AERIAL SURVEYS OF BELUGAS IN COOK INLET, ALASKA, JUNE 2007

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Abstract

The National Marine Fisheries Service (NMFS) conducted surveys of the beluga population in Cook Inlet, Alaska, 7-15 June 2007. The aerial surveys (47.2 flight hours) were 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' surveys of Cook Inlet conducted each year since 1993. Although in most years an Aero Commander aircraft was used for these surveys, in 2007 the survey aircraft was a Twin Otter. The study in June 2007 included one or more surveys of coastal areas (flown 1.4 km offshore) around most of the Inlet and 1342 km of transects across the Inlet, effectively searching 25% of Cook Inlet and 71% of the coastline. Paired, independent observers searched on the coastal (left) side of the plane where virtually all beluga sightings occur, while a single observer and computer operator/data recorder were on the right side of the plane. After finding belugas, multiple aerial passes were made with paired observers doing four or more independent counts of each group. Daily median counts made on seven different days ranged from 64 to 126 belugas in the Susitna delta (between the Beluga and Little Susitna rivers), 0 to 9 belugas in Knik Arm, and 8 to 60 belugas in Turnagain Arm and Chickaloon Bay (including whales seen north of Point Possession). Belugas were not observed in lower Cook Inlet, which is typical of annual surveys in most of the recent years. In June 2007, the highest daily median estimate, used here as an index for relative abundance (not corrected for effort nor for estimates of missed whales), was 224 belugas. This is below index counts for survey years prior to 1998 (305 belugas in 1993, 281 in 1994, 324 in 1995, 307 in 1996, and 264 in 1997), but higher than index counts made during the past nine years (193 in 1998, 217 in 1999, 184 in 2000, 211 in 2001, 192 in 2002, 174 in 2003, 187 in 2004, 192 in 2005, and 153 in 2006).

Introduction

The National Marine Fisheries Service (NMFS) conducts annual aerial surveys to study beluga (*Delphinapterus leucas*) distribution and abundance in Cook Inlet, Alaska. These surveys typically occur in June and have been repeated each year since 1993 (Rugh et al. 2005). This project is in cooperation with the Cook Inlet Marine Mammal Council (CIMMC) and the Alaska Beluga Whale Committee (ABWC). The objectives for the annual June surveys are to document beluga sightings for distributional analysis and to count and video belugas in Cook Inlet for abundance estimates. The intent of the 2007 survey was to maintain continuity with preceding NMFS surveys to allow for inter-year trend analyses.

The small population size, approximately 300-400 whales (Hobbs et al. 2000a) and isolation of the Cook Inlet beluga stock (O'Corry-Crowe et al. 1997; Laidre et al. 2000; Rugh et al. 2000) has focused management concerns on these whales. Until 1999, Cook Inlet belugas were subjected to an unregulated subsistence harvest (Mahoney and Shelden 2000). Following abundance estimates that indicated this stock had declined nearly 50% between 1994 and 1998, NMFS designated the stock as depleted under the Marine Mammal Protection Act (65 FR 34590) on 31 May 2000. As of April 20, 2007 (72 FR 19854), this population has been proposed for listing as endangered under the Endangered Species Act. Cook Inlet belugas are now managed with a small, regulated subsistence harvest.

Methods

Aircraft and data

The survey aircraft used in June 2007, a Twin Otter (*N46RF*), has twin-engines, high-wings, and more than 6-hour flying capability. Large bubble windows were at the right and left forward observer positions, maximizing the search area; however, the left rear observer window was flat, unlike surveys in previous years. An opening window in the left rear position allowed for photography. The intercom system provided communication among the observers, data recorder, and pilots, but a selective listening device was used to aurally isolate each observer position. A laptop computer[1] recorded sighting data as well as location data from a portable Global Positioning System (GPS). Data entries included routine updates of time, locations, percent cloud cover, sea state (Beaufort scale), glare (on the left and right sides of the aircraft), and visibility (on the left and right sides). Visibility was documented in five subjective categories from excellent to useless; conditions rated poor or useless were considered unsurveyed. Each start and stop of a transect leg was recorded. Observer seating positions were noted each time they were changed, generally every 1-2 hours to minimize fatigue.

[1] Starting in 2006, survey data were entered using a new software program specifically developed for the Cook Inlet beluga aerial survey by Niel and Kimberly Goetz.

Tracklines

Coastal surveys were conducted approximately 1.4 km offshore from the apparent waterline. The objective was to search all nearshore, shallow waters where belugas are typically seen in late spring/early 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 rivers until the water appeared to be too shallow for belugas, as indicated by Native hunters.

