

The productivity of polar bears (*Ursus maritimus*) in the southeastern Baffin Island area, Northwest Territories

by Charles Jonkel¹, Ellis Land², and Robert Redhead³

Introduction

This study is part of a long-term, co-operative, mark-recapture, and denning area study begun in 1973 by the Northwest Territories Fish and Wildlife Service (NWT-FWS) and the Canadian Wildlife Service (CWS) to evaluate the population status of the polar bears (*Ursus maritimus*) in the southeastern Baffin Island area (Fig. 1). Additional information on polar bear denning areas and ecology in the Eastern Arctic is available in Harington (1962, 1968), Stirling and Jonkel (1972), Smith *et al.* (1975), Jonkel (1976), Jonkel *et al.* (1976a and b), Schweinsburg *et al.* (1977), and Stirling *et al.* (1978). This progress note provides data on the productivity of polar bears which den on the Meta Incognita, Hall, and Cumberland peninsulas on southeastern Baffin Island.

Methods

Preliminary ground and fixed-wing aerial surveys carried out in March 1973 (Tables 1 and 2) and reports from local Inuit hunters indicated that the Cumberland, Hall, and Meta Incognita peninsulas are utilized as polar bear maternity denning areas. In order to determine the importance of these areas, more intensive ground and aerial searches were carried out in March-April 1974 and 1975. We based the timing of the surveys on known emergence times in the Hudson and James bay areas (Harington 1968, Jonkel *et al.* 1976a, Stirling *et al.* 1977), and in the Jones Sound and Barrow Strait areas (Stirling *et al.* 1978, Kiliaan *et al.* 1978). The dates, areas, and distances surveyed by the ground and aerial crews are listed in Table 1. Fuel caches were placed in known denning areas using long-liner boats during the summers previous to the surveys.

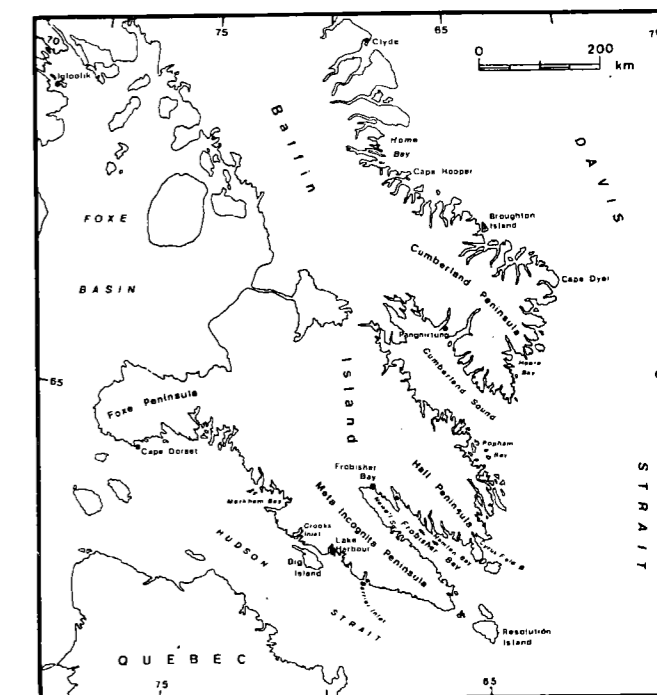
The survey parties searched pressure ridges along shorelines and across fiords and bays, roughened ice and snow areas, icebergs, floe edges, and some inland areas because of the presence of soft snow in such locations where the tracks of females with young might still be found. Family groups were back-tracked to winter dens whenever possible. Data were recorded on family groups sighted, tracks of family groups, direction of movement, age of young (whether new-born young, yearlings, two-year-olds), track-size, litter-size, and possible maternity den sites. We compared the observations

made in areas covered by both ground and aerial searches to eliminate as many double counts as possible. By taking careful consideration of weather and snow conditions and visibility which may have affected the count, the emergence of cubs before and after the surveys, and reports from Inuit hunters, subjective estimates of productivity, in terms of number of cubs produced, were calculated for each peninsula in 1974 and 1975.

