Annual Progress Report

Results of Humpback Whale Monitoring in Glacier Bay and Adjacent Waters: 2010

A humpback whale surfaces in Sitakaday Narrows in Glacier Bay, May 2010.

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INTRODUCTION

This report summarizes the findings of the National Park Service's (NPS) humpback whale monitoring program during the summer of 2010, the twenty-sixth consecutive year of consistent data collection in Glacier Bay and Icy Strait. Each summer, Glacier Bay National Park & Preserve (GBNPP) 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. These data are used to monitor long-term trends in the population's abundance, distribution and reproductive parameters. 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 GBNPP “whale waters” vessel course and speed restrictions should be implemented in Glacier Bay.

METHODS

The methods used for population monitoring 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 2010 are outlined below.

Vessel Surveys

We conducted surveys in Glacier Bay and Icy Strait from April 30 through October 26, 2010. 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 four-stroke Johnson 140 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.

Between June 1 and August 31 we surveyed the main body of Glacier Bay (a rectangle defined by four corners: Bartlett Cove, Point Carolus, Geikie Inlet and Garforth Island) 3 – 4 days per week (Fig. 1), focusing the day’s effort in a particular part of the study area. We surveyed the East and West Arms of Glacier Bay (to the mouth of Tarr Inlet) infrequently. We surveyed Icy Strait approximately once per week, with the greatest survey effort focused along the shoreline of Chichagof Island from Pinta Cove to Mud Bay and in Park waters around Point Carolus. 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.

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. Upon locating a pod, 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, 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.

Individual Identification

The ventral surface of each whale's flukes has a distinct, stable black and white pigment pattern that allows for individual identification (Jurasz

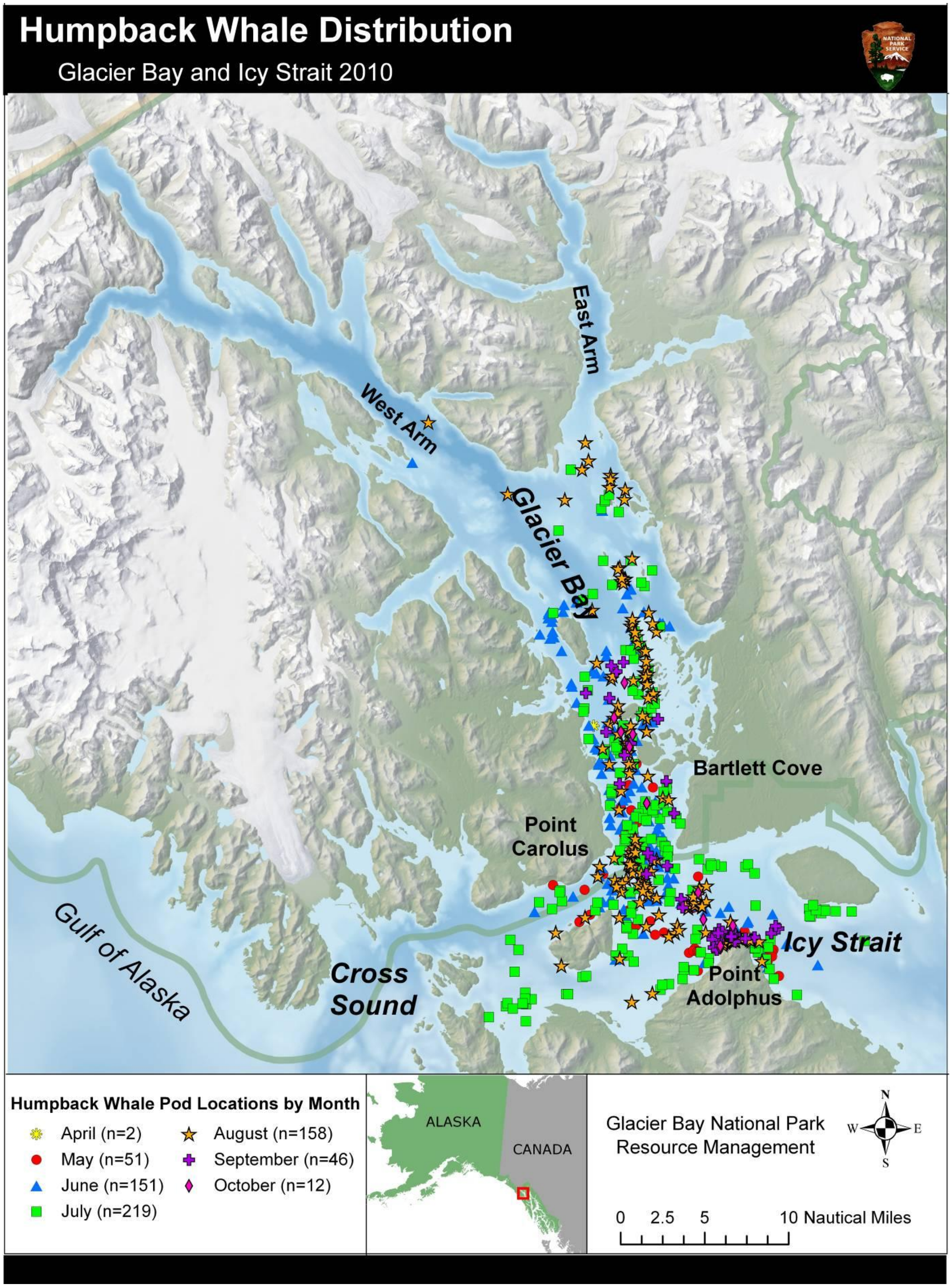

Figure 1. Study area in Glacier Bay and Icy Strait showing distribution of humpback whale pods in 2010. Each symbol represents a pod containing one or more whales.

