

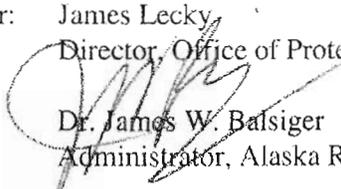


**UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration**

National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

January 2, 2008

Memorandum For: James Lecky
Director, Office of Protected Resources

From: 
Dr. James W. Balsiger
Administrator, Alaska Region

Subject: Biological Opinion on the Issuance of Annual Quotas Authorizing the Harvest of Bowhead Whales to the Alaska Eskimo Whaling Commission for the Period 2008 through 2012

This attached document is the National Marine Fisheries Service's (NOAA Fisheries) Biological Opinion regarding the issuance of annual quotas to the Alaska Eskimo Whaling Commission, allowing for the harvest of bowhead whales over a 5 year period, and its effects on the endangered bowhead whale in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*). NOAA Fisheries, Office of International Affairs, requested formal consultation on this matter by letter dated September 20, 2007. A transmittal memorandum for your signature is also attached. A complete administrative record of this consultation is on file at the NOAA Fisheries' offices in Juneau, Alaska.

NOAA Fisheries concludes the proposed action is not likely to jeopardize the continued existence of the bowhead whale. No critical habitat has been designated for bowhead whales so no critical habitat will be affected by the proposed action. Conservation recommendations are provided with the Biological Opinion which are intended to improve our understanding of the impacts of subsistence harvest on the bowhead whale, as well as to minimize or mitigate adverse effects.

This opinion concerns the lethal take of an endangered species, may be considered controversial, and has implications of national significance through the interrelationship between the U.S. action to convey the harvest quota to the Alaska Eskimo Whaling Commission, the International Whaling Commission which establishes the quota, and Russia who share the aboriginal quota for the Western arctic bowhead whale with the United States. According to the provisions of the Delegation of Authority for Section 7 Consultations Under the ESA, the Director, Office of Protected Resources is delegated authority for this consultation.

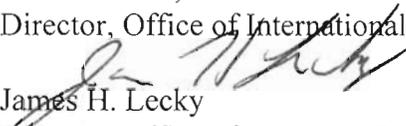




UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

JAN 4 2008

Memorandum For: Rebecca Lent, Ph.D.
Director, Office of International Affairs

From: 
James H. Lecky
Director, Office of Protected Resources

Subject: Biological Opinion on the Issuance of Annual Quotas Authorizing the Harvest of Bowhead Whales to the Alaska Eskimo Whaling Commission for the Period 2008 through 2012

This document transmits the National Marine Fisheries Service's (NOAA Fisheries) Biological Opinion regarding the issuance of annual quotas to the Alaska Eskimo Whaling Commission, allowing for the harvest of bowhead whales over a 5 year period, and its effects on the endangered bowhead whale in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*). A complete administrative record of this consultation is on file at the NOAA Fisheries offices in Juneau, Alaska.

NOAA Fisheries, Office of International Affairs, requested formal consultation on this matter by letter dated September 20, 2007. In formulating this Biological Opinion, NOAA Fisheries used information presented in the 2007 Draft Environmental Impact Statement for Issuing Annual Quotas to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the Years 2008 Through 2012, reports from the International Whaling Commission, its Scientific Committee and its Subcommittee on Aboriginal Subsistence Whaling, along with other research relating to bowhead whales and information provided by NOAA's National Marine Mammal Laboratory, the North Slope Borough, the Alaska Eskimo Whaling Commission, and the traditional knowledge of the Alaskan Eskimo community.

NOAA Fisheries concludes the proposed action is not likely to jeopardize the continued existence of the bowhead whale. No critical habitat has been designated for bowhead whales so no critical habitat will be affected by the proposed action. Conservation recommendations are provided with the Biological Opinion which are intended to improve our understanding of the impacts of subsistence harvest on the bowhead whale, as well as to minimize or mitigate adverse effects.

This biological opinion concludes the consultation for this proposed action. Reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained and if: (1) new information reveals effects of this action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this biological opinion; (2) the identified action is subsequently modified in a manner that causes



an effect to the listed species or critical habitat that was not considered in this biological opinion; or (3) a new species is listed or critical habitat designated that may be affected by the identified action. Normally, in instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending reinitiation. However, because Alaskan Natives participating in the traditional subsistence harvest of bowhead whales are exempted from the “take” prohibitions of the ESA, including prohibition of incidental take, this requirement would not apply.

If you have questions regarding the opinion, contact me or Brad Smith in the Alaska Region at (907) 271-3023.