NWT-FWS based out of Broughton Island, Frobisher Bay, and Pangnirtung conducted the ground surveys, which were co-ordinated by Ellis Land, Regional Fish and Wildlife Officer in Frobisher Bay. Each ground survey crew usually consisted of a NWT-Fish and Wildlife Officer, and two local Inuit familiar with the areas to be surveyed. One or two of the two or three snowmobiles were driven as close as possible to the shore, while the other travelled about 1 km offshore, depending upon the ice conditions.

Most of the coastal areas surveyed were searched only once each year. The only area searched twice was between Wiswell Inlet and Cornelius Grinnell Bay on southeastern Hall

Figure 1
 Location of southeastern Baffin Island



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Table 1
Dates of surveys, areas, and distances travelled in southeastern Baffin Island area, 1973-75

Year	Area	Type of survey	Dates	Distance in km	
1973	Cumberland Peninsula				
	Cape Dyer to Cape Hooper	Fixed-wing	23 March	615	
	Pangnirtung to Hoare Bay area	Fixed-wing	24 March	510	
	Hoare Bay area	Snowmobile	9-15 April	150	
	Total			1275	
1974	Hall Peninsula				
	Frobisher Bay to Brevoort Island (including Loks Land)	Fixed-wing	25 March	675	
1974	Cumberland Peninsula				
	Northern Hoare Bay area	Snowmobile	22 March-5 April	430	
	Broughton Island to Durban Island	Snowmobile	23 March-12 April	610	
	Kingnait Fiord to Kumlein Fiord	Helicopter	9 April	280	
	Broughton Island to Canso Channel	Helicopter	7 April	280	
	Hoare Bay area to Cape Dyer	Helicopter	5-6 April	800	
	Total			2400	
	1975	Hall Peninsula			
		Wiswell Bay area to Cornelius Grinnell Bay, Okalik Bay	Snowmobile	23 March-2 April	660
		Frobisher Bay to Wiswell Inlet	Helicopter	10 April	235
		Frobisher Bay to Loks Land-Cyrus Field Bay area	Helicopter	3-5 May	860
	1976	Meta Incognita Peninsula			
		Markham Bay to Jackman Sound	Fixed-wing	10 April	525
		Frobisher Bay to Jackman Sound	Helicopter	3-4 May	520
	Total			1045	
1975	Cumberland Peninsula				
	Cape Hooper to Durban Island	Snowmobile	18 March-3 April	2425	
	Hoare Bay area	Snowmobile	21 March-10 April	940	
	Hoare Bay area to Broughton Island	Helicopter	6-9 April	1850	
	Total			5215	
	1976	Hall Peninsula			
		Hamlen Bay to Popham Bay	Helicopter	10-11 April	675
	1977	Meta Incognita Peninsula			
		Newell Sound to Barrier Inlet	Helicopter	11-12 April	700

Table 2
Numbers of females and new-born cubs observed or tracked, litter size, and estimates of new-born cubs produced in southeastern Baffin Island area, March-April, 1973-75

Area	1973			1974			1975			Litter size
	Sightings	Tracks	Estimate	Sightings	Tracks	Estimate	Sightings	Tracks	Estimate	
Cumberland Peninsula										
Females	1	3	9	17	17	50-60	20	28	100	1.6
Cubs	2	5	12	27	27	50-60	32	46	100	1.6
Hall Peninsula										
Females	2	5	5	6	6	40	0	7	30-40	1.6
Cubs	4	7	9	11	11	40	0	11	30-40	1.6
Meta Incognita Peninsula										
Females	-	-	0	6	6	10-20	0	7	10-20	1.3
Cubs	-	-	0	9	9	10-20	0	9	10-20	1.3
Total										
Females	3	8	14	29	29	100-120	20	42	140-160	1.6
Cubs	6	12	21	47	47	100-120	32	66	140-160	1.6

Peninsula. Except in the Hoare Bay area, on southeastern Cumberland Peninsula, the survey parties spent little time travelling to the heads of the fiords and bays. In some cases, they measured tracks of females and young to help minimize the number of double counts.

