FOXE BASIN POLAR BEAR RESEARCH PROGRAM 1987 FIELD REPORT

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ABSTRACT

In 1987 the Foxe Basin project was divided into two sections. The objective of the first section was to determine which polar bear populations the residents of northern and eastern Foxe Basin communities were harvesting in the spring. The areas harvested were surveyed by helicopter and all females encountered were radio-collared. The objectives of the second section were to deploy 30 radio collars in the summer concentration areas on Southampton Island and Wager Bay, and to field test the delivery system for the tetracycline tagging.

The spring surveys indicated a distinct boundary for the Foxe Basin population at its northern and eastern extremities in spring. All of the bears harvested from Cape Dorset and those harvested east of Fury and Hecla Strait with tags from Hall Beach or Igloolik may be considered to be from the Foxe Basin Population. The Igloolik and Hall Beach harvest taken west of Fury and Hecla Sound may be considered to be from the Gulf of Boothia population.

Eight radio transmitters were placed on adult females in April, 1987. Thirty radio transmitters were placed on adult females in September of 1987.

The tetracycline (disposable dart) delivery system was field tested and found to be both reliable and accurate after some modification. Both the large volume (15cc) and conventional darts appear to be fully functional.

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 co-operative 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 NT, initiated a mark-recapture program on Southampton and Coats islands. Stenhouse and Lunn (1987) and Lunn and Stenhouse (1987) summarized the results of the work conducted in 1984 and 1985, respectively.

In 1986, the Department of Renewable Resources re-evaluated the Foxe Basin Polar Bear Project because: 1) without the research agreement, the NT would have 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 had been 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 flown to relocate instrumented animals (Figure 1).

An alternative to traditional mark-recapture methods has been developed and is being evaluated. The antibiotic tetracycline binds with calcium and leaves a permanent mark in the bones and in the cementum annuli of teeth. In sectioned teeth, this mark is visible under ultra-violet light. Therefore, tetracycline could be used as the mark; 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 random, the marking will be randomized.

