



NOAA Technical Memorandum NMFS-AFSC-237

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

by  
M. A. Smultea, D. Fertl, D. J. Rugh, and C. E. Bacon

**U.S. DEPARTMENT OF COMMERCE**  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service  
Alaska Fisheries Science Center

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by  
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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]<sup>1</sup>), 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

<sup>1</sup> 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.

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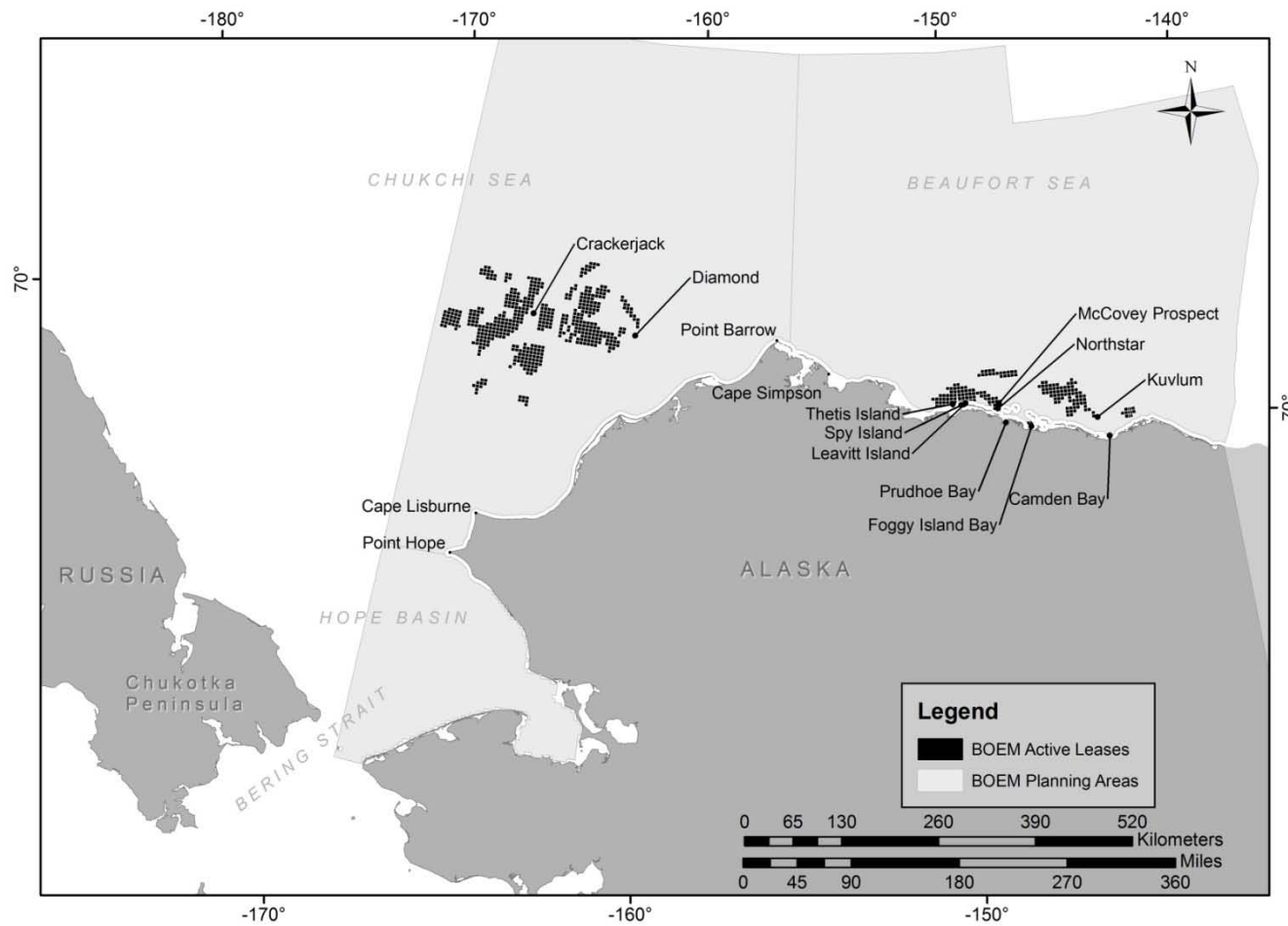




## INTRODUCTION

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 2009<sup>1</sup>.

| First Yr. of Study <sup>1</sup> | Study Years  | Method                  | Funding Source  | PI / POC                      | Research Team | Project Title   | Description   | General Location                                       | Time-frame            | Reports and Publications  |
|---------------------------------|--|-------------------------|---|-------------------------------|---------------|---|---|--|-----------------------|---|
| <b>1975</b>                     | 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1984, 1985, 1986, 1987, 1989, 1990, 1991, 1992                   | Aerial survey           | NMML  | D. Rugh, H. Braham, M. Nerini | NMML          | Bowhead & white whale migration, distribution & abundance in the Bering, Chukchi, and Beaufort seas | Develop reliable technique for counting bowhead whales to determine population size; supported ice-based censuses during same years | Vicinity of Pt. Barrow, Bering, Chukchi, Beaufort seas | Spring                | Braham et al. 1977, 1978, 1979a,b, 1980a,b, 1981, 1984; Krogman 1980; Krogman et al. 1989, Braham and Krogman 1978; Everitt and Krogman 1979; George et al. 2005  |
| <b>1976</b>                     | 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988; 1992, 1993, 1999, 2000, 2001 | Ice-based visual survey | NSB-DWM, NOAA-AEWC, BP Exploration AK, Ilisagvik College, NSF | J.C. George                   | NMML, NSB/DWM | Observations of bowhead whales during spring migration  | Ice-based censuses of W Arctic stock of bowheads whales passing near Pt. Barrow during spring migration                             | Vicinity of Pt. Barrow                                 | Mid-April to mid-June | Braham et al. 1979a, b; Braham et al. 1980a,b, 1984; Braham and Krogman 1977; Carroll and Smithhisler 1980; Johnson et al. 1981; Ljungblad 1981; Marquette et al. 1982; Dronenburg et al. 1983, 1984, 1986; Krogman and Rugh 1983, Krogman et al. 1982, 1985, 1986, 1989; Zeh et al. 1983; George et al. 1995, 2004 |

| First Yr. of Study <sup>1</sup> | Study Years  | Method                                   | Funding Source   | PI / POC              | Research Team                                  | Project Title  | Description   | General Location         | Time-frame             | Reports and Publications   |
|---------------------------------|--|--|--|-----------------------|--|--|---|--------------------------|------------------------|--|
| 1977                            | 1977, 1978   | Shore-based visual survey                | NMML   | D. Rugh               | NMML   | Census and monitoring of bowhead whale migration from Pt. Hope & Cape Lisburne | Shore-based visual survey   | Pt. Hope & Cape Lisburne | April through mid-June | Rugh 1979; Rugh and Cabbage 1980   |
| 1978                            | 1978   | Vessel survey                            | NMML   | M. Dahlheim           | NMML   | Vessel survey for bowhead whales in the Bering and Chukchi Seas                | See Project Title   | Chukchi & Bering seas    | June-July              | Dahlheim et al. 1980   |
| 1978                            | 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1992, 1993, 2000, 2001 | Acoustic including arrays & pop-up buoys | NOAA, State of AK through the Department of Natural Resources to NSB | C. Clark, J.C. George | NMML, NSB, AEW, NMML, NOSC, Cornell University | Acoustic censusing of spring bowhead migration                                 | Part of effort to census bowhead population from ice-based sites off Pt. Barrow in spring | Pt. Barrow               | Mid-April through May  | Braham et al. 1977, 1979a,b; Cummings and Holliday 1985; Ko et al. 1986; Sonntag et al. 1986; Clark 1983a,b; Clark et al. 1986a,b, 1996; Clark and Ellison 1985, 1988, 1989, 2000; Clark and Johnson 1984; George et al. 1989, 2004; Zeh et al. 1988a,b; Philo et al. 1990 |

| First Yr. of Study <sup>1</sup> | Study Years          | Method  | Funding Source | PI / POC   | Research Team   | Project Title                               | Description   | General Location             | Time-frame                                | Reports and Publications   |
|---------------------------------|----------------------|---|----------------|--|-----------------|---|---|------------------------------|---|--|
| 1979                            | Annually 1979 - 2009 | Aerial survey (systematic & non-systematic) & acoustics | MMS            | J. Clarke, S. Moore, C. Monnett, J. Montague, S. Treacy, C. Cowles, D. Ljungblad | NOSC, MMS, NMML | Bowhead Whale Aerial Survey Project (BWASP) | Obtain data on distribution, migration, and abundance and monitor late-summer and fall migration of bowheads in Beaufort & Chukchi seas relative to oil & gas exploration; acoustic data obtained from sonobuoys launched from aircraft | W Beaufort & NE Chukchi seas | Mid-June through mid-Nov (varied by year) | Ljungblad 1981; Ljungblad et al. 1980, 1981, 1982, 1983, 1984a,b,c, 1985a,b,c, 1986a,b,c, 1987a,b, 1988a,b; Moore et al. 1986, 1989a,b, 2000; Treacy 1988a, b, 1989, 1990a,b, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 2000, 2002a,b; Treacy et al. 2006; Moore and Clarke 1991, 1992a,b, 1993; Moore 1990, 1992, 2000; Landino et al. 1994, Clarke et al. 2010a,b, Monnett and Treacy 2005, Richardson 1990; Griffeth 1993; Reeves et al. 1983, 1984; Moore and DeMaster 1998, Richardson and Finley 1989, Moore 1997, George et al. 2008, Wartzok 1990, Wartzok et al. 1990 |
| 1979                            | 1979, 1980, 1982     | Vessel survey   |                |  | NMML & Russia   | U.S.- U.S.S.R. Marine Mammal Project        | Document summer-fall distribution of bowheads in the Chukchi sea  | Chukchi sea                  | Oct 1979; Sept-Oct 1980; July-Aug 1982    | Miller and Burns 1979, Miller et al. 1986  |

| First Yr. of Study <sup>1</sup> | Study Years                        | Method                   | Funding Source                              | PI / POC                   | Research Team | Project Title   | Description   | General Location                              | Time-frame    | Reports and Publications  |
|---------------------------------|------------------------------------|--------------------------|---|----------------------------|---------------|---|---|---|---------------|---|
| <b>1980</b>                     | 1980, 1981, 1982, 1983, 1984, 1985 | Aerial, acoustic, vessel | MMS   | W.J. Richardson            | LGL           | Monitoring bowhead whale behavior in presence & absence of industrial stimuli, including playbacks                                  | Baseline & exposure studies assessing importance of E Alaskan Beaufort Sea to feeding bowhead whales & effects of industrial activities including overflights; included systematic aerial surveys | E Beaufort sea                                | July-Sept     | Richardson 1982, 1983, 1984, 1985, 1986, 1987; Richardson et al. 1985, 1986, 1990, 1991a,b; Würsig et al. 1984, 1985, 1986, 1989, Fraker and Richardson 1980; Dorsey et al. 1989; Fraker et al. 1985; Miles et al. 1987 |
| <b>1981</b>                     | 1981                               | Aerial                   | Dome Petroleum Ltd. and SOHIO AK Petrol Co. | R. Davis & W.J. Richardson | LGL           | Distribution, numbers and productivity of the W Arctic stock of bowhead whales in the E Beaufort Sea and Amundsen Gulf, summer 1981 | Distribution, relative abundance and movements of bowheads on their summer range in the E Beaufort Sea; determine the length composition of the population.                                       | E Beaufort & Amundsen Gulf, Canadian Beaufort | Summer & fall | Davis et al. 1982a,b  |



| First Yr. of Study <sup>1</sup> | Study Years  | Method                            | Funding Source   | PI / POC          | Research Team   | Project Title   | Description  | General Location                                | Time-frame    | Reports and Publications  |
|---------------------------------|--|-----------------------------------|--|-------------------|---|---|--|---|---------------|---|
| <b>1981</b>                     | 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1989, 1990, 1991, 1992, 1994, 1998, 1999, 2000, 2003, 2004, 2005 | Aerial photo-grammetry & photo ID | BP, CIAP, DIAMD & DSS, MMS, NMML-NMFS, NSB-DWS, SOHIO, SWEPI | D. Rugh, W. Koski | NMML-NMFS, LGL, University of Washington, Cascadia Research Collective, NSB | Bowhead whale abundance through photographic analysis using resighting rates; photos are also used to estimate calving intervals and adult survival rates | Analyses include photos taken from 1976-2005 during aerial surveys by NMML & LGL | Entire Beaufort sea, especially near Pt. Barrow | Spring & fall | Cubbage and Rugh 1981, 1982; Cubbage et al. 1984a,b; Cubbage and Calambokidis 1987; Nerini and Rugh 1986; Nerini et al. 1987; Richardson et al. 1987, 1990, 1991a,b, 1995; Withrow and Goebel-Diaz 1989; Rugh 1990, 2008; Miller et al. 1991, 1992, 2005; Rugh et al. 1992, 2009; Da Silva et al. 2000; Angliss et al. 1995; Zeh et al. 2002; Schweder 2003; Schweder et al. 2009, 2010; Brandon et al. 2005, 2007; Koski et al. 2005. 2006a,b, 2007a,b, 2010; Rugh and Wade 2005; Brandon and Wade 2004, 2006; Rugh and Koski 2007; Sadykova and Schweder 2009, 2010; Schweder and Sadykova 2009; Rugh et al. 1998 |
| <b>1985</b>                     | 1985   | Vessel, acoustic, aerial          | UNOCAL   | P. McLaren        | LGL   | Bowhead whales and underwater noise near a drillship operation in the Alaskan Beaufort Sea,   | See project title  | Alaskan Beaufort sea                            | Summer & fall | McLaren et al. 1986   |

