Gray Whale Foraging Occurrence in the Northeastern Chukchi Sea, Summer and Fall 2015

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Overview

Foraging gray whales (*Eschrichtius robustus*) were documented in the northeastern Chukchi Sea in summer and fall 2015 by the Aerial Surveys of Arctic Marine Mammals (ASAMM) project. ASAMM line transect surveys, conducted by the Marine Mammal Laboratory and funded and co-managed by the Bureau of Ocean Energy Management, were conducted in the eastern Chukchi Sea, 67°-72°N and 155°-169°W, from July through October 2009-2015. The northeastern Chukchi Sea is an important foraging and weaning ground for gray whales. They typically begin to arrive in the northeastern Chukchi Sea in June and July, feed heavily in July and August, and migrate south in September and October. Feeding gray whales accounted for 58% of the total gray whales sighted on effort in 2015, similar to 2009-2014 (50-76% of total gray whales sighted on effort per year). Feeding gray whale sighting rate (SR, number of whales on effort per km flown) in summer 2015 was higher than summer SRs in 2009-2014, but fall 2015 SR was lower than the mean fall SR from 2009-2014. Gray whales were sighted foraging predominantly between Point Barrow and Icy Cape, similar to 2009-2014. However, compared to previous years, gray whales in 2015 were sighted farther offshore in July, were not sighted as far offshore between Point Franklin and Icy Cape, and were not sighted east of 157.8°W.

Methods & Survey Effort

- Line transect aerial surveys
- Twin engine turboprop aircraft
- 2 July – 30 October 2015
- 1200 ft (366 m) in the Chukchi Sea
- 1500 ft (457 m) in the Beaufort Sea
- Survey effort: "on-effort" (transect and circling from transect), "off-effort" (search and circling from search), or deadhead
- ~34,300 km flown on effort in survey blocks 12-22 in 2015 (Figure 1).

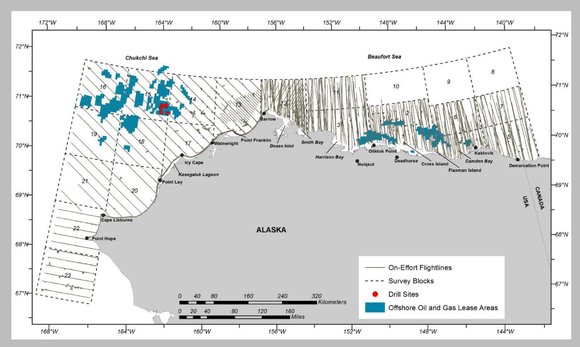

Figure 1. ASAMM on-effort survey flightlines, 2015.

Feeding Gray Whale Sighting Rates

Survey Blocks 12-22

- Sighting Rate (SR): Number of on-effort feeding whales per on-effort kilometer surveyed (whales per unit effort, WPUE).
- 2015 had the highest summer SR (WPUE = 0.0120) (Figure 2), despite poor weather that reduced survey effort in July.
- Fall 2015 SR (WPUE = 0.0013) was lower than the Fall SR in some previous years (Figure 2) and lower than the mean SR from 2009-2014 (mean WPUE = 0.0016), possibly due to differing survey protocols during the Arctic Aerial Calibration Experiments, 26 Aug- 7 Sep which reduced survey effort in some areas where gray whales are sighted most frequently.
- The highest season total SR was in 2012 (WPUE = 0.0065) (Figure 2).
- High summer and low fall SRs of gray whales document the seasonal gray whale migration south out of the Chukchi Sea.

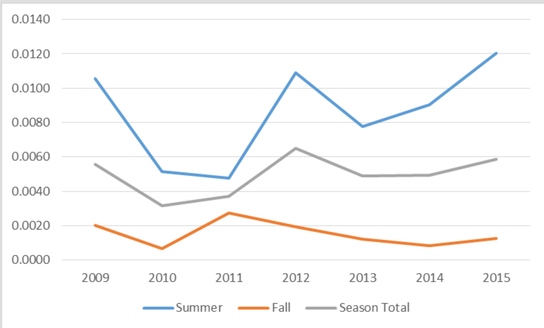

Figure 2. Foraging gray whale SRs, 2009-2015, summer (Jul-Aug), fall (Sep-Oct), and season total (Jul-Oct).

