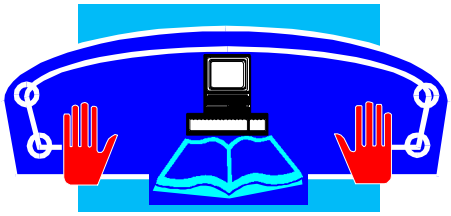


Some Considerations For The Development Of Remote Site Char Fisheries In The Central Arctic Region Of The Nwt

Type of Study: Exploration / Stock Assess.Fisheries, Kitikmeot Fishery

Date of Report: 1992

Author: Marine Institute

Catalogue Number: 3-8-8

TABLE OF CONTENTS

1.0 INTRODUCTION

As a result of telephone discussions with John McGrath in mid-July requesting information on the cost of designing and constructing traps for an Arctic Char fishery in the North West Territories, an offer was made to the Institute to visit some of the remote sites to get a first hand view of the area, its potential and some of the problems associated with attempting any development in the Central Arctic. The Department of Economic Development and Tourism for the Territory offered the services of their fisheries specialists and covered the costs of chartering a light aircraft to visit several remote sites in the Cambridge Bay/Gjoa Haven region of the Central Arctic.

To date, many of the rivers and lakes in the central arctic have yet to be surveyed to determine the size of Arctic Char resources with the exception of those that are currently part of the traditional commercial trap and gillnet fishery. In view of the large number of river systems open to the sea and connecting to fresh water lakes, there is the possibility that many of these systems have the potential for holding sizeable resources of Arctic Char.

Development of a commercial fishery at a site remote from the single processing facility is difficult for a number of technical and economic reasons. Firstly, transportation of fish during the spring and fall run of fish is generally conducted by light aircraft. The ability of the aircraft to take off and land at a site is weather dependent and thus fish caught using gillnets may spoil if the aircraft is unable to arrive or depart on schedule. To some extent, this problem has been overcome by using weirs in the shallow water estuaries and holding fish live until the aircraft arrives. However, not all rivers are suitable for weirs and the cost of weir materials, installation, together with the high cost of transporting fish by air all add up to making development of remote sites a costly venture. At the present time, all fish caught in the Cambridge Bay region is shipped to Cambridge Bay, and processed frozen, head on, gutted by the local co-op. It is then shipped out by aircraft and sold wholesale for $3.00/lb.

The Department of Economic Development and Tourism has been looking at alternative fishing, transportation and processing practices that might enable the remote sites to operate economically. The central theme of which, has been to identify some mechanism whereby transportation costs could be reduced and where reliance on a central processing facility could be diminished. This has led to the idea of harvesting fish live, holding them for extended periods (as long as 6 months - till winter) and either transporting fish wet or frozen by Kermatec to Cambridge Bay. Other possible alternatives could be to hold fish live and transport them back to Cambridge Bay by a high speed craft (similar to FV Innovation operating out of Newfoundland) or, dried at point of capture and transported during the winter months by light aircraft or Kermatec. At the present time little effort has been devoted to finding markets for speciality processed char products or for wetfish char deiivered to the market out of the traditional season and remains a critical missing part of a strategy to develop a remote site fishery.

However, the purpose of the visit to Cambridge Bay was primarily to evaluate the sites from a technical perspective and to offer technical advice on the appropriateness of a range of harvesting and holding technologies to the region. These notes cover the site visits, a cursory evaluation of appropriate technologies (in terms of suitability of fishing gear to the site) and a series of suggestions related to further development of a program to harvest fish in remote locations.

2.0 ITINERARY

August 7th	2:30 p.m.	Depart St. John's
August 8th	2:30 p.m.	Arrive Cambridge Bay, NWT
		Meet territorial personnel responsible for renewable resources
August 9th	8:00 a.m.	Depart Cambridge Bay ---> Byron Bay site
	10:30 a.m.	Aerial observation of 30 mile river site
	11:30 a.m.	Visit Surrey River site
	12:30 p.m.	Return to Cambridge Bay to refuel
	2:00 p.m.	Aerial observation Ekalluk River site
	3:30 p.m.	Visit Jayco River site
	5:00 p.m.	Return to Cambridge Bay
August 10th	8:00 a.m.	Cambridge Bay ---> Ellice River site
	10:00 a.m.	Aerial observation of Ellice River site
	10:30 a.m.	Aerial observation of Perry River site
	12:00 p.m.	Visit Hood River site Brown Sound
	2:00 p.m.	Visit Bay Chimo
	3:00 p.m.	Depart to Cambridge Bay
	4:00 p.m.	Return to Bay Chimo due to bad weather (overnight in Bay Chime)
August 1 Ith	1:00 p.m.	Depart Bay Chimo ---> Cambridge Bay
	3:00 p.m.	Land Kent Peninsula due to bad weather
	6:00 p.m.	Arrive Cambridge Bay

3.0 OVERVIEW OF SITES VISITED

Figures 1 & 2 indicate the commercial fishing regions in the Northwest Territories. Although it was planned to visit Gjoa Haven, visits were only made to rivers in the Cambridge Bay region. Information on Back river in the Gjoa Haven region is included since the fishing community in this area have expressed an interest in developing a remote site fishery. Figure 3, maps 1-7 and photographs 1-19 (see appendices) present a more detailed picture of the various sites visited. Overall the river systems were very similar but differences did exist in the width and depth of river channels, the orientation of the estuary to prevailing winds, the degree of shelter offered from surrounding land masses and distance from existing processing facilities. They could be broadly categorized in the following manner:

