Gray Whale Calf Occurrence in the Alaskan Arctic,
Summer and Fall 2013, with Comparisons to Previous Years

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Abstract

Marine mammal surveys were conducted in the northeastern Chukchi and western Beaufort seas (68-72°N and 140-169°W) from July to late October, 2013, as part of the Aerial Surveys of Arctic Marine Mammals project conducted by the National Marine Mammal Laboratory and co-managed and funded by the Bureau of Ocean Energy Management. Surveys were conducted in the larger study area from 1982 to 1991, and recommenced in 2008. Gray whale (*Eschrichtius robustus*) calves were sighted in great frequency in the northeastern Chukchi Sea in 2013, similar to 2012. Total numbers of calf sightings in these two individual years are far higher than gray whale calf sightings recorded in previous years. Gray whale calves in 2013 were abundant in the month of July (n=47); few calves were seen in August, September or October, similar to previous years. Distribution of calves was also similar to previous years: primarily nearshore along the Alaskan coast from Point Lay to just east of Barrow, with particularly high numbers offshore of Wainwright and in a cluster between Barrow and Point Franklin, and in ice-free, shallow water (<50 m). This area is an important foraging ground for gray whales; feeding was the dominant behavior documented in this area throughout the survey years. It is possible that these shallow waters are also used as protection from predators; killer whales were sighted in multiple locations in the Chukchi Sea. In gray whale calf counts conducted along the California coast by the Southwest Fisheries Science Center during the annual northern migration, calf counts were high in 2012 and 2013 when compared with counts of previous years. It is possible that conditions were favorable for foraging in 2011-2013 and many females were able to accumulate sufficient energy reserves to conceive in 2011 and 2012 and give birth in 2012 and 2013. Another possibility is that other habitats where gray whale cow-calf pairs have been documented in the past, such as along the Chukotka Peninsula, may not have been as favorable to cow-calf pairs in 2012 and 2013.

Methods and Survey Effort

- Transect flightlines of the study area lie generally perpendicular to the coastline, cutting across isobaths, prevailing currents, and expected gradients in marine mammal density. Beginning in 2009, a coastal transect between Point Barrow and Point Hope was regularly flown 1 km offshore and parallel to the coast.
- Surveys were conducted in twin turbine Aero Commander aircraft at a targeted altitude of 1200 ft (366 m) in the Chukchi Sea and 1500 ft (457 m) in the Beaufort Sea, and a speed of ~115 kts (213 km/h).
- The field season spanned 2 July to 28 October, although the federal government shutdown suspended survey effort from 1-19 October. There were 90 survey flights initiated for a total of ~51,000 km flown on- and off-survey effort (Fig.1); ~ 45,000 km were on-effort. Of these, ~25,000 transect km were in the Chukchi Sea.
- Survey effort in 2013 was more than 2009-2011, but less than 2012. In 2012 and 2013, survey effort was higher due to the Beaufort Sea surveys, which began in mid-July instead of August or September. In 2013, survey effort was lower than 2012 due to prevailing bad weather conditions, the government shutdown, and the absence of additional surveys to target belugas, which took place in 2012. The beluga surveys were sponsored by the Alaska Beluga Whale Committee and increased survey coverage in the northeastern Chukchi Sea and the western Beaufort Sea in the first half of July).
- Survey effort was designated as "on-effort" (transect and circling from transect), "off-effort" (search and circling from search), or deadhead; designation of circling effort was incorporated into the database in 2009.
- Beginning in 2012 and continuing in 2013, more circling on cetacean sightings was initiated in an attempt to more accurately estimate group size and determine whether calves were present. About 10% of the total non-deadhead survey time in 2013 and 2012 was spent on circling, compared with 5% in 2011.
- Gray whale calf sighting rates include only on-effort sightings and kilometers flown, and include the Chukchi Sea portion of the study area and block 12 of the Beaufort Sea study area. Sighting rates (whales per unit effort, WPUE) were calculated for gray whale calves as the number of calves per kilometer (km) surveyed per month. On- and off-effort sightings are included in the analyses of gray whale calf distribution and habitat.

