



## Polar bear research in the Chukchi and Bering Seas: A synopsis of 2010 field work

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### Summary

- Information on the status and trend of the polar bear population that inhabits the Chukchi and Bering Seas (referred to as the “Chukchi Sea” population) is urgently needed. Polar bears in the Chukchi Sea face a number of conservation challenges, including potentially unsustainable levels of human-caused mortality, sea ice loss due to climate change, and the future exploration and development of natural resources. Furthermore, a treaty signed between the US and Russia for the conservation and management of polar bears in this region is currently being implemented. This treaty includes an agreement to identify a sustainable harvest, to be divided evenly between coastal native residents of the US and Russia. Scientific data are needed to identify sustainable harvest levels, and to ensure the long-term conservation of the Chukchi Sea polar bear population.
- The US Fish and Wildlife Service (USFWS) and the US Geological Survey (USGS) initiated a study in 2008 to address information needs for the Chukchi Sea population. The objectives of this study are to identify the best methodology to estimate survival rates, breeding rates, and population size; to develop an initial understanding of population dynamics (e.g., the sex and age structure of the population); to evaluate body condition, health, and feeding ecology; and to understand the distribution of polar bears and their response to environmental changes.
- In March–April 2010, the USFWS continued this study for the third year. Our activities included the following:
  - Capture, measurement, sampling, and release of 69 polar bears. Of these, 10 polar bears had been captured in the Chukchi Sea in 2008 or 2009. Six of the Chukchi Sea recaptures were located by standard search (i.e., by searching for new polar bears) and four were re-located by radiotelemetry. Additionally, we recaptured three polar bears that had been previously captured by the USGS in the southern Beaufort Sea.
  - The sex and age class distribution of captured bears in 2010 differed from 2008 and 2009. The 2010 sample included 5 single adult females, 14 adult females with dependent young, 17 adult males, no subadult females, 8 subadult males, 4 two-year-olds, and 21 yearlings. The large number of yearlings captured in 2010 differed from 2008 and 2009, when only four and one yearling(s) were captured, respectively. This suggests that many females gave birth in maternal dens during the winter of 2008–2009 and were subsequently successful at rearing their cubs through the first year of life.
  - Similar to previous capture seasons, no cubs of the year (COYs; cubs less than one year old) were observed. Tracks that appeared to belong to an adult female and two

- COYs were observed in both 2009 and 2010. The absence of COYs from our capture samples is likely a result of denning occurring primarily in Russia. Since females with COYs tend not to travel far after den emergence, they may not be able to access habitats off the US coast in early spring.
- Overall, captured polar bears appeared to be in good nutritional condition. Average body weights were 545 lbs for adult females, 1016 lbs for adult males, 550 lbs for subadult males, 301 for two-year-old females, 423 lbs for two-year-old males, 225 lbs for yearling females, and 317 lbs for yearling males. Three adult males weighed over 1200 lbs.
  - We deployed 16 satellite radiocollars on adult females and 20 ear-mounted satellite transmitters on subadults, adult males, and adult females. Radiocollars and ear-mounted tags provide information on the distribution, habitat use, and movement patterns of polar bears in the Chukchi Sea population. This information can be used to determine how bears may be responding to changing sea ice conditions and human activities. All radiocollars included an automatic release device, programmed to drop one year after deployment. Currently, radiocollars are the only method available to obtain movement data throughout the year. In an effort to investigate alternatives to radiocollars, we also deployed a new type of small, ear-mounted satellite transmitter. The ear tags will provide limited data on other sex and age classes of polar bears, which is important because radiocollars can only be deployed on adult females. In preliminary trials, ear-mounted tags have typically provided movement data for up to 3 months.
  - Observations from the 2008–2010 capture seasons suggest that the offshore area between Kotzebue and Point Hope is important breeding and feeding habitat for polar bears in the spring. Numerous other marine mammals were observed during the polar bear study, including bowhead whales, belugas, and ringed and bearded seals.
  - Data collected from 2008–2010 will be used to begin analyzing the feeding ecology, body condition, and population dynamics of polar bears in the Chukchi Sea. Additionally, by spring of 2011, we plan to begin analyzing movement and habitat use data. These analyses will provide important information that can be used by the Scientific Working Group, established under the US-Russia treaty, to make recommendations regarding management of the Chukchi Sea polar bear population.
  - The USFWS expects to continue polar bear studies in the Chukchi Sea in 2011. Polar bears are long-lived animals, occurring at low densities in a rapidly changing environment. Multiple years of data are necessary to understand and monitor their population status and to account for variability among years.
  - This report summarizes the USFWS capture effort in spring 2010. All information is considered preliminary and subject to revision until published in peer-reviewed scientific literature.