(i) open aspect shallow water estuary eg. Byron Bay

(ii) open aspect estuary with deep water channels eg. Surrey river

(iii) sheltered estuary with deep water channels eg. Perry river

(iv) sheltered deep water estuary entering into a sound eg. Hood river

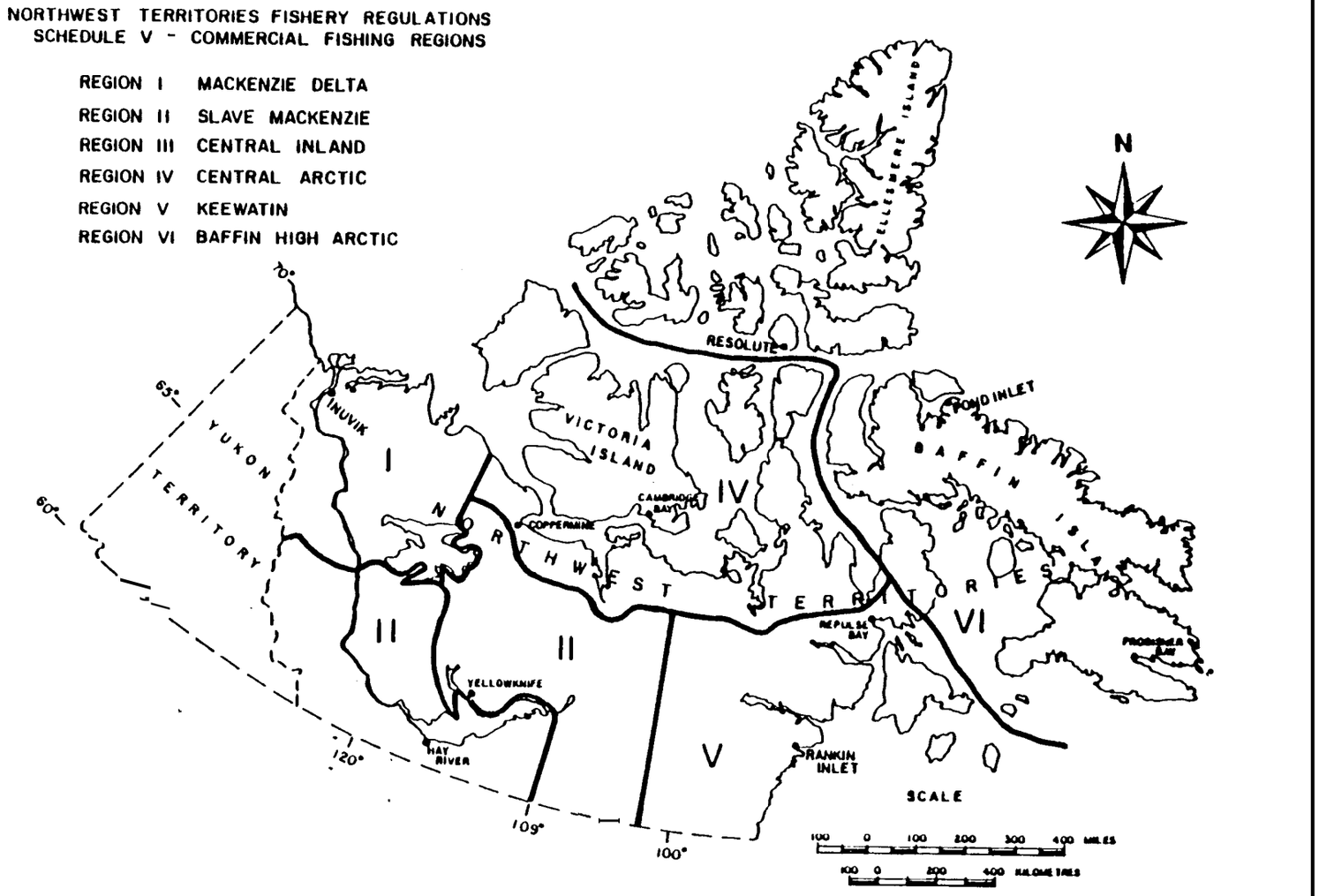


Fig. 1. Commercial fishing regions in Schedule V of the Northwest Territories Fishery Regulations.

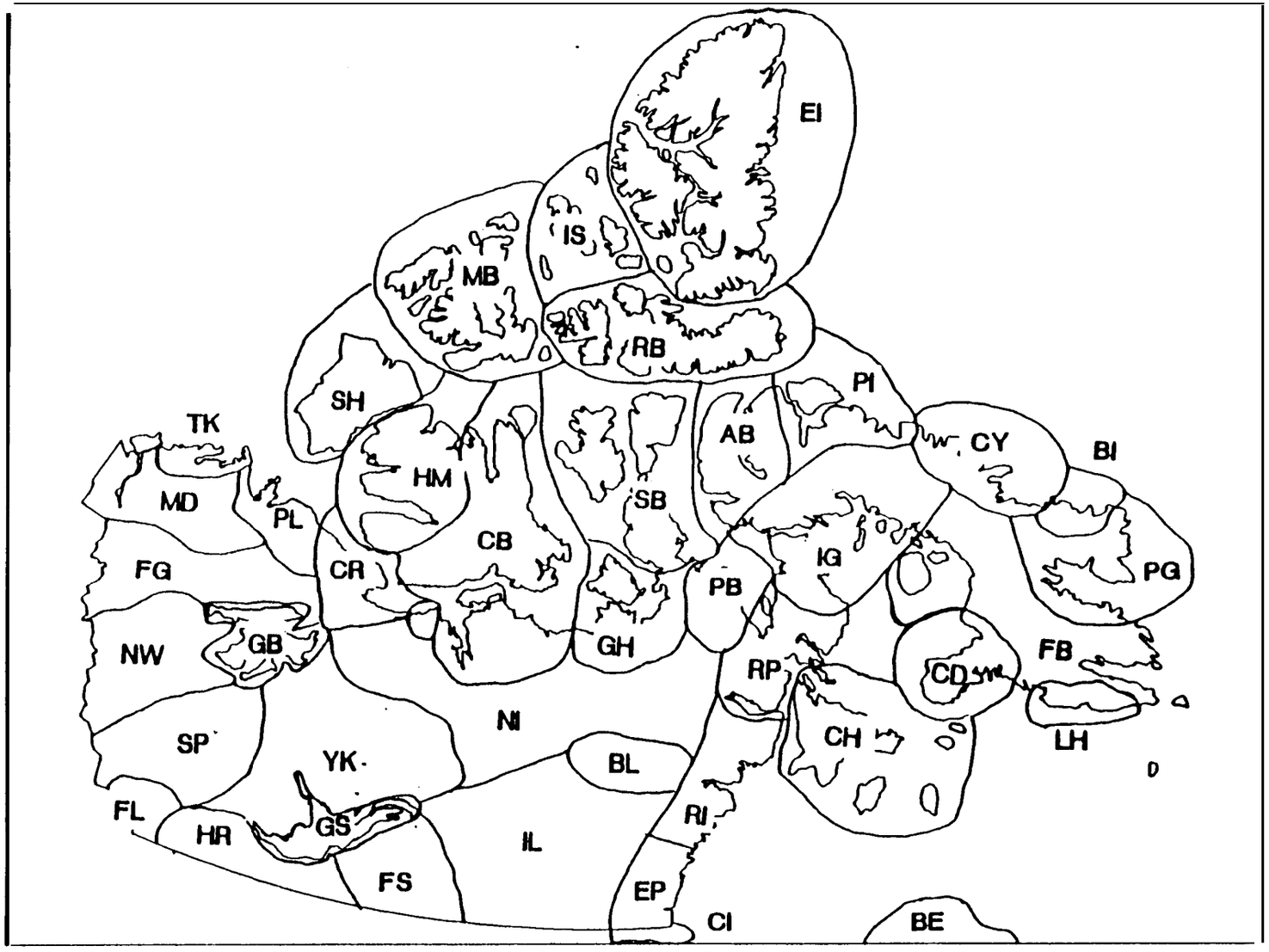


Fig. 2. Community harvest areas of the Northwest Territories.

KEY TO COMMUNITY HARVEST AREAS SHOWN IN FIGURE 2

AB = Arctic Bay

BE = Belcher Islands

BI = Broughton Island

BL = Baker Lake

CB = Cambridge Bay

CD = Cape Dorset

CH = Coral Harbour

CI = Churchill

CR = Coppermine

CY = Clyde

EI = Ellesmere Island

EP = Eskimo Point

FB = Iqaluit (Frobisher Bay)