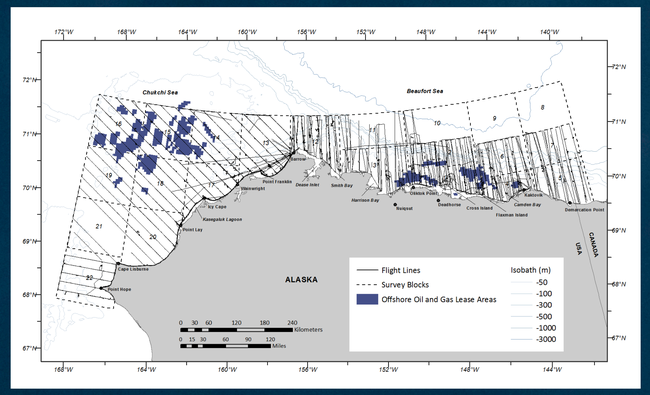

Figure 1. 2013 On- and off-effort flightlines.

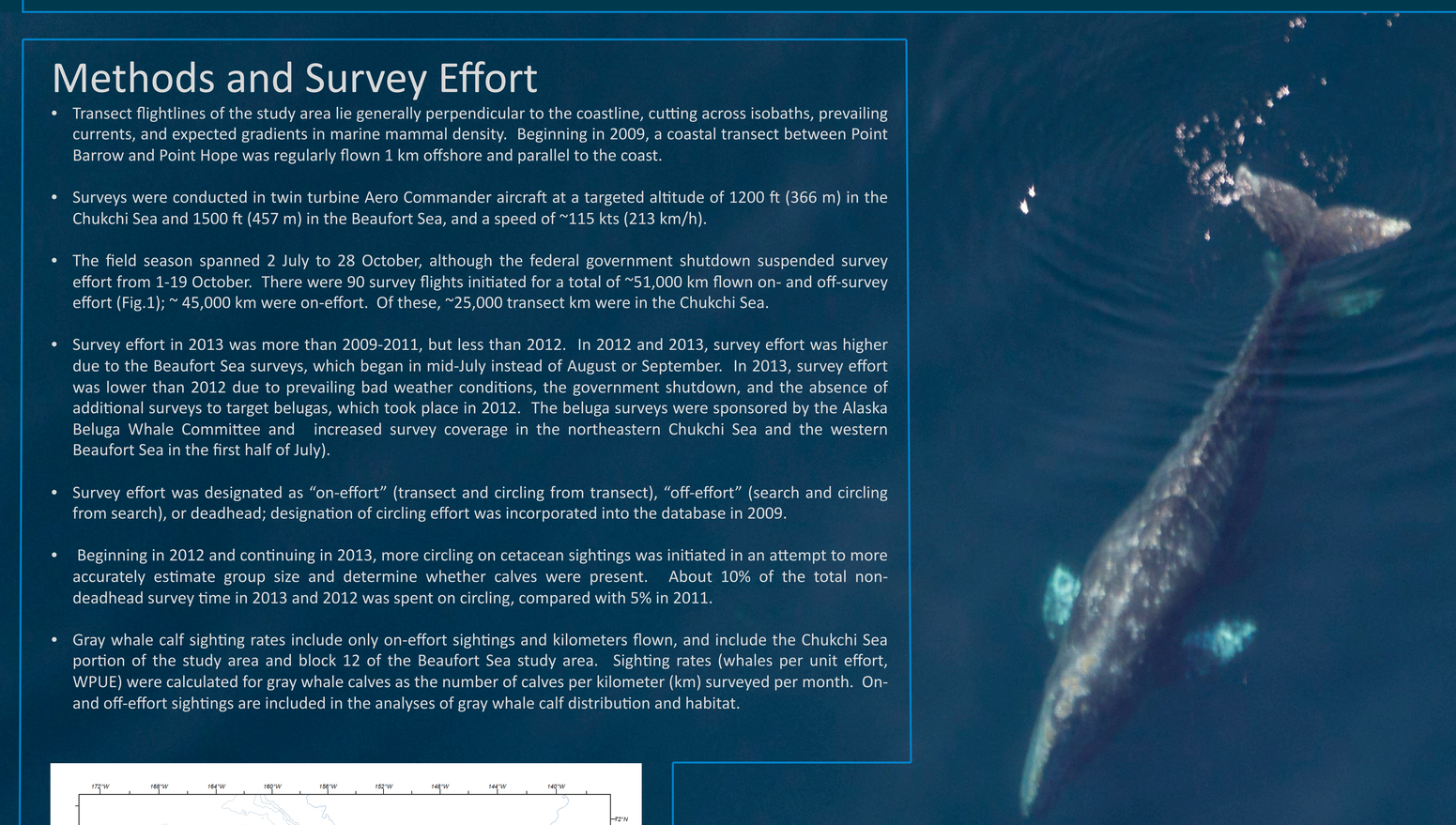

Photo by Vicki Beaver, NOAA/NMFS/AFSC/NMML, Permit No. 14245

Table 1. Gray whale calf sighting numbers per month for each survey year.

Year	June	July	August	September	October	Total
1982	0	18	0	0	0	18
1983	0	0	1	0	0	1
1984	0	0	0	0	0	0
1985	0	15	0	0	0	15
1986	0	0	0	1	0	1
1987	0	0	0	1	0	1
1988	0	0	0	0	0	0
1989	0	0	0	1	0	1
1990	0	0	0	0	0	0
1991	0	0	0	0	0	0
2008	0	0	1	0	0	1
2009	0	10	0	0	0	10
2010	0	0	0	0	0	0
2011	5	8	4	1	0	18
2012	0	57	10	0	0	67
2013	0	47	9	1	0	57

Sighting Summary

- In 2013, there were 174 sightings of 281 gray whales on- and off-effort in the study area; 57 of these individuals were calves (Fig. 2). When only on-effort sightings were considered, there were 114 sightings of 194 gray whales in the study area; 37 of these individuals were calves. Some calf sightings were likely of the same calf on multiple days.
- Gray whale sightings spanned all months surveyed in 2013; calves were sighted in July, August, and September. The month with the highest total number of gray whale sightings gray whale calves was July: 47 calves were sighted in July; 9 calves were sighted in August, and 1 calf was sighted in September. July has historically been the month with the highest numbers of gray whale and gray whale calf sightings (Table 1); it is likely that gray whales and their calves begin migrating south after July. It is also possible that calves grow large enough that they are no longer identified as "calves" by September-October.
- More gray whale calves were seen in 2012 (67 calves) and 2013 than in previous survey years (Table 1). Prior to 2012 and 2013, the years with the greatest number of calf sightings were 1982 and 2011, with 18 calves each year.
- 2013 had a higher proportion of calves (20%) compared with other years' calf sightings, which ranged 1-13%.
- More survey time spent on circling has led to more calves being detected and recorded while on circling. Increased circling began in 2012, and more calves were sighted while on circling in 2012 and 2013: 67% in 2013 and 43% in 2012 compared to 22% in 2011 and 0% in 2009 (no calves were sighted in 2010).

Distribution and Habitat

- Gray whale calf sightings in 2013 ranged from east of Barrow to Point Lay, and offshore and south of Point Hope. The majority of calf sightings were <25 km from shore and in waters <50 m deep, with scattered sightings out to 77 km from shore and in water up to 56 m deep.
- In July, 15 calves were sighted in 10-75% broken floe sea ice; sea ice moved out from the primary gray whale habitat of the study area in August and no calves were sighted near sea ice in August or September.
- Distribution of calves in 2013 was similar to gray whale calf distribution in previous survey years (Fig. 2).

