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**Social play in adult polar bears (*Ursus maritimus*) and human influences on the behavior of bears near Churchill, Manitoba.**

Report on Field Activities

October 17- November 12, 2003

Churchill, Manitoba, Canada

33 volunteers

**HIGHLIGHTS**

The first goal of this research was to examine the play behavior of free-ranging male polar bears and determine the adaptive significance of these interactions. Our second major goal was to examine the influence of humans on the behavior, use of space and energetics of the polar bears in the tourist regions. During this field season we increased our focus on the second goal of this study. We established photo identification records of 36 bears (22 confirmed males, 6 females and 8 of unknown sex), of which 5 males were identified from previous years. One male was first identified in 1996. Many other bears were observed but we were unable to identify them permanently in the field due to a lack of facial scar patterns. These individuals may be permanently identified after whisker spot pattern analyses have been performed on these unknowns. We videotaped 46 separate play bouts between polar bears, which are currently being digitized and analyzed in greater detail to help distinguish among alternative hypotheses for the function of these interactions.

To determine the influence of humans on bear behavior, we conducted a series of experiments to determine if vehicle movements or sounds may affect bears, and how the responses of individuals may change over time. We are really excited by the outcomes of these experiments. The approach experiments were designed to determine at what distance, if any, bears were disturbed by vehicle approach, if responses changed over time for individuals, as well as any possible subtle behavioral cues that may be predictors of disturbance. We recorded 76 approaches for multiple bears (19 known and identified individuals and up to 25 unknown bears), with up to six approaches per bear. We also worked on the design for a series of sound experiments that will test if bears are affected by human produced sound. We collected baseline data on human sounds during encounters with bears that will be used in 2004 playback experiments

## **OBJECTIVES**

Polar bears (*Ursus maritimus*) spend most of their lives on the sea ice, where they hunt seals, but when the ice melts in summer they come ashore. While on land they rarely eat, sustaining themselves from stored fat, and by autumn most have lost considerable body mass. Yet in western Hudson Bay males form highly social groups each autumn and spend a great deal of time in energetically costly "play fighting". Even though individuals may engage in prolonged play bouts, injuries rarely occur, in contrast to the spring breeding season, where males can inflict severe wounds on each other. Such nonaggressive interactions suggest that these activities are a form of play, which is very rare among adults of most mammalian species, and indicate that the social system of polar bears is much more complex than previously recognized. Yet the significance of such highly cohesive male groups and play fighting in this "asocial" species has not been adequately examined. Our first main research objective, therefore, has been to determine the adaptive significance of play fighting by male polar bears in autumn.

These large congregations of interacting polar bears and the accessibility of polar bears in the Churchill region has led to a growing tourist industry. This heightened human activity, including the addition of two temporary tourist camps that recently have been set up in the area, has increased the contact between bears and people. Although harassment of polar bears appears to be higher in the tourist areas, nothing is known about how such exposure could affect polar bear behavior, use of space, and energy expenditure. As more bears become habituated to the presence of humans, a greater number of habituated bears may be attracted to the town of Churchill or the tourist areas, resulting in a greater likelihood of adverse conflict between humans and bears. In addition, odors and gray water from the tourist camps may attract bears, creating a resource for bears to contest, and the behavior of bears around these camps may differ from those in other areas. Thus, our second main research objective has been to assess the effects of human (tourist)-bear interactions on the behavior and use of space by free-ranging polar bears.

In addition, our specific goals for this field season were to incorporate direct experimental manipulations to examine the influence of humans on the behavior of the bears. We also continued to increase our permanent photo identification record of polar bears in the study, especially by the use of whisker spot patterns.

## **METHODS**

We observed polar bears during October and November of 2003 in northeastern Manitoba, Canada, in a region about 25 km east of the town of Churchill. Daily observations were conducted from tundra vehicles, i.e., large buses specially designed and built to travel on the tundra. We used digital photographs to document the scar patterns and other abnormalities that can be used for the identification of individual polar bears, and created a digital photo-identification folder for each bear highlighting the distinguishing features. The body size of each polar bear was estimated using a digital camera and a rangefinder.

Between 9 a.m. and 4 p.m. of each day of data collection, we recorded the identity, location, and behavior of all bears in view from our vehicle every 30 minutes (scan sampling). The number of other tundra vehicles and helicopters in the area was also recorded. Locations of bears were determined using a hand-held GPS, compass, and laser rangefinder. In addition, all social interactions (any play, aggression, or other interaction between two or more individuals) were recorded with a digital camcorder (all-occurrences sampling). Behaviors recorded during scan observations included these categories: 1) social (all interactions between individuals), 2) resting, 3) sitting, 4) walking, 5) running, and 6) drinking at the gray water. All social interactions were further classified as one of the following behavioral categories: 1) chases, 2) vocalizations, 3) fighting, 4) allogrooming, and 5) greeting behavior.