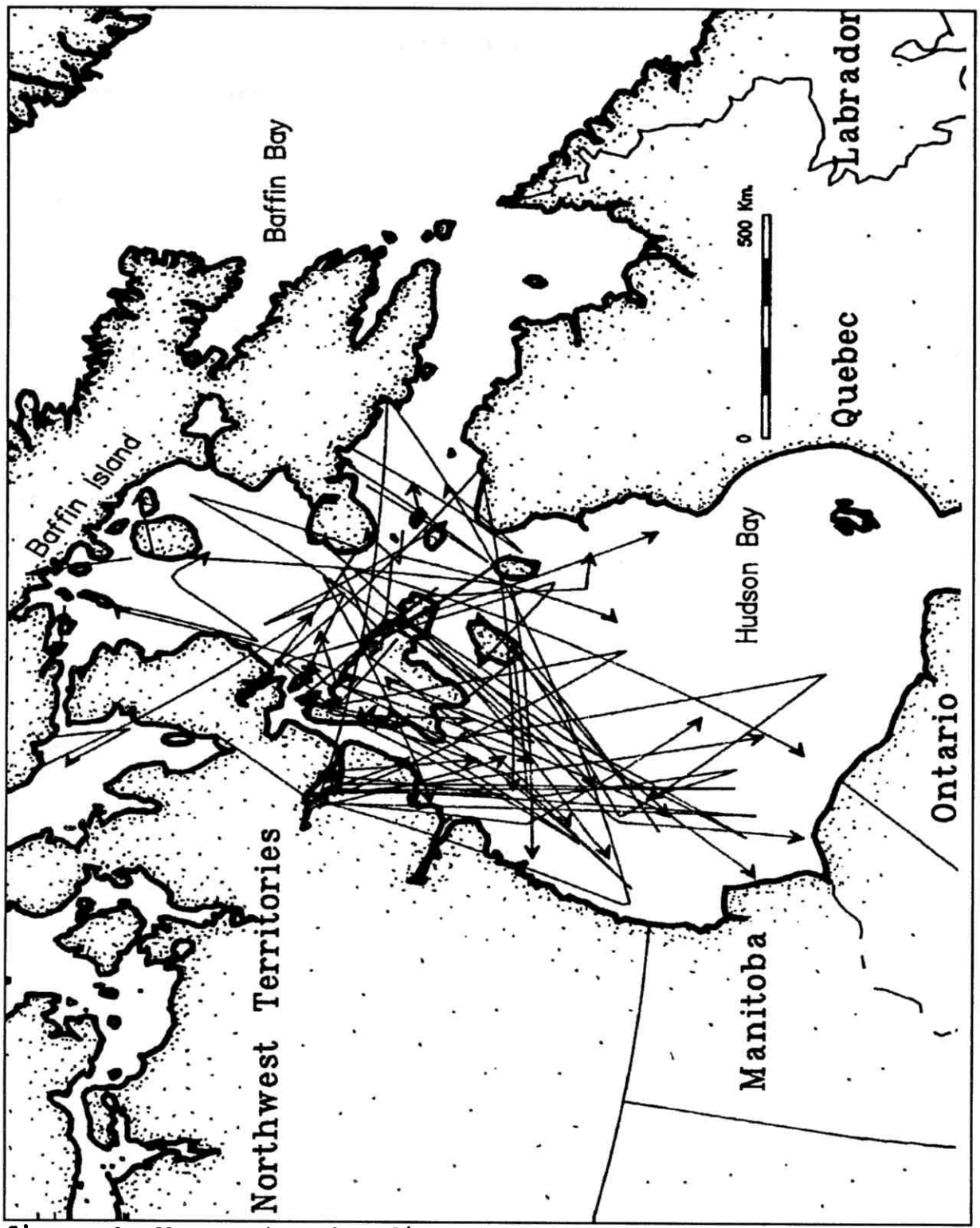

figure 1. Movements of radio collared polar bears 1986-1988.

OBJECTIVES

The objectives of the 1987 field season were to:

1) instrument up to 40 polar bears with radio transmitters in an effort to determine population boundaries;
2) field test the tetracycline delivery system in a controlled situation; and
3) document the spring distribution and abundance of polar bears in Hudson Strait and Northern Foxe Basin for the purpose of determining the harvest levels on the Foxe Basin Population.

This report summarizes the 1987 field season of the Foxe Basin Polar Bear Project.

METHODS

A Bell 206B Jet Ranger helicopter was used to locate and capture polar bears. The spring survey covered the coastal and near-shore areas of Foxe Basin except for the eastern islands and coastline. The summer survey was mainly confined to the coastal areas of Wager Bay and Southampton Island where polar bears are known to concentrate. Wherever possible, bears were classified based on sex (male, female or unknown) and on age class (adult, subadult, yearling cub, cub-of-the-year (COY) or unknown). Females were distinguished from males by general morphology (particularly size of neck) and the presence of a pronounced vulva patch stain (for females) below the anus and tail. Size and body morphology were the criteria used to separate polar bears into age classes. Cubs were readily identifiable as they were accompanied by an adult female. COY's were much smaller than yearling cubs. Bears that could not be classified were placed in the category "unknown".

Due to the conical shape of the head and neck of adult males, only adult females were radio collared (Telonics Inc., Mesa, Arizona, USA and Lotek Engineering Inc., Aurora, Ontario, Canada). Polar bears were immobilized by remote injection using Palmer Cap-Chur darts containing Zoletil 100 (Virbac Laboratories, Nice, Cedex, France) mixed to a concentration of 200 mg/ml. Zoletil 100 consists of a 1:1 ratio of the drugs tiletamine hydrochloride and zolazepam hydrochloride. Stirling et al. (1980) and Ramsay and Andriashek (1986) describe the capture and tagging of polar bears.

