



Seasonal prey use and partitioning of sympatric whale species in a Kodiak, Alaska embayment

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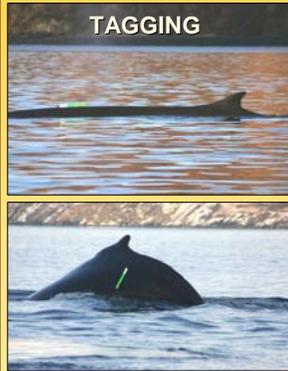
ABSTRACT: Between late November 2007 and late January of 2008, personnel from multiple agencies conducted a study of the interactions between sympatric whale species (humpback and fin whales), their habitat, and seasonally abundant prey aggregations within Uganik Bay on the west side of Kodiak Island, Alaska. The multi-disciplinary research approach involved synchronous exploration of diving habits of fin and humpback whales through tag attachments, documentation of the distribution and abundance of prey resources through systematic hydroacoustic and trawl surveys, and documentation of relative abundance and distribution of whales throughout Uganik Bay through the study period. Humpback whales were observed more frequently than fin whales during daily skiff surveys of the bay, but the number of sightings of both species declined between December 2007 and late January 2008. Hydroacoustic surveys conducted during this period produced estimates of "herring" and "non-herring" backscatter (m^2/Nm^2) along broad-scale, bay-wide transects and fine-scale, whale-focused grids. Herring backscatter was greater than non-herring backscatter, but non-herring backscatter increased slightly between surveys while herring backscatter declined. Herring schools were dominated by old (average age 5+ years) and large (average >28 cm) herring. Numerically dominate zooplankton taxa within the non-herring backscatter were determined to be copepods, chaetagnaths and euphausiids. Acoustic time depth transmitter tags were affixed to one fin and one humpback whale during this period. The maximum depth of dives recorded for these whales showed a significant positive relationship with non-herring backscatter ($r^2 = 0.54, p < 0.001$) and no significant relationship with herring back scatter ($r^2 = 0.01, p = 0.60$), suggesting that both species were targeting non-herring prey and not schools of herring. We hypothesize that whales may have favored non-herring over herring due to the relatively large size and low density of herring

OBJECTIVES

- Explore diving habits of fin and humpback whales through real-time acoustic tag attachments.
- Document the distribution and abundance of prey resources through systematic vessel surveys utilizing hydroacoustic and trawl methodologies.
- Document the relative abundance and distribution of whale species in Uganik Bay in early winter.



WHALE DIVE PATTERNS



TAGGING

One fin and one humpback whale were affixed with acoustic time depth transmitter (ATDT) tags that relayed real-time dive depth data to a following vessel. During attachment periods, 34 total dives were recorded.

The fin whale dove to an average maximum depth of 118.4m; dives lasted an average of 5.3 min.

The humpback whales dove to an average maximum depth of 125.7m; dives lasted an average of 7.2 min.

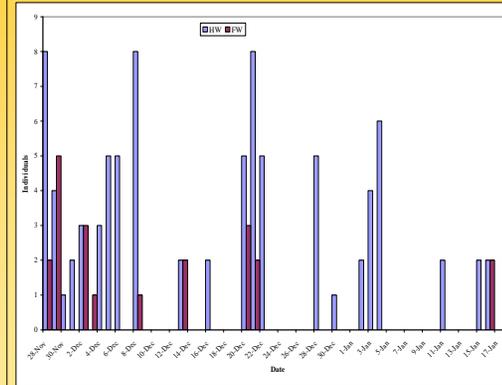
PREY SURVEYS

The Alaska Department of Fish and Game vessel, *R/V Resolution*, conducted hydroacoustic surveys of Uganik Bay to document relative backscatter of prey within the bay.

Pelagic volume backscatter (m^2/Nm^2) was estimated with a BioSonics DT-X with a split beam 200kHz transducer. Midwater trawl tows were conducted and targeted schools of Pacific herring in localized areas. Length and weight measurements were taken from a random subsample of collected herring. Tucker trawls were deployed to assess relative species composition of zooplankton.



EARLY WINTER WHALE PRESENCE IN UGANIK BAY

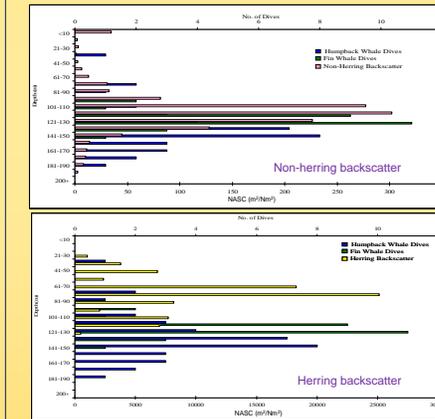


Humpback (HW) and fin whales (FW) were photographed and individually identified during skiff and acoustic prey surveys conducted between 28 November 2007 and 21 January 2008.

Humpback whales were sighted throughout the study period, while fin whales had generally moved out of the bay by the start of January.

The overall number of whale sightings diminished throughout the period with an overall peak seen in late December.

DEPTH of WHALE DIVES vs PREY BACKSCATTER

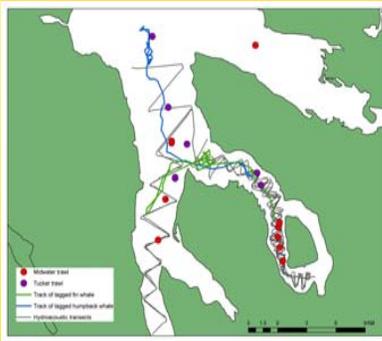


Two categories of acoustic backscatter were recorded: herring and non-herring. Mid-water and tucker trawls revealed most non-herring backscatter could be attributed to zooplankton.

Comparison of backscatter to the frequency of dives for the tagged whales by 10 m depth bins showed that both species of whales appeared to have targeted non-herring prey.

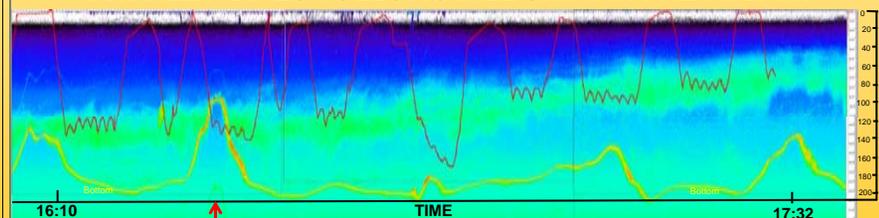
Regression analysis showed a significant positive relationship between depth of dive of tagged whales and the distribution of non-herring backscatter ($r^2 = 0.54, p < 0.001$) and a non-significant relationship with herring backscatter ($r^2 = 0.01, p = 0.60$).

WHALE - PREY OVERLAP



Tracks of the tagged fin (green line) and humpback whale (blue line) traversed Uganik Bay in areas where hydroacoustic and trawl surveys (midwater and tucker trawl) were used to document relative prey distribution.

A WHALE'S DIVES FOLLOWS DIEL SHIFT IN PREY DEPTH



Humpback whale dive depths (solid red line) recorded via ATDT and overlaid on acoustic backscatter (green diffuse band), 5 December 2007. Whale dive depths (meters on y-axis) are shown to correspond to the distribution of a layer of backscatter as it migrates up in the water column following sunset (↑ on x-axis).