We investigated the effect of tourist vehicles on polar bear behavior by recording responses of bears to approaching vehicles. Bears in a stationary position (i.e. sitting, lying down) were approached by vehicle at a constant, slow rate of speed, and the response of the bear was recorded. Any sudden movement or change in body position by the bear during the approach was considered a reaction to the activity of the vehicle, and resulted in termination of the experiment.

## **VOLUNTEER TASKS AND ACCOMPLISHMENTS**

This season 33 volunteers in 4 teams assisted in data collection. Volunteers worked in pairs, and each pair was assigned a specific task. The assignments were as follows:

- 1) Photo id: learn to recognize individuals by determining scar patterns or other abnormalities for identification. Record data on these identifying features using a digital camera. Assist the Behavioral Data and Camcorder teams with identifying bears.
- 2) Body size estimates: use a digital camera and a laser range finder to estimate body sizes of the bears.
- 3) Behavioral data: every 30 minutes, record the identity, behavior, and location of all bears in view (scan sampling). In addition, record all human-bear interactions.
- 4) Camcorder: use a digital camcorder to record ANY interactions between bears, taking note of the identity of the interactors, who initiates and who terminates the interaction.
- 5) Spatial data: collect data on the locations of bears. Use a Global Positioning System (GPS) to find the location of the tundra vehicle, and then determine the direction and distance to each bear using a compass and digital rangefinder. Collect this data every 30 minutes while in the field.

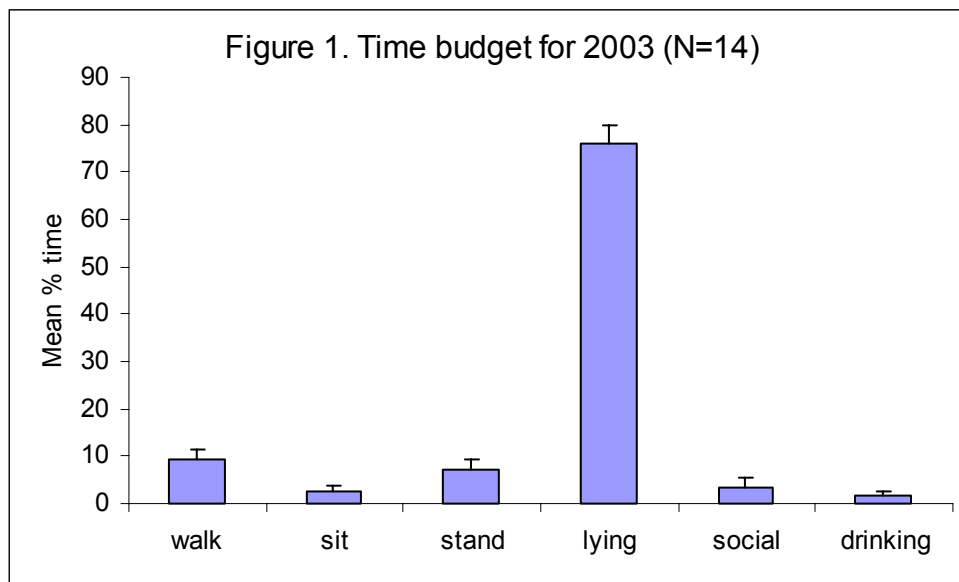
This field season was our first to use a vibration reduction lens on the digital camera. This lens allowed us to gather more fine-scale, detailed data on the facial pattern and body size of polar bears than we had ever been able to collect, as the constant motion

of the vehicles makes such images difficult to obtain. Thanks to the skill of our volunteers and the vibration reduction lens, the photographs were the most focused and the best we have ever had.

