POPULATION CHARACTERISTICS OF HUMPBACK WHALES IN GLACIER BAY AND ADJACENT WATERS: 2002

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ABSTRACT

We photographically identified 85 individual humpback whales (*Megaptera novaeangliae*), including 11 mother/calf pairs, in Glacier Bay and Icy Strait between June 1 and August 31, 2002. We documented an additional mother/calf pair in October, outside of the normal survey period. Despite high concentrations of whales in specific areas such as Dundas Bay, Berg Bay, Hugh Miller Inlet and Point Adolphus, the standardized count of 56 whales in Glacier Bay and Icy Strait is the lowest standardized whale count in the study area since 1995. For the second year in a row, whales were not abundant in lower Glacier Bay for most of the summer. Twenty-seven percent (n = 23) of the whales that we identified were of known age. The sex of two of the mothers (#1079 and #1011) was not previously known. We have documented whale #1079, the 1993 calf of #235, every year in the study area since 1995 without a calf, making her 9 years old at the age of her first known reproduction in 2002. Whale #235 is the fourth documented grandmother in the study population. We observed whale #1432, identified with a calf in August, without her calf in September, October and November. We collected nine sloughed skin samples, bringing the total number of sloughed skin samples collected in the study area since 1996 to 82. We positively identified herring, capelin and sand lance as potential whale prey. We documented several whale/human interactions, including a whale capsizing a sea kayak and damage to whale #118's dorsal fin that likely resulted from a recent vessel collision.

INTRODUCTION

This report summarizes the findings of the National Park Service's (NPS) annual humpback whale monitoring program during the summer of 2002, the eighteenth consecutive year of consistent data collection in Glacier Bay and Icy Strait. This research program stemmed from concern in the late 1970's that an increase in vessel traffic in Glacier Bay National Park (GBNP) may have caused a large proportion of the local whale population to abandon the bay (Jurasz and Palmer 1981). As a federal agency, the National Park Service is mandated to ensure that park management decisions do not negatively impact endangered species, including humpback whales.

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. These data are used to monitor long-term trends in the population's abundance, distribution and reproductive rates. Photographic identification data are shared with other researchers studying North Pacific humpback whales. In addition, Park biologists use whale distribution data locally to determine when and where GBNP "whale waters" vessel course and speed restrictions should be implemented in Glacier Bay.

The number of whales documented in Glacier Bay and Icy Strait from 1985 to 2001 ranged from 41 to 104 (Doherty and Gabriele 2001). Whale movement throughout southeastern Alaska presumably is 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 the study area 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 harengus pallasi*) (Wing and Krieger 1983; Krieger and Wing 1984, 1986). Notable exceptions are the large, stable "core group" that commonly feeds at Point Adolphus, and the much less consistent large pods at Bartlett Cove and Pleasant Island Reef (Baker 1985; Perry *et al.* 1985; Gabriele 1997).

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 2002 are outlined below.

Vessel Surveys: We conducted surveys in Glacier Bay and Icy Strait from April 17 through November 21, 2002. We searched for, observed and photographed humpback whales from a 5.8-meter motorboat powered with a four-stroke 115 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. However, if circumstances such as time, weather, or the presence of other vessels interfered with obtaining whale identification photographs, we occasionally returned to the same area on consecutive days. Glacier Bay is the main area of NPS management concern with regard to whales, but descriptions of the whales' use of Icy Strait are needed to put the Glacier Bay results in context, because whales frequently move between these areas.

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. 2). We surveyed the West Arm of Glacier Bay (as far north as Russell Island) every few weeks. We surveyed the East Arm of Glacier Bay infrequently. We conducted approximately one Icy Strait survey per week, with the greatest survey effort focused along the shoreline of Chichagof Island from Pinta Cove to Mud Bay. Several Icy Strait surveys included Dundas Bay, Idaho Inlet, Lemesurier Island and Pleasant Island.

Upon locating a pod of whales, we recorded the latitude and longitude coordinates of their initial location, determined with a Garmin III Plus (using NAD27-Alaska datum) Global Positioning System (GPS). We defined a pod of whales as one or more whales within five body lengths of each other, surfacing and diving in unison. We used datasheets to record 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 echo-sounder, as well as details pertaining to feeding behavior.

Individual Identification: Each whale's flukes have a distinct, stable black and white pigment pattern that allows for individual identification (Jurasz and Palmer 1981; Katona *et al.* 1979). In addition, we collected photographs of the shape and scarification of each whale's dorsal fin to supplement the identification of individuals. We took photographs of the ventral surface of the flukes of each whale and of the dorsal fin with a Nikon N90S camera equipped with a motor drive, databack and 300 mm lens (Fig. 1). We used Fuji Neopan 1600 ASA and Kodak TMAX 3200 ASA black and white film shot at 800 ASA to accentuate the markings on the flukes. Panda Photographic Lab in Seattle, Washington processed and printed the film. We analyzed the contact sheets and field notes to determine the date and location where each whale was photographed.

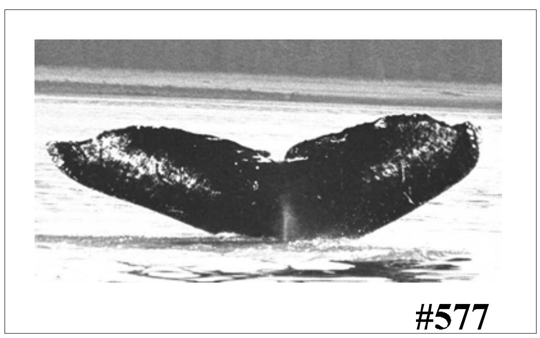

Figure 1. Sample whale fluke identification photograph.

We compared fluke and dorsal fin photographs to previous NPS photographs and to other available fluke catalogs (Darling 1991; Jacobsen unpubl. data; Keiki Kohola Project unpubl. data; Jurasz and Palmer 1981; National Marine Mammal Laboratory unpubl. data; Perry *et al.* 1985; Perry *et al.* 1988; Sharpe unpubl. data; Straley and Gabriele 1998; Szabo unpubl. data; Uchida and Higashi 1995; von Ziegesar *et al.* 2001) to determine the identity and past sighting history of each whale. We referred to many whales by an identification number issued by the Kewalo Basin Marine Mammal Laboratory (KBMML) catalog of North Pacific humpback whales (Perry *et al.* 1988). Identification numbers lower than #950 coincide with those in the KBMML catalog; those higher than #950 are unique to the combined catalogs of Glacier Bay National Park and University of Alaska Southeast researcher Jan Straley (Straley and Gabriele 1998). We also referred to those whales first photo-identified by Jurasz and Palmer (1981) by their nicknames (Appendix 4).

We assigned temporary identification codes to whales that had not been previously identified in Glacier Bay and Icy Strait, denoting the film roll and frame number of the identification photograph, for example GB02-13(34). We replaced temporary "filmcodes" with permanent identification numbers if we identified the whale on more than one day, or if it had been identified elsewhere or in previous years. We assigned calves an identification number if we obtained adequate photographs of the flukes, but only if the calf was sighted on more than one day. We are able to identify an increasing number of whales by their dorsal fin alone, enabling us to augment the sighting histories of individuals whose dorsal fins we recognize from other observations accompanied by a fluke photograph. After we completed the photographic analysis, we added each whale's identity and the sighting data from the field notes to a Microsoft Access database containing Glacier Bay and Icy Strait whale sighting histories from 1977 to 2002. Finally, we printed and catalogued the best 2002 photograph of each individual.