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 GBNPP 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 2010. We also printed and catalogued the best 2010 identification photograph (fluke or dorsal fin) of each individual.

Whale Counts

We examined the 2010 photographs to determine the number of distinct individual whales in the sample. We made separate counts of Glacier Bay and Icy Strait for the dedicated monitoring period (June 1 – August 31) and for a 'standardized period' (July 9 – August 16) (after Perry *et al*. 1985). 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).

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

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 GBNPP (in dry salt) and sent the other half to be archived (frozen at -80° F) at the National Marine Fisheries Service (NMFS) Southwest Fisheries Science Center where they are available on request to other scientists studying a variety of topics.

RESULTS AND DISCUSSION

Vessel Surveys: We searched for, observed and photographed humpback whales for a total of 293 hours in the combined Glacier Bay/Icy Strait study area (Table 1). This level of survey effort is comparable to the average for 2005 – 2009. Although we strive to maintain a comparable level of 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 – 2010.

YEAR	MAY # survey days GB	MAY IS	JUNE # survey days GB	JUNE IS	JULY # survey days GB	JULY IS	AUG # survey days GB	AUG IS	SEPT # survey days GB	SEPT IS	TOTAL # SURVEY DAYS (June 1 - August 31) GB	TOTAL # SURVEY DAYS IS	TOTAL # SURVEY HOURS (June 1 - August 31) GB	TOTAL # SURVEY HOURS IS	TOTAL # SURVEY HOURS 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***
2005-2009 average survey effort:											42.6	21.0	197.0	96.4	293.4

The dashed line highlights a change in the way survey effort was calculated beginning in 2005.
Total # survey hours are not available for 1986 & 1987

Whale Counts

We documented a record high number of whales in the study area as a whole (n = 192), Fig. 2, Appendix 1), which represents a 9% increase over the previous high count of 177 whales in 2009 (Neilson and Gabriele 2009). The number of whales in Glacier Bay (n = 131) was 18% higher than the previous high count of 111 whales in 2004. The number of whales in Icy Strait (n = 144) was higher than in recent years but 9% lower than the high count of 159 whales in 2009.

For the second year in a row, an unusually high number of whales (n = 17) were observed in Glacier Bay and Icy Strait only outside of the regular June through August monitoring period, for a grand total and record high of 209 individual whales documented in 2010. Overall the humpback whale population in southeastern Alaska is growing and the current rate of increase for humpback whales in the North Pacific is estimated to be approximately 5% per year (Calambokidis *et al*. 2008).

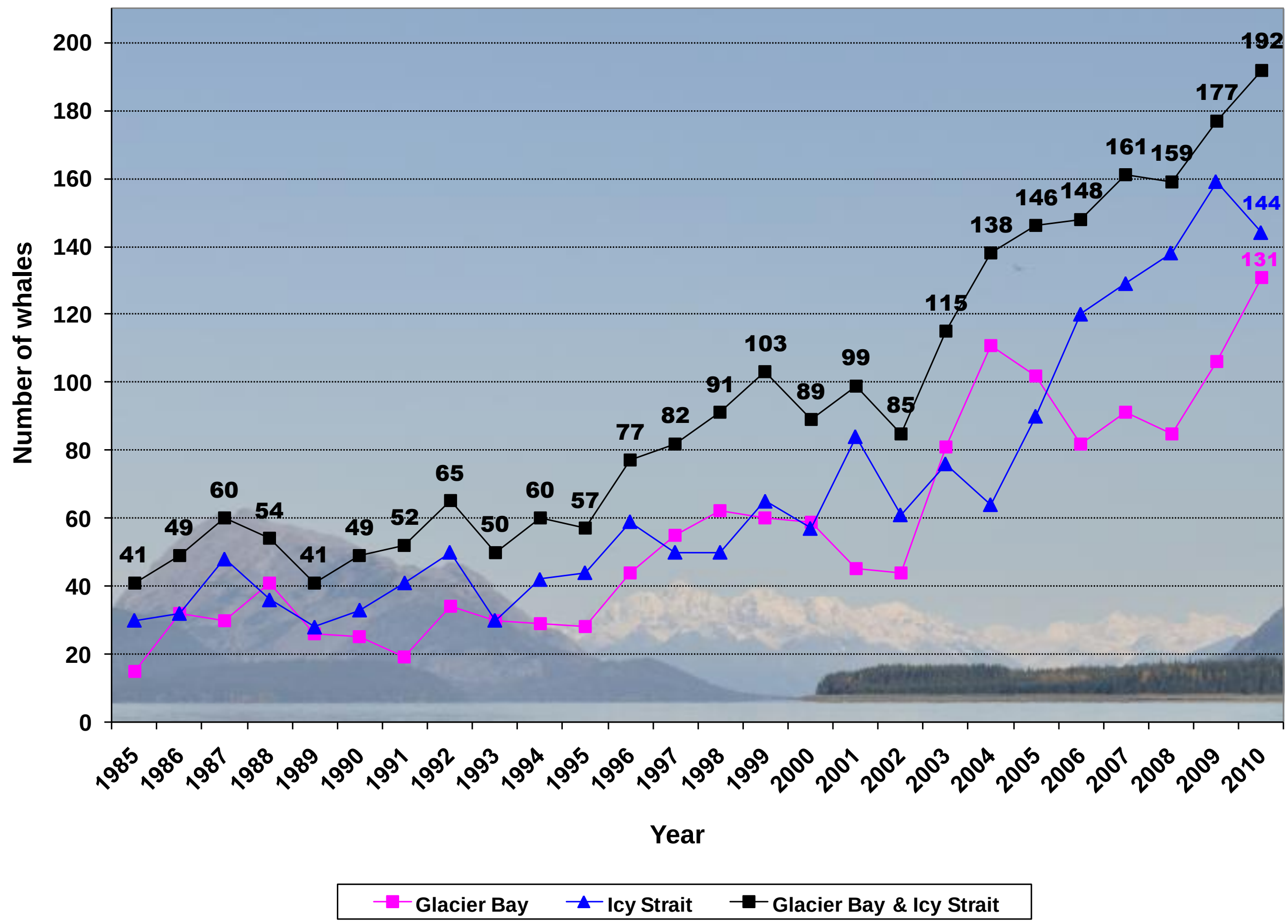

Figure 2. Number of individual whales documented in Glacier Bay & Icy Strait from June 1 through August 31, 1985 – 2010.