| First Yr. of Study <sup>1</sup> | Study Years            | Method   | Funding Source                             | PI / POC        | Research Team        | Project Title   | Description   | General Location   | Time-frame      | Reports and Publications   |
|---------------------------------|------------------------|--|--|-----------------|----------------------|---|---|--|-----------------|--|
|                                 |                        |  |  |                 |                      | 1985.   |   |  |                 |  |
| 1986                            | 1986                   | Aerial   | Shell Western E&P Inc.                     |                 | LGL                  | Bowhead whale feeding in the E Alaskan Beaufort Sea   | Systematic aerial surveys as part of study to investigate responses of migrating bowheads to an exploratory offshore drilling operation   | Near Hammerhead & Corona drill sites in Camden Bay, Beaufort Sea | 2 Sept-9 Oct    | Richardson and Thomson 2002; LGL and Greeneridge 1987, Johnson et al. 1986 |
| 1989                            | 1989, 1990, 1991, 1994 | Aerial, visual & acoustic ice-based monitoring (ice edge & pack ice) | MMS  | W.J. Richardson | LGL                  | Acoustic effects of oil production activities on bowhead and white whales visible during spring migration near Pt. Barrow, AK | Monitor distribution & behavior of bowheads, belugas, and seals to playback of industrial sounds from ice edge & pack ice; ice-based visual & acoustic monitoring; sonobuoy drops from Twin Otter | Near Pt. Barrow, Beaufort Sea                                    | Spring          | Richardson et al. 1990, 1991a,b, 1995; Patenaude et al. 2002               |
| 1990                            | 1990, 1991             | Aerial, vessel & acoustic monitoring                                 | Shell Western E&P Inc. & Chevron USA, Inc. | J. Brueggeman   | Ebasco Environmental | Chukchi Sea 1990 & 1991 Marine Mammal Monitoring Programs   | Monitored effects of offshore drilling and icebreaker activities on marine mammals  | Chukchi Sea  | 29 June – 5 Oct | Brueggeman et al. 1991a, 1992  |
| 1991                            | 1991                   | Vessel monitoring  | Western Geophysical                        | J. Brueggeman   | Ebasco Environmental | Marine Mammal monitoring program relative to seismic vessel operations in the Beaufort Sea, 1991                              | Vessel-based monitoring for marine mammals during seismic operations  | Beaufort Sea   | Summer          | Brueggeman et al. 1991b  |

| <b>First Yr. of Study<sup>1</sup></b> | <b>Study Years</b>                             | <b>Method</b>   | <b>Funding Source</b>        | <b>PI / POC</b>    | <b>Research Team</b>   | <b>Project Title</b>   | <b>Description</b>  | <b>General Location</b>  | <b>Time-frame</b> | <b>Reports and Publications</b>  |
|---------------------------------------|--|---|------------------------------|--------------------|--|--|---|--|-------------------|--|
| <b>1992</b>                           | 1992   | Satellite tag   | MMS                          | B. Mate            | Oregon State University  | Satellite-monitored movements of radio-tagged bowhead whales in the Beaufort & Chukchi seas during the late-summer feeding season and fall migration | See project title   | Tagged 12 juvenile bowheads in Canadian Beaufort off Mackenzie River Delta | 30 Aug – 6 Sept   | Krutzikowsky and Mate 2000; Mate et al. 2000   |
| <b>1992</b>                           | 1992, 1993, 1994, 1995, 1996                   | Vessel surveys  | NSF                          | S. Moore           | Joint Japanese-Russian-American (SAIC, NSB, University AK Fairbanks) | Marine mammal surveys in & near Chukotka Peninsula and Chukchi Sea   | Vessel-based surveys conducted during Japanese-Russian-American Chukchi Sea Circulation Study Cruises   | Chukchi Sea  | Fall              | Melnikov et al. 1998a,b; Melnikov and Zeh 2007; Moore 1992; Moore et al. 1995                            |
| <b>1992</b>                           | 1992, 1993                                     | Aerial, vessel, acoustic  | ARCO Alaska, Inc.            | J. Hall, K. Brewer | Coastal & Offshore Pacific Corp. (COPAC)                             | Marine mammal monitoring for Kuvlum drilling site  | Systematic aerial line surveys focused around the drilling site to study distribution & abundance of bowheads relative to exploratory offshore drilling operation | Kuvlum in Camden Bay area  | Mid-Aug - Sept    | Brewer et al. 1993; Hall et al. 1994; Hall and Francine 1990; Gallagher et al. 1992a,b; Hall et al. 1991 |
| <b>1996</b>                           | 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003 | Aerial, vessel-based, & acoustic monitoring & ice-based seal monitoring of lair use | BP Exploration (Alaska) Inc. | W.J. Richardson    | LGL  | Marine mammal & acoustical monitoring of BPXA's seismic program in the Alaskan Beaufort Sea, 1997  | Intensive localized monitoring of distribution & behavior of bowheads over small geographic area focused on seismic surveys                                       | Alaskan Beaufort Sea   |                   | Richardson 1998; Richardson and Williams 2004; Manly et al. 2007   |

| <b>First Yr. of Study<sup>1</sup></b> | <b>Study Years</b>   | <b>Method</b>                                      | <b>Funding Source</b> | <b>PI / POC</b>                           | <b>Research Team</b>   | <b>Project Title</b>  | <b>Description</b>   | <b>General Location</b>    | <b>Time-frame</b> | <b>Reports and Publications</b>   |
|---------------------------------------|--|--|-----------------------|---|--|---|--|----------------------------|-------------------|---|
| <b>1996</b>                           | 1996, 1997, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009 | Aerial, vessel, acoustic                           | BP Alaska             | B.Streever, L.A.M. Aerts, W.J. Richardson | LGL, Greeneridge Sciences Inc., Applied Sociocultural Research | Monitoring marine mammals relative to BP's Northstar oil development & operations, Alaskan Beaufort Sea             | Monitoring distribution & behavior of bowheads, belugas, & seals relative to BP's Northstar oil production construction, development & operations, including monitoring of industrial sounds, seals, and whale calls | Northstar Alaskan Beaufort |                   | Richardson 1997, 1998, 1999, 2000, 2006a,b, 2007, 2008; Richardson and Williams 2001, 2002, 2003a,b, 2004, 2005; Aerts & Richardson 2008,2009,2010; LGL Ecological Research and Greeneridge Sciences, Inc. 1996 |
| <b>1997</b>                           | 1997, 1998   | Aerial & vessel-based visual & acoustic monitoring | Western Geophysical   | W.J. Richardson                           | LGL, Greeneridge Sciences                                      | Marine mammal & acoustic monitoring of Western Geophysical's open-water seismic program in the Alaskan Beaufort Sea | Monitor effects of open-water seismic on marine mammals  | Alaskan Beaufort Sea       | 24 July - 11 Oct  | Richardson 1998, 1999   |
| <b>1998</b>                           | 1998, 1999, 2000   | Aerial   | MMS                   | W.J. Richardson                           | LGL  | Aerial surveys during feeding study   | Systematic aerial surveys to assess importance of E Alaskan Beaufort Sea to bowheads.  | E Alaskan Beaufort Sea     | Sept              | Richardson and Thomson 2002   |
| <b>2001</b>                           | 2001   | Vessel, aerial                                     | WesternGeco, BP       | W.J. Richardson                           | LGL  | Marine mammal monitoring of WesternGeco's open-water seismic program in the Alaskan Beaufort Sea, 2001.             | See Project Title  | Alaskan Beaufort Sea       |                   | Richardson and Lawson 2002  |

| <b>First Yr. of Study<sup>1</sup></b> | <b>Study Years</b> | <b>Method</b>                   | <b>Funding Source</b>                             | <b>PI / POC</b>           | <b>Research Team</b>               | <b>Project Title</b>   | <b>Description</b>   | <b>General Location</b>                      | <b>Time-frame</b>   | <b>Reports and Publications</b>               |
|---------------------------------------|--------------------|---------------------------------|---|---------------------------|------------------------------------|--|--|--|---------------------|---|
| <b>2002</b>                           | 2002, 2003         | Vessel                          | EnCana Oil & Gas (USA) Inc., and Lynx Enterprises | G. Green                  | Foster Wheeler Environmental Corp. | Marine mammal monitoring program McCovey exploration prospect  | Objective: document presence & behavior of marine mammals in vicinity of steel drilling caisson; incidental sightings of bowheads  | McCovey Prospect, US Beaufort Sea            | Summer/fall/winter  | Green and Hall 2003, Green et al. 2003        |
| <b>2005</b>                           | 2005               | Vessel-based monitoring         | NSF   | B. Haley, W.J. Richardson | LGL                                | Marine mammal monitoring during University AK Fairbanks' marine Geophysical survey across Arctic Ocean, Aug-Sep 2005 | Marine mammal monitoring during seismic geophysical survey   | Transarctic from Barrow to Norway            | 5 Aug - 26 Sept     | LGL 2005; Haley and Ireland 2006              |
| <b>2005</b>                           | 2005, 2006         | Aerial surveys and oceanography | NSF   | S. Moore, C. Ashjian      | NOAA, WHOI                         | Study of Northern Alaska Coastal System (SNACS)  | Study of vulnerability of natural, human, and living systems of the coastal zone to current and future environmental changes in the Arctic   | Near Pt. Barrow                              | Late summer         | Moore et al. 2010                             |
| <b>2005</b>                           | 2005, 2006, 2007   | Vessel-based monitoring         | ASRC Lynx Enterprises, Inc., & FEX L.P.           | G. Green                  | Tetra Tech EC, Inc.                | Marine mammal monitoring program FEX barging project 2005, 2007  | Vessel-based monitoring for marine mammals from two supply barges in conjunction with barging operations supporting onshore oil & gas exploration involving transportation of equipment. Opportunistic sightings of bowheads | Cape Simpson to Prudhoe Bay, US Beaufort Sea | 31 July-24 Aug 2007 | Green and Negri 2005, 2006; Green et al. 2007 |

| First Yr. of Study <sup>1</sup> | Study Years                | Method                   | Funding Source                                     | PI / POC                  | Research Team  | Project Title   | Description   | General Location                           | Time-frame    | Reports and Publications |
|---------------------------------|----------------------------|--------------------------|--|---------------------------|--|---|---|--|---------------|--------------------------|
| 2006                            | 2006                       | Vessel-based monitoring  | NSF  | B. Haley, W.J. Richardson | LGL  | Marine geophysical survey by the USGC Healey of the Western Canada Basin, Chukchi Borderland, and Mendeleev Ridge, Arctic Ocean, July-August 2006 | Marine mammal monitoring during seismic geophysical survey  | Crossed Chukchi & Beaufort to Arctic Ocean | July-Aug 2006 | LGL 2006                 |
| 2006                            | 2006 (see also 2007, 2008) | Vessel, acoustic aerial  | GX Technology                                      | D. Ireland                | LGL  | Marine mammal monitoring and mitigation during open-water seismic exploration by GX Technology in the Chukchi Sea, October-November 2006          | See project title   | Chukchi Sea                                | Oct-Nov 2006  | Ireland et al. 2007a     |
| 2006                            | 2006                       | Vessel, aerial, acoustic | NSF, Conoco Phillips Alaska, Inc., & GX Technology | D. Funk                   | LGL, Greeneridge Sciences Inc., Applied Sociocultural Research | Joint monitoring program in the Chukchi & Beaufort seas, July-November 2006   | Aerial surveys conducted E of Barrow as part of Study of Northern Alaska Coastal System (SNACS) "Environmental Variability, Bowhead Whale Distributions and Inupiat Subsistence Whaling". Aerial surveys conducted in collaboration with C. Monnett (MMS) | Chukchi & Beaufort seas                    | July-Nov 2006 | Funk et al. 2007         |

| <b>First Yr. of Study<sup>1</sup></b> | <b>Study Years</b> | <b>Method</b>            | <b>Funding Source</b>       | <b>PI / POC</b>                     | <b>Research Team</b>           | <b>Project Title</b>   | <b>Description</b>                                       | <b>General Location</b>                                  | <b>Time-frame</b>             | <b>Reports and Publications</b>  |
|---------------------------------------|--------------------|--------------------------|-----------------------------|-------------------------------------|--------------------------------|--|--|--|-------------------------------|--|
| <b>2006</b>                           | 2006, 2008         | Aerial, vessel, acoustic | Shell Offshore Inc.         | M. Macrander, D. Funk, H. Patterson | LGL, Greeneridge Sciences Inc. | Baseline & seismic marine mammal monitoring and mitigation during open-water seismic exploration by Shell Offshore Inc. in the Chukchi & Beaufort seas | Aerial & vessel surveys & 35 acoustic recorders (DASARs) | Beaufort & Chukchi seas, Chukchi Sea: 0-25 mi from coast | July-Sept 2006, July-Nov 2007 | Patterson et al. 2007; Funk et al. 2008; Ireland et al. 2009a,b; Funk et al. 2010; Christie et al. 2009; Thomas et al. 2010; Blackwell et al. 2007 |
| <b>2006</b>                           | 2006               | Vessel                   | ConocoPhillips Alaska, Inc. | D. Ireland                          | LGL                            | Marine mammal monitoring and mitigation during open-water seismic exploration by ConocoPhillips Alaska Inc. in the Chukchi Sea, July-October 2006      | See Project Title  | Chukchi Sea  | July-Oct 2006                 | Ireland et al. 2007b   |
| <b>2007</b>                           | 2007, 2008, 2009   | Satellite tagging        | MMS                         | L. Quakenbush                       | ADFG                           | Satellite tagging of the Bering-Chukchi-Beaufort bowhead whales  | See project title  | Bering, Chukchi, Beaufort Sea US & Canada                |                               | Quakenbush and George 2008, Quakenbush and Small 2005; Quakenbush 2007, Quakenbush et al. 2009   |