Survey Block 23

- Block 23 in the southcentral Chukchi Sea was flown only in 2014 and 2015. Foraging gray whale density in this area was very high in 2014, but there were few sightings in 2015 (Figure 3), possibly due to less survey effort.

Feeding Gray Whale Distribution

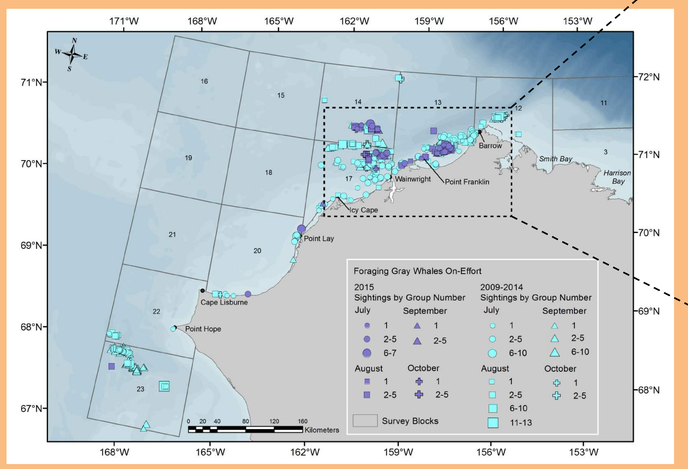

Figure 3. Foraging gray whale monthly sightings on effort in the eastern Chukchi Sea, 2015 and 2009-2014.

In 2015, foraging gray whales sighted on effort in all months were documented predominantly in water <55 m deep in these areas (Figure 3):

- Point Barrow to Point Franklin 10-30 km from shore
- NNW of Wainwright 25-40 km and 65-90 km from shore

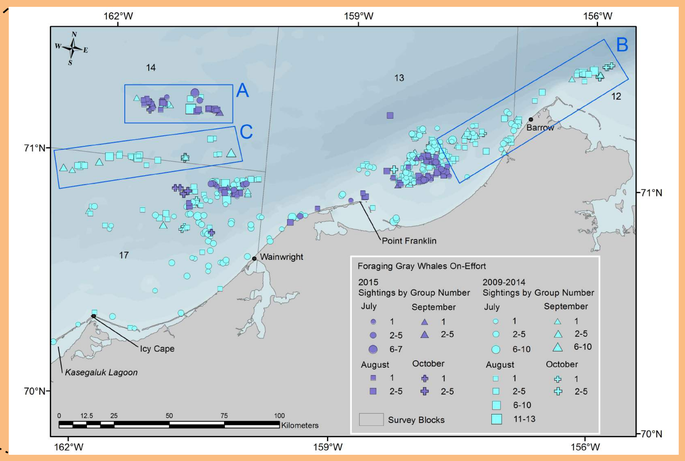

Figure 4. Area of high density of foraging gray whale sightings in the northeastern Chukchi Sea. On-effort, monthly sightings for 2015 and 2009-2014 are shown. Areas of differing distribution are shown in rectangle A (2015) and rectangles B and C (2009-2014).

How 2015 feeding gray whale sightings differed from 2009-2014 (Figure 4):

- Gray whales were consistently sighted offshore 65-90 km to the NNW of Wainwright from July to October 2015 (Figure 4, rectangle A). Gray whales were seldom seen in that area in July of previous years.
- In 2009-2014, gray whales were documented foraging east of 157.8°W (Figure 4, rectangle B), and beginning in August, foraging farther offshore between Point Franklin and Icy Cape up to ~70 km offshore (Figure 4, rectangle C); gray whales were seldom sighted foraging in these areas in 2015.

