Photo-identification of Cook Inlet Beluga Whales in the Waters of the Kenai Peninsula Borough, Alaska

Final Report of Field Activities

and

Belugas Identified 2011–2013

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Prepared for:

The Kenai Peninsula Borough

January 2014

Photo-identification of Cook Inlet Beluga Whales in the Waters of the Kenai Peninsula Borough, Alaska

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Belugas Identified 2011–2013

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EXECUTIVE SUMMARY

Introduction

Many information gaps and uncertainties are associated with our failure to understand the lack of recovery of the endangered Cook Inlet beluga whale (CIBW) population (*Delphinapterus leucas*). Although the Kenai Peninsula Borough (KPB) encompasses the majority of Cook Inlet and much of the historic range of CIBWs, the current core range has contracted to the upper part of Cook Inlet. The cause of the shift in the core range and reduction in numbers of CIBWs in the KPB and Inlet-wide is unknown. Understanding if the belugas found in the KPB are the same whales found elsewhere in Cook Inlet may provide insight into population dynamics, habitat use, and movement and exposure to different types of stresses/threats. These insights will refine our understanding of CIBW habitat requirements and will improve our knowledge of factors that are limiting recovery of the beluga population in the KPB and throughout Cook Inlet.

The CIBW Photo-id Project has been ongoing since 2005. It has demonstrated that CIBWs possess distinct natural marks that persist across years, and that these marks can be effectively identified and re-sighted with digital photography. A grant from the KPB allowed for the expansion of the geographic scope of the CIBW Photo-id Project to cover the waters of the KPB 2011–2013. The goals of the expanded research project, "Photo-identification of Cook Inlet Beluga Whales in Waters of the Kenai Peninsula Borough", correspond to two categories in the initial Request for Proposals from the KPB:

1. Improve knowledge of CIBWs to determine factors that are limiting recovery,
2. Refine knowledge of CIBW habitat requirements.

Data gathered about individual whales identified in the waters of the KPB were compared to data gathered during our long-term (2005–2013) study of CIBWs in Upper Cook Inlet. This final project report summarizes field effort and photo-id surveys in the KPB from the 2011–2013 field seasons, and presents results from the analyses of photos of belugas encountered and identified in 2005–2013, including sighting rates, distribution and movement patterns, reproductive histories, group composition, and indications of injury or disease.

Methods

Project activities consisted of field surveys, photo processing, cataloging of photos, data entry, database management, data analysis, reporting, and educational outreach. Boat-based surveys were conducted in Chickaloon Bay, the lower Kenai River, and the waters of the Kenai River Delta. Shore-based surveys were conducted from observation stations along Turnagain Arm, the lower reaches and mouth of the Kenai River, and occasionally from Salamantof Beach and the mouth of the Kasilof River.

Additional beluga photo-id surveys for the CIBW Photo-id Project, supported by other funding sources, were conducted 2005–2013 in Knik Arm, the Susitna River Delta, and 2005–2010 in Turnagain Arm, and Chickaloon Bay. Sighting histories (i.e., dates and locations of sightings) were compiled for all cataloged belugas seen in the waters of the Kenai Peninsula Borough 2011–2013 in order to examine residency and movement patterns. These sighting histories include information from surveys conducted throughout Upper Cook Inlet 2005–2013.

Results

Seventy-five surveys were conducted in the KPB 2011–2013, and 74 beluga whale groups were encountered. For the larger 2005–2013 study, 134 surveys were conducted in the waters of the KPB, and 132 groups were encountered. Inlet wide since 2005, 349 photo-id surveys have been conducted and 488 beluga groups were encountered, resulting in about 250,000 photographs taken.

There were 85 individual belugas identified in the KPB 2011–2013; 82 were re-sightings of individual whales in the 2005–2011 Cook Inlet catalog, and three were newly identified individuals who were added to the catalog. The 2005–2013 right-side catalog currently contains sighting histories for 312 individual whales.

Whales identified in the KPB 2005–2013 had sighting histories ranging between one and eight field seasons, with one to 38 sighting days per identified whale. Most individuals were seen multiple times within a field season, and one whale was sighted 11 times within the same field season. Of the 85 whales identified in the KPB, 78 percent were found in Turnagain Arm, 22 percent in Chickaloon Bay/South Fire Island, and 9 percent in the Kenai River Delta. In addition, the majority of these whales were also found in waters outside of the KPB; 89 percent were found in the Susitna River Delta, and 81 percent were found in Knik Arm.

There was no evidence of a “Kenai River Delta group” that persisted during the study. Group composition appeared to change among days, and the eight individuals identified in the Kenai River Delta were seen throughout Cook Inlet. There was also no evidence of a distinct “Chickaloon Bay/South Fire Island group”, as individuals identified in the seven groups found in Chickaloon Bay/South Fire Island 2005–2013 were also photographed elsewhere in Cook Inlet. Sixty-six different individual belugas were identified in Turnagain Arm 2005–2013. The majority of these whales were also found in the Susitna River Delta and Knik Arm, although relatively few were found in Chickaloon Bay/South Fire Island or in the Kenai River Delta.

Of the 85 belugas identified in the waters of the KPB 2011–2013, 58 whales (68 percent) were presumed to be reproductive females based on photographs in which they were closely accompanied by a calf at least once in 2005–2011. Thirty-one identified belugas were photographed with calves in more than one year.

Marks on the cataloged belugas were evaluated to assess health. Marks fell into nine categories: infection, general trauma, rake marks, molting, satellite tag scars, puncture wounds, entanglement, pigment, and mud/silt. Indications of injury were associated with the “general trauma, rake marks, satellite tag scars, puncture wound”, or

"entanglement" categories. All of the 85 belugas identified in KPB waters displayed rake marks, and 81 percent had signs of infection (healed or active lesions). Of marks categorized as injuries, in addition to rake marks (*n*=85) and satellite tag scars (*n*=5), nine whales showed signs of other trauma, with three of these cases associated with puncture wounds. One unidentified whale was classified as emaciated. Two dead CIBWs were matched to whales in the catalog.

Approximately 120 incidental reports of belugas in the waters of the KPB were received April 2011 through October 2013, with the number of reports increasing every year. Sightings were reported by fishermen/women, pilots, the media, law enforcement officers, large vessel operators, tourists, biologists, educators, environmentalists, and oil company employees. Seasonal patterns in sightings were consistent across years; CIBWs were reported in Turnagain Arm, Chickaloon Bay, and the Kenai River Delta in the spring and fall. Belugas in the KPB waters of the Upper West Inlet were also reported in the spring and fall, with occasional sightings during the summer. Belugas were reported in deeper waters near Kalgin Island and the Tyonek oil and gas platform in November and December. Two notable sightings where of a beluga in the Kenai River in February 2013, and of a group of belugas south of Ninilchik in March of 2013.

Discussion

In addition to the two original goals of this project, gathering data to help understand factors that are limiting recovery and adding to the knowledge of CIBW habitat requirements, this study had three underlying questions:

1. Given their contracting range and decreasing population size, do belugas still use the waters of the KPB, particularly in the lower Inlet (i.e., south of the Forelands)?

The results of this study demonstrate that belugas still use the waters of the KPB, including the lower Inlet.

2. If belugas do still use the KPB waters of the lower Inlet, do they occur in large enough numbers and in predictable enough locations for them to be reliably found during photo-id surveys?

Predictable seasonal and tidal patterns in CIBW distribution allowed them to be surveyed and photographed in certain areas of the KPB waters of the lower Inlet, but they were found there in smaller numbers and less reliably than in the Upper Inlet.

3. If belugas are encountered and photo-identified in the lower Inlet waters of the KPB, are they the same individuals already identified in the upper Inlet, or do they belong to a separate group?

Most of the individual belugas encountered in the lower Inlet waters of the KPB have also been identified elsewhere in the upper Inlet. Although beluga groups had been reported in KPB waters prior to this study, the individual composition of the groups was unknown. It could not be determined if the groups contained the same individuals every

time that had a preference for particular areas, or if these groups were fluid and open to the entire CIBW population. By identifying individual belugas seen in the KPB and matching their records with whales in the greater 2005–2013 catalog, we were able to determine that most of the CIBWs photo-identified in the waters of the KPB have also been seen elsewhere in Upper Cook Inlet, especially in the Susitna River Delta and Knik Arm.

KPB habitat used by reproductive females and their calves

Whale groups in the waters of the KPB, as elsewhere in Cook Inlet, did not appear to be segregated by age-class or color. Groups containing calves and neonates were seen in all areas of the KPB study area where belugas were encountered. The photographic records of individuals in the catalog underscore the use of these areas by reproductive females and their calves: 68 percent of whales identified in the waters of the KPB were presumed to be reproductive females based on sighting records in the 2005–2013 catalog.

Information about factors that may be limiting CIBW recovery

Several of the identified belugas in the waters of the KPB display marks indicative of injury. An in-depth study of identified CIBWs in Eagle Bay, Knik Arm, indicated a similarly high injury mark rate. Because CIBWs appear to move freely around the Inlet, it cannot be known if the injury occurred in KPB waters or elsewhere. Marks indicative of injury may have been caused by vessel strikes (bow and propeller), gunshots, harpoons, other belugas, other marine mammals (killer whales, harbor seals), or even sharks, but without witnessing the injury as it occurred and monitoring the resulting marks, we can only guess at the source based on photographs of known injuries of other marine mammals. Even when the cause of injury is known, as in the case of the beluga entangled in a rope, it is unknown if this rope was from unattended fishing gear, floating debris, or the attempted illegal capture of the whale. A high percentage of individual CIBWs identified in the KPB bore signs of infection, at rates comparable to CIBWs identified in the Eagle Bay study.

Humans and CIBWs in the KPB

Potential threats to CIBWs from human activities observed in the waters of the KPB during this study include: entanglement in gillnets, vessel strikes (e.g., a recreational vessel was observed to drive directly over a small group of belugas in shallow waters in the Kenai River), contaminants in the water and prey from runoff from onshore and in-water activities (e.g., corroded fuel storage drums along shore, accidental fuel spills from vessels), habitat loss from construction, and noise from vessels and near-shore activities such as pile driving and blasting for construction and highway expansion. We found that beluga whales in the Kenai River Delta seemed more wary of boats than beluga groups encountered elsewhere in Cook Inlet, but whether this behavior was unique to the specific location or simply to belugas found in the relatively confined area of a narrow river is unknown. On a positive note, it was our experience that people who live in and visit the KPB were very active in reporting sightings of CIBWs and in supporting efforts to learn more about these whales and their recovery. Incidental

sighting rates, areas of sightings, and the demographics of the people making the sightings were linked to the effort levels, locations, and target audiences of educational outreach activities.

When sharing their opinions of why CIBWs are seldom seen in the KPB anymore, local residents and Inlet-users expressed concern about human disturbance, reduction in prey, and changes in bathymetry.

Conclusion

The waters of the KPB are still used seasonally by CIBWs (including calves and neonates), identified individual whales have been seen to return here year after year as well as multiple times within a year, and these same individuals are seen in Upper Cook Inlet. Many CIBWs in the KPB, as elsewhere in the Inlet, bear signs of infection and a few show signs of injury, although the ultimate sources of the injuries and infections could not be determined. People who live in and visit the KPB were very active in reporting sightings of CIBWs and in supporting efforts to learn more about these whales and their recovery.

Potential anthropogenic threats to CIBWs exist in the waters of the KPB as well as in the Upper Inlet, and because all of the individuals in the CIBW population move throughout the Inlet seasonally, whales are likely exposed to multiple potential threats. For example, the same individual whale might be exposed to noise from seismic exploration near the Forelands, fishing vessels and nets in the Kenai River Delta, vessel traffic in the shipping lanes for the Port of Anchorage, military exercises in Knik Arm, and physical habitat alteration and noise from in-water highway expansion activities in Turnagain Arm. When considering the possible effects on CIBWs from human activities in the KPB, it should be noted that most, and most likely all, of the CIBW population could be seasonally exposed to these activities. Such exposure would very likely occur for neonates, calves, and adults, and the same individuals may be exposed multiple times within a year, as well as year after year. The cumulative effects of all activities in the range of CIBWs and their potential to affect the entire population should be considered when making management decisions to improve CIBW recovery.

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INTRODUCTION

Beluga Whales in Cook Inlet

Alaska's Cook Inlet beluga whale (CIBW) population (*Delphinapterus leucas*) is considered a distinct population segment (DPS) by the National Marine Fisheries Service (NMFS) due to 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). After finding little evidence to demonstrate the population was recovering, in October 2008 NMFS listed the CIBW population as endangered under the Endangered Species Act (ESA; NMFS 2008). As a result 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 the 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 action does not jeopardize the continued existence of the endangered species or result in the destruction or adverse modification of its designated critical habitat. A CIBW Recovery Team was convened by NMFS in 2010 to produce a draft Recovery Plan, which it delivered to NMFS in March 2013. This draft is currently under review by NMFS and, until it is finalized, the management of the species will continue to be heavily influenced by the NMFS CIBW Conservation Plan (NMFS 2008).

An unsustainable level of hunting was thought to be the primary cause of the decline of the CIBW population, however cooperative efforts between NMFS and subsistence users greatly reduced subsistence hunts, and no CIBWs were hunted after 2005 (NMFS 2008). This reduction in hunting should have allowed the CIBW population to recover if subsistence harvest was the only factor limiting population growth. Abundance data collected by NMFS during the past several years indicate that the population is not increasing as expected (Hobbs et al. 2012), and at this time, it is unknown what factors continue to limit growth and recovery of the CIBW population.

Many information gaps and uncertainties are associated with our current understanding of the CIBW population and its lack of recovery (NMFS 2008). Information needed for effectively recovering and conserving the CIBW population includes habitat preferences, annual abundance estimates of age-specific cohorts, 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). Data describing CIBW residency and movement patterns, habitat use by mothers and calves, and assessment of behavior are needed to aid in the identification of movement corridors and locations of grounds for feeding, calving, and rearing of young.

Available sources of information used to identify and characterize CIBW habitat include the distribution of CIBWs sighted from annual aerial surveys, tidal flow models, and movement data from 15 satellite-tagged individuals from 1999 to 2002 (Rugh et al. 2000, 2004, 2005, 2006; Hobbs et al. 2005, 2008; Goetz et al. 2007; NMFS 2008; Shelden et al. 2008, 2012). This information plays a key role in characterizing and understanding habitat needs, as does information on movement and residency patterns obtained from land-based observational studies of CIBWs in Upper Cook Inlet (Funk et

al. 2005, Prevel-Ramos et al. 2006, Markowitz and McGuire 2007, Markowitz et al. 2007, Nemeth et al. 2007). Land- and vessel-based photo-identification (photo-id) surveys (LGL 2009; McGuire and Kaplan 2009; McGuire and Bourdon 2012; McGuire et al. 2008, 2009, 2011a,b, 2013 a,b) are also used to characterize distribution and movement patterns of individual CIBWs, and results of these surveys complement information from aerial surveys and tagging-tracking studies conducted by NMFS.

Beluga Whales in the Waters of the Kenai Peninsula Borough

Although the Kenai Peninsula Borough (KPB) encompasses the majority of Cook Inlet (Figure 1) and much of the historic range of CIBWs, the current core range has contracted to upper part of Cook Inlet. The distribution of CIBWs has changed significantly since the 1970s, when aerial surveys for belugas were first conducted and CIBWs were distributed over a relatively large area. There was a northwest contraction of the CIBW core range into Upper Cook Inlet from the 1970s to the 1990s and into the 2000s, as well as a shift west toward Anchorage between 1993 and 2008 (Rugh et al. 2010; Figures 2a, 2b, 2c). In aerial surveys for CIBWs conducted by NMFS 1993–2012, belugas were often seen south of North Foreland prior to 1996 (Rugh et al. 2000, 2010), but since the mid-1990s, only one or two beluga groups have been found in the lower Inlet (Rugh et al. 2010). With the recent exception of a group of seven CIBWs seen southeast of the West Forelands in May 2012, CIBWs were last observed in the Lower Inlet during aerial surveys in 2001 (Shelden et al. 2012).

Traditional Ecological Knowledge (TEK) reports CIBWs historically occurring in the waters of the KPB, including Kachemak Bay on the eastern side and Tuxendi and Trading bays on the western side, although rarely in large numbers (Huntington 2000, Braund and Huntington 2011). Incidental sightings of CIBWs in the KPB are still reported on occasion (Vate-Brattstrom et al. 2010; T. McGuire, unpublished data), but not as often and not in the large numbers that were historically reported from the public (Vate-Brattstrom et al. 2010, Dutton et al. 2012).

The cause of the shift in the core CIBW range and reduction in numbers of CIBWs in the KPB is unknown. Understanding if the CIBWs found in the KPB are the same whales found elsewhere in Cook Inlet may provide insight into population dynamics, habitat use, and movement and exposure to different types of stresses/threats; these insights will refine our understanding of CIBW habitat requirements and will improve our knowledge of factors that are limiting recovery of the CIBWs in the KPB and throughout Cook Inlet. Ultimately, such information will provide important guidance for management decisions.

The Use of Photo-Id to Study Beluga Whales in the Waters of the Kenai Peninsula Borough

The CIBW Photo-id Project has been ongoing since 2005, and has demonstrated that a large number of CIBW (n=312 as of January 2014) possess distinct natural marks that persist across years, and that these marks can be effectively identified and re-sighted

with digital photography. The project uses photo-id methods to study distribution and movement patterns of individual CIBWs throughout Upper Cook Inlet, with emphasis on Knik Arm, the Susitna River Delta, Chickaloon Bay, and Turnagain Arm (LGL 2009; McGuire et al. 2008, 2009, 2011a,b, 2013a,b; McGuire and Bourdon 2012). The photo-identification catalog and associated surveys from nine field seasons (2005–2013) have provided information about the distribution, movement patterns, and life-history characteristics of individually identified CIBWs, including mothers with calves. Although several individuals in the catalog have died during the duration of the nine-year study, and many others in the population have yet to be identified, nevertheless the catalog of 312 individuals contains sighting histories for the majority of the CIBW population. NMFS estimated that the size of the CIBW population was 312 whales in 2012 (https://alaskafisheries.noaa.gov/newsreleases/2012/cibelugas010912.htm).

The objectives of the CIBW Photo-id Project are to:

1. Build a photo-identification catalog of distinctively marked individual CIBWs describing re-sight rates and discoveries of new individuals over time;
2. Describe population characteristics of CIBWs in Cook Inlet, including age class distribution, residency/movement patterns, behavior, and social group structure;
3. Determine CIBW life history characteristics, such as calving frequency, calving interval, period of maternal care/association, survival rates of calves, and survival rates of identified individuals; and,
4. Photographically document signs of trauma (e.g., vessel interactions, entanglement, predation) and disease in CIBWs.

Most of the CIBW Photo-id Project surveys have been conducted in Upper Cook Inlet, north of the waters of the KPB. A grant from the KPB (contract signed May 31, 2011; end date January 30, 2014) allowed for the expansion of the geographic scope of the CIBW Photo-id Project to cover the waters of the KPB 2011–2013. The goals of the expanded research project, "Photo-identification of Cook Inlet Beluga Whales in Waters of the Kenai Peninsula Borough", correspond to two categories in the initial Request for Proposals from the KPB:

1. Improve knowledge of CIBW to determine factors that are limiting recovery,
2. Refine knowledge of CIBW habitat requirements.

Data gathered about individual whales identified in the waters of the KPB were compared to data gathered during our long-term (2005–2013) study of CIBWs in Upper Cook Inlet. The outcomes achieved with the expanded research activities include: an extension of the geographic range of the current CIBW photo-id catalog; the addition of three field seasons (2011, 2012, and 2013) to the photo-id catalog; updated sighting histories of identified whales; documentation of mortality of identified dead whales; documentation of new births; documentation of length of mother/calf bonds; documentation of incidence and potential sources of trauma and disease; documentation of association patterns among individuals; and the addition of information about habitat

use by individual belugas and by particular sectors of the CIBW population (such as mother/calf pairs) to the dataset.

This final project report summarizes field effort and photo-id surveys in the KPB from the 2011–2013 field seasons, and presents results from the analyses of photos of CIBW encountered and identified in 2005–2013, including sighting rates, distribution and movement patterns, reproductive histories, group composition, and indications of injury or disease.

METHODS

Project activities consisted of field surveys, photo processing, cataloging of photos, data entry, database management, data analysis, reporting, and educational outreach.

Field Surveys

Survey effort

Primary field activities included dedicated surveys and opportunistic sampling for CIBWs in the waters of the Kenai Peninsula Borough. Boat-based surveys were conducted in Chickaloon Bay, the lower Kenai River, and the waters of the Kenai River Delta. Shore-based surveys were conducted from observation stations along Turnagain Arm, the lower reaches and mouth of the Kenai River, and occasionally from Salamantof Beach and the mouth of the Kasilof River (Figure 3). The survey schedule was adaptive with respect to date, location, and tidal stage, and was based on reports of CIBW sightings in the area (reported to NMFS and to the CIBW Photo-id Project via an existing observer network). Tidal information was obtained from the program JTides (*www.arachnoid.com/JTides/*) for the Anchorage Small Boat Launch, from *ProTides.com* for the Kenai River Delta, and from a combination of *JTides* and *www.Tides.info* (Sunrise Station) for Turnagain Arm.

Additional beluga photo-id surveys for the CIBW Photo-id Project, supported by other funding sources, were conducted 2005–2013 in Knik Arm, the Susitna River Delta, and 2005–2010 in Turnagain Arm, and Chickaloon Bay.

Vessel surveys

Vessel surveys of Chickaloon Bay were conducted from an 8.5 m (28 ft) aluminum hulled Munson landing craft powered by two 140 hp 4-stroke engines, and the *R/V Leucas,* a 4.9 m (16 ft) inflatable Proman 9 Zodiac® powered by a 4-stroke 50 hp Yamaha motor. The landing craft was used when weather and sea conditions made the trip from the Anchorage small boat launch to Chickaloon Bay too dangerous for the smaller vessel. Although all boats carried safety "kicker" engines, the second engine on the landing craft proved to be a useful safety measure in the rough waters and shallow channels often encountered in Chickaloon Bay. A third boat, a Willie Predator 6 m (20 ft) aluminum river boat with a 50 hp Yamaha engine was used for surveys of the Kenai River and Delta.

The zodiac and river boat usually carried one skipper and one photographer, while the landing craft also carried an additional observer to assist with beluga observations because the vessel design made it difficult for one observer to monitor both fore and aft of the vessel. Vessel position was recorded with a Garmin™ GPS (Global Positioning System) Map 76C. A whale group was usually approached once per survey and 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.

Researchers noted the position of whales relative to the vessel and GPS-logged tracks were used to estimate approximate whale group positions. All LGL vessel surveys were conducted under NMFS MMPA/ESA Research Permit #14210, issued in 2009 to LGL Alaska Research Inc., Tamara McGuire PI.

Land-based surveys

Land-based surveys were conducted along Turnagain Arm and near the Kenai River Delta. Surveys along Turnagain Arm generally began three hours before high tide, based on results from previous research conducted by LGL (Markowitz and McGuire 2007). Along Turnagain Arm, a single observer drove south and east from Anchorage along the Seward Highway and stopped at turnouts along the highway. The observer alternated searches for marine mammals with binoculars and the naked eye. When beluga whales were seen, the observer attempted to follow them along Turnagain Arm as they moved with the tide. Most photographs were taken from sites where whales approached closest to shore and that afforded relatively easy vehicle access. Land-based surveys in the Kenai River Delta were conducted from stationary sites during times when small-craft advisories, extreme low tides, or duck hunters firing weapons from boats prevented the safe deployment of the survey vessel.

Field data (vessel- and land-based surveys)

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 or vehicle, 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, average distance among individuals, and any other marine mammals or 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 both observers to be the most accurate. Group size was usually difficult to determine and counts provided estimates rather than actual number of whales in the group.

Behavioral data were collected using focal group sampling (Mann 2000). The two types of behavioral data recorded were activities (i.e., states: behavior patterns of relatively long duration, such as prolonged activities) and events (i.e., behavior patterns of relatively short duration, such as discrete body movements like tail slaps or spy hops or vocalizations; Martin and Bateson 1993). Group activity was sampled at the beginning and end of each group encounter, and every five minutes during the encounter. Events were noted as they were observed throughout the group encounters; although it should be noted the observers were focused on photographing whales, not sampling all events. Activities were classified into primary and secondary activities. Primary activities were behaviors that appeared to be the dominant behavior of the group, and secondary activities were behaviors that occurred sporadically during primary activities. 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 or apparently 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 behavior was only classified as "feeding observed" if the prey was seen in the beluga's 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 (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 due to 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, water depth, and habitat type (e.g., mudflat, bay, mid-channel, river mouth, depositional bank, erosional bank, island, and shoal).

Digital photographs of beluga whales were collected by the CIBW Photo-id Project with a Nikon D300, 12.3 megapixel digital SLR camera with a Nikkor 70-400 mm zoom telephoto auto focus lens, and with a Nikon D600 digital camera with a Sigma 80-400 mm telephoto auto focus lens. Typical settings included shutter speed priority, dynamic auto-focus, 800 ISO, and shutter speed of 1,000 or greater. Photographs were taken in RAW (not compressed) format and stored on compact flash memory cards. Photographs taken by the public and shared with the CIBW Photo-id Project were taken on a variety of cameras and cell phones.

Processing of Photographs

All RAW format photographs were downloaded from the camera's compact flash memory card onto a computer hard drive and archived to DVDs to preserve the original data before any further processing. Copies of photographs were then reformatted into JPEGs (JPEG files are smaller than RAW files) for more-efficient processing. Photographs were sorted according to image quality using ACDSee™ 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 marks were obvious even in poor quality photographs, the photo was considered for inclusion in the catalog.

All suitable quality images were cropped to show only the focal whale. When original field photographs contained two or more whales, each whale was cropped individually and saved as a separate file with a unique name. Cropped images were separated into left and right sides of whales. Images of the left sides of belugas were archived. In order to conserve project funds, only photographs of the right sides of the whales photographed 2011–2013 were further processed. Funding has since been provided by the North Pacific Research Board that will allow for the processing and cataloging of left-side photos taken 2009–2011; results will be presented in a report that will be issued publicly July 2014. Left-side photos from 2012–2013 were archived and may be analyzed and cataloged at some point in the future, pending funding.

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 contained 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, the new photos were entered into the catalog. If no match was made, the new photos were put into a newly created "potential whale" folder.

Cataloging of Photographs

As a beluga surfaces and submerges, different portions of its body are available to photograph. Side-profile photographs are most useful for matching marks used to identify individual whales. Profile images were divided into 11 sections along the right half of the whale (Figure 4). 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 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 unique individuals in the catalog. Another criterion that allowed for the acceptance of a whale into the catalog was if two temporary whale folders that spanned two or more years were matched.

Mark-type categories were created in order to facilitate cataloging. Locations of all visible marks were assigned to sections of the body (Figure 4). This was done for each individual within the catalog. Computer software developed by LGL for photo-id of beluga whales was used for computer-aided filtering of the database according to mark type and location.

Sighting Histories

Sighting histories (i.e., dates and locations of sightings) were compiled for all cataloged belugas seen in the waters of the Kenai Peninsula Borough 2011–2013 in order

to examine residency and movement patterns. These sighting histories include information from surveys conducted throughout Upper Cook Inlet 2005–2013, and are presented graphically according to year and geographic area. Locations of cataloged beluga whale sightings were mapped in ArcGIS™ Version 10 (http://www.esri.com).

Classification of Mothers and Calves in Photographs

Identified belugas were classified as presumed mothers if they appeared in the same photo-frame with a calf or neonate alongside. Belugas were classified as calves in photographs if they were dark gray (although light-gray calves were also observed), relatively small (i.e., <2/3 the total length of adult belugas), and photographed swimming and surfacing in synchrony alongside a larger beluga. Neonates were distinguished in photographs by visible fetal folds and often a "peanut-shaped" head. Sighting histories (i.e., dates and locations of sightings) were compiled for all cataloged mothers and calves. Sighting records for mothers included information on when the mother was photographed with and without a calf, as well as information on the relative size of the calf.

Marks from Disease or Injury

Many photographs of CIBWs in the catalog contain marks indicative of disease and injury (LGL 2009). Using the cataloging tools within the database application, marks were labeled according to mark type and body segment in which they occurred in a photograph (Figure 4).

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 while assisting with necropsies, 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. Photographs of dead belugas were examined for marks that could be used to compare to records in the 2005–2013 catalog. Sex and relative age (calf, juvenile, adult) of dead whales were determined and entered into the records of cataloged individuals.

Database Development

We continued to consolidate all photo-id data (2005–2013) into a single, comprehensive, and integrated database. Data from surveys included the survey route, environmental conditions, photographs, and 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 lighting conditions. Finally,

catalog data included the number of photos in the catalog, the dates and locations when photos were taken, the number of individual whales represented in the catalog, and the number of temporary files yet to be matched.

Educational Outreach

Incidental beluga sighting reports

Incidental beluga sighting reports were collected by biologists and skippers with the CIBW Photo-id Project from the public and colleagues via email, phone calls, and conversations in the field. The CIBW Photo-id project website (www.cookinletbelugas.org) contains a page for members of the public to report beluga sightings, and the website address was distributed via the project bumper sticker (Figure 5) and project pamphlets (Figure 6). Project pamphlets and bumper stickers were distributed to the Kenai Senior Center, the Kenai Visitor's Center, Veronica's Café in Kenai, OSK dock staff, the Beluga RV Park and Lodge, students with UAA, the public along Turnagain Arm, and users/visitors of the Kenai City boat launch. Incidental beluga sighting reports were entered in the project database and shared with NMFS's National Marine Mammal Lab.

A presentation on the photo-id project was given at the Kenai Senior Center, and instructions and incidental sighting forms were left at the Center for volunteers to record their sightings. A talk on the photo-id project was given at the Four Valleys School in Girdwood, and students later participated in a land-based survey along Turnagain Arm. Additional talks on the project were given to the Kenai Peninsula Fishermen's Association and to the Cook Inlet Beluga Recovery Team. Students and professors from the UAA Homer Marine Mammal class accompanied a project biologist during fieldwork along Turnagain Arm and the Kenai River in fall 2013 and assisted with observations.

An interview on the project was given to the Redoubt Reporter (Appendix G). The project worked with the Pratt Museum in Homer and the Alaska SeaLife Center to provide information and photographs about Cook Inlet belugas and the photo-id project for displays in each institution.

Reporting and dissemination of results

Reporting activities consisted of quarterly financial and progress reports to the Kenai Peninsula Borough, as well-as a desktop review in early 2013. This final report will be submitted to the Kenai Peninsula Borough, and disseminated to NMFS, the CIBW Recovery Coordinator, relevant agencies, and non-governmental organizations, and to interested members of the public. A copy of the final report will be made available on the project website (www.cookinletbelugas.org) and the NOAA website (www.alaskafisheries.noaa.gov/protectedresources/whales.beluga.htm). Results from the final report will be presented to the public in January 2014 at a conference in Soldotna hosted by the Kenai Peninsula Borough, and in April 2014 to a conference in Anchorage hosted by NMFS. A summary and synthesis of results of all photo-id surveys of Cook

Inlet conducted 2005–2013 will be presented in a comprehensive report to be released at a future date.

RESULTS

Surveys

Survey effort and whale groups encountered in the KPB 2011–2013

Seventy-five surveys were conducted in the KPB 2011–2013 (Table 1), and 74 beluga whale groups were encountered. For the larger 2005–2013 study, 134 surveys were conducted in the waters of the KPB, and 132 groups were encountered. Inlet wide since 2005, 349 photo-id surveys have been conducted and 488 groups encountered, resulting in about 250,000 photographs taken.

Turnagain Arm

Twenty-one beluga whale groups were encountered during 15 survey days in 2011 (Table 2), 26 groups were encountered during 15 days in 2012 (Table 3), and nine groups were encountered during 12 days in 2013 (Table 4). Survey effort in Turnagain Arm was greatest in August and September of all three years (Tables 5–10). Maps of whale group sighting locations and survey routes in Turnagain Arm 2011–2013 are presented in Appendix A. Previously, 96 surveys of Turnagain Arm had been conducted 2005–2010.

Between 2011 and 2013, the total number of belugas sighted per group ranged between one and 82 whales in Turnagain Arm (Figure 7). The largest groups per year were recorded on August 29, 2011, October 11, 2012, and August 24, 2013 (Tables 2–4). Mean group size was 22.4 whales for the entire 2011–2013 study period, but differed by year: mean group size was nine whales in 2011 and again in 2012, but 40 whales in 2013.

Chickaloon Bay/South Fire Island

Eleven beluga whale groups were encountered during ten survey days in 2011–2013 in Chickaloon Bay/South Fire Island (Table 11). Previously only four groups had been encountered during five surveys of Chickaloon Bay/South Fire Island conducted 2005–2010. Surveys of Chickaloon Bay/South Fire Island were conducted in May, June, and September (Tables 5–10). Maps of whale group sighting locations and survey routes in Chickaloon Bay/South Fire Island are presented in Appendix A.

Between 2011 and 2013, the total number of belugas sighted per group ranged between one and 200 whales in Chickaloon Bay/South Fire Island (Figure 8). The largest groups per year were recorded on September 26, 2011, June 21, 2012, and September 16, 2013 (Table 11). Mean group size was 40 whales. The mean group size differed by year: 33 whales per group in 2011; 17 in 2012; and 64 in 2013.

Kenai River Delta

Seven beluga whale groups were encountered during the 23 survey days in 2011–2013 in the Kenai River Delta (Table 12). Surveys of the Kenai River Delta were conducted in May, September, and October (Tables 5–10). Maps of whale group sighting

locations and survey routes in the Kenai River Delta 2011–2013 are presented in Appendix A. The Kenai River Delta was not surveyed prior to 2011. Figures 9–14 indicate when Kenai River Delta surveys were conducted and when whales were encountered relative to the daily tidal cycle. Whales were seen twice on the outgoing tide, and five times on the incoming tide.

Between 2011 and 2013, the total number of belugas sighted per group ranged from four to 10 whales in the Kenai River Delta (Figure 15). The largest group was observed on October 4, 2012; only one group was seen in 2011, and whales were not encountered in 2013 in the Kenai River Delta (Table 12). Mean group size was seven whales, with a mean group size of eight in 2011 and seven in 2012.

Color and age class composition of groups encountered during surveys

Turnagain Arm

For all surveys of Turnagain Arm 2011–2013 combined, groups contained slightly more white belugas than gray belugas; the average group was composed of 26 percent white belugas, 14 percent gray belugas, 7 percent calves; and 1 percent neonates (Table 13). Slightly more than half (52 percent) of belugas sighted in Turnagain Arm could not be assigned to a color or age-class.

Calves were seen in August and September of the 2011–2013 field seasons, but not in October of 2011 (the presence of calves could not be determined in October 2012 and Turnagain Arm was not surveyed in October 2013). Neonates in Turnagain Arm were first seen in September of 2011, 2012, and 2013, and in August of 2013 (the presence of neonates could not be determined for all groups in August of 2011 and 2012). Groups with calves and/or neonates were seen in the same areas of Turnagain Arm as were groups without (Figure 16).

Chickaloon Bay/South Fire Island

For all surveys of Chickaloon Bay/South Fire Island 2011–2013 combined, groups contained slightly more white belugas than gray belugas; the average group was composed of 45 percent white belugas, 42 percent gray belugas, 9 percent calves, and less than 1 percent neonates (Table 13). Four percent of belugas sighted in Chickaloon Bay/South Fire Island could not be assigned to a color or age-class.

Calves were seen in all months in which belugas were encountered in Chickaloon Bay/South Fire Island (i.e., May, June, and September). Neonates were only seen on one occasion, September 27, 2011. Groups with calves and/or neonates were seen slightly closer to shore in Chickaloon Bay and South Fire Island than were groups without (Figure 16).

Kenai River Delta

For all surveys of the Kenai River Delta 2011–2013 combined, groups contained more white belugas than gray belugas; the average group was composed of 50 percent white belugas, 29 percent gray belugas, 17 percent calves, and 4 percent neonates (Table 13). All belugas sighted in the Kenai River Delta were assigned to a color and age-class.

Calves were seen in all groups encountered in the Kenai River Delta (Figure 17). Neonates were seen in May and October.

Behavior of whale groups

Turnagain Arm

The most common primary group activity in Turnagain Arm was traveling with the tide, although milling and suspected feeding were occasionally recorded. Secondary activities were milling, diving, and suspected feeding. Diving was extremely rare and was only recorded on one occasion in Turnagain Arm.

Chickaloon Bay/South Fire Island

The most common primary group activity in Chickaloon Bay/South Fire Island was traveling, with milling and diving occasionally recorded. Secondary activities were milling, diving, suspected feeding, and traveling.

Kenai River Delta

The most common primary group activity in the Kenai River Delta was traveling, with suspected feeding, milling, and diving occasionally recorded. On one occasion, September 14, 2012, belugas were confirmed to be feeding on salmon (Figure 18), when belugas and harbor seals were observed fishing along a confluence line where river water met the Inlet water at a wide bend in the lower Kenai River. Secondary activities were suspected feeding, diving, milling, and traveling.

Catalog Development and Current Status

There were 1,265 beluga sightings during 75 photo-id surveys in the KPB 2011–2013. Identification rates varied according to survey location: two percent of whales sighted in the Chickaloon Bay/South Fire Island were identified, eight percent of whales in Turnagain Arm were identified, and 35 percent of whales in the Kenai River Delta were identified (Table 14). Gaps remain in the 2005–2013 right-side and left-side catalogs (Tables 15a and 15b), and more whales will likely be added to the catalog when photo-analysis has been completed for all areas and years that were surveyed.

There were 85 individual belugas identified in the KPB 2011–2013; 82 were re-sightings of individual whales in the 2005–2011 Cook Inlet catalog, and three were newly identified individuals who were added to the catalog. The 2005–2013 right-side catalog currently contains sighting histories for 312 individual whales (Figure 19).

Sighting Histories

Sighting histories of belugas in the Kenai Peninsula Borough

Whales identified in the KPB 2005–2013 had sighting histories ranging between one and eight field seasons (Figure 20), with one to 38 sighting days per identified whale

(Figure 21). Most individuals were seen multiple times within a field season, and one whale was sighted 11 times within the same field season (Figure 22).

Of the 85 whales identified in the KPB, 78 percent were found in Turnagain Arm, 22 percent in Chickaloon Bay/South Fire Island, and 9 percent in the Kenai River Delta (Table 16). In addition, the majority of these whales were also found in waters outside of the KPB; 89 percent were found in the Susitna River Delta, and 81 percent were found in Knik Arm (Table 16).

Sighting histories of belugas in the Kenai River Delta

There was no evidence of a "Kenai River Delta group" that persisted during the study. Group composition appeared to change among days, and the eight individuals identified in the Kenai River Delta were seen throughout Cook Inlet. All eight of these whales were also seen in the Susitna River Delta, and the majority were seen in Knik Arm and Turnagain Arm, although none were seen in Chickaloon Bay/South Fire Island (Tables 16 and 17). Maps of their sighting histories are presented in Appendix B.

Group composition with respect to identified whales was compared among the groups encountered in the Kenai River Delta; for this analysis, groups seen on the same day and in the same location but at different times of day were combined into one group (Table 18). Three individuals were seen together in the Kenai River Delta in early October of both 2011 and 2012, but were also seen apart elsewhere in Cook Inlet (Table 19). Two individual belugas, R50 and R1238, were seen together in the Kenai River Delta on two consecutive days (September 13 and 14, 2012), but during their entire 2005–2013 Cook Inlet sighting histories, were only seen together on one other occasion (in 2008 in the Susitna River Delta). Of the eight individuals identified in the Kenai River Delta, beluga R7199 was seen most often in four of the five groups with identified whales. A review of the entire sighting history for beluga R7199 indicates that it is the calf of beluga R3215, and was first seen in the Susitna River Delta in 2009 when it was most likely a one-year old (Table 19).

Sighting histories of belugas in Chickaloon Bay/South Fire Island

Nineteen individual belugas were identified in Chickaloon Bay/South Fire Island, and maps of their sighting histories are presented in Appendix C. There was no evidence of a distinct "Chickaloon Bay/South Fire Island group", as individuals identified in the seven groups found in Chickaloon Bay/South Fire Island 2005–2013 were also photographed elsewhere in Cook Inlet. Most of these individuals were also found in the Susitna River Delta and Knik Arm, and some were found in Turnagain Arm (Tables 16 and 17).

None of these individuals were found in the Kenai River Delta. Group composition with respect to identified whales was compared among the groups encountered in Chickaloon Bay/South Fire Island, and none of the nineteen whales were seen with each other on more than one occasion in Chickaloon Bay/South Fire Island. Only identified individual, beluga R102, was seen in more than one of the groups in Chickaloon Bay/South Fire Island (Table 20); this whale was seen in 2008 and 2011, and on each occasion it was seen with different individuals.

Sighting histories of belugas in Turnagain Arm

Sixty-six different individual belugas were identified in Turnagain Arm 2005–2013. The majority of these whales were also found in the Susitna River Delta and Knik Arm, and relatively few were found in Chickaloon Bay/South Fire Island or in the Kenai River Delta (Tables 16 and 17). Twenty-seven belugas were identified in Turnagain Arm 2011–2013 and maps of their sighting histories are presented in Appendix D.

Fifty-one individuals were sighted in Turnagain Arm only once, and 15 individuals were seen in Turnagain Arm on more than one occasion (Table 21). Ten whales were seen twice, two were seen three times, two were seen four times, and one was seen on as many as five occasions.

Only six of the 14 identified individuals in Turnagain Arm were seen together in Turnagain Arm on more than one occasion. Four individuals were each seen with another identified whale on two occasions. Two individual belugas, R25 and R103 were seen together three times in Turnagain Arm. Throughout Cook Inlet 2005–2013, these two whales were seen together on 14 occasions; however, R25 was seen six times without R103, and R103 was seen 19 times without R25.

Sighting histories of belugas identified by satellite tag scars

Seven photo-identified belugas had unique scars from holes used by NMFS to affix satellite tags 1999–2002 (Figure E5 in Appendix E; McGuire et al. 2013b). These individuals were identified photographically based on a combination of natural marks and the tag scars to avoid mistakenly matching similar scar patterns caused by the same tag type. Five of these seven belugas were sighted in Turnagain Arm 2005–2013; none were seen in the Kenai River Delta or in Chickaloon Bay/South Fire Island. Sighting histories of identified whales bearing scars from previous satellite tags were no different from sighting histories of untagged whales (Table 16).

Sighting histories of reproductive females and calves

Of the 85 belugas identified in the waters of the KPB 2011–2013, 58 (68 percent) were presumed to be reproductive females based on photographs in which they were closely accompanied by a calf at least once in 2005–2011 (Table 22). Thirty-one identified belugas were photographed with calves in more than one year. The majority of calves could not be identified as individuals because they were either not marked or they were not photographed with enough of the body above water to allow marks to be seen. Thirteen identified individuals were seen in multiple years with maturing calves (i.e., if a presumed mother was seen with a calf in multiple years, and the calf accompanying her appeared larger every year, it was presumed to be the same calf maturing; Figure 23). Fifteen identified belugas were each seen with a calf, and then later were seen with a relatively smaller calf (assumed to be a new calf; Figures 24 and 25) one to eight years later, with a mean of 2.5 years between calves. One identified calf, beluga R7199, thought to be the calf of beluga R3215, was first seen in the Susitna River Delta in 2009 when it was most likely a one-year old (Table 19). It was only ever seen in the company

of beluga R3215 in 2009 and 2011, but in 2012 was seen once with its presumed mother and twice without her.

Signs of injuries and infections sustained by belugas encountered in KPB waters

Marks on cataloged whales fell into nine categories: infection, general trauma, rake marks, molting, satellite tag scars, puncture wounds, entanglement, pigment, and mud/silt. Indications of injury were associated with the "general trauma, rake marks, satellite tag scars, puncture wound", or "entanglement" categories. Photographic examples of the different mark types, along with brief descriptions, are found in Appendix E. In addition, photographs were examined for signs of emaciation.

All of the 85 belugas identified in KPB waters displayed rake marks (Table 23), and 81 percent had signs of infection (healed or active lesions). Of marks categorized as injuries, in addition to rake marks (*n*=85) and satellite tag scars (*n*=5), nine whales showed signs of other trauma, with three of these cases associated with puncture wounds. Additionally, two whales had signs of possible infection, two had signs of possible trauma, and two had possible puncture wounds; photographs did not show enough of the marks and/or were not clear enough images of the marks to allow them to be definitively classified. One unidentified whale was classified as emaciated (Figure E10 in Appendix E).

One live whale showed signs of rope entanglement (Figure 26). This whale was first encountered and photographed throughout the 2010 field season (McGuire and Bourdon 2012) and was also photographed in 2011, 2012, and 2013 throughout Upper and Middle Cook Inlet (Figure 26). NMFS and the Alaska Marine Mammal Stranding Network were updated annually with sighting information and photographs of this entangled whale.

Identification of dead belugas found in KPB waters 2011–2013

Identified dead whales

On October 5, 2012, biologists with the CIBW Photo-id Project assisted the Alaska Marine Mammal Stranding Network with a response to a dead beluga first reported a day earlier to NMFS as found dead in the water near Tyonek. Marks on the dead beluga were matched to records of an identified beluga in the photo-id catalog, R7244. This adult male had been photographed in the upper part of Knik Arm in 2005, and in Eagle Bay and the Susitna River Delta in 2009 (Figure 27). Results of the necropsy conducted by Dr. Kathy Burek-Huntington can be requested from NMFS via http://www.alaskafisheries.noaa.gov/belugas/.

On September 4, 2013, a pilot with the Army Air National Guard reported a dead beluga in Turnagain Arm near Taylor Creek/Potter Marsh. The pilot provided photographs to NMFS, who in turn shared the photos with the CIBW Photo-id Project. This whale was identified as beluga L2634, who was previously seen on one occasion, August 2008 at the mouth of Ship Creek (Port of Anchorage) with a newborn calf. It could not be determined from photographs if this adult female was pregnant in 2013 or if it was simply bloated from decomposition. The whale was not necropsied or otherwise

examined by NMFS or the Alaska Marine Mammal Stranding Network, and cause of death is unknown.

Dead whales that were photographed but not identified

On May 7, 2012, an immature male beluga was reported dead in the Kenaitze educational fishery set gillnet to the south of the mouth of the Kenai River (see article in the Redoubt Reporter, Appendix G). NMFS was notified and the Alaska Marine Mammal Stranding Network retrieved the whale. Results of the necropsy conducted by Dr. Carrie Goertz of the Alaska SeaLife Center can be requested from NMFS via http://www.alaskafisheries.noaa.gov/belugas/. Photographs were provided to the CIBW Photo-id Project, but could not be matched with identified whales in the catalog.

On September 4, 2013, a pilot with the Army Air National Guard reported a dead beluga in Turnagain Arm in the mud flats across from Hope. The pilot provided photographs to NMFS, who in turn shared the photos with the CIBW Photo-id Project, but the photos were taken from too far away to match any whales in the catalog. The whale was not necropsied or otherwise examined by NMFS or the Alaska Marine Mammal Stranding Network, and cause of death is unknown.

In mid-October 2013, NMFS informed the CIBW Photo-id Project that the Alaska Marine Mammal Stranding Network had responded to a dead beluga in Turnagain Arm near Hope. Photographs were taken but have not yet been made available to the CIBW Photo-id Project.

Incidental sighting reports

Approximately 120 incidental reports of belugas in the waters of the KPB were received April 2011 through October 2013, with the number of reports increasing every year (Tables 24–26). Sightings were reported by fishermen/women, pilots, the media, law enforcement officers, large vessel operators, tourists, biologists, educators, environmentalists, and oil company employees. Figure 28 shows the place names referred to in the sighting reports. Seasonal patterns in sightings were consistent across years (Tables 27–29). Belugas were reported in Turnagain Arm, Chickaloon Bay, and the Kenai River Delta in the spring and fall. Belugas in the KPB waters of the Upper West Inlet were also reported in the spring and fall, with occasional sightings during the summer. Belugas were reported in deeper waters near Kalgin Island and the Tyonek oil and gas platform in November and December. Two notable sightings were of a beluga in the Kenai River in February 2013, and of a group of belugas south of Ninilchik in March of 2013.

DISCUSSION

In addition to the two original goals of this project, gathering data to help understand factors that are limiting recovery and adding to the knowledge of CIBW habitat requirements, this study had three underlying questions:

1. Given their contracting range and decreasing population size, do belugas still use the waters of the KPB, particularly in the lower Inlet (i.e., south of the Forelands)?
2. If belugas do still use the KPB waters of the lower Inlet, do they occur in large enough numbers and in predictable enough locations for them to be reliably found during photo-id surveys?
3. If belugas are encountered and photo-identified in the lower Inlet waters of the KPB, are they the same individuals already identified in the upper Inlet, or do they belong to a separate group?

1. Given Their Contracting Range and Decreasing Population Size, Do Belugas Still use the Waters of the KPB, Particularly in the Lower Inlet (i.e., South of the Forelands)?

The results of this study demonstrate that belugas still use the waters of the KPB, including the lower Inlet. Belugas were observed during dedicated surveys in the Kenai River Delta, as well as in KPB waters in Chickaloon Bay and Turnagain Arm. Incidental sightings of belugas were reported in KPB waters as far south as in between Happy Valley and Ninilchik in the eastern lower Inlet, around Kalgin Island mid-Inlet, along the western Inlet from just above the West Forelands north, and along the entire northern boundary of the Borough.

2. If Belugas Do Still use the KPB Waters of the Lower Inlet, Do They Occur in Large Enough Numbers and in Predictable Enough Locations for Them to be Reliably Found During Photo-id Surveys?

Predictable seasonal and tidal patterns in CIBW distribution allowed them to be surveyed and photographed in certain areas of the KPB, but more reliably in the upper Inlet. Belugas were most predictably found in Turnagain Arm beginning mid-August and followed a very clear pattern of following the tides in and out of Turnagain Arm throughout the fall. Belugas in Chickaloon Bay also had a seasonal distribution pattern, but the tidal pattern seemed to vary somewhat according to season. In contrast, the presence of belugas in the Kenai River Delta was much less predictable and more sporadic; although there was an overall spring/fall seasonal pattern, belugas might be present one day and entirely absent the next. Although belugas were reported around Kagin Island, Nikiski, Ninilchik, and the upper west side of Cook Inlet, their occurrence was too unpredictable and ephemeral for photo-id surveys to be used effectively in these areas. Group sizes were relatively small in the Kenai River Delta (10 or fewer whales); however, one group in Chickaloon Bay contained 200 belugas, and the maximum group size in Turnagain Arm was 82 belugas. In comparison, maximum group sizes elsewhere

in the Upper Inlet have been 205 belugas in the Susitna River Delta (McGuire et al. 2013a) and 96 belugas in Knik Arm (McGuire et al. 2013b). In summary, belugas are still found in the KPB waters of the lower Inlet, but they are found there in smaller numbers and less reliably than in the Upper Inlet.

3. If Belugas are Encountered and Photo-identified in the Lower Inlet Waters of the KPB, Are They the Same Individuals Already Identified in the Upper Inlet, or Do They Belong to a Separate Group?

Most of the individual belugas encountered in the lower Inlet waters of the KPB have also been identified elsewhere in the upper Inlet. Although beluga groups had been reported in KPB waters prior to this study, the individual composition of the groups was unknown. It could not be determined if the groups contained the same individuals every time that had a preference for particular areas, or if these groups were fluid and open to the entire CIBW population. By identifying individual belugas seen in the KPB and matching their records with whales in the greater 2005–2013 catalog, we were able to determine that most of the CIBW photo-identified in the waters of the KPB have also been seen elsewhere in Upper Cook Inlet, especially in the Susitna River Delta and Knik Arm. Previous photo-id studies in the upper Inlet indicated that identified individuals move among different areas of the upper Inlet (McGuire et al. 2011a,b), with frequent occurrence in the Susitna River Delta and in Knik Arm, and somewhat less-frequent occurrence in Turnagain Arm and Chickaloon Bay.

To date, the CIBW Photo-Id Project has not found evidence that beluga groups in Cook Inlet are highly structured in terms of association patterns among individuals. Although results are preliminary, all group composition and individual sighting history information indicates the portion of the population we have identified is homogenous and group composition is fluid. Other than mother/calf bonds, there is no evidence of strong associations among individuals. While some individuals were somewhat more likely than others to be seen together, these patterns were not widespread or consistent enough to allow the population to be divided into subgroups (McGuire et al. 2011b and this report). Future studies will examine the entire 2005–2013 Inlet-wide catalog to determine if subgroups exist on a seasonal scale (e.g., Do the large groups seen in Chickaloon Bay or the Susitna River Delta break into smaller, more stable, subgroups during other seasons and in other locations?).

When making inferences about the greater population of CIBW based on sighting histories of individually identified whales, it is important to consider the results within the context of survey effort. Survey effort was affected by difficult and infrequent access to some survey areas as well as a reduction in quality of photographs from some locations, which were surveyed frequently but only allowed for very distant observations. Photo-id surveys were not systematic relative to the entirety of the waters of the KPB. Instead, efforts were focused in certain areas during particular times of the year that would maximize the probability of encountering and photographing whales. Occurrence rates were lower in areas where sampling is more difficult, and therefore results may under represent beluga use of these areas. For example, overall sampling effort has been lower in Chickaloon Bay/South Fire Island than in other areas due to the logistical

challenges in surveying this area. Several planned surveys of Chickaloon Bay were rescheduled or canceled mid-survey due to dangerous boating conditions in the area. In addition, sighting histories that were obtained from cataloged whales were a function of which whales within a group were photographed and which of these had marks that could be reliably identified through time. A few whales in the catalog have only ever been photographed in Turnagain Arm, but this is very likely an artifact of low sampling rates rather than an indication of site fidelity, and it is predicted that with more photo-id surveys over time, these whales will be identified throughout Cook Inlet. Group encounters in Turnagain Arm typically yielded a much lower percentage of identified whales than groups encountered in other areas, which was likely a result of greater sighting distances in Turnagain Arm compared to other areas. Despite the limitations encountered while photographing belugas from land along Turnagain Arm, these photos have provided important evidence that belugas identified in Turnagain Arm were also seen elsewhere in Cook Inlet and are not a sub-population seasonally endemic to Turnagain Arm.

It has been the experience of the CIBW Photo-id Project that re-sighting and identification rates increase with sampling effort. It is highly likely that an increased sampling effort in the KPB, as well as the future inclusion in the catalog of left-side photos from 2011, 2012, 2013 will indicate that many and perhaps all of the CIBW in the photo-id catalog use the waters of the KPB and lower Inlet at some point in their lifetime.

Seasonal and Tidal Patterns of Habitat use by CIBW in the Waters of the KPB

Beluga whales encountered during photo-id surveys of Cook Inlet 2005–2013 were rarely observed traveling among broad areas, but were instead encountered in distinct areas (i.e., in the Kenai River Delta, traveling up and down Turnagain Arm, in Chickaloon Bay, along the Susitna Delta; this report and McGuire et al. 2008, 2011a, 2013 a,b). The seasonal distribution and tidally-driven movement patterns are likely in response to patterns of seasonal migrations of prey (e.g., eulachon runs in May, followed by salmon runs late July–early August; NMFS 2008).

Belugas in the Kenai River Delta often appeared to patrol the waters along Salamantof Beach as if searching for prey, then were seen traveling south and entering the Kenai River with the rising tide. In the Kenai River, belugas were observed most often in the relatively deep pools of the wide river bends, and appeared to search for and pursue prey along the confluence ("rip") lines where river water met Inlet waters. Local fishermen report that belugas in the Kenai River Delta feed seasonally on king and silver salmon, hooligan, smelt, herring, Dolly Varden, sculpin, flounder, and halibut.

Belugas in Turnagain Arm typically entered Turnagain Arm about four hours before the high tide and moved up the Arm with the tides. They tended to follow the deeper channels along the north and south shores of the Arm and usually avoided the shallow areas found in the middle of the Arm, although during the rising tide they sometimes appeared to be looking for and pursuing prey along the edges of these shallow areas. On both the incoming and outgoing tides, whales often used the relatively quiet pools and eddies created by natural and artificial outcroppings to mill, presumably search for food, and possibly reduce their exposure to strong currents. The outcropping at Bird

Point appeared to be an important area for belugas to congregate and wait until waters reached a sufficient depth with the incoming tide to allow for their continued travel up the Arm. The strong seasonal pattern of belugas in Turnagain Arm coincided with fall salmon runs in this area, and the scattered incidental sightings in the spring may have been associated with the eulachon runs up Turnagain Arm. The fact that little diving behavior was observed in Turnagain Arm may have been due to the relatively shallow waters of the Arm and should not be interpreted as a sign of lack of feeding behavior.

Belugas in Chickaloon Bay were often first detected during the low tide and were seen milling and were suspected to be feeding along the shallow edges of the bay and in the mouths of the Chickaloon River, Big Indian Creek, and Little Indian Creek. When the water began to rise with the incoming tide, whales would often aggregate at the base of the cliffs at the far east side of Chickaloon Bay, and then travel up the south shore of Turnagain Arm in a linear, fast-moving group. The distinction among behavioral categories used to describe group activities and habitat use 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 often simultaneously diving, socializing, and traveling as they searched for, pursued, and captured prey. For example, the largest group recorded during the KPB study consisted of 200 whales first seen in Chickaloon Bay then later traveling up Turnagain Arm. This group was seen milling, socializing, traveling, and was 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).

On a few occasions in the springtime, groups of whales were encountered in transit between Chickaloon Bay and Fire Island, either heading to Chickaloon Bay with the falling tide, or headed toward the Susitna River Delta with the rising tide. It was interesting to note that most of the identified individuals in the groups of whales seen in Chickaloon Bay/South Fire Island were more likely to have been seen in the Susitna River Delta or Knik Arm than in Turnagain Arm. This suggests that not all the whales seen in Chickaloon Bay were simply using it as a staging area to enter Turnagain Arm, but that Chickaloon Bay appeared to be a destination in itself.

Patterns of localized aggregations and rapid and directed travel among these areas have been reported for satellite-tagged CIBWs (Hobbs et al. 2005) and beluga whales in Norway (Lydersen et al. 2001). Because sightings of belugas transiting between known aggregation areas are low, it remains unknown if there are distinct movement corridors among areas or if movement patterns are more diffuse and variable. For example, whales may always use the channel between Fire Island and Anchorage to travel between Knik Arm and Turnagain Arm, or they may sometimes take a circuitous route along the western inlet and Susitna River Delta. For CIBW conservation and protection of critical habitat, the identification and protection of movement corridors would seem to be as important as the identification and protections of aggregation areas.