| First Yr. of Study <sup>1</sup> | Study Years      | Method  | Funding Source | PI / POC  | Research Team                          | Project Title  | Description  | General Location                        | Time-frame  | Reports and Publications  |
|---------------------------------|------------------|---|----------------|---|--|--|--|---|-------------|---|
| 2007                            | 2007, 2008, 2009 | Aerial, vessel & acoustic monitoring and oceanography | MMS            | D. Rugh   | Interagency agreement: MMS & NMML/NMFS | Bowhead whale feeding ecology study (BOWFEST)  | 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 | <100 miles N & E of Pt. Barrow          | Late summer | 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 |
| 2007                            | 2007, 2008       | Vessel  | Japan          | K. Sekiguchi  |  | Cetacean sighting records in the Chukchi Sea during <i>T/S Oshoro Maru</i> 2007 and 2008 IPY cruises                             | Marine mammal monitoring during vessel surveys   | Chukchi Sea                             | August      | Sekiguchi et al. 2007   |
| 2008                            | 2008             | Unmanned aircraft                                     | Shell/ JIP     | J. Kendrick, W. Koski, M. Macrander, P. Smith, R. Lee | LGL                                    | Unmanned aircraft  | Compare UAV surveys to manned surveys  | Chukchi Sea                             | August      | Koski et al. 2009b,c  |
| 2008                            | 2008, 2009       | Acoustic, vessel                                      | BP             | L.A.M. Aerts  | LGL, Greeneridge Sciences, JASCO       | Marine mammal monitoring and mitigation during BP Liberty OBC seismic survey in Foggy Island Bay, Beaufort Sea, July-August 2008 | Acoustic recorders, visual monitoring from seismic vessels   | Liberty, Foggy Island Bay, Beaufort Sea | July-Aug    | Aerts et al. 2008, 2009; Koski et al. 2009a ; Delarue et al. 2009a,b  |



| <b>First Yr. of Study<sup>1</sup></b> | <b>Study Years</b> | <b>Method</b>    | <b>Funding Source</b>                        | <b>PI / POC</b>   | <b>Research Team</b>    | <b>Project Title</b>   | <b>Description</b>  | <b>General Location</b>                         | <b>Time-frame</b>                  | <b>Reports and Publications</b>                   |
|---------------------------------------|--------------------|------------------|--|---|-------------------------|--|---|---|------------------------------------|---|
| <b>2008</b>                           | 2008               | Acoustic         | NOPP   | C. Ashjian  |                         | Episodic upwelling of zooplankton  | 2 recorders/Stafford; assoc. w/ BOWFEST   | Near Barrow                                     | Late Aug - early Sep               | Ashjian et al. 2009, Ashjian and Baumgartner 2009 |
| <b>2008</b>                           | 2008               | Acoustic         | NOPP   | K. Stafford, R. Pickart, T. Weingartner, C. Ashjian, S. Okkonen |                         | Circulation and cross-shelf exchange   | 2 recorders, CTD surveys  | Alaskan Beaufort Sea shelf                      | Early Aug., early Oct. (2 cruises) | Okkonen 2010                                      |
| <b>2008</b>                           | 2008               | Acoustic, AUV    | NOPP   | A. Pluedemann, T. Weingartner, R. Pickart                       |                         | Circulation and cross-shelf exchange   | CTD and AUV surveys   | Alaskan Beaufort Sea shelf                      | Early August                       | Weingartner et al. 2008                           |
| <b>2008</b>                           | 2008               | Acoustic         | State of Alaska                              | R. Small  |                         | ADFG acoustic survey   | 2 recorders; SIO HARPS  | NE Chukchi                                      |                                    | Roth et al. 2010, Alaska CIAP 2009                |
| <b>2008</b>                           | 2008               | Vessel, acoustic | Eni US Operating Co. Inc., PGS Onshore, Inc. | D.D.W. Hauser   | LGL, JASCO              | Marine mammal and acoustical monitoring of the ENI/PGS open-water seismic program near Thetis, Spy and Levitt islands, Alaskan Beaufort Sea, | Monitoring from seismic vessels during ocean bottom cable/transition zone seismic surveys. Saw total of 3 whales, all unidentified mysticetes | Near Thetis, Spy & Levitt Islands, Beaufort Sea | Aug-Sept                           | Hauser et al. 2008                                |
| <b>2008</b>                           | 2008               | Vessel           | Conoco Phillips Alaska, Inc.                 | C. Rea, J. Brueggeman   | Canyon Creek Consulting | Seismic monitoring   | Research cruise   | Chukchi Sea                                     | Summer                             | Brueggeman 2009                                   |

| First Yr. of Study <sup>1</sup> | Study Years | Method | Funding Source | PI / POC               | Research Team                          | Project Title  | Description   | General Location                                | Time-frame          | Reports and Publications  |
|---------------------------------|-------------|--------|----------------|------------------------|--|--|---|---|---------------------|---|
| 2008                            | 2008, 2009  | Aerial | MMS            | J. Clarke, M. Ferguson | Interagency agreement: MMS & NMML/NMFS | Chukchi Offshore Monitoring In Development Area (COMIDA) | Distribution and abundance of marine mammals in CSPA. Results to facilitate mitigation-related to oil and gas development | Chukchi Sea Planning Area (CSPA) NE Chukchi Sea | Mid June to mid Nov | Clarke 2009, Clarke et al. 2010a,b; MBC Applied Environmental Sciences 2007 |

<sup>1</sup>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

- Aerts, L.A.M., and W.J. Richardson (editors). 2008. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2007: Annual Summary Report. LGL Rep. P1005b. Rep. from LGL Alaska Research Associates (Anchorage, AK), Greeneridge Sciences Inc. (Santa Barbara, CA) and Applied Sociocultural Research (Anchorage, AK) for BP Exploration (Alaska) Inc., Anchorage, AK.
- Aerts, L. A. M., and W. J. Richardson (editors). 2009. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2008: Annual Summary Report. LGL Rep. P1081. Rep. from LGL Alaska Research Associates Inc. (Anchorage, AK), Greeneridge Sciences Inc. (Santa Barbara, CA) and Applied Sociocultural Res. (Anchorage, AK) for BP Exploration (Alaska) Inc., Anchorage, AK.
- Aerts, L.A.M., and W.J. Richardson (editors). 2010. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2009: Annual summary report. LGL Rep. P1132. Rep. from LGL Alaska Research Associates (Anchorage, AK), Greeneridge Sciences Inc. (Santa Barbara, CA) and Applied Sociocultural Res. (Anchorage, AK) for BP Exploration (Alaska) Inc., Anchorage, AK.
- Aerts, L.A.M., M. Bleses, S. Blackwell, C. Greene, K. Kim, D. Hannay, and M. Austin. 2008. Marine mammal monitoring and mitigation during BP Liberty OBC seismic survey in Foggy Island Bay, Beaufort Sea, July-August 2008: 90-day report. LGL Report P1011-1. Report from LGL Alaska Research Associates Inc., LGL Ltd., Greeneridge Sciences Inc. and JASCO Research Ltd. for BP Exploration Alaska.
- Aerts, L.A.M., S.B. Blackwell, C.R. Greene, W.J. Richardson, and B.J. Streever. 2009. Sounds from an offshore oil production island and bowhead whale call characteristics. [Abstracts] Alaska Marine Science Symposium, 19-23 January 2009, Anchorage, Alaska.
- Alaska CIAP (State of Alaska Coastal Impact Assessment Project). 2009. Hydroacoustic monitoring of ambient noise and marine mammals in the Chukchi Sea. May 4, 2009 - September 30, 2009, semiannual progress report. Submitted to Minerals Management Service, Anchorage, Alaska by State of Alaska, Department of Natural Resources, Coastal Impact Assessment Project, Anchorage, Alaska.
- Angliss, R.P., D.J. Rugh, D.E. Withrow, and R.C. Hobbs. 1995. Evaluations of aerial photogrammetric length measurements of the Bering-Chukchi-Beaufort seas stock of bowhead whales (*Balaena mysticetus*). Rep. Int. Whaling Comm. 45:313-324.
- Anonymous. 1985. Oil and Gas Technologies for the Arctic and Deepwater (Washington, DC: U.S. Congress, Office of Technology Assessment, OTA-O-270, May 1985).

- Ashjian, C.J., and M.F. Baumgartner. 2009. Bowhead whale feeding in the western Beaufort Sea: Oceanographic conditions, whale prey distributions, and whale feeding and foraging behavior. Pages 24-34 *In* Cooperative Institute for Climate and Ocean Research, Annual Report 2008 - 2009. Published by National Oceanic and Atmospheric Administration and Woods Hole Oceanographic Institution.
- Ashjian, C.J., R.G. Campbell, S.R. Okkonen, and K.M. Stafford. 2009. Episodic upwelling of zooplankton within a bowhead whale feeding area near Barrow, AK. Prepared for Office of Naval Research, Arlington, VA.
- Blackwell, S., W. Richardson, C. Green, and B. Steever. 2007. Bowhead whale (*Balaena mysticetus*) migration and calling behaviour in the Alaskan Beaufort Sea, Autumn 2001–04: An Acoustic Localization Study. *Arctic* 60(3): p. 255-270.
- Braham, H.W., and B.D. Krogman. 1977. Population biology of the bowhead (*Balaena mysticetus*) and beluga (*Delphinapterus leucas*) whale in the Bering, Chukchi and Beaufort seas. Northwest and Alaska Fisheries Center Processed Report 77-05. Available at Alaska Fish. Sci. Cent., 7600 Sand Point Way, NE, Seattle, WA 98115.
- Braham, H.W., and B.D. Krogman. 1978. Seasonal distribution and abundance of bowhead and beluga whales in the Bering Sea and Arctic Ocean. Quarterly Report: 1 January - 31 March 1978. Environmental Assessment of the Alaskan Continental Shelf, Annual Reports 1:29-38.
- Braham, H.W., C. Fiscus, and D.J. Rugh. 1977. Marine mammals of the Bering and southern Chukchi seas. Environmental Assessment of the Alaskan Continental Shelf, Annual Reports 1:1-99.
- Braham, H.W. et al. 1978. Seasonal distribution and abundance of bowhead and beluga whales in the Bering Sea and Arctic Ocean. Quarterly Report: 1 April - 30 June 1978. Environmental Assessment of the Alaskan Continental Shelf, Quarterly Reports 1:63-65.
- Braham, H., B. Krogman, S. Leatherwood, W. Marquette, D. Rugh, M. Tillman, J. Johnson, and G. Carroll. 1979a. Preliminary report of the 1978 spring bowhead whale research program results. *Rep. Int. Whaling Comm.* 29:291-306.
- Braham, H., B. Krogman, W. Marquette, D. Rugh, J. Johnson, M. Nerini, S. Leatherwood, M. Dahlheim, R. Sonntag, G. Carroll, T. Bray, S. Savage, and J. Cabbage. 1979b. Bowhead whale (*Balaena mysticetus*) preliminary research results, June-December 1978. Northwest and Alaska Fisheries Center Processed Report 79-08. Available at Alaska Fish. Sci. Cent., 7600 Sand Point Way, NE, Seattle, WA 98115.
- Braham, H.W., M.A. Fraker, and B.D. Krogman. 1980a. Spring migration of the western Arctic population of bowhead whales. *Mar. Fish. Rev.* 42 (9-10):36-46.

- Braham, H., B. Krogman, M. Nerini, D. Rugh, W. Marquette, and J. Johnson. 1980b. Research on bowhead whales, June-December 1978. Rep. Int. Whaling Comm. 30:405-413.
- Braham, H.W., B.D. Krogman, and G. Carroll. 1981. Bowhead whale (*Balaena mysticetus*) migration, distribution, and abundance in the Bering, Chukchi, and Beaufort seas, 1975-78, with notes on the distribution and life history of white whales (*Delphinapterus leucas*). Environmental Assessment of the Alaskan Continental Shelf, Annual Reports 20:75-170.
- Braham, H.W., B.D. Krogman, and G.M. Carroll. 1984. Bowhead and white whale migration, distribution, and abundance in the Bering, Chukchi and Beaufort seas, 1975-78. U.S. Dep. Commer., NOAA Tech. Rep. NMFS SSRF-778, 39pp.
- Brandon, J., and P.R. Wade. 2004. Assessment of the Bering-Chukchi-Beaufort Seas stock of bowhead whales. Working paper SC/56/BRG20 submitted to the Scientific Committee of the International Whaling Commission, June 2004, Cambridge, U.K.
- Brandon, J., and P.R. Wade. 2006. Assessment of the Bering-Chukchi-Beaufort Sea stock of bowhead whales using Bayesian model averaging. J. Cetacean Res. Manage. 8(3):225-239.
- Brandon, J.R., J.M. Breiwick, A.E Punt, and P.R. Wade. 2005. Alternative resampling schemes for life history parameters used in Bayesian stock assessments of bowhead whales. Working paper SC/57/BRG5 submitted to the Scientific Committee of the International Whaling Commission, June 2005, Ulsan, Korea.
- Brandon, J. R., Breiwick, J. M., Punt, A. E., and Wade, P. R. 2007. Constructing a coherent joint prior while respecting biological realism: application to marine mammal stock assessments. ICES J. Mar. Sci. 64: 1085–1100.
- Brewer, K. D., M. L. Gallagher, P.R. Regos, P.E. Isert, and J.D. Hall. 1993. Kuvlum #1 Exploration Prospect. Site specific monitoring program final report. Prepared by Coastal & Offshore Pacific Corporation, Walnut Creek, CA.
- Brueggeman, J. 2009. 90-day report of the marine mammal monitoring program for the ConocoPhillips Alaska shallow hazards survey operations during the 2008 open-water season in the Chukchi Sea. Prepared by Canyon Creek Consulting LLC, Seattle, WA for ConocoPhillips Alaska, Inc.
- Brueggeman, J.J., D.P. Volsen, R.A. Grotefendt, G.A. Green, J.J. Burns, and D.K. Ljungblad. 1991a. 1990 Marine mammal monitoring program: The Klondike, Burger, and Popcorn prospects in the Chukchi Sea. Report by Ebasco Environmental, Bellevue, WA, for Shell Western E&P Inc., Houston, TX.

