Glacier Bay & Icy Strait Humpback Whale Population Monitoring: 2018 Update

National Park Service
U.S. Department of the Interior

Glacier Bay National Park & Preserve

A group of humpback whales surfaces in Icy Strait, September 2018. (NPS/C. Gabriele, taken under NMFS ESA/MMPA Permit No. 21059)

Background

Migratory humpback whales (*Megaptera novaeangliae*) use the waters in and around Glacier Bay National Park and Preserve (GBNPP) in southeastern Alaska as spring, summer, and fall feeding habitat. The majority of these whales spend the winter breeding season in Hawaii, although a small proportion migrates to Mexico. By the mid-20th century, commercial whaling had decimated these populations but they have since recovered to the point that only the Mexico population remains listed as threatened under the Endangered Species Act. Individual whales return year after year to the same areas where their mother brought them as a calf and this strong maternally directed site fidelity has driven population growth over time.

This document summarizes GBNPP's humpback whale monitoring program in Glacier Bay and Icy Strait (GB-IS) in 2018, our 34th consecutive year of consistent data collection in June-August. The initial impetus for this program stemmed from concern in the 1970s that increased vessel traffic in Glacier Bay may have caused many whales to abandon the bay (Jurasz & Palmer 1981). Understanding the condition of park resources is essential to making informed management decisions. GBNPP's annual monitoring program is unique within Alaska and has produced one of the world's longest and most complete time-series of data on a baleen whale population.

Key Findings from 2018

- We documented 100 unique humpback whales, our lowest annual count since 2002.
- Humpback whale abundance in Glacier Bay & Icy Strait has declined by >50% since peaking in 2013.
- This downtrend trend has been most dramatic in Glacier Bay, where we identified only 45 whales in 2018, a 72% decline compared to our record high count of 161 whales in 2013.
- We documented only one mother/calf pair in 2018 but by mid-August the mother had lost her calf, marking total reproductive failure for the first time in this 34-year study.
- An increasing number of whales that exhibited long-term site fidelity to GB-IS in 2004-2013 (n = 66) have not been documented since 2013. In 2018, over half (56%) of these well-known whales were missing.
- For the third year in a row, we observed numerous abnormally thin whales.
- Our findings are consistent with negative trends in abundance, reproduction, and body condition for humpbacks in other areas in the central North Pacific. It is unclear if declines in abundance represent a shift in distribution and/or increased mortality.
- There is growing evidence that these trends reflect widespread declines in prey availability and/or quality in the greater Gulf of Alaska ecosystem associated with the unprecedented marine heatwave in the North Pacific in 2014-2016.