KPB habitat used by reproductive females and their calves

Whale groups in the waters of the KPB, as elsewhere in Cook Inlet, did not appear to be segregated by age-class or color. Groups that were composed exclusively of

white adult animals, mother-calf pairs, or only small gray animals were not encountered (McGuire et al. 2011b, 2013a). Although not quantified, observers 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 from survey vessels. Observers 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, possibly resulting in better photographs of gray individuals and a higher rate of identification. Environmental conditions, most notably ambient light, may also have resulted in some variability in the color assigned to whales during surveys. Color composition was most difficult to determine in Turnagain Arm, where whales were often far from the land-based observers and harder to detect in the often-rough water.

Groups containing calves and neonates were seen in all areas of the KPB study area where belugas were encountered. The photographic records of individuals in the catalog underscore the use of these areas by reproductive females and their calves: 68 percent of whales identified in the waters of the KPB were presumed to be reproductive females based on sighting records in the 2005–2013 catalog. We use the term "presumed" because we can only make informed guesses about maternity based on reasonable evidence such as physical proximity and behavior. It is possible that some of the whales classified as presumed mothers were in fact other companions (including siblings) to the calves (Figure 29). In the future, combined photo-id and genetic sampling from remote biopsy would allow for the testing of assumptions of maternity and reproductive histories.

The timing and location of beluga whale calving in Cook Inlet is not well documented in the literature (Hobbs et al. 2008). 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 indicate that calving for CIBWs begins in mid-late July/early August, with an annual variation of up to two-weeks (McGuire et al. 2013a). A calf observed with an emaciated adult beluga in the Kenai River in early May 2012 had initially been classified as a neonate based on small size and unsteady swimming behavior, which would have been early in the season for a neonate compared to other neonate sightings. However, it is possible this was instead the small calf that was found dead in a gillnet a few days later, and the small size and uncoordinated behavior were a result of disease or poor nutrition rather than recent birth early in the season.

The development of long-term sighting histories of identified mothers and calves can provide data necessary for the determination of several aspects of life history, including calving interval (minimum time period between calving events), calving frequency (how often females give birth), period of maternal care/association, and survival rates of calves (Michaud 1996). It is important to monitor these life history parameters over time, because a decline in population abundance is sometimes associated with a decrease in female age at maturity and a decrease in calving interval (Fowler

1984). We are slowly developing the reproductive histories of a large number of belugas, but additional years of photo-id effort and analyses are needed to determine how long calves remain with their mothers, if variation exists among individual mothers, and how often identified mothers give birth to new calves. Although several mothers were photographed with neonates, calving interval cannot be determined until these same mothers are photographed with new neonates. We have obtained funding to review the entire 2005–2013 Inlet-wide catalog and photo-id survey database for an in-depth analysis of reproductive rates, survival of young calves, and recruitment rates (survival of calves to reproductive age), and results of this review will be publicly available in 2015.

Information about Factors that may be Limiting CIBW Recovery

Several of the identified belugas in the waters of the KPB display marks indicative of injury. An in-depth study of identified CIBWs in Eagle Bay, Knik Arm, indicated a similarly high injury mark rate (McGuire et al. 2013b). Because CIBWs appear to move freely around the Inlet, it cannot be known if the injury occurred in KPB waters or elsewhere. Marks indicative of injury may have been caused by vessel strikes (bow and propeller), gunshots, harpoons, other belugas, other marine mammals (killer whales, harbor seals), or even sharks (LGL 2009), but without witnessing the injury as it occurred and monitoring the resulting marks, we can only guess at the source based on photographs of known injuries of other marine mammals (Moore et al. 2013). Even when the cause of injury is known, as in the case of the beluga entangled in a rope, it is unknown if this rope was from unattended fishing gear, floating debris, or the attempted illegal capture of the whale.

A high percentage of individual CIBW identified in the KPB bore signs of infection, at rates comparable to CIBW identified in the Eagle Bay study (McGuire et al. 2013b). Without knowing the cause of the marks (bacterial, viral, parasitic, and fungal infections have all been found in dead CIBW; Burek et al. in review), we cannot say if these infections pose a risk to the health of individuals or to the population. The herpes virus has been identified as the cause of death for one CIBW, and other dead CIBWs have tested positive for the virus (Burek et al. in review). Herpes-like lesions have been photographed on several CIBWs in the catalog, but cannot be conclusively attributed to the herpes virus by visual analysis alone. By continuing to collaborate with other investigators, particularly those authorized to investigate mortalities (NMFS, the Alaska Marine Mammal Stranding Network, and subsistence users), we can increase the utility of our documentation of skin lesions by pairing photographs of skin lesions on stranded animals with tests of these lesions for infectious disease, thus creating a photo-catalog of known skin diseases. By documenting the occurrence and frequency of these marks and attempting to identify mark sources, more can be learned about the incidence of risk factors that may be preventing the recovery of the endangered CIBW population. This application of photo-id has been used to characterize and quantify epidermal lesions on adult and young delphinids, providing information relevant to coastal environmental health (Wilson et al. 1999; Van Bressem et al. 2003, 2009; Bearzi et al. 2009).

Continuing to identify dead belugas as known individuals in the photo-id catalog provides information necessary for understanding survivorship and population dynamics.

In addition to providing a history of the previous sightings and habitat use of the dead whales, obtaining information such as sex and approximate age of the dead whale can also add to the life-history information of identified individuals in the catalog. For example, we had presumed beluga L2634 was a reproductive female based on photographs of her in 2008 with a neonate, but we could only confirm this with information obtained once she was dead. We created and distributed a protocol for photographing beluga mortalities (McGuire et al. 2009) to guide stranding responders who are willing to photo-document markings on beluga mortalities.

With the exception of a few whales first photographed as young-of-the-year calves, the ages of most of the whales in the catalog are unknown. Eighteen CIBW were satellite tagged by NMFS between 1999 and 2002 (Hobbs et al. 2005); although the satellite tags are no longer present, we are still able to photographically track and obtain survivorship data from seven of these individuals up to 14 years later.

Humans and CIBWs in the KPB

Cook Inlet is home to the state's largest human population, which has grown by almost 70 percent since 1980 (http://laborstats.alaska.gov/census). Development activities in the Inlet are increasing at a rapid pace; humans use the waters and shores of Cook Inlet for fishing, hunting, timber harvest, mining, shipping, dredging, renewable energy, discharge of wastewater, military activities, oil and gas development, transportation, and residential and industrial development. Potential threats to CIBWs from human activities observed in the waters of the KPB during this study include: entanglement in gillnets, vessel strikes (e.g., a recreational vessel was observed to drive directly over a small group of belugas in shallow waters in the Kenai River), contaminants in the water and prey from runoff from onshore and in-water activities (e.g., corroded fuel storage drums along shore, accidental fuel spills from vessels), habitat loss from construction, and noise from vessels and near-shore activities such as pile driving and blasting for construction and highway expansion. On several occasions in the fall along the Kenai River, boat-based duck hunters were observed firing over the water and belugas were never seen to enter the river during these times; although the hunters were not firing at belugas, it is possible that groups containing older belugas with previous exposure to beluga hunting would have avoided the area. We found that beluga whales in the Kenai River Delta seemed more wary of boats than beluga groups encountered elsewhere in Cook Inlet, but whether this behavior was unique to the specific location or simply to belugas found in the relatively confined area of a narrow river is unknown.

On a positive note, it was our experience that people who live in and visit the KPB were very active in reporting sightings of CIBWs and in supporting efforts to learn more about these whales and their recovery. Incidental sighting rates, areas of sightings, and the demographics of the people making the sightings were linked to the effort levels, locations, and target audiences of educational outreach activities.

When sharing their opinions of why CIBWs are seldom seen in the KPB anymore, local residents and Inlet-users expressed concern about the following:

Human disturbance

Belugas may no longer be using the Kenai River Delta in summer due to disturbance from fishing vessels and nets. Long-time local fishermen report that in the late 1970s and early 1980s, 200–300 belugas could be seen in June and July feeding in the Kenai River and along the shore (anon. personal communication to Sean Burrill, LGL; personal communication to Tamara McGuire from KPFA members).

Reduction in prey

Fishermen report that the herring run in the Kenai River Delta used to be good, but is now declining, and that there used to be lots of herring in the early 1980s, but now it is not worth fishing. There is also concern that the eulachon run has declined in the last two decades. Reduction in prey may be due to climate change, overfishing by humans, and/or competition with seals. There was a widely expressed opinion that the harbor seal population has increased in the last decade, especially in the Kenai River Delta.

Changes in bathymetry

Some people think the beaches around the Kenai River Delta have changed in their bathymetry and that the belugas have a harder time catching fish and avoiding stranding.

Continued Photo-id Work

The strength and utility of the CIBW Photo-id Project grows with the proportion of the CIBW population that is re-sighted. Continuation of a long-term, Inlet-wide data set provides insight into the population dynamics and life history of CIBW, and will help with the identification of appropriate conservation measures to recover and preserve the population. Funding has been secured for a comprehensive analysis of the 2005–2013 Inlet-wide database and photo-id catalog, with particular emphasis on calving rates, survivorship, and fine-scale habitat use. Project results are ongoing, and are updated in reports that are available at www.cookinletbelugas.org and http://alaskafisheries.noaa.gov/protectedresources/whales/beluga.htm.

CONCLUSION

The waters of the KPB are still used seasonally by CIBWs (including calves and neonates), identified individual whales have been seen to return here year after year as well as multiple times within a year, and these same individuals are seen in Upper Cook Inlet. Many CIBWs in the KPB, as elsewhere in the Inlet, bear signs of infection and a few bear signs of injury, although the ultimate sources of the injuries and infections could not be determined. People who live in and visit the KPB were very active in reporting sightings of CIBWs and in supporting efforts to learn more about these whales and their recovery.

Potential anthropogenic threats to CIBWs exist in the waters of the KPB as well as in the Upper Inlet, and because all of the individuals in the CIBW population move throughout the Inlet seasonally, whales are likely exposed to multiple potential threats. For example, the same individual whale might be exposed to noise from seismic exploration near the Forelands, fishing vessels and nets in the Kenai River Delta, vessel traffic in the shipping lanes for the Port of Anchorage, military exercises in Knik Arm, and physical habitat alteration and noise from in-water highway expansion activities in Turnagain Arm. When considering the possible effects on CIBWs from human activities in the KPB, it should be noted that most, and most likely all, of the CIBW population could be seasonally exposed to these activities. Such exposure would very likely occur for neonates, calves, and adults, and the same individuals may be exposed multiple times within a year, as well as year after year. The cumulative effects of all activities in the range of CIBWs and their potential to affect the entire population should be considered when making management decisions to improve CIBW recovery.

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Table 1. Total photo-identification survey effort in the waters of the Kenai Peninsula Borough (KPB), 2005–2013. Research sponsored by the KPB was conducted 2011–2013.

Year	Turnagain Arm	Chickaloon Bay/South Fire Island	Kenai River	# KPB Surveys
2011	15	2	4	21
2012	15	5	13	33
2013	12	3	6	21
Total 2011–2013	42	10	23	75
2005–2010	54	5	0	59
Total 2005–2013	**96**	**15**	**23**	134

Table 2. Group size, color, and age-class composition of beluga groups sighted during surveys along Turnagain Arm in 2011.

Date	Beluga Group #[1]	# White	# Gray	# Calves	# Neonates[2]	# Unknown[3]	Total Beluga Sightings
08-20-2011	1	14	7	1	0	0	22
08-21-2011	1	CBD[4]	CBD	CBD	CBD	CBD	CBD
08-24-2011	1	5	1	0	0	0	6
08-25-2011	1	2	0	0	0	0	2
08-25-2011	2	1	0	0	0	0	1
08-25-2011	3	CBD	CBD	CBD	CBD	CBD	CBD
08-28-2011	1	na	na	na	na	25	25
08-29-2011	1	na	na	na	na	60	60
08-29-2011	2	2	4	0	0	0	6
09-04-2011	1	na	na	na	na	4	4
09-04-2011	2	3	0	1	0	0	4
09-04-2011	3	1	0	0	0	0	1
09-05-2011	1	2	0	0	0	0	2
09-05-2011	2	1	0	0	0	0	1
09-05-2011	3	1	0	1	0	0	2
09-05-2011	4	CBD	CBD	CBD	CBD	CBD	CBD
09-08-2011	1	5	5	3	1	0	14
09-17-2011	1	10	5	2	1	0	18
09-18-2011	1	5	4	1	na	3	13
09-30-2011	0	0	0	0	0	0	0
10-04-2011	1	2	0	0	0	0	2
10-07-2011	1	1	0	0	0	0	1
10-20-2011	0	0	0	0	0	0	0
Total	**21**	**55**	**26**	**9**	**2**	**92**	**184**

[1] Group numbers were assigned by day and will not sum to the total number of groups.

[2] Neonates are separate from calf totals.

[3] Unknown=beluga of unknown color and size.

[4] CBD= # could not be determined.

Table 3. Group size, color, and age-class composition of beluga groups sighted during surveys along Turnagain Arm in 2012.

Date	Beluga Group #[1]	# White	# Gray	# Calves	# Neonates[2]	# Unknown[3]	Total Beluga Sightings
08-15-2012	1	3	0	0	0	0	3
08-15-2012	2	4	2	0	0	0	6
08-24-2012	1	6	1	3	0	0	10
08-24-2012	2	CBD[4]	CBD	CBD	CBD	CBD	CBD
08-27-2012	1	3	2	1	0	0	6
08-29-2012	1	na	na	na	na	5	5
08-29-2012	2	2	1	0	0	0	3
08-29-2012	3	3	2	1	0	0	6
09-02-2012	1	6	4	3	1	0	14
09-02-2012	2	3	1	2	0	0	6
09-07-2012	1	1	0	0	0	0	1
09-07-2012	2	1	0	0	0	0	1
09-07-2012	3	2	0	0	0	0	2
09-07-2012	4	3	0	0	0	0	3
09-07-2012	5	4	2	2	1	0	9
09-09-2012	1	6	3	2	0	0	11
09-09-2012	2	5	1	1	0	0	7
09-09-2012	3	1	0	0	0	0	1
09-11-2012	1	2	2	0	0	0	4
09-14-2012	1	na	na	na	na	3	3
09-21-2012	1	na	na	5	1	40	46
09-23-2012	1	5	0	0	0	0	5
10-03-2012	1	6	0	0	0	0	6
10-11-2012	1	na	na	na	na	50	50
10-17-2012	1	na	na	na	na	12	12
10-21-2012	1	na	na	na	na	10	10
Total	**26**	**66**	**21**	**20**	**3**	**120**	**230**

[1] Group numbers were assigned by day and will not sum to the total number of groups.

[2] Neonates are separate from calf totals.

[3] Unknown=beluga of unknown color and size.

[4] CBD= # could not be determined.

Table 4. Group size, color, and age-class composition of beluga groups sighted during surveys along Turnagain Arm in 2013.

Date	Beluga Group #	# White	# Gray	# Calves	# Neonates[1]	# Unknown[2]	Total Beluga Sightings
04-20-2013	0	0	0	0	0	0	0
05-06-2013	0	0	0	0	0	0	0
05-09-2013	0	0	0	0	0	0	0
08-13-2013	1	na	na	na	na	10	10
08-15-2013	1	13	12	2	1	0	28
08-21-2013	1	na	na	na	na	4	4
08-24-2013	1	na	na	5	2	75	82
08-25-2013	1	na	na	2	na	50	52
09-01-2013	1	15	10	5	2	0	32
09-08-2013	1	na	na	3	1	50	54
09-14-2013	1	20	10	5	0	0	35
09-20-2013	1	30	30	5	0	0	65
Total	**9**	**78**	**62**	**27**	**6**	**189**	**362**

[1] Neonates are separate from calf totals.

[2] Unknown=beluga of unknown color and size.

Table 5. Distribution of photo-identification effort in the waters of the Kenai Peninsula Borough, in May of 2011, 2012, and 2013. Numbers represent size of groups encountered.

	Turnagain Arm			Kenai River			Chickaloon Bay/South Fire Island		
Date	2013	2012	2011	2013	2012	2011	2013	2012	2011
1			na*			na			na
2			na		0	na			na
3			na		5;7	na			na
4			na			na			na
5			na			na			na
6	0		na			na			na
7			na	0		na			na
8			na	0		na			na
9	0		na			na			na
10			na		0	na			na
11			na		4	na			na
12			na			na			na
13			na	0		na			na
14			na	0		na			na
15			na			na			na
16			na			na		23	na
17			na			na			na
18			na			na			na
19			na			na			na
20			na			na			na
21			na			na	50;6	0	na
22			na			na			na
23			na			na			na
24			na			na			na
25			na			na			na
26			na			na			na
27			na			na			na
28			na			na			na
29			na			na			na
30			na			na			na
31			na			na			na

*na=non-applicable; contract executed May 31, 2011

Table 6. Distribution of photo-identification effort in the waters of the Kenai Peninsula Borough, in June of 2011, 2012, and 2013. Numbers represent size of groups encountered.

	Turnagain Arm			Kenai River			Chickaloon Bay/South Fire Island		
Date	**2013**	**2012**	**2011**	**2013**	**2012**	**2011**	**2013**	**2012**	**2011**
1			na			na			na
2			na			na	0		na
3			na			na			na
4			na			na			na
5			na			na			na
6			na			na			na
7			na			na			na
8			na			na			na
9			na			na			na
10			na			na			na
11			na			na			na
12			na			na			na
13			na			na			na
14			na			na			na
15			na			na			na
16			na			na			na
17			na			na			na
18			na			na			na
19			na			na			na
20			na			na			na
21			na			na		26	na
22			na			na		3	na
23			na			na			na
24			na			na			na
25			na			na			na
26			na			na			na
27			na			na			na
28			na			na			na
29			na			na			na
30			na			na			na

Table 7. There was no photo-identification effort in the waters of the Kenai Peninsula Borough, in July of 2011, 2012, and 2013. Numbers represent size of groups encountered.

	Turnagain Arm			Kenai River			Chickaloon Bay/South Fire Island		
Date	2013	2012	2011	2013	2012	2011	2013	2012	2011
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									

Table 8. Distribution of photo-identification effort in the waters of the Kenai Peninsula Borough, in August of 2011, 2012, and 2013. Numbers represent size of groups encountered.

	Turnagain Arm			Kenai River			Chickaloon Bay/South Fire Island		
Date	**2013**	**2012**	**2011**	**2013**	**2012**	**2011**	**2013**	**2012**	**2011**
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13	10								
14									
15	28	3;6							
16									
17									
18									
19									
20			22						
21	4		CBD						
22									
23									
24	82	10;CBD	6						
25	52		2;1;CBD						
26									
27		6							
28			25						
29		5;3;6	60; 6						
30									
31									

Table 9. Distribution of photo-identification effort in the waters of the Kenai Peninsula Borough, in September of 2011, 2012, and 2013. Numbers represent size of groups encountered.

	Turnagain Arm			Kenai River			Chickaloon Bay/South Fire Island		
Date	**2013**	**2012**	**2011**	**2013**	**2012**	**2011**	**2013**	**2012**	**2011**
1	32								
2		14;6							
3									
4			4;4;1						
5			2;1;2;CBD						
6									
7		1;1;2;3;9							
8	54		14						
9		11;7;1							
10									
11		4							
12					0				
13					8				
14	35	3			8				
15									
16							1; 200		
17			18						
18			13						
19									
20	65								
21		46		0					
22				0					
23		5							
24									
25									
26									8;62
27									45;15
28									
29									
30			0					0	

Table 10. Distribution of photo-identification effort in the waters of the Kenai Peninsula Borough, in October of 2011, 2012, and 2013. Numbers represent size of groups encountered.

	Turnagain Arm			Kenai River			Chickaloon Bay/South Fire Island		
Date	**2013**	**2012**	**2011**	**2013**	**2012**	**2011**	**2013**	**2012**	**2011**
1	na*			na			na		
2	na			na			na		
3	na	6		na			na		
4	na		2	na	10		na		
5	na			na	0	8	na		
6	na			na	0	0	na		
7	na		1	na			na		
8	na			na			na		
9	na			na			na		
10	na			na			na		
11	na	50		na			na		
12	na			na			na		
13	na			na			na		
14	na			na			na		
15	na			na			na		
16	na			na			na		
17	na	12		na			na		
18	na			na	0		na		
19	na			na	0		na		
20	na		0	na	0		na		
21	na	10		na		0	na		
22	na			na		0	na		

*na = non-applicable = occurred after the grant period of performance for fieldwork

Table 11. Group size, color, and age-class composition of beluga groups sighted during surveys of Chickaloon Bay/South Fire Island, 2011–2013.

Date	Beluga Group #[1]	# White	# Gray	# Calves	# Neonates[2]	# Unknown[3]	Total Beluga Sightings
09-26-2011	1	4	4	0	0	0	8
09-26-2011	2	30	30	2	0	0	62
09-27-2011	1	20	20	3	2	0	45
09-27-2011	2	na	na	na	na	15	15
05-16-2012	1	15	5	3	0	0	23
05-21-2012	0	0	0	0	0	0	0
06-21-2012	1	15	8	2	0	1	26
06-22-2012	1	3	0	0	0	0	3
09-30-2012	0	0	0	0	0	0	0
05-21-2013	1	15	30	5	0	0	50
05-21-2013	2	5	1	0	0	0	6
06-02-2013	0	0	0	0	0	0	0
09-16-2013	1	1	0	0	0	0	1
09-16-2013	2	88	85	27	0	0	200
Total	**11**	**196**	**183**	**42**	**2**	**16**	**439**

[1] Group numbers were assigned by day and will not sum to the total number of groups.

[2] Neonates are separate from calf totals.

[3] Unknown=beluga of unknown color and size.

Table 12. Group size, color, and age-class composition of beluga groups sighted during surveys of the Kenai River, 2011–2013.

Date	Beluga Group #[1]	# White	# Gray	# Calves	# Neonates[2]	# Unknown[3]	Total Beluga Sightings
10-05-2011	1	3	3	1	0	1	8
10-06-2011	0	0	0	0	0	0	0
10-21-2011	0	0	0	0	0	0	0
10-22-2011	0	0	0	0	0	0	0
05-02-2012	0	0	0	0	0	0	0
05-03-2012	1	2	1	1	0	1	5
05-03-2012	2	3	2	1	1	0	7
05-10-2012	0	0	0	0	0	0	0
05-11-2012	1	2	1	1	0	0	4
09-12-2012	0	0	0	0	0	0	0
09-13-2012	1	5	2	1	0	0	8
09-14-2012	1	5	1	2	0	0	8
10-04-2012	1	4	4	1	1	0	10
10-05-2012	0	0	0	0	0	0	0
10-06-2012	0	0	0	0	0	0	0
10-18-2012	0	0	0	0	0	0	0
10-19-2012	0	0	0	0	0	0	0
10-20-2012	0	0	0	0	0	0	0
05-07-2013	0	0	0	0	0	0	0
05-08-2013	0	0	0	0	0	0	0
05-13-2013	0	0	0	0	0	0	0
05-14-2013	0	0	0	0	0	0	0
09-21-2013	0	0	0	0	0	0	0
09-22-2013	0	0	0	0	0	0	0
Total	**7**	**24**	**14**	**8**	**2**	**2**	**50**

[1] Group numbers were assigned by day and will not sum to the total number of groups.
[2] Neonates are separate from calf totals.
[3] Unknown=beluga of unknown color and size.
[4] CBD=could not be determined.

2005–2010 no Kenai surveys

Kenai tides www.farmersalmanac.com

Table 13. Percent color and age-class composition of groups encountered 2011–2013 in the waters of the Kenai Peninsula Borough (KPB), according to area surveyed.

Area	# Beluga Groups	# Beluga Sightings	% White	% Gray	% Calves	% Neonates	# Unknown
Turnagain Arm	56	778	26	14	7	1	52
Chickaloon Bay/South Fire Island	11	439	45	42	9	<1	4
Kenai River	7	48	50	29	17	4	0
All KPB Areas 2011–2013	**74**	**1265**	**33**	**24**	**9**	**1**	**33**

Table 14. Identification rates for belugas encountered during 75 surveys of the waters of the Kenai Peninsula Borough (KPB), 2011–2013.

Area	# Beluga Sightings	# Sightings that were Identified Individuals	% Sightings that were of Identified Individuals
Chickaloon Bay/South Fire Island	439	9	2
Turnagain Arm	778	59	8
Kenai River	48	17	35

Table 15a. Summary of the status of the 2005–2013 right-side Cook Inlet Beluga Whale Project Photo-identification Catalog, according to year and area.

Area	Susitna River Delta	Knik Arm	Turnagain Arm	Chickaloon Bay/South Fire Island	Kenai River Delta
Year	**Photographs cataloged?**				
2005–2011	yes	yes	yes	yes	not surveyed
2012	in progress	no	yes	yes	yes
2013	no	no	yes	yes	yes

Table 15b. Summary of the status of the 2005–2013 left-side Cook Inlet Beluga Whale Project Photo-identification Catalog, according to year and area.

Area	Susitna River Delta	Knik Arm	Turnagain Arm	Chickaloon Bay/South Fire Island	Kenai River Delta
Year	**Photographs cataloged?**				
2005–2008	yes	yes	yes	yes	not surveyed
2009–2011	in progress	in progress	in progress	in progress	in progress
2012–2013	no	no	no	no	no

Table 16. Sighting records of 85 individual belugas identified in the waters of the Kenai Peninsula Borough (KPB), according to location photographed. Sighting records are from the 2005–2013 catalog, excluding surveys from those areas/years that have not yet been cataloged; (see footnotes). P=Photographed. * indicates the whale had been satellite tagged by NMFS sometime 1999–2002.

Whale ID	Susitna River Delta[1]	Knik Arm[1]	Turnagain Arm	Chickaloon Bay/South Fire Island	Kenai River Delta
	# Surveys (337 total)				
	87	117	96	14	23
R1014	P	P		P	
R102	P	P		P	
R103 *	P	P	P		
R107	P	P	P		
R108	P	P	P		
R1086	P	P	P		
R1103		P		P	
R112	P	P	P		
R113	P	P	P		
R114 *	P	P	P		
R115 *	P	P	P		
R1156	P	P	P		P
R118	P	P		P	
R12	P	P	P		
R1238	P	P	P		P
R125	P	P		P	
R129	P	P	P	P	
R1314	P	P	P	P	
R1318	P		P		
R1319	P	P	P		
R1326	P	P	P		
R1337	P	P	P		
R1358	P	P	P		
R1365	P		P		
R140	P		P		
R145	P	P	P		
R15	P	P	P	P	
R158	P	P		P	
R166	P	P	P		
R17	P	P	P		
R177	P	P	P		
R19	P	P	P		
R195	P	P	P		
R197		P		P	

Table 16. Continued.

Whale ID	Susitna River Delta[1]	Knik Arm[1]	Turnagain Arm	Chickaloon Bay/South Fire Island	Kenai River Delta
R198	P	P		P	
R200	P	P		P	
R219	P	P	P		
R220	P	P	P		
R224	P	P	P		
R242	P	P	P		
R243 *	p	p	p		
R25	P	P	P		
R26	P	P	P		
R3179	P			P	
R3203	P	P		P	
R3215	P				P
R3292	P			P	
R3305	p		p		
R3354			P		
R3564	P		P		
R37	P	P	P		
R3846	P	P	P		P
R4058	P		P		
R4236			P		
R48	P	P	P		
R49	P	P	P		
R5	P	P	P		
R50	P	P			P
R529	p	p	p		
R538		P	P		
R542	P	P	P		
R544	P	P		P	
R56	P	P	P		
R595	P	P	P		
R60	P	P	P		
R61		P	P		
R642	P	P		P	
R67	P	P	P		
R69			P		
R70	P	P	P		
R7132	P		P		
R7199	p				p
R72	P	P	P		
R7244	P	P			

Table 16. Continued.

Whale ID	Susitna River Delta[1]	Knik Arm[1]	Turnagain Arm	Chickaloon Bay/South Fire Island	Kenai River Delta
R7484			P		
R7508			P		
R77	P	P	P		
R8	P	P	P		
R85	P	P	P		
R86	P	P	P		
R87	P	P	P		
R875	P	P	P		P
R9	P	P		P	
R96 *	P	P	P		
R987	P	P		P	
TOTAL	**76**	**69**	**66**	**19**	**8**
% of 85 KPB whales	**89**	**81**	**78**	**22**	**9**

[1] excludes surveys from 2012 and 2013

Table 17. Summary of sighting histories, according to area, of the 85 whales identified in the waters of the Kenai Peninsula Borough. Sighting records are from the 2005–2013 catalog, excluding surveys from those areas/years that have not yet been cataloged; (see footnotes).

Area	% in Susitna River Delta[1]	% in Knik Arm[1]	% in Turnagain Arm	% in Chickaloon Bay/South Fire Island	% in Kenai River Delta
Turnagain Arm (*n* =66 whales)	89	82	100	5	8
Chickaloon Bay/South Fire Island (*n* =19 whales)	89	89	16	100	0
Kenai River Delta (*n* =8 whales)	100	63	63	0	100

[1] excludes surveys from 2012 and 2013

Table 18. Identified whales in groups seen in the Kenai River Delta, 2011–2013. P=photographed.

	Date of Group Sighting				
	10-05-2011	05-11-2012	09-13-2012	09-14-2012	10-04-2012
	Group Size				
Whale ID	7	4	8	8	10
R1238			P	P	
R7199	P		P	P	P
R50			P	P	P
R1156		P			
R3215	P				P
R742	P				P
R3846					P
R875		P			

Table 19. Long-term (2005–2013) sighting histories of the eight individual belugas identified in the Kenai River Delta 2011–2013. P=photographed.

		Whale ID							
Date of Sighting	**Area of Sighting**	**R1238**	**R1156**	**R50**	**R3215**	**R742**	**R3846**	**R875**	**R7199**
10-06-2005	Knik Arm			P					
10-07-2005	Knik Arm			P					
08-07-2006	Susitna River Delta			P					
09-09-2006	Knik Arm	P							
09-23-2006	Knik Arm	P							
09-25-2006	Knik Arm	P							
07-13-2007	Susitna River Delta	P							
07-27-2007	Susitna River Delta			P		P			
06-19-2008	Susitna River Delta	P							
07-15-2008	Susitna River Delta	P		P					
07-22-2008	Susitna River Delta	P							
07-24-2008	Susitna River Delta	P	P						
07-29-2008	Susitna River Delta	P	P						
08-06-2008	Susitna River Delta		P						
08-18-2008	Knik Arm			P					
09-12-2008	Knik Arm	P							
09-12-2008	Turnagain Arm							P	
09-15-2008	Knik Arm	P							
08-03-2009	Susitna River Delta	P			P			P	P
08-05-2009	Susitna River Delta	P							
08-09-2009	Susitna River Delta				P				
08-19-2009	Susitna River Delta				P				
08-22-2009	Susitna River Delta							P	
09-08-2009	Knik Arm							P	
10-01-2009	Susitna River Delta							P	
07-29-2010	Susitna River Delta	P							
08-12-2010	Susitna River Delta	P					P		
08-27-2010	Susitna River Delta						P		
07-27-2011	Susitna River Delta							P	
08-10-2011	Susitna River Delta						P		
08-14-2011	Knik Arm							P	
08-15-2011	Knik Arm						P		
08-22-2011	Knik Arm		P						
08-28-2011	Turnagain Arm						P		
09-08-2011	Turnagain Arm	P							
09-14-2011	Knik Arm						P		
10-05-2011	Kenai River Delta				P	P			P
05-11-2012	Kenai River		P					P	
08-24-2012	Turnagain Arm		P						
09-13-2012	Kenai River Delta	P		P					P
09-14-2012	Kenai River Delta	P		P					P
10-04-2012	Kenai River Delta			P	P	P	P		P
08-15-2013	Turnagain Arm					P			

Table 20. Identified individual whales in groups seen in Chickaloon Bay/South Fire Island, 2005–2013. P=photographed.

	Date of Group Sighting						
	07-07-2005	06-03-2006	07-26-2007	09-30-2008	09-26-2011	09-27-2011	05-21-2013
	Group Size						
Whale ID	5	8	19	42	62	45	50
R118	P						
R125	P						
R197		P					
R9			P				
R15			P				
R198			P				
R158				P			
R544				P			
R1014				P			
R1103				P			
R102				P		P	
R129					P		
R3292					P		
R200						P	
R1314						P	
R3203						P	
R624							P
R987							P
R3179							P

Table 21. Identified individual whales (*n*=15) in groups seen more than once in Turnagain Arm, 2005–2013. P=photographed.

Whale ID	2006			2008		2009		2010			2011		2012			2013				# days seen in Turnagain Arm	# field seasons seen in Turnagain Arm	max. # times seen in Turnagain Arm within a field season
	9/5	9/11	9/15	9/27	9/28	8/30	9/1	8/28	9/4	9/5	8/24	8/25	8/24	9/7	9/9	8/15	8/21	8/24	8/25			
17								P					P							2	2	1
25				P												P	P	P		4	2	3
56	P													P						2	2	1
70	P							P												2	2	1
86	P	P																P		3	2	2
103				P												P		P	P	4	2	3
113	P							P												2	2	1
115	P							P	P			P		P						5	4	2
129					P		P								P					3	3	1
140			P		P															2	2	1
242						P												P		2	2	1
542													P			P				2	2	1
1314											P		P							2	2	1
1319														P	P					1	2	2
4236										P	P									2	2	1

Table 22. Yearly sighting records of 58 individual beluga whales photographed in the waters of the Kenai Peninsula Borough that were assumed to be reproductive females based on the close accompaniment of a calf at least once during 2005–2013 (C=photographed with a calf; P=Photographed without a calf; -=not seen/photographed; CBD=could not be determined; na=not applicable).

Whale ID	2005	2006	2007	2008	2009	2010	2011	2012	2013	# Years Photographed with a Calf	Calf Age Information Inferred from Individuals seen with Calves in Multiple Years
% survey effort	**17**	**12**	**8**	**11**	**11**	**12**	**11**	**11**	**7**		
R108	C	P	C	C	-	C	-	-	-	4	smaller calf in 2007 than 2005; CBD in 2008; smaller calf in 2010
R112	C	C	P	C	C	P	P	-	-	4	maturing calf 2005–2009; plus small calf 2009
R1238	-	C	P	C	C	P	P	C	-	4	maturing calf 2006–2009; CBD in 2012
R224	C	C	P	P	C	C	-	-	-	4	smaller calf 2006 than 2005; smaller calf 2009 than 2006; maturing calf 2010
R103	P	P	C	C	P	C	P	-	-	3	CBD
R1086	-	P	-	C	C	-	C	-	-	3	maturing 2008–2009; smaller calf in 2011
R1365	-	-	-	C	C	-	C	-	-	3	maturing calf
R195	P		-	C	C	-	C	-	P	3	smaller 2008 than 2009; smaller calf 2011
R219	P	C	C	C	P	-	P	-	-	3	maturing calf
R60	P	P	C	C	P	-	C	-	-	3	maturing calf
R67	C	-	P	C	-	-	C	-	-	3	large calf in 2005; maturing calf and smaller calf in 2008; two maturing calves in 2011
R72	P	C	P	C	C	-	-	-	-	3	maturing calf
R86	P	C	P	C	-	-	P	-	C	3	CBD
R96	-	P	P	C	P	C	C	-	-	3	CBD
R1014	-	-	-	C	C	-	-	-	-	2	CBD
R102	C	P	P	P	P	-	C	-	-	2	CBD
R115	P	P	P	C	P	P	C	P	-	2	CBD
R1156	-	-	-	C	-	-	P	C	-	2	small calves in 2008 and 2012
R125	P	P	-	-	C	C	P	-	-	2	smaller calf in 2010 than 2009
R158	P	P	-	C	P	C	-	-	-	2	smaller calf in 2010 than 2008
R166	P	-	-	C	-	-	C	-	-	2	CBD

Table 22. Continued.

Whale ID	2005	2006	2007	2008	2009	2010	2011	2012	2013	# Years Photographed with a Calf	Calf Age Information Inferred from Individuals seen with Calves in Multiple Years
R198	P	P	P	C	C	P	P	-	-	2	maturing calf
R200	P	-	-	-	C	C	P	-	-	2	maturing calf
R220	P	-	C	C	P	-	-	-	-	2	CBD
R242	P	-	P	C	P	-	C	-	-	2	CBD
R25	C	P	-	C	P	P	P	-	-	2	CBD
R3215	-	-	-	-	C	-	C	P	-	2	maturing calf
R3292	-	-	-	-	C	-	C	-	-	2	smaller calf in 2011 than 2009
R3564	-	-	-	-	C	-	-	C	-	2	smaller calf in 2012 than 2009
R49	P	P	-	C	-	P	C	-	-	2	maturing calf
R50	P	P	P	C	-	-	-	C	-	2	smaller calf in 2012 than 2008
R538	-	C	-	-	-	-	C	-	-	2	small calves in 2006 and 2011
R544	-	C	-	P	P	-	C	-	-	2	CBD
R742	-	-	P	-	-	-	C	P	C	2	CBD
R87	P	P	-	C	C	-	-	-	-	2	smaller calf in 2009 than 2008
R8	C	P	-	-	-	P	P	-	C	2	smaller calf in 2013 than in 2005
R9	P	-	C	P	C	-	-	-	-	2	CBD
R1358	-	-	-	C	P	P	-	-	-	1	na
R15	P	P	P	C	-	-	-	-	-	1	na
R17	P	-	-	C	P	P	P	P	-	1	na
R177	P	P	-	P	C	-	P	-	-	1	na
R19	P	P	-	C	-	-	-	-	-	1	na
R243	P	-	P	P	P	P	-	-	C	1	na
R26	P	-	P	P	P	C	-	-	-	1	na
R3203	-	P	-	-	P	C	P	-	-	1	na
R3305	-	-	-	P	C	-	-	-	P	1	na
R37	C	-	-	-	P	P	-	-	-	1	na
R48	C	P	-	-	-	-	-	-	-	1	na
R529	P	C	-	-	-	-	P	-	P	1	na
R542	-	-	P	-	-	P	C	P	-	1	na

Table 22. Continued.

Whale ID	2005	2006	2007	2008	2009	2010	2011	2012	2013	# Years Photographed with a Calf	Calf Age Information Inferred from Individuals seen with Calves in Multiple Years
R56	P	P	C	-	-	-	P	P	-	1	na
R595	-	-	P	C	P	P	-	-	-	1	na
R61	P	-	-	C	-	-	-	-	-	1	na
R624	-	-	P	-	C	-	-	-	P	1	na
R7132	-	-	-	P	-	-	-	C	-	1	na
R85	C	P	-	P	P	-	P	-	-	1	na
R875	-	-	-	P	C	-	P	P	-	1	na
R987	-	-	C	P	-	-	-	-	-	1	na

Table 23. Types of marks displayed by the 85 identified whales seen in the waters of the Kenai Peninsula Borough.

Mark Type	Mark Type Seen?		
	Yes	No	Maybe
Infection	69	14	2
General Trauma	9	74	2
Rake Marks	85	0	0
Molting	0	74	11
Satellite Tag Scars	5	80	0
Puncture Wound	3	80	2
Entanglement	1	82	2
Pigment	7	77	1
Mud/Silt	0	77	8

Table 24. Incidental Sightings of Cook Inlet Beluga Whales in the waters of the Kenai Peninsula Borough, reported to LGL in 2011. (x=no incidental sightings reported.; mp=mile post marker along highway.)

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2011	Jan–March	x	x	x	x	x	x
2011	April 8	Kenai River Delta	Salamantof Beach	2	?		"Beluga Bob" anonymous
2011	April 11	Kenai River Delta	Salamantof Beach	4	4 grays		"Beluga Bob" anonymous
2011	April 12	Kenai River Delta	Salamantof Beach	2	2 whites		"Beluga Bob" anonymous
2011	April 14	Kenai River Delta	Salamantof Beach	25	Calves in group	Moving with incoming tide	"Beluga Bob" anonymous
2011	April 16	Turnagain Arm	1 mile east of Girdwood	12	At least one calf	Made their way upriver among ice floes	Michael Link, LGL
2011	April 16	Turnagain Arm	Twenty Mile River	2	2 white whales	Swimming up arm	Steve Crawford, LGL
2011	April 19	Upper West Side KPB	Three Mile Beach, near mouth of Chuitna River	?	?	Feeding	Letter from Terry Jorgensen to ADFG, reported by Robert Freeman
2011	April 20	Turnagain Arm	Beluga Point	2	2 white ones	Heading west at low tide	Kate Lomac-MacNair, via Megan Blees, former LGL
2011	April 29	Kenai River Delta	Kenai River, river mile 0.3–1.5	6			Visitor log at Kenai Visitor Center, via Ken Tarbox
2011	May 2	Kenai River Delta	Kenai River, mouth of river	12	Mix of adults and darker young		Jim Butler via Ken Tarbox
2011	May ?	North of Kenai River Delta	Nikiski	8		Around ships and docks	Staff at Kenai Visitor's Center, via Tamara McGuire, LGL

Table 24. Continued.

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2011	May 2	Turnagain Arm	mp 80	8	8 white	Swimming out of Arm, north	Mike Williams, NMFS via Barb Mahoney, NMFS
2011	May 5	Kenai River Delta	Kenai River, river mile 0.3–1.5	6	4 adults, 2 calves (one smaller and darker)	Near high tide	Ken Tarbox
2011	May 11	Turnagain Arm	mp 98	?	?		Officer with NMFS OLE heard troopers on radio talking about belugas
2011	May 13	Kenai River Delta	Kenai River, Across from Pac Star cannery (river mile 1 and 1.5)	16	Up to 8 were dark gray		Commercial fisherman to Ken Tarbox
2011	June	x	x	x	x	x	x
2011	July	x	x	x	x	x	x
2011	Aug 18	Turnagain Arm	?	2 or more			Mike Beck, ConocoPhillips
2011	Aug 20	Turnagain Arm	1 mile east of Gull Rock	20–25	About 8 grays and 1 calf	Very close to shore, heading west	Steve Crawford, LGL
2011	Aug 21	Turnagain Arm	McHugh Creek	Couple dozen		Swimming up Arm with flooding tide	Michael Link, LGL
2011	Aug 22	Turnagain Arm	Windy Corner	4	No calves	Whales in same place 4 hours later	Tom Coursen, ConocoPhillips
2011	Aug 23	Turnagain Arm	Pullout by Girdwood	15			Steve Crawford, LGL
2011	Aug 26	Turnagain Arm	AK RR marker 52 near Portage	2			Karla Dutton, Defenders of Wildlife
2011	Aug 28	Turnagain Arm	mp 108	20	Adults and calves		Lisanne Aerts, LAMA Ecological

Table 24. Continued.

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2011	Aug 29	Upper West Side KPB	Mouth of Beluga River	60		Pilot said they had been there earlier in day too	Steve Crawford, LGL
2011	Aug 29	Turnagain Arm	AK RR marker 52 near Portage	18			Karla Dutton, Defenders of Wildlife
2011	Sept 3	Turnagain Arm	Spread out over a couple of miles	4		Hanging out in eddies away from main flow	Steve Crawford, LGL
2011	Sept 8	Kenai River Delta	Salamantof Beach	2 or 3		Silvers are running right now	"Beluga Bob" anonymous
2011	Sept 9	Turnagain Arm	McHugh Creek to Beluga Point	25	In glare, CBD	Driving and couldn't stop	Tamara McGuire, LGL
2011	Sept 10	Chickaloon/ Turnagain Arm	1 mile east of Point Possession; 5 miles east of Point Possession	12; 2	9 white and 3 gray; 2 adults	Feeding about 20 m off beach	Gregory Beise, ConocoPhillips
2011	Sept 11	Turnagain Arm	mp 111	3		Headed east	Jennifer Segelhorst
2011	Sept 14	Turnagain Arm	1 mile east of Beluga Point	10		Moved from middle to south shore	Steve Crawford, LGL
2011	Sept 18	Turnagain Arm	mp 106; mp 100	2; 4	2 whites; 3 whites and 1 gray	Appeared to be feeding, short dives	Tom Coursen, ConocoPhillips
2011	Sept 18	Turnagain Arm	Between Beluga Point and Potter Marsh	12		Swimming up Arm, offshore about 100 yards	Gina Luckey

Table 24. Continued.

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2011	Sept 19	Turnagain Arm	Just east of Beluga Point	3	3 large adults	30 ft from shore, high tide and whales were pushing fish up to shore, noon	Vern Smith
2011	Sept 21	Kenai River Delta	Kenai River	?	?	Appeared to be fine	Anonymous, via Carrie Goertz, Alaska SeaLife Center
2011	Sept 23	Turnagain Arm	mp 94	10			Alice Barnett, ConocoPhillips
2011	Sept ?	Upper West Side KPB	Beluga River	?			"Beluga Bob" anonymous
2011	Oct–Dec	x	x	x	x	x	x

Table 25. Incidental Sightings of Cook Inlet Beluga Whales in the waters of the Kenai Peninsula Borough, reported to LGL in 2012. (x=no incidental sightings reported.; mp=mile post marker along highway.)

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2012	Jan–March	x	x	x	x	x	
2012	April 1	Upper West Side KPB	Tyonek	?	?	Seen over a span of several days	Anonymous, as reported to “Beluga Bob” anonymous
2012	April 4	Kenai River Delta	Salamantof Beach	6	?A	Whales heading south	“Beluga Bob” anonymous
2012	April 6	Kenai River Delta	Mouth of Kenai River	12		Ice only broken up as far as bridge, herring run right now	“Beluga Bob” anonymous
2012	April 8–15	Kenai River Delta	Salamantof Beach	15	Young in group	Seemed to be feeding	Setnet fisherman, via Paul Shadura
2012	April 9	Kenai River Delta	Salamantof Beach	7	3 or 5 grays and a mom/calf pair		“Beluga Bob” anonymous
2012	April 15–20	Kenai River Delta	Kenai River, river mile 6.5	25–30	Several grays in group	Enter river on incoming tide and leave just after high tide, feeding on long fin smelt run	Commercial fisherman, via Roland Maw

Table 25. Continued.

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2012	April 18	Kenai River Delta	Salamantof Beach	5		Also a fin whale in area	Anonymous, as reported to "Beluga Bob" anonymous
2012	April 19	South of Kenai River Delta	Ninilchik	4	3 adults, 1 young		Steve Vanik
2012	April 20	Kenai River Delta	Salamanatof Beach	10		Whales passing by at low tide	"Beluga Bob" anonymous
2012	April 22	Turnagain Arm	Near mouth of Twenty Mile River	5	?		Bryn Clark, ConocoPhillips
2012	April 30	Kenai River Delta	Salamantof Beach	10			"Beluga Bob" anonymous
2012	May 2	Kenai River Delta	Kenai River, across from City Dock	5	3 white, 2 gray		"Beluga Bob" anonymous
2012	May 3	Turnagain Arm	Near Twenty Mile River	?	?		Amber Stephens, LGL
2012	May 4	Kenai River Delta	Kenai River, between bridge and City Dock	7	?		Mindy, via "Beluga Bob" anonymous
2012	May 4	Kenai River Delta	Salamantof Beach	2		Off beach	Kenai SetNetters Association, via Paul Shadura
2012	May 8	Turnagain Arm	?	4 or 5	?		"Beluga Bob" anonymous
2012	May 11	Kenai River Delta	Salamantof Beach	10–20		Heading south towards Kenai River	"Beluga Bob" anonymous
2012	May 12	Turnagain Arm	2 miles west of Twenty Mile River	6	4 gray, 1 mother/calf pair	Heading up Arm	Michael Link, LGL

Table 25. Continued.

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2012	May 13	Turnagain Arm	mp 90, just past Twenty Mile River	5	4 white, 1 gray	Swimming towards mouth of river, where lots of people fishing (eulachon?)	Karla Dutton, Defenders of Wildlife
2012	May 20	Turnagain Arm	Twenty Mile River	3	3 white	Swimming in to river where people dip netting	Danny Saufea via AOOS
2012	June 10	Upper West Side KPB	Shirleyville, near Tyonek	25	?	By beach, heading north	Anonymous on seismic vessel
2012	June 22	Turnagain Arm	mp 103	15–20	No calves	Heading up Arm	Erin Dunable, URS
2012	June 30	Upper West Side KPB	Shirleyville, near Tyonek	50	?	Heading towards Kenai, crossing the Inlet, just before low tide	Anonymous on seismic vessel
2012	July	x	x	x	x	x	x
2012	Aug 7	Upper West Side KPB	South of Ivan, Theodore, and Lewis, near Beluga	?	?		NMML aeriel survey
2012	Aug 8	Turnagain Arm	Between Rainbow and Indian	?	?		NMML aeriel survey
2012	Aug 17	Turnagain Arm	Between Bird Point and Twenty Mile River	30			Amber Stephens, LGL

Table 25. Continued.

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2012	Sept 6	Turnagain Arm	Portage River	6			Matt Nemeth, LGL
2012	Aug 18	Upper West Side KPB	Mouth of Beluga River	Big school	?	Milling	Geoff Herschberger's boss
2012	Aug 18	Turnagain Arm	Twenty Mile River	?	?	Also at Little Su and Eagle River	Dave McKay, via Geoff Herschberger
2012	Aug 21	Turnagain Arm	Beluga Point	6			Carole Miller
2012	Aug 20	Turnagain Arm	Bird Point	3			Amber Stephens, LGL
2012	Aug 25	Turnagain Arm	McHugh Creek	?			Michael Link, LGL
2012	Sept 22	Turnagain Arm	Mouth of Sixmile Creek (by Sunrise)	8	8 adults, no calves	Feeding suspected, stayed in one area over an hour	Josh Brekken biologist
2012	Sept 26	Kenai River Delta	Mouth of Kenai River	5	4 white, 1 gray		Anonymous on seismic vessel
2012	Sept 28	Turnagain Arm	Bird Point	5		About 100 yards from shore, heading up Arm with rising tide	Anonymous, as reported to "Beluga Bob" anonymous
2012	Sept 30	Kenai River Delta	Kenai River	4	3 white, 1 gray	Feeding, seals in same area feeding on silver salmon	Ken and Connie Tarbox

Table 25. Continued.

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2012	Sept ?	Upper West Side KPB	Beluga River	?		No date	Anonymous, as reported to “Beluga Bob” anonymous
2012	Oct	x	x	x	x	x	x
2012	Nov 23	Upper West Side KPB	By Tyonek Oil and Gas Platform	20–30	?	Whales passed by platform	Heidi George, ConocoPhilips
2012	Dec	x	x	x	x	x	x

Table 26. Incidental Sightings of Cook Inlet Beluga Whales in the waters of the Kenai Peninsula Borough, reported to LGL in 2013. (x=no incidental sightings reported.; mp=mile post marker along highway.)

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2013	Jan	x	x	x	x	x	
2013	Feb 11	Kenai River Delta	Kenai River, river mile 4	1	Grayish	Staying in general area	Amber Every, via Ken Tarbox
2013	March 31	Southern Kenai Peninsula	Between Ninilchik, and Happy Valley	3	3 white	Feeding, circling in same area, about 1 mile offshore	Steve Crawford, LGL
2013	April 2	Kenai River Delta	1 mile south of docks on Salamatof Beach	7–10	2 calves	Milled, then headed south to Kenai River	Jan Korstad
2013	April 3	Kenai River Delta	Salamatof Beach	6	Mixed white and gray	Heading north, tide falling	“Beluga Bob” anonymous
2013	April 4	Kenai River Delta	Kenai River, south bank, upstream of City Dock and downstream of bridge	6	6 gray		Mindy, via “Beluga Bob” anonymous
2013	April 19	Turnagain Arm	Chugach Forest sign east of Girdwood	8	?	One group in shallow water as if looking for fish	Michael Link, LGL
2013	April 21	Kenai River Delta	Salamatof Beach	6	?		“Beluga Bob” anonymous
2013	April 27	Turnagain Arm	Between Bird Point and Girdwood	3	?	Headed up Arm	Brian via Mark Boydston, AKDOT

Table 26. Continued.

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2013	April 26	North of Kenai River Delta	1 km south of East Foreland	1 or 2	?		Monty Worthington, ORPC
2013	April ?	Kenai River Delta	Kenai River in front of Senior Center	?	?	Doesn't remember exact dates, residents saw several belugas but didn't record details	Staff at Kenai Senior Center to Tamara McGuire
2013	May 8	Kenai River Delta	Salamatof Beach	6 harbor porpoises		Accurately described species	"Beluga Betty" anonymous
2013	May 10	Turnagain Arm	?	7	5 whites, 2 young		Amanda Prevel-Ramos, former LGL
2013	May 12	Turnagain Arm	West of McHugh Creek	11	2 pairs of moms and calves	Milling in an eddy	Steve Crawford, LGL
2013	May 30	Chickaloon Bay	Between Chickaloon Bay and Fire Island	15–30			Guy Wade, former LGL
2013	June	x	x	x	x	x	x
2013	July	x	x	x	x	x	x

Table 26. Continued.

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2013	Aug 16	Turnagain Arm	Bird Point	50	?	Two hours before high tide	Amber Stephens, LGL
2013	Aug 22	Turnagain Arm	Bird Point	20–30	At least 2 were gray	Travelling with tide	Jon Walgate, via Mandy Migura, NMFS
2013	Aug 23	Turnagain Arm	mp 97	1	?		Sean Burril, Justin Priest, LGL
2013	Aug 23	Turnagain Arm	Pullout before Girdwood	?	?		Brad Goetz
2013	Aug 23	Turnagain Arm	mp 94	7	6 adults, 1 calf	Traveling up Arm, far from road and spread out	Patrick Lowe, via Lisa Malette, LGL
2013	Aug 23	Turnagain Arm	mp 95	4	3 adults, 1 calf		Anonymous, via Lisa Malette, LGL
2013	Aug 24	Turnagain Arm	3 miles east of Hope, on Hope side	10	10 white		Steve Crawford, LGL
2013	Aug 25	Turnagain Arm	mp 97.5	?	?	Spread out between Bird Point and Girdwood	Carrie Ziolkowski, LGL
2013	Aug 25	Turnagain Arm	Beluga Point	?	?		Laura Morse, Shell
2013	Aug 29	Turnagain Arm	Beluga Point, far channel, 3 miles from shore	12	1 calf	Belugas traveled to Bird Point	Heather Patterson, LGL

Table 26. Continued.

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2013	Aug 30	Turnagain Arm	Between Bird Point and Girdwood	5–10	?		Dan Olsen, via Monty Worthington, ORPC
2013	Aug 31	Turnagain Arm	Beluga Point	4	?		Heather Patterson, LGL
2013	Sept 3	Turnagain Arm	2 miles west of Girdwood	6	4 adults, 2 smaller	Feeding and traveling to W, chasing bait fish/herring	Richard Winslow, ConocoPhillips
2013	Sept 7	Turnagain Arm	Just west of Bird Point, shallow flat area	5	3 white, 2 gray		Steve Crawford, LGL
2013	Sept 7	Turnagain Arm	Just east of Girdwood	2	x	x	Steve Crawford, LGL
2013	Sept 7	Turnagain Arm	Just east of Beluga Point	3	3 white		Steve Crawford, LGL
2013	Sept 13	Turnagain Arm	Windy Point	13	4 whites, 4 grays, 3 calves	Milling and traveling nearshore	Amber Stephens, LGL
2013	Sept 13	Turnagain Arm	Bird Point	9	?		Amber Stephens, LGL
2013	Sept 18	Turnagain Arm	Just west of Whittier Turnoff	15	No calves	30–50 yards from shore	Scott Bartlett, Pratt Museum Homer
2013	Sept 18	Turnagain Arm	Bird Point, south shore cove	10	No calves	30–50 yards from shore, feeding suspected	Scott Bartlett, Pratt Museum Homer

Table 26. Continued.

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2013	Sept 19	Kenai River Delta	Salamantof Beach	15	Mostly grays	Heading north	"Beluga Bob" anonymous
2013	Sept 19	Kenai River Delta	Kenai River Bridge	6	?		Duck hunters, via "Beluga Bob" anonymous
2013	Sept 21	Kenai River Delta	North shore mouth of Kenai River	8	?	Leave north channel, travel north	Jerry Dunn, via Deborah Boege-Tobin, UAA
2013	Sept 30	Turnagain Arm	By Girdwood	1	?		
2013	Oct 1	Turnagain Arm	Just east of Bird Point	30	At least one calf		Guy Wade, former LGL
2013	Oct 4	Turnagain Arm	mp 92.4	lots	?	Well off shore	Michael Link, LGL
2013	Oct 23	Kenai River Delta	Salamantof Beach	5	Can't tell, in shadows	Appear to be fishing in surf, blowing bubbles	"Beluga Bob" anonymous
2013	Oct 25	Turnagain Arm	Bird Point	4	?	Morning	Katrin Ryan, ConocoPhillips
2013	Oct 25	Turnagain Arm	Bird Point	10	1 calf	Afternoon Swam down and across Arm	Katrin Ryan, ConocoPhillips
2013	Oct 31	Turnagain Arm	Bird Point	6	?		Guy Wade, former LGL

Table 26. Continued.

Year	Date	Location	Details of Location	# of Belugas	Color/Size	Comment	Reported By
2013	Nov	x	x	x	x	x	x
2013	Dec	x	x	x	x	x	x

Table 27. Summary of incidental sightings of Cook Inlet beluga whales in the waters of the Kenai Peninsula Borough in 2011, as reported to LGL. (x=no sightings reported; B=beluga sighting.)

2011	Turnagain Arm	Chickaloon Bay	Kenai River Delta	Other
January	x	x	x	x
February	x	x	x	x
March	x	x	x	x
April	B	x	B	near mouth of Chuitna River
May	B	x	B	Nikiski
June	x	x	x	
July	x	x	x	
August	B	x	x	mouth of Beluga River
September	B	B	B	mouth of Beluga River
October	x	x	x	x
November	x	x	x	x
December	x	x	x	around Kalgin Island, in previous years (years not specified)

Table 28. Summary of incidental sightings of Cook Inlet beluga whales in the waters of the Kenai Peninsula Borough in 2012, as reported to LGL. (x=no sightings reported; B=beluga sighting.)

2012	Turnagain Arm	Chickaloon Bay	Kenai River Delta	Other
January	x	x	x	
February	x	x	x	
March	x	x	x	
April	B	x	B	Ninilchik; Tyonek
May	B	x	B	
June	B	x	x	Shirleyville (near Tyonek)
July	x	x	x	
August	B	x	x	Beluga River (on KPB border)
September	B	x	B	mouth of Beluga River
October	x	x	x	
November	x	x	x	by Tyonek Oil and Gas platform
December	x	x	x	

Table 29. Summary of incidental sightings of Cook Inlet beluga whales in the waters of the Kenai Peninsula Borough in 2013, as reported to LGL. (x=no sightings reported; B=beluga sighting.)

