Harbor Porpoise Hotspot: Halibut Cove Lagoon

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Introduction

Kachemak Bay, which leads into Cook Inlet, is one of the most productive and biodiverse bays in the subarctic[1] and experiences some of the largest tidal shifts in the world. Glacial runoff and freshwater streams dispense into the inner part of the bay and increase productivity[2]. This may be the reason schooling fish are more abundant and diverse in this area[3]. Our main study area is in Halibut Cove Lagoon (HCL; Fig. 1), located in a protected portion of the inner bay, where all these factors are important when studying harbor porpoise (*Phocoena phocoena*; HAPO) behavioral ecology. This species breeds year round. Due to the energy cost for pregnant females, there is an indication of site fidelity to highly productive foraging areas[4]. This lagoon is around 230 ft. deep however, the channel is much shallower and can only be accessed by boat at higher tides. This study site is known for consistent harbor porpoise activity, as well as the amount of appealing factors for marine mammals such as: limited human activity, higher food abundance, and a sheltered area from the elements. Students conducted marine mammal surveys, specifically targeting harbor porpoises, en route to/from and in HCL (QR Code). These surveys included behavioral observations and photographs used to monitor the marine mammals in Kachemak Bay.

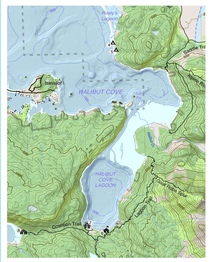


Figure 1. Map of HCL.

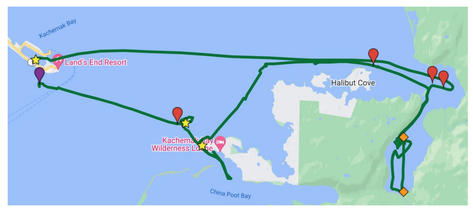
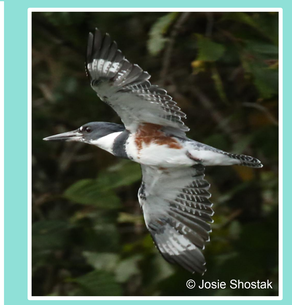


Figure 2. Track line from day 2. Day 1 track was similar to day 2. Yellow: Locations (Homer Harbor, Gull Island, China Poot), Purple: Minke whale, Red: Sea otter rafts, Orange: Transect line start and end.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Methods & Materials

Dates: September 24th and 25th, 2022

Locations in Kachemak Bay: Green Can, Gull Island, China Poot Bay, HCL (Fig. 2)

- Transect line completed from HCL entrance to pier (Fig. 3)
- Marine mammal count (minimum, maximum, and best) and behavior observed and recorded by students
- Species seen included a minke whale (*Balaenoptera acutorostrata*), HAPOs, sea otters (*Enhydra lutris*; SEOT), harbor seals (*Phoca vitulina*; HASE), and birds
- All data collected from 50+ m away due to lack of permit

- Canon 5D Mark 3, 100-400mm len + 1.4x extender; Canon EOS Rebel XS, Tamron 18-400 F/3.5-6.3 lens; Canon EOS R5, Canon EF 100-400 1:4.5-5.6 L IS II USM lens; Nikon D500, Sigma 150-600mm lens; Sony RX10IV, Zeiss Vario-SonnarT* 2.4-4/8.8-220 lens; Nikon D3500, Nikon DX VR AF-P 18-55mm 1:3.5-5.6G lens; Lumix GH 5, Olympus 100-400 1:5.0-6.3 & Lumix T:0.24m/0.79ft-∞ lens
- GoPro 10
- iPhone 13
- 8X42 Vortex Crossfire HD binoculars
- Garmin GPS 12
- Behavioral ecology data sheets

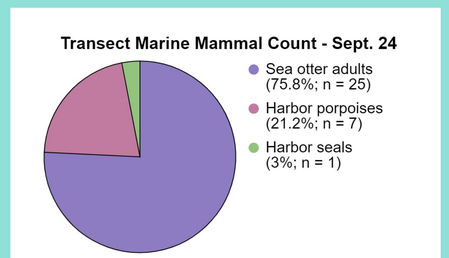

Figure 3. Pie charts showing marine mammal diversity along transect surveys in HCL.

Results

Complete Species Statistics

September 24th:
- SEOT – Min: 138, Max: 160, Best: 150
- HASE – Min: 9, Max: 9, Best: 9
- HAPO – Min: 7, Max: 12, Best: 9
- Birds – 12 species

September 25th:
- SEOT – Min: 126, Max: 151, Best: 140
- HASE – Min: 9, Max: 9, Best: 9
- HAPO – Min: 4, Max: 6, Best: 5
- Minke – Min: 1, Max: 1, Best: 1
- Birds – 10 species


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HAPO Photo Identification

- Photo ID features: dorsal fin shape; trailing edge of fin; scars, lesions, and notches on body; thoracic patch; overall coloration[4] (Fig. 4)
- All HAPOs assigned unique ID number and added to catalog (QR Code)
- 1 HAPO (22003) was seen during both surveys and was previously seen in HCL and Kasitsna Bay, which is the 2nd HAPO resighting in Kachemak Bay[5]
- 22003 had a pointed dorsal fin with a v-shaped notch (Fig. 4A)
- 22003 believed to be female due to presence of calf (Fig. 5)


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Figure 5. 22003 and calf.

HAPO Mating Behavior

- HAPOs have unique aerial mating behavior
- Male approaches female from left side
- Females do body roll or throw tail fluke if they are not interested[6]
- Calves present may be briefly separated from mother without harm
- 6 documented mating behavior events in Alaska (Fig. 6)


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Figure 6. Mating behavior 9/24/22.

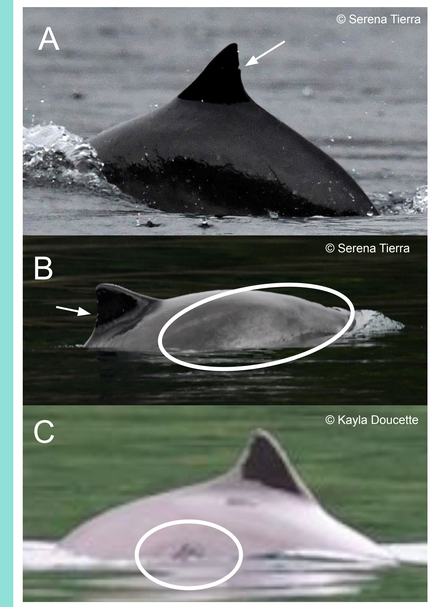
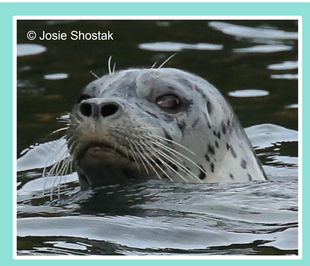


Figure 4. ID photos of 3 HAPOs. **A.** An individual with a notched dorsal fin. **B.** An individual with a light thoracic patch and distinct dorsal fin. **C.** An individual with lesions on its body.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Raw data

HAPO catalog

Acknowledgements

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