AERIAL SURVEYS OF BELUGAS IN COOK INLET, ALASKA, MAY 2006

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Abstract

National Marine Fisheries Service (NMFS) conducted an aerial survey of upper Cook Inlet, Alaska, 2-3 May 2006 with the intention of: 1) documenting beluga distribution; 2) recording calf sightings relative to other seasons; and 3) testing new survey equipment. The 7.1 hr survey was flown in a twin-engine, high-wing aircraft at an altitude of 244 m (800 ft) and speed of 185 km/hr (100 kt), consistent with NMFS' annual abundance surveys for Cook Inlet belugas. The flights in May included coastal searches of most areas within 1.4 km of the shoreline around the northern portion of Cook Inlet and some transects well away from shore. After sighting a beluga group, a series of aerial passes was made to mark the group location and to make quick aerial counts. Unlike June surveys, when groups are generally large, concentrated, and close to shore, belugas in May were in very small, widely scattered groups, some of them well offshore making them hard to find. The beluga distribution in early May appeared to be similar to winter/spring observations (November-April) made in previous years and in sharp contrast to the summer/fall distribution (June-October) when whales are in dense groups in shallow water. Although the total number of belugas seen (43 whales in two days) is small, no calves were observed, suggesting that this May survey preceded the calving season. With the small, scattered nature of beluga groups, cameras could not be tested directly on whales. However, broken river ice provided an ideal test of camera performance because ice color ranged from white to black (similar to belugas) with crisp, uniquely identifiable ice edges, which helped in pair-wise comparisons between images.

Introduction

NMFS conducts aerial surveys in Cook Inlet annually each June/July to study the distribution and abundance of belugas (*Delphinapterus leucas*; Rugh et al. 2000, 2005a; Hobbs et al. 2000a). This survey effort cooperates with the Cook Inlet Marine Mammal Council (CIMMC) and the Alaska Beluga Whale Committee (ABWC). In addition to the June/July surveys, aerial surveys have been conducted most months of the year to establish seasonal distribution (Rugh et a*l*. 2004), and tagged belugas have provided precise information on seasonal distribution (Hobbs et al. 2005). With the intention of collecting supplemental data on the monthly distribution of beluga whales, aerial surveys were proposed for May, August, and September 2006. This report describes results of the survey conducted in May. In addition to documenting beluga distribution, the

objectives of the May survey were to observe beluga whales prior to the presumed calving period (mostly in June and July; Hazard 1988), and to test new survey equipment (cameras and data entry system). Unlike the June surveys when upper Cook Inlet is sampled multiple times, covering essentially all coastal areas of the entire Inlet, the May survey was designed to minimize flight time by searching only shallow, near-shore areas in the upper Inlet where belugas are commonly known to occur (Rugh et al. 2000).

Methods

The survey aircraft, an Aero Commander 680 FL (*N98UP*), has twin-engines, high-wings, and 10-hr flying capability. There are bubble windows at each of the observer positions, maximizing the search area. An intercom system provided communication among the observers, data recorder, and pilots. A laptop with a new data entry program was used to collect locations from a Global Positioning System (GPS) every five seconds as well as sighting data. Other data entries included routine updates of time, percent cloud cover, sea state (Beaufort scale), glare (on the left and right), and visibility (on the left and right). Visibility was documented in five subjective categories from excellent to useless; conditions rated poor or useless were considered unsurveyed. Each start and stop of systematic survey effort was recorded. Observer seating positions were noted each time they were changed, generally every 1-2 hrs to minimize fatigue.

Coastal surveys were conducted approximately 1.4 km offshore. The intent was to search nearshore, shallow waters where belugas are typically seen in summer (Rugh et al. 2000). The trackline distance from shore was monitored with an inclinometer such that the waterline was generally 10° below horizontal while the aircraft was at the standard altitude of 244 m (800 ft). Ground speed was approximately 185 km/hr (100 knots). This coastal survey included searches up Beluga, Susitna, Little Susitna, Knik, and Chickaloon Rivers where whales have been found in the past. In addition to the coastal surveys, some ad hoc transects were flown across the inlet to search for whales well away from coastal areas (Figs. 1 and 2). Generally in June, there is an attempt to survey the Susitna Delta and Knik Arm during low tide when whales are concentrated at the edge of the shallow coastal areas. However, in May, survey dates were not selected as a function of tides but were based on aircraft availability; therefore, the timing and location of survey tracklines were designed within the available options of daylight and tide. Turnagain Arm was surveyed on a slack high tide, but Susitna Delta and Knik Arm were surveyed on falling tides.