- Brueggeman, J.J., R. Grotefendt, M. Smultea, J. Vulk and C. Malme. 1991b. Marine mammal monitoring program relative to seismic vessel operations in the Beaufort Sea, 1991. Report by Ebasco Environmental, Bellevue, WA, for Western Geophysical Company.
- Brueggeman, J.J., G.A. Green, R.A. Grotefendt, M.A. Smultea, D.P. Volsen, R.A. Rowlett, C.C. Swanson, C.I. Malme, R. Mlawski, and J.J. Burns. 1992. 1991 Marine Mammal Monitoring Program (seals and whales): Crackerjack and Diamond prospects, Chukchi Sea. Report by Ebasco Environmental, Bellevue, WA, for Shell Western E&P, Inc. and Chevron U.S.A., Inc.
- Carroll, G.M., and J.R. Smithhisler. 1980. Observations of bowhead whales during spring migration. *Mar. Fish. Rev.* 42(9-10):80-85.
- Christie, K., C. Lyons, W.R. Koski, D.S. Ireland, and D.W. Funk. 2009. Patterns of bowhead whale occurrence and distribution during marine seismic operations in the Alaskan Beaufort Sea. Presentation at the 18th Biennial Conference on the Biology of Marine Mammal, Quebec City, Quebec, 12-16 October 2009.
- Clark, C.W. 1983a. The use of bowhead vocalizations to augment visual censusing estimates on the number of whales migrating off Barrow, Alaska in the spring of 1980. Working paper SC/35/PS13 submitted to the Scientific Committee of the International Whaling Commission, June 1983, Cambridge, U.K.
- Clark, C.W. 1983b. The use of bowhead vocalizations to augment visual censusing estimates on the number of whales migrating off Barrow, Alaska in the spring of 1980. Prepared by Rockefeller University for North Slope Borough.
- Clark, C.W., and W.T. Ellison. 1985. Acoustic tracking and distribution of migrating bowhead whales, *Balaena mysticetus*, off Point Barrow, Alaska in the Spring of 1984. Working paper SC/37/PS11 submitted to the Scientific Committee of the International Whaling Commission, June 1985, Bournemouth, U.K.
- Clark, C.W., and W.T. Ellison. 1988. Numbers and distributions of bowhead whales, *Balaena mysticetus*, based on the 1985 acoustic study off Pt. Barrow, Alaska. *Rep. Int. Whaling Comm.* 38:365-370.
- Clark, C.W., and W.T. Ellison. 1989. Numbers and distributions of bowhead whales, *Balaena mysticetus*, based on the 1986 acoustic study off Pt. Barrow, Alaska. *Rep. Int. Whaling Comm.* 39:297-303.
- Clark, C.W., and W.T. Ellison. 2000. Calibration and comparison of the acoustic location methods used during the spring migration of the bowhead whale, *Balaena mysticetus*, off Pt. Barrow, Alaska, 1984-1993. *J. Acoust. Soc. Amer.* 107(6):3509-3517.
- Clark, C.W., and J.H. Johnson. 1984. The sounds of the bowhead whale, *Balaena mysticetus*, during the spring migrations of 1979 and 1980. *Can. J. Zoo.* 62(7):1436-1441.



- Clark, C.W., W.T. Ellison, and K. Beeman. 1986a. An acoustic study of bowhead whales, *Balaena mysticetus*, off Point Barrow, Alaska during the 1984 spring migration. Prepared by Marine Acoustics, Clinton, MA for North Slope Borough, Barrow, AK.
- Clark, C.W., W.T. Ellison, and K. Beeman. 1986b. A preliminary account of the acoustic study conducted during the 1985 spring bowhead whale, *Balaena mysticetus*, migration off Point Barrow, Alaska. Rep. Int. Whaling Comm. 36:311-316.
- Clark, C.W., R.A. Charif, S.G. Mitchell, and J. Colby. 1996. Distribution and behavior of the bowhead whale, *Balaena mysticetus*, based on analysis of acoustic data collected during the 1993 spring migration off Point Barrow, Alaska. Rep. Int. Whaling Comm. 46:541–552.
- Clarke, J. 2009. Chukchi Offshore Monitoring in Drilling Area (COMIDA) aerial survey, 2008. Draft report prepared by SAIC, San Diego, CA, for the National Marine Mammal Laboratory, Seattle, WA.
- Clarke, C., C. Christman, M. Ferguson, and L. Morse. 2010a. Bowhead Whale Aerial Survey Project (BWASP) Status Update in 2009. [Abstracts]. Alaska Marine Science Symposium, 18-22 January 2010, Anchorage, AK.
- Clarke, C., M. Ferguson, L. Morse, G. Friedrichsen, B. Rone, and C. Christman. 2010b. Aerial surveys for marine mammals in the Northeastern Chukchi Sea: 2009. [Abstracts] Alaska Marine Science Symposium, 18-22 January 2010, Anchorage, AK.
- Cubbage, J.C., and J. Calambokidis. 1987. Size-class segregation of bowhead whales discerned through aerial stereophotogrammetry. Mar. Mamm. Sci. 3(2):179-185.
- Cubbage, J., and D. Rugh. 1981. Bowhead whale calf counts in the eastern Beaufort Sea, 1980. Abstracts, Fourth Biennial Conference on the Biology of Marine Mammals, 14-18 December 1981, San Francisco, CA.
- Cubbage, J., and D. Rugh. 1982. Bowhead Whale Length Estimates and Calf Counts in the Eastern Beaufort Sea, 1980. Working paper SC/33/PS6 submitted to the Scientific Committee of the International Whaling Commission, June 1982, Cambridge, U.K.
- Cubbage, J.C., J. Calambokidis, and D.J. Rugh. 1984a. Bowhead whale length measured through stereophotogrammetry. Final report contract #83-ABC-00129. Prepared by Cascadia Research Collective, Olympia, WA, for the National Marine Mammal Laboratory, Seattle, WA.
- Cubbage, J.C., J. Calambokidis, and D. Rugh. 1984b. Bowhead whale lengths measured through stereophotogrammetry. Working paper SC/36/PS3 submitted to the Scientific Committee of the International Whaling Commission, May 1984, Eastbourne, U.K.

- Cummings, W.C., and D.V. Holliday. 1985. Passive acoustic location of bowhead whales in a population census off Point Barrow, Alaska. *J. Acoust. Soc. Amer.* 78(4):1163-1169.
- Dahlheim, M., T. Bray, and H. Braham. 1980. Vessel survey for bowhead whales in the Bering and Chukchi seas, June-July 1978. *Mar. Fish. Rev.* 42(9-10):51-57.
- Da Silva, C.Q., J. Zeh, D. Madigan, J. Laake, D. Rugh, L. Baraff, W. Koski, and G. Miller. 2000. Capture-recapture estimation of bowhead whale population size using photo-identification data. *J. Cetacean Res. Manage.* 2(1):45-61.
- Davis, R.A., W.R. Koski, W.J. Richardson, C.R. Evans, and W.G. Alliston. 1982a. Distribution, numbers and productivity of the Western Arctic stock of bowhead whales in the eastern Beaufort Sea and Amundsen Gulf, summer 1981. Report from LGL Ltd., Toronto, Ontario, for Sohio Alaska Petrol. Co. [now BP Alaska], Anchorage, summer 1981. Report from LGL Ltd., Toronto, Ont., for Sohio Alaska Petrol. Co. [now BP Alaska], Anchorage, AK and Dome Petrol. Ltd., Calgary, Alberta (co-managers).
- Davis, R.A., W.R. Koski, W.J. Richardson, C.R. Evans, and W.G. Alliston. 1982b. Distribution, numbers and productivity of the Western Arctic stock of bowhead whales in the eastern Beaufort Sea and Amundsen Gulf, summer 1981. Working paper SC/34/PS20 submitted to the Scientific Committee of the International Whaling Commission, June 1982, Cambridge, U.K.
- Delarue, J., M. Hannele Laurinolli, S.B. Martin, and S. Carr. 2009a. A year-long acoustic monitoring program of bowhead whales in the Chukchi Sea. [Abstracts]. Alaska Marine Science Symposium, 19-23 January 2009, Anchorage, Alaska.
- Delarue, J., M. Hannele Laurinolli, and S.B. Martin. 2009b. Passive acoustic survey of bowhead whales in the Chukchi Sea. *J. Acoust. Soc. Amer.* 125(4):2549.
- Dorsey, E.M., W.J. Richardson, and B. Würsig. 1989. Factors affecting surfacing, respiration, and dive behaviour of bowhead whales, *Balaena mysticetus*, summering in the Beaufort Sea. *Can. J. Zoo.* 67(7):1801-1815.
- Dronenburg, R.B., G.M. Carroll, D.J. Rugh, and W.M. Marquette. 1983. Report of the 1982 spring bowhead whale census and harvest monitoring including 1981 fall harvest results. *Rep. Int. Whaling Comm.* 33:525-537.
- Dronenburg, R., G.M. Carroll, J.C. George, R.M. Sonntag, B.D. Krogman, and J.E. Zeh. 1984. Final report of the 1983 spring bowhead whale census and harvest monitoring including the 1982 fall harvest results. *Rep. Int. Whaling Comm.* 34:433-444.
- Dronenburg, R.B., J. C. George, B.D. Krogman, R.M. Sonntag, and J. Zeh. 1986. Report of the 1984 spring bowhead whale (*Balaena mysticetus*) ice-based visual census. *Rep. Int. Whaling Comm.* 36:293-298.

- Everitt, R., and B. Krogman. 1979. Sexual behavior of bowhead whales observed off the north coast of Alaska. *Arctic* 32(3):277-280.
- Fraker, M.A., and W.J. Richardson. 1980. Bowhead whales in the Beaufort Sea: A summary of their seasonal distribution and activities, and potential disturbance by offshore oil and gas exploration and development. Report from LGL Ecological Research Associates, Inc., Bryan, TX, for U.S. Bureau of Land Management, Washington, D.C.
- Fraker, M.A., D.K. Ljungblad, W.J. Richardson, and D.R. Van Schoik. 1985. Bowhead whale behavior in relation to seismic exploration, Alaskan Beaufort Sea, Autumn 1981. OCS Study 85-0077. Minerals Management Service, Reston, Virginia.
- Funk, D.W., R. Rodrigues, D.S. Ireland, and W.R. Koski. 2007. Joint Monitoring Program in the Chukchi and Beaufort seas, July-November 2006. LGL Alaska Report P891-2, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., Bioacoustics Research Program, Cornell University, and Bio-Wave Inc. for Shell Offshore, Inc., ConocoPhillips Alaska, Inc., and GX Technology, and National Marine Fisheries Service, U.S. Fish and Wildlife Service.
- Funk, D., D. Hannay, D. Ireland, R. Rodriguez, and W. Koski (editors). 2008. Marine mammal monitoring and mitigation during open-water seismic exploration by Shell Offshore, Inc. in the Chukchi and Beaufort Seas, July- November 2007; 90 day report. LGL Report P969-1. Reports from LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Research Ltd. for Shell Offshore Inc., National Marine Fisheries Service and U.S. Fish and Wildlife Service.
- Funk, D., D. Ireland, R. Rodriguez, and W. Koski (editors). 2010. Joint Monitoring Program in the Chukchi and Beaufort seas, open-water season 2006–2008. LGL Report P1050-1. Reports from LGL Alaska Research Associates, Inc., Greeneridge Sciences, Inc., and JASCO Research, Ltd., for Shell Offshore, Inc. and Other Industry Contributors, and National Marine Fisheries Service, U.S. Fish and Wildlife Service.
- Gallagher, M.L., K.D. Brewer, and J. D. Hall. 1992a. Results of Site Specific Marine Mammal Monitoring at the AMOCO Production Company exploratory drilling prospect "Galahad" in Camden Bay, Alaska, September- October 1991. Final report by Coastal & Offshore Pacific Corp., Walnut Creek, CA to AMOCO Production Co., Denver, CO. 51pp. plus appendices.
- Gallagher, M.L., K.D. Brewer, and J.D. Hall. 1992b. Results of Site Specific Marine Mammal Monitoring at the ARCO Alaska, Inc. exploratory drilling prospect "Cabot" in the Alaska Beaufort Sea, September-October 1991. Final Report by Coastal & Offshore Pacific Corp., Walnut Creek, CA. to ARCO Alaska, Inc., Anchorage, AK. 78pp. plus appendices.

- George, J.C., C. Clark, G.M. Carroll, and W.T. Ellison. 1989. Observations on the ice-breaking and ice navigation behavior of migrating bowhead whales (*Balaena mysticetus*) near Point Barrow, Alaska, Spring 1985. *Arctic* 42(1):24-30.
- George, J.C., R.S. Suydam, L.M. Philo, T.F. Albert, J.E. Zeh, and G.M. Carroll. 1995. Report of the spring 1993 census of bowhead whales, *Balaena mysticetus*, off Point Barrow, Alaska, with observations on the 1993 subsistence hunt of bowhead whales by Alaska Eskimos. *Rep. Int. Whaling Comm.* 45:371-384.
- George, J.C., R. Suydam, and C. Clark. 2004. Abundance and population trend (1978-2001) of western Arctic bowhead whales surveyed near Barrow, Alaska. *Mar. Mamm. Sci.* 20(4):755-773.
- George, J. C., J.W. Bickham, G. Givens, R. LeDuc, V. Melnikov, S. Moore, P. Morin, D. Rugh, R. Suydam, B. L. Taylor, P. Wade, and J. Zeh. 2005. Update on stock structure research on the Bering-Chukchi-Beaufort Seas stock of bowhead whales. Paper SC/57/BRG21 presented to the IWC Scientific Committee, June 2005, 6p.
- George, J.C., S. Moore, and R. Suydam. 2008. Summary of stock structure research on the Bering-Chukchi-Beaufort Seas stock of bowhead whales 2003-2007. *Rep. Int. Whaling Comm.* SC/59/BRG3.
- Goetz, K.T., D.J. Rugh, and J.A. Mocklin. 2008a. Aerial surveys. Bowhead Whale Feeding Ecology Study BOWFEST quarterly report. National Marine Mammal Laboratory, Alaska Fisheries Science Center, Seattle, WA.
- Goetz, K.T., D.J. Rugh, and J.A. Mocklin. 2008b. Aerial Surveys of Bowhead Whales in the Vicinity of Barrow, Alaska, August-September 2007. [Abstracts]. Alaska Marine Science Symposium. 20-23 January 2008. Anchorage, AK.
- Goetz, K.T., D.J. Rugh, and J.A. Mocklin. 2009a. Bowhead Whale Feeding Ecology Study (BOWFEST) in the Western Beaufort Sea, 2009 Annual Report. National Marine Mammal Laboratory, Alaska Fisheries Science Center, Seattle, WA.
- Goetz, K.T., D.J. Rugh, and J.A. Mocklin. 2009b. Bowhead Whale Feeding Ecology Study (BOWFEST) Aerial Surveys: a Comparison of Bowhead Whale Distribution and Survey Effort in 2007 and 2008 in the Vicinity of Barrow, Alaska. [Abstracts]. Alaska Marine Science Symposium, 19-23 January 2009, Anchorage, AK.
- Green, G.A., and M. Hall. 2003. Marine Mammal Monitoring Program McCovey Exploration Prospect, summer/fall 2002. Report prepared by Tetra Tech FW, Inc., Bothell, WA, for EnCana Oil & Gas (USA) Inc., Anchorage, AK, and Lynx Enterprises, Anchorage, AK.
- Green, G.A., and S. Negri. 2005. Marine Mammal Monitoring Program, FEX Barging Project, 2005. Report by Tetra Tech EC, Inc., Bothell, WA for ASRC Lynx Enterprises, Inc., Anchorage, AK.

