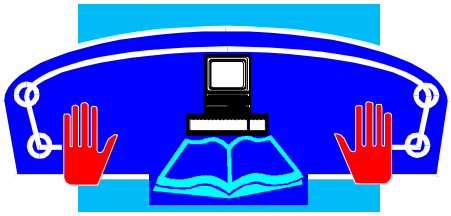
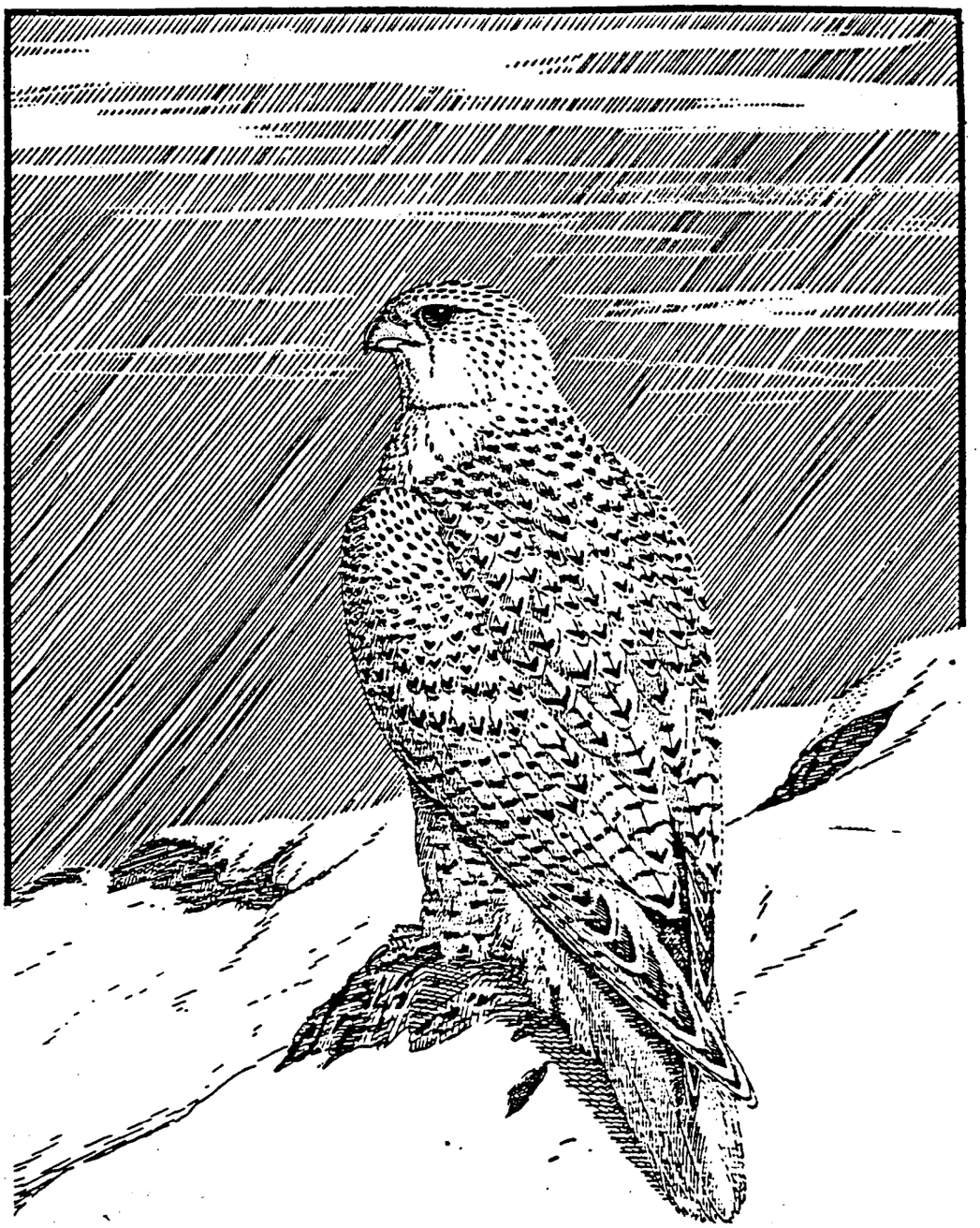


The Gyrfalcon
Type of Study: Analysis/review
Date of Report: 1976
Author: B. D. Mclean
Catalogue Number: 5-1-25

THE GYRFALCON



Falco rusticolus (Beebe , 1976)

ABSTRACT

In 1982" it became legal to capture and export passage gyrfalcons from the Northwest Territories. This study took place in response to the need for basic information on the population and distribution of gyrfalcons in the Baffin Region. This year (1984) was the first year of a proposed three year study. Survey crews of Inuit hunters from the settlements of Broughton Island, Frobisher Bay and Pangnirtung, surveyed a total area of 5191 square kilometers and an additional 3653 km of coastline by snowmobile, in May-June 1984. Twenty-three occupied gyrfalcon nest sites were found. Density of occupied nest sites ranged from 1 pair per 222 square kilometers to-4. pair per 775 square kilometers with an average of 1 pair per 472 -square kilometers. Where coastline only was surveyed values ranged from 1 pair per 157 kilometers to 1 pair per 378 kilometers with an average of 1 pair per 332 kilometers. Nest site characteristics? additional sightings and colour phase are discussed, as well as-a brief discussion of possible limiting factors to gyrfalcon numbers and the behaviour and observed reaction of gyrfalcons to the survey. Observations of nesting by the common raven, peregrine falcon and rough-legged hawk and sightings of the latter two species are reported= Raven nest site characteristics and their importance to gyrfalcons are also discussed. Economic implications of a gyrfalcon harvest are discussed. The survey limitations are recognized and conclusions and-recommendations for continued studies are made.

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INTRODUCTION

Birds of prey have long captivated the interest of man. The first written records of falcons date to almost 4,000 years ago, from the Far and Middle East (Terres 1982). Although initially kept for ceremonial or religious significance, they were later trained to hunt game for man. This practice developed into a sport or pastime for kings and nobles. Falconry, as it came to be known, became very popular in mediaeval times. The most valued birds were the falcons. In particular the peregrine falcon (*Falco peregrinus* spp.) and the gyrfalcon (*Falco rusticolus*) were sought after. The size (largest of the Falconidae), speed, and majestic appearance of the gyrfalcon, especially those with white plummage, meant they were worth "A King's Ransom" (Beebe 1974). The difficulties in procuring such a bird, found only in arctic conditions and transporting it back to Europe or the Middle East, prevented any possibility of overharvesting. The sport declined in the 18th and 19th centuries. It appears however, to have undergone a revival in certain parts of the world. Interest in falconry is strong in the Middle East and has also increased in North America and Europe recently.

Although well known to the Inuit, and other native peoples living in the high latitudes, traditionally there has not been much more than a passing interest in these birds, certainly not for sport and rarely for food. The Government of the Northwest Territories (G.N.W.T.), prior to July 1st, 1979, had not developed any policy or regulations pertaining specifically" to the harvest of birds of prey. Since that date however, there has been provision within the G.N.W.T. Wildlife Ordinance and Regulations for the live capture and

export of young passage or free flying gyrfalcons (as opposed to eyesses or g taken from the nest). A quota of 20 passage gyrfalcon=, for all of the N.W.T., was established in 1982, with a maximum of S to 7 birds alloted to the Baffin Region. This quota was made available subject to the approval of the Baffin Regional Inuit Association (B.R.I.A.) and the Baffin Regional Hunters and Trappers Association (B.R.H.T.A.). Overseas falconers have "in the past approached local H.T.A.'s with offers to purchase falcons. The Baffin Regional Hunters and Trapper= Association in meetings with the 'local H.T.A.'s decided not to proceed with applications to harvest gyrfalcons at that time, because of a lack of information available on the population status of gyrfalcons in the Baffin Region. The need for some baseline information became apparent.

In 1983-1984 application for funding by the Economic Development Agreement #5. D.A.), Natural Resource Development section, was made by B.R.I.A. and the Baffin Regional Council (B.R.C.), to conduct surveys of the Baffin Region to determine gyrfalcon numbers. A snowmobile survey to identify active and potential gyralcon nest sites was proposed. With the technical assistance of Renewable Resources staff a proposal was put forward with the following objectives:

1) Assess the size and distribution of the gyrfalcon population, in the Baffin Region.

2) Develop indices of the nesting densities of gyrfalcons within the Inuit hunting areas of specific settlements.

3) Determine the return rates of gyrfalcons to specific nest sites (or alternate nest sites) during at least two nesting seasons.

4) Record nest site characteristics in the study areas.

5) Record nest sites of the common raven (Corvus corax) and sightings or

evidence of nesting by peregrine falcons (Falco peregrinus tundrius) and rough-legged hawks (Buteo lagopus).

6) Educate local hunters about gyrfalcon nesting biology through active participation in the study.

Achievement of these objectives will contribute information needed to assess the ability of the gyrfalcon population in the Baffin Region to support commercial harvests=

This year (1984) surveys were completed, by snowmobile, in areas near Broughton Island, Frobisher Bay, and Pangnirtung. Figure 1 shows the settlements and surrounding areas from which a sample was surveyed. The dates of survey, which vary slightly with the community, were during the period of May 14th to June 10th, 1984.