Each sighting was reported immediately to the recorder. The whale group location was established by flying directly over the group. Small groups were counted by making several passes without video, due to very low whale densities (such as 4-5 whales across a 1-2 km). In May, the survey protocol did not include an independent search effort because no calculation of missed groups was necessary. Instead, observers exchanged information on sightings.

Two High Definition (HD) video cameras were tested relative to cameras used in the past. For many years, abundance surveys have relied on a “standard” camera (a Sony DVCAM, DSR-PDX10 Model L10A) to document whale groups for precise counts later in the laboratory (Hobbs et al.2000b). Switching to HD cameras provides better resolution and may increase the accuracy of the counts. However, the HD camera performance needed to be compared to the “standard” camera (Sony DVCAM) to allow for inter-year comparisons of count data. Also, a digital still camera (Nikon D1X with a 300 mm Nikkor AF lens) was mounted alongside an HD video camera to compare still image quality between the two formats. Still images are used to document ratios of white, gray, and dark belugas. This will provide information to be applied to a population analysis

of the proportion of adults to juveniles. Replacing the digital still and standard DV cameras with dual HD video cameras will simplify equipment needs and sampling protocol while increasing image quality.

Results

A total of 7.1 hrs were flown in upper Cook Inlet 2-3 May 2006. The flights were based out of Anchorage. Visibility and weather conditions interfered with the survey effort during only 0.2 hrs when the left-front observer considered the visibility poor or useless. All observers were already experienced in surveying Cook Inlet belugas. Most coastal areas of upper Cook Inlet were surveyed two times, especially areas where groups of belugas have consistently been found in the past – such as the Susitna Delta, Knik Arm, and Turnagain Arm/Chickaloon Bay. A total of 0.8 hrs (11.5%) were surveyed in offshore waters.

Small groups of belugas were found at scattered locations as presented in Figs. 1 & 2 and Table 1. Most of these sighting locations (Susitna Delta and Chickaloon Bay) were typical of the summer distribution; however, several small groups of whales were well away from shore which rarely is observed during in the abundance surveys. The other striking difference is that the beluga counts in May were very low (Table 1). Instead of counting approximately 200 belugas (mean = 194 whales for the June surveys 1998-2005; Rugh et al. 2005b), only 18 whales were counted on 2 May, and 25 whales were seen on 3 May. Whales were in groups of 1 to 7 instead of large, dense concentrations of a hundred or more as seen in June.

Besides belugas, harbor seals (*Phoca vitulina*) were the only other marine mammal seen. A total of 28 harbor seals were recorded. Perhaps because the surveys were not conducted at low tides, few seals were hauled out at the time.

An examination of the video footage showed that the HD cameras have a remarkable resolution (1280 x 720 pixels) compared to standard digital video (740 x 480 pixels). This increase in resolution shows crisp, clean edges of ice chunks, obviously improving on video cameras used in the past. However, still images captured from the 1280 x 720 resolution HD video camera are not quite as well defined as the 3008 x 1960 resolution images from the digital still camera used to capture calf images. Examination of the lower resolution HD still images reveals sufficient quality to distinguish small gray ice chunks from background waters and sandbars.

Discussion

The May aerial surveys had three primary objectives: 1) learn more about beluga habitat use and distribution in a month other than June (when the standard abundance surveys are conducted); 2) note the presence of beluga calves to better assess calving season; and 3) test out new equipment and a program prior to the June abundance survey. May survey results, in terms of the first objective, were informative. It was evident that belugas were not in concentrated, large groups in shallow waters near river mouths, as they are typically found in June. This may be related to fish runs which are not yet significant. The Cook Inlet beluga distribution observed in May is similar to the distribution seen in winter months (November through April; Rugh et al. 2004; Hobbs et al. 2005).

The second objective, regarding the timing of beluga calving, was achieved in that no beluga calves were seen, but the lack of whale concentrations made it impractical to collect video images for later analysis in the laboratory. The lack of calf sightings provides some confirmation to the idea that the calving season is not underway in Cook Inlet until sometime after early May.

The third objective, testing new video cameras, was met not with a large sampling of belugas but by capturing video footage and images of ice along Susitna River. The advantage of this test is that the ice provided all shades of color from white to gray to black (similar to the colors of belugas at different maturity stages), yet each piece of ice was uniquely distinctive, making it ideal to compare images between cameras. Increased resolution of the HD video cameras will improve the clarity of video footage used for counting belugas. Each year the appropriate correction for missed belugas is calculated through a comparison of the zoomed video relative to the standard video. Therefore, switching to dual-HD video cameras for counting purposes will still provide the same type of correction procedure as used in the past. Regarding still image analysis, changing from a high resolution digital still camera to HD video images for analysis of beluga colors (white vs gray vs black) will lower the resolution of individual images. However, the reduction in resolution is not sufficient to interfere with identification of individual calves. Additionally, there is the benefit of increased number of images available from HD video footage relative to a still camera improving the chance a small, dark whale might be detected. These tests of the camera systems: 1) provide qualitative confirmation that the new HD cameras have sufficient resolution to compare favorably with previous cameras; 2) have the added benefit of improved efficiency; and 3) are easier to handle by simplifying the training on use of equipment and the infield workload.

