FOXE BASIN POLAR BEAR RESEARCH PROGRAM 1985 FIELD REPORT

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ABSTRACT

The second year of a multi-year study to determine the size and discreteness of the population of polar bears resident in Foxe Basin was conducted in the fall of 1985. The program was expanded to include the Wager Bay area and a more complete coverage of Southampton Island. In approximately three months of work, 113.6 hours were flown, a total of 291 bears were seen, and 68 bears were immobilized. The bears all appeared to be in good physical condition. A population estimate for the area was calculated; however, due to the localized mark and recapture effort and small capture sample, the estimate is considered preliminary.

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INTRODUCTION

The Foxe Basin Polar Bear Research Program was continued in 1985 and expanded to include Wager Bay and a more complete coverage of Southampton Island. The objective of the program is to estimate the size and discreteness of the population of polar bears (Ursus maritimus) resident in Foxe Basin. Stenhouse and Lunn (In prep.) discussed in more detail the rationale for this multi-year study as well as summarizing previous research efforts in this management zone.

This report presents the data collected during the 1985 field season.

METHODS

In order to expand our tagging efforts into the Wager Bay area, a base camp was established on the north shore of the bay, at Douglas Harbour. We decided to work in this area prior to working on Southampton Island for two reasons. We were using boats for most of the logistics of establishing our base camp; by the end of August or early September, the roughness of the waters of Wager Bay and Roes Welcome Sound make travel hazardous. Secondly, we observed that in the previous year there had been greater concentrations of polar bears along the coast of Southampton Island in early October than in early September (Stenhouse and Lunn In prep.). Therefore, we felt that we could maximize the numbers of polar bears captured by working on Southampton Island later in the year.

All bears were located from a Bell 206B helicopter and immobilized using the techniques of Schweinsburg et al. (1982) and Ramsay and Andriashek (1986). We immobilized all polar bears with the drugs ketamine hydrochloride and xylazine hydrochloride and administered yohimbine hydrochloride as an antagonist (Ramsay et al. 1985). A uniquely numbered delrin tag was attached to each ear. The inside of each upper lip was tattooed with the same number as the ear tag. The straight-line length was recorded and the bear's weight determined by measuring the axillary girth (Stirling et al. 1977). Hair dye (Lady Clairol, Clairol Canada, Knowlton, Quebec) was used to mark the rump of

each polar bear to facilitate future identification during the field season.

The first premolar (PM1) was taken for later age determination using methods described by Thomas and Bandy (1973) as modified by Stirling et al. (1977). From counts of cementum annuli, each bear was aged and placed into one of the following age classes:

1) Cub-of-the-year (COY) - less than 1 year of age
2) Yearling - between 1 and 2 years of age
3) Two-year-old - between 2 and 3 years of age
4) Subadult - between 3 and 5 years of age
5) Adult - 5 years of age or older

The population estimate was determined using the mark-recapture technique described by DeMaster et al. (1980).

RESULTS

Wager Bay

We began work in Wager Bay on 17 August. Over the next 19 days, 31.7 hours were flown and a total of 45 bears seen (Fig. 1). Of this total, 34 bears were not captured as they were in areas that were either too wet to drug them safely or inaccessible by helicopter. The remaining 11 bears were captured; 6 were successfully released, but 5 died: these included a family group of 3, and 2 single bears (see Appendix A). After the deaths of the family group, we decided to fly in the early morning or early evening, when temperatures were cooler (<15 C). Even with this precaution, two more bears died. Although the exact causes of deaths of these bears is unknown, we suspect that four of the five bears died as result of overheating. The other bear had recently been shot through the lungs, the combination of the drugs and the recent damage to the lungs probably caused this bear's death.

The use of the antagonistic drug, yohimbine hydrochloride, produced a wide range of effects, some not understood. Three bears stood up and walked off within 5 minutes of administration of the antagonist; four lifted their heads, tracked the helicopter, and exhibited increased respiration (two subsequently died); and one showed no marked effects yet was gone from the capture location when checked 6 days later.

