Summary of Systematic Bowhead Surveys Conducted in the U.S. Beaufort and Chukchi Seas, 1975-2009

by
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by
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Jane Lubchenco, Under Secretary and Administrator
National Marine Fisheries Service
Eric C. Schwaab, Assistant Administrator for Fisheries

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ABSTRACT

Nearly 200 systematic studies involving bowhead whales (*Balaena mysticetus*) were conducted in the United States (U.S.) Beaufort and Chukchi seas from 1975 to 2009. Most (67%) of these studies were associated with monitoring and mitigation relative to offshore oil and gas exploration and development. A compilation of this information has been needed to determine anthropogenic impacts to the species throughout its range in Arctic and subarctic waters, including facts for required environmental impact assessment determinations. As a part of the Bowhead Whale Feeding Ecology Study (BOWFEST) conducted by the Alaska Fisheries Science Center’s, National Marine Fisheries Service (NMFS), National Marine Mammal Laboratory (NMML) for the Minerals Management Service (MMS) (now called Bureau of Ocean Energy Management [BOEM])¹, a comprehensive review and compilation was undertaken of all prominent scientific surveys that systematically recorded bowhead whales in the U.S. Beaufort and Chukchi seas from 1975 to 2008 (and some from early 2009). Given the cumulative number of such studies and the predicted continued growth of industrial activities in this region, our goals were to provide: (1) a summary for historical comparisons; (2) a format to integrate and track the studies; and (3) a publicly available starting point to identify data of relevance to ongoing work. To address these goals, we compiled a list synthesizing past and ongoing systematic sighting/acoustic detection studies on bowheads. This compilation included data derived from aerial surveys for whale distribution, aerial photography, ice- and shore-based census efforts, vessel-based and tagging efforts, and monitoring associated with offshore oil and gas exploration, development, and operations. This information is directly relevant to fulfilling the goals of current inter-disciplinary efforts to study bowhead ecology (e.g., BOEM-funded studies such as BOWFEST, Bowhead Whale Aerial Survey Project (BWASP), and

¹ The Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), formerly the Minerals Management Service (MMS), was replaced by the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) as part of a major reorganization on October 1, 2011.
Chukchi Offshore Monitoring in Drilling Area (COMIDA)) relative to ongoing, proposed, and anticipated offshore oil and gas activities in BOEM’s Beaufort and Chukchi Sea planning areas. Our intent is to provide a comprehensive resource to serve as a foundation for the integration of past and ongoing bowhead studies relative to industrial activities, mitigation, and management. It is also meant to assist and improve the flow of scientific information between interested entities and the public, leading eventually to an integration of research on bowhead whales.
INTRODUCTION

In 2006, the Minerals Management Service (MMS, now the Bureau of Ocean Energy Management, BOEM), provided funds to the National Marine Mammal Laboratory (NMML, a part of NOAA’s National Marine Fisheries Service [NMFS] at the Alaska Fisheries Science Center) to initiate a 5-year study of bowhead whale (Balaena mysticetus) feeding ecology (referred to as BOWFEST). Field operations for BOWFEST were conducted from 2007 to 2011 and involved a partnership of 17 scientists from 7 research institutions across the United States. As a part of the BOWFEST, a comprehensive review was conducted of all prominent scientific surveys that systematically recorded bowhead whales in the U.S. Beaufort and Chukchi seas from 1975 to 2008 (and some from early 2009). This review represents the best available information on bowheads needed to support environmental risk assessments, environmental impact assessments, and other pre-and post-leasing decision documents for potential gas and oil leasing in BOEM’s Beaufort and Chukchi Sea planning areas. A general map of such past, ongoing, and proposed activities is presented in Figure 1 to illustrate the extent and general geographic locations of these activities.
Figure 1. – Map of selected historical, current, and proposed oil and gas production activities in the U.S. Chukchi and Beaufort Seas. Associated marine mammal monitoring programs have contributed to systematic studies of bowhead whales along with projects funded by many other entities.
Examples of major entities funding bowhead whale systematic surveys and monitoring efforts include BOEM, U.S. and Canadian petroleum industries, National Marine Mammal Laboratory (NMML, NMFS, NOAA), North Slope Borough (NSB), Alaska Eskimo Whaling Commission (AEWC), Alaska Department of Fish and Game (ADFG), National Science Foundation (NSF), and Indian and Northern Affairs, Canada (INA). Controversies surrounding marine mammal issues demonstrate the complexity of managing and protecting bowhead whales (Shelden and Rugh 1995, Rugh et al. 2003). Bowhead whales, which are classified as an endangered species, (Shelden et al. 2001), could be adversely affected by offshore oil and gas extraction in the Arctic. Bowhead whales hold special meaning for the native Inuit and Yupik peoples, and they serve as a supplementary food source for native people throughout much of the Arctic region (Anonymous 1985).

