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Natural Resource Stewardship and Science

Results of Humpback Whale Monitoring in Glacier Bay and Adjacent Waters 2012

Annual Progress Report

Natural Resource Technical Report NPS/GLBA/NRTR—2013/796

ON THE COVER
A shoal of humpback whales in Icy Strait, October 2012.
Photograph courtesy of Glacier Bay National Park and Preserve.

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Annual Progress Report

Natural Resource Technical Report NPS/GLBA/NRTR—2013/796

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This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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This report is available from the Glacier Bay National Park and Preserve website (http://www.nps.gov/glba/naturescience/whale_acoustic_reports.htm) and the Natural Resource Publications Management website (http://www.nature.nps.gov/publications/nrpm/). To receive this report in a format optimized for screen readers, please email irma@nps.gov.

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Abstract

Migratory endangered humpback whales (*Megaptera novaeangliae*) from the Central North Pacific stock use southeastern Alaska as summer feeding habitat, including the waters in and around Glacier Bay National Park and Preserve (GLBA). This report summarizes the findings of GLBA's humpback whale monitoring program in 2012, the twenty-eighth consecutive year of consistent data collection in Glacier Bay and Icy Strait (GB-IS). In June, July and August, the number of whales in GB-IS (n = 208) was the second highest count ever documented. Seventy-three percent of the whales, including 12 mother/calf pairs, met our definition of 'resident' (remaining 20 or more days). This highlights the importance of GB-IS as a summer feeding ground for humpback whales. Compared to the past two years, the number of whales in Icy Strait was up (n = 176 vs. n = 145 in 2010 and n = 157 in 2011) while the number of whales in Glacier Bay was down (n = 125 vs. n = 132 in 2010 and n = 149 in 2011). We documented 16 mother/calf pairs, including a calf with deformed flukes and large gray patches and dents of unknown origin on its body. We collected 16 sloughed skin samples (including seven samples from calves) for genetic analysis. Overall, we observed fewer whales feeding on capelin (*Mallotus villosus*) than in past years. In September, dense concentrations of pteropods (*Limacina helicina*) occurred in lower Glacier Bay and Icy Strait, although we did not observe any whales feeding on this known prey species. We documented several whale/human interactions, including two whale-vessel collisions in Icy Strait. Between July 20 and September 18, we observed unusually large shoals of whales (20-41 whales) around Point Adolphus in Icy Strait.

Acknowledgments

Whale sightings, behavioral observations and enthusiasm from Park staff and volunteers continue to play an important role in this long term study. We commend Jen Cedarleaf and Jan Straley for their continued diligence in maintaining our shared regional whale sighting database. We are ever grateful to Bruce McDonough for keeping the *Sand Lance* running smoothly for another productive season. We appreciate Park staff who reported whale sightings, and the Park's Visitor Information Station for recording them and passing them along to us. We especially appreciated the many sightings we received from Nat Drumheller, Deb Johnson and Dena Matkin. We thank Yumi Arimitsu for identifying the whale prey that we observed on June 14th in Icy Strait. We are grateful to Captain Nelsen on the M/V *Safari Endeavour* and Captain De Vries on the cruise ship *Zuiderdam* for passing on their reports of unusual whale behavior in Glacier Bay. In addition, we thank Captain Bos on the cruise ship *Volendam* and crew member W.J.M. Klappert for sharing their account and photograph of whales near the ship. We extend a big thanks to Hank Lentfer, Lane Ply, Fay Schaller, Chuck Schroth, Molly Sturdevant, Jan Straley, Tom Trevarthian, Katie Unertl, Kelsey Brasseur and the Kittlitz's Murrelet crew for sharing their field observations with us. Thanks to Kaili Jackson, Aleria Jensen and Ed Lyman [National Oceanic and Atmospheric Administration (NOAA)] for compiling and sharing data on humpback whale strandings and entanglements in Alaska. We thank Christopher Sergeant, Craig Murdoch, Lisa Etherington and Paul Burger for reviewing this report and providing valuable comments.

National Park Service (NPS) data from 1988 to 1990 were collected by Jan Straley. NPS data from 1985 to 1988 were collected by C. Scott Baker. This work was carried out under NOAA Fisheries Permit #15844.

Introduction

This report summarizes the findings of Glacier Bay National Park and Preserve's (GLBA) humpback whale (*Megaptera novaeangliae*) monitoring program during the summer of 2012, the twenty-eighth consecutive year of consistent data collection in Glacier Bay and Icy Strait. The initial impetus for this program stemmed from concern in the late 1970s that increased vessel traffic in Glacier Bay may have caused a large proportion of the local whale population to abandon the bay (Jurasz and Palmer 1981). The federal government is mandated to ensure that park management decisions do not negatively impact endangered species such as humpback whales. Therefore, each summer Park biologists document the number of individual humpback whales in Glacier Bay and Icy Strait, as well as their residence times, spatial and temporal distribution, reproductive parameters and feeding behavior. Residence times are valuable because they reflect site fidelity and habitat use. These data are used as an index to monitor long-term trends in the population's abundance, distribution and reproduction. Long term and consistent data collection in longitudinal studies is extremely rare and valuable in understanding the population parameters and trajectory of an endangered species. A summary of whale/human interactions in the study area and elsewhere in Alaska has been included in this report since 2003 to document trends in whale conservation issues such as entanglements and vessel collisions. Photographic identification data are also shared with other researchers studying North Pacific humpback whales. In addition, Park biologists use whale distribution data on a daily basis to make recommendations regarding when and where GLBA 'whale waters' vessel course and speed restrictions should be implemented in Glacier Bay.

The humpback whales in the study area are part of the southeastern Alaska feeding herd which is in turn a part of the central North Pacific stock. Humpback whales in this stock winter mainly in the Hawaiian Islands and migrate in the summer to feed in northern British Columbia and southeastern Alaska (SEAK), the Gulf of Alaska and the Bering Sea/Aleutian Islands (Baker *et al.* 1990; Perry *et al.* 1990; Calambokidis *et al.* 1997). In SEAK, the most recent population estimate was 1585 whales in 2008 (95% central probability interval: 1455, 1644) (Hendrix *et al.* 2012). This is considered a minimum population estimate for SEAK because no data were collected in southern SEAK. From 1985 to 2000, the number of individual whales documented in Glacier Bay and Icy Strait ranged from 41 to 219 (Neilson *et al.* 2012), which closely matches population size estimates for this area derived from capture-recapture statistical analyses (Saracco *et al.*, in press). From 1985-2009, the average annual rate of population growth in Glacier Bay and Icy Strait was 4.4% (Saracco *et al.*, in press).

Humpback whale movement throughout southeastern Alaska is presumed to be linked with prey availability, which likely influences the number of whales in the study area (Baker *et al.* 1990; Krieger 1990; Straley and Gabriele 1995; Straley 1994). Whales in Glacier Bay and Icy Strait typically feed alone or in pairs, primarily on small schooling fishes such as capelin (*Mallotus villosus*), juvenile walleye pollock (*Theragra chalcogramma*), sand lance (*Ammodytes hexapterus*) and Pacific herring (*Clupea pallasi*) (Wing and Krieger 1983; Krieger and Wing 1984, 1986). Notable exceptions are the large, stable "core group" that commonly feeds at Point Adolphus in Icy Strait, and the much less consistent large pods at Bartlett Cove and Pleasant Island Reef (Baker 1985; Perry *et al.* 1985; Gabriele 1997; Neilson *et al.* 2012).

Methods

The methods used for this annual monitoring program have been described in previous reports. The primary techniques have not changed significantly since 1985, allowing for comparison of data between years. The specific methods used in 2012 are outlined below.

Vessel Surveys

We conducted surveys in Glacier Bay and Icy Strait from May 3 through October 10, 2012. We searched for, observed and photographed humpback whales from the *Sand Lance*, a 5.8-meter motorboat based in Bartlett Cove and equipped with a two-stroke Evinrude E-TEC 150 HP outboard engine. To minimize the potential impact that monitoring efforts might have on whales, we typically did not conduct surveys in the same area on consecutive days.

The study area included all of Glacier Bay and most of Icy Strait (Fig. 1) with a primary survey area covering the main body of Glacier Bay (roughly defined by four corners: Point Gustavus, Point Carolus, Geikie Inlet and Garforth Island) contiguous with a primary survey area in central Icy Strait (roughly defined by four corners: Point Gustavus, Point Carolus, Pinta Cove and Mud Bay). Between June 1 and August 31 we surveyed the primary survey area in Glacier Bay 3 – 4 days per week, focusing the day's effort in a particular part of the study area. We surveyed the East Arm of Glacier Bay (to the mouth of Adam's Inlet) and the West Arm of Glacier Bay (to Russell Island) infrequently. We did not conduct surveys in any Park designated non-motorized waters. We surveyed Icy Strait approximately once per week, with the greatest survey effort focused in the primary survey area. When whale numbers in Icy Strait were high and the weather allowed, we sometimes surveyed Icy Strait two or more times per week. Glacier Bay is the main area of NPS management concern with regard to whales, but descriptions of the whales' use of Icy Strait provide essential context for the Glacier Bay results because whales frequently move between these areas and because Park waters include portions of Icy Strait. Several Icy Strait surveys included Lemesurier and Pleasant Islands and the mouths of Dundas Bay and Idaho Inlet.

