and British Columbia over the past 19 years. Mr. Smith is also experienced in product development and in marketing.

Gordon Blankstein, B.Sc., M.B.A., Partner Foodwest. Mr. Blankstein will be responsible for all market evaluation and market strategy development for this project. He has considerable experience in the food marketing field at the retail level.

Maurice Goulet, M.Sc., Consultant, Foodwest will be responsible for the financial projections.

Nancy Baillie, B.Sc. (Ag.), Consultant and Food Technologist Foodwest, will be responsible for assisting in any product development that may be required.

Stafford Hardy, B.Comm., Associate Consultant to Foodwest will assist in the financial analysis for this project. Mr. Hardy spent 25 years with B.C. Packers in the financial planning analysis area and has worked on many consulting projects in the fishery area for both the provincial and federal governments and for native Indian bands.

David Smith, B.Sc., Partner, Foodwest will assist in the evaluation of processing plant requirements. Mr. Smith has been a plant manager for a number of food processing operations in Canada and is very familiar with the proper layout and setup of food processing operations.

Ralph Towsley, Associate Consultant, Foodwest will be responsible for evaluating the meat processing possibilities for reindeer. Mr. Towsley was for thirty years in the management of Intercontinental Packers Limited, and for the last 10 years General Manager of British Columbia operations.

COSTS AND TIMING

If this project is started promptly, that is during early October, we should be able to conduct, in conjunction with the Research Assistant of the Inuvialuit Development Corporation, the majority of the data collection and field work in the north before the end of November. Any delay will seriously affect the efficiency of our research due to data collection problems during the winter.

On-site data collection will occur simultaneously to market evaluation which should be completed by the end of December.

The draft of the final report of Part I should be completed by the end of February with the project completed by April 30, 1980, depending upon the amount of changes to the Part I draft.

Only time directly spent on this project will be charged. The figures quoted below are maximum and hopefully will be less. Disbursements such as travel, accommodation, telephone (long distance), copying, secretarial, etc. are charged at cost.

The staff and travel costs for Part I will not exceed:

R. Smith		$400/day x 35 days	$14,000
G. Blankstein	)		
D. Smith	)		
R. Towsley	)		
S. Hardy	)	$300/day x 45 days	$13,500
M. Goulet	)	$225/day x 30 days	$ 6,750
N. Baillie	)		
			$34,250

The above includes time for product development which, if not needed, will reduce the cost by **$2-3,000.** The cost may reduce if more work is done by your Research Assistant.

9/8-7

Disbursements are difficult to estimate for this project as travel costs will be high. We estimate that all disbursements will be $6-8,000.

Thus the total maximum cost of Part I is:

Professional Fees	$34,250
Disbursements	8,000
	$42.250

Part II could begin as soon as Part I has been accepted. This part would take an elapsed time of 3-4 months thus with completion about the end of September 1980.

Part II

Professional fees	Phillips Barratt	$11,000
	Foodwest Resource Consultants	11,000
		$22,000
Disbursements		**$ 4,000**
		$26,000

9/8-8

Appendix C

Another economic development possibility that is presenting itself to I. D.C. from the resources of the Western Arctic is in the field of tourism. Specifically, with the government decision to open the musk ox herds to sports hunters, the Sachs Harbour Hunter and Trapper Association has taken an outfitter's licence, is planning to conduct the Banks Island musk ox sport hunt and has asked I.D.C. to act as the sport hunt agent. I.D.C. officers after a meeting with Sam Ransom, the Inuvik Fish and Wildlife Officer that has been aiding the Sachs Harbour H.T.A., decided to take advantage of the opportunity and agreed to take on this responsibility.

Banks Island has a quota of 150 musk oxen. The Sachs Harbour H.T.A. decided to commit about 20 of these to this year's sport hunt. Although musk ox season officially opened October 1, 1979 and one hunter has been taken out, the majority of sports hunters will be scheduled for the month of March 1980 for a combination of promotional and daylight factors.

The initial responsibility of I.D.C. as sport hunt agent is to publicize the hunt and obtain hunters. It is already too late to advertise in any of the hunting magazines for this year's hunt (although I would seriously consider beginning to advertise for next year's) . However, with the help of the Fish and Wildlife Department, we have obtained the names and addresses of about 350 people who have previously hunted in the Arctic, and might therefore be interested in the musk ox hunt. These people have been sent circular letters containing information about the hunt (a sample letter is attached at the end of this appendix) . There have already been several inquiries regarding the hunt. The next step should be to prepare a brochure. This brochure can serve a dual purpose; a marketing device for potential customers and a detailed informational package for those who have already bought the tour. Possibly for this year something simple containing mainly information for the hunters that can be xeroxed will suffice. For next year, photos can be obtained by sending someone on one ‘f this year's hunts, and back-ground information can be collected. Parts of the following article out of “Arctic in Colour", Vol. V., No. 4, 1977, could easily be used in an initial form of such a brochure.

[illegible]

by
D.R. Urquhart

A fair description of the muskox should begin by dispelling the total inaccuracy of its name which unfortunately presents the image of a smelly, plodding, dull witted cousin of the buffalo. Despite a superficial resemblance to the cow-type bovids, the muskox is not closely related to them. Neither is it a brainless drudge, but instead an alert and nimble-footed creature; an agile climber like its near relatives the goats and sheep and a worthy adversary of the wolf who, having been out-maneuvered, finds himself impaled on a wickedly curved horn.

As for musk, this species produces none. Perhaps the early explorers were referring to the odour of rutting bulls but more likely it was a deliberate attempt to link them with the musk-deer of Europe and thus further aggrandize the value of their heroic expeditions.

That the muskox should be misrepresented is not so suprising for it is a singularly un-Arctic looking animal. In a land where white fur coats (and feathers) are de rigeur, muskoxen are conspicuous in their bulky black garments, unevenly trimmed at tne knees and with loose threads everywhere in evidence. Beneath the ragged hem of their coats, coarse white leggings project, completely covering the hooves. Their one major concession to Arctic fashion isa peculiar white saddle on the back which, far from being esthetic, makes the wearer look like the victim of a bad dye job. And when other Arctic residents are changing costumes for the summer season, our friends merely pull out their woo! underwear (called qiviut) and leave it carelessly draped on the willows, clinging to boulders and trailing across the hummocks.

