BEAR DETECTION AND DETERRENT STUDY

CAPE CHURCHILL, MANITOBA, 1983

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ABSTRACT

Bear detection and deterrent tests were completed at Cape Churchill, Manitoba from 19 September to 10 November and 28 November to 6 December 1983. Polar bears (*Ursus maritimus*) were attracted to the study site by the use of beluga whale (*Delphinapterus leucas*) and ringed seal (*Phoca* hispida) carrion bait. Field tests were conducted on: rubber batons, plastic slugs, prototype plastic slugs, and flare/scaring cartridges. Testing was carried out during daylight hours and, with the aid of an electric floodlight system, during periods of darkness. A capture program (immobilization) and a dye marking program enabled the return rates and behavioural data of 42 bears to be determined.

Rubber batons were 99.2% effective in deterring both experimental (n=67) and control bears (n=56) from the bait site. One bear (1/123) could not be deterred. One bear was killed during the field season when struck in the abdomen by a rubber baton. Of the 42 marked bears struck with batons, 30 (71.4%) were tested once and 12 (28.6%) returned to the bait site after being deterred once. Behavioural differences were observed in marked bears which received deterrent tests in 1982 and 1983.

Of the 49 bears struck with 12 gauge plastic slugs while approaching a ground crew, 27 (55%) moved away and 22 (45%) continued their approach. Age class appeared to be an important factor in the responses of bears to plastic slugs.

Flare/scaring cartridges were successful in deterring 16 (64%) of the bears approaching a ground crew; 9 (36%) were not deterred.

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INTRODUCTION

Confrontations between man and bear have occurred since both species began competing for a common habitat. The success of this co-existence and the long-term effects of man/bear confrontations can be seen by counting the remaining "pockets" of grizzly bears (Ursus arctos) in the continental United States (Cowan 1972). Similar confrontations between man and bear still occur today throughout North America (Gildart 1981, Herrero 1970, 1976).

A number of authors (Hamer et al. 1981, McArthur 1982, McCullough 1983) have made the association between non-hunted bear populations and bears which have lost their "natural" avoidance or fear of man, thus becoming problem bears. For example, Hamer et al. (1981) state that: "In the past, hunting, or the removal of problem bears, probably established an avoidance behaviour in the bear population: aggressive or bold animals were culled, and consequently bears that avoided people were selected".

Although this hypothesis seems reasonable, it may be a somewhat simplistic view of the problem. First, it assumes that boldness and aggressiveness are genetically inherited traits. There is no evidence on which to judge this assumption. Secondly, the indigenous people of the Canadian arctic have probably been hunting polar bears (Ursus maritimus) for centuries, yet today there are still polar bears that do not avoid humans. We must, therefore, conclude that either the purported selection process has not existed long enough to affect the total polar bear population, or other factors must be influencing the behaviour of bears towards man (e.g., motivation, curiosity, past associations with human habitations, physical condition, social status in the bear population, etc.). It is doubtful that hunting a bear population will eliminate the occurrence of problem bears, now or in the future.

In the Northwest Territories (NWT), man's increasing utilization of previously undisturbed bear habitat (Stirling and Calvert 1983) has resulted in an increase in the number of serious man/bear conflicts. Many of these conflicts result in human injury or death, and/or the destruction of property. While it is not known what percentage of man/bear encounters result in the death of a bear, it must be recognized that bears which cannot be chased away (deterred) are usually shot.

With an increase in industrial exploration and development (e.g., oil and gas, and mining), and other forms of human activity (e.g., scientific research, tourism, etc.) in the NWT, more man/bear encounters can be expected, and indeed are occurring. It is important to emphasize that northern industrial exploration and development is not responsible for all problem bear kills; many problem bears are killed by residents of the NWT. Therefore, it is important to realize that all human activities occurring in bear habitat will have an impact on bear populations.

It is well recognized that man/bear confrontations can result in damage to property and/or serious injury or death to man (Whitlock 1950, Norris-Elye 1951, Herrero 1970, Manning 1973, Jonkel 1975, Stirling 1975, Pelton et al. 1976, Stenhouse personal files); however, little emphasis has been placed on the effects of problem bear "mortalities" on resident bear populations in the NWT. Although an increased awareness of the problem has occurred in recent years through reports of the number of problem bears killed each year in the NWT (Stenhouse 1983a,b,c), more interest is generated by reports and details of bear maulings and human fatalities of man/bear encounters in the popular media (Fadiman 1984).

The number of problem polar bears destroyed annually could, when combined with natural mortality and current harvest rates, result in population reductions of this species. It is important to note that insufficient data are available to assess the short or long-term effects of problem bear kills on grizzly and black bear populations.

Man/bear conflicts can occur for a variety of reasons; many of which are not fully understood by biologists. It is known that bears are attracted to human habitations by food, garbage, and associated odours (Stenhouse 1983c, Tietje and Ruff 1983). Many conflict situations can be avoided or reduced through more efficient handling of food, garbage and other waste materials. Once bears have found a nutrient-rich food source (e.g., garbage), they are often reluctant to leave. If and when they do leave, they may make regular return visits to the site in search of food (Dorrance and Gunson 1976).

In addition to being attracted by food, bears will investigate any novel stimulus in their environment (Bacon 1980, Bacon and Burghardt 1976, Stenhouse 1982, 1983b). This behavioural trait has been termed curiosity, but the exact cause of this behaviour is unknown. Bears attracted by novel stimuli can inflict major damage to equipment and machines and jeopardize the safety of personnel working in the area. Encounters between bears and humans often result in economic loss to a company working in bear habitat (Follmann et al. 1980). There are circumstances in which workers will have to stop work until the bear(s) have been driven from the work site. In addition, there are many individuals who will want to observe or photograph the intruding bear irrespective of the possible danger. Accordingly, it is important that workers be trained and provided with basic knowledge which will allow them to respond to a bear's presence in an appropriate and safe manner. This approach would reduce danger to personnel and potentially reduce the number of bears destroyed in defense of life or property.

In the NWT, application of proper camp and work-site procedures can be used to reduce the occurance of man/bear conflicts. Despite the implementation of proper camp procedures, there will be cases in which bears will enter human installations and encounter people. These encounters cannot be avoided and must be dealt with effectively.

Problem bears have been exposed to a number of management techniques across North America. The most common technique is bear relocation (Cole 1972, Craighead and Craighead 1972, Pearson 1972, Craighead 1976). Miller and Ballard (1982) concluded that ..."although transplanting problem bears may be occasionally justifiable by social or economic factors, we conclude that such efforts have high probabilities of failure". Most programs have been implemented to relocate problem grizzly and black bears, and have made use of existing roads for the transportation of bears.

The lack of an extensive road system in the NWT reduces the applicability of problem bear relocation programs. In addition, the relocation of problem polar bears has met with little success (Stirling et al. 1977).

No effective electrified fence system has been designed or tested for problem polar bears (Stenhouse 1982). Electrified fence systems have been used to protect apiaries (Gilbert and Roy 1975, Gunson 1980) and construction camps (Follmann et al. 1980) from intruding black and grizzly bears. Fencing requirements are site specific and must be designed accordingly. The design developed by Follmann et al. (1980) appears to be promising. A complete review of the use of electrified fences to deter bears is outlined by Herrero (1983).

In addition to these common management techniques, research on food aversion paradigms has been conducted (Wooldridge 1980), but has proven ineffective in deterring bears from a food source.

In most cases where people have had to deal with problem bears, a number of common deterrent techniques have typically been used (e.g., firing warning shots, cracker shells, airhorns, chasing the bear by snowmobile or helicopter). Unfortunately, in most cases these techniques have been ineffective. Once these common techniques fail, and the bear remains a threat to life and property, the animal is killed as a last resort.

The NWT Wildlife Service (NWTWS) and others (Craighead and Craighead 1972, Cowan 1972, Hamer et al. 1981, McCullough 1983) have long recognized the fact that the killing of problem bears and the safety of people in bear habitat are serious problems. In response to these problems a Bear Detection and Deterrent Research Program was initiated by the NWTWS in 1981 to test and develop equipment and techniques to detect and deter problem bears, thereby increasing human safety and reducing the number of problem bears killed.

The goals of this program are:

1) to develop and test a variety of detection and deterrent systems that are effective and can be applied to each type of human installation whether it be a small exploration camp or a large industrial site or community; and,

2) to develop and implement education and training programs for people who may have to deal with nuisance bears.

The results of the first 2 years of work have been reported elsewhere (Stenhouse 1982, 1983b).

This paper reports on the research completed from 19 September to 10 November and 28 November to 6 December 1983 at Cape Churchill, Manitoba.

STUDY AREA

The study area is located at Cape Churchill, Manitoba (56°46'N, 93°14'W) (Fig. 1), within the coastal zone of the Hudson Bay Lowlands (Coombs 1954). The eastern half of the study area is composed chiefly of gravel beach ridges interspersed with freshwater lakes and ponds, and the western half is mainly a large, shallow brackish lake (Fig. 1). The inland waters were frozen by the first week of November. Vegetation in the area is typical of subarctic regions (Hustich 1957), mainly consisting of sedges (*Carex* spp.), willow (*Salix* spp.), mosses, lichens and forbs.