## Background

There is an urgent need to better understand the status of the polar bear (*Ursus maritimus*) population in the Chukchi and Bering Seas (CS). Important information, including estimates of population size, survival, reproduction, and habitat use, as well as knowledge of the trends and variability in these parameters, are currently lacking. Polar bears in the CS range between the US and Russia and are legally harvested by native coastal residents in the US. Though Russia

has had a moratorium on polar bear harvest since the 1950s, recent reports suggest that poaching along the Chukotkan coast may be occurring at levels that are too high to be sustained by the population. The CS population also faces rapid loss of sea ice habitat, and exploration and development for oil and gas.

The listing of polar bears as a threatened species under the US Endangered Species Act in May 2008 highlights the conservation concerns for polar bears in the CS and other parts of the Arctic. A recent study estimated that the CS has experienced an 8% decline per decade in polar bear habitat; one of the highest rates of loss in the Arctic. Historic CS polar bear research, conducted from 1987–1994, investigated movements, habitat use, and maternal den distribution. Significant changes in sea ice dynamics suggest that these factors have changed since that time. In the adjacent Southern Beaufort Sea polar bear population, similar, but smaller, declines in the extent and duration of annual sea ice have negatively impacted survival and breeding rates, raising concerns about the future of polar bears throughout the region.

Concern over the status of the CS polar bear population led the US and Russia to sign the Bilateral Treaty for the Conservation and Management of Polar Bears in 2000. This treaty establishes a joint US-Russia Commission with federal and native members from both countries responsible for making management decisions concerning polar bears in this region, including the potential establishment of a legal, sustainable harvest. In 2007, the US Congress passed legislation to implement the treaty, and in 2008 commissioners were appointed. The first meeting of the US-Russia polar bear Commission was held in Moscow, Russia in September of 2009. At this meeting the Commission established a Scientific Working Group (SWG) tasked with identifying a sustainable harvest level. The SWG subsequently met in Anchorage, Alaska in March 2010. A report was provided to the Commission with the group's recommendations on May 10, 2010. The second meeting of the Commission will be held June 7–9, 2010 in Anchorage, Alaska.

The SWG recently acknowledged that information necessary to accurately identify a sustainable harvest level for the Chukchi Sea polar bear population are lacking. In anticipation of the need for this information, the USFWS and USGS initiated a polar bear research program in the Chukchi Sea in 2008. To date, we have obtained sufficient data to begin analyses that will inform future recommendations of the SWG. We will be focusing much of our effort over the next year on analyzing these data. However, key information for harvest management, such as population size and vital rates, is difficult to estimate and requires a long-term effort. Therefore, the USFWS and collaborators will continue to move forward with research and monitoring in coming years.

## **Methods**

Polar bears were captured on sea ice habitats offshore from the Chukchi Sea coast of Alaska. A fixed-wing aircraft equipped with skis to land on the sea ice (Cessna 185 or 206) and a helicopter (Bell 206) were used to search for polar bears. We also used the fixed-wing to haul barrels of jet fuel to the helicopter. For the entire season, the helicopter and capture crew were based at the Red Dog Mine port facility. The fixed-wing and its crew were based at USFWS facilities operated by the Selawik National Wildlife Refuge in Kotzebue. We used jet fuel in the community of Point Hope via an arrangement with North Slope Borough Search and Rescue.