Adult females were fitted with radio transmitter collars. Fixed-wing aerial surveys will be flown periodically to relocate these instrumented bears. To determine whether or not females were pregnant, femoral blood was collected for later analysis of progesterone levels (Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada). Blood was only collected from females without cubs and females with yearlings captured in September.

RESULTS AND DISCUSSION

In April, the density of polar bears was low in both Hudson Strait and northern Foxe Basin. In spring, polar bears are taken in these areas primarily because the hunters have access to the bears on stable shore-fast ice. The density of polar bears was low in Hudson Strait from King Charles Cape to the Strathcona Islands. The area around the Strathcona Islands appeared to have higher densities; however, areas to the east were not searched. West of the Strathcona Islands, the shore-fast ice did not appear to be favourable habitat and the ice beyond the floe edge was highly crushed and 3 to 7 tenths open water. The area searched included Mill, Salisbury and Nottingham islands.

The floe ice in northern Foxe Basin was also highly fragmented and between 3 to 10 tenths open water. The shore-fast ice was reduced to about 0.5 km along the western edge of Foxe Basin north of Vansittart Island to Igloolik Island. Except for a small polynya at the eastern edge of Fury and Hecla Strait, Fury and Hecla Strait and all of northern Foxe Basin to Rowley Island was covered by shore-fast ice. The shore-fast ice allowed the hunters access to polar bears although the density of polar bears there was very low. Most of the active ice was being carried south by the strong (3-5 km/hr) currents.

The shore-fast ice extended west from Fury and Hecla Strait and north along the coast of Baffin Island. The prevailing northwest winds caused the shore-fast ice to contain multi-year floes and extend 50 - 60 km west into the Gulf of Boothia. Polar

bear densities were low on the shore-fast ice, although west of Agu Bay it appeared that densities of bears hunting seal pups along pressure ridges were increasing to coincide with the onset of pupping in subnivian lairs. Most tracks encountered in the Agu Bay area were coming into Agu Bay from the Gulf of Boothia.

The density of polar bears west of the floe edge in the Gulf of Boothia appeared to be extremely high based on a single east-west transect. It is believed that bears found in this area are a separate population from those in Foxe Basin, so polar bears were not captured west of the Gulf of Boothia floe edge.

Eight radio transmitters were placed on adult females in April, 1987. One radio was put on just west of Southampton Island. Six radios were put on in the Hudson Strait area: two along the floe edge east of Cape Dorset, two in the vicinity of Salisbury Island, and two along the west coast of the Dorset peninsula. Only one radio was put on in the north Foxe Basin area, just east of Jens Munk Island. One radio was also put on an adult male in the Gulf of Boothia, just south of Agu Bay.

A total of 65 hours was spent flying between 3 April and 6 April: 35 hours in northern Foxe Basin, 15 hours in southern Foxe Basin, and 15 hours in Hudson Strait. Table 1 summarizes the numbers of polar bears seen in April according to sex and age classes.

The mean number of bears seen per hour of searching in April was 0.52 bears , which is low relative to the bears seen per hour in most other areas. The searching was done by experienced

Table 1. Numbers of polar bears observed or handled, by sex and age classes, in Foxe Basin, Hudson Strait and northeast Gulf of Boothia in April 1987.

	AM	AF	SM	SF	SU	YR	CY	U	Total
NFB	3	1	0	0	1	0	1	0	6
SFB	2	3	0	0	1	1	2	0	8
HS	4	6	2	0	2	1	3	0	18
NGB	1	0	0	1	0	0	0	0	2
	10	10	2	1	4	2	6	0	34

NFB = northern Foxe Basin, SFB = southern Foxe Basin,
HS = Hudson Strait, NGB = northern Gulf of Boothia

AM = adult males, AF = adult females, SM = subadult males,
SF = subadult females, SU = subadults unidentified,
YR = yearling males, CY = COY females,
U = unidentified bears

personnel who concentrated their efforts on what appeared to be the best available habitat. The ice conditions were typically poor for polar bears in the areas searched. The low density and poor conditions probably explain why only 20% of the harvest occurs in the spring for Foxe Basin communities.

