Spatio-Temporal Distribution of Fin Whales in the Bering Sea, 2007-2011

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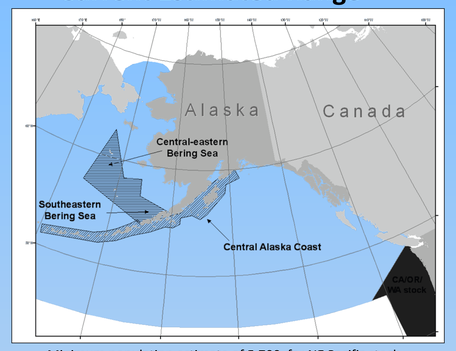
ABSTRACT

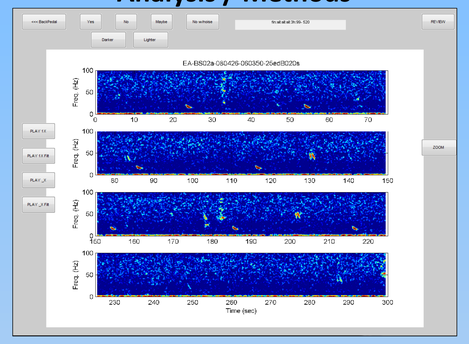
The National Marine Mammal Laboratory has been collecting passive acoustic recordings of vocalizing marine mammals throughout much of the southeastern Bering Sea since 2000. The present analysis combines these recordings with those obtained in 2007 from a North Pacific Research Board-funded study (Stafford and Mellinger) to determine the long-term spatio-temporal distribution of fin whales throughout the Bering Sea shelf. A total of 28 moorings (19 Autonomous Underwater Recorders for Acoustic Listening (AURALs); 9 Ecological Acoustic Recorders (EARs)) were deployed year-round from October 2007 to September 2011 at varying depths and locations along the Bering Sea shelf, from Umnak Pass to just south of St. Lawrence Island. Preliminary analyses show an annual southward movement of calling fin whales in winter, seemingly associated with the expanding ice edge; these results will be compared with 1-day composite ice cover measured by the Advanced Microwave Scanning Radiometer for the Earth Observing System (NOAA Coastwatch). Furthermore, the results show a considerably lower number of calls detected south of St. Matthews compared to the other mooring locations. In addition, overall fin whale seasonal calling trends along and between the 50m and 70m isobaths, and the species' use of Umnak Pass and Unimak Pass will be described.

Current Estimated Range

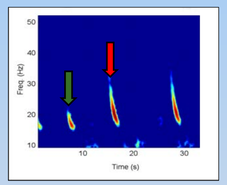


Minimum population estimate of 5,700 for NE Pacific stock
(*Moore et al 2002 & Zerbini et al. 2006*)

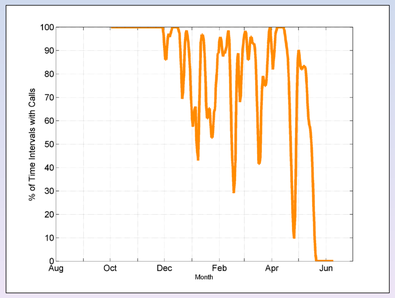
Analysis / Methods



MATLAB SoundChecker YES/NO/MAYBE, Bandwidth: 0-100 Hz Window duration: 5 mins, Interval : Aural 3hr bin/EAR analyze all

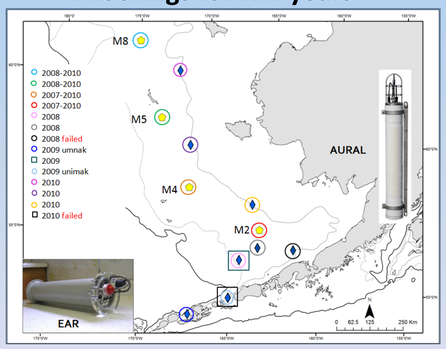


15-Hz backbeat: Freq range: avg 8-25 Hz, Interval: 2-20 sec, Duration: 1-1.5 sec
20-Hz pulse: Freq range: avg 15-45 Hz, Interval: 10-20 sec, Duration: 1-1.5 sec
Other pulses: Freq range: avg 20-42 Hz, Interval: 10-20 sec, Duration:1-4 sec



All plots x-axis representing time in months, and y-axis representing the percent of time intervals with calls. Analysis was done in 3 hr intervals with each plot representing a 3 day moving average.

Moorings for ALL years



Passive acoustic recordings from

- Mellinger & Stafford (NPRB), 2006-2007
- National Marine Mammal Laboratory,
  - 2007-2011: Phyllis Stabeno's PMEL moorings
  - 2008-2010: EAR moorings

AURAL and Haruphones (HA)

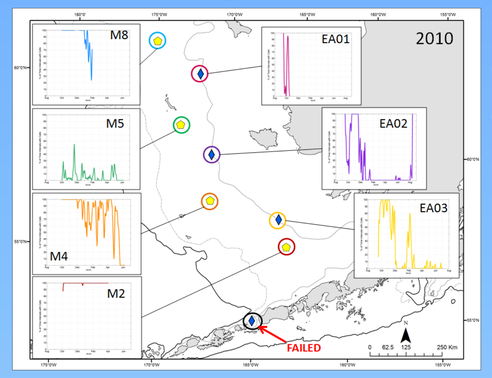
- 70 m isobath
- Sampling rate: AURAL (8192 Hz), Haruphone (2000 Hz)
- Duty cycle: *30-99%*