Buddies with the hairy mamoth

A July photo of a mature bull standing ankle deep in a tundra pond would be mistaken by many for a scene from the sweltering tropics of India, or a rice paddy in Cambodia, where dark beasts resembling the muskox are commonplace. But the most incongruous sight of all is a large herd silhouetted against the stark white background of midwinter tundra. They look as though they had just been air-dropped from a Hercules transport - utterly alien; huddled together in a snow packed valley staring solemnly at the bleak landscape in apparent bewilderment. Of course quite the opposite is true. They are very much at home in that harsh environment, indeed they are endemic to Arctic Canada and Greenland. Before the last ice age they were hobnobbing with other Arctic notables such as the hairy mammoth and the wooly rhinoceros.

The bizarre appearance of muskoxen can only be matched by their eccentric behaviour. When confronted at close quarters, a single muskox

The natural instinct of the muskox is to form an impressive defensive circle when being attacked. Here, two bulls do their best to assume a defensive position.

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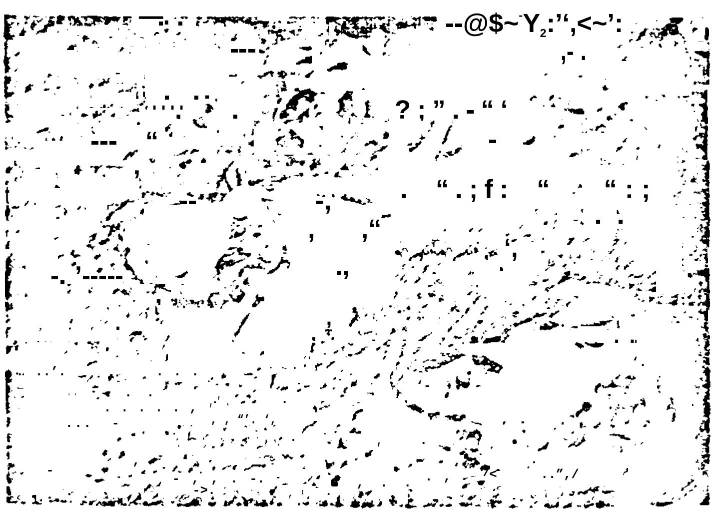
performs a series of antics, accompanied by snorts and grunts, that suggest it is somewhat demented. The routine usually begins with a glaring contest of manic intensity which lasts for some minutes. This is followed by the annihilation of any suitable nearby object with the horn tips. Very impressive. Clearly the message is - 'This dismembered moss hummock could be you!'. But just when a climax seems imminent, the enraged beast pauses to rub its eye as if a speck under the lid were more important than a fatal contest with its foe. This process is repeated for some time and one begins to wonder whether he has forgotten about you altogether. Actually the muskox is rubbing a preorbital gland on its foreleg. There is, as yet, no known purpose for this behaviour which seems out of context in a threat sequence, unless it is a very subtle challenge or warning.

The most interesting and often described aspect of muskox behaviour is the defense formation. Whereas other Arctic herbivores (and consequently prey species) are either equipped for concealment or flight, a herd of muskoxen can be seen miles away and instead of escaping with the high stepping trot of the caribou, they form a circle, prairie schooner style, with kids in the middle (but often peeking out between someone's forelegs), and fight to the finish. When a predator, usually wolf, approaches within a certain distance, the nearest adult charges out and attempts to maim it. If the forav is unsuccessful, it wheels abruptly and returns to its place in the ring. The whole operation is so beautifully coordinated and effective it is a marvel to witness - from a distance. This method of defence is an ideal one since it minimizes the effort required from the herd and is adequate protection against all comers except, you know who.

Easy to kill - hard to harvest

At times muskoxen must have seemed like manna to the starvation prone explorers. Imagine tons of delicious meat willing to stand still and be shot down by even the most unsteady hand of the most emaciated seaman. The only problem was that those who fell were stubbornly defended by the survivors so it became an all or none situation, and I



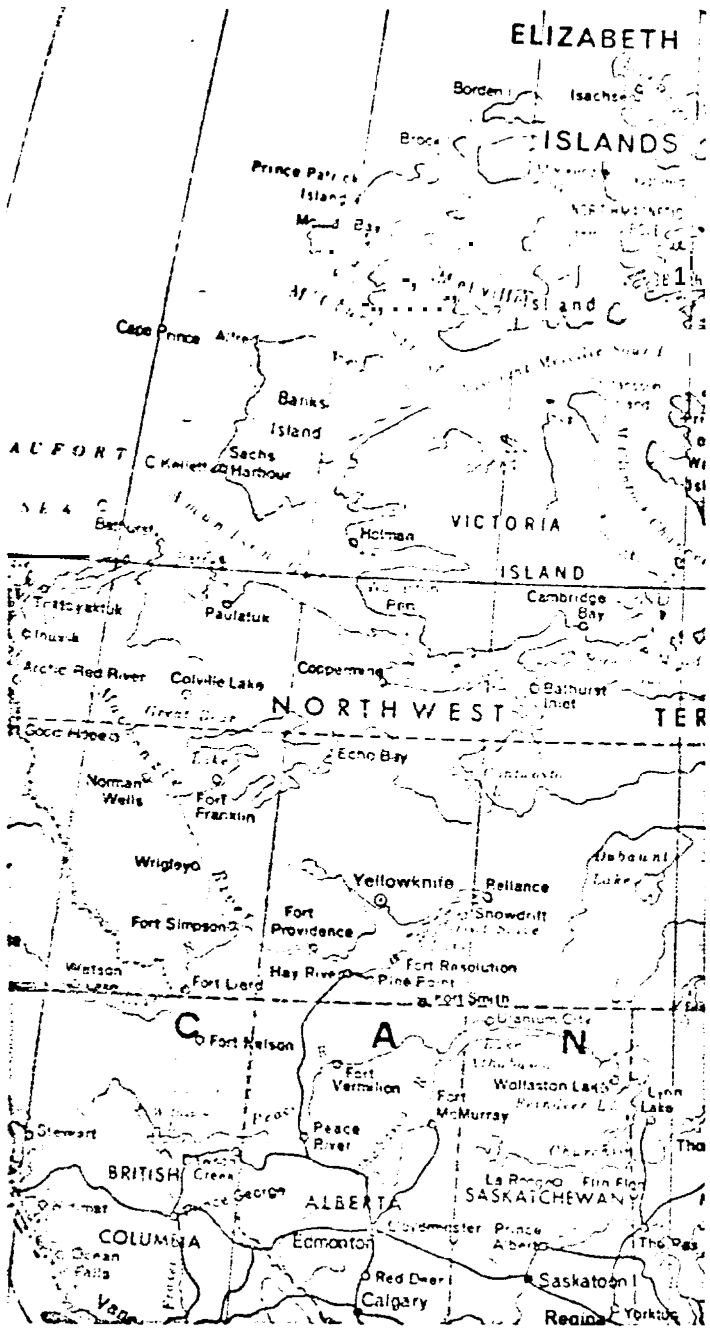
Normally a very peaceful and quiet animal, the muskox can rake a very intimidating stance when confronted. Photographer Art Martel took only one shot of this bull and quickly left.