## RESULTS

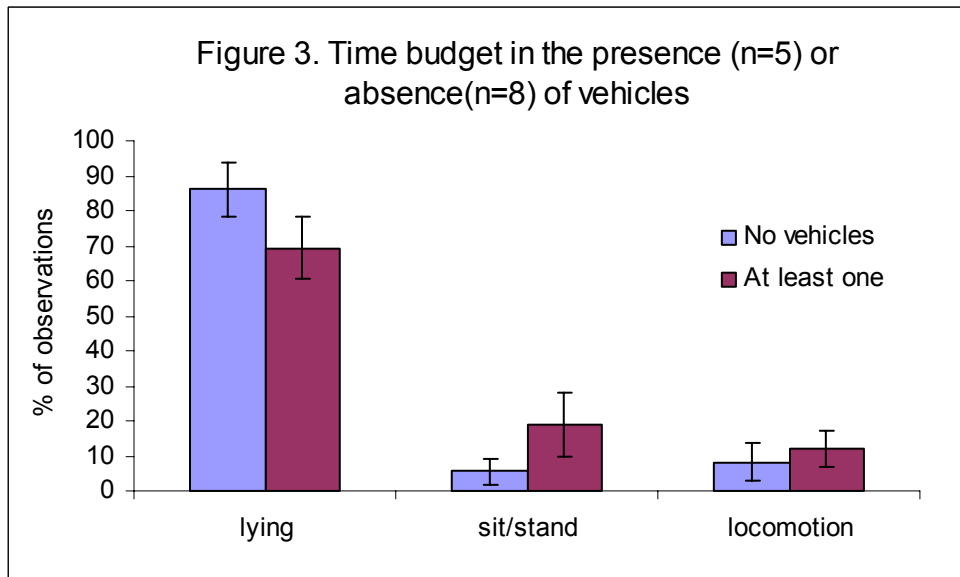
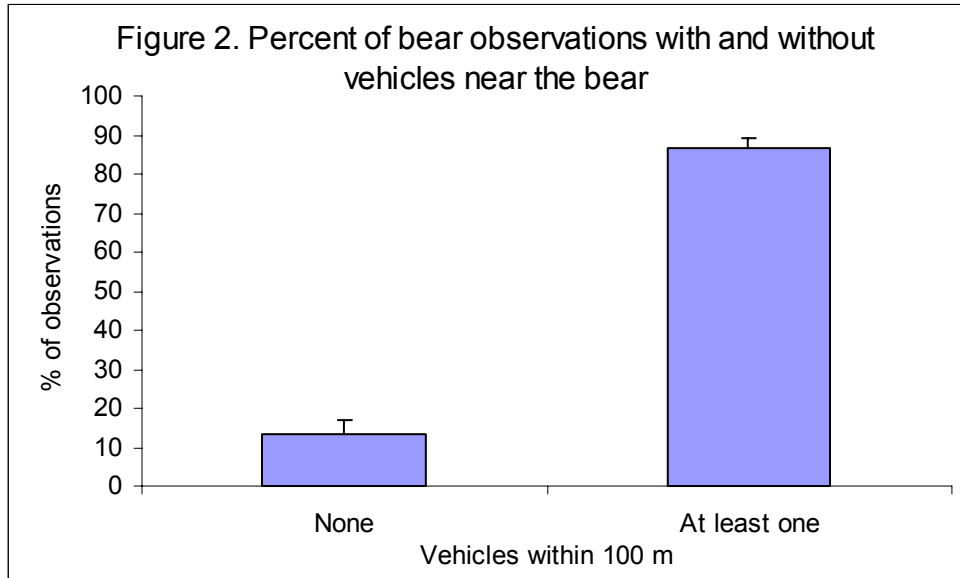
Photo identification portraits were made of 36 bears (the other bears either did not have any distinguishable marks or were not seen close enough for portraits to be made). Five bears were bears we had already identified in previous field seasons (One Eye (Tower), Juju/Tango, Xray/Eggplant, Cheek/DB). We are currently working on a method to quantify whisker spot patterns and hope to increase the sample size of known bears in the area. Body size measurements were obtained for all 36 bears (with up to 16 estimates per bear). Forty-six total social interactions were observed and videotaped. In total, 25 hours of videotape were recorded. All video data have been archived by converting to MPEG1 format and then burning onto a DVD. These MPEG1 files are currently being analyzed for frequency and duration of behavioral components using Observer Video Pro software (Noldus Inc.).

Time budget analysis of male bears indicated that they spend most of their time lying (Fig. 1). Walking and standing were the second most common behaviors.