Study Population

Polar bears come ashore along the Manitoba and Ontario coasts when the Hudson Bay ice melts in late July or early August. Females with cubs and pregnant females move 20-50 km inland, adult males congregate along the coasts, and subadults of both sexes are distributed inland between the males and females (Knudsen 1973, Stirling et al. 1977). Subadults of both sexes do, however, utilize coastal regions in conjuction with adult males (Stenhouse 1983b).

While on land, polar bears feed on birds, mammals, carrion, and kelp (found on the tidal flats) (Nero 1971), as well as shoots (*Salix* spp.) and submergent vegetation from freshwater lakes during the ice-free season of Hudson Bay.

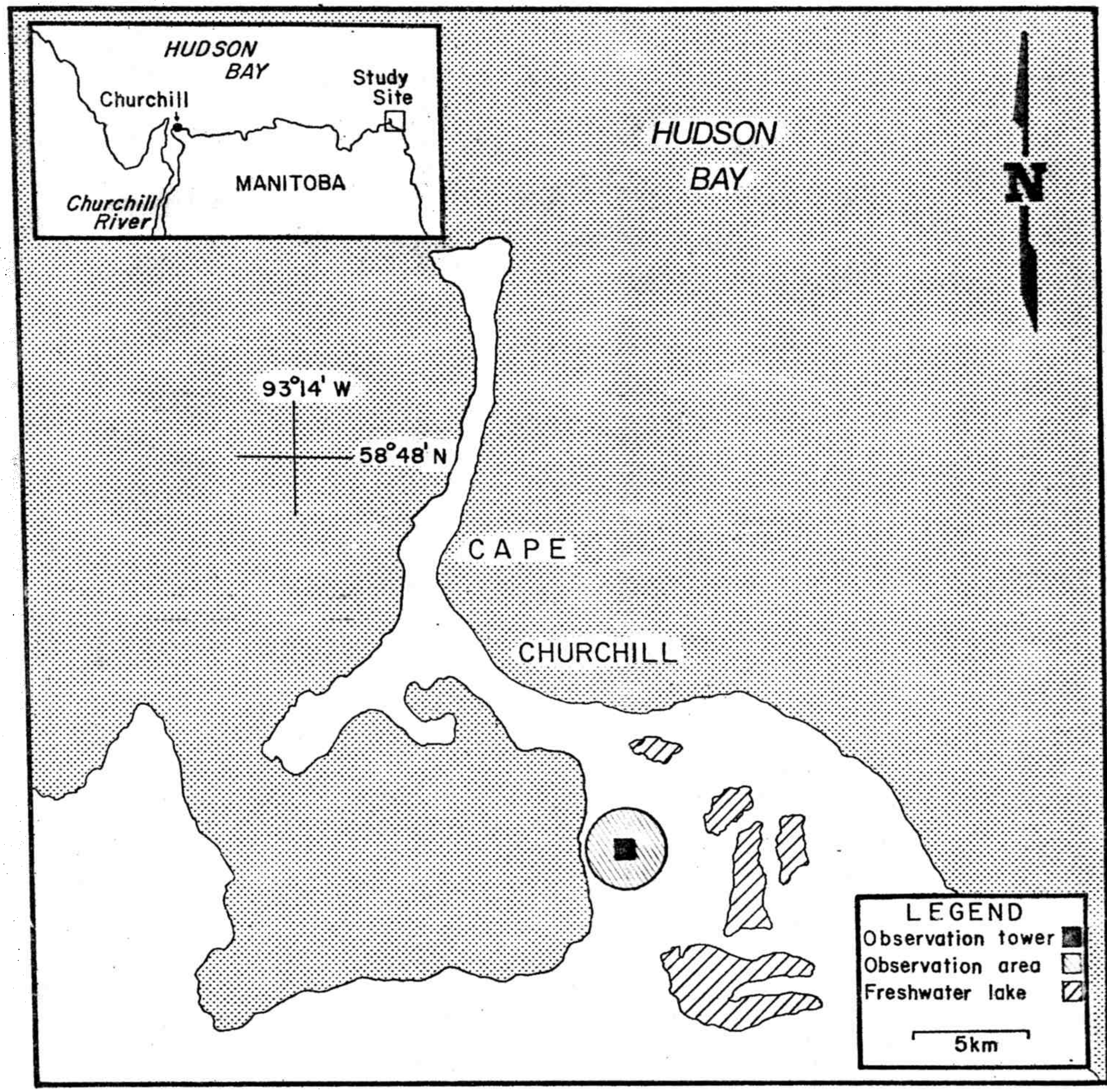

Figure I. Location of the 1983 bear detection and deterrent study site at Cape Churchill, Manitoba.

The bears gradually move north along the Manitoba coast between September and November and large numbers congregate in the Cape Churchill region during these months (Russell 1975, Latour 1980, Stenhouse 1982, 1983b). At freeze-up (usually in mid-November), the bears disperse onto the new ice. During the 1983 field season, freeze-up did not occur until mid-December and, therefore, the experimental testing period was lengthened.

METHODS

Observations were made from a Canadian Wildlife Service (CWS) observation tower located 1.5 km south of the Hudson Bay coast (Fig. 1) at Cape Churchill, Manitoba. A wooden hut on top of the 13.5 m high tower served as the observation post/living quarters.

A steel cage at the base of the observation tower was used to store bait and equipment. No deterrent tests were conducted from inside this cage since previous results demonstrated that bears struck with rubber batons did not charge or display any aggression towards the researchers (Stenhouse 1983b). Four electic lights (Crous-Hinds High Pressure Sodium NAC 1100, 110 v A.C.) were mounted on the roof of the observation hut to allow testing during periods of darkness.

Baits of ringed seal (*Phoca hispida*) and beluga whale (*Delphinapterus leucas*) carrion were placed at a site 45 m north of the observation tower. Pieces of this bait were placed inside both a collapsed 45 gallon steel drum and a piece of chain link fence, which was folded over the bait, chained, and wired shut to enclose the bait. These containers prevented bears from easily removing the bait prior to the initiation of deterrent tests. The barrel and chain link fence were then anchored to another 45 gallon barrel, which was cut open and filled with rocks and gravel to serve as an anchor. Bait was put out as required, typically three times daily. A small quantity of naphtha gas was poured into the collapsed barrel and ignited in order to heat the bait and generate odours to attract the bears. Later, during the field season, when temperatures were consistently below freezing, it was impossble to remove pieces of bait from the bait barrels and, therefore, the entire barrel was placed at the bait site. The barrel was heated with naphtha gas and bears had to chew or dig out pieces of the frozen bait from the open barrel.

Tests were conducted each day from approximately sunrise to sunset (0800-1800 hrs). In addition, tests were conducted for between 2 and 3 hours each night. Painted wooden stakes were positioned around the observation tower to form a series of concentric circles (Fig. 2), which were used as timing zones. The distance of the zones were 40 m, 60 m, 80 m, and 175 m from the base of the observation tower. These zones were used to measure the approach and exit rates of each polar bear, before and after deterrent tests.

As bears approached the tower and bait site, they were randomly assigned to an experimental or control subject category. However, marked bears (see section "Identification of Individuals") that had already received deterrent tests were always classed as experimental subjects if they returned. This was done to avoid the problem of intermittent positive reinforcement.

Data were collected on focal individuals approaching the tower and bait site, as well as on focal groups of bears within the timing zone during this same period (Altmann 1974). It was, therefore, possible to test the reactions of numerous bears at the