Although the actual number of bears seen was low (34) no females with 2-year old cubs were observed. Four out of nine adult females observed were with cubs of the year (Table 2). These results neither prove nor disprove the hypothesis that some polar bears may be on a 2 rather than a 3 year reproduction schedule, similar to the Churchill population (Stirling and Ramsay 1986).

It was obvious that most of the Foxe Basin polar bear population was not present in the areas surveyed. This raises the question of where Foxe Basin polar bears do spend the winter and spring. The southeastern and south central portion of Foxe Basin, the southern coast of Hudson Strait, and Northern Hudson Bay were not surveyed in April 1987. Additionally a very large area of high polar bear density in the Gulf of Boothia was observed incidental to the study. The Foxe Basin polar bears that spend the summer in large numbers in the vicinity of Southampton Island and Wager Bay may be in any of the above mentioned areas in the spring.

The radios deployed in both 1986 and 1987 will be followed through autumn 1988. These surveys should identify the primary winter and spring habitat of the Foxe Basin polar bears.

Table 2. Litter sizes of family groups observed in northern Hudson Bay and Foxe Basin in April 1987.

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

The autumn field work was restricted to the coastal areas of Roes Welcome Sound, Wager Bay, Coats Island and Southampton Island. A total of 144 polar bears was sighted, but only 67 of these were handled (Tables 3 and 4). Thirty-one radio collars were deployed on adult females (Table 2) and 21 were checked to be sure they had not been removed by the bear. One radio collar had fallen off. It was put on another bear. Thirty radio collars were deployed in the fall and 9 in the spring in 1987 (Appendix A).

Most of the bears encountered were within 3 km of the coast. Areas that were used by large males for summer retreats appeared to have fewer females, especially females with cubs. The apparent exception in Wager Bay is misleading. Most of the males sighted were on islands or in coastal areas where females with cubs were not found. Most females with cubs were in high relief areas on the south shore of Wager Bay and located so that they could survey the surrounding countryside.

The mountainous areas of northeastern Southampton Island are known to be maternity denning and summer retreat areas. Efforts to search in these areas were frustrated by high winds and low cloud ceilings. However, with the onset of stable shore-fast ice in late September, the density of family groups along the northeast coastline of Southampton Island increased, while the density of males and subadults dropped precipitously. Our interpretation is that the subadults and males moved onto the ice to hunt seals, while the females with cubs waited for more ice to form, perhaps

Table 3. Numbers of polar bears observed, by sex and age classes, in northern Hudson Bay and Foxe Basin in September 1987.

	AM	AF	SM	SF	SU	YR	CY	U	Total
COT	12	3	1	0	1	0	3	0	20
WAG	25	14	7	0	6	0	10	0	62
NE	1	10	0	1	0	10	3	0	25
NW	6	2	1	0	2	0	1	0	12
SE	9	2	1	1	1	3	0	0	17
SW	4	1	1	1	0	0	1	0	8
TOTAL	57	32	11	3	10	13	18	0	144

COT = Coats Island, WAG = Wager Bay, NE = NE Southampton Island, NW = NW Southampton Island, SE = SE Southampton Island, SW = SW Southampton Island

AM = adult males, AF = adult females, SM = subadult males, SF = subadult females, SU = subadults unidentified, YR = yearlings, CY = cubs, U = unidentified bears

Table 4. Litter sizes of family groups observed in northern Hudson Bay and Foxe Basin in September 1987.

	COY LITTERS	YEARLING LITTERS	NO CUBS
Singles	13	6	-
Twins	4	2	-
Triplets	0	1	-
Total	17	9	5

because the density of males on the shore-fast ice was too high.