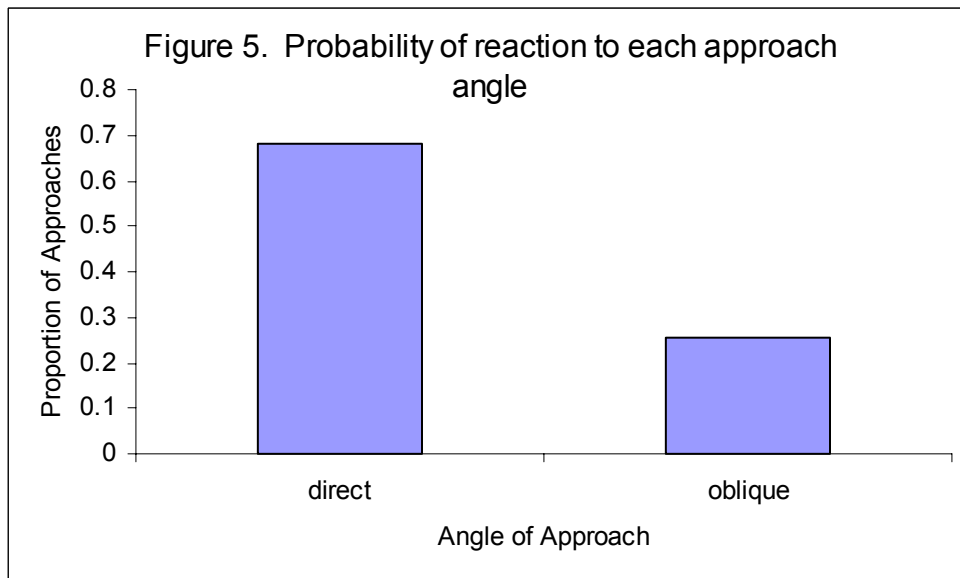
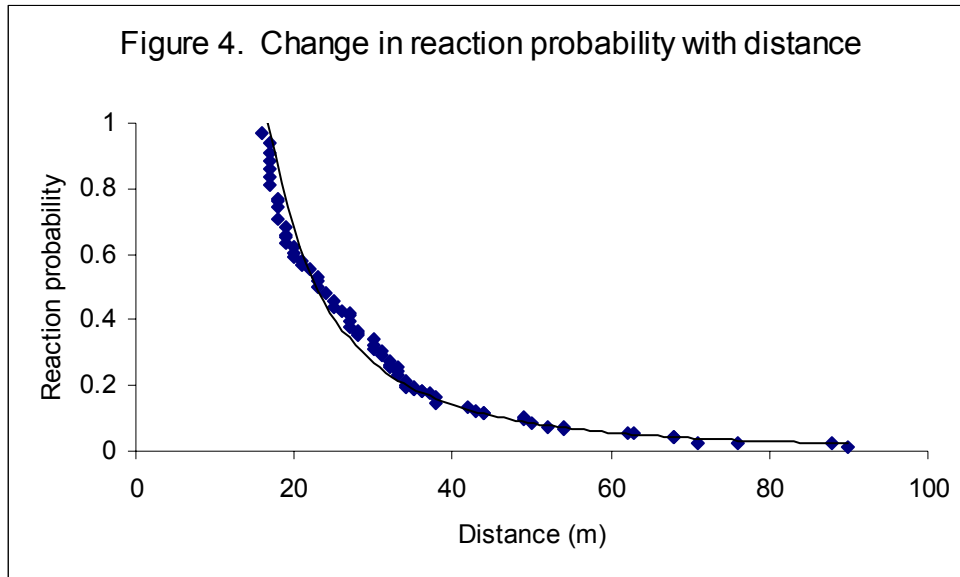
During our observations of bears, the average number of tourist vehicles within 100 m of a bear was 2.4, and in only 14% of our observations were no tundra vehicles within 100 m of the bear (Fig. 2). Although the sample size was small, when vehicles

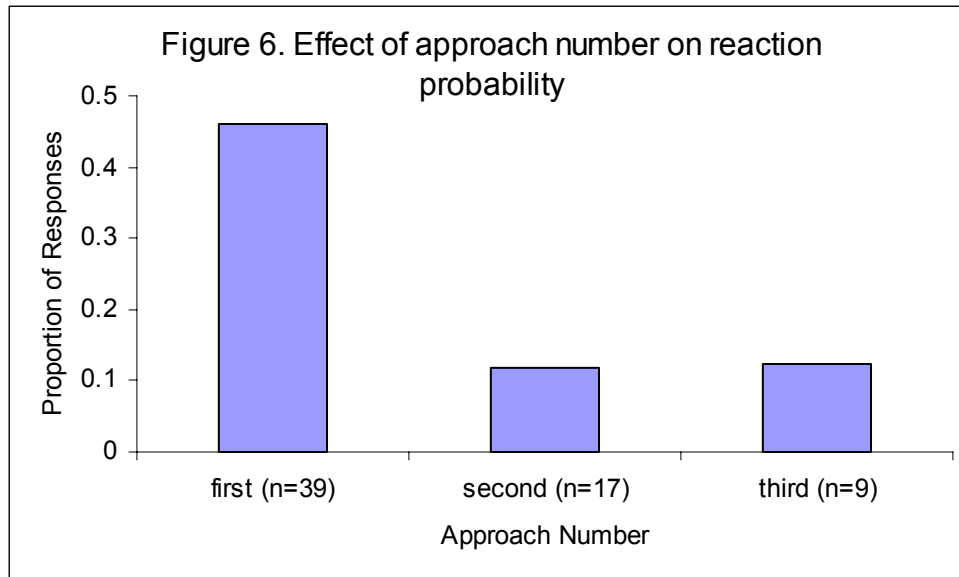
were present, bears spent significantly less time lying and more time sitting or standing (Fig. 3). There was no difference in the time spent in locomotion.