Whale Counts: After we analyzed all of the photographs, we counted the number of distinct individual whales in the sample. We made separate counts of Glacier Bay and Icy Strait for the total monitoring period from June 1 to August 31 and for a 'standardized period' (after Perry *et al.* 1985) from July 9 to August 16. Although the standardized period is substantially shorter than the current NPS June through August monitoring season, 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 subsequent years (Gabriele *et al.* 1995). 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 skin sloughed by surface active whales into the water with a fine-meshed dip net. We stored these sloughed skin samples in plastic film canisters filled with dry table salt (NaCl). From 1996-2002, we archived the half of each skin sample at the Park. From 1996-2001, we sent the other half of each skin sample to Dr. C. Scott Baker at the University of Auckland in New Zealand for genetic analysis. In 2002, we stopped sending our samples directly to Dr. Baker. Instead, we began sending half of each skin sample to the National Marine Fisheries Service (NMFS) Southwest Fisheries Science Center (SFSC) in La Jolla, CA to be archived. The SFSC then sent a portion of each archived skin sample to Dr. C.

Scott Baker for genetic analysis. During summer 2002, Dr. Baker visited southeastern Alaska and accompanied us on three whale surveys in Icy Strait. He collected skin samples with a small biopsy dart fired at individual whales from a modified rifle.

Prey Identification: We used field guides (Hart 1988; Mecklenburg *et al.* 2002; Pearse *et al.* 1987; Smith and Johnson 1977) to taxonomically identify sample prey items that we collected opportunistically at the surface.

RESULTS

Vessel Surveys: We surveyed for a total of 364 hours in the combined Glacier Bay/Icy Strait study area. Our monthly and annual survey effort from 1985-2002 is summarized in Appendix 1.

Whale Counts: Between June 1 and August 31, 2002, we photographically identified 85 individual humpback whales in the combined Glacier Bay/Icy Strait study area. During the same period, we identified 44 whales in Glacier Bay and 61 whales in Icy Strait. During the 2002 standardized period (July 9 – August 16), we identified 56 individual whales in the combined Glacier/Bay Icy Strait study area, 28 whales in Glacier Bay and 34 whales in Icy Strait. The number of whales that we identified in the study area from 1985-2002 is summarized in Fig. 2 and in Appendix 2.

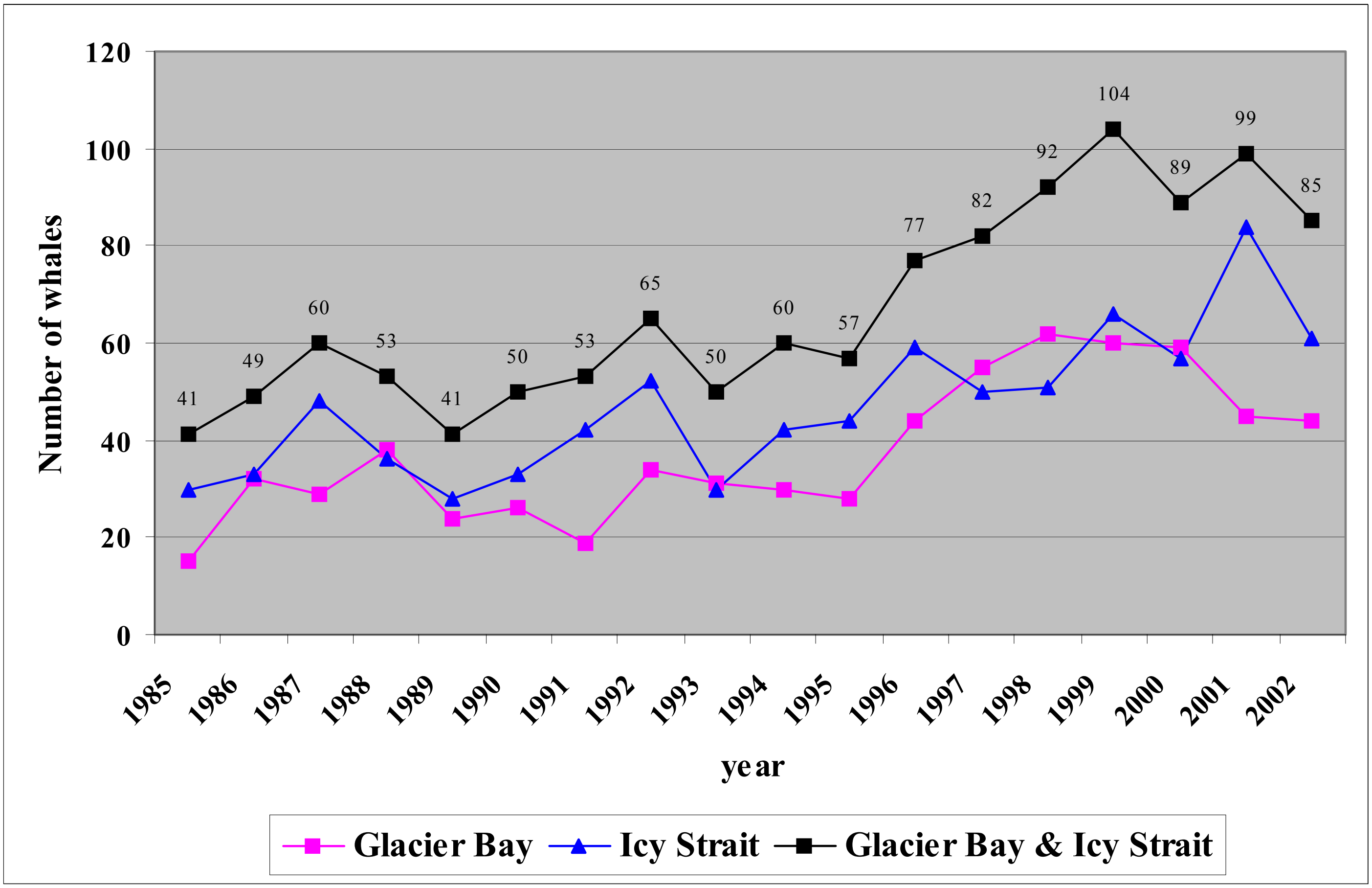

Figure 2. Number of individual whales documented in Glacier Bay and Icy Strait, 1985-2002. [See Appendix 2 for a detailed annual summary of the standardized and total whale counts in Glacier Bay and Icy Strait.]

Seasonal Distribution: We documented the first humpback whale in Glacier Bay in 2002 on April 3 when we heard a whale vocalizing on the hydrophone anchored in outer Bartlett Cove. During the 2002 field season we observed whales throughout the study area, with the highest numbers concentrating around Dundas Bay, Berg Bay, Hugh Miller Inlet and Point Adolphus (Fig. 3).

Unlike in some years, we did not observe large aggregations of whales feeding at the entrance to the East Arm and Adams Inlet in the early spring, although a mother/calf pair was reported at the mouth of McBride Inlet in mid-May (J. Brakel, pers. comm.). In addition, we did not observe large aggregations of whales around the Marble Islands in the early summer as we did in 1999-2001. Overall, whale use of the eastern side mid-bay remained low throughout the summer (Fig. 3).