The gyrfalcon because of it's largely inaccessible range (Arctic areas) has received little intensive study until fairly recently. Several authors have written reports on the biology of gyrfalcons, noteably Cade (1960), Muir (1973), Nelson (1978), and Roseneau (1972). However most studies have been fairly limited and much basic information remains unknown. The Wildlife Branch of the Yukon Territorial Government undertook a six year study of gyrfalcons on the Yukon Arctic Slope from 1974-1979 (Mossop and Hayes 1980). One focus of the research was a gyrfalcon harvesting experiment. Their work continues and some of their results and experiences may be relevant to the Baffin Region.

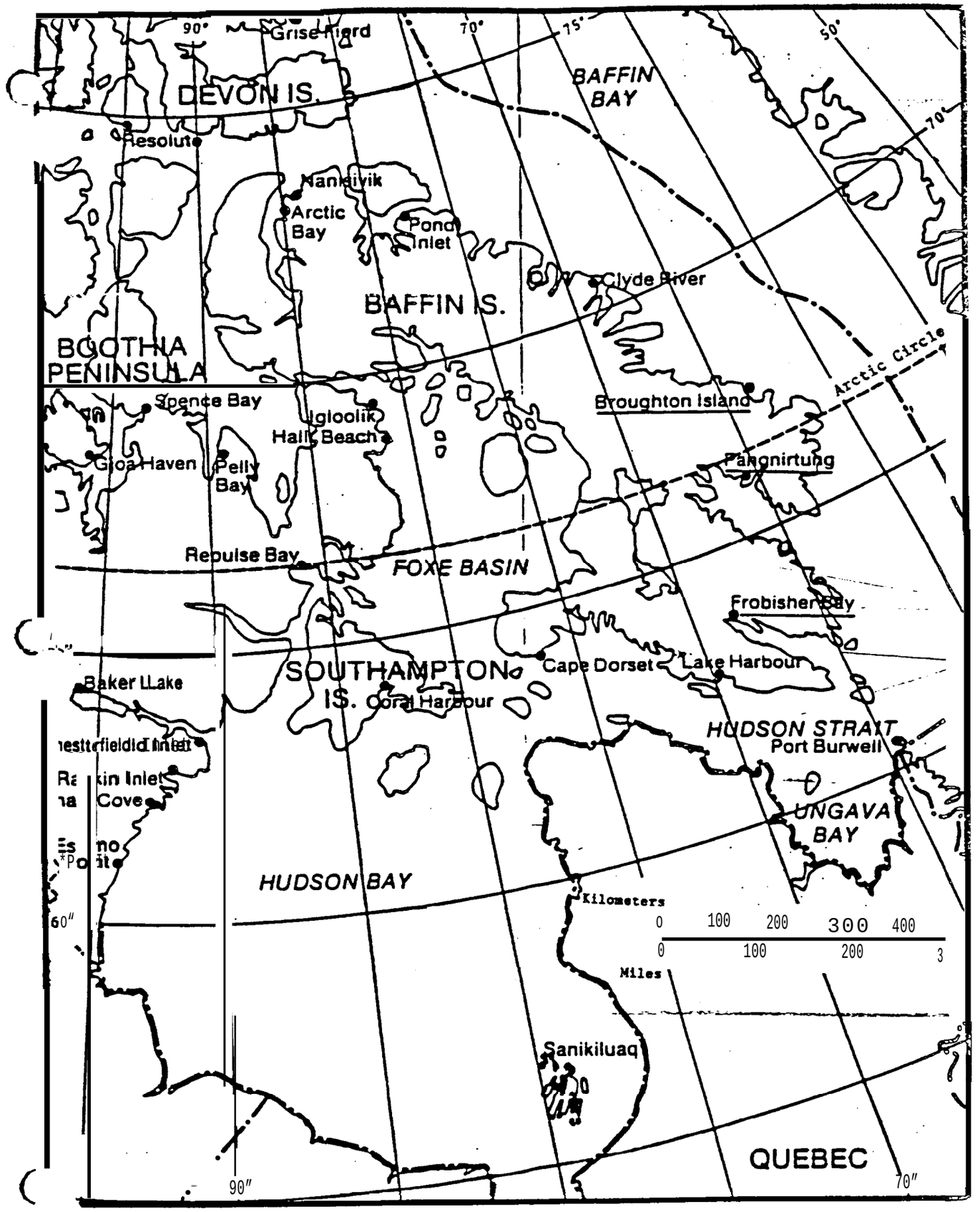

Figure 1. Map of eastern Northwest Territories showing the communities from which surveys were conducted on Baffin Island in 1984.

Until recently, there have been no detailed studies completed on gyrfalcons or other raptors in the Baffin Region. Files of raptor sightings and nest sites were maintained by the Canadian Wildlife Service (C.W.S.) until 1982, when Renewable Resources (N.W.T.) assumed that responsibility. However in the case of C.W.S. the information was gathered in the course of other work and is quite scanty.

In 1982 Renewable Resources iniated baseline studies of birds of prey in the Baffin, Kitikmeot, and Keewatin regions. It is hoped that their ongoing research will complement this study and help establish parameters such as productivity and nesting chronology.

METHODS . . . .-

The three settlements chosen for surveys in 1984 were Broughton Island (67 33′ N 64 02'W), Pangnirtung (66 09′N 65 43′ W), and Frobisher Bay (63 45′N 68 31'W). From each of these centres an area was delineated, subjectively, under the following criteria:

1) Accessibility, travel by snowmobile must be possible.
2) Proximity , the area must be within reasonable range of the settlements.
3) Within what was considered to be that settlement's hunting area.

These criteria excluded areas which were impractical or impassable for snowmobile travel because the terrain was too rugged; there was too much dangerous open water; or travel conditions were poor.

Each area was divided into sample units. A sample unit being the timated area which could receive 100% coverage of the cliff habitat within a week period. The sample units were approximately 1500 square kilometers. These units were drawn on the map subjectively using natural features as convenient borders to delineate the areas. The sample units therefore are only approximately equal in size. Two of these sample units were selected at random from each area, using a random numbers table.

Broughton Island was approached differently. Because of the rugged terrain on the eastern coast of Baffin Island access to the land from the sea ice by snowmobile is very" restricted. This meant that a survey could only be done from the level of the ice. This survey of the coast and islands gave an estimate of distance surveyed and not area. This same approach was

subsequently necessary for one of the sample areas near Frobisher Bay and a part of the survey from Pangnirtung.

If the survey of the sample area was completed ahead of schedule or extra days were available, additional areas were surveyed. Because this was done at the end of the primary survey, with spring advancing, travel was more restricted "and these areas were chosen subjectively.

Each community had two survey crews, a survey Crew" consisting of three Inuit hunters. Where possible a Wildlife Officer from Renewable Resources or the project supervisor accompanied a crew. The Wildlife Officers, because of other responsibilities, were not always available. The project supervisor attempted to get out with all the crews, both for a training period to explain the data collection methods, and during the surveys themselves. Time and logistic constraints meant that this was not always possible or practical.

The sample area was surveyed systematically, 'making use of natural features, where possible, to delineate the day's survey. The survey route was also marked on a 1:250,000 topographical map. An attempt was made to search all cliffs. Travel conditions, especially as spring progressed? did influence the accessibility of some areas. Warm temperatures made travel in deep snow impossible and the presence of water, especially in the fiords, underneath the snow was a problem. The topography also dictated the survey route taken, resulting in some cases, in an erratic course. For these reasons it was not always possible to reach all cliffs and some may have been missed.

The crew members would stop periodically to scan more intensely any likely

1 i ng cl i ffs. The presence of "whitewash", namely bird guano, orange lichen growth, or a flushed bird often called the attention of the observer to a potential nest site. Gyrfalcon nest sites are known for their repeated use year after year. The accumulated guano is quite noticeable below any perches (which may be used by an adult bird through the winter) aria' often below the nest itself. Prey remains are commonly found below the nest site or perches, however this is often hard to see at this time of year. Orange lichen (Xantheria elegans) often grows on rock faces that have previously been covered in nitrogen rich bird guano.

"Nest site" is the term used to describe an area where birds are actively nesting (or their behaviour suggests they are), have nested in the past (abandoned nests) or recently fledged young raptors are observed. A nest site considered "occupied" or "active" if defensive behaviour was displayed by an adult or if signs of occupation (fresh whitewash? prey remains, scrape looked recent) or if incubation (an adult sitting on, or flushed from a nest) was observed. A "productive site" was considered to be one where eggs or young were observed. It was not possible in most cases to distinguish between nest sites that were merely occupied and those which were productive. Adults observed, that were not found on or near a nest or did not display defensive behavior were recorded as sightings only.

Binoculars were used by most crew members (range of sizes), as well as spotting scopes or rifle scopes. In general binoculars were inn-e convenient for use on snowmobile. Because of the great variations encountered in "

topography and travel conditions no attempt was made to use a standardized speed or viewing time.