In addition to the coastal surveys, systematic transects were flown across the Inlet (Fig. 1). Offshore tracklines were designed to run the length of Cook Inlet or cross it, minimizing overlap within the 2007 survey effort (Fig. 2) and between years.

Tides

Due to the broad geographical range of these surveys, in conjunction with rapidly changing tide heights, surveys were not flown at specific tidal conditions throughout Cook Inlet. There was an attempt to synchronize flights with low tides in the Susitna delta and Knik Arm, because: 1) the effective survey area was minimized at low tide when large areas of mudflats were exposed; and 2) beluga groups tend to concentrate at low tide, making them easier to find and count. It has proved best to survey Knik Arm during a rising tide because whale groups were relatively more concentrated as they moved up flooding channels. Also, when the whales followed the tide north, they moved away from the intense air traffic experienced near Anchorage (Elmendorf Air Base, Merrill Field, Lake Hood, and the Anchorage International Airport) where the plane could not circle whales for the standard counting protocol. Because tide changes in Turnagain Arm can be so rapid that tide rips with white caps compromise visibility, attempts were made to survey Turnagain Arm at slack tide. In Chickaloon Bay, belugas tend to be close to shore or in Chickaloon River at high tide, where they were relatively easy to video and count. Aerial surveys south of East and West Forelands were scheduled as a function of weather, not tides.

Although there are many daylight hours in this area during June (which was just prior to the summer solstice), light levels were low enough at night so that no surveying was done prior to 07:30 or after 19:30, local time. The flight schedule for every survey day was designed to take advantage of tidal patterns, as described above, relative to workable daylight hours.

Counting protocol

Immediately upon seeing a beluga group, each observer independently reported the sighting to the data recorder. As the aircraft passed abeam of the whale group, the observer(s) informed the recorder of the inclinometer angle and notable group behaviors but not group size. An important component to the survey protocols was the independence of the paired observers (i.e., that they not cue each other to sightings). This was done by having a visual barrier between the two left observers and audio shutoffs at each observer position. After a beluga group was reported, the trackline was maintained until the group was well behind the aircraft. This allowed each observer an opportunity to independently sight and report whale

groups, and helped identify which beluga groups were missed by an observer. The pilot and data recorder did not call out beluga sightings until the whales were past the wing and likely missed by observers on that side of the aircraft. After passing the whales, the systematic search effort was stopped, and all headsets were activated so that everyone was able to communicate during counting passes.

Whale group locations were established at the onset of the counting passes by flying directly over the group and marking the group perimeters with GPS positions. The flight pattern used to count a whale group involved an extended oval around the longitudinal axis of the group with turns made well beyond the belugas. Whale counts were made on each pass down the long axis of the oval, with the observers and cameras on the left side of the aircraft. Counts began and ended on cue from one counter, starting when the leading edge of the beluga group was close enough to be counted and ending when the trailing edge went behind the wing line. This provided a precise record for the duration of each counting effort. The paired observers made independent counts and recorded their results along with date, time, pass number, and quality of the count. The pass quality was a function of how well the observers saw the group location – it was not a function of how many whales were at the surface on the respective pass. Ratings were A (the counting effort was uncompromised by glare, whitecaps, distance, etc.) through F (when it was not practical to count whales). Only quality A and B estimates were used in the abundance analysis. Although whale tracks can be seen in muddy water, only whales at the surface during a pass were included in the counts. Daily count records were not shared within the aerial team until the survey effort was completed to maximize the independence of each observer's counts.

The daily aerial counts are represented by medians of each observer's median counts on multiple passes (typically 4 to 8 passes) over each whale group (Table 1). Using median counts instead of maximum or mean counts reduces the effect of outliers (extreme high or low counts) and makes the NMFS surveys more comparable to other surveys that lack multiple counting passes over whale groups. Median counts are also more appropriate than maximums when these counts are corrected for missed whales because correction factors should be applied to representative counts, not extremes. However, when establishing the annual index, the procedure has been to use the highest of the daily medians instead of a median of all daily medians; this avoids including counts from days with only partial surveys.

Cameras

Paired High Definition (HD) video cameras were used to document beluga groups; one camera had a lens set at wide angle to view the entire beluga group, and the second camera lens was zoomed to magnify individual whales in the group. The zoomed video is used to determine correction factors for missed animals (see Hobbs et al. 2000b) and to examine color ratios of white adults relative to dark juveniles (Litzky 2001; Sims et al. 2003, 2006). For many years, Cook Inlet beluga abundance surveys relied on a "standard" mini digital video camera with resolution of 720 x 480 pixels (a Sony DVCAM, DSR-PDX10 Model L10A), but the new HD cameras provide better resolution offering 1280 x 720 pixels. The paired cameras were operated on all counting passes when group size appeared to be more than 20 belugas. Video clips from the two cameras will be studied in the laboratory to obtain precise

beluga counts. These beluga counts will be assessed for the amount of time the area was in view, and then a correction can be applied for whales under the surface and not visible in the video (Hobbs et al. 2000b). The beluga counts in the video images will be used to determine the 2007 Cook Inlet beluga abundance estimate (Hobbs et al. 2000a).