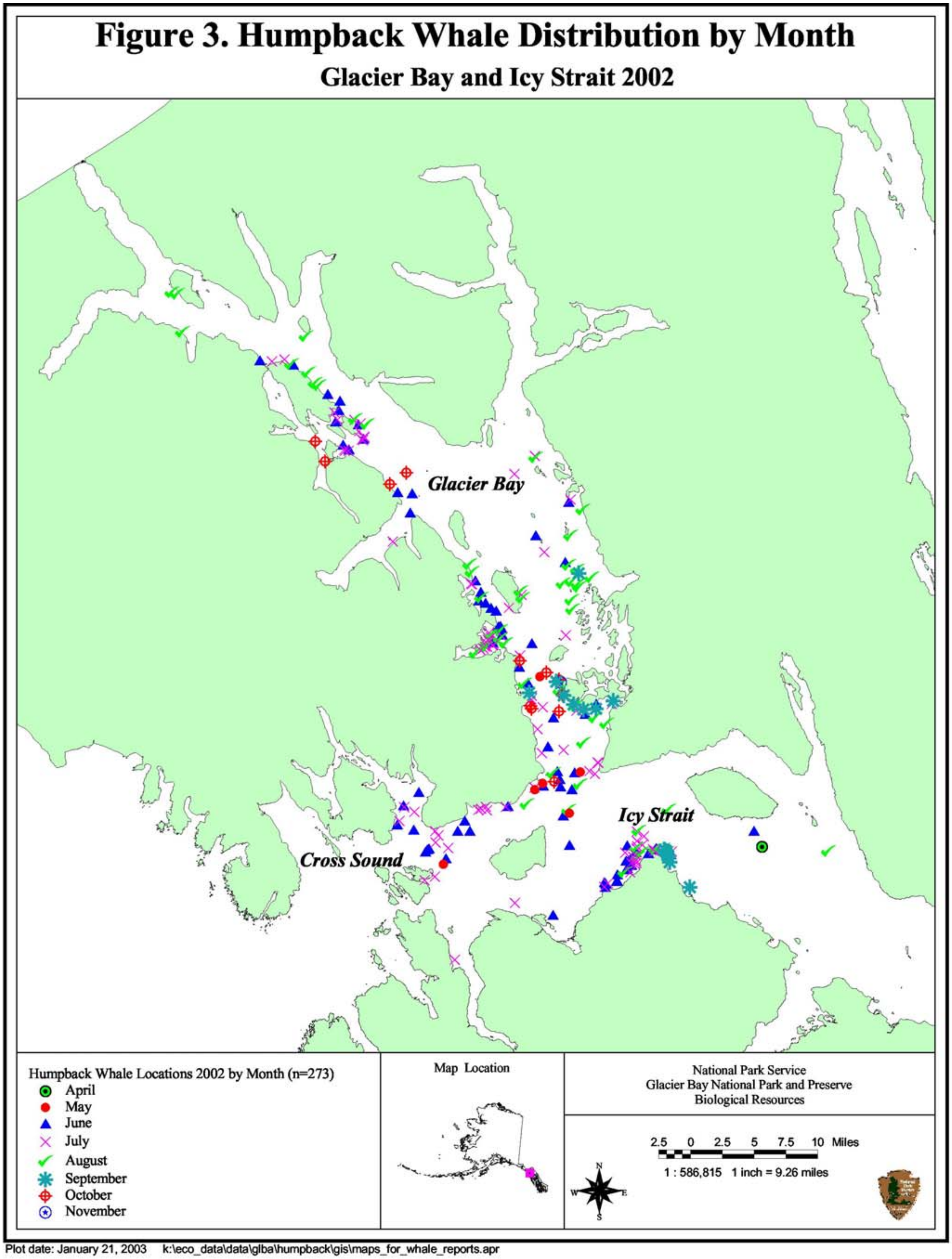

Figure 3. Study area in Glacier Bay and Icy Strait, showing humpback whale distribution in 2002. See Appendix 1 for a detailed summary of survey effort in the study area.

The first major concentration of whales that we documented in 2002 lasted from early June until mid-July when whales numbers were consistently high in Dundas Bay and North Passage (Fig. 3). On June 13, we documented a minimum of 14 adult whales between Point Wimbledon and western Point Carolus, eight of them in Dundas Bay. Interestingly, the individual whales frequenting Dundas Bay were not constant over time. For instance, on July 12 we documented eight whales in Dundas Bay, but only one of these individuals was among the eight whales that we had documented there on June 13.

By the end of June, several of the whales that we had sighted in Dundas Bay in mid-June moved into Glacier Bay. This shift contributed to the next major concentration of whales that we documented in Berg Bay and lower Whidbey Passage from mid-June until mid-August (Fig. 3). Whale numbers in Berg Bay were uncharacteristically high throughout this period, with as many as seven whales documented inside the bay on July 8. As was the case in Dundas Bay, however, the individual whales frequenting Berg Bay changed over time. Compared to recent years, the concentrated use of Berg Bay by whales as a feeding area in 2002 is unprecedented (Fig. 4).

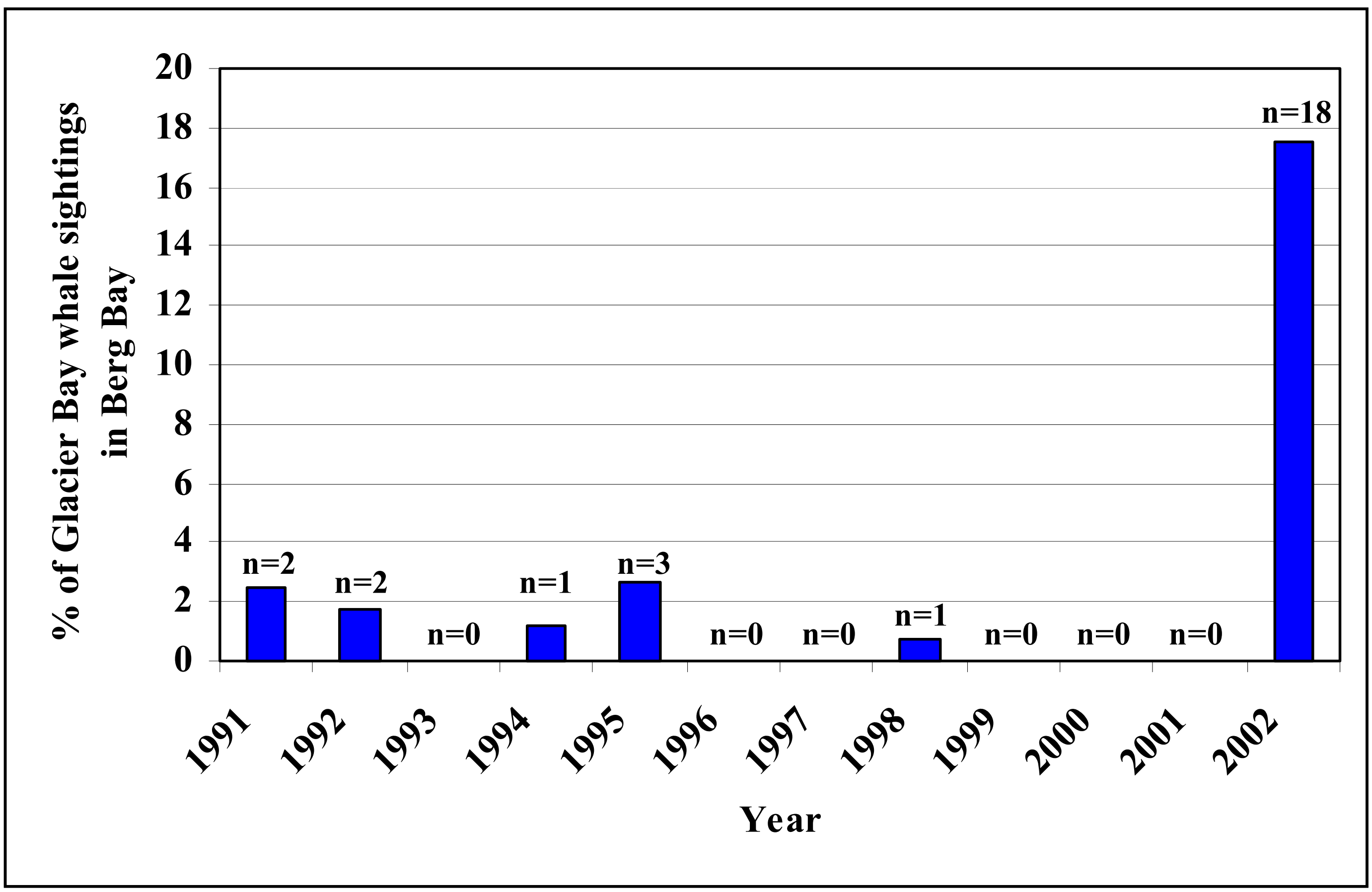

Figure 4. Percentage of Glacier Bay annual whale sightings that occurred in Berg Bay 1991-2002. The number of whale sightings in Berg Bay is found above each bar in the graph.

The density of whales in Berg Bay and lower Whidbey passage warranted a 10-knot vessel speed limit there from June 26 to August 16.