The intent of the survey protocol is to photographically identify as many whales as possible in the study area between June 1 and August 31 in a manner that is comparable between years. We use a mixed approach in which we go to 'hotspots' where whale sightings have been reported or are very probable, while also surveying outlying areas where whales may or may not be present. We strive for five surveys per week that cover the entire primary survey area (Fig. 1). Survey effort is only systematic to the extent that we aim to survey a particular portion of the study area on a given day and we generally do not survey the same area on consecutive days. However, where the whales actually are, and how many there are dictates where the survey takes place and how much area we cover each day. Gathering life history data on individual whales is a secondary goal of the study, made possible by the whales' strong site fidelity to the study area and the high level of effort with which we cover the study area. The geographical distribution of whales is primarily of interest to the extent that it affects vessel management (*e.g.*, whale waters). Therefore, the true distribution of whales is not represented by our monitoring data because our data are biased towards areas where vessel management is a concern. We limit our observations to good to fair ocean and visibility conditions [*e.g.*, in most cases, Beaufort ≤ 3, seas < 0.6 m (2 ft) and visibility > 0.8 km (0.5 mi)] and we make periodic stops to scan with binoculars and listen for blows to keep our detection rate of whales high. This survey approach,

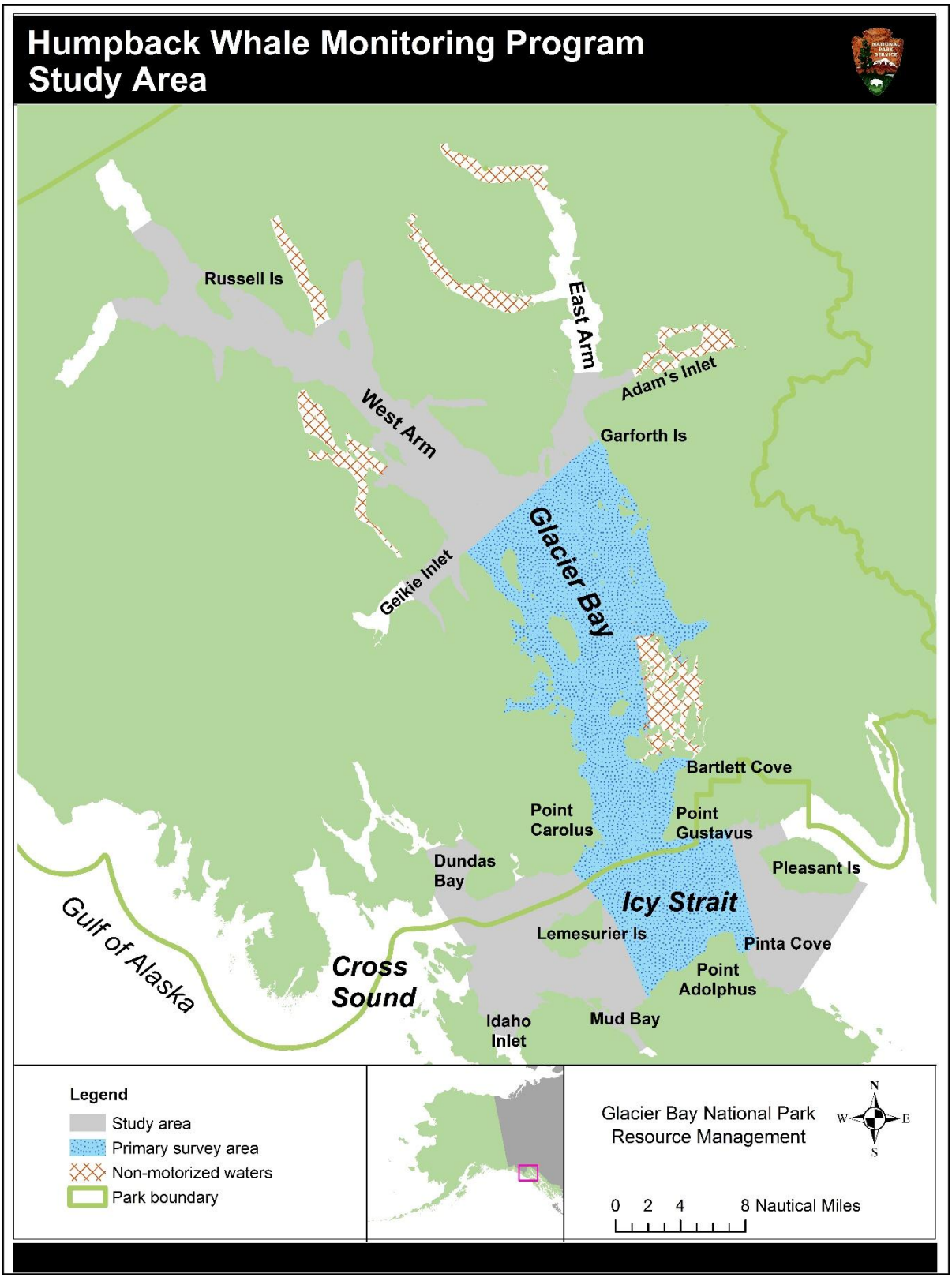

Figure 1. Study area in Glacier Bay and Icy Strait showing primary survey area and non-motorized waters.

combined with a high level of effort, approximates a census that identifies most of the whales in the study area in a given summer. In a recent study, capture-recapture statistical techniques were applied to GLBA humpback whale monitoring data collected from 1985-2009 and revealed that our annual whale counts accurately capture about 90% of the non-calf whales in the study area (Saracco *et al*. in press).

We defined survey effort hours as only those hours that we spent actively surveying for whales (*i.e.*, transit time to/from Bartlett Cove was not counted). We defined a survey "day" as any day with survey effort hours in Glacier Bay or Icy Strait, thus we counted days in which there was survey effort in both Glacier Bay and Icy Strait as one Glacier Bay day and one Icy Strait day.

We defined a pod of whales as one or more whales within five body lengths of each other, surfacing and diving in unison. We defined a shoal as a group of whales composed of subgroups that were within five body lengths of each other that were not necessarily surfacing and diving in unison and in which associations between individuals were fluid and ephemeral. Upon locating a pod or a shoal, we recorded the latitude and longitude coordinates of their initial location, determined with a GPS. We recorded on field datasheets all information pertaining to the pod or shoal, including the number of whales, their activity (feed, travel, surface active, rest, sleep, unknown), sketches of the markings on their tail flukes and dorsal fin, photographs taken, whale identity (if known), water depth, temperature and any prey patches observed on the depth sounder. If the whales were feeding we categorized their feeding behavior as subsurface, vertical lunge, lateral lunge, bubblenet, other bubble, flick or unknown (Jurasz and Jurasz 1979).

Whale Counts

The ventral surface of each whale's flukes has a distinct, stable black and white pigment pattern that allows for individual identification (Jurasz and Palmer 1981; Katona *et al*. 1979). For some whales, the shape and scarification of the dorsal fin also serve as unique identifiers (Blackmer *et al*. 2000). We took photographs of each whale's flukes and dorsal fin with a Nikon D90 digital camera equipped with a 100-300 mm zoom lens. We compared fluke and dorsal fin photographs to previous NPS photographs and to photographs of other humpback whales from southeastern Alaska (University of Alaska Southeast, unpublished data) to determine the identity and past sighting history of each whale.

We referred to many whales by a permanent identification number common to the combined catalogs of GLBA and University of Alaska Southeast researcher Jan Straley. We also referred to those whales first photo-identified by Jurasz and Palmer (1981) by their nicknames (Appendix 2). We only assigned calves a permanent identification number if we obtained adequate photographs of the calf's flukes and the calf was sighted on more than one day. For whales that had not been previously identified in Glacier Bay and Icy Strait, we assigned temporary identification numbers. We replaced these temporary numbers with permanent identification numbers if we identified the whale on more than one day or if the whale was identified elsewhere by another researcher. Photographic and sighting data were added to a relational database containing Glacier Bay and Icy Strait whale sighting histories from 1977 to 2012. We also printed and catalogued the best 2012 identification photograph (fluke or dorsal fin) of each individual.

We examined the 2012 photographs to determine the number of distinct individual whales observed. We made separate counts of the number of individual whales that we sighted in Glacier Bay, Icy Strait and the combined Glacier Bay-Icy Strait area for the dedicated monitoring period (June 1 – August 31) and for a 'standardized period' (July 9 – August 16) (after Perry *et al*. 1985). We used the "line drawn between Point Gustavus and Point Carolus" [found in Park regulations defining Glacier Bay (Title 36 Code of Federal Regulations (CFR) Subpart N, 13.1102)] to separate Glacier Bay and Icy Strait and assigned sightings north of the line to Glacier Bay and sightings south of the line to Icy Strait. Appendix 2 shows where each whale sighting took place. Although the standardized period is substantially shorter than the current NPS monitoring period and the beginning and ending dates have no particular biological significance, we continue to use the standardized period because it provides the only valid means of comparing whale counts in 1982 –1984 to later years (Gabriele *et al*. 1995).

Residency

We determined the number of whales that were 'resident' in the study area. We defined a whale as resident if it was photographically identified in Glacier Bay and/or Icy Strait over a span of 20 or more days (after Baker 1986).

Reproduction and Juvenile Survival

We defined the following age classes: calves (less than one year old), juveniles (age 1 – 4 years, as determined by prior sighting history) and adults (age ≥ 5 years) (Chittleborough 1959). We keep track of reproductive histories of individual females and document the return and recruitment of these offspring into the population. Only calves who were observed more than once and whose flukes were photographed received an identification number. We calculated crude birth rate as an index of reproduction by dividing the number of calves by the total whale count from June 1 - August 31. 'Known age' whales are non-calf whales whose birth year is known from photo-identification.

Genetics

We opportunistically collected sloughed skin on the sea surface with a small dip net when whales breached or performed other surface active behavior. We stored these sloughed skin samples in plastic canisters filled with dry table salt (NaCl). We archived half of each skin sample at GLBA (in dry salt) and sent the other half to be archived (frozen at -80° F) at the National Marine Fisheries Service Southwest Fisheries Science Center where they are available on request to other scientists studying a variety of topics.

Feeding Behavior and Prey Identification

We recorded instances when we observed probable whale prey such as small schooling fish in the vicinity of whales. In addition, we opportunistically collected anecdotal reports of whale prey in the study area. We used field guides (Smith and Johnson 1977; Pearse *et al.* 1987; Hart 1988; Mecklenburg *et al.* 2002) to taxonomically identify sample prey items that we collected opportunistically at the surface using a dip-net.

Whale/Human Interactions

'Whale waters' are defined by NPS regulation as "any portion of Glacier Bay, designated by the superintendent, having a high probability of whale occupancy, based upon recent sighting and/or patterns of occurrence" (Title 36 CFR Subpart N, 13.1102). The whale observations from this

study are used to make recommendations to the superintendent on where and when whale waters should be implemented. Vessel course and speed restrictions have long been used to reduce whale disturbance and collision risk in whale waters (Title 36 CFR Subpart N, 13.1174). Speed and course restrictions are both important aspects of whale protection because the increasing whale population combined with whales' unpredictable distribution means that whales are often in mid-channel as well as within one mile from shore.

We opportunistically documented whale/human interactions in the study area including strandings, entanglements in fishing gear and disturbance by vessels and aircraft. We summarized whale/human interactions elsewhere in Alaska based on stranding data compiled by the NOAA Alaska Region Office of Protected Resources. In addition, we opportunistically collected reports of interactions in Alaska such as vessel collisions and entanglements via the grapevine and the media. While our reporting is likely not all inclusive because under-reporting is known to occur, we attempted to document the number and types of whale/human interactions to the best of our ability.

Notable Behavioral Observations

We summarized any unusual or notable whale behavior that we observed while photographing whales in the study area. In addition, we opportunistically collected anecdotal reports of unusual or notable whale behaviors in the study area.