Results

Survey effort

A total of 47.2 hours were flown around Cook Inlet 7-15 June 2007. All flights (13 take-offs and landings ranging from 2.3 to 6.0 hours) were based out of Anchorage, sometimes with refueling stops in Homer or Kenai. Of the 47.2 flight hours, 23.5 hours were spent on survey effort (i.e., not including time on the runway, deadheading without a search effort, circling whale groups to conduct counts, or periods with poor or useless visibility). Visibility conditions interfered with the survey effort during 2.8 hours (12% of the effective search time) when the left-front observer considered the visibility poor or useless.

Four observers in 2007 have participated in the Cook Inlet beluga surveys in most or all seasons since the project began in 1993. One observer had not participated in surveys of Cook Inlet before but had been on many other cetacean aerial surveys.

Coverage

The June 2007 aerial surveys provided a thorough coverage (71%) of the Cook Inlet coastline (1286 km surveyed relative to a total of 1810 km) for most waters within approximately 3 km of shore (Figs. 1 and 2). In addition, 1342 km of systematic transects were flown across the Inlet. Assuming a 2.0 km transect swath (1.4 km on the left side plus 1.4 km on the right side, less the 0.8 km blind zone beneath the aircraft), the cumulative survey tracklines covered 5255 km^2, which is 25% of the Cook Inlet surface area (20,943 km^2). This coverage was similar to past beluga surveys in Cook Inlet (Rugh et al. 2000). Upper Cook Inlet was surveyed on five days in 2007, concentrating in areas where beluga groups have consistently been found in the past, such as Susitna delta, Knik Arm, Turnagain Arm, and Chickaloon Bay. Even when ignoring the repetition of coastal surveys in the upper Inlet, the sum of all offshore transects and coastline surveys (550 km) relative to the surface area shows that 63% of upper Cook Inlet was surveyed in 2007. In lower Cook Inlet, surveys covered 17% of the area based on 1260 km of coastline plus offshore transects relative to a surface area of 17,130 km^2.

2007 Daily reports

June 7

The season began with a survey of lower Cook Inlet. We flew along the east coast of the Inlet, proceeding from Anchorage to Chickaloon Bay, around Point Possession, south to East Foreland, and then south to Homer, where the plane was refueled. The coastal survey included flying up the Kenai, Kasilof, and Fox rivers. From Homer, the survey continued on offshore transects in and around Kachemak Bay almost to Kayuktolik Bay, where weather (rain and low cloud ceilings) forced us to turn the plane north. We then flew offshore

transects to Anchorage, with a circuit around Kalgin Island. Viewing conditions were generally good except near the Gulf of Alaska.

One beluga group was seen in Chickaloon Bay, but no other beluga sightings were made that day. More than 900 harbor seals (*Phoca vitulina*) were seen in Kachemak Bay, including about 650 seals hauled out near the mouth of Fox River. In addition, almost 250 sea otters (*Enhydra lutris*) were counted, mostly in northern Kachemak Bay.

June 8

Because the weather forecast for lower Cook Inlet was more favorable than for the upper Inlet on this day, an attempt was made to fly south, including a survey of the western shoreline. We proceeded on offshore transects as far south as Augustine Island, but high winds (>50 knots), fog, and rain made us abandon the effort. Visibility remained poor throughout offshore transects back to Anchorage.

Similar to June 7, only one beluga group was seen, and typical of the spring/summer distribution, the belugas were in upper Cook Inlet, near the Little Susitna River. Other marine mammal sightings included approximately 50 harbor seals hauled out on a sandbar north of Kalgin Island, and 250 sea otters near Augustine Island. Many sea otters were hauled out on Augustine Island, perhaps because of the storm. In addition, one humpback whale (*Megaptera novaeangliae*) was seen on the southeast side of Augustine Island, and four harbor porpoise (*Phocoena phocoena*) were seen in mid-Inlet.

June 9

This was the first survey of upper Cook Inlet for this season. We started at low tide in Knik Arm and found belugas in Goose Bay (group 1) and Eagle Bay (group 2). Fire Island was surveyed after Knik Arm, and then we continued down the coastline from Point Possession to East Foreland. From East Foreland we flew to the north end of Kalgin Island to check on a report of two dead, stranded belugas. After finding what appeared to be a dead beluga, we flew to West Foreland and continued the survey around the Susitna delta, Turnagain Arm, and Chickaloon Bay. Viewing conditions were excellent all day.