- Green, G.A., and S. Negri. 2006. Marine Mammal Monitoring Program, FEX Barging Project, 2006. Report prepared by Tetra Tech EC, Inc., Bothell, WA, for ASRC Lynx Enterprises, Inc., Anchorage, AK.
- Green, G.A., M. Hall, and M. Newcomer. 2003. Marine Mammal Monitoring Program McCovey Exploration Project, Winter 2002/2003. Report prepared by Foster Wheeler Environmental Corporation, Bothell, WA, for EnCana Oil & Gas (USA) Inc., Anchorage, AK, and Lynx Enterprises, Anchorage, AK.
- Green, G.A., K. Hashagen, and D. Lee. 2007. Marine Mammal Monitoring Program, FEX Barging Project, 2007. Report by Tetra Tech EC, Inc., Bothell, WA for FEX L.P., Anchorage, AK.
- Griffeth, B. 1993. Marine mammal surveys and subsistence coordination during industrial activities in the Beaufort Sea. Pages 89-94 in MBC Applied Environmental Sciences, ed. Alaska OCS Region Fifth Information Transfer Meeting Conference Proceedings. OCS Study MMS 93-0043. Minerals Management Service, Anchorage, Alaska.
- Haley, B., and D. Ireland. 2006. Marine mammal monitoring during University of Alaska Fairbanks' marine geophysical survey across the Arctic Ocean, August–September 2005. LGL Report TA4122-3. Prepared by LGL Ltd., King City, Ontario for University of Alaska Fairbanks, Fairbanks, AK, and National Marine Fisheries Service, Silver Spring, MD.
- Hall, J.D., and J. Francine. 1990. Report on sound monitoring and bowhead whale call localization efforts associated with the Concrete Island Drilling Structure (CIDS) off Camden Bay, Alaska. Hubbs Marine Research Center Technical Report 89-219. San Diego, CA.
- Hall, J.D., M.L. Gallagher, K.D. Brewer, and D.K. Ljungblad. 1991. Passive acoustic monitoring program at the ARCO Alaska, Inc. "Fireweed" prospect September-October 1990. Report from Coastal & Offshore Pacific Corporation, Walnut Creek, CA for ARCO Alaska, Inc., Anchorage, AK.
- Hall, J.D., M.L. Gallagher, K.D. Brewer, P.R. Regos and P.E. Isert. 1994. ARCO Alaska, Inc. 1993 Kuvlum exploration area site specific monitoring program/Final report. Report from Coastal & Offshore Pacific Corp., Walnut Creek, CA, for ARCO Alaska Inc., Anchorage, AK.
- Hauser, D.D.W., V.D. Moulton, K. Christie, C. Lyons, G. Warner, C. O'Neill, D. Hannay, and S. Inglis. 2008. Marine mammal and acoustic monitoring of the Eni/PGS open-water seismic program near Thetis, Spy and Leavitt islands, Alaskan Beaufort Sea, 2008: 90-day report. LGL Report P1065-1. Report from LGL Alaska Research Associates Inc. and JASCO Research Ltd., for Eni US Operating Co. Inc., PGS Onshore, Inc., National Marine Fisheries Service, and U.S. Fish & Wildlife Service.

- Ireland, D., D. Hannay, R. Rodrigues, H. Patterson, B. Haley, A. Hunter, M. Jankowski and D.W. Funk. 2007a. Marine mammal monitoring and mitigation during open-water seismic exploration by GX Technology in the Chukchi Sea, October—November 2006: 90-day report. LGL Draft Report P891-1. Report from LGL Alaska Research Associates Inc., Anchorage, Alaska, LGL Ltd., King City, Ontario, and JASCO Research, Ltd., Victoria, British Columbia, Canada for GX Technology, Houston, TX, and National Marine Fisheries Service, Silver Spring, MD.
- Ireland, D., R. Rodrigues, D. Hannay, M. Jankowski, A. Hunter, H. Patterson, B. Haley and D.W. Funk. 2007b. Marine mammal monitoring and mitigation during open-water seismic exploration by ConocoPhillips Alaska Inc. in the Chukchi Sea, July–October 2006: 90-day report. LGL Draft Report P903-1. Report from LGL Alaska Research Associates Inc., Anchorage, AK, LGL Ltd., King City, Ontario and JASCO Research Ltd., Victoria, British Columbia, Canada for ConocoPhillips Alaska, Inc., Anchorage, AK, and National Marine Fisheries Service, Silver Spring, MD.
- Ireland, D.S., R. Rodrigues, D. Funk, W. Koski, and D. Hannay. (editors). 2009a. Marine mammal monitoring and mitigation during open-water seismic exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July–October 2008: 90-day report. LGL Rep. P1049-1. Rep. from LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Research Ltd. for Shell Offshore Inc., National Marine Fisheries Service, and U.S. Fish and Wildlife Service.
- Ireland, D., W.R. Koski, T.A. Thomas, J. Beland, C.M. Reiser, D.W. Funk and A.M. Macrander. 2009b. Updated distribution and relative abundance of cetaceans in the Eastern Chukchi Sea in 2006-8. Paper SC/61/BRG4 submitted to the International Whaling Committee Scientific Committee, 31 May - 12 June 2009, Madeira, Portugal.
- Johnson, S.R., C.R. Greene, R.A. Davis and W.J. Richardson. 1986. Bowhead whales and underwater noise near the Sandpiper Island Drillsite, Alaskan Beaufort Sea, 1985. Report from LGL Ltd., King City, Ontario for Shell Western Exploration and Production, Inc., Anchorage, AK.
- Johnson, J.H., H.W. Braham, B.D. Krogman, W.M. Marquette, R.M. Sonntag, and D.J. Rugh. 1981. Bowhead whale research: June 1979 to June 1980. Rep. Int. Whaling Comm. 31:461-475.
- Ko, D., J.E. Zeh, C.W. Clark, W.T. Ellison, B.D. Krogman, and R. Sonntag. 1986. Utilization of acoustic location data in determining a minimum number of spring-migrating bowhead whales unaccounted for by the ice-based visual census. Rep. Int. Whaling Comm. 36:325-388.

- Koski, W.R., J.C. George, R. Suydam, D.J. Rugh, J. Zeh, A.R. Davis, B.D. Mactavish, J. Brandon, J., and S. Moore. 2005. An update of aerial photography of bowhead whales conducted during the 2003-2005 spring migrations. Working paper SC/57/BRG16 submitted to the Scientific Committee of the International Whaling Commission, 26 May–10 June 2005, Ulsan, Korea.
- Koski, W. R., D. J. Rugh, A. E. Punt, and D. J. Zeh. 2006a. An approach to minimize bias in estimation of the length-frequency distribution of bowhead whales (*Balaena mysticetus*) from aerial photogrammetric data. *J. Cetacean Res. Manage.* 8:45-54.
- Koski, W.R., D.J. Rugh, J. Zeh, J.C. George, R. Suydam, A.R. Davis, and J. Mocklin. 2006b. Review of bowhead whale aerial photographic studies in 2003-2006. Working paper SC/58/BRG20 submitted to the Scientific Committee of the International Whaling Commission, June 2006, St. Kitts and Nevis.
- Koski, W.R., D.J. Rugh, J.C. George, R. Suydam, A.R. Davis, J. Mocklin, and K. Trask. 2007a. An update on analyses of bowhead whale aerial photographs obtained in 2003-2005. Working paper SC/59/BTG6 presented to the Scientific Committee of the International Whaling Commission, May 2007, Anchorage, AK.
- Koski, W.R., D.J. Rugh, J. Zeh, J.C. George, R. Suydam, A.R. Davis, J. Mocklin, and K. Trask. 2007b. Review of bowhead whale aerial photographic studies in 2003-06. Working paper SC/59/BRG6 presented to the Scientific Committee of the International Whaling Commission, May 2007, Anchorage, AK.
- Koski, W.R., D.W. Funk, D.S. Ireland, C. Lyons, K. Christie, A.M. Macrander, and S.B. Blackwell. 2009a. An update on feeding by bowhead whales near an offshore seismic survey in the central Beaufort Sea. Working paper SC/61/BRG3 presented to the Scientific Committee of the International Whaling Commission, 22-25 June 2009, Madeira, Portugal.
- Koski, W.R., P. Abgrall, and S. Yazvenko. 2009b. A review and inventory of unmanned aerial systems for detection and monitoring of key biological resources and physical parameters affecting marine life during offshore exploration and production activities. Working paper SC/61/E9 submitted to the Scientific Committee of the International Whaling Commission, June 2009, Madeira, Portugal.
- Koski, W.R., T. Allen, D. Ireland, G. Buck, P. Smith, M. Macrander, M. Halick, C. Rushing, D. Swila, and T. McDonald. 2009c. Evaluation of an unmanned airborne system for monitoring marine mammals. *Aquat. Mamm.* 35(3):347-357.
- Koski, W.R., J. Zeh, J. Mocklin, A.R. Davis, D.J. Rugh, J.C. George, and R. Suydam. 2010. Abundance of Bering-Chukchi-Beaufort bowhead whales (*Balaena mysticetus*) in 2004 estimated from photo-identification data. *J. Cetacean Res. Manage.* 11(2):89-99.

- Krogman, B.D. 1980. Sampling strategy for enumerating the western Arctic population of the bowhead whale. *Mar. Fish. Rev.* 42(9-10):30-36.
- Krogman, B. and D. Rugh. 1983. Instructions for conducting a census of bowhead whales from ice-based observations sites near Point Barrow, Alaska. U.S. Dep. Commer., NOAA Tech. Memo. NMFS/NWC-45, 54pp.
- Krogman, B.D., R. Sonntag, D. Rugh, J. Zeh, and R. Grotefendt. 1982. Ice-based census results from 1978-81 on the western Arctic stock of the bowhead whale. Working paper SC/34/PS6 submitted to the Scientific Committee of the International Whaling Commission, June 1982, Cambridge, U.K.
- Krogman, B.D. R.M. Sonntag, J.E. Zeh, and D. Ko. 1985. Environmental factors affecting the results of the 1984 ice-based census of bowhead whales, *Balaena mysticetus*, near Point Barrow, Alaska. Working paper SC/37/PS9 submitted to the Scientific Committee of the International Whaling Commission, June 1985, Bournemouth, U.K.
- Krogman, B.D., J.C. George, G. Carroll, J. Zeh, and R. Sonntag. 1986. Preliminary results of the 1985 spring ice-based census of the bowhead whale, *Balaena mysticetus*, conducted near Point Barrow, Alaska. *Rep. Int. Whaling Comm.* 36:343-352.
- Krogman, B.D., D. Rugh, R. Sonntag, J. Zeh, and D. Ko. 1989. Ice-based census of bowhead whales migrating past Point Barrow, Alaska, 1978-1983. *Mar. Mamm. Sci.* 5(2):116-138.
- Krutzikowsky, G.K., and B.R. Mate. 2000. Dive and surfacing characteristics of bowhead whales (*Balaena mysticetus*) in the Beaufort and Chukchi Seas. *Can. J. Zool.* 78(7):1182-1198.
- Landino, S.W., S.D. Treacy, S.A Zerwick, and J.B. Dunlap. 1994. A large aggregation of bowhead whales (*Balaena mysticetus*) feeding near Point Barrow, Alaska, in late October 1992. *Arctic* 47(3):232-235.
- LGL Ecological Research Associates and Greeneridge Sciences, Inc. 1987. Responses of bowhead whales to an offshore drilling operation in the Alaskan Beaufort Sea, Autumn 1986. Prepared for Shell Western Exploration and Production, Inc., Anchorage, AK.
- LGL Ecological Research Associates and Greeneridge Sciences, Inc. 1996. Northstar Marine Mammal Monitoring Program, 1995: Baseline surveys and retrospective analyses of marine mammal and ambient noise data from the Central Alaskan Beaufort Sea. LGL Report TA 2101-2. Report from LGL Ltd., King City, Ontario, and Greeneridge Sciences Inc., Santa Barbara, CA, for BP Exploration (Alaska) Inc., Anchorage, AK.



