Polar Bear Diversionary Feeding Workshop Report

June 8-9, 2011
Anchorage, Alaska

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SUMMARY

On June 8–9, 2011, the Defenders of Wildlife hosted an informational workshop on diversionary feeding of polar bears in Anchorage, Alaska. Because polar bears are facing environmental changes such as a reduction in sea ice habitat, an increasing use of coastal habitat has resulted along Alaska's Beaufort Sea coast, placing bears in close proximity to humans for extended periods of time thus increasing the likelihood of human-bear conflicts. The purpose of the workshop was to share information on the use of diversionary feeding as a potential management tool for reducing human-polar bear conflicts in Alaska. Diversionary feeding involves moving/placing food sources (such as marine mammal carcasses) away from human settlements to reduce human-bear conflicts.

The U.S. Fish and Wildlife Service (USFWS) has oversight responsibility for polar bears in the United States, and in 2008 listed the species as "threatened" under the Endangered Species Act, due to ice habitat loss. Scientific studies indicate that the majority of polar bears using the coast during the open water season occur in areas where Inupiat hunters conduct bowhead whaling activities. Unused portions of whale remains provide a food source to polar bears at a time that they would otherwise likely be fasting. However, feeding on whale remains aggregates relatively large numbers of bears near human settlements or hunting camps at Barrow, Cross Island, and Kaktovik (on Barter Island), Alaska and human-bear conflicts have resulted.

Defenders of Wildlife and the U.S. Fish and Wildlife Service share the common goal of reducing human-bear conflicts as a means of conserving polar bears. The idea was born to hold a workshop to bring together internationally recognized researchers and managers with knowledge about polar bear ecology, behavior, habitat use, and diversionary feeding, as well as local residents with knowledge of both polar bear and human use of coastal habitat. Approximately 55 people consisting of federal and local wildlife managers, biologists, researchers, village residents, non-profit organizations, and representatives from oil and gas industry attended. The meeting was facilitated by Ann Rothe, Alaska Conservation Foundation, and was held at the Days Inn in downtown Anchorage.

THIS IS AN INFORMATION TRANSFER WORKSHOP. THIS IS NOT A DECISION-MAKING WORKSHOP. The workshop has been set up to start with a broad biological overview; then narrowing to the coastal community perspective and applied case studies. We will hear FACTS about: polar bear ecology, bear physiology and nutrition, habitat use and distribution patterns, diversionary feeding as a conservation tool and the problems diversionary feeding may cause.

You will have the opportunity to ask questions to presenters as time permits following their presentations and then again on the second day during the panel discussion.

So, thank you all for coming we are looking forward to your participation. The polar bear community is the best defense we have for preventing human-bear conflicts including polar bear mortality. Success in minimizing bear-human conflicts will require the whole community working together.

Photo: Susanne Miler, USFWS

2. ECOLOGY OF URSIDS

2.1. Climate Change Effects on Polar Bears

(Presented by Dr. Andrew E. Derocher, University of Alberta, Canada)

Polar bears (*Ursus maritimus*) are dependent on ice-covered seas and their distribution is as such related to the presence of ice. Polar bears live throughout the ice-covered circumpolar Arctic, mainly in areas with near shore annual ice over the continental shelf where biological productivity is highest. Some polar bear individuals are born at sea and will never set foot on land during their entire lifetime. However, under scenarios predicted by climate change models, these preferred sea ice habitats will to a large degree be substantially altered.

What are the possible effects of climate change on polar bears and is there a possibility that they can adapt to these new conditions? To better understand what climate change means for the polar bear we need to take a closer look at the evolution of the polar bear, its ecology, and the current indicators or symptoms of climate change that have been identified through monitoring efforts. These aspects will briefly be discussed below.

Polar bear evolution – how did it define their ecology?

Evolutionary, grizzly bears are the ancestral stock of polar bears. The evolution from grizzly bear to the current polar bear took about 150,000 years. These two species are therefore very closely related. Polar and grizzly bears have interbred in zoos, producing fertile offspring. The first evidence of wild polar–grizzly bear hybrids were recently shot in the Canadian Arctic [2006]. So, hybrids are rare, but it is uncertain how this will develop over a longer term.

The 150,000 years of evolution resulted in various adaptations in polar bear physiology and life history as summarized in the Table 1. The evolutionary history of the polar bear shows the very specific adaptations that have occurred over a long time period to adapt to life on sea ice habitat. For a polar bear to have to rely on a living on land would mean a reverse evolution in a relatively short time period, which basically seems unattainable.

Photo: courtesy of Andrew Derocher

Symptoms of climate change – how does it affect polar bears?

It is well documented that sea ice habitat is in decline. Research in the Canadian Beaufort Sea indicated several observations which may be symptomatic of climate change effects on polar bears (Table 2).