suspect that black powder and musket balls permitting, it was usually all. [1]

Soon muskox meat became a favorite staple of exploration parties and the hides were shipped home for use as robes in open sleighs - shades of the buffalo decline. Between 1863 and 1916, over 15,000 muskox hides were exported from Northern Canada. Then the government stepped in and saved the species from extinction. Although technically no one was allowed to hunt muskoxen in the NWT from 1917 to 1970, the odd few were taken by hard-up Inuit who needed the meat. Hides and skulls were always disposed of discreetly before returning to the settlements, but in the tourist shops I used to see some suspiciously fresh looking muskox horns fashioned into blubber pounders. And, as one Holman Islander is reported to have said when the limited quota system was introduced, 'Well at least we won't have to sink our hides in the lakes

Muskox skulls left from ancient Inuit camp could date back further than 100 years.

1. The same problem was encountered by zoo collectors after calves and was often solved the same manner.



anymore.' These few transgressions not withstand. ing, the muskox made a substantial recovery during the grace period and today can be numbered along with the Alaska Fur Seal and a few (very few) others, as one of the success stories of conservation.

The hairy one and the true people

However the pursuit of Ovibos moschatus by Homo sapiens did not begin in the 18th century and the original contenders went by different names: that of Unimgmuk (the hairy one) and Inuit (the true People). When did the first spear pierce the first hide or perhaps the first horn punctured the first parka? No one knows. But on Banks Island there are muskox bones over 34,000 years old and its a safe bet that aboriginal man was chasing then around back then. Considering the impressive defence system of the former an-d the primitive weapons of the latter, it must have been an awesome struggle. The only factual clue I can offer about such engagements comes from a Sachs Harbour trapper who told me that his grandfather was literally deformed with body scars from an unfortunate muskox encounter. Another old timer said that as a child on Victoria Island he wore fresh calf hides on his back for clothing because his family was constantly on the move in pursuit of game and could not aftord the time to stretch and dry the skins properly. This octogenarian now wears a plaid shirt, a black windbreaker, flared corduroys and Adidas shoes.

With respect to the long time association of man and muskox, Banks Island has been an arena for practically every stage of the contest. in the millenia succeeding the last ice age, nomadic people crisscrossed the island leaving a trail of tent rings and muskox bones for modern archaeologists to ponder. Even during the last ice age only part of Banks Island was glaciated and it has been suggested that the remaining portion was a refugium for muskoxen who held out there until things began to warm up. However by the time the first white men stumbled ashore in early 1850's, muskoxen were apparently very scarce on the island and thus contributed nothing to the larders of the shipwrecked McClure expedition, nor did they warm the knees of any sleigh drivers, courtesy of the Hudson's Bay Company.

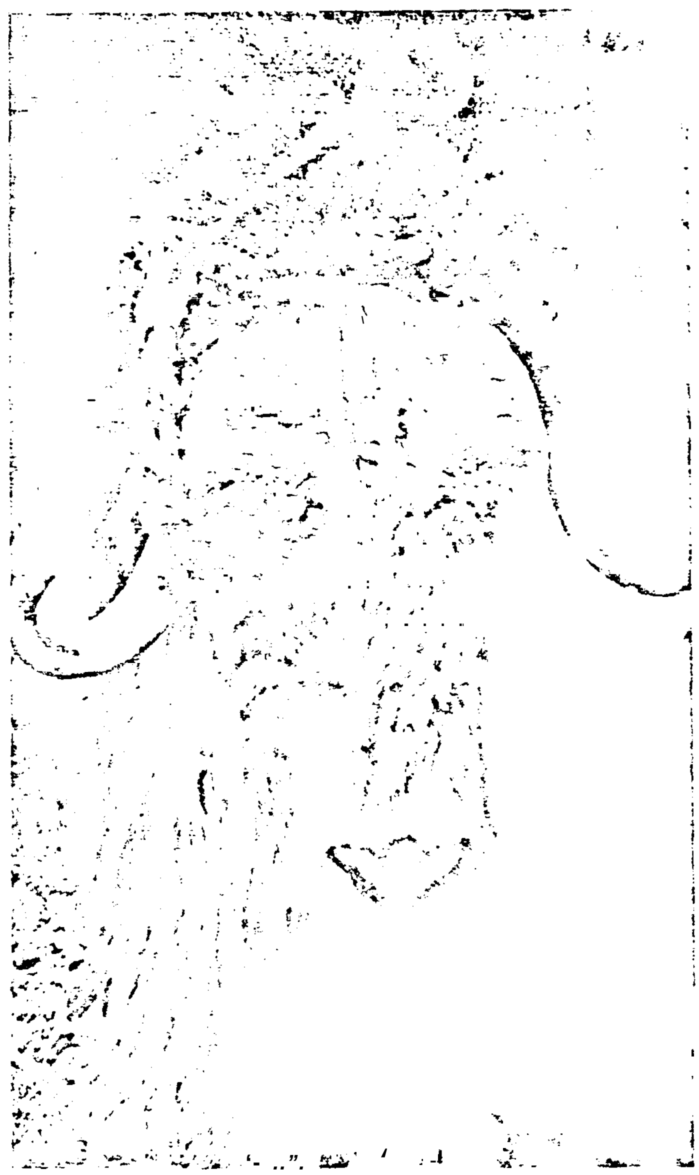
Then in the late 1920's, Banks Island became the white fox Mecca of the Western Arctic and the status of muskoxen in the area was rarely considered. Trappers seldom saw them as they lived in the south-west part of the island and the muskoxen preferred the n:::th-east. There they quietly staged an impressive comeback and eventually some animals penetrated the trapping areas and were even seen near Sachs Harbour on the rare occasion.