Whenever a nest site or a raptor was sighted, the location was marked on a 1:250,000 map and given a sequential site number. The date and time of the observations site and map sheet number, species" and number of birds were recorded. In some cases birds were observed, but a nest was not located; while in others, a nest was found but no birds were observed in the area. If a nest was found, the nest type, height on the cliff (near bottom, near centre, or near top), presence and degree of a rock overhang (none, some, complete), amount of whitewash guano (none,some,lots) , presence of orange lichen, and the spect (N,NE,E,SE,S,SW, W,NW) of the nest site was recorded= If birds were cated, their behaviour in response to our approach as well as any other k als noted in the area , and additional remarks were recorded. The observers' names were also noted. If a nest was suspected, but not confirmed, an effort was made to return to the site at a later date to recheck it. Figure 2 illustrates a typical nest site and shows some of the terms used for data collection.

Whenever an occupied gyrfalcon nest was found the crews remained in the area only briefly. No attempt was made to climb into the nest or to flush an incubating bird off the nest. The laying of eggs and their incubation is a critical time for breeding gyrfalcons (Muir 1973). Physical injury to the eggs or young can occur if the adult is flushed off the nest unexpectedly. Eggs exposed t. the sub-zero temperatures common at that time Of year may become

chilled enough to kill the developing embryo, if the adult is prevented from incubating. There is a risk of nest desertion if the birds are unduly disturbed. This problem is discussed more fully in Fyfe and Olendorff (1976) and their guidelines were adhered to. Where possible we attempted to approach nest cliffs in full view of any birds present. A bird sitting on the nest was assumed to be incubating eggs.

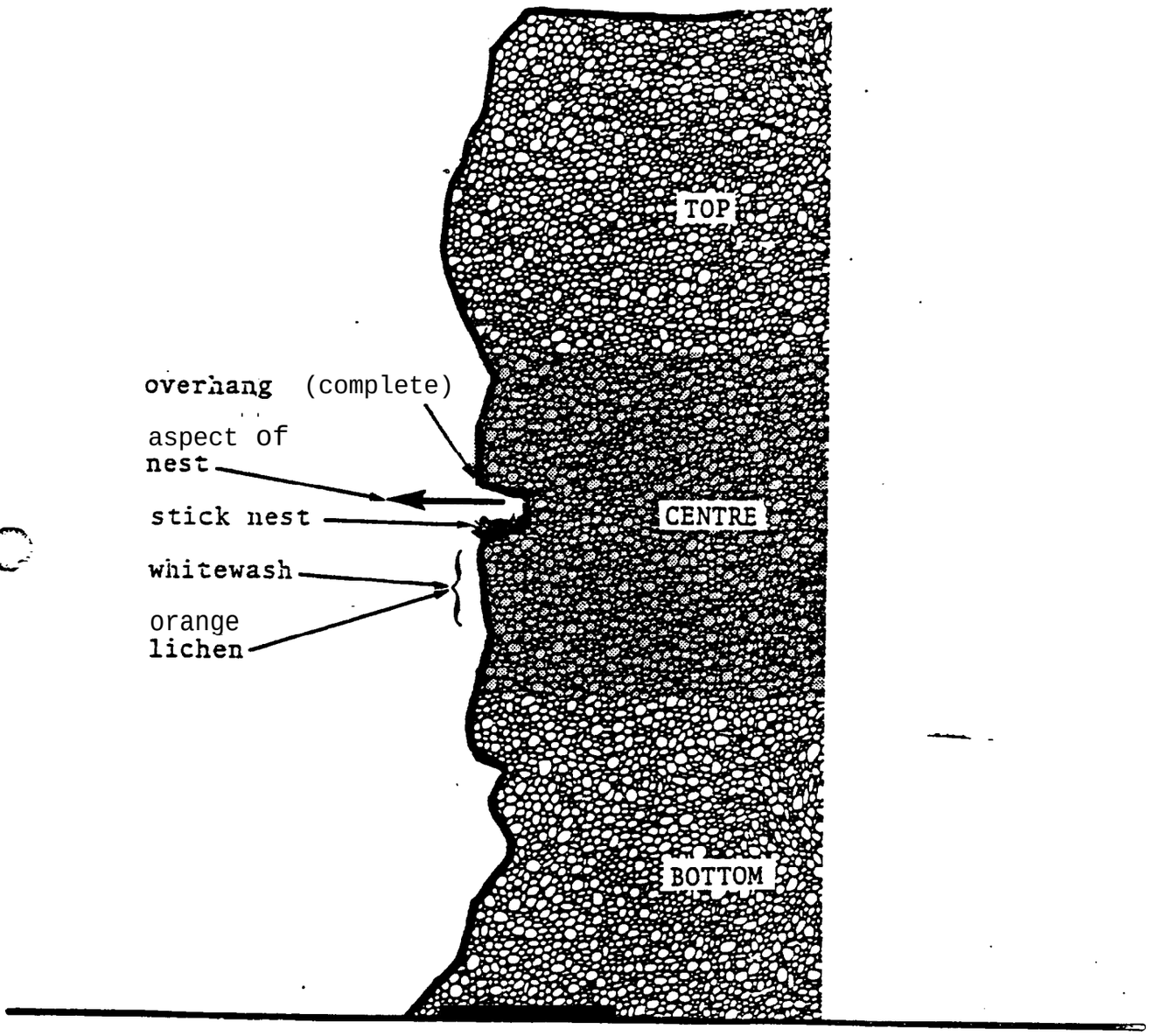

Figure z. Sketch of gyrfalcon nest cliff showing the terms used in the data collection.

Survey timing and dates:

Gyrfalcons begin nesting in the more moderate parts of the Arctic in April (Cade 1960). Bromley ('1983) found an average initial laying date of May 19 or later (range 9th to 26th), from a sample of eleven productive sites in the south Baffin Island area. The adult birds are most likely to desert the nest because of disturbance in the early stages of incubation. As incubation proceeds a very strong nest site attachment develops, making it easier to spot the birds and consequently the nest. Ideally therefore the survey would be timed during or at the end of the incubation period, which would also reduce chance of missing any late nesting birds. However, travel by snowmobile can become limited, depending on the year, by the 2nd or 3rd week of May. Travel on the sea ice is possible several weeks later, but access onto the land can become difficult. The dates of the survey took into account these variables as well as the snow conditions this year in May.

The dates of this year's survey were: Frobisher Bay area, May 14th to May 28th and June 1st to June 5th; Pangnirtung area, May 14th to May 27th, and May 30th to June 3rd; and Broughton Island, May 17th to June 1st, and June 9th and 10th.

One crew (three men) working for one day was considered to be a survey day. Based from Broughton Island, Frobisher Bay, and Pangnirtung there were 27, 28, and 25 survey days completed respectively for a total of 80 survey days. Between the six crews, 12 other survey days were lost because of bad

weather, 9 survey days were spent in travel, and 3 additional survey days were lost for other reasons. These figures are approximate as part days were spent in travel, survey or lost due to weather.

Maps showing the location of nests will not be published in this report, they will be kept on file at the Baffin Regional Office of Renewable Resources. This information will be available to BRC, BRIA, and the BRHTA as required, to plan continuation of the studies. This precaution is necessary because of the real risk of poaching should this information be made public.

RESULTS

Physical Description of study areas:

Broughton Island and :

The areas surveyed north and south of Broughton Island were representative of the east coast of Baffin Island. Uplifting of eastern Baffin Island in the geologic past intensified erosion of the overlying marine sediments exposing the Canadian Shield bedrock beneath. This forms the majority of the" bedrock on Cumberland Peninsula today except for some outcrops of volcanic and sedimentary rocks between Cape Searle and Cape Dyer (Wilson 1976). Glaciation intensified the ruggednes of this area and continues to affect this region, The nearby Penny icecap is the largest on Baffin Island, covering almost 6000 sq. kilometers (Bird 1967).

The areas surveyed were characterized by steep cliffs rising from the sea and long U-shaped glaciated valleys. Most of the islands have sheer cliffs. Although there is an abundance of cliffs they may not all be suitable for nesting gyrfalcons. Few rock ptarmigan (Lagopus mutus) or arctic hare (Lexus arcticus) were observed. Waterfowl and seabirds tend to concentrate in areas of open water (between some of the islands, currents keep the water open) and at the flow edge. Near Cape Searle and Reid Bay flocks of thick-billed murre (Uria aalge), fulmar (Fulmar boreal), black guillemot (Cepphus columba), black-legged kittiwakes (Rissa tridactyla) were observed on May 20th.

Glacous gulls (Larus hyperboreus), and iceland gulls (Larus glaucoides) commonly nest at suitable cliffs all along this coast and were observed throughout the study. The extent to which gyrfalcons prey on gulls is not known, particularly during the early stages of nesting. Cade (1960) makes reference to gyrfalcons preying heavily on seabirds in coastal areas.

