



## DAVIS STRAIT POLAR BEAR INVENTORY

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## Davis Strait Polar Bear Inventory

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### Summary:

The entire Davis Strait summer retreat area (e.g. onshore coastal and inshore areas of Nunavut, Labrador, and Quebec, Fig. 1) were searched by the capture team during the first year of this three year project. The capture work was completed between 01 August and 01 October with 633 total captures (626 original captures and releases). There were 2 handling mortalities. No analyses of these data have been attempted to date; however a summary of the sex, age and family status of the bears captured is provided.

### Introduction

Over 50% of the world's total polar bears occur in Nunavut. Approximately 80% of the world's total kill of polar bears occur in Canada, mainly by the local Inuit, but also by sport hunters on guided hunts. Of the 14 polar bear populations in Canada, all but one is within or shared with Nunavut. Therefore, most of the responsibility for conservation of polar bears and the economic value gained from this species fall to Nunavut.

Canada and the other arctic nations have signed the *International Agreement for the Conservation of Polar Bears*. The mandate for polar bear management was passed from the federal government to the Northwest Territories with the passage of the Northwest Territories Act, followed by the Wildlife Act and associated regulations for polar bear management. With the onset of Nunavut, the Minister of Environment retained ultimate responsibility for conservation, wildlife research, management, enforcement, and conservation education as identified in the Nunavut Final Agreement.

A population inventory is a determination of the essential information to manage a harvest or assess an impact. A population inventory has 5 main parts. The first is to identify demographic units for the target species in the affected area (the population boundaries). The second is to enumerate the population and determine the distribution of individuals into the various sex/age and family status categories. The third is to determine the natural (no harvest, no impact) rates of birth and death. The fourth is to determine and quantify the human-caused effects (reductions to birth rates or increases to mortality). The final part is to combine this information to determine the population status and, for our application, the sustainable harvest (sustainable quotas for polar bears). This research is a population inventory of the Davis Strait polar bear populations (Figure 1).

For Davis Strait, the population delineation work (part 1) has already been done, and the harvest monitoring program (part 4) is ongoing. Development of new quota recommendations (part 5) cannot occur until the second and third steps are completed. This research is necessary to obtain estimates of the Davis Strait polar bear population number (part 2) and birth and death rates (part 3). The summary report will also include the new quota recommendations. The estimates of population numbers and vital rates will be based on mark-recapture data. This method has been used successfully for the Kane Basin (KB), Norwegian Bay (NB), Lancaster Sound (LS), Viscount Melville (VM), Foxe Basin (FB), Gulf of

Boothia (GB), M'Clintock Channel (MC), and Baffin Bay (BB) populations by the primary investigator.

### **Project Objectives:**

The objectives of this study are:

- 1) To identify the population boundaries for the Davis Strait polar bear population (completed).
- 2) Monitor the harvest of polar bears (ongoing as a separate program).
- 3) To estimate:
  - i) The population number,
  - ii) Sex/age/family status population composition,
  - iii) Recruitment and survival rates, and
  - iv) Population number.
- 4) To estimate population status and sustainable harvest for each population using the above.

### **Materials and Methods:**

#### *Methods (Study Area):*

The study area (Figure 1) is the Davis Strait population and also the adjacent populations. The method for determining the boundaries requires that movements of polar bears be recorded on both sides of the boundaries being delineated. The following Nunavut Baffin communities harvest polar bears from this population: Pangnirtung (19), Iqaluit (23), and Kimmirut (4). Currently, the combined annual Nunavut quota for this population is 46.

#### *Methods (Project Design):*

The first phase of this population inventory (1993-1998) was identification of boundaries. Approximately 80 satellite radio collars were deployed in a uniform fashion throughout the Davis Strait and Baffin Bay area. The population boundaries were based on an analysis of the movements of these polar bears (Taylor et al. 2001).

The next phase of the population inventory is a mark-recapture population estimate. One of the assumptions in the classical analysis model is that each individual has an equal opportunity to be captured. We attempt to meet this assumption by capturing every bear seen during uniform geographic coverage of the population area. However, we also employ analysis models that can account for capture heterogeneity (e.g., Program MARK). Under ideal conditions, approximately 15-30% of the total population must be marked to obtain an accurate and precise survival and population estimate. Under typical conditions the fraction marked must be higher to achieve the sample size necessary to fit an analysis model that contains co-variants. We will assess our data after 3 years to determine if additional sampling is required.

