

BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies

Region: Alaska

Planning Area(s): Beaufort Sea, Chukchi Sea

Title: Bowhead Whale Feeding Variability in the Western Alaskan Beaufort Sea: Oceanography and Feeding (AK-06-01; AK-10-02)

BOEM Information Need(s) to be Addressed: With additional information on the importance of the study area to feeding bowhead whales, and a better understanding of potentially predictable factors that correlate with variations in whale behavior, alternative mitigation options for future Beaufort Sea lease sales may be feasible. Also, this study addresses a conservation recommendation in NMFS' 2001 *Arctic Region Biological Opinion* to study "the use of the Beaufort Sea by feeding bowheads and assess the importance of this feeding to the health and well-being of these animals." Information from this study will be used for permit approvals for all Beaufort Sea Lease Sales and NEPA analysis and documentation for Beaufort Sea Lease Sales, EPs and DPPs.

Total Cost: \$6,887,320 plus Joint Funding **Period of Performance:** FY 2006-2013

Conducting Organization: NMFS NMML, WHOI, UAF, URI, NSB, OSU, UW

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Description:

Background: A previous MMS study estimated the extent to which the bowhead whale population utilizes OCS areas in the eastern Alaskan Beaufort Sea for feeding, as well as that area's importance to individual whales. Additional research on this subject has been requested particularly at locations other than those included in the previous study. In a 2001 Arctic Region Biological Opinion NMFS made a Conservation Recommendation that MMS (now BOEM) continue to study "the use of the Beaufort Sea by feeding bowheads and assess the importance of this feeding to the health and wellbeing of these animals." Other stakeholders have recommended that MMS/BOEM expand the scope of the research to include the entire Alaskan Beaufort Sea.

In this study, emphasis will be placed on achieving an understanding of the factors enhancing or limiting the expression of feeding behavior in various locations in the western Alaskan Beaufort Sea. Implicit to the proposed study is the assumption that feeding by bowhead whales occurs with some degree of regularity during August-October the western Beaufort Sea study area. It is further assumed that variation in feeding behavior potentially results from any, or all, of a variety of environmental and behavioral variables including, but not limited to: sea ice coverage, oceanographic conditions, prey concentrations, and movements by whales, potentially from summering areas in both the Beaufort Sea and Chukchi Sea. By understanding how such factors are related to bowhead feeding in western Beaufort Sea locations near offshore oil and gas leases, BOEM would be in a better position to mitigate potential effects of such actions on bowheads and their populations.

Objectives: To better understand the relationship between feeding and environmental and behavioral variables on the timing and spatial extent of bowhead feeding in the western Alaska Beaufort Sea; specifically to:

- Document the movements of whales of various ages, sexes, and reproductive status from the Beaufort Sea and Chukchi Sea within the study area.
- Document feeding behavior and prey utilization by bowheads at locations in the western Alaska Beaufort Sea with emphasis on timing and dynamics/variability.
- Document variability in locations and densities of potential prey of bowhead whales.
- Estimate variability of physical oceanographic conditions associated with concentrations of bowheads and their prey.
- Integrate results from this study with previous results from other sources to develop a dynamic model of bowhead feeding behavior in the western Alaska Beaufort Sea.
- Synthesize existing results and conclusions in a scientifically reviewed monograph to be published in an appropriate journal or other similar outlet.

Methods: This study will be conducted over geographic and temporal scales sufficient to include normal variability associated with environmental phenomena including local currents and upwellings, variation in ice conditions, and el Nino. The study area will be encompassed by the polygon bounded by the shoreline, 100 m isobath, 152° W and 155° W meridians.

Collaborations will be developed among whaling captains, AEWG, NSB, ADF&G, NMFS, BOEM and other interested parties to clarify roles in research permitting, co-sponsorship and implementation. Based on preliminary observations of locations of bowhead feeding having high potential for more comprehensive study and analysis, project planning and research would be initiated using logistics and field methods including, but not limited to, those similar to those used to accomplish the previous eastern Alaskan Beaufort Sea bowhead feeding study. These could include placement of permanent moorings for passive acoustic and sea-water current, temperature and salinity monitoring, fieldwork such as analyses of stomach contents at Barrow and Cross Island, behavioral observations by aircraft, bowhead tagging from Native operated boats, plankton tows by small vessel, stable isotope ratios in baleen layers, fatty acid comparisons, recording of traditional knowledge, and computer modeling of feeding information. Real-time distribution of whales in the Beaufort Sea, as well as historic information on bowhead whale feeding activity in the study area, would also be provided by the ongoing BOEM *Bowhead Whale Aerial Survey Project*. The study would be carefully coordinated with the AEWG and Whaling Captains Associations in Barrow, Nuiqsut and Kaktovik to avoid interference with fall subsistence hunts and, where feasible, to involve whaling communities in the conduct of the study.