The coastline south of Wager Bay and the coastline between Wager Bay and Repulse Bay was surveyed, but no adult females were found there. Additionally, the coastline from Repulse Bay to the vicinity of Vansittart Island, Vansittart Island and White Island were surveyed without finding adult females. The above areas did contain a low density of males and subadults.

The disposable Pneu-Darts were field tested with gelatin collars, gelatin barbs, soldered wire barbs, and improved soldered wire barbs. Neither the gelatin barbs nor the gelatin collars remained in the bears when the dart fired. The gelatin barbs failed five times in five attempts and their use was discontinued. The gelatin collars have even less holding power. Use of the gelatin collars was discontinued after two failures of two attempts. The soldered barbs held the dart in for a good injection; however, the barbs pulled off the needle and remained in the animal after the dart was removed. The small barbs had to be extracted with forceps. After two wire barbs pulled off the needle in two attempts at use, we discontinued use of the wire barbs.

A modification of the wire barbs was developed. The stainless steel wire was wound into a spring just large enough to fit over the needle. The "spring" was soldered to the needle and the end was cut to form a 5mm barb. Thirty-one of these improved barbed darts were successfully used. The smaller gauge wire allowed the dart to be removed with a slow steady pull.

The Pneu-Dart capture rifle uses charges of varying strength and has a mechanism for adjusting the power of a given charge. We found that setting #2 with a green charge worked well in both helicopter capture and ground capture. Both cubs and adults were darted. Cub darts had 3/4 inch needles while adult darts had 1 1/4 inch needles. There was no penetration of the skin by the darts.

The 15cc darts were loaded with penicillin for testing. The pink colour of the penicillin allowed visual verification of successful injections. The needles of the 15cc darts were constructed so that the fluid is injected perpendicular to the long axis of the dart body. Vinegar and baking soda are used to expel the fluid rather than an explosive charge. The combination of sideways injection and slow injection reduces the blow back effect as well as reducing the trauma of injection to the bear. Because of reduced blow back, these darts did not have barbs.

The dart needles failed to penetrate far enough for a successful injection on the first three trials. A stronger power setting was used, and 15 of 17 subsequent trials were successful. The darts were always given in the muscular neck or shoulder. Injection was visually verified, and the darts usually dropped out after a few minutes.

Two unsuccessful trials occurred on the same bear. The bear in question was a very large and very fat male. The dart needles were only 1 1/4 inches long. We suspected that the needles were not long enough to reach muscle tissue through the fat layer. The

fat was not sufficient to hold the dart in for the injection. Longer needles appear to be necessary for unusually fat bears.

Both the large and conventional dart rifle would appear to benefit from modifications to the sighting system and dart loading bolt. These modifications are in progress in preparation for final field testing in 1988.

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 Okanagan Helicopters Ltd., especially pilot M. Hutcheson 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.

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APPENDIX A. POLAR BEARS CAPTURED, FOXE BASIN, APRIL AND SEPTEMBER 1987