In the Susitna delta, three beluga groups were found (groups 3, 4, and 5) and at least 150 harbor seals. One beluga group was seen in Turnagain Arm, near Potter's Creek (group 6), and three beluga groups were in Chickaloon Bay (groups 8, 9, and 10).

June 10

We left Anchorage on an ebb tide and circled Fire Island before heading to Point Possession. One beluga group (group 1) was found between Fire Island and Point Possession. The survey effort continued south along the coast to Moose Point where we crossed Cook Inlet to North Foreland, and then we flew north along the west coast, surveying Susitna delta and Knik Arm. After refueling in Anchorage, we surveyed Turnagain Arm and Chickaloon Bay. Viewing conditions were very good all day.

Two beluga groups were seen near Beluga River (groups 2 and 3), and four beluga groups were in the Susitna delta area (groups 3, 4, 5, and 6). One beluga group (group 7) was found in Knik Arm north of Eagle Bay. No whales were seen in Turnagain Arm, but four

beluga groups were found in Chickaloon Bay (groups 8, 9, 10, and 11). Many harbor seals were counted in the Susitna delta (70+) and Chickaloon Bay (40+).

June 11

The survey began in upper Cook Inlet nearly three hours before low tide. After leaving Anchorage, we surveyed Turnagain Arm and Chickaloon Bay before crossing the Inlet from Point Possession to the Native Village of Tyonek. From there we surveyed north around the Susitna delta and Knik Arm on a flood tide. This survey, as with the previous upper Cook Inlet surveys, was conducted under excellent viewing conditions.

Only one beluga whale was spotted in Turnagain Arm (group 1), and three beluga groups were found in Chickaloon Bay (groups 2, 3, and 4). Similar to earlier surveys, beluga groups were found in the Susitna delta (groups 5 and 6), and one group was seen in Knik Arm (group 7). Again, harbor seals were found in both Chickaloon Bay and the Susitna delta.

June 12

A second attempt was made to survey the west side of lower Cook Inlet. The survey team left Anchorage and flew south following offshore transects almost to Cape Douglas, where weather deteriorated. We flew to Homer to refuel, and then from Homer we crossed the Inlet, staying north of fog and rain, until we reached Chinitna Bay. Survey conditions along the west coast were good until winds picked up north of Tuxedni Bay; as a result, Redoubt Bay was not surveyed this year.

Two humpback whales were seen in lower Cook Inlet, between Kachemak Bay and Augustine Island.

June 13

There was mandatory down time for the pilots on this day after flying 6 days in a row.

June 14

The fourth upper Cook Inlet survey began in Turnagain Arm and went around Chickaloon Bay. From Point Possession, the survey continued south along the coast to Kenai River, and the plane refueled in Kenai, waiting for low tide in the Susitna delta. We crossed the Inlet from Kenai to West Foreland and surveyed north, along the coast to the Susitna delta, before surveying Knik Arm and Fire Island. This survey was conducted under excellent viewing conditions.

No whales were seen in Turnagain Arm, but three beluga groups were found in Chickaloon Bay (groups 1, 2, and 3). One beluga group was found at the mouth of the Beluga River (group 4), and five beluga groups were in the Susitna River (groups 5, 6, 7, 8, and 9). One beluga group (group 10) was found in Knik Arm, near Birchwood, at high tide. In addition, two belugas (group 11) were spotted northeast of Fire Island when the aircraft was making the approach into Anchorage.

June 15

The last survey of upper Cook Inlet was an abbreviated trackline, covering all areas where belugas have typically been found in the past. The survey went into Turnagain Arm as far as Bird Point, then around Chickaloon Bay as far as Point Possession. From there we crossed the Inlet to North Foreland, surveying north around the Susitna delta and Knik Arm as far as Birchwood before returning to Anchorage. Viewing conditions were excellent, as they had been on all upper Cook Inlet surveys this season.

A single beluga was seen in Turnagain Arm (group1), and three beluga groups were found in Chickaloon Bay (groups 2, 3, and 4). One beluga group was found at the mouth of the Beluga River (group 5), and a large beluga group (group 6) was near the Susitna River.

Summary counts of belugas

Medians of beluga counts are shown in Table 1, and beluga sighting locations are shown in Figure 3. The daily medians ranged from 132 to 224 whales (Fig. 5). Following the standard procedure, the highest daily median is used as the annual index count; therefore, in June 2007 the index count was 224 belugas. This annual index does not reflect any correction for missed whales. Calculations for whales missed during these aerial counts and abundance estimates are described in Hobbs et al. (2000a, b). The median count in 2007 (224 belugas) is higher than similar counts from 1998-2006 (153-217 belugas; Table 2).