Although the survey effort on the north and south shores of Wager Bay were similar, 69% (31/45) of the total bears seen were

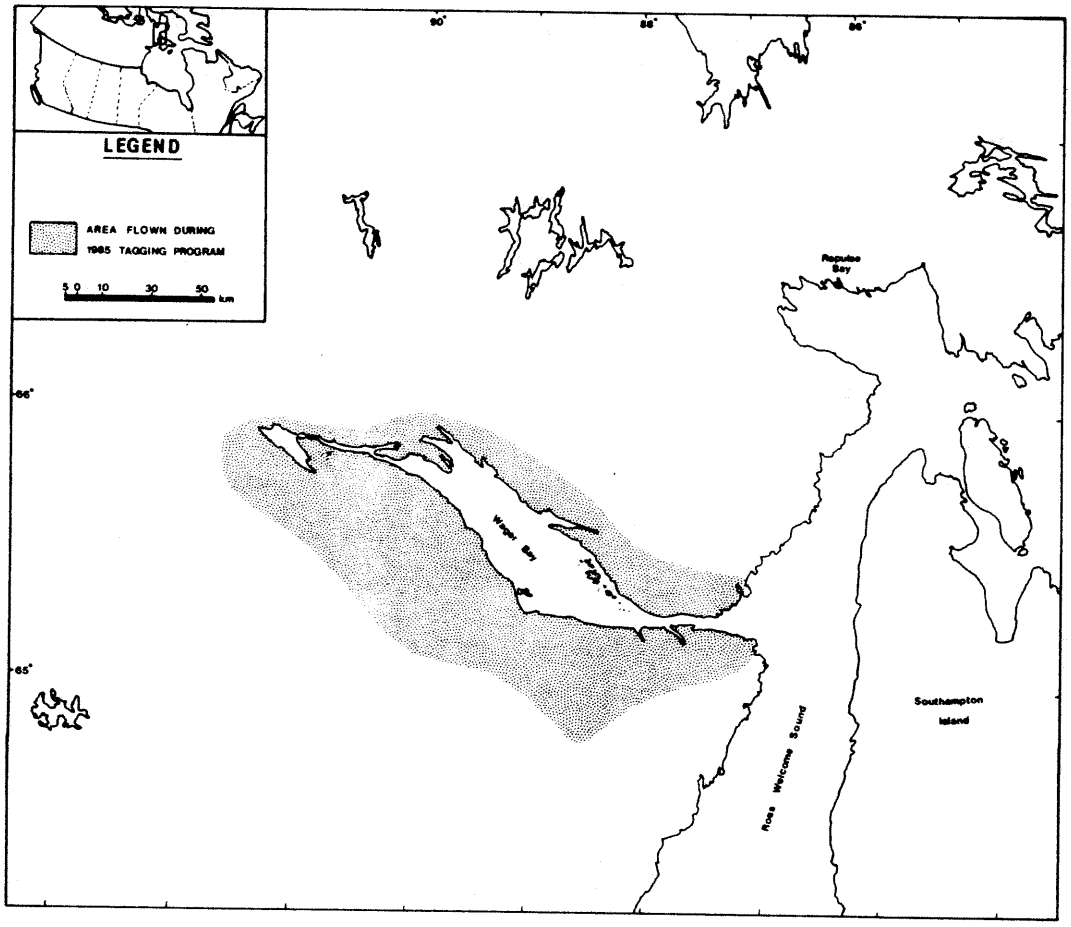

Figure 1. Areas flown in Wager Bay from 17 August to 4 September 1985.

on the south side of Wager Bay and were either lying among the rocks at the shore of the bay or by lakes and rivers 5 to 20 km inland. All but one of the 14 bears observed on the north side were within 1 km of the shore, the other bear was within 5 km. Five of seven family groups observed were females with single cubs and five of seven family groups were observed on the north side of Wager Bay.

By the last week of August, the weather conditions had begun to deteriorate (low overcast skies, snow and rain mixed, strong winds). From 27 August to 4 September, we were only able to fly a total of 8 hours. We decided to close down camp on 4 September, but due to inclement weather were unable to leave until 9 September.

