FOXE BASIN POLAR BEAR RESEARCH PROGRAM 1988 FIELD REPORT

M.K. TAYLOR

J. LEE

and

R. MULDERS

DEPARTMENT OF RENEWABLE RESOURCES

GOVERNMENT OF THE NORTHWEST TERRITORIES

YELLOWKNIFE, NWT

1990

Northwest Territories Renewable Resources

Manuscript Report No. 33

ABSTRACT

The objectives of the 1988 Foxe Basin project were to complete the aerial telemetry surveys for radio collared polar bears and to field test the tetracycline marking technique. In 1988, aerial surveys were conducted in March and September. Most of the bears that were relocated were found in Hudson Bay (winter and spring) and in the vicinity of Wager Bay and Southampton Island (Fall). These results were consistent with both survey and telemetry results from 1986 and 1987. Fifty-eight polar bears were inoculated with tetracycline from a helicopter in Wager Bay during September 1988. The tetracycline marking method appears to be operational if a permanent dye can be used to identify marked bears. All teeth from bears that had been inoculated with tetracycline and either harvested or recaptured were examined in the laboratory. Fifty-four of fifty-five teeth marked were positive for tetracycline 180 or more days after having been marked.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Since 1977, the Inuit living in the northern Hudson Bay and Foxe Basin settlements of the Northwest Territories (NT) have made formal requests to the Territorial Government for increases in their polar bear quotas. However, as there were no population estimates for polar bears in this area (Stirling and Ramsay 1986), few quota adjustments have been made. A cooperative research agreement was proposed that would have seen the federal, territorial, and three provincial governments fund and actively participate in a large scale polar bear project encompassing all of James Bay, Hudson Bay, Hudson Strait and Foxe Basin. However, due to cutbacks at all levels of government, the research agreement was never signed.

In 1984, the Department of Renewable Resources, Government of the Northwest Territories, initiated a mark-recapture program on Southampton and Coats islands. Stenhouse and Lunn (1987), Lunn and Stenhouse (1987), Lunn et al. (1987) and Taylor et al. (1990) summarized the results of the work conducted in 1984, 1985, 1986, and 1987, respectively.

In 1986, the Department of Renewable Resources re-evaluated the Foxe Basin Polar Bear Project because: 1) without the research agreement, the NWT would had to have expanded the study to include all of northern Hudson Bay, Hudson Strait, and Foxe Basin to be confident that the entire population was delineated; 2) traditional mark-recapture programs appeared to be too expensive to continue

the study (in its present form) over such a large area and produce a reliable population estimate; and 3) 2 years of work in this area had shown that both the weather conditions in the fall and the inaccessibility of some polar bears precludes capturing a sample large and representative enough to be used for a population estimate (Stirling and Ramsay 1986).

The project was redesigned in an attempt to avoid some of the problems of the traditional mark-recapture technique. We intend to determine population boundaries of polar bear populations resident in this region. To help determine population boundaries, radio transmitters were deployed in 1986 and 1987. Fixed-wing aerial surveys were conducted to relocate instrumented animals until September 1988 when it appeared that most of the transmitters had failed.

An alternative to traditional mark-recapture methods has been developed (Taylor et al. 1990, Taylor and Lee 1990) and was field tested at Wager Bay, NT in September 1988. The antibiotic tetracycline binds with calcium and leaves a permanent mark in the bones and in the dentine and cementum of teeth. In sectioned uncalcified teeth, this mark is visible under ultra-violet light. Therefore, tetracycline can be used as the mark by injecting it into polar bears from a helicopter. The recapture sample could then come from the annual harvest (137) of polar bears in this region. From that sample, the proportion of marked animals and the year of marking could then be determined by sectioning and aging each tooth. Although the harvest is not a random sample of the

population, the marking will be randomized.

The objectives of the 1988 field season were to: 1) document the spring and autumn distribution of polar bears in Hudson Strait and Northern Foxe Basin and, 2) field test the tetracycline biomarking system. This report summarizes the 1988 field season of the Foxe Basin Polar Bear Project.

METHODS

The aerial telemetry searches for approximately 50 polar bears that had been given radio collars were conducted with a Beechcraft Tradewinds twin engine turbine aircraft. Two Telonics directional H antennas were mounted near the wing tips facing left and right. Two Telonics scanning receivers (1 for each antenna) were used to relocate animals along the cruise track. The effective range of the antennas was 60+ statute miles. The range and receivers were tested initially and at various times during the survey.