Results and Discussion

Vessel Surveys

We searched for, observed and photographed humpback whales for a total of 273 hours in the combined Glacier Bay/Icy Strait study area (Table 1, Fig. 2). Our 2012 survey effort in Glacier Bay and the study area as a whole was below average, while our survey effort in Icy Strait was above average. We spent less time surveying in Glacier Bay and more time surveying in Icy Strait based on where most of the whales were distributed in 2012. Although we strive to maintain a comparable level of overall survey effort each year, it inevitably fluctuates as a result of inter-annual variability in uncontrollable factors such as weather, availability of staff and the frequency of unexpected events that detract from our ability to conduct surveys (*e.g.*, mechanical difficulties and marine mammal strandings).

Table 1. Monthly & Annual Survey Effort, 1985 – 2012.

YEAR	MAY		JUNE		JULY		AUG		SEPT		TOTAL # SURVEY DAYS (June 1 - August 31)		TOTAL # SURVEY HOURS (June 1 - August 31)		
	# survey days		# survey days		# survey days		# survey days		# survey days						
	GB	***IS***	***GB***	***IS***	***GB***	***IS***	***GB***	***IS***	***GB***	***IS***	***GB***	***IS***	***GB***	***IS***	***GB + IS***
1985	0	0	10	7	11	4	10	3	0	1	***31***	***14***	*234*	*92*	***326***
1986	0	0	13	5	17	3	6	6	0	2	***36***	***14***	-	-	-
1987	3	2	12	5	12	7	5	7	1	2	***29***	***19***	-	-	-
1988	0	0	11	5	12	7	12	5	7	3	***35***	***17***	*199*	*108*	***307***
1989	3	1	17	6	14	6	16	7	1	4	***47***	***19***	*231*	*123*	***354***
1990	6	4	16	5	18	6	14	8	0	0	***48***	***19***	*215*	*115*	***330***
1991	7	3	14	7	17	6	13	4	6	3	***44***	***17***	*256*	*100*	***356***
1992	3	2	19	4	17	5	12	4	7	1	***48***	***13***	*248*	*71*	***319***
1993	2	1	10	3	13	3	7	5	1	1	***30***	***11***	*192*	*62*	***254***
1994	1	0	9	5	10	4	13	8	1	1	***32***	***17***	*169*	*92*	***261***
1995	3	2	10	4	11	4	10	7	2	2	***31***	***15***	*167*	*90*	***258***
1996	4	2	11	5	17	10	16	3	3	1	***44***	***18***	*259*	*116*	***374***
1997	5	2	17	4	21	7	19	6	9	4	***57***	***17***	*327*	*90*	***417***
1998	10	4	20	3	23	6	12	4	5	2	***55***	***13***	*344*	*64*	***408***
1999	4	1	16	4	18	6	18	3	5	1	***52***	***13***	*318*	*64*	***382***
2000	1	0	21	8	21	5	23	6	5	1	***65***	***19***	*321*	*84*	***405***
2001	3	1	17	6	14	5	20	5	6	2	***51***	***16***	*236*	*76*	***312***
2002	3	1	19	6	19	4	18	2	4	2	***56***	***12***	*297*	*68*	***365***
2003	5	0	20	7	19	5	16	5	3	1	***55***	***17***	*283*	*101*	***384***
2004	6	2	21	3	19	5	21	5	8	2	***61***	***13***	*373*	*74*	***447***
2005	1	0	16	5	17	3	12	3	4	3	***45***	***11***	*216*	*56*	***272***
2006	2	2	14	6	15	7	16	7	5	1	***45***	***20***	*197*	*85*	***282***
2007	4	2	15	10	14	7	14	6	5	2	***43***	***23***	*206*	*117*	***323***
2008	4	1	16	10	14	8	12	9	3	1	***42***	***27***	*187*	*117*	***304***
2009	6	5	12	10	16	9	10	5	5	4	***38***	***24***	*179*	*107*	***286***
2010	5	3	14	9	11	11	17	8	3	5	***42***	***28***	*194*	*99*	***293***
2011	3	1	13	10	14	6	13	7	5	3	***40***	***23***	*189*	*110*	***299***
2012	5	2	11	8	12	9	12	10	4	2	***35***	***27***	*144*	*129*	***273***
										2005-2011 average survey effort:	42.1	22.3	195.4	98.7	293.3

The dashed line highlights a change in the way survey effort was calculated beginning in 2005 (Neilson and Gabriele 2007).

Total # survey hours are not available for 1986 & 1987.

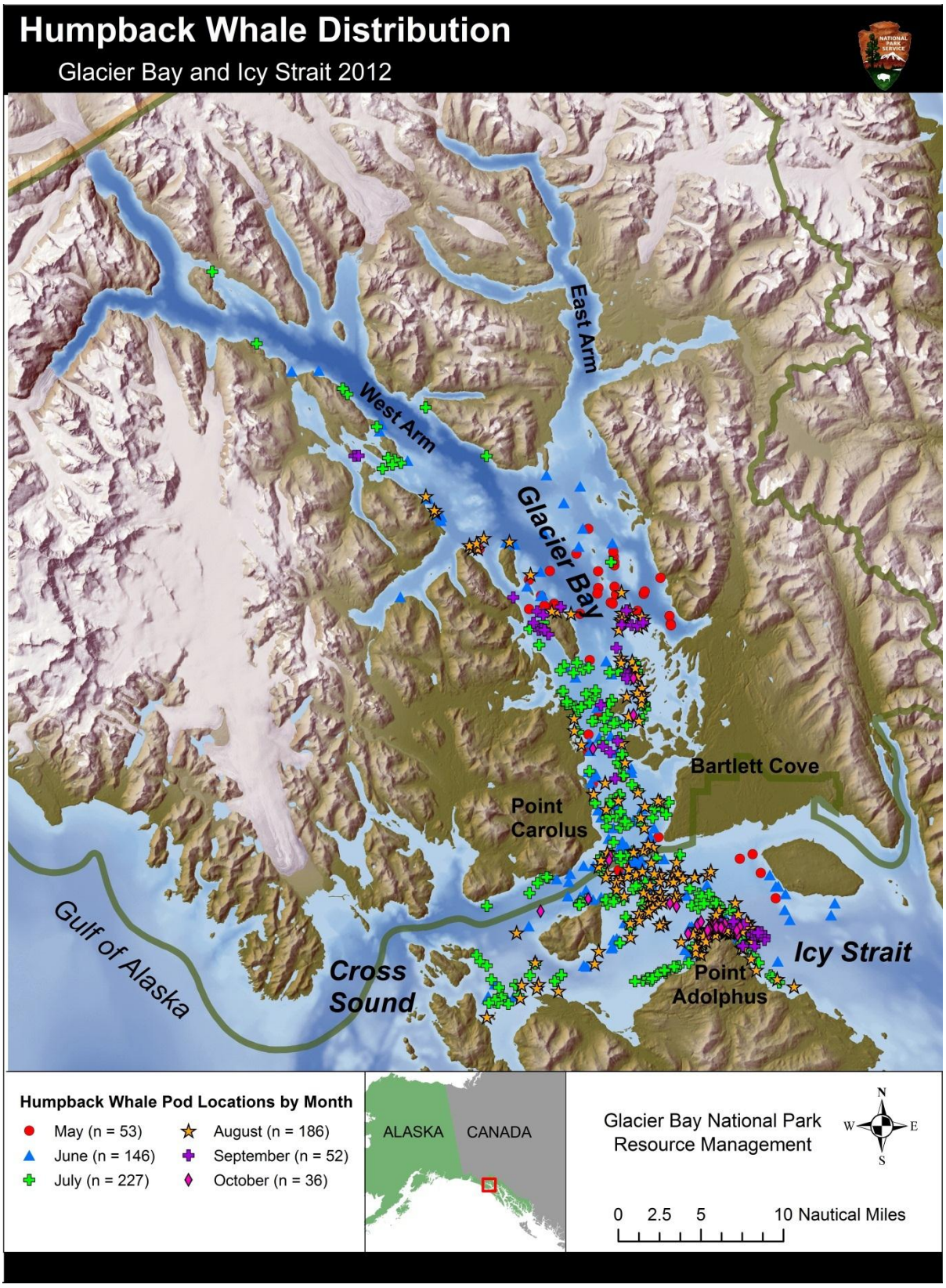

Figure 2. Study area in Glacier Bay and Icy Strait showing distribution of humpback whale pods in 2012. Each symbol represents a pod containing one or more whales.

Whale Counts

The number of whales in the study area as a whole in June, July and August (n = 208, Fig. 3, Appendix 1, Appendix 2) was the second highest count ever documented after the record high count of 219 whales in 2011 (Neilson *et al*. 2012). Compared to the past two years, the number of whales in Icy Strait was up (n = 176 vs. n = 145 in 2010 and n = 157 in 2011) while the number of whales in Glacier Bay was down (n = 125 vs. n = 132 in 2010 and n = 149 in 2011) (Neilson and Gabriele 2010, Neilson *et al.* 2012). The standardized period counts (July 9 – August 16) reflect this same general trend, with an unprecedented number of whales in Icy Strait (n = 144). During this same time period, the number of whales we documented in Glacier Bay (n = 87) was below the record high count in 2011 (n = 132).

We observed an additional 15 whales only outside of the regular June through August monitoring period, for a grand total of 223 individual whales in 2012. Overall the humpback whale population in the study area is growing with an estimated 4.4% annual rate of increase between 1985 and 2009 (Saracco *et al*. in press).

Eleven of the whales that we documented in the study area in June, July and August had not been sighted previously in Glacier Bay or Icy Strait. The percentage of "new" whales in the study area (5%) was lower than the 1985 – 2011 average (12%).

One more new whale was observed in Icy Strait outside of the June through August monitoring period, for a grand total of 12 new (non-calf) whales in 2012. This total is well below the record high count of 34 new (non-calf) whales in 2011. Three of the 12 new whales in 2012 were small to medium in body size which indicates that they may have been juveniles. Four of the 12 new whales were adults known to have been sighted elsewhere in southeastern Alaska; the remaining eight animals did not match any of the whales in the southeastern Alaska fluke catalog (University of Alaska Southeast, unpublished data) The number of new whales that did not match the SEAK catalog was low compared to recent years and well below the record set in 2011 when 26 unknown whales were identified (Neilson *et al.* 2012).

Residency

In 2012, 152 (73%) of the 208 whales that we documented in the study area between June 1 and August 31, including 12 mother/calf pairs, remained 20 or more days, meeting our definition of 'resident' (Appendix 2). This proportion is similar to recent years and highlights the importance of the Glacier Bay-Icy Strait region as a summer feeding ground for many humpback whales. Furthermore, monitoring results over many years have shown that while some whales are exclusive residents to Glacier Bay or Icy Strait, many move frequently between the two areas, demonstrating that the Glacier Bay-Icy Strait ecosystem is a single contiguous habitat (*e.g.*, Neilson *et al*. 2012).