2013	Turnagain Arm	Chickaloon Bay	Kenai River Delta	Other
January	x	x	x	x
February	x	x	B	x
March	x	x	x	south of Ninilchik
April	B	x	B	East Foreland
May	B	B	B	
June	x	x	x	x
July	x	x	x	x
August	B	x	x	x
September	B	x	B	
October	B	x	B	x
November	x	x	x	x
December				

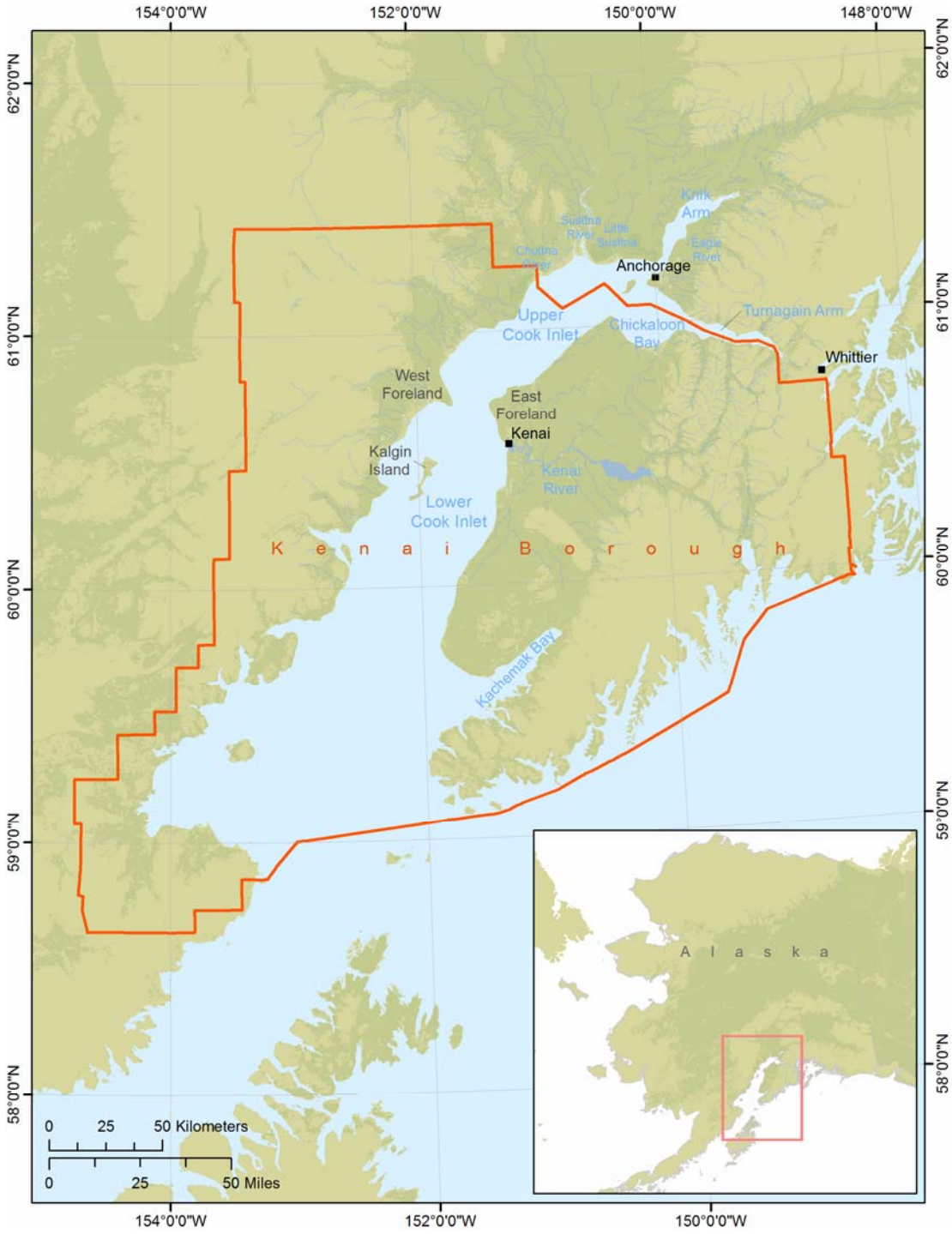

Figure 1. Map of the Kenai Peninsula Borough, Cook Inlet, Alaska.

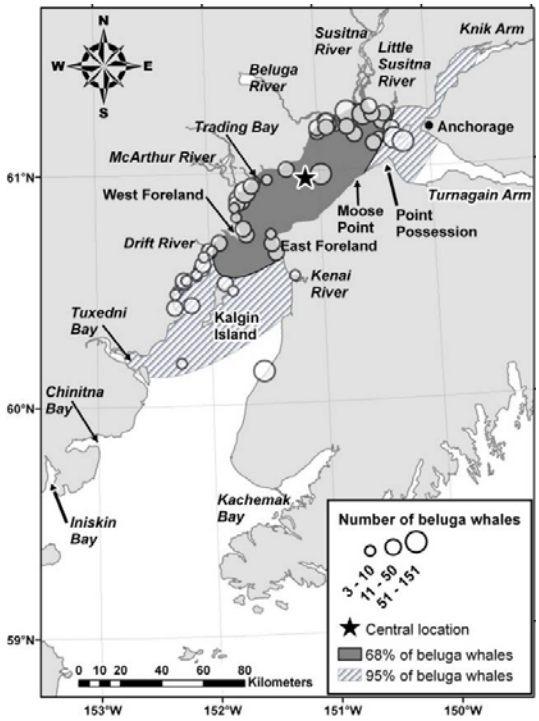

Figure 2a. Areas occupied by CIBWs in June/July 1978–1979 (from Rugh et al. 2010).

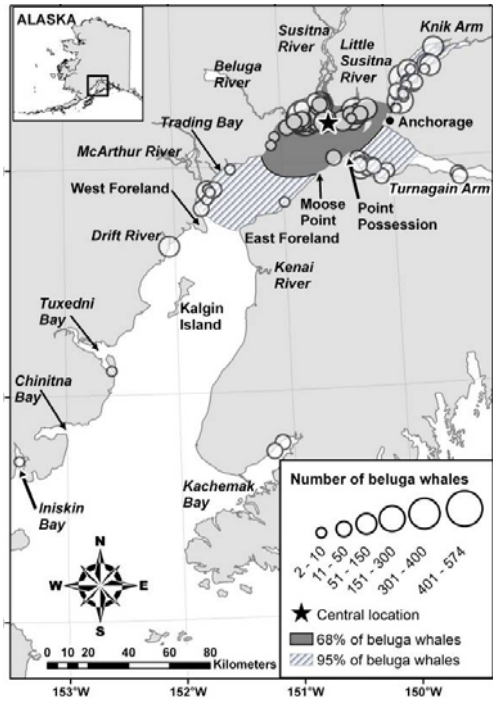

Figure 2b. Areas occupied by CIBWs in June/July 1993–1997 (from Rugh et al. 2010).

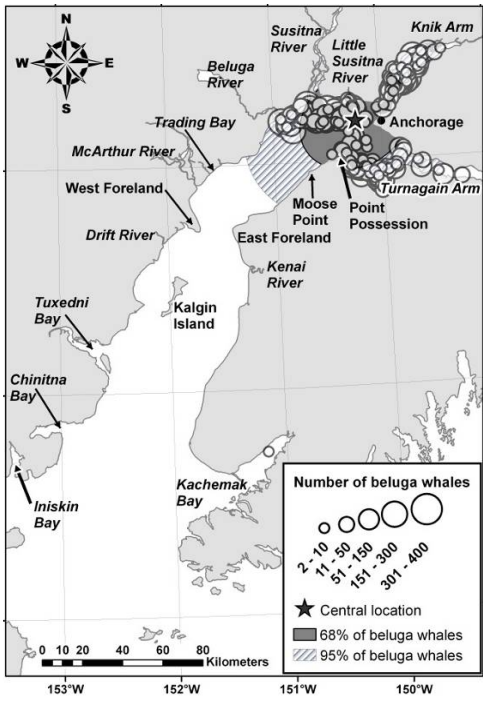

Figure 2c. Areas occupied by CIBWs in June 1998–2008 (from Rugh et al. 2010).

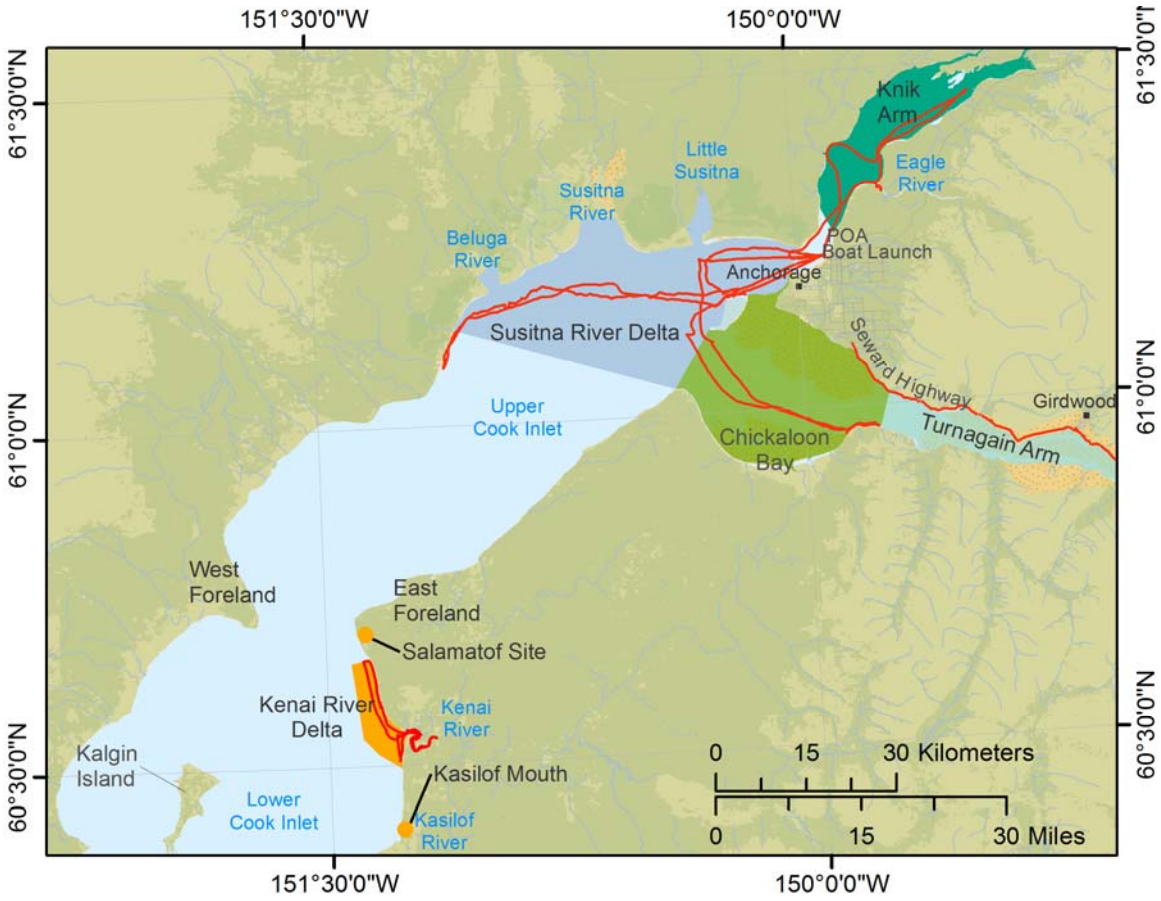

Figure 3. Map of Middle and Upper Cook Inlet, Alaska, showing boundaries of sub-areas within the study area and the vessel- and land-based survey routes used during 2005–2013. The Kenai River Delta study area was added in 2011.

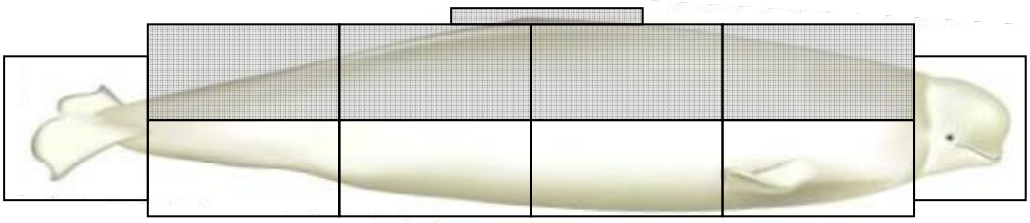

Figure 4. Diagram showing the various segments used when cataloging. The five shaded areas were the critical sections used in matching marks. Beluga illustration courtesy of Uko Gorter.

Figure 5. The CIBW Photo-id Project bumper sticker with website address for reporting beluga sightings and submitting photographs.

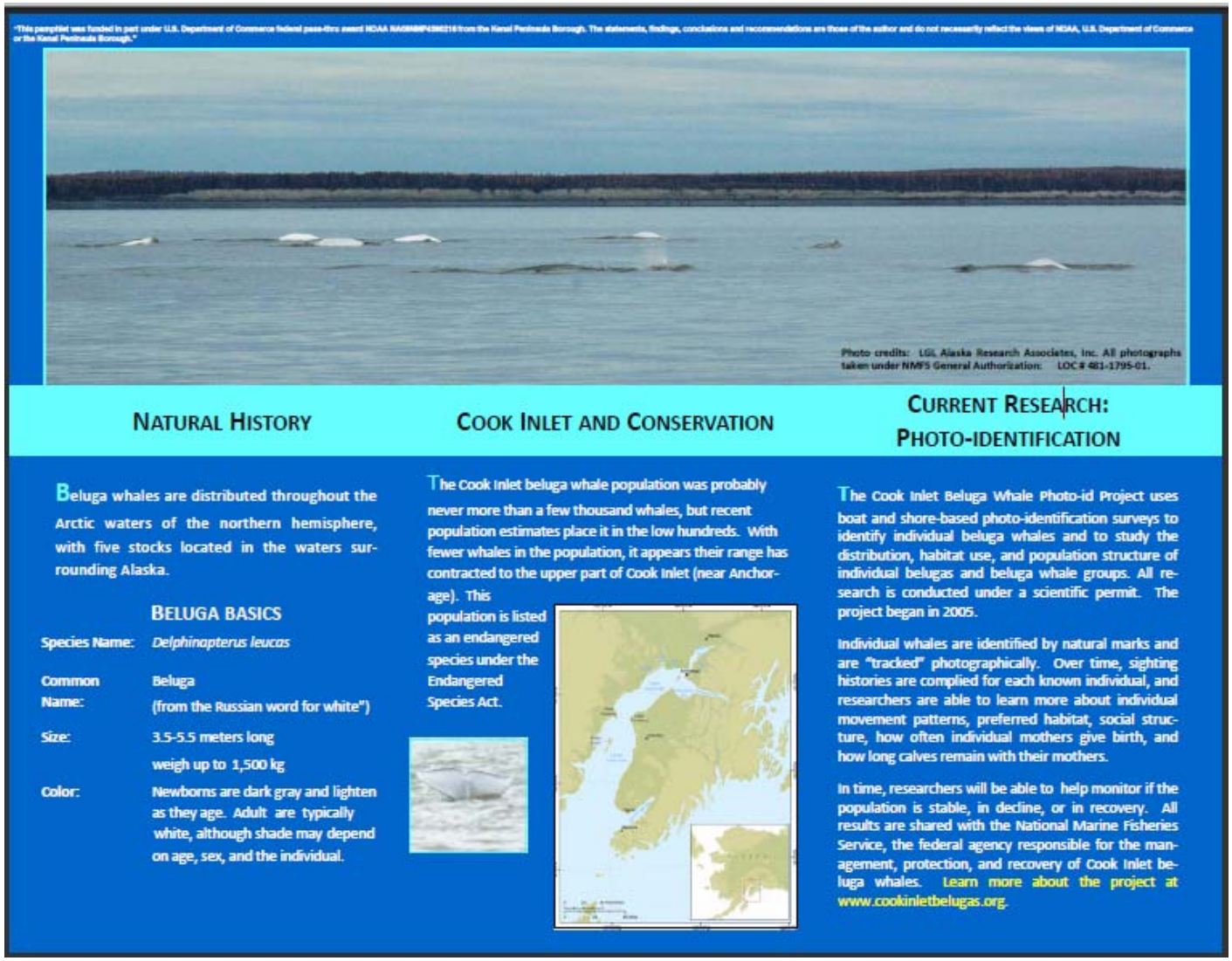

Figure 6a. Inside page of tri-fold educational pamphlet about CIBWs and the CIBW Photo-id Project.

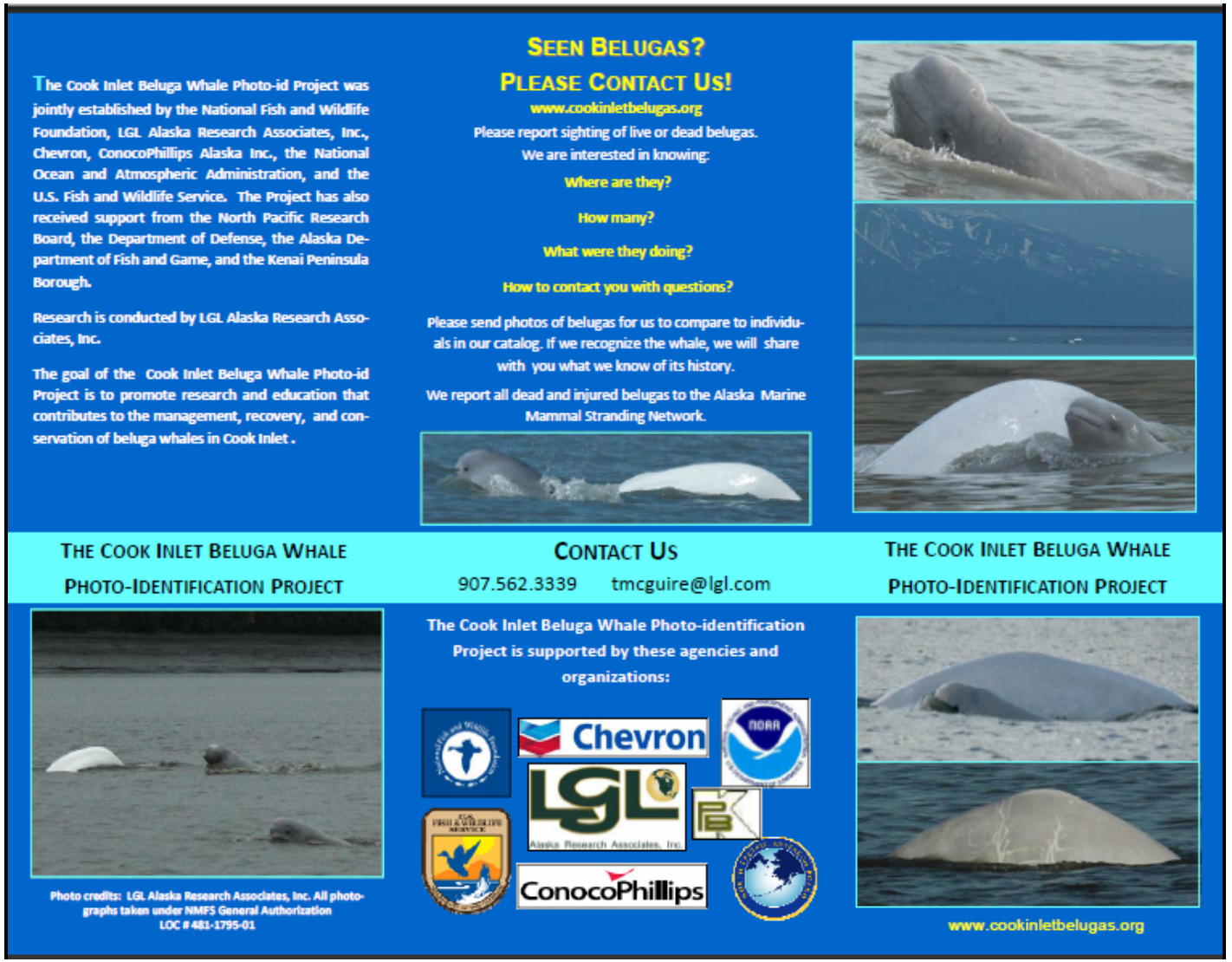

Figure 6b. Outside page of tri-fold educational pamphlet about CIBWs and the CIBW Photo-id Project.

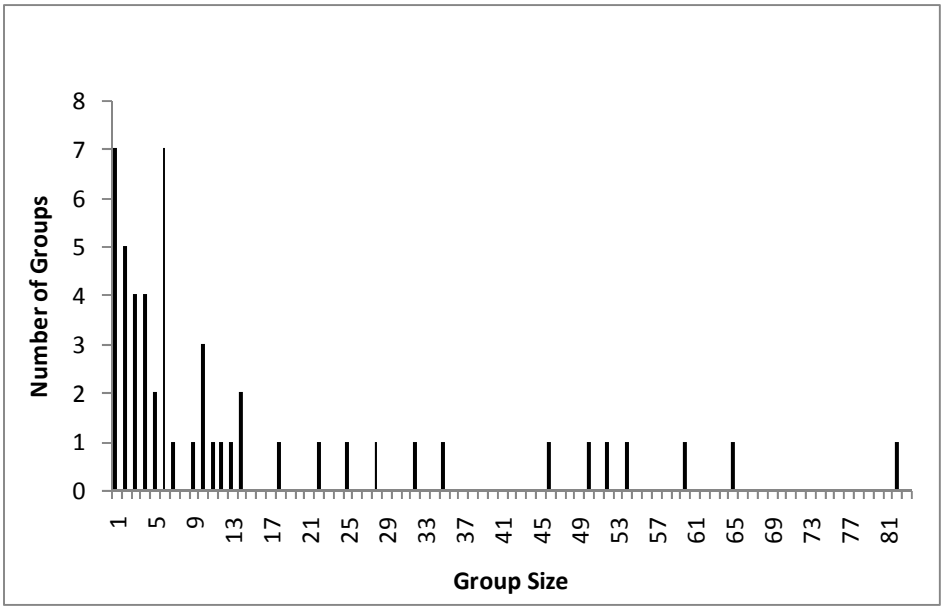

Figure 7. Group-size frequency distribution of beluga whales encountered during photo-identification surveys of Turnagain Arm, 2011–2013 (*n*= 56 groups, 4 of undetermined group size).

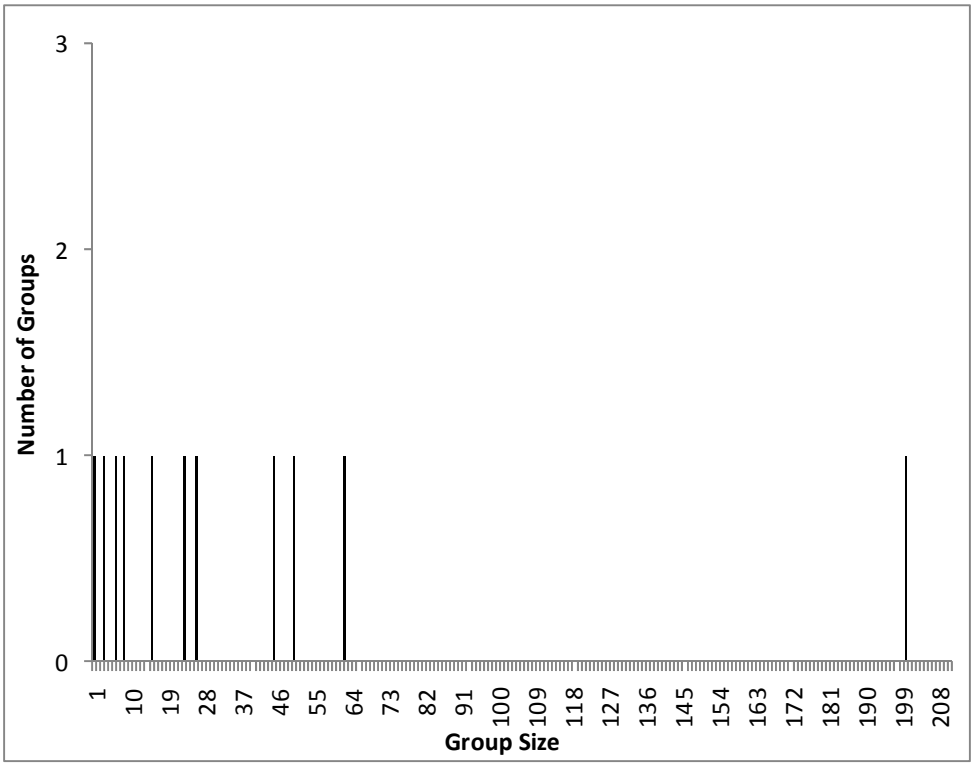

Figure 8. Group-size frequency distribution of beluga whales encountered during photo-identification surveys of Chickaloon Bay/South Fire Island, 2011–2013 (*n*=11 groups).

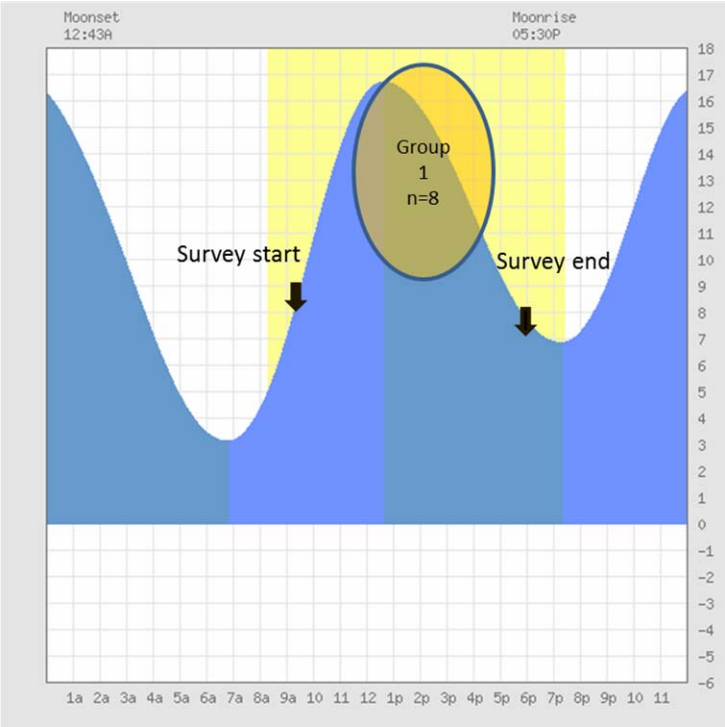

Figure 9. Survey effort and beluga group encountered according to tide cycle on October 5, 2011 at the Kenai City Pier (www.protides.com).

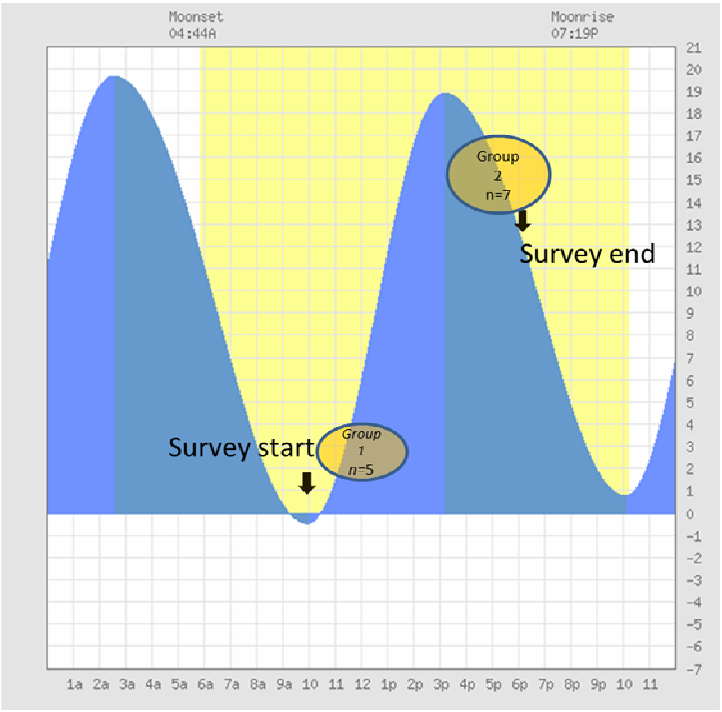

Figure 10. Survey effort and beluga groups encountered according to tide cycle on May 3, 2012 at the Kenai City Pier (www.protides.com).

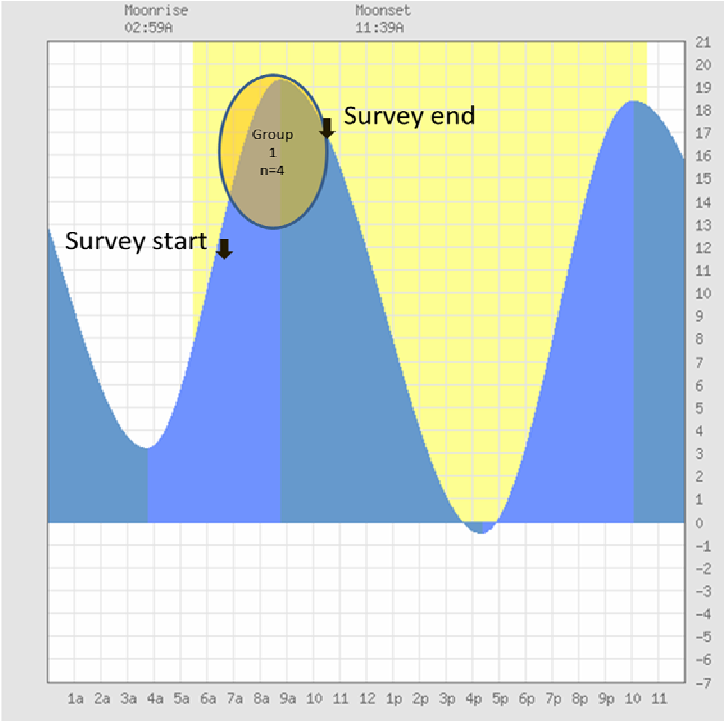

Figure 11. Survey effort and beluga group encounter according to tide cycle on May 11, 2012 at the Kenai City Pier (www.protides.com).

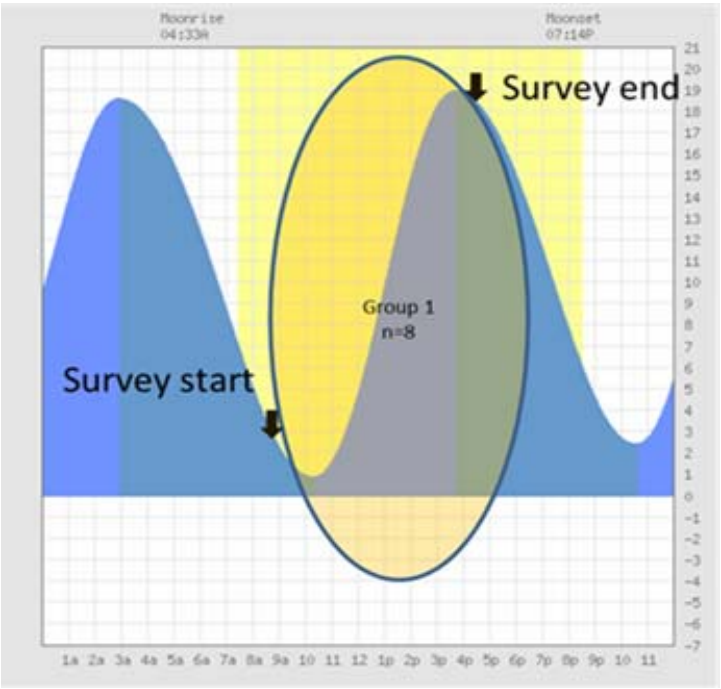

Figure 12. Survey effort and beluga group encounter according to tide cycle on September 13, 2012 at the Kenai City Pier (www.protides.com).

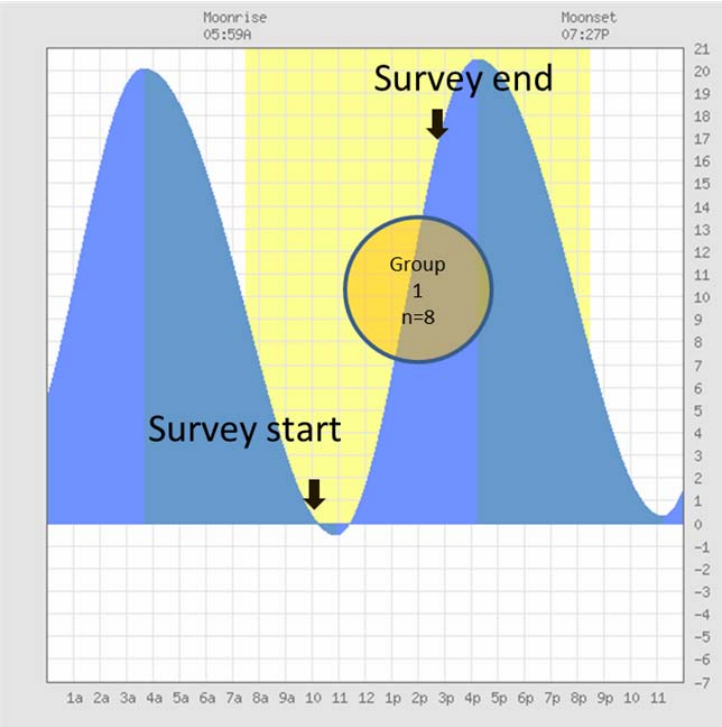

Figure 13. Survey effort and beluga group encounter according to tide cycle on September 14, 2012 at the Kenai City Pier (www.protides.com).

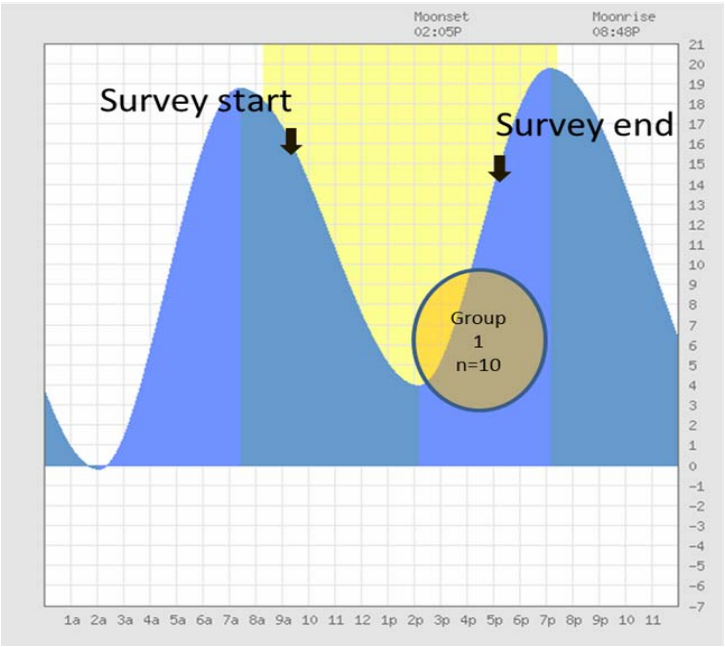

Figure 14. Survey effort and beluga group encounter according to tide cycle on October 4, 2012 at the Kenai City Pier (www.protides.com).

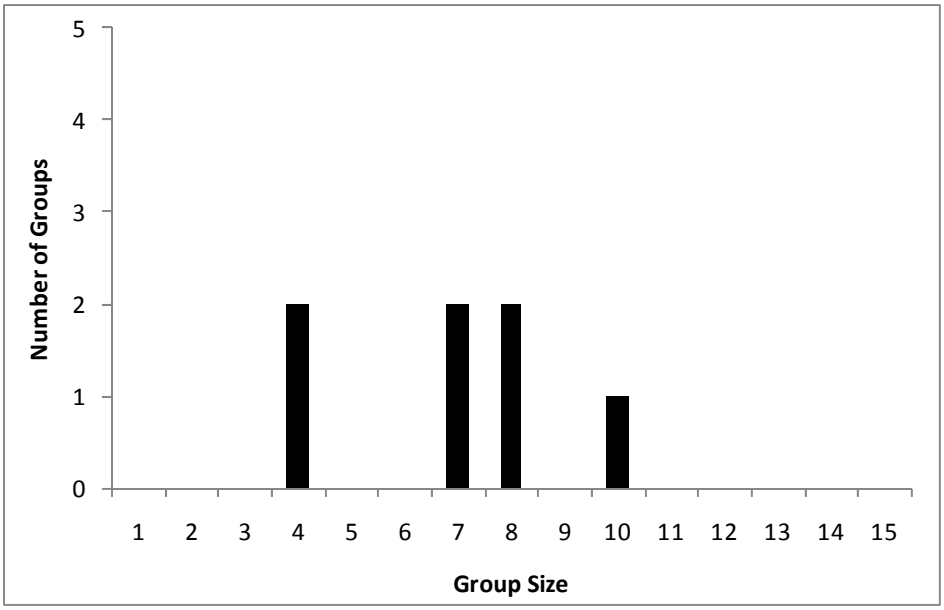

Figure 15. Group-size frequency distribution of beluga whales encountered during photo-identification surveys of the Kenai River, 2011–2013 (*n*=7 groups).

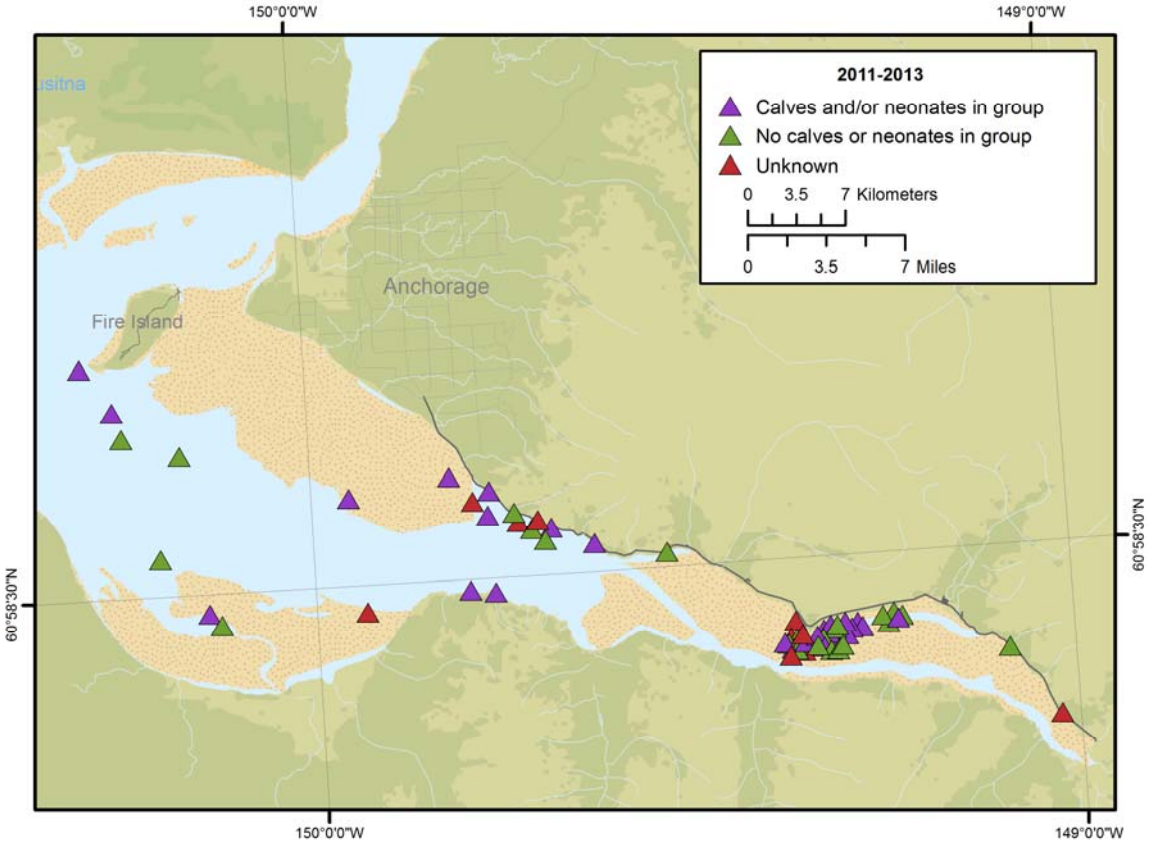

Figure 16. Sighting locations of CIBW groups with calves and/or neonates in Chickaloon Bay, South Fire Island, and Turnagain Arm, 2011–2013.

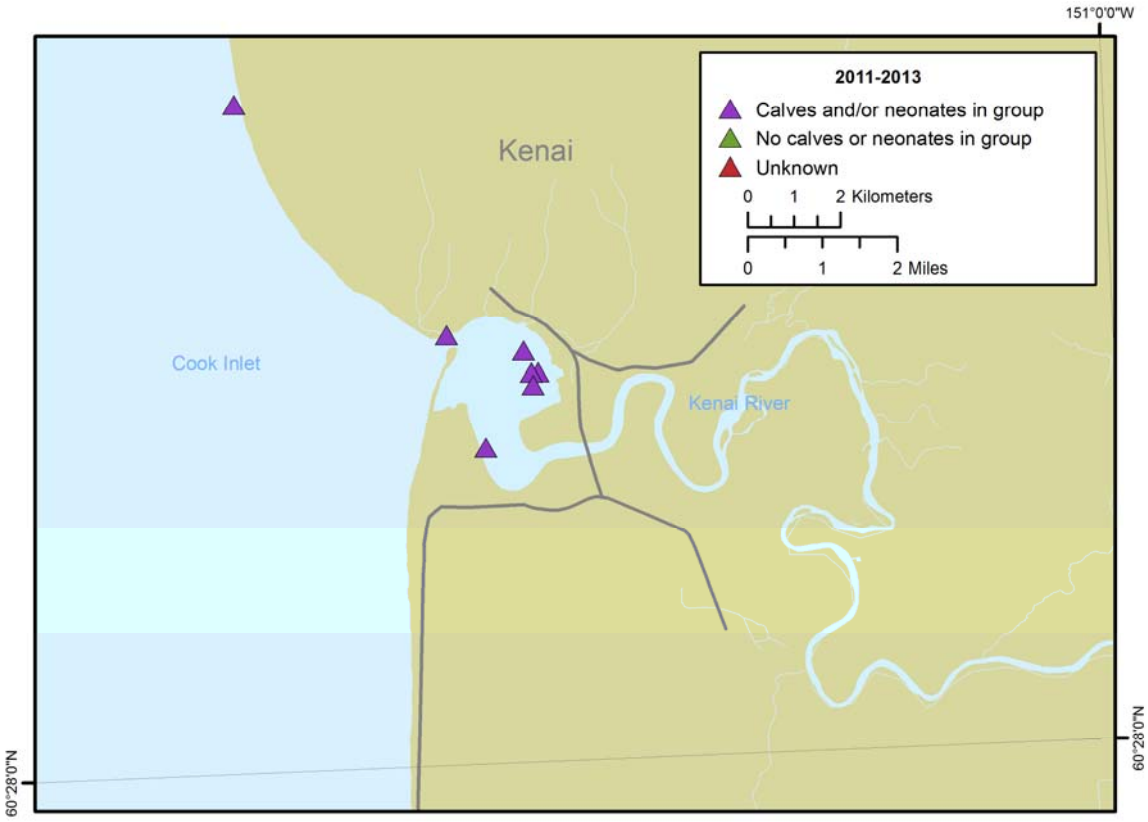

Figure 17. Sighting locations of CIBW groups with calves and/or neonates in the Kenai River Delta, 2011–2013.

Figure 18. Beluga observed pursuing and later feeding on salmon in the Kenai River, September 2012.

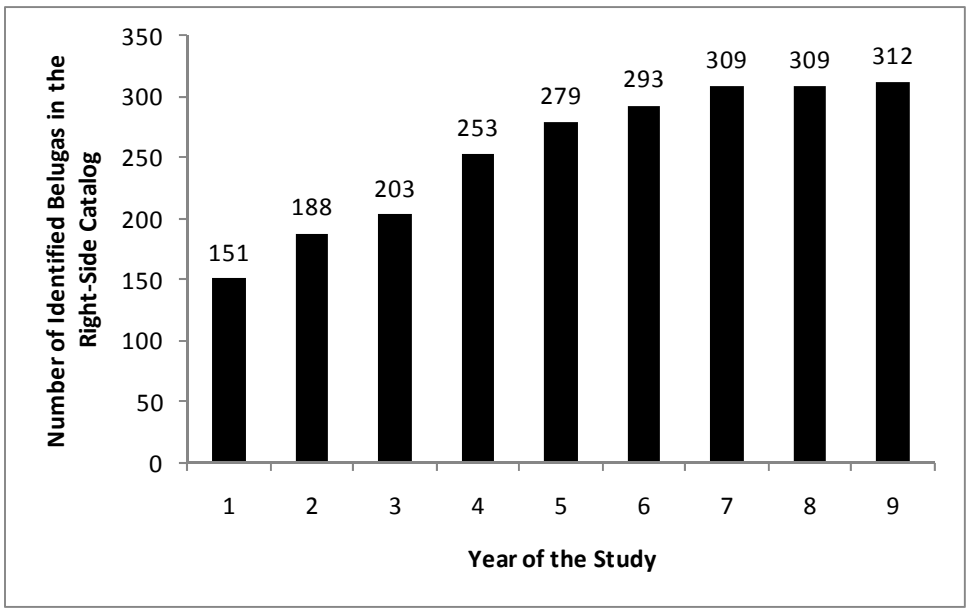

Figure 19. The number of identified individual whales in the right-side catalog, according to the year of the photo-identification study. Year 1=2005; Year 9=2013.

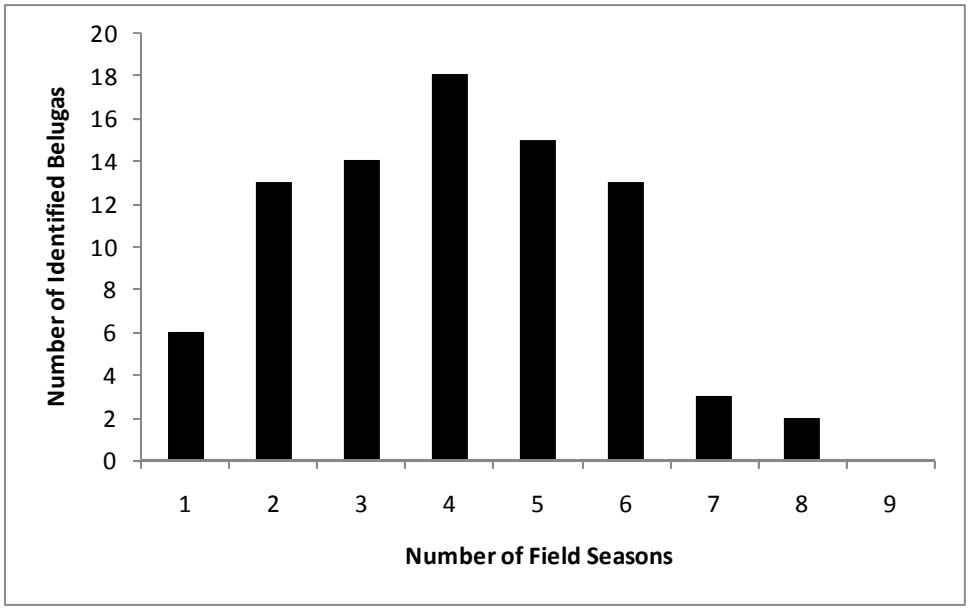

Figure 20. The number of field seasons in which individual whales identified in the waters of the Kenai Peninsula Borough were resighted in Cook Inlet during the 2005–2013 study period (*n*=85 identified whales).

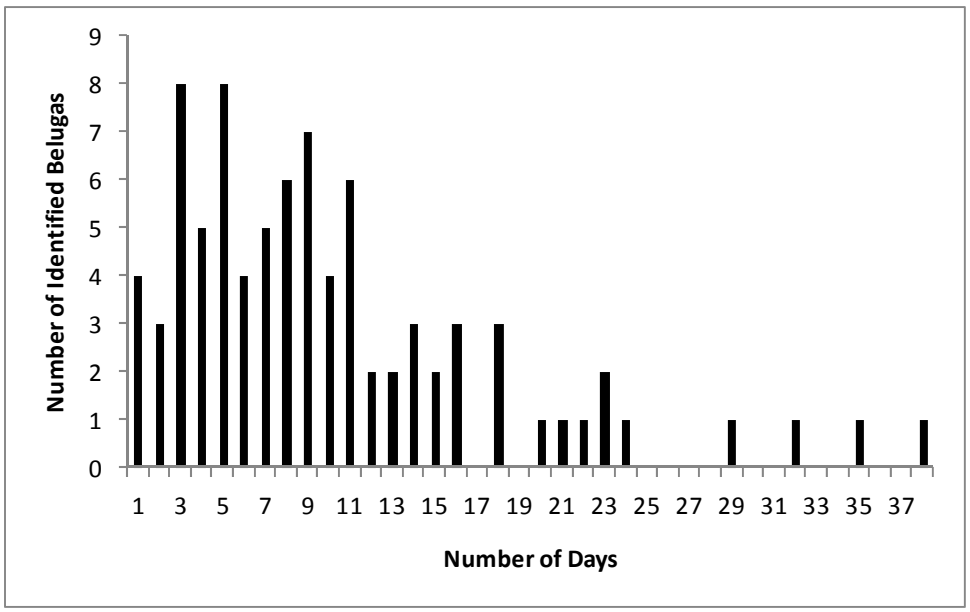

Figure 21. The number of days in which individual whales identified in the waters of the Kenai Peninsula Borough were resighted in Cook Inlet during the 2005–2013 study period (*n*=85 identified whales).

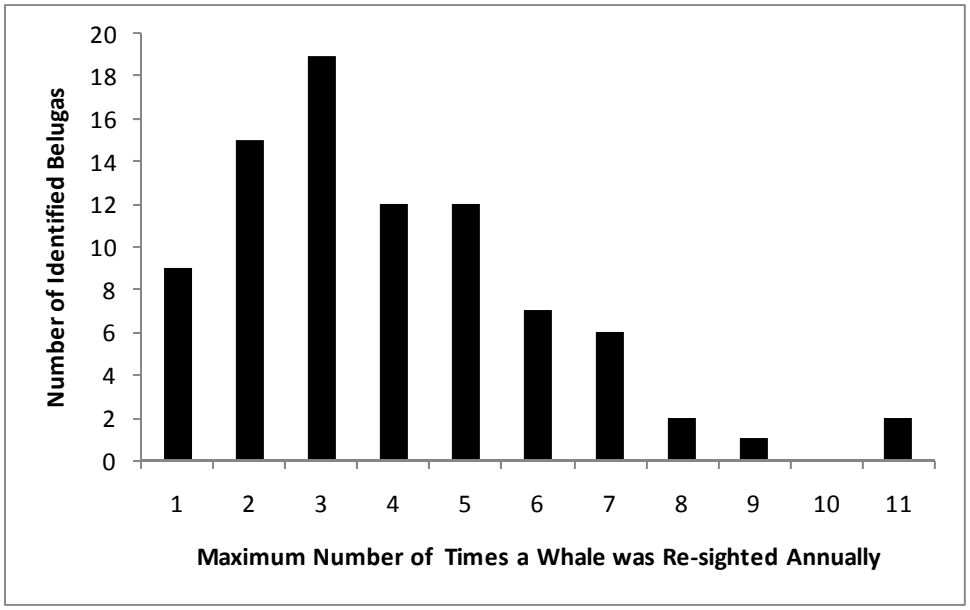

Figure 22. The maximum number of times per field season that individual whales identified in the waters of the Kenai Peninsula Borough were resighted in Cook Inlet during the 2005–2013 study period (*n*=85 identified whales).

Figure 23. An example of a maturing calf in 2009 (top) and 2010 (bottom).

Figure 24. Example of an identified whale, R1156, with small calves in 2008 (top) and in 2012 (bottom). Because there was no increase in calf size during the four-year interval between sightings, these are assumed to be different calves, with the calf in 2012 being younger. Neither calf could be identified by natural marks.

Figure 25. An identified whale, R112 (far left), with a new calf (middle) and a maturing calf (far right).

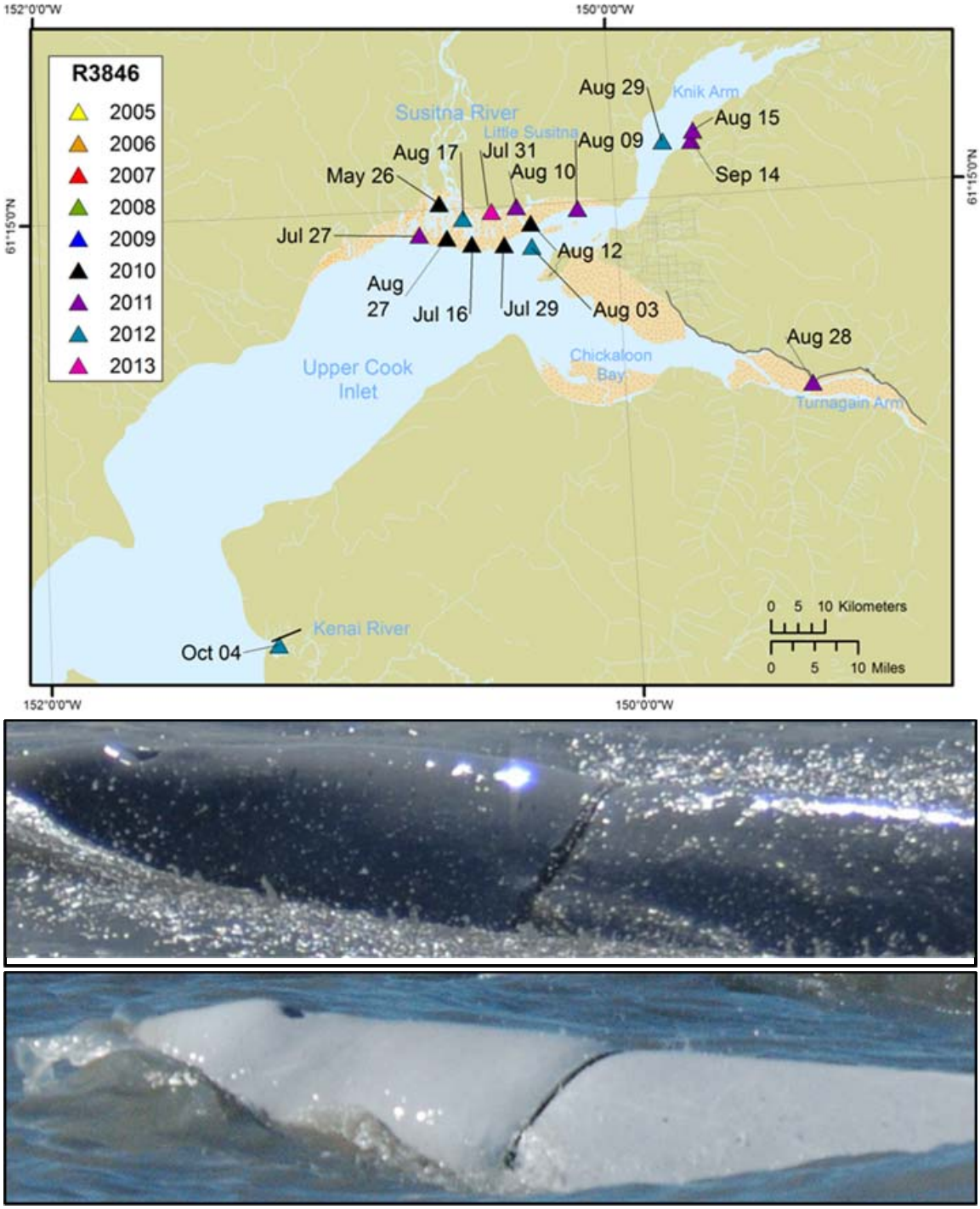

Figure 26. Sighting history and left-side photographs of an entangled beluga whale, R3846 Ropey, during the 2005–2013 field season in Cook Inlet, Alaska. Whale color differences in the photographs are due to different ambient lighting conditions. The whale identification was confirmed by matching scars on the whale's body that are visible in the photo-processing program. This whale was not seen before 2010.

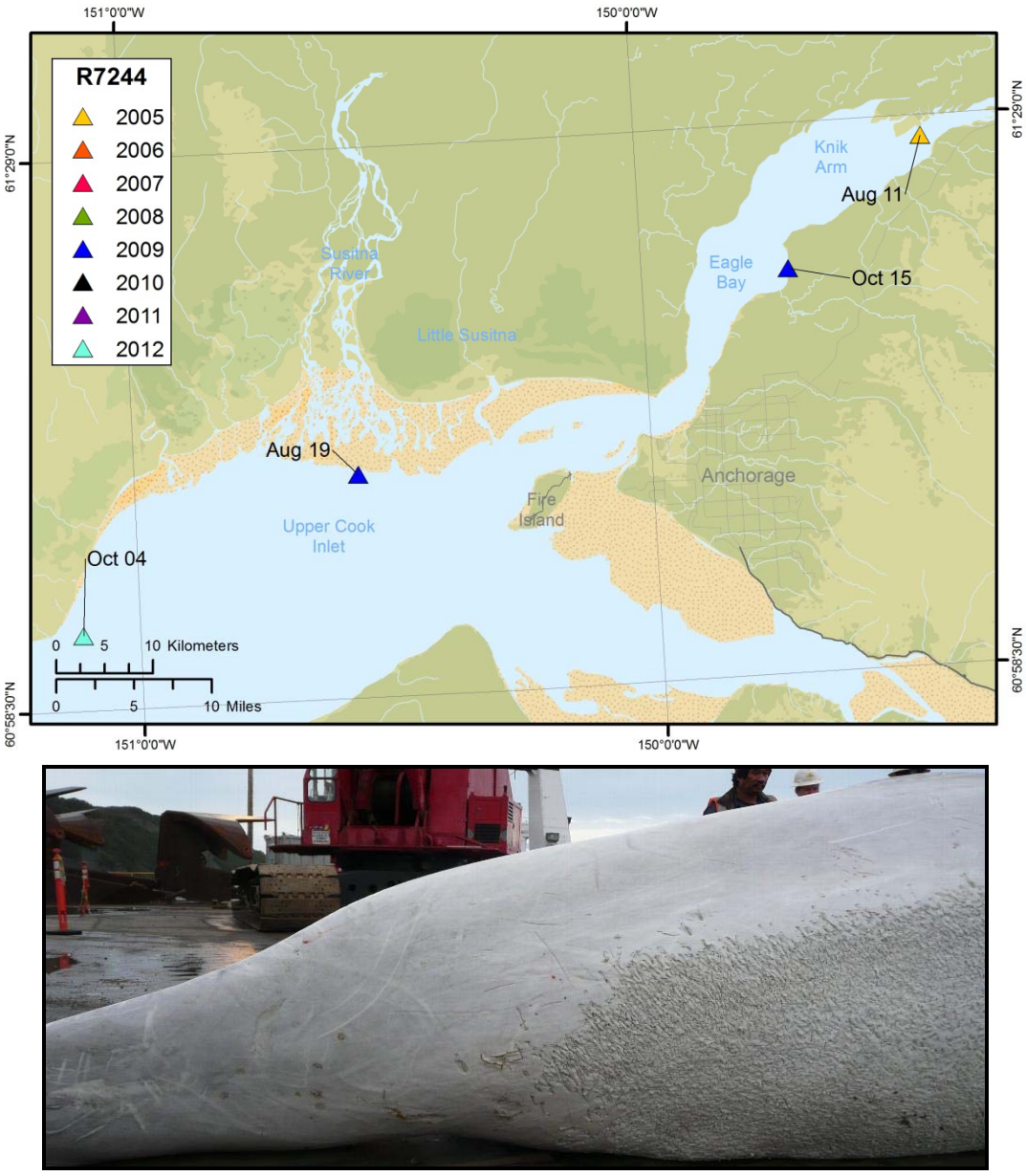

Figure 27. Sighting history and photograph of beluga R7244. This adult male was found dead in 2012 near Tyonek, and was necropsied in Nikiski.