- LGL Alaska Research Associates, Inc. 2006. Draft environmental assessment of a marine geophysical survey by the USCG *Healy* of the Western Canada Basin, Chukchi Borderland, and Mendeleev Ridge, Arctic Ocean, July-August 2006. LGL Report TA4285-1. Prepared for the National Science Foundation, Office of Polar Programs, Arlington, VA.
- LGL Alaska Research Associates, Inc. and LGL Environmental Research Associates. 2005. Environmental assessment of a marine geophysical survey by the Coast Guard Cutter *Healy* across the Arctic Ocean, August-September 2005. LGL Report 4122-1 (Draft). Prepared for University of Alaska Fairbanks, Fairbanks, AK and National Science Foundation, Office of Polar Programs, Arlington, VA.
- Ljungblad, D. 1981. Aerial surveys of endangered whales in the Beaufort Sea, Chukchi Sea and northern Bering Sea. NOSC Technical Document 449. Prepared by Naval Ocean Systems Center and SEACO for Minerals Management Service, Anchorage, AK.
- Ljungblad, D., M.F. Platter-Rieger, and F.S. Shipp, Jr. 1980. Aerial surveys of bowhead whales, North Slope, Alaska. NOSC Technical Document 314. Prepared by Naval Ocean Systems Center, San Diego, CA for Bureau of Land Management, Anchorage, AK.
- Ljungblad, D.K., S.E. Moore, D.R. Van Schoik, and C.S. Winchell. 1981. Methods for estimating density of bowhead whales (*Balaena mysticetus*) in the Beaufort Sea during fall migration: A review of progress and a proposal for future research efforts. Prepared for the Minerals Management Service.
- Ljungblad, D.K., S.E. Moore, D.R. Van Schoik, and C.S. Winchell. 1982. Aerial surveys of endangered whales in the Beaufort, Chukchi and northern Bering seas. NOSC Technical Document 486. Prepared by Naval Ocean Systems Center, San Diego, CA for Minerals Management Service, Anchorage, AK.
- Ljungblad, D.K., S.E., Moore, and D.R. Van Schoik. 1983. Aerial surveys of endangered whales in the Beaufort, eastern Chukchi and northern Bering seas, 1982. NOSC Technical Document 605. Prepared by Naval Ocean Systems Center, San Diego, CA for Minerals Management Service, Anchorage, AK.
- Ljungblad, D.K., S.E. Moore, and D.R. Van Schoik. 1984a. Aerial surveys of endangered whales in the northern Bering, eastern Chukchi, and Alaskan Beaufort seas, 1983: With a five year review, 1979-1983. NOSC Technical Report 995. Prepared by Naval Ocean Systems Center, San Diego, CA for Minerals Management Service, Anchorage, AK.
- Ljungblad, D., B. Würsig, R.R. Reeves, J.T. Clarke, and C.R. Greene, Jr. 1984b. Fall 1983 Beaufort Sea seismic monitoring and bowhead whale behavior studies. Prepared for Minerals Management Service, Alaska OCS Region, under Interagency Agreement No. 14-12-0001-29064.

- Ljungblad, D.K., B. Würsig, R.R. Reeves, J.T. Clarke, and C.R. Greene, Jr. 1984c. Fall 1983 Beaufort Sea seismic monitoring and bowhead whale behavior studies. Prepared by SEACO Inc., San Diego, CA for Minerals Management Service, Anchorage, AK.
- Ljungblad, D.K., S.E. Moore, J.T. Clarke, and J.C. Bennett. 1985a. Aerial surveys of endangered whales in the northern Bering, eastern Chukchi, and Alaskan Beaufort seas, 1984: With a six year review, 1979-1984. NOSC Technical Report 1046. Prepared by Naval Ocean Systems Center, San Diego, CA for Minerals Management Service, Anchorage, AK.
- Ljungblad, D.K., S.E. Moore, J.T. Clarke, and J.C. Bennett. 1985b. Aerial surveys of endangered whales in the northern Bering, eastern Chukchi, and Alaskan Beaufort seas, 1985: With a seven year review, 1979-85. OCS Study MMS 86-0002. Minerals Management Service, Anchorage, AK.
- Ljungblad, D.K., S.E. Moore, and J.C. Bennett. 1985c. A guide to sightings of feeding bowhead whales (*Balaena mysticetus*) in the eastern Alaska Beaufort Sea. Prepared by SEACO, Inc., San Diego, CA for Minerals Management Service, Anchorage, AK.
- Ljungblad, D.K., S.E. Moore, and J.T. Clarke. 1986a. Assessment of bowhead whale (*Balaena mysticetus*) feeding patterns in the Alaskan Beaufort and Northeastern Chukchi seas via aerial surveys, fall 1979-84. Rep. Int. Whaling Comm. 36:265-272.
- Ljungblad, D.K., S.E. Moore, and D.R. Van Schoik. 1986b. Seasonal patterns of distribution, abundance, migration and behavior of the Western Arctic stock of bowhead whales, *Balaena mysticetus*, in Alaskan seas. Rep. Int. Whaling Comm., Special Issue 8:177-120.
- Ljungblad, D. K., S. E. Moore, J. T. Clarke, and J. C. Bennett. 1986c. Aerial Surveys of Endangered Whales in the Northern Bering, Eastern Chukchi, and Alaskan Beaufort Seas, 1985: With a 7-Year Review, 1979-1985. NOSC TR 1111, 407pp. incl. appendices.
- Ljungblad, D.K., S.E. Moore, J.T., and J.C. Bennett. 1987a. Distribution, abundance, behavior, and bioacoustics of endangered whales in the Alaskan Beaufort and eastern Chukchi Seas, 1979-86. OCS Study MMS 87-0039. Minerals Management Service, Anchorage, AK.
- Ljungblad, D. K., S. E. Moore, J. T. Clarke, and J. C. Bennett. 1987b. Distribution, Abundance, Behavior, and Bioacoustics of Endangered Whales in the Alaskan Beaufort and Eastern Chukchi Seas, 1979-1986. NOSC TR 1177, 362 pp. incl. appendices.
- Ljungblad, D.K., S.E. Moore, J.T. Clarke, and J.C. Bennett. 1988a. Distribution, abundance, behavior, and bioacoustics of endangered whales in the western Beaufort and northeastern Chukchi seas, 1979-87. OCS Study MMS 87-0122. Minerals Management Service, Anchorage, AK.

- Ljungblad, D.K., B. Würsig, S. Swartz, and J. Keene. 1988b. Observations on the behavioral responses of bowhead whales (*Balaena mysticetus*) to active geophysical vessels in the Alaskan Beaufort Sea. *Arctic* 41(3):183-194.
- Manly, B.F.J., V.D. Moulton, R.E. Elliott, G.W. Miller, and W.J. Richardson. 2007. Analysis of covariance for fall migration of bowhead whales in relation to human activities and environmental factors, Alaskan Beaufort Sea: Phase 1, 1996-1998. OCS Study MMS 2005-033. Minerals Management Service, Anchorage, AK.
- Marquette, W.M., H.W. Braham, M.K. Nerini, and R.W. Miller. 1982. Bowhead whale studies, Autumn 1980-Spring 1981: Harvest, biology and distribution. *Rep. Int. Whaling Comm.* 32:357-370.
- Mate, B.R., G.K. Krutzikowsky, and M.H. Winsor. 2000. Satellite-monitored movements of radio-tagged bowhead whales in the Beaufort and Chukchi seas during the late-summer feeding season and fall migration. *Can. J. Zool.* 78(7):1168-1181.
- MBC Applied Environmental Sciences. 2007. Proceedings of a Workshop on Chukchi Sea Offshore Monitoring in Drilling Area. OCS Study MMS 2007-002. Minerals Management Service, Anchorage, AK.
- McLaren, P.L., C.R. Greene, W.J. Richardson, and R.A. Davis. 1986. Bowhead whales and underwater noise near a drillship operation in the Alaskan Beaufort Sea, 1985. Prepared by LGL Limited Environmental Research and Greeneridge Sciences, Inc. for Unocal Corporation, Oil and Gas Division, Los Angeles, CA.
- Melnikov, V.V., and J.E. Zeh. 2007. Chukotka Peninsula counts and estimates of the number of migrating bowhead whales. *J. Cetacean Res. Manage.* 9(1):29-35.
- Melnikov, V.V., M. A. Zelensky, and L.I. Ainana 1998a. Observations on distribution and migration of bowhead whales (*Balaena mysticetus*) in the Bering and Chukchi seas. Working paper SC/50/AS3 submitted to the Scientific Committee of the International Whaling Commission, May 1998, Muscat, Oman.
- Melnikov, V.V., M.A. Zelenskii, and V.V. Bychkov. 1998b. Seasonal migrations and distribution of bowhead whale in waters of Chukotka. *Biologiya Morya (Vladivostok)* 23(4):199-208.
- Miles, P.R., C.I. Malme, and W.J. Richardson. 1987. Prediction of drilling site-specific interaction of industrial acoustic stimuli and endangered whales in the Alaskan Beaufort Sea. OCS Study MMS 87-0084. Minerals Management Service, Anchorage, AK.
- Miller, R., and J. Burns. 1979. Joint marine mammal programs between the U.S. and U.S.S.R. *Transactions of the 44th North American Wildlife and Natural Resources Conference*, 1979:480-487.

- Miller, R.V., D.J. Rugh, and J.H. Johnson. 1986. The distribution of bowhead whales, *Balaena mysticetus*, in the Chukchi Sea. *Mar. Mamm. Sci.* 2:214–222.
- Miller, G.W., R.A. Davis, and W.J. Richardson. 1991. Behavior of bowhead whales of the Davis Strait and Bering/Beaufort stocks vs. regional differences in human activities. OCS Study MMS 91-0029. Minerals Management Service, Anchorage, AK.
- Miller, G.W., R.A. Davis, W.R. Koski, M.J. Crone, D.J. Rugh, D.E. Withrow, and M. Fraker. 1992. Calving intervals of bowhead whales-- An analysis of photographic data. *Rep. Int. Whaling Comm.* 42:501-506.
- Miller, G.W., V.D. Moulton, R.A. Davis, M. Holst, P. Millman, A. MacGillivray and D. Hannay. 2005. Monitoring seismic effects on marine mammals—southeastern Beaufort Sea, 2001-2002. Pages 511-542 *In* S.L. Armsworthy, P.J. Cranford, and K. Lee (editors). *Offshore oil and gas environmental effects monitoring: Approaches and technologies*. Battelle Press, Columbus, OH.
- Mocklin, J. A. 2009. Evidence of bowhead whale feeding behavior from aerial photography. AFSC Processed Rep. 2009-06, 118p. Alaska Fish. Sci. Cent., Natl. Mar. Fish. Ser., 7600 Sand Point Way NE, Seattle WA 98115.
- Mocklin, J., D. Rugh, and S. Moore. 2009. Evidence of Feeding by Bowhead Whales from Aerial Photography. [Abstracts]. Eighteenth Biennial Conference on the Biology of Marine Mammals, 12-16 October 2009, Quebec City, Canada.
- Mocklin, J., D. Rugh, and S. Moore. 2010. Evidence of feeding by bowhead whales from aerial photography. [Abstracts]. Alaska Marine Science Symposium, 18-22 January 2010, Anchorage, AK.
- Monnett, C., and S.D. Treacy. 2005. Aerial surveys of endangered whales in the Beaufort Sea, fall 2002-2004. OCS Study MMS 2005-037. Minerals Management Service, Anchorage, AK.
- Moore, S.E. 1990. Distribution and migration of cetaceans in the U.S. Chukchi Sea in the fall of 1989, with a summary of data collected from 1980-89. Pages 11-19 *In* MBC Applied Environmental Sciences, ed. Alaska OCS Region Third Information Transfer Meeting conference proceedings, January 30 - 1 February 1990, Anchorage, AK. OCS Study MMS 90-0041. Minerals Management Service, Anchorage, AK.
- Moore, S.E. 1997. Cetacean habitats in the Alaskan Arctic. Ph.D. Dissertation, University of California at San Diego, Scripps Institution of Oceanography. 318pp.
- Moore, S.E. 1992. Summer records of bowhead whales in the northeastern Chukchi Sea. *Arctic* 45(4):398-400.

- Moore, S.E. 2000. Variability of cetacean distribution and habitat selection in the Alaskan Arctic, Autumn 1982-91. *Arctic* 53(4):448-460.
- Moore, S.E., and J.T. Clarke. 1991. Estimates of bowhead whale (*Balaena mysticetus*) numbers in the Beaufort Sea during late summer. *Arctic* 44(1):43-460
- Moore, S.E., and J.T. Clarke. 1992a. Distribution, abundance, and behavior of endangered whales in the Alaskan Chukchi and western Beaufort seas, 1991: With a review 1982-91. OCS Study MMS 92-0029. Minerals Management Service, Anchorage, AK.
- Moore, S.E., and J.T. Clarke. 1992b. Patterns of bowhead whale distribution and abundance near Barrow, Alaska, in fall 1982-1989. *Mar. Mamm. Sci.* 8(1):27-36.
- Moore, S.E., and J.T. Clarke. 1993. Bowhead whale autumn distribution and relative abundance in relation to oil and gas lease areas in the northeastern Chukchi Sea. *Polar Record* 29: 209-214.
- Moore, S.E., and D.P. DeMaster. 1998. Cetacean habitats in the Alaskan Arctic. *J. Northwest Atlantic Fish. Sci.* 22:55-69.
- Moore, S.E., J.T. Clarke, and D.K. Ljungblad. 1986. A comparison of gray whale (*Eschrichtius robustus*) and bowhead whale (*Balaena mysticetus*) distribution, abundance, habitat preference and behavior in the northeastern Chukchi Sea, 1982-84. *Rep. Int. Whaling Comm.* 36:273-279.
- Moore, S.E., J.C. Bennett, and D.K. Ljungblad. 1989a. Use of passive acoustics in conjunction with aerial surveys to monitor the fall bowhead whale (*Balaena mysticetus*) migration. *Rep. Int. Whaling Comm.* 39:291-295.
- Moore, S.E., J.T. Clarke, and D.K. Ljungblad. 1989b. Bowhead whale (*Balaena mysticetus*) spatial and temporal distribution in the central Beaufort Sea during late summer and early fall 1979-86. *Rep. Int. Whaling Comm.* 39:283-290.
- Moore, S.E., D.P. DeMaster, and P.K. Dayton. 2000. Cetacean habitat selection in the Alaskan Arctic during summer and autumn. *Arctic* 53(4):432-447.
- Moore, S.E., J.C. George, K.O. Coyle, and T.J. Weingartner. 1995. Bowhead whales along the Chukotka coast in autumn. *Arctic* 48(2):155-160.
- Moore, S.E., J. C. George, G. Sheffield, J. Bacon, C. J. Ashjian. 2010. Bowhead whale distribution and feeding near Barrow, Alaska, in late summer 2005-06. *Arctic* 63(2):195-205.
- Nerini, M.K., and D.J. Rugh. 1986. Distribution of bowhead whales in the vicinity of Point Barrow, Alaska: Aerial observations 1984 and 1985. *Rep. Int. Whaling Comm.* 36:359-61.