Twenty-eight (13%) of the whales that we documented between June 1 and August 31 were identified on just one day (12 in Glacier Bay and 16 in Icy Strait), including two mother/calf pairs in Icy Strait and one mother/calf pair in Glacier Bay. Five of the whales that we documented on one day were in Glacier Bay (between Willoughby Island and Geikie Inlet) on either June 13 or June 18; otherwise the sightings occurred over a broad range of dates and locations, indicating that it was not a single pulse of whales arriving in the area. The proportion of whales sighted on one day between June 1 and August 31 varies widely each year, with a

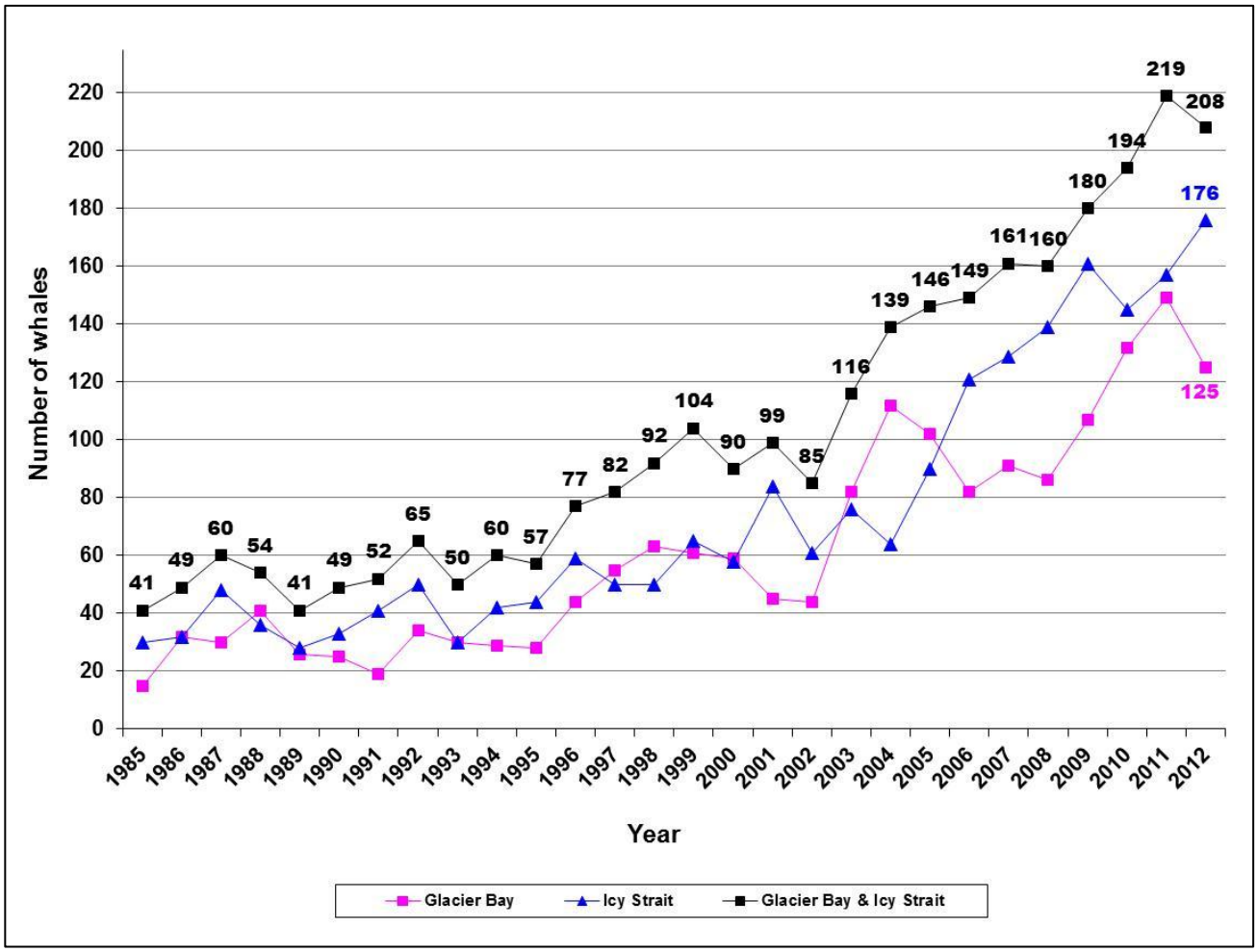

Figure 3. Number of individual whales documented in Glacier Bay & Icy Strait from June 1 through August 31, 1985 – 2012.

range of 12% – 37% since 1985. Overall, we have documented a decreasing trend in the percentage of whales sighted on one day only since 1985 (R^2=0.3475, df = 27, $p < 0.001$) but it is difficult to say whether this is due to a decrease in the number of transient whales and/or an increase in our success at identifying individuals on more than one day (*e.g.,* increased photographic analysis skills with increased experience, improved camera equipment over time, etc). We documented 9 more whales on just one day outside of the June 1 – August 31 monitoring period, bringing the grand total of whales identified on one day to 37 individuals.

Reproduction and Juvenile Survival

We documented 16 mother/calf pairs in 2012 (Table 2) with a crude birth rate (7.7%) lower than the historic average (9.9%) but within the documented range of values since 1984 for this highly variable parameter (3.3% - 18.5%) (Table 3). On June 19 we documented a very small whale (#2479) that we initially identified as a possible calf based on its size, overall appearance and proximity to known female #1658, however subsequent sightings of #2479 alone on July 20 and August 3 led us to conclude that this whale was not a calf.

We identified two mother/calf pairs exclusively in Glacier Bay, seven pairs exclusively in Icy Strait and seven pairs in both areas. The pairs using both areas reinforce the point that the entire study area, not just Park waters, is important whale habitat. As previously mentioned, three of the mother/calf pairs were identified on just one day (#1968 + calf on July 20, #1235 + calf on July 27, and #1443 + calf on August 9).

In June we documented female #541 with a calf in Icy Strait. This well-known female was last seen October 29, 2011 entangled in shrimp pot gear in Tenakee Inlet (NOAA Alaska Region unpublished data). Our 2012 sightings confirmed not only her survival, but that she had been pregnant during the entanglement. We did not detect any entangling gear remaining on whale #541 or any obvious entanglement injuries, although we were unable to assess the lower edge of her left fluke blade where an incision from line had been documented in 2011.

We documented female #944 and her calf #2483 during several encounters in Icy Strait between June 22 and August 8 (Fig. 4). The calf's behavior was normal during all of the encounters, however the calf had deformed flukes that were severely concave, giving the appearance that they were inserted upside-down in the caudal peduncle. In addition, there were large gray patches on the calf's skin and on the top of its head and back there were large gray patches and dents of unknown etiology. There were also several line scars on the calf that indicated it may have been formerly entangled in line. We speculate that there may have been multiple factors contributing to the calf's condition (including possibly an entanglement and/or vessel collision and/or disease and/or congenital defects).

When we documented whale #235 on August 27, her calf appeared to be missing. We monitored her for 30 minutes and saw no sign of her calf. We did not see #235 on any subsequent surveys to confirm her calf's absence. Although we occasionally observe mothers separate from their calves for periods up to one hour, in most cases we eventually document both the mother and the calf on the same day. We will not know the fate of this calf unless we identify it again in subsequent years based on its flukes and/or dorsal fin.

We documented killer whale (*Orcinus orca*) rake marks on the calf of #1432's flukes and caudal peduncle (calf #2488). About 6% of whales in SEAK have killer whale rake marks on their flukes (Steiger *et al*. 2008). Adult sized humpbacks rarely obtain new killer whale rake marks from year to year (*i.e.* most attacks occur on calves) (Mehta *et al*. 2007).

Whale #1968 (age unknown) was documented with her first known calf. The sex of this first-time mother was previously unknown.

The value of the longevity of this study is highlighted by the fact that 28% (n = 58) of the whales that we identified in 2012 (n = 208) were of known age, primarily from previous sightings in the study area. This is similar to the proportion of known age whales in recent years. Overall, there has been an increasing annual trend in the proportion of known age whales as we accumulate long-term sighting histories of the whales in the study area. This means that our dataset is increasingly useful for estimating life history parameters such as age at first reproduction in females.

Table 2. Mother-calf pairs documented in 2012.

	Mother ID#	Calf ID#	Documented in:
1.	161	2478	IS
2.	235	2480	GB & IS
3.	397	2481	IS
4.	541	2482	IS
5.	944	2483	GB & IS
6.	1014	2484	GB & IS
7.	1019	2485	IS
8.	1235	1235_calf_2012	GB
9.	1298	2486	GB & IS
10.	1421	2487	GB & IS
11.	1432	2488	GB & IS
12.	1443	1443_calf_2012	IS
13.	1470	1470_calf_2012	GB
14.	1479	2489	GB & IS
15.	1480	2490	IS
16.	1968	1968_calf_2012	IS

GB = Glacier Bay; IS = Icy Strait

Figure 4. Deformed calf of #944's concave flukes (left) and gray patches and dents on head and back (right).

Table 3. Reproduction and known age whales in Glacier Bay and Icy Strait, 1982 – 2012.

Year:	# Calves	# Calves Photo ID'd	% Calves Photo ID'd	Crude Birth Rate (%)	# Known Age Whales	Total # Whales
1982	6	3	50	-	-	-
1983	0	0	0	-	-	-
1984	7	5	71	17.9	-	39
1985	2	1	50	4.9	3	41
1986	8	5	63	16.3	2	49
1987	4	3	75	6.7	5	60
1988	8	5	63	14.8	4	54
1989	5	3	60	12.2	5	41
1990	6	6	100	12.2	7	49
1991	4	4	100	7.7	8	52
1992	12	10	83	18.5	7	65
1993	3	3	100	6	12	50
1994	9	5	56	15	10	60
1995	3	2	67	5.3	9	57
1996	6	3	50	7.8	18	77
1997	9	7	78	11	17	82
1998	8	7	88	8.7	18	92
1999	9	5	56	8.7	25	104
2000	3	2	67	3.3	23	90
2001	12	9	75	12.1	26	99
2002	11	6	55	12.9	23	85
2003	7	5	71	6	27	116
2004	16	12	75	11.5	36	139
2005	10	5	50	6.8	35	146
2006	13	8	62	8.7	41	149
2007	17	12	71	10.6	39	161
2008	15	12	80	9.4	48	160
2009	12	10	83	6.7	51	180
2010	21	15	71	10.8	51	194
2011	11	8	73	5	60	219
2012	16	14	88	7.7	58	208
1982-2011 average:	8.6	6.3	68.6	9.9	23.9	96.8

Only includes whales documented during the June 1 - August 31 study period. Number of calves photo ID'd is the number of calves with fluke photos (vs. dorsal fin only photos). Crude Birth Rate (CBR) is a percentage computed by # calves / total whale count. CBRs for 1982 & 1983 could not be calculated because total whale counts for these years are not available. Number of known age whales does not include calves of the year. These data are not available for 1982 – 1984.

