

Photo-identification of beluga whales in the Susitna River Delta,
Upper Cook Inlet, Alaska

Summary of field activities and whales identified in 2014

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EXECUTIVE SUMMARY

More information about Alaska's endangered Cook Inlet beluga whale (CIBW) population (*Delphinapterus leucas*) is needed to promote its recovery and conservation. The CIBW photo-identification catalog and associated surveys from ten field seasons (2005–2014) provide information about the distribution, movement patterns, and life-history characteristics of individually identified CIBWs, including mothers with calves. This report summarizes field effort and whales identified in the Susitna River Delta in 2014.

Surveys of the Susitna River Delta of Upper Cook Inlet, Alaska were conducted from a small vessel in July and August 2014 under National Marine Fisheries Service (NMFS) Marine Mammal Protection Act /Endangered Species Act Scientific Research Permit # 18016. CIBW sightings and environmental conditions were recorded during the surveys, and whales were photographed with a digital camera and zoom lens. Locations of CIBW groups and survey routes were mapped and figures were prepared showing survey routes, group location, group size, and group color composition for each survey conducted in 2014.

Eight beluga whale groups were encountered and photographed during seven survey days in 2014. Group size in the Susitna River Delta in 2014 ranged between 1 and 250 whales per group, with a mean group size of 133 whales. For all 2014 Susitna River Delta sightings combined, there were 50% white whales, 37% gray whales, 10% calves, and 3% neonates. Neonates were first seen July 21 (surveys began July 8). Traveling (including suspected feeding combined with traveling) was the most frequently observed primary group activity in 2014. Belugas and harbor seals were the only marine mammal species seen during photo-identification surveys of the Susitna River Delta in 2014. Approximately 100 incidental reports of sightings of Cook Inlet belugas were received by the CIBW Photo-Identification Project in 2014.

There were 130 individual whales identified from right-side photos taken in the Susitna Delta in 2014; nine of these were new to the catalog in 2014 and 121 were individuals that had been identified in previous years of the study. Ten dead belugas were photographed in 2014 and five of these were identified as known individuals in the photo-identification catalog. The individual sighting histories, movement patterns, and information on association with calves of all of these identified whales will be included in the 2005-2015 comprehensive report.

The seasonal pattern of CIBWs in the Susitna River Delta during the 2014 field season was consistent with patterns found in previous years of this study. The occurrence of large beluga groups in the Susitna River Delta relative to groups found in other areas of Cook Inlet during the summer was also consistent with patterns reported by NMFS from previous aerial surveys. Our observations continue to indicate that calving for CIBWs in the Susitna River Delta begins in mid-late July/early August. Annual timing of first occurrence of neonates coincides with the annual timing of maximum group size.

A summary and synthesis of results of all photo-identification surveys of Cook Inlet conducted 2005–2015 will be presented in a comprehensive report, scheduled to be

issued December 2016. Previous project results are presented in reports that are available at:

<https://alaskafisheries.noaa.gov/pr/beluga-research-cook-inlet>

TABLE OF CONTENTS

EXECUTIVE SUMMARY v
 TABLE OF CONTENTS..... vii
 LIST OF TABLES vii
 LIST OF FIGURES viii
 INTRODUCTION 1
 METHODS 3
 RESULTS 8
 DISCUSSION 10
 ACKNOWLEDGMENTS 13
 LITERATURE CITED 14

LIST OF TABLES

Table 1. Number, composition, and size of groups sighted during vessel surveys in the Susitna River Delta in 2014. Group numbers were assigned by day. (Neonates are separate from calf total. Unknown = beluga of unknown color and size.) 19
 Table 2. Total photo-id survey effort and beluga whale group encounters 2005-2014, Susitna River Delta, Upper Cook Inlet, Alaska. 20
 Table 3. Photo-id survey effort and beluga whale groups encountered in 2014 in the Susitna River Delta, Upper Cook Inlet, Alaska. 21
 Table 4. Daily range of environmental conditions measured during vessel-based surveys conducted in 2014 in the Susitna River Delta, Upper Cook Inlet, Alaska..... 22
 Table 5. Percent color composition of beluga whale groups sighted during surveys conducted in 2014 from vessels in the Susitna River Delta, Upper Cook Inlet, Alaska. 23
 Table 6. Summary of primary and secondary activities of beluga groups encountered in 2014 during photo-id surveys in the Susitna River Delta, Upper Cook Inlet, Alaska. 23
 Table 7. Summary of dead Cook Inlet beluga whales with photographs provided to or taken by the CIBW Photo-ID Project in 2014. 24
 Table 8. Summary of incidental sighting reports of Cook Inlet belugas made to the CIBW Photo-ID Project in 2014. Shaded cells indicate beluga sightings were reported. 24

LIST OF FIGURES

Figure 1. Map of Cook Inlet, Alaska, showing major features discussed in text.	27
Figure 2. Map of Middle and Upper Cook Inlet, Alaska, showing boundaries of sub-areas within the study area and the general routes used 2005–2014. The Kenai River Delta study area was surveyed 2011-2013. This report is limited to surveys conducted in the Susitna River Delta 2014.....	28
Figure 3. Route and beluga whale group encountered during the vessel-based survey route of July 8, 2014 in Upper Cook Inlet, Alaska.	29
Figure 4. Route and beluga whale groups encountered during the vessel-based survey route of July 15, 2014 in Upper Cook Inlet, Alaska.	30
Figure 5. Route and beluga whale group encountered during the vessel-based survey route of July 21, 2014 in Upper Cook Inlet, Alaska.	31
Figure 6. Route and beluga whale group encountered during the vessel-based survey route of July 23, 2014 in Upper Cook Inlet, Alaska.	32
Figure 7. Route and beluga whale group encountered during the vessel-based survey route of July 27, 2014 in Upper Cook Inlet, Alaska.	33
Figure 8. Route and beluga whale group encountered during the vessel-based survey route of July 29, 2014 in Upper Cook Inlet, Alaska.	34
Figure 9. Route and beluga whale group encountered during the vessel-based survey route of August 10, 2014 in Upper Cook Inlet, Alaska.	35
Figure 10. Location of groups with and without calves and neonates encountered during vessel-based photo-id surveys of the Susitna River Delta, Upper Cook Inlet, Alaska in 2014.	36
Figure 11. Location of groups with and without observations of suspected feeding behavior during vessel-based photo-id surveys of the Susitna River Delta, Upper Cook Inlet, Alaska in 2014.	37
Figure 12. Location of dead Cook Inlet beluga whales with photographs provided to or taken by the CIBW Photo-ID Project in 2014.	38
Figure 13. Map showing place names given in stranded and incidental sighting reports for CIBWs in 2014 (Tables 7 and 8).....	39

INTRODUCTION

Alaska's Cook Inlet beluga whale (CIBW) population (*Delphinapterus leucas*) is considered a distinct population segment by the National Marine Fisheries Service (NMFS) because of geographic and genetic isolation. A steep decline in the CIBW population occurred in the late 1990s, and the population was designated as depleted in 2000 under the Marine Mammal Protection Act (MMPA). In 2008, NMFS listed the CIBW population as endangered under the Endangered Species Act (ESA; NMFS 2008a). Because of the ESA listing, NMFS was required to designate critical habitat (i.e., habitat deemed necessary for the survival and recovery of the population) and to develop a Recovery Plan for CIBWs. In addition, the ESA mandates that all federal agencies consult with NMFS regarding any action that is federally authorized, funded, or implemented, to ensure that the action does not jeopardize the continued existence of the endangered species or result in the destruction or adverse modification of its designated critical habitat.

Many information gaps and uncertainties are associated with the current understanding of the CIBW population's lack of recovery following the cessation of an unsustainable level of hunting that was thought to have contributed to the population decline (NMFS 2008b). More information on annual abundance estimates of age-specific cohorts, habitat preferences, life history characteristics associated with population growth (births, calving intervals, age at sexual maturity, etc.), and sources of stress and mortality (natural and human-induced) is needed to promote recovery and conservation of the CIBW population. Data describing CIBW residency and movement patterns, habitat use by mothers and calves, and behavior will aid in the identification of movement corridors and locations of habitats for feeding, calving, and rearing of young.

Available sources of information used to understand distribution, movement, and habitat use include beluga whale sightings from aerial surveys (Hobbs et al. 2015; Rugh et al. 2000, 2004, 2005, 2006, 2010; Shelden et al. 2013, 2015a&b), tidal flow models (Ashford et al. 2013, Goetz et al. 2007, 2012a), and movement data from 14 satellite-tagged individuals (Goetz et al. 2012b, Hobbs et al. 2005, Shelden et al. 2015a). This information is key in characterizing and understanding habitat needs, as is information on beluga whale movement and residency patterns obtained from land-based observational studies of CIBWs in Upper Cook Inlet (Funk et al. 2005, Markowitz and McGuire 2007, Markowitz et al. 2007, Nemeth et al. 2007, Prevel-Ramos et al. 2006). Land- and vessel-based photo-identification surveys (McGuire and Bourdon 2012; McGuire and Kaplan 2009; McGuire et al. 2008, 2009, 2011a&b, 2013a&b, 2014) are also used to characterize distribution and movement patterns of individual beluga whales, and results of these surveys complement information from aerial surveys and tagging-tracking studies conducted by NMFS.

The CIBW Photo-identification (photo-id) Project has been ongoing since 2005, and has demonstrated that a large number of beluga whales in Upper Cook Inlet possess distinct natural marks that persist across years, and that these marks can be effectively identified and re-sighted with digital photography. The photo-id catalog and associated surveys from ten field seasons (2005–2014) provide information about the distribution, movement patterns, and life-history characteristics of individually identified beluga

whales, including mothers with calves (McGuire and Bourdon 2012; McGuire and Kaplan 2009; McGuire et al. 2008, 2009, 2011a&b, 2013a&b, 2014).

This report presents results of vessel-based surveys in the Susitna River Delta (defined as the nearshore areas between the Beluga River and the Little Susitna River) in 2014. Additional beluga photo-identification surveys in 2014 were conducted in Knik Arm and Turnagain Arm, and those results are presented in a separate report (McGuire and Stephens 2016). A summary and synthesis of results of all photo-id surveys of Cook Inlet conducted from 2005 to 2015, including all belugas identified in the 2005-2015 right-side and 2005-2011 left-side catalogs, will be presented in a comprehensive report scheduled to be issued December 2016.