Other marine mammals

Besides belugas, the only other marine mammals found in upper Cook Inlet (north of 60°43'N) were harbor seals. There were 23 harbor seal sightings ranging 1-150 seals per group (total 393 harbor seals; median group size was 4 seals). Harbor seals were seen on every survey day in lower Cook Inlet (primarily Kachemak Bay) and upper Cook Inlet (primarily between the Theodore and Ivan Rivers and Chickaloon River).

Although belugas were not seen in lower Cook Inlet (south of 60°43'N), many other marine mammals were recorded (Fig. 4). Harbor seals were common (20 sightings ranging 1-650 seals; total 1081 harbor seals; median group size 16 seals). Sea otters were seen in or near Kachemak Bay (32 sightings for a total of 269 otters; median group size 4 sea otters) and near Augustine Island (8 sightings for a total of 247 otters; median group size 21 sea otters). Whale sightings in lower Cook Inlet included two humpback whales sightings (three individuals). Only four harbor porpoise were seen this year, although in the past they were commonly seen in the lower Inlet.

Discussion

The June 2007 Cook Inlet survey was similar to previous surveys in terms of research protocol and survey area. Although aircraft altitude, air speed, and coastal search patterns were kept as constant as possible between years, and most observers were experienced in these beluga surveys, this year a Twin Otter aircraft was used instead of an Aero Commander and window configurations were not quite the same as in previous survey efforts. Instead of two equal-sized bubble windows for the two left observers, the left-front observers had one very large bubble window, and the rear observer had a flat window. In addition to the many

years this project has been underway (1993-2007), each of these beluga surveys has involved several replicate flights around upper Cook Inlet. The large number of flights and consistency in effort has helped detect whale distribution patterns. In 2007, as in most years, belugas were found in small groups near river mouths and shallow waters in upper Cook Inlet, in particular near the Susitna River, Little Susitna River, Knik Arm, Turnagain Arm, and Chickaloon Bay. Also, typical of most surveys in recent years, belugas were not found south of the Forelands (Fig. 3; Table 1). Prior to 1996 it was not uncommon to see beluga groups south of North Foreland (Rugh et al. 2000), but since the mid-1990s, only one or two beluga groups have been found in lower Cook Inlet (Table 2). In spite of good sighting conditions during most of these annual surveys in June, belugas were regularly observed only in upper Cook Inlet. Because many other marine mammals were seen in the lower Inlet, the lack of beluga sightings was not due to visibility.

The 2007 index count, that is, the median count from the best survey day (224 belugas) is higher than index counts made annually since 1998 (Table 2) but lower than index counts made prior to 1998. These median counts are uncorrected for missing whales, but they do provide a quick assessment of the aerial survey effort. The annual calculated abundance will include corrections for whales missed within the viewing range of observers, whales missed because they were beneath the surface. These corrected abundance estimates are shown in Table 2 (estimates from 1994-2000, Hobbs et al. [2000a]; estimates from 2001-06, NMFS unpublished data). The abundance estimates, with their associated coefficients of variance, are the appropriate values to be used in interyear trend analyses.

Acknowledgments

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Table 1. Beluga counts made during aerial surveys of Cook Inlet in June 2007. Counts are medians from observers doing multiple counts of each whale group. Dashes indicate no survey effort, and zeros indicate that the area was surveyed, but no whales were seen. Sites are listed in a clockwise order around Cook Inlet starting with Turnagain Arm.

Location	6/7	6/8	6/9	6/10	6/11	6/12	6/14	6/15
Turnagain Arm	---	---	76	0	1	---	0	1
Chickaloon Bay/ Point Possession	40[2]*	---	47	50	30	---	44	20
Point Possession to East Foreland	0	---	0	---	---	---	0	---
Mid-inlet east of Trading Bay	0	0	---	---	---	0	---	---
East Foreland to Homer	0	---	---	---	---	---	---	---
Kachemak Bay	0	---	---	---	---	---	---	---
West side of lower Cook Inlet	---	0*	---	---	---	0	---	---
Redoubt Bay	---	---	---	---	---	---	---	---
Trading Bay	---	---	0	---	---	---	0	---
Susitna delta[3]	---	30[2]	74	131	132	---	152	111
Knik Arm	---	---	27	23	20	---	0[4]	0
Fire Island	---	---	0	0	---	---	2	---
Totals			**224**	**204**	**183**		**198**	**132**

*Viewing conditions compromised by high winds in some areas.