Fifteen 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 (8%) was lower than the 1985 – 2009 average (12%).

Four more new whales were observed in Glacier Bay or Icy Strait outside of the June through August monitoring period, for a grand total of 19 new (non-calf) whales in 2010. Almost half of all the new whales (42%, n = 8) were small to medium in body size which indicates that they may have been juveniles. Only three of the 19 new whales were known to have been sighted elsewhere in southeastern Alaska; the remaining 16 animals did not match any of the whales in the southeastern Alaska fluke catalog (University of Alaska Southeast, unpublished data).

Whale Waters

Vessel course and speed restrictions have long been used to reduce whale disturbance and collision risk in Park waters (36 CFR Subpart N, 13.1170). The length of whale waters vessel speed restrictions in lower Glacier Bay (143 days) was the longest since 1985. 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 = 125 days, 2008 = 137 days, 2009 = 124 days).

For the fifth 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 July 3 – September 16 (76 days), however this was significantly shorter than the duration of whale waters in this area in 2009 (173 days). In 2010, temporary whale waters were also designated in lower Whidbey Passage from June 23 – July 8 (16 days).

Residency

Thirty-five (27%) of the 131 whales that entered Glacier Bay between June 1 and August 31, including seven mother/calf pairs, remained 20 or more days, meeting our definition of 'resident' (Appendix 2). The proportion of Glacier Bay residents in 2010 was within the documented range of values for this variable parameter since 1990 (15% - 67%) and higher than the record low in 2009 (15%) (Neilson and Gabriele 2009). The number of mother/calf pairs that were resident in Glacier Bay was unusually high compared to recent years.

Forty-five (31%) of the 144 whales that we identified in Icy Strait, including two mother/calf pairs, remained long enough to be considered resident. The proportion of Icy Strait residents in 2010 was lower than in recent years but within the documented range of values for this variable parameter since 1990 (24% - 58%). Similar to recent years, 41 (21%) of the 192 whales that we sighted in Glacier Bay/Icy Strait, including two mother/calf pairs, were resident in the combined Glacier Bay/Icy Strait study area. An additional 15 whales (8%), including two mother/calf pairs, were resident in more than one area (*e.g.*, resident in Glacier Bay and then resident in Icy Strait).

Overall, 136 whales (71%) were resident in Glacier Bay, Icy Strait or the combined area between June 1 and August 31. 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.

Twenty-four (13%) of the whales that we documented between June 1 and August 31, including two mother/calf pairs, were identified on just one day: 8 in Glacier Bay and 16 in Icy Strait. Four of these whales were documented on July 13 when we surveyed the Pleasant Island reef; otherwise the sightings occurred over a broad range of dates, indicating that it was not a single pulse of whales arriving in the area. The proportion of whales sighted on one day varies widely each year, with a range of 12% – 43% since 1994. We documented 12 more whales, including two mother/calf pairs, on just one day outside of the June 1 – August 31 monitoring period, bringing the grand total of whales identified on one day to 36 individuals (17%).

Reproduction and Juvenile Survival

We documented a record high number of mother/calf pairs (n = 21) in 2010 (Table 2) with a crude birth rate (10.9%) similar to the historic average (10.1%) (Table 3). Three mother/calf pairs (#1031 and calf, #1090 and calf and #1657 and calf) were present only outside of the regular monitoring period. Unlike 2008 and 2009 when few mother/calf pairs were documented exclusively in Glacier Bay, in 2010 five mother/calf pairs were identified solely in Glacier Bay. The remaining pairs were identified at least once, if not exclusively, in Icy Strait.

On July 14, we observed whale #250's calf (#2331) in Glacier Bay with what appeared to be fresh killer whale (*Orcinus orca*) rake marks on the right side of its dorsal fin (Fig. 3). Otherwise the calf seemed to be healthy and active with no obvious rake marks elsewhere on its body. When we documented the calf previously on June 21 it did not have these injuries to its dorsal fin. We also saw the calf on July 9 and July 28 but we did not photographically document its right side during these sightings. If the injuries were produced by a killer whale attack, we suspect that the attack

Table 2. Mother-calf pairs in 2010.

	Mother ID#	Calf ID#	Documented in:
1.	181	181_calf_2010	GB
2.	193	193_calf_2010	IS
3.	232	2330	GB
4.	250	2331	GB & IS
5.	535	2332	GB
6.	573	2333	IS
7.	581	581_calf_2010	IS
8.	801	2334	GB
9.	965	2335	IS
10.	1031*	1031_calf_2010	IS
11.	1088	2322	GB & IS
12.	1090*	1090_calf_2010	IS
13.	1233	1233_calf_2010	GB & IS
14.	1246	2323	GB & IS
15.	1298	2324	GB & IS
16.	1304	2325	GB & IS
17.	1421	1421_calf_2010	IS
18.	1479	2326	GB & IS
19.	1657*	2327	IS
20.	1812	2328	GB
21.	1896	2329	GB & IS

GB = Glacier Bay; IS = Icy Strait
Only calves whose flukes were photographed received an identification number
* Indicates mother/calf pair documented outside of the June 1 – August 31 study period

Figure 3. Whale #250's calf with what appear to be fresh killer whale rake marks on its dorsal fin, July 14, 2010.