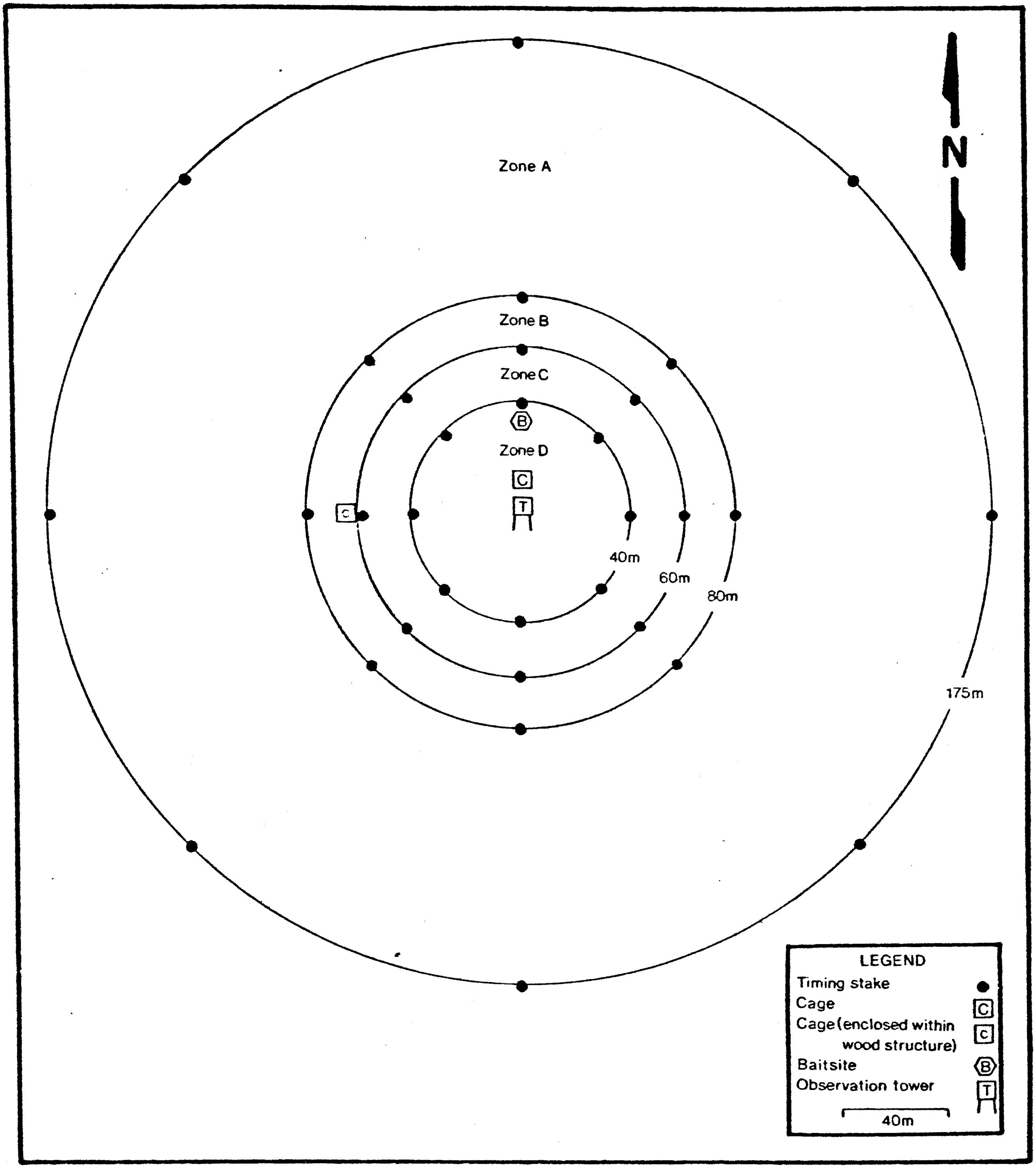

Figure 2. Location of timing zones, bait site, testing cage and observation tower at the study site, Cape Churchill, Manitoba, fall, 1983.

bait site, as well as recording the responses of other bears in the various timing zones during each experimental trial.

As bears entered the study site and moved through the timing zones, a record was kept of the amount of time spent in each of the four zones, as well as the behavioural state (Lehner 1979) the bear displayed in each zone.

Once an experimental bear reached the bait site, it was allowed to feed undisturbed for 1-2 minutes. Time spent feeding (defined as licking oil or eating bait) was recorded along with the results of any interactions between other bears at the bait site.

After 1 to 2 minutes, rubber batons or dye-filled rubber batons were fired at the focal bear from the ground by a researcher at the northern base of the observation tower in an attempt to deter the bear from the bait site. The distance between the bait site and the researcher was approximately 35 m. The behavioural response of the focal bear and all other bears within the study site, to each deterrent were recorded. Control bears were not subjected to any deterrent tests for 15 minutes after beginning to feed. After 15 minutes, tests were conducted with rubber batons in an attempt to also deter control bears from the study site. Control bears were classified as control animals prior to receiving any deterrent; after that time (i.e., on exit of timing zones), these bears were also regarded as experimental animals.

During the course of daily activities at the study site, there were many man/bear encounters. In these situations, and when the safety of the research staff was not in jeopardy, flare/scaring cartridges and/or 12 gauge plastic slugs were tested for their effectiveness as deterrents. Tests were not structured and, therefore, simulated a typical man/polar bear encounter in a camp setting.

In addition, we planned to test a trip wire detection system that was integrated with a trip flare deterrent device. A semi-enclosed wooden tent frame was constructed with a small steel testing cage inside it, for testing purposes. However, when the trip flares arrived at the study site it was felt that there was a strong possibility that when the inquisitive nature of the polar bear was combined with highly explosive flares, serious injury could be inflicted upon experimental polar bears. Post field season studies revealed the flares to contain more powder than initially specified in the original design of the product. For these reasons, no tests were conducted with the trip flare detection system.

The following data were recorded on cassette tapes for each bear entering the study area:

1) date, time, wind speed and direction, and temperature;
2) direction of approach and exit;
3) tag, mark number or identifying characteristics, sex and age of the bear if known;
4) approach and exit times in each zone;

5) amount of time at the bait site;

6) number and marks of other bears within the study area;

7) aggressive encounters at the bait site;

8) order of feeding when more than one bear was at the site;

9) number of shots fired at the bears at the bait site;

10) responses of bears struck;

11) simultaneous responses of other bears within the study area when deterrents were being tested;

12) location where deterrent projectile struck the bear;

13) distance between bear and shooters when testing plastic slugs; and

14) location, color, and mark left on bears struck with dye-marking rubber baton.

The data were transcribed onto coded sheets for statistical analyses. Detailed behavioural responses were extracted from 16 mm film (via Bolex H-16), which were recorded during some of the tests. Statistical analysis of the 1983 data included the following tests: analysis of variance, and, to test selected data, a Mann-Whitney U test and the Wilcoxon test for matched subjects.

Behavioural Catalogue

Based on observations made during the 1981 and 1982 field seasons at Cape Churchill (Stenhouse 1982, 1983b), a behavioural catalogue was compiled and utilized during the 1982 field season (Table 1). Two new behaviours, "bite" or "snap", and "hiss", were added to the behavioural catalogue in 1983.

Table 1. Behavioural catalogue of experimental and control polar bears observed during the 1983 bear detection and deterrent study, Cape Churchill, Manitoba.

Behavioural Catalogue	
<u>Lying and resting</u>	<u>Exploring/curiosity</u>
lying stretched	lateral head shift
lying curled	stand on hind legs
sitting	sniff - air
	sniff - substrate
	head-up-down
<u>Agonistic</u>	<u>Comfort Movements</u>
charge/rush	roll
lip smack/snarl	scratch
snort	lick
head-up-down	shake
bite or snap	defecate
hiss	urinate
<u>Locomotion</u>	<u>Ingestion</u>
walk	drink
trot	chew
gallop	tear
	lick

These behaviours were only exhibited when a bear was struck with a rubber baton (Stenhouse 1983b), and both behaviours were agonistic. No new behaviours were observed during the 1983 field season.

As in 1981 and 1982, observations once again focused on behavioural states and frequency of occurrence to analyze behavioural sequences.

Table 1 does not include social, sexual or hunting behaviour categories and, therefore, does not represent the full behavioural repertory of the polar bear.

Field Reports on Rubber Batons

Based on the successful testing of rubber batons in 1981 and 1982, (Stenhouse 1983b) the NWTWS provided Wildlife Officers with 38 mm rubber batons and rifles during 1983. The Manitoba Department of Natural Resources also purchased this equipment for use by their staff in Churchill, Manitoba.

In an effort to provide an ongoing evaluation and to receive feedback from field staff utilizing this equipment in actual problem bear situations, data sheets were distributed to each officer receiving this equipment in the NWT and Manitoba.

Identification of Individuals

In order to gather information on the behavioural responses of individual bears and to determine the effects that age and sex might have on these responses, a marking program was conducted. The program was divided into two components: 1) immobilization of bears from a helicopter, and 2) marking bears without handling the animal.

In the first component, polar bears within a 15 km radius of the study site were captured and marked in cooperation with the Canadian Wildlife Service (CWS) polar bear research team. These bears were darted and immobilized from a helicopter (Bell Jet Ranger 206B). Each bear was marked with a tattoo on the upper lip, ear tags, and a numeral or a letter painted on the back using a commercial hair dye (Lady Clairol). Each bear was sexed and weighed. A premolar tooth was extracted for ageing. Approximately 25 hours of helicopter time were devoted to capturing and marking polar bears during the 1983 deterrent program at Cape Churchill. Those hours were spaced over the course of a one month period.

The second component of the marking program was carried out over the course of the entire study period. Unmarked bears approaching the observation tower were struck with dye-filled eggs thrown by the researchers. Bears that approached the bait site were struck with rubber batons modified (Fig. 3) to contain approximately 5 cc of dye. Each dye-filled baton had a 7 cm x 1.3 cm hole drilled in the centre of each rubber baton, and four 1.2 cm x 0.3 cm holes were drilled around the perimeter of the main

