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# Spatio-temporal movement patterns of Alaskan beluga (*Delphinapterus leucas*) populations based on vocal peaks and common call types

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## Abstract

Beluga whales (*Delphinapterus leucas*) are likely to be impacted by climate change as a reduction in sea-ice may increase both the seasonal range and timing of migration, as well as modify prey availability and increase the risk of human-induced impacts. Belugas are highly vocal animals which make them ideal candidates for passive acoustic monitoring (PAM). In Alaska, two subpopulations migrate annually from their predictable summering grounds in the eastern Chukchi and eastern Beaufort Seas to overwinter in the Bering Sea. Determining the timing and migration route(s) in spring and autumn for each subpopulation requires additional information due to spatial and seasonal overlaps that complicate stock assessment and management. To differentiate migratory streams we investigated temporal peaks in vocal activity based on detections (Sep-2010 to Aug-2011) and common call types from long-term acoustic recorders located in the Bering, Chukchi and Beaufort Seas. Belugas were detected sporadically throughout autumn in the western Beaufort and eastern Chukchi Seas, with a strong temporal migration peak in the inshore waters of the eastern Chukchi in late November. Winter detections were confined to the Bering Sea, except for sporadic Chukchi detections. During spring, belugas were detected migrating through the eastern Chukchi in two distinct vocal peaks (early and late-May). An early-May peak followed by smaller late-May detections occurred in the western Beaufort; the timing suggests that these animals were from the first and second Chukchi peaks. In addition, common call types were identified and proportions compared among temporal peaks in autumn and spring; anecdotal evidence suggests that subpopulations may be identified through vocalizations and fine-scale spatio-temporal separation. This study highlights the successful application of PAM of seasonal beluga movements to improve our understanding of stock structure for management and conservation in a region undergoing rapid change. [Funding: National Research Council and Bureau of Ocean Energy Management].

**Keywords:** seasonal movements, passive acoustic monitoring, call types, vocal, Alaskan Arctic, stock structure, beluga whale, *Delphinapterus leucas*

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