Frobisher Bay:

The topography around the town of Frobisher Bay, especially to the north, much gentler relief than the Cumberland Peninsula. The western side of Baffin Island was not uplifted nor subsequently eroded to the same extent as the eastern side. It has also 'not been as heavily glaciated (Wilson 1976). The coastal areas are deeply dissected however and along with the numerous islands provide a good variety of potential "nest cliffs. Inland, the topography tends to offer less potential for nesting gyrfalcons. Although there is considerable relief, "especially in the southern parts of the Meta Incognita and Hall Peninsulas, suitable cliffs are generally restricted to the river courses or the occasional large rock outcrop, most of the terrain being gently rolling uplands (Bird 1?67). Ptarmigan appeared to be numerous to the west of Frobisher Bay, with flocks of 5 to 10 being commonly seen daily, although "how the population compares with other years is unknown. Arctic hare occasionally seen. Snow buntings (Plectrophenax nivalis) were common and by the end of May other migratory birds such as the Lapland Longspur (

Calcarius lapponicus) were arriving in the area. Any sizeable open water had concentrations of potential prey birds, predominately glaucous gull and iceland gull, and in some cases king eider duck (Somateria spectabilis) or common eider duck (Somaterai mollissima) duck were observed as on June 4th.

Pangnirtung :

The Pangnirtung sample area was split between the Cumberland Peninsula and t' Hall Peninsula. The former is a largely inaccessible area dominated by glaciers, fiords and steep mountains. Once again travel in these areas was restricted to the valleys and the coast. The rest of the Pangnirtung sample area is highly dissected by lakes, water courses and fiords, with numerous islands. The relief is less extreme than the Cumberland Peninsula and snowmobile travel is more feasible, although the south-east coast of the Hall Peninsula has been deeply dissected to form a broken, almost mountainous fiord belt (Bird 1967). There are numerous cliffs and outcrops, many overlooking water. During the survey few arctic hare or ptarmigan were observed, and snowbuntings were recorded. Glacous and iceland gulls were common particularly near open water,' with increasing numbers by the end of May.

Weather:

The weather during the survey was quite variable. Wilson (1976) states that perhaps the most important aspect of Baffin Island weather and climate is

not just its year-to-year variation but also its variability from one area to another. The orientation of the valleys, amount of shading, proximity to ice bodies. and open water can all affect the local climate (Wilson 1976). It is quite common for large climatic gradients to occur over relatively short distances eg. between the fiord mouths and the fiord heads. This local variation affected visibility and travel conditions. All the lakes in the area were still ice covered and the only open water on the sea ice was in areas where fast current kept the water open. Although the snow was starting to melt, fresh snow did fall, and heavy snowstorms and blowing snow stopped the survey several times. The temperatures were consistently below freezing during the nightime, rising to near or above freezing during the daytime. The mean minimum temperature for Frobisher Bay was approximately -7 Celcius for the last half of May and the mean maximum temperature for the same time period was just below zero (-. 1 Celcius, Environment Canada data). Although these temperatures were available only from Frobisher Bay, it reflects the general temperatures in southern Baffin Island. The temperatures were gradually increasing so that by early June the daily maximum was always above zero. Snow conditions varied a great deal from deep soft snow to rocky windbare patches. Travel on the sea ice was generally good although it was occasionally restricted depending on the tides and" distance of the flow-edge.

Gyrfalcon

A total of twenty-three occupied gyrfalcon nest sites were found during the survey. Table 1 summarizes the area covered, by community, during the survey and the number of occupied nest sites found. A density (expressed as 1 nesting pair per amount of area surveyed) was calculated where possible. In those sample areas where only the coastline was surveyed the number of gyrfalcons found was expressed as one nesting pair per amount of distance surveyed.

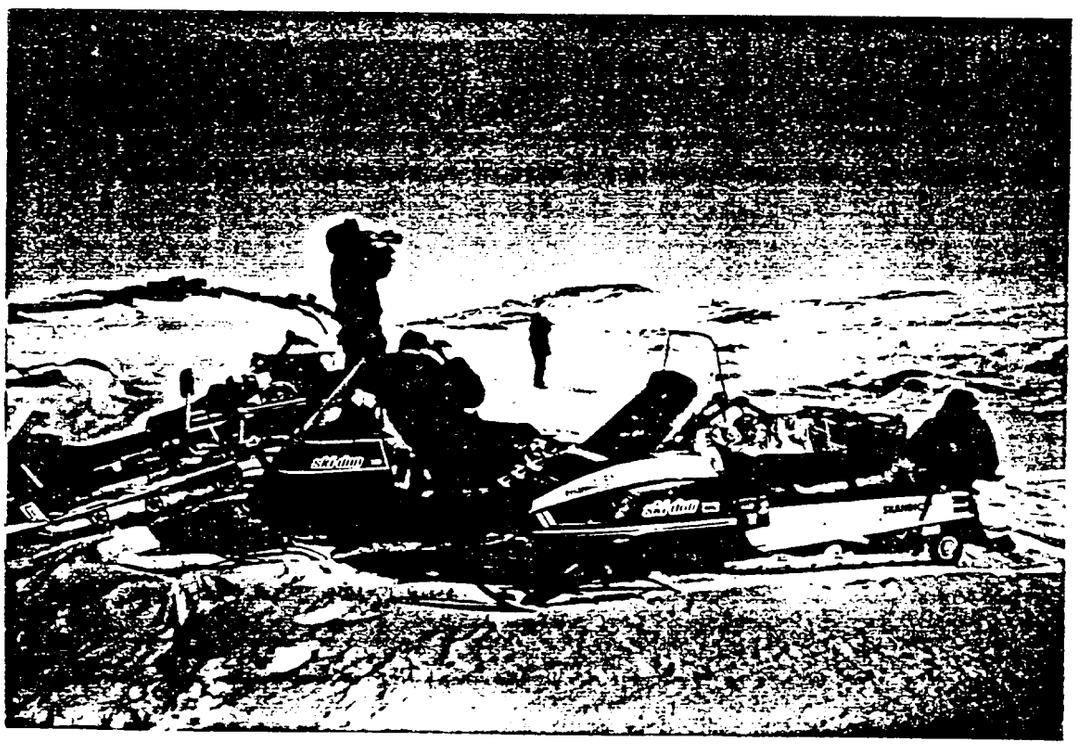

Table 1, Areas surveyed, number of occupied gyrfalcon nest sites and density of occupied nest sites by sample area and community.

Survey Area	Area Surveyed (km²)	Distance (km)	Number of occupied nest sites: Area	Distance	Density of nest sites*: (km²)	(km)
Broughton		000	---		----	0
		1313		4		328
Total		2113	---	4	--	528
Frobisher	1960	---	3	-	653	---
	443	---	2 "	-	222	---
	---	785		5	---	157
Total	2403	785	5	5	481	157
Pangnirtung	1550	---	2#1	-	775	--- "
	1238	---	4	-	310	---
	---	755		2	---	378
Total	2788	755	6+1#	2	465	378
Sum of al 1 areas	5191	3653	11+1# 23	11	472	,332

*expressed as 1 occupied nest site per amount of area surveyed or one occupied nest site per distance surveyed.
an additional occupied nest was found outside the survey area.

A total "area of S191 square kilometers and an additional 3653 kilometers of coastline were surveyed. A digital planimeter was used to calculate both areas and distance of coastline. The data on nest site characteristics is listed in Table 2. Sixteen (70%) of the occcupied gyrfalcon nests were in stick nests, predominately ravens nests. The use by gyrfalcons of nests previously built by ravens, rough-legged hawks, or eagles has been well documented in the literature (Cade 1960, Kuyt 1980). Bromley (1983) reports 60% of active nests found in the Baffin and Kitikmeot region= were stick nests, the majority being ravens nests on Baffin Island. Gyrfalcons do not build stick nests themselves but make a "scrape" or depression on a dirt or rock ledge. Thirty percent (7 nests) of occupied nests found in this study were on ledges.

Gyrfalcons typically nest on a ledge under an overhang (Cade 1960, Beebe 1 v. Eleven active gyrfalcon nests (48)% had some overhang, while another eleven had a complete rock overhang, for a total of 96% with at least some overhang. Only one nest was recorded as having no overhang.

Nests-were found at all height levels although 52% were recorded in the bottom third of the nest cliff, and only 13% in the top third.

Figure 3 shows the aspect of the active gyrfalcon nests found. Four nests had some northerly aspect (N, NE, NW) while eleven nests had southerly aspect (S, SE, SW) and eight had an east or west orientation. It seems likely that in general northern exposures would not be selected because they would be much colder than southern exposures.

The first active gyrfalcon nests were found on May 15th, 1984. This study

has no estimate of dates of initiation of egg laying, other than one observation of four eggs on May 22, in the Frobisher area. No attempt will be made to estimate nesting chronolgy or productivity. It is hoped that the work of Bromley (1983) will continue in the Baffin Region and provide estimates of this important information.

Table 2 Gyrfalcon nest site characteristics in southern Baffin Island in 1984.