FG = Fort Good Hope

FL = Fort Liard

FS = Fort Smith

GB = Great Bear Lake

GH = Gjoa Haven

GS = Great Slave Lake

HM = Holman

HR = Hay River

IG = Igloolik

IL = Inland NWT Lakes

IS = Isachsen

LH = Lake Harbour

MB = Mould Bay

MD = Mackenzie Delta

NI = Northern Inland

NW = Norman Wells

PB = Pelly Bay

PG = Pangnirtung

PI = Pond Inlet

PL = Paulatuk

RB = Resolute

RI = Rankin Inlet

RP = Repulse Bay

SB = Spence Bay

SH = Sacks Harbour

SP = Fort Simpson

TK = Tuktoyaktuk

YK = Yellowknife

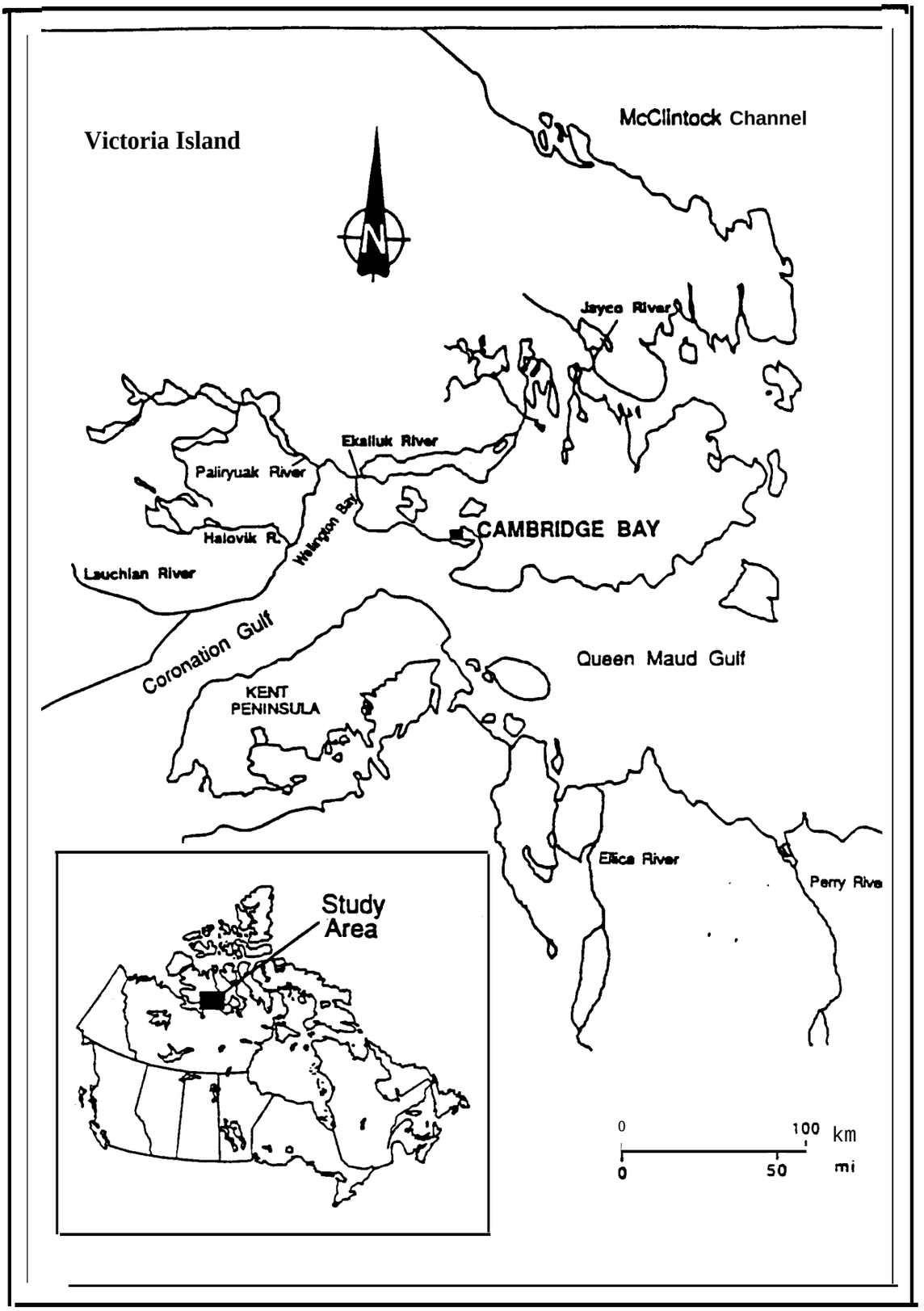


Fig. 3 **Map of the Cambridge Bay area** showing the commercially fished rivers.

4.0 CONCLUSIONS & RECOMMENDATIONS

There are many factors that influence the suitability of a particular fishing method to catching Arctic Char in remote locations. Presently, gillnets and weirs are the preferred catching methods with gillnets offering flexibility in terms of areas of operation but suffering from the fact that the fish are killed in the capture process and will spoil within a few hours in the absence of ice. Using light aircraft to pick up gillnet caught fish enables fish to be transported to the processing plant, but it is expensive and the aircraft is subject to departure and arrival delays as a result of poor weather conditions. In the case of weir caught fish, the fish are held live and consequently delays in arrival and departure are not such a problem. However, the time fish can be held in weirs situated at the mouth of the river is limited and does not allow fish to be held for any extended period. Additionally, because of the synchronous run of fish in the spring and fall, both the method of transportation and the ability to process fish during this short time frame may be limiting factors on further development of the commercial char fishery,

Increasing the quantity of wild fish harvested requires accessing rivers and lakes remote from the Cambridge Bay processing facilities. Traditional weir and gillnet fisheries are proven methods of hatvesting fish but do not enable the capture and holding of live fish for extended time periods. The effectiveness of using light aircraft to transport fish from remote areas is both expensive and subject to prevailing environmental conditions and may be a further source for concern if the quantity of fish harvested from remote areas is increased,

In developing a plan for harvesting Arctic Char from remote locations, the following issues need to be considered:

(i) The requirement for capturing fish live

(ii) The requirement for holding fish temporarily (5-10 days) or for extended periods (5-6 months)

(iii) The method of transporting fish from the capture site to the processing facility.

(iv) The fishing methods for capturing fish live in

(a) the ocean

(b) the river

(c) the lakes

(v) The methods for transferring fish from the fishing gear to the holding pen.

(vi) The design, construction and operation of holding pens.

(vii) The ability of holding pens to withstand severe ice conditions.

(viii) The ability of Arctic Char to survive in pens for extended periods under ice.

(ix) The ability to remove some fish from the holding pen and transport them to Cambridge Bay for processing.

(x) The ability of the processor and distributor to accept fish at non-traditional times at a reasonable price.

(xi) The production costs for harvesting fish from remote sites.

Sites with Development Potential

The following sites were visited or discussed

		LOCATION	APPROX. DISTANCE (miles) FR. CAMBRIDGE AIR	SEA
BYRON BAY	VISITED	VI	95	95
30 MILE	VISITED	VI	35	35
SURREY RIVER	VISITED	VI	42	42
EKALLUK RIVER	VISITED	VI	32	50
JAYEO RIVER	VISITED	VI	60	140+
HOOD	VISITED	MAINLAND	130	145
PERRY RIVER	VISITED	MAINLAND	100	110
ELLICE RIVER	VISITED	MAINLAND	65	70
BACK RIVER	DISCUSSED	MAINLAND	275*	295*
GJOA HAVEN	DISCUSSED	VI	200	220

• Via Gjoa Haven

Mode of Transporting Fish From Site to Cambridge Bay

Assuming that all fish caught need to be delivered to a central processing facility (Cambridge Bay), there are only two options for summer caught fish i.e. air transportation or the use of a high speed collector vessel. In the more distant locations such as Back River, unless the fish can be held live for extended periods, air transportation would appear to be the only option except in the instance where fish might be transferred from Back River to Gjoa Haven by a high speed collector vessel. The high speed vessel FV 'Innovation', currently in commercial operation out of Burnt Islands, Newfoundland is 30' LOA and can carry 6 tonnes of iced fish at 20 knots. In calm water in the unloaded condition the vessel can travel at 30 knots, A vessel of this type might be an alternative to air transportation for some of the remote sites. Typical transportation times for fish collection using a high speed vessel would be as follows:

FISH SITE	PLANT	DISTANCE (miles)	STEAMING TIME (hrs.)	RETURN TRIP TIME (hrs)
BYRON BAY	CAMBRIDGE	95	5.0	4.5
30 MILE	CAMBRIDGE	35	1.5	1.5
SURREY RIVER	CAMBRIDGE	42	2.0	2.0
EKALLUK RIVER	CAMBRIDGE	50	3.0	2.5
JAYCO RIVER	CAMBRIDGE	140	8.0	7.0
HOOD RIVER	CAMBRIDGE	145	8.0	7.0
PERRY RIVER	CAMBRIDGE	110	6.0	5.0
ELLICE RIVER	CAMBRIDGE	70	4.0	3.0
BACK RIVER	GJOA HAVEN	70	4.0	3.0
GJOA HAVEN	CAMBRIDGE	220	12.0+	10.00 . (refueling stop required)

If the fish can be held over winter then the third possibility of transporting fish by Kermatec is an option. The choice of using a high speed collector boat or winter transportation using a Kermatec as alternatives to air transportation will depend on fish availability, light aircraft availability, ease of access and cost.

SUGGESTED COURSE OF ACTION

Renewable resources conduct an economic evaluation of various transportation methods to transfer fish from river/lake to the processing plants for spring, fall and winter caught fish.