Southampton Island

We arrived in Coral Harbour, Southampton Island, on 12 September and began flying the next day. Over the following 59 days, 81.9 hours were flown and a total of 246 bears seen (Figs. 2 and 3). Of this total, 41% (102) were on the east side of the island, north of East Bay; 35% (86) were on Bell Peninsula; 11% (27) were on the south coast between Bear Cove Point and Cape Low; 10% (25) were on the west coast between Cape Kendall and Ell Bay; and 2% (6) were north of Duke of York Bay, including one bear along the southwest coast of White Island. We tagged a total of 57 bears; including 7 family groups: 3 single COY litters, 1 twin COY litter, 2 twin yearling litters, and 1 single two-year-old litter. The number of bears that we could capture

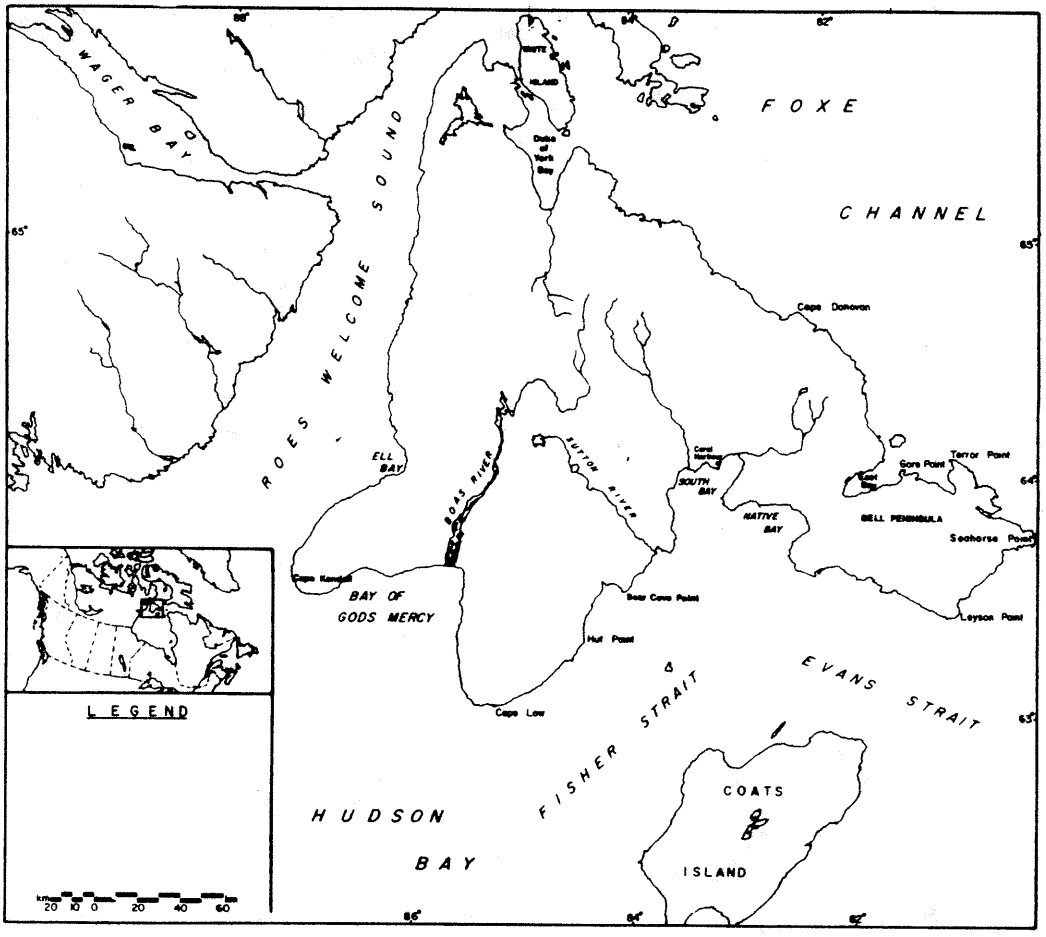

Figure 2. Southampton Island study area.