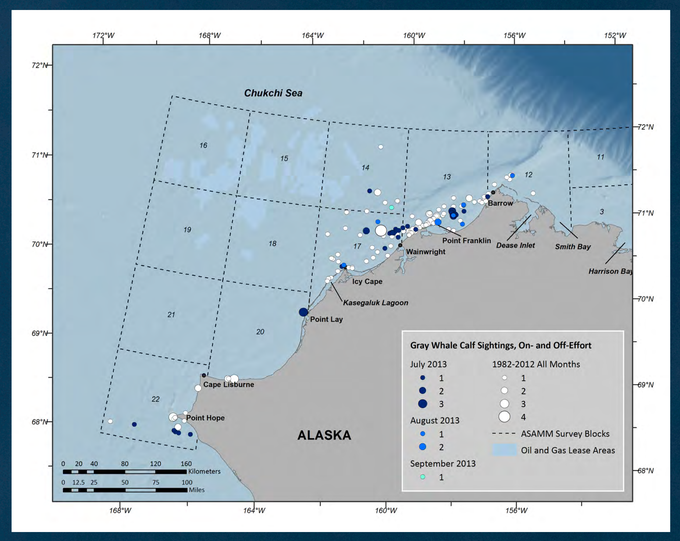

Figure 2. 2013 compared with 1982-2012 gray whale calf sightings on- and off-effort per month, all months shown.

- Distribution of gray whale calves was similar to non-calves, and overlaps the areas where adults are feeding. It is possible that the shallow, nearshore waters also provide some protection from predatory killer whales. Killer whale numbers may be increasing in the Arctic as a result of an increase in gray whale calves. Killer whales have been documented in the northeastern Chukchi Sea by several research groups (including ASAMM) and by villagers. The Arctic Whale Ecology Study (ARCWEST) research cruise observed a killer whale predatory attack on a gray whale calf near Wainwright on 2 September 2013 (NMML, unpublished data; B. Rone, NMML-AFSC, pers. comm. to A. Brower, 18 December 2013).

Transect Sighting Rates per Year

- When on-effort gray whale calf sighting rates were compared to past years' on-effort gray whale calf sighting rates, the results were significantly higher in 2012 and 2013 (Table 2). Despite the additional survey effort in 2012 and increased circling in 2012 and 2013, the substantially higher gray whale calf sighting rates likely signify there were more calves in the northeastern Chukchi Sea in 2012 and 2013 than in previous years. During the gray whale annual northern migration from February to May, 2012 and 2013, the Southwest Fisheries Science Center (SWFSC) also had relatively high gray whale calf counts when compared to previous years' counts, which have been conducted since 1994 (see the SWFSC's Gray Whale Studies – Calf Production website at: http://swfsc.noaa.gov/textblock.aspx?Division=PRD&ParentMenuId=211&id=16464).
- In all years surveyed, July has consistently been the month with the highest gray whale calf sighting rates. Therefore, the continuation of broad-scale aerial surveys in the northeastern Chukchi Sea in July is imperative to assess the importance of this area to gray whale calves.

Table 2. Gray whale calf on-effort sightings (n = number of calves) and sighting rate (WPUE) derived from on-effort kilometers flown (km) per month per year.

	June			July			August			September			October			Total		
Year	km	n	WPUE	km	n	WPUE	km	n	WPUE	km	n	WPUE	km	n	WPUE	km	n	WPUE
2009	1313	0	0.0000	5279	5	0.0009	3949	0	0.0000	7155	0	0.0000	5726	0	0.0000	23421	5	0.0002
2010	0	0	0.0000	7646	0	0.0000	4253	0	0.0000	5218	0	0.0000	4081	0	0.0000	21198	0	0.0000
2011	4211	1	0.0002	5286	7	0.0013	7363	4	0.0005	10427	1	0.0001	3057	0	0.0000	30344	13	0.0004
2012	490	0	0.0000	11250	50	0.0044	7644	5	0.0007	9446	0	0.0000	8819	0	0.0000	37649	55	0.0015
2013	0	0	0.0000	5534	36	0.0065	10612	9	0.0008	10683	1	0.0001	1776	0	0.0000	28605	46	0.0016
Total	6014	1	0.0002	34995	98	0.0028	33821	18	0.0005	42929	2	0.0000	23459	0	0.0000	141217	119	0.0008

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