Genetics

In 2012 we collected 16 sloughed skin samples, including seven samples from individually identified calves. Since 1996, we have collected 257 sloughed skin samples in the study area. Genetic analysis of these samples allows sex determination, definition of mitochondrial DNA haplotype and nuclear DNA genotyping. The only other practical ways we determine a whale's sex are if the whale returns to the study area with a calf (in which case we know that the mother is female) or in the infrequent event that we obtain photographs of the whale's urogenital area.

Feeding Behavior and Prey Identification

Whale sightings in Bartlett Cove in 2012 were notably rare compared to 2011, when record high numbers of whales, harbor porpoises (*Phocoena phocoena*) and seabirds concentrated there to feed in July (Neilson *et al*. 2012). In 2012, we documented only three pods in Bartlett Cove (June 11, June 21 and August 6). We received an additional report of three whales in Bartlett Cove on July 24 (D. Johnson, pers. comm.).

Overall in 2012, we observed fewer whales feeding on capelin (*Mallotus villosus*) (n = 3, Table 4) compared to the previous four years, when capelin were confirmed or suspected as whale prey in 4 - 15 cases (Neilson and Gabriele 2008, 2009, 2010; Neilson *et al*. 2012). On August 1 we noted a distinctive cucumber smell near feeding whales in Icy Strait that likely indicated the presence of capelin. On June 14 we positively identified capelin and euphausiids swarming at the sea surface near several whales that were feeding in the middle of Icy Strait (Y. Arimitsu, pers. comm.). On July 18 we observed a dense school of forage fish that we suspect was capelin boiling at the sea surface near two whales that were feeding in the middle of Icy Strait but we were unable to confirm the species. Similarly, on August 20 we observed a dense school of forage fish that we suspect was sand lance (*Ammodytes hexapterus*) boiling at the sea surface near a whale that was feeding off Flapjack Island but we were unable to confirm the species. Interestingly, in all three of these cases where dense concentrations of prey were swarming at the sea surface, we observed no seabirds targeting the prey, as we have seen in past years.

Early in the summer, several whales were reported to be feeding on salmon smolt along the south shore of Lemesurier Island in Icy Strait. Based on the size and appearance of the fish and the life history of the salmon species found in Icy Strait, they were most likely pink salmon (*Oncorhynchus gorbuscha*) (C. Murdoch, pers. comm.). The whales were observed close to shore turning in tight circles at the surface, then surface lunging to engulf the fish (H. Lentfer, pers. comm.).

From approximately September 21 – 25, we observed unusually high numbers of pteropods (*Limacina helicina*) concentrating at the sea surface in Bartlett Cove, around Point Adolphus and along the south shore of Lemesurier Island. Around the same time, windrows of dead pteropods were observed on the Gustavus beach. Although we did not observe any whales feeding directly on the pteropods, they are known to be humpback whale prey (Johnson and Wolman 1984) and humpback whales were observed eating pteropods in lower Chatham Strait in August 2012 (J. Straley, pers. comm.). Pteropods were noted to be highly abundant in Icy Strait in summer 2012 during surveys conducted as part of NOAA's Southeast Alaska Coastal Monitoring (SECM) project. SECM biologists speculated that pteropod abundance in 2012 may have been a related to colder than average ocean temperatures. Summer 2012 was the third coldest recorded by SECM out of 16 years of monitoring (M. Sturdevant, pers. comm.).

Table 4. Humpback whale prey type determinations.

METHOD:	PREY SPECIES (# of cases):			
	capelin	***capelin?***	***euphausiids***	***sand lance?***
Prey observed near surface	1	1	1	1
'Cucumber' smell in air		1		

Whale/Human Interactions

On June 13th we observed adult male #1489 and adult female #883 sleeping at the mouth of Blue Mouse Cove in the West Arm of Glacier Bay. The pair woke up and dove when a large non-breaking wake from a cruise ship that had passed several minutes earlier rolled past them. This is the fourth incident we have documented in the study area in which sleeping whales appear to have been awoken by cruise ship wakes (Gabriele and Doherty 1998, Neilson and Gabriele 2009). While documenting the behavioral disturbance caused by wakes is important, a more critical issue may be that whales sometimes sleep through a cruise ship passing by without getting out of the way, which may put them at risk of being struck in some cases.

On July 2nd we documented several vessels harassing whales while whale watching at Point Adolphus in Icy Strait. We reported the operators to NOAA for violating Alaska humpback whale approach regulations (50 CFR 224.103). Specifically, we documented the operators driving around the whales in excess of a "slow, safe" speed and one operator placed their vessel in the path of oncoming whales so that whales surfaced within 100 yards (91.4 m) of the vessel.

On July 17th we documented a propeller scar on adult male #159's dorsal side that was not there in photos taken August 31, 2011 (Fig. 5). This is the fifth whale with a propeller scar that we have documented in the study area since 1985. On August 30th we documented a new propeller scar on adult female #1014's right flank that was not there in photos taken on June 19, 2012. This scar is adjacent to an older propeller scar that #1014 has had since at least 2002.

On August 19th three humpback whales surfaced approximately 70 meters from the bow the cruise ship *Volendam* as it transited at 6 knots through whale waters in Sitakaday Narrows in Glacier Bay (NPS unpublished data; P. Bos, pers. comm.). We used a photograph of the whales' dorsal fins that was taken by a crew member to identify two of the whales (female #1302, age 20, and female #1486, age 13). Although close encounters between cruise ships and whales in Glacier Bay occur several times each summer, this is the first time we have been able to individually identify the whales that were involved based on observations from the ship. This information is valuable to identify if the same individual whales are repeatedly involved in close encounters and to document survival/mortality in the event of a collision.

On August 22nd the operator of a 6.7-meter private vessel reported that while anchored and fishing near Rush Point in Glacier Bay three humpback whales closely circled the vessel in an apparent feeding frenzy. The activity occurred in a tide rip and the surface active whales created a significant amount of commotion around the vessel. They felt a whale bump the anchor line several times and when a whale pulled on their fishing line, they stopped fishing but remained anchored. For approximately 45 minutes, the whales circled around and under the vessel but

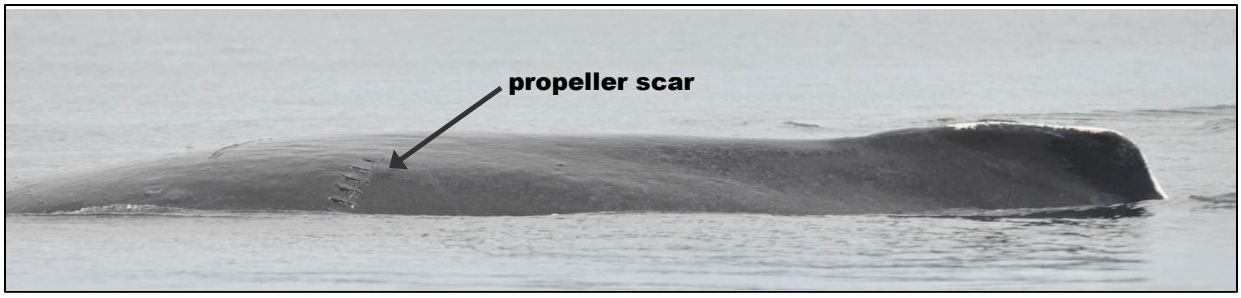

Figure 5. Adult male #159 with propeller scar observed on July 17, 2012.

never made contact with the hull. At one point, a whale breached 50 meters from the vessel and another breached 25 meters away. The passengers slapped on the hull in an attempt to alert the whales to their presence (T. Trevarthian pers. comm.).

Whale Waters

In 2012, whale waters vessel speed restrictions in lower Glacier Bay were in place for 110 days. Until recently, the duration of these speed restrictions has varied greatly from year to year depending on whale use in the lower bay, however, in recent years similarly long duration whale waters have become typical (2007-2011 range = 100 – 143 days) due to sustained high numbers of whales in the area.

For the eighth year in a row, a large aggregation of whales centered around Point Carolus in Park waters in Icy Strait. This resulted in a prolonged 13-knot speed limit from June 12 – September 11 (92 days). In addition, temporary whale waters were designated in the middle of Glacier Bay from May 25 – June 19 (26 days) and in an area just north of lower bay whale waters from June 20 – July 2 (13 days).

On July 10th, high numbers of whales in Sundew Cove and at the entrance to Hugh Miller Inlet prompted the park to issue a whale "advisory" for this area, in which we recommended a maximum vessel speed limit of 13 knots to protect whales from collision and disturbance. Under this novel, non-regulatory approach we worked directly with the only motorized vessel known to regularly transit through the area, Glacier Bay Lodge's day tour boat, the 22-m catamaran *Baranof Wind*. The advisory was well received and this targeted conservation approach appeared to be successful, with no collisions or close calls reported in this area by NPS rangers or crew onboard the *Baranof Wind*.

Vessel Collisions

In early August, a 9-meter charter fishing vessel anchored near Lemesurier Island in Icy Strait was struck by a humpback whale. The force of the collision knocked a passenger into the water but no further details are known. The identity and fate of the whale are also unknown (NOAA Alaska Region unpublished data).

On August 16th, a humpback whale in Pinta Cove in Icy Strait was struck by a 6-meter aluminum skiff with two people onboard that was transiting at approximately 30 knots. Both passengers sustained injuries, the vessel was damaged and all of the propeller blades on the outboard engine were bent and inoperable. One passenger was knocked overboard and suffered

two broken ribs, while the other passenger was thrown against the steering wheel and suffered five broken ribs, a ruptured spleen and a punctured lung (NOAA Alaska Region unpublished data). We were in the area conducting a whale survey and we did not observe any injured or distressed whales. The fate of this whale is unknown but we presume it was injured based on the damage to the vessel.

Elsewhere in Alaska in 2012, there were five other humpback whale-vessel collisions reported (two in southeastern Alaska, two near Seward and one near Whittier). In addition, two unidentified whales were involved in collisions: a large unidentified whale was struck by a vessel in Prince William Sound and an unidentified whale struck a 7.3-meter sailboat offshore in the Gulf of Alaska. Two of the whales appeared to be seriously injured (blood was observed in the water) but the fate of the other whales is unknown (NOAA Alaska Region unpublished data).