METHODS

Field Surveys

Survey effort

Surveys of the Susitna River Delta of Upper Cook Inlet, Alaska (Figure 1 and Figure 2) were conducted from a small vessel in 2014. Survey schedules varied according to those combinations of season, location, and tide that provided the greatest likelihood of detecting the largest groups of beluga whales. These combinations were derived from results from NMFS aerial surveys (Hobbs et al. 2015; Rugh et al. 2000, 2004, 2005, 2006, 2010; Shelden et al. 2013, 2015a&b), other studies of CIBWs (Funk et al. 2005, Markowitz and McGuire 2007, Markowitz et al. 2007, Nemeth et al. 2007, Prevel-Ramos et al. 2006), and previous years of photo-id surveys in this area (McGuire and Kaplan 2009; McGuire et al. 2008, 2009, 2011a&b, 2013a&b, 2014). General routes were followed (Figure 2), although deviations were made depending on where beluga groups were encountered. Surveys generally lasted six hours, although the duration of surveys depended on hours of daylight, tidal conditions, if whale groups were encountered, and size and behavior of whale groups. Surveys were not conducted on days for which rain or high winds (>15 mph/24 km/hr) were predicted. In 2014, the Susitna River Delta (Figure 2) was surveyed six days in July and one day in August. All surveys were centered around the low tide.

Vessel surveys

Photographs of CIBWs in the Susitna River Delta were taken from the *R/V Leucas*, a 4.9 m (16 ft) inflatable Proman 9 Zodiac® powered by a 4-stroke 50 hp Yamaha motor. The *Leucas* usually carried one skipper (who assisted with observations) and one observer/photographer. Vessel position was recorded with a Garmin™ GPS (Global Positioning System) Map 76C. Survey routes were determined by tidal stage, water depth, and navigational hazards, and were designed to maximize the probability of encountering large groups of belugas. Surveys were not appropriate for line-transect methods designed to estimate abundance. A whale group was only approached once per survey and usually followed in the manner described by Würsig and Jefferson (1990): the research vessel approached slowly, parallel to the group, and matched group speed and heading in order to obtain images of lateral sides of individuals while minimizing disruption of the group. We did not approach within 50 meters of the belugas, as specified by our research permit. At times, the boat drifted with the engine off, or was at anchor with the engine off, and whales were photographed as they passed by. Researchers noted the position of whales relative to the vessel and GPS-logged tracks were used to estimate approximate whale group positions. All vessel surveys were conducted under NMFS MMPA/ESA Scientific Research Permit # 18016.

Field data

Standardized data forms were used to record beluga whale sightings and environmental conditions. For each beluga whale group sighting, observers recorded

time of day, group size, GPS position of the vessel, magnetic compass bearing to the group, estimated distance of the vessel from the group (distance at first detection and minimum distance to individual whales), water depth (under the vessel), group formation, direction of travel, movement patterns, behavioral data, average distance among individuals, and any human activities near the sighting.

For groups with multiple records on a single day, the best record was selected at the end of the survey, which was either the highest count (for groups that merged) or the count considered by all observers to be the most accurate. Group size was usually difficult to determine and counts provided best estimates rather than the actual number of whales in the group.

Behavioral data were collected using focal group sampling (Mann 2000). Behavior was recorded as activities (i.e., group behavior patterns of relatively long duration) or events (i.e., individual behavior patterns of relatively short duration, such as discrete body movements; Martin and Bateson 1993). Group activity was recorded at the beginning and end of each group encounter, and approximately every five minutes during the encounter. Events were noted as they were observed throughout the group encounters; although it should be clarified that the observers were focused on photographing whales, not observing all events. Activities were classified into primary and secondary activities. Primary activities appeared to be the dominant behavior of the group, and secondary activities occurred sporadically during primary activities. For example, a group might be recorded to have the primary activity of travelling (most of the group most of the time), with the secondary activity of diving (some of the group some of the time). A tail slap would be an example of a discrete event by an individual.

Behavioral activities were defined as follows:

Traveling – directed movement in a linear or near-linear direction, transiting through an area, usually at a relatively high speed.

Diving – movement directed downward through the water column.

Feeding Suspected – chasing prey, as evidenced by bursts of speed, lunges, and/or focused diving in a particular location, or by fish jumping out of the water near belugas.

Feeding confirmed was only recorded if a beluga was seen with a prey item in its mouth.

Resting – little or no movement, body of animal visible at or near the surface.

Milling – non-linear, weaving or circular movement within an area.

Socializing – interactions among whales indicated by physical contact observed at the surface, or by audible vocalizing of multiple whales.

Body color (white or gray) and relative size/age-class (calf, neonate) of whales in the group were recorded. Calves were usually dark gray, relatively small (i.e., <2/3 the total length of adult belugas), and usually swimming within one body length of an adult-sized beluga. Observers noted if any calves appeared to be neonates (i.e., newborns, estimated to be hours to days old) based on extremely small size (1.5 m [5 ft]), a wrinkled

appearance because of the presence of fetal folds, and uncoordinated swimming and surfacing patterns.

Environmental data were collected hourly or when conditions changed. Environmental variables recorded included Beaufort sea state, swell height, cloud cover, visibility, wind speed and direction, air temperature, water temperature at the surface, and water depth.

Digital photographs of beluga whales were collected using digital SLR camera with a telephoto zoom lens with auto-focus. Typical settings included shutter speed priority, dynamic-area autofocus, 800 ISO, and shutter speed of 1,000 or greater. Photographs were taken in JPEG format and stored on compact flash memory cards.

Archiving and Analysis of Field Survey Data

All photographs were downloaded from the camera's compact flash memory card onto a computer hard drive and archived to external hard drives to preserve the original data before any further processing. All photo-id data and photographs (2005–2014) were consolidated into a single, comprehensive, and integrated custom database. Data from surveys included the survey route, environmental conditions, group size, color, and behavior. Data associated with each photograph included the "metadata", such as the original camera settings, the time the original photograph was taken, and the dates and locations when photos were taken. Locations of beluga whale sightings and survey routes were mapped in ArcGIS™ 10.2 (<http://www.esri.com>) and figures were prepared showing survey routes, group location, group size, and group color composition for each survey conducted.

Processing of Photographs

Photographs were sorted according to image quality using ACDSsee photo software (<http://www.acdsee.com>). Photographs of unsuitable quality for identification (e.g., poor focus, whale obscured by splash, or too distant) were noted and archived, but not used for subsequent analyses. If distinguishing features of marks were obvious even in poor quality photographs, the photo was considered for inclusion in the catalog.

When an original field photograph contained two or more whales, each whale was cropped individually and given a separate file name. Cropped images were separated into left and right sides of whales. Daily photo samples (i.e., all cropped photos taken on a single survey day) were sorted into temporary folders. Each temporary folder contained all of the cropped images taken of the same individual beluga on a single day, and was comprised of one to many images. Images within a temporary folder may have been taken seconds or hours apart, and often showed different sections of the body as the beluga surfaced and submerged. Temporary folders were then examined to determine if there was a match to photographic records of individual belugas identified within that year or in previous years. If a match was made to a previous year in the catalog, the new photos were entered into the catalog.

Cataloging of Photographs

Markings used for photo-id of individual beluga whales consist of natural marks from conspecifics, pigmentation patterns, scars from injury or disease, and marks left from satellite tags attached by NMFS 1999-2002. Our research project depends on existing marks and does not apply marks to whales. Mark-type categories were created in order to facilitate cataloging. Computer software specialized for this species was developed to allow for computer-aided filtering of the database according to mark type and location.

As a beluga surfaces and submerges, different portions of its body are available to photograph. Side-profile photographs were most useful for matching marks used to identify individual whales. Profile images were divided into 11 sections along the right and left halves of the whale; sections containing the head, tail, and ventral half of the whale were less commonly captured in photographs and were therefore less likely to provide identifying marks. “Profile completeness” was determined by the number of sections with high quality images; a right or left side profile set was considered complete if it contained high quality images of all five sections of the dorsal half of the whale, beginning just behind the blowhole to the base of the tail. Whales with complete profile sets were considered to be individuals in the catalog. Another criterion that allows for the acceptance of a whale into the catalog is if two temporary whale folders that spanned two or more years were matched. All matches in the existing catalog were reviewed and verified by at least two experienced photo-analysts.

Identification of Dead Belugas

When informed of dead belugas by the Alaska Marine Mammal Stranding Network and authorized by NMFS, CIBW Photo-ID Project biologists photographed dead belugas or relied on other stranding responders to obtain photographs of dead belugas. The project developed a protocol for photographing dead belugas for identification marks that was distributed to members of the Alaska Marine Mammal Stranding Network and posted on the NMFS Alaska Region website <https://alaskafisheries.noaa.gov/pr/beluga-research-cook-inlet>. Photographs of dead belugas were examined for marks that could be used to compare to records from the 2005-2014 catalog. Sex and relative age (i.e., neonate, calf, adult) of dead whales were determined and entered into the records of cataloged individuals.

Incidental Beluga Sighting Reports

Incidental beluga sighting reports were collected by the CIBW Photo-ID Project from the public and colleagues via email, phone calls, public presentations, and conversations in the field. The CIBW Photo-ID Project website (www.cookinletbelugas.org) contains a page for members of the public to report Cook Inlet beluga whale sightings. The website address was distributed via the project bumper sticker, wallet-sized cards, project pamphlets, and public outreach. Incidental beluga

sighting reports were entered into the project database and shared with the NMFS Alaska Region Office and NMFS's National Marine Mammal Lab.

RESULTS

Surveys

Survey effort, number of whales, and whale groups encountered in 2014

Eight beluga whale groups were encountered and photographed in the Susitna River Delta during seven survey days in 2014 (Table 1). Maps of whale group sighting locations and survey routes in 2014 are presented in Figures 3 through 9. The fieldwork completed in 2014 brings the project total to 110 photo-identification surveys conducted in the Susitna River Delta over ten consecutive field seasons, with 176 group sightings (Table 2).