An unique rodeo

This brings us to the present phase of the muskox-man relationship: harassment. One day an old bull muskox blundered into the settlement of Sachs Harbour and was pursued by some of the M.O. T. boys until he was cornered in a narrow gully. Under the leadership of the O.I.C., a particularly mischievous character, the animal was lassoed. While his captors were capering about, congratulating themselves and daring each other to ride him, someone informed the local constable who arrived minutes later and advised the pranksters at drill sergeant volume to release the animal posthaste or court action would ensue. Apparently unharmed by his brief rodeo exposure, the old bull departed with dignity and even remained in the vicinity of the settlement for some days thereafter.

My only encounter with a muskox in town was also a memorable one. It was late September and for the past seven months ihad been surveying the island in a small aircraft counting caribou and muskoxen. Sometime past midnight I was awaken - ed by gale force winds shaking my bedroom and my first thought was of our little plane which was not tied down. My pilot, being of the bibulous variety, was incapacitated at the time so I had to walk up to the airstrip alone. Outside, the landscape was in a turmoil of blowing dust, airborne pieces of plywood and other flotsam. I had not staggered more than two hundred yards from the house when the M.O.T. pick-up roared out of the night and slid to a halt beside me. I climbed in and asked what was going on at this hour. The bug-eyed meteorologists told me that an Inuit girl had stabbed herself with a bayonet in the men's dormitory and they were on their way back from notifying the R.C.M.P. and the lay nurse. Others at the weather station were already administering oxygen to her from a welding tank and they had radioed for a rescue plane from Inuvik.[2]

As I was hearing this, a rugged form was suddenly illuminated by the headlights. Wild strands of hair blowing in the wind, iridescent eyes and scimitar horns; a muskox was standing at the roadside by the fieldstone monument. Reflexively the driver slammed on the brakes and for a moment the beast glared at us: then whirling about and with rainments flapping disappeared into the night. If ever an aparition of evil portent was to manifest itself, that was the moment. Beelzebub was on the scene, this time in the guise of a shaggy muskox rather than a boar's head on a stake. Of such coincidences are superstitions made and had we been three Inuit hunters circa 3,000 B. C., instead of three iconoclastic youths in a pick-up, the event would undoubtedly have become part of our folklore.



The odd encounter with Sachs Habour residents near the settlement and on the trapline, would hardly constitute a threat to the species, but in the summer of 1970 a new form of disturbance arrived on the island - oil companies. Of course the trappers were most concerned about their effect on Arctic foxes, but when I was sent to Banks Island to investigate the problem, I was instructed to al observe the reaction of muskoxen to seisn exploration vehicles and related support equ: ment.

Having pored over the photographs in Tene book, Muskoxen in Canada, I expected to impressed by my first observation of these stran animals. However the actual event was of such lit moment I could hardly believe it. The Twin Ott banked sharply and the copilot called back to 'Muskox down there!' As we circled at sor thousands of feet, a f black lumps slid across tiny plexiglass windo That was it. From th altitude they resembl nothing more than ca bou droppings on a sn bank. Black and white. fact sometime later I tas fully arranged a doz fecal pellets on the sn and photographed the When the slide was sho among others of Ba Island muskoxen, to satisfaction, everyone fr Phd. biologists to Inuit timers assumed it was aerial shot of a herd.

Because muskoxen c be so easily spotted, ev from high flying aircr they are often harassed the tourist element w swoop down and stra them with their Niko The adults quickly form defence ring into wh the calves dive, som times with such enth iasm that they squirt the other side. But t position is after all signed for terrestrial tacks and the novelty of airborne threat is so c fusing that they so break and run, tempo ily abandoning the calves, although sometimes a or two will lag behind. Sadly m-ost perpetrator: these air raids do not think of the harm they can by forcing muskoxen to charge flat out across tundra for miles without respite. Calves sometimes injured in the stampedes and ad might stumble and fall on the rough terrain.

2. The plane arrived despite the high winds and the girl survived.

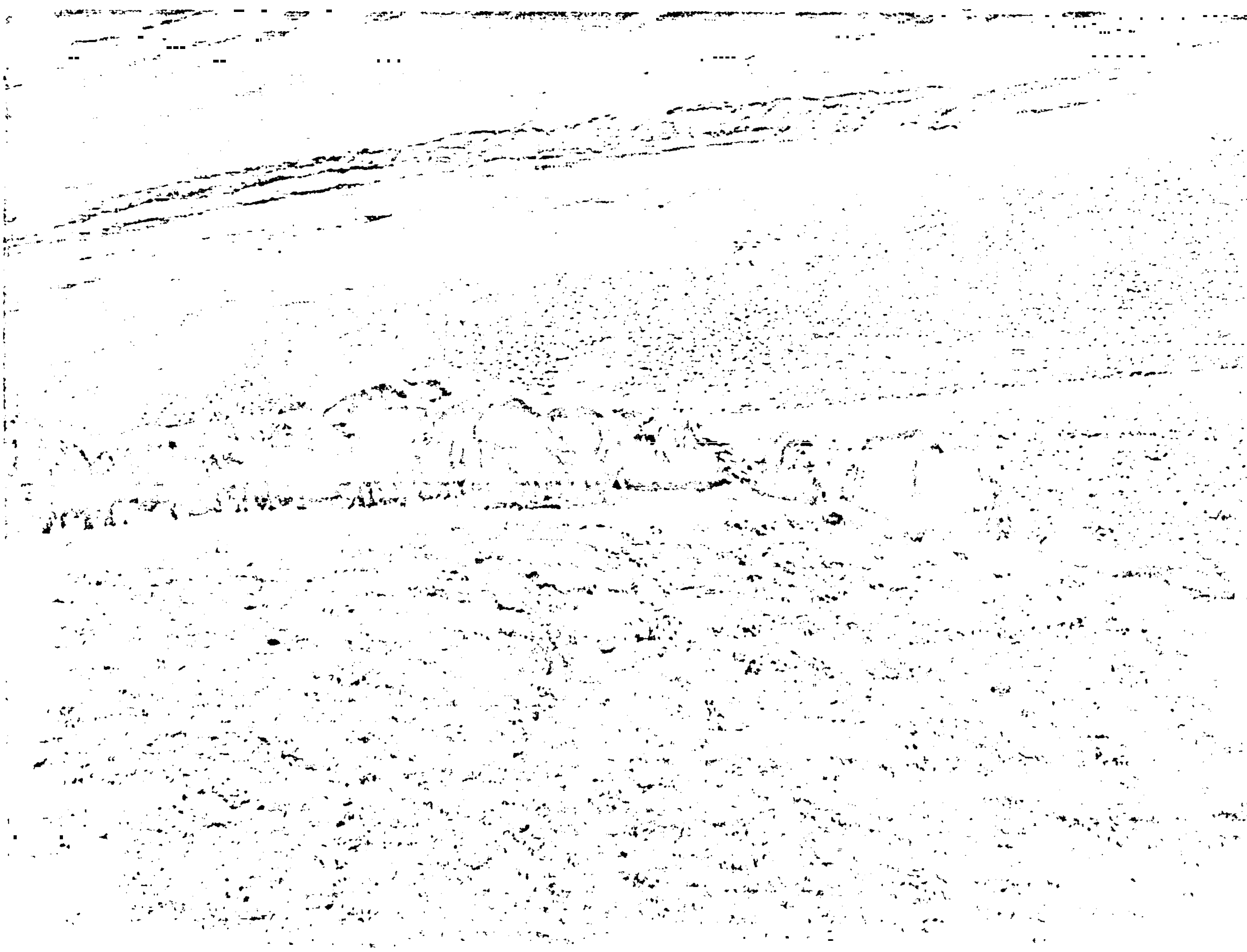
Even when no outward signs of injury result, the additional stress of a long distance run is something these animals don't need, especialy at critical times such as during calving and in midwinter when food resources are scarce.