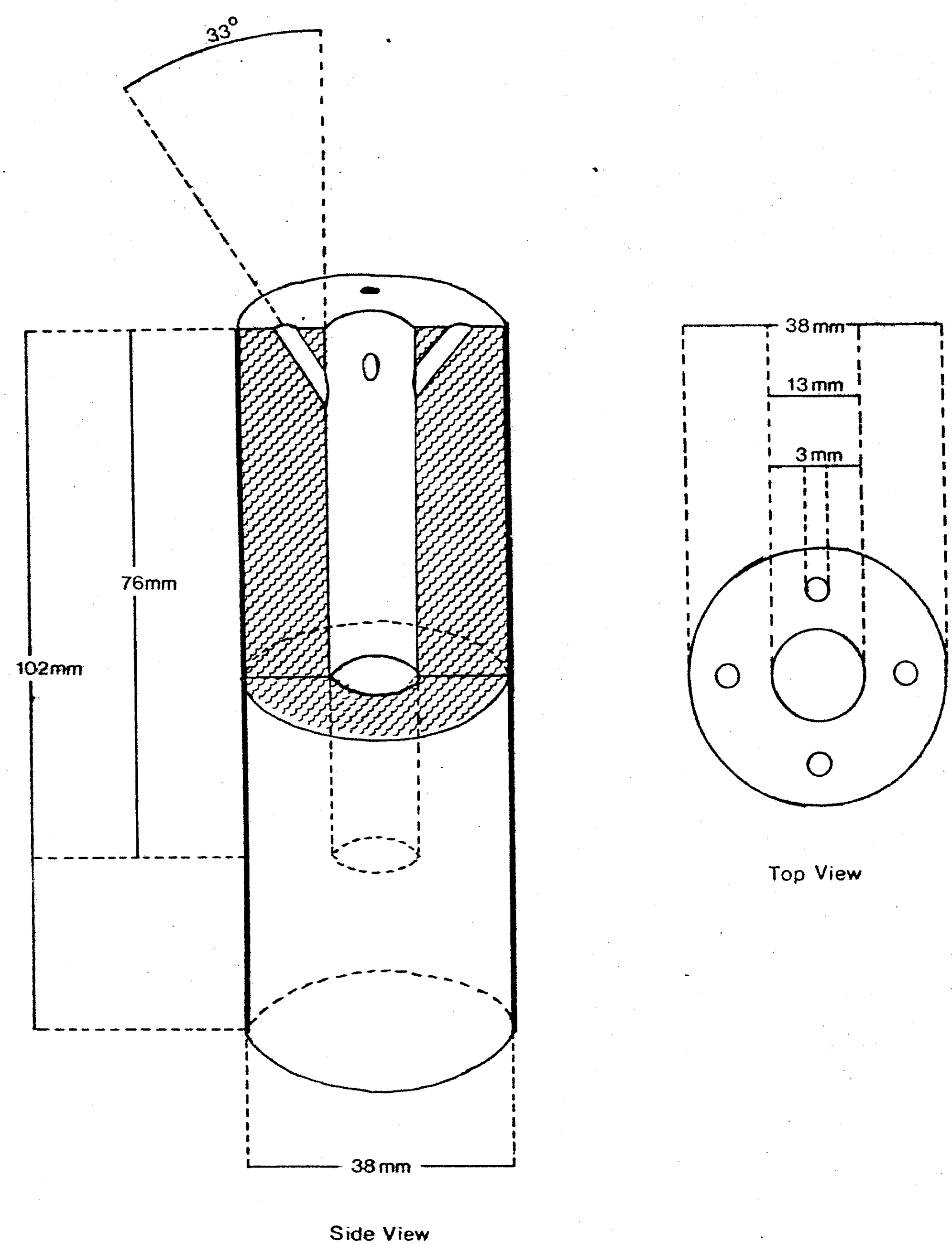

Figure 3. Modified rubber baton used for dye marking program, Cape Churchill, Manitoba, fall, 1983.

hole at approximately 30° angles. Each of the five holes was then filled with various coloured dyes, prepared by mixing food coloring with blonde Lady Clairol hair dye. The holes were sealed with transparent adhesive tape.

When a bear was struck with a dye filled baton, the impact caused the dye to push away the adhesive tape and spray onto the animal through the five outlet holes. Photographs were taken of all polar bears which were marked with this rubber baton/dye-marking technique to provide recognition of individuals over the course of the study.

Only the Schermuly (English) rubber batons were drilled to accept dye; no alterations were made to the Fiestal (German) rubber batons, because it was felt that the Schermuly product was adequately secured in its casing, while the Fiestal shell was not.

MATERIALS

Rubber Batons

Two different models of 38 mm anti-riot rubber batons were tested during the study. The first was the Schermuly (English) 38 mm rubber baton (Stenhouse 1982, 1983b) and the second was the Fiestal (German) 37/38 mm rubber baton. The Fiestal product cost $4.00/shell less than the Schermuly cartridge. The ballistics of both shells were almost identical; however, the manufacturers' production techniques differ. The rubber projectile of the Schermuly cartridge is molded or pre-formed and then inserted into the aluminum casing. The Fiestal rubber projectile is inserted into the aluminum casing in rod form and then cut at the appropriate length. The Fiestal baton does not have bevelled edges on the projectile as does the Schermuly baton. In addition, the aluminum casing of the Fiestal shell does not completely enclose the rubber projectile and the projectile can be hand-turned in its casing.

Plastic Slugs

Additional tests of the "Ferret" practise rounds or 12 gauge plastic slugs were conducted during the 1983 field program. A Ferret practise round consists of a 5 cm solid plastic tapering projectile with four tail fins. This projectile is housed inside a standard 12 gauge shotgun shell. The muzzle velocity of this shell is 167.6 m/sec (550 ft/sec) when fired from a 12 gauge shotgun (Figure 4). Stenhouse (1983b) showed that these shells were not effective in deterring polar bears from a bait site. As a result of this finding, a different testing methodology was employed to determine whether these same shells would deter polar bears approaching a ground-based field crew.

Since 1982, we have been attempting to develop and test a projectile that would be as effective as rubber batons have proven to be, and at the same time, eliminate some of the drawbacks of rubber batons, which include: inaccuracy, short range capability, single shot capability, cost, and the need for a special (38 mm) gun to fire the batons. Since this time, the Ferret practise round has been modified to provide a similar impact velocity to a bear from a distance of 35-40 m (Fig. 4). A number of prototypes have been produced using a heavier projectile and a variety of powder charges. This paper reports on the results of tests conducted using the prototypes on bear carcasses (black, grizzly, and polar bear) in various locations during the past year. It is important to stress that none of these tests were conducted on live bears and no tests were undertaken with these modified cartridges at Cape Churchill.

All Ferret practise rounds and the modified rounds were fired from a Winchester (Model 1200) stainless steel 12 gauge pump shotgun during the 1983 field season. This shotgun proved to be an excellent weapon with a 7 shot capacity and a stainless steel barrel which prevented plastic from the cartridges adhering to its barrel.

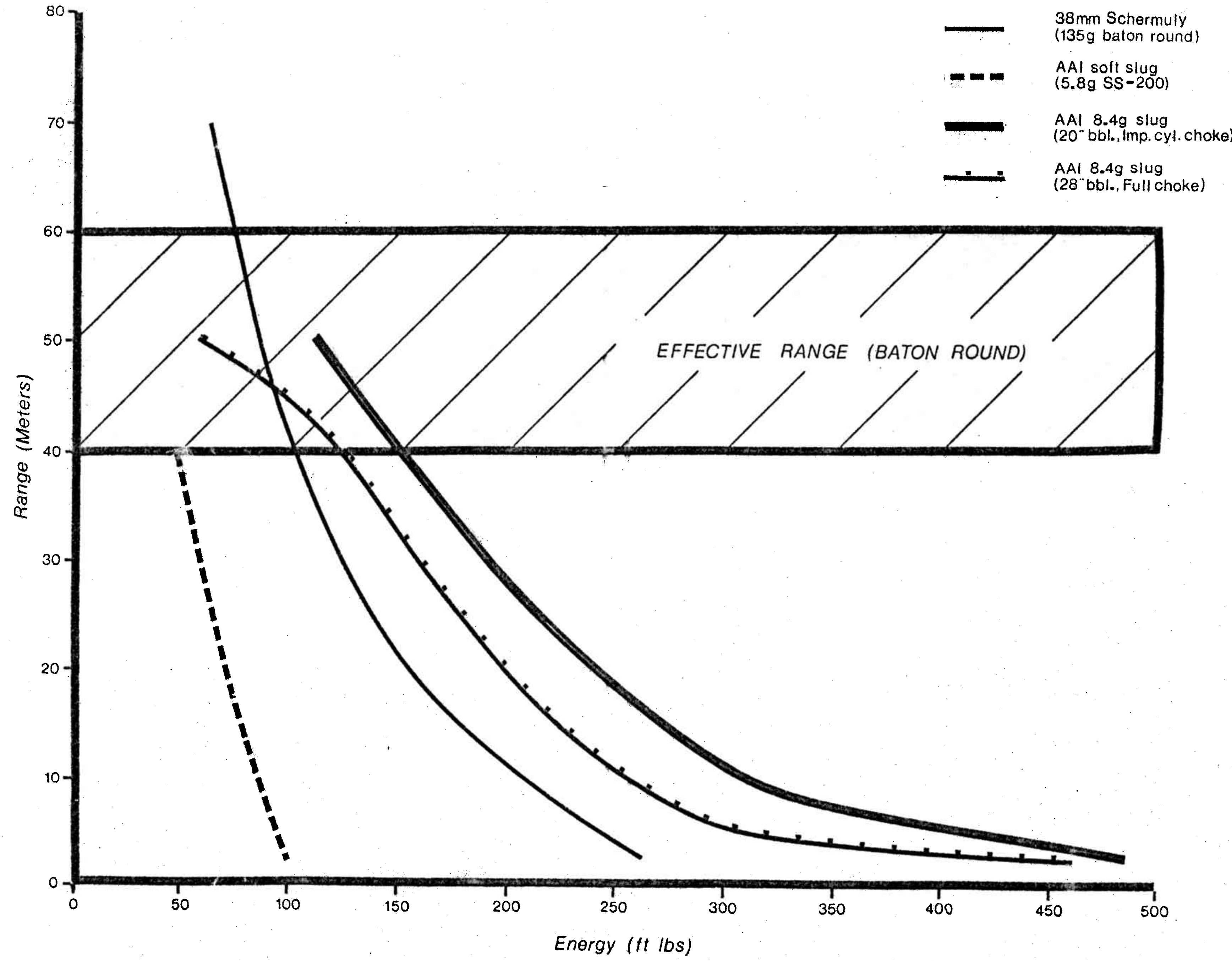

Figure 4. Ballistic data for rubber batons and plastic slugs tested during the 1983 Bear Detection and Deterrent Research Program.