The fixed-wing surveys (Table 1) were designed to locate possible denning areas, and were flown using a Twin Otter aircraft flying at an altitude of 60–120 m and an airspeed of about 160 km/h. These reconnaissance surveys were flown approximately parallel to the coastline and very little time was spent in the bays or fiords. Because of the limited manoeuvrability of fixed-wing aircraft, little back-tracking was carried out. No areas were flown twice in one year.

Helicopter surveys covered parts of the Cumberland and Hall peninsulas in 1974 and 1975, and the Meta Incognita in 1975 (Table 1). The helicopter flew at 30–100 m above the surface and at airspeeds of about 160 km/h. There was a certain amount of overlap with the ground surveys, particularly in the Hoare Bay area in 1974 and 1975, in the Canso Channel area, northern Cumberland Peninsula, in 1974, and in the Broughton Island–Durban Island area, northern Cumberland Peninsula, in 1975. The survey put most emphasis on inland areas with extensive snowbanks suitable for denning, although the coastlines and floe edges were also surveyed. Most areas were searched only once. We obtained a few additional observations during a brief capture program in early May 1974.

Results and discussion

The Cumberland Peninsula

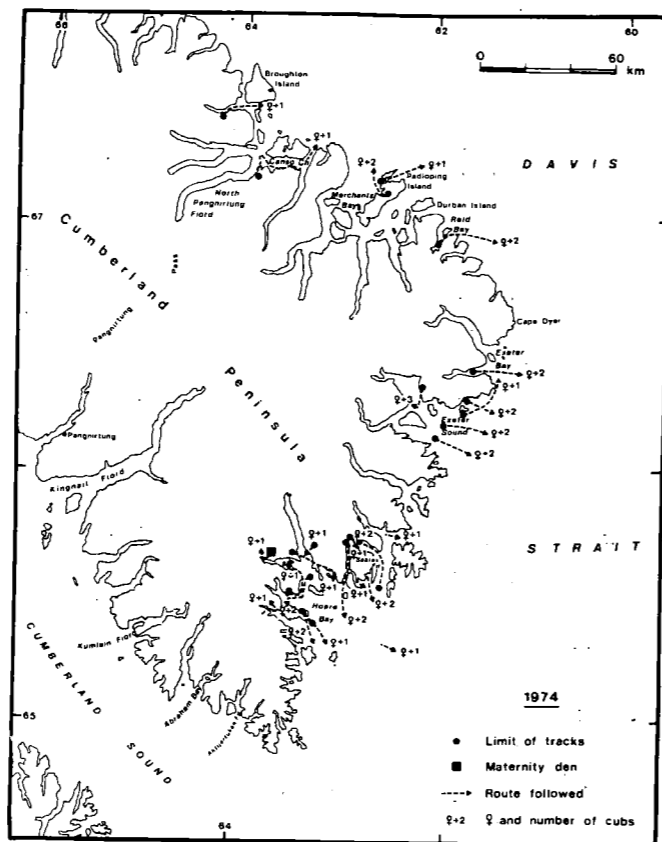
The numbers of females and new-born cubs sighted or tracked on the Cumberland Peninsula during the March–April surveys 1973–75 are listed in Table 2. The locations and movements of the family groups for 1974 and 1975 are presented in Figures 2 and 3.

The area surveyed extends from Pangnirtung, in north-eastern Cumberland Sound, to Cape Hooper, north of Broughton Island (Fig. 2). Due to weather conditions and logistical (including fuel, mechanical, and financial) problems, coverage of the area was not complete and varied each year (Table 1). The preliminary fixed-wing survey in 1973 covered most of the area except for the northeastern part between Cape Dyer and Sakiak Fiord, northern Hoare Bay area. In 1974, although almost twice the distance as in 1973 was flown, surveys were concentrated in the Hoare Bay area and Broughton Island to Durban Island area. The areas between Cape Hooper and Broughton Island, Durban Island and Exeter Bay, and Kumlien Fiord and southern Hoare Bay were not surveyed.