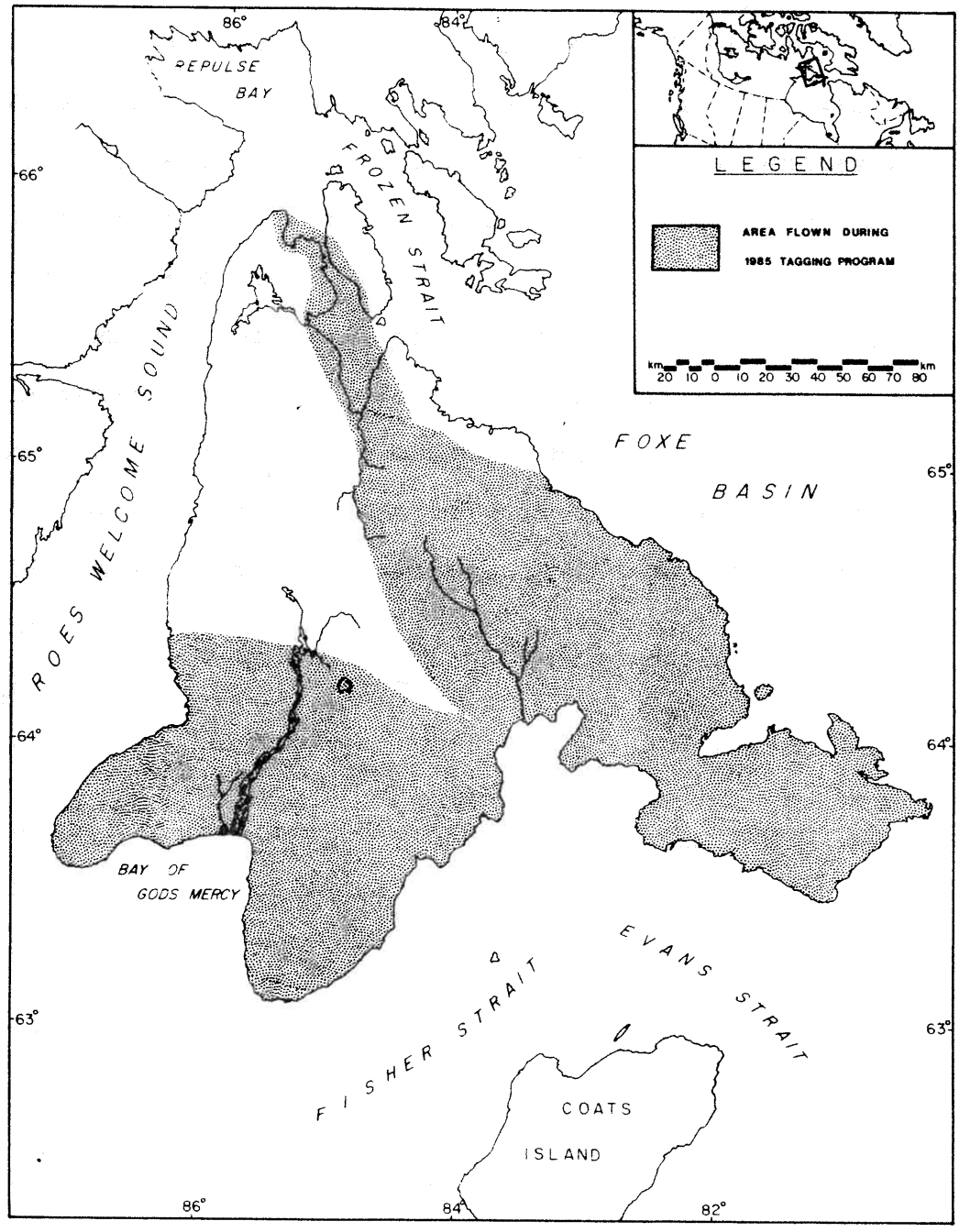

Figure 3. Areas flown on Southampton Island from 13 September to 10 November 1985.

was primarily restricted by the location of the bear and by the amount of daylight which limited the numbers of bears that we could handle each day. The age and sex structure of polar bears handled in Wager Bay and on Southampton Island is presented in Fig. 4. There was no significant difference between the mean ages of bears handled in 1984 and in 1985 (t-test, $0.5<p<0.9$).

We recaptured three bears this year that were originally captured and tagged in 1984 (Fig. 5). Two of these bears were in the same general area both years. However, one bear was caught in 1984 on the southeast coast and recaptured in 1985 along the west coast, a straight-line distance of approximately 270 km.

We found one carcass of an emaciated bear of unknown age along the southeast coast of Bell Peninsula. There was no evidence that the carcass had been scavenged. From the general appearance of the bear, it had probably not died in the fall of 1984 but had likely died subsequent to coming ashore in the summer of 1985. We did not see or handle any other emaciated bears. We caught a total of 10 bears that each weight over 400 kg (7 over 500 kg, 3 over 600 kg, and 1 over 700 kg).

Although the polar bear hunting season on Southampton Island opened on 1 October, the hunters agreed amongst themselves to postpone hunting until 25 October. As of 16 April 1986, only one tagged bear (a female caught as a yearling with her mother in 1984) had been shot. This bear was killed in the same general area in which it had been caught a year earlier.