Even though survey effort in the West Arm was comparable to past years, whale numbers in the West Arm were relatively high throughout the summer, with a pulse of activity around Hugh Miller Inlet beginning in mid-June (Fig. 3). From June 22 to July 18, a 10-knot vessel speed limit was implemented between Hugh Miller Inlet and Blue Mouse Cove. Although activity in this region tapered off later in July, Hugh Miller Inlet continued to be used sporadically by a few whales and on October 3 we documented two mother/calf pairs inside Charpentier Inlet. We documented several whales along the Gilbert Peninsula, especially in July and August. Whale sightings elsewhere in the West Arm were spread out but consistent throughout the summer. Notably, in late June there was a report of a single whale approximately three miles inside Tarr Inlet (K. Mallery, pers. comm.), followed in July by three separate reports of two whales, including a mother/calf pair, in Tarr Inlet (M. Ausema, pers. comm.; M. Blakeslee, pers. comm.; K. Jones, pers. comm.). On July 27, a mother/calf pair was reported in Johns Hopkins Inlet near the Topeka Outwash (J. Brakel, pers. comm.).

We documented seven whales that over the past 10 years had been identified rarely, if ever, in the West Arm using this part of Glacier Bay in 2002 (Table 1). From 1991-2001, very few (0-7%) of these whales' sightings occurred in the West Arm. Three of the whales (#283, #1065 and #1299) had not been documented previously in the West Arm.

For the second year in a row, whales were not abundant in lower Glacier Bay for most of the summer (Fig. 3). The number of whales in the lower bay finally increased in late July and the 10-knot vessel speed limit was implemented on August 1. However, the speed limit was lifted on August 16 after the whales stopped concentrating in the lower bay. Whale sightings in Bartlett Cove were sporadic throughout the summer. From early to mid-September we received reports of 3-5 whales in Bartlett Cove (J. Challoner-Wood, pers. comm.; D. Foley, pers. comm.). Unfortunately, due to our irregular survey effort in September we did not fully document this apparent pulse in activity.

We sighted whales regularly at Point Adolphus, with a peak in sightings in July (Fig. 3). Whale sightings near the Mud Bay day marker were also consistent, with a peak in June. We encountered the 'core group' consistently during Icy Strait surveys, unlike in 2001 when the group was present for only about a month starting in late July. We observed very little whale activity off Pleasant Island, eastern Lemesurier Island or the Gustavus Flats in 2002. We documented a few whales scattered in the middle of Icy Strait in June and

August. Unfortunately, our whale survey effort in July and August was hampered by frequent poor weather conditions, particularly in Icy Strait. Heavy fog on July 22-24 and August 7-9, 14-15, 19, 22 and 26-27, and a gale force storm on August 12-13 precluded regular surveys later in the summer.

Table 1. Individual whales that we documented in the West Arm in 2002 that have been sighted regularly in Glacier Bay over the past 10 years, but rarely in the West Arm.

Whale ID	# of sightings (2002) in West Arm	# of sightings (2002) in Glacier Bay	# of sightings (1991-2001) in West Arm	# of sightings (1991-2001) in Glacier Bay
117	1	3	1	77
283	1	1	0	10
351	4	9	5	76
535	1	3	1	59
1012	2	7	2	72
1065	1	11	0	52
1299	2	6	0	23

Residency: Twenty-two (50%) of the 44 whales that entered Glacier Bay between June 1 and August 31, including two mother/calf pairs, remained 20 or more days, long enough to be considered resident (Appendix 4). Eighteen (30%) of the 61 whales that we identified in Icy Strait, including two mother/calf pairs, remained long enough to be considered resident. An additional six (7%) of the 85 whales that we sighted in Glacier Bay/Icy Strait were resident in the combined Glacier Bay/Icy Strait area but not in either specific sub-region. Thirty-four percent of the whales that we identified between June 1 and August 31 were sighted only once: seven in Glacier Bay and 22 in Icy Strait (including seven mother/calf pairs.) However, five of these individuals, including one mother/calf pair, were identified again outside of the regular monitoring period (either before June 1 or after August 31.) Of the 29 whales sighted only once, we sighted 12 of these whales, including three mother/calf pairs, in western Icy Strait (Dundas Bay, North Passage, western Lemesurier Island and eastern Inian Islands), although their temporal distribution suggests that they do not represent a pulse of whales arriving together in this area (Appendix 4).

Reproduction and Juvenile Survival: We documented 11 mother/calf pairs in the study area in 2002 (Appendix 3). The crude birth rate (CBR) of this year's study population, computed by dividing the number of calves by the total number of whales, is 12.9%. We documented a twelfth mother/calf pair (#1011 and her calf) in October, outside of the normal survey period. The sex of two of the mothers (#1079 and #1011) was not previously known. We first documented whale #1011 in the study area in 1989, but her age is unknown. We have documented whale #1079, the 1993 calf of #235, every year in the study area since 1995 without a calf, making her 9 years old at the age of her first known reproduction in 2002. Whale #235 is the fourth documented grandmother in the study population.

Mother/calf separation sometimes made it difficult to determine the reproductive status of certain females, as well as the identity of some mothers. For example, on August 19, we identified whale #1432 with her calf near Flapjack Island during an encounter that lasted 60 minutes. However, in subsequent sightings of #1432 on September 19 (60 minutes), September 23 (12 minutes), October 3 (8 minutes) and November 18 (approx. 20 minutes) we did not see any sign of her calf. In addition, it was common for us to see calf #1655, separated from its mother, whale #397, by up to 800 meters, which made it difficult to determine the identity of this calf's mother. In most instances, whale #397 was associated with the 'core group' and did not associate closely with her calf.

We identified two whales that had not been sighted in the study area since they were calves: #1438 (age 4) and #1486 (age 3), bringing the 1974-2002 total number of returning offspring to 39. We documented 23 of these 39 known age whales in the study area in 2002 (Appendix 3). Although associations between mothers and their weaned calves are rare, on June 17 we observed whale #1438, the 1998 calf of #155, join a pod comprised of #155 and two other adults. In addition, on June 18 we observed whale #1486, the 1999 calf of #801, alone near the entrance to Hugh Miller Inlet. Less than one hour later, we sighted #801 and her 2002 calf in the same area. We did not document any interaction between #1486 and #801, but it is notable that mother and offspring were utilizing the same feeding area at the same time. For several years, we have documented similar overlap in the timing and location of sightings of whale #581 and her 1987 calf, #1042.

Genetics: We collected nine sloughed skin samples from eight individual whales, including two calves. Since 1996, we have collected 82 sloughed skin samples from humpback whales in Glacier Bay and Icy Strait. The results of the genetic analysis of many of these samples are summarized in a master's degree thesis by Vant (2002). Dr. C. Scott Baker collected eight biopsy dart skin samples from whales in Icy Strait during GBNP whale surveys. He collected an additional 17 biopsy dart samples in Icy Strait during whale surveys conducted independent of the GBNP whale monitoring program.