Other problems arise when muskoxen encounter seismic vehicles on the ground. Incne instance a three day old calf was abandoned by a herd and insisted on crawling underneath a mobile drill where the heater was giving off a cozy maternal warmth. The drillers tried in vain to return the calf but he persistently followed the vehicle and for fear of running over him, the little guy was scooped up and taken back to camp in the cab. From there he was transferred to Sachs Harbour where the R. C.M. P. couple, Ron and Gaileen Kingdon, fostered him and another calf, using a turkey blaster to squirt milk formula into them as standard nipples were too small.[3]

Although the outcome of muskox - oil company confrontations strongly favour the latter, the hairy ones sometimes get their own back. On another Arctic island, two seismic workers approached a herd, disregarding the aforementioned warnings, when suddenly a bull charged. Seismic men being what they are, the two fellows were as much amused as anything and one had the presence of mind to raise his Instamatic just at the moment when his partner was being tossed bodily over the muskox's back. Needless to say no one was seriously hurt. Such people lead charmed lives.

The inevitable increase in oil expiration must result in greater contact between muskoxen and oil companies. As in our society, gentle, quiet people are apt to get stepped on, so it is with the muskoxen who are essentially pacifists requiring only solitude and who quickly retreat in the face of implacable machinery. Fortunately they have a sympathetic advocate in the NWT Fish and Wildlife Service which monitors and regulates exploration activities on Banks Island as well as promoting research into more sophisticated methods of studying the effects of exploration disturbances on this species. Thus the future seems hopeful for muskoxen in the NWT, where the population is still increasing, where they are valued as a nearly unique resource an'd where their special requirements are being sincerely respected.

3. The calves were eventually *sold by auction tothe Okanagan Game farm where they still reside.*



Another activity that would be advisable at this time is the preparation of suggested clothing lists for sports hunters and post hunt questionnaires. The questionnaires would rate satisfaction level, hunt problems and suggestions of the hunter. It could also ask questions regarding typical reading material, i.e., magazines, and usual method of making decisions regarding vacation hunts. This information can be used in the preparation of future promotional material.

As stated above, the primary activity of I.D.C. in this enterprise , is the promotion and advertising of the hunts, acquiring hunters to fill the allotted number of places and animals provided and to take care of the hunt financial matters. A secondary activity will be to facilitate matters for clients arriving in Inuvik. The hunter should be met at the airport upon his arrival, provided with a tour of the town, assisted with last minute shopping and acquisition of licences, provided with a hotel room, have his equipment checked, and have transportation arranged to Sachs Harbour. For I.D.C., there will also be a tertiary activity of expediting any materials, supplies or information required for the hunt by the Sachs Harbour Hunter and Trapper Association. It appears that during the month and a half of actual hunt time there will be required one full-time employee and a couple of part-time, occasional employees.

This project presents several different directions for possible expansion. The obvious one is expansion of sports hunting activity; there are several species in the Western Arctic that would lend themselves to this and already are hunted through other agencies. These species are polar bear, Dan sheep, grizzly bear, moose and caribou. Information on these species can be found in G.H. Watson, et al, An Inventory of Wildlife Habitat of the Mackenzie Valley and the Northern Yukon, Information Canada, **1973.** A sport fishery could also be organized with the Delta resources available.

Another direction for expansion would be that of tourism itself, a field that may be in for a small boom with the opening of the Demster. Some discussion with the Beaufort Sea Tourism Committee may be useful if this type of plan is considered. A final, and more tenuous, possibility that arises out of work with musk ox is the potential in game ranching. There are several musk ox game ranches established for scientific and commercial study that can be investigated: the Alberta Game Farm was ranching quite a large herd, there is a scientific study farm in Fort Chime, P.Q., and John J. Teal, Jr., is raising musk oxen near Fairbanks, Alaska for qiviut production for native handicrafts (see attached advertisement). The following references may be useful if this is followed up: J.J. Teal "Domesticating the Musk-Ox: the gentle agriculture," Saturday Review (10 June 1972); Paul F. Wilkinson, "The Domestication of the Musk-Ox", Polar Record, Vol. 15, No. 98 (1971); G.W. Scotter, "Report on Musk ox Domestication", (1970); G.W. Scotter and E.S. Telfer, "Report on Musk Ox Domestication, (1975) Canadian Wildlife Service.

A final note I would like to make is that the musk ox sport hunt may find itself having some difficulties with a new Greenpeace program. This new program is an attempt to discourage northern sports hunting by invading hunt areas. The program has just been announced on the 27th of November by Greenpeace representative, Dr. Patrick Moore, and although concentrating on polar bear and caribou, I suspect musk ox were only left out through lack of knowledge - an oversight that will be corrected if this turns into a major program. It is possible that any Greenpeace action can be defused by demonstrating that in our musk ox hunts the entire carcass is ultimately utilized (the fact that it normally is not, is the central premise of their action).

HAND-TROLLER
Continued from page 16

The bill state Rep. Jim Duncan of Juneau introduced for the association would impose a 500-pound per year minimum landing requirement. Unless good cause was shown, those who missed the minimum would forfeit their permit to the state. Of the 2,604 hand-trollers who fished in 1978, nearly half of them, 1,282, landed less than 500 pounds each.