Table 2: Observations of potential climate change effects on polar bears

Observation	Description
Increased home range	Polar bears have been observed ranging outside of their home ranges due to low ice conditions. This means that polar bear individuals have to walk more for feeding or reproduction, increasing their energetic demands.
Longer fasting period	Information from blood samples (serum urea and creatinine levels) showed that the proportion of bears fasting during springtime increased from 8% to 22% over a 20-yr period. This is likely due to earlier break-up and later freeze-up periods with less food availability. Based on research conducted in Western Hudson Bay, bears forced to use land habitat for 130 days survived into the following year, whereas bears having to use land for 150 days resulted in increased mortality. If bears must use land for up to 170 days, it is predicted that up to half would die. This means that in a place like Western Hudson Bay, over half the population could be lost in one year.
Changing food availability	Changing sea ice conditions will result in changing prey distribution and accessibility. Seals might still be present in open water, but polar bears need ice as a hunting platform. To date it is not clear yet how changes in prey species might affect their availability to polar bears.
Decreasing accessibility to onshore den locations	Female polar bears show fidelity to specific den habitat areas, most of which are on land near the coast. With increasing distance between the southern edge of the pack ice and the coast, it will become more difficult to access these preferred den habitat areas. Changes in den habitat usage have been noted in both Alaska and Norway.
Decreased cub survival	In several populations (Western Hudson Bay, Southern Beaufort Sea) the cub survival rate appears to be decreasing.
Unusual mortality	More incidents of cannibalism have been reported in recent years and might be evidence of stress in polar bear behavior. Additionally, unusual drowning events have occurred along the Alaskan coast and may be indicative of swimming activity associated with increased distance of pack ice from shore.
Declines in body condition and size	Declines in body condition have been noted in Western Hudson Bay and the Southern Beaufort Sea (SBS) populations

Additionally, research has shown that bears' energy intake is controlled by leptin production. Leptin (Greek for leptos, which means thin) is a protein hormone that plays a key role in regulating energy intake and energy expenditure, including appetite and metabolism. Essentially, leptin signals whether a bear should quit eating; the absence of leptin leads to uncontrolled food intake. Leptin levels found in blood plasma of bears are low most (60-80%) of the year, which explains why bears are so motivated to eat[2].

Are there successful supplemental feeding programs for bears and what makes them successful?

Supplemental feeding refers to a food source that is provided to wildlife by humans in addition to their natural food. Historically, supplemental feeding mostly consisted of situations where private citizens tried to attract bears with garbage for bear viewing purposes, or bears were attracted to garbage dumps near human settlements. These are poor examples of supplemental feeding because the food is often not nutritious, and often, dangerous situations are created.

One example of successful supplemental feeding occurred in the mid-1980s in Washington where black bears were inflicting damage to western hemlock and Douglas fir commercial forests, leading to costs of up to $20 million per year [3]. The first response to this problem was the unlimited killing of bears by professional hunters using bait, hounds, snares, and shooting. Because of the poor reception of this type of lethal control, a seasonal, supplemental feeding program was initiated in 1986. Food was available to bears in the form of a pellet diet provided from barrel feeders. Virtually all black bears in the area were using the feeders, and it reduced the damage inflicted by bears on commercial forests. Economically it made sense because the cost for the bear food was about $150,000 per year and resulted in protection of 1 million acres of commercial forests [3].

What determines a bear's dietary selection?

Dietary selection in bears is mainly energy-based, balancing diet quality and foraging efficiency. The diet quality is determined by the proportional intake of carbohydrates, fat, and protein. Body mass gain by bears on a fruit diet is much slower than for bears on a salmon diet. However, results from one study [4] indicate that when mixing various food sources, the relationship between weight gain and energy intake changed. It appeared that a benefit exists for brown bears in combining protein-rich food sources with carbohydrates, and bears appear to naturally select a mixed diet when available.

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[2] Jansen and Robbins, unpublished

[3] Partridge ST, Nolte DL, Ziegltrum GJ, Robbins CT (2001). Impacts of supplemental feeding on the nutritional ecology of black bears. J Wildl Manage 65:191–199. Ziegltrum, G.J. (2004). Efficacy of black bear supplemental feeding to reduce conifer damage in western Washington. J. Wildl. Manage. 68:470-474. Ziegltrum, G. (2006). Cost-effectiveness of the black bear supplemental feeding program in western Washington. Wildlife Soc. Bull. 34:375-379.

[4] Robbins et al. 2007. Optimizing protein intake as a foraging strategy to maximize mass gain in an omnivore. Oikos 116:1675-1682

Another factor to keep in mind is that supplemental feeding may create an artificially elevated population of big, productive animals that would not otherwise be able to exist without the added food source. If the supplemental foods were later removed, it will be much more difficult for such large bears to revert back to a diet based only on natural foods, especially if their natural diet mainly consists of berries and vegetation. Bears would likely have to be killed because they might become problem bears as they search human settlements for additional food to meet their energetic requirements.

In conclusion, as long as any organized supplemental feeding program is based on an understanding of bear ecology, the outcome for the bears could be positive. However, difficult decisions must be made about balancing costs, short and long-term goals, public expectations, public involvement, and what is best for the bear population that is targeted.

2.3. Current Status of Polar Bears in the Southern Beaufort Sea

(Presented by Dr. Jeff Bromaghin, U.S. Geological Survey)

Research has been conducted on the southern Beaufort Sea (SBS) population of polar bear since the 1960s. The primary focus of this research has been monitoring population status and trends, bear movements and distribution, use of sea ice habitat, bear feeding ecology and contaminants. The current focus is on improvement of population assessments and projections, understanding the mechanisms that drive population trends, and evaluating polar bears' behavioral responses to the changing environment.