EAR moorings, M. Lammers

- Depth: ranges 48-161 m isobath
- Sampling rate: 4000 Hz
- Duty cycle: 6.7-11%

Results/Conclusions

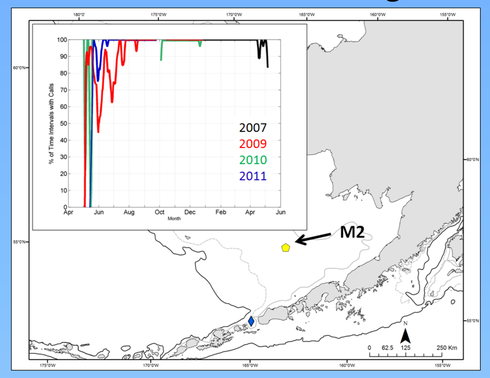
Peak calling distributions



- Peak percent time intervals with calls from August - January
- Consistent for all mooring except for M5
- Trend seen in all years (2010 shown here)

FINS ARE CONSTISTENTLY CALLING IN THE BERING SEA DURING FALL AND WINTER

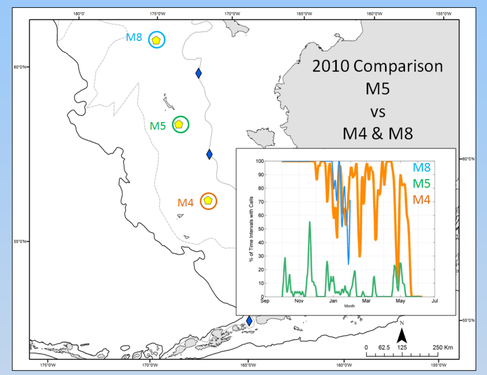
M2 has most calling

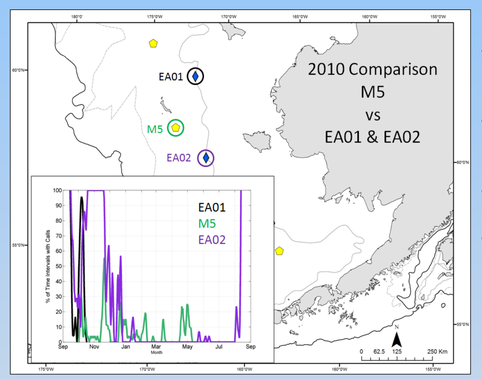


- High percentage of intervals with calling for most of year
- Trend seen in all years
- This location has the highest percentage of calling for right whales as well.

IMPORTANT LOCATION FOR MARINE MAMMALS

M5 has least amount of calling

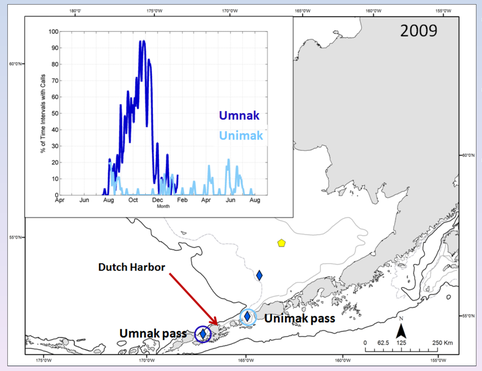




- **70 m isobath comparison (left)** Lower percent of time with calls at M5 than at M4 and M8 (consistent with all years). Peak percent on M5 barely reaches 50%.
- **50 m isobath comparison (right)** Even with 100% of time intervals with calls at EA02 (closest to M5) there are few at M5
- This trend seen in other years and for multiple species in this location
- Oceanographic studies have shown M5 is neither truly benthic water nor truly shelf water.

LOWEST % TIME WITH CALLS CORRESPONDS WITH THE "EL CAMINO" OF OCEANOGRAPHIC WATERS.

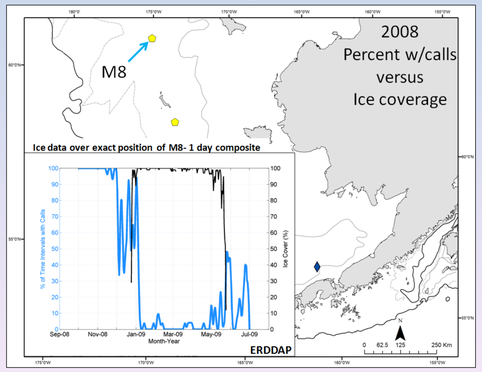
Pass Use



- **Umnak pass** Peak in the month of October that reaches over 90%
- **Unimak pass** Consistently low detection rate throughout its recording
- Only have one year with recorders in both locations

2009 STRONG PEAK AT UMNAK PASS VERSUS LOW TREND AT UNIMAK PASS

Ice Comparison



- Shows an inverse relationship between detections and ice coverage.
- Pattern has been seen on other moorings and other years

FEWER DETECTIONS WITH ICE

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