Table 3. Reproduction and known age whales in Glacier Bay and Icy Strait, 1982 – 2010.

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	6.0	12	50
1994	9	5	56	15.0	10	60
1995	3	2	67	5.3	9	57
1996	6	3	50	7.8	18	77
1997	9	7	78	11.0	17	82
1998	8	7	88	8.8	18	91
1999	9	5	56	8.7	25	103
2000	3	2	67	3.4	23	89
2001	12	9	75	12.1	26	99
2002	11	6	55	12.9	23	85
2003	7	5	71	6.1	27	115
2004	16	12	75	11.6	36	138
2005	10	5	50	6.8	35	146
2006	13	8	62	8.8	41	148
2007	17	12	71	10.6	39	161
2008	15	12	80	9.4	48	159
2009	12	10	83	6.8	51	177
2010	21	15	71	10.9	51	192
1982-2009 average:	8.0	6.0	67.8	10.1	21.2	91.8

Only includes whales documented during the June 1 – August 31 study period. Crude Birth Rate (CBR) is a percentage computed by # calves / total whale count. CBR's 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.

may have occurred in the study area because we observed this pair frequenting the study area before and after the injuries were incurred.

When we documented whale #250 on August 4, her calf appeared to be missing. We monitored her for 52 minutes under excellent sighting conditions with no sign of her calf. We did not see #250 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 (NPS, unpublished data), 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 using the fluke and dorsal fin photographs that we took earlier in the summer. Only three documented cases of calf mortality have been recorded in the study area (Baker 1986, Baker and Straley 1988, Doherty and Gabriele 2004). In two more cases, we documented females without their calves late in the season but we could not determine if the calves had died or been weaned early (Doherty and Gabriele 2001, Neilson and Gabriele 2007). However, in these two cases the calves were missing in late August and September, not in early August. Overall, late season calf absences are very ambiguous given observations of temporary mother/calf separation as well as weaning on the feeding grounds (Baraff and Weinrich 1993, Gabriele et al. 2001).

The most prolific female known in the study population, whale #581, returned with her 13th known calf since 1984. Whale #1088 (age 16 with a complete annual sighting history since age 7), whale #1657 (age unknown) and whale #1896 (age unknown) were documented with their first known calves. The mean age at first calving for female humpback whales in southeastern Alaska is 11.8 years (Gabriele *et al.* 2007). The sex of these three first-time mothers was previously unknown.

The value of the longevity of this study is highlighted by the fact that 27% (n = 51) of the whales that we identified in 2010 (n = 192) were of known age. As we accumulate long-term sighting histories of the whales in the study area, this is similar to the proportion of known age whales in recent years.

Genetics

In 2010 we collected 21 sloughed skin samples, including four samples from individually identified calves. Since 1996, we have collected over 200 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

On July 21 we positively identified sand lance (*Ammodytes hexapterus*) from a sample we collected with a dipnet near several whales that were feeding off Leland Island in Glacier Bay (Craig Murdoch, pers. comm.) (Table 4). Similar to past years, on five occasions between early June and mid-July we noted a distinctive cucumber smell near feeding whales that likely indicated the presence of capelin (*Mallotus villosus*). On other occasions we observed forage fish near feeding whales that we suspect were capelin (n = 3) and Pacific herring (*Clupea harengus pallasi*) (n = 2).

Table 4. Humpback whale prey type determinations.

METHOD:	**PREY SPECIES (# of cases):** *sand lance*	*capelin?*	*herring*
Collected specimen with dip net	1		
'Cucumber' smell in air		5	
Fish observed near surface		3	1
Seabirds observed eating fish			1

In early and mid-August, we received reports of widespread areas off Point Adolphus where herring were boiling at the sea surface (M. Nigro, pers. comm.; K. Owen, pers. comm.).

Whale/Human Interactions

On June 22, we received a report of a mother and calf humpback whale entangled in fishing gear off Point Adolphus. The mother was reported to have several wraps of green line behind her dorsal fin and the calf had gillnet draped over its back. Both animals were mobile and did not appear to be in immediate distress. We arrived on the scene 48 minutes later and searched for the entangled whales for approximately three hours. We observed several mother/calf pairs in the area but none were entangled. No further sightings of the entangled pair were reported.

On August 29, a humpback whale was reported entangled in what appeared to be crab pot gear in Port Frederick near Hoonah, however the whale was not sighted again (NOAA unpublished data). On Sept 3, we observed and photographed crab buoys and line of similar description to what was reported on this whale but we could retrieve the gear from our small research vessel. Subsequent efforts to locate and retrieve the gear with an NPS patrol vessel with a winch were unsuccessful.

On September 2, a humpback whale calf was reported entangled in an assortment of gear in Chatham Strait, including commercial Dungeness crab pot gear from Tenakee Inlet. The calf was identified as #181's calf, which we had documented in Glacier Bay on June 3 and was also known as "Oliver" to researchers from the Alaska Whale Foundation. On September 3, the calf was successfully disentangled by members of the North Pacific Large Whale Disentanglement Network (NOAA unpublished data).

In addition to these three entanglements, in 2010 there were 10 more reports of entangled humpback whales and two reports of unidentified entangled large whales elsewhere in southeastern Alaska, plus one report of an entangled humpback whale near Whittier (NOAA unpublished data).

An unusually high number of humpback whales were found dead in Alaska in 2010 (five in southeastern Alaska and one in the Aleutian Islands.) The cause of death was not determined in all cases, however vessel collisions were suspected, if not confirmed, in five of the six cases (NOAA unpublished data).