Acknowledgments

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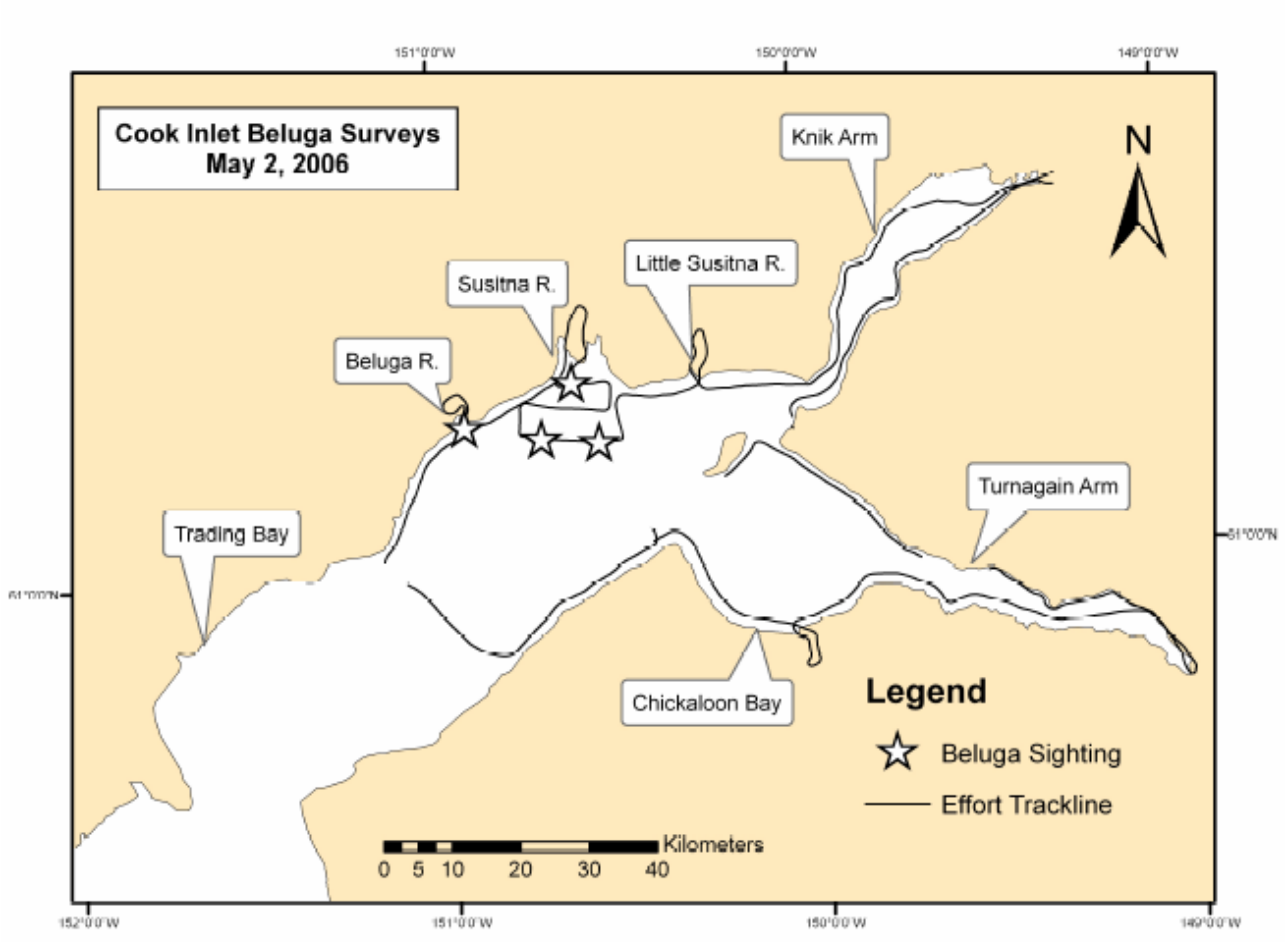

Figure 1. Tracklines and beluga sightings made during an aerial survey of upper Cook Inlet on 2 May 2006.