Given the cumulative number of such studies and the predicted continued growth of industrial activities in this region, our goals have been to provide: (1) a summary for historical comparisons; (2) a format to integrate and track the studies; and (3) a publicly available starting point to identify data of relevance to ongoing work.

METHODS

To address these goals, information was compiled on visual/acoustic detection studies that systematically recorded bowhead whales in the U.S. Beaufort and Chukchi seas from 1975 to 2008. Some studies from 2009 were also included that could be gathered prior to the original report’s completion date in 2009. For our purposes, “systematic” studies were defined as studies consisting of pre-planned scientific surveys with dedicated visual/acoustic monitoring effort of bowhead whales in the U.S. Beaufort and Chukchi seas. This compilation was derived from aerial surveys (both manned and unmanned) for whale distribution, aerial photography, ice- and shore-based census/tracking efforts, vessel-based and tagging efforts, and monitoring associated with offshore oil and gas exploration, development and operations. Studies were retrieved via online web searches, library database searches,
personal communications, reviewing the literature cited sections of reports, publications and books, and by soliciting scientists for copies of their resumes that included lists of published peer-reviewed journal articles as well as unpublished reports. Our primary goal was to list all documented studies and to provide a sample of publications associated with these studies. Thus, we did not provide an exhaustive list of all publications and reports regarding bowhead whales; rather, we provided a list of those that were referenced.

RESULTS

Our review indicates that at least 189 systematic studies involving bowhead whales were conducted in the U.S. Beaufort and Chukchi seas from 1975 to 2008, including some from 2009. Most (67%) of these studies were associated with monitoring and mitigation relative to offshore oil and gas exploration and development. These studies include many obscure and/or unpublished reports/datasets that are difficult to locate.

The results of our review are provided in Table 1 as a chronological listing. For each study, we provide information on the first year of the study, the study year(s), the primary study methods, the funding source, the name of the Primary Investigator (PI)/Point of Contact (POC), the research team name, the project title, a general description of the study, the study location, the seasonal or monthly timeframe, and a list of the some of the publications and reports generated though the study. The information is meant to provide a base from which interested parties can search for more detailed information regarding the research conducted.
Table 1. -- List of systematic scientific studies of bowhead whales conducted in the U.S. Beaufort and Chukchi Seas 1975-2008 and some studies from 2009¹.