Mode of Fish Capture

Presently, there are three times during which Arctic Char can be harvested:

1. The spring run of fish out of the river/lake during ice break-up
2. The fall run of fish into the river/lake in late August
3. The bay/ocean fishery between spring and fall runs during which the fish are feeding

The fall run of fish returning to the river is the main fishery when fish are harvested using either weirs or gillnets at the head of the river. At this time the fish are in good condition and river quotas can be harvested in a very short period. Only the weir can be used for holding fish live, but because of its location at the head of the river the fish can only be held for a limited time.

The type of fishing gear used in future development projects should be based around the need to capture and hold fish live for extended periods to overcome transportation problems (arrival/departure of aircraft/boats). Delivering fish to the plant outside the peak run time may also be advantageous from the perspective of reducing bottlenecks in the plant due to oversupply. Also, it maybe possible to develop markets for fresh char during the winter months. These problems could be overcome by the following:

1. Developing techniques to catch and hold fish live during the spring run during break up.
2. Developing low energy techniques to catch and hold fish live for short periods in the ocean fishery

(bay areas).

3. **Developing techniques to catch and hold fish live for extended periods during the fall fishery.**

4. **Developing techniques to catch and hold fish live for extended periods in the winter lake fishery,**

Since not all rivers are suitable for the installation of traditional weirs (depth and flow rate too high), alternative live fish capture techniques should be investigated. There are five fishing gear types that could be used for harvesting live char in either the ocean, rivers or lakes. Each gear type will be particularly suited to a particular area and its effectiveness in a variety of locations will be dependent on river and ocean conditions, river and seabed topography, as well as the fish density and behaviour in the various locations. The ability or ease of transferring fish live from the trap or net will depend on fishing gear type and relative location of fishing and holding sites.

;H SITES & ME OF 'ERATION	METHOD OF HOLDING	TRADITIONAL WEIR	PORTABLE WEIR	WING TRAP WITH	BEACH LEADER SEINE	DANISH SEINE	GILL NETS
RING RIVER	CATCH & KILL						x
	CATCH & HOLD (T)				x		
	CATCH & HOLD (E)						
:EAN FISHERY	CATCH & KILL					x	x
	CATCH & HOLD (T)			x	x		
	CATCH & HOLD (E)						
LL RIVER	CATCH & KILL						x
	CATCH & HOLD (T)	x	x	x	x (?)		
	CATCH & HOLD (E)	x[1]	x[1]	x[1]	x (?)		
LL/WINTER KE	CATCH & KILL					x	x
	CATCH & HOLD (T)					x (?)	
	CATCH & HOLD (E)			x			

EXTENDED HOLDING TIME > 1 MONTH
TEMPORARY HOLDING TIME < 10 DAYS
FEASIBLE BUT NEEDS DEVELOPMENT WORK
NEEDS TRANSFER SYSTEM TO MOVE FISH TO DEEP WATER SITE

The above table lists the main types of fishing gear that would be suitable for live fish capture. Fishing gears that can be easily modified and set in a variety of locations would enable fishermen to expand their season. In a development project where little information is known on the size of the river fishery and where traditional weirs are impractical, it maybe advantageous to have a program that allows both the river and adjacent areas to be sampled. In bay areas where there are several rivers in close proximity, beach seining operations may be quite successful even though the vessel will in all likelihood have no acoustic fish detection equipment.

SUGGESTED COURSE OF ACTION

1. **Ocean fishing operations using traps or beach seines can offer an alternative to gill netting in between the Spring and Fall runs. Areas should be chosen that have a high catchment area, with several rivers emptying into a single bay e.g. Chester Bay, Arctic Sound. Sites where the seabed is smooth and shelves away gradually into deeper water should be identified. Exposure of the site, size of vessel and experience of crew should be borne in mind.**
2. **Spring river fishing is not a preferred option because of the condition of fish exiting the river, however, beach seines could be used if required immediately after the break-up or at times when the river is temporarily free of ice.**
3. **Fall river fishing in deep water areas can be conducted using traps and portable weirs Beach seining can also be used but setting the seine to intercept fish moving against the current will be much harder to achieve.**
4. **Portable traps set in the lake to intercept returning Fall fish would seem to be an exciting possibility not only because of the certainty of fish arrivals, but also because the ease in transferring the fish to a holding pound.**

Transfer Technology & Holding Pens

There are three options for holding char live after capture:

(i) holding ocean caught fish in ocean pens;

(ii) holding river caught Fall fish in the estuary;

(iii) holding lake caught fish in fresh water

Ocean caught fish are in a feeding phase of their life cycle and loss of conditions may result if the fish are not fed during this time. Studies may need to be conducted on survivability and fish condition if fish are to be held for extended periods. Short term holding may be acceptable if the time period is fairly short (< 10 days) and no loss of condition occurs. Alternatively, it may also be worthwhile to carry out feeding experiments using naturally occurring schools of bait fish that could be harvested using a beach seine.

Fish entering the river in the Fall are migrating from a salt water to fresh water environment. The effects of holding fish in a saline environment for extended periods at this time are not known and may need to be investigated. Some rivers such as the Surrey, Hook, Ellice and Perry may all have suitable estuarine berths for extended holding of char for extended periods.

An alternative to the Fall river fishery is to intercept the fish as they enter the lake. Having the fish gear and holding pen in the same locations has tremendous advantages in terms of reducing the transfer costs, However, as with estuarine pen sites, there are many potential problems in terms of fish surviving under ice as well as the problems of retrieving the pens and fishing gear from under the ice for occasional culling throughout the winter and then to remove the equipment before break-up.

SUGGESTED COURSE OF ACTION

(1) A preliminary study should be conducted to determine the survivability of Arctic Char held for extended periods in:

(i) an ocean environment for periods up to 20 days

(ii) a shallow water estuarine environment for periods up to 20 days

(iii) a deep water estuarine environment over winter

(iv) a lake environment over winter

A sample size of 20 fish for each location would be adequate, with regular monitoring of fish condition (length, girth, weight) as well as water temperature.

(2) More detailed studies of potential fishing sites is required prior to holding pen design, construction and deployment. These studies should collect data on speed of currents in the region, water depth, bottom type, data of ice thickness expected at the site. This information will assist in the design, construction of pens for holding fish over an extended period.

(3) At sites where fish need to be transferred from the fishing gear to a remote pen location, consideration must be given to the method of transportation. In some locations, the holding pen may be part of the capture apparatus i.e. the pen may be the bag of a wing trap or bunt of a beach seine that is disconnected from the main part of the fishing gear and towed to the pen site. In other instances such as ocean fishing, where numbers of fish caught are low, the fish could be transferred by boat. In the lake scenario, the holding pen may remain attached to the fishing gear and the mouth of the trap closed when a sufficient quantity of fish have entered the trap.

(4) Some consideration be given to the holding and feeding of arctic char using naturally occurring schools of bait fish.

Problems Associated with Changing the Traditional Fishery

Some consideration needs to be given to the ability of the existing processor to handle the increased quantity of fish arriving during the traditional season as well as the economics of processing fish during the non-traditional season. If the price structure remains the same for fish over-wintered and the processor has excess processing capacity, then it may not be worthwhile to hold fish live for extended periods unless transportation costs are a dominant factor.

If the strategy in developing remote rivers was to develop not just an alternative fishing style but to look at other types of processing and processors i.e. dried char, supplying wet fish to the market or freezing the product in remote locations, then the emphasis for this type of program should be an identifying and developing markets for these new products.