On July 23rd a dead male humpback whale calf was found floating in Resurrection Bay near Seward. A necropsy revealed that the calf had a broken rib and other possible signs of blunt trauma, indicating that it might have been struck by a vessel. However, it was unclear if the rib fracture occurred pre or post mortem and there had also been heavy scavenging on the carcass (most likely by killer whales) which confounded the interpretation of the cause of death (NOAA Alaska Region unpublished data).

Dead whales

On July 10th, a pilot flying over the outer coast of GLBA reported seeing a dead whale on the beach between La Perouse Glacier and Icy Point. The carcass was partially buried in sand with numerous bears feeding on it. It was not possible to confirm the species and no photos were available, but it appeared to be the size of a small humpback or gray whale (*Eschrichtius robustus*) and no long pectoral flippers were visible (C. Schroth, pers. comm.).

On September 29th, a commercial fisherman reported finding what appeared to be a highly decomposed whale carcass floating in tiderips outside Dundas Bay in western Icy Strait. It was approximately 20 feet long and tapered off at both ends underwater. It appeared white with pink overtones, with no skin remaining (L. Ply, pers. comm.). No further sightings of this mass were reported and we were unable to confirm that it was a whale.

Elsewhere in Alaska in 2012, two dead humpback whales washed ashore near Kodiak. The first carcass, found on July 12th, was in an advanced state of decomposition and no necropsy was conducted. The second carcass, found in late September, was a 12.2-meter (40 ft) animal that appeared to have died after being preyed on by killer whales, however no necropsy was conducted (NOAA Alaska Region unpublished data).

Entangled whales

There were no entangled whales reported in the study area in 2012. Elsewhere in Alaska, five humpback whales were reported entangled in southeastern Alaska (including two calves), one humpback was reported entangled in Unalaska and one humpback was reported entangled in Kodiak. In addition, two gray whales were reported entangled in Prince William Sound. At least five of the nine large whale entanglements reported in Alaska in 2012 involved gillnets (NOAA Alaska Region unpublished data). Commercial gillnets are not permitted in the study area (Title

5 Alaska Administrative Code 33.310) and the use of subsistence gillnets is rare (Fall *et al*. 2012).

Notable Behavioral Observations

This year was noteworthy for the unusually large shoals of whales that formed around Point Adolphus in Icy Strait. Prior to 2012, the largest pod of whales we had documented at any location was 20 whales at Point Adolphus on August 9, 2004. Between July 20 and September 18, 2012 we documented five shoals that ranged in size from 20 to 41 whales. A few of these shoals contained whales commonly associated with the "core group" but the majority of the whales were not typical core group members. Even typically solitary whales such as male #352 were present in shoals. The ecological significance of these shoals is unknown.

In 2012 we documented adult male #1012 (age unknown; minimum age 26) repeatedly associating with female #1014 (age 23) and her calf. Between May 28 and October 10, we documented #1014 and her calf on 17 days and #1012 was with them in approximately half of these encounters (n = 8). Because of the similarity to mother/calf/escort pods found on the winter breeding grounds, we found it unusual for these whales to have such a strong affiliation in summer.

On June 11th we observed a Steller sea lion (*Eumetopias jubatus*) interacting with adult male humpback whale #1012 in rough seas at the entrance to Glacier Bay. When #1012 made a terminal dive, it appeared that he batted the sea lion several meters into the air with his flukes. The sea lion proceeded to porpoise out of the water several times, circling where the whale had gone down. When #1012 surfaced again several minutes later, the sea lion appeared to have departed the area. Although it is not uncommon for us to observe sea lions and humpback whales interacting, this is the first time we have seen a humpback whale appear to hit a sea lion, sending it flying through the air.

On June 21st, we identified whale #1179 (sex unknown) near Francis Island in Glacier Bay. This is the first confirmed sighting of this whale in the study area since 1997.

On June 25th, researchers staying on the NPS raft anchored next to Russell Island observed a single humpback whale bubblenet feeding in the small cove around the raft at 0330 hours (K. Brasseur, pers. comm.). The whale came within approximately five meters of the raft and then departed the cove after about five minutes. We reviewed a video of the whale and tentatively identified it as #1654 (age 10, sex unknown), however we could not confirm the whale's identity with certainty.

On July 24th, the captain of the M/V *Safari Endeavour* reported seeing what appeared to be competitive behavior common during the winter breeding season near Rush Point in Glacier Bay. In August 2012, we documented several similar instances that were consistent with behavior usually observed on the winter breeding grounds and we noted that compared to previous years, the onset of these behaviors in the season seemed early (Neilson *et al*. 2012). It is notable that this year's report from July 24th occurred even earlier in the summer.

From late August through most of September, one to two humpback whales were observed regularly in mid to upper Tarr Inlet (N. Drumheller, pers. comm.), an area where whale sightings

are typically rare (NPS unpublished data). We identified one of the whales as #2334, the 2010 calf of #801, based on a fluke photograph taken from a passing cruise ship (N. Drumheller, pers. comm.). At least one of the whales was reported frequently sleeping amongst icebergs, making it difficult for vessels to see and avoid. On September 12th, a NPS ranger onboard the cruise ship *Zuiderdam* observed a lethargic humpback whale amongst icebergs in upper Tarr Inlet. The whale "looked very brown, as though the silt was being collected on his topside" and the ship's captain expressed concern about the whale's health after seeing a whale in Tarr Inlet over several consecutive weeks (F. Schaller, pers. comm.). We received no other reports of a whale in distress and concluded that the whale had been sleeping.

On September 2nd, a humpback whale surfaced near a cruise ship at the entrance to Johns Hopkins Inlet (N. Drumheller, pers. comm.) and on September 22nd, NPS employees camped in the inlet reported a humpback whale at approximately 58.92327° N, 136.98680° W (K. Unertl, pers. comm.). These reports are notable because sightings of humpback whales in Johns Hopkins Inlet are rare.

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Appendix 1

Standardized (July 9 – August 16) and Total (June 1 – August 31)

Humpback Whale Counts, 1985 – 2012

	GLACIER BAY		ICY STRAIT		GLACIER BAY & ICY STRAIT	
Year:	standardized whale count	total whale count	standardized whale count	total whale count	standardized whale count	total whale count
1985	7	15	19	30	24	41
1986	26	32	23	32	38	49
1987	18	30	33	48	40	60
1988	19	41	29	36	40	54
1989	22	26	20	28	33	41
1990	16	25	24	33	33	49
1991	17	19	34	41	45	52
1992	27	34	36	50	48	65
1993	23	30	24	30	40	50
1994	17	29	29	42	44	60
1995	18	28	26	44	37	57
1996	37	44	43	59	64	77
1997	41	55	33	50	66	82
1998	46	63	27	50	68	92
1999	36	61	39	65	68	104
2000	44	59	26	58	62	90
2001	26	45	58	84	72	99
2002	28	44	34	61	56	85
2003	53	82	61	76	102	116
2004	85	112	38	64	110	139
2005	66	102	50	90	95	146
2006	66	82	98	121	130	149
2007	76	91	98	129	132	161
2008	56	86	98	139	126	160
2009	59	107	124	161	144	180
2010	79	132	97	145	142	194
2011	132	149	82	157	174	219
2012	87	125	144	176	176	208
average:	**43.82**	**62.43**	**51.68**	**74.96**	**78.89**	**102.82**
stdev:	**29.04**	**37.96**	**34.78**	**45.87**	**45.58**	**54.8**

Appendix 2

Sighting Histories of Individually Identified Whales: 2012

[GB = Glacier Bay; IS = Icy Strait; green cells = Jun 1 – Aug 31 surveys (total period); blue cells = Jul 9 – Aug 16 surveys (standardized period)]

	Whale_ID	Nickname	5/3/2012	5/9/2012	5/16/2012	5/23/2012	5/28/2012	6/4/2012	6/5/2012	6/6/2012	6/11/2012	6/13/2012	6/14/2012	6/15/2012	6/18/2012	6/19/2012	6/20/2012	6/21/2012	6/22/2012	6/25/2012	6/26/2012	6/28/2012	6/29/2012	7/2/2012	7/5/2012	7/6/2012	7/8/2012	7/9/2012	7/11/2012	7/12/2012	7/16/2012	7/17/2012	7/18/2012	7/19/2012	7/20/2012	7/23/2012	7/24/2012	7/25/2012	7/26/2012	7/27/2012	7/30/2012	8/1/2012	8/3/2012	8/6/2012	8/8/2012	8/9/2012	8/10/2012	8/13/2012	8/14/2012	8/16/2012	8/17/2012	8/20/2012	8/21/2012	8/22/2012	8/23/2012	8/24/2012	8/27/2012	8/30/2012	8/31/2012	9/7/2012	9/10/2012	9/11/2012	9/17/2012	9/18/2012	9/25/2012	10/2/2012	10/9/2012	10/10/2012
1	117	White Eyes	IS									GB														GB	GB																IS									IS					IS					IS				
2	1298		IS										IS				IS					IS					IS				GB		IS		IS				IS							IS				IS														IS				IS
3	2486	calf of 1298	IS										IS				IS										IS				GB				IS				IS							IS				IS														IS				IS
4	1438		IS							GB				GB													IS					GB							IS								IS							IS				IS													
5	1489		IS			GB	GB					GB											IS				IS							GB							GB	GB																											IS				IS
6	1505		IS				GB			GB																																																		IS												IS
7	1784		IS																											IS			IS				IS																						IS					IS					IS				
8	2336		IS														IS																												GB																												
9	1065			GB		GB	GB													GB			IS				IS							GB								IS	GB	GB																											
10	1302			GB		GB										GB			GB			IS			GB		IS						IS				IS								GB						IS	GB					GB	IS			GB	GB					IS	IS
11	1816			GB	GB			GB							GB							IS											GB	GB					IS				GB				IS								GB															IS				
12	1836			GB		GB						GB													GB					GB													GB																	GB													GB			GB			
13	1842			GB																																																																														GB		GB			
14	2338			GB																																												IS																									IS
15	351			GB																GB										IS							GB																																IS									
16	1012				GB		GB			GB	GB	GB		GB		IS	IS	GB		IS	GB				GB	GB	IS										GB					GB						GB	GB				GB							IS								GB	IS
17	1233				GB											GB						GB				GB							GB	IS	GB									GB	IS																														
18	1470				GB	GB																							GB																					GB													GB	GB										GB					
19	1470_calf_2012	calf of 1470			GB	GB																							GB																					GB													GB	GB										GB					
20	1839				GB							GB																										IS					IS										IS				IS				IS					IS				IS
21	2153				GB	GB	GB																																														IS																						
22	2491				GB		GB										GB																																																									
23	159	Black Fork			IS	GB	GB					GB											GB					IS					GB				GB																GB					GB												
24	1018				GB													GB					GB																GB																																
25	1063				GB	GB																													IS														IS				IS					IS				IS					IS				IS
26	1299				GB	GB											GB	GB	IS						IS				IS						GB					GB					IS						GB						GB										IS
27	1439				GB									GB		IS							IS						IS								IS							IS				IS																						
28	1838				GB						GB		GB							GB							GB	GB							GB					GB											GB		GB													GB			
29	1896				GB	GB																							GB		GB																												GB														GB			
30	1900				GB	GB																				IS							IS																			IS					IS											IS				
31	2346				GB																													GB																																GB		GB	GB		GB			
32	2470				GB																	IS																																																			
33	587	Gertrude			GB								GB			IS			IS				IS						IS			IS						IS							IS				IS					IS				IS									IS
34	883				GB	GB					GB																																				GB																											
35	1014					GB			GB	GB		GB	GB		IS	IS			IS						GB	IS				GB						IS		IS							IS										IS		GB										IS
36	2484	calf of 1014				GB			GB	GB		GB	GB		IS	IS			IS						GB	IS				GB						IS		IS							IS			IS							IS													IS
37	1426					GB																																																																													
38	166	Frenchie				GB			GB			IS				IS			IS												GB	GB					IS		IS																			IS					IS									
39	1813					GB														GB																																													IS					IS				IS
40	1840					GB															IS					IS							IS												GB											IS																				IS				