<table>
<thead>
<tr>
<th>First Yr. of Study¹</th>
<th>Study Years</th>
<th>Method</th>
<th>Funding Source</th>
<th>PI / POC</th>
<th>Project Team</th>
<th>Project Title</th>
<th>Description</th>
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<td>First Yr. of Study</td>
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<tr>
<td>1978</td>
<td>1978</td>
<td>Vessel survey</td>
<td>NMML</td>
<td>M. Dahlheim</td>
<td>NMML</td>
<td>Vessel survey for bowhead whales in the Bering and Chukchi Seas</td>
<td>See Project Title</td>
<td>Chukchi &amp; Bering seas</td>
<td>June-July</td>
<td>Dahlheim et al. 1980</td>
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<td>1981</td>
<td>1981</td>
<td>Aerial</td>
<td>Dome Petroleum Ltd. and SOHIO AK Petrol Co.</td>
<td>R. Davis &amp; W.J. Richardson</td>
<td>LGL</td>
<td>Distribution, numbers and productivity of the W Arctic stock of bowhead whales in the E Beaufort Sea and Amundsen Gulf, summer 1981</td>
<td>Distribution, relative abundance and movements of bowheads on their summer range in the E Beaufort Sea; determine the length composition of the population.</td>
<td>E Beaufort &amp; Amundsen Gulf, Canadian Beaufort</td>
<td>Summer &amp; fall</td>
<td>Davis et al. 1982a,b</td>
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<td>1986</td>
<td>1986</td>
<td>Aerial</td>
<td>Shell Western E&amp;P Inc.</td>
<td>LGL</td>
<td>Systematic aerial surveys as part of study to investigate responses of migrating bowheads to an exploratory offshore drilling operation</td>
<td>Near Hammerhead &amp; Corona drill sites in Camden Bay, Beaufort Sea</td>
<td>2 Sept-9 Oct</td>
<td>Richardson and Thomson 2002; LGL and Greeneridge 1987, Johnson et al. 1986</td>
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<td>Vessel surveys</td>
<td>NSF</td>
<td>S. Moore</td>
<td>Joint Japanese-Russian-American (SAIC, NSB, University AK Fairbanks)</td>
<td>Marine mammal surveys conducted during Japanese-Russian-American Chukchi Sea Circulation Study Cruises</td>
<td>Vessel-based surveys focused around the drilling site to study distribution &amp; abundance of bowheads relative to exploratory offshore drilling operation</td>
<td>Chukchi Sea</td>
<td>Fall</td>
<td>Melnikov et al. 1998a,b; Melnikov and Zeh 2007; Moore 1992; Moore et al. 1995</td>
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<td>2005</td>
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<td>Aerial surveys and oceanography</td>
<td>NSF</td>
<td>S. Moore, C. Ashjian</td>
<td>NOAA, WHOI</td>
<td>Study of Northern Alaska Coastal System (SNACS)</td>
<td>Study of vulnerability of natural, human, and living systems of the coastal zone to current and future environmental changes in the Arctic</td>
<td>Near Pt. Barrow</td>
<td>Late summer</td>
<td>Moore et al. 2010</td>
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<td>2006 (see also 2007, 2008)</td>
<td>2006</td>
<td>Vessel, acoustic aerial</td>
<td>GX Technology</td>
<td>D. Ireland</td>
<td>LGL</td>
<td>Marine mammal monitoring and mitigation during open-water seismic exploration by GX Technology in the Chukchi Sea, October-November 2006</td>
<td>See project title</td>
<td>Chukchi Sea</td>
<td>Oct-Nov 2006</td>
<td>Ireland et al. 2007a</td>
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<td>Vessel</td>
<td>ConocoPhillips Alaska, Inc.</td>
<td>D. Ireland</td>
<td>Marine mammal monitoring and mitigation during open-water seismic exploration by ConocoPhillips Alaska Inc. in the Chukchi Sea, July-October 2006</td>
<td>See Project Title</td>
<td>Chukchi Sea</td>
<td>July-Oct 2006</td>
<td>Ireland et al. 2007b</td>
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<td>2007</td>
<td>2007, 2008, 2009</td>
<td>Aerial, vessel &amp; acoustic monitoring and oceanography</td>
<td>MMS</td>
<td>D. Rugh</td>
<td>Interagency agreement: MMS &amp; NMML/NMFS</td>
<td>Bowhead whale feeding ecology study (BOWFEST)</td>
<td>Multi-year focused on late-summer oceanography and prey densities relative to whale distribution over continental shelf waters. Goal is increased understanding of bowhead behavior and distribution to minimize potential impacts from petroleum development activities</td>
<td>&lt;100 miles N &amp; E of Pt. Barrow</td>
<td>Late summer</td>
<td>NMML 2008, 2009a,b, 2010; Goetz et al. 2008a,b, 2009a,b; Smultea et al. 2010; Rugh et al. 2010; Mocklin 2009; Mocklin et al. 2009, 2010</td>
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<td>2008</td>
<td>2008</td>
<td>Unmanned aircraft</td>
<td>Shell/ JIP</td>
<td>LGL</td>
<td>Unmanned aircraft</td>
<td>Compare UAV surveys to manned surveys</td>
<td>Marine mammal monitoring and mitigation during BP Liberty OBC seismic survey in Foggy Island Bay, Beaufort Sea, July-August 2008</td>
<td>Chukchi Sea</td>
<td>August</td>
<td>Koski et al. 2009b,c</td>
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<td>2008</td>
<td>Acoustic</td>
<td>NOPP</td>
<td>C. Ashjian</td>
<td>Episodic upwelling of zooplankton</td>
<td>2 recorders/Stafford; assoc. w/ BOWFEST</td>
<td>Near Barrow</td>
<td>Late Aug - early Sep</td>
<td>Ashjian et al. 2009, Ashjian and Baumgartner 2009</td>
<td></td>
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<tr>
<td>First Yr. of Study</td>
<td>Study Years</td>
<td>Method</td>
<td>Funding Source</td>
<td>PI / POC</td>
<td>Research Team</td>
<td>Project Title</td>
<td>Description</td>
<td>General Location</td>
<td>Time-frame</td>
<td>Reports and Publications</td>
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<tr>
<td>2008</td>
<td>2008, 2009</td>
<td>Aerial</td>
<td>MMS</td>
<td>J. Clarke, M. Ferguson</td>
<td>Interagency agreement: MMS &amp; NMML/NMFS</td>
<td>Chukchi Offshore Monitoring In Development Area (COMIDA)</td>
<td>Distribution and abundance of marine mammals in CSPA. Results to facilitate mitigation-related to oil and gas development</td>
<td>Chukchi Sea Planning Area (CSPA) NE Chukchi Sea</td>
<td>Mid June to mid Nov</td>
<td>Clarke 2009, Clarke et al. 2010a,b; MBC Applied Environmental Sciences 2007</td>
</tr>
</tbody>
</table>