Area	Site#	Type	Aspect	Overhang	Position
B	51	SN	SE	SOME	BOTTOM
	74	SN	W	COMPLETE	BOTTOM
	75	L	N	SOME	TOP
	83	L	E	SOME	BOTTOM
F	5	L	NE	SOME	BOTTOM
	6	SN	W	SOME	CENTRE
	10	L	SW	SOME	CENTRE
	25	SN	SE	COMPLETE	TOP
	3s	SN	SW	COMPLETE	BOTTOM
	38	SN	W	COMPLETE	TOP
	50	SN	S	COMPLETE	BOTTOM
	55	SN	S	NONE	BOTTOM
	60	SN	W	SOME	BOTTOM
	71	SN	W	COMPLETE	BOTTOM
P	1	L	E	SOME	CENTRE
	10	SN	E	COMPLETE	BOTTOM
	28	SN	NE	COMPLETE	CENTRE
	30	SN	S	COMPLETE	BOTTOM
	33	SN	S	SOME	CENTRE
	37	L	N	SOME	BOTTOM
	43	L	S	COMPLETE	CENTRE
	56	SN	SW	SOME	CENTRE
	60	SN	S	COMPLETE	CENTRE

B = Broughton Island
F = Frobisher Bay
P = Pangnirtung
SN= Stick nest
L = Ledge, rock ledge or ground ledge
Aspect= direction nest cliff faces, 8 cardinal directions (N,NE, E,SE,S,SW,W,NW) .

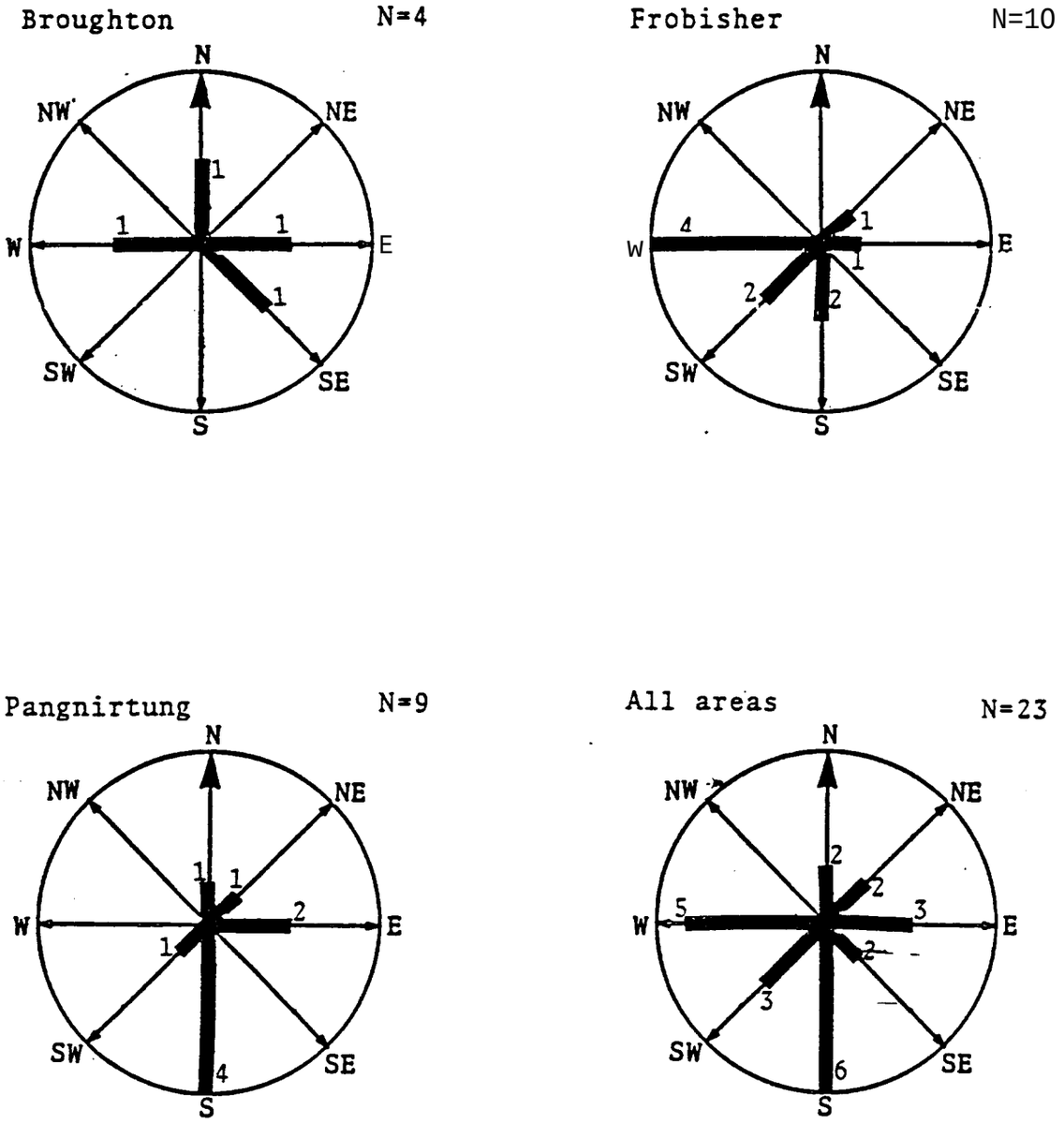

Figure 3. Aspect of occupied gyrfalcon nest sites on southern Baffin Island in 1984.

Gyrfalcon numbers and colour phase:

During the survey a total of 68 gyrfalcons were observed, all adults. Thirty-nine of these were associated with occupied nest sites, 6 birds were observed in 4 possible nest sites where occupancy was not confirmed, and there were 23 additional sightings which were not associated with an occupied or possible nest cliff. Of a total of 51 gyrfalcons for which the colour was distinguishable and recorded, 4S (88%) had white plummage and 6 (12%) were considered to be grey phase.

Gyrfalcons are considered a single species taxonomically, with a large ...nt of individual colour variation, ranging from white through grey to a dark phase (Brown and Amadon 1968). The relationship between colour phase and geographic distribution is not wholly understood. However in general most Eastern Arctic birds have white plummage and the darker birds are found in the Western Arctic and the Yukon. Bromley (1983) found 86% of birds in the areas he surveyed on Baffin Island were white phase and in the Kitikmeot region only 77% were white.

Raven

A total of ninety-seven active raven nests were found during the survey, from all areas. The nest site characteristics are listed in Appendix A. Eighty-eight percent of the nests had some to a complete overhang, 38% having a ...replete overhang.

The nest site aspects are illustrated in Figure 3. Twenty-five percent (24 nests) had some northerly aspect (N, NE, NW) whereas 45% had some southerly aspect (S, SE, SW). Nests were found at all heights with 47% in the central area, 28% near the top third and 24% near the bottom.

Ravens are the only other species which starts nesting at the same time or earlier than the gyrfalcons. The significance of recording raven nest locations is their possible subsequent use by gyrfalcons in another year. Nesting at the same time of year and being about the same size bird, ravens have nest site requirements which are very similar to gyrfalcons. Ravens nests are commonly protected by an overhang for instance. It is well known that gyrfalcons will use nests built by ravens or other species (Bromley 1983 and Cade 1960). The role and degree of competition for these nest sites between the two species is not well understood.