Current Status: Ongoing

Final Report Due: September 2013

Publications/Presentations Completed:

- Ashjian, C.J., Campbell, R.G., Okkonen, S.R., Sherr, B.F., Sherr, E. B. 2011. Year-to-year variability of ocean conditions across Barrow Canyon and the western Beaufort Shelf: 2005-2010. Oral presentation. Alaska Marine Science Symposium, Anchorage Alaska, January 17-21, 2011.
- Berchok, C. L., K. M. Stafford, S. L. Grassia, J. L. Crance, D. K. Mellinger, S. Heimlich, S. E. Moore, J. C. George, F. Brower. Passive Acoustic Monitoring. Oral Presentation. . Alaska Marine Science Symposium, Anchorage Alaska. January 17-21, 2011.
- Grassia, S. L., C. K. Berchok, P. Clapham. 2012. Interannual Temporal and Spatial Distribution of Bowhead Whales in the Western Beaufort Sea: 2007-2010. Oral presentation, Alaska Marine Science Symposium, Anchorage, AK; January 2012.
- Grassia, S. L., C. L. Berchok, D. L. Wright, M. O. Lammers. 2011. Interannual temporal and spatial distribution of bowhead whales in the Western Alaskan Beaufort Sea; 2007-2010. Oral Presentation. Acoustic Society of America Conference, San Diego, CA. Oct 31- Nov. 4, 2011.
- Grassia, S., C. Berchok, D. Wright, and P. Clapham. 2012. Interannual temporal and spatial distribution of bowhead whales in the western Alaskan Beaufort Sea; 2007-2010. Poster. 2011 Nov 28-2 Dec: Biennial Marine Mammal Conference in Tampa, Florida:
- Grassia, S., C. Berchok, D. Wright, and P. Clapham. 2012. Interannual temporal and spatial distribution of bowhead whales in the western Alaskan Beaufort Sea; 2007-2010. Poster. 2012 Jan 16-20: Alaska Marine Science Symposium, Anchorage, AK.
- Horstmann-Dehn, L., C. George, G. Sheffield, and M. Baumgartner. 2011. Bowhead whale feeding efficiency – making a living in the Arctic. Poster. 2011 Nov 28-2 Dec: Biennial Marine Mammal Conference in Tampa, Florida
- Horstmann-Dehn, L., C. George, G. Sheffield, and M. Baumgartner. 2011. Bowhead whale feeding efficiency – making a living in the Arctic. Poster. 2012 Jan 16-20: Alaska Marine Science Symposium, Anchorage, AK.
- Lysiak, N., M. Baumgartner, and J.C. George. 2011. Correlating shifting baselines in the Arctic to long-term bowhead whale isotope records. Poster. 2011 Nov 28-2 Dec: Biennial Marine Mammal Conference in Tampa, Florida.
- Lysiak, N., M. Baumgartner, and J.C. George. 2012. Correlating shifting baselines in the Arctic to long-term bowhead whale isotope records. Poster. 2012 Jan 16-20: Alaska Marine Science Symposium, Anchorage, AK.
- McEachen, H.J., S.R. Okkonen, and R.R. Hopcroft. 2012. Measuring Arctic zooplankton advection in the Bering and Chukchi Seas. Poster. 2012 Jan 16-20: Alaska Marine Science Symposium, Anchorage, AK.
- Mocklin, J., L. Vate Brattström, K. Shelden, K. Goetz, and D. Rugh. 2012. Results from five years of aerial surveys during the Bowhead Whale Feeding Ecology Study (BOWFEST) off Barrow, Alaska. Poster. 2012 Jan 16-20: Alaska Marine Science Symposium, Anchorage, AK.
- Mocklin, J. A. 2009. Evidence of bowhead whale feeding behavior from aerial photography. AFSC Processed Rep. 2009-06, 118 p. Alaska Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, 7600 Sand Point Way NE, Seattle WA 98115. (.pdf, 7.25 MB). <http://www.afsc.noaa.gov/Publications/ProcRpt/PR2009-06.pdf>.