The ice cover survey was intended to provide 100% coverage of the Foxe Basin, Hudson Strait, and northern Hudson Bay areas. Fractional coverage of southern Hudson Bay was also achieved in some ice period surveys. The ice free (summer) survey in 1988 was designed to cover the coastal areas during the ice free season.

Three types of darts were used to deliver the tetracycline: Palmer 10cc darts, PNEU-DART 6cc darts, and PNEU-DART 15cc darts. The 6cc PNEU-DARTS must be filled through the needle. That was accomplished by loading a syringe with the required volume and injecting the drug into the dart through the dart needle. Spinal needles (long and thin) are required for that operation to avoid a pressure lock as the liquid is injected into the dart. A wire passes through the tail of the dart as a safety pin to prevent accidental discharge if the dart is dropped. This wire must be removed before the dart is loaded into the rifle.

The 15cc PNEU-DARTs are .75 caliber and require a special gun.

They are filled like a Palmer dart by pouring the tetracycline into the dart barrel, then screwing the needle cap onto the dart barrel. The needles are barbless and needle lengths of 1.75 inches, 2 inches, and 2.5 inches were tested. The point of the needle is blocked, and the injection occurs sideways from ports bored near the tip of the needle. The drug is held in the dart by a polyethylene button that seals the needle ports.

The 15cc darts were pressurized by injecting 2.0 ml of dilute acid (vinegar) into the tail chamber of the dart through the rubber seal in the centre of the tail section. The injection was performed quickly and the syringe needle was kept straight. The needle was pulled out immediately to avoid any pressure leaks. The darts were charged immediately before use, although the pressure seals were good for up to 20 minutes. Darts were loaded by the front seat biologist and fired by the rear seat biologist.

The .75 caliber dart rifle power adjustment was tested before field operations to provide a flat trajectory up to 10m. The power setting works by providing an air cushion for the gas from the power charge (also a Remington green charge). The reservoir can be reduced by screwing the knob in and increased by screwing the knob out.

The tetracycline solution was a slurry mixed at 200 mg/ml to reduce the number of darts required to a minimum. The solution was not mixed more than 1 day before it was used.

All remote injections were administered in the neck or shoulder. Any subcutaneous injections or hits in any other area

were repeated.

All polar bears that were injected with tetracycline were also marked with a dart filled with "Nelspot" paint ball dye (Nelson Paint Company, Iron Mountain, Michigan, USA). This non-toxic, oil-based dye was available in black, blue, green, orange, and yellow. The dye varied in viscosity.

RESULTS AND DISCUSSION

The results of the telemetry part of the Foxe Basin research program are indicated in Figure 1. It appears that the "Foxe Basin population" is in fact better described as a third and northern Hudson Bay population, and that most of the bears in Foxe Basin proper are transients from Foxe Channel, Hudson Strait, and Hudson Bay. Both survey and telemetry data indicate that most of the polar bears in this area summer along the mainland coast from Chesterfield Inlet to Winter Island, and on Southampton and other islands in the confluence of Foxe Channel, Hudson Strait, and northern Hudson Bay. Wager Bay and Southampton Island are areas of particularly high concentration, and areas in the vicinity of communities appear to have the lowest concentrations during the ice free period.

During the ice cover period, most of the bears were relocated in Hudson Bay. Although the southern part of Hudson Bay was incompletely surveyed, a significant fraction of the relocations occurred there. These results indicate that many polar bears from the eastern Hudson Bay (Ontario), western Hudson Bay (Manitoba), and Foxe Basin (Northwest Territories) utilize the same winter feeding and breeding areas in Hudson Bay. Summer fidelity to different areas appears to be the sole basis for considering the populations to be separate.