Group size in the Susitna River Delta in 2014 ranged between 1 and 250 whales per group (Table 1). The largest of these groups was seen on July 27 (Table 1). A mean of one group per survey was observed in 2014, with a mean group size of 133 whales (Table 3).

Survey conditions afforded good visibility (on a scale of good/fair/poor) on all survey days (Table 4). Human activities near the sightings consisted of set nets, other vessels and aircraft (Table 4). Aircraft (including small private planes, commercial jets, and military overflights) were observed over the survey boat and/or belugas on all but one of the survey days.

Color composition and age class of groups encountered during surveys in 2014

Color and age-class composition of all groups varied by survey date (Table 1). For all 2014 Susitna River Delta surveys combined, 50% of the sightings were of white belugas, 37% were gray belugas, 10% were calves, and 3% were neonates (Table 5).

Calves were seen in six of the eight groups encountered in the Susitna River Delta in 2014 (Table 1). Neonates were seen in five of the eight groups, were first seen July 21, and were observed in all subsequent surveys. Groups in the Susitna River Delta with calves or neonates occurred in the same general location that groups without calves or neonates had occurred before July 21 (Figure 10).

Behavior of whale groups in the Susitna River Delta in 2014

Regardless of group size or date, traveling (including suspected feeding combined with travel) was the most frequently observed primary group activity in 2014 (Table 6). Suspected feeding, socializing, and vocalizing were observed in the larger groups (150 or more individuals per group) but not in the smaller groups (1-6 whales per group). Suspected feeding behavior was not noted for the groups seen on July 8 and July 15, but was seen in all groups on and after July 21 (Figure 11).

Photo-identification of beluga whales in the Susitna River Delta in 2014

The 15,604 photos taken in the Susitna River Delta in 2014 were cropped and sorted into 6,555 useable images of the right side of whales and 7,935 left-side images.

Left-side images were archived, to be cataloged later. There were 130 individual whales identified from right-side photos taken in the Susitna Delta in 2014; nine of these were new to the catalog in 2014 and 121 were individuals that had been identified in previous years of the study. Ninety-nine individual whales were photographed in 2014 that were presumed to be mothers based on the close accompaniment by a calf sometime during their sighting history; this number will likely change once records from 2015 are added to the catalog. The individual sighting histories, movement patterns, and information on association with calves of these identified whales will be included in the 2005-2015 comprehensive report, scheduled to be issued December 2016.

Dead belugas photographed in 2014

Photographs of ten dead belugas were either taken by or supplied to the CIBW Photo-ID Project in 2014 (Table 7 and Figure 12). Photographs were provided by NMFS, members of the Alaska Marine Mammal Stranding Network, and the public. Of these ten dead belugas, five were identified as known individuals in the photo-id catalog, and five could not be identified from photographs. Detailed histories of the five identified dead whales will be provided in the 2005-2015 comprehensive report.

Incidental sighting reports of belugas in 2014

Approximately 100 incidental reports of sightings of Cook Inlet belugas were received by the CIBW Photo-ID Project in 2014 (Table 8 and Figure 13). Sightings were reported by fishermen/women, pilots, the media, law enforcement officers, vessel operators, tourists, biologists, educators, regulators, environmentalists, and oil company employees. Belugas were reported in the Susitna River Delta in May, June, and July. A beluga sighting in Homer was reported in August of 2014; although photographs were provided of the sighting event, the images did not offer clear views of belugas and this sighting could not be confirmed.

Observations of other marine mammals in 2014

Other than belugas and harbor seals, no other marine mammal species were seen during photo-id surveys of the Susitna River Delta in 2014. A live-stranded juvenile humpback whale was photographed by LGL biologists in April in Turnagain Arm and reported to NMFS. A stranded harbor porpoise was reported by NMFS in September in Kincaid Park in Anchorage.

DISCUSSION

Whales Encountered During Surveys

The seasonal pattern of CIBWs in the Susitna River Delta during the 2014 field season was consistent with patterns found in previous years of this study (McGuire and Bourdon 2012; McGuire and Kaplan 2009; McGuire et al. 2008, 2009, 2011a&b, 2014) and in other studies (Hobbs et al. 2005, Moore et al. 2000, Nemeth et al. 2007, Shelden et al. 2015 a, b); groups are small from early July through mid-July, become large in mid-July, and peak in mid-late July through mid-August.

These patterns are likely in response to patterns of seasonal migrations of anadromous fish into the Susitna River (i.e., eulachon migration in May, followed by salmon migration in late July–early August; NMFS 2008b) on which the belugas feed. The occurrence of large beluga groups in the Susitna River Delta relative to groups found in other areas of Cook Inlet during the summer months was consistent with patterns reported by NMFS from aerial surveys conducted in June and August of multiple years (Shelden et al. 2013, 2015 a, b). For all 2005–2014 photo-id effort in Upper Cook Inlet, the largest groups of each season were always seen between mid-July and early August (these periods were sampled in every year), and all were seen in the Susitna River Delta.

In 2014, maximum group size was greater than in any of the previous ten years of the study, when annual maximum group size ranged between 61 and 200 (Figure 2). In fact, three of the eight groups seen in the Susitna River Delta in 2014 were larger than any groups seen in previous years during this same seasonal window. The 2005–2015 comprehensive report will examine inter-annual differences in group size in more detail.

Color and Age Composition of Groups

Whale groups did not appear to be segregated by color, and all but one of the groups encountered in 2014 in the Susitna River Delta contained both white and gray whales (one group consisted of a lone white whale). Although not quantified, observers on the survey vessel had the impression that white whales were more likely to be detected than gray whales, as gray whales tended to blend with the turbid gray waters of Cook Inlet. This suspected bias in detection towards white whales seemed greater with distance from the observer. Behavioral differences between white and gray belugas, however, may have resulted in an opposite bias. Observers also had the impression that gray animals were more likely to approach the survey boat and to remain near the boat. Therefore, although white belugas were more likely to be detected at a distance, gray whales may have been more likely to be photographed from vessels. Environmental conditions, most notably ambient light, may also have resulted in some variability in color assigned to whales during surveys.

Calves were found in 75% of the groups seen in the Susitna River Delta in 2014 and composed 10% of the overall sightings, while neonates made up 3% of the sightings. Compared to previous years, this was a slightly higher percentage for both calves and

neonates; during 2007–2013, calves composed 6–9% of the sightings and neonates 0.5–3% (neonates not distinguished from calves 2005–2006).

The timing and location of beluga whale calving in Cook Inlet is not well documented in the literature (Hobbs et al. 2008). Groups of belugas in the Canadian Arctic were found to have seasonal differences in proportions of calves, juveniles, and adults (Smith et al. 1994), which were used to determine seasonality of calving. Based on the presence of calves sighted in summer aerial surveys, Calkins (1983) speculated that calving might occur between mid-June and mid-July in the larger estuaries of western Upper Cook Inlet. Our observations continue to indicate that calving for CIBWs in the Susitna River Delta begins in mid-late July/early August, with an inter-annual variation of up to two-weeks; neonates were first seen on July 21 in 2014, July 31 in 2013, July 20 in 2012, July 27 in 2011, July 16 in 2010, August 1 in 2009, July 24 in 2008, and July 27 in 2007. The first year we sub-classified calves as neonates was 2007. The “calf” category used during field surveys in 2005 and 2006 did not differentiate newborn calves from those now known to be calves between one and four years old (ages determined photographically by sighting histories of calves of identified mothers); thus, newborn calf numbers cannot have been captured in the data recorded during these earlier field surveys. Annual timing of the first appearance of neonates generally coincides with the timing of annual maximum group size. The largest groups per year encountered during photo-id surveys of Upper Cook Inlet 2011–2014 were recorded on July 27 in 2011, July 20 in 2012, July 22 and July 31 in 2013, and July 27 in 2014, all in the Susitna River Delta.

During 2007–2014, the first neonates of the season were always seen at the Susitna River Delta, and were later seen in Knik Arm and Turnagain Arm (McGuire et al. 2014, McGuire and Stephens 2016). Within the broad area defined as the Susitna River Delta, neonates were seen in the river mouths of the Susitna River and Little Susitna River, and along the mudflats between the two rivers.

Behavior

The distinction among behavioral categories was somewhat artificial as the terms only described behaviors seen when the whales were briefly at the surface. In reality, it is likely that whales were simultaneously feeding, diving, and traveling as they pursued and captured prey. The largest group recorded during the study (2005–2014) consisted of 250 whales seen July 27, 2014; this audibly vocal group was traveling, milling, socializing, and suspected to be feeding (whales were seen making waves against the shore and in shallow water, which may have been caused by pursuing prey at high speed in short bursts). The next-largest groups encountered during photo-id surveys 2005–2014 consisted of 225 beluga whales encountered in the Susitna River Delta on July 21, 2014 and 228 whales on July 29, 2014; behavior of each group was recorded as traveling and suspected to be feeding. Whales were much easier to count and photograph when feeding or traveling than when diving. Feeding and traveling animals remained at the surface longer, had higher surfacing profiles, and exhibited less response (attraction or avoidance) to the survey vessel, whereas diving animals often remained submerged for long periods of time and were unpredictable in their surfacing locations and patterns.

Progress Made in 2014 and Dissemination of Project Results

Progress made in 2014 was measured in terms of the number of field surveys conducted, the number of groups of whales photographed, the number of whales identified, and improvements in survey and data processing techniques. Ongoing project results are presented in reports that are available at: <https://alaskafisheries.noaa.gov/pr/beluga-research-cook-inlet>

Communication of project results and collaboration with colleagues continue to be productive and remain project priorities. Examples of existing partnerships include: the exchange of information with NMFS about beluga locations during aerial (NMFS) and vessel (LGL) surveys during the field season; informing NMFS-AK of dead belugas (in some cases securing the carcass until NMFS is able to respond) and assisting with necropsies; informing the NMFS Office of Law Enforcement of suspected cases of beluga poaching or harassment; circulating photographs of injured or visibly diseased belugas to the Alaska Marine Mammal Stranding Network for expert opinion; exchange of whale sighting reports, photographs, and sighting history with wildlife biologists at the Joint Base Elmendorf Richardson and other researchers in Cook Inlet; and making project data available to the NMFS Alaska Region Protected Resources Division for use in management decisions, including ESA consultations.