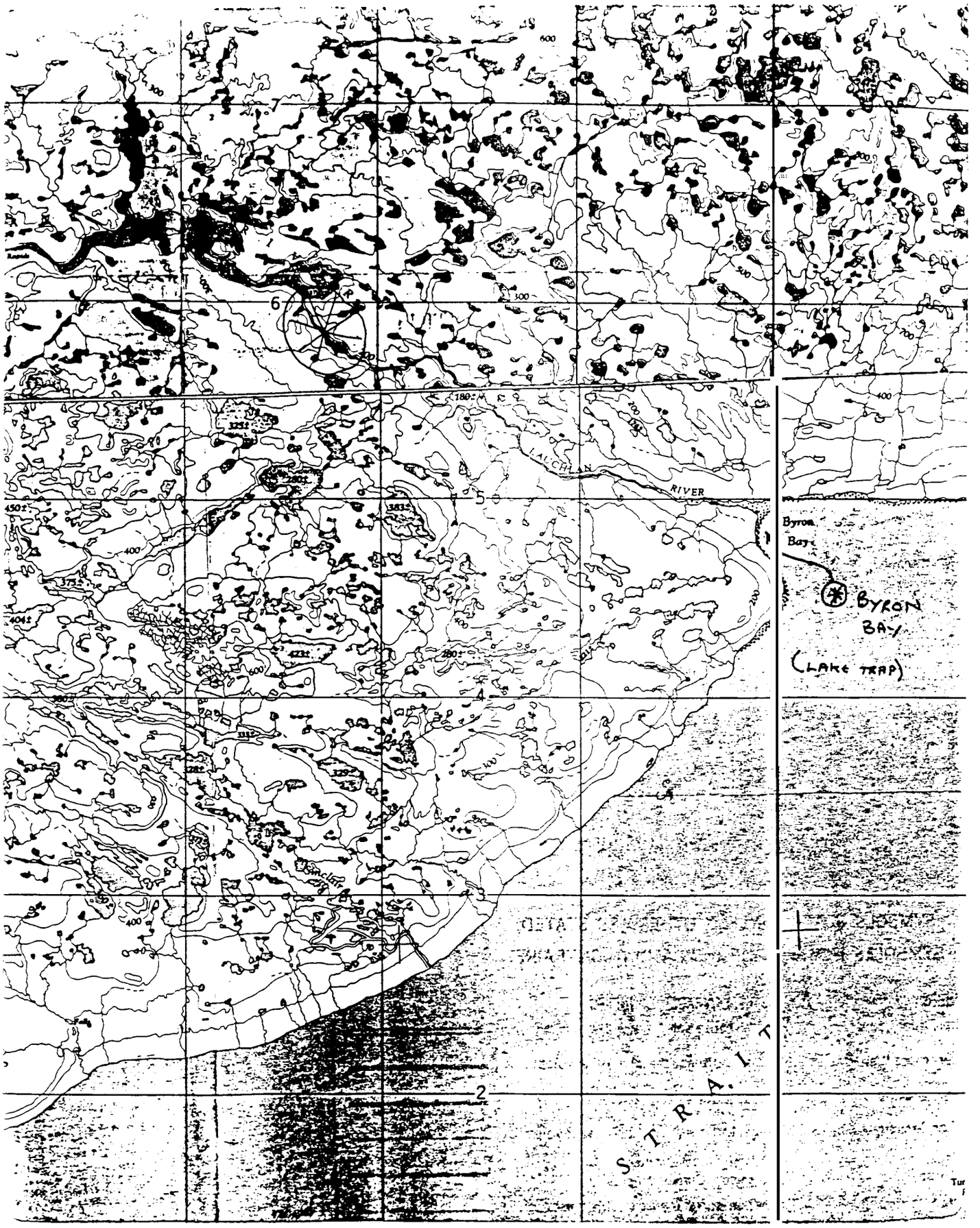
A development project to increase fish production on remote rivers should be market driven. It will be necessary to determine whether the fish caught will enter into the traditional frozen market or whether the different capture and holding techniques will give access to alternative markets. At the present time, these issues have not been properly addressed.

Recommendations

1. Identify market opportunities for traditional and non-traditional char products. Determine size and seasonality of the market and specifications of products required.
2. Identify whether fish from remote locations will fill existing markets for a frozen, head on gutted product and whether processing the fish at the remote site at transporting out by Kermatec or boat is a justifiable alternative to flying out fresh fish.
3. Develop a model to simulate the various catching, transporting, processing and marketing scenarios to help identify the most cost effective method of developing the fishery,