Flare/Scaring Cartridges

Further tests were conducted on flare/scaring cartridges (Stenhouse 1983b). These 12 gauge cartridges weigh 22 g, and when fired from an improved cylinder bore 12 gauge shotgun or liner-fitted signal pistol, they will travel approximately 120 m prior to ignition. Each cartridge emits a yellow flare trace, and explodes (110 dB) to produce a bright white flash. These cartridges were fired at a 45 degree angle towards an approaching polar bear to ensure that the shell detonated between the bear and the researcher.

RESULTS

The 1983 study period extended from 19 September - 10 November and 28 November - 6 December. During this time, 197 bears were tested with various deterrent techniques. Of this number, 123 bears received tests with rubber batons at the bait site (67 experimental bears and 56 control bears). A total of 794 hours of observation were recorded during the study period; 694 hours of observation were completed during the daylight hours and 100 hours during darkness.

Marked Bears

In conjunction with the CWS Polar Bear Research Program, a total of 42 polar bears were captured and marked following techniques described by Stirling et al. (1977) within a 24 km radius of the study site during the testing period. Thirty-five tagged/marked bears received deterrent tests. This marked sample included 10 females (3 $<$ 5 years, and 7 $>$ 5 years), and 25 males (7 $<$ 5 years, and 18 $>$ 5 years) (Fig. 5). Of the 35 tagged/marked bears described, 7 (20%) of these bears were captured and tagged at distances greater than 15 km from the study site in conjunction with other polar bear research projects. Also included in the sample of 35 tagged/marked bears were 7 (20%) bears that had been captured, marked, and tested during the 1982 deterrent field work at the same study site (Stenhouse 1983b).

In addition, 14 bears were dye-marked for individual recognition. The sex of these 14 bears was determined (9 males, 5 females) by the presence of penile hairs or urine stains around the vulva.

An additional 8 polar bears were identified through unique morphological characteristics (scarring, etc.) and/or social units (females with cubs).

Thus 57 polar bears could be individually recognized during the testing period.

Zone A (175-80 m), Zone B (80-60 m) and Zone C (60-40 m)

Seven experimental bears were excluded from this analysis; these bears were the animals that were marked and tested in 1982 and 1983. Analysis of the data for these seven bears is presented in "Bears Receiving Deterrent Tests in 1982 and 1983".

There were no significant differences in the amount of time experimental (N=60) and control bears (N=56) spent in Zone A ($t=0.05$, $p>0.05$), Zone B ($t=0.41$, $p>0.05$), or Zone C ($t=0.29$, $p>0.05$) during approaches to the bait site. However, experimental bears spent significantly less time exiting through zone A($W=18.23$, $p<.01$), zone B($W=7.49$, $p<.01$), and zone C($W=9.21$, $p<.01$), than was spent during approaches to the bait site (Table 2). This same result was also shown for control bears (Zone A, $W=21.01$, $p<0.01$; Zone B, $W=6.85$, $p<0.01$; Zone C, $W=9.04$, $p<0.01$). These findings suggest that the deterrents utilized in Zone D altered both the experimental and control bears' rates of movement out of the timing zone to a significant degree. In addition, there were no significant differences found in the amount of time experimental and control bears spent exiting Zone C ($t=1.79$, p>

0.05), Zone B (t=1.65, p>0.05) and Zone A (t=0.83, p>0.05). Therefore, we can conclude that the rate of movement during approach and exit through Zones A, B and C did not differ significantly between experimental and control bears.

Since there were no significant differences in approach or exit rates between experimental and control bears, these two categories were combined in order to analyze movement rates (m/sec). There was a significant difference (W=5.72, p<0.01) found in the movement rate between Zones C and B, as well as between Zones B and A (W=12.37, p<0.01) during exit. Deterred bears moved faster out of Zone C than Zone B and faster out of Zone B than Zone A. There were no significant differences found in the movement rate during approaches through Zones A and B (W= 1.05, p>0.05); however, there were significant differences found in movement rates between Zones B and C (W=3.24, p<0.05). This suggests that bears increased their rate of movement as they moved closer to the bait site.

The occurrence of behavioural categories of experimental and control bears during approach and exit through the four timing zones is presented in Table 3. These data were compiled by recording the amount of time each focal animal engaged in each of the six behavioural categories in each of the four timing zones. These data represent the number of focal bears spending the majority (>50%) of the time in that zone exhibiting the various behavioural categories.

Table 2. Summary of the time spent in each experimental zone during the 1983 bear detection and deterrent study, Cape Churchill, Manitoba[1].

Subject type	Test Zone: Approach				Test Zone: Exit			
	A (175-80m)	B (80-60m)	C (60-40m)	D (40-0m)	D (after shot)	C (40-60m)	B (60-80m)	A (80-175m)
Experimental								
Mean($\bar{X}$)	3:42[2]	1:24	:40	2:18	:03	:09	:21	1:47
Variance(s^2)	8:49	:29	:12	1:08	:07	:03	:12	:55
$\bar{S}$	2:91	:54	:35	1:03	:26	:17	:35	:74
Sample size	60[2]	60	60	60	60	60	60	60
Control								
Mean($\bar{X}$)	3:45	1:20	:38	18:33	:04	:10	:25	1:54
Variance(s^2)	8:38	:54	:15	4:21	:02	:02	:14	1:01
$\bar{S}$	2:89	:52	:39	2:05	:14	:14	:37	1:00
Sample size	56	56	56	56	56	56	56	56

1 Seven bears that were tested in 1982 and 1983 were excluded from this analysis.

2 All times given in minutes:seconds.

Table 3. Occurrence of behavioural categories during approach and exit of directly approaching bears through the four timing zones during the 1983 bear detection and deterrent study, Cape Churchill, Manitoba.

	Behavioural Category					
Zone and subject type	Lying/ resting	Ingestion	Agonistic	Locomotory	Exploring curiosity	Comfort movements
Zone A (approach)						
Experimental[1]	13	0	0	43	1	3
Control[2]	17	0	0	33	0	6
Zone B (approach)						
Experimental	0	0	0	53	5	2
Control	0	0	0	48	7	1
Zone C (approach)						
Experimental	0	0	0	51	8	1
Control	0	0	0	52	1	3
Zone D (approach)						
Experimental	0	33	10	2	4	11
Control	0	29	12	4	5	6
Zone D (exit)						
Experimental	0	0	0	58	0	2
Control	0	0	0	53	0	3
Zone C (exit)						
Experimental	0	0	0	52	0	8
Control	0	0	0	51	1	4
Zone B (exit)						
Experimental	0	0	0	46	2	12
Control	0	0	0	43	4	9
Zone A (exit)						
Experimental	1	0	1	42	1	14
Control	0	0	1	38	3	14

1. N=60
2. N=56

Table 4 indicates that both experimental and control bears spent the majority of their time engaged in locomotory activities during approach and exit in all zones except Zone D during approach. In Zone D (approach) bears arrived at the bait site and, not surprisingly, spent the majority of their time in this zone displaying ingestion behaviours. While in Zone D, prior to experimental trials, both experimental and control bears displayed agonistic behaviours towards other bears at the bait site. These behaviours were observed only twice (Zone A exit) outside Zone D (bait site) during the course of this study. On these two occasions we could not determine the cause of the agonistic behaviour.

Lying/resting behaviour was exhibited only in Zone A (175-80 m) by experimental and control bears. It is possible that the distance from the bait site to Zone A represented a "safe distance" for the bears, or that the vegetation (willows) and snow drifts in this zone offered a preferred area in which to rest. It is important to note that lying/resting was almost (1 in Zone A during exit) totally confined to approaches through Zone A.

More comfort movements were observed after bears left Zone D than were observed prior to their arrival in this zone (approach N=16, exit N=61). Comfort movements observed prior to deterrent tests were confined to scratching (95%) and occasionally to licking (5%). However, after deterrent tests, comfort movements displayed by bears were almost exclusively rolling (98%) and occasionally shaking (2%). Bears struck with rubber batons at the bait site in Zone D typically attempted to roll and scratch the

Table 4. Behavioural responses of non-focal bears to discharge of rubber batons during the 1983 bear detection and deterrent study, Cape Churchill, Manitoba.

Initial behavioural response	At bait* site	0-40 m	40-60 m	60-80 m	N
Gallop	13	6	3	2	24
Trot	5	3	4	3	16
Walk	1	1	2	4	8
No response	0	0	1	4	5

* Movement away from bait site.

area where they had been struck by the baton, once they had left the bait site area. After rolling, some bears shook themselves vigorously, similar to the way a canine does when it emerges from swimming.