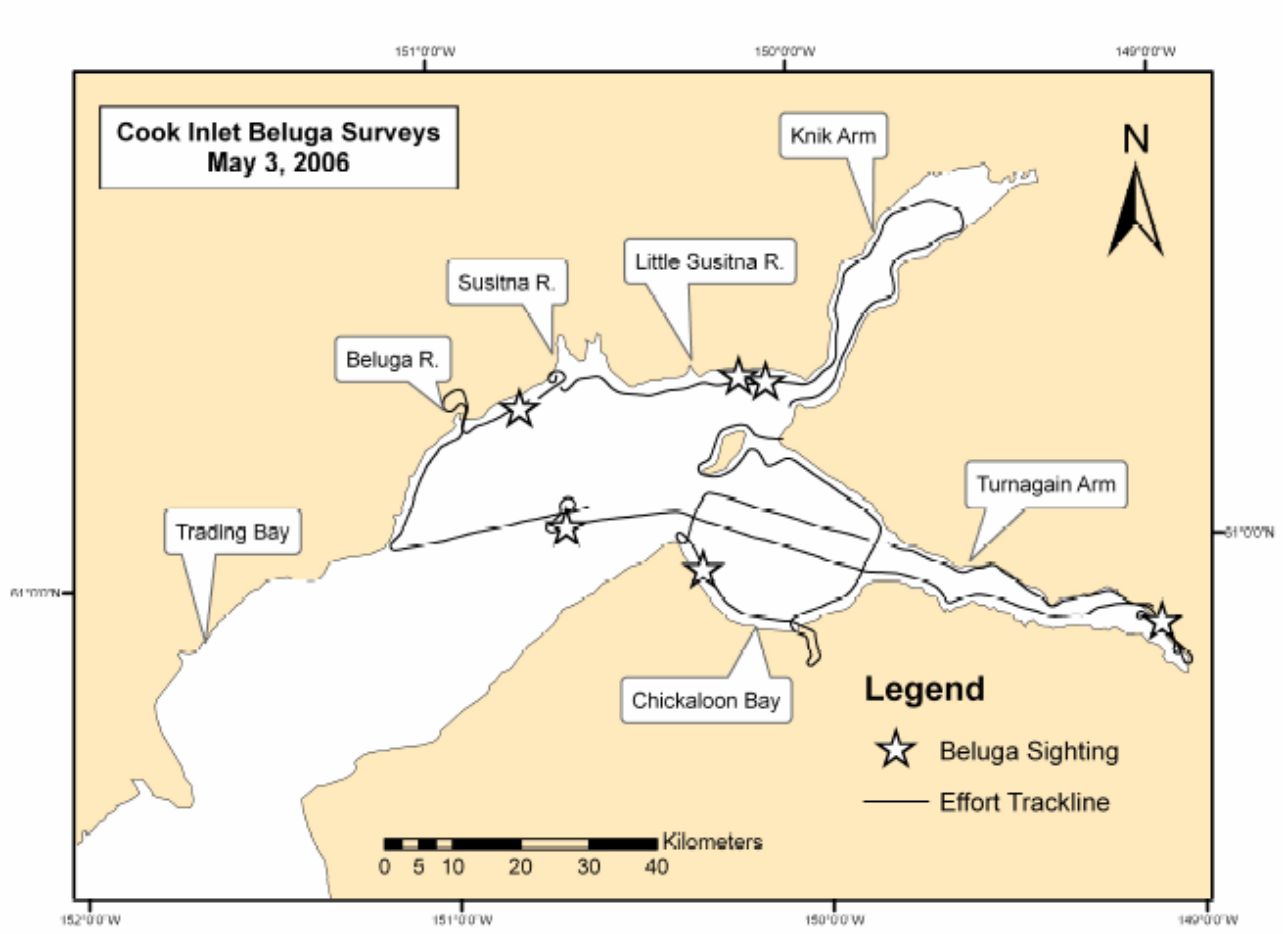

Figure 2. Tracklines and beluga sightings made during an aerial survey of upper Cook Inlet on 3 May 2006.

Table 1. Summary counts of belugas made during aerial surveys of Cook Inlet in May 2006. Dashes indicate no survey, and zeros indicate that the area was surveyed but no whales were seen. Sites are listed in a clockwise order around Cook Inlet. No estimates are provided for missed whales.

Location	2 May	3 May
Turnagain Arm (not including Chickaloon Bay)	0	3
Chickaloon Bay/ Pt. Possession	0	1
East of Pt. Possession	---	7
Susitna delta (N Foreland to Pt. Mackenzie)	18	14
Knik Arm	0	0
Fire Island	0	0
Totals	18	25