APPENDIX 1

DETAILED MAPS OF SITES VISITED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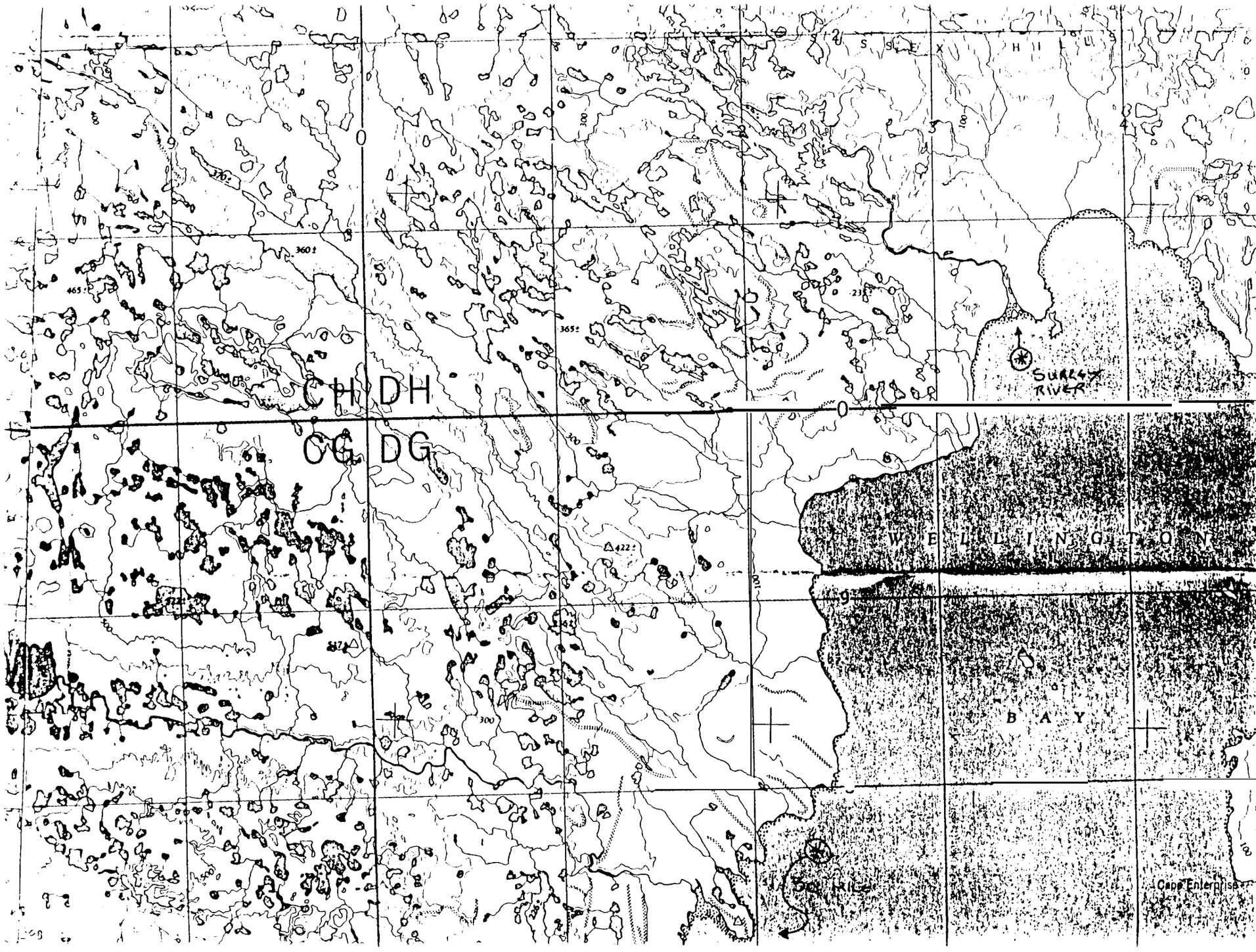
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HOOD
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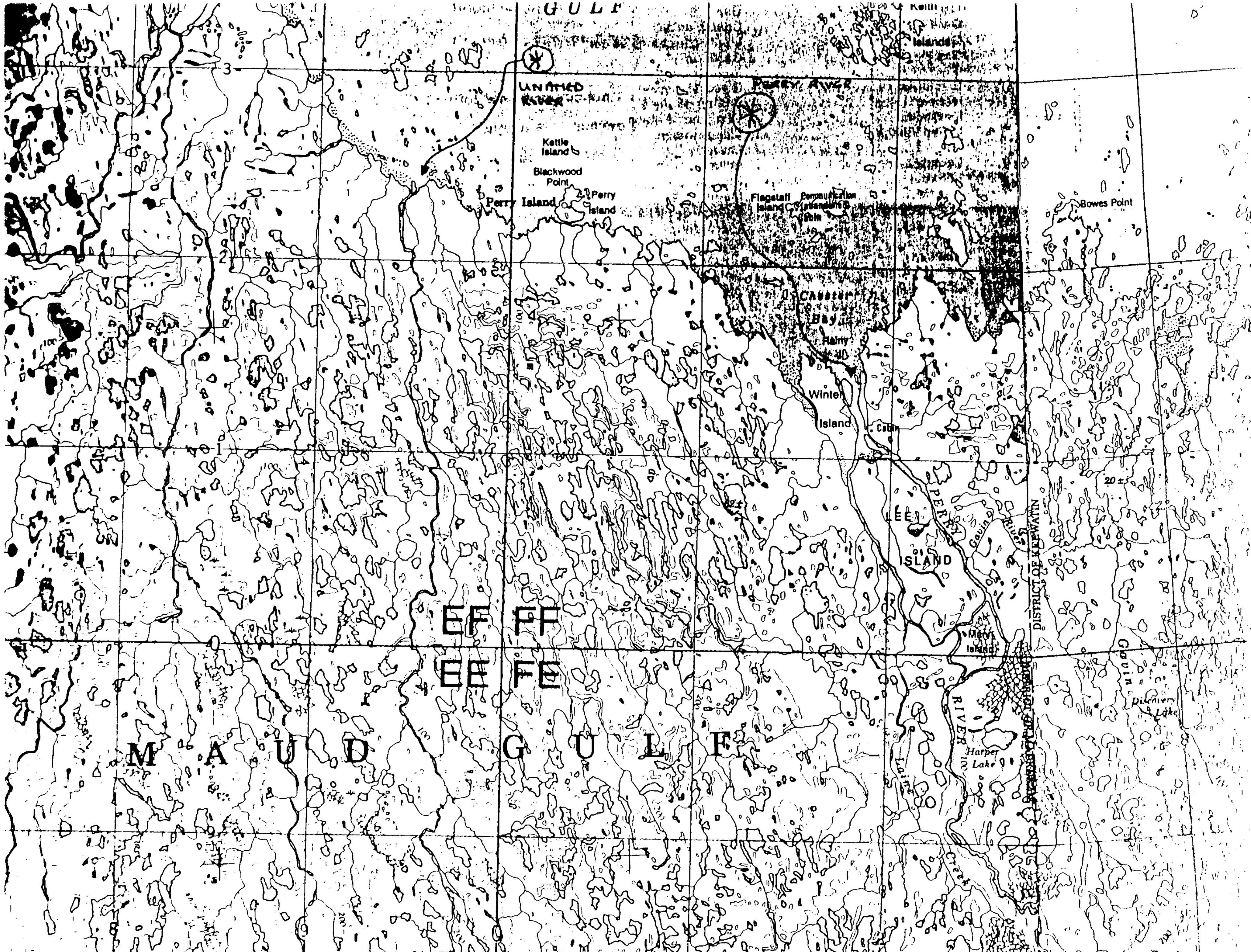
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Rainy
Winter Island
Cabin
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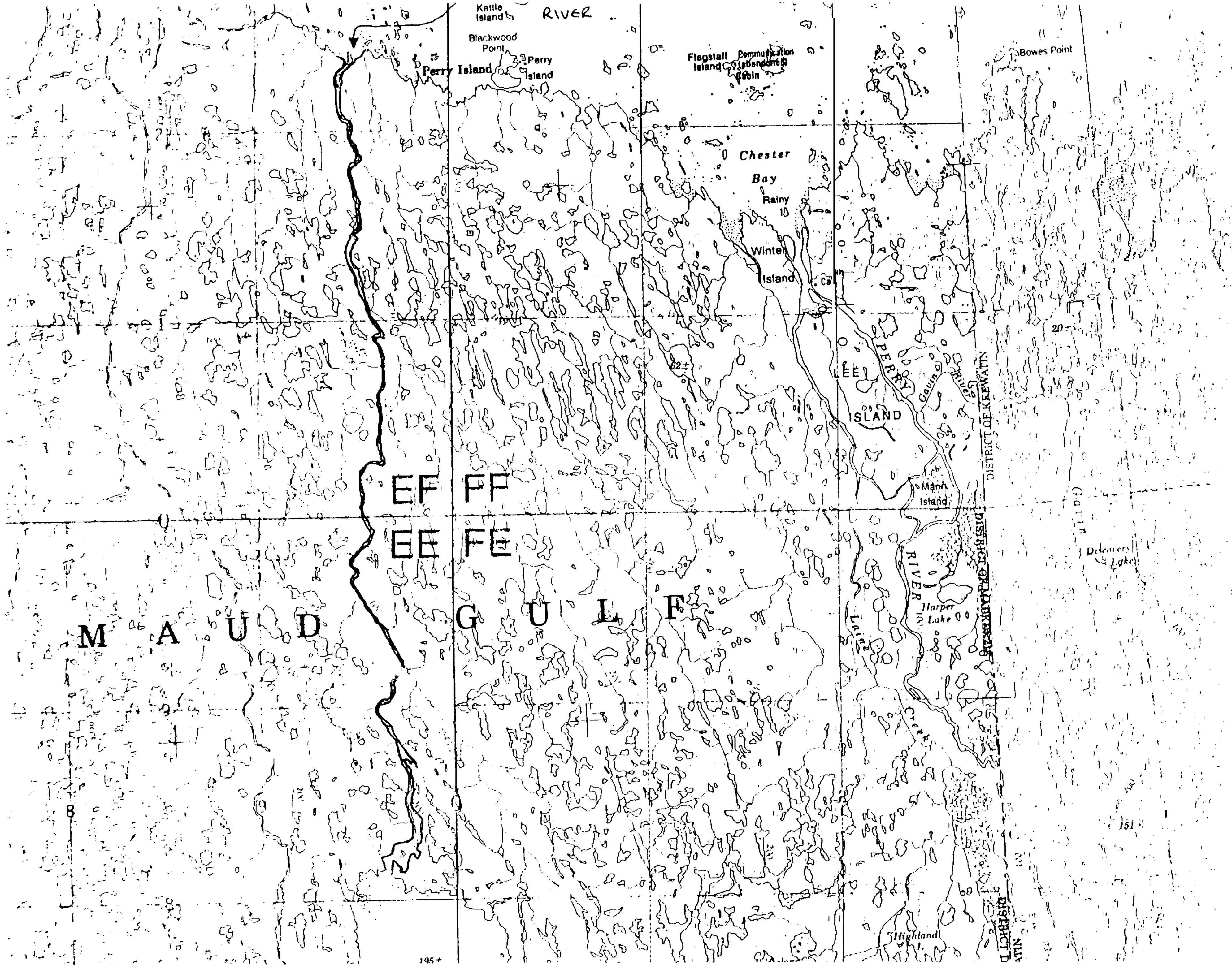
Kettle Island
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Flagstaff Island
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Bowes Point
Chester Bay
Rainy
Winter Island
PERRY
LEE ISLAND
Gavin River
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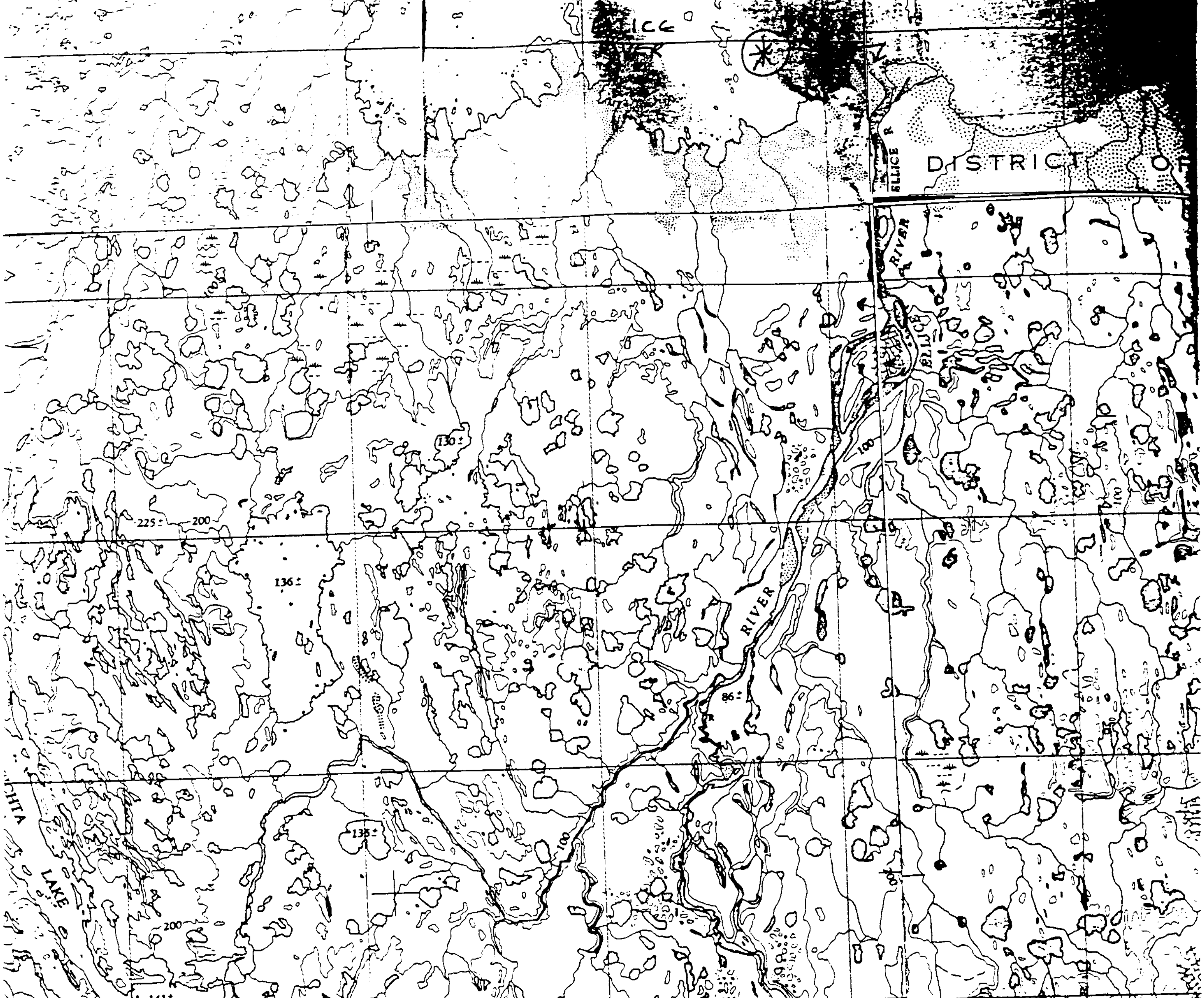