Figure 28. Map showing place names given during incidental sighting reports for CIBWs 2011–2013.

Figure 29. This photograph demonstrates the difficulty in assigning maternity based on physical proximity and differences in relative color and size. The middle animal has been classified as the mother of the small calf in the foreground; it is possible the white animal is the grandmother. It is also possible this is a photograph of a mother (white whale in background) and young calf (foreground) with an older sibling (middle).

APPENDIX A

BELUGA WHALE GROUPS ENCOUNTERED DURING SURVEYS CONDUCTED IN THE WATERS OF THE KENAI PENINSULA BOROUGH

DAILY SURVEY TRACKS AND LOCATIONS OF WHALES,

2011–2013 FIELD SEASONS

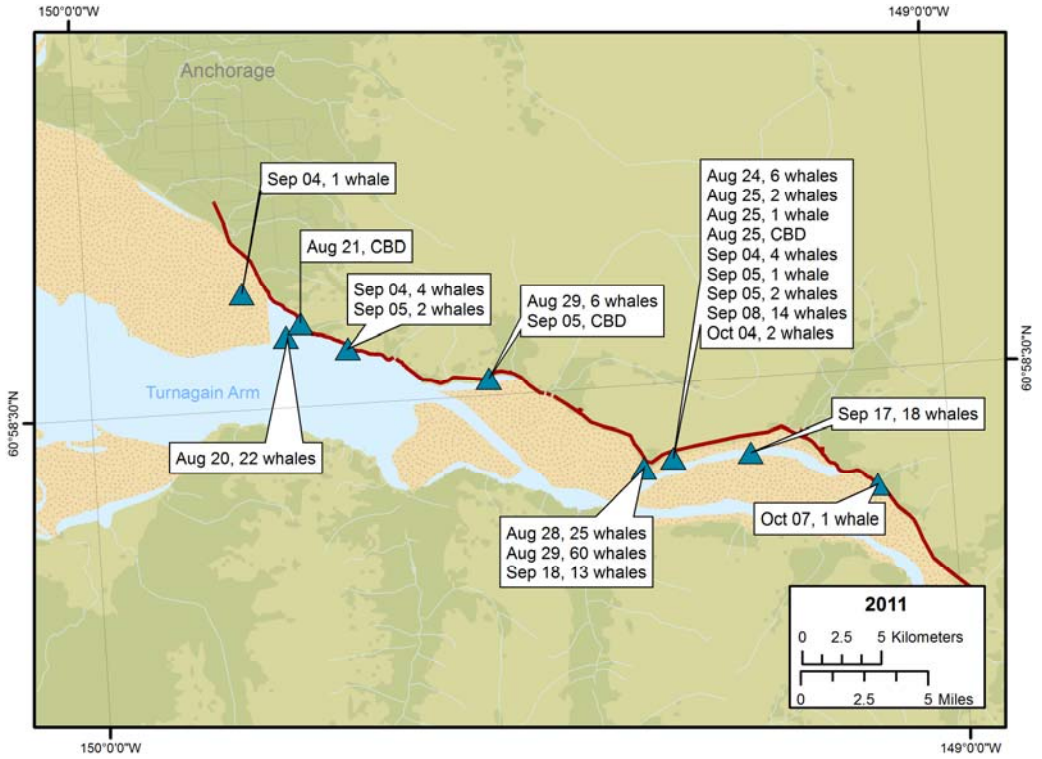

Figure A1. Route and beluga whale group(s) encountered and general survey route of all 2011 land-based surveys along Turnagain Arm, Upper Cook Inlet, Alaska.

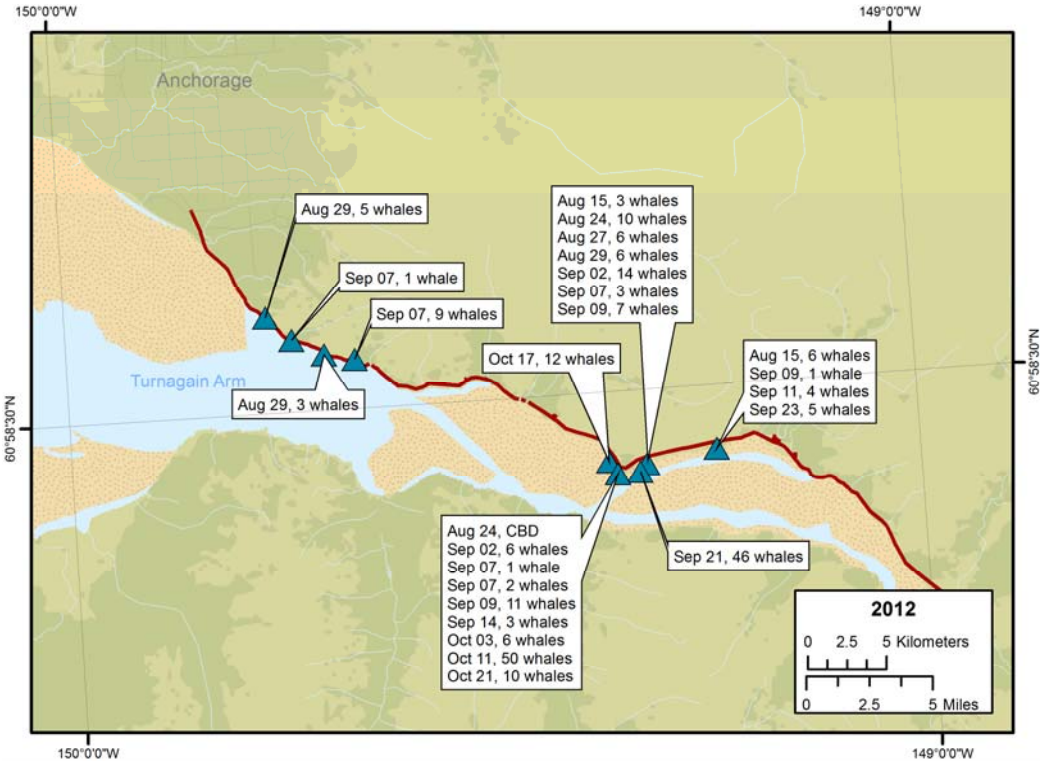

Figure A2. Route and beluga whale group(s) encountered and general survey route of all 2012 land-based surveys along Turnagain Arm, Upper Cook Inlet, Alaska.

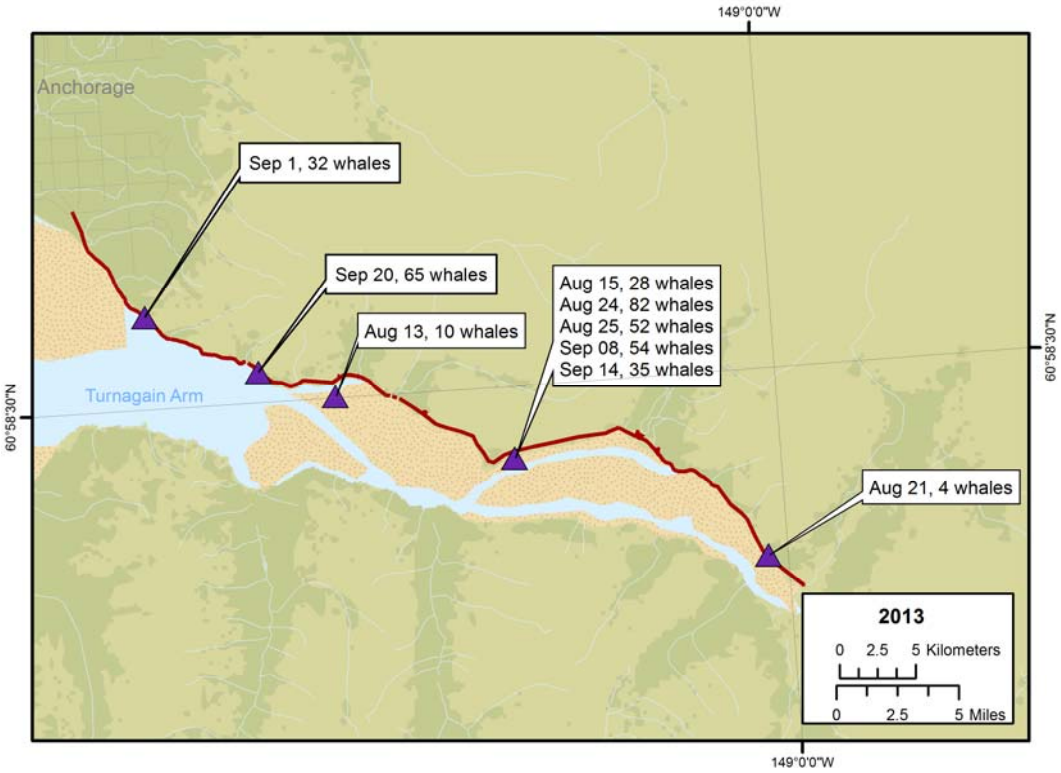

Figure A3. Route and beluga whale group(s) encountered and general survey route of all 2013 land-based surveys along Turnagain Arm, Upper Cook Inlet, Alaska.

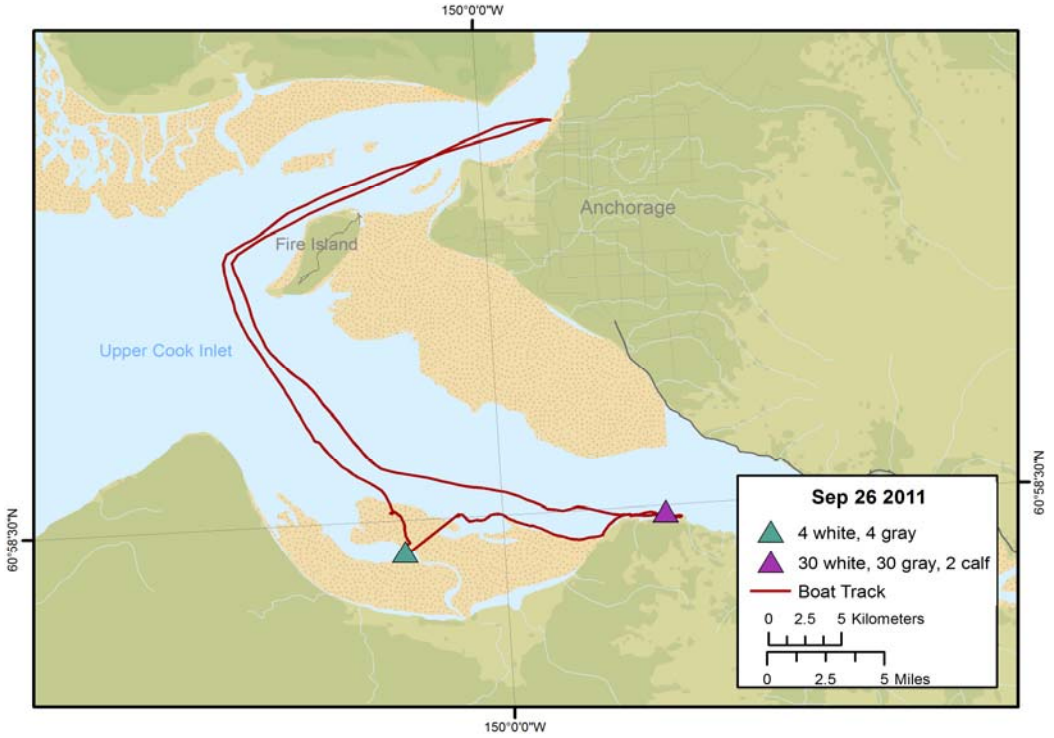

Figure A4. Route and beluga whale group(s) encountered during the vessel-based survey route of September 26, 2011 in Chickaloon Bay, Upper Cook Inlet, Alaska.

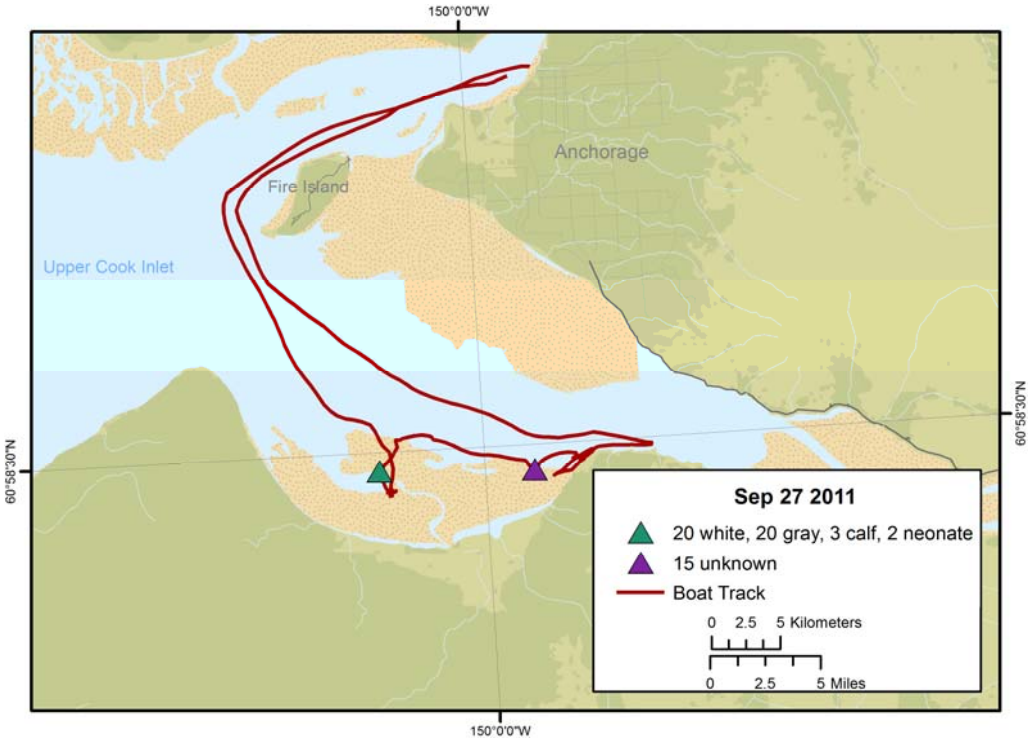

Figure A5. Route and beluga whale group(s) encountered during the vessel-based survey route of September 27, 2011 in Chickaloon Bay, Upper Cook Inlet, Alaska.

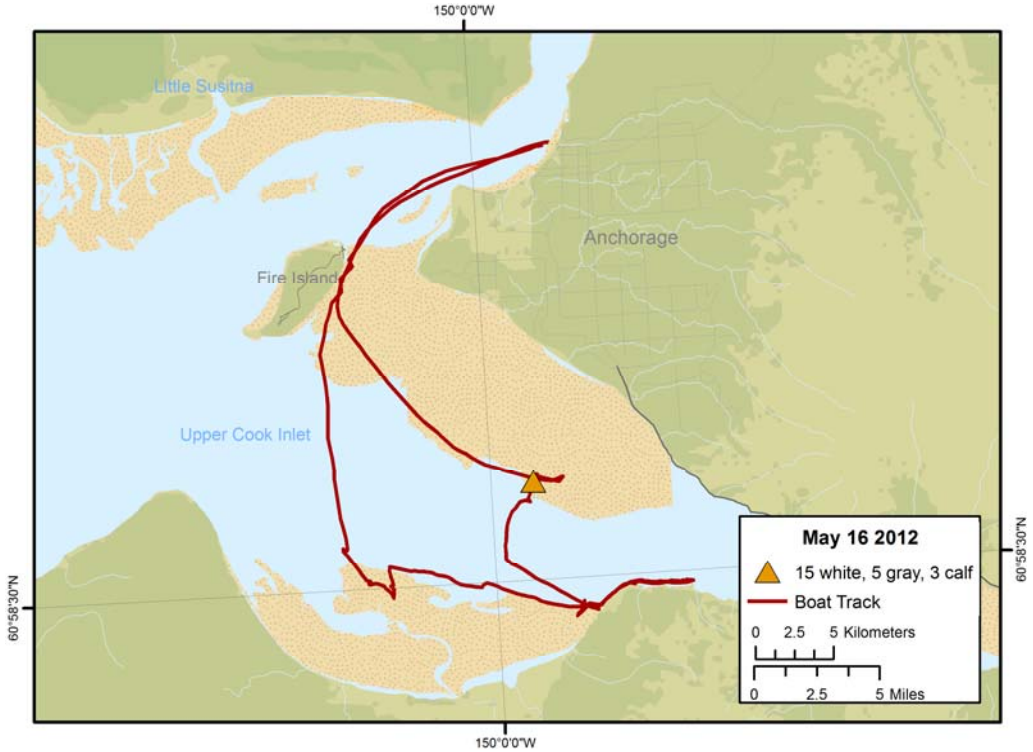

Figure A6. Route and beluga whale group(s) encountered during the vessel-based survey route of May 16, 2012 in Chickaloon Bay, Upper Cook Inlet, Alaska.

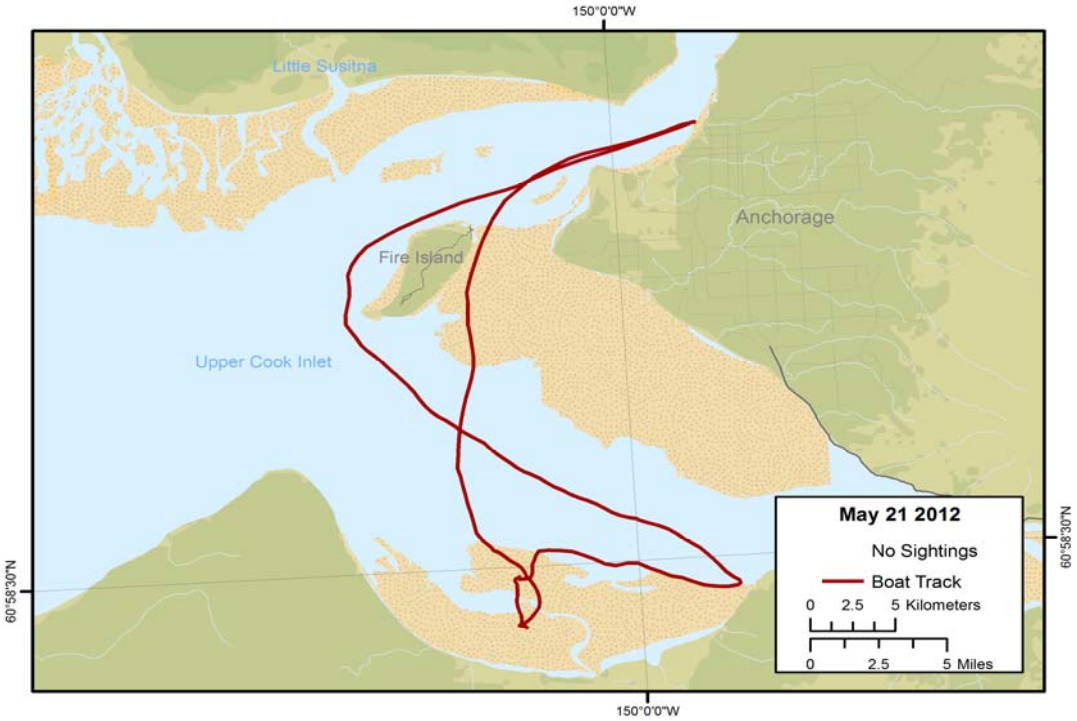

Figure A7. Route and beluga whale group(s) encountered during the vessel-based survey route of May 21, 2012 in Chickaloon Bay, Upper Cook Inlet, Alaska.

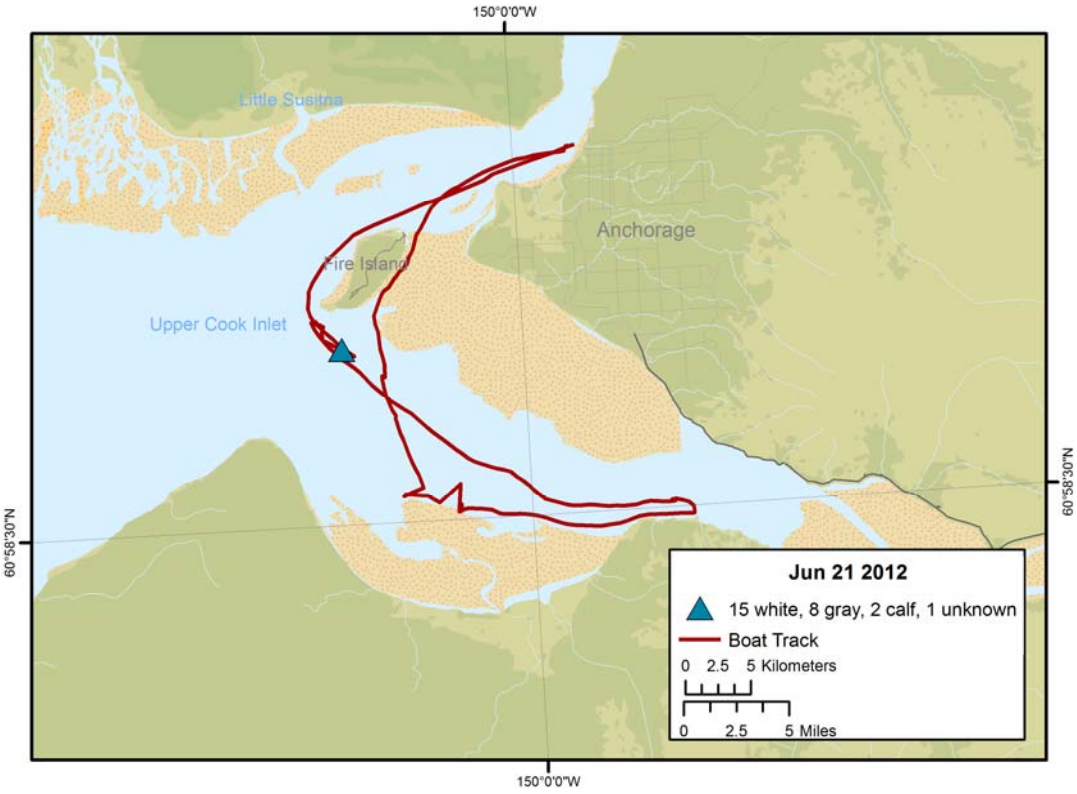

Figure A8. Route and beluga whale group(s) encountered during the vessel-based survey route of June 21, 2012 in Chickaloon Bay, Upper Cook Inlet, Alaska.

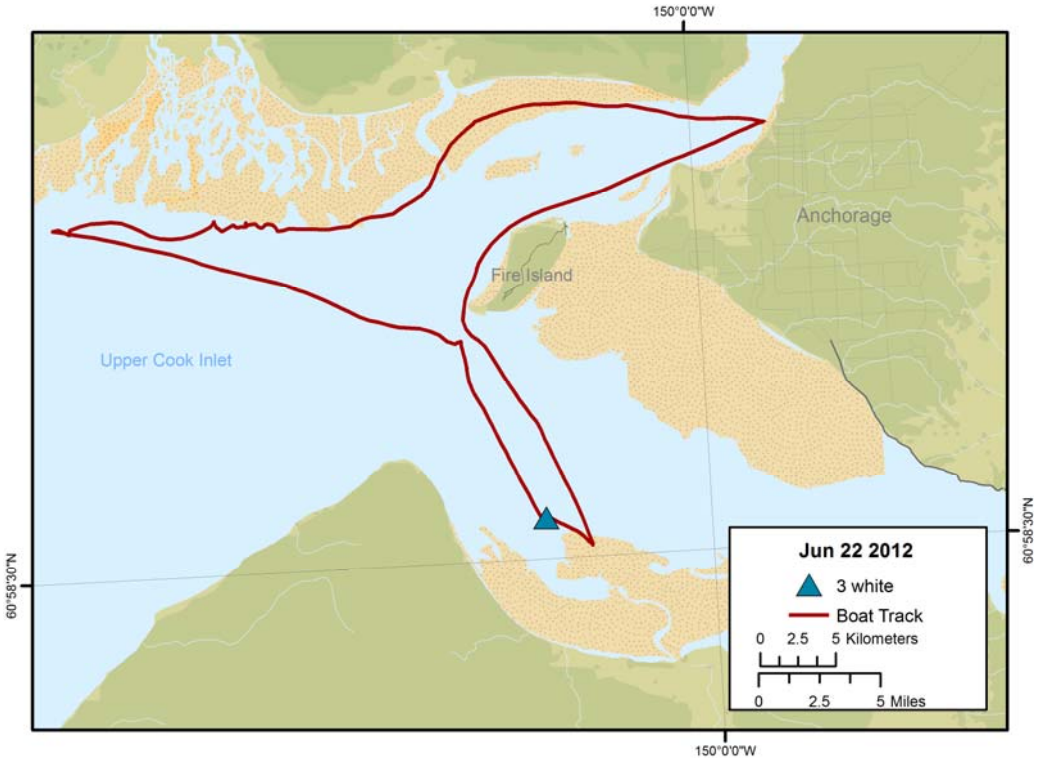

Figure A9. Route and beluga whale group(s) encountered during the vessel-based survey route of June 22, 2012 in Chickaloon Bay, Upper Cook Inlet, Alaska.

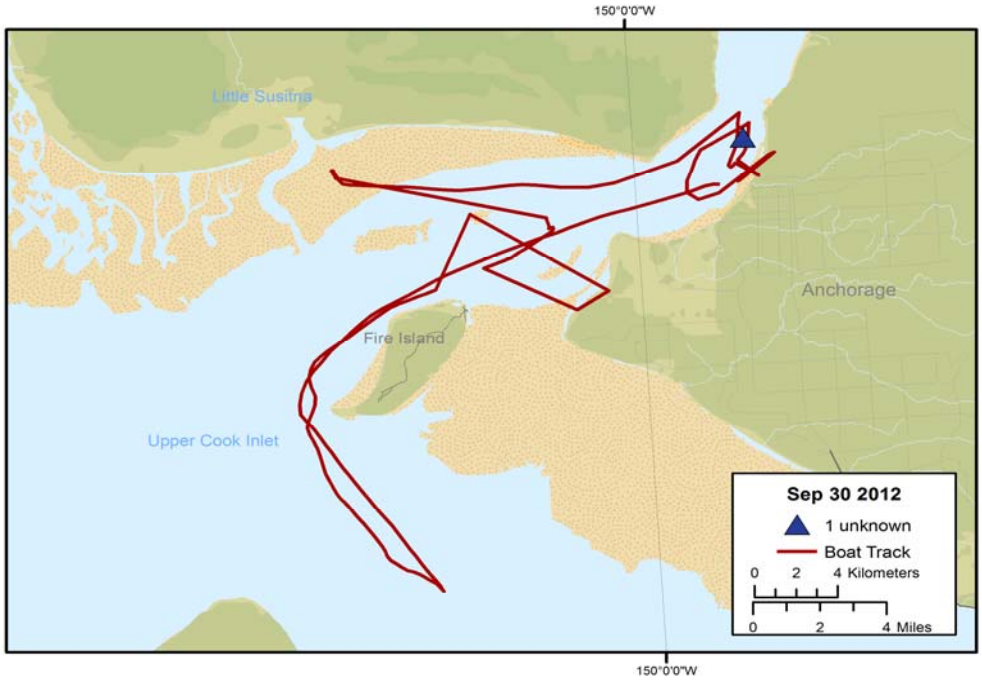

Figure A10. Route and beluga whale group(s) encountered during the vessel-based survey route of September 30, 2012 in Chickaloon Bay, Upper Cook Inlet, Alaska.

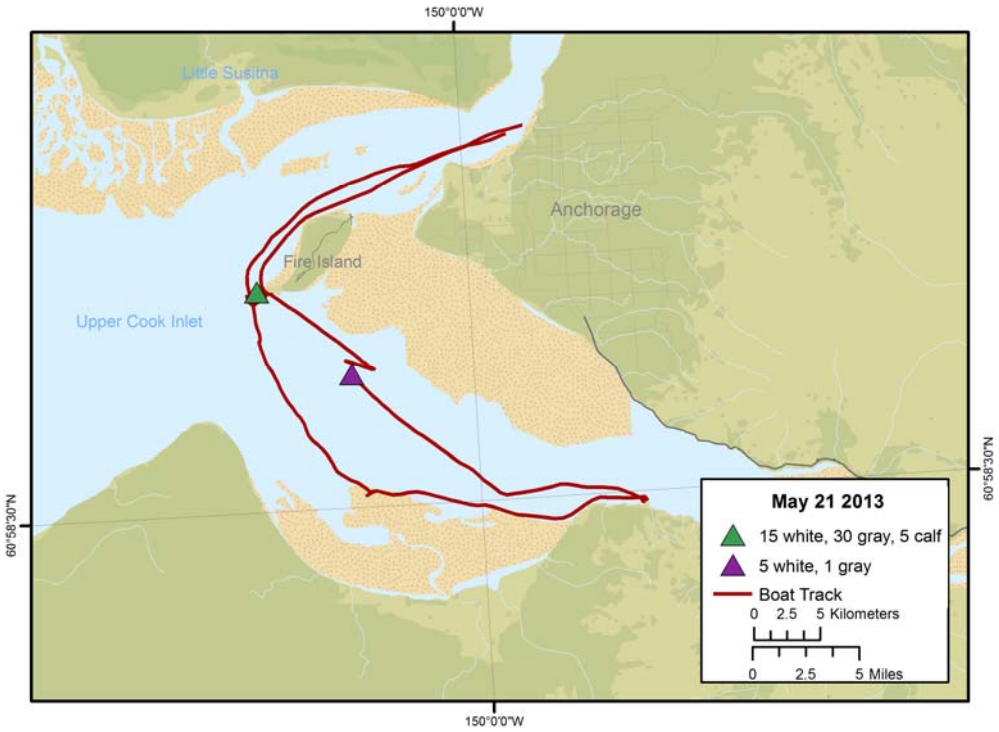

Figure A11. Route and beluga whale group(s) encountered during the vessel-based survey route of May 21, 2013 in Chickaloon Bay, Upper Cook Inlet, Alaska.

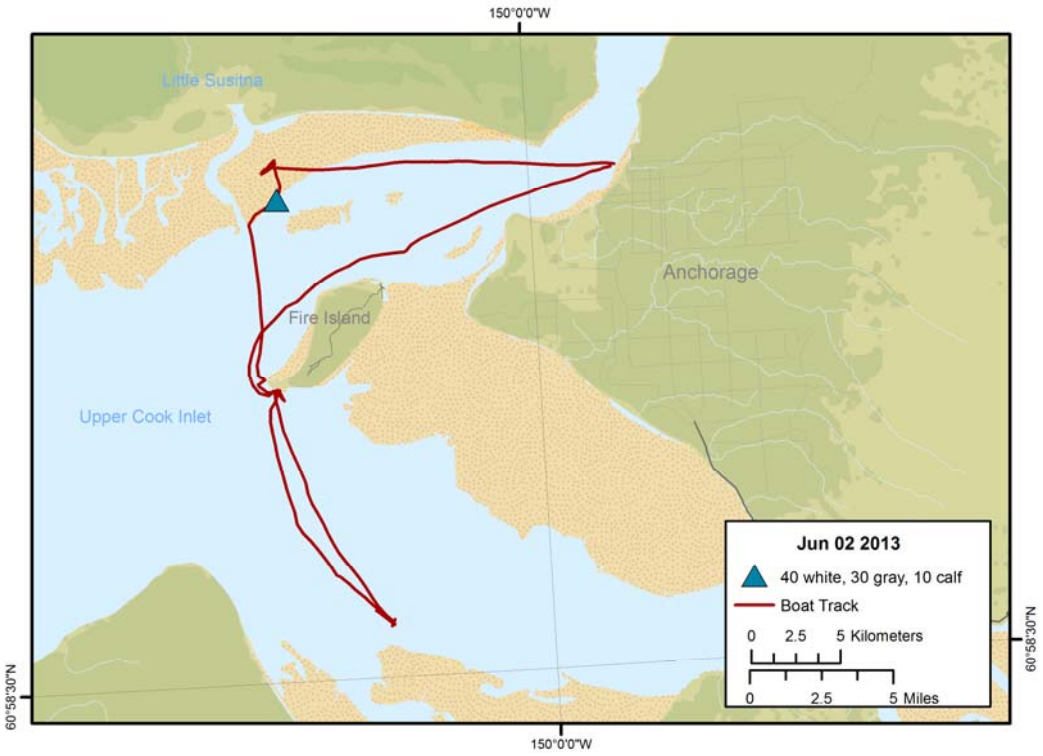

Figure A12. Route and beluga whale group(s) encountered during the vessel-based survey route of June 02, 2013 in Chickaloon Bay, Upper Cook Inlet, Alaska.

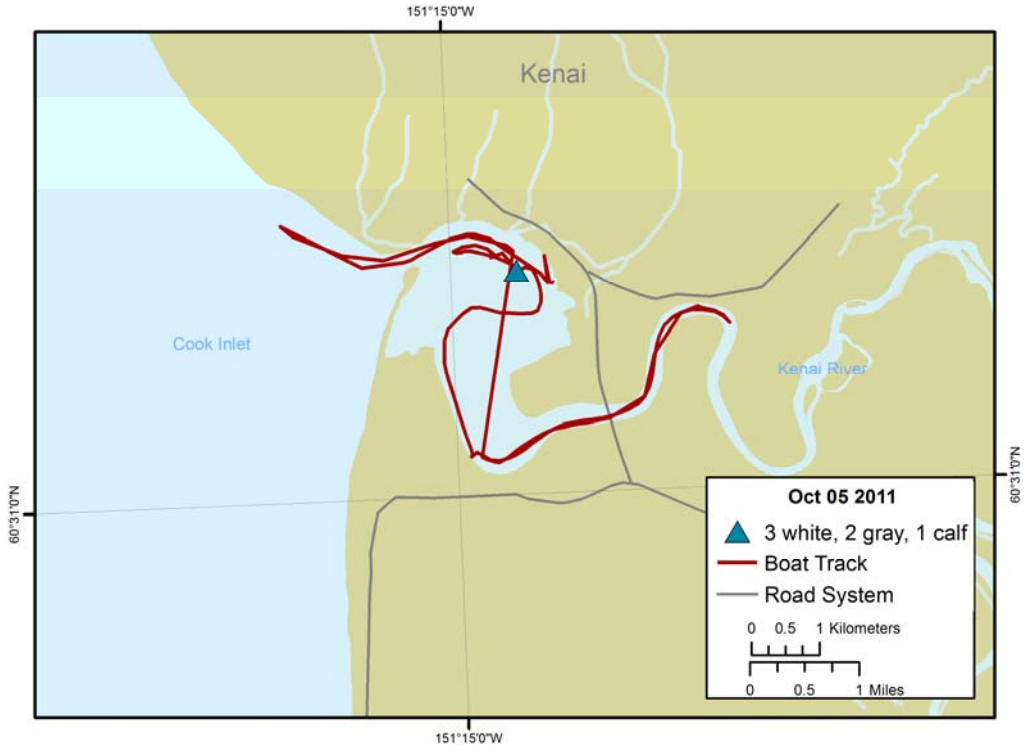

Figure A13. Route and beluga whale group(s) encountered during the survey route of October 05, 2011 in the Kenai River, Cook Inlet, Alaska.

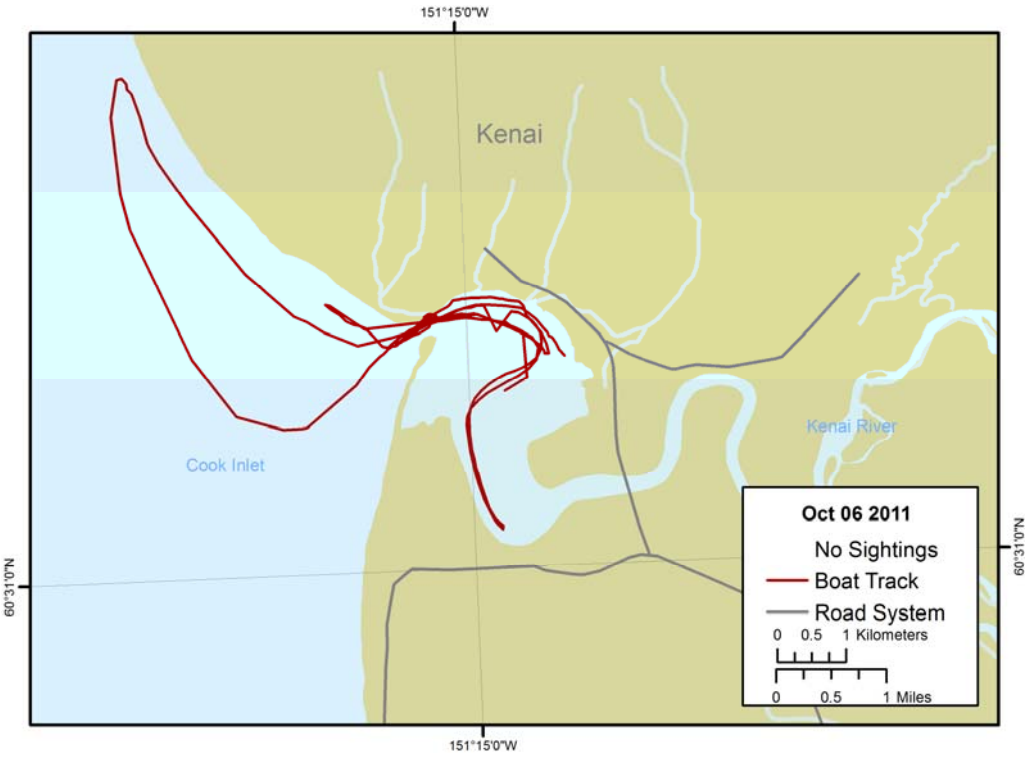

Figure A14. Route and beluga whale group(s) encountered during the survey route of October 06, 2011 in the Kenai River, Cook Inlet, Alaska.

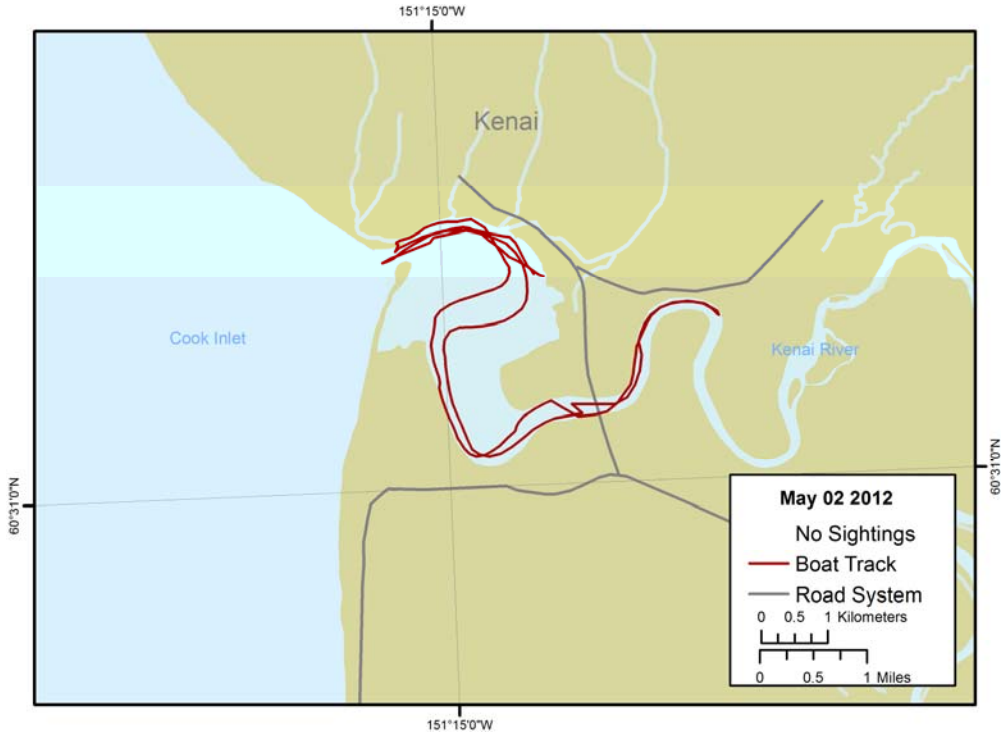

Figure A15. Route and beluga whale group(s) encountered during the survey route of May 02, 2012 in the Kenai River, Cook Inlet, Alaska.

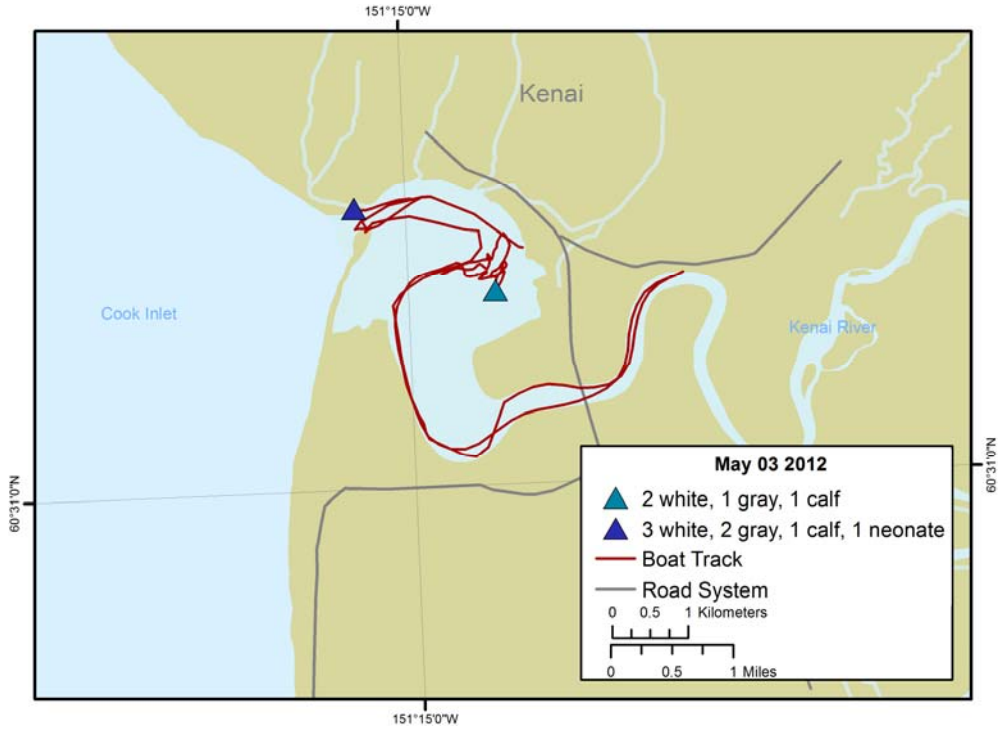

Figure A16. Route and beluga whale group(s) encountered during the survey route of May 03, 2012 in the Kenai River, Cook Inlet, Alaska.

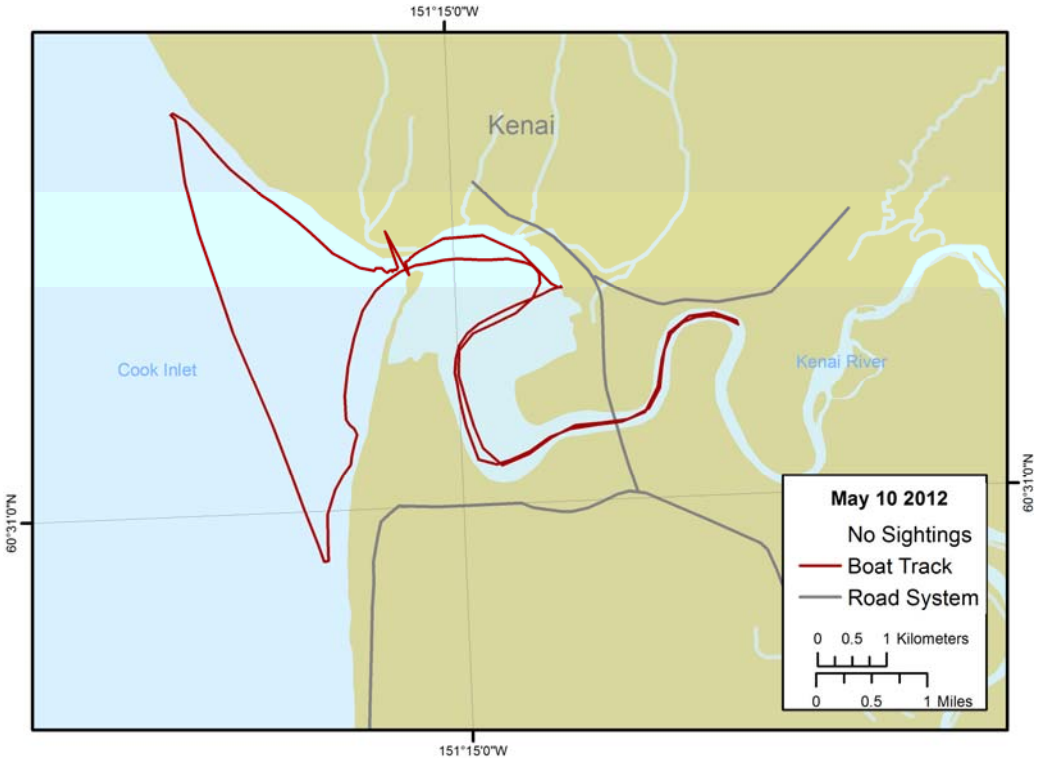

Figure A17. Route and beluga whale group(s) encountered during the survey route of May 10, 2012 in the Kenai River, Cook Inlet, Alaska.

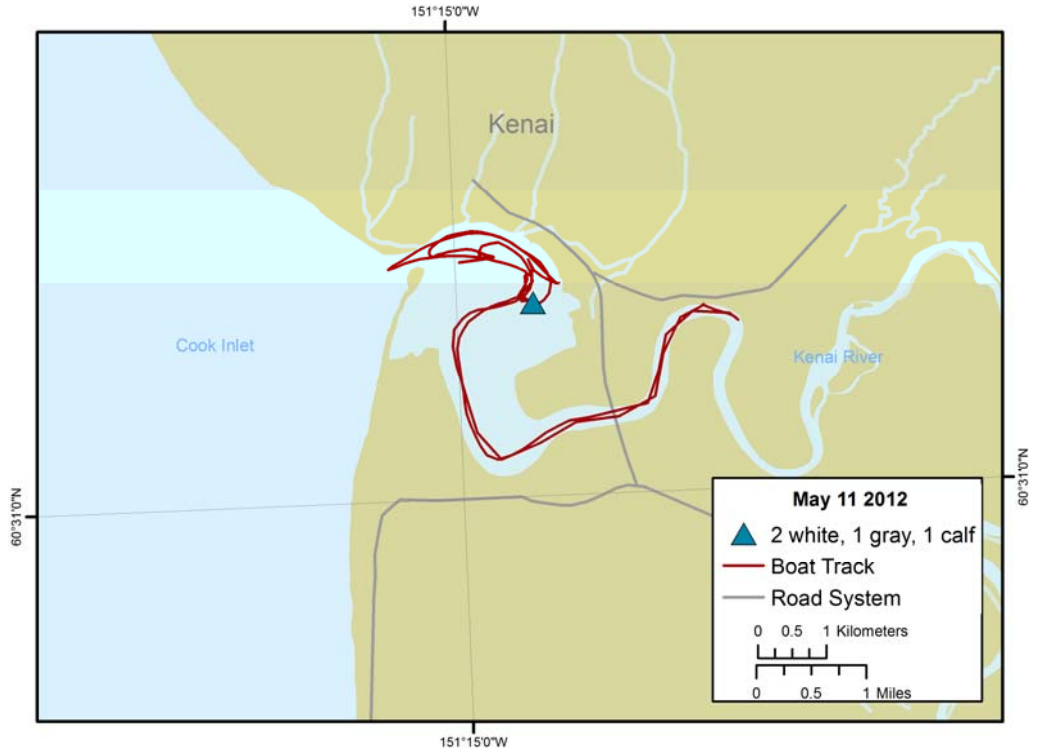

Figure A18. Route and beluga whale group(s) encountered during the survey route of May 11, 2012 in the Kenai River, Cook Inlet, Alaska.

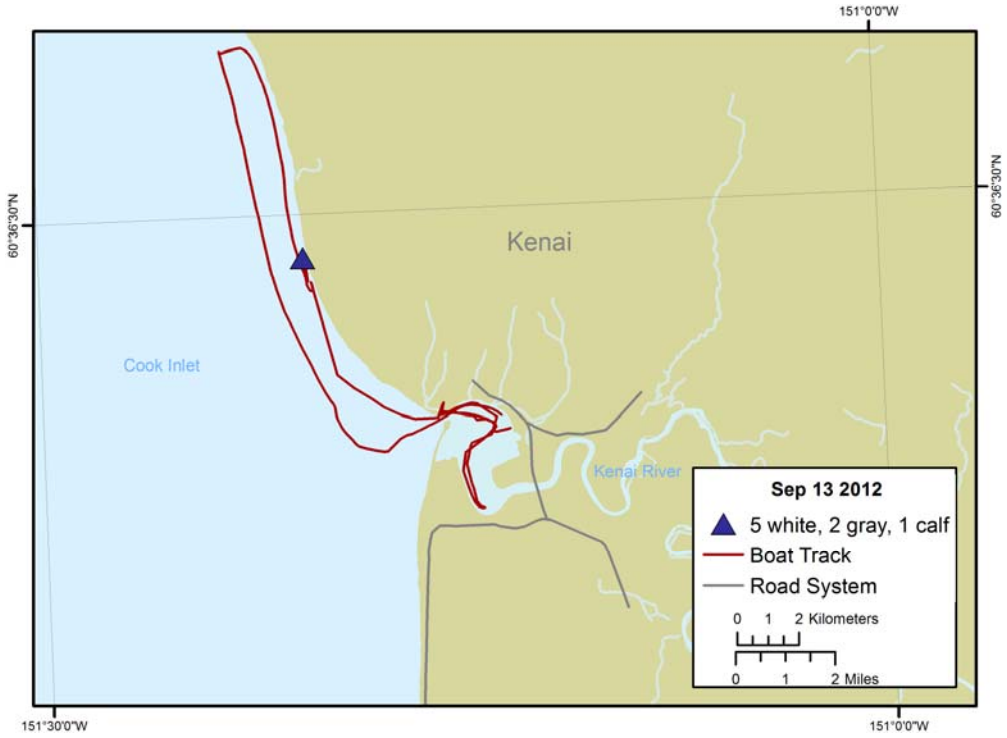

Figure A19. Route and beluga whale group(s) encountered during the survey route of September 13, 2012 in the Kenai River, Cook Inlet, Alaska.

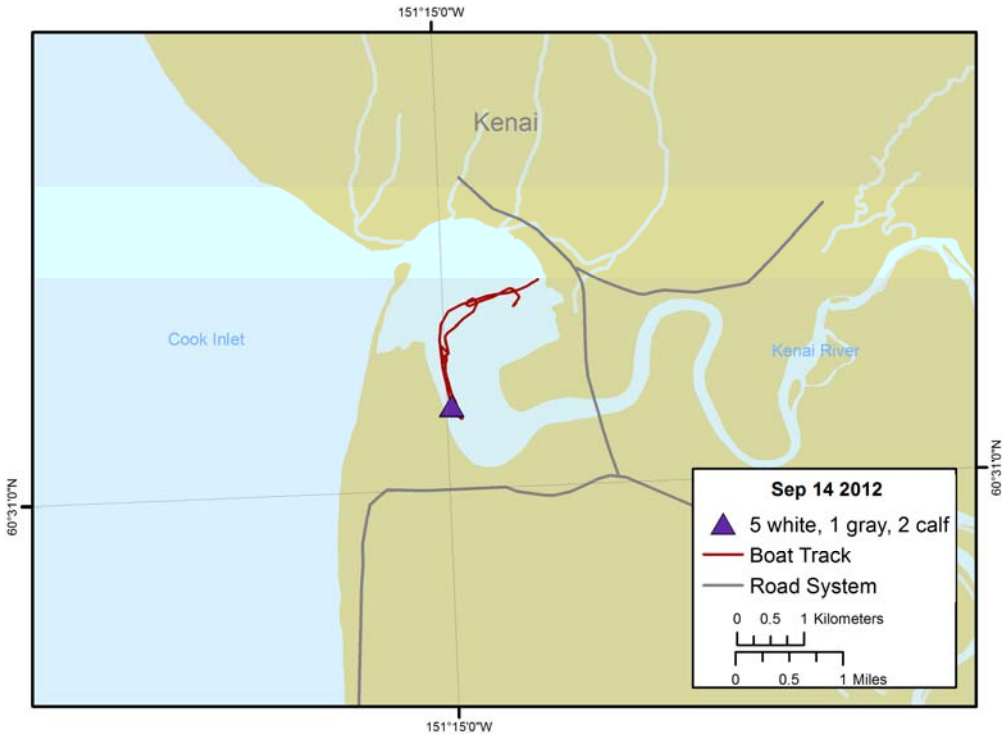

Figure A20. Route and beluga whale group(s) encountered during the survey route of September 14, 2012 in the Kenai River, Cook Inlet, Alaska.

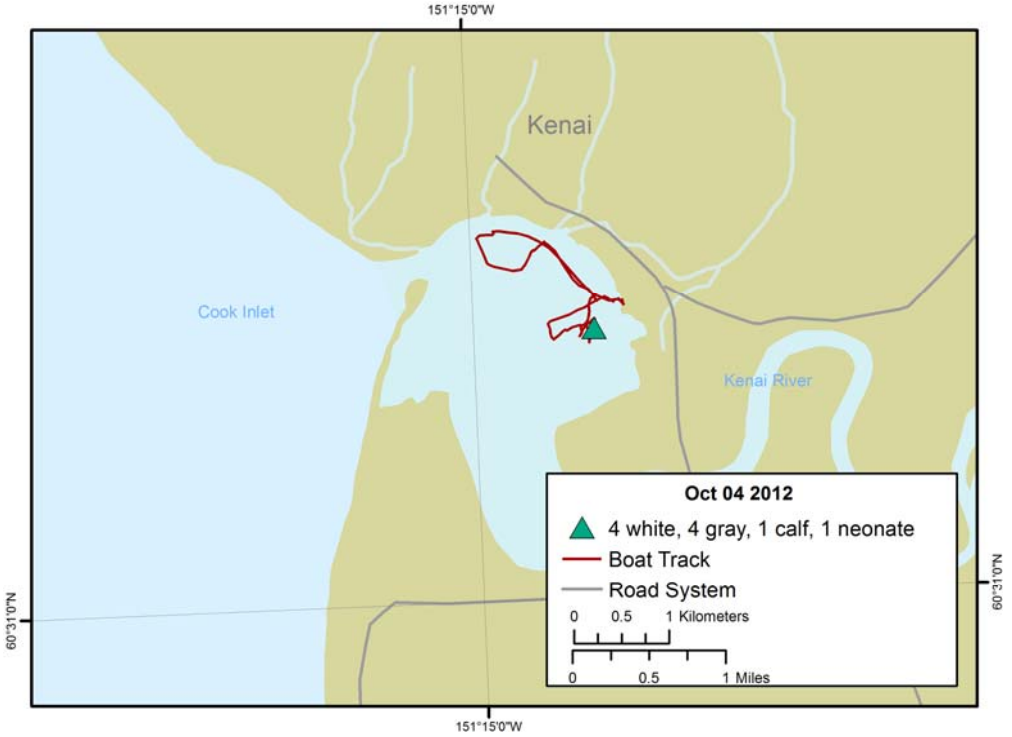

Figure A21. Route and beluga whale group(s) encountered during the survey route of October 04, 2012 in the Kenai River, Cook Inlet, Alaska.

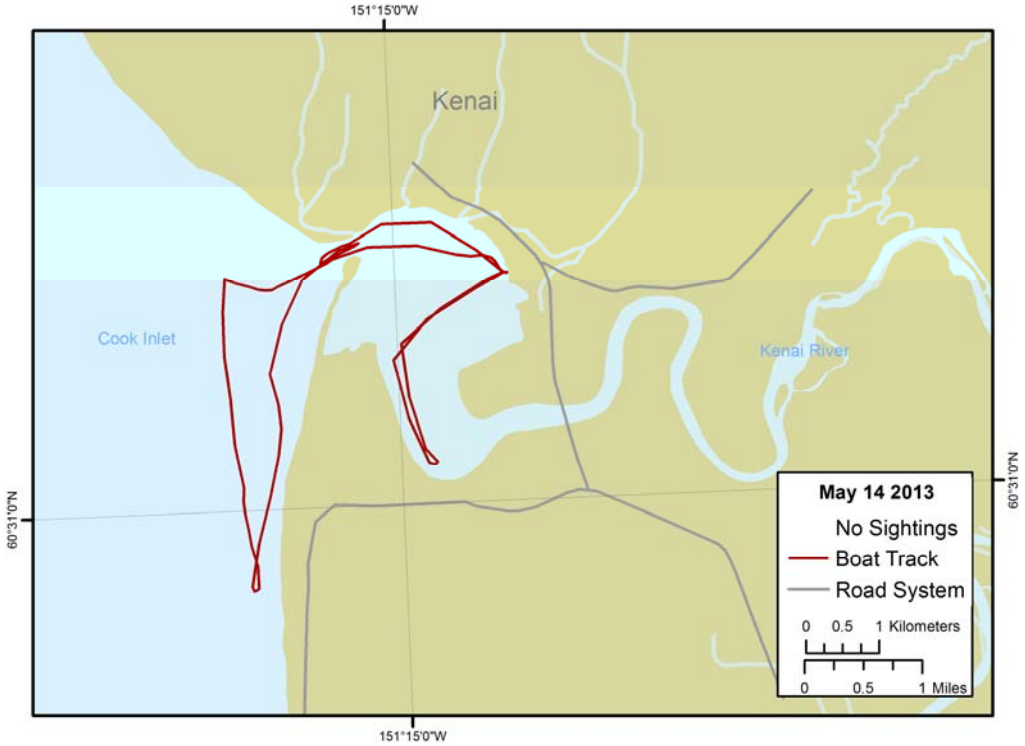

Figure A22. Route and beluga whale group(s) encountered during the survey route of May 14, 2013 in the Kenai River, Cook Inlet, Alaska.