In 1975, the distance surveyed was over twice that of 1974. As in 1974, the parties did most of their surveying in the Hoare Bay area and the Broughton Island–Durban Island area, and also to the west of Broughton Island to Cape Hooper. Only small areas north of Cape Dyer and on the Cumberland Sound coast between Pangnirtung and Aktijartukan Fiord were not surveyed. Because of the size of the peninsula, and the remoteness from the settlements of Pangnirtung and Broughton Island, the area between Durban Island and Sakiak Fiord was not covered by ground surveys.

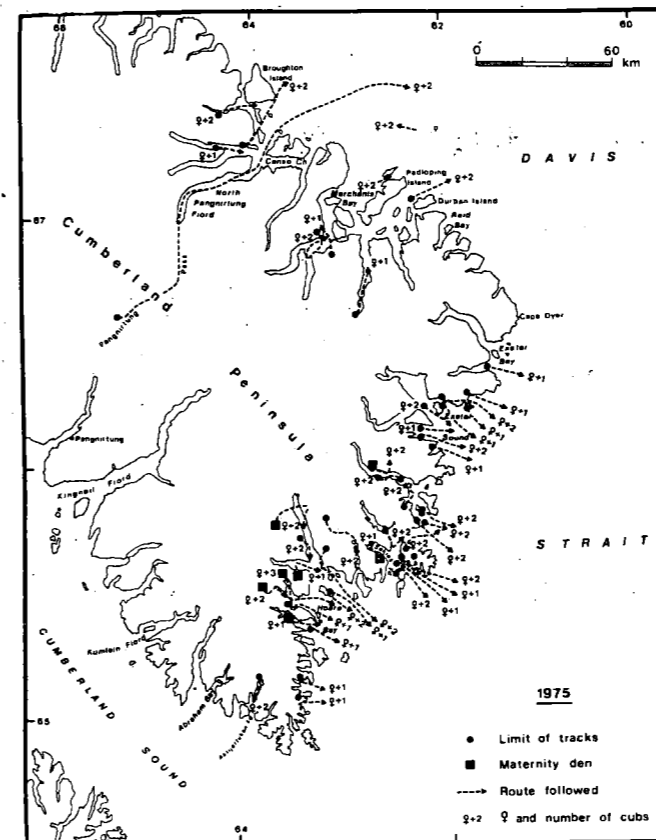
In 1974 the results of the surveys indicated that the Hoare Bay area contained 15 discrete family groups (20 cubs); the Exeter Bay area six (12 cubs); and the Broughton Island–Padloping Island area five (seven cubs), for a total of 26 family groups (Table 2, Fig. 2). These totals and also ones given for other years and other areas probably represent the minimum number of family groups, because of the incomplete coverage and the possibility of family groups emerging before and possibly after the surveys.

Figure 2
Polar bear maternity den locations and movements of females with cubs, Cumberland Peninsula, Baffin Island, 1974



Ideal snow and weather conditions prevailed throughout the helicopter and part of the ground search intervals in 1975. A fresh, deep snowfall on 1 and 2 April remained unblown for 7 to 10 days before and during the survey. Though difficult for travelling on the ground, the snow conditions aided observations from both the air and ground. Forty-eight females with a total of 78 cubs were observed or tracked (Table 2, Figure 3). These included a female with two cubs which had denned near Summit Lake at the head of Pangnirtung Pass, emerged prior to 15 March, and then travelled 175 km northeast down North Pangnirtung Fiord and out past Broughton Island to the floe edge. The productivity for 1974 was estimated at 50–60 cubs, and for 1975 at about 100.

Figure 3
Polar bear maternity den locations and movements of females with cubs, Cumberland Peninsula, Baffin Island, 1975