Although the capture sample was small, a population estimate

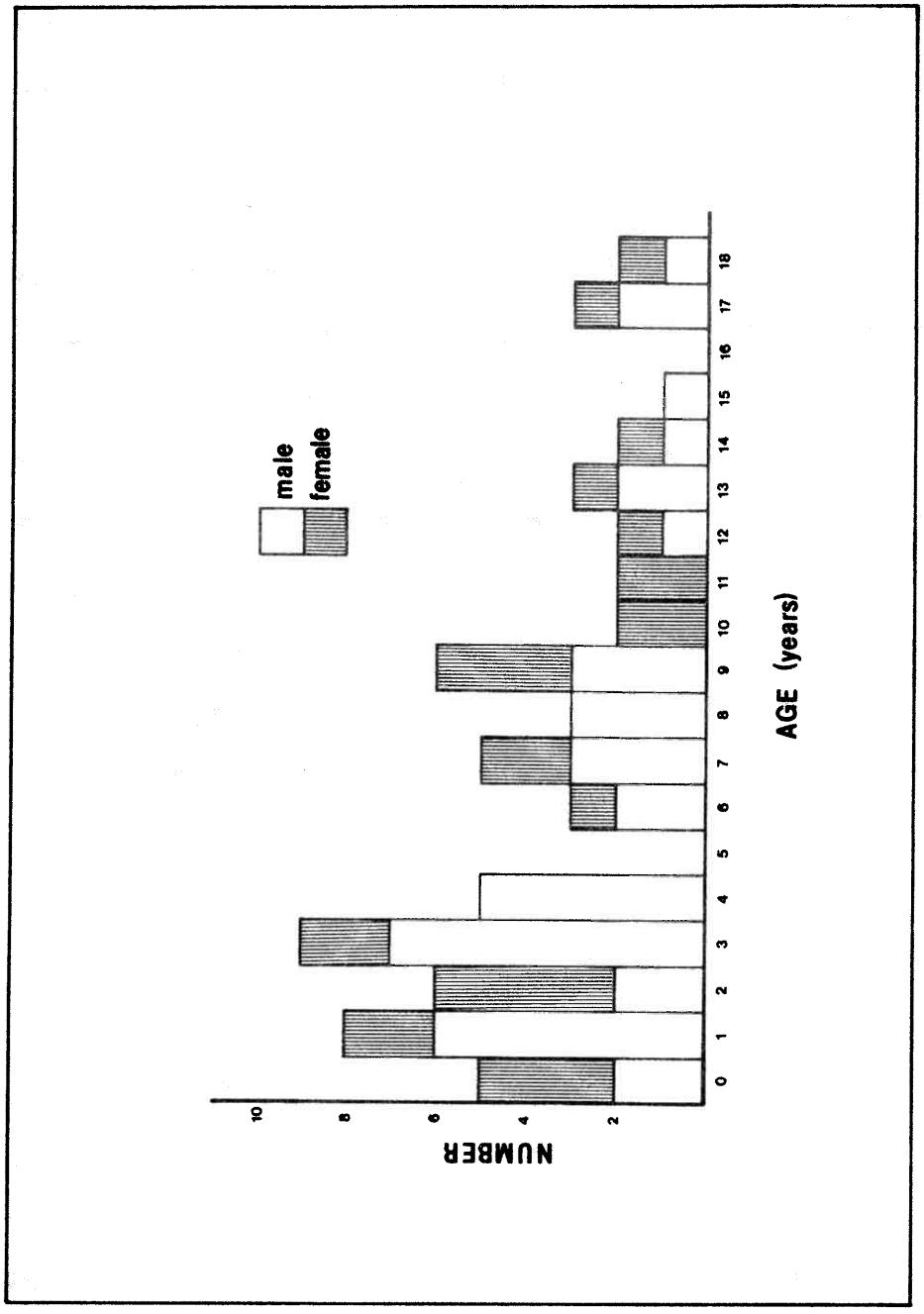

Figure 4. Numbers of polar bears handled in Wager Bay and on Southampton Island, in 1985, by age and sex class.

