



## **Polar bear research in the Chukchi Sea region: a synopsis of 2011 fieldwork**

Karyn Rode and Eric V. Regehr  
U.S. Fish and Wildlife Service, Marine Mammals Management  
1011 East Tudor Road, MS341  
Anchorage, Alaska 99503  
Phone: 907-786-3800

### **Summary**

- Information is urgently needed on the status and trends of polar bears in the Chukchi Sea region (referred to as the “Alaska-Chukotka” or “Chukchi Sea” population). Polar bears in this region 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.
- A treaty signed between the United States and the Russian Federation on the conservation and management of the Alaska-Chukotka polar bear population (referred to as the “U.S.-Russia Agreement”) is currently being implemented. The Agreement requires that reliable information be used to identify whether there is a sustainable level of subsistence harvest. In June 2010, Native and federal Commissioners of the Agreement agreed upon a harvest limit of up to 58 polar bears per year, of which no more than 19 will be female, to be divided evenly between the U.S. and Russia. The Commissioners and their technical advisors proposed that the new harvest limit is likely to be sustainable in the short term. Biological information is needed to evaluate whether this limit should be increased or decreased in the future, to simultaneously provide for subsistence use and safeguard the Alaska-Chukotka population.
- The new harvest limit will not go into effect for another 1-2 years. Until that time, harvest will continue as currently managed. Hunters should continue to report and tag harvested polar bears within 30 days with their local tagger through the U.S. Fish and Wildlife Service (USFWS) Marking, Tagging, and Reporting Program.
- The USFWS and collaborators initiated a study in 2008 to provide scientific data on the status Alaska-Chukotka polar bear 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 the condition, health, and feeding ecology of polar bears in the region; and to understand the distribution of polar bears and their potential response to environmental changes.
- In March-April 2011, the USFWS continued this study for the fourth year. Results from this year’s fieldwork included the following:
  - The distribution of captured polar bears was different compared to 2008-2010, with more animals captured in areas west and south of the Red Dog Mine port facility, including the sea ice adjacent to Shishmaref.

- We captured, collected information from, and released 77 polar bears. Of these, 16 had been previously tagged during polar bear studies in the Chukchi Sea region from 2008-2010.
- We deployed 17 Global Positioning System (GPS) satellite radiocollars on adult females, which will be dropped off by an automatic release device after one year. We also deployed 14 glue-on satellite transmitters (applied just behind the shoulder) and 10 ear-mounted satellite transmitters on adult males and subadults of both sexes.
- The sex and age structure of captured bears differed from 2008-2010. The 2011 sample included 3 single adult females, 15 adult females with dependent young, 16 adult males, 17 subadults (some of which may have been independent two-year-olds), 16 two-year-olds with their mothers, 7 yearlings with their mothers, 1 independent yearling, and 2 cubs-of-the-year. The high proportion of two-year-old bears in 2011 likely reflected the large cohort of yearlings that was observed in 2010.
- 2011 marked the first year that cubs-of-the-year (COY) were captured or observed since the study began in 2008. Two adult females, each with one male COY, were captured. The COYs appeared healthy and weighed 49 and 52 lb.
- Overall, captured polar bears appeared to be in poorer nutritional condition compared to 2008-2010. This may have reflected the younger age of captured bears, reduced access to food resources, or both. Average body weights were 478 lb for adult females, 911 lb for adult males, 339 lb for subadult females, 496 lb for subadult males, 331 for two-year-old females, 443 lb for two-year males, 194 lb for yearling females, 253 lb for yearling males, and 50 lb for COY males.
- Fewer ringed and bearded seals were observed in the study area compared to 2008-2010.
- Similar to previous years, our observations suggest that the offshore area between Shishmaref and Point Hope is important breeding and feeding habitat for polar bears in the spring.
- Data collected from 2008-2011 provide sufficient sample sizes to begin analyzing feeding ecology, body condition, and population dynamics. Radiotelemetry information will be used to evaluate whether the polar bears captured in this study are representative of the larger Alaska-Chukotka population. The USFWS and collaborators plan to start publishing peer-reviewed results in 2012. These results will help guide conservation and management under the U.S.-Russia Agreement.
- The USFWS expects to continue polar bear studies in the Chukchi Sea region in future years. Polar bears are long-lived animals that live in a variable and rapidly changing environment. Long-term studies are necessary to understand interannual variation and monitor population trends.

## **Background**

There is an urgent need to better understand the status of the polar bear (*Ursus maritimus*) population that inhabits the Bering, Chukchi, and eastern portion of the East Siberian seas (referred to as the “Alaska-Chukotka” or “Chukchi Sea” population). 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 Chukchi Sea region range between the U.S. and Russia and are legally harvested by Native coastal residents in the U.S. Although

Russia has had a ban on polar bear harvest since the 1950s, recent reports suggest that poaching occurs at substantial and potentially unsustainable levels along the Chukotkan coast.