On May 26, adult female #952 was found floating near Sitka. The carcass floated away and was lost before a necropsy was conducted, therefore the cause of this whale's death remains unknown. However, she was seen feeding in Sitka Sound the day before she was found dead, indicating that her death was very sudden (i.e., possibly from a vessel collision) (Jan Straley, pers. comm.).

On July 3, an adult female humpback whale was found dead in King Cove in the Aleutian Islands. A necropsy revealed multiple fractures at the base of the whale's skull and concluded that ship strike was the probable cause of death (NOAA unpublished data).

On July 28, an adult female humpback whale was found pinned to the bulbous bow of the cruise ship *Sapphire Princess* near Juneau. A necropsy revealed a complex array of injuries and histopathology results remain pending to determine the degree of pre- versus post-mortem tissue damage (NOAA unpublished data).

On August 18, sub-adult male #2337 was found floating in Tenakee Inlet. This whale had been documented alive in Glacier Bay on July 8. A necropsy found injuries consistent with high impact blunt trauma and concluded that #2337 died from a vessel collision (NOAA unpublished data).

On September 6, an adult female humpback whale was found floating near Hydaburg. A full necropsy was not possible and the cause of this whale's death remains unknown. However, on

September 5 a passenger on a cruise ship in this general area reported possibly striking a humpback whale, but this was never confirmed (NOAA unpublished data).

In 2010 there were reports of three different Allen Marine catamarans (all approximately 24 meters in length) accidentally striking humpback whales near Haines, Juneau and Hoonah. The fate of the struck whales is unknown, however observations of the whales immediately after the strikes indicated no apparent injuries (NOAA unpublished data).

In addition, on May 7 another 24-meter Allen Marine catamaran may have struck a humpback whale near the Inian Islands, however this was not confirmed. No injured whales were observed or reported in the area following this possible collision.

On July 27 we observed three jet skis harassing humpback whales, including the "core group", at Point Adolphus (Fig. 4). This was the first time we have observed jet skis whale watching in southeastern Alaska. We reported the operators to NMFS 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 "T-boning" the whales [i.e., placing their jet skis in the path of oncoming whales so that whales surfaced within 100 yards (91.4 m) of the jet skis.]

Figure 4. Jet skis harassing whales at Point Adolphus on July 27, 2010.

Whale Mortality

On May 5, a dead whale was sighted on a beach at Scidmore Cut in the upper West Arm of Glacier Bay (Fig. 5). Marine mammal observer Nat Drumheller, onboard the Park's first cruise ship of the year, spotted the carcass from several miles away. Subsequent examinations revealed that it was a female humpback whale approximately 12.5 m (41 ft) in length, but the whale was too decomposed to allow for individual identification via markings on her ventral flukes. We collected tissue samples for genetic analysis and age determination but we did not conduct a full necropsy because of the advanced state of decomposition of the carcass.

In early September, after bears, wolves and other scavengers had foraged extensively on the carcass, we found fetal bones on the beach that revealed the whale had been pregnant. The size of the fetal bones indicates that its mother likely died in the fall of 2009, however more information is needed on the size of humpback whale neonates to date her death. We also found a 0.6 m x 1.8 m (2 ft x 6 ft) piece of clear plastic covered in whale fat near the fetal bones that we suspect may have come from inside the mother's body, however we are unable to confirm that it originated inside the whale or that it contributed to her cause of death.

Figure 5. Three brown bears (*Ursus arctos*) and two wolves (*Canis lupus*) feed on an adult humpback whale carcass at Scidmore Cut on August 20, 2010 (NPS photo).

Notable Behavioral Observations

On July 7 we observed an unusual interaction between humpback whale calf #2326 and a northern sea otter (*Enhydra lutris kenyoni*) in Glacier Bay while the calf's mother, #1479, was feeding in the distance. The rambunctious calf, which had been breaching and rolling, began swimming in circles around the otter, which was resting at the surface in some kelp. The calf then appeared to slap the otter with one of its pectoral fins but the otter displayed no obvious reaction. Next the calf dove and a few seconds later, performed a head rise right next to the otter, as if trying to bump the otter with its rostrum. The otter reacted by diving immediately and then slowly swimming away. This was the first time we have observed an overt interaction between a humpback whale and a sea otter.

On December 14 we opportunistically observed a minimum of six to eight humpback whales spread out in Mud Bay in Icy Strait from the Alaska state ferry *Aurora* en route from Gustavus to Pelican. We were too far away to photographically identify any of the individuals. Around the same time, several local residents also reported observing a lot of whale activity in this area. While it is not uncommon for us to receive occasional reports of scattered whales in Icy Strait during the winter, this number of animals in one area seemed unusual.

Singing humpback whales were heard on the anchored hydrophone in Bartlett Cove on numerous occasions between September 28 and November 18, 2010. Daily monitoring of the hydrophone continued through December. Song is a male display related to mating, and was previously not believed to be common in Alaska waters (McSweeney et al 1989, Gabriele and Frankel 2002).

ACKNOWLEDGEMENTS

The whale monitoring study is vastly enriched by participation from Park staff and volunteers. We thank David Cannamore for his hard work and assistance with data entry. We are indebted to Bill Eichenlaub for spending countless hours building our new shared regional database, and to Jen Cedarleaf, Ellen Chenoweth and Jan Straley for their diligence in merging our data into the new database. We are grateful to everyone who helped respond to the dead whale at Scidmore Cut, with special kudos to NPS shipboard marine mammal observer Nat Drumheller for spotting and monitoring the carcass; Tania Lewis, Christopher Behnke, Diana Raper, Janene Driscoll and others for tracking the decomposition and scavenging of the carcass and many other park staff and volunteers who assisted in various ways. We extend our gratitude to Bruce McDonough for keeping the *Sand Lance* running smoothly for another 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 from Nat Drumheller, Justin Smith and Dena Matkin. We are grateful to Mike Nigro and Kimber Owen for sharing their observations of whale prey and to Craig Murdoch for confirming the species of fish in a sample we collected. We thank Craig Smith for his support of this research. A big thanks goes out to Kaili Jackson and Ed Lyman (NOAA) for compiling and sharing data on humpback whale strandings and entanglements in Alaska. 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 #945-1776-01.