[2] This beluga group was seen on the outbound leg of the lower Cook Inlet survey.
[3] For purposes of dividing Cook Inlet into coverage areas, this table includes all coastline between North Foreland and Point MacKenzie as a part of the Susitna delta, although belugas were only found between the Beluga and Little Susitna rivers.
[4] Small group seen near Fire Creek, median count of zero.

Table 2. Cook Inlet beluga index counts made during aerial surveys in June or July 1993-2007 showing abundance estimates with respective CVs (Hobbs et al. 2000a; NMFS unpublished data). Sighting percentages are indicated in three generalized zones.

Year	Dates	Index counts	Abundance estimates	CV	Lower Cook Inlet	Susitna delta[1]	Elsewhere in upper Cook Inlet
1993	June 2-5	**305**	---	---	0%	56%	44%
1994	June 1-5	**281**	653	0.43	4%	91%	5%
1995	July 18-24	**324**	491	0.44	4%	89%	7%
1996	June 11-17	**307**	594	0.28	0%	81%	19%
1997	June 8-10	**264**	440	0.14	0%	28%	72%
1998	June 9-15	**193**	347	0.29	0%	56%	44%
1999	June 8-14	**217**	367	0.14	0%	74%	26%
2000	June 6-13	**184**	435	0.23	0%	62%	38%
2001	June 5-12	**211**	386	0.09	1%	35%	64%
2002	June 4-11	**192**	313	0.12	0%	48%	52%
2003	June 3-12	**174**	357	0.11	0%	9%	91%
2004	June 2-9	**187**	366	0.2	0%	6%	94%
2005	May 31-June 9	**192**	278	0.18	0%	60%	40%
2006	June 5-15	**153**	302	0.16	0%	76%	24%
2007	June 7-15	**224**	---	---	0%	64%	36%

[1] For purposes of dividing Cook Inlet into coverage areas, this table includes all coastline between North Foreland and Point MacKenzie as a part of the Susitna delta.

Figure 1. June 2007 on-effort tracklines for upper Cook Inlet surveys.