The listing of polar bears as a threatened species under the U.S. Endangered Species Act in May 2008 further highlights the conservation concerns for polar bears in this region. Recent studies indicate that the Chukchi Sea has experienced an 8% decline per decade in polar bear habitat, one of the highest rates of loss in the Arctic, and that sea ice declines are projected to continue through the next century. 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. Ecological differences (e.g., higher biological productivity in the Chukchi Sea) suggest that, in the short term, the potential responses of polar bears to sea ice loss may differ between these two regions.

Concern over the status of the Alaska-Chukotka polar bear population led the U.S. and Russia to sign a treaty called the *Agreement between the Government of the United States of America and the Government of the Russian Federation on the Conservation and Management of the Alaska-Chukotka Polar Bear Population* in 2000. The following documents, which accompany this fieldwork report and can be accessed online at <<http://alaska.fws.gov/fisheries/mmm/polarbear/bilateral.htm>>, provide up-to-date information on the U.S.-Russia Agreement and polar bear management in the Chukchi Sea region: *PBearTreatyFactSheetSept2010.pdf*; *U.S.-Russia polar bear management Q&A 12Jan11.pdf*.

To provide the biological information necessary for management and conservation of the Alaska-Chukotka polar bear population, the USFWS and collaborators initiated a research study in 2008. The fieldwork described in this report marks the fourth year of this study. We will be focusing much of our effort over the next year on analyzing the resulting data. However, key information required for harvest management, such as population size and population growth rate, are difficult to estimate and require longer-term studies. Therefore, the USFWS plans to continue the study of polar bears in the Chukchi Sea region in future years.

### **Fieldwork methods**

Polar bears were captured on sea ice habitats offshore from the Chukchi Sea coast of Alaska. A Cessna 206 fixed-wing aircraft, equipped with skis to land on the sea ice, and two helicopters (Bell 206 and R44) were used to search for polar bears. We also used the fixed-wing to haul jet fuel to the Bell 206. For the entire season, the helicopters and capture crew were based at the Red Dog Mine port facility. The Cessna 206 and its crew were based at USFWS facilities operated by the Selawik National Wildlife Refuge in Kotzebue. When a polar bear was sighted and it was safe to proceed, we sedated the bear with the drug Telazol® delivered in a dart fired from the back seat of the Bell 206. 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. Using aircraft to access their habitats and physically capture a limited number of bears is necessary to obtain information on population status, habitat use, nutritional condition, and health.

Captured polar bears were tattooed with a unique identification number on the inside of the upper lip, and fitted with small plastic ear tags. These marks allow us to monitor the history of individual bears over time. We measured 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 vestigial premolar (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. For adult females, bioelectrical impedance analysis was used to determine body composition (some bathroom scales use a similar technology to estimate a person's body fat). Finally, we used fur dye to mark a number on the backs of captured bears, so they could be identified from the air—and therefore not recaptured—within the same capture season. The numbers will disappear in early summer when the bears molt.

Over the years, great care has been taken to develop capture methods that ensure each animal's safe handling and welfare, and to maximize the scientific information obtained. Most bears are handled for about one hour and are were often up and moving within several hours. We monitor the body temperature, respiration rate, and drug response of all sedated bears. Following capture, we attempt to visually assess the recovery of bears later in the day, or on the next day. In 2011, all family groups were revisited within 48 hours and were found to be up and looking good.

Adult female polar bears were fitted with Global Positioning System (GPS) satellite radiocollars, 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 may be 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 would cause collars to slip off. Each collar was equipped with a release mechanism to ensure that it will drop off one year after deployment. We also deployed ear-mounted and glue-on tag satellite transmitters on some bears (Figure 1). We are currently evaluating whether these technologies can provide movement data on young bears and adult male bears, which cannot be fitted with radiocollars.



Figure 1. A glue-on satellite transmitter applied behind the shoulder of a young male polar bear.

## Results

Results from this year's fieldwork are listed in the *Summary* section at the beginning of this report. Here we provide more detailed information, and note some interesting observations.

We performed captures on 28 flight days from 16 March to 28 April, 2011. There were no accidents or injuries to humans or bears. This year, most polar bears were captured to the west and south of the Red Dog Mine port facility (Figure 2), whereas in previous years most bears were captured to the northwest of the port facility. This difference likely reflected both interannual variability in polar bear distribution, and a change in our search patterns. In 2011 we did not fly within 30 miles of Point Hope to avoid potential disturbance of subsistence activities. Also, weather and sea ice conditions prevented us from working in the area 30-60 miles southwest of Point Hope, where high densities of bears were observed from 2008-2010.