- Mocklin, J. A., L.V. Brattstrom, K. E. W. Sheldon, K. T. Goetz, D. Rugh. 2012. Barrow, Alaska: Pit Stop on the bowhead Highway? Results from Aerial Surveys During Bowhead Whale Feeding Ecology Study (BOWFEST). Poster Presentation at Alaska Marine Science Symposium, Anchorage, AK; January 2012. *Mocklin, J., L. Vate Brattström, K. Sheldon, K. Goetz, and D. Rugh. 2011. Barrow, Alaska: Pit stop on the bowhead highway? Results from aerial surveys during the Bowhead Whale Feeding Ecology Study (BOWFEST). Poster. 2011 Nov 28-2 Dec: Biennial Marine Mammal Conference in Tampa, Florida.
- Mocklin, J.A., D.J. Rugh, S.E. Moore, and R.P. Angliss. In press. Using aerial photography to investigate evidence of feeding by bowhead whales. *Marine Mammal Science*.
- Mocklin, J, L. Vate Brattström, K. Goetz, and D. Rugh. Advanced techniques for improving aerial photography of whales. Poster. Alaska Marine Science Symposium, Anchorage Alaska. January 17-21, 2011.
- Mocklin, J, K. Goetz, D. Rugh, and L. Vate Brattström. BOWFEST aerial survey 2010. Poster. Alaska Marine Science Symposium, Anchorage Alaska. January 17-21, 2011.
- Okkonen, S. R., C. J. Ashjian, R. G. Campbell, W. Maslowski, J. L. Clement-Kinney, and R. Potter (2009), Intrusion of warm Bering/Chukchi waters onto the shelf in the western Beaufort Sea, *J. Geophys. Res.*, 114, C00A11, doi:10.1029/2008JC004870.
- Okkonen, S.R., Ashjian, C.J., Campbell, R.G. Does the Alaska Coastal Current carry krill to the Arctic? Poster. Alaska Marine Science Symposium, Anchorage Alaska. January 17-21, 2011.
- Okkonen, S.R., D. Jones, C. Ashjian, M. Baumgartner, R.G. Campbell, J. Citta, J.C. George, K. Goetz, W. Maslowski, J. Mocklin, D. Rugh, L. Quakenbush, K. Stafford, and L. Vate Brattström. 2012. A year in the life of the bowhead whale: an educational outreach product in calendar format. Poster. 2012 Jan 16-20: Alaska Marine Science, Anchorage, AK.
- Smultea, M. A., D. Fertl, D. J. Rugh, C. E. Bacon. 2012. Summary of Systematic Bowhead Surveys Conducted in the U.S. Beaufort and Chukchi Seas, 1975-2009. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-237, 48 p. Online. (.pdf, 851 KB). <http://www.afsc.noaa.gov/Publications/newPubs.php>
- Stafford, K., S. Moore, and C. Berchok. 2012. Acoustic detections of bowhead and beluga whales in the Beaufort Sea and the Chukchi Plateau 2008-2009. Poster. 2012 Jan 16-20: Alaska Marine Science Symposium, Anchorage, AK.
- Vate Brattström, L., K. Goetz, D. Rugh, C. Ashjian, S. Okkonen, and R. Campbell. Bowhead whales feeding in echelon formation. Poster. Alaska Marine Science Symposium, Anchorage Alaska. January 17-21, 2011.
- Wright, D. L. 2011. Short term interannual comparison of bowhead whale (*Balaena mysticetus*) calls off Barrow, AK in the Western Alaskan Beaufort Sea during fall; 2008-2010. Oral Presentation. Hollings Scholar Final Presentation. Aug. 1, 2011.

Affiliated WWW Sites:

<http://www.boem.gov/akstudies/>

http://www.afsc.noaa.gov/nmml/species/species_bowhead.php#research

ftp://ftp.afsc.noaa.gov/posters/pRugh04_bowfest.pdf

ftp://ftp.afsc.noaa.gov/posters/pMocklin02_bowhead-feeding.pdf

ftp://ftp.afsc.noaa.gov/posters/pGoetz02_bowfest.pdf

ftp://ftp.afsc.noaa.gov/posters/pMocklin01_bowhead-feeding.pdf

ftp://ftp.afsc.noaa.gov/posters/pGoetz01_aerial-surveys-bowhead.pdf

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ESPIS: Environmental Studies Program Information System

All *completed* ESP studies can be found

here: http://www.data.boem.gov/homepg/data_center/other/espis/espisfront.asp