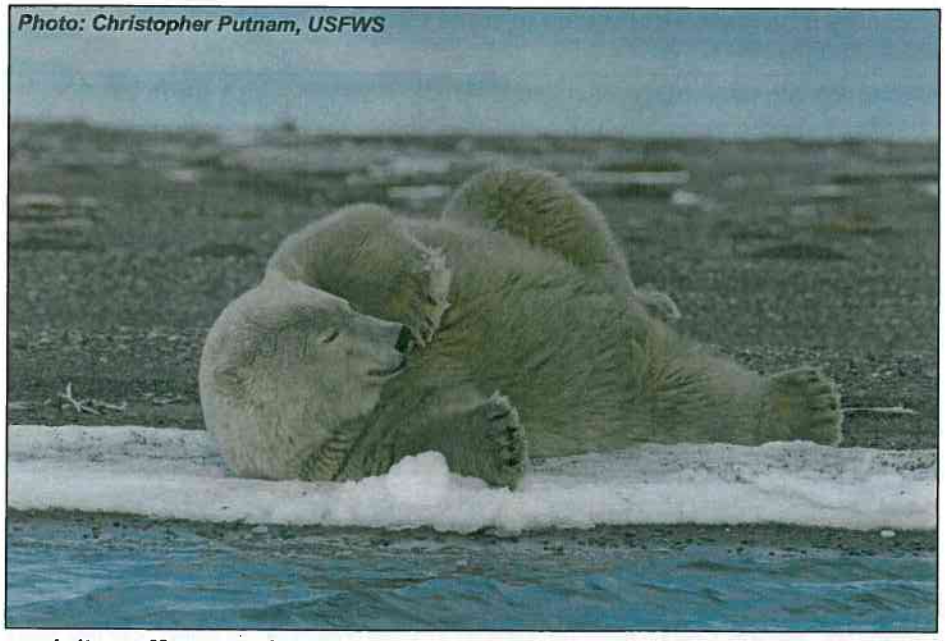
Photo: Christopher Putnam, USFWS

As mentioned earlier, polar bears are highly dependent on sea ice for mating, denning, rearing young, and foraging. Historically, most polar bears remained on the ice year-round. Recent modeling efforts to determine polar bear habitat preference indicate that polar bears generally prefer ice over shallow waters of the continental shelf, and ice concentrations

2.4. Polar Bear Monitoring and Conservation at Barter Island, Alaska

(Presented by Susanne Miller, U.S. Fish and Wildlife Service)

The overall status and trends of the SBS polar bear population has been described in the previous section. The following information provides a closer look at a few areas within the SBS population range where polar bears are known to concentrate, and the polar bear monitoring that has been conducted in these areas, as well as current conservation efforts that are underway at Barter Island.

Feeding Ecology Study at Cross and Barter Islands

In the early 1990s, the USFWS started receiving reports that bear use of coastal areas was increasing. Aerial surveys initiated in 1999 confirmed that the highest proportion of polar bears using Alaska's northern coast occurred at Barter Island, and to a lesser extent, at Cross Island. Barter Island is home to the Inupiat village of Kaktovik; Cross Island is used seasonally by the village of Nuiqsut whalers for fall bowhead whaling.

Photo: Susanne Miller, USFWS

Concern over the increase of polar bear use of coastal areas, in combination with increasing human presence from oil and gas operations in polar bear habitat, led to the initiation by USFWS of a polar bear feeding ecology study at Barter and Cross islands in 2002. It was funded by the Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE) with the primary objective being to collect baseline information

Preliminary findings [8] indicate that most interactions initiated by polar bears involving an overt response were with humans, as opposed to other polar bears or brown bears. A typical scenario involved the approach by curious cubs or sub-adults of a vehicle parked at the bone pile to view bears, and the vehicle's humans subsequently responding with some type of deterrence action, such as honking the horn, revving the engine, or re-positioning the vehicle, then resulting in the cubs fleeing. Interactions initiated by brown bears involving overt responses by polar bears typically occurred when brown bears approached the bone pile (often in a neutral manner), causing polar bears to flee and often not returning to feed. Few approaches by brown bears involved aggressive acts towards polar bears; however, in those cases brown bears mostly won. Interestingly, preliminary analysis of data indicates that a higher proportion of aggressive interactions occurred when brown bears interacted with other brown bears.

Human-initiated interactions that resulted in an overt response by a polar bear typically involved approaches of vehicles that were driving rapidly up to the bone pile, thereby displacing bears. Polar bears seemed to respond to ATVs at farther distances than to vehicles. Unlike polar bears' response to brown bears, vehicle-caused displacement of polar bears was often temporary, e.g., bears came back after the disturbance was eliminated (vehicle was parked, or left the area).

How do these results fit into a bigger picture?

Despite the obvious attraction of hunter-harvested whale remains to polar bears that use coastal areas during fall months, the density of polar bears on shore is not related only to the presence of whale remains. Data from aerial surveys [9] indicate a correlation between the distance from the pack ice to shore with the density of bears on shore. Likewise, a correlation exists between ringed seal density and polar bear density; the Barter Island area appears to have a higher ringed seal density than elsewhere along the Alaskan Beaufort coast. These factors, in addition to the presence of whale remains, could be why polar bear numbers are higher near Barter Island than in other areas along the coast.