XNumber	Sex	Age Class	Lat	Long	Location	Reason	Radio	Freq	Date
X8621	M	ADULT	6250	8156	COATES I.	M-CAP			10/9
X8800*	F	ADULT	6217	8156	COATES I.	RECAP	27804	164.311	10/9
S0054*	M	COY	6217	8343	COATES I.	SIGHT			10/9
X8623	F	ADULT	6214	8343	COATES I.	M-CAP	87008	164.132	10/9
X8624#	F	ADULT	6507	8258	CAPE COMFORT	M-CAP	87007	164.119	12/9
X8625#	U	YRLG	6507	8325	CAPE COMFORT	M-CAP			12/9
X8626*	F	ADULT	6545	8325	S. WAGER	M-CAP			13/9
S0055*	U	COY	6545	8950	S. WAGER	SIGHT			13/9
X8627#	F	ADULT	6551	8950	BENNET BAY	M-CAP	27699	164.070	13/9
S0056#	U	COY	6551	8950	BENNET BAY	SIGHT			13/9
S0057#	U	COY	6551	8950	BENNET BAY	SIGHT			13/9
X8628*	F	ADULT	6558	8950	SILA LODGE	M-CAP	27811	165.780	13/9
S0058*	M	COY	6558	8940	SILA LODGE	SIGHT			13/9
X8629#	F	ADULT	6518	8940	WAGER BAY	M-CAP	27808	164.621	13/9
X8630#	F	COY	6518	8902	WAGER BAY	M-CAP			13/9
X8631	M	ADULT	6527	8902	SAVAGE ISLAND	M-CAP			13/9
X8633*	F	ADULT	6519	8826	S. WAGER	M-CAP	27803	164.291	14/9
X8634*	M	COY	6519	8902	S. WAGER	M-CAP			14/9
X8635#	F	ADULT	6530	8902	S. WAGER	M-CAP	27805	164.371	14/9
X8636#	M	YRLG	6530	8960	S. WAGER	M-CAP			14/9
X8637*	F	ADULT	6557	8960	FORD LAKE	M-CAP	27809	164.931	14/9
X8638	M	COY	6557	9019	FORD LAKE	M-CAP			14/9
X8639*	M	COY	6557	9019	FORD LAKE	M-CAP			14/9
X8640#	F	ADULT	6542	9019	S. WAGER	M-CAP	27817	165.980	16/9
X8641#	F	COY	6542	8945	S. WAGER	M-CAP			16/9
X8826*	F	ADULT	6546	8945	S. WAGER	RECAP	27807	164.540	16/9
S0061*	U	COY	6546	8959	S. WAGER	SIGHT			16/9
X8642	F	ADULT	6519	8959	S. WAGER	M-CAP	27813	165.421	16/9
X8830	F	ADULT	6551	8850	N. WAGER	RECAP	27802	164.281	13/9
X8785	F	SUBAD	6531	8928	NW SOUTHAMPTION I.	RECAP	27810	164.890	18/9
X8643*	F	ADULT	6353	8545	ELL BAY	M-CAP	21466	164.410	20/9

APPENDIX A. CONTINUED

XNumber	Sex	Age Class	Lat	Long	Location	Reason	Radio	Freq	Date
S0062*	U	COY	6353	8655	ELL BAY	SIGHT			20/9
X8644	F	ADULT	6448	8655	MURRY RIVER	M-CAP	18110	165.601	23/9
X8645#	F	ADULT	6502	8604	MURRY RIVER	M-CAP	18571	165.602	23/9
S0063#	U	COY	6502	8611	MURRY RIVER	SIGHT			23/9
X8646*	F	ADULT	6354	8611	SEAHORSE POINT	M-CAP	27812	164.970	27/9
X8647*	F	YRLG	6354	8033	SEAHORSE POINT	M-CAP			27/9
X8648*	F	YRLG	6354	8033	SEAHORSE POINT	M-CAP			27/9
X8649#	F	ADULT	6413	8033	CARIBOU I. AREA	M-CAP	27814	165.550	27/9
X8680#	M	YRLG	6413	8140	CARIBOU I. AREA	M-CAP			27/9
X8681*	F	ADULT	6422	8140	ASCENSION I. AREA	M-CAP	25939	164.781	28/9
X8682*	F	YRLG	6422	8144	ASCENSION I. AREA	M-CAP			28/9
X8683#	F	ADULT	6415	8144	15KM N CARIBOU I.	M-CAP	25940	164.790	28/9
X8684#	M	YRLG	6415	8141	15KM N CARIBOU I.	M-CAP			28/9
X8685*	F	ADULT	6425	8141	20M N ASCENSION	M-CAP	87010	164.151	29/9
S0064*	U	COY	6425	8145	20M N ASCENSION	SIGHT			29/9
X8686#	F	ADULT	6440	8205	C. FISCHER	M-CAP	87005	164.061	29/9
X8687#	F	YRLG	6440	8205	C. FISCHER	M-CAP			29/9
X8688*	F	ADULT	6520	8408	C. BYLOT	M-CAP	87003	164.041	29/9
X8689*	F	COY	6520	8408	C. BYLOT	M-CAP			29/9
X8650#	F	ADULT	6522	8413	NW C. BYLOT	M-CAP	87001	164.020	29/9
X8651#	M	YRLG	6522	8413	NW C. BYLOT	M-CAP			30/9
X8652*	F	ADULT	6429	8158	E. SOUTHAMPTON	M-CAP	87009	164.140	30/9
X8653*	M	YRLG	6429	8158	E. SOUTHAMPTON	M-CAP			30/9
X8654*	M	YRLG	6429	8158	E. SOUTHAMPTON	M-CAP			30/9
X8655*	F	YRLG	6429	8158	E. SOUTHAMPTON	M-CAP			30/9
X8656#	F	ADULT	6434	8156	C. FISCHER	M-CAP	87006	164.001	30/9
X8657#	F	YRLG	6434	8156	C. FISCHER	M-CAP			30/9
X8658#	F	YRLG	6434	8156	C. FISCHER	M-CAP			30/9
X8659*	F	ADULT	6431	8249	MATHIASSEN BROOK	M-CAP	87002	164.031	30/9
X8865*	M	COY	6431	8249	MATHIASSEN BROOK	M-CAP			30/9
X8622#	F	ADULT	6215	8315	COATS I.	M-CAP	27801	164.220	10/9
S0065#	U	COY	6215	8315	COATS I.	SIGHT			10/9
S0066#	U	COY	6215	8315	COATS I.	SIGHT			10/9