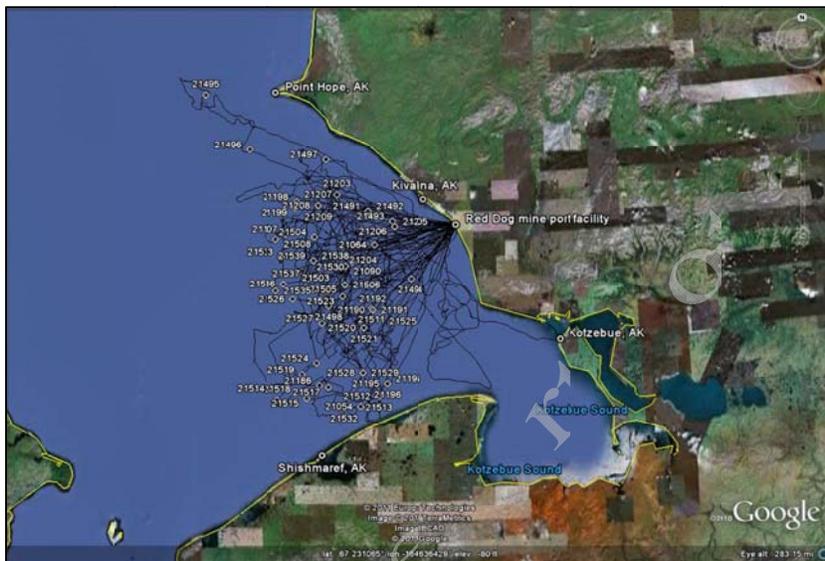


Figure 2. Track log of the Bell 206 helicopter (black lines) and locations of captured polar bears (white diamonds and individual identification numbers) for U.S. Fish and Wildlife Service polar bear studies in 2011.

We captured and released 77 polar bears, an increase from previous years (35, 39, and 69 animals captured in 2008, 2009, and 2010, respectively). Of the 77 bears captured, 61 were captured for the first time in 2011. Three adult females, and their six dependent young, had been tagged in 2008-2010 and were recaptured using radiotelemetry. Seven other polar bears had been tagged in 2008-2010 and were recaptured after being encountered by chance when searching polar bear habitats. We did not encounter any polar bears that had been previously tagged by the U.S. Geological Survey during their long-term study in the adjacent southern Beaufort Sea.

We deployed 17 GPS satellite radiocollars on adult females (Telonics Inc. GEN4 series). All collars will be dropped off by an automatic release device after one year. We also deployed 14 glue-on satellite transmitters (Wildlife Computers S216C series, applied just behind the

shoulder) and 10 ear-mounted satellite transmitters (Wildlife Computers S227D series) on adult males and subadults of both sexes.

The sex, age, and reproductive class of captured polar bears differed from previous years (Table 1). Two-year-old and subadult (3-4 years) polar bears composed approximately 43% of the capture sample. Some bears that were field-estimated to be subadults were likely two-year-olds that had recently become independent of their mothers; their ages will be confirmed by laboratory analysis of vestigial premolars. The high proportion of two-year-olds in 2011 likely reflected the cohort of yearlings that composed approximately 30% of the capture sample in 2010. Monitoring the fate of this cohort in future years should provide information on the rate at which young polar bears are becoming breeding members of the Alaska-Chukotka population.

	Cub-of-the-year	Yearling	Two-year-old	Subadult*	Adult** female (single)	Adult female (with young)	Adult male
2008	0	4	1	7	6	4	13
2009	0	1	3	8	6	3	18
2010	0	21	4	8	5	14	17
2011	2	8	16	17	3	15	16

Table 1. Sex, age, and reproductive class of polar bears captured in the Chukchi Sea region during U.S. Fish and Wildlife Service studies 2008-2011. \*Subadults were field-estimated to be 3-4 years. \*\*Adults were field-estimated to be  $\geq 5$  years.

2011 marked the first year that cubs-of-the-year (COY) were observed since the study began in 2008. Two adult females, each with one male COY, were captured and released (Figure 3). The COYs appeared healthy and weighed 49 and 52 lb. Also, in late March local residents reported two maternal dens north of Point Lay, and an adult female with a COY was observed around Kotzebue Sound. These observations suggest that some female polar bears gave birth in maternal dens along the U.S. coastline of the Chukchi Sea during the winter of 2010-2011. Previous studies have suggested that most females in region den in Russia.



Figure 3. An adult female and her cub-of-the-year captured and released on 21 April 2011.