[8] Miller et al. in prep.
[9] Schliebe et al. 2008

Kaktovik and elsewhere on the North Slope. Community residents as well as wildlife managers noted that limited guidance or oversight of commercial polar bear viewing was in place, and sometimes conflicts occur. Professional viewing standards were needed that take into account human safety. In 2010, USFWS worked with the Kaktovik Polar Bear Committee, the North Slope Borough and others to develop guidelines that helped ensure that viewing is conducted in a manner that is legal, safe, and consistent throughout the state.

When considering the bone pile's potential long-term use as a supplemental food source for polar bears, seeral issues should be taken into account as summarized in Tabe 4.

Table 4. Issues that need to be taken into account when considering bone piles as supplemental food source for polar bears.

Consideration	Description
Availability of meat	The amount of meat that is available to polar bears at the bone pile varies annually. Generally there are always some remains available to polar bears annually, with a limit of 3 bowhead whales as an annual quota. While the exact poundage or caloric equivalency is unknown, it is clear that remains from three whales will only sustain a limited number of polar bears, especially considering competition from brown bears;
Human habituation versus food conditioning	Polar bears feeding at the bone pile generally appear to be habituated to human presence; however, individual bears' habituation to humans or noise, and the factors that affect habituation, have not been well studied, e.g., we know little about polar bears that may want to use the bone pile but chose not to because of either the presence of humans or brown bears. Regardless, managers must think about the potential results of polar bears learning to feed near a village, and how that affects the bear's behavior as they travel through other human settlements.
Site fidelity of individual bears to feeding location	Whether the same bears return to bone piles year after year remains unanswered. Our study design prevented us from monitoring known individuals over subsequent years; however, of 5 radio-collared female polar bears observed at Barter Island in 2002, at least one family group (female with triplets) was known to return to the feeding site the following year; unfortunately, movement data for the rest of the collared bears was inconclusive.

Possible concerns and benefits of bone piles are as follows:

- Some question exists as to whether bone piles are any different than beached marine mammal carcasses, or whether they should be considered an anthropogenic food source that could cause polar bears to become food-conditioned.
- Conditioning bears to specific use areas is a concern
- Attract unwanted wildlife (gulls, foxes) may be a concern
- Bone piles could be places to meet mates, which could be a possible benefit.

3.2. Polar Bear Use of Whale Remains at Barrow

(Presented by Jason Herreman, North Slope Borough)

A pilot study was initiated by the NSB and U.S. Geological Survey (USGS) in 2010 to test a non-invasive method of monitoring polar bears using hair samples recovered at the Barrow bone pile. Genetic information was obtained from polar bear hair collected from a barbed wire fence that was erected around the bone pile. The purpose of this study was to test if this non-invasive monitoring method could provide information on the annual and seasonal use of carcass sites by bears. Specific questions of interest were:

- Are the same individuals visiting the site or different ones?
- Are the individuals that use the bone piles related?
- What is the age/sex of these individuals?
- Are visitation rates high enough to use this technique for mark recapture analyses?
- How does the use of bone piles by polar bears compare to their use of beached whales?

Photo: Jason Herreman, NSB

3.3. Management of Whaling Remains, Kaktovik

(Presented by Carla Sims-Kayotuk and Nora Jane Burns, Kaktovik)

Barter Island has been used traditionally for many years but in about 1964, the village of Kaktovik was established at its current location. Polar bears visited the community in earlier years, but it seems that they occur more often now than in previous years. Whales have been caught regularly since the mid-1960s; nowadays whalers usually catch three per year, and only during the fall. In the past, whale remains were deposited at the same location as where they are deposited now because that site is about as far away from the community as it can get. Prior to 1980 the remains were taken out to sea in the wintertime and dumped in the ocean. This posed some logistical challenges however, and since 1980 the bones have been left at the current site. The community decided that this was the best place to provide safety from bears for the community, as it was the farthest location away from town but still accessible by road.

One year (2001) the community moved the bone pile to the south side of the island because of concern over too many gulls at the bone pile becoming a hazard for aircraft that use the nearby landing strip. However, that caused polar bears to pass through the village to get to the south location, and it also attracted brown bears from the mainland. So the following year, the whale remains were deposited back at the original location. Polar bears still visit the south side, maybe remembering that there was food in earlier years.

Another way that Kaktovik deals with the danger of polar bears in the village is the Polar Bear Patrol. When polar bear problems arise, the Patrol is called to deal with the situation. Most polar bears arrive on the island in August when whaling season starts. Sometimes the bears come into the village looking for food and at these times the Polar Bear Patrol is most active. Through the hazing activities of the Patrol, less bears are coming to the community. The village of Kaktovik has worked with USFWS to make sure this program is successful and it has been working well so far.

Kaktovik residents typically would see brown bears only on the mainland. The bone pile in the south definitely attracted brown bears that then also found and used Kaktovik's garbage dump. We had experience and knowledge of polar bears and their behavior, but we didn't know much about brown bears. Polar bears that roamed through town in the early years were harvested, because we didn't see that many around and it was a treat to have one to eat. Nowadays we count on Patrol to scare them out of town, and only shoot them if necessary. Some people also still take them for subsistence.