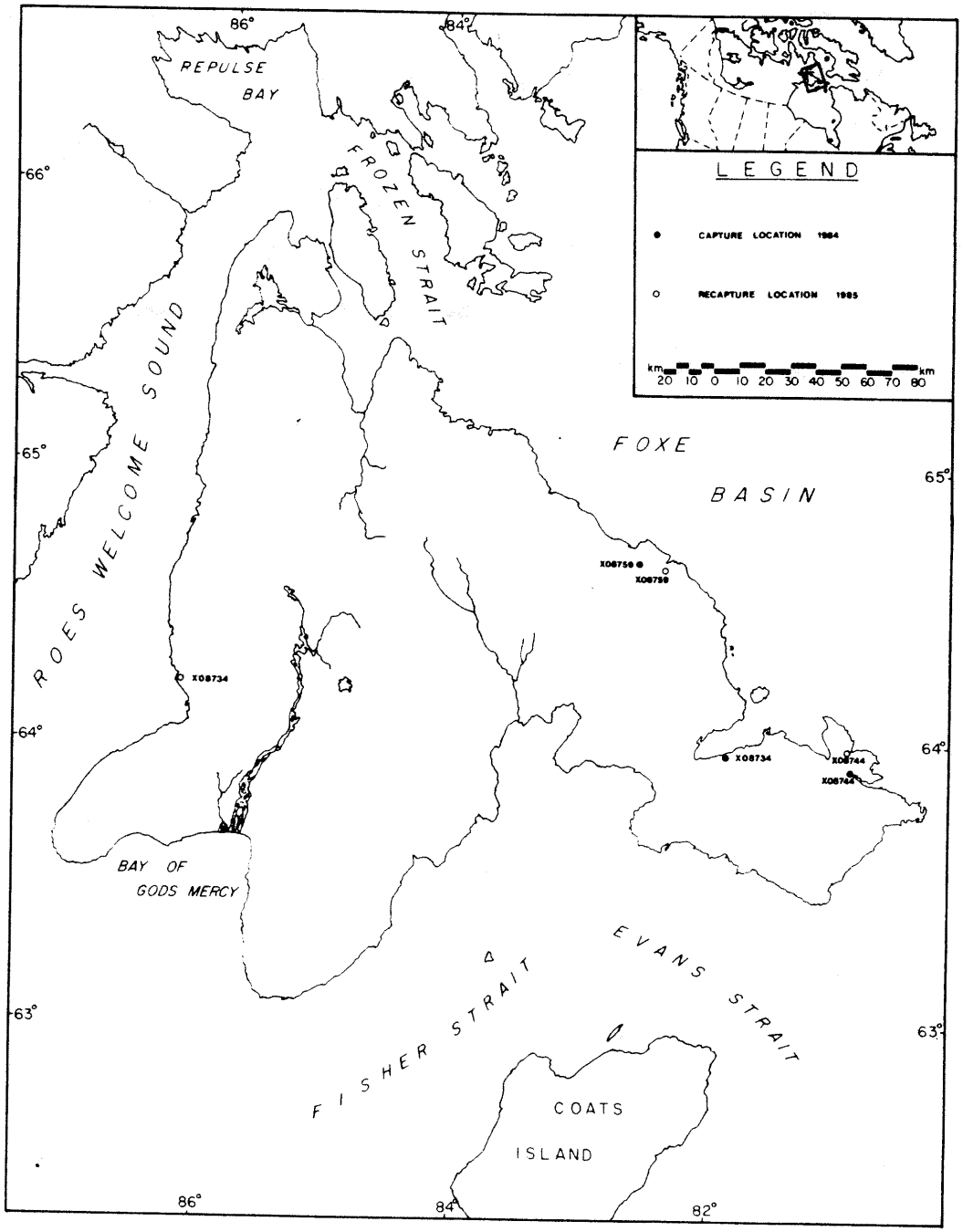

Figure 5. Movements of polar bears caught on Southampton Island in 1984 and recaptured in 1985.

for polar bears on Southampton Island was calculated (Table 1). The estimated annual survival rate (Ø) was 0.92 and the resultant population size estimated at 1252 ± 713 (1 SD).

The weather conditions severely hampered our capture efforts, especially later in the year. From 13 October to 10 November, we were only able to fly a total of five days. By the beginning of November, sufficient ice had formed around the island to allow polar bears to leave. We concluded the field season on 11 November 1985.

Table 1. Population estimate for polar bears on Southampton Island (after DeMaster et al. 1980).