Project Status and Future Work

Fieldwork in the Susitna River Delta from 2014 was completed August 10. Additional project fieldwork was conducted May-October 2015, and right-side photographs are currently being cataloged during winter 2015/2016. A summary and synthesis of results of all photo-id surveys of Cook Inlet conducted 2005–2015 will be presented in a comprehensive report, scheduled to be issued December 2016. Plans for 2016 include May through August photo-id surveys of the Susitna River Delta, including cataloging of the photographs taken during these surveys.

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The CIBW Photo-ID Project represents work conducted by numerous people and was supported by several organizations. The people and institutions listed below are sincerely thanked for their support of this project.

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NMFS Office of Law Enforcement (Les Cockreham, Noah Meisenheimer)
US Air Force (Chris Garner, Rich Graham, Christie Osburn)
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Database Development

Axiom Consulting and Design (Shane St. Clair)

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TABLES

Table 1. Number, composition, and size of groups sighted during vessel surveys in the Susitna River Delta in 2014. Group numbers were assigned by day. (Neonates are separate from calf total. Unknown = beluga of unknown color and size.)

Date	Beluga Group #	# White	# Gray	# Calves	# Neonates	# Unknown	Group Size
July 8	1	3	2	1	0	0	6
July 15	1	1	0	0	0	0	1
July 15	2	2	3	0	0	0	5
July 21	1	107	86	26	6	0	225
July 23	1	100	60	30	10	0	200
July 27	1	135	100	10	5	0	250
July 29	1	120	88	15	5	0	228
Aug 10	1	60	60	25	5	0	150
Annual Total	8	528	399	107	31	0	1065

Table 2. Total photo-id survey effort and beluga whale group encounters 2005-2014, Susitna River Delta, Upper Cook Inlet, Alaska.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Ten-Year Total
Photo-id Survey Days	17	18	4	8	15	14	11	9	7	7	110
Group Encounters	40	29	14	9	17	22	14	16	7	8	176
Range of Surveys	May 30 - Oct 21	May 12 - Oct 5	Jun 28 - Jul 27	May 21 - Aug 6	Jun 19 - Oct 6	May 26 - Aug 31	May 17 - Oct 12	May 23 - Aug 17	May 27 - Aug 13	July 8 - Aug 10	
Maximum Group Size	152	61	74	121	152	173	136	200	200	250	
Season Survey Span (Months)	5	5	1	3	4	3	5	3	3	1	

Table 3. Photo-id survey effort and beluga whale groups encountered in 2014 in the Susitna River Delta, Upper Cook Inlet, Alaska.

Susitna River Delta	2014
Number of Surveys	7
Total Number of Beluga Whale Groups	8
Annual Group Size Total	1065
Mean Number of Groups per Survey	1.1
Mean Number of Beluga Whales per Survey	152.1
Mean Number of Beluga Whales per Group	133.0
Maximum Number of Beluga Whales per Group	250

Table 4. Daily range of environmental conditions measured during vessel-based surveys conducted in 2014 in the Susitna River Delta, Upper Cook Inlet, Alaska.

Daily Ranges													
Date	Survey Start Time	Survey End Time	Sea Ice?	Surface Water Temp (°C)	Air Temp (°C)	Wind Speed (km/hr)	Wind Direction	% Cloud Cover	Precipitation	Visibility	Swell (m)	Beaufort Sea State*	Other Human Activities Noted
July 8	7:15	13:36	no	12.2 - 14.6	14.5 - 17.5	0 - 7	SW	60-90	none	good	0	0 - 2	none
July 15	13:20	18:50	no	12.3 - 14.5	16.8 - 18.7	0 - 5	SW	50-60	none	good	0	0 - 1	aircraft, boats
July 21	6:47	12:43	no	13.0 - 14.3	12.8 - 21.5	0.3 - 4	SE	0-10	none	good	0-.25	1	set nets and boats, aircraft
July 23	8:43	14:30	no	12.9 - 14.5	15.9 - 18.0	0 - 5	N, then SE	85-98	none	good	0-1.5	1 - 3	aircraft
July 27	11:11	17:20	no	11.9 - 14.8	18.0 - 19.5	0 - 3	N	15-30	none	good	0	0 - 2	aircraft (JBER airshow)
July 29	12:45	17:45	no	12.9 - 14.4	16.3 - 21.3	2 - 7	NE, then SE	10-30	none	good	0	1 - 2	aircraft, container ship
Aug 10	10:35	16:04	no	13.2 - 14.6	20.1 - 21.0	0 - 7	W, then SE	70-90	light rain, then none	good	0-.5	0 - 1	aircraft

* Beaufort Sea State: 0=sea like a mirror; 1=ripples without foam crests; 2=small wavelets, crests do not break; 3=large wavelets, crests begin to break, scattered white caps

Table 5. Percent color composition of beluga whale groups sighted during surveys conducted in 2014 from vessels in the Susitna River Delta, Upper Cook Inlet, Alaska.

Area	Survey Method	Group Size Total	% White	% Gray	% Calves	% Neonates	% Unknown
Susitna Delta	vessel	1065	50	37	10	3	0

Table 6. Summary of primary and secondary activities of beluga groups encountered in 2014 during photo-id surveys in the Susitna River Delta, Upper Cook Inlet, Alaska.

Date	Group Size	Primary Group Activities Noted	Secondary Group Activities Noted	Events and additional comments
July 8	6	diving, traveling	milling	
July 15	1	traveling, milling	none	patrolling back and forth along shore
July 15	5	traveling, milling	diving	
July 21	225	traveling, milling	feeding suspected, socializing	vocalizing, diving, head standing with tail flukes up and waving, rolling around in groups of 3-6 with pectoral fins out of water
July 23	200	traveling, milling, feeding suspected	diving, socializing	vocalizing, snorting, patrolling back and forth along shore, headstands, tail flukes up, rolling around in groups of 3-6 with pectoral fins out of water
July 27	250	traveling, milling, feeding suspected	diving, socializing	young belugas blowing bubbles under anchored survey boat, rolling around in groups of 3-6 with pectoral fins out of water, head standing, snorting, lunging after fish, chuffing, bugling, groups of 5-10 splashing and circling in deeper water, fish flung out of group
July 29	228	feeding suspected	traveling	whales not very vocal for most of the survey day, tightly bunched and traveling rapidly, became vocal when traveling up Susitna River on rising tide, lots of splashing and tail waving as they went
Aug 10	150	traveling	feeding suspected	lots of vocalizing when two subgroups met and joined, group bunched up when entered Susitna River on rising tide

Table 7. Summary of dead Cook Inlet beluga whales with photographs provided to or taken by the CIBW Photo-ID Project in 2014.

2014 Date	Location of Dead Beluga	Necropsy performed by Alaska Marine Mammal Stranding Network?	Age Class and Sex	Whale Matched to Known Catalog Whale?
May 26	Kincaid Park, Anchorage	yes	adult male	yes
May 26	Kincaid Park, Anchorage	yes	pregnant female	no (no identifying marks on exposed side)
July 10	Carr-Gottstein Park, Anchorage	no	calf, unknown sex	no (advanced decomposition)
Aug 1	Tyonek	yes	adult male	yes
Aug 26	Fire Island	no	adult, unknown sex	no (poor photo quality)
Sept 2	Chuitna River mouth	yes	adult female	yes
Sept 8	Indian, Turnagain Arm	yes	adult male	yes
Sept 27	Pt. Possession	no	adult female	yes
Oct 6	Potter Marsh, Turnagain Arm	no	adult, unknown sex	no (poor photo quality)
Nov 1	Moose Point, south of Pt. Possession	no	adult, unknown sex	no (advanced decomposition)

Table 8. Summary of incidental sighting reports of Cook Inlet belugas made to the CIBW Photo-ID Project in 2014. Shaded cells indicate beluga sightings were reported.

Month	Location						
	Susitna Delta	Knik Arm	Turnagain Arm	Chickaloon Bay	Kenai River Delta	Port of Anchorage	Other
January							
February							
March							Ninilchik; Kasilof
April							Nikiski; southwest of Fire Island by Beluga River
May							Nikiski; Granite Point; Tyonek Platform
June							Fire Island
July							
August							Anchorage; Homer (unconfirmed)
September							
October							Anchorage
November							mouth of Big River Lake (south of West Forelands)
December							