Sighting Histories of Individually Identified Whales: 2012 (continued)

[GB = Glacier Bay; IS = Icy Strait; green cells = Jun 1 – Aug 31 surveys (total period); blue cells = Jul 9 – Aug 16 surveys (standardized period)]

	Whale_ID	Nickname	5/3/2012	5/9/2012	5/16/2012	5/23/2012	5/28/2012	6/4/2012	6/5/2012	6/6/2012	6/11/2012	6/13/2012	6/14/2012	6/15/2012	6/18/2012	6/19/2012	6/20/2012	6/21/2012	6/22/2012	6/25/2012	6/26/2012	6/28/2012	6/29/2012	7/2/2012	7/5/2012	7/6/2012	7/8/2012	7/9/2012	7/11/2012	7/12/2012	7/16/2012	7/17/2012	7/18/2012	7/19/2012	7/20/2012	7/23/2012	7/24/2012	7/25/2012	7/26/2012	7/27/2012	7/30/2012	8/1/2012	8/3/2012	8/6/2012	8/8/2012	8/9/2012	8/10/2012	8/13/2012	8/14/2012	8/16/2012	8/17/2012	8/20/2012	8/21/2012	8/22/2012	8/23/2012	8/24/2012	8/27/2012	8/30/2012	8/31/2012	9/7/2012	9/10/2012	9/11/2012	9/17/2012	9/18/2012	9/25/2012	10/2/2012	10/9/2012	10/10/2012
41	1899						GB																				IS										IS			IS				GB				IS							GB					GB						GB		GB			
42	1904						GB			GB			IS	GB		IS				IS		IS													IS			IS					IS			IS														IS									
43	2311						GB											GB							GB	GB			GB																		GB	GB									GB								GB			
44	1293							GB					IS																				IS		IS							IS													IS									IS				
45	1304							IS					IS						GB	IS						IS					GB				IS																				IS									IS		IS		IS
46	1061								IS													IS		IS																																												
47	1292								IS				IS							IS											GB		IS		IS				IS							IS																						IS
48	1480								IS								IS							IS						IS																																						
49	2490	calf of 1480							IS								IS							IS						IS																																						
50	157	M.D.							IS				IS						GB			IS				IS			GB				IS			GB			IS			IS				IS									IS									IS	GB			
51	1593								IS															IS						IS			IS																																			
52	1659								IS								IS													IS																									IS													IS
53	1803								IS											IS	GB																		IS			IS				IS									IS													
54	1815								IS																								IS																																			
55	186								IS																														IS											IS					IS				IS					IS				
56	2028								IS																		IS																					GB				GB															IS		
57	221								IS				IS				IS									GB					GB				IS		IS			GB										IS					IS													
58	352								IS				IS											IS															IS											IS									IS					IS				
59	465								IS				IS						GB								IS					GB	IS							GB		IS				IS									IS		GB											
60	516	Garfunkle							IS															IS						IS			IS															GB																			
61	875								IS															IS									IS																															IS				
62	GBNP-JLN-20120605-1-080								IS																																																											
63	1834									GB																																																									
64	1894									GB									GB	IS						IS									IS																	IS														GB			
65	1898									GB			IS	GB						IS	GB					IS					GB								IS											IS					IS				IS					IS				
66	2310									GB																																	GB												IS									IS				
67	2321									GB																					GB																			IS														IS				IS
68	937									GB			IS									IS					IS				GB				IS				IS							IS				IS									IS									
69	2317										GB																															IS																										IS
70	2055											GB																																																								
71	2157											GB																																																								
72	2530											GB																																																								
73	118	Chop Suey											GB				IS																																		IS				IS				IS									
74	1652												GB						GB									GB													GB						GB			IS									IS					IS				
75	1088												IS														IS				GB		IS		IS				IS							IS				IS					IS				IS								IS		IS
76	1246												IS									IS		IS		IS	IS				GB		GB						IS							IS				IS									IS					IS				
77	1428												IS																																														IS					IS				
78	1461												IS	GB		IS	IS			IS		IS		IS			IS				GB																									IS	GB	GB						IS				IS
79	1474												IS				IS					IS		IS		IS	IS						GB													IS				IS					IS				IS					IS				
80	1485												IS									IS		IS			IS												IS							IS				IS									IS									IS

Sighting Histories of Individually Identified Whales: 2012 (continued)

[GB = Glacier Bay; IS = Icy Strait; green cells = Jun 1 – Aug 31 surveys (total period); blue cells = Jul 9 – Aug 16 surveys (standardized period)]

	Whale_ID	Nickname	5/3/2012	5/9/2012	5/16/2012	5/23/2012	5/28/2012	6/4/2012	6/5/2012	6/6/2012	6/11/2012	6/13/2012	6/14/2012	6/15/2012	6/18/2012	6/19/2012	6/20/2012	6/21/2012	6/22/2012
81	1507												IS				IS		
82	1532												IS						GB
83	1539												IS				IS		
84	1655												IS						
85	1805												IS	GB					
86	1907												IS						
87	541												IS						
88	2482	calf of 541											IS						
89	250												IS						
90	577	Scoper											IS						
91	GBNP-CMG-20120614-1-072												IS						
92	1809													GB		IS			
93	535	Quits												GB			IS		
94	2160														GB				
95	235	Spot													GB				GB
96	2480	calf of 235													GB				GB
97	GBNP-JLN-20120618-1-025														GB				
98	1486															GB			GB
99	1811															GB			
100	573															GB			
101	1658															IS			
102	1849															IS			
103	2463															IS			
104	2479															IS			
105	1306																IS		
106	1844																IS		
107	193																IS		
108	584																IS		
109	616	Lesser															IS		
110	1082																	GB	
111	1179																	GB	
112	1479																	GB	
113	2489	calf of 1479																GB	
114	1905																	GB	
115	283																	GB	
116	564	Roundup Taylor																GB	
117	1432																		GB
118	2488	calf of 1432																	GB
119	944																		GB
120	2483	calf of 944																	GB

	Whale_ID	6/25/2012	6/26/2012	6/28/2012	6/29/2012	7/2/2012	7/5/2012	7/6/2012	7/8/2012	7/9/2012	7/11/2012	7/12/2012	7/16/2012	7/17/2012	7/18/2012	7/19/2012	7/20/2012	7/23/2012
81	1507			IS														
82	1532			IS					IS								IS	
83	1539			IS				IS							IS			
84	1655			IS				IS										
85	1805			IS					IS				GB					
86	1907					IS						IS						
87	541			IS														
88	2482			IS														
89	250														GB			
90	577	IS	GB						IS				GB		IS		IS	
91	GBNP-CMG-20120614-1-072																	
92	1809																IS	
93	535	IS																
94	2160																	
95	235							IS						GB				
96	2480													GB				
97	GBNP-JLN-20120618-1-025																	
98	1486			IS			GB		IS									
99	1811																	
100	573					IS						IS			IS			
101	1658																	
102	1849																IS	
103	2463																IS	
104	2479																IS	
105	1306					IS						IS						
106	1844								IS									
107	193					IS						IS			IS			
108	584	IS												GB	IS		IS	
109	616																IS	
110	1082				GB					GB								
111	1179																	
112	1479														IS			
113	2489														IS			
114	1905																	GB
115	283																	
116	564	IS									GB		GB					
117	1432		GB			IS	GB						GB		IS			GB
118	2488		GB			IS	GB						GB		IS			
119	944								IS									
120	2483								IS									

	Whale_ID	7/24/2012	7/25/2012	7/26/2012	7/27/2012	7/30/2012	8/1/2012	8/3/2012	8/6/2012	8/8/2012	8/9/2012	8/10/2012	8/13/2012	8/14/2012	8/16/2012	8/17/2012	8/20/2012
81	1507			IS			IS										
82	1532	IS					IS				IS					IS	
83	1539														IS		
84	1655			IS	IS												
85	1805	IS					IS				IS					IS	
86	1907			IS													
87	541																
88	2482																
89	250			IS												GB	
90	577			IS							IS				IS		
91	GBNP-CMG-20120614-1-072																
92	1809	IS								IS							GB
93	535																
94	2160																
95	235				GB												
96	2480				GB												
97	GBNP-JLN-20120618-1-025																
98	1486	IS								GB						IS	GB
99	1811						IS				IS					IS	
100	573			IS							IS				IS		
101	1658																
102	1849														IS		
103	2463													IS			
104	2479							GB									
105	1306			IS											IS		
106	1844														IS		
107	193														IS		
108	584						IS										
109	616	IS														IS	
110	1082																
111	1179																
112	1479				IS						IS						
113	2489				IS						IS						
114	1905										IS						
115	283																
116	564	IS		IS							IS						
117	1432					GB			GB								GB
118	2488					GB			GB								GB
119	944									IS							
120	2483									IS							