REFERENCES

Baker, C. S. (1986). Population characteristics of humpback whales in Glacier Bay and adjacent waters: Summer 1986. Report to the National Park Service, Gustavus, AK, 30 pp.

Baker, C. S. and J. Straley (1988). Population characteristics of humpback whales in Glacier Bay and adjacent waters: Summer 1988. Report to the National Park Service, Gustavus, AK, 30 pp.

Baraff, L. and M. T. Weinrich (1993). Separation of humpback whale mothers and calves on a feeding ground in early autumn. Marine Mammal Science 9(4):431-434.

Blackmer, A. L., S. K. Anderson and M. T. Weinrich (2000). Temporal variability in features used to photo-identify humpback whales (*Megaptera novaeangliae*). Marine Mammal Science 16:338-354.

Calambokidis, J., E. A. Falcone, T. J. Quinn, A. M. Burdin, P. J. Clapham, J. K. B. Ford, C. M. Gabriele, R. LeDuc, D. Mattila, L. Rojas-Bracho, J. M. Straley, B. L. Taylor, J. R. Urban, D. Weller, B. H. Witteveen, M. Yamaguchi, A. Bendlin, D. Camacho, K. Flynn, A. Havron, J. Huggins and N. Maloney (2008). SPLASH: Structure of Populations, Levels of Abundance and Status of Humpback Whales in the North Pacific. Final report to U.S. Department of Commerce for Contract AB133F-03-RP-00078, Cascadia Research, Olympia, WA. 57 pp.

Doherty, J.L. and C.M. Gabriele (2001). Population characteristics of humpback whales in Glacier Bay and adjacent waters: 2001. Report to the National Park Service, Glacier Bay National Park and Preserve, Gustavus, AK. 24 pp.

Doherty, J. L. and C. M. Gabriele (2004). Results of humpback whale population monitoring in Glacier Bay and adjacent waters: 2004. Report to the National Park Service, Glacier Bay National Park and Preserve, Gustavus, AK. 25 pp.

Gabriele, C. M., J. M. Straley, S. A. Mizroch, C. S. Baker, A. S. Craig, L. H. Herman, D. Glockner-Ferrari, M. J. Ferrari, S. Cerchio, O. von Ziegesar, J. Darling, D. McSweeney, T. J. Quinn II and J. K. Jacobsen (2001). Estimating the mortality rate of humpback whale calves in the central North Pacific Ocean. Canadian Journal of Zoology 79:589-600.

Gabriele, C. M. and A. S. Frankel (2002). The occurrence and significance of humpback whale songs in Glacier Bay, southeastern Alaska. Arctic Research of the United States 16:42-47.

Gabriele, C. M., J. M. Straley and C. S. Baker (1995). The Variability of Humpback Whale Counts in Glacier Bay and Icy Strait. Proceedings of the Third Glacier Bay Science Symposium, 1993, edited by D. R. Engstrom, p. 239-245.

Gabriele, C. M., J. M. Straley and J. L. Neilson (2007). Age at first calving of female humpback whales in southeastern Alaska. Marine Mammal Science 23:226-239.

Jurasz, C. M. and V. P. Palmer (1981). Censusing and establishing age composition of humpback whales (*Megaptera novaeangliae*), employing photodocumentation in Glacier Bay National Monument, Alaska. Report to the National Park Service, Anchorage, AK, 42 pp.

Katona, S. K., B. Baxter, O. Brazier, S. Kraus, J. Perkins and H. Whitehead (1979). Identification of Humpback whales by Fluke Photographs. In: Behavior of Marine Animals, vol. 3: Cetaceans. Edited by H. E. Winn and B. L. Olla, Plenum Press, p. 33-44.

McSweeney, D., K. C. Chu, W. F. Dolphin and L. N. Guinee (1989). North Pacific humpback whale songs: a comparison of southeast Alaskan feeding ground songs with Hawaiian wintering ground songs. Marine Mammal Science 5:139-148.

Neilson, J. L., and C. M. Gabriele (2007). Results of humpback whale population monitoring in Glacier Bay and adjacent waters: 2007. Report to the National Park Service, Glacier Bay National Park and Preserve, Gustavus, AK. 26 pp.

Neilson, J. L., and C. M. Gabriele (2009). Results of humpback whale population monitoring in Glacier Bay and adjacent waters: 2009. Report to the National Park Service, Glacier Bay National Park and Preserve, Gustavus, AK. 18 pp.

Perry, A., C. S. Baker, and L. M. Herman (1985). The natural history of humpback whales (*Megaptera novaeangliae*) in Glacier Bay. Final Report to the National Park Service, Alaska Regional Office, Anchorage, AK, 41 pp.