FIGURES

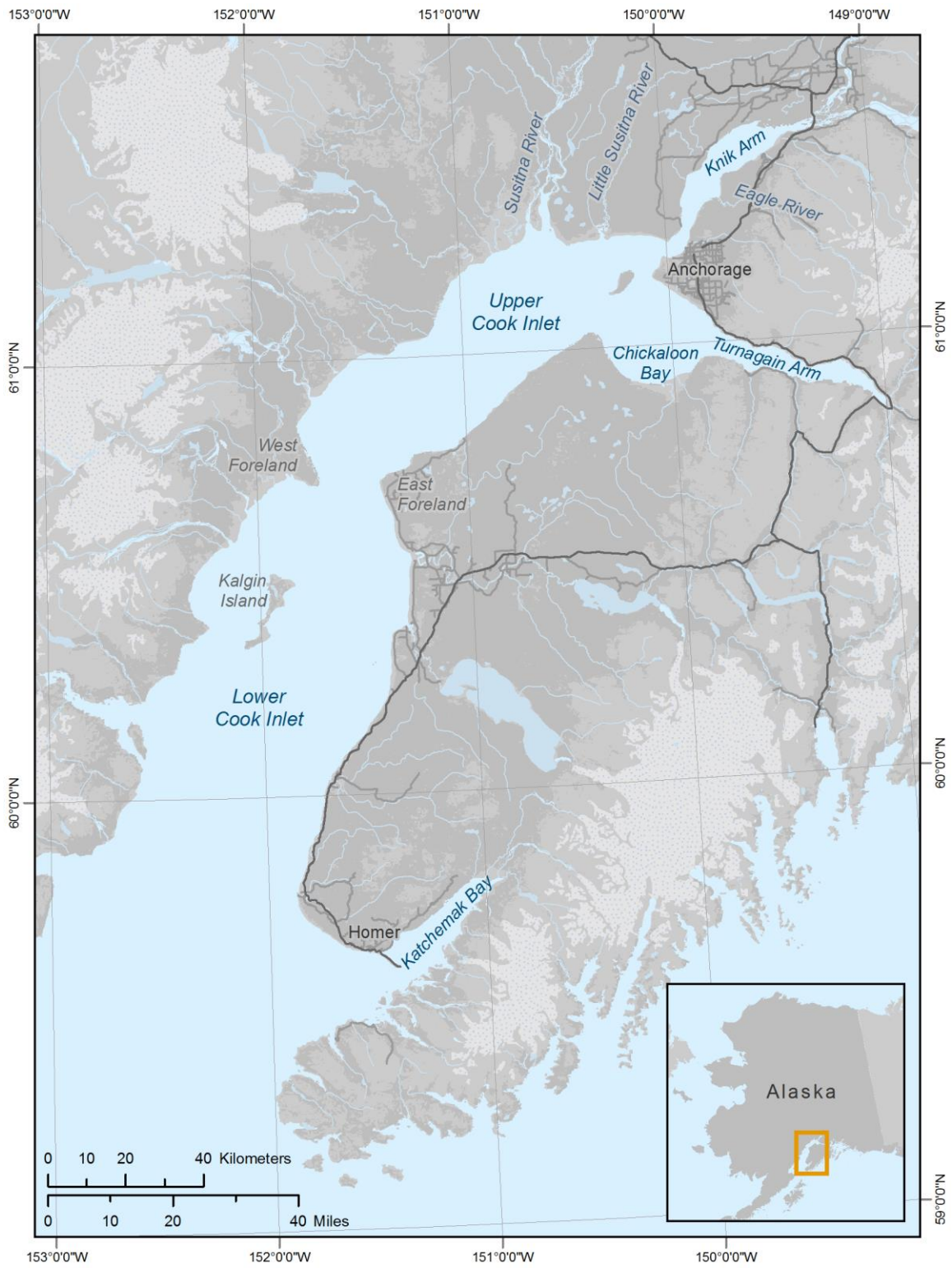


Figure 1. Map of Cook Inlet, Alaska, showing major features discussed in text.

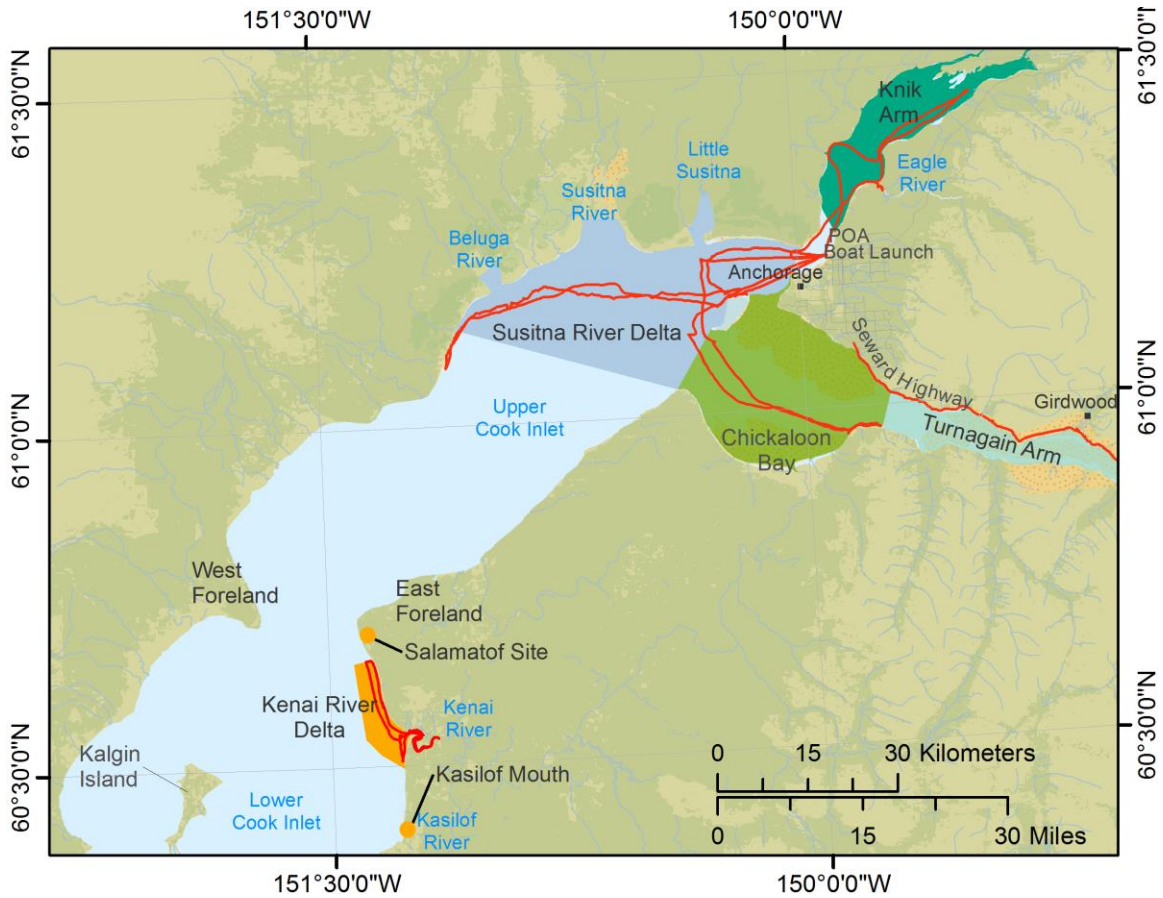


Figure 2. Map of Middle and Upper Cook Inlet, Alaska, showing boundaries of sub-areas within the study area and the general routes used 2005–2014. The Kenai River Delta study area was surveyed 2011-2013. This report is limited to surveys conducted in the Susitna River Delta 2014.

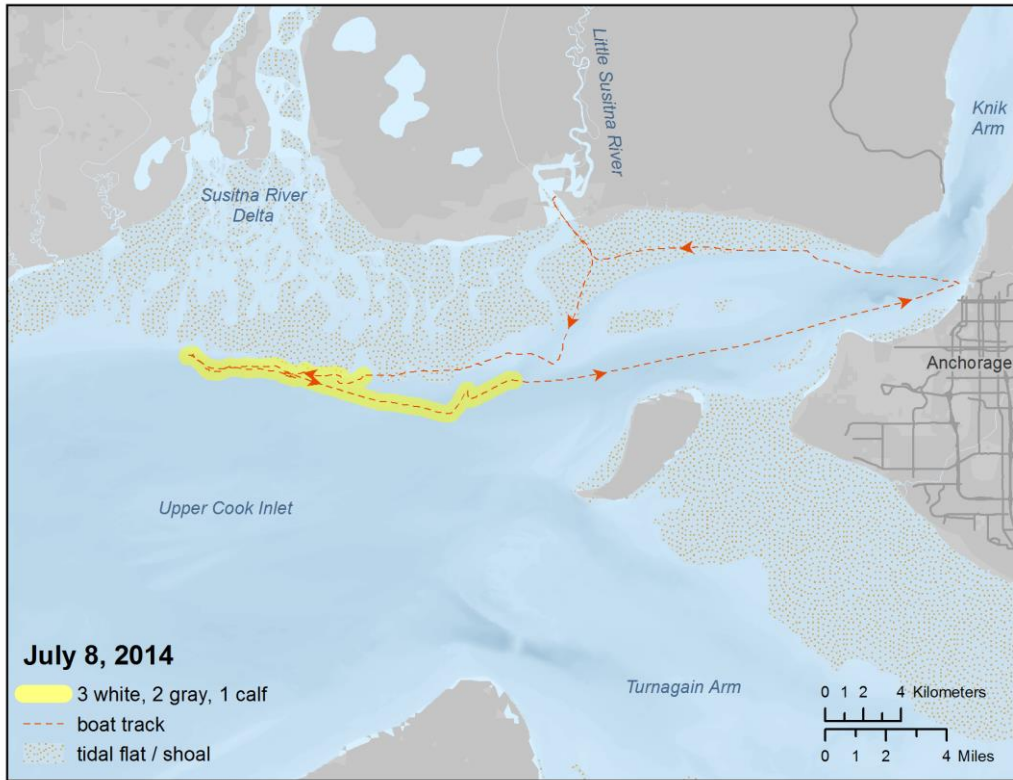


Figure 3. Route and beluga whale group encountered during the vessel-based survey route of July 8, 2014 in Upper Cook Inlet, Alaska.