	Whale_ID	8/21/2012	8/22/2012	8/23/2012	8/24/2012	8/27/2012	8/30/2012	8/31/2012	9/7/2012	9/10/2012	9/11/2012	9/17/2012	9/18/2012	9/25/2012	10/2/2012	10/9/2012	10/10/2012
81	1507																
82	1532					GB											
83	1539												IS				IS
84	1655			IS				IS					IS				
85	1805					GB							IS				
86	1907																
87	541																
88	2482																
89	250			IS													
90	577																
91	GBNP-CMG-20120614-1-072																
92	1809	GB															
93	535																
94	2160																
95	235					GB											
96	2480																
97	GBNP-JLN-20120618-1-025																
98	1486					GB	IS									IS	IS
99	1811					GB											
100	573			IS				IS									
101	1658																
102	1849												IS				
103	2463																
104	2479			IS													
105	1306			IS				IS									
106	1844																
107	193																
108	584																
109	616																
110	1082					GB											
111	1179																
112	1479																
113	2489																
114	1905							IS					IS				IS
115	283	GB															
116	564				IS		GB										
117	1432										GB			GB		GB	
118	2488										GB			GB			
119	944																
120	2483																

Sighting Histories of Individually Identified Whales: 2012 (continued)

[GB = Glacier Bay; IS = Icy Strait; green cells = Jun 1 – Aug 31 surveys (total period); blue cells = Jul 9 – Aug 16 surveys (standardized period)]

	Whale_ID	Nickname	5/3/2012	5/9/2012	5/16/2012	5/23/2012	5/28/2012	6/4/2012	6/5/2012	6/6/2012	6/11/2012	6/13/2012	6/14/2012	6/15/2012	6/18/2012	6/19/2012	6/20/2012	6/21/2012	6/22/2012	6/25/2012	6/26/2012	6/28/2012	6/29/2012	7/2/2012	7/5/2012	7/6/2012	7/8/2012	7/9/2012	7/11/2012	7/12/2012	7/16/2012	7/17/2012	7/18/2012	7/19/2012	7/20/2012	7/23/2012	7/24/2012	7/25/2012	7/26/2012	7/27/2012	7/30/2012	8/1/2012	8/3/2012	8/6/2012	8/8/2012	8/9/2012	8/10/2012	8/13/2012	8/14/2012	8/16/2012	8/17/2012	8/20/2012	8/21/2012	8/22/2012	8/23/2012	8/24/2012	8/27/2012	8/30/2012	8/31/2012	9/7/2012	9/10/2012	9/11/2012	9/17/2012	9/18/2012	9/25/2012	10/2/2012	10/9/2012	10/10/2012
121	1808																		IS																	IS			GB			GB	IS															GB											
122	1846																		IS							IS					GB						IS																												IS				IS
123	2155																			IS							IS															GB	IS				IS																						IS		IS
124	2156																			IS							IS																									IS					IS										IS				IS
125	219																			IS				IS						IS			IS																																			
126	2466																			IS																																																
127	581																			IS				IS									IS																																			
128	1244	Dimple Dorsal																			GB					IS							IS		IS																									IS					IS				IS
129	1802																				GB																											IS				IS					IS														
130	1817																				GB			IS		IS							IS	IS		GB												IS			IS										IS					IS				IS
131	1807																					IS		IS							GB				IS		IS			GB						IS					GB																		
132	1948																					IS																				IS							IS	IS					IS													
133	539	Max																				IS									GB	GB					IS		IS							IS														IS									
134	600																					IS									GB	GB					IS		IS																														
135	1042																							IS						IS			IS								IS																											
136	1460																							IS											IS		IS			GB		IS																										
137	155	Freckle Fluke																						IS						IS			IS						IS											IS					IS				IS									IS
138	397																							IS						IS			IS						IS							IS									IS													
139	2481	calf of 397																						IS						IS			IS						IS																IS													
140	572																							IS															IS							IS			IS																			
141	1295																								GB							GB	IS	GB					IS			IS														IS		GB										
142	2161																								GB																				GB				GB																		GB			
143	1313																									IS														GB																													
144	161	B.W.M.																									IS												IS							IS				IS									IS									
145	2478	calf of 161																									IS												IS							IS				IS									IS									
146	1832																										IS																						IS										IS					IS				IS
147	2472																										IS																						IS										IS									
148	1046																											GB			GB	GB							GB									IS				IS																		
149	1810																											GB																																									
150	2495																											GB											GB									IS		GB																				
151	441	Festus																										GB															IS																										
152	801																											GB																											GB											GB			
153	2034																												GB			GB													GB													GB											
154	2468																												GB			GB													GB																								
155	1019																													IS													IS									IS				IS				IS					IS				
156	2485	calf of 1019																												IS													IS									IS				IS													
157	1057																													IS													IS																									
158	2168																													IS													IS									IS																	
159	2312																													IS																																						
160	232	Notchfin																													GB								IS							IS			IS		IS								IS									

Sighting Histories of Individually Identified Whales: 2012 (continued)

[GB = Glacier Bay; IS = Icy Strait; green cells = Jun 1 – Aug 31 surveys (total period); blue cells = Jul 9 – Aug 16 surveys (standardized period)]

	Whale_ID	Nickname	5/3/2012	5/9/2012	5/16/2012	5/23/2012	5/28/2012	6/4/2012	6/5/2012	6/6/2012	6/11/2012	6/13/2012	6/14/2012	6/15/2012	6/18/2012	6/19/2012	6/20/2012	6/21/2012	6/22/2012	6/25/2012	6/26/2012	6/28/2012	6/29/2012	7/2/2012	7/5/2012	7/6/2012	7/8/2012
161	2340																										
162	933																										
163	1083																										
164	1090																										
165	1421																										
166	2487	calf of 1421																									
167	941																										
168	1968																										
169	1968_calf_2012	calf of 1968																									
170	2030																										
171	2033																										
172	2316																										
173	2465																										
174	2533																										
175	1752																										
176	2324																										
177	2029																										
178	2047																										
179	2354																										
180	965																										
181	1235																										
182	1235_calf_2012	calf of 1235																									
183	2339																										
184	1901																										
185	2038																										
186	2347																										
187	2531																										
188	826																										
189	1657																										
190	1443																										
191	1443_calf_2012	calf of 1443																									
192	2054																										
193	2476																										
194	1908																										
195	2164																										
196	1850																										
197	2049																										
198	2175																										
199	2534																										
200	GBNP-CMG-20120816-1-161																										

	Whale_ID	7/9/2012	7/11/2012	7/12/2012	7/16/2012	7/17/2012	7/18/2012	7/19/2012	7/20/2012	7/23/2012	7/24/2012	7/25/2012	7/26/2012	7/27/2012	7/30/2012	8/1/2012	8/3/2012	8/6/2012	8/8/2012	8/9/2012	8/10/2012	8/13/2012	8/14/2012	8/16/2012	8/17/2012	8/20/2012	8/21/2012	8/22/2012	8/23/2012	8/24/2012	8/27/2012	8/30/2012	8/31/2012	9/7/2012	9/10/2012	9/11/2012	9/17/2012	9/18/2012	9/25/2012	10/2/2012	10/9/2012	10/10/2012
161	2340				GB																			IS									IS					IS		IS		IS
162	933						GB						IS																													
163	1083						IS																						IS				IS					IS				IS
164	1090						IS																							IS												
165	1421						IS			GB														IS								GB										
166	2487						IS			GB														IS								GB										
167	941						IS						IS											IS					IS													
168	1968								IS																																	
169	1968_calf_2012								IS																																	
170	2030								IS										IS												GB									IS		
171	2033								IS																																	
172	2316								IS																								IS									IS
173	2465									GB															GB									GB								
174	2533									GB																				IS								IS		IS		
175	1752										IS																															
176	2324											GB																														
177	2029												IS																IS				IS					IS				
178	2047												IS																													
179	2354												IS																													
180	965												IS											IS					IS													
181	1235													GB																												
182	1235_calf_2012													GB																												
183	2339														GB									IS	IS					IS												
184	1901															IS													IS												GB	
185	2038															IS																						IS				
186	2347															IS			IS							GB																
187	2531															IS																										
188	826															IS									IS																	
189	1657																GB			IS				IS																		
190	1443																			IS																						
191	1443_calf_2012																			IS																						
192	2054																			IS																						IS
193	2476																					GB															GB		GB			
194	1908																						IS																			
195	2164																						IS																			
196	1850																							IS									IS									
197	2049																							IS					IS													
198	2175																							IS														IS				
199	2534																							IS					IS											IS		IS
200	GBNP-CMG-20120816-1-161																							IS																		

Sighting Histories of Individually Identified Whales: 2012 (continued)

[GB = Glacier Bay; IS = Icy Strait; green cells = Jun 1 – Aug 31 surveys (total period); blue cells = Jul 9 – Aug 16 surveys (standardized period)]

	Whale_ID	Nickname	5/3/2012	5/9/2012	5/16/2012	5/23/2012	5/28/2012	6/4/2012	6/5/2012	6/6/2012	6/11/2012	6/13/2012	6/14/2012	6/15/2012	6/18/2012	6/19/2012	6/20/2012	6/21/2012	6/22/2012	6/25/2012	6/26/2012	6/28/2012	6/29/2012	7/2/2012	7/5/2012	7/6/2012	7/8/2012	7/9/2012	7/11/2012	7/12/2012	7/16/2012	7/17/2012	7/18/2012	7/19/2012	7/20/2012	7/23/2012	7/24/2012	7/25/2012	7/26/2012	7/27/2012	7/30/2012	8/1/2012	8/3/2012	8/6/2012	8/8/2012	8/9/2012	8/10/2012	8/13/2012	8/14/2012	8/16/2012
201	2493																																																	
202	1654																																																	
203	2086																																																	
204	2060																																																	
205	2460																																																	
206	525																																																	
207	2535																																																	
208	2315																																																	
209	1795																																																	
210	2032																																																	
211	2023																																																	
212	1483																																																	
213	1736																																																	
214	2150																																																	
215	2494																																																	
216	2532																																																	
217	2050																																																	
218	2320																																																	
219	2325																																																	
220	2334																																																	
221	2318																																																	
222	2342																																																	
223	2492																																																	

	Whale_ID	Nickname	8/17/2012	8/20/2012	8/21/2012	8/22/2012	8/23/2012	8/24/2012	8/27/2012	8/30/2012	8/31/2012	9/7/2012	9/10/2012	9/11/2012	9/17/2012	9/18/2012	9/25/2012	10/2/2012	10/9/2012	10/10/2012
201	2493		GB																	
202	1654				GB	GB			GB								GB			
203	2086				GB	GB														
204	2060						IS													
205	2460						IS				IS					IS				IS
206	525						IS													
207	2535							IS			IS					IS				IS
208	2315								GB		IS					IS				IS
209	1795										IS					IS		IS		
210	2032										IS									
211	2023														GB					
212	1483															IS				
213	1736															IS				
214	2150															IS				
215	2494															IS				
216	2532															IS				
217	2050																GB			
218	2320																GB			
219	2325																	IS	IS	
220	2334																		IS	
221	2318																			IS
222	2342																			IS
223	2492																			IS

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 132/122343, September 2013

National Park Service
U.S. Department of the Interior

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