Bears in Zone D (bait site) also displayed comfort movements; however, these differed from those observed in any of the other zones. These comfort movements involved bears licking seal and whale oil and blood off their front paws after feeding at the bait site prior to deterrent tests.

<u>Zone D (40-0 m, Bait Site)</u>

Bears entering this zone moved directly to the bait site; however, there were numerous occasions when bears first moved towards the bait storage barrels, stored in the steel case at the base of the tower. Once they learned that they could not obtain meat at the storage site, the bears moved to the bait site to feed. No control bears left the bait site without administration of a deterrent (rubber baton).

Sixty experimental bears were successfully deterred from the bait site with the use of rubber batons. Of these, 50 (83.3%) galloped from Zone D when struck with a single rubber baton. Three (5%) experimental bears required two hits before trotting from Zone D, four (6.6%) bears trotted from the bait site after three hits, one (1.6%) bear walked from the bait site after four hits, one bear (1.6%) trotted from the bait site after five hits, and one (1.6%) bear left after seven hits. No significant ($p>0.05$) correlations were found between the number of shots required to move a bear from the bait site and the amount of time a bear had been feeding, its age, sex, or body weight.

We stopped testing one bear with rubber batons. This bear, a large, thin, male polar bear, was struck a total of five times without leaving the bait site. We did not continue firing at this bear because of its deteriorated (emaciated) physical condition. After consuming most of the meat on a whale head at the bait site, the bear walked slowly out of the timing zone (D) carrying the whale head.

A yearling male was killed when it was struck with a rubber baton. This bear was feeding at the bait site and was struck behind the left front shoulder from a distance of approximately 35 m. The bear responded in the normal manner by hissing and running from the area. In this case, however, after running approximately 40 m, the animal rolled on its back, convulsed twice, and stopped breathing. A necropsy performed by Dr. Jerry Haigh (Appendix A) showed that the baton had broken a rib. The cause of death was diagnosed as cardiac tamponade subsequent to filling of the periocordial sac with blood from a rupture in the ventricular wall. The pericardium was not damaged; it is likely that the damage to the ventricle resulted from a shock wave rather than from a direct physical injury from either the projectile or rib.

In addition, 56 control bears were struck with rubber batons after feeding at the bait site for the allotted 15 minutes. Of this number 49 (87.5%) galloped from Zone D after one hit; two (3.6%) bears trotted from the zone after two hits; three (5.4%) trotted from the bait zone after three hits; and, two (3.6%) bears walked from Zone D after five hits with rubber batons. Once again, no significant correlations ($p>0.05$) were found between the amount of time a control bear was feeding at the bait site and the number of batons required to deter it.

None of the bears struck (N=116) with rubber batons displayed any overt vocal or postural aggression towards the person firing the batons. If a baton missed, bears would typically hiss and continue feeding.

Bears struck with rubber batons responded by flinching, snapping at the area of contact (sometimes accompanied by a hiss or growl), spinning around and then galloping, trotting, or walking from the bait site. Occasionally, bears stopped and looked back briefly (2-3 seconds) at the bait site before continuing to exit from the timing zones.

No significant differences ($p>0.05$) were found in the amount of time experimental or control bears spent in Zone D after being struck by a rubber baton. After being struck with a baton, experimental and control bears exited Zone D within 3 seconds.

In 1983 two persons conducted the field tests with rubber batons. I fired rubber batons at 82 (67%) of the polar bears tested, while Marc Cattet fired at the remaing 41 (33%) bears. The accuracy of the shooters was 86% and 80%, respectively. These figures represent the number of shots fired compared to the number of bears struck.

During the rubber baton tests, 53 additional bears were observed within the study area. The distances between each of these "additional bears" and focal bears were divided into the following categories: 80-60 m, 60-40 m, 40-0 m, and at the bait site in close association with the focal bears (Table 4). As in previous testing (Stenhouse 1983b), only locomotory activities were observed after the firing of batons. One of the 53 bears showed an initial response of moving towards the bait site area following the discharge of a rubber baton. Bears closer to the focal animal at the time of baton discharge were more prone to move away quickly (gallop or trot) than were bears that were further away. It is also important to note that 5 bears in the "other" category demonstrated no overt behavioural response to the discharge of the rubber batons. These bears were furthest away from the focal animal (4 in the 60-80 m zone and 1 in the 40-60 m zone).

Bears within the study area, but not struck, during the rubber baton tests did return to the bait site. We were able to successfully monitor the movements of 37 of the 53 bears after their initial responses. Of this number, 28 (76%) returned within 2-3 hours (x=2:07), four (11%) bears returned within 4-5 hours (x=4:48), and five (13.5%) bears returned within 6-8 hours (x=7:21). No significant difference ($p<0.05$) was found between the amount of time required for these bears to return to the bait site and the distance of exposure from the bait site. This suggests that the noise generated from discharging the rubber baton was not a sufficient deterrent to keep these bears from the bait site. This is supported by the fact that five bears showed no overt behavioural responses when the gun was discharged.

Return Rates and Behaviour of Marked Bears

Forty-four marked bears (28 tagged during the helicopter marking program and 16 bears individually marked during the dye marking program) received deterrent tests at the study site. This total excludes 7 bears tested in 1982 and 1983. Since we did not conduct deterrent tests on a 24 hour basis, the data represent <u>observed</u> return rates. We did notice that bears outside the study area during the night testing periods moved into the bait site when the lighting systems were turned off, and testing stopped. Therefore, we attempted to conduct night testing using hand held portable spotlights; however, tests were stopped because of concern for human safety.

Of the 44 marked bears tested, 30 (68%) were tested once and 14 (32%) returned to the bait site after being deterred once. Five (35.7%) of the repeat-visit bears returned twice, three (21.4%) returned five times, four (28.6%) bears returned six times, and two (14%) bears returned nine times to the bait site over the course of the study period. The times between each approach and visit to the bait site are presented in Table 5, which indicates that the repeat-visit bears spent increasingly more time away from the bait site after each successful deterrent attempt.

Although the number of repeat-visit bears represents a relatively small sample size, there were some interesting differences noted between these two groups. First, there were significant differences found between the amount of time spent in each timing zone during approach between single visit and repeat visit bears (Zone D, $U=2.54$, $p<0.05$; Zone C, $U=5.37$, $p<0.05$; Zone B, $U=4.61$, $p<0.05$; Zone A, $U=8.29$, $p<0.01$). This suggests that bears spent more time approaching the bait site after they had been deterred once. This cautiousness in approach through Zones A-D displayed by repeat-visit bears was also shown when the data from individual bears was compared between visits. This data showed that individual bears spent more time during approach in all of the timing zones on each successive repeat visit.

No significant differences ($p>0.05$) were found in the amount of time single-visit and repeat-visit bears spent exiting from the four timing zones (A-D) after deterrent tests.

Table 5. Amount of time between repeat visits to the bait site by marked experimental bears during the 1983 bear detection and deterrent study, Cape Churchill, Manitoba.

MARKED BEARS

Number of visits to bait site	1	2	3	4	5	6	7
2	0:4:47:12	1:3:58:04	2:1:15:09	0:2:01:18	1:6:38:45	0:18:24:16	1:04:51:12
3						0:21:15:33	1:00:14:06
4						1:04:03:47	2:11:32:16
5						1:07:15:51	2:21:14:23
6							
7							
8							
7							

Number of visits to bait site	8	9	10	11	12	13	14
2	2:14:01:46	0:21:08:37	1:23:04:47	0:12:25:18	0:04:06:35	1:15:41:28	2:17:05:14
3	1:04:15:09	0:19:18:04	1:03:15:12	0:23:15:03	1:05:21:06	3:14:15:20	1:18:02:18
4	2:20:11:14	1:01:34:18	2:14:35:06	2:15:21:13	1:12:15:11	5:13:20:41	2:05:16:23
5	4:21:35:19	1:15:12:39	3:21:07:25	4:21:10:35	5:21:05:21	5:21:14:17	4:14:42:02
6		4:02:25:41	6:01:25:13	4:05:18:41	8:01:14:35	6:14:18:03	3:21:13:06
7						6:03:15:27	4:13:25:52
8						5:13:24:35	5:06:31:28
9						7:19:04:26	6:15:21:33

Time = days:hours:minutes:seconds

Bears Receiving Deterrent Tests in 1982 and 1983

We recaptured 7 bears in 1983 that had been captured and marked near the study site during the 1982 deterrent tests and had been deterred with rubber batons in 1982. Five of these bears were single-visit bears in 1982, and two of these bears returned to the bait site four times in 1982.

During the 1983 deterrent tests 4 of the 7 bears visited the bait site once, while 3 bears returned to the bait site five times after being hit with batons. Data from these seven bears were compared to the data from the marked bears which made repeat visits in 1983. Keeping in mind the small sample size, the analysis showed that there were no significant differences ($p>0.05$) in the time between repeat visits between these two groups. However, significant differences were found in approach rates in all timing zones (Zone A, $t=14.36$, $p<0.001$; Zone B, $t=18.71$, $p<0.001$; Zone C, $t=16.52$, $p<0.001$; Zone D, $t=9.37$, $p<0.001$) between bears that had been tested in 1982 and 1983, and repeat-visit bears in 1983. The seven bears tested during two consecutive years spent significantly more time approaching the bait site than did the marked bears tested only in 1983.