When a polar bear was sighted and determined to be in a safe area for capture, we tranquilized the bear with the drug Telazol® delivered in a projectile syringe fired from the helicopter. To obtain a representative sample, we captured all polar bears that were sighted, regardless of sex or age. Polar bears are difficult to study because they occur at low densities in remote areas. Therefore, using aircraft to access and physically capture a limited number of bears is necessary to obtain information on population status, habitat use, movements, nutritional condition and health.



Figure 1. Polar bear family groups, including mothers with yearlings as shown in this picture, were a large proportion of the Chukchi Sea capture sample in 2010.

Each captured bear was tattooed with a unique identification number on the inside upper lip, and fitted with dime-sized plastic ear tags in each ear. These marks allow us to monitor the history of individual bears during repeated capture efforts. Body measurements and biological samples were taken from each bear. We recorded body length, skull size, chest girth, and body mass using a scale and chain hoist suspended from a collapsible tripod. Blood and hair were collected to evaluate diet, disease, and contaminant levels. A small, unused tooth was extracted for age determination by counting growth rings. A small fat biopsy was taken to assess nutritional condition and diet using fatty acid analysis. Lastly, percent body fat was determined using bioelectrical impedance analysis, a painless procedure that passes a weak electrical current through the body (some bathroom scales use this technology). We marked all bears with a fur dye so they could be identified from the air—and therefore not recaptured—within the same capture season. The number painted on each bear's back will disappear in summer when the bear molts.

Over the years, great care has been taken to develop research methods that ensure each animal's safe handling and welfare, and maximize the scientific information obtained. Most bears are handled for about one hour and are often moving again within several hours. We monitor the

body temperature, respiration rate, and drug response of tranquilized bears. Following capture, we attempt to visually assess the recovery of bears later in the day, or on the next day. In 2010, all family groups were revisited within 36 hours, and were found to be up and well.

Adult female polar bears were fitted with satellite radiocollars (Telonics, Inc.), which were applied by sliding them over the bear's head. While the majority of polar bears retain their collars, a few will remove them immediately after waking up. Radiocollars provide year-round information on a bear's movements, which allows us to understand which habitats are most important and how polar bears are responding to declining sea ice. Data from radiocollars also show how polar bear populations are structured across the landscape, and how polar bears react to human activities such as oil and gas exploration. We do not fit radiocollars to young bears because they are still growing, or to adult males because their necks are larger than their heads, which causes the collars to slip off. Each collar was equipped with a release mechanism to ensure that it will drop off the bear one year after deployment. In addition to radiocollars, we also deployed small, ear-mounted satellite transmitters (Wildlife Computers) on some bears (Figure 2). These new tags are being tested to determine how long they can provide movement data, and to evaluate whether ear-mounted tags deployed on radiocollared adult females can be used to estimate survival rates. Double-tagging adult females (i.e. deploying both an ear tag and collar on the same bear) will aid in differentiating between a bear that removes its collar, and a bear that may have died. For example, if a bear dies, both the ear tag and collar will show inactivity, whereas if only the collar is removed, we will continue obtaining movement data from the ear tag. If successful, this method will provide a critically needed way to estimate the survival of adult females, which is the most important factor affecting population dynamics of polar bears.



Figure 2. Ear-mounted satellite transmitter deployed on an adult male polar bear in the Chukchi Sea in 2010.

## Results

We engaged in capture operations on 28 flight days from 16 March–30 April, 2010 (Figure 3). Polar bears were not distributed evenly throughout the area that was accessible by helicopter, but instead were often patchily distributed, with a main concentration of bear appearing in the region about 30 miles southwest of Point Hope (Figure 3).



Figure 3. Locations of captured polar bears (red dots) and track log for the helicopter (black lines) used in polar bear research in the Chukchi Sea, 16 March–30 April, 2010.