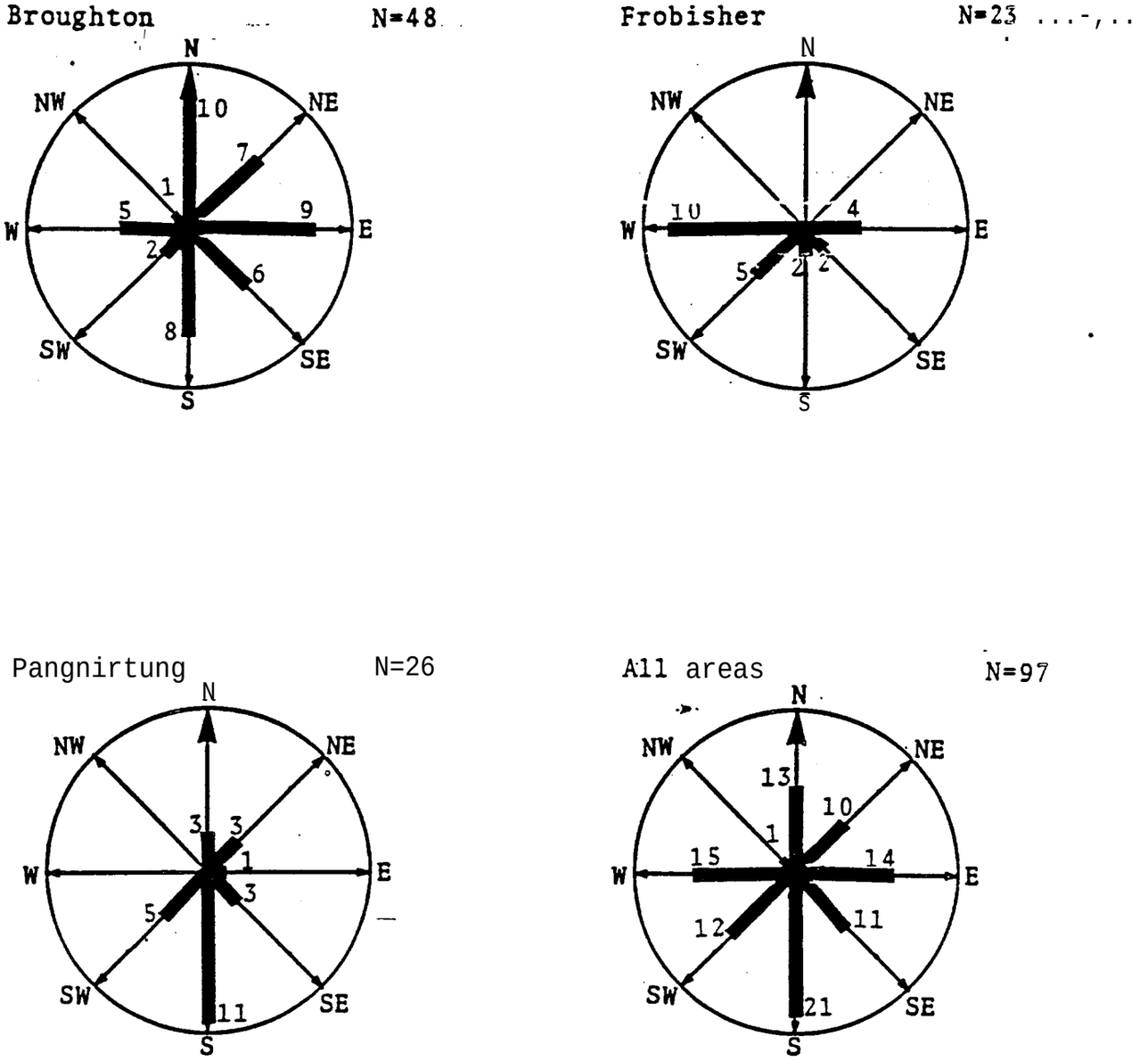

Figure 4. Aspect of raven nest sites in southern Baffin Island in 1984

Peregrine falcon:

The peregrine falcon, which winters as far south as South America, arrives in the Baffin Region about the middle to the end of May. This corresponds with the arrival of their principal food source, the migratory passerine and waterfowl. A total of twenty-three peregrine were observed during the survey. Table 3 summarizes these observations. Of the ten occupied cliff sites (9 pairs, 1 single) nine of the sites (9 pairs) were observed after June 3rd, after the bulk of the survey was completed. Therefore the numbers of peregrine observed is not indicative of the breeding population, as the birds were just occupying nest cliffs at the end of our survey.

Table 3, Peregrine falcon observations in Southern Baffin Island, 1984.

Area	# of occupied nest cliffs(a)	# of possible nest cliffs(b)	#'s at cliff sites		Sightings (c)	
			Pairs	Singles	Pairs	Singles
B	1	---		1		1
F	8	1	8	1		1
P	-	2	-	2	-	1
Total	9	3	8x2 = 16	4		3
						+3 = 23

a) defensive behaviour or alarm call.
b) no defensive behaviour although near possible nesting cliff
c) not associated with likely nest cliff

Rough-legged hawk:

A total of eleven rough-legged hawks were observed. One pair and two single birds displayed defensive behaviour, suggesting the would be nesting in the area. An additional seven birds were sighted in flight. Rough-legged hawks normally arrive in the arctic with other migratory birds (Godfrey 1966) in this study only two birds were observed before the end of May.

Discussion :

The Baffin Region encompasses a very large area, Baffin Island alone being over a half a million square kilometers in size. It is hoped that by the completion of this three year study, an estimate of gyrfalcon numbers in this region will be made. With such a huge region it will not be possible to sample all areas. In selecting the sample units, this year, certain large areas were excluded, mainly because of inaccessibility, such as the mountainous areas of the Cumberland Peninsula. This area would have little potential for nesting raptors as much of it is covered in permanent snow and would offer a limited prey base especially in the spring. Mossop and Hayes (1982) did not find any productive gyrfalcon nests above 1500 meters, in the Yukon, where nesting takes place up to six weeeks before the Baffin Region. Other inaccessible areas were excluded which may be optimal habitat for gyrfalcons. Caution must be used in extrapolating the densities of birds found in this preliminary survey to the whole Baffin Region. As this study continues it is hoped that -a more complete picture of the nesting potential in certain areas will emerge.

The majority of estimates of gyrfalcon numbers in the literature are expressed as a density of territorial or nesting pairs, namely amount of area per pair. This figure doesn't necessarily *represent* the actual area used by a nesting pair, except possibly at high densities. Cade (1960) suggests that falcons defend the immediate area of their nest and possibly nearby roosts or alternate sites however, they do not defend all of the area they might use for

nting. It was not possible to calculate an area density for all of the results of this survey. The results expressed as 1 nesting pair per number of kilometers of survey are difficult to compare with those expressed as one nesting pair per area and with other previously published values. Densities from other studies vary widely. Hayes and Mossop (19S2) list a range of nesting densities from 1 pair per 159 square kilometers to one pair per 2136 square kilometers. Bromley (1983) found an overall density of one nesting pair per 370 square kilo-meters in the Baffin Island areas that he surveyed, and 1 active pair per 584 square kilometers in the Kitikmeot Region. His survey. however, was conducted in July after some pairs had likely failed and left the nesting territories and he states that their areas of survey were selected on the basis of appropriate cliff habitat from topographical maps. In this survey, where it was possible to express the results as a density, they ranged from 1 active nesting pair per 222 square kilometers to 1 -active pair per 775 square kilometers with an average of 1 active pair per 472 square kilometers. This would seem to indicate comparable numbers, although this survey has no estimate of how many nests were productive.

The results of the survey would suggest that during this first year of the survey, the Pangnirtung and Frobisher Bay areas surveyed were supporting higher numbers of gyrfalcons than the Broughton Island areas surveyed. The rugged east coast of the Cumberland Peninsula offers numerous cliffs. However some of the fiords, eg. Padle Fiord, have long sections of smooth, sheer cliffs offering no suitable ledge= Other cliffs are swept by avalanches of snow (heavy snowfalls observed in late May) or loose rock and scree. Clearly these

eas would d not be sui tab 1 e for nesti ng. However the coast as a whole offers potenti Al nesting sites than would appear to be utilized.

Gyrfalcons have a circumpolar range in high boreal, sub-Arctic, and Arctic regions. Breeding records extend as far south as the Belcher Islands and Great Whale River at approximately 55° N and as far north as central Ellesmere Island at 80° N (Beebe 1974). Distribution however, within this large area is not uniform or well known and is thought to be regulated by several factors. The availability of suitable nest cliffs and adequate food supply, especially during nesting, are considered the most important limiting factors (Cade 1960).

Gyrfalcons require a relatively long nesting period which is typical of large raptors (Barichello 1983). With the short Arctic summer season nest initiation must start quite early, well before areas are snow-free. Because of the timing and duration of nesting a nest site must not only offer protection ' nst ground predation, it must also be snowfree and offer some shelter from falling snow. Consequently the majority of gyrfalcons select nest sites that are protected by a direct rock overhang or a cliff face that is overhanging. Platt (1976) found that nest sites which were snowfree through -the winter were more likely to be used for egg-laying.

South facing sites become snowfree much earlier than north facing sites. Bromley (1983) suggested that gyrfalcons, in the Baffin and Kitikmeot regions, avoided north facing cliffs for nesting. He found only 14% of all nests had a northwest to northeast aspect and only 9% of all productive sites had a northerly aspect. Barichello (1983) describes a detailed study of gyrfalcon nest site characteristics in the Yukon. He developed an index of nest

protection and suggests protection is the most important nest site characteristic. South facing cliffs he found were in some cases not as well protected as other aspects. The implication was that south facing nest sites were more forgiving of snowfall, as the snow would melt more quickly.

Nest height appeared quite variable in this study. This is reported a number of ways in the literature and there is a wide range of values. Cade (1960) reported an average height above the river, a height from the base of the cliff, and a distance below the brink of the cliff. Bromley (1983) found the height of nesting cliffs varied widely, but averaged 36 m (+-20) and the height of nests on cliffs averaged 20 m (+-13). The snowmobile survey results indicate. only the nest's relative height on the cliff (near bottom, near centre, or near top) and therefore are not comparable with other values. Barichello (1'?83) suggests that in areas of low density gyrfalcon nest heights quite variable because of the paucity of suitable sites. However at high densities (numerous potential sites to chose from) he found a more regular pattern of nest height being chosen. A more detailed analysis of nest site characteristics should be possible at the end of the third year of study.

Gyrfalcon numbers depend to some extent on prey availability, which may vary seasonally,' annually, and from region to region. Roseneau (1972) found that prey availability varied from year to year and habitat type to habitat type within the hunting ranges of nesting pairs. The exact relationship and how gyrfalcon numbers fluctuate with the cyclic nature of some of their prey, particularly ptarmigan is not well understood (Nelson 1978). Published studies of prey taken by gyrfalcons vary widely. Certain studies have indicated a diet

almost entirely of ptarmigan, up to 96% by weight (Brown and Amadon 1968). (1960) found a diet in Alaska which was 63% birds (mostly ptarmigan) and 36% mammals, while Muir (1973) found a high Arctic gyrfalcon pair raised successful broods on a diet predominately of arctic hare and lemmings. It seems that gyrfalcons will readily shift their effort to a variety of prey species depending on availability. This could be especially important in coastal populations where large- seabird numbers offer potential prey and there are few ptarmigan found. In all coastal areas of the -survey some passages between the islands remain open through the winter or are the first places to open up in the spring. Seabirds and waterfowl were observed "at some of these polynas by the end of May.