Prey Identification: We positively identified three species of fish as potential whale prey in 2002: Pacific herring, capelin and sand lance. On June 28, we visually identified schools of Pacific herring intermittently boiling at the water's surface near whales feeding in the vicinity of the Mud Bay day marker. On July 31 and August 1, we observed numerous dense aggregations of small schooling fish just below the water's surface near whales feeding in Sitakaday Narrows and Berg Bay. We also observed harbor porpoises (*Phocoena phocoena*), gulls (*Larus* spp. and *Rissa* spp.) and murrelets (*Brachyramphus* spp.) apparently feeding on the same fish, which looked reddish-brown through the water. We opportunistically collected three samples of these fish with a dip net (near Lester Point, inside the entrance to Berg Bay and at the back of Berg Bay) and later identified them as capelin (Mecklenburg et al. 2002; confirmed by J. Gasper.) On June 14 and June 21, we observed similar aggregations of small schooling fish near whales feeding at the entrance to Fingers Bay and in lower Whidbey Passage. Based on the color, size and shape of the fish that we observed in these schools, it is highly probable that these fish were also capelin, although we were unable to collect samples to confirm the identity of the species. On August 15, we observed a dense ball of small schooling fish near the water's surface off the western side of Flapjack Island. We collected a sample of these fish with a dip net in close proximity to a feeding whale (#1302) and later identified the fish as sand lance (confirmed by M. Litzow.) On November 21, we observed a single whale (#1304) feeding off of Point Adolphus and simultaneously we collected numerous small fish scales that were floating in the water next to the whale. We sent some of the scales to a USGS fisheries biologist who compared them with Pacific herring, walleye pollock, sand lance, capelin, pink and coho salmon (*Oncorhynchus* spp.), and the two species of myctophids previously collected in the Glacier Bay area - the California headlampfish (*Diaphus theta*) and the northern lampfish *(Stenobrachius leucopsarus*). The scales were determined to have originated from an undetermined species of myctophid, which tends to have very deciduous scales (Y. Arimitsu, pers. comm.).

Whale/Human Interactions: On June 5, we documented an injury to whale #118's dorsal fin that had occurred since our last sighting of this whale on September 11, 2001 (Fig. 5). Based on the red tissue that we observed on the inside of the wound, the injury appeared to be recent. It closely resembled an injury that we first documented to whale #166's dorsal fin during summer 2001 (Fig. 6).

On June 5, we documented an incident in which two floatplanes circled low over humpback whales #219, #1593 and #1593's calf near Point Adolphus. The first floatplane circled three times over the whales (and our vessel) at an altitude of approximately 150 meters and then departed. While the first plane was still circling, a

Figure 5. Whale #118's dorsal fin, summer 2002.

Figure 6. Whale #166's dorsal fin, summer 2001.

second floatplane began circling the same group of whales. It circled twice at an altitude of approximately 90 meters and then departed. The floatplanes did not appear to affect the three whales' short-term behavior, although in an effort to reduce the potential for disturbance, we ended our encounter with the whales and left the immediate area when the planes began to circle.

On June 13, a local resident reported that he saw a cruise ship approaching whales in Park waters near Point Carolus. He reported that the cruise ship maneuvered in a circle around at least two humpback whales and appeared to be less than 800 meters (0.5 mile) from shore. Subsequent investigation by the NPS indicated there was insufficient evidence to proceed with the incident as a violation of park regulations.

On June 30, a tourist paddling in a single sea kayak along northern Gilbert Peninsula in the West Arm collided with a humpback whale, causing the kayak to capsize. In an interview with Park rangers, the man stated that he was paddling alone approximately 45 meters from shore at 16:00 when he saw at least two humpback whales surface approximately 35-45 meters ahead. Shortly thereafter, he felt his kayak lifted as one of the whales surfaced directly underneath him. After a few seconds, he lost his balance, capsizing and exiting the kayak. The man managed to get back into his kayak and paddled safely to shore (NPS Incident Record 2002a).

On July 8, a passenger on the tour boat *Wilderness Adventurer* reported that the vessel's operator engaged in highly inappropriate whale watching near Point Adolphus. The passenger reported that for at least two hours the *Wilderness Adventurer*'s operator actively pursued groups of 1-8 whales, maneuvering so that the distance between the vessel and the whales was as short as 5-6 meters. The passenger documented the close proximity of the vessel to the whales with photographs. He felt that the vessel operator's actions elicited evasive behaviors from the whales, causing them to turn and swim away rapidly and "even to dive under the vessel to escape" (NPS Incident Record 2002b).

On September 1, whale watchers near Point Adolphus saw a humpback whale that may have been entangled in fishing gear (M. Kralovec, pers. comm.). The whale was swimming slowly (possibly resting) and appeared to have kelp draped over its head. However, during one surfacing it appeared that it might be a line or rope, not kelp, wrapped around the whale's head. While looking through binoculars, one person saw a yellow object next to the whale, but neither the presence nor the identity of the yellow object was confirmed. The whale watchers observed the whale, which was near the core group, from a distance for approximately 30 minutes. We conducted a whale survey around Point Adolphus on September 5 under excellent sighting conditions but did not locate any entangled whales. There were no additional reports of whales entangled in fishing gear in Icy Strait or Glacier Bay in 2002.

On September 5, the captain of the charter vessel *Sea Wolf*, a 20-meter motor vessel, reported to the Park 's Visitor Information Station that a whale bumped the vessel's hull while the vessel was anchored in Bartlett Cove (J. Challoner-Wood, pers. comm.).

DISCUSSION

Vessel Surveys: In the combined Glacier Bay/Icy Strait study area, the total number of hours that we spent surveying in 2002 was above average for all years since the study began in 1985 (Appendix 1). The total number of days and hours that we spent surveying in just Glacier Bay was also above average for all years and exceeded the relatively low level of survey effort in Glacier Bay in 2001. However, the total number of days and hours that we spent surveying in Icy Strait was below average for all years since the study began in 1985. We attribute the relatively low level of survey effort in Icy Strait in 2002 to the lower than average number of surveys there in July and August. Beginning in late July and continuing through the remainder of the monitoring period, survey effort in Icy Strait was low because frequent poor weather conditions, primarily dense fog, repeatedly precluded surveys in this area. In order to maintain comparable levels of survey effort in

Icy Strait for all years of the study, we will strive, weather permitting, to increase the frequency and duration of surveys in Icy Strait in future years.

Whale Counts: Even though the number of hours that we spent surveying in the combined Glacier Bay/Icy Strait region was above average (Appendix 1), the total count of 85 whales represents the lowest number of whales identified in the study area since 1997 (Appendix 2). In addition, the standardized count of 56 whales in the combined Glacier Bay/Icy Strait region represents the lowest standardized count since 1995. The standardized and total counts of whales in Glacier Bay were lower than they have been since the mid-1990's, but comparable to the low counts documented there in 2001. However, despite the lower than average level of survey effort in Icy Strait in 2002, the standardized and total counts in this area were comparable to counts in past years with the exception of 2001, when the number of whales in Icy Strait reached a record high. In retrospect, it appears likely that the super-abundance of whales that we documented in Icy Strait in 2001 resulted from a regional shift in whale distribution within southeastern Alaska and that in 2002 the number of whales in Icy Strait simply returned to typical levels.

The number of whales in Glacier Bay has decreased each year since 1998, although the numbers of whales in Icy Strait and the entire area have been variable over that time period. Variability on local and regional scales likely demonstrates the whales' changing distribution in response to local conditions, rather than genuine population increases or decreases. Notably, recent work indicates that the population of humpback whales in southeastern Alaska increased from 404 whales (95% confidence interval, 350-458) in 1992 (Straley 1994) to 961 whales (95% confidence interval, 657-1,076) in 2000 (Straley *et al.* 2002). The number of whales identified in the Glacier Bay – Icy Strait study area will likely continue to vary annually but remain higher than the 41 to 57 whales counted in the years prior to 1996.

Seasonal Distribution: For the third year in a row, whale use of Bartlett Cove failed to approach the high levels observed in 1991-1992 and 1995-1999 (Doherty and Gabriele 2001). In addition, whales did not concentrate in high numbers around the Marble Islands, at the entrance to the East Arm or in the lower bay as they have in some years. Because whale movement throughout southeastern Alaska presumably is linked with prey availability (Baker *et al*. 1990; Krieger 1990; Straley and Gabriele 1995; Straley 1994), we speculate that the low level of whale activity in these parts of Glacier Bay historically occupied by whales was correlated with a relatively low abundance of whale prey in these areas in 2002. Standardized, annual assessments of forage fish temporal and spatial patterns throughout the study area are needed to understand how these patterns affect short-term and long-term changes in whale distribution and abundance, especially in the context of the Park's vessel management policies pertaining to whale waters.