APPENDIX B

SIGHTING-HISTORY AND RIGHT-SIDE PHOTOGRAPHS OF EIGHT INDIVIDUALLY-IDENTIFIED BELUGA WHALES PHOTOGRAPHED IN THE KENAI RIVER DELTA 2011–2013.

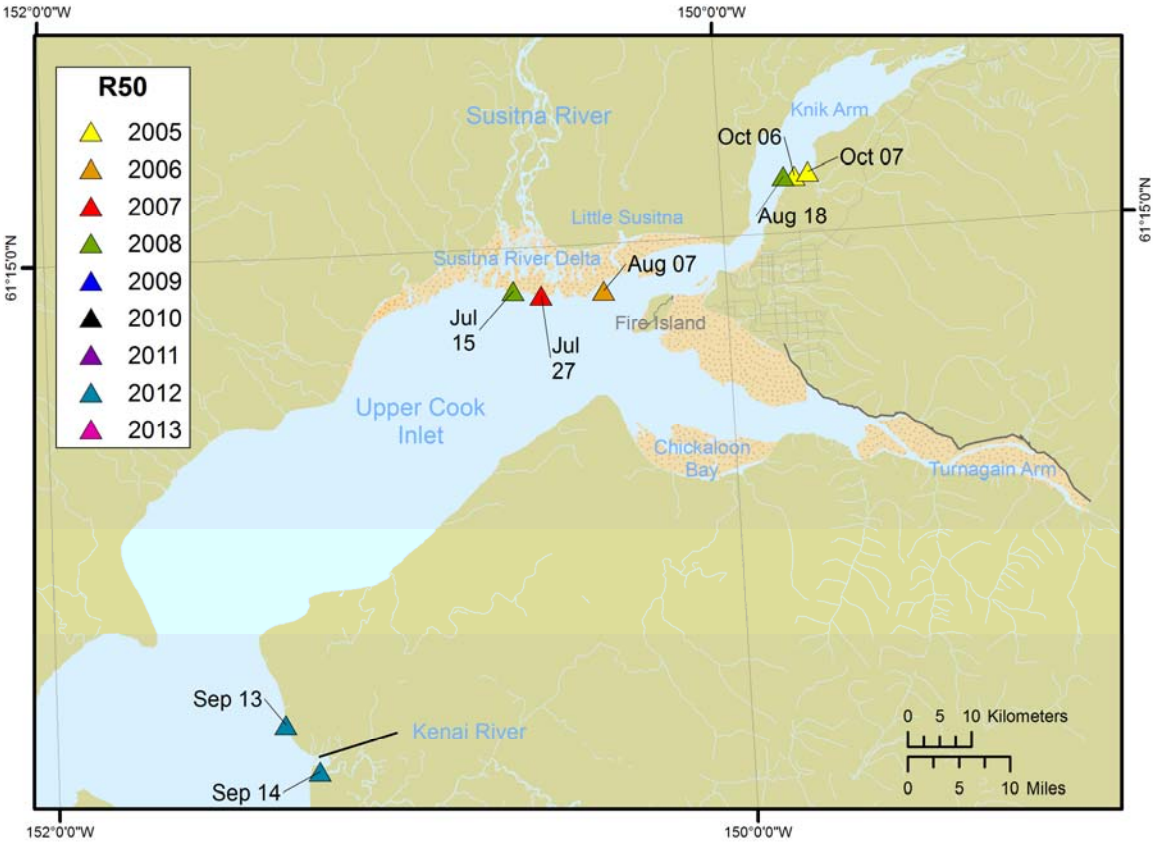

Figure B1. Sighting history and photograph of beluga R50, who was photographed in the Kenai River Delta in 2012. This beluga is a presumed mother based on photographs with an accompanying calf.

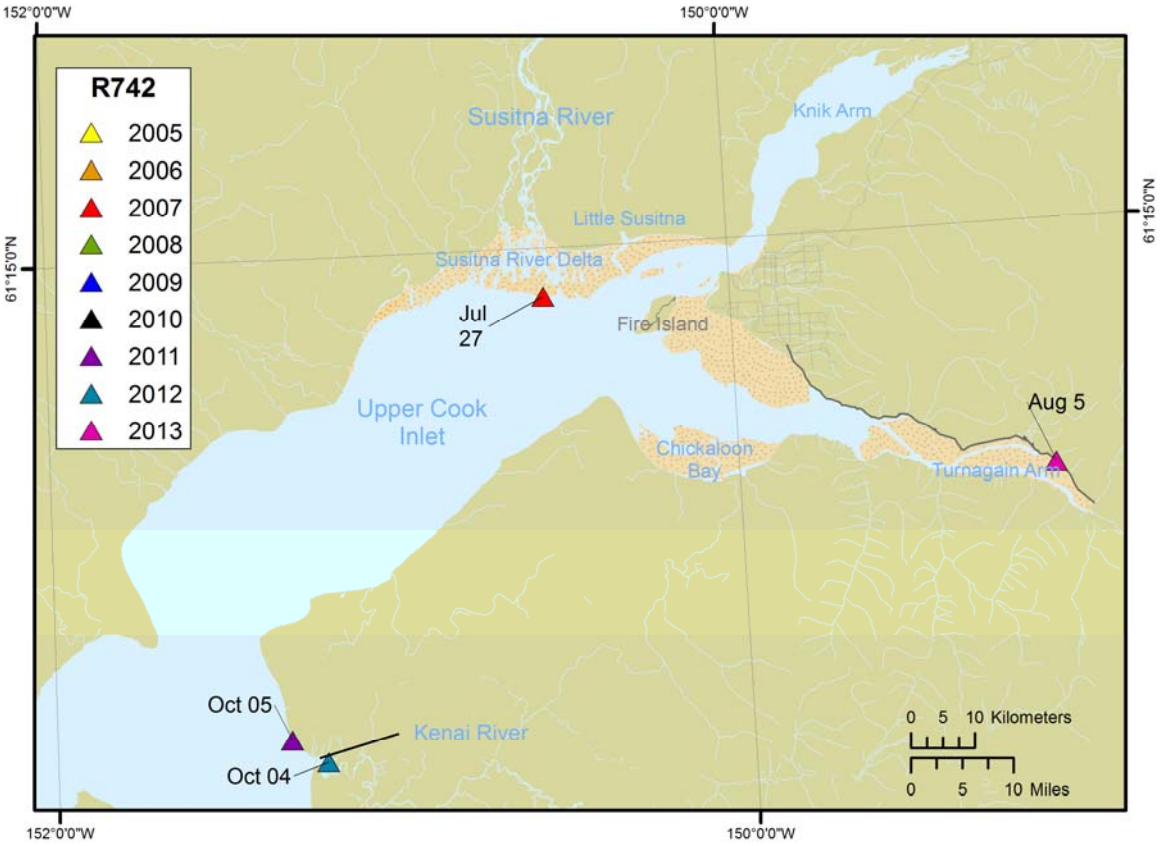

Figure B2. Sighting history and photograph of beluga R742, who was photographed in the Kenai River Delta in 2011 and 2012. This beluga is a presumed mother based on photographs with an accompanying calf.

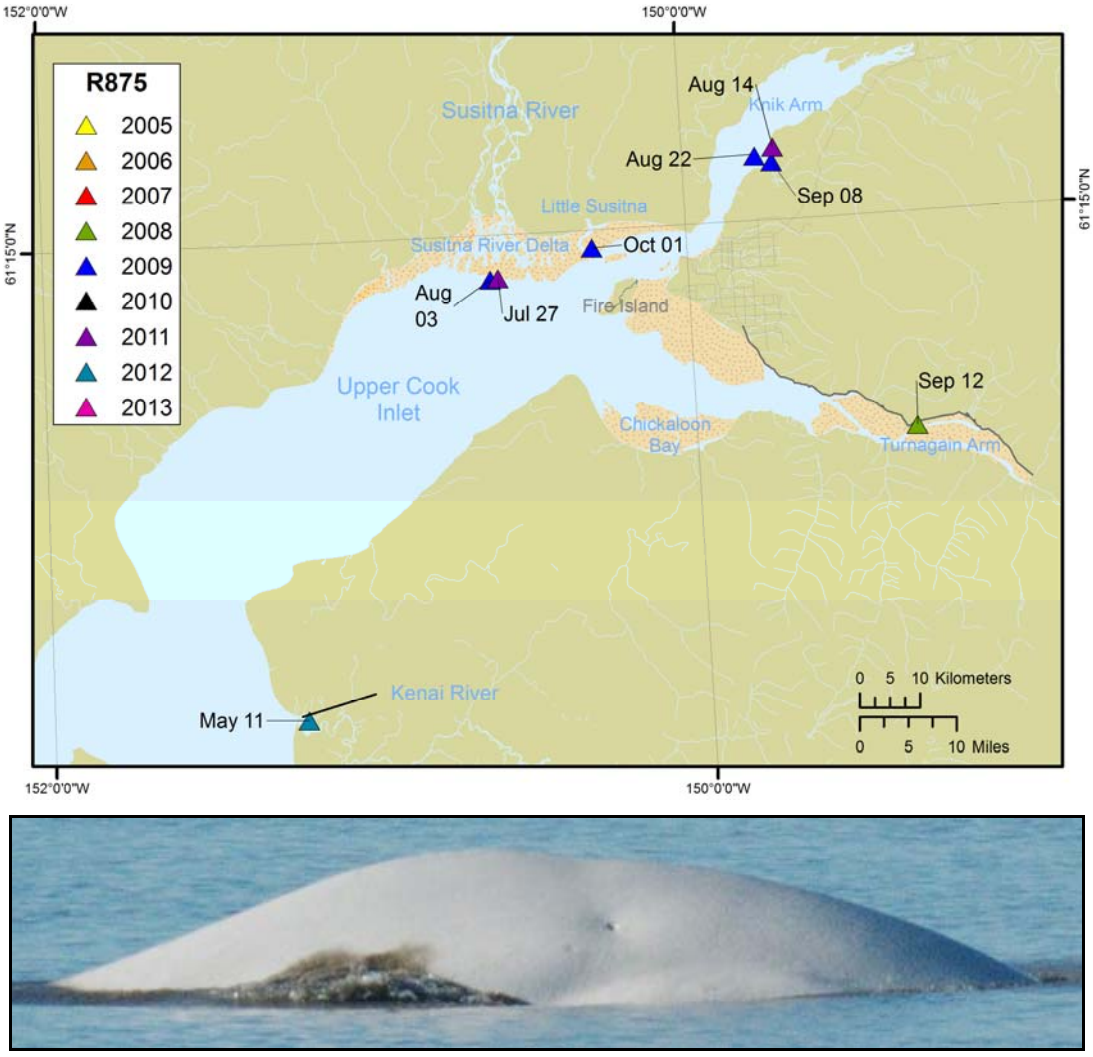

Figure B3. Sighting history and photograph of beluga R875, who was photographed in the Kenai River Delta in 2012. This beluga is a presumed mother based on photographs with an accompanying calf.

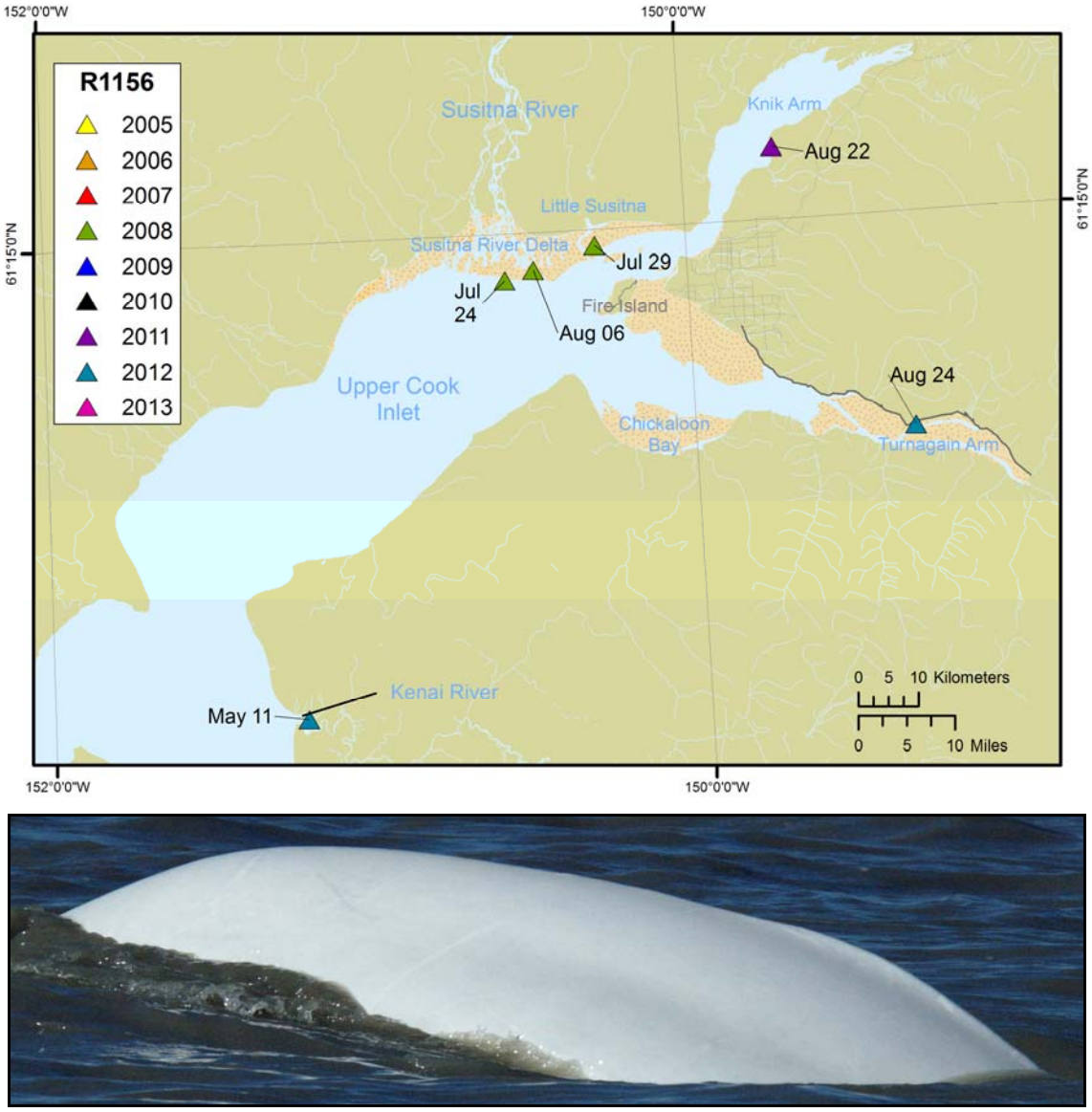

Figure B4. Sighting history and photograph of beluga R1156, who was photographed in the Kenai River Delta in 2012. This beluga is a presumed mother based on photographs with an accompanying calf.

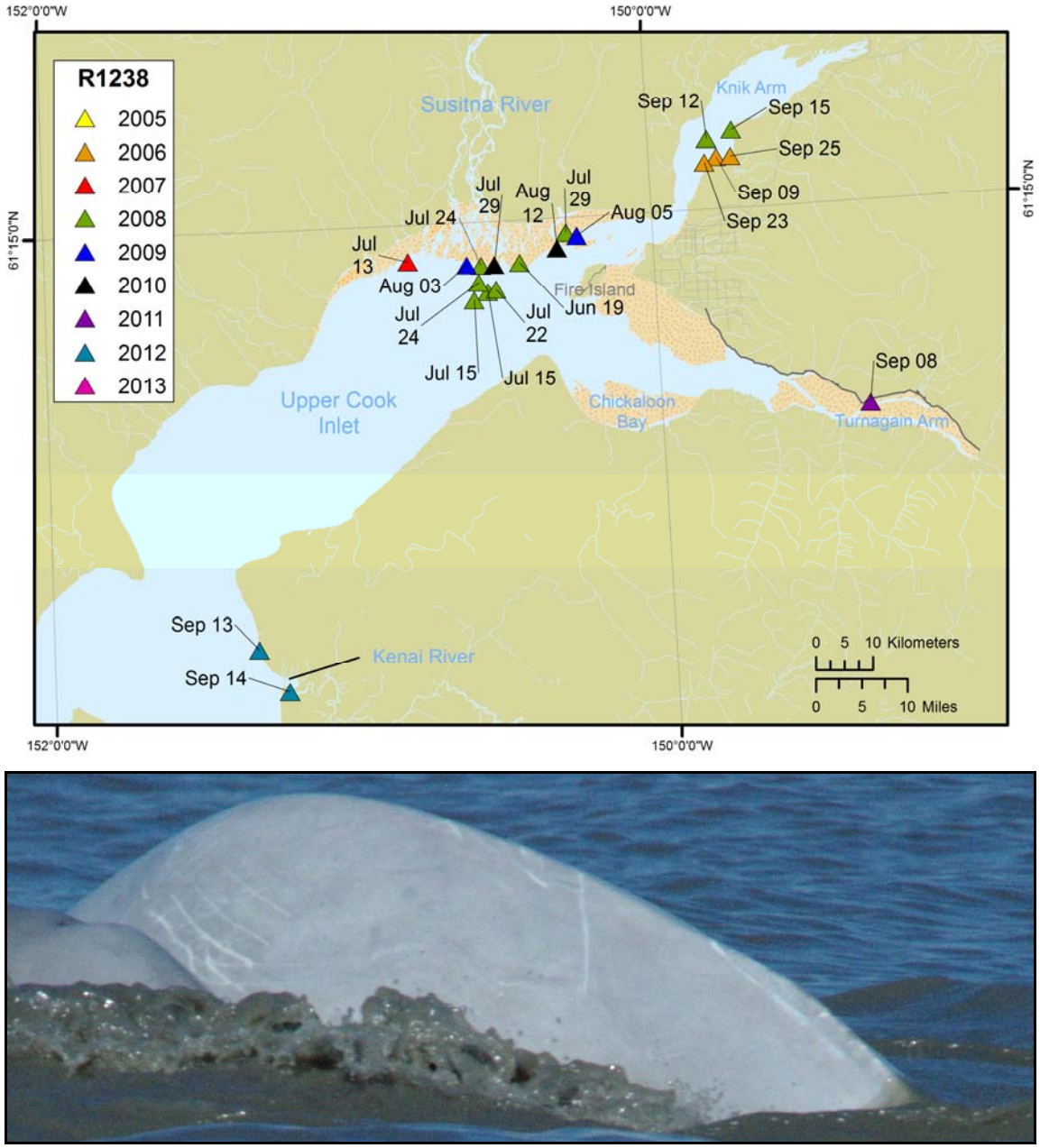

Figure B5. Sighting history and photograph of beluga R1238, who was photographed in the Kenai River Delta in 2012. This beluga is a presumed mother based on photographs with an accompanying calf.

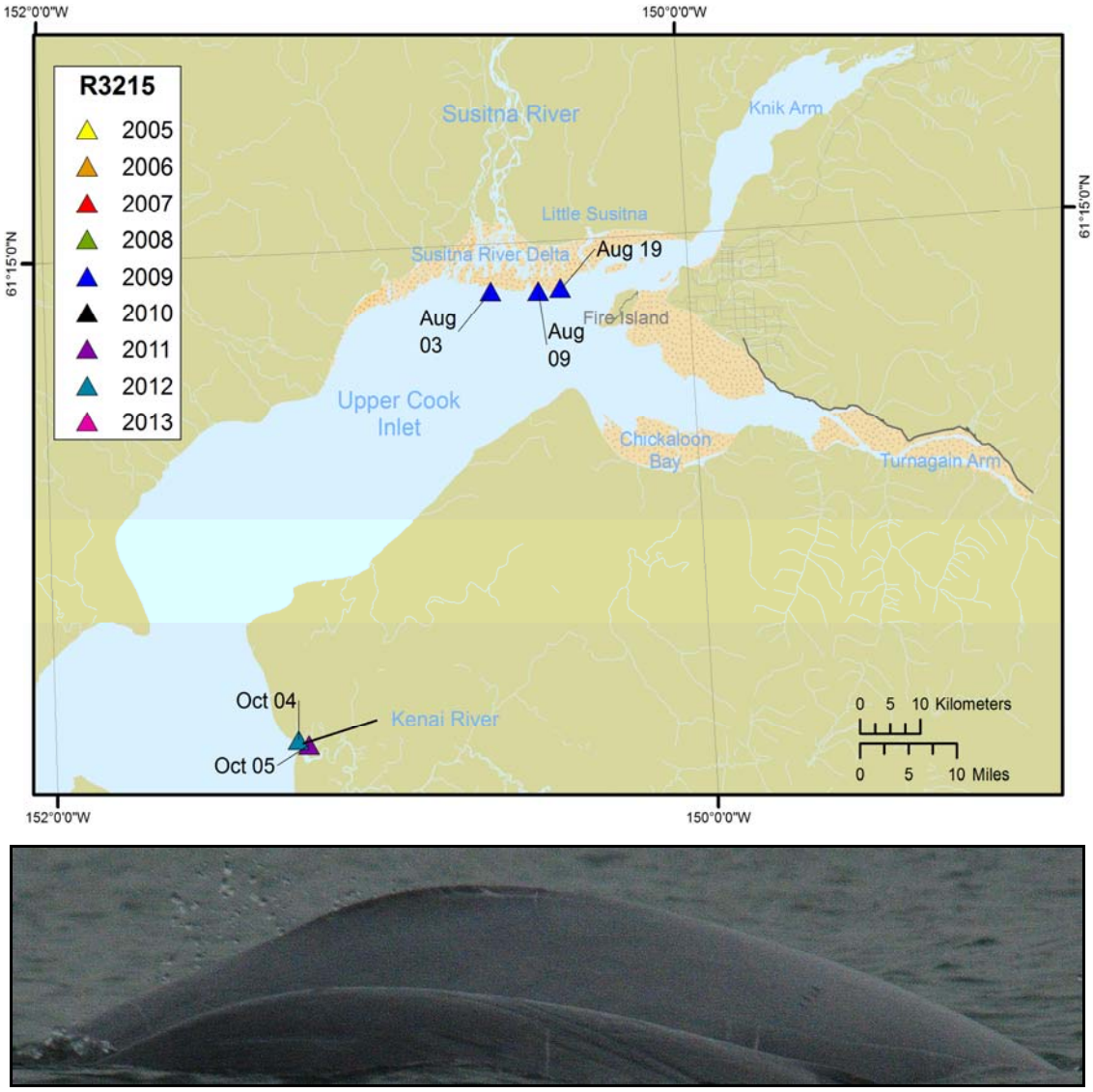

Figure B6. Sighting history and photograph of beluga R3215, who was photographed in the Kenai River Delta in 2011 and 2012. This beluga is a presumed mother based on photographs with an accompanying calf.

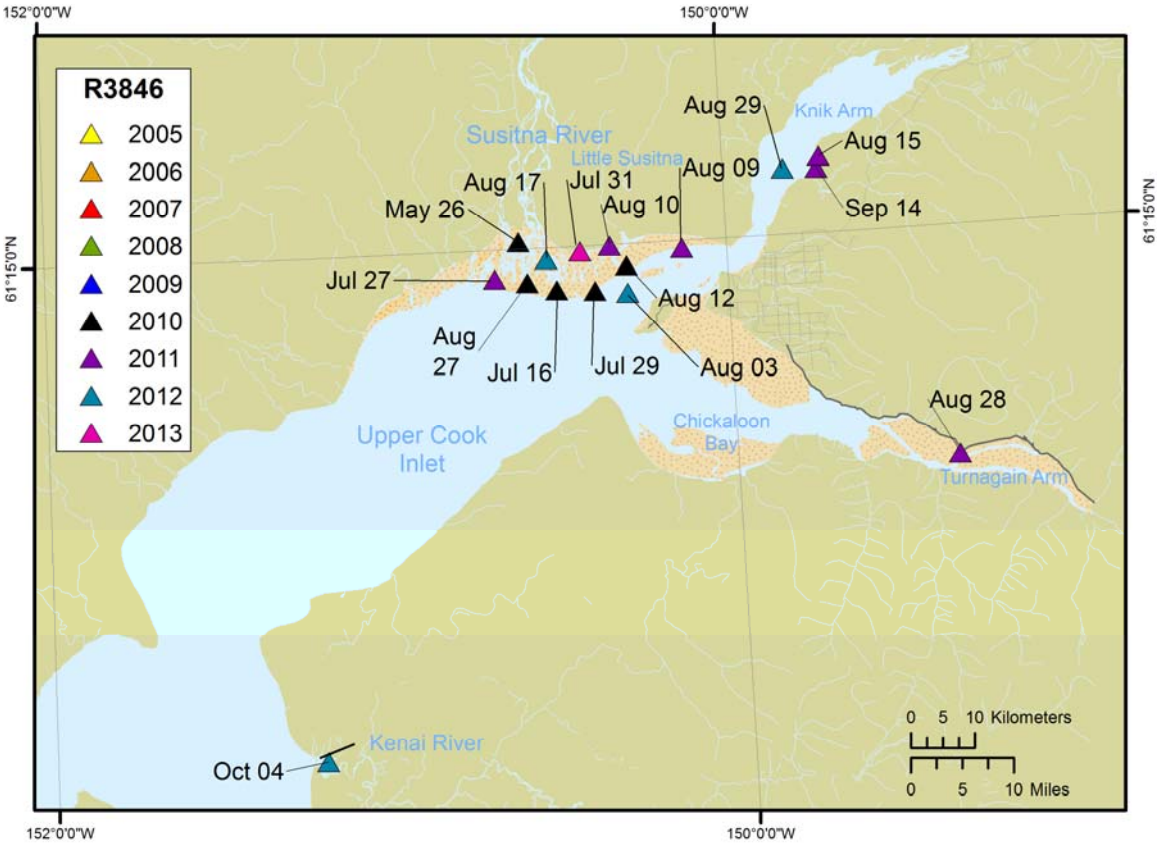

Figure B7. Sighting history and photograph of beluga R3846, who was photographed in the Kenai River Delta in 2011.

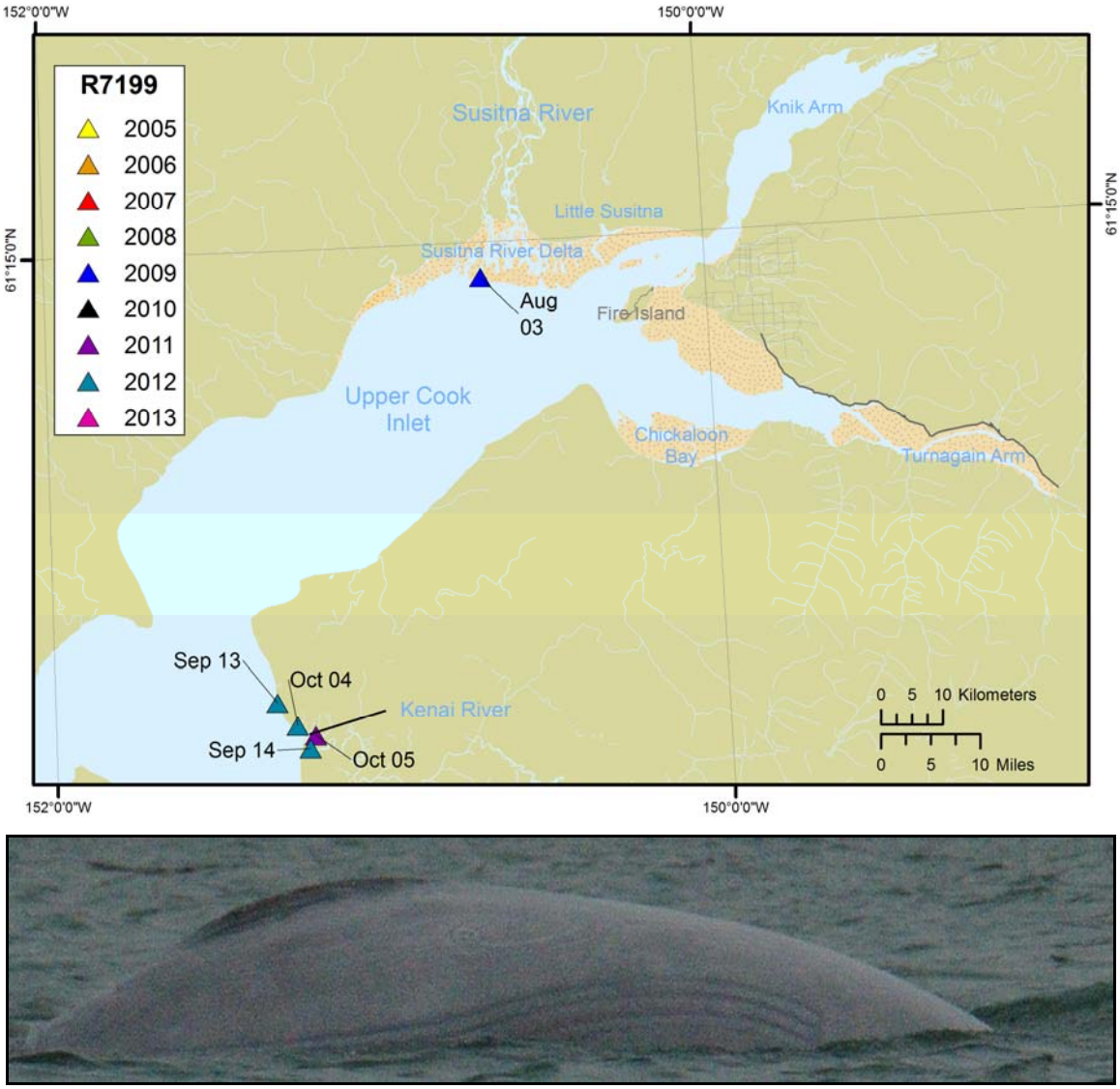

Figure B8. Sighting history and photograph of beluga R7199, who was photographed in the Kenai River Delta in 2011 and 2012.

APPENDIX C

SIGHTING-HISTORY AND RIGHT-SIDE PHOTOGRAPHS OF NINETEEN INDIVIDUALLY-IDENTIFIED BELUGA WHALES PHOTOGRAPHED IN CHICKALOON BAY/SOUTH FIRE ISLAND 2005–2013.

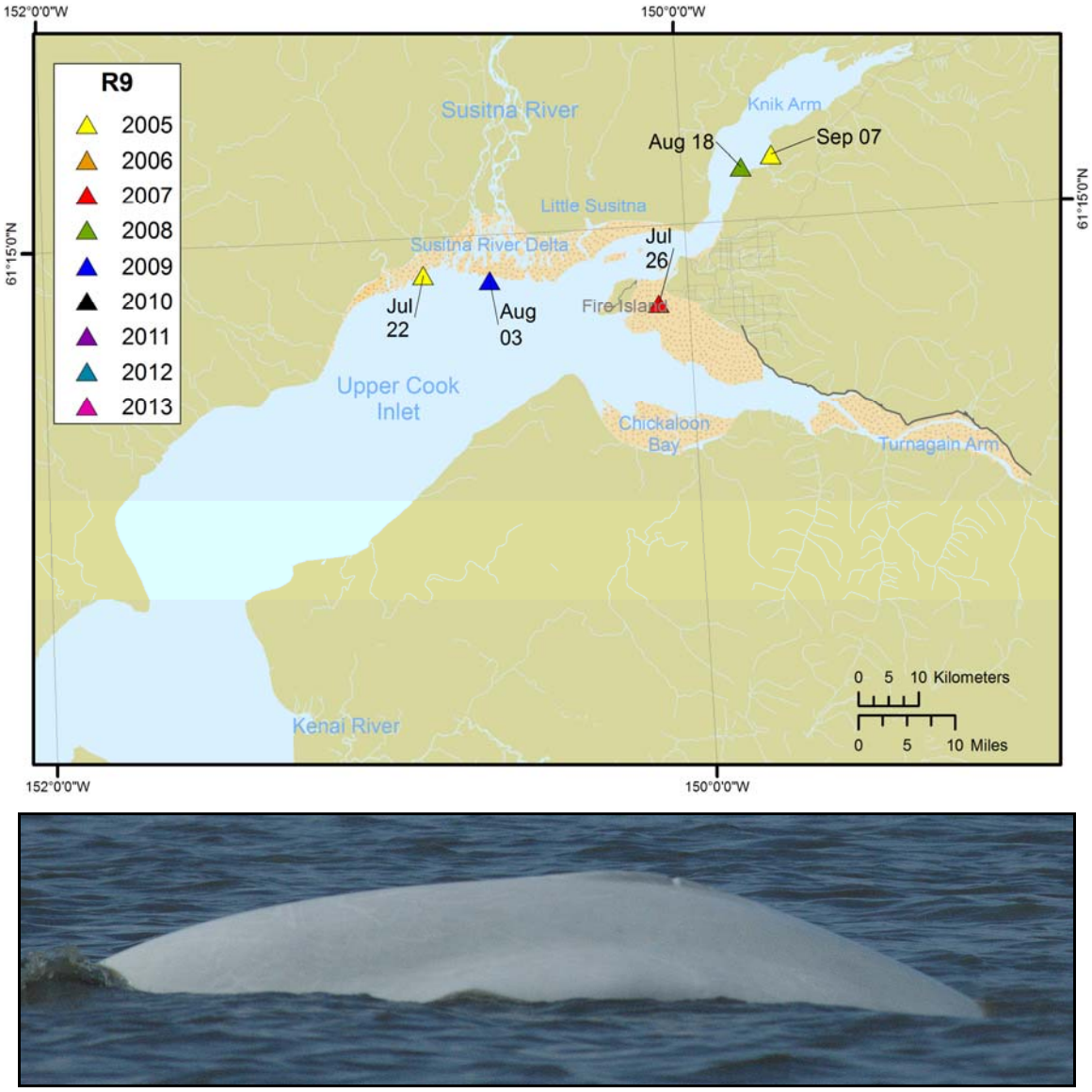

Figure C1. Sighting history and photograph of beluga R9, who was photographed in 2007 south of Fire Island. This beluga is a presumed mother based on photographs with an accompanying calf.

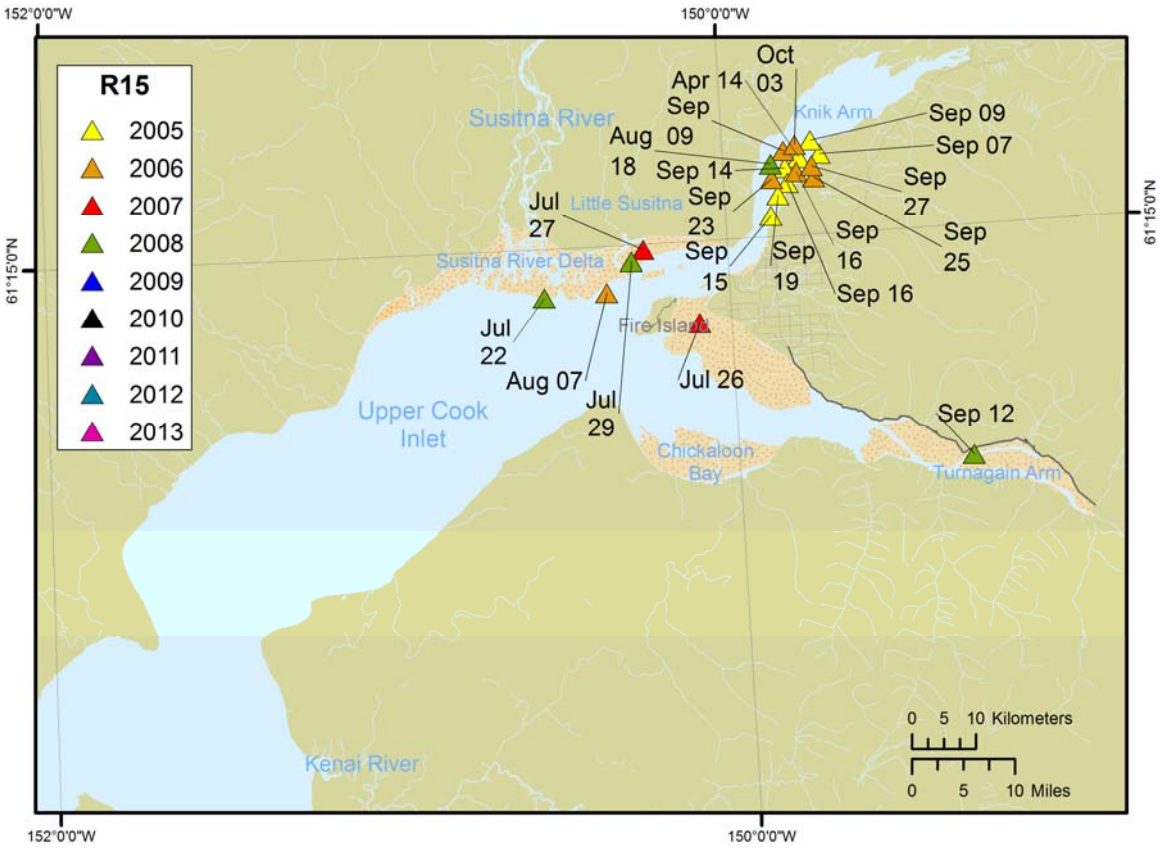

Figure C2. Sighting history and photograph of beluga R15, who was photographed in 2007 south of Fire Island. This beluga is a presumed mother based on photographs with an accompanying calf.

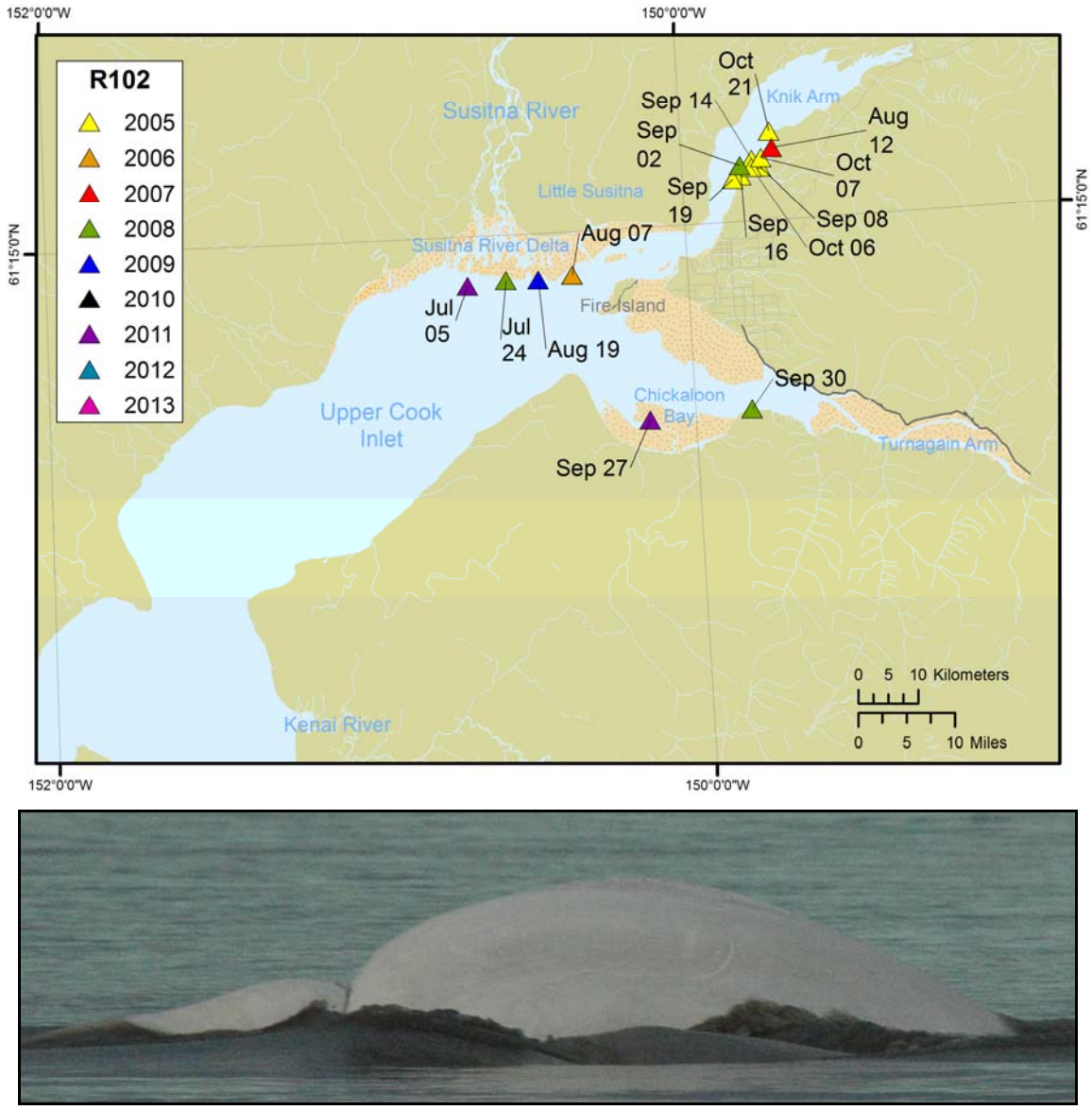

Figure C3. Sighting history and photograph of beluga R102, who was photographed in Chickaloon Bay in 2008 and 2011. This beluga is a presumed mother based on photographs with an accompanying calf.

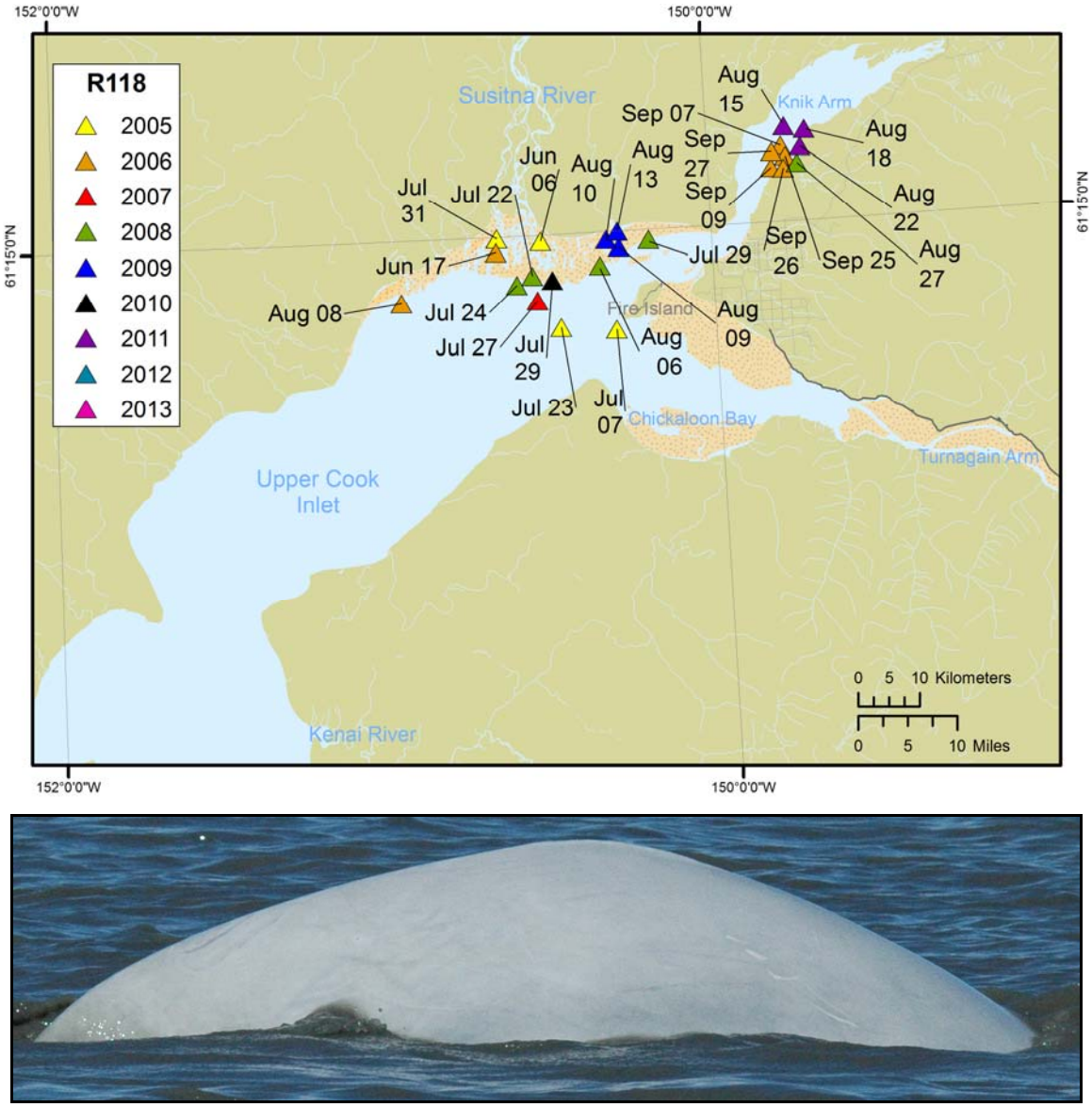

Figure C4. Sighting history and photograph of beluga R118, who was photographed in 2005 south of Fire Island.

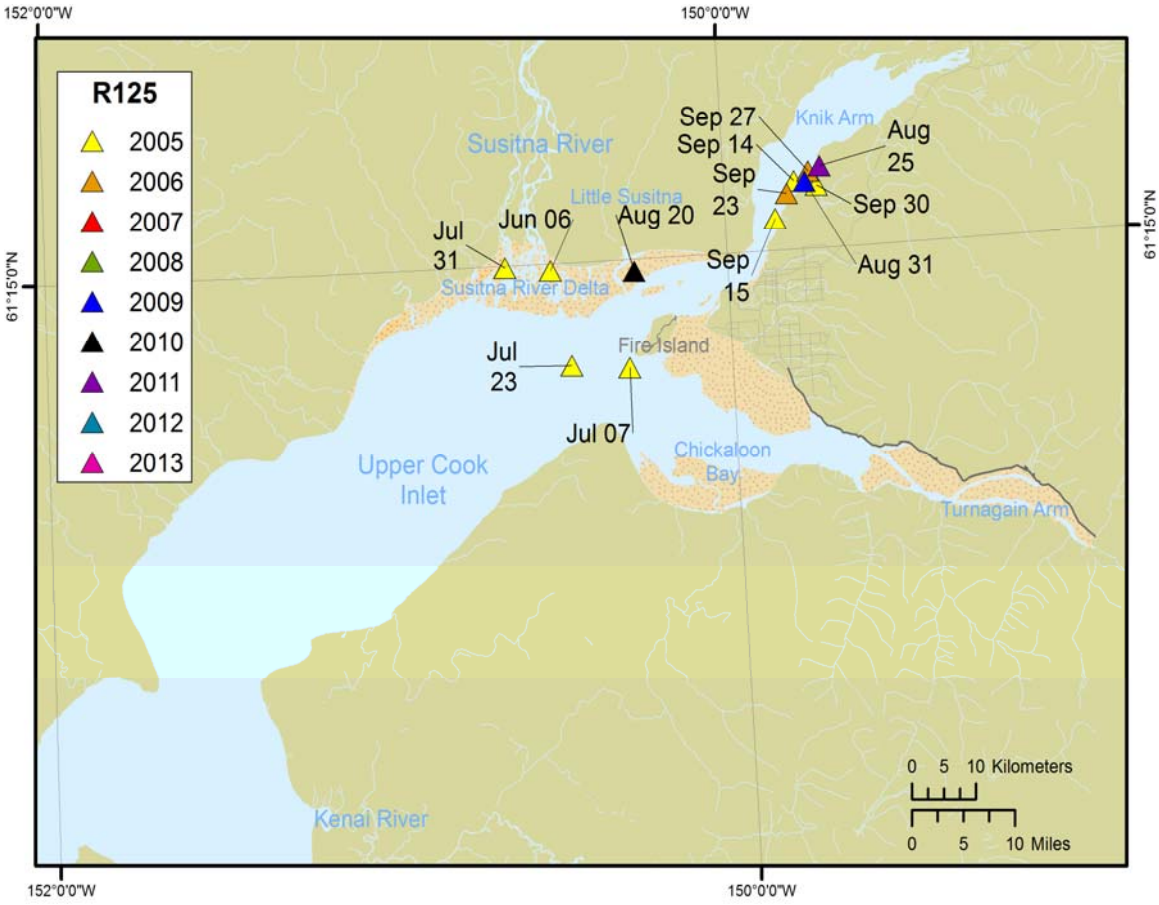

Figure C5. Sighting history and photograph of beluga R125, who was photographed in 2005 south of Fire Island. This beluga is a presumed mother based on photographs with an accompanying calf.

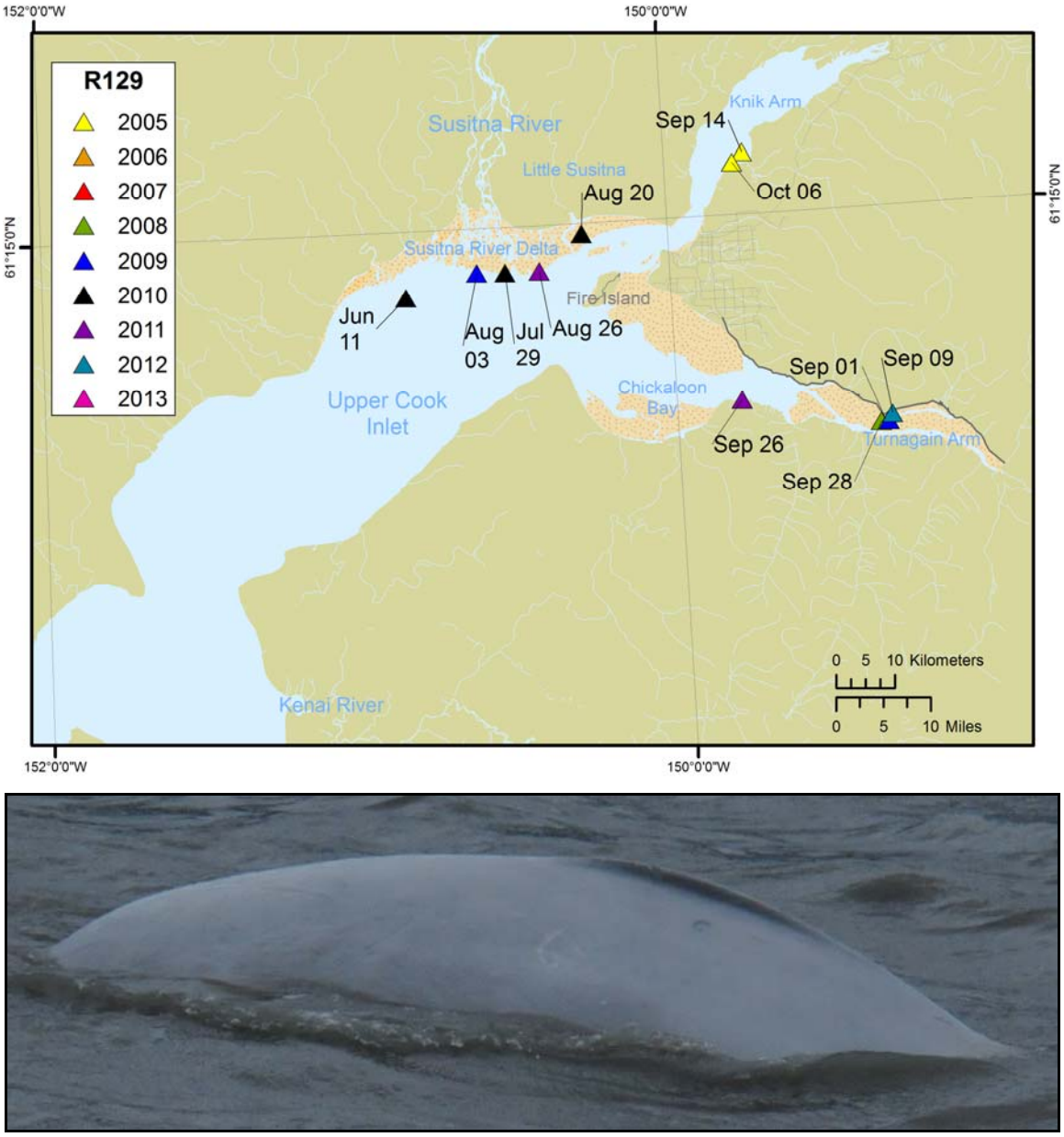

Figure C6. Sighting history and photograph of beluga R129, who was photographed in Chickaloon Bay in 2011.

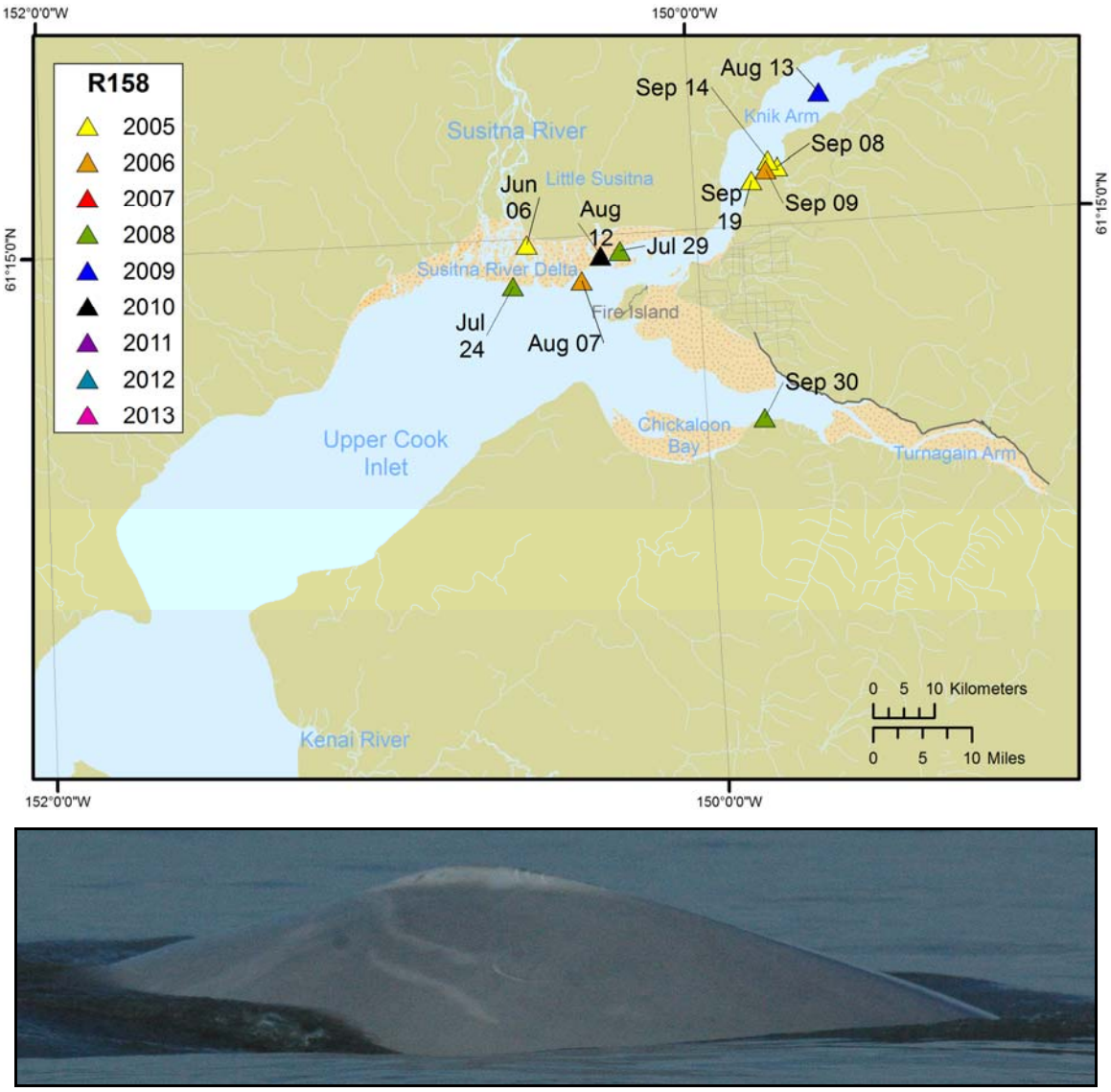

Figure C7. Sighting history and photograph of beluga R158, who was photographed in Chickaloon Bay in 2008. This beluga is a presumed mother based on photographs with an accompanying calf.

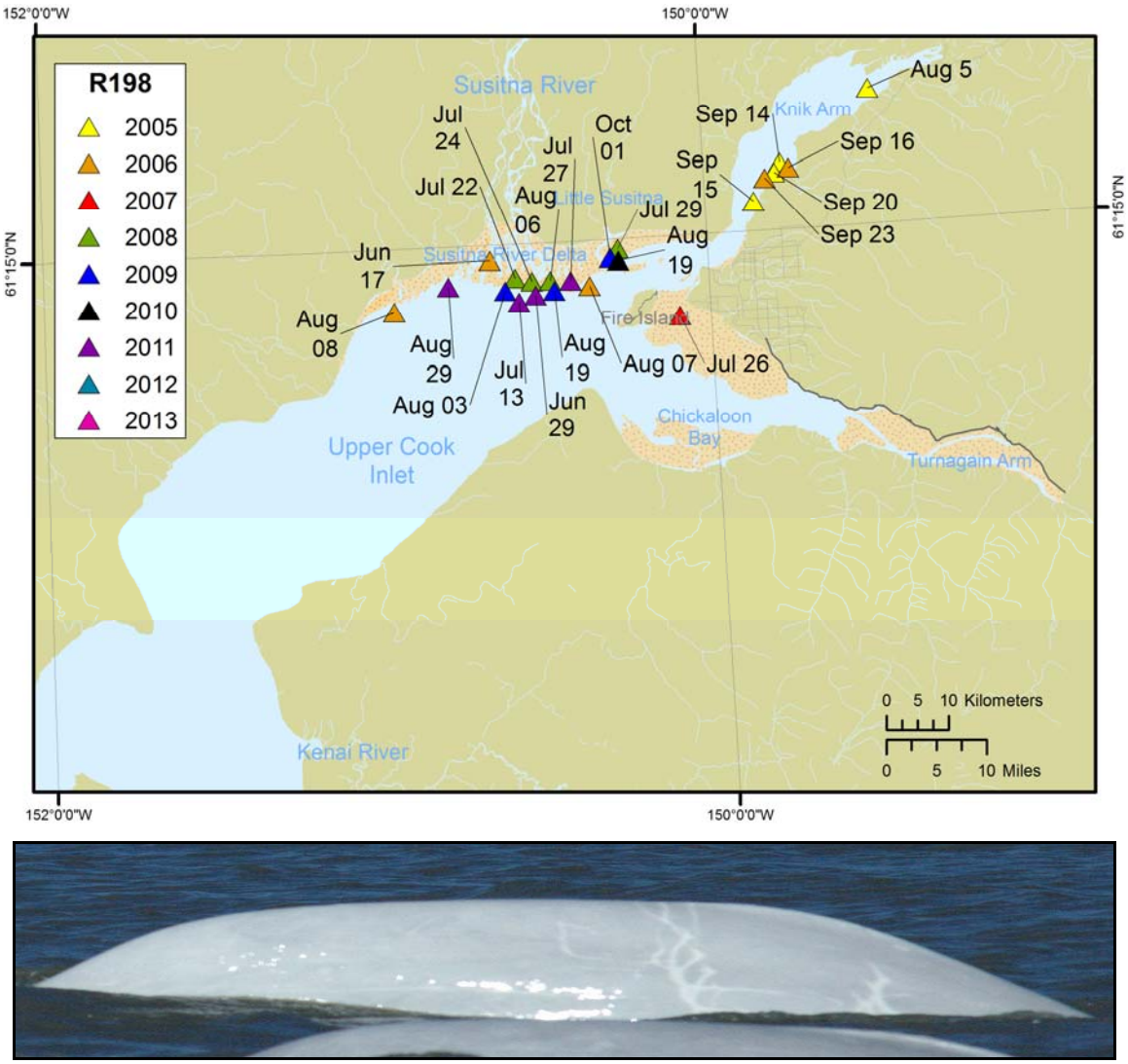

Figure C8. Sighting history and photograph of beluga R198, who was photographed in 2007 south of Fire Island. This beluga is a presumed mother based on photographs with an accompanying calf.