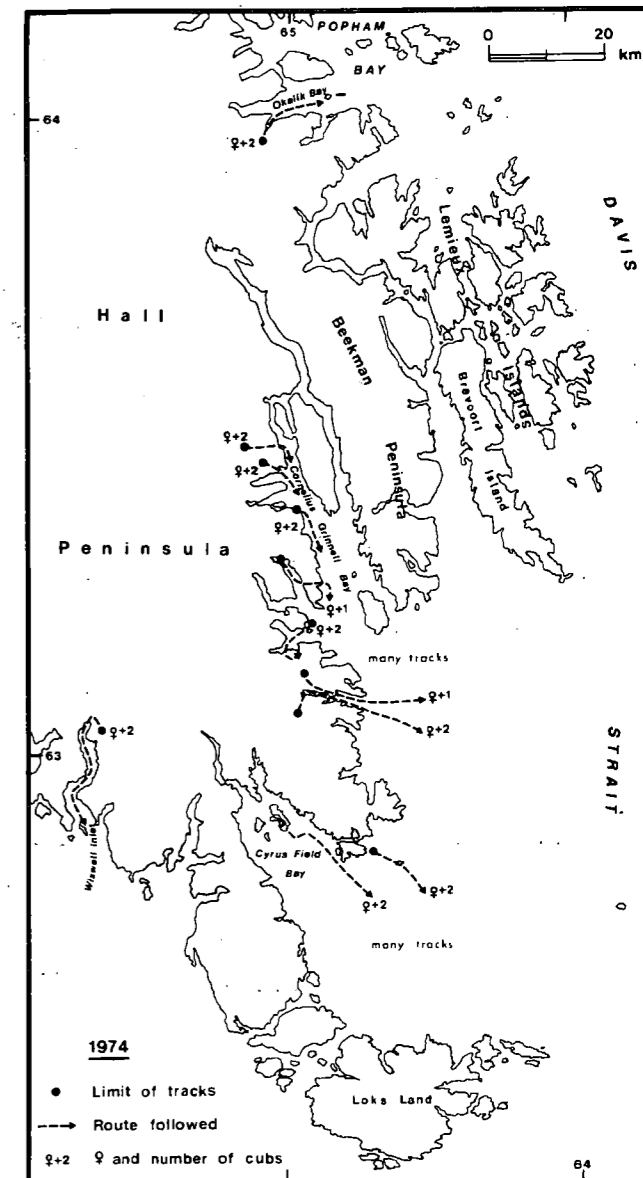
Hall Peninsula

The numbers of family groups, with new-born young seen or tracked on the Hall Peninsula in 1973–75 are listed in Table 2. The locations and movements of family groups are presented in Figures 4 and 5.

The coastal area of the Hall Peninsula was surveyed from Frobisher Bay to Popham Bay, on northeastern Hall Peninsula. The coastal area of Cumberland Sound was not surveyed at all. Coverage of the area varied each year (Table 1), mainly as a result of logistical problems and weather conditions. Except for a preliminary survey of Loks Land and Brevoort Island by fixed-wing aircraft in 1973, none of the numerous islands off the eastern coast of the peninsula were surveyed.

In 1974, the parties recorded 11 females and 20 cubs in the Wiswell Inlet to Okalik Bay area (Table 2, Fig. 4). The 1975 aerial survey resulted in a total count of only 7 females with 11 cubs (Table 2, Fig. 5). Because of a lack of ground surveys, the lateness of the aerial survey, and the hard snow conditions, the 1975 data were considered poor. Within the areas surveyed there appeared to be two main areas: Cornelius Grinnell Bay and Okalik Bay. Many old tracks were noted, but not tallied, during the ground survey, indicating that some family groups had emerged prior to the survey. Hunters from Pangnirtung reported seeing bears with young cubs throughout the Lemieux Islands and along the northern coast

Figure 4
Polar bear maternity den locations and movements of females with cubs, Hall Peninsula, Baffin Island, 1974