YEAR	1984	1985
n_i	63	68
m_i	0	3
R_i	60	63
$\hat{p}_i$	-	0.044
$\hat{M}_i$	-	55.2
SD $\hat{M}_i$	-	2.1
$\hat{N}_i$	-	1252
SD $\hat{N}_i$	-	713
$\hat{M}_i + R_i - m_i$	60	115.2

n_i = captures at time i

m_i = recaptures at time i

R_i = total marks released at time i

$\hat{p}_i$ = estimated fraction marked before time i = $\frac{m_i}{n_i}$

$\hat{M}_i$ = estimated marks in population before time i = $(\hat{M}_i+R_i-m_i)\phi$

$\hat{N}_i$ = estimated population at time i = $\frac{\hat{M}_i}{\hat{p}_i}$

ϕ = survival rate = loglinear regression of age structure = 0.916

SD $\hat{M}_i$ & SD $\hat{N}_i$ = standard deviations (SD) of above parameters

DISCUSSION

Wager Bay

Polar bears appeared to favor the south side of Wager Bay over the north side. Donaldson and Heard (1981) also documented higher concentrations of bears on the south side. Reasons for this distribution pattern are unclear, but may be a function of strategies to avoid overheating during the summer. The south shore of Wager Bay is composed of 400 to 500 m high rocky hills rising sharply from the water. Steep water drainages cut through these hills. By way of contrast, the north shore consists of a 10 to 15 km wide coastal plain between Wager Bay and the high hills. One might expect that the ambient temperatures in between the rocks and in the steep water drainages on the south shore to be cooler than on the exposed north shore coastal plains. These areas would, therefore, be good locations for polar bears to inhabit to remain cool. Along the Hudson Bay coast, near Churchill, Manitoba, polar bears remain largely inactive during the summer to conserve energy and to minimize the chance of becoming hyperthermic (Lunn and Stirling 1985). It has been documented that they are energetically inefficient walkers and during the warm season may be subject to hyperthermia (Øritsland 1970, Best 1982).

Although only seven family groups were seen, five were on the north shore. We had expected to find the majority on the south shore, a known maternity denning area (Davidge 1980), as data from other studies had shown that female polar bears with

cubs show a high degree of fidelity to denning areas and return there when they come ashore in the summer (Stirling et al. 1977). However, the number of family groups seen on the north shore may reflect a strategy to minimize confrontations between their cubs and other bears and still stay in the preferred coastal region. It is known that females with cubs are wary of all other bears (Stirling et al. 1977, Latour 1981, Lunn and Stirling 1985). Mortality, resulting from intraspecific aggression, has been documented (Russell 1975, Lunn and Stenhouse 1985, Taylor et al. 1985).

The wide range of responses using the drug yohimbine hydrochloride was both unexpected and unexplained. This drug had been tested on polar bears in Manitoba with good results (Ramsay et al. 1985). Whether individual variations in physiology or some other factor was responsible was unknown. Perhaps further testing under more controlled conditions is required.

Southampton Island

As we were able to survey much more of Southampton Island this year than last, we have a better understanding of the distribution of polar bears on the island. It is apparent that the mountainous eastern coastal region is an important denning area as suggested by Harington (1968). A larger number of animals were seen in the region but, due to the rugged terrain, they were not safely accessible by helicopter. Once snow had accumulated in the denning area, we saw fresh dens and observed one female in a den; however, we were unsuccessful in capturing

her. We also observed a number of snowbanks where bears had been digging, these appeared to be denning attempts.

Bell Peninsula was another major area of high polar bear concentrations. In 1984 a large number of bears was observed there (Stenhouse and Lunn In prep.). The preference for this area is most likely a result of early ice formation each fall (Canada, Atmospheric Environment Service 1980-1984). We did not observe any bears in the central part of the island. As this area is a large plain, with no suitable denning habitat, there would appear to be no advantage for polar bears to walk 100 km inland to spend 2 or 3 months prior to heading back out on the ice. Although the north end of the island appeared to be an area of low polar bear concentrations, we were hampered by weather conditions and unable to survey this area until late October. When we flew over this area there was at least 3 to 4 km of newly formed ice, and polar bears may have already returned to the ice prior to our arrival.

It is known that polar bears can make long movements (Stirling et al. 1977, Stirling and Kiliaan 1980). A bear we tagged at Terror Point on 23 October 1984, was shot near Lake Harbour, Baffin Island on 5 January 1985, a straight-line distance of approximately 1200 km. Therefore, although it is interesting to note that we recaptured a bear 270 km from where it was caught the previous year, it should not be surprising.