Whales concentrated in unexpectedly high numbers in Berg Bay and the West Arm, two areas in Glacier Bay where we generally do not find many whales. Although in some years whales have aggregated in lower Whidbey Passage, the large number of whales that we observed in Berg Bay was extremely atypical, presumably due to the dense aggregations of capelin that we documented there, and possibly due to comparatively low prey abundance elsewhere. Similarly, we speculate that a relatively high abundance of prey in the West Arm may have attracted the unusually high number of whales that we documented there in 2002, including at least seven individuals that were previously seen rarely, if ever, in the West Arm. Whale numbers around Hugh Miller Inlet were higher than normal in 2002, but the fact that most of the inlet is designated as non-motorized wilderness waters from May 1 – September 15 precludes us from conducting comprehensive surveys there.

Linking weather patterns with oceanographic parameters and the unusually high whale density in Hugh Miller Inlet is difficult but intriguing. Weather data from eight regional NOAA weather stations in 1993-2002 (L. Etherington, pers. comm.) indicate that spring 2002 was colder and drier than usual. Minimal and maximal daily temperatures in March and April 2002 were 2.0-3.2^{o} C colder than the average for 1993-2002. Mean daily precipitation in March and April 2002 was 0.1 cm, as compared with the 0.4 cm average in 1993-2002. Oceanographic monitoring in Glacier Bay (1993-2002) at a station just outside Blue Mouse Cove in April 2002 (L. Etherington, pers. comm.) showed a strikingly high salinity compared with all months and years sampled and a slightly lower average water temperature than April 2001. The low temperature and lack of precipitation appear to have also decreased turbidity, allowing light to penetrate deeper in the water column in March 2002 (40 m) than had previously been recorded. For comparison, March 1993-2001 photic depth values ranged from approximately 10-32 m. We speculate that the unusually cold, dry spring resulted in a slower development of surface water stratification (L. Etherington, pers. comm; L. Sharman, pers.comm.), which in turn caused a gradual phytoplankton bloom rather than the more typical sudden extreme peak. A gradual bloom would lead to a longer period of plankton interaction with the grazing community and could result in increased biomass incorporated into the pelagic food web (Eslinger et al. 2001). We presume that the cascading effects of a prolonged bloom on the food web would include the unknown prey species' that drew the whales to the Hugh Miller Inlet in large numbers.

Correlating oceanographic monitoring data with whale feeding aggregations is difficult because comparable data are not available for all months of interest and the conditions at the mid-channel oceanographic stations (Hooge and Hooge 2002) may not be a good indicator of conditions near shore. It would undoubtedly take a directed multi-year study throughout the season and at specific depths in the water column to identify the oceanographic features of most importance for predicting whale aggregations. However, simply establishing long term oceanographic monitoring sites in the near-shore areas that comprise typical humpback whale habitat would facilitate future attempts to opportunistically link oceanographic conditions with the distribution of whales and other species.

Historically, whale sightings in close proximity to the glaciers have been rare, however in recent years it appears that such sightings have become more common. The reports of several whales, including mother/calf pairs, in Tarr Inlet, Johns Hopkins Inlet and near McBride Inlet in 2002 contribute to our developing understanding of whale use patterns of near-glacier habitat and highlight the need for great survey effort in these areas.

In Icy Strait, whales were distributed comparably to past summers with the majority of whales concentrated around Point Adolphus. For the second year in a row, the density of whales in western Icy Strait early in the summer was high, especially in Dundas Bay and North Passage. Unlike in 1999 and 2001, though, we did not detect a western shift of whales towards Idaho Inlet later in the summer. Unfortunately, because survey effort in Icy Strait was low starting in late July, it is possible that such a shift could have occurred without us detecting it.

Residency: Overall patterns of whale movement in 2002 were similar to patterns we have observed in previous years. The proportion of whales that were considered resident in Glacier Bay (50%) and Icy Strait (30%) was typical for the period between 1992 and 2001. The proportion of whales sighted only once in the study area in 2002 (34%) was comparable to the proportion between 1994 and 2001 (23-43%). The fact that we documented most of these one-day whales (n = 22) in Icy Strait is also similar to trends observed in past years. As was the case in 2001, many of the whales (n = 12) that we sighted only once in Icy Strait were west of Lemesurier Island, reinforcing the importance of regular surveys in western Icy Strait. Surprisingly, most of the mother/calf pairs that we documented apparently passed through the study area, as we sighted 64% of the mother/calf pairs only once, although in different locations and at different times of the year.

Reproduction and Juvenile Survival: The number of calves that we observed in 2002 (n = 11) is the second highest number of calves that we have observed in the study area since 1982 and is significantly higher than the average number of calves (6.5) for all years. The high number of calves in 2002 resulted in the highest crude birth rate (12.9%) since 1994. However, because such a sizeable proportion of the mother/calf pairs was identified on one day, if we had not surveyed on these days, we would have documented a much lower crude birth rate. The utility of calculating the crude birth rate as an indicator of reproductive success will be diminished if we continue to document a high proportion of transient mother/calf pairs in future years.

Our discovery that whale #1079 is a female contributes to our developing understanding of the demographics of the study population. Based on available information from the North Atlantic humpback whale population, where female humpbacks have their first calf at an average age of 5-7 years (Clapham 1992), it would be unusual for a female humpback to have her first calf at the age of 9. However, whale #1079's reproductive history, added to the reproductive history of several other well-known females in the study population, lends weight to our hypothesis that females are older than age 5-7 when they are first sighted with calves in Glacier Bay and Icy Strait (Gabriele and Hart 2000). We plan to collaborate with other researchers to investigate the average age at first reproduction for female humpback whales in the North Pacific.

The value of long-term studies is highlighted by the fact that 27% (n = 23) of the whales that we identified in 2002 are of known age. The proportion of known age whales in the population has increased annually as we continue to accumulate long-term sighting histories of the whales in the study area. Tracking the life history of known age whales has helped elucidate the age at first reproduction for female whales in the study area and the degree of overlap in mother/offspring feeding ranges. Despite our documentation of #155 and her 1998 calf in the same pod in 2002, based on our observations (NPS, unpubl. data) we expect that such mother/offspring reunions after weaning will continue to be rare in future years.

Although we occasionally observe calves separate from their mothers for periods of up to one hour (NPS, unpubl. data), in most cases we eventually document both the mother and the calf on the same day. Therefore, the absence of whale #1432's calf during sightings of #1432 in September, October and November is cause for some concern. To date, only two documented cases of calf mortality have been recorded in the study area (Baker 1986, Baker and Straley 1988). However, given observations of temporary mother/calf separation (Gabriele *et al.* 2001), as well as weaning on the feeding grounds (Baraff and Weinrich 1993), late-season calf absences are highly ambiguous. We recently reexamined our 1998 data and field notes and realized that we had documented the apparent weaning of whale #1432's only known previous calf, #1474, in the study area in August 1998. On August 19, 1998, we documented #1474 alone, 16 days after we had documented it with its mother. We confirmed #1474's subsequent survival with sightings in 2000, 2001 and 2002. The early weaning of #1474 suggests that #1432 may have a tendency to wean her calves early, which could explain her 2002 calf's absence from September to November. However, only by re-sighting #1432's 2002 calf in the future will we be able to confirm its survival and weaning. Unfortunately, we only obtained dorsal fin photographs of this calf, so confirming its identification in the future may be difficult. In 1999 and 2001, we documented ambiguous calf absences in the study area late in the summer (Gabriele *et al.*1999; Doherty and Gabriele 2001) that have yet to be resolved by re-sightings of the calves. In one of these cases, we obtained a fluke identification photograph of the calf; in the other case, we only obtained dorsal fin photographs.

The observed separation between whale #397 and her calf, #1655, is noteworthy because we observed a similarly loose relationship between #397 and her only known previous calf in 1998 (Gabriele and Doherty 1998). In fact, we encountered #397's 1998 calf alone so often that it was initially difficult to confirm the identity of this calf's mother. Future sightings of #397's offspring may or may not help to discern whether #397's apparent lack of attention to her calves has repercussions on their survival.