4. USE OF SUPPLEMENTAL/DIVERSIONARY FEEDING AS A TOOL IN WILDLIFE MANAGEMENT

Photo: Susanne Miller, USFWS

What is diversionary or supplemental feeding?

The terms diversionary and supplemental are often used differently in many contexts. According to the dictionary there is a clear distinction. Diversionary means "to draw attention away from the principal concern". Supplemental means "something added to complete a thing, or make up for a deficiency".

Because of the strong drive that bears have to obtain food, and the potential consequences related to human-bear safety, managers need to make sure that they adequately consider the factors that may affect bear behavior during an encounter, prior to developing a diversionary feeding program. These factors include:

- Environmental factors such as nutrient availability, season, time of day, amount of cover, and presence of con-specifics
- Bear-related factors such as species, sex/age class, degree of habituation to humans, an individual's social status in the bear hierarchy, and its genetic disposition
- Human-related factors such as a bear's previous experience with humans, group size, and human responses during a bear encounter.

Montana to reduce human-bear conflicts. It is probably the longest running diversionary feeding program in the U.S. and has been successful in reducing conflicts between ranchers and bears that occurred when brown bears, after leaving their winter dens in early spring, were attracted to ranches where winter-killed livestock carcasses provided a protein-rich food source. Over time, individual bears became less prone to flee when disturbed, leading to an increasing potential for conflict.

The objectives of the diversionary program were to relocate livestock carcasses further away from the vicinity of ranch operations to decrease potential conflicts, while at the same time maintaining important spring protein sources for bears on the RMF.

Since the start in 1988, the livestock carcass redistribution program has been conducted annually in cooperation with ranch landowners. During that time over 2200 livestock carcasses have been redistributed to more remote locations with limited or no human access, ranging from 26 to 202 carcasses per year (with an average of 96 carcasses per year). Bear movements shifted from human settlements to more remote areas, thereby decreasing human-bear conflicts, especially during spring months. Additionally, electric fencing was used by many farmers to protect sheep bedding grounds and beehives, which often attracted brown bears.

No correlation was apparent between grizzlies feeding on livestock carcasses and the same bears being prone to prey on livestock. It is likely that bear conflicts will increase over time if the livestock redistribution program is abandoned, or if carcasses are removed from RMF lands traditionally used by bears to search for carrion.

of about 2000-3000 (mostly seasonal) residents, and the adjacent ski hill area, for a 2-3 week period in early spring.

Photo: courtesy of Hal Morrison

Lake Louise is within Banff National Park which is home to about 60 brown bears. In spring, bears come to the valley bottom where they graze on a variety of early emergent vegetation including dandelion at the campground, ski hill, and parking lots, and can also gain access to garbage. Not many feeding options exist other than scavenging on winter kill ungulates. About 150 road kills per year occur in the area; previously, these carcasses were moved to carrion pits or shipped off to a renderer. Under the diversionary feeding program, approximately 4000-8000 kilogram of these carcasses are collected and transported out of the valley bottom in spring into the surrounding mountains by helicopter and punched off to avoid human scent being associated with the drop-off sites. This protocol has since been modified in 2011 with landing at the sites and placing remote cameras. Diversionary feeding locations had to be close to the areas intended to draw the bears away from and yet inaccessible to people, as public safety is a large concern. Carcass sites were located at least 500 meters apart, preferably at sites of high elevation and with presence of cover vegetation. Randomized placement proved difficult because only a limited number of sites were available that matched the site selection criteria. Large communication efforts exist to increase bear awareness and discuss garbage handling practices.

Was the program successful?

Human-bear conflicts have declined since inception of the program; however, it was difficult to assess whether the diversionary feeding program reduced the number of bears and human-bear conflicts in the Lake Louise town and ski hill area because:

Body size and growth rates of food-conditioned bears were significantly higher than bears feeding entirely on naturally available foods ("natural food bears"). Removing access to supplemental food made it more difficult for food-conditioned bears to survive because they could not get enough natural food to maintain their large body size. Almost all food-conditioned bears were shot in Deadhorse the first two years after access to supplemental foods was removed. Post-weaning mortality of food-conditioned bears was 91%, which is much higher than naturally occurring. Only two food-conditioned females survived after 2002 and both were among the smallest body size of adult females.

A study was initiated comparing characteristics and demographics between food-conditioned and natural food bears. Food-conditioned bears were defined as bears that fed on anthropogenic food sources for 3 or more days in a given year. Between 1991 and 2006 119 bears were captured and marked, of which 24 were classified as food-conditioned and 95 were classified as "natural food" bears. Results indicated the following:

- Food-conditioned females had higher body weights and skeletal measurements in spring; they started the season bigger and grew faster. This is significant because larger bodied bears need food sources that will allow them to maintain their body weights.
- No significant difference in home range size was observed between food-conditioned and natural food bears.
- A higher proportion of food-conditioned bears left dens earlier (about two weeks) and entered dens later than natural food bears. Early in the season less food is available, so bears used readily available and predictable anthropogenic food at the landfill and garbage bins for supplemental feeding.
- Reproductive rate was higher for food-conditioned bears; litter size was slightly higher in food-conditioned bears but age at first reproduction was significantly higher.
- Cubs of food-conditioned bears had a higher rate of survival to weaning (65%).

that if you start with a supplemental feeding program, it is difficult to quit without bears being lethally affected; therefore, it will never be a short-term solution to bear issues, rather, it must be implemented with a long term commitment.