Program Vital Rates provides estimates of recruitment and cub survival rates from an analysis of the mark-recapture data arranged as a series of standing age distributions. The adult survival estimate is based on the recapture history of the bears and is estimated using program MARK. The survival rate estimates are required to estimate the number of marked bears in the population at any given time. The estimated number of marked individuals allows

the ratio of marked to unmarked bears to be interpreted as an estimate of the number of unmarked bears in the population. The estimate of population numbers is thus based both on the survival rate estimates and the marked to unmarked ratio in the capture sample. The total allowable harvest (maximum sustainable yield) can be calculated as a function of the rates of recruitment and survival once the population size is known.

#### *Methods (Polar Bear Capture):*

The polar bear capture will take place during spring. Whenever a polar bear is encountered it will be immobilized with a dart gun (Pneudart ) from a Bell 206 helicopter (or an equivalent aircraft). Zoletil (tiletamine hydrochloride and zolazepam hydrochloride) will be used at a concentration of 200mg/ml and administered at approximately 5mg/kg. Immobilized bears are measured (auxiliary girth, zygomatic width, total straight length), ear tagged, lip tattooed, a tooth is taken for aging, and a claw tip as well as a hair sample are collected. The sex, an approximate age, the condition, and any genital abnormalities are noted. When abnormalities are found, blood samples and a fat biopsy may be taken. When cubs of the year are encountered, they are immobilized by restraining them with rope and they are hand injected. Following processing, the bear or family group is allowed to recover. All telemetry and mark-recapture data are archived as part of the Canadian National Database for polar bears.

This methodology contained in this proposal has been extensively reviewed both internally and by the Federal/Provincial Polar Bear Technical Committee. It is the only accepted method for obtaining this information. This proposal was also reviewed by GN biologists at their annual meeting for that purpose.

#### **Results:**

A total of 633 polar bears were captured. There were 2 capture mortalities (adult female and a male cub of the year). Two family groups were captured twice because the marking crayon had worn off. These were counted as re-sights on the second capture of 2005. A total of 626 individuals were captured and released.

The sex/age/family status of captures (including mortalities, but not re-sights) is provided in Table 1. Of the 628 captures (includes 2 capture mortalities, but not 5 accidental same-year re-captures) 17 were recaptures.

#### **Discussion:**

No analyses of these data have occurred yet, however the number captured in 2005 is more than double the number ever captured in a fall field season by any project in any population. Most of those participating in this work had never done polar bear capture work before, and the lead researcher had not been able to capture polar bears at a similar rate in any previous studies. The unavoidable conclusion is that densities of polar bears were extraordinarily high compared to other polar bear populations.

This qualitative conclusion from our systematic survey of the entire population summer retreat area confirms Inuit knowledge that this population is present at high densities. Our impression was that family groups tended to be geographically segregated from large males.

We also had the impression that family groups tended to be in poor condition relative to large males and single females. This suggests that the population may be experiencing a density effect on cub survival. It will be necessary to sample over more years to confirm or reject these hypothesis.

**Management Conclusions:**

The current harvest levels, including the Nunavut TAH increases in 2004 seem well within conservation limits. A quantitative analysis will require sampling at the same level for the next 2 years.

**Reporting to Communities/Resource Users:**

HTO representatives from Kimmirut, Iqaluit, and Pangnirtung participated in the research activities in their area. Our intention is to meet with the HTOs over the winter to review our information once it has been entered and graphical materials are available. The report will be provided to collaborators in Greenland, Labrador, and Quebec for dissemination to management authorities and local hunters there.

**References:** None.

Table 1. The sex/age/and family status frequencies of polar bears captured from 01/08/2005 to 03/10/2005 in summer retreat areas of the Davis Strait population are listed.

<b>Sex/Age/Family Status</b>	<b>Number</b>	<b>Frequency by sex</b>	<b>Frequency by total</b>
Female cubs of the year	20	0.08	0.03
Female yearlings	15	0.06	0.02
Female subadults (2-5)	61	0.25	0.10
Female adults with no cubs	82	0.34	0.13
Female adults with 1 COY	22	0.09	0.04
Female adults with 2 COYs	16	0.07	0.03
Female adults with 1 yearling	15	0.06	0.02
Female adults with 2 yearlings	13	0.05	0.02
Male cubs of the year	34	0.09	0.05
Male yearlings	26	0.07	0.04
Male subadults (2-5)	46	0.12	0.07
Male adults	276	0.72	0.44
Total Captures	326		
Mean COY litter size		1.42	
Mean yearling litter size		1.46	

Figure 1. The Davis Strait DS polar bear population is one of 13 polar bear populations within or shared with Canada.