DeMaster et al. (1980) commented that their population estimate technique will yield relatively imprecise estimates with

sample sizes less than 150, if the proportion of marked animals in the population is between 0.1 and 0.2. For the Southampton Island population we calculated this proportion to be 0.044. With their technique, larger sample sizes produce more precise estimates. Unfortunately, our capture efforts, over the past two years, have been hampered primarily by weather. As a result, our sample sizes have been small and the resultant population estimate has been relatively imprecise, as shown by the high standard deviation.

It is our opinion that the weather has been the major limiting factor preventing us from increasing the capture sample. It is apparent that the weather conditions at this time of the year are poor for flying. As a result, we feel that the only realistic approach to increase the capture sample to a reasonable size (>150 bears) is by using two helicopters and two crews.

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APPENDIX A

Report of polar bear fatalities - Wager Bay

1 August 1985

Polar Bear Fatalities - Wager Bay

The following report summarizes the events that have led to the deaths of five polar bears in Wager Bay during August of 1985.

On 17 August, Gord Stenhouse, myself, and pilot Marc Hutcheson spotted an adult female polar bear with two yearling cubs 38 km SSW of Tikilak Point (65 20 N, 89 06 W). The adult was immobilized with 3400 mg of Ketamine and Rompun (K/R) at 1228. At 1325, while tattooing the adult female, the yearling female got up on her front quarters. We administered 400 mg (K/R) at 1328 to allow us to finish processing the other bears. A few minutes later her breathing stopped; artificial resuscitation was immediately started and 15 mg of the Rompun antagonist, Yohimbine, was given. After 20 minutes, the bear was not responding, we were concerned with both our safety and the of the other bears as they were showing signs of recovery and the decision was made to leave. We returned the next morning to skin the yearling female and found the other tow bear also dead. The adult female had not moved while the yearling male was found 30 yards from where he was processed.

Gord Stenhouse and Nick Lunn skinned all three bears at this time. The yearling female had recently been shot and one lobe of the right and left lungs each had a 4 cm tear in them. We concluded that the combined effect of the drugs on the respiration and the fact that only half of her lungs were

functioning probably caused her death. Although we are uncertain as to the cause of death of the other two bears, both were fat and the weather warm. The second cub was found to have a 12 gauge bullet wound on the left cheek. This wound, although recent, was not considered to have played a part in this bear's death. Under the effect of the drugs, the bears may have overheated which may have contributed to respiratory failure. Although body core temperatures were monitored they were not considered abnormal and thus not a cause for concern. At this point we decided to no longer work in the middle of the day, but confine our tagging to early morning or late evening when temperatures are cooler.

On 18 August we spotted an adult female 15 km NW of the mouth of Kuugaayiik Creek (66 51 N, 89 21 W). She was immobilized with 3600 mg K/R at 1933. When we finished processing her, body temperature was near normal, we administered 30 mg of Yohimbine and with 5 minutes her respiration increased from 12 to 69 breaths per minute. We left and returned 45 minutes later, she lifted her head and visually tracked the helicopter, once again another sign that everything was fine. She was found dead at 2046 on 19 August in the same location and was skinned the following morning.

On 19 August, we spotted and adult male 37 km SW of Tikilak Point (65 23 N, 89 19 W). He was immobilized with 4400 mg K/R at 0756. His body temperature was normal and was given 40 mg of Yohimbine when we had finished. Once again, respiration

increased and we left. We returned 2 hours later and he was moving his head as we flew by.

After finding the previous female dead later that evening, we rechecked the adult male, only to fine him dead. He was also skinned out on the morning of 20 August, and Gord Stenhouse, myself and helicopter pilot returned to Rankin Inlet that afternoon.

We called Dr. Ian Stirling, Canadian Wildlife Service, an international polar bear specialist. We explained the details to him and he stated that he could see no fault in our techniques and was unable to explain what was happening. Similar events have happened in Churchill and it was concluded that overheating was probably the cause. This year we have caught bears under identical conditions and there have been no problems.

In consultation with Dr. Stirling, we have decide to continue tagging, wait for cooler temperatures and stay longer with each bear.

All 5 hides were turned over to Renewable Resources in Rankin Inlet. This work is being conducted on Wildlife Research Permit Number 0237 issued to Gordon Stenhouse, Regional Biologist, Rankin Inlet.

Nick Lunn
Wildlife Biologist
Rankin Inlet