Only 7 studies are included from 2009 as the contract ended in early 2009.

Table acronyms in alphabetical order: **ADFG** = Alaska Department of Fish and Game, **AEWC** = Alaska Eskimo Whaling Commission, **AK** = Alaska, **ARCO** = Atlantic Richfield Company (now ConocoPhillips), **ASRC** = Arctic Slope Regional Corporation, **AUV** = Autonomous Underwater Vehicle, **BOWFEST** = Bowhead Whale Feeding Ecology Study, **BP** = British Petroleum, **BPXA** = British Petroleum Exploration Alaska, **BWASP** = Bowhead Whale Aerial Survey Project, **CIAP** = Coastal Impact Assistance Program, **COMIDA** = Chukchi Offshore Monitoring in Drilling Area, **COPAC** = Coastal and Offshore Pacific Corporation, **CSPA** = Chukchi Sea Planning Area, **CTD** = Coiled Tubing Drilling, **DASAR** = Directional Autonomous Seafloor Acoustic Recorder, **DIAMD** = Diamond Shamrock Corporation, **DSS** = Department of Supply and Services, **DWM** = Department of Wildlife Management, **FEX** = FEX L.P., **HARP** = High Frequency Acoustic Recording Package, **IPY** = International Polar Year, **JASCO** = JASCO Research, **JIP** = Joint Industry Program, **LGL** = LGL Limited Environmental Research Associates, **MD** = Maryland, **MMS** = Minerals Management Service, (now the Bureau of Ocean Energy Management [BOEM]), **NMFS** = National Marine Fisheries Service, **NMML** = National Marine Mammal Laboratory, **NOAA** = National Oceanic and Atmospheric Administration, **NOPP** = National Ocean Partnership Program, **NOSC** = Naval Ocean Systems Center, **NSB** = North Slope Borough, **NSF** = National Science Foundation, **OBC** = Ocean-bottom cable, **Photo ID** = Photo Identification, **PI** = Primary Investigator, **POC** = Point of Contact, **SAIC** = Science Applications International Corporation, **SIO** = Scripps Institution of Oceanography, **SNACS** = Study of Northern Alaska Coastal System, **SOHIO** = Standard Oil of Ohio, **SWEPI** = Shell Western Exploration and Production, **UAV** = Unmanned Aerial Vehicles, **UNOCAL** = Union Oil Company of California, **USA** = United States of America, **U.S.S.R.** = Union of Soviet Socialist Republics, **WHOI** = Woods Hole Oceanographic Institute.
SUMMARY

Our review provides a comprehensive resource to serve as a foundation for the integration of past and ongoing bowhead studies relative to industrial activities, mitigation, and management. This review is meant to assist and improve the flow of scientific information between interested entities and the public, leading eventually to an integration of research on bowhead whales.

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CITATIONS


Richardson, W.J. (editor). 2006b. Monitoring of industrial sounds, seals, and bowhead whales near BP’s Northstar Oil Development, Alaskan Beaufort Sea, 1999–2004. [Updated comprehensive report, April 2006.] LGL Report TA4256A. Report from LGL Ltd. (King City, Ontario), Greeneridge Sciences Inc. (Santa Barbara, CA) and WEST Inc. (Cheyenne, WY) for BP Exploration (Alaska) Inc., Anchorage, AK.


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