Further prey availability constraints may be put on the distribution of >-ceding pairs because of their timing of nesting, size of prey avail able, and relatively long post-fledging dependence of the young on the adults. On Baffin Island most pairs begin to lay eggs by mid-May (Bromley 1983) and "gyrfalcons are known to occupy cliff sites year round (Platt 1976). During egg-laying and incubation the male does the majority of the hunting (Muir 1973). Being smaller in size he may be more limited in the size o?_ prey available to him.

Behaviour and reaction of gyrfalcons :

The behaviour and sensitivity of nesting raptors is known to vary with the stage of nesting (Fyfe and Olendorff 1976). Peregrine falcons are well known for their characteristic aggressiveness near their nest sites. Any approach illicits an alarm cry and often dive-bombing by the adults. The majority of gyrfalcons however, appear by contrast non-aggressive to. humans near their nest sites '(Beebe 1974). They can be more aggressive in response to an attempt to climb into the nest after the young have hatched (Bromley, pers. comm.) and then use the typical falcon alarm cry and swoop at the intruder, however this is the "exception" rather than the norm. During the. snowmobile survey the typical response was for the male to fly off quietly, if present, and perch a short distance away. This would often alert us to the presence of a nearby . The female or incubating bird, typically remined sitting on the nest. There were 3 observed instances of a sitting (incubating) bird flushing from the nest site. One of these instances was when the observers were leaving the area, and the bird returned to the nest when we were out of sight. On two occasions the incubating bird was observed to rise to its feet and step to the edge of the nest, obviously ready to fly if approached any closer. The observers would withdraw from the area if this was observed and the bird would settle down again. It is difficult to assess possible disturbance to the birds by the survey. Snowmobile approach would certainly give the birds advanced warning of our presence, so that an incubating bird would not be suddenly startled. There-is some evidence that if a nesting pair is disturbed greatly

ey may move to an alternate nest site the next year (Barichello 1983, Platt 1 . Reaction varies greatly amongst individuals, the males being more timid in nature. The survey is felt to have caused a minimum of disturbance.

Survey limitations :

The survey method was quite successful, however the following limitations should be pointed out.

1) Productivity unknown: although this survey was effective in locating occupied nest sites, we have no measure of how many of these occupied sites are successful or how many young survive.

2) Restricted coverage: only areas where snowmobile travel was possible and practical were surveyed.

3) The thoroughness with which very high cliffs can be searched is limited.

With these limitations 'in mind some follow-up before the young birds f ge is necessary to monitor nesting success. The continuing work of Bromley (1983) in the Baffin region has made this possible. In 1984 he will attempt to check the occupied nest sites in the Baffin Region located in the snowmobile survey (Bromley pers comm.) The results of the two surveys-should increase our understanding of the numbers and productivity of gyrfalcons in this region. Further, the results will enable the Regional Inuit organizations to decide with confidence whether or not they should take advantage of the existing quota and also assist Renewable Resources in assessing the existing quota of passage gyrfalcons in the Baffin Region.

Conclusions and Recommendations

Dickinson (1979) states that wildlife resources must be managed to maintain populations as functioning components of ecosystems. In order to "manage a resource effectively reliable information on the population dynamics of a species must be available. In particular population size or density, the age and sex structure? and productivity must be determined. Reproductions mortality, and seasonal movements all influence the population size (Taber and Raedeke 1979), and cause regional and annual variations. Long and short term fluctuations in abundance, often of a cyclic nature, are characteristic of northern animals (Dickinson 1979). Raptor populations are, by nature, relatively small and are amongst the most sensitive in 'nature (Mossop and Hayes 1980). Production of young can therefore be quite variable.

Gyrfalcons require a relatively long period until they reach breeding age ? to 5 years (Mossop 19S2). Their production has been reported at 0.8 fledged young per potential breeding adult annually in the best populations (Mossop 1982). How fluctuations in the numbers of ptarmigan and other prey species affect gyrfalcon numbers is not yet well understood (Nelson 1977). The need for a careful approach to harvesting is apparent. Mossop and Hayes (1980) in a review of the 1974 to 1980 Yukon gyrfalcon harvest experiment outlined the following pre-requisites for a harvest.

1) The need to obtain good ecological and population data, the effect of the harvest on the wild population must be the prime consideration of the management agency.

2) A harvest must be shown to take "surplus" individuals namely not required to maintain the breeding population at its current level.

Acccess to the birds must be monitored to safeguard against illegal harvesting and to ensure the well being of the birds themselves.

This year's survey has helped increase the knowledge required to wisely manage the gyrfalcon population in the Baffin Region. I would strongly recommend that the survey be continued and expanded (as proposed) for 1985 and 1986. It is also crucial to be able to have some estimate of production of young. The work of Bromley (1983) has filled this role and it is also recommended that their program continue to monitor some of the nest sites identified by the snowmobile survey. As this is only the first year of the survey and only three areas were surveyed it would be premature to speculate on numbers of gyrfalcons which could be harvested in the Baffin Region.

Economic considerations :

Gyrfalcons are currently very much in demand by falconers, especially in the Middle East. However, it is difficult to state an exact value. The demand for birds greatly exceeds availability. This situation has increased the value and unfortunately has encouraged illegal harvesting. The market value has been conservatively estimated at 10 to 12 thousand dollars per captive-raised gyrfalcons in the Yukon (Mossop 1982). The Kitikmeot Region has sold birds for up to 35,000 dollars for two birds. There is however a certain amount of uncertainty regarding the market. It will be necessary to determine the actual market potential, if there are any preferences for sex (females larger) or colour phase (currently white birds are more in demand). The export of a bird of prey to another country involves dealing with a complex chain of agencies in

Canada and overseas. Captive gyrfalcon breeding programs are currently under way in the Yukon, British Columbia, Ontario, as well as the U.S. and the Middle East. This will undoubtedly affect the potential far marketing wild birds, but to what extent remains unclear. Further research into the market variables and potential clients should be undertaken by B.R.I.A. and the B.R.H.T.A.

In addition to the money received from the purchase of the birds directly, the communities would receive indirect economic gains through lodging, meals, and transport of clients. Local people would be hired to assist the clients and ideally Inuit hunters would become trained in the capture, handling, and transport of gyrfalcons. This would reduce the need to have outside expertise capture the falcons.

It would appear that a gyrfalcon harvest has the potential to bring direct and indirect economic benefits to the communities. Exactly how the communities in the Baffin Region divide the potential profits is something which should be discussed amongst the H.T.A.'s and the B.R.I.A.

SUMMARY

Snowmobile surveys for gyrfalcon nest sites, were conducted from the communities of Broughton Island, Frobisher Bay, and Pangnirtung during May-June 19s4. Each settlement had two three-man crews, in some cases accompanied by a Wildlife Officer from Renewable Resources, N.W.T., or the project supervisor. A total area of 5191 square kilometers and an additional 3653 kilometers of coastline were surveyed. Twenty-three occupied gyrfalcon nest sites were identified with 39 birds present, 6 other birds were observed at possible nests, and an additional 29 individuals were sighted, but not associated with a nest site. Of the 51 gyrfalcons for which colour phase was observed and recorded, 45 had white plummage, and 6 had darker or grey plummage.

Nest site characteristics showed a range of values. The majority (70%) of nests were in stick nests (mostly raven), the remainder were located on a ledge. - All but one of the nests had some, to a complete rock overhang, and nests were found at all height categories, although over half were in the bottom third of the cliff. Eleven of the nest sites had some southerly aspect although four nests had a northerly aspect and eight had an--east or west aspect.

A total of ninety-seven active raven nests were found during the survey, Ravens have similar nesting requirements and as mentioned gyrfalcons utilize previously built raven nests. The nest site characteristics also displayed a range of values, however 80% of nests had some to a complete overhang and 24% of the nests had. some northern aspect with 45% having some southern aspect.

Twenty-three peregrine were observed during the survey. Ten occupied

Cliff sites were observed, however, nine of these were after June 3rd near the end of the survey. The number of peregrine found in this survey are not indicative of the breeding population as the birds were just starting to nest at the end of the survey. Eleven rough-legged hawks were observed, however, like the peregrine falcon, this survey was completed before the majority of rough-legged hawks would be nesting.

It is felt that the survey had a minimal disturbance on the nesting gyrfalcons and was quite successful. It will help add to needed information for the management of gyrfalcon populations in the Baffin Region. The survey however can not estimate productivity of young or nesting chronology. This information is being monitored by Renewable Resources and their studies will hopefully continue. The snowmobile survey should be expanded and continued as planned in 1985 and 19S6.

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PERSONAL COMMUNICATIONS

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Appendix A - Raven nest site characteristics in Southern Baffin Island, 1984.