The tetracycline marking method involves new types of remote injection equipment, and requires that each bear injected with

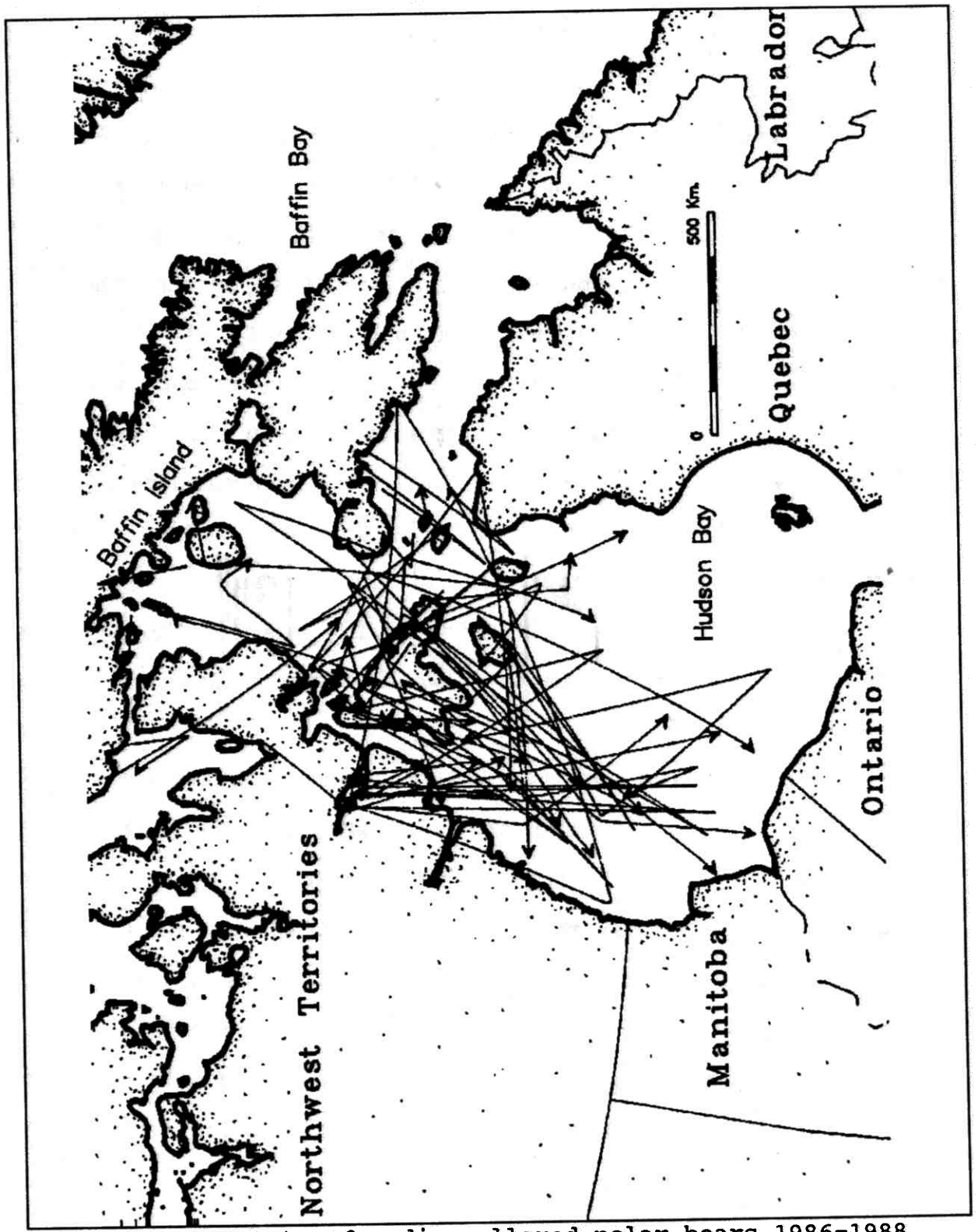

Figure 1. Movements of radio collared polar bears 1986-1988.

tetracycline be marked with a dye to insure it is counted/marked only once per year. Fifty-eight polar bears of various sex and age categories were marked with tetracycline and the marker dye between 08/09/88 and 11/10/88 (Table 1). Between 19/09/88 and 21/09/88, 10 of these animals were relocated, immobilized and a vestigial premolar was extracted. Females were observed with cubs, yearlings, and without cubs (Table 2).

The initial study design was to capture up to 60 animals using conventional immobilization methods at Wager Bay, NT. Just prior to capture the bears would be inoculated with tetracycline from the air. After inoculation with tetracycline, the bear would be immobilized and fitted with a VHF radio transmitter. After a minimum of 7 days incubation, the bear would be relocated using the VHF transmitter, reimmobilized, and a vestigial premolar taken for analysis.