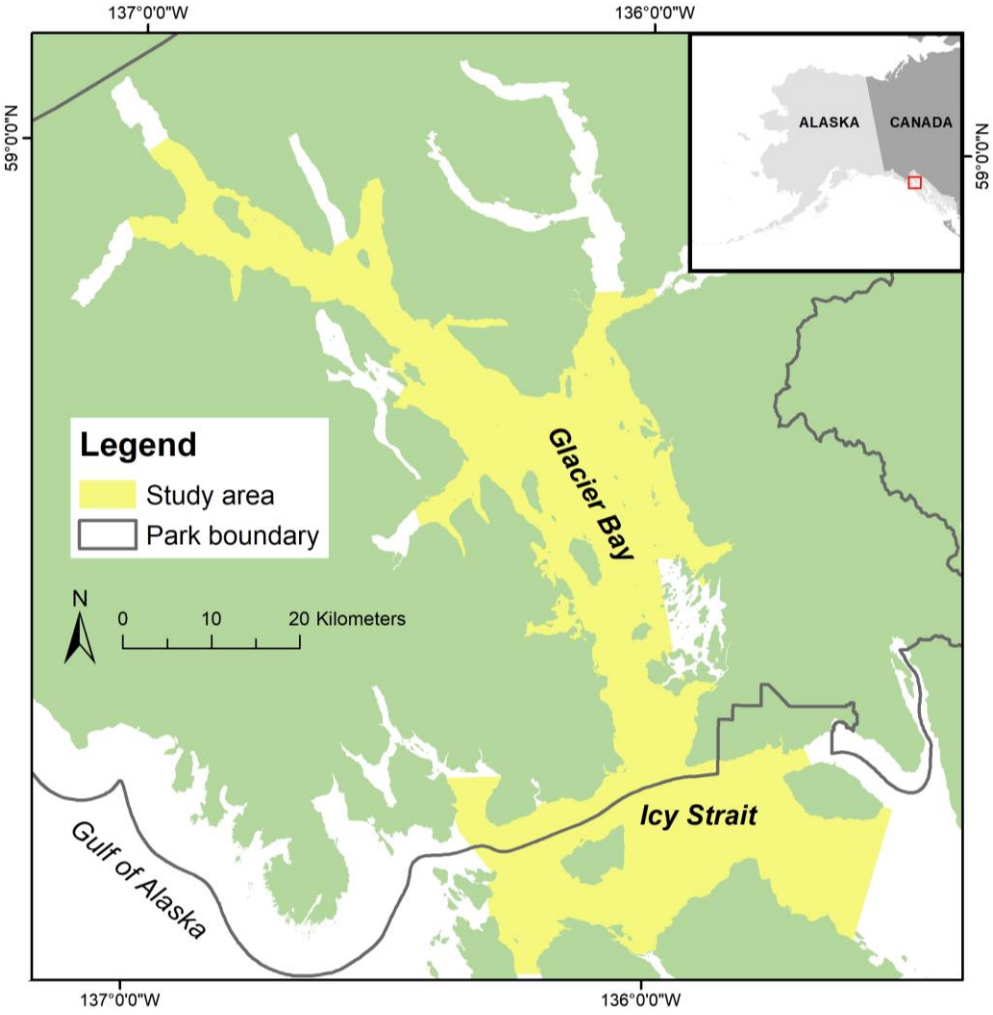

Figure 1. Study area in Glacier Bay and Icy Strait, Alaska.

Figure 2. The stable, distinct coloration and shape of a whale's flukes allow researchers to track individuals over time. Each whale receives a unique identification number. For example, the whale with black flukes is adult female #1834 (left) and the whale with white flukes is 24-year-old male #1293 (right). (NPS photos taken under NMFS ESA/MMPA Permit No. 21059)

Figure 3. R/V *Sand Lance* underway with research team. (Mark Kelley photo)

Where & How Do We Gather Data?

Every year since 1985, GBNPP biologists have conducted small boat-based photo-identification surveys in GB-IS (Figs. 1, 2) 4-5 days per week from June 1 – August 31 (core period) with less frequent surveys in the spring and fall (see Gabriele *et al.* 2017 and Neilson *et al.* 2018 for detailed methods). Our primary goal is to describe the distribution and abundance of humpback whales in a way that is comparable between years. We use a mixed approach in which we target 'hotspots' where whale sightings have been reported or are known to frequent, while also surveying outlying areas where whales may or may not be present.

Between April 26 and October 2, 2018, we searched for and photographed humpback whales from the *Sand Lance*, a 5.8-m motorboat (Fig. 3).

We took photographs of each whale's flukes and dorsal fin with a Nikon D7200 digital camera equipped with an 80-400mm zoom lens. We compared these photos to previous GBNPP photos and to fluke photos from other areas in SE Alaska to determine the identity and past sighting history of each whale. Sighting data were added to a database shared with the University of Alaska Southeast in Sitka, Alaska.

Other information that we collected opportunistically included: 1) sloughed whale skin for genetic analysis and 2) opportunistic observations of whales' body condition (e.g., emaciation), body size (e.g., small), and probable whale prey. We also recommended to the GBNPP superintendent where and when 'whale waters' vessel speed and/or course restrictions should be implemented to protect humpback whales from collision and disturbance.