In addition to this use-it-or-lose-it provision, hand-troll permits would revert to the commission upon death of the holder, and all permits would be nontransferable, meaning they could not be sold. Duncan said some people want to modify the bill to allow no-value permit transfers to sons or daughters, but he acknowledged that it may be unconstitutional to have transfers only to a small, closed class of people.

The legislature appears likely to establish a special interim study committee to examine a variety of limited entry matters and make recommendations, "so this will at the least bring the hand-troll problems to the foreground, and the situation may be better next year," Duncan said.

Meanwhile, the new Entry Commission chairman John Garner said in late March that the commission intends to develop regulations for limited entry into the hand-troll fishery and "make them available for public consideration toward the end of summer or early fall. If appropriate, regulations will be adopted near the end of 1979 or in early *1980.* "

Garner said the commission is concerned about the social and economic consequences of limited entry and wants to develop a fair system to implement the program.

The most significant indication of a need for limited entry, he said, is "a combination of fishery management considerations and the economic condition of the fishermen involved, considering what reasonable alternative opportunities they have available. The commission will spend a lot of time going to cities and villages, making sure people have the opportunity to express their concerns, explaining what is being done and why, and laying out the alternatives."

In people's hearts, the questions are, 'Who will be able to go hand-trolling?' and "What will it be like?" The answers are in the hands of the Entry Commission, guided perhaps by the legislature, and the Board of Fisheries. □

INUVIALUIT DEVELOPMENT CORPORATION
P.O. Box 2000
Inuvik, N.W.T.
CANADA
XOE OTO

November 13, 1979

Dear Sir:

We have obtained your name from the files of the Northwest Territories government as a person potentially interested in polar big game hunting. This year, for the first time, the Musk ox herds of the high arctic islands have been opened to sports hunters. We would like to invite you to avail yourself of this unique opportunity to participate in Canada's first Musk ox sport hunt during the month of March 1980.

The cost of the hunt will be $4,500.00, plus the Territorial trophy fee. Its duration will be approximately one week, taking place on Banks Island about 500 km. northeast of Inuvik. Each hunter will be paired with a local guide who will arrange a hunt tailored to the personal requirements of the hunter. While in the settlement area, each hunter will be made welcome in the family home of his guide, and during the hunt food and supplies are, of course, the responsibility of the outfitter. The hunter need only bring with him his personal effects, such as clothing, guns and sleeping gear.

It will be the hunter's responsibility to make arrangements for his flight to Inuvik. Once landed in Inuvik, he will be met by a representative from I.D.C., the agent for the hunt, and arrangements will be made for the rest of the hunt. The price of the hunt includes all travel and lodging requirements in Inuvik and beyond.

If you are interested in obtaining more information regarding the hunt, please contact myself:

John Matson
Inuvialuit Development Corporation
P.O. Box 2000,
Inuvik, N.W.T.
XOE OTO
CANADA

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or telephone me at (403) 979-3510. We regret the short notice given, but nonetheless must request any favorable replies as soon as possible in order to make arrangements. Should this notice provide you with too little time to arrange your schedule for this year's hunt, we will be happy to welcome you to next year's.

Yours truly,

John Matson
Inuvialuit Development Corporation

JM/amp

Appendix D

As a possible subsidiary to the fish processing plant, while touring the settlements I also looked into the utilization of seal products. It was initially suggested that there was presently a great deal of meat being wasted during sealing. As a background to the seal situation I would like to first present the following excerpts from a draft report by W.J. Hunter to the Berger Pipeline Inquiry in 1975:

Seals and seal utilization are not characteristic of the Mackenzie settlements: Aklavik, Inuvik and Tuktoyaktuk. A few seals are reportedly shot near Herschel Island and Tuktoyaktuk but these appear to be inconsequential in terms of resource utilization. Seals become important however as one moves east of this area. Banks Island is a sealing centre as are Paulatuk and Holman. The question arises where one draws the line for sealing and, ultimately, the eastern boundary of the study area. There seemed to be sufficient evidence to support including the eastern area as part of the resource area for this study. The seals harvested at Paulatuk and Holman may well spend part of their time in the Beaufort Sea. Moreover, Amundsen Gulf lies in a predominantly leeward direction from the Beaufort Sea and is closely inter-related through currents. These factors seemed to support the eastward extension of the study area to include Amundsen Gulf to Holman and seal utilization.

Traditional seal use was based on meat for dog food, oil for heat and light and to a lesser degree skins for clothing. The uses have diminished or disappeared throughout much of the area. The snow machine lessened the importance of dog teams. Fuel oil replaced seal oil for heating, cooking and light. Clothing increasingly came from factories and synthetic products. The incentive for sealing shifted from domestic uses to skins for commercial export.

Seals are an important source of cash income in a subsistence economy. The desire and need for market goods does not automatically disappear as one moves from a market to a domestic economy. In many ways consumer desires remain similar while the means to satisfying these desires are diminished. By the same token, those desires which can be satisfied through domestic utilization of resources become secondary to the shortage of cash income sources. The scarcity of cash income has remained greatest in the area east of Cape Bathurst where employment opportunities are least and resource utilization maximum.

Resource utilization may produce cash or domestic income. As noted previously, domestic income provides a savings since market goods are not purchased. Domestic utilization can produce only certain goods however and once satiation is reached, there is no incentive for further utilization. Remaining desires go unsatisfied since seal can only be seal. The value of another unit of the resource is zero.

In most economies natural resources are exchanged for money which can then be used to purchase a variety of goods in the market. The area east of Cape Bathurst affords a minimum of commercial opportunities. Employment is minimal. Social assistance payments and commercial resource utilization are the remaining income sources.

Since cash income is at a premium, and remaining market goods cannot be satisfied through domestic utilization, commercial utilization occurs on a different level than domestic use. Domestic utilization values represent local exchange in a system where cash is at a premium. Local exchange occurs at prices reflecting the abundance of domestic resource use and the scarcity of money as a commodity. Local exchange prices are not equivalent to export-import markets as a result. Commercial trade prices correspond to the market economy while domestic values must be treated separately. If domestic prices were converted to substitute or replacement values, based on market purchases, they could be combined with commercial prices. However, unless this takes place, and it does not within this study, the values are incomparable.

The difference between domestic and commercial prices becomes very important for seals (and polar bears) especially since this resource use is concentrated in areas of minimum wage opportunities. The export of seals (and polar bears) is even more important in Paulatuk and Holman than the same trade would be in the Mackenzie area. Banks Island is probably closer to the Mackenzie settlements since high incomes are received from fox pelts. However, the fox remains vulnerable to its habitat and in this way remains similar to seals. Moreover, there is evidence that a reciprocal relationship may exist between seals and fox on Banks Island. This will be discussed below. The fact remains that domestic and commercial values cannot be combined into a single estimate of value. Domestic values must be treated separately from commercial values.