APPENDIX A. CONTINUED

XNumber	Sex	Age Class	Lat	Long	Location	Reason	Radio	Freq	Date
X8632*	F	ADULT	6538	8827	DOUGLAS HARBOUR	M-CAP	27806	164.430	14/9
S0059*	U	COY	6538	8827	DOUGLAS HARBOUR	SIGHT			14/9
S0060*	U	COY	6538	8827	DOUGLAS HARBOUR	SIGHT			14/9
X8838	F	ADULT	6442	8205	C. FISCHER	SIGHT	12468	164.643	05/4
X8853#	F	ADULT	6402	8145	EAST BAY	M-CAP	20112	165.491	05/4
X8854#	M	COY	6402	8145	EAST BAY	M-CAP			05/4
X8855#	M	COY	6402	8145	EAST BAY	M-CAP			05/4
X8856	F	ADULT	6431	7810	LONE BUTTE BAY	M-CAP	25855	165.211	08/4
X8857*	F	ADULT	6350	7730	PUTNAM ISLAND	M-CAP	18586	165.820	08/4
X8858*	M	YRLG	6350	7730	PUTNAM ISLAND	M-CAP			08/4
X8859	F	SUBAD	6415	7512	CAPE WELLINGTON	M-CAP	20111	165.480	09/4
X8861#	F	ADULT	6330	7715	SALISBURY ISLAND	M-CAP	25852	165.111	15/4
S5050#	M	COY	6330	7715	SALISBURY ISLAND	SIGHT			15/4
S5051#	F	COY	6330	7715	SALISBURY ISLAND	SIGHT			15/4
X8860*	F	ADULT	6425	7311	KORSK INLET	M-CAP	14905	165.353	11/4
S5052*	F	COY	6425	7311	KORSK INLET	SIGHT			11/4
X8862	F	ADULT	6443	7815	CAPE QUEENS	M-CAP	18578	165.671	19/4
X8863#	F	ADULT	6940	7900	JENS MUNK ISLAND	M-CAP	27815	165.650	21/4
S5053#	F	COY	6940	7900	JENS MUNK ISLAND	SIGHT			21/4
X8864	M	ADULT	7015	8750	FOSS FIORD	M-CAP	27800	165.110	22/4

* Family Group
\# Family Group