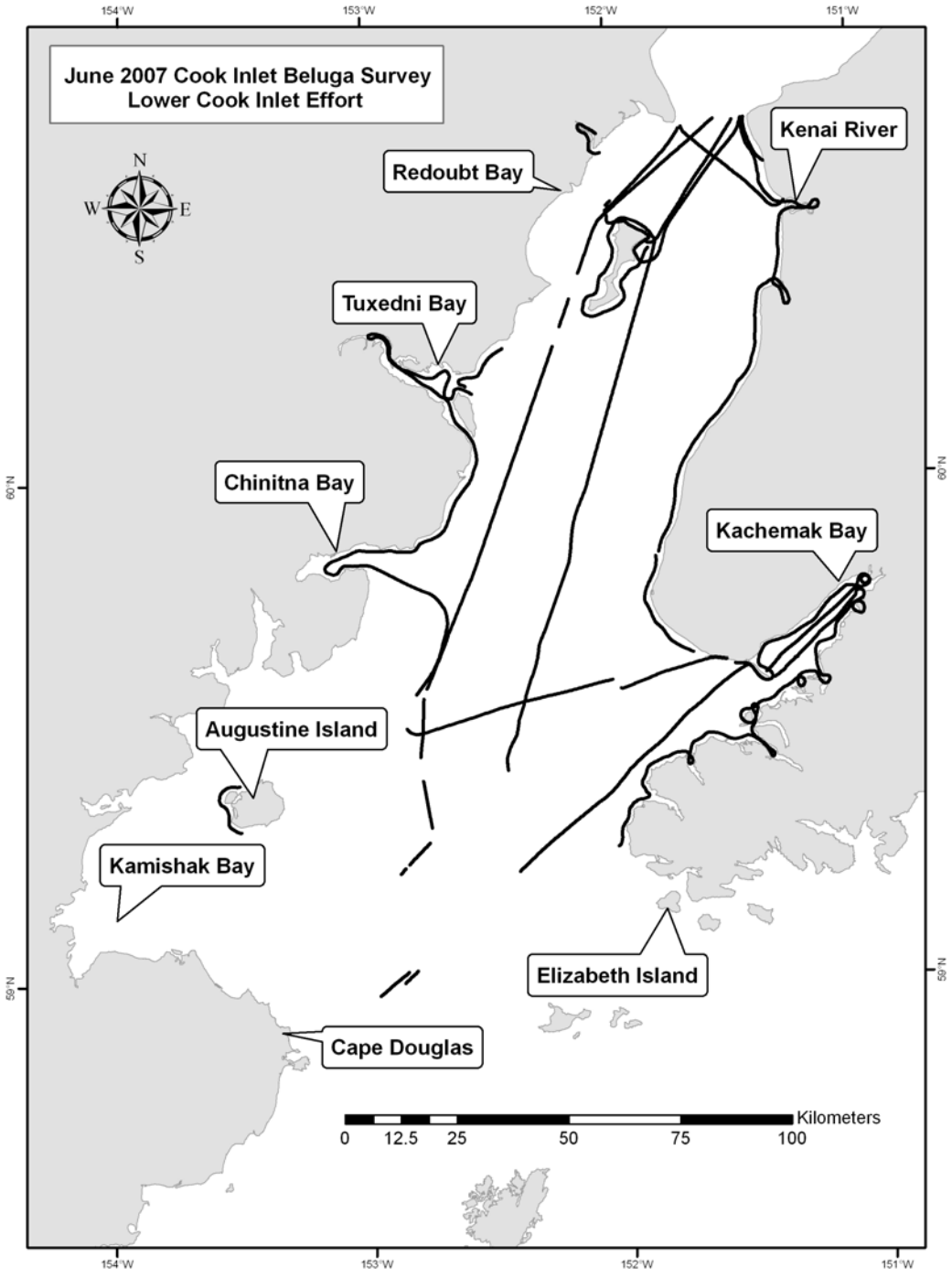

Figure 2. June 2007 on-effort tracklines for lower Cook Inlet

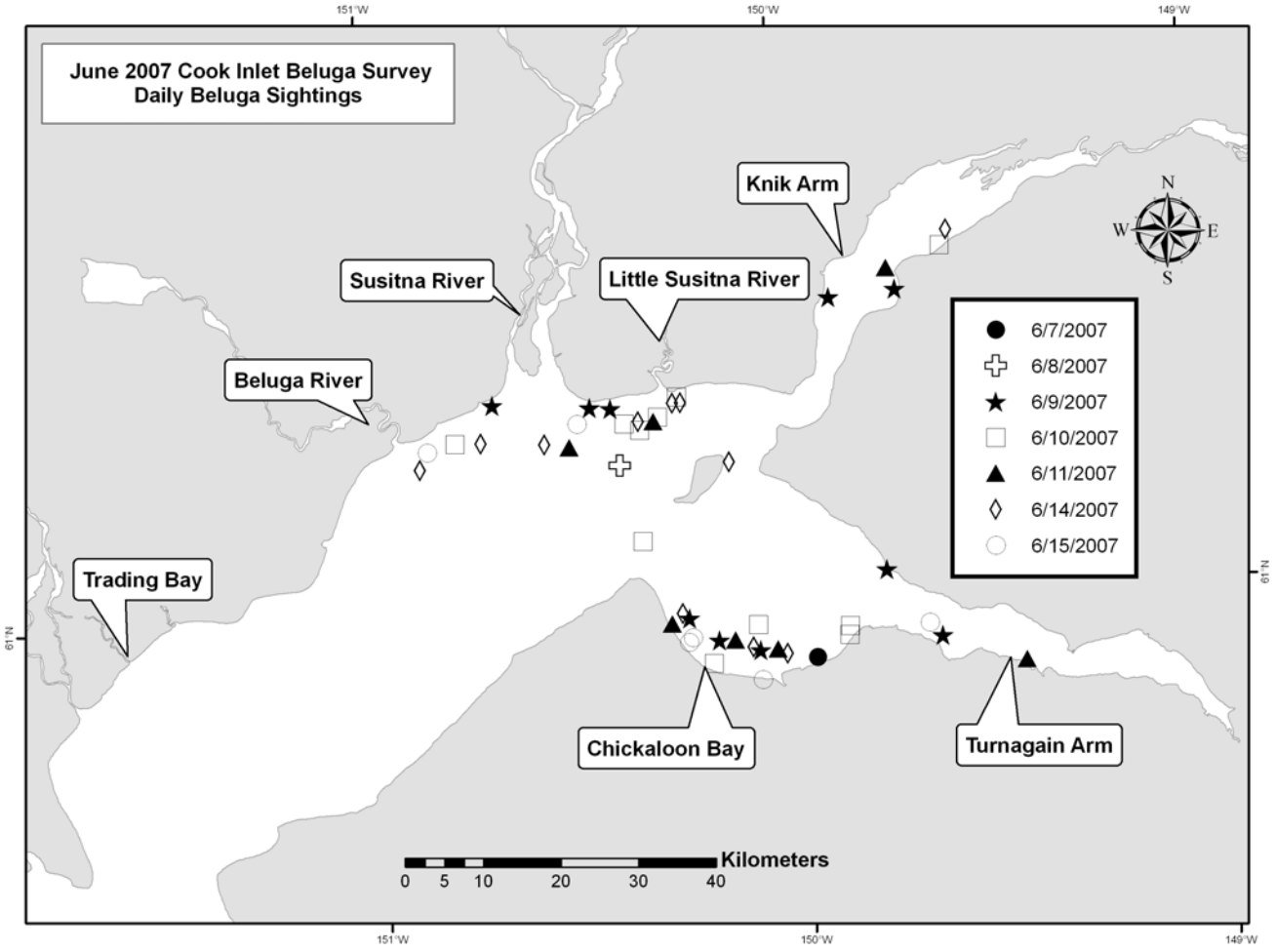

Figure 3. June 2007 beluga sightings in Cook Inlet.