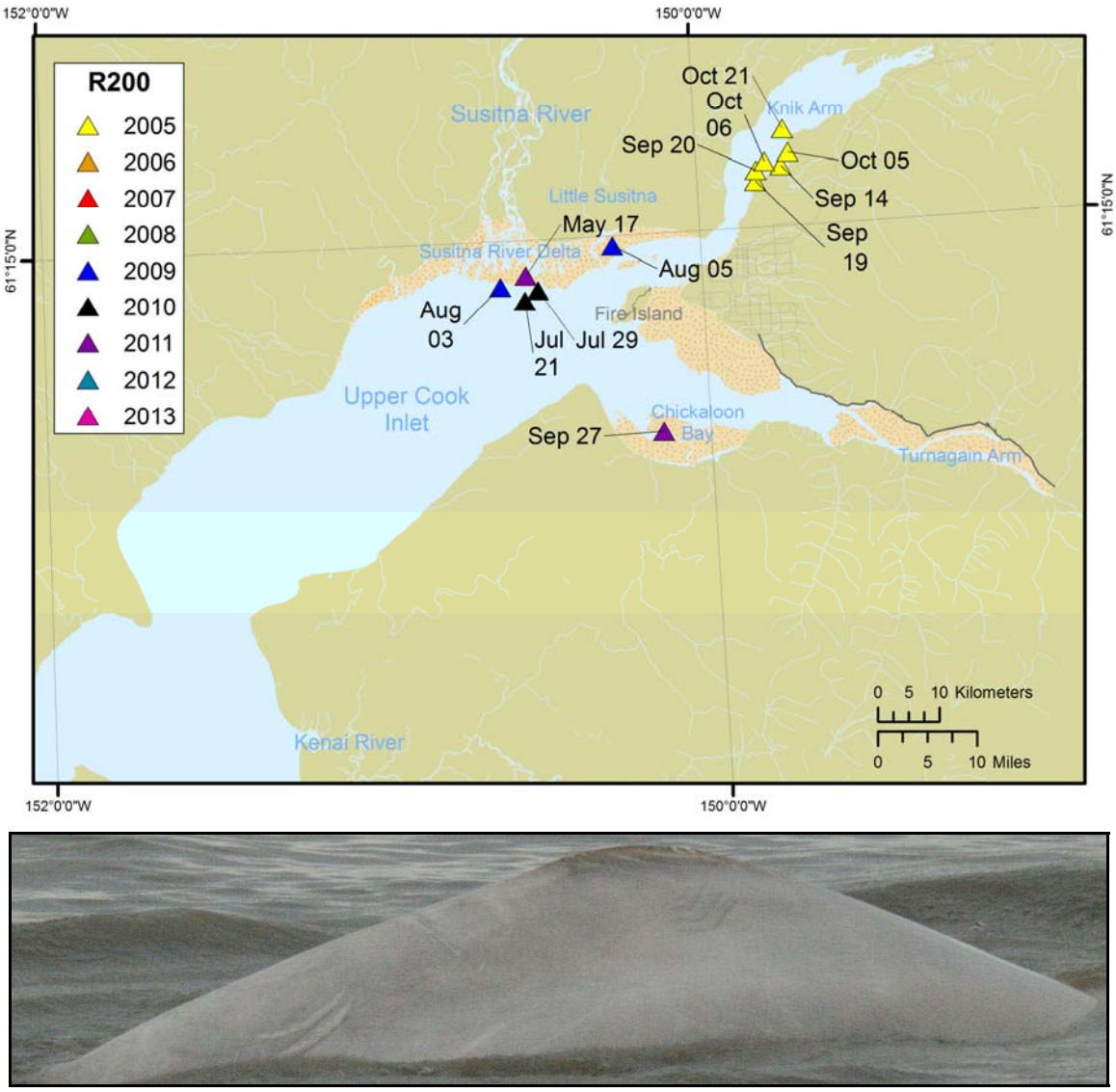

Figure C9. Sighting history and photograph of beluga R200, who was photographed in Chickaloon Bay in 2011. This beluga is a presumed mother based on photographs with an accompanying calf.

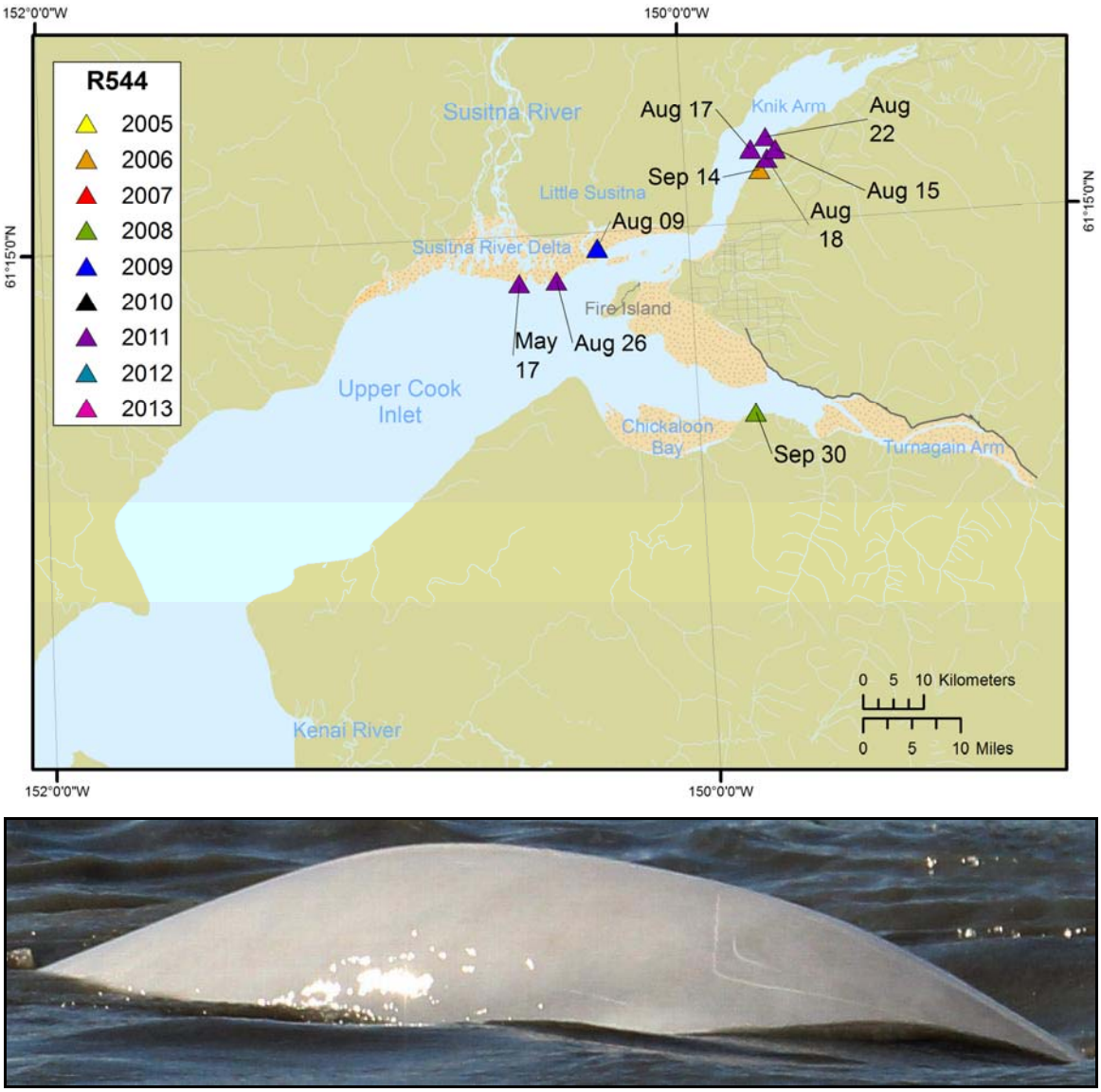

Figure C10. Sighting history and photograph of beluga R544, who was photographed in Chickaloon Bay in 2008. This beluga is a presumed mother based on photographs with an accompanying calf.

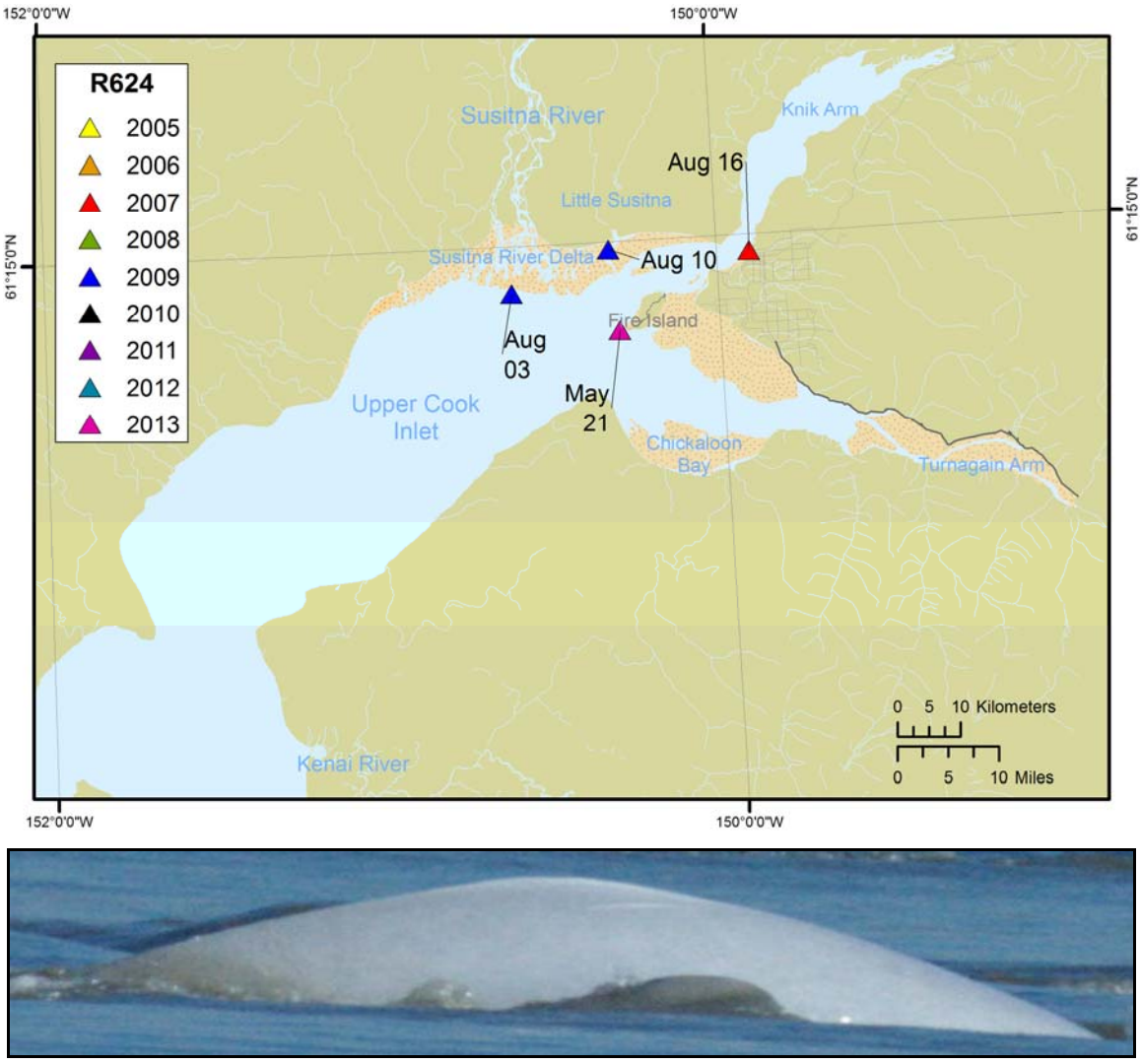

Figure C11. Sighting history and photograph of beluga R624, who was photographed in 2013 south of Fire Island. This beluga is a presumed mother based on photographs with an accompanying calf.

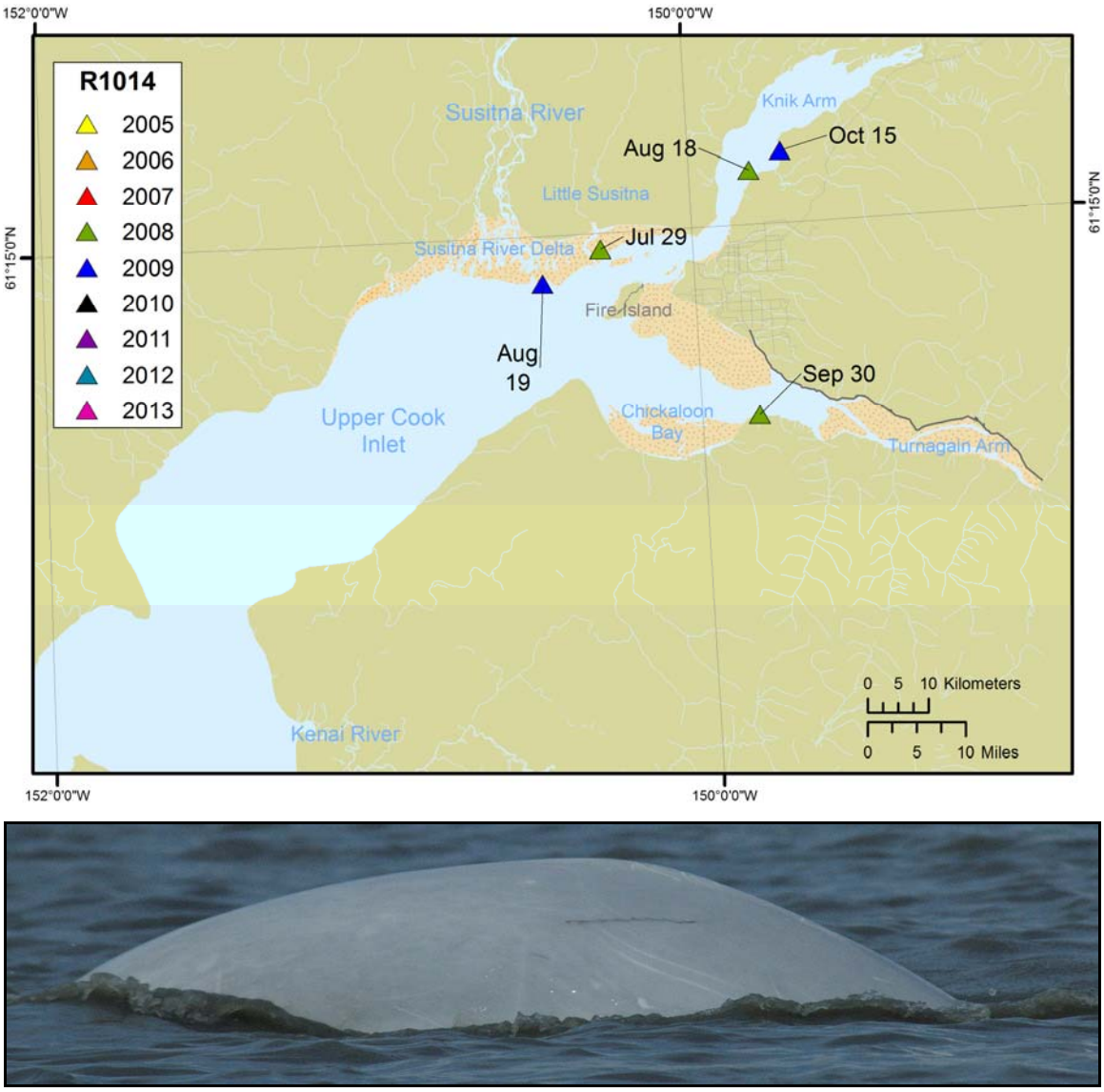

Figure C12. Sighting history and photograph of beluga R1014, who was photographed in Chickaloon Bay in 2008. This beluga is a presumed mother based on photographs with an accompanying calf.

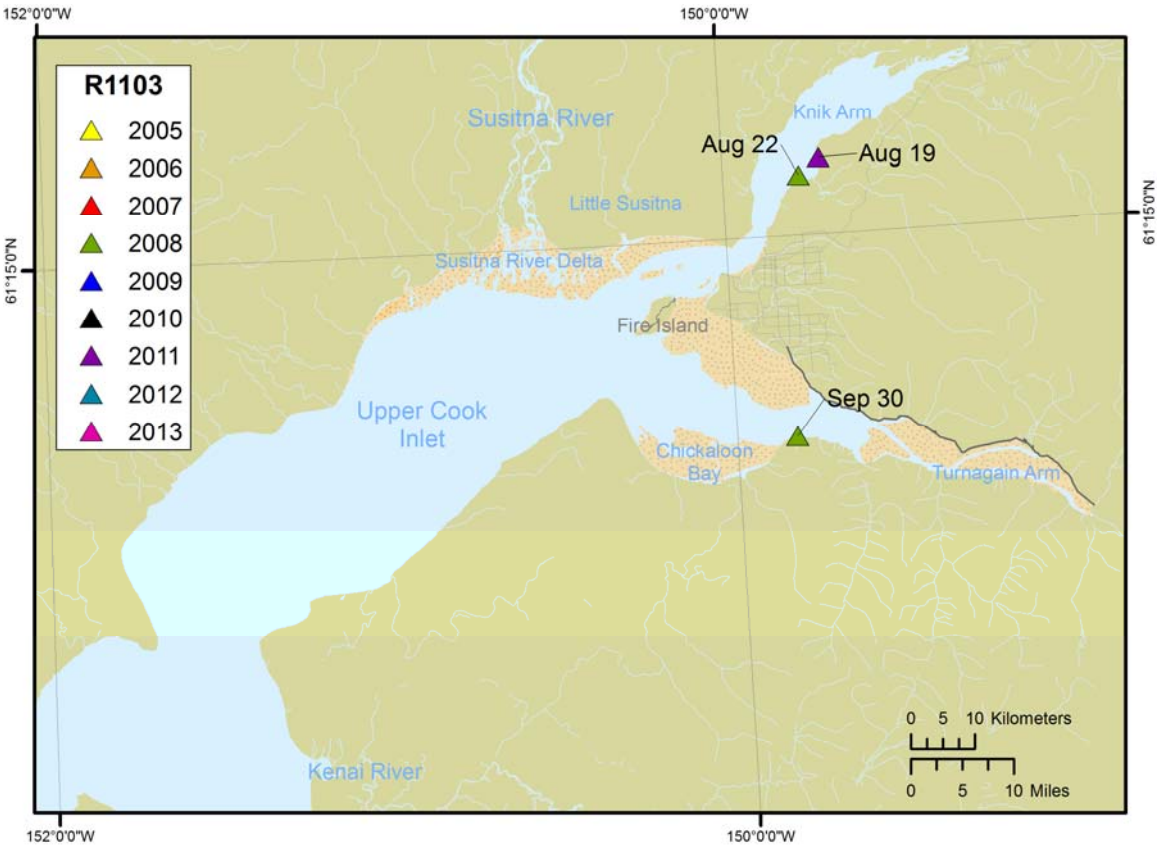

Figure C13. Sighting history and photograph of beluga R1103, who was photographed in Chickaloon Bay in 2008.

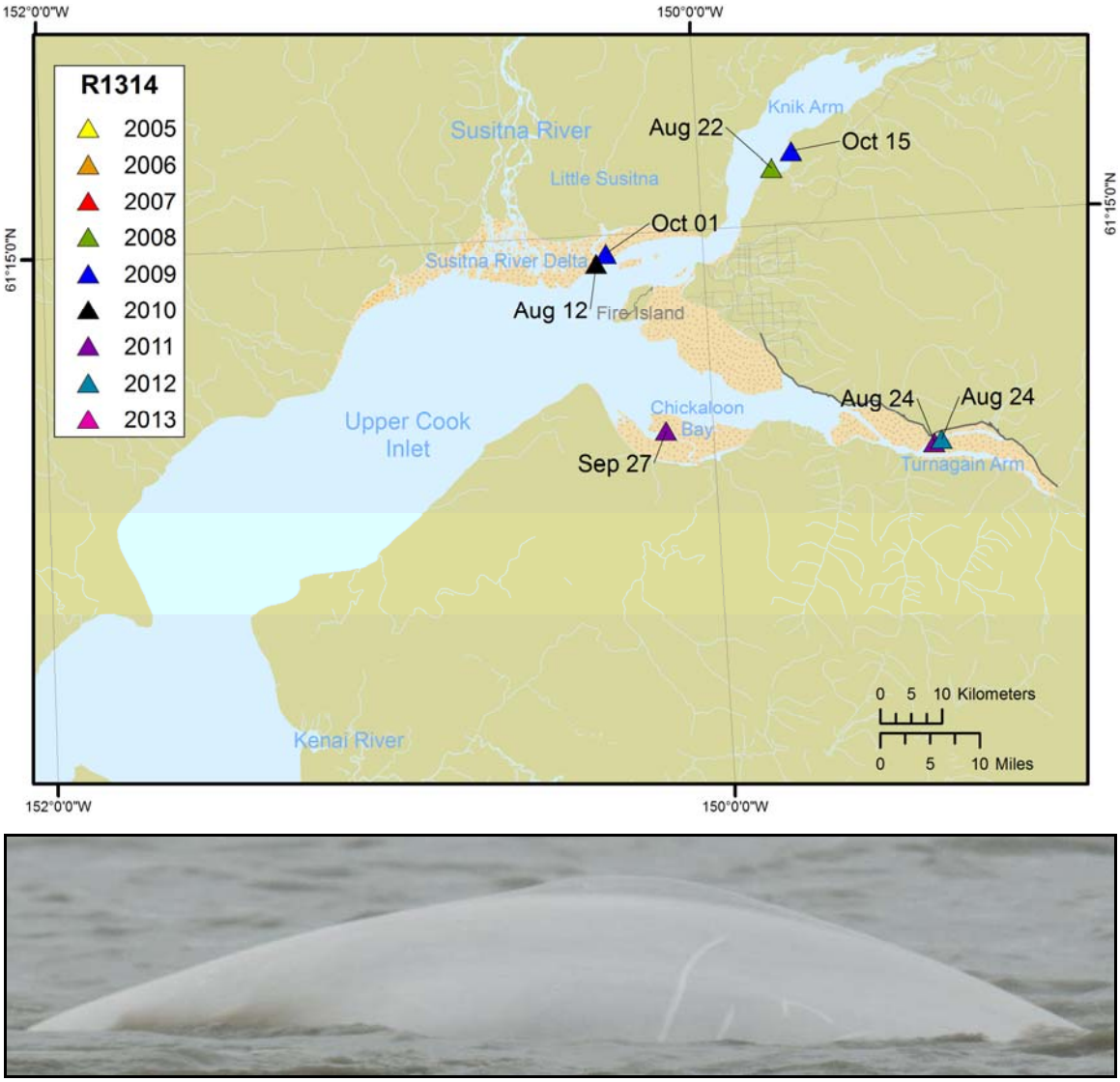

Figure C14. Sighting history and photograph of beluga R1314, who was photographed in Chickaloon Bay in 2011.

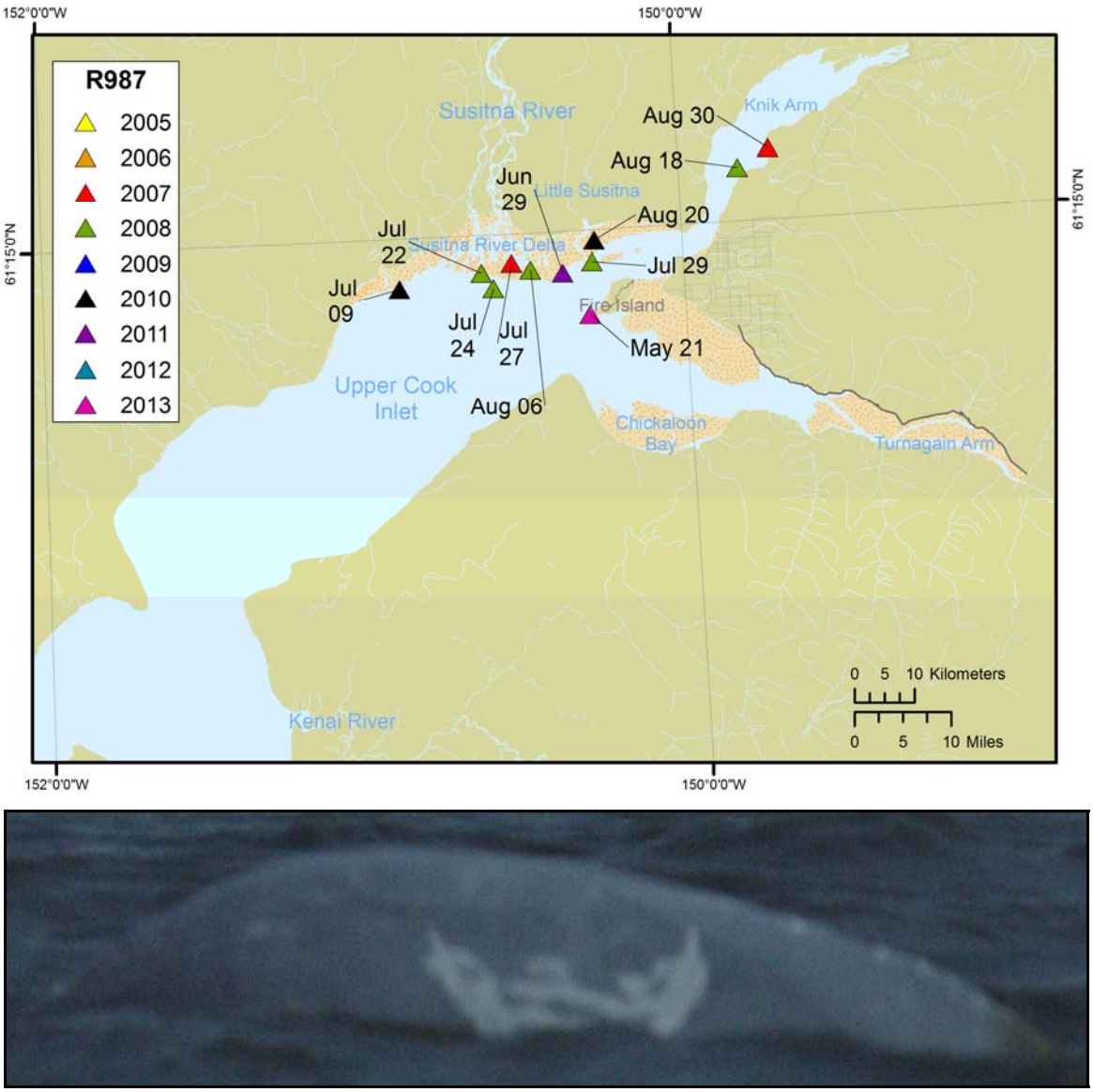

Figure C15. Sighting history and photograph of beluga R987, who was photographed in 2013 south of Fire Island.

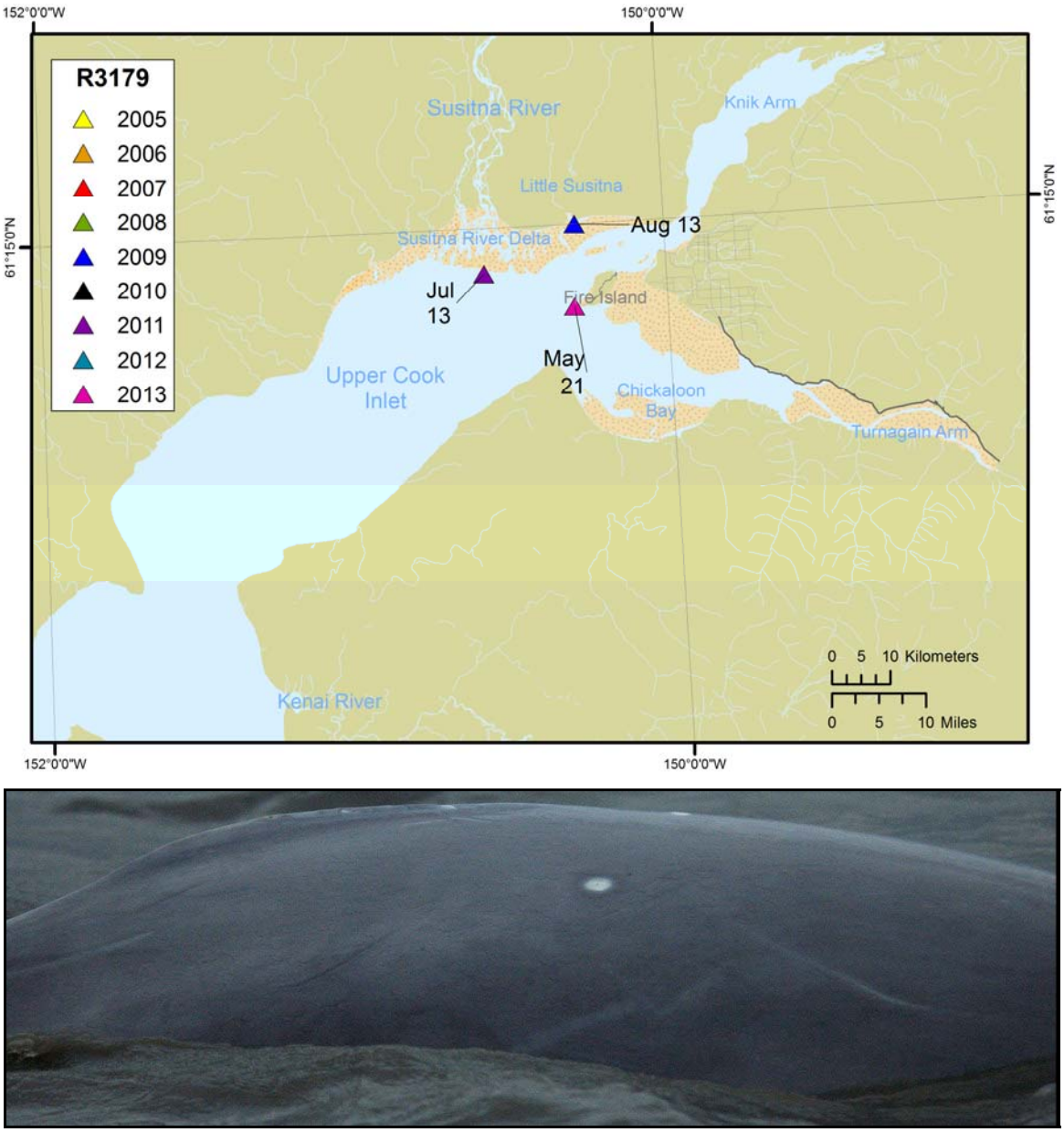

Figure C16. Sighting history and photograph of beluga R3179, who was photographed in 2013 south of Fire Island.

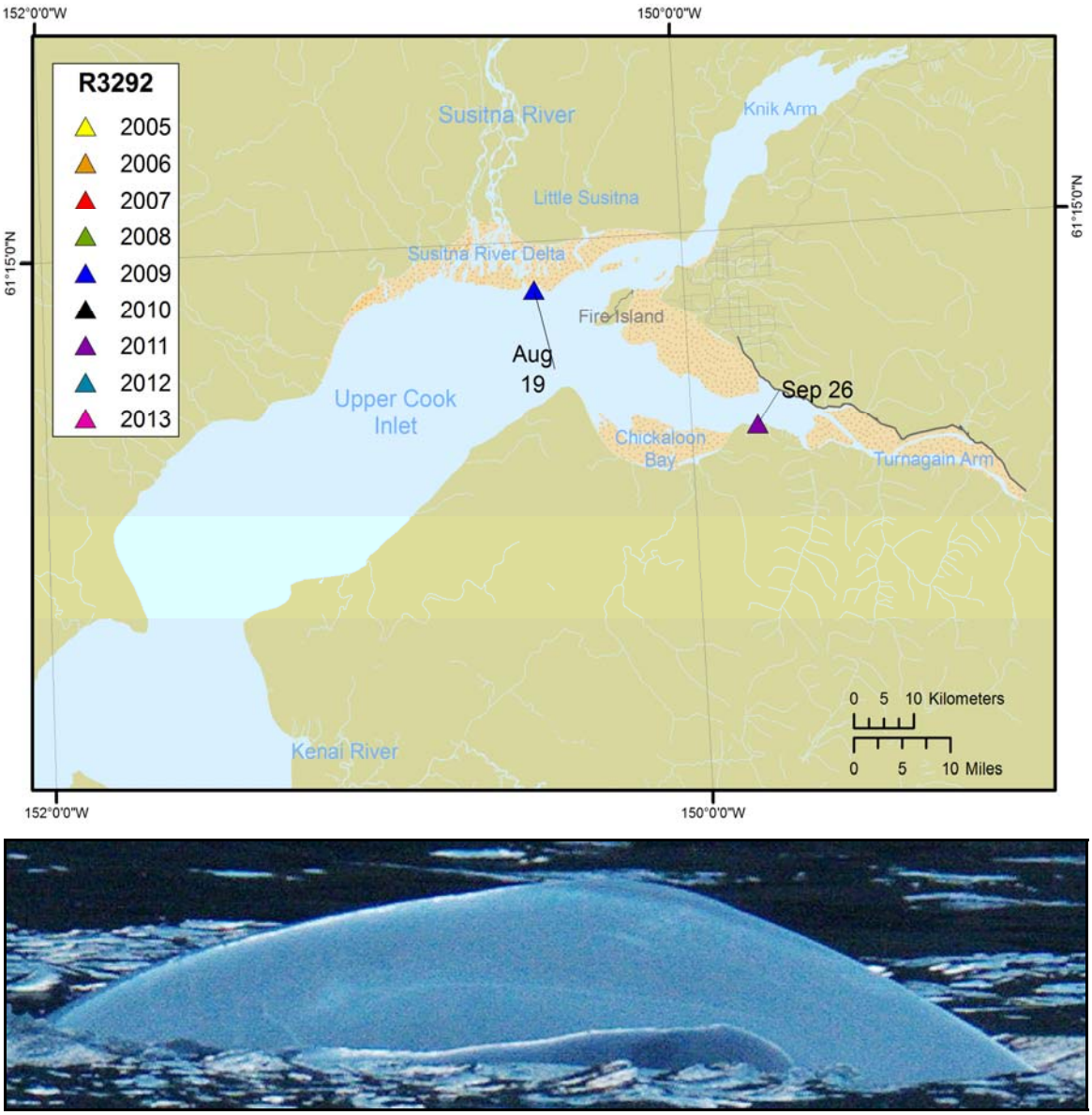

Figure C17. Sighting history and photograph of beluga R3292, who was photographed in Chickaloon Bay in 2011. This beluga is a presumed mother based on photographs with an accompanying calf.

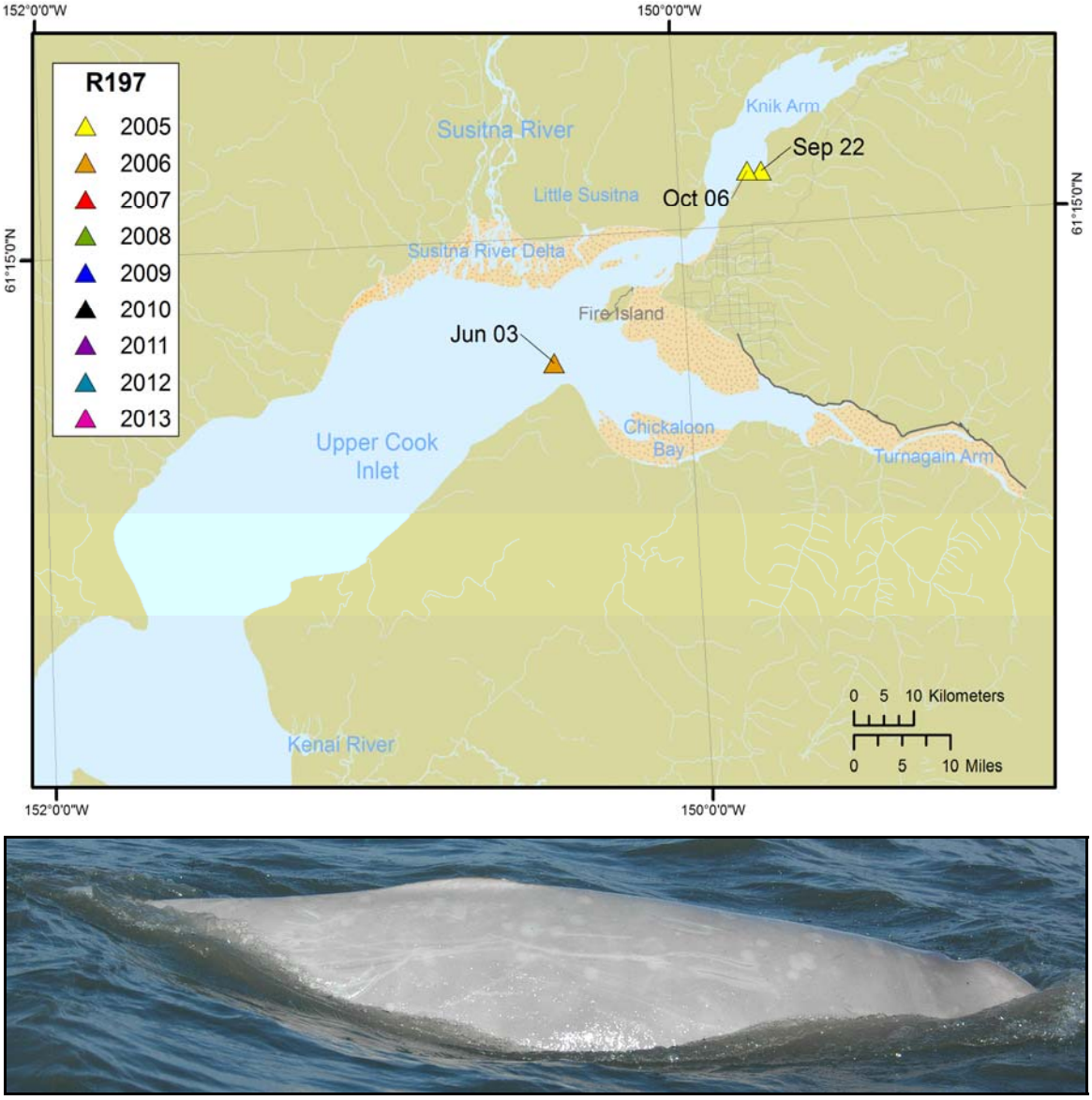

Figure C18. Sighting history and photograph of beluga R197, who was photographed in 2006 south of Fire Island.

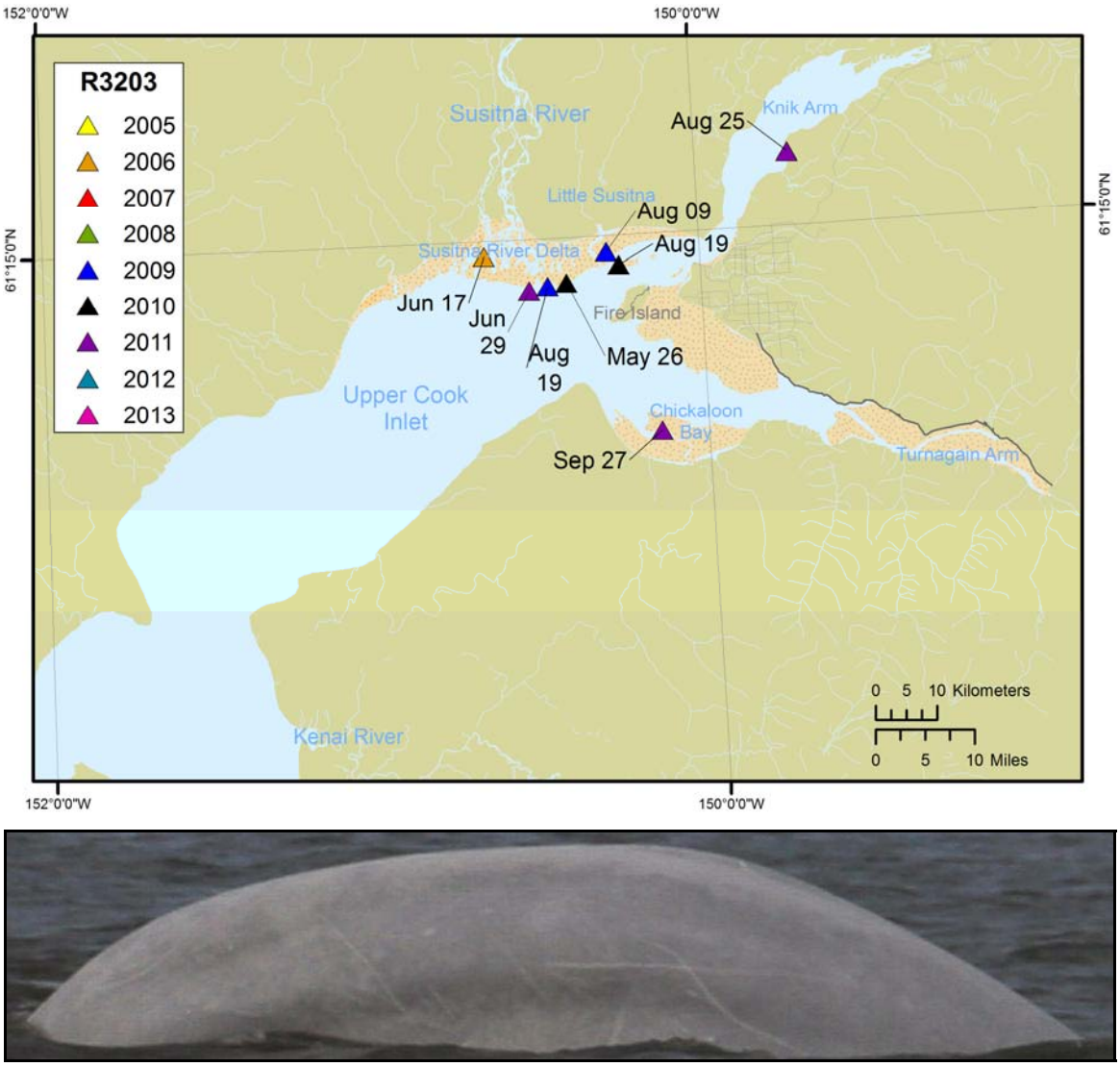

Figure C19. Sighting history and photograph of beluga R3203, who was photographed in Chickaloon Bay in 2009. This beluga is a presumed mother based on photographs with an accompanying calf.

APPENDIX D

SIGHTING-HISTORY AND RIGHT-SIDE PHOTOGRAPHS OF TWENTY-SEVEN INDIVIDUALLY-IDENTIFIED BELUGA WHALES PHOTOGRAPHED IN TURNAGAIN ARM 2005–2013.

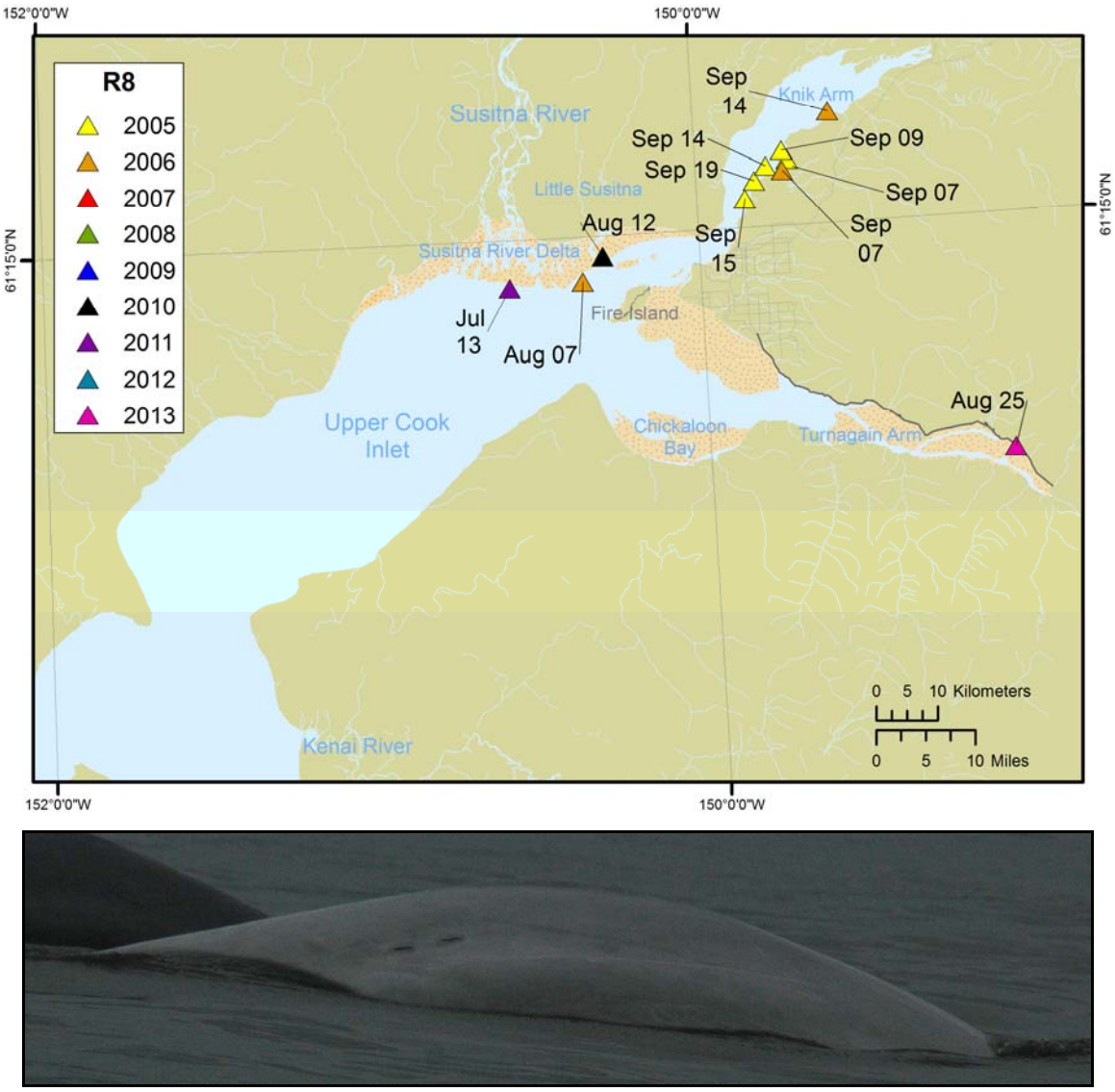

Figure D1. Sighting history and photograph of beluga R8, who was photographed in Turnagain Arm in 2013. This beluga is a presumed mother based on photographs with an accompanying calf.

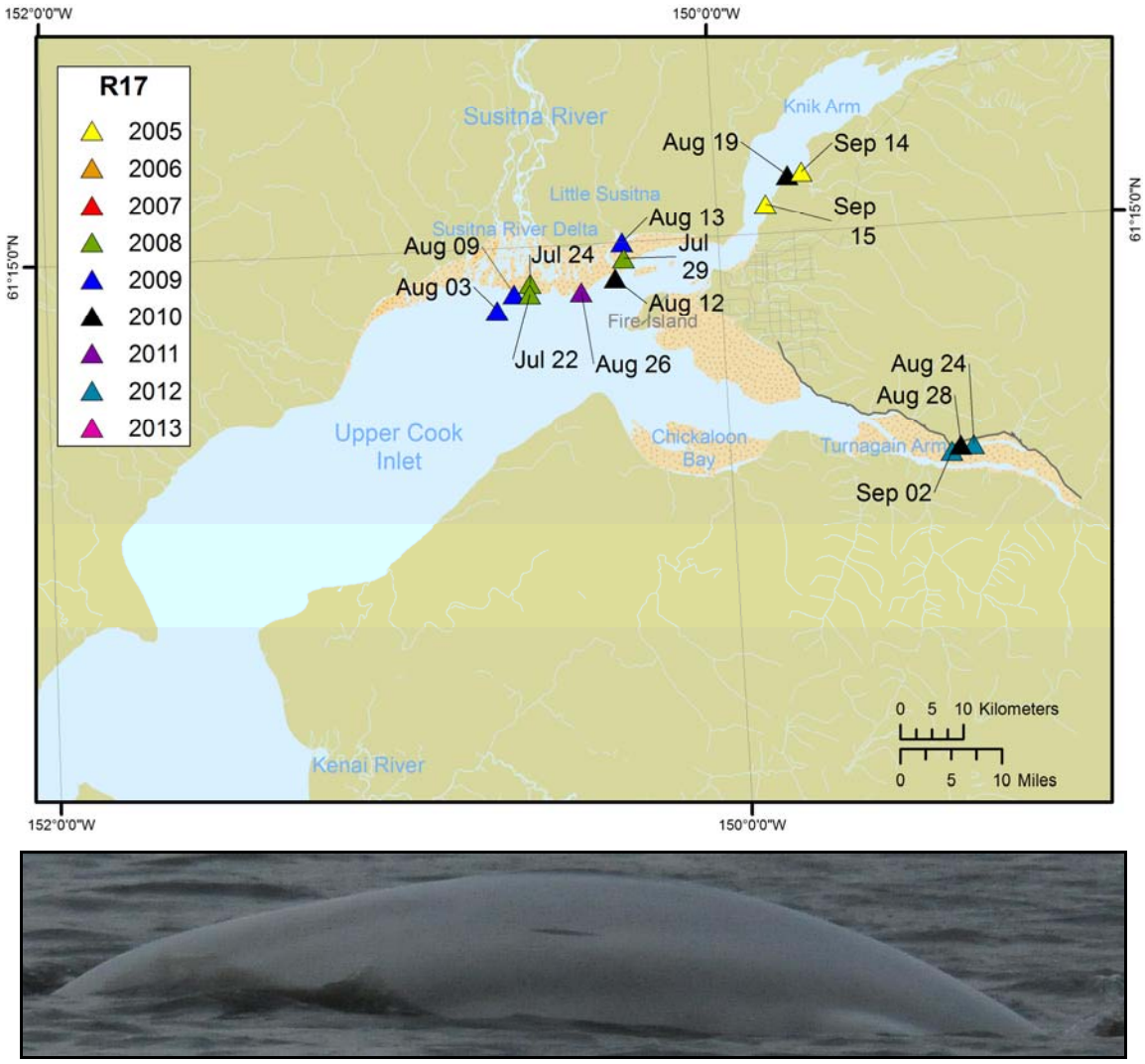

Figure D2. Sighting history and photograph of beluga R17, who was photographed in Turnagain Arm in 2010 and 2012. This beluga is a presumed mother based on photographs with an accompanying calf.

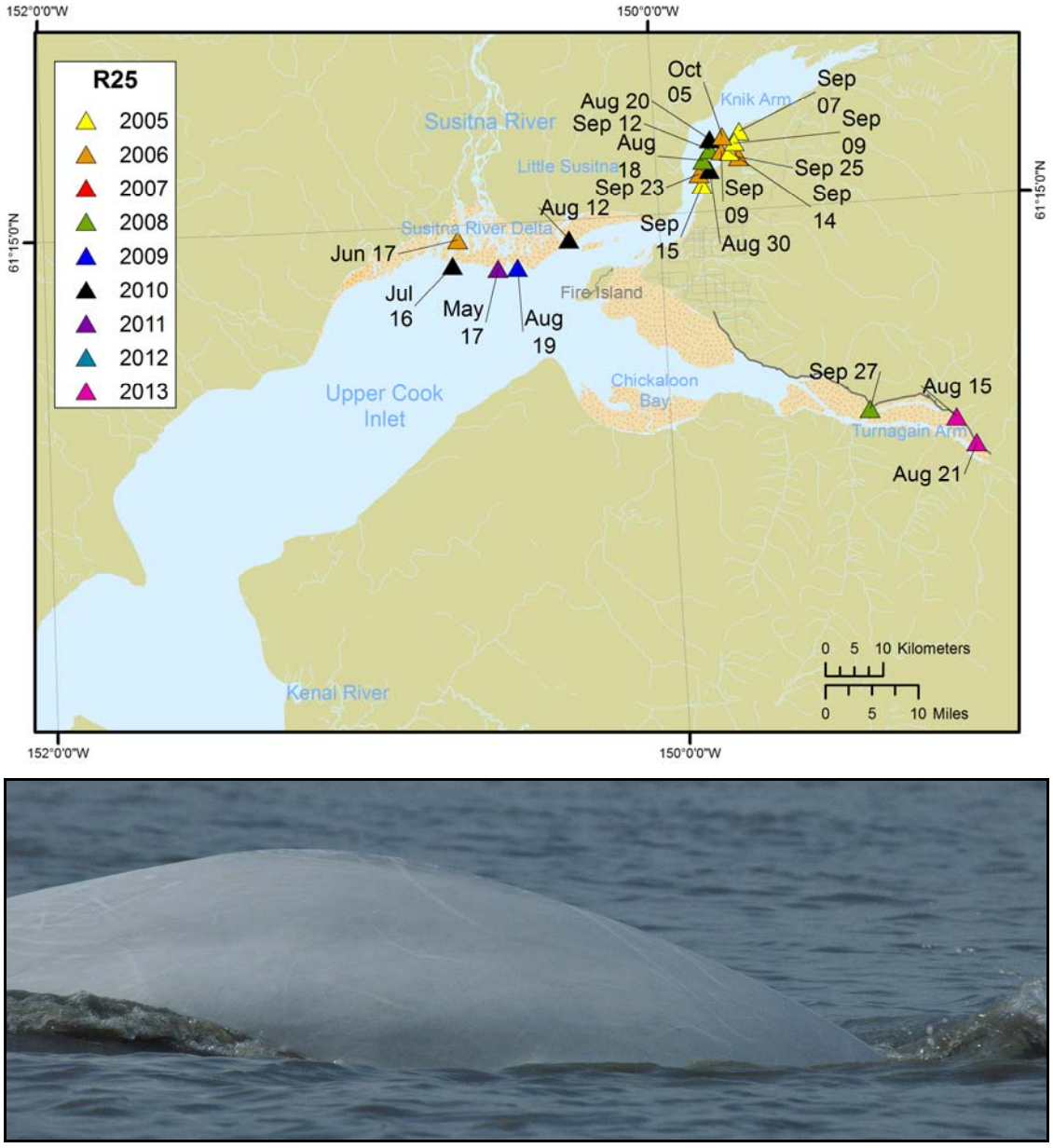

Figure D3. Sighting history and photograph of beluga R25, who was photographed in Turnagain Arm in 2008 and 2013. This beluga is a presumed mother based on photographs with an accompanying calf.

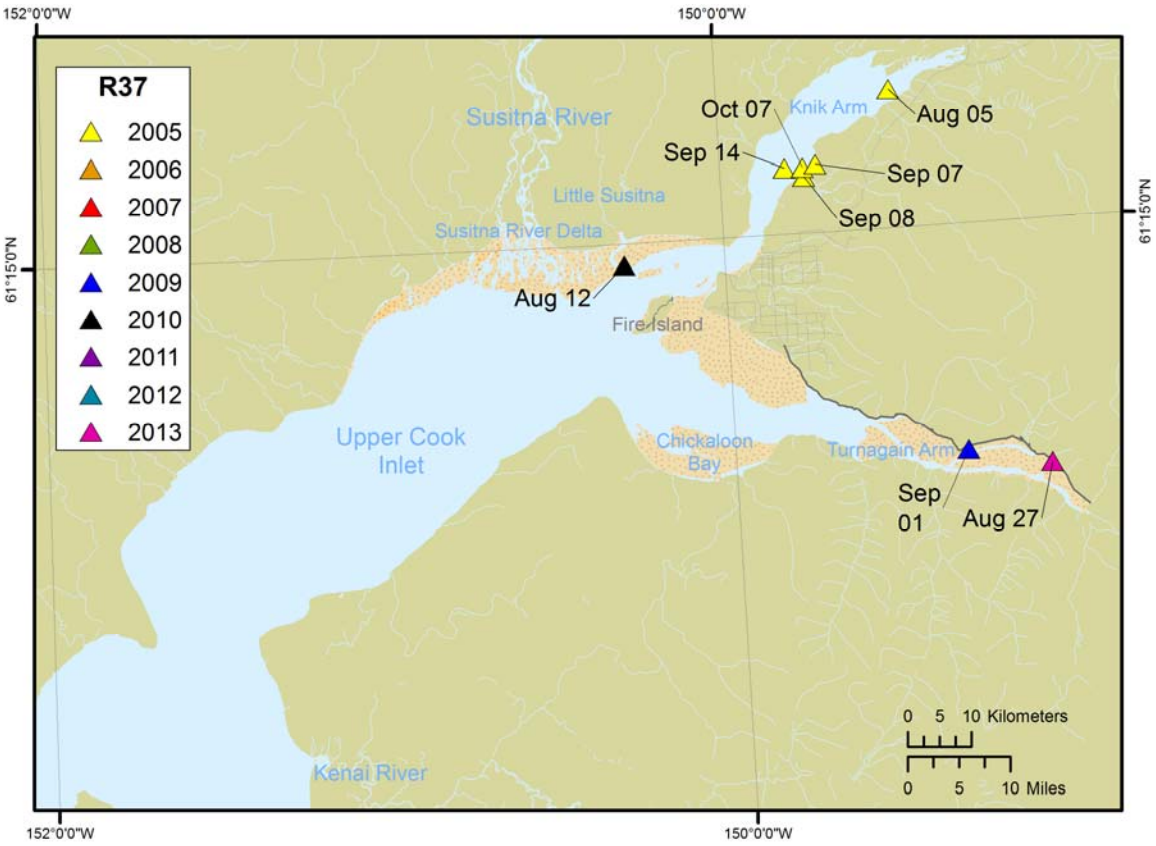

Figure D4. Sighting history and photograph of beluga R37, who was photographed in Turnagain Arm in 2009 and 2013. This beluga is a presumed mother based on photographs with an accompanying calf.