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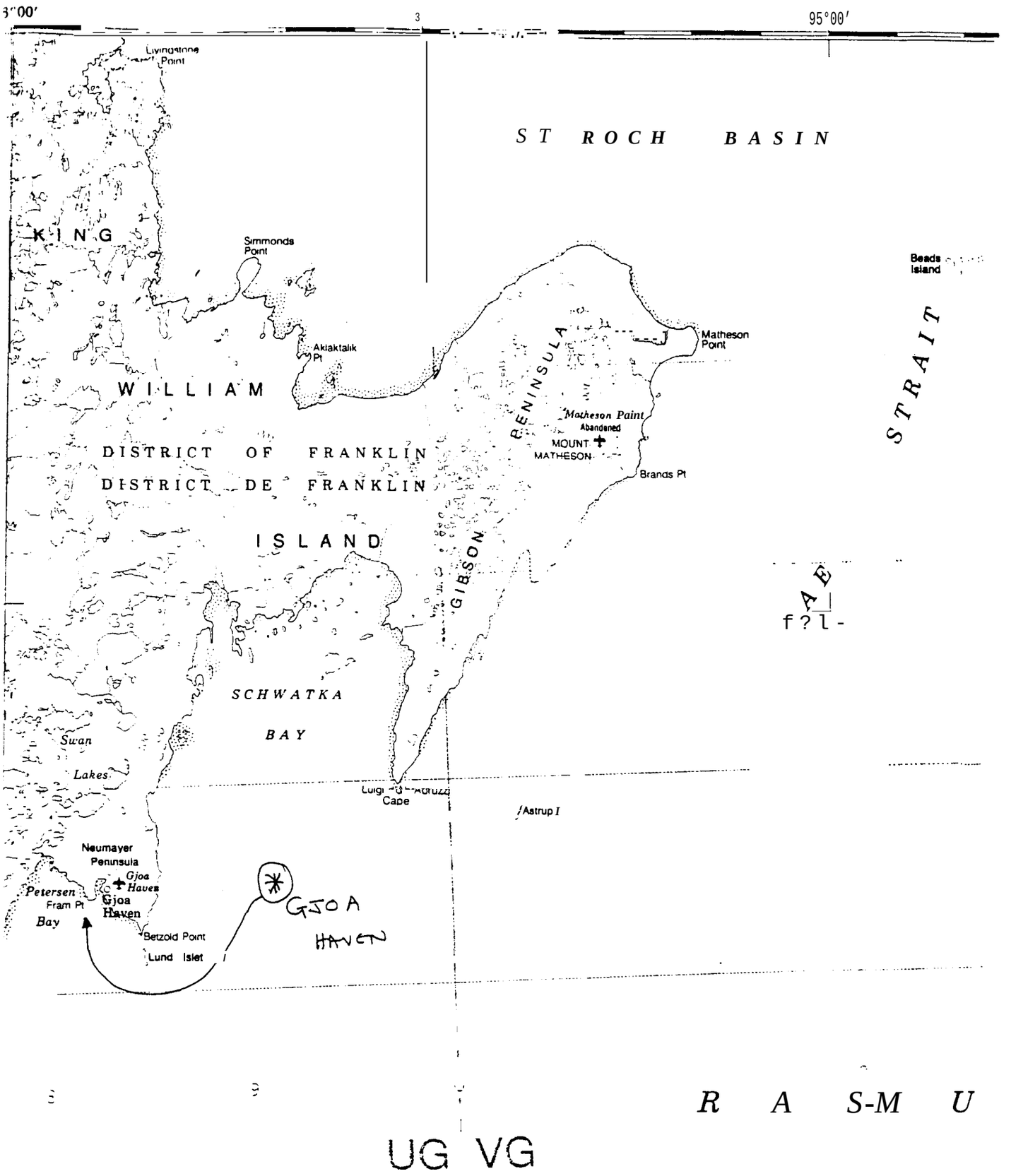
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MOUNT MATHESON
STRAIT
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Brands Pt
ISLAND
SCHWATKA
BAY
Swan
Lakes
Cape
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Neumayer Peninsula
Gjoa Haven
Petersen Bay
Fram Pt
Gjoa Haven
Betzold Point
Lund Islet
GJOA HAVEN
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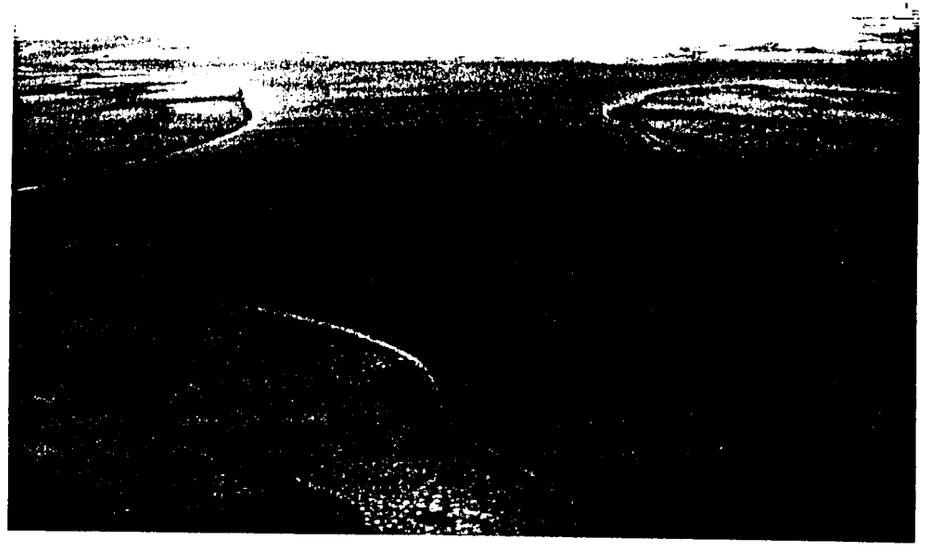
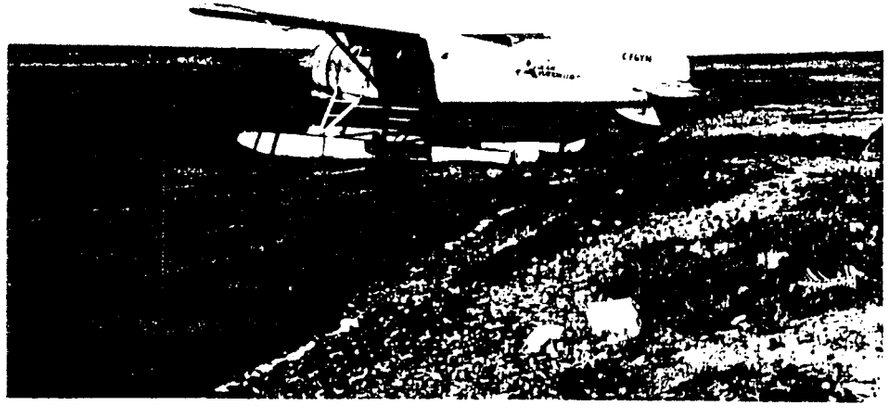
APPENDIX II