We captured and released 69 polar bears, a significant increase from the 35 and 39 polar bears tagged in 2008 and 2009, respectively. We recaptured 13 bears that were tagged in previous research efforts. There were no accidents or injuries to humans or bears. Most results of this year's capture season are provided in the summary at the beginning of this report. Highlights and some additional information are provided below.

The sex, age, and reproductive class of captured polar bears suggests that adult males were over-represented in our sample (i.e., we caught adult males in higher proportion than their actual proportion of the population; Table 1). We did not observe any females with cubs of the year (COY), although tracks that appeared to be of an adult female and two COY were observed. The lack of encounters of females with COYs supports previous observations that females in the CS population den primarily in Russia. Den surveys conducted on Wrangel Island during 1990–1994 reported an average of 400 maternity den sites per year. In spring, females with COYs may be unlikely to occur on the US side of the CS south of Cape Lisburne, simply because it is too long a distance for them to walk in the several weeks since emerging from their maternal den. In contrast with previous years, yearlings were very common in the 2010 sample. We also observed

several mating groups consisting of a female in estrous pursued by one or more adult males (Figure 4).

Age class	Female	Male
Adult* solitary	5	17
Adult with dependent young	14	0
Subadult**	0	8
Two-year-old	1	3
Yearling	7	14

Table 1. Sex and age composition of polar bears captured in the Chukchi Sea, 16 March–30 April, 2010. \*Adult (estimated to be  $\geq 5$  years); \*\*Subadult (independent bears estimated to be  $\leq 4$  years old).



Figure 4. A breeding pair (male on the right and female on the left) captured in the Chukchi Sea in 2010.

On average, adult males captured weighed approximately twice as much as adult females, which is typical of both polar bears and brown bears (Table 2). Three adult males weighed over 1200 lbs and the heaviest bear was 1353 lbs, which is a record for spring research in Alaska. The previous record of 1266 lbs was a bear captured in the Chukchi Sea in 2009. Overall, captured polar bears appeared to be in good nutritional condition. Using a body condition index that ranges from 1-5, with 1 being skinny and 5 being very fat, we classified one bear as index 2 (thin), 67 bears as index 3 (average), and one bear as index 4 (fat). We observed multiple sites where polar bears had killed seals, including adult ringed and bearded seals, and sites where ringed seal pups had been extracted from snow lairs. Beginning in mid-April, we observed bearded seal pups that were born on the exposed sea ice adjacent to newly refrozen leads.

Sex and age class	Mean weight (lbs)	Maximum weight (lbs)	Standard deviation (lbs)	Sample size
Female adult	545	716	72	18
Male adult	1016	1353	192	15
Male subadult	550	770	128	8
Female two-year-old	301	301	NA	1
Male two-year-old	407	486	69	3
Female yearling	225	260	37	5
Male yearling	317	393	49	13

Table 2. Weights of polar bears captured in the Chukchi Sea, 16 March–30 April, 2010. This table excludes six polar bears that were not weighed.

As of 10 May, 2010, all 16 of the satellite radiocollars and 17 of the 20 ear-mounted satellite tags were still transmitting the movements of polar bears (Figure 5). Movement data is critical to determining how the CS population is distributed geographically, and how polar bears in this region may respond to sea ice loss and human activities. The USFWS intends to distribute polar bear movement maps, similar to Figure 5, to collaborators and interested parties in the future.



Figure 5. Locations of 20 captured polar bears that were fitted with ear-mounted satellite tags (red dots) during polar bear research in the Chukchi Sea, 16 March–30 April, 2010. The white lines show the movements of these tagged bears through 10 May, 2010.