4.4. Case study: Black bears in Minnesota

(Presented by Dr. Lynn Rogers, Wildlife Research Institute)


Photo: courtesy of Lynn Rogers

In Minnesota the issue of habituation and food-conditioned black bears is a big concern. In one area where a campground was located near a subdivision and bear density was relatively high, bears were frequently being removed annually as bears encroached on human space. Although controversial, Dr. Lynn Rogers began to intentionally habituate and food-condition black bears to find out if bears would become more aggressive toward humans to obtain food. Dr. Rogers began to intentionally feed beef fat to bears within a ¼ mile of the campground. From his experiences he concluded that both habituation and food conditioning is very location- and situation-specific. Contrary to what has been noted elsewhere in this report, he believes that bears do not necessarily carry over experience from one situation to the next.

If given a choice, black bears in his area always selected natural foods. If a high abundance of natural food was present, fewer problems with bears occurred. However, when natural food was scarce, bears were attracted to garbage which can increase encounters with humans. Introducing a less preferred food helped keep bears away from human areas during times when preferred foods weren't available. As soon as natural food was available, introduced food was not of interest anymore and the bears that he observed moved away.

The driving force behind "problem" bears is hunger. The term habituation and food-conditioning should be used carefully and in the right context. Hunger is what makes bears food-conditioned, and they learn quickly where to find food. It is hunger that can get bears in problems, not whether they are habituated or food-conditioned. This

- Establish new protected areas
- Improve management of attractants
- Limit disturbance at walrus haul-outs (including boat and aircraft traffic)
- Use hazing to reduce conflicts with bears
- Condemn poaching
- Monitor polar bears and walruses
- Conduct education.

Funding and fuel levels dictate the number of carcasses that can be moved, and the distance over which the carcass can be transported. Moving carcasses removes conflict, but effort in making people more aware on how to behave around bears is believed to be more important.

The Umky Patrol's activities and schedule are as follows:

- In September and October, effort is focused on primarily on protection of walrus haul-outs to minimize disturbance and on moving carcasses to at least 1-8 km from the villages.
- In November and December mainly polar bear activity occurs, meaning heavy patrolling of human areas and an emphasis on education (which also occurs year-round).

Some successes that were achieved since 2006 are:

- Through a referendum, Vankarem village voted for protection of the local walrus haul out; thereafter, the regional government approved the establishment of Cape Vankarem as a designated protected area. The Umky Patrol ultimately plans to create a network of regional protected areas for all sites where walruses form haul-outs in autumn.
- No additional human injuries or fatalities occurred since the Umky Patrol was established. Also no known cases of poaching have occurred in areas where the Patrol operates.
- In cooperation with researchers and managers, better monitoring protocols were developed.

One aspect of subsistence hunting of walrus that reduces disturbance in the Vankarem area is that the hunt is mostly traditional, using spears. This is a less expensive method, and also allows the hunters to carefully approach walrus haul-outs and selectively take animals without causing too much disturbance.

5. SUMMARY

A summary of the successful diversionary feeding program components and the risks of implementing a diversionary feeding program as discussed during this workshop are presented in Table 5 and Table 6, respectively.

Table 5. Summary of successful diversionary feeding program components as discussed during the workshop.

Theme	Discussion
Establish clear objectives	Make sure the objectives meet your achievement goal. Main objective for Kaktovik and Barrow may be to protect subsistence whaling and the public. Consideration should also be given to tourism and making sure that tourists are safe when visiting areas where polar bears can occur.
Use existing food sources	Diversionary feeding programs should use an existing food source, versus the introduction of a novel food source. The food source should meet the dietary needs of the target species.
	If initiated, a diversionary feeding program must be continued in the long term, or at least not stopped abruptly.
Have local residents informed and involved	Local people directly affected by bears and their actions must be given an opportunity to participate in management decisions.
Select appropriate location	Choosing an area where natural foods will become available may be preferable. For example, the bone pile in Kaktovik is located in an area where ringed seals, the natural food source, are also present later in the year. As soon as freeze-up occurs and polar bears have access to ringed seals, polar bears leave the bone pile and hunt seals.
	Distance is an important factor if the objective is to manage public safety. The further away from human access, the better.
	Using random locations may be preferable to prevent bears from associating feeding sites with humans.
Remove attractants near human settlements	Ensure that attractants in villages and camps are minimized.
	Consider the consequences of increased numbers of bears showing up at the feeding sites, especially in years when the amount of whale remains available to bears may be low (e.g., a fewer number of whales is harvested by a given community) or more bears showing up earlier in the season, prior to whaling.

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APPENDIX A

Workshop Agenda

Agenda

Polar Bear Diversionary Feeding Workshop
Hosted by Defenders of Wildlife
Days Inn, Anchorage Alaska
June 8-9, 2011

Workshop Goal: To inform managers and others of the potential use (pros and cons) of diversionary feeding (e.g. placing food such as whale carcasses in a manner that diverts polar bears away from human settlements) as a tool for reducing human-bear conflicts along Alaska's coast.