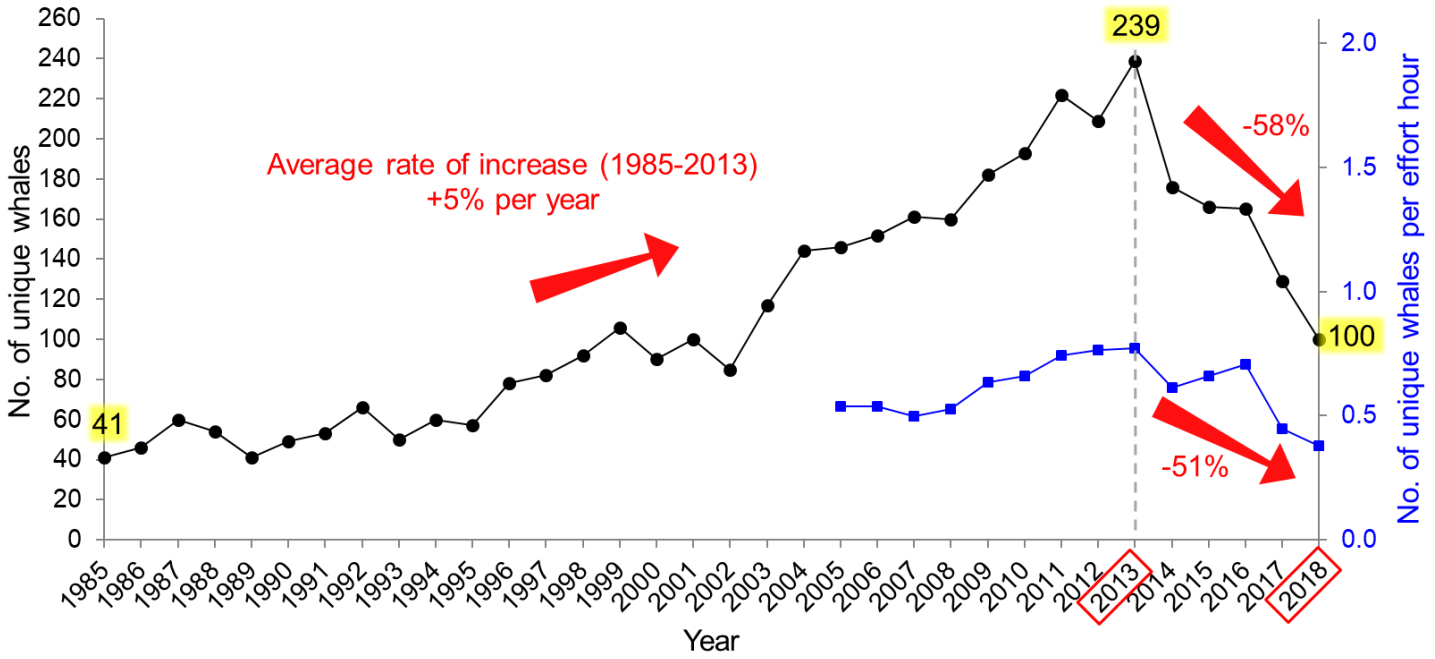

Figure 4. Relative abundance metrics for Glacier Bay & Icy Strait showing significant declines since 2013. Annual whale counts (black) and annual whale counts corrected for survey effort (blue) from Jun 1 – Aug 31, 1985–2018. Whales/effort hour is not available for 1985–2004.

What Did We Find in 2018?

Survey Effort

Our survey effort during the June 1 – August 31, 2018 core period (265 h) was below average compared to 2005–2017 (mean 285 h, SD = 23.9 h) but well within the range for survey effort in these years (233–323 h). We strive to maintain consistent survey effort each year but it inevitably fluctuates as a result of factors such as weather, staff availability, and unexpected events (e.g., mechanical difficulties and marine mammal strandings).

Whale Counts

Between June 1 and August 31, we documented 100 different humpback whales in the study area (Fig. 4). This count is 22% lower than in 2017 and our lowest annual count since 2002. Following a long-term pattern of population growth from 1985–2013, the number of whales in GB-IS has declined by 58% over the past five years. Correcting our annual counts for effort reveals similar declines (–51%) in abundance since numbers peaked in 2013. Outside of the core monitoring period, we documented four additional whales (a typical proportion for the non-core monitoring period), for a grand total of 104 unique whales in 2018.

In Glacier Bay, the number of whales in 2018 (n = 45) was remarkably low. This count is about half (48%) of the 2017 GB count and represents a 72% decline compared to 2013. In contrast, the 2018 count in Icy Strait was 6% higher than in 2017; however, it also represents a sharp decline (–65%) compared to 2013.