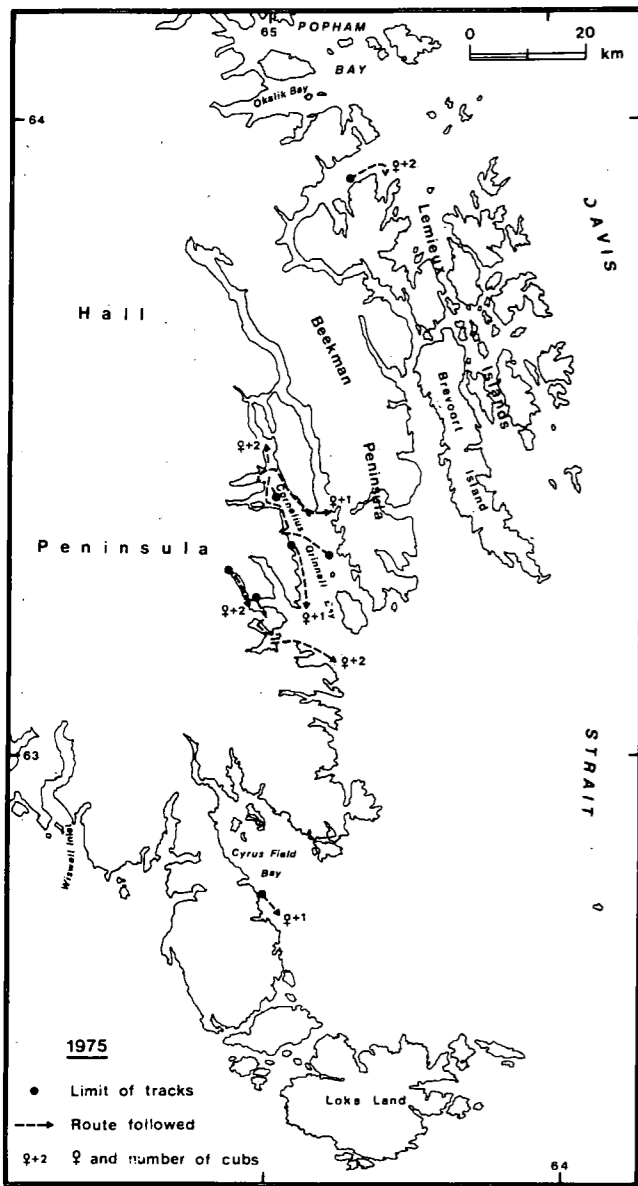
of the Beekman Peninsula. These areas were not surveyed, but in future a special effort should be made to survey these islands. It is estimated that at least 40 young in 1974 and 30–40 young in 1975 emerged from the Hall Peninsula.

Meta Incognita Peninsula

The number of tracks of family groups with new-born young seen during the 1974 and 1975 aerial surveys are listed in Table 2. No family groups were sighted. The locations and movements of the family groups are shown in Figure 6.

The Meta Incognita Peninsula was covered from the head of Frobisher Bay to Markham Bay on Hudson Strait. We did not survey Resolution Island and adjacent islands off the southeastern tip of the peninsula, and Big Island in Hudson

Figure 5
Movements of female bears with cubs, Hall Peninsula, Baffin Island, 1975



Strait. Except for the northern coast between Pugh Island and Charles Francis Hall Bay, which was surveyed three times in 1975, the coast was surveyed only once each year. Flight paths followed approximately parallel to the coastline and little time was spent searching bays and fiords, except in the Jackman Sound area. No ground surveys were carried out.

In 1974, the parties located five females and eight cubs (Fig. 6), and noted one female with a cub near Crooks Inlet, west of Lake Harbour (Fig. 1). Judging from the lateness of the one-day fixed-wing survey, and the extent of suitable coast not covered, we made an estimate of 20 cubs produced in 1974. During 1975, parts of the peninsula were searched by helicopter, but winds made tracking conditions poor. Only

seven females and nine cubs were tracked (Fig. 6). We estimated 10–20 cubs for 1975.