- Nerini, M.K., D. Withrow, and K. Strickland. 1987. Length structure of the bowhead whale population derived from aerial photogrammetry, with notes on recruitment, spring 1985 and 1986. Working paper SC/39/PS14 submitted to the Scientific Committee of the International Whaling Commission, June 1987, Bournemouth, U.K.
- NMML (National Marine Mammal Laboratory). 2008. Bowhead Whale Feeding Ecology Study (BOWFEST) annual report for 2007. Inter-Agency Agreement Number MMS 4500000120. Prepared by the Alaska Fish Sci. Cent., National Marine Mammal Laboratory, Seattle, WA for Minerals Management Service, Anchorage, AK.
- NMML (National Marine Mammal Laboratory). 2009a. Bowhead Whale Feeding Ecology Study (BOWFEST) in the western Beaufort Sea, 2008 Annual Report. Inter-Agency Agreement Number MMS 4500000120. Prepared by the Alaska Fish Sci. Cent., National Marine Mammal Laboratory, Seattle, WA for Minerals Management Service, Anchorage, AK.
- NMML (National Marine Mammal Laboratory) 2009b. Bowhead Whale Feeding Ecology Study (BOWFEST) Quarterly Report, July-September 2009. Prepared for Minerals Management Service, Anchorage, Alaska by National Marine Fisheries Service, Seattle, Washington.
- NMML (National Marine Mammal Laboratory). 2010. Bowhead Whale Feeding Ecology Study (BOWFEST) In the Western Beaufort Sea. 2009 Annual Report. Prepared by the Alaska Fish Sci. Cent., National Marine Mammal Laboratory, Alaska Fisheries Science Center, Seattle, WA.
- Okkonen, S. 2010. Circulation Features Associated with the Barrow Area Bowhead Whale Feeding Hotspot. [Abstracts]. Alaska Marine Science Symposium, 18-22 January 2010, Anchorage, AK.
- Patenaude, N. J., W. J. Richardson, M. A. Smultea, W. R. Koski, G. W. Miller, B. Würsig, and C. R. Greene, Jr. 2002. Aircraft sound and disturbance to bowhead and beluga whales during spring migration in the Alaskan Beaufort Sea. *Mar. Mamm. Sci.* 18 (2):309-335.
- Patterson, H., S.B. Blackwell, B. Haley, A. Hunter, M. Jankowski, R. Rodrigues, D. Ireland, and D. W. Funk. 2007. Marine mammal monitoring and mitigation during open-water seismic exploration by Shell Offshore Inc. in the Chukchi and Beaufort seas, July–September 2006: 90-day report. LGL Draft Report P891-1. Report from LGL Alaska Research Associates Inc., Anchorage, AK, LGL Ltd., King City, Ont., and Greeneridge Sciences Inc., Goleta, CA, for Shell Offshore Inc, Houston, TX, and Nat. Mar. Fish. Serv., Silver Spring, MD.

- Philo, L.M., C.W. Clark, W.T. Ellison, and J.E. Zeh. 1990. Comparison of recorded bowhead whale (*Balaena mysticetus*) vocalization rates at two widely-separated hydrophone sites near Point Barrow, Alaska (Extended abstract). Pages 23-26 *In* Proceedings of the Fifth Conference on the Biology of the Bowhead Whale, *Balaena mysticetus*. Anchorage, Alaska, North Slope Borough.
- Quakenbush, L. 2007. Preliminary satellite telemetry results for Bering-Chukchi-Beaufort bowhead whales. Working paper SC/59/BRG12 submitted to the Scientific Committee of the International Whaling Commission, May 2007, Anchorage, AK.
- Quakenbush, L., J.J. Citta, J.C. George, R. Small, and M.P. Heide-Jorgensen. 2009. Fall movements of bowhead whales in the Chukchi Sea. [Abstracts]. Alaska Marine Science Symposium, 19-23 January 2009, Anchorage, AK.
- Quakenbush, L., and C. George. 2008. Satellite tracking of bowhead whales. Project update for the Alaska Eskimo Whaling Commission, Barrow, AK.  
[http://wildlife.alaska.gov/management/mm/bowhead\\_update.pdf](http://wildlife.alaska.gov/management/mm/bowhead_update.pdf)
- Quakenbush, L.T., and R.J. Small. 2005. Satellite tracking of bowhead whales: The planning process. OCS Study MMS 2005-058. Minerals Management Service, Anchorage, AK.
- Reeves, R., D. Ljungblad, and J.T. Clarke. 1983. Report on studies to monitor the interaction between offshore geophysical exploration activities and bowhead whales in the Alaskan Beaufort Sea, Fall 1982. Prepared for the Minerals Management Service, Anchorage, AK.
- Reeves, R.R., D.K. Ljungblad, and J.T. Clarke. 1984. Bowhead whales and acoustic seismic surveys in the Beaufort Sea. *Polar Record* 22:271-280.
- Richardson, W.J. (editor). 1982. Behavior, disturbance responses and distribution of bowhead whales, *Balaena mysticetus*, in the eastern Beaufort Sea, 1980-81. Prepared by LGL Ecological Research Associates, Bryan, TX for Minerals Management Service, Reston, VA.
- Richardson, W.J. (editor). 1983. Behavior, disturbance responses and distribution of bowhead whales, *Balaena mysticetus*, in the eastern Beaufort Sea, 1982. Prepared by LGL Ecological Research Associates, Bryan, TX for Minerals Management Service, Reston, VA.
- Richardson, W.J. (editor). 1984. Behavior, disturbance responses and distribution of bowhead whales, *Balaena mysticetus*, in the eastern Beaufort Sea, 1983. Prepared by LGL Ecological Research Associates, Bryan, TX for Minerals Management Service, Reston, VA.

- Richardson, W.J. (editor). 1985. Behavior, disturbance responses and distribution of bowhead whales, *Balaena mysticetus*, in the eastern Beaufort Sea, 1980-84. OCS Study MMS 85-0034. Minerals Management Service, Reston, VA.
- Richardson, W.J. (editor). 1986. Importance of the eastern Alaskan Beaufort Sea to feeding bowhead whales, 1985. OCS Study MMS 86-0026. Minerals Management Service, Reston, VA.
- Richardson, W.J. (editor). 1987. Importance of the eastern Alaskan Beaufort Sea to feeding bowhead whales, 1985-86. OCS Study MMS 87-0037. Minerals Management Service, Reston, VA.
- Richardson, W.J. 1990. Effects of oil production sounds on Arctic whales in spring ice leads. Pages 41-47 in MBC Applied Environmental Sciences, ed. Alaska OCS Region Third Information Transfer Meeting conference proceedings, January 30 - 1 February 1990, Anchorage, AK. OCS Study MMS 90-0041. Minerals Management Service, Anchorage, AK.
- Richardson, W.J. (editor). 1997. Northstar Marine Mammal Monitoring Program, 1996: Marine mammal and acoustical monitoring of a seismic program in the Alaskan Beaufort Sea. LGL Report TA2121-2. Report from LGL Ltd., King City, Ontario, and Greeneridge Sciences Inc., Santa Barbara, CA, for BP Exploration (Alaska) Inc., Anchorage, AK, and National Marine Fisheries Services, Anchorage, AK, and Silver Spring, MD.
- Richardson, W.J. (editor). 1998. Marine mammal and acoustical monitoring of BPXA's seismic program in the Alaskan Beaufort Sea, 1997. LGL Report TA2150-3. Report from LGL Ltd., King City, Ontario, and Greeneridge Sciences, Santa Barbara, CA, for BP Exploration (Alaska) Inc., Anchorage, AK, and National Marine Fisheries Service, Anchorage, AK, and Silver Spring, MD.
- Richardson, W.J. (editor). 1999. Marine mammal and acoustical monitoring of Western Geophysical's Open-Water Seismic Program in the Alaskan Beaufort Sea, 1998. LGL Report TA2230-3. Report from LGL Ltd., King City, Ontario, and Greeneridge Sciences Inc., Santa Barbara, CA, for Western Geophysical, Houston, TX, and National Marine Fisheries Service, Anchorage, AK, and Silver Spring, MD.
- Richardson, W.J. (editor). 2000. Marine mammal and acoustical monitoring of Western Geophysical's Open-Water Seismic Program in the Alaskan Beaufort Sea, 1999. LGL Report TA2313-4. Report from LGL Ltd., King City, Ontario, and Greeneridge Sciences Inc., Santa Barbara, CA, for Western Geophysical, Houston, TX, and National Marine Fisheries Service, Anchorage, AK, and Silver Spring, MD.



- Richardson, W.J. (editor). 2006a. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2005: Annual summary report. LGL Report TA4209 (rev.). Report from LGL Ltd., King City, Ontario, and Greeneridge Sciences, Inc., Santa Barbara, CA for BP Exploration (Alaska) Inc., Anchorage, AK.
- 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.
- Richardson, W.J. (editor). 2007. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2006: Annual summary report. LGL Report TA4441. Report from LGL Ltd. (King City, Ontario) and Greeneridge Sciences Inc. (Santa Barbara, CA) for BP Exploration (Alaska) Inc., Anchorage, AK.
- Richardson, W.J. (editor). 2008. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 1999–2004. [Updated comprehensive report, Feb 2008.] LGL Report PI004. Report from LGL Ltd. (King City, Ontario), Greeneridge Sciences Inc. (Santa Barbara, CA), WEST Inc. (Cheyenne, WY) and Applied Sociocultural Research (Anchorage, AK) for BP Exploration (Alaska) Inc., Anchorage, AK.
- Richardson, W.J., and K.J. Finley. 1989. Comparison of behavior of bowhead whales of the Davis Strait and Bering/Beaufort stocks. OCS Study MMS 88-0056. Minerals Management Service, Herndon, VA.
- Richardson, W.J., and J.W. Lawson (editors). 2002. Marine mammal monitoring of WesternGeco's open-water seismic program in the Alaskan Beaufort Sea, 2001. LGL Rep. TA2564-4. Rep. from LGL Ltd., King City, Ont., for WesternGeco LLC, Anchorage, AK, BP Exploration (Alaska) Inc., Anchorage, AK, and National Marine Fisheries Service, Anchorage, AK, and Silver Spring, MD.
- Richardson, W.J., and D.H. Thomson (editors). 2002. Bowhead whale feeding in the eastern Alaskan Beaufort Sea: Update of scientific and traditional information. OCS Study MMS 2002-012. Minerals Management Service, Anchorage, AK.
- Richardson, W.J. and M. T. Williams (editors). 2001. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2000. LGL Rep. LGL Rep. TA2573-2. 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.

- Richardson, W.J. and M. T. Williams (editors). 2002. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2001. LGL Report TA2431-2. 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.
- Richardson, W.J. and M. T. Williams (editors). 2003a. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2002. LGL Report TA2706-2. 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.
- Richardson, W.J. and M.T. Williams (editors). 2003b. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan for BP Explor. (Alaska) Inc., Anchorage, AK, and Nat. Mar. Fish. Serv., Anchorage, AK, and Beaufort Sea, 1999–2002. [Dec. 2003 ed.] Rep. from LGL Ltd. King City, Ont., and Greeneridge Sciences Inc., Santa Barbara, CA, Silver Spring, MD.
- Richardson, W.J. and M.T. Williams (editors). 2004. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 1999-2003. [Dec. 2004 ed.] LGL Report TA4002-8. 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.
- Richardson, W.J. and M.T. Williams (editors). 2005. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2004: Summary report. LGL Report TA4143. Report from LGL Ltd. (King City, Ontario), Exploration (Alaska) Inc., Anchorage, AK.
- Richardson, W.J., M.A. Fraker, B. Würsig, and R.S. Wells. 1985. Behavior of bowhead whales *Balaena mysticetus* summering in the Beaufort Sea: Reactions to industrial activities. Biol. Conserv. 32(3):195-230.
- Richardson, W.J., B. Würsig, and C.R. Greene, Jr. 1986. Reactions of bowhead whales, *Balaena mysticetus*, to seismic exploration in the Canadian Beaufort Sea. J. Acoust. Soc. Amer. 79:1117-1128.
- Richardson, W.J., R.A. Davis, C.R. Evans, D.K. Ljungblad, and P. Norton. 1987. Summer distribution of bowhead whales, *Balaena mysticetus*, relative to oil industry activities in the Canadian Beaufort Sea, 1980-84. Arctic 40(2):93-104.

