
**Using movement, diving and haul out behavior to identify the relative importance of foraging areas for walruses in the Alaskan Chukchi Sea**

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Female Pacific walruses and their young summer in the Chukchi Sea, resting on sea ice between benthic feeding bouts, when sea ice is available. The rapid decrease of sea ice in summer is changing walrus habitat in the Chukchi Sea and consequently the Pacific walrus is being considered for listing under the U.S. Endangered Species Act. Knowing the location and use of foraging areas is important as industrial and shipping activities increase. We worked with walrus hunters from Saint Lawrence Island to deploy 88 satellite-linked dive recorders on walruses in the Chukchi Sea during three multi-agency walrus research cruises in June of 2013–2015. Of the 88 tagged walruses, 79 were females (34 of which were accompanied by calves of the year and 45 were not) and 9 were adult males. Walruses were tracked for up to 124 days. Using data from 2013 and 2014, we identified Hanna Shoal, a known foraging area for walruses, and Icy Cape as two areas within the Alaskan Chukchi Sea with a higher than average density of dives. To evaluate the relative importance of these areas for foraging, we compared diving and haul out behavior within these two areas with that found in the rest of the Alaskan Chukchi Sea. Adult females (with and without calves) dove longer (6.2 vs. 4.5 min), made fewer dives (6.6 vs. 8.1 dives/hour), and hauled out for a larger proportion of time (22.1 vs. 17.0 min/hr) at Hanna Shoal than the other two areas (P < 0.01). Icy Cape and the rest of the Alaskan Chukchi Sea did not differ statistically. Walruses in better quality habitat, with higher densities of prey, are expected to make fewer dives, dives of longer duration and spend more time resting. As such, diving and haul out behavior indicated higher quality habitat near Hanna Shoal than Icy Cape and the rest of the Alaskan Chukchi Sea, which were similar to each other. Therefore, Icy Cape may not be higher quality foraging habitat than the Alaskan Chukchi Sea in general. Here we update our 2013 and 2014 results to include data from 2015.

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INTRODUCTION

Pacific walruses (Odobenus rosmarus) winter in the Bering Sea. In spring, females move north with the receding sea ice and summer in the Chukchi Sea, resting on sea ice between benthic feeding bouts; most adult males remain in the Bering Sea where they rest on land. Over the past decade, sea ice in the Chukchi Sea has receded north beyond the shallow continental shelf in late summer. The rapid retreat of sea ice in summer is changing walrus habitat in the Chukchi Sea and, consequently, the Pacific walrus is being considered for listing under the U.S. Endangered Species Act. Knowing the location and use of foraging areas relative to industrial activities and shipping traffic in the Chukchi Sea is important.

METHODS

• In association with a multi-agency (ADF&G, USFWS, and USGS) walrus research cruise in May and June of 2013–2015 we worked with hunters to deploy satellite-linked transmitters on adult female walruses in the Chukchi Sea (Fig. 1).
• We used a state-space model to predict locations to match the date and time of dive and haulout data.
• We identified potentially important foraging areas based on kernel density estimates of dive locations; high densities of dive locations suggest a higher quality foraging area (Fig. 2).
• To evaluate the relative importance of areas identified for foraging, we compared diving and haul out behavior within areas identified with that found in the rest of the Alaskan Chukchi Sea (“Other”).
  • We used a repeated-measures mixed model to test for differences in:
    • Dive rate
    • Dive duration
    • % of an hour hauled out
  • Variables of interest included:
    • Area of use: determined by kernel density estimates
    • Calf: was the female with or without a calf of the year
    • Time of day
  • Models were fit using SAS software (PROCs MIXED and GLIMMIX) and the best model was selected using AICc.

RESULTS

• We deployed 80 satellite-linked transmitters on adult walruses.
  • 60 transmitters sent dive and/or haul out data (27 females with calves & 33 females without calves) while in the Chukchi Sea.
  • Tags transmitted an average of 53 days (range: 7–134 days).
  • We identified Hanna Shoal and Icy Cape as two areas within the Alaskan Chukchi Sea with a high density of dives (Fig. 2).
  • Adult females (with & without calves) dove longer and made fewer dives at Hanna Shoal than the other two areas (P < 0.01; Fig. 3).
  • Adult females (with & without calves) hauled out for a larger proportion of time at Hanna Shoal than Icy Cape (P < 0.01; Fig. 3).
  • Adult females with calves hauled out longer than females without calves at Hanna Shoal and Icy Cape (P < 0.01; Fig. 3).

SUMMARY

• Foraging habitat near Icy Cape appears to be of lower quality than near Hanna Shoal.
• Activities associated with supporting a calf may obligate females with calves to haul out longer than females without calves.

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