Acknowledgements: *This study is funded and co-managed by the Bureau of Ocean Energy Management and NOAA (IA No. M11PG00033) and was supported Carol Fairfield (BOEM COR). At MML, additional support was provided by Robyn Angliss, Stefan Ball, Phil Clapham, Nancy Friday, Kim Shelden, Janice Waite, and administrative personnel. At JISAO, support was provided by Amy Kennedy and administrative personnel. In addition to the authors, numerous dedicated biologists have participated in these surveys. Clearwater Air, Inc. pilots safely navigated us through the skies. Real-time flight following via satellite link was provided by Department of Interior personnel. Programming support was provided by Mike Hay (Xera GIS). Without all of these people, our surveys would not have been possible; our sincerest thanks to all!*

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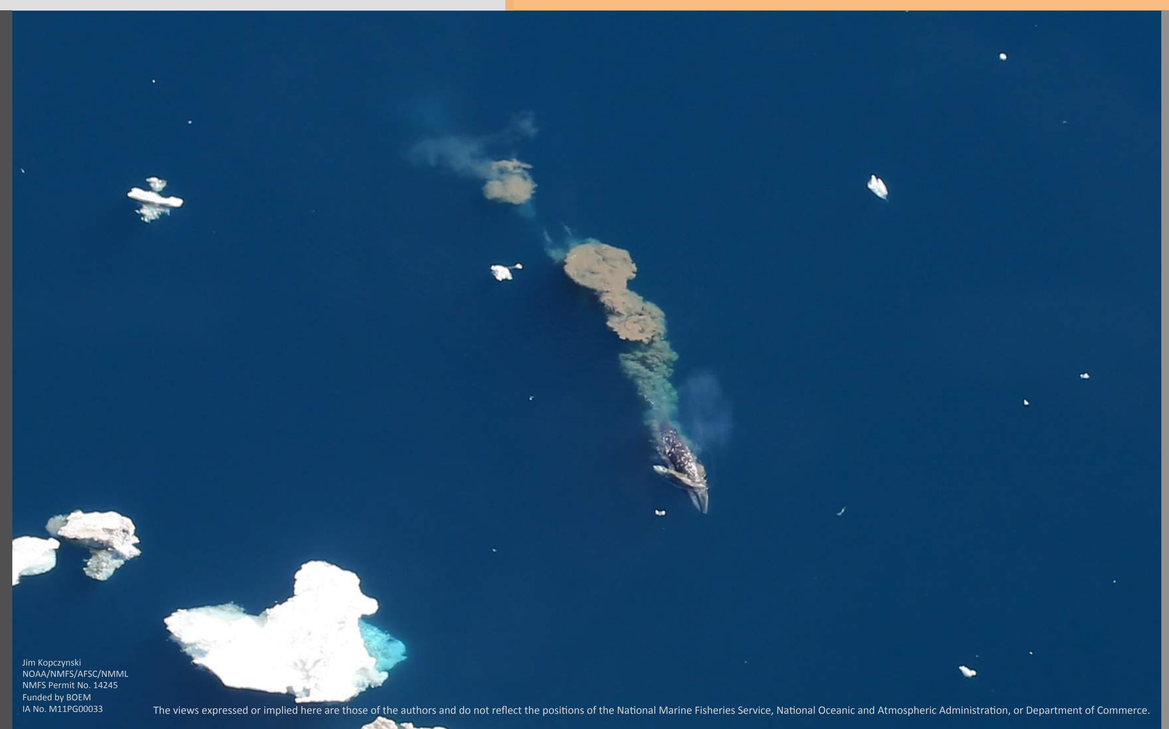

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NOAA/NMFS/AFSC/NMML
NMFS Permit No. 14245
Funded by BOEM
IA No. M11PG00033

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Discussion

- The differences in distribution and relative abundance from 2015 and previous years could be due to changes in prey distribution resulting from changing hydrographic conditions and oceanic productivity or from intense feeding by gray whales.
- Gray whales documented in the Chukchi Sea overlay areas of dense benthic amphipod communities (Blanchard and Feder 2014, Schonberg et al. 2014), and it is assumed that gray whales associated with mud plumes in this area are feeding on this prey.
- As global climate change accelerates and multi-year sea ice continues to melt, benthic-dominated ecosystems of the Bering and Chukchi seas may become pelagic-dominated (Grebmeier et al. 2006).
- Gray whales have a flexible and opportunistic foraging strategy and may shift their foraging habits from the benthic- to the pelagic-dominated ecosystem.
- The spatial, temporal, and interannual changes in gray whale foraging distribution and relative abundance highlight the need for continued broad-scale aerial surveys each summer and fall.