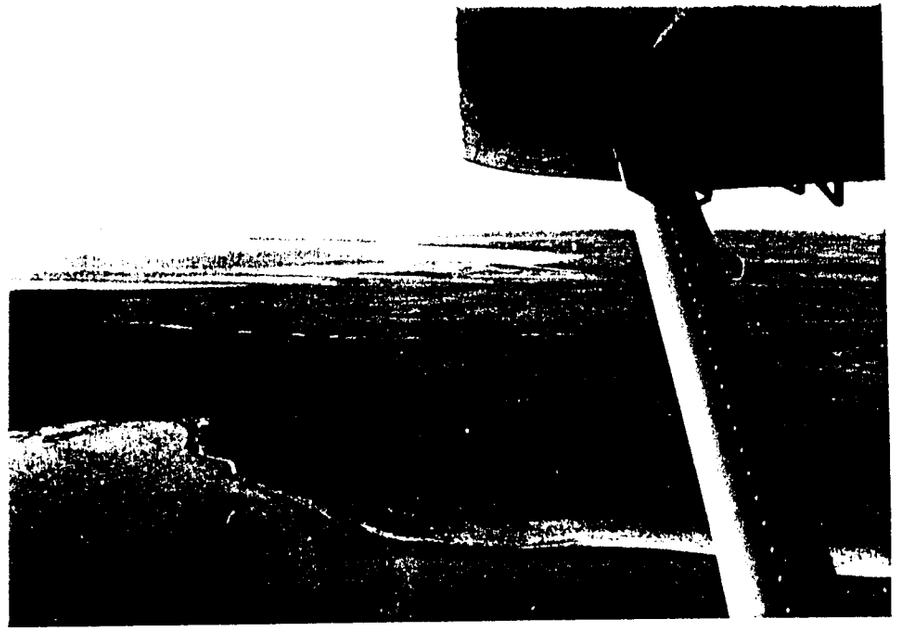
AERIAL PHOTOGRAPHS OF SITES VISITED





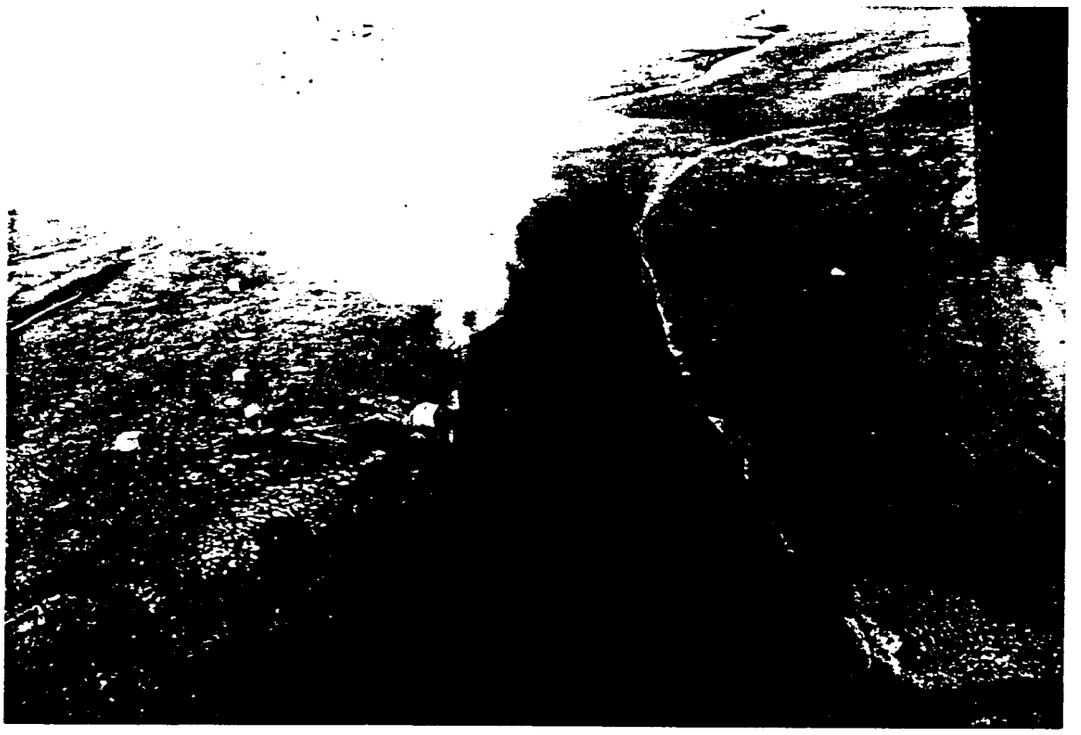
PHOTOGRAPHS SHOWING BYRON BAY, NWT

PHOTOGRAPHS SHOWING 30 MILE RIVER NWT



PHOTOGRAPHS SHOWING SURREY RIVER ESTUARY, NWT

PHOTOGRAPH SHOWING PERRY RIVER ESTUARY , NWT



PHOTOGRAPHS SHOWING EKALLUK RIVER , NWT