The USFWS performed outreach activities and maintained contact with local communities and organizations before, during, and after this year's polar bear studies. We greatly appreciate input

that was provided from local hunters and residents about the location of subsistence activities, including whaling, so that we could avoid working in these areas. We hope to make residents aware of our work and why it is important, and to learn from people living in polar bear country. During field operations, we participated in a live call-in program on KBRW Barrow public radio. In late April we discussed this year's findings at the Red Dog port facility, the Red Dog mine site, and at the National Park Service visitor center in Kotzebue. We are planning visits to Kivalina and Point Hope in summer 2010, and have initiated a study of traditional knowledge on polar bears focused on Chukchi Sea communities, in collaboration with the North Slope Borough and Alaska Nanuuq Commission.

### **Future plans**

The USFWS expects to continue polar bear studies in the Chukchi Sea in 2011. Thus far, logistical bases between Kotzebue and Point Hope have been ideal for this research. We considered expanding to other areas in 2010, but ultimately decided to work exclusively out of Red Dog mine's port site for another year, due to the high efficiency of basing operations there. Currently we are staging to expand our capture effort to include land-based fall captures on Wrangel Island in Russia. In addition, we hope to utilize at least one additional logistical base for US-based spring captures in 2011. To understand the status of the entire CS polar bear population, it is important to work throughout the region, not just in one small geographic area. We look forward to working with the communities to determine the locations and timing for research that will simultaneously improve our study and avoid interference with native subsistence activities.

In the coming year, we will be analyzing data on body condition, feeding ecology, and population dynamics for polar bears in the CS. We are developing plans for examining habitat selection, distribution, and movement patterns, and are awaiting an additional year of data from the ear-mounted transmitters and collars deployed in 2010. We plan to submit analyses that are completed within the coming year to peer-reviewed scientific journals for publication. We will continue to provide information to federal and state environmental planners, the Alaska Nanuuq Commission, the North Slope Borough Department of Wildlife Management, the Northwest Arctic Borough, local communities along the CS coast, and other interested parties via email updates, written reports, radio interviews, and live meetings.

### **Questions or comments?**

If you have any questions or comments about this study, please contact Karyn Rode (Karyn\_Rode@fws.gov) or Eric Regehr (Eric\_Regehr@fws.gov) at the U.S. Fish and Wildlife Service, Marine Mammals Management office in Anchorage, Alaska, or call us toll-free at 1-800-362-5148.

We ask hunters who harvest a polar bear to please check for ear tags and a lip tattoo. If the bear was previously tagged, please notify Karyn Rode or Eric Regehr. This will allow us to provide the hunter with information about the sex, age, and date of when the polar bear was captured. Additionally, this information is important to understanding survival rates of Chukchi Sea polar bears.

## Acknowledgements

This project would not have been possible without the generous support of numerous individuals and organizations, including Red Dog Mine, Teck mining company, the USFWS Selawik National Wildlife Refuge in Kotzebue, the Native Village of Point Hope, the City of Point Hope, North Slope Borough Search and Rescue, staff of the Marine Mammals Management Program with USFWS in Anchorage, the US Geological Survey, Polar Bears International, the Native Village of Kotzebue, the Alaska Nanuuq Commission, Kotzebue Flight Services, and NANA Regional Corporation. In particular we would like to thank Kei Curtiss, John Terry, John Anderson, Jim Hoyt, John Martinisko, Chris Eckert, Jim Kulas, Robert Napier, Steve Ommituk, Lily Tuzroyluke, Alex Whiting, Lee Anne Ayres, and Eric Sieh. We would like to thank the pilots and mechanics including Howard Reed and Jeff Ruppert with Maritime Helicopters; Sandy Hamilton, Robert Wing and Bob Eubanks with Arctic Air Alaska; and Quintin Slade with Quicksilver Helicopters. We thank David Douglas (USGS) for processing satellite telemetry data. This project was funded by the US Fish and Wildlife Service; radiocollars were provided by the US Geological Survey. Capture work was performed by Eric Regehr (USFWS), Karyn Rode (USFWS), Jim Wilder (USFWS), Mike Lockhart (Polar Bears International), and Geoff York (World Wildlife Fund). Laboratory support was provided by Jessica Carie (USFWS) and Rachael Donaldson (USFWS).