No significant differences ($p>0.05$) were found in the exit rates from the four timing zones between the seven bears and the repeat-visit bears tested in 1983. In addition, none of the seven bears required more than one hit to deter them from the bait site.

Plastic Slugs

In 1983, 49 polar bears were hit with 12 gauge plastic slugs during the field program. Of the 49, 27 (55%) moved away (all walked) from the researchers when struck, while 22 (45%) bears continued their approach. It appeared that the age class of the bear was an important factor in determining how it responded to being struck by a plastic slug (Table 6). Test bears were broadly classed as adult, subadult, or unknown, based on body size, size of the head, and facial features.

Despite this crude age classification technique, it appeared that plastic slugs were more effective in deterring approaching subadult (smaller) bears than adult (larger) bears (Table 6). However, it must be stressed that although the plastic slug successfully deterred the majority (80%) (N=20) of the subadults tested, 20% (N=14) of the subadult bears were not deterred and continued to approach the field crew.

The behavioural response of bears that were struck with plastic slugs and deterred consisted of the animal flinching and hissing, with a slight increase in the rate of movement while walking away. Bears that continued to approach even though they were struck with a plastic slug flinched but did not hiss when hit. Flinching was not observed when some of the adult bears were struck by the slug. All plastic slugs fired hit the target (100% accuracy).

Table 6. Responses of polar bears to 12 gauge plastic slugs during approaches to a ground crew during the 1983 bear detection and deterrent study, Cape Churchill, Manitoba.

	Subadult	Adult	Unknown	N
Walked away (deterred)	16	8	3	27
Walked towards	4	14	4	22
Total	20	22	7	49

Other Factors Affecting Approach and Exit

An analysis of variance (ANOVA) was performed on three groups of bears (experimental, control, and bears tested in 1982 and 1983), which approached and exited through the four timing zones of the study site. In this 12 way ANOVA, the dependent variable was the amount of time spent in each zone. The independent variables included: day in the study period, time, wind speed, wind direction, ambient air temperature, direction of approach, direction of exit, sex, age, amount of time at the bait site, number of other bears within the study area, and, the number of batons striking the bear.

Results from this analysis indicate that none of the independent variables had a significant effect ($p>0.01$) (including all possible interactions on the time spent in Zones A, B, C or D during approach or exit for the three groups of bears). Therefore, it can be concluded that other factors influenced the amount of time bears spent approaching and exiting through the four timing zones. As has been shown in previous sections, the use of rubber batons did have a significant effect on the approach rates of repeat-visit bears.

Flare/Scaring Cartridges

Twenty-five flare/scaring cartridges were tested. All of these cartridges ignited when fired and travelled approximately 120 m. The majority (18 or 72%) of these cartridges were fired at night towards bears approaching the field crew. The remaining cartridges (7 or 28%) were used to deter bears approaching the field crew during equipment maintenance in daylight hours.

The behavioural responses of the bears tested (Table 7) show that 9 (36%) of all bears tested continued their approach despite the use of the flare cartridge, and 16 (64%) of the bears tested were deterred from continuing their approach towards the ground crew. While it was not possible to quantify the rate of movement of bears exposed to flare/scaring cartridges from the ground, two bears showed what appeared to be more of an avoidance response than any of the other bears tested. These two marked bears had been previously deterred from the bait site with rubber batons and appeared to move away at a faster rate when the flare/scaring cartridge exploded. It is possible that these bears formed an association between the auditory stimulus (explosion) and the impact of the rubber baton, which influenced their response to the flare/scaring cartridge.

Table 7. Behavioural responses of polar bears to flare/scaring cartridges during the 1983 bear detection and deterrent study, Cape Churchill, Manitoba.

Behavioural response	Number of bears
Night test	
Continued approach	6 (24%)
No approach - deterred	12 (48%)
Day test	
Continued approach	3 (12%)
No approach - deterred	4 (16%)
Total	25 (100%)

Prototype Plastic Slugs

The 12 gauge plastic slug described in the previous section was modified and redesigned so that the terminal velocity approximated that of the rubber baton (Fig. 5). This new prototype used a heavier projectile to achieve a similar impact velocity.

Prototype tests conducted on the carcass of a brown bear (Ursus arctos middendorffi) showed that at 50 m the projectiles penetrated the hide of the bear and embedded themselves approximately 2 cm into the flesh of the animal. Since this result was obviously unacceptable, the manufacturer produced additional rounds of this same prototype using 3 sets of powder

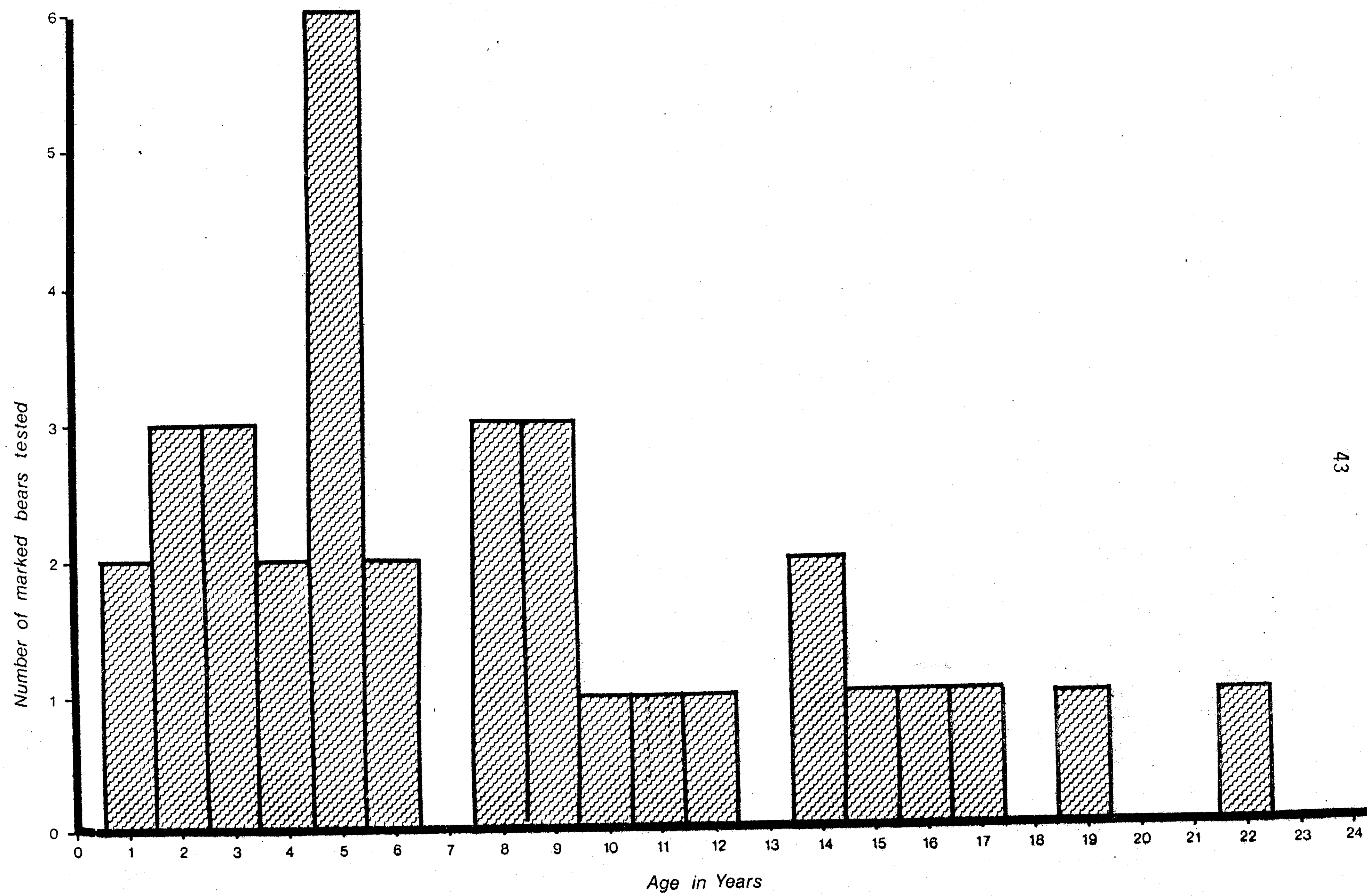

Figure 5. Age of marked bears tested during the 1983 Bear Detection and Deterrent Research Program, Cape Churchill, Manitoba, fall, 1983.

charges. Specifically, cartridges were produced with 70%, 80% and 90% of the full powder charges of the prototype.

Tests were conducted with these cartridges on carcasses of polar bears and black bears destroyed as nuisance animals. Shots were fired from a distance of 50 m from the carcasses and all shots were aimed at the hind quarters of the target animal. The results of these tests showed that all of these new cartridges broke the hide of the animals and penetrated into the flesh. As a result of these findings, no tests were conducted on live bears using any of the prototype plastic slugs.

Field Reports on Rubber Batons

A total of 22 field reports have been received regarding the use of rubber batons in deterring bears at the time of writing this report.

All officers issued with deterrent equipment have been contacted verbally and have expressed their comments and opinions.