The second issue was the difference between predation or biological harvest and utilization. From a resource standpoint, one individual removed from the population has the same effect regardless of utilization. The socio-economic perspective is somewhat different. Only utilized animals provide domestic or commercial gains. It may be necessary to harvest several animals in order to get one which can be utilized. Only the utilized animal contributes to the socio-economic of utilization. It is therefore misleading if one bases the value of utilization on the level of harvest or predation.

The difference between harvest and utilization is also increased as utilization becomes more specialized. As the demand for seals has shifted from domestic to commercial utilization, the level of utilization has declined relative to harvest. Furs suited for trade form a select portion of the seal population harvested. Domestic use will occur so long as it is desirable and worthwhile but this decision will be on a different level and harvesting for commercial utilization.

The relationship between biological harvest and utilization can be illustrated by examining the ringed seal harvest. It should be recognized that the difference between harvest and utilization is probably greater for ringed seals than any other marine-related resource.

Between one-third and one-tenth of the seals shot are lost due to sinking or non-recovery due to hunting conditions. This varies with season. Sinking is highest during late spring and summer when blubber content is lowest. Moulting occurs during July and August. Half of the Holman harvest and seventy percent of the Sachs Harbour harvest takes place during this period. Fifty percent of the furs recovered are not suitable for trade during the moult. Juvenile seals are also unsuited for commercial use. These "silver jars" make up twenty to twenty-five percent of the harvest. In other words, there is more to obtaining a commercial grade pelt than harvesting the first available seal since some of the hides will also be damaged during preparation.

It is estimated that twenty percent of the biological harvest was lost prior to utilization at Holman during 1963-64 peak prices for skins. A biological harvest of 8,800 to 9,200 seals was estimated necessary to produce 7,364 skins for trade. An even more striking example was found in Tuktoyaktuk-Cape Peary where 150 seals killed during 1961-62 resulted in twenty-four skins traded. This was sixteen percent of the animals killed or one in six animals harvested. It can be seen that while biological harvest is a key item in terms of resource conservation and management, socio-economic importance is more closely related to utilization than harvest.

The relationship between harvest and utilization is also influenced by profitability and income. This is the key to domestic utilization and certainly influences commercial utilization in addition to resource suitability. Despite the differences in values for domestic and commercial utilization, both are factors in harvesting and utilization. Satisfying domestic needs may produce hides for commercial trade which otherwise would not be justified. The seals on Banks Island are an example of this situation. The cost of producing seal skins was $11.26* when delivered to Edmonton. Fur prices were less than $10.OO*. Seal meat however was essential, i.e., less expensive than alternative sources, and skins provided an extra return for the cost of producing dog food . If the costs of preparing the skins were not offset by the price received, the skins would rationally remain on the beach or be used domestically. The reverse situation also exists where domestic use of muskrat and fox meat is coincidental to trapping.

The socio-economics of seals will depend then on the level of harvest. The degree of utilization and the value of domestic and commercial utilization. Each seal landed represents fifty pounds of edible material valued between $15 and $22* per pound. The minimum average potential value is $7.50* per seal. The value of the skin depends of course on market prices and the socio-economics of utilization is a function of the importance of domestic utilization and cash income. All of this begins with the resource and harvest and the relationship with offshore activities.

* All values quoted in the text were evaluated in 1975.

The third issue introduced by seals was the extension of resource impacts and socio-economic vulnerability beyond the Beaufort Sea. Seal utilization tends to be inversely distributed to fisheries, whaling and wage employment opportunities. The latter are concentrated in the vicinity of the Mackenzie Delta while sealing is centered to the east.

The infusion of southern influence did not begin in the area east of Cape Bathurst until six decades after the whaling fleets entered the Mackenzie area. Twenty years after the DEW line, southern influence is still minimal as the area remains outside the current boom of petroleum activities. The resource endowment, resource utilization and socio-economic patterns from Banks Island east to Holman remain in sharp contrast to the Mackenzie area. Seal utilization is closely associated with these differences.

Two species of seals are found in the study area. Ringed seals (Phoca hispida) are most commonly found throughout the study area. This is the smaller species averaging fifty-four inches in length and weighing up to 150 pounds. The highest populations are found near Banks Island and east of Cape Peary. Ringed seals are ninety-six percent of the Sachs Harbour harvest. The Holman share is slightly higher while Paulatuk has about the same proportion.

The remainder of the harvest is Bearded seals (Erignathus barbatus). This is a larger species up to six feet in length and weighing 750 pounds. Bearded seals are rarely found west of Cape Bathurst and represent less than two percent of the Holman harvest and four percent of Sachs Harbour.

Seal harvest records are available for Holman, Sachs Harbour, Tuktoyaktuk, Inuvik and Aklavik. The latter three unfortunately correspond with a period of peak seal production and a corresponding low for fox during 1963-65. This no doubt leads to greater seal hunting effort at the expense of trapping and may be an exceptional deviation from longer term relationships. These data are shown in the following table.

Table Q

Estimated Ringed Seal Harvest for Selected Beaufort Sea Study Area Communities During 1973[1]

Community	Ringed Seal Harvest	Percent of Total
Aklavik	50	2
Holman	8,000	93.6
Paulatuk	141	1.6
Sachs Harbour	335	3.9
Tuktoyaktuk	20	2

1. Source: Marine Mammal Working Group Draft.
2. Less than one percent.

Seal harvest utilization in the Beaufort Sea study is dominated by Holman where nearly ninety-four percent of the seals are harvested. Since seal skins are the primary source of cash income for Holman, comercial utilization will be the dominant use unless skin prices dropped sufficiently to make domestic use for survival more important. Sachs Harbour and Paulatuk are secondary sealing areas with roughly four percent and two percent of the total harvest respectively. The Beaufort Sea proper accounts for less than one percent of the seal harvest.

An interesting insight to seal harvest trends can be gained from the data in tables, and "The 1955-67 seal harvest record for Banks Island (table)" is exceptional since over a decade is included. The possible influence of poor trapping, mentioned above, can be seen in 1964-65. This was an exceptional harvest and one might question whether the resource could sustain this level of utilization. The data also indicate how a resource base might be heavily cropped one year and allowed to recover over intervening years until conditions lead to another intensive harvest.