On average, adult males captured in 2011 weighed nearly twice as much as adult females, which is typical of both polar bears and brown bears (Table 2). One adult male over 1200 lb was weighed, and two other adult males that likely exceeded 1200 lb were captured but not weighed due to logistical constraints. Overall, captured polar bears appeared to be in poorer nutritional condition compared to 2008-2010. Using a body condition index that ranges from 1-5, with 1 being skinny and 5 being very fat, we classified 18 bears as index 2 (thin) and 57 bears as index 3 (average). The COYs were not classified. The lower body condition indices this year likely reflected a combination of poorer nutritional condition and the high proportion of young bears, which are typically thinner than other bears because they are less skilled at hunting and are investing their energy into growth rather than into the accumulation of fat reserves.

Sex	Age class	Mean weight (lb)	Maximum weight (lb)	Sample size
Female	Adult	478	660	17
Male	Adult	911	1225	14
Female	Subadult	339	391	6
Male	Subadult	496	660	11
Female	Two-year-old	331	362	7
Male	Two-year-old	443	525	9
Female	Yearling	194	208	4
Male	Yearling	253	308	4
Male	Cub-of-the-year	50	52	2

Table 2. Scale weights of polar bears captured in the Chukchi Sea region in 2011. This table excludes three bears that were not weighed due to logistical constraints.

Subjectively, the number of ringed and bearded seals in the study area appeared low compared to 2008-2010. Evidence of feeding by polar bears (e.g., seal kills or bears with very full bellies) was less frequent than in previous years. On 19 April we observed the first bearded seal pup born on the exposed sea ice adjacent to new lead; a total of less than 10 bearded seal pups were observed during the remainder of the field season. We observed the first beluga in a lead on 29 March, and the first bowhead whales on 17 April. Other interesting observations included a moose on the sea ice 10 miles west of the Red Dog Mine port facility on 11 April, and a single walrus hauled out on an ice floe approximately 70 miles west of the port facility on 27 April. Finally, on 28 April we observed a site where multiple polar bears had apparently consumed a beluga over the preceding 1-2 weeks. Based on the amount of blood pooled on the sea ice, it appeared that the beluga had been pulled out of the water while still alive or shortly after being killed. Observations of polar bear predation on beluga are not uncommon in the Arctic, although most such observations involve beluga that were stranded on land or restricted to a small breathing hole by tight sea ice.



Figure 4. Remains of a beluga that had been consumed by polar bears on the sea ice, 28 April 2011.

We performed outreach activities and maintained contact with local communities and organizations before, during, and after this year's polar bear studies. We worked closely with the community of Point Hope to identify no-fly zones and ensure that our activities did not overlap with subsistence hunting, including spring whaling. This included visiting the community and working with the Native Village and City Council as well as maintaining weekly contact with whaling captains throughout the field season. We greatly appreciate input that was provided from local hunters and residents on the location of subsistence activities. In 2011 we did not fly within 30 miles of Point Hope to ensure that whaling activities were not disturbed. At the end of 2011 fieldwork, we discussed this year's findings at the Red Dog Mine port facility, the Red Dog Mine main site, and the National Park Service Northwest Arctic Heritage Center in Kotzebue. We are planning visits to Kivalina and Point Hope in 2011, and are conducting a study of

traditional knowledge on polar bears focused on Chukchi Sea communities in collaboration with the North Slope Borough and Alaska Nanuuq Commission. We hope to share our observations with local residents, and to learn about observations from people living in polar bear country.

### **Future plans**

The USFWS expects to continue polar bear studies in the Chukchi Sea region in future years. Perceived changes in the sex and age structure and nutritional condition of polar bears captured from 2008-2011 suggest a large amount of interannual variability. Analyses are necessary to evaluate these changes, and longer-term studies are necessary to separate this variation from potential underlying trends such as population increases or decreases.

In the coming year, we will be analyzing data on body condition, feeding ecology, and population dynamics for polar bears in the Chukchi Sea region. We are also using the movement data obtained from satellite telemetry to evaluate polar bear distribution and habitat selection. We hope to submit analyses for publication in peer-reviewed scientific journals in 2012. 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, and local communities along the Chukchi Sea coast via town meetings, written reports, and radio interviews.

### **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, AK, or call us toll-free at 1-800-362-5148.

We ask that hunters who harvest a polar bear please check for ear tags and a tattoo. If the bear has these research marks, please notify your local polar bear tagger under the USFWS Marking, Tagging, and Reporting Program, or contact Karyn Rode or Eric Regehr directly. If a polar bear with a radiocollar or other satellite telemetry device is harvested, we ask that the hunter or local tagger contact Karyn Rode or Eric Regehr directly so that arrangements can be made to obtain the collar. Important data can be obtained from collars that are retrieved. This will also allow us to tell the hunter how old the bear was and when it was captured.

### **Acknowledgements**

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