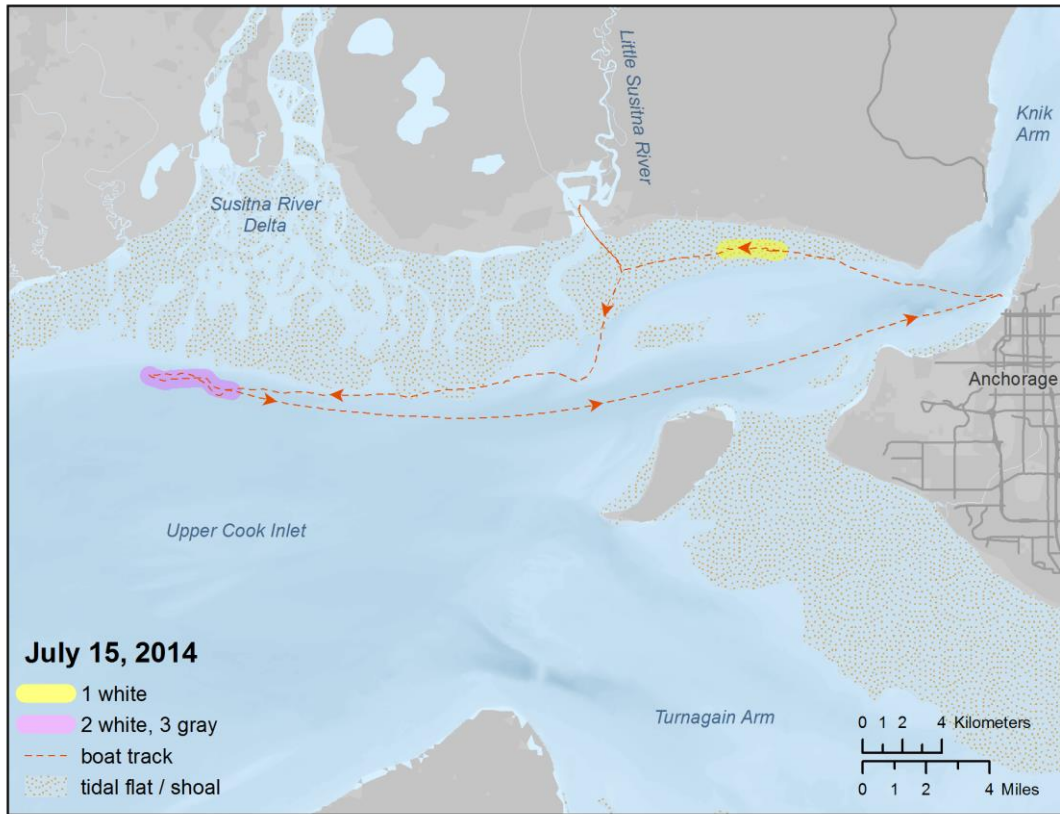


Figure 4. Route and beluga whale groups encountered during the vessel-based survey route of July 15, 2014 in Upper Cook Inlet, Alaska.

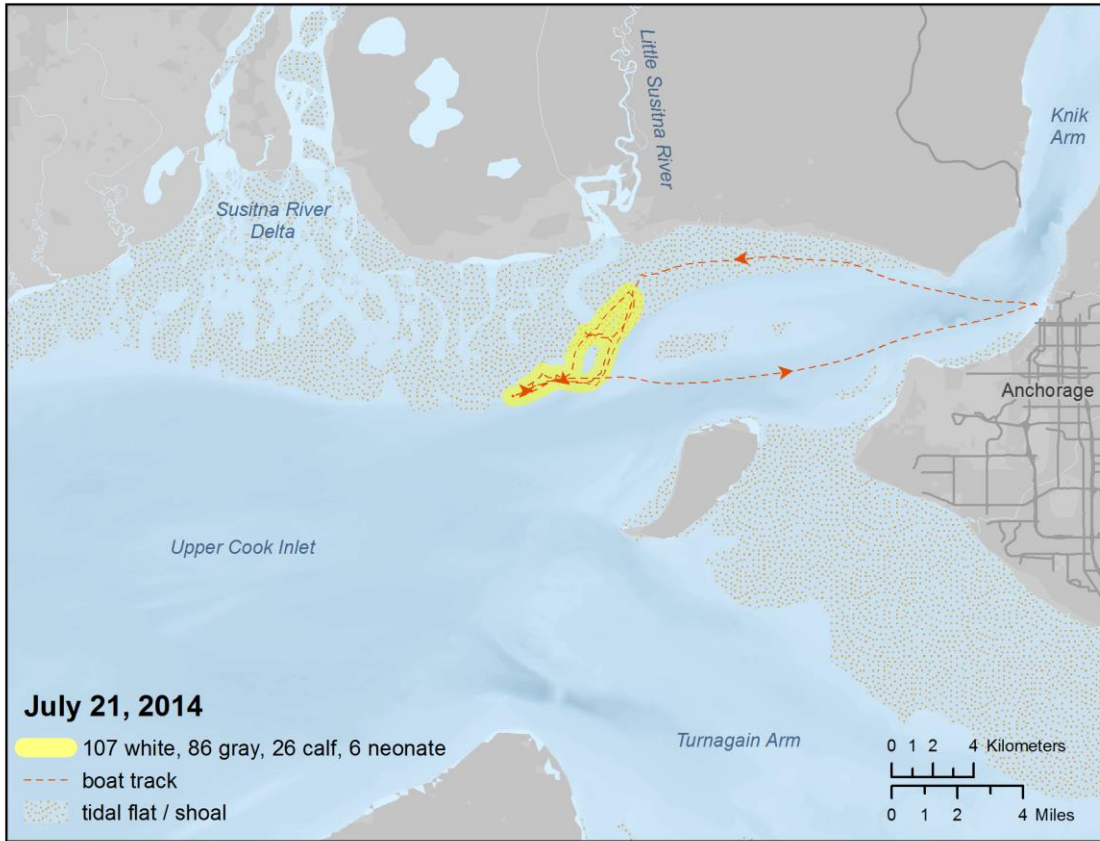


Figure 5. Route and beluga whale group encountered during the vessel-based survey route of July 21, 2014 in Upper Cook Inlet, Alaska.

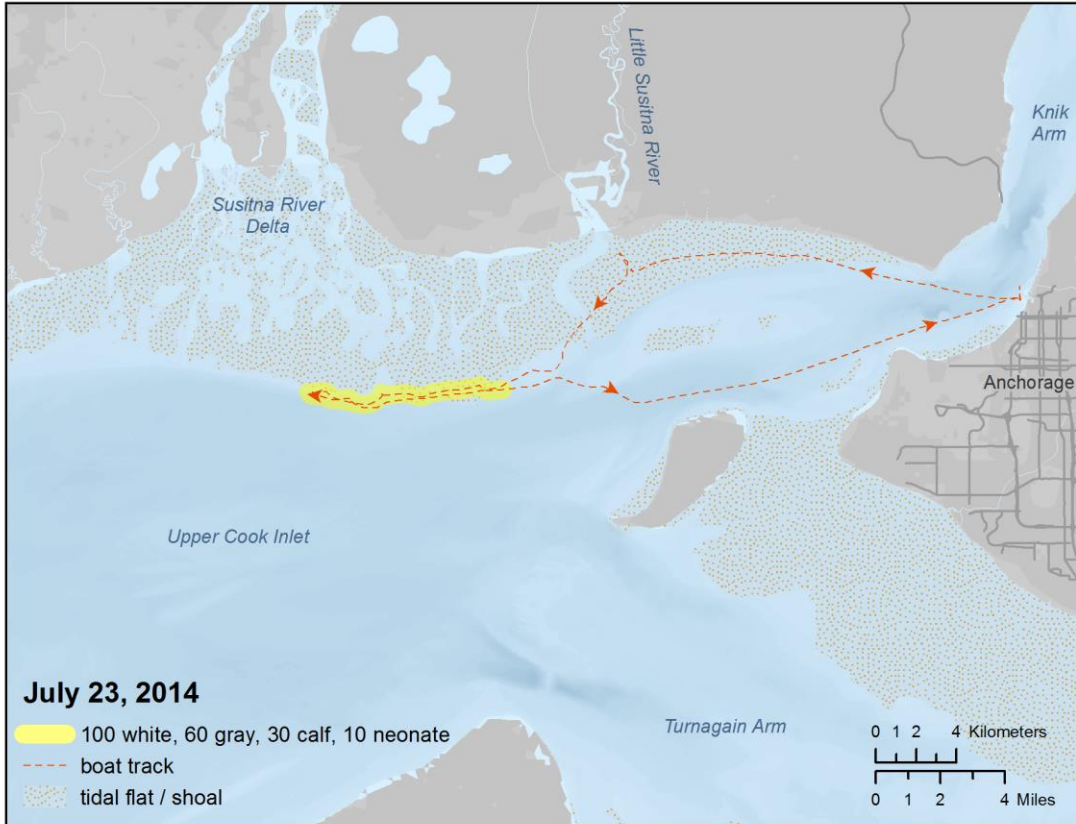


Figure 6. Route and beluga whale group encountered during the vessel-based survey route of July 23, 2014 in Upper Cook Inlet, Alaska.

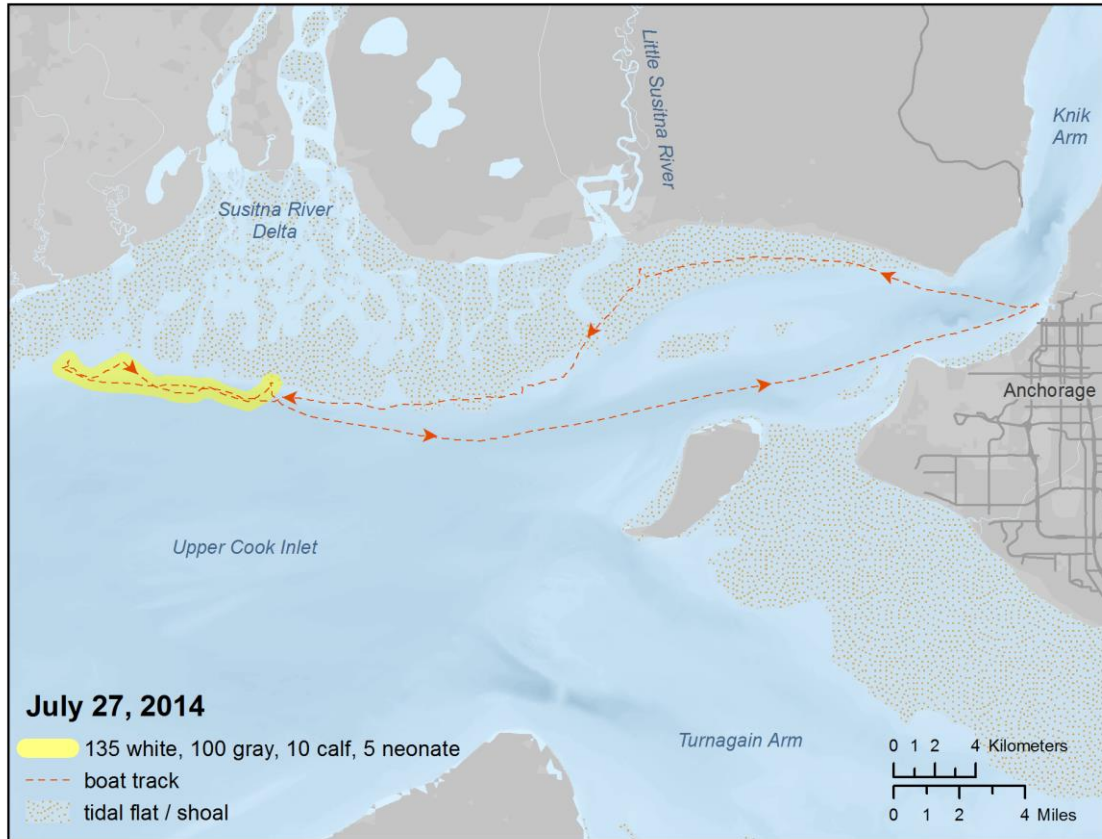


Figure 7. Route and beluga whale group encountered during the vessel-based survey route of July 27, 2014 in Upper Cook Inlet, Alaska.