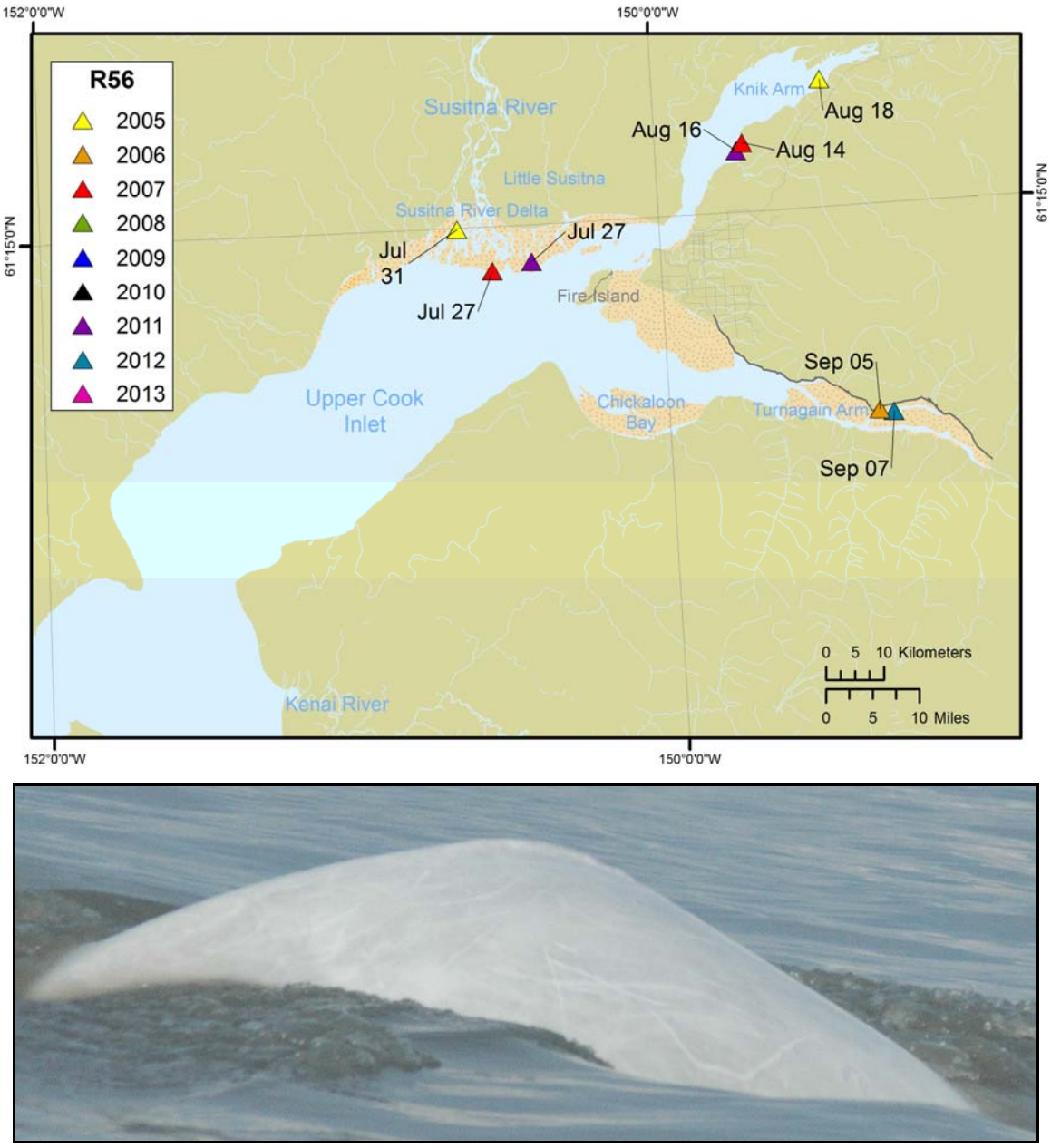

Figure D5. Sighting history and photograph of beluga R56, who was photographed in Turnagain Arm in 2006 and 2012. This beluga is a presumed mother based on photographs with an accompanying calf.

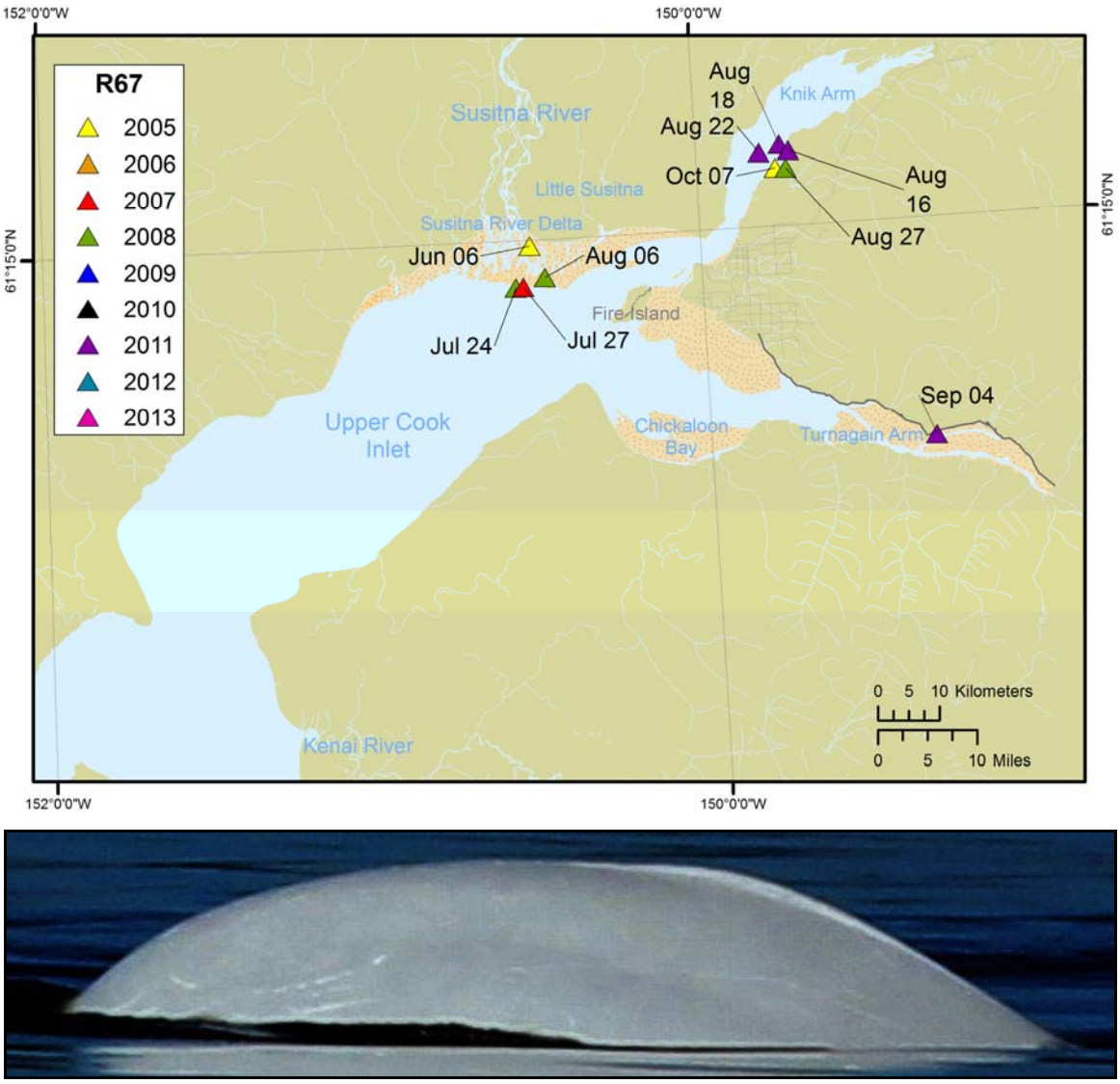

Figure D6. Sighting history and photograph of beluga R67, who was photographed in Turnagain Arm in 2011. This beluga is a presumed mother based on photographs with an accompanying calf.

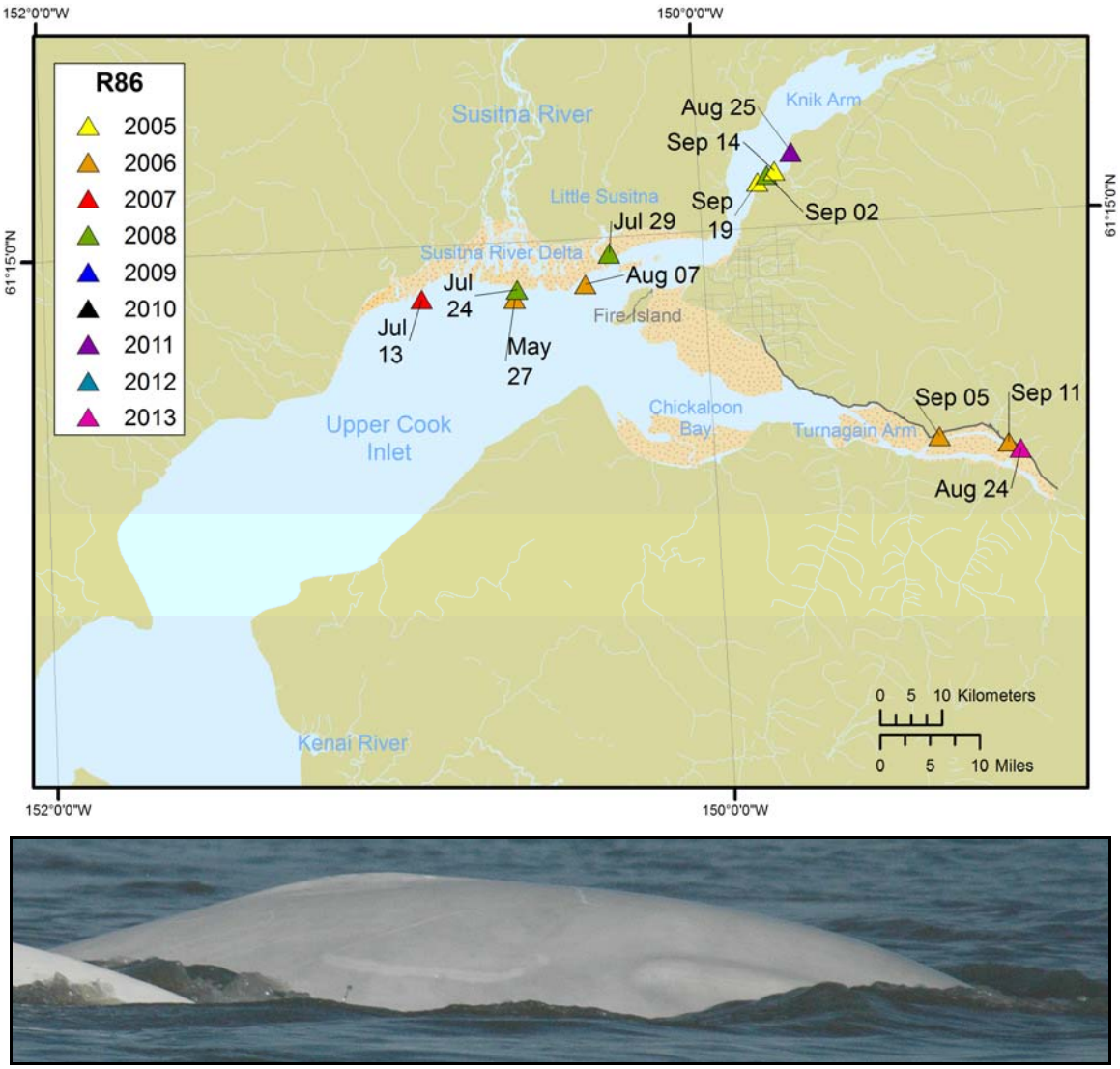

Figure D7. Sighting history and photograph of beluga R86, who was photographed in Turnagain Arm in 2006, and 2013. This beluga is a presumed mother based on photographs with an accompanying calf.

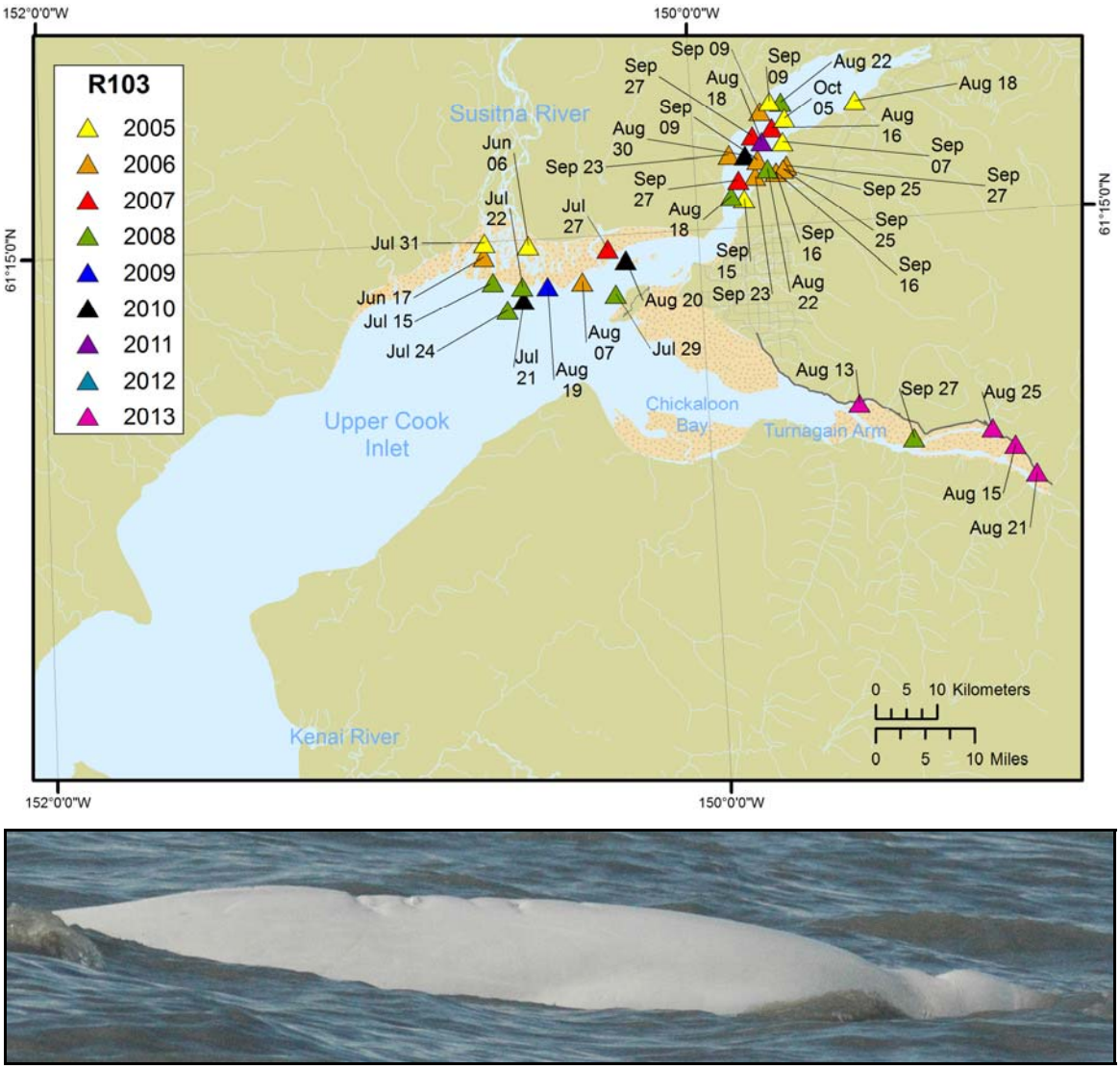

Figure D8. Sighting history and photograph of beluga R103, who was photographed in Turnagain Arm in 2008 and 2013. This beluga is a presumed mother based on photographs with an accompanying calf. This beluga was tagged by NMFS sometime between 1999 and 2002.

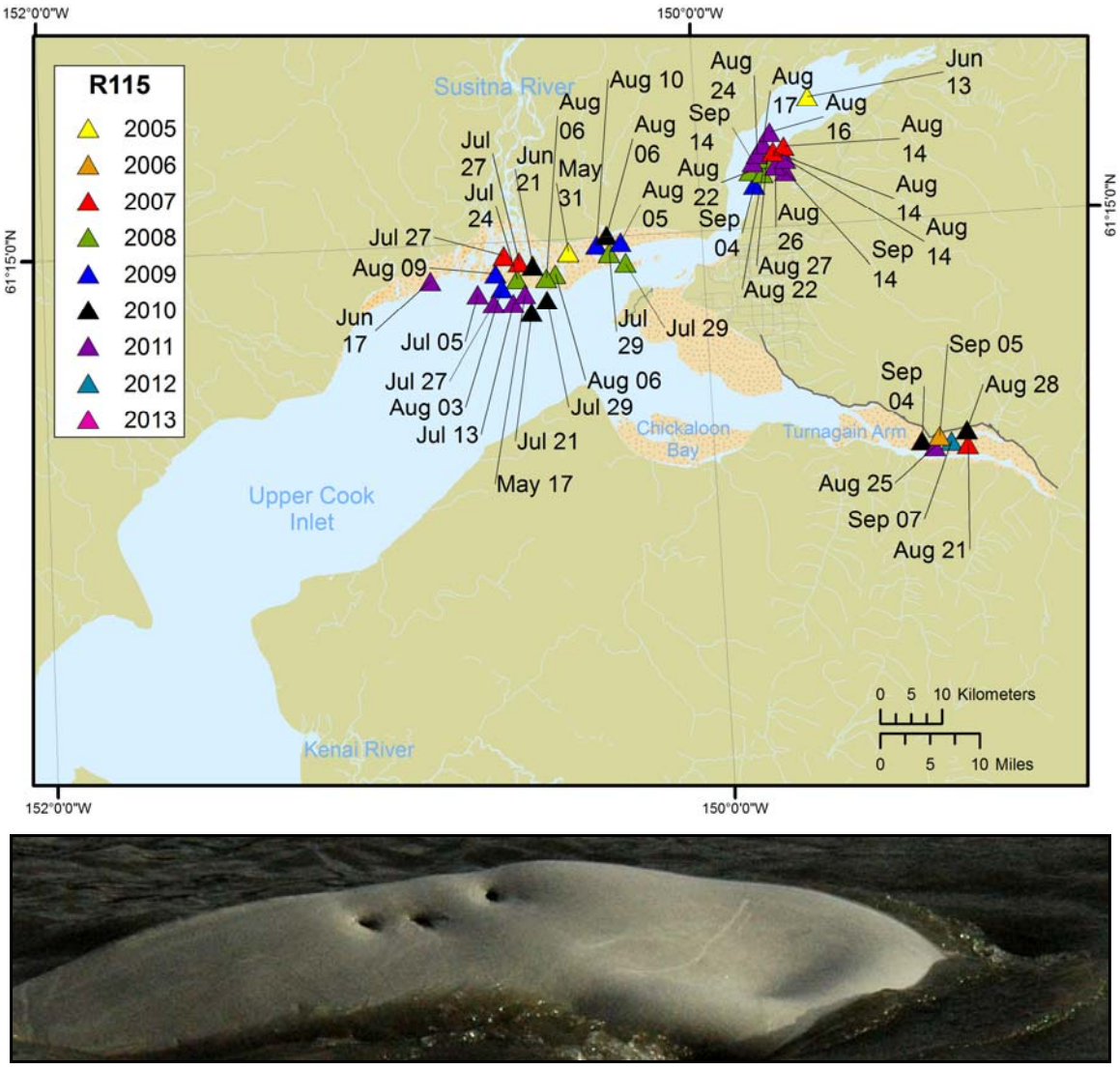

Figure D9. Sighting history and photograph of beluga R115, who was photographed in Turnagain Arm in 2006, 2007, 2010, 2011 and 2012. This beluga is a presumed mother based on photographs with an accompanying calf. This beluga was tagged by NMFS sometime between 1999 and 2002.

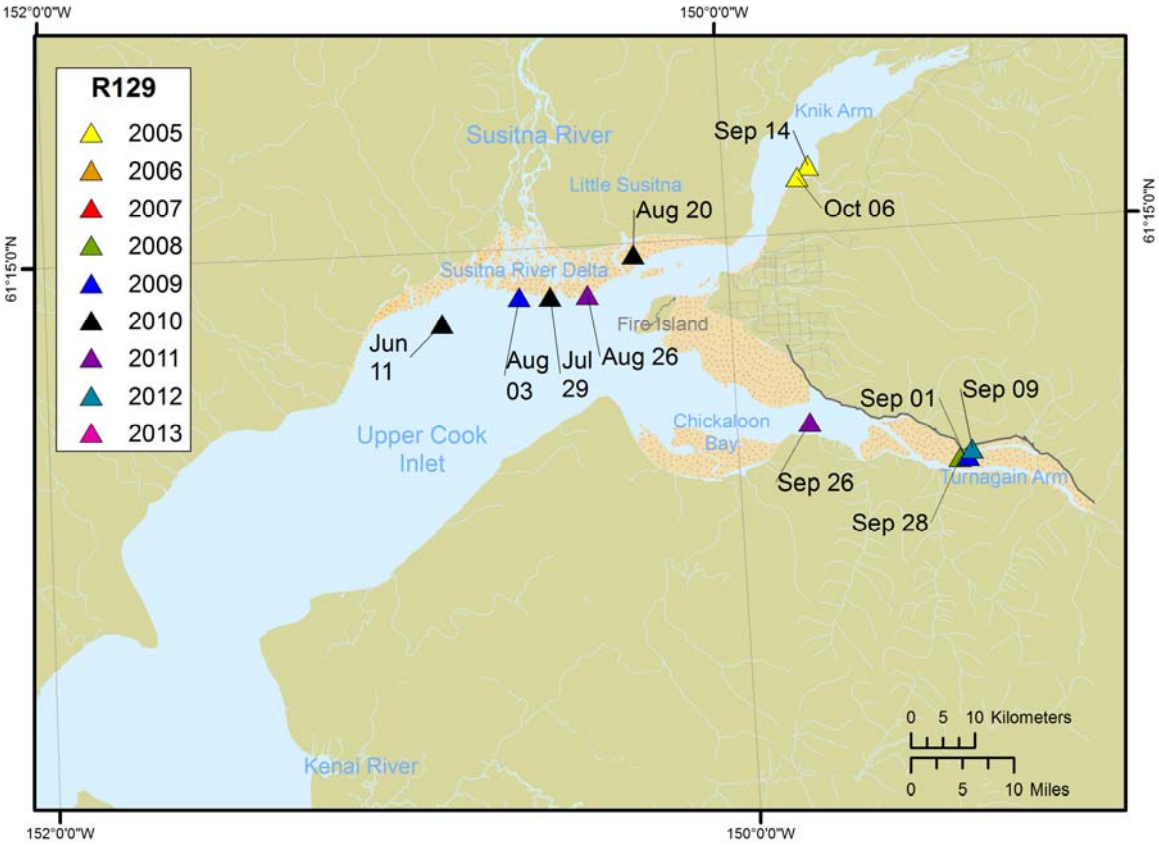

Figure D10. Sighting history and photograph of beluga R129, who was photographed in Turnagain Arm in 2008, 2009 and 2012.

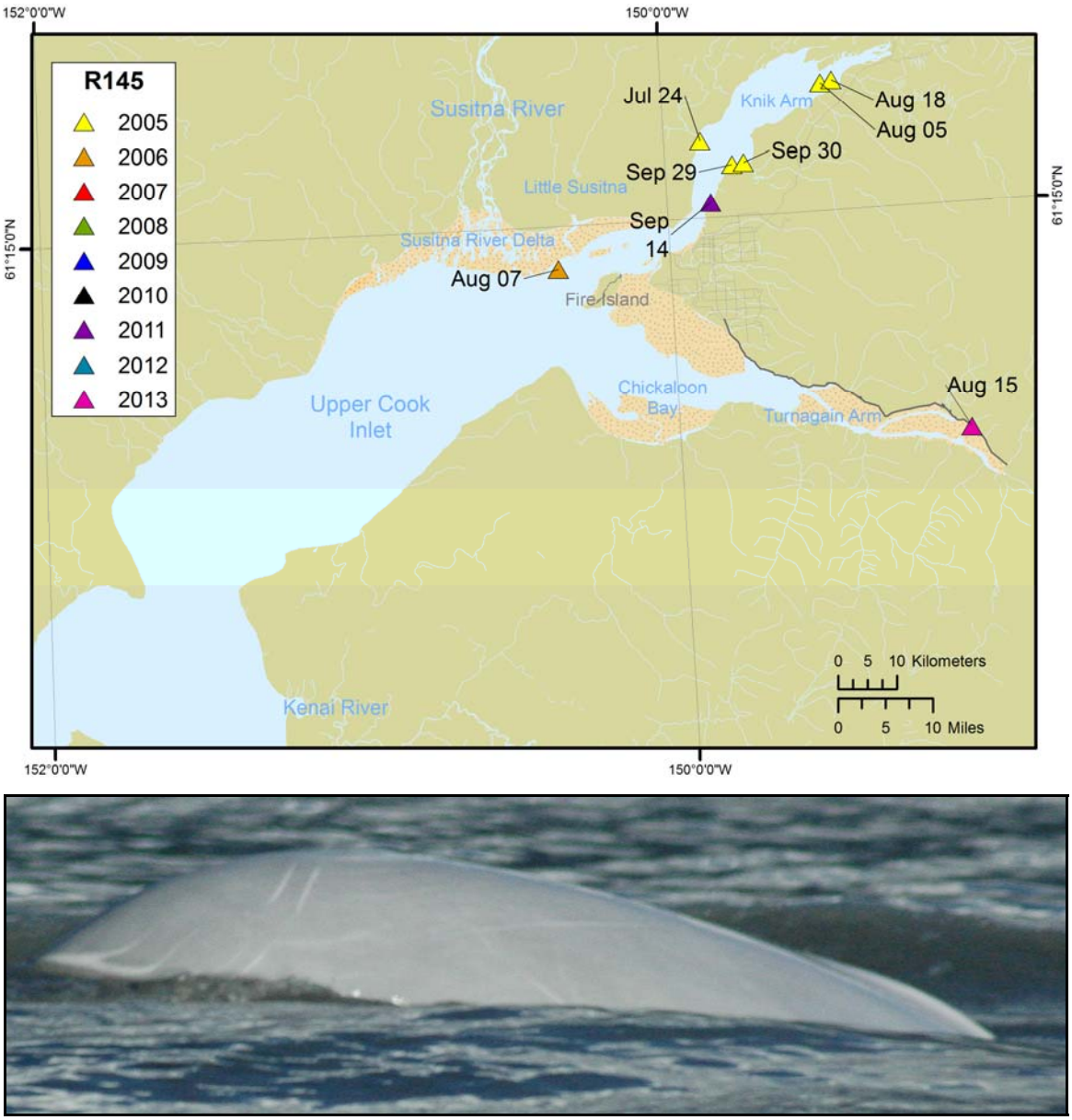

Figure D11. Sighting history and photograph of beluga R145, who was photographed in Turnagain Arm in 2013.

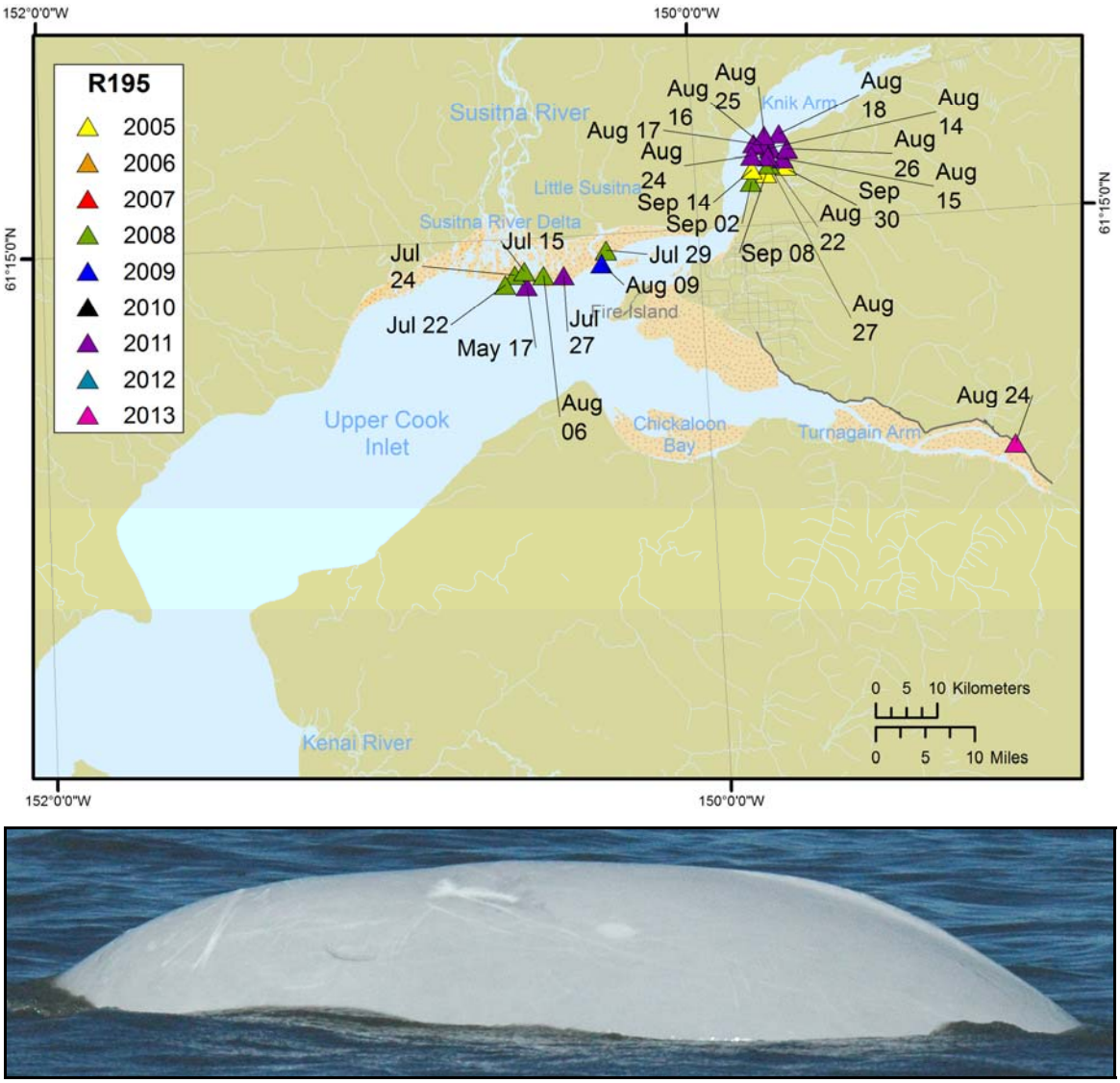

Figure D12. Sighting history and photograph of beluga R195, who was photographed in Turnagain Arm in 2013. This beluga is a presumed mother based on photographs with an accompanying calf.

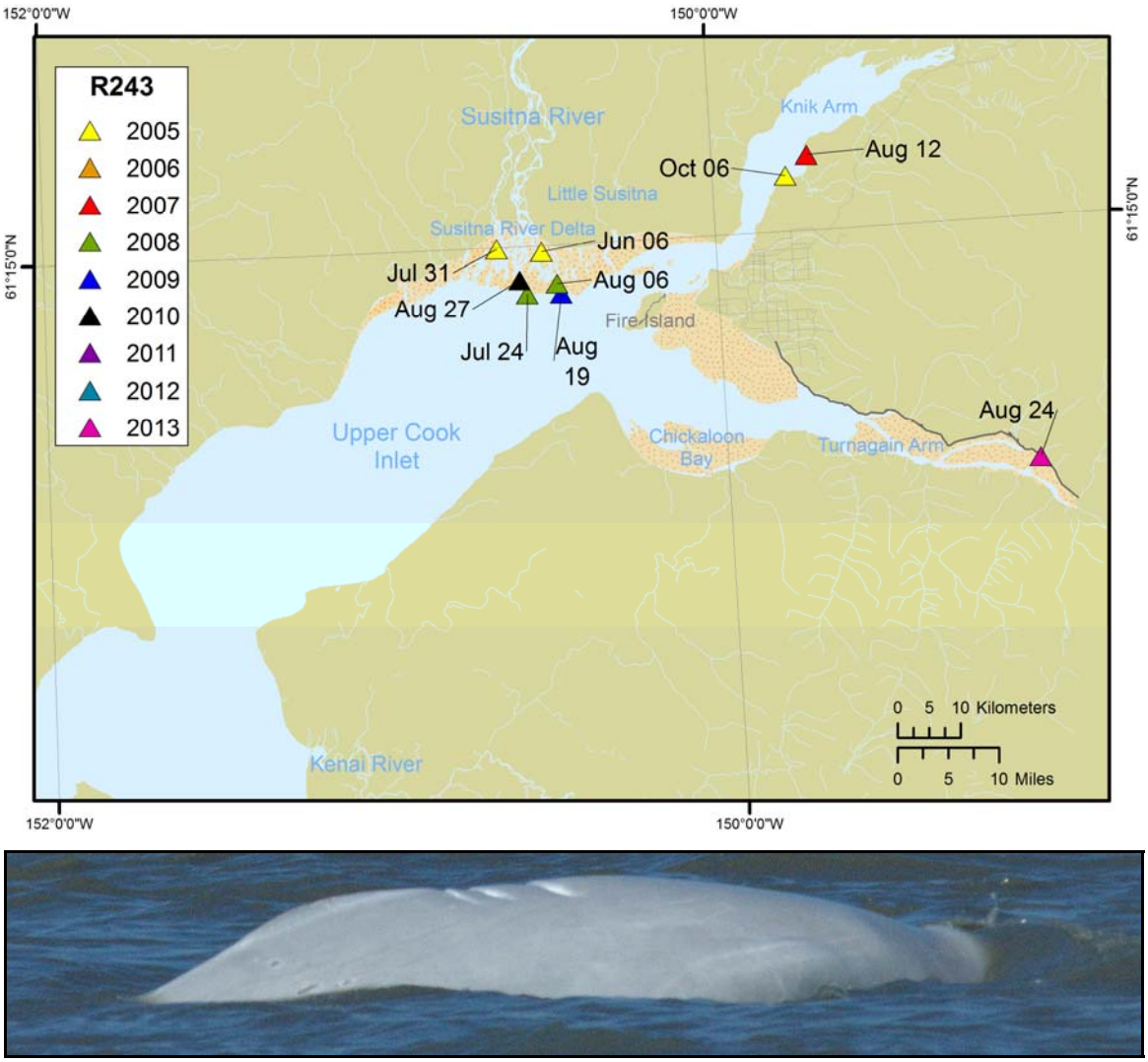

Figure D13. Sighting history and photograph of beluga R243, who was photographed in Turnagain Arm in 2013. This beluga was tagged by NMFS sometime between 1999 and 2002.

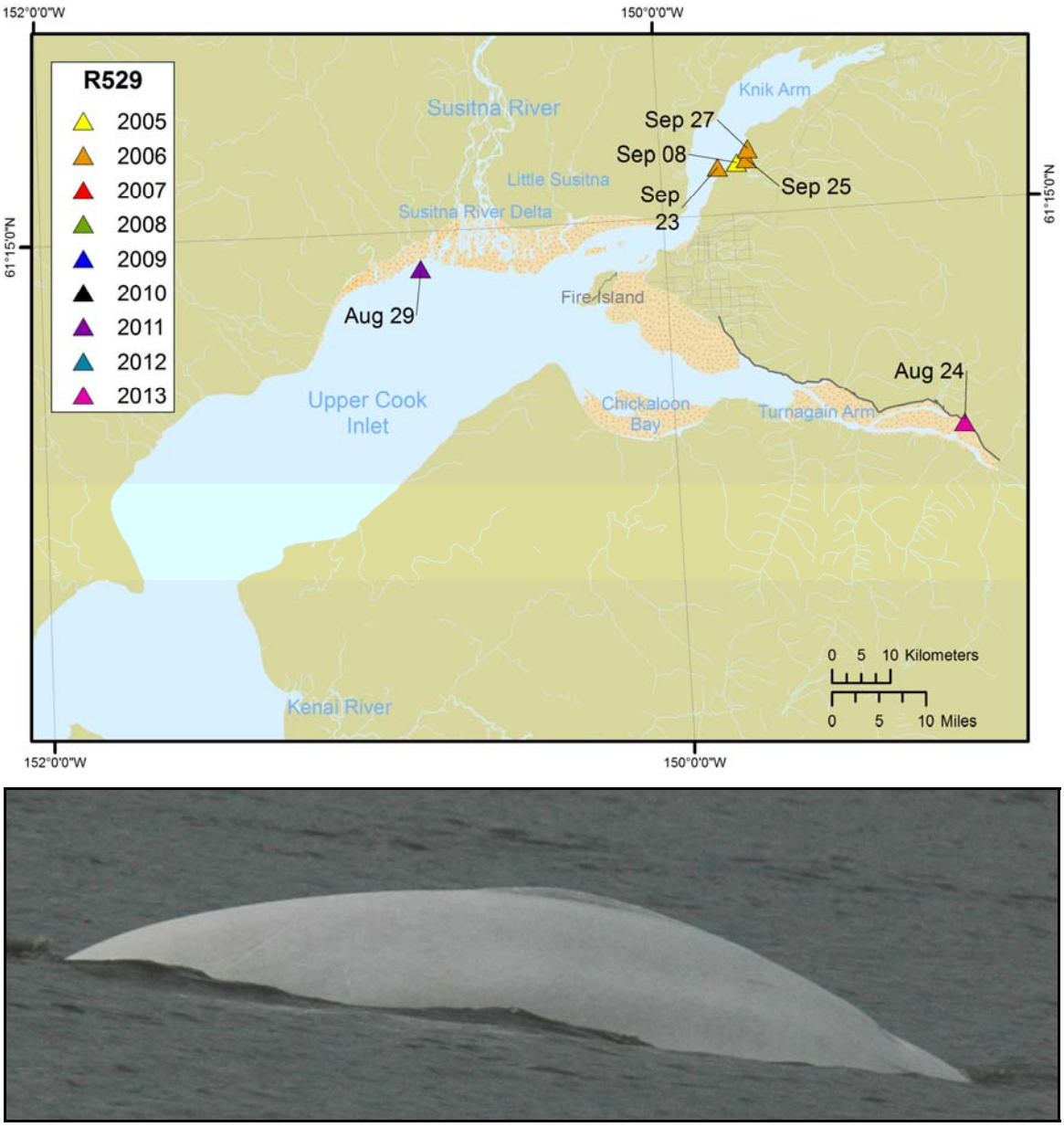

Figure D14. Sighting history and photograph of beluga R529, who was photographed in Turnagain Arm in 2013. This beluga is a presumed mother based on photographs with an accompanying calf.

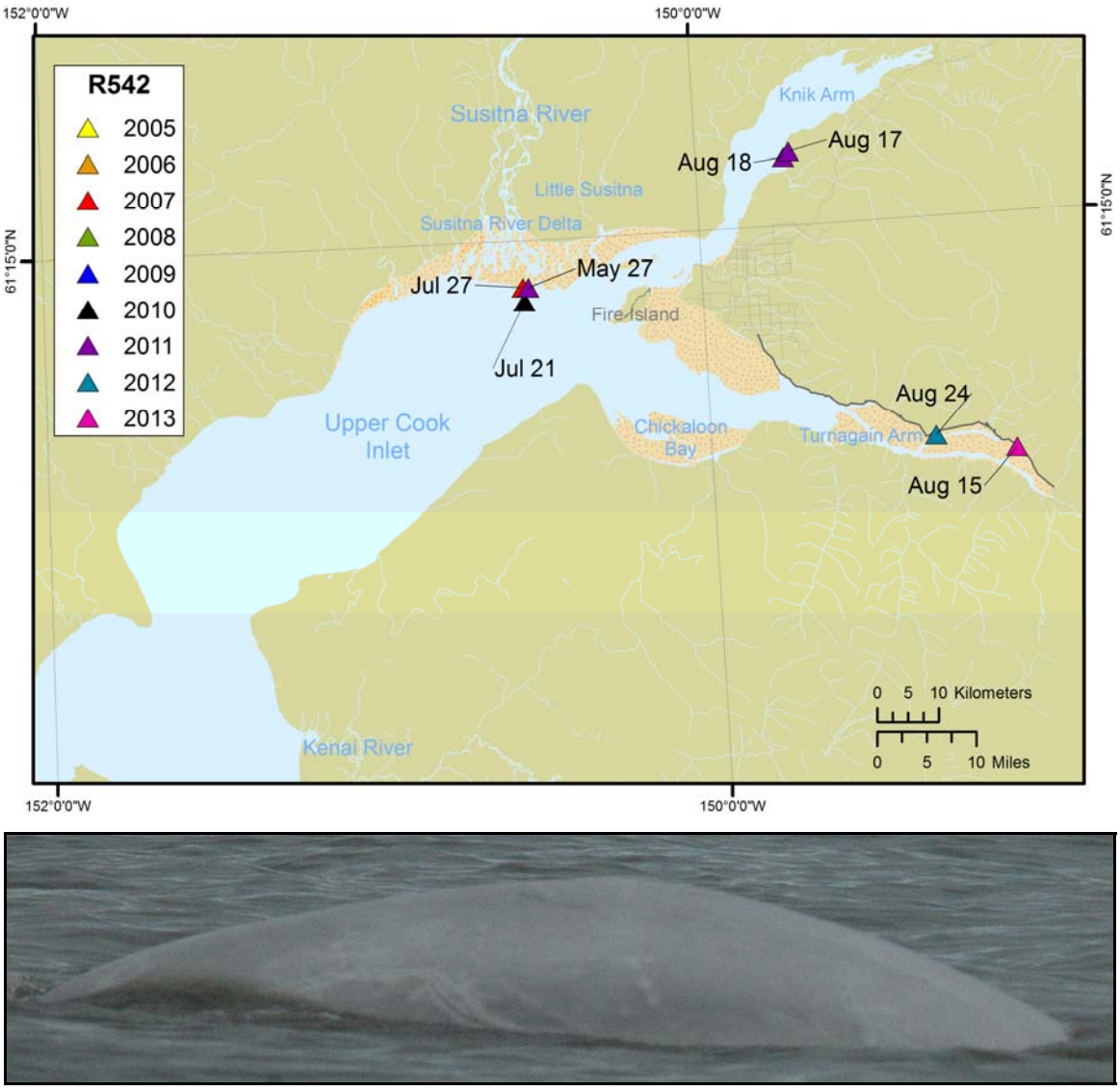

Figure D15. Sighting history and photograph of beluga R542, who was photographed in Turnagain Arm in 2012 and 2013.

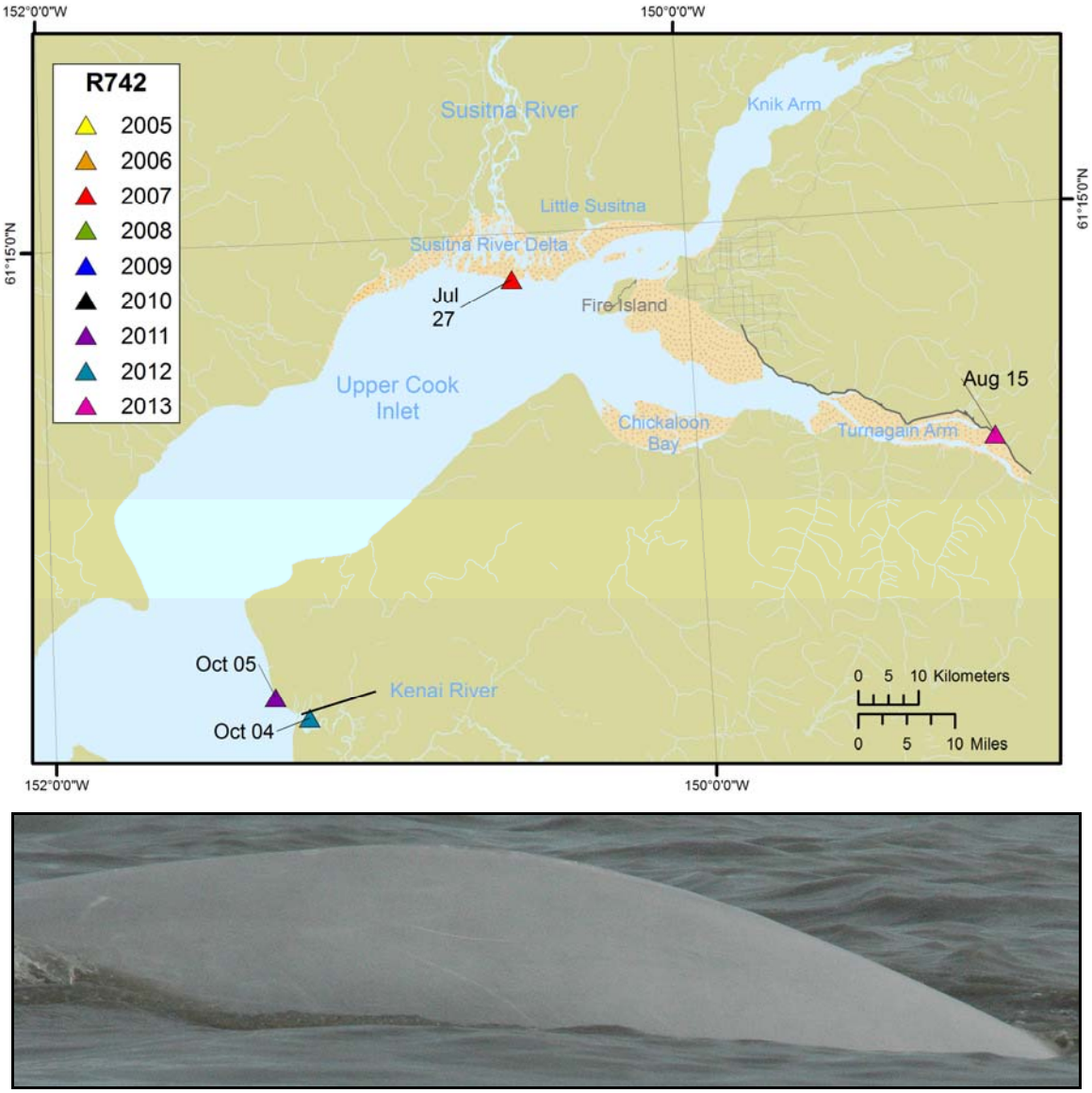

Figure D16. Sighting history and photograph of beluga R742, who was photographed in Turnagain Arm in 2013. This beluga is a presumed mother based on photographs with an accompanying calf.

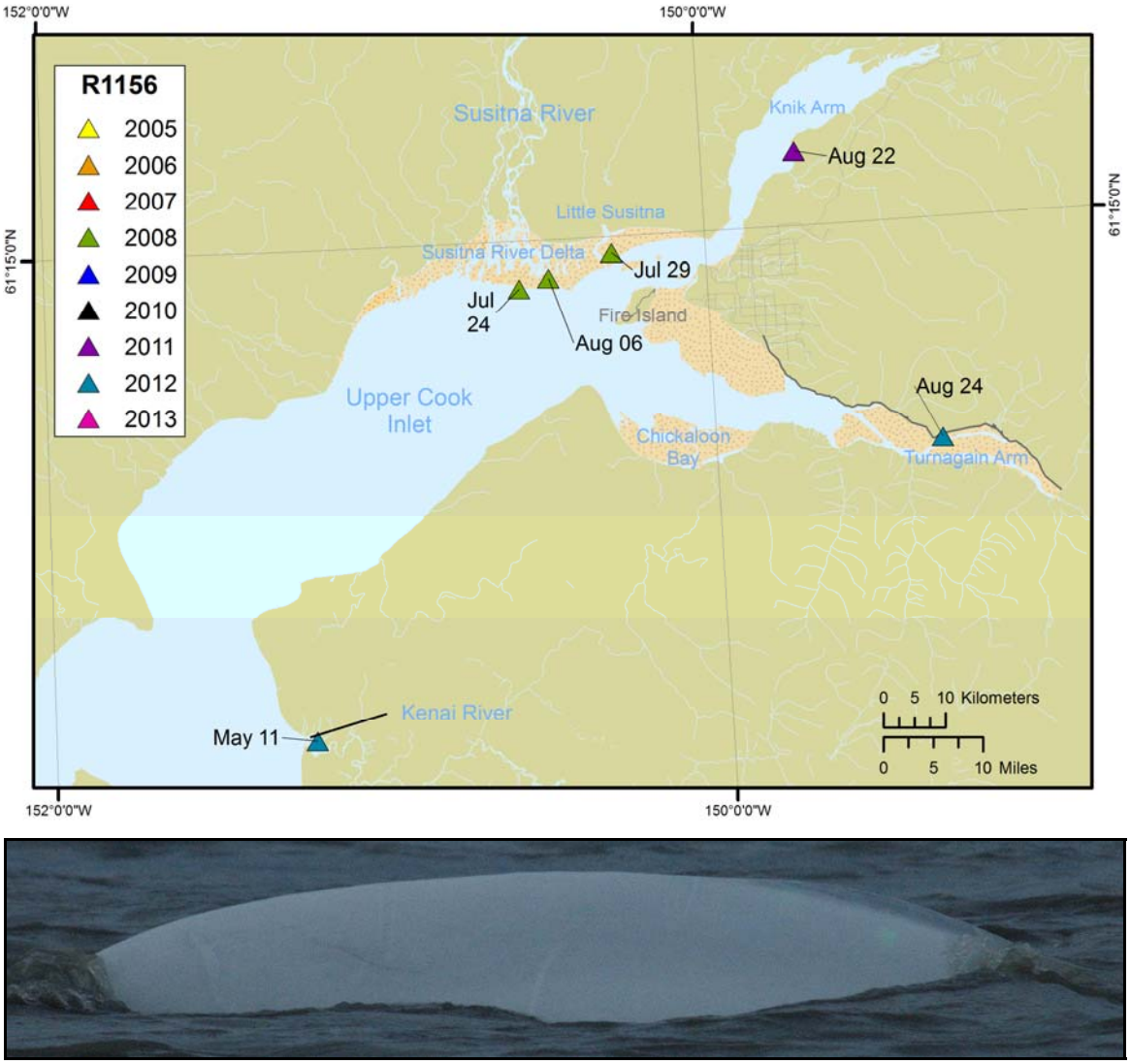

Figure D17. Sighting history and photograph of beluga R1156, who was photographed in Turnagain Arm in 2012. This beluga is a presumed mother based on photographs with an accompanying calf.

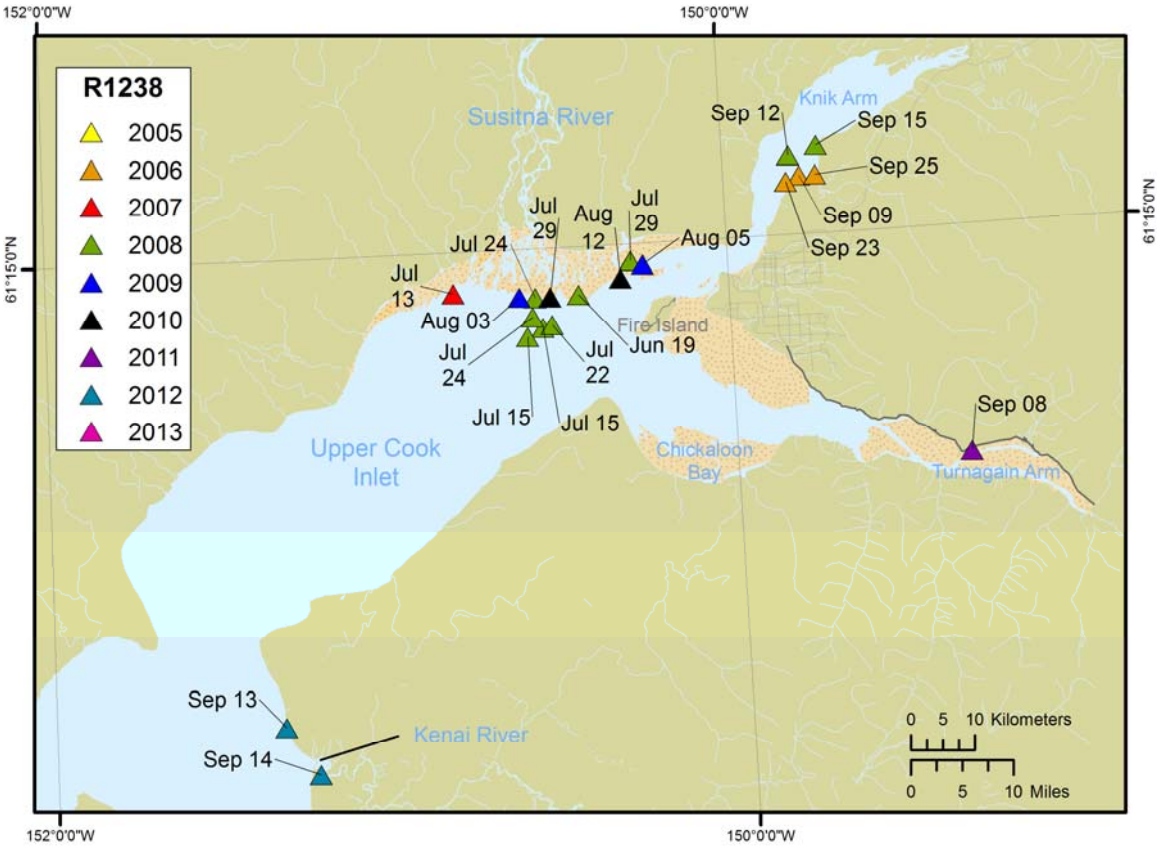

Figure D18. Sighting history and photograph of beluga R1238, who was photographed in Turnagain Arm in 2011. This beluga is a presumed mother based on photographs with an accompanying calf.

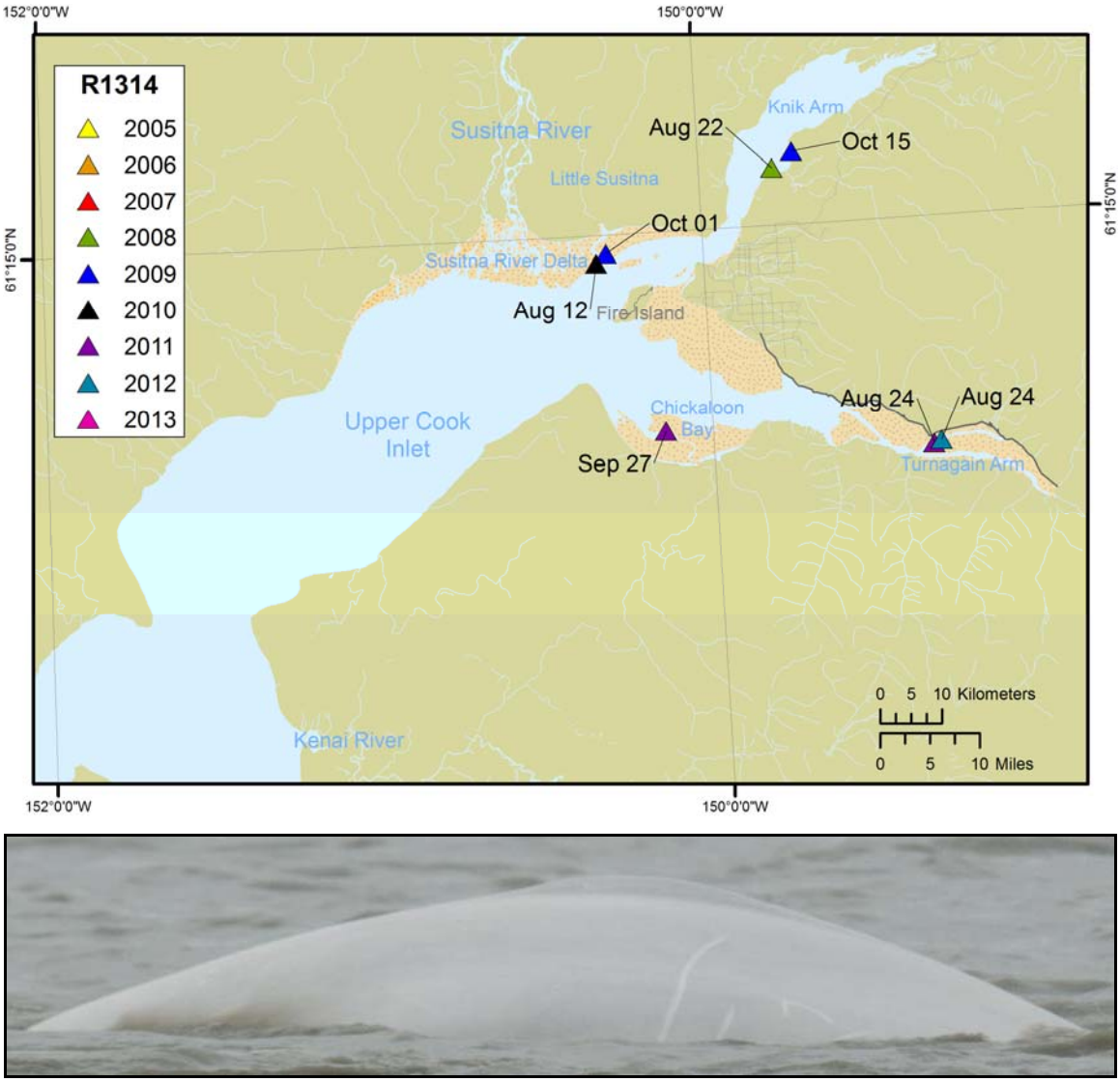

Figure D19. Sighting history and photograph of beluga R1314, who was photographed in Turnagain Arm in 2011 and 2012.