APPENDIX 1

STANDARDIZED (July 9 – August 16) and TOTAL (June 1 – August 31) Humpback Whale Counts, 1985 – 2010

	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	62	27	50	68	91
1999	36	60	39	65	68	103
2000	44	59	26	57	62	89
2001	26	45	58	84	72	99
2002	28	44	34	61	56	85
2003	53	81	61	76	102	115
2004	85	111	38	64	110	138
2005	66	102	50	90	95	146
2006	66	82	98	120	130	148
2007	76	91	98	129	132	161
2008	55	85	97	138	125	159
2009	59	106	122	159	142	177
2010	76	131	97	144	140	192
average:	**38.62**	**56.42**	**46.85**	**67.69**	**71.31**	**93.85**
stdev:	**22.09**	**32.35**	**29.83**	**38.91**	**37.70**	**46.19**

APPENDIX 2

Sighting Histories of Individually Identified Whales: 2010

[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	4/30/2010	5/3/2010	5/10/2010	5/13/2010	5/19/2010	5/25/2010	5/28/2010	6/1/2010	6/3/2010	6/4/2010	6/7/2010	6/8/2010	6/9/2010	6/11/2010	6/14/2010	6/15/2010	6/17/2010	6/18/2010	6/21/2010	6/22/2010	6/23/2010	6/24/2010	6/25/2010	6/28/2010	6/29/2010	7/1/2010	7/2/2010	7/6/2010	7/7/2010	7/8/2010	7/9/2010	7/11/2010	7/13/2010	7/14/2010	7/16/2010	7/19/2010	7/20/2010	7/21/2010	7/26/2010	7/27/2010	7/28/2010	7/29/2010	7/30/2010	8/2/2010	8/3/2010	8/4/2010	8/6/2010	8/9/2010	8/12/2010	8/13/2010	8/16/2010	8/17/2010	8/18/2010	8/19/2010	8/20/2010	8/23/2010	8/24/2010	8/25/2010	8/26/2010	8/27/2010	8/30/2010	8/31/2010	9/3/2010	9/8/2010	9/13/2010	9/17/2010	9/30/2010	10/15/2010	10/6/2010	10/26/2010
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APPENDIX 2 (cont'd.)

Sighting Histories of Individually Identified Whales: 2010

[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	4/30/2010	5/3/2010	5/10/2010	5/13/2010	5/19/2010	5/25/2010	5/28/2010	6/1/2010	6/3/2010	6/4/2010	6/7/2010	6/8/2010	6/9/2010	6/11/2010	6/14/2010	6/15/2010	6/17/2010	6/18/2010	6/21/2010	6/22/2010	6/23/2010	6/24/2010	6/25/2010	6/28/2010	6/29/2010	7/1/2010	7/2/2010	7/6/2010	7/7/2010	7/8/2010	7/9/2010	7/11/2010	7/13/2010	7/14/2010	7/16/2010	7/19/2010	7/20/2010	7/21/2010	7/26/2010	7/27/2010	7/28/2010	7/29/2010	7/30/2010	8/2/2010	8/3/2010	8/4/2010	8/6/2010	8/9/2010	8/12/2010	8/13/2010	8/16/2010	8/17/2010	8/18/2010	8/19/2010	8/20/2010	8/23/2010	8/24/2010	8/25/2010	8/26/2010	8/27/2010	8/30/2010	8/31/2010	9/3/2010	9/8/2010	9/13/2010	9/17/2010	9/30/2010	10/15/2010	10/6/2010	10/26/2010
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APPENDIX 2 (cont'd.)

Sighting Histories of Individually Identified Whales: 2010

[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	4/30/2010	5/3/2010	5/10/2010	5/13/2010	5/19/2010	5/25/2010	5/28/2010	6/1/2010	6/3/2010	6/4/2010	6/7/2010	6/8/2010	6/9/2010	6/11/2010	6/14/2010	6/15/2010	6/17/2010	6/18/2010	6/21/2010	6/22/2010	6/23/2010	6/24/2010	6/25/2010	6/28/2010	6/29/2010	7/1/2010	7/2/2010	7/6/2010	7/7/2010	7/8/2010	7/9/2010	7/11/2010	7/13/2010	7/14/2010	7/16/2010	7/19/2010	7/20/2010	7/21/2010	7/26/2010	7/27/2010	7/28/2010	7/29/2010	7/30/2010	8/2/2010	8/3/2010	8/4/2010	8/6/2010	8/9/2010	8/12/2010	8/13/2010	8/16/2010	8/17/2010	8/18/2010	8/19/2010	8/20/2010	8/23/2010	8/24/2010	8/25/2010	8/26/2010	8/27/2010	8/30/2010	8/31/2010	9/3/2010	9/8/2010	9/13/2010	9/17/2010	9/30/2010	10/15/2010	10/6/2010	10/26/2010
101	2333	calf of 573												IS								IS							IS				IS					IS				IS								IS						IS																
102	1246														GB		IS							GB		GB								GB											IS														IS									IS				
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121	1046																		GB					GB		GB								GB										GB		GB													GB						IS							
122	155	Freckle Fluke																	GB										IS				IS	GB				IS				IS												IS															IS				
123	232	Notchfin																	GB								GB							GB																									GB										GB			
124	2330	calf of 232																	GB								GB							GB																									GB										GB			
125	1489																				GB																			GB	GB						GB																					IS			IS	
126	1536																				GB																																																			
127	1802																				GB																																						IS												IS	
128	250																				GB												IS			GB							GB					GB																								
129	2331	calf of 250																			GB												IS			GB							GB																													
130	441																				GB														IS																																					
131	1901																					IS																																IS																		
132	193																					IS							IS																																											
133	193_calf_2010	calf of 193																				IS							IS																																											
134	879																					IS																																																		
135	1083																							GB					IS				IS							GB										IS																		IS		GB		
136	1795																							GB	IS																																														GB
137	1839																							GB				GB		IS				IS							IS							GB																							
138	2310																							GB				GB																										IS									GB								
139	564																							GB										GB																																					
140	GBNP-CMG-20100624-1-027																							GB																																																
141	1313																								IS																																	IS						IS	GB		IS		GB		
142	1844																								IS																																															
143	1018																									GB									IS																	GB											GB								
144	1832																									GB																																												IS	
145	2320																									GB										GB						IS																				GB										
146	2346																									GB												GB										GB															GB								
147	1432																										GB							GB																				IS				IS							GB		IS	GB		IS	GB
148	GBNP-JLN-20100629-1-006																										GB																																													
149	600																											GB		GB	GB			GB																																						
150	GBNP-CMG-20100701-1-096																											GB																																												

APPENDIX 2 (cont'd.)