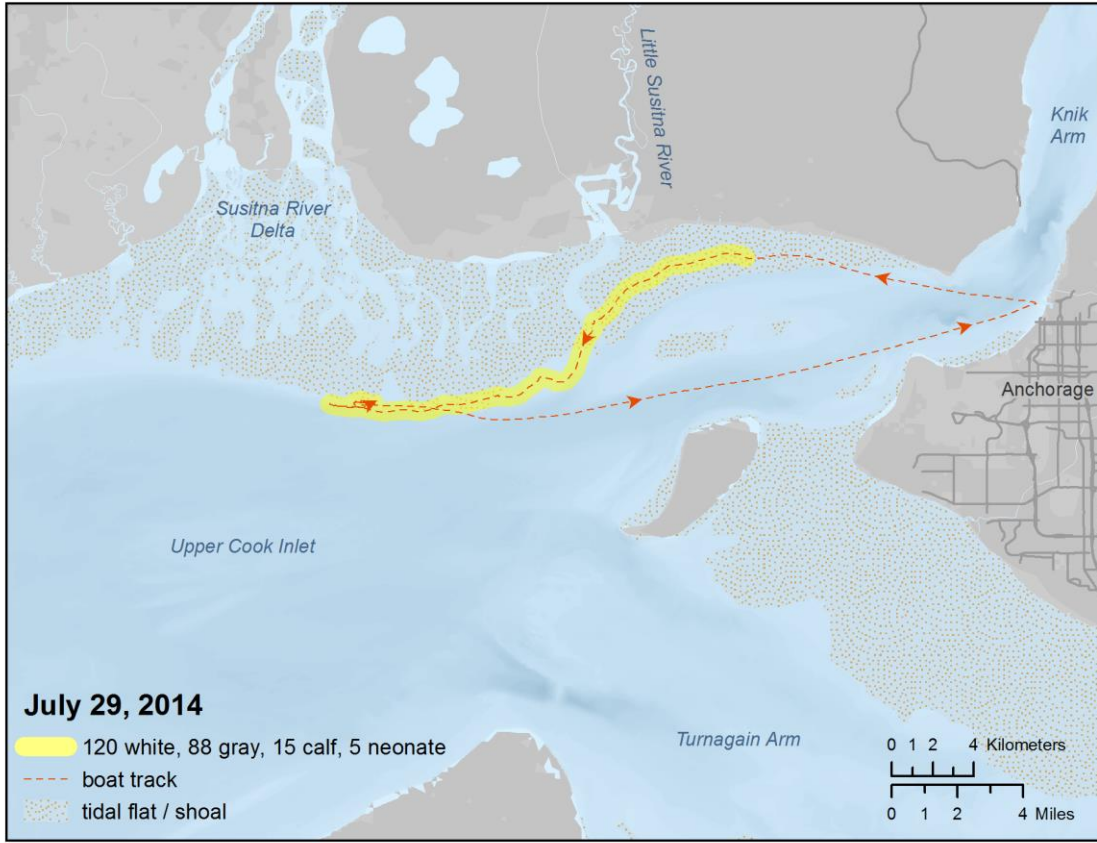


Figure 8. Route and beluga whale group encountered during the vessel-based survey route of July 29, 2014 in Upper Cook Inlet, Alaska.

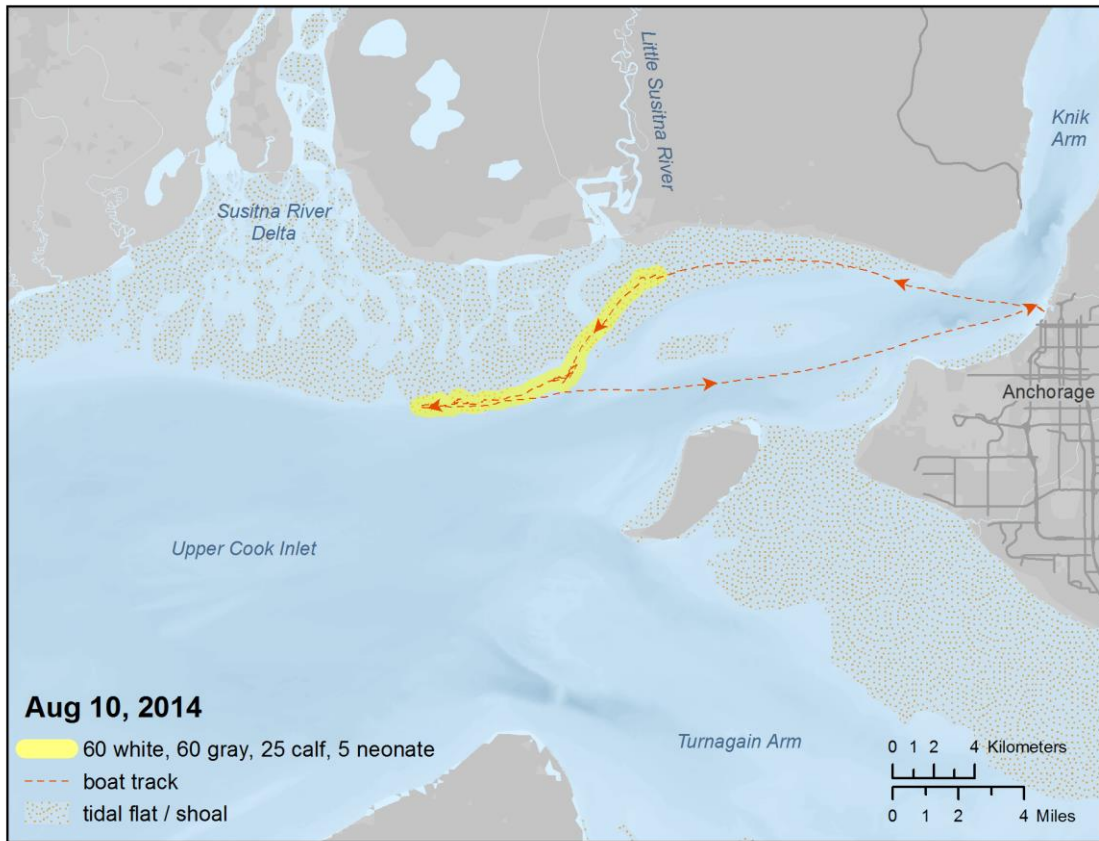


Figure 9. Route and beluga whale group encountered during the vessel-based survey route of August 10, 2014 in Upper Cook Inlet, Alaska.

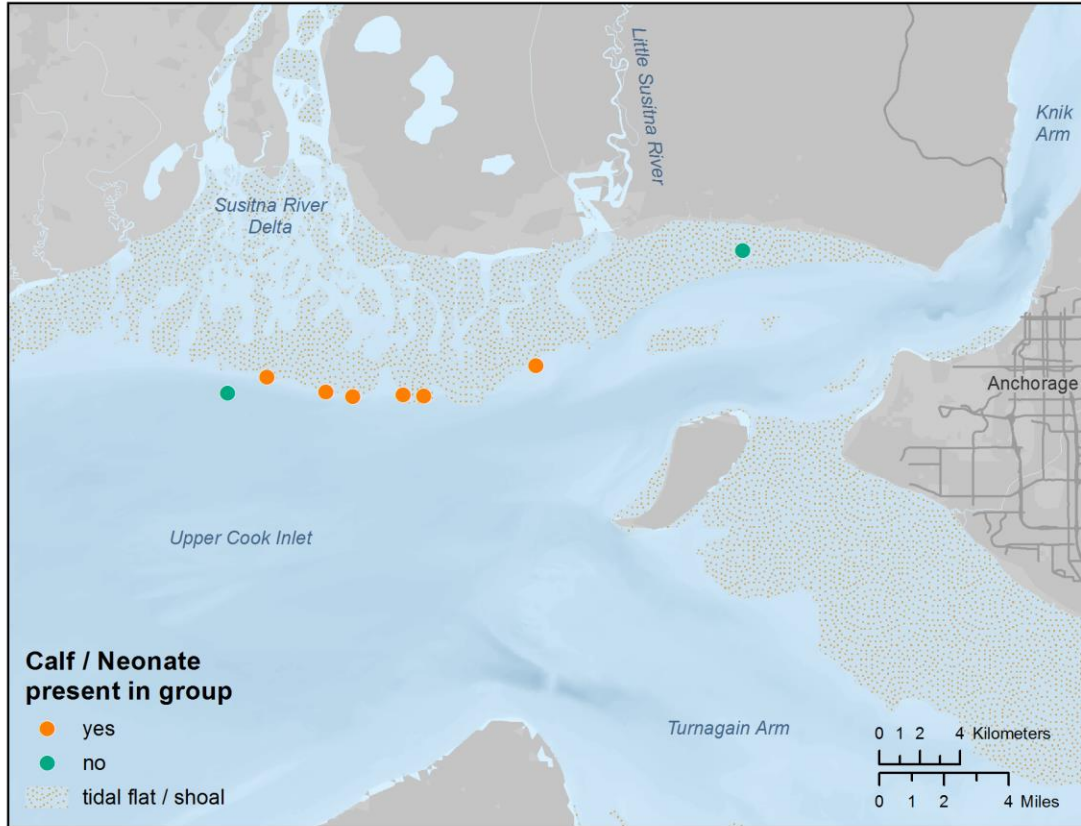


Figure 10. Location of groups with and without calves and neonates encountered during vessel-based photo-id surveys of the Susitna River Delta, Upper Cook Inlet, Alaska in 2014.