Reproduction & Juvenile Survival

2018 marks the fifth consecutive year of calving anomalies in the study area, with a decreasing trend in the calving rate (Fig. 5) and an increasing trend in missing calves. We identified only one mother-calf pair in 2018 but by August 16, the mother (20-year-old #1470) had lost her calf, marking total reproductive failure for the first time in this 34-year study. We presume that the calf died because mid-August would be extremely early for complete weaning and calf independence (Baraff and Weinrich 1993, Neilson et al. 2015). Overall, from 2014–2018, 30% of calves (7 of 23) have gone missing. None from 2014–2017 have been resighted, indicating they likely died. In contrast, from 1985–2013 we documented an average of 9.3 calves/yr and only 3% of calves (8 of 270) went missing.

Notably, calf sightings in 2018 throughout our region were very rare; we are aware of only three other

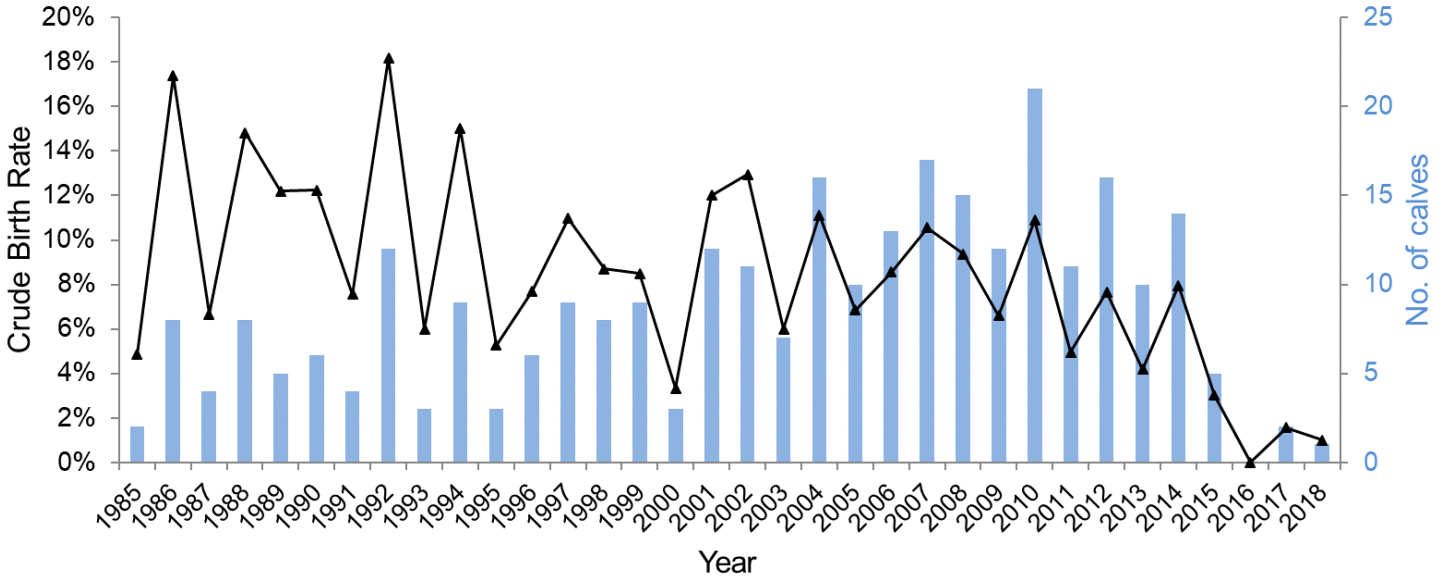

Figure 5. Crude birth rate (black line; # of calves/total # whales) and annual number of calves (blue bars) in GB-IS from 1985-2018.

mother/calf pairs in all of Southeast Alaska (A.A. Pack, Alaska Whale Foundation, and National Marine Fisheries Service (NMFS) unpublished data).