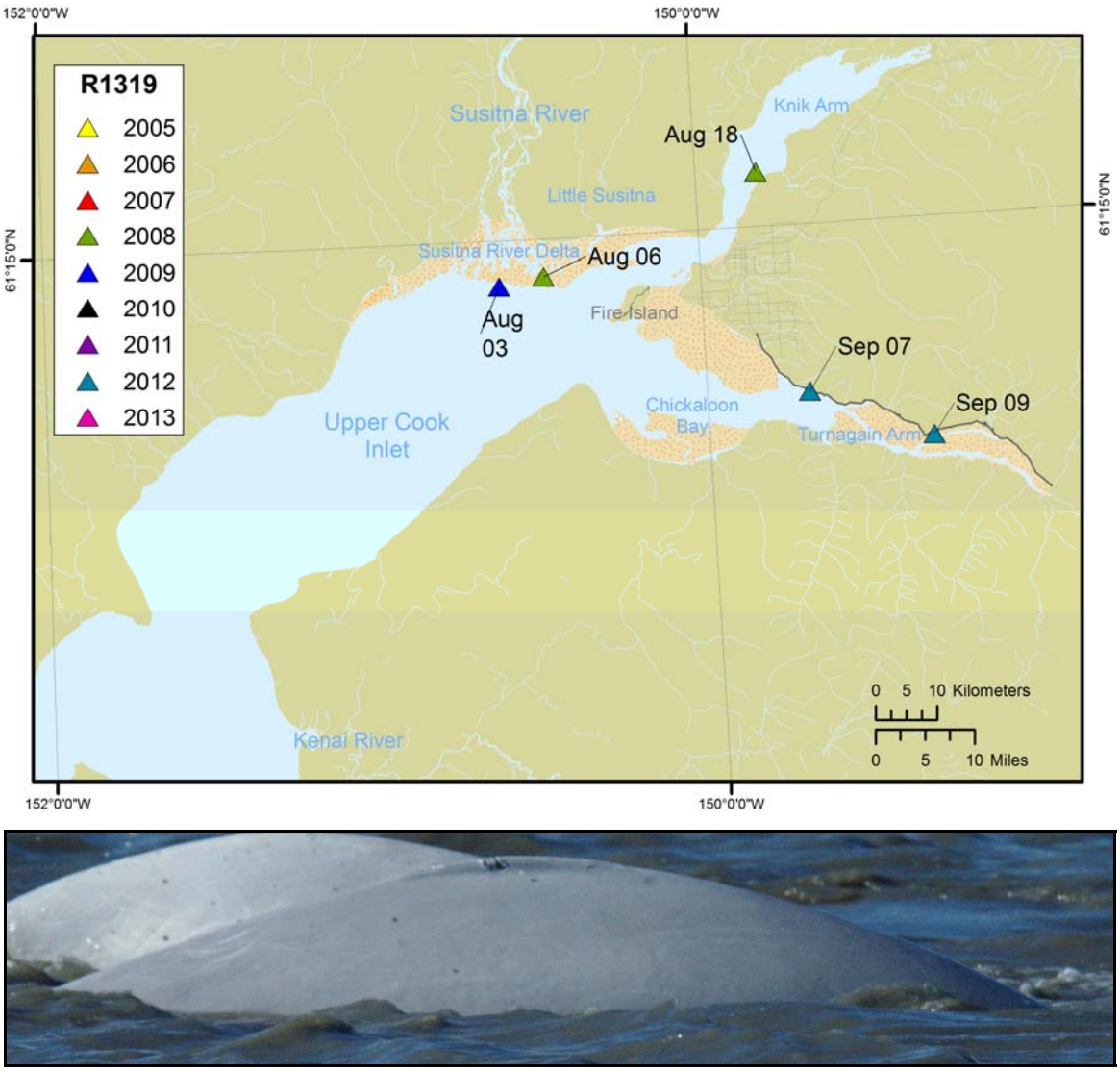

Figure D20. Sighting history and photograph of beluga R1319, who was photographed twice in Turnagain Arm in 2012. This beluga is a presumed mother based on photographs with an accompanying calf.

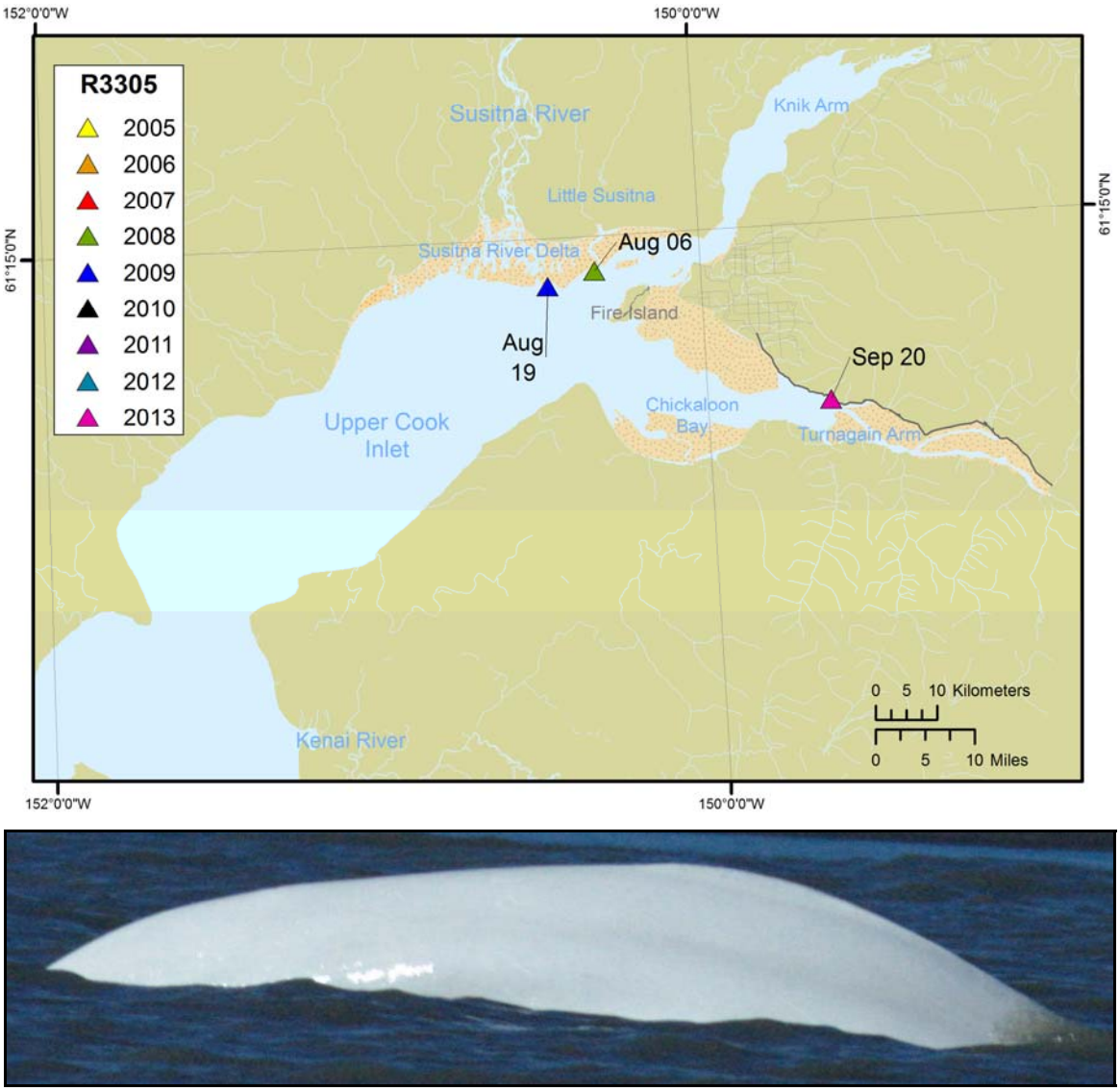

Figure D21. Sighting history and photograph of beluga R3305, who was photographed in Turnagain Arm in 2013. This beluga is a presumed mother based on photographs with an accompanying calf.

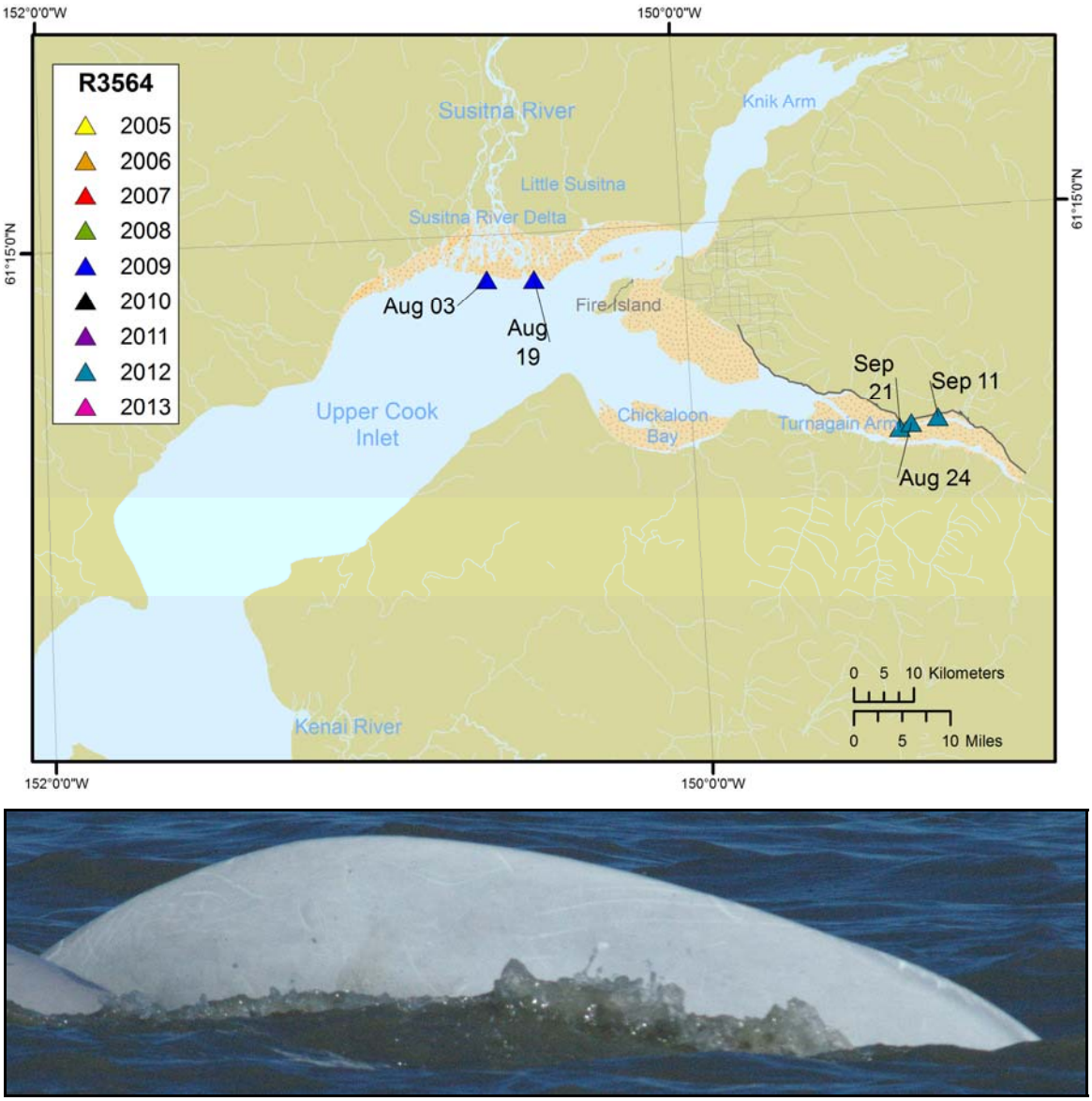

Figure D22. Sighting history and photograph of beluga R3564, who was photographed in Turnagain Arm in 2012. This beluga is a presumed mother based on photographs with an accompanying calf.

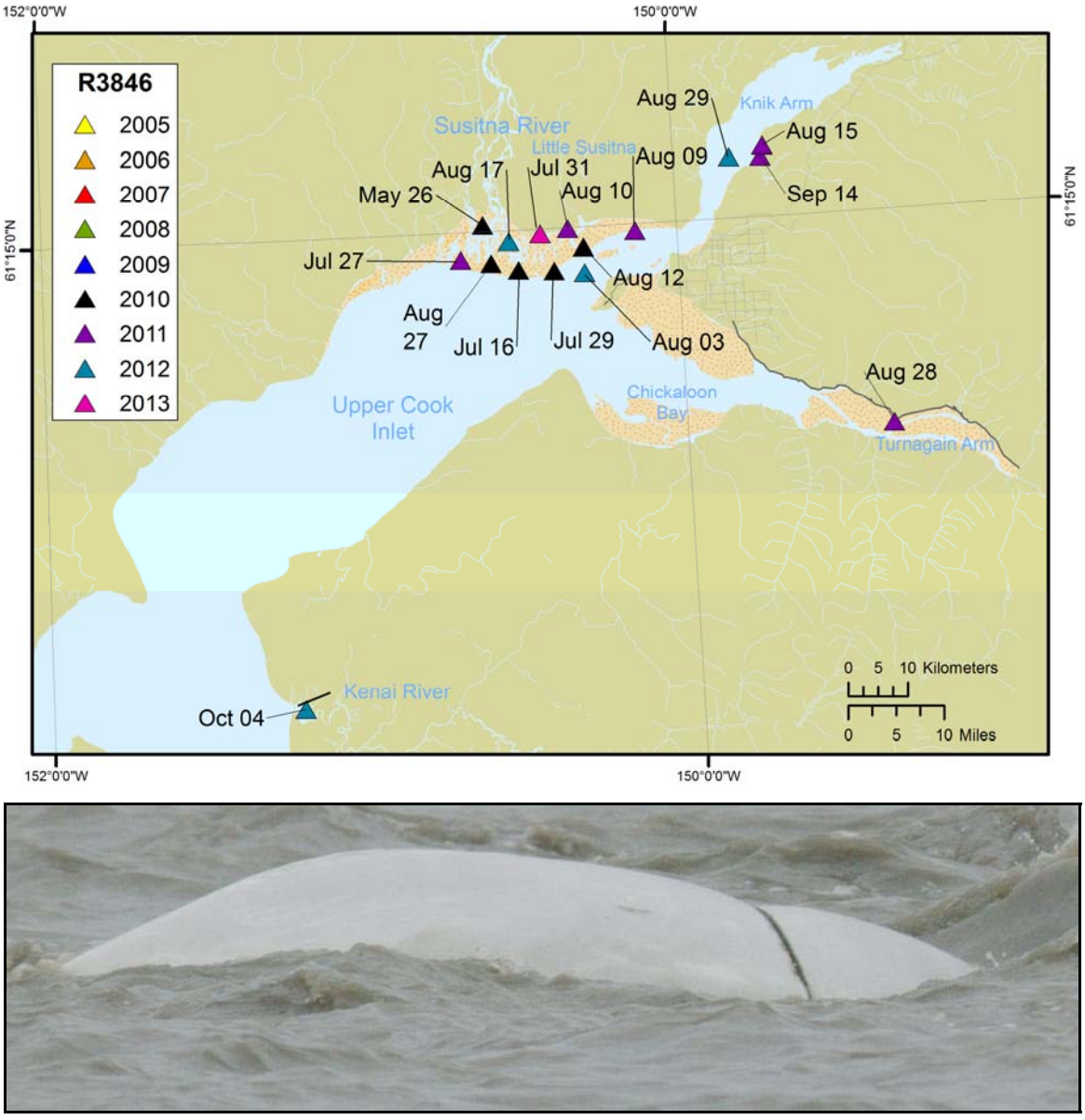

Figure D23. Sighting history and photograph of beluga R3846, who was photographed in Turnagain Arm in 2011.

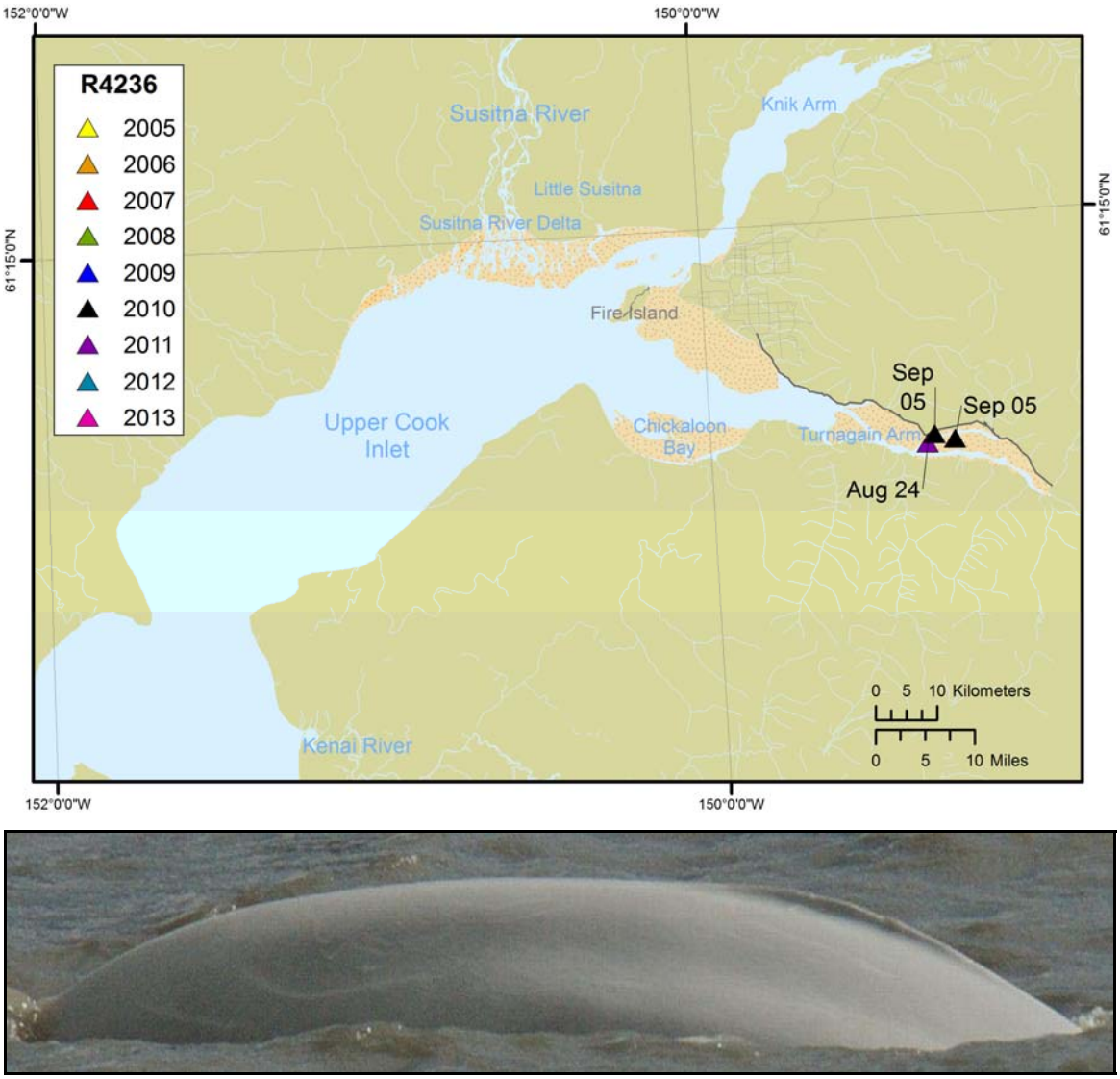

Figure D24. Sighting history and photograph of beluga R4236, who was photographed in Turnagain Arm 2010 and 2011.

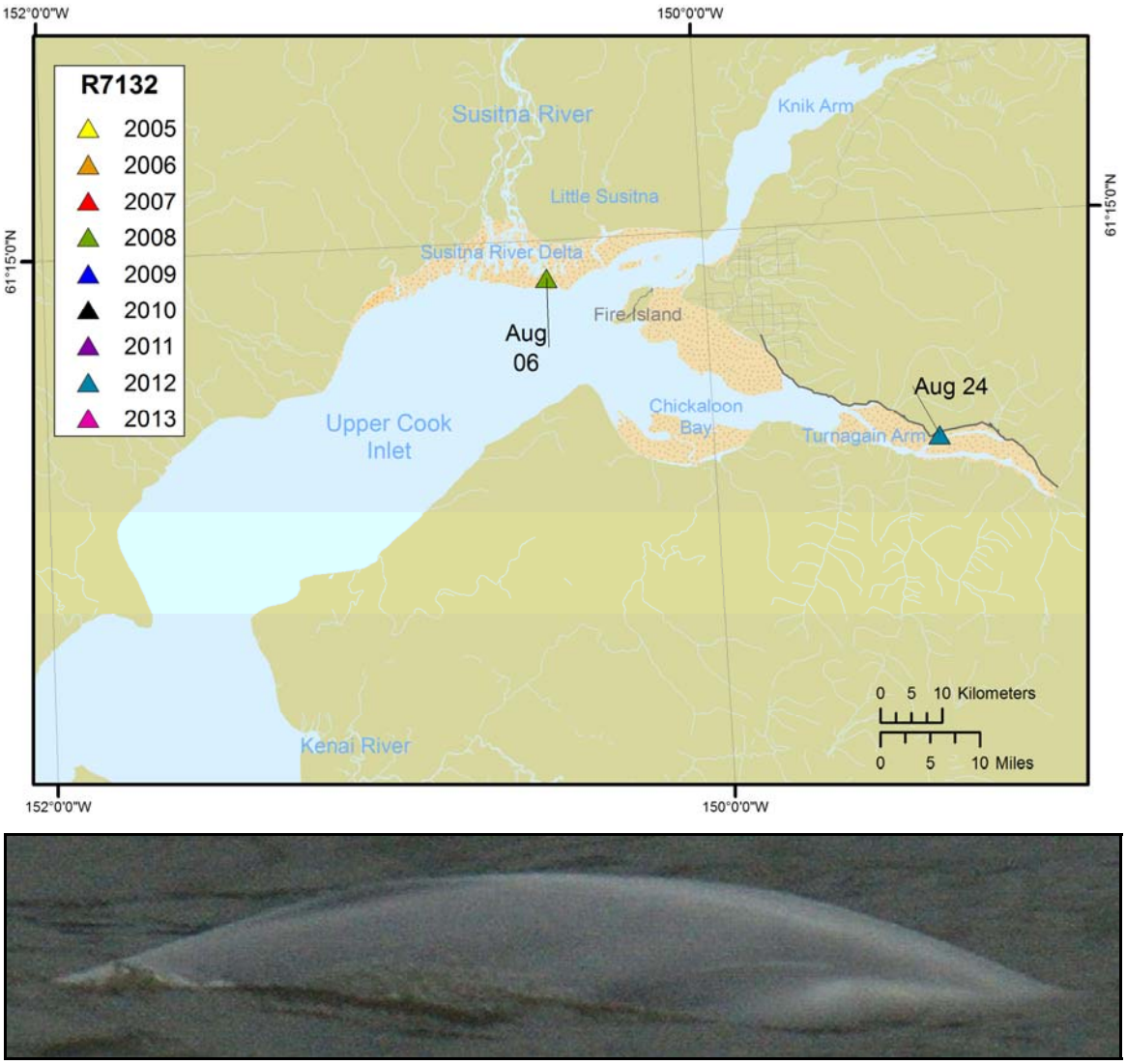

Figure D25. Sighting history and photograph of beluga R7132, who was photographed in Turnagain Arm in 2012. This beluga is a presumed mother based on photographs with an accompanying calf.

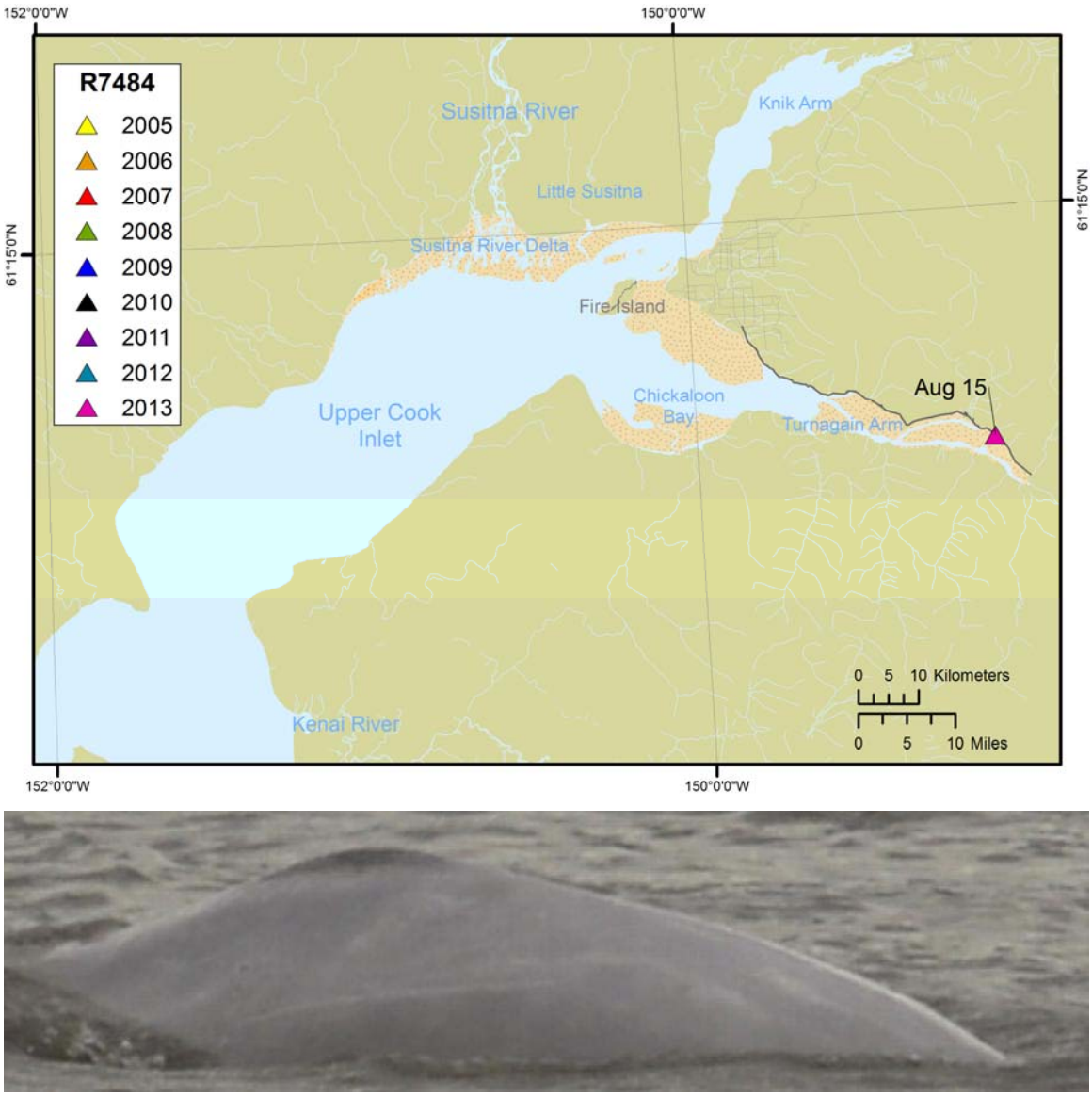

Figure D26. Sighting history and photograph of beluga R7484, who was photographed in Turnagain Arm in 2013.

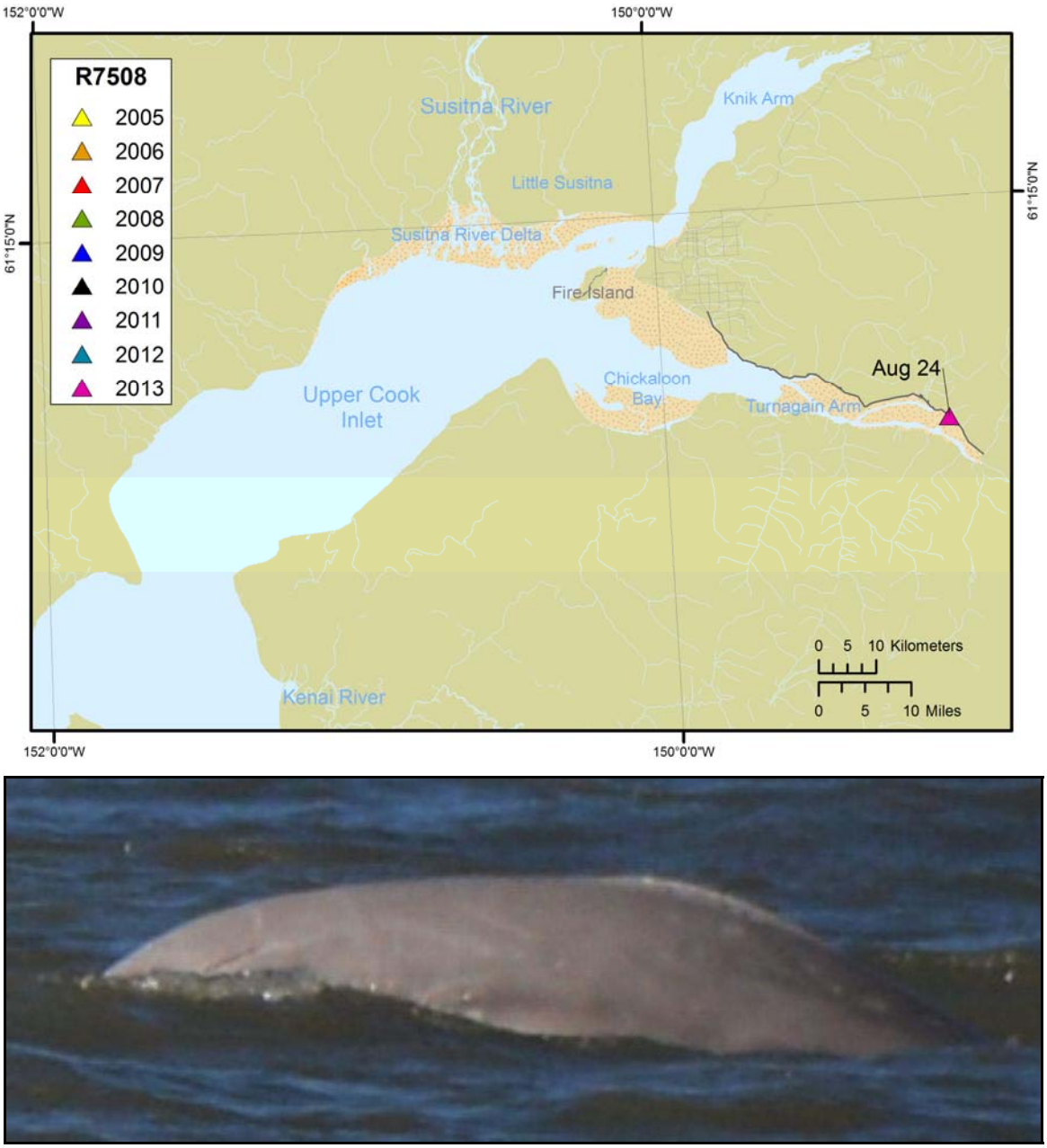

Figure D27. Sighting history and photograph of beluga R7508, who was photographed in Turnagain Arm in 2013.

APPENDIX E

EXAMPLES OF MARK TYPES IDENTIFIED FOR BELUGA WHALES PHOTOGRAPHED IN THE WATERS OF THE KENAI PENINSULA BOROUGH

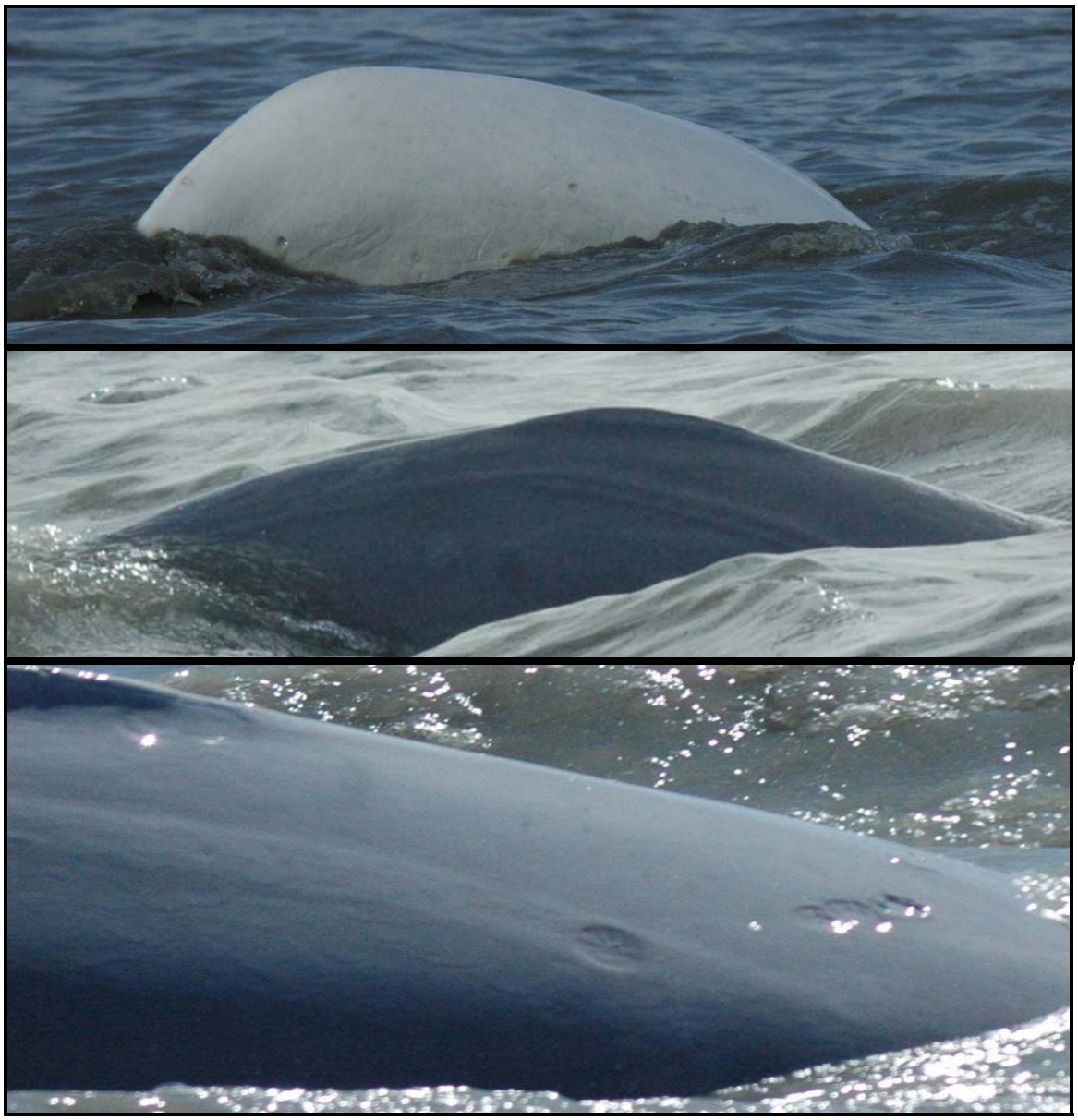

Figure E1a. Examples of marks classified as “Infection”.

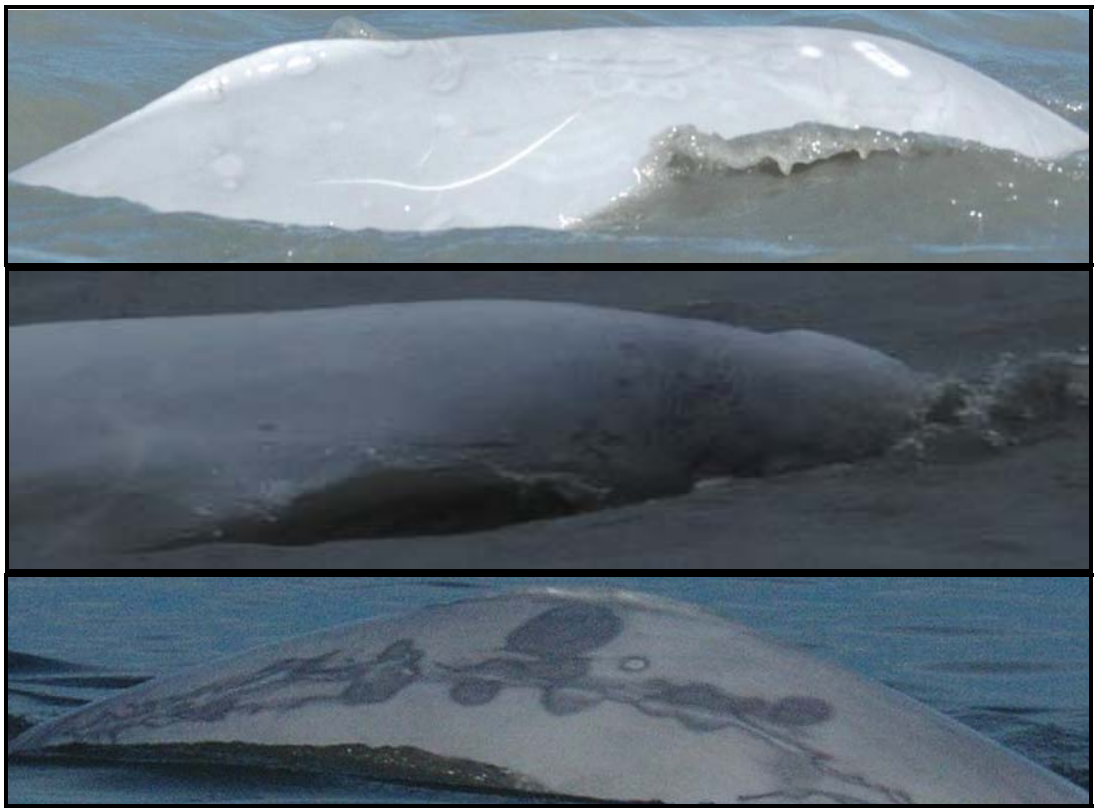

Figure E1b. Additional examples of marks classified as “Infection”.

Figure E2. Examples of marks classified as “Trauma”. These marks could be caused by vessel strikes (bow or propeller), guns, harpoons, arrows, or unknown sources.

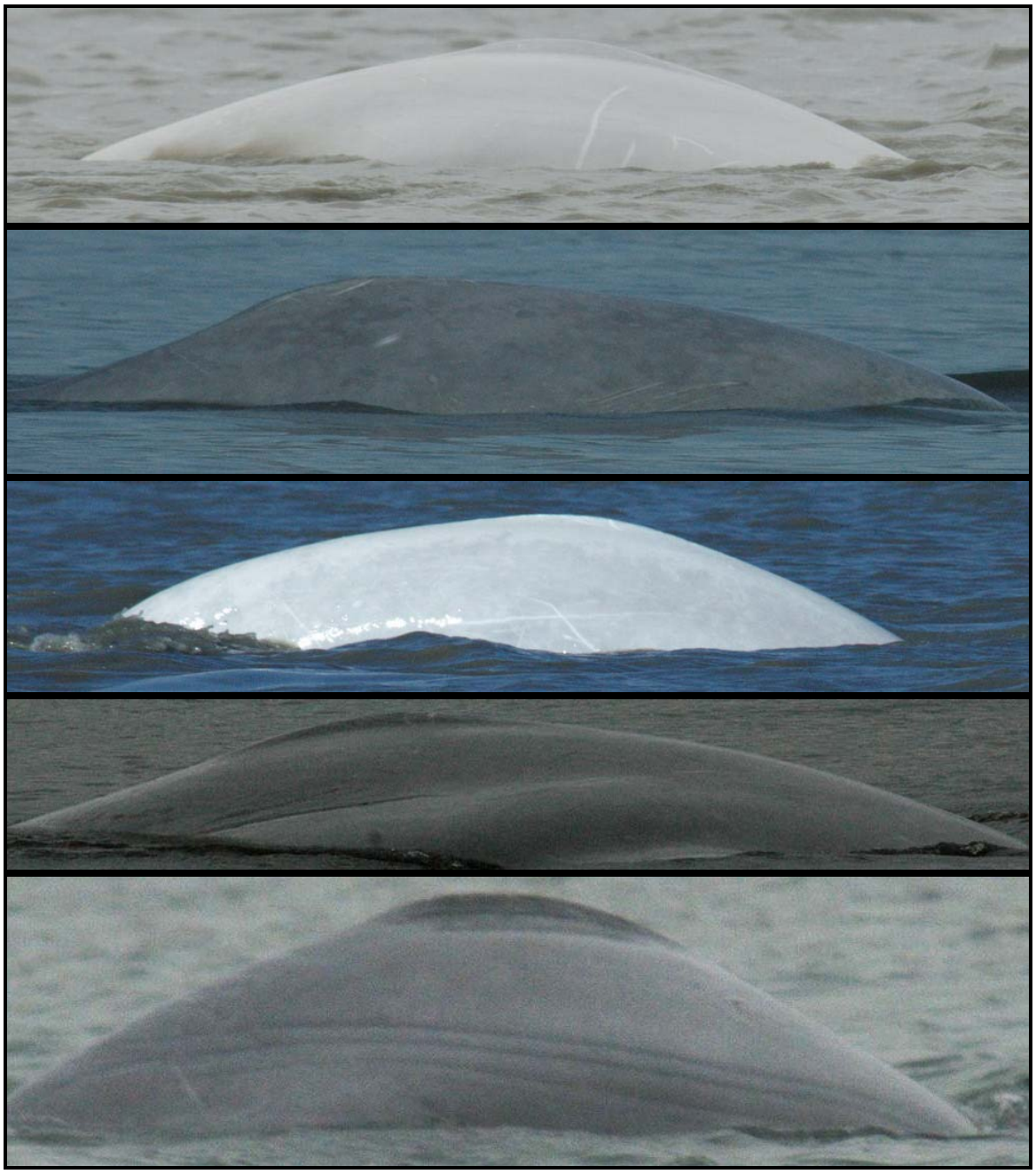

Figure E3. Examples of marks classified as "Rake Marks". Rake marks may be caused by teeth (of other belugas, orcas, or seals) or claws (harbor seals).

Figure E4. Examples of marks classified as "Possible Molting". These marks may also be from mud/silt and/or disease.

Figure E5. Examples of marks classified as "Satellite Tag Scars". These scars also appear to be infected.

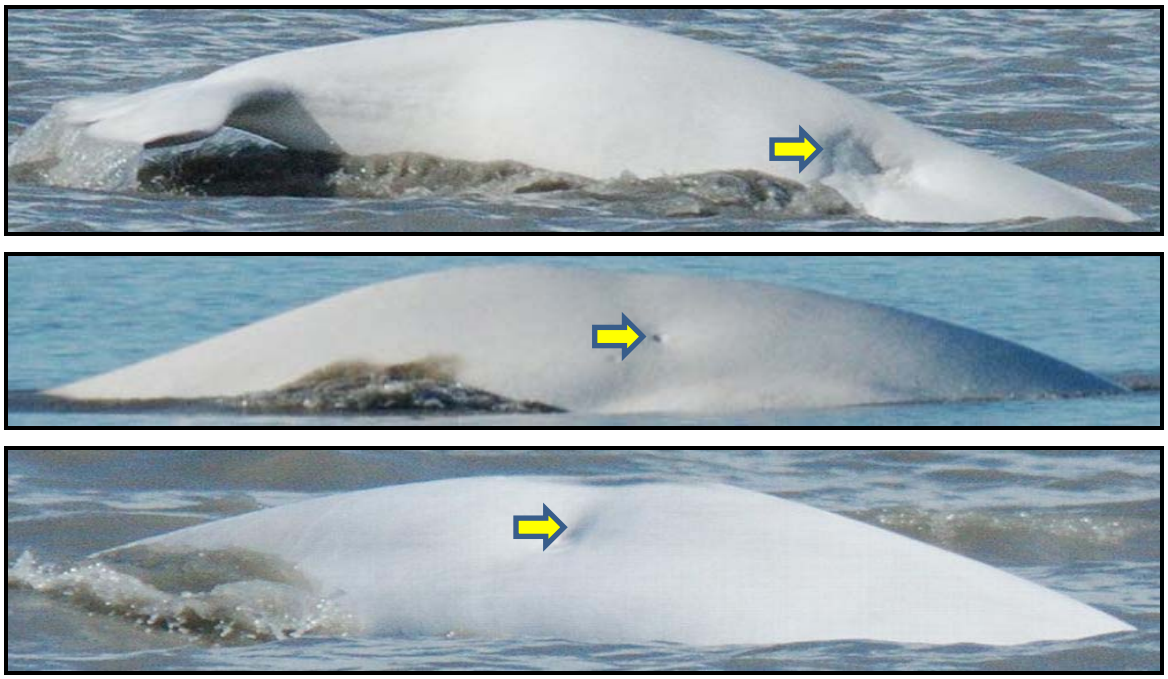

Figure E6. Examples of marks classified as "Puncture Wounds". Wounds may be caused by gunshots, harpoons, or unknown sources. These wounds are also classified as "Trauma". Wounds caused by satellite tags are not classified as puncture wounds or trauma.

Figure E7. Examples of mark classified as "Entanglement" (top photo) and "Possible Entanglement" (bottom photo).

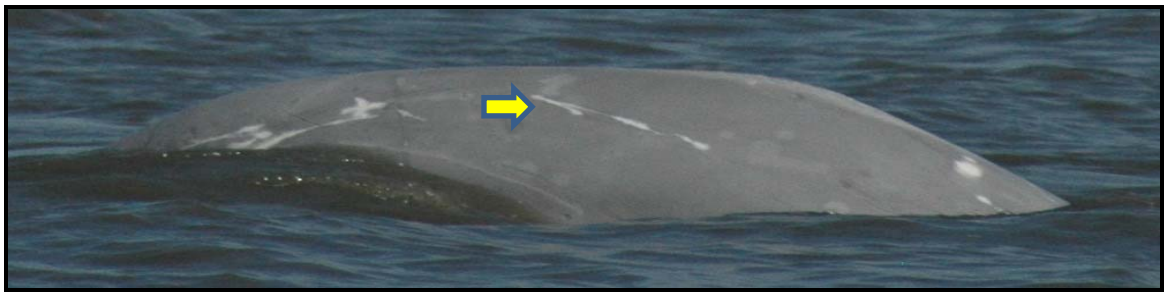

Figure E8. Examples of mark classified as "Pigment".

Figure E9. Examples of mark classified as "Mud/Silt". These marks could also be from molting and/or disease.

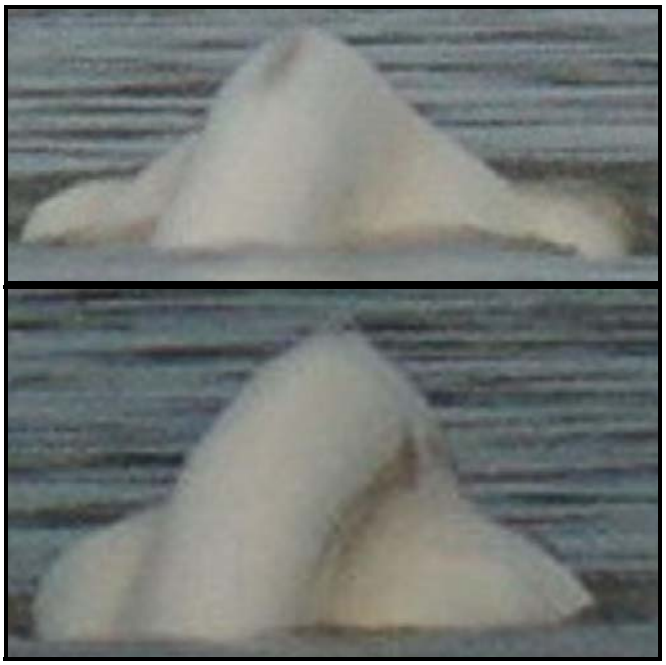

Figure E10. Photographs of an emaciated unidentified whale photographed in the Kenai River, May 03, 2012. This whale was accompanied by a small calf.

APPENDIX F

COOK INLET BELUGA INCIDENTAL SIGHTING REPORT FORM

Kenai River Beluga Whale Sightings

Please record all sighting of live or dead belugas.

- Date of sighting (day-month-year): _____
- Time of sighting: _____am/pm (circle one)
- Location of observer: _____
- Location of whales: _____
- Number of animals (# white, # gray, # calves, # unknown color): _____
- Behavior (traveling, resting, chasing fish, etc.): _____
- Boats near whales? (if so, what kind, how many, how far, doing what_____
- Other animals near whales? (birds, seals) _____
- Name and contact info of person who saw the whales: _____
- Name and contact info of person recording the sighting _____
- Were photos taken? If so, how can we get a copy of them? _____
- Additional comments (please use reverse side of form if necessary): _____
- Please send your photos of belugas for us to compare to individual whales in our catalog. If we recognize the whale, we will share with you what we know of its history.

- Please mail completed sighting forms and photos to:
  Tamara McGuire, LGL Alaska Research Associates, Inc.
  2000 West International Airport Road, Suite C1, Anchorage, AK 99502
  Tel 907 562 3339 or email to: tmcguire@lgl.com

- We report all dead and injured belugas to the Alaska Marine Mammal Stranding Network, and share reports of all live beluga sighting with NMFS's Marine Mammal Laboratory.

APPENDIX G

COOK INLET BELUGA WHALE AND PROJECT ARTICLE IN THE REDOUBT REPORTER

THE REDOUBT REPORTER

May 23, 2012

Beluga dead at river mouth — Juvenile whale entangled in educational fishery set net

By Jenny Neyman

Photos courtesy of LGL Alaska Research Associates, MMPA/ESA research permit No. 14210.

Tamara McGuire, wildlife biologist with LGL Alaska Research Associates, has been documenting beluga whales in Upper Cook Inlet as part of a photo identification project. The project has been extended to the Kenai Peninsula Borough. Seen here are examples of some of McGuire's beluga identification photos from the project.

Though an updated Cook Inlet beluga whale population survey isn't going to be conducted until early June, there is one recently confirmed change to the 2011 population number, when a subadult beluga was caught in the Kenaitze Indian Tribe's educational fishery set gillnet near the mouth of the Kenai River on May 7.

"We were deeply saddened. This was not an intentional harvest," said Sasha Lindgren, cultural director for the Kenaitze Indian Tribe.

The whale was found the evening of May 7 in the tribe's educational fishery net, about a mile south of the mouth of the Kenai off Cannery Road.

Lindgren said that the crew running the net was on the beach, noticed the whale and called authorities.

"We're not exactly sure what happened, if the beluga was dead and got caught. It looks like it was dead and just it rolled up into the net with the surf action, so we're thinking it was dead or had no strength, because normally they go right through a net," she said.

Barbara Mahoney, with the National Marine Fisheries Service out of Anchorage, said the cause of death wasn't immediately clear. Representatives from the Alaska SeaLife Center in Seward collected the whale May 8 and performed an autopsy.

Photos courtesy of LGL Alaska Research Associates, MMPA/ESA research permit No. 14210.

"The cause of death is not known at this time, but tissue samples have been sent out for analysis," Mahoney said. She said that it could take weeks for the necropsy samples to come back.

The whale was a male, 8 to 9 feet long, meaning it was a few years old and not yet full-grown. Lindgren said the educational fishery crew had not noticed other whales in the vicinity when the subadult was caught.

"Normally they chase the hooligan (into the Kenai River in the spring), and we haven't gotten the hooligan yet, so everything's kind of slow this year," Lindgren said.

It isn't unusual for belugas to be near the mouth of the Kenai this time of year, however, or even to be seen as far upstream as the Warren Ames Memorial Bridge on Bridge Access Road.

"Right about now, April or May, we hear about belugas in the Kenai. We have heard third-hand about a group of whales above the bridge about a week or two ago, and

Photos courtesy of LGL Alaska Research Associates, MMPA/ESA research permit No. 14210.

we're trying to get that confirmed. In the past we've had whales reported about this time, and then they kind of disappear in the summertime and return again in the fall," Mahoney said.

She said that Cook Inlet belugas, while they can be found in deeper waters mid-inlet, tend to stick closer to shore, where commercial, personal-use and educational set net fisheries take place. However, reports of belugas caught in set gillnets are exceedingly rare.

"When we do our abundance surveys the first week of June we try to cover 100 percent of the coastline because that tends to be where we see the whales. But (the fishermen) say that the whales are smart. This was a young whale so maybe it was still learning, but the whales avoid the nets," Mahoney said. "This is the first known mortality in our records for the last 25 years associated with fishing nets."

Two other incidents of belugas entangled in fishing nets have been reported in recent years. In the mid-1990s a beluga was reported caught in a drift net, but was successfully released, and a few years back a beluga got caught in a set net in Nikiski, and also was released. This is the first reported beluga whale mortality associated with a fishing net in Cook Inlet.

"It's pretty sad, especially since it was a baby. But I really don't believe that it died in our net, because commercial fishermen are always talking about belugas avoiding the nets or going right through their nets," Lindgren said.

The educational fishery, which is in its 23rd year, is permitted to operate two, 60-foot set gillnets for salmon starting May 1. Both can be on the beach, or one on the beach and one in the river. Fish caught cannot be sold. The tribe partners with other organizations and user groups to come participate in the fishery, with the tribe providing a fishing crew, which oversees the operation. Lindgren said it's a cultural event as well as an educational opportunity.

"The first kings every elder in the tribe get a piece and then they go out to the members. It's a focus point for the tribe. You go down there and see people you haven't seen for a while, 'How many grandkids do you have now?' and that type of stuff. So it reaffirms their bonds with each other, and identity. Lots of people go down there and just sit around the fire. You might not be the person that's holding the permit, it might not be

your day to go get fish but it's a day to go down there and visit your family," Lindgren said.

Continuing research

With the return of spring and summer comes a reprise of field season for several research projects regarding belugas. The Cook Inlet whales, identified as a genetically

Photos courtesy of LGL Alaska Research Associates, MMPA/ESA research permit No. 14210.

isolated stock, were listed as endangered in 2008. Their population was estimated to be as many as 1,300 in the late 1970s. Harvest of the whales was stopped in 1995, but their population still has continued to decline.

The NMFS's population estimate in June 2011 was 284, down from the June 2010 estimate of 340. The decline has slowed, but the population still has not begun to grow, despite having the added protections — in designation of critical habitat area, for example — that an endangered listing entails.

Environmental groups are pushing for more measures to be taken. Just this month a lawsuit was announced, with the village of Chickaloon, Natural Resources Defense Council, Center for Biological Diversity and the Center for Water Advocacy challenging a permit issued by the NMFS allowing Texas-based oil and gas producer Apache Corp. to explore for oil and gas in Cook Inlet. The suit charges that Apache's planned use of air guns, high-intensity seismic exploration and explosives could harm the whales, with the resultant noise disrupting their movements and feeding habits.

Meanwhile, research efforts continue to try to shed light on why the whales' population hasn't started to grow. Some of that research is ongoing in the Kenai Peninsula Borough, after $800,000 in federal funds was allocated to the borough about two years ago to be spent on research projects falling under three categories:

- Improve knowledge of Cook Inlet belugas to determine factors that are limiting recovery.
- Refine knowledge of Cook Inlet beluga habitat requirements.
- Evaluate the impacts of anthropogenic activities on the beluga habitat.

The borough, not being experienced in beluga research, enlisted the assistance of staff with the National Oceanic and Atmospheric Administration.

"It was very beneficial to us that staff at NOAA in Anchorage was a very close player with us throughout this process. They helped us draft and review the RFP, and we also included one of them in review committee," said John Mohorcich, director of the Donald E. Gilman River Center.

The proposals were evaluated for how well they fit the priorities laid out in the RFP, the technical and scientific merit of the proposal, the overall management qualifications of those submitting proposals, and the proposed cost — though scientific merit outweighed cost considerations, Mohorcich said.

"This started under (Kenai Peninsula Borough Mayor Dave Carey) and he always made it very clear that what we were pursuing here was good science. The scoring basically was adjusted specifically to make sure those projects actually were evaluated on the merits themselves," he said.

Five projects were selected in 2011 and are ongoing:

- The Center for Coastal Physical Oceanography at Old Dominion University in Norfolk, Va., was awarded $176,000 to analyze physical and biological data from Cook Inlet as it relates to the environmental and climatic parameters of belugas. Basically, it's combing through, corralling and evaluating existing data and relating it specifically to the waters of the borough.

"It's tough because they'll pull in some of these studies and some of these parameters and nobody else had that magical political line running right down the middle of Turnagain Arm, so they'll have to decipher a little bit through that data process what is pertinent to the borough," Mohorcich said.

- The Cook Inlet Regional Citizens Advisory Council was awarded about $102,000 to take and analyze sediment samples in the near-tide areas of the borough's coastline, and compare it to other sampling that has already been done.

"They're trying to make a correlation, basically, if there's some physical attributes in the inlet with the distribution of the fish (belugas eat) and therefore, we think, directing where the potential feeding grounds would be for the belugas," Mohorcich said.

- Another literature-related project, for $54,000, is being conducted by Alaska Ecological Research LLC, "looking to try to compile some similar methods analysis developed into databases that they can correlate, basically, to the belugas' distribution," Mohorcich said.
- The Alaska SeaLife Center in Seward got just over $65,000 to compile an oral history of habitat use of the inlet. ***(See related story, next post.)***

"They really reached out and tried to identify a lot of residents and locals everywhere from Homer all the way up to the Kenai and Point Possession area. They did interviews, taped them, videoed them, and now they're compiling that oral history," Mohorcich said.

An exhibit of the oral history is set to open June 8, to coincide with National Oceans Day.

- The remaining $237,000 went to LGL Alaska Research Associates to extend the

Photos courtesy of LGL Alaska Research Associates, MMPA/ESA research permit No. 14210.

Cook Inlet Beluga Whale Photo-ID Project to the borough. The project uses boat and shore-based photography to identify individual beluga whales and to study the distribution, habitat use and population structure of inlet belugas, according to LGL researcher Tamara McGuire.

The project has been ongoing since 2005 in Upper Cook Inlet, mainly around the mouth of the Susitna River and in Knik Arm. Photos of whales are taken and archived, and whales are identified by specific markings, such as from injuries that have healed but are still visible.

Over time, sighting histories are compiled for each known individual, and researchers are able to learn more about individual movement patterns, preferred habitat, social structure, how often individual mothers give birth and how long calves remain with their mothers, according to LGL.

"One of the things we do is go back and try to figure out who the mom is and who her calf is and then we try to track them through time to try to learn more about how long calves stay with their moms, how often moms are reproducing, what's the success rate — in other words, are the calves dying off earlier than they should or are they maturing and living to reproduce themselves?" McGuire said.

Results are shared with NMFS, so expanding the project to the borough expands the knowledge base available to researchers.

"A big question we have is are the whales we see in the upper part of the inlet the same whales that you see in the Kenai River or are they a different subgroup? Are they feeding on the same things, are they being exposed to the same types of human activities or are they very localized?" McGuire said. "I really didn't know if we'd see whales in the Kenai River anymore, because we received reports from people that live down there that they're patchy, so I didn't know if we'd be able to go down there in the boat and say, 'OK, we're going to go out at this time, on this date and see whales.' I really thought we'd have a lot more days of no whales. But it seems that they're there in the fall and spring. They might be there in low numbers but they're still there, which is exciting to know that."

McGuire asks that if anyone sees a beluga, they report it on the website, www.cookinletbelugas.com. There also are 24-hour hotlines for reporting stranded whales, or other marine mammals: 1-800-853-1964 for the NOAA Fisheries hotline, or 1-888-774-7325 for the Alaska SeaLife Center's hotline.

Now is the time to keep an eye out for white in the water.

"The exciting part is we're ice-free again and we can see these guys easier," Mohorcich said. "I'm looking forward to seeing them again. They're always way cool, in my opinion, when we get to spot them out there."