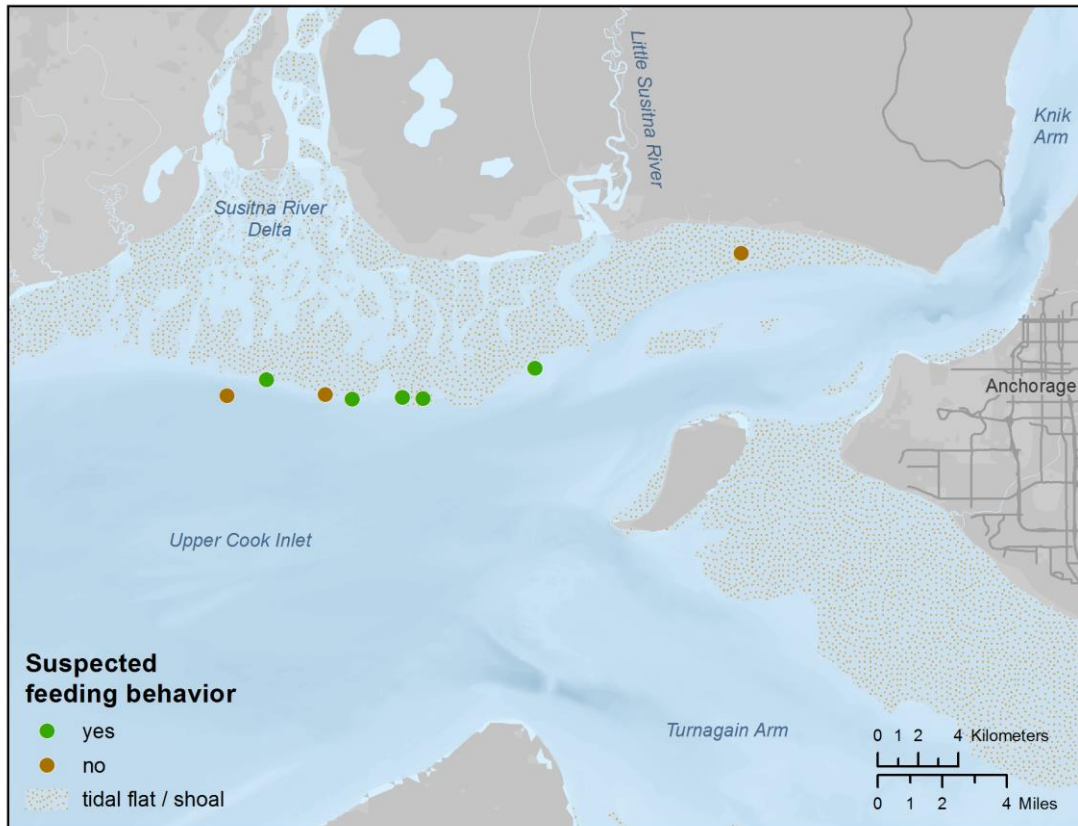


Figure 11. Location of groups with and without observations of suspected feeding behavior during vessel-based photo-id surveys of the Susitna River Delta, Upper Cook Inlet, Alaska in 2014.

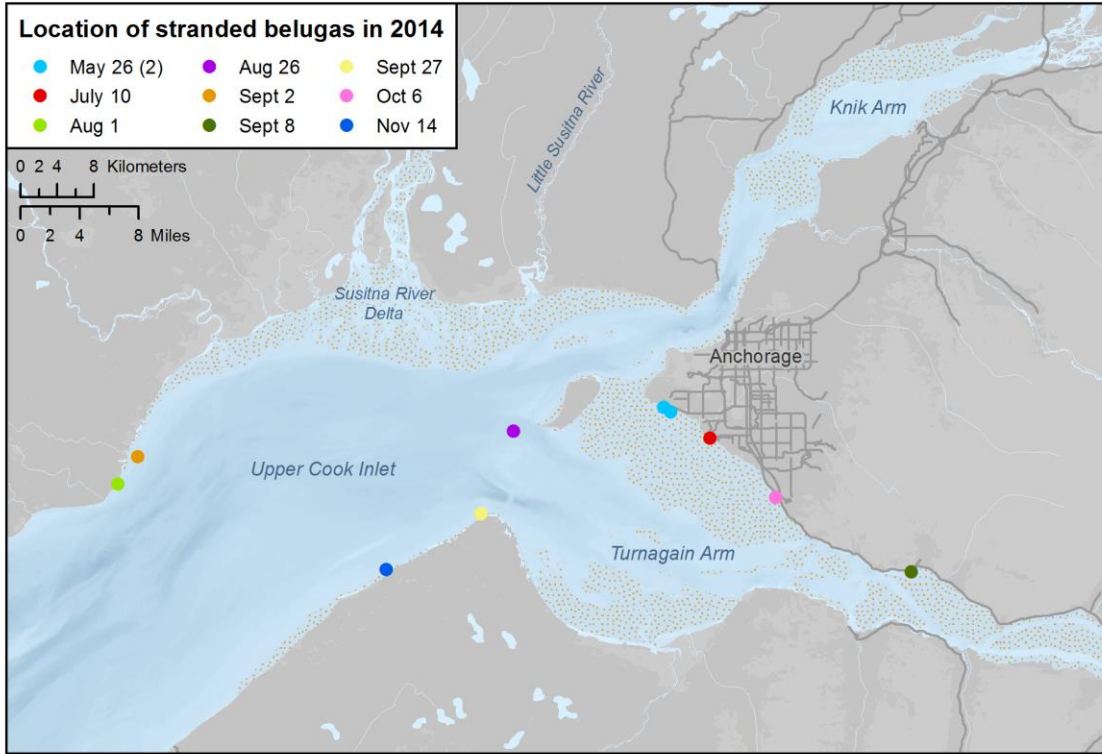


Figure 12. Location of dead Cook Inlet beluga whales with photographs provided to or taken by the CIBW Photo-ID Project in 2014.

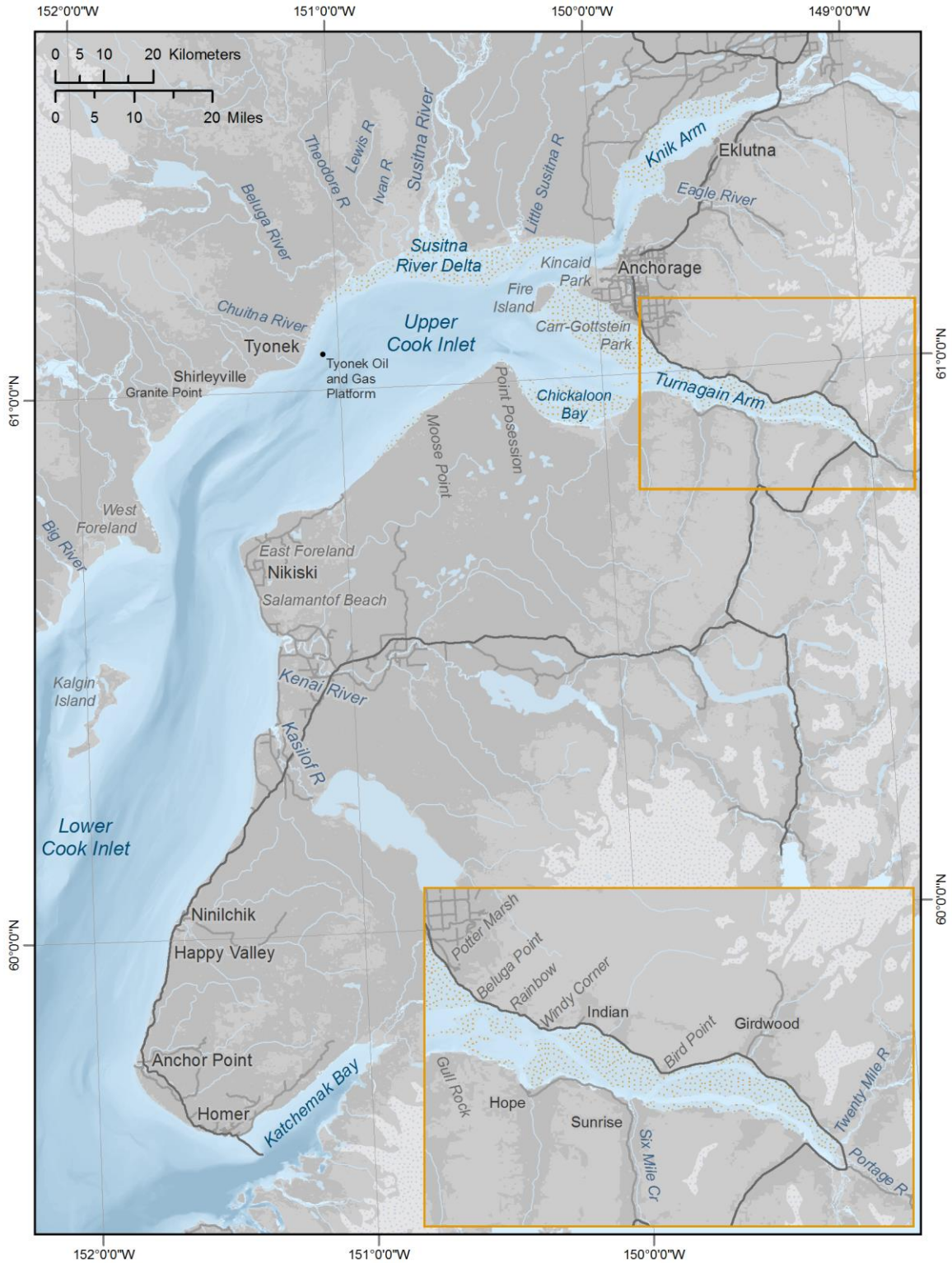


Figure 13. Map showing place names given in stranded and incidental sighting reports for CIBWs in 2014 (Table 8).