Of the 22 deterrent reports, 6 (27%) involved polar bears, 9 (41%) involved grizzly bears, and 4 (18%) involved black bears. All reports from officers indicated that they judged the effectiveness of the deterrent as good to very good. No bears struck with a rubber baton charged or displayed any aggression towards the officer firing the rubber baton. All but one bear ran from the immediate area when struck with a rubber baton.

In the officers' summaries there was one interesting observation made on three separate problem bears. These involved bears which returned some time after being struck with a rubber baton. Upon the return of each bear, officers again approached the bear to fire a rubber baton at it. In these cases, all three animals ran from the approaching officer before the officer had a chance to fire. All officers involved in these cases suggest that the bears learned to associate pain with their approach. In one instance, a polar bear ran from the approach of a truck before the officer could get out of the truck to deter the bear a second time. Officers felt that returning bears showed a dramatic change in behaviour. This change in behaviour was felt to be positive in terms of preventing man/bear conflicts.

One polar bear was struck with a baton three times over a four hour period at a camp on Baffin Island. The bear was described as hungry and thin, and was feeding from a seal meat cache (a very strong attractant) during the deterrent efforts. The officer decided to allow the bear to finish the seal meat and then hit it with a rubber baton. This bear was deterred and did not return.

Two major complaints about the equipment were stated by most officers. The most common complaint concerned the inaccuracy of the riot gun and rubber baton. However, many officers also felt that they were getting better with the equipment with experience. The second major complaint was that they felt the effective range (approximately 40 m) of the weapon was too limited. It is our opinion that officers will feel more comfortable shooting at problem bears from this distance with more experience.

All officers indicated that this equipment was useful in certain situations, and wanted to continue its use in future problem bear situations. Also, it was generally agreed that practice would increase the officers' effectiveness in using rubber batons in field situations.

DISCUSSION

Rubber Batons

Over the past 3 years of deterrent research at Cape Churchill, Manitoba, 404 polar bears have been successfully deterred with the use of rubber batons. During these tests one bear (0.2%) was killed with a rubber baton. Stenhouse (1983b) recognized that rubber batons have the potential to injure or kill bears; however, given the extremely low percentage of bears killed and the proven effectiveness of this technique in deterring bears, we feel it should continue to be used by trained personnel.

In 1983 we ceased testing on one polar bear after 5 hits with a rubber baton. It is possible that further hits with batons could have deterred this animal, but because the bear was in poor physical condition, no additional rounds were fired. This represents one polar bear that was not deterred out of a total of 404 bears in 3 years. If this same bear had come into a camp, endangering human safety, further shots would have been taken irrespective of the bear's physical condition; most likely it would have been driven off.

Over the past 3 years none of the animals subjected to deterrent tests displayed any overt behavioural aggression towards the person firing the batons. This result is extremely important in terms of field implementation of rubber batons as a bear deterrent technique.

Since this deterrent program has been on-going at Cape Churchill each fall (September-November) from 1981 to 1983, we have been able to address the behavioural responses of specific bears over time. In 1983, 7 of the bears tested had also been tested in 1982. The data from these seven bears indicate a clear behavioural difference between these bears and the other bears tested. We feel this data suggests that these polar bears did learn that the bait site, and indeed the study site, were areas where they had to be extremely cautious.

At this point an event which took place at Cape Churchill during the fall of 1983 should be recounted, because it demonstrates the behavioural change (learning) that deterred bears display. A bear, which had been struck with a dye-filled rubber baton at the bait site at Cape Churchill, was observed in the vicinity of the Churchill airport approximately two weeks later. The conservation officers in Churchill set up a culvert trap on the outskirts of the airport using seal meat for bait in an attempt to capture this marked bear. After the trap had been set, the conservation officers observed this marked bear approach the trap, where it cautiously sniffed the bait, and then <u>ran</u> from the area. This bear was not seen in the vicinity of either Churchill or the airport for the remainder of the season (Thorleifson, pers. comm.).

Plastic Slugs

In 1983 plastic slugs were tested using a different methodology than was used in 1982. Tests in 1982 showed that these plastic slugs were ineffective in deterring polar bears from the bait site. The 1983 data showed that these plastic slugs deterred 55% of bears approaching a ground-based research team; however, 45% were not deterred in their approach. Clearly this deterrent technique may deter some bears, but it is a technique that, at the present time, cannot be recommended for deterring polar bears. This plastic slug may be an effective deterrent technique for black or grizzly bears, but adequate and controlled testing has not been conducted to date.

The prototype plastic slug that was tested on problem bear carcasses proved to be inappropriate for bear deterrent efforts. Further work on materials and design modifications of this cartridge are planned for 1984 and additional tests on bear carcasses are essential before any field trials are conducted on live bears.

Flare/Scaring Cartridges

These cartridges deterred 64% of approaching polar bears. Again, however, 36% of the bears continued their approach towards the research team. Clearly, this technique is not totally effective in deterring polar bears and should never be relied upon to deter a polar bear. These cartridges, however, are extremely useful because they are reliable, travel 120 m, and have a flare component which allows people to locate a bear during periods of darkness.

CONCLUSIONS

It should be recognized by all people who are faced with the task of deterring a bear that the use of deterrents is an art as much as a science. Three years of bear deterrent research has provided much scientific data and knowledge; however, the application of this knowledge involves the use of individual judgement and adaptation to special circumstances. In this context it is essential to emphasize the importance of educating and training individuals who are expected to deal with problem bears. The more training and experience people have, the more capable they will be in handling problem bear situations.

The NWT Wildlife Service Bear Detection and Deterrent Education and Training Program, now being completed, will be available to individuals, companies, and agencies who are working in bear habitat. Those who use this program will be better equipped to act in a responsible manner towards bears and to increase the safety of people's living and working habitat.

Data from 3 years of research indicate that there are effective means with which to detect and deter bears. These techniques can be applied in many situations. Undoubtedly, man/bear encounters will continue, and some bears will have to be destroyed to protect human life, but we are convinced that effective application of these techniques will improve human safety and reduce the number of problem bears which must be destroyed.

We should not forget that deterrents should be used when an unavoidable bear problem has occurred. If people do not behave ina responsible and appropriate manner (e.g., storing and handling food stuffs, garbage, and other waste materials), no deterrent will solve the problem. Every effort must be made to avoid attracting bears to human habitations.

RECOMMENDATIONS

1. Continue with the research, development, and testing of new 12 gauge plastic slugs on bear carcasses. If these tests are successful, field trials on polar bears should be conducted.

2. Continue to collect data on the effectiveness of rubber batons in deterring bears in actual problem bear cases. (Field Officers reports).

3. Conduct research into the movement of deterred bears using radio telemetry techniques.

4. Complete and implement the education and training program for interested user groups, and obtain feedback from participants on the effectiveness of this program.

5. Continue investigating and testing other detection and deterrent techniques as they are recognized or suggested.

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PERSONAL COMMUNICATIONS

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APPENDIX A: Post-mortem report of polar bear killed during research activities of N.W.T bear detection and deterrent program.

30/10/83

To Whom It May Concern:

Re: Post-Mortem Report of Polar Bear Killed During Research Activities of N.W.T. Bear Detection and Deterrent Program.

This is to certify that the request of Gordon Stenhouse of Yellowknife, I did this day carry out a post-mortem examination of a subadult male polar bear at Churchill, Manitoba.

History - The animal had reportedly been struck in the thorax by a rubber anti-personnel projectile on the morning of 29 Oct., 1983. The bear had apparently run a distance of approximately 40 metres, after being struck, and then fell into dorsal recumbency, convulsed briefly, and died.

Examination - The examination was carried out at 1100 hrs. on 30 Oct., 1983. The carcass of the polar bear was in dorsal recumbency with no apparent lesions of the skin or pelage. Palpation revealed an area of approx. 15 x 20 cm. over the right ventral thorax which had sub-cutaneous fluids and crepitation. Just dorsal to the costo-chondral junction, over the 6th rib, was a defect in the thoracic wall (large enough to admit three fingers).

On opening the carcass, there was less than 1.0 cm subcutaneous fat. All visible lesions were confined to the area on the right thorax. As well, there was a sub-cutaneous hemorrhage (area approx. 10 x 4 cm) over the ventral portion of the 6th rib. There was extensive hemorrhage between muscle bundles in this area and the 6th rib was fractured approximately 3.0 cm. dorsal to the costo-chondral junction.

Opening of the thorax revealed an enlarged turgid pericard and the presence of a few free clots in the pleural cavity. There was a tear in the ventral portion of the anterior lobe of the right lung approximately 4.0 cm. in length. There was approximately 250 ml. of dark red fluid in the pleural cavity.

Opening of the pericardium revealed a large volume of dark red fluid and gelatinous clotted material. The pericardium had no lacerations. The heart was fully contracted and over the right coronary grove was a hemorrhage (approx. area 4 x 2 cm.) descended into the right ventricle. When opened, there was a hemorrhage in the myocardium, around the tear, to a distance of 3 - 4 cm. from the tear.

Examination of the remainder of the carcass revealed no visible abnormalities. Specimens of liver, kidney, spleen, lung, diaphragm, masseter and temporalis muscles, and myocardium were fixed in formalin. A histological report will follow.

Cause of Death - In my opinion, this bear died due to a rupture of the myocardium and hemorrhage into the pericardial sac. This rupture was due to trauma inflicted in the area of the 6th rib, which had been factured.

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