- Richardson, W.J., C.R. Greene, Jr., W.R. Koski, C.I. Malme, G.W. Miller, M.A. Smultea, and B. Würsig. 1990. Acoustic effects of oil production activities on bowhead and white whales visible during spring migration near Pt. Barrow, Alaska - 1989 phase: Sound propagation and whale responses to playbacks of continuous drilling noise from an ice platform, as studied in pack ice conditions. OCS Study 90-0017. Minerals Management Service, Herndon, VA.
- Richardson, W. J., C. R. Greene Jr., W.R. Koski, M.A. Smultea, G. Cameron, C. Holdsworth, G. Miller, T. Woodley, and B. Würsig. 1991a. Acoustic effects of oil production activities on bowhead and white whales visible during spring migration near Pt. Barrow, Alaska - 1990 phase: Sound propagation and whale responses to playbacks of continuous drilling noise from an ice platform, as studied in pace ice conditions. OCS Study MMS 91-0037. Anchorage, Alaska: Minerals Management Service.
- Richardson, W.J., C.R. Greene, Jr., W.R. Koski, C.I. Malme, G.W. Miller, and M.A. Smultea. 1991b. Acoustic effects of oil production activities on bowhead and white whales visible during spring migration near Pt. Barrow, Alaska - 1990 phase. OCS Study MMS 91-0031. Minerals Management Service, Herndon, VA.
- Richardson, W.J., C.R. Greene Jr., J.S. Hanna, W.R. Koski, G.W. Miller, N.J. Patenaude, and M.A. Smultea. 1995. Acoustic effects of oil production activities on bowhead and white whales visible during spring migration near Pt. Barrow, Alaska--1991 and 1994 phases. OCS Study MMS 95-0051. Minerals Management Service, Herndon, VA.
- Roth, E.H., J. Jones, and J.A. Hildebrand. 2010. Long-term passive acoustic monitoring of marine mammals and ambient noise in the Chukchi Sea. Progress Report on Cooperative Agreement 10-078. Prepared by Marine Physical Laboratory of the Scripps Institution of Oceanography, University of California, San Diego for Alaska Department of Fish and Game, Division of Wildlife Conservation.
- Rugh, D. 1979. A day at Alokut. *Pacific Search* 13(12):40-43.
- Rugh, D. 1990. Bowhead whales reidentified through aerial photography near Point Barrow, Alaska. *Rep. Int. Whaling Comm., Special Issue* 12:289-294.
- Rugh, D.J. (editor) 2008. Bowhead whale abundance through photographic analysis: Data analysis supported by Minerals Management Service; final report. OCS Study MMS 2008-002. Minerals Management Service, Anchorage, AK.
- Rugh, D.J., and J.C. Cabbage. 1980. Migration of bowhead whales past Cape Lisburne, Alaska. *Mar. Fish. Rev.* 42(9-10):46-51.
- Rugh, D., and B. Koski. 2007. Identifying individual bowhead whales through aerial photography. [Abstracts]. Alaska Marine Science Symposium, 21-27 January 2007, Anchorage, AK.

- Rugh, D., and P. Wade. 2005. Aerial photography of bowhead whales to estimate the size of the Bering-Chukchi-Beaufort population. Pages 85-87 *In* MBC Applied Environmental Sciences, ed. Proceedings of the Tenth MMS Information Transfer Meeting and Barrow Information Update Meeting. OCS Study MMS-2005-036. Minerals Management Service, Anchorage, AK.
- Rugh, D., G. Miller, D. Withrow, and W. Koski. 1992. Calving intervals of bowhead whales established through photographic identifications. *J. Mamm.* 73(3):487-490.
- Rugh, D.J., J.E. Zeh, W.R. Koski, L.S. Baraff, G.W. Miller, and K.E.W. Shelden. 1998. An improved system for scoring photo quality and whale identifiability in aerial photographs of bowhead whales. *Rep. Int. Whaling Comm.* 48:501-512.
- Rugh, D., D. DeMaster, A. Rooney, J. Breiwick, K. Shelden, and S. Moore. 2003. A review of bowhead whale (*Balaena mysticetus*) stock identity. *J. Cetacean Res. Manage.* 5(3):267-279.
- Rugh, D., W. Koski, J. George, and J. Zeh. 2009. Interyear re-identification of bowhead whales during their spring migration past Barrow, Alaska, 1984-1994. *J. Cetacean Res. Manage.* 10(3):195-200.
- Rugh, D., C. Ashjian, M. Baumgartner, C. Berchok, B. Campbell, C. George, K. Goetz, D. Mellinger, J. Mocklin, S. Okkonen, G. Sheffield, M. Smultea, and K. Stafford. 2010. The Bowhead Whale Feeding Ecology Study (BOWFEST). [Abstracts]. Alaska Marine Science Symposium, 18-22 January 2010, Anchorage, AK.
- Sadykova, D., and T. Schweder. 2009. Migration ranks for bowhead whales (*Balaena mysticetus*) at Barrow in spring. Working paper SC/61/BRG20 submitted to the Scientific Committee of the International Whaling Commission, June 2009, Madeira, Portugal.
- Sadykova, D., and T. Schweder. 2010. Migration ranks for bowhead whales (*Balaena mysticetus*) at Barrow in spring. *J. Cetacean Res. Manage.* 11(1): 17-21.
- Sekiguchi, K., T. Uyama, and K. Yamshiro. 2007. Cetacean sighting survey during *T/S Oshoro Maru* Bering and Chukchi Sea cruise, 1 July-28 August 2007. Unpublished cruise report. Available at National Marine Mammal Laboratory, Alaska Fish. Sci. Cent., 7600 Sand Point Way NE, Seattle, WA 98115.
- Schweder, T. 2003. Abundance estimation from multiple photo surveys: Confidence distributions and reduced likelihoods for bowhead whales off Alaska. *Biometrics* 59:974-983.
- Schweder, T., and D. Sadykova. 2009. Information is gained increasingly fast in capture-recapture surveys - bowheads assessed by photographic surveys, and minke whales by genetic marking? Paper SC/61/BRG21 presented to the Scientific Committee of the International Whaling Commission, June 2009, Madeira, Portugal.

- Schweder, T., D. Sadykova, D. Rugh, and W. Koski. 2009. Population estimates from aerial photographic surveys of naturally and variably marked bowhead whales. *J. Agricult. Biol. Environ. Stat.* 14(1):1-19.
- Schweder, T., D. Sadykova, D. Rugh, and W. Koski. 2010. Population estimates from aerial photographic surveys of naturally and variably marked bowhead whales. *American Statistical Association and the International Biometric Society J. Agricult. Biol. Environ. Sci. (JABES)* 15(1):1-19.
- Shelden, K.E.W. and D.J. Rugh. 1995. The bowhead whale (*Balaena mysticetus*): Its historic and current status. *Mar. Fish. Rev.* 57(3-4):1-20.
- Shelden, K.E.W., D.P. DeMaster, D.J. Rugh, and A.M. Olson. 2001. Developing classification criteria under the U.S. Endangered Species Act: bowhead whales as case study. *Conserv. Biol.* 15(5):1300-1307.
- Sonntag, R.M., W.T. Ellison, C.W. Clark, D.R. Corbit, and B.D. Krogman. 1986. A description of a tracking algorithm and its application to bowhead whale acoustic location data collected during the spring migration near Point Barrow, Alaska 1984-85. *Rep. Int. Whaling Comm.* 36:299-310.
- Smultea, M., D. Fertl, and D. Rugh. 2010. History of Bowhead Surveys in the US Beaufort and Chukchi Seas ~ 1975-2009. [Abstracts]. Alaska Marine Science Symposium, 18-22 January 2010, Anchorage, AK.
- Thomas, T., W. Koski, and D. Ireland. 2010. Chukchi Sea nearshore aerial surveys. (Chapter 4) *In: Funk, D.W., D.S. Ireland, R. Rodrigues, and W.R. Koski, (Editors). Joint monitoring program in the Chukchi and Beaufort seas, open-water seasons, 2006-2008. LGL Alaska Report P1050-2. Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., and JASCO Research Ltd. for Shell Offshore Inc. and other industry contributors, and National Marine Fisheries Service, and U.S. Fish and Wildlife Service.*
- Treacy, S.D. 1988a. The Minerals Management Service Bowhead Whale Monitoring Program and its application. Pages 180-183 in *Proceedings, Oceans '88, 31 Oct.-2 Nov. 1988, Baltimore, MD.*
- Treacy, S.D. 1988b. Aerial surveys of endangered whales in the Beaufort Sea, Fall 1987. OCS Study MMS 88-0030. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 1989. Aerial surveys of endangered whales in the Beaufort Sea, Fall 1988. OCS Study MMS 89-0033. Minerals Management Service, Anchorage, AK.

- Treacy, S.D. 1990a. Aerial surveys of endangered whales in the Beaufort Sea in the fall, 1988 and 1989. Pages 27-31 *In* MBC Applied Environmental Sciences, ed. Alaska OCS Region Third Information Transfer Meeting Conference Proceedings, January 30 - 1 February 1990, Anchorage, AK. OCS Study MMS 90-0041. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 1990b. Aerial surveys of endangered whales in the Beaufort Sea, Fall 1989. OCS Study MMS 90-0047. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 1991. Aerial surveys of endangered whales in the Beaufort Sea, Fall 1990. OCS Study MMS 91-0055. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 1992. Aerial surveys of endangered whales in the Beaufort Sea, Fall 1991. OCS Study MMS 92-0017. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 1993. Aerial surveys of endangered whales in the Beaufort Sea, Fall 1992. OCS Study MMS 93-0023. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 1994. Aerial surveys of endangered whales in the Beaufort Sea, Fall 1993. OCS Study MMS 94-0032. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 1995. Aerial surveys of endangered whales in the Beaufort Sea, Fall 1994. OCS Study MMS 95-0033. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 1996. Aerial surveys of endangered whales in the Beaufort Sea, Fall 1995. OCS Study MMS 96-0006. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 1997. Aerial surveys of endangered whales in the Beaufort Sea, Fall 1996. OCS Study MMS 97-0016. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 1998. Aerial surveys of endangered whales in the Beaufort Sea, Fall 1997. OCS Study MMS 98-0059. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 2000. Aerial surveys of endangered whales in the Beaufort Sea, Fall 1998-1999. OCS Study MMS 2000-066. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 2002a. Aerial surveys of endangered whales in the Beaufort Sea, Fall 2000. OCS Study MMS 2002-014. Minerals Management Service, Anchorage, AK.
- Treacy, S.D. 2002b. Aerial surveys of endangered whales in the Beaufort Sea, Fall 2001. OCS Study MMS 2002-061. Minerals Management Service, Anchorage, AK.
- Treacy, S.D., J.S. Gleason, and C.J. Cowles. 2006. Offshore distances of bowhead whales (*Balaena mysticetus*) observed during fall in the Beaufort Sea, 1982-2000: An alternative interpretation. *Arctic* 59(1):83-90.

- Wartzok, D. 1990. Industry-sponsored bowhead whale monitoring and research in the U.S. and Canadian Beaufort Sea. Alaska OCS Region, Conference Proceedings, Third Information Meeting, January 30 to February 1, 1990, Anchorage, Alaska. OCS Study MMS 90-0041. MBC Applied Environmental Sciences. Anchorage, Alaska, Minerals Management Service: 33-40.
- Wartzok, D., W.A. Watkins, B. Würsig, J. Guerrero, and J. Schoenherr. 1990. Movements and behavior of bowhead whales. Report from Purdue University, Fort Wayne, Indiana for Amoco Production Company, Denver, CO.
- Weingartner, T., B. Holt, R. Kwok, R. Pickart, A. Plueddemann, S. Moore, and K. Stafford. 2008. NOPP: Circulation, Cross-Shelf Exchange, Sea Ice, and Marine Mammal Habitats on the Alaska Beaufort Sea Shelf. Progress report submitted to Office of Naval Research, Arlington, VA.
- Withrow, D., and C. Goebel-Diaz. 1989. Distribution of bowhead whales near Point Barrow, Alaska, 1984-1986. Rep. Int. Whaling Comm. 39:305-308.
- Würsig, B., E.M. Dorsey, M.A. Fraker, R.S. Payne, W.J. Richardson, and R.S. Wells. 1984. Behavior of bowhead whales, *Balaena mysticetus*, summering in the Beaufort Sea: Surfacing, respiration, and dive characteristics. Can. J. Zool. 62:1910-1921.
- Würsig, B., E.M. Dorsey, M.A. Fraker, R.S. Payne, and W.J. Richardson. 1985. Behavior of bowhead whales, *Balaena mysticetus*, summering in the Beaufort Sea: A description. Fish. Bull., U.S. 83:357-377.
- Würsig, B., E.M. Dorsey, M.A. Fraker, R.S. Payne, and W.J. Richardson. 1986. Behavior of bowhead whales summering in the Beaufort Sea. Rep. Int. Whaling Comm., Special Issue 8:167-175.
- Würsig, B., E.M. Dorsey, W.J. Richardson, and R.S. Wells. 1989. Feeding, aerial and play behaviour of the bowhead whale, *Balaena mysticetus*, summering in the Beaufort Sea. Aquat. Mamm. 15(1):27-37.
- Zeh, J.E., D. Ko, B.D. Krogman, and R. Sonntag. 1983. Minimum population estimates of the western Arctic stock of the bowhead whale from ice-based census results 1978-82. Working paper SC/35/PS12 submitted to the Scientific Committee of the International Whaling Commission, Cambridge, June 1983.
- Zeh, J., A. Raftery, and P. Styer. 1988a. Mark-recapture estimation of bowhead whale, *Balaena mysticetus*, population size and offshore distribution from 1986 visual and acoustic data collected off Point Barrow, Alaska. Working paper SC/40/PS5 submitted to the Scientific Committee of the International Whaling Commission, 30 May-3 June 1988, Auckland, New Zealand.

Zeh, J., P. Turet, R. Gentlemen, and A. Raftery. 1988b. Population size estimation for the bowhead whale, *Balaena mysticetus*, based on 1985 visual and acoustic data. Rep. Int. Whaling Comm. 38:349-364.

Zeh, J., D. Poole, G. Miller, W. Koski, L. Baraff, and D. Rugh. 2002. Survival of bowhead whales, *Balaena mysticetus*, estimated from 1981-1998 photo-identification data. Biometrics 58:832-840.



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### AFSC-

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- 221 GRAY, A. K., W. T. MCCRANEY, C. T. MARVIN, C. M. KONDZELA, H. T. NGUYEN, and J. R. GUYON. 2011. Genetic stock composition analysis of chum salmon bycatch samples from the 2007 Bering Sea groundfish fisheries, 29 p. NTIS No. PB2011-110764.