Acoustic Monitoring and Prey Association for Beluga and Harbor Porpoise off Two River Mouths in Yakutat Bay, Alaska

BACKGROUND

Little is known about the ecology of beluga and harbor porpoise in Yakutat Bay. Various human activities occur in their habitat including cruise ship visits, commercial fishing, marine geophysical surveys, seal hunting, and scientific activities, but none of these have been evaluated for potential impacts on this small and isolated population. Improving knowledge of Yakutat’s beluga and porpoise seasonal distribution and habitat use is needed to better evaluate the potential effects of anthropogenic activities and to define proper conservation management measures.

OBJECTIVES

To determine beluga and harbor porpoise seasonal and geographic usage of the waters around two river mouths, Eisker Creek and Grand Wash, in Yakutat Bay, and whether their presence near these river mouths was related to potential prey field

METHODS

ACOUSTIC DATA

Three acoustic moorings with echolocation loggers (C-POD, Chelonia Ltd.) deployed on June 2012. Beluga and porpoise detection results were converted into detection positive hours (hours with at least one echolocation click train, DPM). The percentage of feeding buzzes (Delhaurin et al. 2009, Castellote et al. 2013) over the total number of click trains detected per month for each species was calculated.

SALMON RUN DATA

A Coho salmon, Oncorhynchus kisutch, run occurred in Eisker Creek from 25 August until 5 October, and no salmon runs were detected in Grand Wash River (ADF&G).

FISHERY TRAWL DATA

Fish and invertebrate data collected in 2013 using bottom trawl at both Eisker Creek and Grand Wash River (Fig. 1). Catch data expressed as catch-per-unit-effort (CPUE), relative number of fish captured per trawl, and percentage of species (FO; relative number of tows in which species was captured) from all tows analyzed. CPUE/month of fish and invertebrate catch

RESULTS

![Figure 1](image1.png)

Figure 1. Disenchantment and Yakutat Bays, marking deployment locations (dots) and trawl transects (lines). Beluga catching a salmon. By R. Michael

![Figure 2](image2.png)

Figure 2. Detected positive hours (DPM) per day for beluga (black line) and harbor porpoise (gray line) for the full deployment period in A) Eisker Creek and B) Grand Wash River. In Eisker Creek, the coho salmon run period is denoted by a gray block with peak-run period by a dark gray block (note the different date scales between panels).

![Figure 3](image3.png)

Figure 3. Distribution of summed number of DPM for beluga and harbor porpoise by hour of day in Eisker Creek and Grand Wash River.

![Figure 4](image4.png)

Figure 4. A) Monthly values in Eisker Creek for overall CPUE for fish and invertebrates in June–August 2013 and DPM for beluga and porpoise in June–August 2012. B) Monthly values in Grand Wash River for overall CPUE for fish and invertebrates in March–August 2013 and DPM for porpoise in March–August 2012.

![Figure 5](image5.png)

Figure 5. Percentage of belugas and harbor porpoises foraging buzzes (DPM trains containing terminal buzzes with ID between 1 and 2 ms) per month in Eisker Creek and Grand Wash River.

![Figure 6](image6.png)

Figure 6. Median, percentiles, and maximum/minimum DPM/day for A) beluga and B) harbor porpoise, and the salmon run period (pros–pros–pros) in Eisker Creek.

![Table 1](image7.png)

Table 1. Total catch, mean catch-per-unit-effort (CPUE, unit = tow) and percent frequency of occurrence (FO) of fish and invertebrates data captured with a bottom trawl in Eisker Creek and Grand Wash River, Yakutat Bay, Alaska. A total of 24 transects were made during June–August 2013 at Eisker Creek (n = 10) and March–August 2013 at Grand Wash River (n = 14).

![Table 2](image8.png)

Table 2. Summary of catch data from Eisker Creek and Grand Wash River for fish and invertebrates in March–August 2013 and DPM for porpoise in March–August 2012.

DISCUSSION

BELUGA

- Eisker Creek is important during summer. Belugas do not leave Disenchantment Bay in fall but may move to another area north or northeast of Eisker Creek.
- Beluga travel to waters offshore, primarily in the coastal area.
- Belugas are not present in Grand Wash River.
- Beluga are considered to be of biological value for the survival of this population.

HARBOR PORPOISE

- DPM higher at Grand Wash River, seasonally (Fig. 2) and daily (Fig. 3). Both areas are frequented by porpoise, changes in fish and/or invertebrate diversity or abundance may not affect foraging resources for porpoise, reinforcing the opportunistic nature of this species foraging behavior.
- Known prey: cragion shrimp very abundant in both areas.
- New prey: mysids, pink shrimp and dungeness crab very abundant. The single porpoise stomachs available data to date showed a significant amount of shrimp, primarily cragion shrimp (SPDFG). Also abundant and ubiquitous were Pacific tomcod, longfin smelt, and snake porpoise. These could be part of the will be part of the Yukatam beluga diet.
- Harbor porpoise might actively avoid Eisker Creek when belugas are present. The opposite diet pattern between both species in Eisker Creek and the lack of a pattern in Grand Wash River for harbor porpoise suggests competitive overlap in prey between beluga and harbor porpoise, which share common prey.
- Foraging behavior may displace harbor porpoise during peak salmon run in Disenchantment Bay area (Fig. 6).

CONCLUSIONS

Passive acoustic monitoring of Yukatam beluga and harbor porpoise is feasible and effective. Beluga likely inhabits Disenchantment Bay year-round, seldom venturing into southern areas of Yakutat Bay. Coho salmon run in Eisker Creek might be a significant driver for beluga and merits further consideration because this area could be of biological value for the survival of this small beluga population of beluga.

Actual catches in Eisker Creek and Grand Wash River

Yukatam beluga potential prey: Coho salmon, Pacific tomcod, snab absolut, northern rock sole, cragion shrimp, pink shrimp, mysids, and dungeness crab.

Yukatam harbor porpoise potential prey: Pacific tomcod, longfin smelt, capelin, snab absolut, cragion shrimp, pink shrimp, and mysids.

Some of these taxa have not yet been described as part of the beluga or harbor porpoise diet in Alaska. The results presented here support the notion that both species are highly opportunistic in their feeding habits and invertebrates might be an important part of both beluga and harbor porpoise diets in Yakutat Bay.

LITERATURE CITED


Delhaurin, S. L., A. B. Groth, G. O’Corry-Crowe, E. Komarek, and T. Hilton. 2013. Echinopis bychkovi (Chelonia Ltd.) deployed on June 2012. Beluga and porpoise detection results were converted into detection positive hours (hours with at least one echolocation click train, DPM). The percentage of feeding buzzes (Delhaurin et al. 2009, Castellote et al. 2013) over the total number of click trains detected per month for each species was calculated.

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