Day 1

8:00 – 8:30 Register and breakfast provided

8:30 – 9:00 Welcome (Dr. Terry D. DeBruyn, U.S. Fish and Wildlife Service)

9:00 – 9:40 Overview of factors affecting the feeding ecology of polar bears in the face of climate change. (Dr. Andrew Derocher, University of Alberta)

9:40 – 10:20 Nutritional ecology of ursids: physiological response of bears to novel or introduced foods. (Dr. Charles Robbins, Washington State University)

10:20 – 10:35 Break

10:35 – 11:05 Current trends in the Southern Beaufort Sea population of polar bears. (Dr. Jeff Bromaghin, U.S. Geological Survey)

11:05 – 11:45 Polar Bear Monitoring and Conservation at Barter Island, Alaska. (Susanne Miller, U.S. Fish and Wildlife Service)

11:45 – 1:00 Lunch provided

1:00 – 3:00 North Slope Community Observations

- Barrow: polar bear use of coast and feeding patterns (use of whale remains and other food sources); whaling practices/handling of whale remains; preliminary results form hare snare project. (Jason Herreman, North Slope Borough Department of Wildlife Management and Community of Barrow Speakers)
- Barter Island/Kaktovik: polar bear use of coast and feeding patterns (use of whale remains and other food sources); whaling practices/handling of whale remains. (Carla Sims-Kayotuk and Nora Jane Burns, community of Kaktovik)

APPENDIX B

Presenters

Polar Bear Supplemental & Diversionary Feeding Workshop

Nora Jane Burns
Village Liaison for the village of Kaktovik

I work for the NSB Mayor's Office as a Village Liaison for the village of Kaktovik for 7 yrs. I enjoy serving the community of Kaktovik. I am a Councilmember of City of Kaktovik as well. In the past 7 yrs. I have worked closely with the NSB Fish and Wildlife Dept. and also with the US Fish and Wildlife on working keeping our community safe from the Polar Bears. Each fall our office hires two Polar Bear Patrol workers and keeping the polar bears away from the village itself. We have our Patrol do a gun safety class before hiring. Keeping our village safe during the early morning hours especially when School starts and people walking to work or students walking to school. Our goal is to keep the community safe from the polar bears. I have enjoyed this part of my job in helping our village and keeping the village safe from polar bears with working with both NSB Wildlife Dept. and US Fish and Wildlife.

Terry D. DeBruyn, Ph.D.
Polar Bear Project Leader, Marine Mammals Management, U.S. Fish and Wildlife Service

Received M.S. and Ph.D. studying black bears in Michigan's Upper Peninsula Since December 2008 served as U.S. FWS Polar Bear Project Leader—Have overall responsibility for the U.S. Fish and Wildlife Service's polar bear project and supervision of staff. Previous: 2000–2008 Regional Wildlife Biologist, National Park Service, and Alaska Region. Among other experiences are: Section Leader, Bear Research and Management, Florida Conservation Commission; Bear Biologist Katmai National Park and Preserve, Alaska. Have 22 years bear management and research experience; studied all three species of North American bears; published *Walking With Bears* about decade long experience with bears in Michigan's Upper Peninsula.

Andrew E. Derocher, Ph.D.
Professor of biological sciences at the University of Alberta

He began his polar bear research career in 1984 and completed his M.Sc. and Ph.D. studying polar bears. He worked as the polar bear research scientist for the Norwegian Polar Institute based in Tromso in northern Norway from 1996 to 2002 before taking up a tenured professorship at the University. He is the past chair and currently a member of the IUCN/SSC Polar Bear Specialist Group. He is currently conducting polar bear research in the Southern Beaufort Sea, Western Hudson Bay and Foxe Basin subpopulations. He has published over 100 peer reviewed scientific publications with the majority on polar bear ecology.

Stephen Herrero, Ph.D.

Professor Emeritus of Environmental Science, University of Calgary, Alberta, Canada: August, 2010

I am a professor, researcher and practicing professional focused primarily on mammalian carnivore ecology, behavior, conservation and management. My work has been extensively published in refereed scientific journals and other places. In 1971 I was a founding member of the Environmental Science Program in the Faculty of Environmental Design at the University of Calgary. I have supervised and graduated 63 Masters and PhD students. In 1980 I founded the still active company BIOS Environmental Research Ltd. I am the past elected president of the International Association for Bear Research and Management (IBA) and past chair of the IUCN/SSC Bear Specialist Group. I have over 5,000 hours of field experience working with various bear species. I am author of *Bear attacks: Their causes and avoidance*--- over 115,000 copies sold. In 1990 this book was chosen "the most important scientific work on bears in past 25 years" by research peers. The book has been translated into German and Japanese. I have been the recipient of several awards: J.B. Harkin medal of the Canadian Parks and Wilderness Society, J.D. Soper Award of the Alberta Society of Professional Biologists, the Alberta Emerald award, and the William Rowan award of the Alberta Chapter of the Wildlife Society.