2018 was the second year in row that we documented no known juveniles in GB-IS (whales age 1-4 years). In contrast, 48% of the calves born 1985-2013 returned to GB-IS in subsequent years at a mean age of 3.2 years (SD = 2.7, range 1-17) (Gabriele et al. 2017). From 2013-2017 we documented 32 calves in GB-IS but only two (6%) are known to have survived to be juveniles (both were calves in 2013 and neither has been documented since 2016). In 2018, we noted only five 'small' whales during our surveys (four were later identified as known whales at least 6-14 years old).

Site Fidelity

We documented unusually low occupancy and site fidelity in GB-IS in 2018 compared to historic norms. Out of 100 whales total, a record low proportion (40%,) were 'resident' to the study area (resighted over a span of ≥20 days) (1985-2017 mean = 61%, SD = 9%), while a record high proportion (44%) were 'transitory' (sighted one day only) (1985-2017 mean = 27%, SD = 7%). Most (80%) of the 44 transitory whales were in IS and 14 of these (32%) were around the Pleasant Island reef, especially in August.

Over half (56%, n = 37) of 66 whales with a long-term pattern of site fidelity to GB-IS (annually observed 2004-2013) were missing from the study area in 2018 (16 females, 20 males, one unknown sex) with an age range of 14-44+ years old). The survival of six of these whales is known based on sightings elsewhere in SE Alaska but the fate of the remaining 31 whales is unknown. The number of 'regulars' that have gone missing from GB-IS has increased annually since 2014, however a few of these well-known whales have returned to the study area (Fig. 6).

Figure 6. The triumphant return of adult female #581 to the study area on June 20, 2018 after being missing 2014-2017. This female (first identified in 1982; Kewalo Basin Marine Mammal Laboratory unpublished data) holds the SE Alaska record for the most documented calves (13). (NPS/C. Gabriele, taken under NMFS ESA/MMPA Permit No. 21059)

Increased photo-ID effort in areas of SE Alaska with poor survey coverage, including offshore waters, would help determine if whales have shifted their distribution to new feeding locations in recent years. Efforts to locate GB-IS 'regulars' in catalogs from other feeding areas (e.g., British Columbia and Prince William Sound)

have so far yielded no matches. Through a new collaboration with Happywhale.com, we recently initiated expanding our search area to the broader North Pacific.

Genetic Samples

We collected three sloughed skin samples in 2018, one of which came from a whale with unusually gray, roughened skin (Fig. 7). Since 1996, we have collected 335 sloughed skin samples which are analyzed by our collaborators at Oregon State University for sex determination, mitochondrial DNA haplotype, and nuclear DNA genotyping.

Figure 7. Eight-year-old whale #2334 with a gray, roughened skin condition of unknown origin. Analysis of a sloughed skin sample from this animal is underway in hopes of determining the source of the condition (NPS/C. Gabriele, taken under NMFS ESA/MMPA Permit No. 21059)

Physical Condition

For the third year in a row, we observed numerous abnormally thin whales, however it appears this was less common than in 2017 (2016 = 13%; 2017 = 24%; 2018 = 17%). Emaciation is most likely attributable to lack of food but may also indicate illness or disease. On September 20, we documented extremely emaciated and cyamid-infested whale #944 (Fig. 8), a well-known adult female who has produced at least seven calves in her 34-year sighting history.

Figure 8. Emaciated and cyamid-infested adult female #944. (NPS/C. Gabriele, taken under NMFS ESA/MMPA Permit No. 21059)

An unusually high number of whales (n = 17) in 2018 had abnormal skin (e.g., gray blotchy and/or heavily pocked in appearance) (e.g., Fig. 7). We do not know the cause(s) of these skin abnormalities, however some appear to be related to a cyamid (whale lice) infestation.

Whale Prey

We positively identified the following forage fish species near feeding humpback whales in 2018 (n = number of detections):

- Pacific sand lance (*Ammodytes personatus*) (n = 10)
- Capelin (*Mallotus villosus*) (n = 4)
- Pacific herring (*Clupea pallasii*) (n = 3)
- Unidentified lanternfish (Myctophidae spp.) (n = 2)
- Northern lampfish (*Stenobrachius leucopsarus*) (n = 1)
- Eulachon (*Thaleichthys pacificus*) (n = 1)

These species are similar to what we have observed in past years except this was the first time that we have documented eulachon near feeding whales (July 13 along the western shore of the Beardslee Islands). Sand lance were common around Flapjack in mid to late July. Capelin detections appeared to be more frequent than in 2017, but still not as commonplace as they had been before detections declined sharply in 2016-2017. For the second year in a row, we documented group bubblenet feeding on herring at the Pleasant Island Reef in August (Fig. 9).