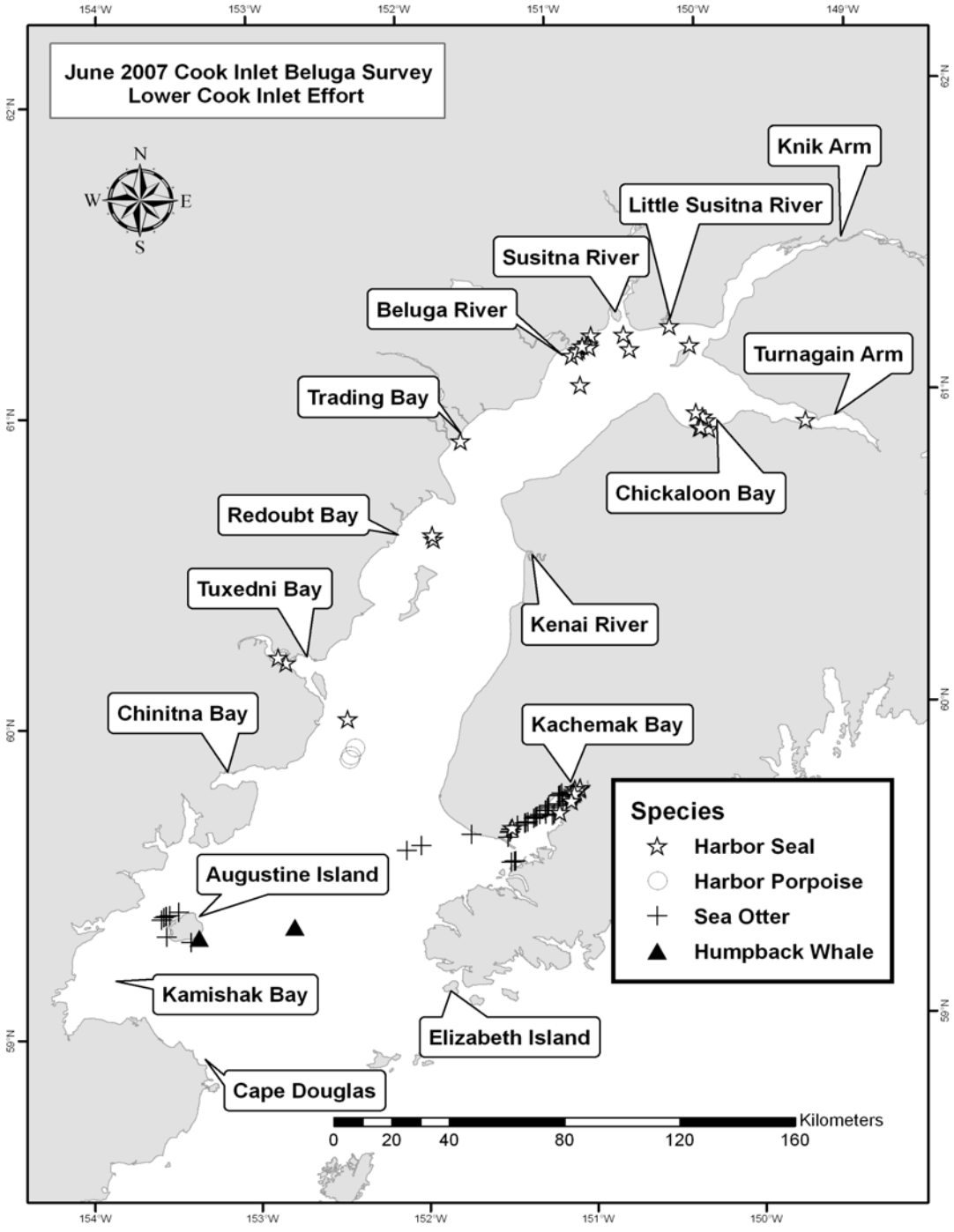

Figure 4. June 2007 marine mammal sightings, other than belugas, in Cook Inlet.