Litter sizes

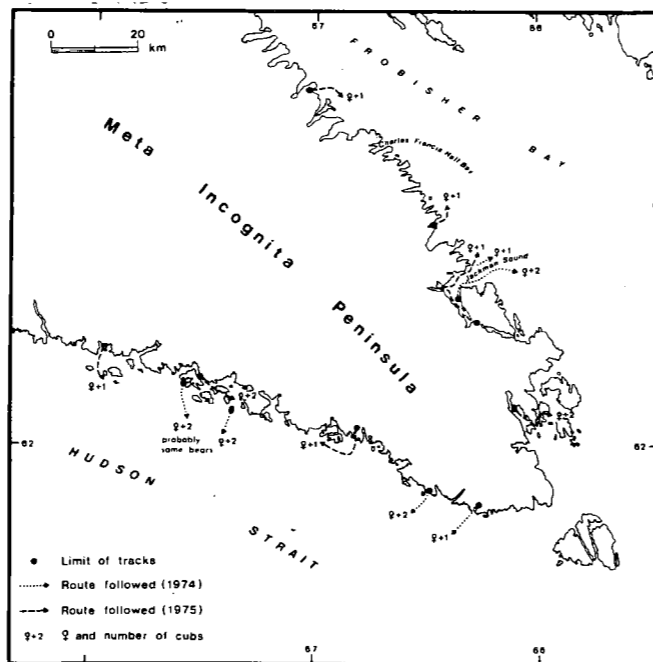
The average number of cubs per female was 1.6 during 1974 and 1975 (Table 2). We found no evidence of the loss of young during the period shortly after emergence from the maternity dens. The average litter sizes recorded for southeastern Baffin Island (1.6) is similar to the mean of 1.8 reported for north-central Baffin Island (Harington 1968), and the 1.8 average reported from the central Canadian Arctic (Van de Velde 1971), but not to the 2.0 average reported from southern Hudson Bay (Kolenosky 1974 and 1975, quoted in Jonkel *et al.* 1976).

The parties made very few observations of females with yearlings, indicating that these groups had either left the area already or had spent the winter elsewhere. In general, it is believed that only pregnant females den for any length of time, although females with yearlings have been recorded in dens in winter (Harington 1968, Van de Velde 1957, 1971).

Den sites

Ten possible maternity den sites were located during the spring 1973–75 surveys. Two of the dens were located in the Brevoort Island area, Hall Peninsula, during the fixed-wing survey in March 1974. The other eight dens were found in the Hoare Bay area, Cumberland Peninsula. One was located during the spring 1974 ground survey (Fig. 4) and seven during the April 1975 helicopter survey. It is noteworthy that all but one of the dens was located from the air.

Figure 6
Movements of female polar bears with cubs, Meta Incognita Peninsula, Baffin Island, 1974 and 1975



The mountainous terrain, deep, soft snow, and poor weather conditions hindered the ground survey crews in back-tracking the family groups to their maternity den sites. In many cases, in both the ground and aerial surveys, drifting snow precluded finding the actual den site.

The locations of the den sites in southeastern Baffin Island follow the same pattern of sites reported by Harington (1968) from north-central Baffin Island. In general, pregnant females select sites in snowbanks on slopes along river banks or lake shores. Seven of the den sites were less than 1 km inland, and none were located farther than 6 km inland, measured in a straight line from the nearest coast. Although, on leaving the dens, the family groups headed in the general direction of the sea ice, many followed circuitous routes. Characteristically the dens were on steep slopes at heights ranging from 12 to 750 m. One den was on a small island in a fiord. The female which denned in the Pangnirtung Pass area, about 30 km from the head of Pangnirtung Fiord, is probably atypical, although certain other females may have travelled far inland, with only the tracks near to the shoreline visible for back-tracking. Harington (1968) found that throughout the Canadian Arctic most dens (61%) were within 8 km of the coast, and none were more than 48 km inland. However, in Manitoba, no den sites were found within 8 km of the coast, and 48% were over 48 km inland (Stirling *et al.* 1977).

Summary

On the basis of preliminary fixed-wing surveys in 1973, denning information collected from local hunters, and ground and helicopter studies in 1973, 1974, and 1975, it appears that the seaward tips of the Cumberland, Hall, and Meta Incognita peninsulas form three important maternity denning areas. In spring 1974, 43 family groups (68 new-born cubs) and in spring 1975, 62 family groups (98 cubs) were recorded in the southeastern Baffin Island area. Allowing for areas not covered, Inuit records not in this report, and the possible emergence of cubs before and after the surveys, estimates of the total productivity for southeastern Baffin Island are 100–120 cubs for 1974 and 140–160 for 1975. Most observations were recorded in the Hoare Bay area, on southeastern Cumberland Peninsula. Most observations in all areas indicated a general movement from the land towards the floe edge. Although only 10 possible maternity den sites were located, numerous resting beds (pits or depressions in the snow) were noted.

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