Whale/Human Interactions

No whale-vessel collisions, entanglements, or dead whales were reported in the study area to GBNPP or to the National Marine Fisheries Service in 2018.

Whale Waters

For a second year in a row, whales did not concentrate to feed in lower Glacier Bay as they have done consistently for decades, therefore a 13 kt vessel speed limit was not implemented in this area in 2018. However, temporary whale waters were designated around Point Carolus from July 14-August 18, marking the first time since 2013 that whales have aggregated for an extended period in this area, which was a consistent whale hotspot from 2005-2013.

Conclusions

Although our monitoring results clearly indicate dramatic population level changes over the past five years, we do not know if the declines in whale numbers represent a shift in distribution and/or increased mortality from 2014–2018. Within Alaska, the consistent, long-term monitoring of humpback whales is limited to our study area, although our findings are consistent with negative trends in abundance, reproduction, and body condition for humpbacks in other areas in the central North Pacific. Growing evidence suggests that recent declines in humpback whales and other marine species may be related to the unprecedented marine heatwave that occurred in the North Pacific from 2014–2016 (Di Lorenzo and Mantua 2016; Walsh et al. 2018).

Figure 9. On August 9, 2018 we documented nine whales group bubblenet feeding on herring around the Pleasant Island reef in Icy Strait. Prior to 2017, this behavior was reported very rarely in the Icy Strait study area. This may indicate that in 2017–2018 herring were relatively more abundant around Pleasant Island compared to other areas where group bubblenet feeding is more typically observed (e.g., Chatham Strait, lower Lynn Canal.) Group bubblenet feeding has never been documented in Glacier Bay, although it is not uncommon for single whales to feed there using a bubblenet (NPS/J. Neilson, taken under NMFS ESA/MMPA Permit No. 21059)

Literature Cited

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: 431–434.

Di Lorenzo, E., and N. Mantua. 2016. Multi-year persistence of the 2014/15 North Pacific marine heatwave. Nature Climate Change 6: 1042–1047 (doi:10.1038/nclimate3082)

Gabriele, C.M., J.L. Neilson, J.M. Straley, C.S. Baker, J.A. Cedarleaf, and J.F. Saracco. 2017. Natural history, population dynamics, and habitat use of humpback whales over 30 years at an Alaska feeding ground. Ecosphere 8: 1–18 (doi:10.1002/ecs2.1641)

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. National Park Service Unpublished Report, Anchorage, Alaska.

Neilson, J.L., C.M. Gabriele, and P.B.S. Vanselow. 2015. Humpback whale monitoring in Glacier Bay and adjacent waters 2014: Annual progress report. Natural Resource Report NPS/GLBA/NRR–2015/949. National Park Service, Fort Collins, Colorado.

Neilson, J.L., C.M. Gabriele, and L.F. Taylor-Thomas. 2018. Humpback whale monitoring in Glacier Bay and adjacent waters 2017: Annual progress report. Natural Resource Report NPS/GLBA/NRR–2018/1660. National Park Service, Fort Collins, Colorado.

Walsh, J.E., R.L. Thoman, U.S. Bhatt, P.A. Bieniek, B. Brettschneider, M. Brubaker, S. Danielson, R. Lader, F. Fetterer, K. Holderied, K. Iken, A. Mahoney, M. McCammon, and J. Partain. 2018. The high latitude marine heat wave of 2016 and its impacts on Alaska. Pages S39–S43 in Herring, S.C., N. Christidis, A. Hoell, J.P. Kossin, C.J. Schreck III, and P.A. Stott, editors. Explaining Extreme Events of 2016 from a Climate Perspective. Bulletin of the American Meteorological Society 99: S1–S157.

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