The conditions at Wager Bay were unfavorable for live capture of polar bears. The temperature was approximately 12° C. Most of the bears were either in high relief terrain or close to the ocean. It quickly became apparent that the risk associated with tetracycline tagging followed by immobilization was unacceptable. No bears were tetracycline marked and immediately immobilized.

One week after the initial marking all bears encountered that were dye marked were immobilized. Thirteen bears were captured, but 3 of the bears were a family group that had been marked by mud rather than dye. Only 10 bears were recaptured that had been previously marked with tetracycline.

Table 1. Numbers of polar bears seen or handled, by sex and age class, in Wager Bay in September, 1988.

DATE	AM	AF	SM	SF	SU	YR	CY	U	Total
08-11	29	10	3	5	2	5	4	0	58
19-21	14	9	4	1	2	3	4	1	37
08-21	43*	19*	7*	6*	4*	8*	8*	1*	95*

* Totals may include bears counted more than once

AM = adult males, AF = adult females, SM = subadult males, SF = subadult females, SU = subadults unidentified, YR = yearling males, CY = COY (cub-of-year) females, U = unidentified bears

Table 2. Litter sizes of adult females and family groups observed in Wager Bay in September, 1988.

	COY LITTERS	YEARLING LITTERS	NO CUBS
Singles	5	4	-
Twins	3	2	-
Triplets	0	0	-
Total	8	6	4

The number of animals that were relocated was limited by the failure of the dye to remain on the bears for more than a few days. Additionally the densities of bears had declined from the initial surveys. The bears seen per hour of searching was 2.25 during the first 3 days of tetracycline marking but only 1.54 during the last 3 days of recapture efforts.

The tetracycline marking procedure performed well with few exceptions. The major exception was the marker dye. Prior to use in the field, the dye had been tested on polar bear hide and on captive wolves. In both instances the mark had remained on for more than 6 weeks even when washed occasionally with salt and fresh water. However, the dye was apparent on only a few of the bears after 7 days of field application and wear. It was apparent that all the colours of dye had been "weathered" off. Some bears could be identified by dart wounds as having been marked with tetracycline. Some members of family groups had lost dye marks while other family group members had retained them.

The failure of the dye to last on free-ranging polar bears may be due to several factors. Many of the bears entered the sea shortly after or during marking. Polar bear fur is oily in part to repel water during swimming. The combination of oily fur and sea water could have caused the dye to be washed from the fur before it had set. Some polar bears were observed licking at the dye. In any event it appears that Nelspot dye may be added to the long list of failed dyes for polar bears.

The 15cc darts were tested on adult males, adult females, and

subadults. The 1.75 inch needles were adequate for subadults and adult females. Two inch needles were adequate for the adult males. The 2.5 inch needles could be used safely on large males, but were not required. The larger diameter of the 15cc dart needles and the non-explosive injection provided by the vinegar and bicarbonate of soda pressure charge allowed the dart to remain in the bear long enough for the injection to occur without requiring the needle to be barbed. The 15 cc darts typically fell free of the bear minutes after the injection had occurred. No bears were found with 15cc darts still attached in subsequent surveys. The clear plexiglass dart body allowed each injection to be visually verified.

In 8 of 89 15cc darts employed, partial rather than complete injection occurred. The principle cause of incomplete injection was the angle of the dart to the surface of the bear. Low angle shots tended to be more susceptible to bouncing than more perpendicular shots. The number of incomplete injections and bounced darts decreased when increased discipline in shot selection was exercised.

The 10cc darts obtained from the Pneu-Dart company had defective charges and tail pieces. Their use was discontinued as soon as these problems were noticed. The charges could be replaced, and the tail pieces were functional if they were tightened with pliers.

The 6cc and 3cc darts disposable Pneu-Darts performed well. However, the needles of these darts (as well as the 10cc darts) are barbed so that the dart is not expelled by the explosive injection

of the drug. In most cases the darts are removed by the bear or work free within a few days; however, 1 cub was observed with a 3cc dart still in its shoulder 1 week post injection. The cub was captured and the dart was removed. The reason the dart had not fallen out or been removed by the mother appeared to be that the needle had been bent making the dart-needle into a fishhook shape. It is not possible to indicate the extent of this problem from our sample because not all bears that were injected with barbed darts were seen later.