Genetics: Sex determination of our collection of 82 sloughed skin samples and Vant's 2002 analysis of many of these samples adds much to our understanding of the population structure and genetic diversity of humpback whales in the study area. The use of biopsy darts by Dr. C. Scott Baker in 2002, although more invasive than the opportunistic collection of sloughed skin, allowed us for the first time to target specific animals in the study area for skin samples. The quality of skin samples collected with biopsy darts is reportedly higher than those collect from sloughed skin because biopsy dart samples tend to contain more live skin vs. dead skin. In addition, skin samples collected with biopsy darts contain blubber, which can be tested the presence of toxic contaminants and hormones indicating pregnancy or stress.

Prey Identification: Previous studies indicate that Pacific herring constitute the primary prey species available to whales in Icy Strait while in Glacier Bay schooling fish such as capelin, sand lance and juvenile pollock constitute the primary prey species (Wing and Krieger 1983; Krieger and Wing 1984, 1986). Our identification of herring in Icy Strait and capelin and sand lance in Glacier Bay as potential whale prey in 2002 is consistent with these studies. Capelin, notably absent from Glacier Bay in 2001 (Doherty and Gabriele 2001) except at Point Carolus (NPS, unpubl. data), appeared to be abundant in 2002 and probably accounted, in part, for the large number of whales that we observed feeding in Berg Bay and lower Whidbey Passage.

Whale/Human Interactions: Although we cannot determine the origin of the injuries to whale #118 and whale #166's dorsal fins, the nature and severity of the damage strongly indicate that they resulted from a collision with a vessel. Based on the fact that we have observed whales #118 and #166 regularly since the 1970's and that they commonly frequent Point Adolphus where they are regularly approached by vessels, we assume that these two individuals are habituated to vessel traffic. Habituation to vessel presence is recognized as one of the main factors contributing to the risk of vessel/whale collisions (Doherty and Gabriele 2001) because habituated whales may ignore approaching vessels.

The risk of vessel/whale collisions involves all types of vessels, whether actively whale watching or in transit, and occurs throughout the range of humpback whales wherever whales and vessels coexist. However, cruise ships and tour boats may be of particular concern because the larger the vessel, the higher the likelihood that a collision will be fatal to the whale (Laist *et al.* 2001). The threat of collisions in southeastern Alaska is real, as demonstrated in 2001 when we documented a dead humpback whale in Park waters with injuries consistent with a collision with a large ship (Doherty and Gabriele 2001) and in 1999 when a cruise ship struck and apparently killed a humpback whale approximately 100 km south of Juneau (Fry 1999). Reports of close and repeated approaches by cruise and tour vessels during whale watching are cause for concern because their actions could have potentially resulted in collisions. Outside Glacier Bay, NMFS regulations, which prohibit vessels from approaching within 100 yards of humpback whales in Alaska (National Oceanic and Atmospheric Administration / NMFS 2001), are intended to reduce the likelihood of vessels having adverse effects on whale behavior such as the evasive behaviors reported by the passenger on the *Wilderness Adventurer*.

We are encouraged by the willingness of Park concessioners to investigate inappropriate whale watching incidents. However, it is alarming that this is the second recent incident in which a cruise ship has apparently engaged in inappropriate whale watching in the study area. In August 1999, we observed a cruise ship whale watching inappropriately within 400 meters of shore at Point Adolphus (Gabriele and Doherty 1999) and reported our observations to the cruise line. In both of these incidents, the potential for whale disturbance or collision becomes almost minor in comparison the the possible consequences if the ship ran aground and spilled fuel as a result of maneuvering a large vessel in close proximity to shore.

Our observations indicate the need for an increased effort to educate floatplane pilots about whales and the potential for disturbance from low-level circling (particularly to mother/calf pairs).

The incident in which a sea kayak was capsized by a whale is, to our knowledge, the first time that this has happened in Park waters. Because humpback whales are not believed to be capable of echolocation, their primary cue for detecting vessels is probably underwater sound. Humpback whales' apparent dependence on sound may help to explain the sea kayak collision and the collision between a whale and an anchored vessel in Bartlett Cove. Although Park regulations prohibit approaching humpback whales within one-quarter mile in park waters, occasional collisions may be inevitable because whale behavior may be difficult to predict and because sea kayaks, anchored vessels and whales frequently co-occur in the same near-shore habitat.

Although we were unable to confirm whether the whale observed on September 1 near Point Adolphus was entangled in fishing gear, it is important to document these types of reports and to follow-up with surveys in the area as soon as possible. Each year in southeastern Alaska, at least one entangled whale is reported in fishing gear (K. Brix, pers. comm.) and since 1985, Park biologists have disentangled three whales. Beginning in 2003, we intend to collaborate with a study to estimate the rate of entanglement in fishing gear for humpback whales in southeastern Alaska.

ACKNOWLEDGEMENTS

The whale monitoring study is vastly enriched by participation from Park staff and volunteers. This summer we were extremely fortunate to have the able assistance of Laurie Mentzer, who endured countless hours in the office entering data, finishing the dorsal fin photo catalog and assisting with other miscellaneous tasks when she would rather have been outside. We thank all of the enthusiastic staff at Glacier Bay National Park for reporting whale sightings, and the Park's Visitor Information Station for recording them and passing them on to us. We especially appreciated receiving regular whale sighting reports from: the Park 'Coastwalkers' (Phoebe Vanselow, Jenni Burr, Tim Troccoli and Lewis Sharman), Justin Smith on the NPS vessel *Capelin* and Jim de la Bruere on the USGS-BRD research vessel *Alaskan Gyre*. Lisa Etherington provided summaries of oceanographic and weather data and, along with Lewis Sharman, participated in very interesting and helpful discussions of oceanography. We are grateful to Alex Bertulis and Pedr Turner for sharing their observations of whale/vessel interactions. Thanks to Yumi Arimitsu, Jason Gasper, Chad Soiseth and Mike Litzow for assisting with fish species identification. Special thanks to Dena Matkin for continuing to contribute supplementary whale photographs and to Bruce McDonough for keeping the *Sand Lance* running smoothly throughout the summer. Thanks to Mary Beth Moss and Mary Kralovec for their ongoing support of this research. National Park Service data from 1988 to 1990 were collected by Jan Straley. National Park

Service data from 1985 to 1988 were collected by C. Scott Baker. This work was carried out under Permit #945-1499-00 and Permit #774-1437 from the National Marine Fisheries Service.

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Appendix 1.
Monthly & Annual Survey Effort, 1985-2002

YEAR	MAY #survey days GB	IS	JUNE #survey days GB	IS	JULY #survey days GB	IS	AUGUST #survey days GB	IS	SEPTEMBER #survey days GB	IS	TOTAL # SURVEY DAYS (June 1 - August 31) GB	IS	TOTAL # SURVEY HOURS (June 1 - August 31) 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*	***313***
2002	3	1	19	6	19	4	18	2	4	2	***56***	***12***	*297*	*68*	***364***
1985-2001 average survey effort:											43.2	15.9	247.7	89.8	337.6

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Appendix 2.
Standardized and Total Whale Counts, 1985-2002

	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	24	33	39	49
1987	18	29	33	48	40	60
1988	17	38	29	36	40	53
1989	20	24	20	28	32	41
1990	16	26	24	33	33	50
1991	17	19	33	42	44	53
1992	27	34	38	52	48	65
1993	24	31	24	30	40	50
1994	17	30	29	42	44	60
1995	18	28	26	44	37	57
1996	37	44	43	59	65	77
1997	41	55	33	50	66	82
1998	45	62	28	51	69	92
1999	36	60	40	66	69	104
2000	44	59	26	57	62	89
2001	26	45	58	84	72	99
2002	28	44	34	61	56	85

Appendix 3.