This variability in annual harvest may be characteristic of resource harvest patterns of time. If SO, then serious questions can be raised about the socio-economics of individual resources over short periods of time.

Table R is an expanded set of seal data combined with fox and bear data for Banks Island. These data overlap the 1964-65

TABLE R

Annual Seal Harvest for Banks Island From 1955 to 1963

Year	Number of Seals	Percent of Previous Year's Harvest	Number of Hunters	Mean Harvest Per Hunter	Percent of Previous Year's Mean Harvest
1955-56	570		7	81	
1956-57	310	54	5	62	76
1957-58	500	161	11	45	73
1958-59	205	41	13	16	36
1959-60	615	300	16	38	237
1960-61	920	150	19	48	126
1961-62	934	101	19	49	102
1962-63	1,025	110	18	57	116
1963-64	1,125	110	18	63	110
1964-65	2,500	231	18	144	229
1965-66	1,298	50	19	68	47
1966-6"?	1,268	98	17	75	110

Source: Usher- II-pg. 57.

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peak seal harvest mentioned above. The interfacing of fur sources provides an indication of the relationship between fox and seal prices, harvest, income and total income. This analysis is probably the most detailed and thorough income and resource utilization analysis for the Canadian Western Arctic.

Table S indicates a great deal about the socio-economics of resource utilization on Banks Island: the level of harvest, utilization, value and relative economic importance in terms of other resources and total income. This is the type of analysis that should be available in order to assess the socio-economic importance of resource utilization with respect to offshore activity in the Beaufort Sea. The key component is estimates of harvest, utilization and value for specific resources and the settlement. These estimates are of course lacking or have marginal accuracy and reliability in most cases.

There are limitations on the statistical analysis possible with four years data as indicated by harvest variability in Table S. It is possible, however, to speculate on the nature of relationships which the data may suggest.

Seal availability tends to be stable relative to fluctuations in fox populations. While the gross profitability is higher for fox than seals ($17.66 versus $7.90), higher profitability has little importance when the supply of fox is severely limited. Seal utilization and trade may increase during periods of low trapping success in order to maintain income levels. Evidence of this is found in rows (7), (12), (18) and (19) on Table S where a reciprocal relationship between seal and fox might be inferred. The relative stability of fur income with respect to total income (18) and income per family (19) supports this possibility suggesting that seal utilization may act as insurance against lean years with low fox trapping success. The evidence shown in Table S is not conclusive but supports this possibility and seems to apply to the period between 1963 and 1967.

One of the most significant results of the Banks Island analysis is the possibility that seal and fox have a supplementary relationship as cash income sources. If this relationship exists, it would assume major importance east of Cape Bathurst where wage-employment opportunities are scarce. The relationship would also be interesting in light of the arctic fox's dependence on seal as a primary prey.

TABLE S

Selected Seal, Fox and Bear Utilization and Trade Characteristics For Banks Island During 1963-1967

	1963-64	1964-65	1965-66	1966-6
Seals				
1. Seals harvested[1]	1,124	2,599	1,298	1,268
2. Skins traded[2]	974	2,043	919	672
3. Percent traded of harvest	86.6	78.6	70.8	53.
4. Average price	30.00	17.72	9.16	9.
5. Value of skins traded[2]	29,220.00	36,205.00	8,421.00	6,222.
6. Percent of fur income[2]	35.3	58.7	10.5	3.
7. Percent of total income	30.9	48.9	7.9	2.
Fox				
8. Pelts traded[2]	1,982	1,498	2,932	8,447
9. Average price	24.00	14.50	23.89	22.
10. Value of pelts[2]	47,578.00	21,728.00	70,046.00	189,567.
11. Percent of fur income[2]	57.6	35.3	88.0	95.
12. Percent of total income	50.2	29.3	65.9	79.
Bear				
13. Pelts traded[2]	39	27	8	15
14. Average price	150.00	137.03	150.00	151.
15. Value of pelts[2]	5,850.00	3,700.00	1,200.00	2,275.
16. Percent of fur income[2]	7.1	6.0	1.5	1..
17. Percent of. total income	6.1	5.0	1.1	1.(
Furs				
18. Percent of total income[3]	88.8	84.0	78.5	91.
Community				
19. Total income per family	4,732.00	3,899.00	5,595.00	11,297.[
20. Total income	94,642.00	74,076.00	106,306.00	237,247.(

1. Usher-II-pg. 57
2. Usher-II-pg. 103
3. Usher-II-pg. 100.

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Seal may be the keystone to the entire fur economy and cash income opportunities east of Cape Bathurst in view of the fox's dependence on seal for food and a reciprocal relationship between seal hunting and fox trapping.

Although arctic fox would not usually be considered a marine-related species, the economic role of fox trapping as an alternative to wage-employment and the close relationship between seals and fox predation requires that the fox be included in this analysis.

The level of seals harvested have continued to drop mainly due to the economic factors involved, as described previously. Most of the seals are caught in August when the percentage of unsalable skins is highest. Seals can be hunted during fall and spring when the skins are prime and the fat content of the meat is higher, but the return on the skins, which presently is the sole return, is not high enough to compete with fox trapping season which occurs concurrently. The present price for seal skins is $25 per good skin; the price for white fox ranges from $67 to $200 per pelt. Consequently, in Holman, which still supplies 90 percent of the Western Arctic seal catch, the take this last year was only about 3,500 seals.

The original problem being addressed in studying the seal situation was the wastage of meat. Due to declining human consumption and decreasing numbers of dogs, much of the seal meat was lost to spoilage. Given the establishment of a Delta fish processing plant, it was thought that there might be a possibility of processing some of. the meat for sale. There has, however, been some changes in the situation. While hunters would be willing enough to sell butchered excess seal meat at about $6-7 per seal, there is considerably less excess now. Besides the decline in total catch, there is also a resurgence of the working dog population due to sports hunt requirements. About half of this year's catch was used, and this amount seems likely -to grow. Whether or not there will be enough to warrant pursuing the seal processing idea has yet to be seen.

There is also about 300 seals caught in Sachs Harbour. As yet there are not many dogs in Sachs, but with the institution of the Sachs Harbour Hunter and Trapper Association as outfitters for this year's musk ox sport hunt it seems likely that dog teams will be brought back there also.

Beyond all this, there is a need for evaluation of transportation costs and freezer storage costs, when a fish plant is established and if a market for seal meat is found. This, however, can only be done after the locational and procedural aspects of the fish plant have been established.