Area	Site #	Nest type	Aspect	Overhang	Vertical Position on cliff
B	1	SN	NW	SOME	CENTRE
	8	*L	SE	SOME	TOP
	12	SN	NE	SOME	TOP
	13	SN	NE	SOME	TOP
	14	SN	E	COMPLETE	BOTTOM
	15	*L	NE	SOME	TOP
	16	SN	E	COMPLETE	CENTRE
	17	SN	E	COMPLETE	TOP
	20	*L	S	SOME	CENTRE
	21	*L	NE	SOME	BOTTOM
	23	L	E	SOME	CENTRE
	24	L	N	SOME	TOP
	25	L	N	COMPLETE	BOTTOM
	26	L	E	COMPLETE	CENTRE
	27	L	S	COMPLETE	TOP
	33	L	E	SOME	CENTRE
	44	L	S	---	CENTRE
	56	SN	S	SOME	CENTRE
	57	L	S	SOME	CENTRE
	63	L	S	SOME	CENTRE
	66	L	SE	COMPLETE	CENTRE
	69	SN	SE	SOME	CENTRE
	71	SN	SE	COMPLETE	BOTTOM
	73	SN	SE	SOME	BOTTOM
	77	SN	N	SOME	CENTRE
	79	L	SW	SOME	BOTTOM
	80	SN	N	COMPLETE	CENTRE
	81	SN	N	COMPLETE	CENTRE
	84	L	W	SOME	CENTRE
	85	SN	N	---	CENTRE
	90	SN	N	COMPLETE	CENTRE
	95	SN	SE	SOME	BOTTOM
	96	SN	S	SOME	BOTTOM
	100	L	L	NONE	TOP
	104	SN	SW	SOME	BOTTOM
	105	SN	NE	SOME	CENTRE
	106	SN	NE	SOME	TOP
	108	SN	E	COMPLETE	TOP
	110	L	W	SOME	CENTRE
	111	L	W	SOME	CENTRE
	112	L	W	SOME	CENTRE
	114	L	N	NONE	CENTRE
	116	SN	N	COMPLETE	CENTRE
	118	SN	E	SOME	CENTRE
	119	SN	NE	SOME	CENTRE

Appendix A continued.

Area	Site #	Nest Type	Aspect	Overhang	Vertical position on cliff
B	122	SN	E	SOME	CENTRE
	124	SN	W	SOME	CENTRE
F	26	SN	W	SOME	CENTRE
	28	SN	S	COMPLETE	TOP
	33	SN	SE	SOME	CENTRE
	34	SN	SW	SOME	- - -
	37	SN	SW	COMPLETE	CENTRE
	40	SN	W	SOME	CENTRE
	41	SN	W	SOME	TOP
	43	SN	SW	SOME	CENTRE
	45	SN	E	SOME	CENTRE
	46	SN	E	COMPLETE	(2 ENTRE
	54	SN	E	NONE	BOTTOM
	56	SN	W	NONE	CENTRE
	62	SN	SW	SOME	TOP
	63	SN	W	SOME	CENTRE
	64	SN	SE	SOME	CENTRE
	66	SN	W	NONE	TOP
	67	SN	W	SOME	BOTTOM
	68	SN	W	NONE	CENTRE
	69	SN	SW	COMPLETE	CENTRE
	70	SN	E	COMPLETE	TOP
	74	SN	S	COMPLETE	BOTTOM
	75	SN	W	NONE	CENTRE
	80	SN	W	COMPLETE	TOP
P	5	SN	SW	COMPLETE	TOP
	8	SN	SE	COMPLETE	BOTTOM
	14	SN	S	COMPLETE	CENTRE
	18	SN	SE	SOME	TOP
	21	L	NE	COMPLETE	TOP
	25	SN	S	COMPLETE	CENTRE
	26	SN	SW	COMPLETE	BOTTOM
	31	SN	S	SOME	TOP
	34	SN	S	SOME	BOTTOM
	35	SN	S	SOME	BOTTOM
	36	SN	S	SOME	TOP
	38	SN	S	SOME	BOTTOM
	39	SN	N	COMPLETE	BOTTOM
	40	SN	NE	COMPLETE	BOTTOM
	41	SN	S	SOME	TOP
	42	SN	S	COMPLETE	TOP
	44	SN	S	COMPLETE	TOP
	45	SN	SW	SOME	BOTTOM
	46	SN	SW	SOME	TOP
	49	SN	E	COMPLETE	BOTTOM

Appendix A Continued

Area	Site #	Nest type	Aspect	Overhang	Vertical position on cliff
	51	SN	SE	COMPLETE	CENTRE
	54	L	NE	COMPLETE	CENTRE
	55	SN	N	COMPLETE	TOP
	59.	SN	S	COMPLETE	CENTRE
	62	SN	SW	COMPLETE	BOTTOM
	63	SN	N	COMPLETE	BOTTOM

SN = Stick nest

L = Ledge, in some cases the nest wasn't completely visible, those recorded as on a ledge were likely a stick nest in fact.

Aspect = direction next site faces, 8 cardinal directions;

(N, NE, E, SE, S, SW, W, NW)

INUKTITUT NAMES USED IN BAFFIN REGION USED FOR BIRDS OF PREY

TTLEMENT	ROUGH-LEGGED HAWK (Bateo Lagopus)	PEREGRINE FALCON (Falco Peregrinus)	GYRFAL CON (Falco Rust:
GRISE" FIORD ᐊᐅᓪᓚᑦᑐᖅ	KAAJUUQ ᑲᔪᐅᖅ	KIGGAVIARJUK ᑭᒡᓚᐃᕐᔪᒃ	QINNUAJUAQ ᖃᓄᐃᔨᐊᖅ
RESOLUTE BAY ᖃᓚᓪᓚᑦ ᑐᖓ	KAAJUUQ ᑲᔪᐅᖅ		KIGGAVIARJU ᑭᒡᓚᐃᕐᔪᒃ
IGLOOLIK ᐃᒡᓗᒃ	KAAJUUQ ᑲᔪᐅᖅ	KIGGAVIARJUK ᑭᒡᒪᐃᕐᔪᒃ	KIGGAVIK ᑭᒡᓚᐃᒃ
HALL BEACH ᖃᓂᕆᒃ	KAAJUUQ ᑲᔪᐅᖅ	KIGGAVIARJUK ᑭᒡᒪᐃᕐᔪᒃ	KIGGAVIARJU ᑭᒡᓚᐃᕐᔪᒃ
ARCTIC BAY ᐃᒃ ᐱᐊᕐ ᓴᒃ	KAAJUUQ ᑲᔪᐅᖅ	KIGGAVIARJUK ᑭᒡᒪᐃᕐᔪᒃ	KIGGAVIK ᑭᒡᓚᐃᒃ
		Kiggaviar juk Qirniqtaq ᑭᒡᓚᐃᕐᔪᒃ ᖃᓄᖅᑕᖅ	Kiggaviarju Qakuqtaq ᑭᒡᓚᐃᕐᔪᒃ
POND INLET ᑎᑦ ᑎᒪᑕᒃ	KAAJUUQ ᑲᔪᐅᖅ	KIGGAVIARJUK ᑭᒡᓚᐃᕐᔪᒃ	KIGGAVIK ᑭᒡᓚᐃᒃ
E RIVER known nerally Kiggaviarjuk) ᑲᕐᓂᑐᐃᓚᐃᒃ	KIGGAVIK ᑭᒡᓚᐃᒃ	KAKKAJUUQ (?) ᑲᒃᑲᔪᐅᖅ	QINNUAJUAQ ᖃᓄᐃᔨᐊᖅ
3ROUGHTON ISLAND ᖃᑭᖅᑕᑦ ᓴᐊᖅ	KAAJUUQ ᑲᔪᐅᖅ	KIGGAVIARJUK ᑭᒡᓚᐃᕐᔪᒃ	QINNUAJUAQ ᖃᓄᐃᔨᐊᖅ
PANGNIRTUNG ᐸᑦ ᓂᖅᑐᖅ	KAAJUUQ ᑲᔪᐅᖅ	KIGGAVIARJUK ᑭᒡᓚᐃᕐᔪᒃ ᓴᐊᒃ	QINNUAJUAQ ᖃᓄᐃᔨᐊᖅ
FROBISHER BAY ᐃᖅᑲᐃᑦ	QINNUAJUAQ ᖃᓄᐃᔨᐊᖅ	KIGGAVIARJUK ᑭᒡᓚᐃᕐᔪᒃ	KIGGAVIK ᑭᒡᓚᐃᒃ
LAKE HARBOUR ᑭᑦ ᒥᑭᑎ	QINNUAJUAQ ᖃᓄᐃᔨᐊᖅ	KIGGAVIARJUK ᑭᒡ LA@ ᓴᒃ	KIGGAVIK ᑭᒡᓚᐃᒃ
CAPE DORSET ᑲᓐᐧᐧ ᐱᑕ	QINNUAJUAQ ᖃᓄᐃᔨᐊᖅ	KIGGAVIARJUK ᑭᒡᒪᐃᕐᔪᒃ	KIGGAVIK ᑭᒡᓚᐃᒃ
SANIKILUAQ ᓇᓂᑭᓗᐊᖅ	QINNUAJUAQ ᖃᓄᐃᔨᐊᖅ	KIGGAVIK ᑭᒡᓚᐃᒃ	KIGGAVIK ᑭᒡᓚᐃᒃ

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