Reproduction, sex ratios and known age whales in Glacier Bay and Icy Strait, 1982-2002

Year:	# Calves	# Calves Photo ID'd	% Calves Photo ID'd	Crude Birth Rate (%)	# Females	# Males	# Unk. Sex	# 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	17	16	8	3	41
1986	8	5	63	16.3	17	16	16	2	49
1987	4	3	75	6.7	24	20	16	5	60
1988	8	5	63	15.1	18	18	17	4	53
1989	5	3	60	12.2	17	14	10	5	41
1990	6	6	100	12.0	20	15	15	7	50
1991	4	4	100	7.5	20	18	15	8	53
1992	12	11	92	18.5	31	17	17	7	65
1993	3	3	100	6.0	21	16	13	12	50
1994	9	5	56	15.0	23	21	16	10	60
1995	3	3	100	5.3	25	18	14	9	57
1996	7	2	29	9.1	30	19	28	17	77
1997	9	8	89	11.0	33	23	26	15	82
1998	9	8	89	9.8	35	24	33	17	92
1999	9	5	56	8.7	38	25	41	22	104
2000	3	2	67	3.4	33	25	31	21	89
2001	12	9	75	12.1	36	23	40	25	99
2002	11	6	55	12.9	28	22	35	23	85

Notes:

- Crude Birth Rate (CBR) = 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.
- Sex ratios are not available for 1982-1984.
- Number of known age whales does not include calves of the year. These data are not available for 1982-1984.

Appendix 4. Sighting Histories of Individually Identified Whales: 2002
(GB = Glacier Bay; IS = Icy Strait)

	Whale ID	Nickname	4/17/02	5/21/02	5/22/02	6/3/02	6/4/02	6/5/02	6/7/02	6/10/02	6/11/02	6/12/02	6/13/02	6/14/02	6/17/02	6/18/02	6/19/02	6/21/02	6/26/02	6/27/02	6/28/02	7/2/02	7/3/02	7/5/02	7/8/02	7/9/02	7/10/02	7/11/02	7/12/02	7/15/02	7/18/02	7/19/02	7/26/02	7/29/02	7/30/02	7/31/02	8/1/02	8/2/02	8/5/02	8/6/02	8/8/02	8/14/02	8/15/02	8/16/02	8/19/02	8/20/02	8/22/02	8/23/02	8/24/02	8/26/02	8/27/02	8/29/02	8/30/02	9/5/02	9/12/02	9/19/02	9/23/02	10/3/02	10/28/02	11/18/2002	11/21/2002
1	1304		IS						GB				IS					GB																											IS										IS							IS
2	1306			IS																	IS											IS																													
3	541			IS									IS																																																
4	937				GB													GB	GB										IS				GB																												
5	1293				GB								IS						GB						GB						GB		GB				GB						GB			GB												GB	IS		
6	221				GB																			IS	GB						GB	IS	GB																					IS							
7	564	Roundup Taylor				GB																		IS	GB																																				
8	1082						GB				GB					GB						GB																																							
9	1065						GB						IS					GB	GB								GB						GB				GB					GB				GB												GB			
10	1012						GB										GB						GB				GB	GB					GB									GB																			
11	350	Lace						GB						GB																																															
12	118	Chop Suey						IS							IS						IS			IS		IS						IS						IS						IS					IS					IS							
13	219							IS							IS						IS					IS									IS									IS																	
14	1593							IS																																																					
15	1593_calf_2002	calf of 1593						IS																																																					
16	1063								GB				IS																				GB				GB																								
17	159									IS								GB	GB					IS	GB													IS																							
18	161	B.W.M.								IS														IS																																			
19	1653	calf of 161								IS														IS																																			
20	215									IS																																																	
21	215_calf_2002	calf of 215								IS																																																	
22	117	White Eyes									GB								GB																		GB																								
23	1299										GB					GB														GB										GB																		GB			
24	801										GB					GB							GB																			GB																GB			
25	1654	calf of 801									GB					GB							GB																			GB																GB			
26	1088											GB																																																
27	1233											IS		GB				GB	GB																	GB																								
28	1014												IS											IS	GB				IS								GB																						GB		
29	1046												IS						GB						GB								GB				GB																								
30	1474												IS																IS																															
31	235	Spot											IS																																															
32	535	Quits											IS									GB			GB																																			
33	584												IS																																															
34	587	Gertrude												GB							IS					IS						IS			IS									IS										IS							
35	1393														IS																																												
36	1438														IS																																												
37	155	Freckle Fluke													IS						IS					IS						IS			IS									IS										IS							
38	157	M.D.													IS						IS										GB				IS									IS										IS							
39	186														IS						IS					IS						IS												IS																	
40	352														IS						IS			GB		IS						IS			IS																										
41	516	Garfunkle													IS											IS						IS						IS																IS							
42	573														IS						IS					IS						IS			IS									IS										IS							
43	581														IS						IS					IS						IS																													
44	1486															GB																																											
45	1489															GB	GB					GB	GB							GB			GB				GB																								
46	351															GB	GB						GB					GB																				GB			GB					GB		GB			
47	1531																	GB	GB									GB			GB		GB																												
48	250																	GB							GB						GB																														
49	GB02-13(34)																	GB																																											
50	1083																		GB		IS				GB															GB																					
51	1244																		GB		IS						GB				GB						GB							IS										IS							
52	1019																			IS																																								
53	GB02-18(23)	calf of 1019																		IS																																								
54	1298																			IS				IS	GB																																			
55	539	Max																		IS																																								
56	GB02-19(3)	calf of 539																		IS																																								
57	616	Lesser																		IS																																								
58	1042																				IS					IS						IS																													
59	875																				IS					IS																																			
60	465																					GB									GB		GB																												
61	283																						GB												IS																										
62	1658																						GB																																						
63	1461																							IS					IS																															
64	941																							IS																																				
65	941_calf_2002	calf of 941																						IS																																				
66	166	Frenchie																								IS						IS			IS									IS										IS	IS						
67	397																									IS						IS						IS						IS										IS							

Appendix 4. Sighting Histories of Individually Identified Whales: 2002
(GB = Glacier Bay; IS = Icy Strait)

	Whale ID	Nickname	4/17/02	5/21/02	5/22/02	6/3/02	6/4/02	6/5/02	6/7/02	6/10/02	6/11/02	6/12/02	6/13/02	6/14/02	6/17/02	6/18/02	6/19/02	6/21/02	6/26/02	6/27/02	6/28/02	7/2/02	7/3/02	7/5/02	7/8/02	7/9/02	7/10/02	7/11/02	7/12/02	7/15/02	7/18/02	7/19/02	7/26/02	7/29/02	7/30/02	7/31/02	8/1/02	8/2/02	8/5/02	8/6/02	8/8/02	8/14/02	8/15/02	8/16/02	8/19/02	8/20/02	8/22/02	8/23/02	8/24/02	8/26/02	8/27/02	8/29/02	8/30/02	9/5/02	9/12/02	9/19/02	9/23/02	10/3/02	10/28/02	11/18/2002	11/21/2002
68	1655	calf of 397																								IS						IS						IS						IS												IS							
69	1242																									IS																																					
70	1090																												IS																																
71	1302																												IS							GB							GB				GB	GB		GB		GB				GB	GB	GB			
72	1313																												IS						IS																										
73	1657																												IS																									GB							
74	1652																														GB					GB					GB	GB			GB		GB						GB								
75	1079																																	GB						GB					GB			GB				GB	GB	GB			GB				
76	1656	calf of 1079																																GB						GB					GB			GB				GB	GB	GB			GB				
77	933																																		IS																										
78	1439																																		IS																										
79	441	Festus																																	IS																										
80	1473																																						GB	GB		GB											GB								
81	1018																																									GB																GB			
82	1018_calf_2002	calf of 1018																																								GB																GB			
83	1295																																											IS																	
84	1432																																												GB											GB	GB	GB	GB		GB
85	1432_calf_2002	calf of 1432																																											GB																
86	1061																																																					IS							
87	577	Scoper																																																				IS							
88	1011	Wide White Eyes																																																									GB		
89	GB02-64(31)	calf of 1011																																																									GB		
90	1246																																																										GB		