I am dedicated to applying research and knowledge to solving complex, real world, and interdisciplinary problems. I am a founding member of the "Staying Safe in Bear Country Society." We have produced 4 bear safety videos, 2000–2010, in cooperation with the International Association for Bear Research and Management. These include: "Staying Safe in Bear Country," "Working in Bear Country," Living in Bear Country," and "Polar Bears: A Guide to Safety." I am past Chair of the Eastern Slopes Grizzly Bear Project (ESGBP) Steering Committee– a multi-stakeholder, multi-jurisdictional research, management and conservation effort 1994 – 2005. The ESGBP has provided research documentation and a forum for generating and sharing population and habitat research on grizzly bears among government, industry, environmental NGOs, universities, and other interested parties. Our research has resulted in specific population and habitat targets for grizzly bears in Banff National Park, and to a lesser extent in Kananaskis Country, Alberta. Our website www.canadianrockies.net/grizzly has the details. I am currently involved in several research projects on bear-human interactions. I also carry out bear and other wildlife safety training and planning.

Lynn Rogers

Wildlife Research Institute, North American Bear Center, Ely, Minnesota

I have studied black bear ecology and behavior since 1967. Part of that study involved mitigating human-bear conflict. In a U. S. Forest Service study (1984 – 1991), I studied diversionary feeding to reduce conflict in a rural residential area and large USFS campground where an average of 2 bears had been removed from the study area each of the 3 previous years. Diversionary feeding reduced nuisance problems 87.5% ($P<0.0025$) throughout the 8 years of study despite the fact that we intentionally habituated and food-conditioned several of the study bears so researchers could walk with them. In a subsequent Wildlife Research Institute study (1996 - 2010), I monitored human-bear conflict in a rural community where a dozen households had fed (and hand-fed) bears since as early as 1961 (50 years). Human-bear conflicts in and around that community were significantly fewer ($P<0.025$) and less serious than the statewide average.

Dick Shideler

Alaska Dept. of Fish and Game, Division of Wildlife Conservation, Fairbanks, Alaska

I have been a biologist with the Alaska Department of Fish & Game since 1975, working initially on Arctic caribou until 1978 when I became involved in monitoring the impacts of the North Slope oil and gas activities on wildlife. Part of that assignment was to develop measures to mitigate impacts on grizzly and polar bears, including requirements for industry to develop bear interaction plans and conduct bear safety training for employees. Since 1991 I have been the principal investigator on a project investigating the interactions of grizzly bears with current and proposed North Slope oil and gas exploration and production areas. During that time, I also assisted the U.S. Fish & Wildlife Service with polar bear conflict management in the oilfields. Beginning in 2009 I have been involved in a cooperative study with the Service evaluating methods to detect denning polar bears.

Jeffrey Bromaghin, Ph.D.

Research Statistician, U.S. Geological Survey, Alaska Science Center, Anchorage, Alaska

Education and/or Training:

Ph.D.	1991 University of Wyoming	Statistics
M.S.	1988 University of Wyoming	Statistics
B.S.	1985 University of Alaska	Wildlife Management

APPENDIX C

Invited and Registered Participant List

Invited and Registered Participant List

Adams, Billy, North Slope Borough
Aerts, Lisanne, Dr., LAMA Ecological
Amstrup, Steve, Dr., Polar Bears International
Anderson, Tracey, Exxon Mobil
Apalook, Herbert, President, Nuiqsut Whaling Captains Association
Audi, Walt, Waldo Arms Hotel, Kaktovik
Bromaghin, Jeffery, Dr., US Geological Survey
Brower, Charlie, President, Kaktovik Whaling Captains Association
Brower, Eugene, President, Barrow Whaling Captains Association
Burns, Nora Jane, North Slope Borough
Cain, Karen, Defenders of Wildlife workshop logistics volunteer
Cody, Mary, Bureau of Oceans and Energy Management
Cox, Rachel, Exxon-Mobil
Cutting, Amy, Oregon Zoo
DeBruyn, Terry, Dr., US Fish & Wildlife Service
Derocher, Andrew, Dr., University of Alberta Canada
Dutton, Karla, Defenders of Wildlife. Alaska Office
Eder, Frannie, Defenders of Wildlife workshop logistics volunteer
Evans, Tom, Dr., US Fish & Wildlife Service
Hamilton, Charlie, Dr., US Fish & Wildlife Service
Hedman, Daryll, Government of Canada
Hepa, Taqulik, Department of Wildlife Management- North Slope Borough
Herreman, Jason, Department of Wildlife Management- North Slope Borough
Herrero, Steve, Dr., University of Calgary, Canada
Inglagasak, Bruce, Kaktovik Arctic Tours
Jahrsdoefer, Sonja, Dr., US Fish & Wildlife Service
Johnson, Charlie, Alaska Nanuuq Commission
La Rosa, Ann Marie, US Fish & Wildlife Service
Kayotuk, Lee, Kaktovik Polar Bear Committee
Lina, Julie, Pioneer
Linn, Adam, Kaktovik
Macrander, Mike, Shell Global Solutions
Madel, Michael, Montana Department of Fish & Game
Mansfield, Sue, Wildlife Research Institute, Minnesota
Meehan, Rosa, Dr., US Fish & Wildlife Service
Miller, Susi, US Fish & Wildlife Service
Monnett, Chuck, Bureau of Oceans and Energy Management
Moran, Matthew, US Air Force