Dart placement was greatly aided by driving the bears into water before darting. Additionally, polar bears sighted in the water could be quickly darted. This technique has obvious drawbacks for use with immobilization drugs, but can be safely utilized with tetracycline marking.

The PNEU-DART marker darts performed well after the rubber tips were shortened by 1/2 and blunted. Both thick and thin dye solutions were deployed effectively.

The tetracycline marking system appears to be fully functional after field testing. Annual dyes have been successfully used in marker darts for marking polar bears. However, the use of annual dyes encumbers the research with the obligation to compensate hunters financially for any marked bears harvested. The 10cc and 6cc darts would be improved if the dart bodies were clear plexiglass so that injection could be verified. It appears that the shorter versions of the same type of needles could be used if the charge system was bicarbonate of soda and vinegar. These

modifications should be field tested before field implementation occurs.

ACKNOWLEDGEMENTS

This work was supported by the Department of Renewable Resources, Government of the Northwest Territories. The Department of National Defense, the Polar Continental Shelf Project, and the Igloolik Northern Research Centre provided logistical support. We thank Aeroarctic Helicopters Ltd., especially pilot K. Faddigan and engineer K. Schaber who contributed greatly to the success of this work. We also acknowledge the support of the Hunters' and Trappers' associations of Cape Dorset, Coral Harbour, Hall Beach, Igloolik, and Repulse Bay.

LITERATURE CITED

Lunn, N.J., L. Gray, M.K. Taylor and J. Lee. 1987. Foxe Basin Polar Bear Research Program. 1986 Field Report. Dept. Ren. Res. Man. Rep.

Lunn, N.J. and G.B. Stenhouse. 1987. Foxe Basin Polar Bear Project - 1985 Field Report. Dept. Ren. Res. Man. Rep.

Stenhouse, G.B. and N.J. Lunn. 1987. Foxe Basin Polar Bear Project - 1984 Field Report. NWT Dept. Ren. Res. Man. Rep.

Stirling, I. and M.A. Ramsay. 1986. Polar bears in Hudson Bay and Foxe Basin: present knowledge and research opportunities. Pages 341-354 in I.P. Martini (ed.), Canadian Inland Seas, Elsevier Science Publishers B.V., Amsterdam, Netherlands.

Taylor, M. and J. Lee. 1990. Mark-recapture polar bear estimates using tetracycline as a biomarker. NWT Dept. Ren. Res. Man. Rep.

Taylor, M., J. Lee and L. Gray. 1990. Foxe Basin Polar Bear Research Program. 1987 Field Report. NWT Dept. Ren. Res. Man. Rep.

APPENDIX A. Polar bears captured in Wager Bay during September 1988

Bear	Reason	Age	Sex	Date	Location	Lat	Long
X8632	Recap	Adult	Female	19 Sep 88	Douglas Hbr	6538	08824
X8640	Recap	Adult	Female	12 Sep 88	North Shore	6540	08845
X8830	Recap	Adult	Female	11 Sep 88	North Shore	6535	08835
X8870	Mcap	Adult	Male	08 Sep 88	South Shore	6542	08950
X8872	Mcap	Yrlg	Female	19 Sep 88	Douglas Hbr.	6538	08824
X8873	Mcap	Yrlg	Female	19 Sep 88	Douglas Hbr.	6538	08824
X8874	Mcap	Adult	Female	19 Sep 88	Douglas Hbr.	6537	08826
X8875	Mcap	Coy	Male	19 Sep 88	Douglas Hbr.	6537	08826
X8876	Mcap	Coy	Female	19 Sep 88	Douglas Hbr.	6537	08826
X8877	Mcap	Adult	Female	19 Sep 88	Handkerchief Pt.	6517	08747
X8878	Mcap	Adult	Male	19 Sep 88	Handkerchief Bay	6516	08803
X8879	Mcap	Adult	Male	20 Sep 88	Savage Islands	6531	08830
X8880	Mcap	Adult	Female	20 Sep 88	South Shore	6541	08943
X8881	Mcap	Adult	Female	20 Sep 88	Northwest Shore	6551	08940
X8882	Mcap	Coy	Male	20 Sep 88	Northwest Shore	6551	08940
X8883	Mcap	Adult	Male	21 Sep 88	North Shore	6535	08832