FINAL REPORT

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Project Title: Acoustic Monitoring of Beluga Whales and Noise in Cook Inlet

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Summary

When this project was first proposed, there was the recognition that deploying acoustic recorders on moorings in Cook Inlet would be challenging due to the extreme environmental conditions of the inlet, especially the large tidal fluctuations, noise from relatively high currents, and sedimentation. Although such challenges required modifications, ingenuity, and perseverance, overall the project's objectives were successfully accomplished.

Previously submitted progress reports provide detailed information on the methods and results of the project; no new analyses are report here. Rather, a general summary of the main results for the primary objectives of the project include the following:

1. Acoustic devices (EARs and PODs) were deployed and recovered throughout Cook Inlet and beluga whales were detected by those devices. The detection rate varied across seasons at individual mooring sites and among sites. The pattern in detection rates has improved the understanding of CIB seasonal presence in the lower, mid, and upper regions of Cook Inlet and the seasonal shifts in their distribution. For example, the detection rate at the Beluga River site (upper inlet, just west of the Big Susitna River) was greatest in June and July, and then quite low from August through November, and then increased in December and January, low rates were detected in February, and then higher rates in March. In contrast, the detection rate at the Trading Bay site (upper inlet, north of the West Foreland) was relatively lower than at Beluga River across all months, with higher rates in only September, January, and late March.

2. The acoustic devices also detected killer whales and harbor porpoises, providing new information on the seasonal presence of these two species. Resident (fish-eating) killer whales were detected at three sites, in the upper (Beluga River), mid (Kenai River), and lower (Homer Spit) inlet. Transient (marine mammal-eating) killer whales were not detected, most likely because transients are acoustically very quiet and thus the probability of detecting them is very low. As such, the ability to detect the primary predator of CIB through passive acoustic monitoring is poor. Harbor porpoises were detected throughout the inlet, except in Knik

Arm, at high rates throughout the year. This extensive distribution of harbor porpoises raises the question of possible competition for prey with CIB, as does the presence of harbor seals in the inlet.

3. Ambient noise levels, both natural and anthropogenic, were recorded at all moorings throughout the Cook Inlet. The total acoustic energy of the ambient noise varied seasonal at individual sites and among sites. At some sites, particularly in Knik Arm, the variability was strongly associated with the tide cycle, whereas at other sites the influence of tide was much less (i.e., the lower inlet). Additionally, the source of the ambient noise varied among sites, with greater anthropogenic noise at the Cairn Point and Fire Island sites. The detection of belugas was relatively low at Cairn Point, considering the site is a natural 'bottleneck' through which belugas must pass when entering or leaving Knik Arm. The relatively high ambient noise Cairn Point may have masked the ability to detect beluga calls, or, the acoustic behavior of CIB may have changed, shifting to higher frequencies above the lower frequencies of ambient noise.

4. A specific type of acoustic signal, known as a 'terminal buzz' was detected at Beluga River. This acoustic signal is indicative of foraging behavior in other odontocetes, including narwhals. If terminal buzzes are associated with foraging of beluga whales, the scope of passive acoustic monitoring can be expanded to gain an understanding of the temporal and spatial patterns of CIB foraging ecology, and when combined with prey assessment, the diet of CIB.

5. In collaboration with other scientists conducting research on CIB, concurrent data on the behavior of whales (e.g., traveling, milling, feeding) was obtained with acoustic behavior. Examining visual and acoustic behavior for relationships will permit inferences on CIB behavior from acoustic data collected at all sites. For example, if acoustic and visual data collected at Eagle Bay (Knik Arm) indicates that whales make a specific type of sound when traveling in contrast to a different sound with milling in a relatively small area, that relationship can be applied to the acoustic data from other sites to infer the whales' behavior in the absence of visual data.

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