We recorded 76 responses of bears to approaching vehicles, for multiple bears (19 permanently identified and up to 25 unknown bears), with up to six approaches per bear. These data were analyzed to determine the factors that affect the likelihood of a bear's reaction to the vehicle (a change in body position or any sudden movement by the bear at the time of approach). Bears reacted to the approaching vehicle in 40% of the approaches. The average distance at which bears reacted was 38m. The likelihood of reaction increased as the vehicle drew closer to an individual, with the probability of reaction increasing rapidly from 40m to 20m (Fig. 4). Approaches that were directly

toward a bear were more likely to elicit a reaction than approaches at an oblique angle (Fig. 5), but the average distance at which the reaction occurred was the same for both. Although the likelihood of reaction was not affected by the minimum number of days bears were in the tourist area, bears were much more likely to react to the first vehicle approach than subsequent approaches (Fig. 6), implying that habituation occurs within a single day in the tourist area. Similarly, reaction distance decreased after the first approach. Raising the head during an approach significantly predicted a reaction, especially when multiple head-raises occurred.





## DISCUSSION

Our analysis of human-bear interactions showed that some bears clearly respond to the presence and activity of the tundra vehicles. The factors that were significant predictors of a reaction response were distance, angle of approach, and approach number. The minimum number of days in the tourist area was unrelated to the reaction response, suggesting habituation to vehicles can occur within one day of arriving in the tourist area. As the vehicle drew closer to a bear, the probability of reaction increased rapidly between 40 and 20m, suggesting this distance may be critical to the bear's perception of intrusion. The way a bear is approached by a vehicle (directly or at an angle) and how close the vehicle gets are variables that are easily controlled by the driver. Reaction to the vehicle by a bear was often preceded by raising the head multiple times during an approach. Such subtle behavioral cues may be used by tour operators to predict and avoid more energetically costly reactions by bears to human activities.

This field season was tremendously successful in examining the influence of humans on the behavior of the bears, and we continued to collect the data necessary to assess the significance of adult male interactions in this species. Coupling behavioral with spatial data will enable us to examine whether affiliations exist between specific bears, as well as the other potential explanations for the play interactions we observe. The quality and quantity of data collected continued to improve dramatically. In particular, the extent of our photoidentification record was increased significantly over previous field seasons. This record was edited using a laptop computer on the tundra vehicles during our data collection sessions, which improved our ability to accurately assess and confirm diagnostic physical characteristics. In addition, the help that our Earthwatch volunteers gave in entering and analyzing data in the computer allowed us to assess our data collection methods while still in the field.

In April, Gillian Eckhardt will present these results to Conservation Manitoba officials in Winnipeg. These officials are considering the development of guidelines

(either voluntary or regulatory) for the tourist industry in Churchill, and our results may be useful to help determine a balance between wildlife viewing and educational opportunities for tourists with practices that promote polar bear conservation.

## **ACKNOWLEDGMENTS**

We would like to thank the volunteers from Earthwatch who helped us during the 2003 field season for their enthusiasm, assistance, and suggestions for improvement of this study. We also wish to point out that Gillian Eckhardt has worked long and hard to prepare many of the results presented in this report and we thank her for hard work over the past 7 months. In addition, we would like to thank Barbara Graunke, Carole Roberts and Kimberly Mayfield for valuable assistance during the field season. We would also like to thank our undergraduate research assistants, Patricia Botero and Jennifer Liable, who have been assisting in analysis of video data. The staff of the Churchill Northern Study Centre once again helped us overcome many research obstacles. We would also like to thank Misty-Anne Marold and the other Earthwatch staff for their infinite patience. Lastly, we thank the Polar Bears International for their continued financial support.