Sighting Histories of Individually Identified Whales: 2010

[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	4/30/2010	5/3/2010	5/10/2010	5/13/2010	5/19/2010	5/25/2010	5/28/2010	6/1/2010	6/3/2010	6/4/2010	6/7/2010	6/8/2010	6/9/2010	6/11/2010	6/14/2010	6/15/2010	6/17/2010	6/18/2010	6/21/2010	6/22/2010	6/23/2010	6/24/2010	6/25/2010	6/28/2010	6/29/2010	7/1/2010	7/2/2010	7/6/2010	7/7/2010	7/8/2010	7/9/2010	7/11/2010	7/13/2010	7/14/2010	7/16/2010	7/19/2010	7/20/2010	7/21/2010	7/26/2010	7/27/2010	7/28/2010	7/29/2010	7/30/2010	8/2/2010	8/3/2010	8/4/2010	8/6/2010	8/9/2010	8/12/2010	8/13/2010	8/16/2010	8/17/2010	8/18/2010	8/19/2010	8/20/2010	8/23/2010	8/24/2010	8/25/2010	8/26/2010	8/27/2010	8/30/2010	8/31/2010	9/3/2010	9/8/2010	9/13/2010	9/17/2010	9/30/2010	10/15/2010	10/6/2010	10/26/2010
151	1842																											IS		IS				GB																										IS							GB	GB					
152	1428																												IS						IS										IS																												
153	1439																												IS							GB																																					
154	1539																												IS																IS														IS				IS							IS				
155	352																												IS						IS																										IS		IS		IS		IS			IS				
156	616	Lesser																											IS								IS								IS																												
157	1273																													GB		GB																																									
158	1479																														GB	GB			IS										GB		GB																										
159	2326	calf of 1479																													GB	GB			IS										GB		GB																										
160	1533																														GB																																										
161	1654																														GB		IS						GB		GB										GB				GB																			
162	801																														GB					GB															GB									GB													
163	2334	calf of 801																													GB					GB															GB									GB													
164	1652																															GB																																	IS							
165	2026																															GB																																								
166	2311																															GB				GB								GB				GB	GB				GB								GB		GB					GB					
167	2337																															GB																																								
168	2341																															GB	IS																																							
169	2038																																IS																																IS							
170	397																																IS									IS																														
171	1299																																	GB																			GB			IS																IS	
172	2339																																	GB																																						
173	1304																																	IS																									IS				IS			GB		IS				
174	2325	calf of 1304																																IS																									IS							GB		IS				
175	2032																																	IS																									IS									IS	GB			
176	2034																																		IS												GB					GB																						
177	2054																																		IS													IS																									
178	2220																																		IS																																						
179	2336																																		IS																																						
180	581																																		IS																																						
181	581_calf_2010	calf of 581																																	IS																																						
182	1836																																			GB			GB					GB					GB			GB	GB								GB		GB											GB
183	2023																																			GB			GB					GB									GB																					
184	2161																																			GB			GB								GB		GB												GB				GB								
185	1019																																				IS								IS																				IS		IS			IS				
186	1849																																				IS								IS																											
187	965																																				IS								IS																											
188	2335	calf of 965																																			IS								IS																											
189	219																																					IS				IS													IS																			
190	1082																																						GB							GB					GB																						
191	2022																																							GB																																		
192	2050																																							GB				GB																				GB		GB		GB						
193	1906																																								GB																				IS						IS			IS			IS	
194	GBNP-JLN-20100726-1-050																																								IS																																
195	GBNP-JLN-20100726-1-059																																								IS																																
196	1470																																									GB																															
197	GBNP-JLN-20100727-1-039																																									IS																															
198	2169																																												IS												GB							IS					IS				
199	2318																																												IS																												
200	1765																																																											IS													

APPENDIX 2 (cont'd.)

Sighting Histories of Individually Identified Whales: 2010

[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	4/30/2010	5/3/2010	5/10/2010	5/13/2010	5/19/2010	5/25/2010	5/28/2010	6/1/2010	6/3/2010	6/4/2010	6/7/2010	6/8/2010	6/9/2010	6/11/2010	6/14/2010	6/15/2010	6/17/2010	6/18/2010	6/21/2010	6/22/2010	6/23/2010	6/24/2010	6/25/2010	6/28/2010	6/29/2010	7/1/2010	7/2/2010	7/6/2010	7/7/2010	7/8/2010	7/9/2010	7/11/2010	7/13/2010	7/14/2010	7/16/2010	7/19/2010	7/20/2010	7/21/2010	7/26/2010	7/27/2010	7/28/2010	7/29/2010	7/30/2010	8/2/2010	8/3/2010	8/4/2010	8/6/2010	8/9/2010	8/12/2010	8/13/2010	8/16/2010	8/17/2010	8/18/2010	8/19/2010	8/20/2010	8/23/2010	8/24/2010	8/25/2010	8/26/2010	8/27/2010	8/30/2010	8/31/2010	9/3/2010	9/8/2010	9/13/2010	9/17/2010	9/30/2010	10/15/2010	10/6/2010	10/26/2010
201	2340																																																										IS					GB				IS				
202	1657																																																																IS			IS				
203	2327	calf of 1657																																																															IS			IS				
204	2342																																																																	GB		IS				
205	1057																																																																			IS				
206	1731																																																																			IS				
207	2086																																																																			IS				
208	2314																																																																			IS				
209	GBNP-CMG-20101026-1-022																																																																							GB