**ENDANGERED SPECIES ACT: SECTION 7 CONSULTATION
BIOLOGICAL OPINION**

Action Agency: National Marine Fisheries Service

Activity: Issuance of Annual Quotas Authorizing the Harvest of Bowhead Whales to the Alaska Eskimo Whaling Commission for the Period 2008 through 2012

Consulting Agency: National Marine Fisheries Service, Office of Protected Resources

Date Issued: _____

Approved By: _____

NOAA Fisheries, Office of International Affairs, requested formal consultation on issuance of a quota to the Alaska Eskimo Whaling Commission (AEWC) for their harvest of bowhead whales (*Balaena mysticetus*) for the period 2008-2012 by letter dated September 20, 2007. This opinion considers the effects of this action on threatened and endangered species under the jurisdiction of NOAA Fisheries. In formulating this Biological Opinion, NOAA Fisheries used information presented in the 2007 Draft Environmental Impact Statement for Issuing Annual Quotas to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the Years 2008 Through 2012, reports from the International Whaling Commission, its Scientific Committee and its Subcommittee on Aboriginal Whaling, along with other research relating to bowhead whales and information provided by NOAA's National Marine Mammal Laboratory, the North Slope Borough, the Alaska Eskimo Whaling Commission, and the traditional knowledge of the Alaskan Eskimo community.

Consultation History

NOAA Fisheries has previously consulted on the issuance of strike quotas for bowhead whales. A Biological Opinion was signed on February 20, 2003 which described the effects of a 5-year quota for the years 2003 through 2007. That consultation was preceded by preparation of an Environmental Assessment of the action released on December 9, 2002.

A. Description of the Proposed Action

The National Marine Fisheries Service (NOAA Fisheries) proposes to issue annual quotas to the AEWC to allow continuation of their subsistence hunt for bowhead whales from the Western Arctic population¹ for the years 2008 through 2012. This action complies with section 101(b)

¹Also referred to as the Bering-Chukchi-Beaufort Seas population and the Bering Sea Population.

of the Marine Mammal Protection Act (MMPA), section 10(e) of the Endangered Species Act (ESA), the Whaling Convention Act, and responsibilities under the auspices of the International Convention for the Regulation of Whaling (ICRW) by granting the AEWEC a quota set by the International Whaling Commission (IWC) for taking bowhead whales for subsistence use.

Background

Eskimos have hunted bowhead whales along the coastlines of the Bering, Chukchi, and Beaufort Seas for at least 2,000 years (Stoker and Krupnik, 1993). This traditional harvest, often referred to as subsistence harvest, is the cultural and historical focal point for the indigenous Natives or Eskimos of Alaska². In Alaska, 10 Native villages currently participate in subsistence whaling. Gambell, Savoonga, Little Diomedea, and Wales are located in the Bering Sea; Kivalina, Pt. Hope, Wainwright, and Barrow are in the Chukchi Sea; and Nuiqsut and Kaktovik are in the Beaufort Sea.

The subsistence harvest of bowhead whales has been regulated by a quota system under the authority of the IWC since 1977. Quotas for aboriginal subsistence whaling are set based on cultural and subsistence need, provided that the quotas are either sustainable or low enough to allow populations to recover if they had previously been depleted by commercial whaling. The quota regulated through the IWC also allows Russian Natives to hunt bowhead whales from the Western Arctic population (IWC, 1998). The annual distribution of the quota between Russian and Alaska Natives is determined through a cooperative agreement between the U.S. and Russian Governments.

Alaska Native subsistence hunters take less than one percent of the population of bowhead whales annually. Since 1973, the number of strikes has ranged from 17 to 111 animals per year (Suydam *et al.*, 1997), depending in part on changes in management strategy as abundance estimates changed.

At its 49th annual meeting in 1997, the IWC approved a 5-year quota for the aboriginal take of the Western Arctic population of bowhead whales (IWC, 1998). The quota allowed for a combined total of up to 280 whales to be landed in the years 1998 through 2002 by Alaskan and Russian Natives. For those years, the number of bowhead whales struck was not to exceed 67 whales per year, except that any unused portion of a strike quota from any year could be carried forward and added to the strike quota of any subsequent year, provided that no more than 15 strikes were added to the strike quota for any one year (i.e., a maximum of 82 potential strikes). The 15 strike carry over was available each year during this 5-year block quota period; 5 to 7 strikes were annually provided to the Russian Natives of Chukotka, while NOAA Fisheries issued an annual quota to the AEWEC between 75 and 77 strikes.

Most recently, during the 59th meeting of the IWC held in May 2007, the IWC renewed these catch limits by consensus, allowing for a combined total of up to 280 whales to be landed in the

²The Eskimo people of northern Alaska who traditionally hunt bowhead whales are Inupiat, while the Yupik Eskimos hunt bowheads from villages along the Bering Sea.

years 2008 through 2012 by Alaskan and Russian Natives. For the years 2008, 2009, 2010, 2011 and 2012, the number of bowhead whales landed shall not exceed 280. For each of these years the number of bowhead whales struck shall not exceed 67, except that any unused portion of a strike quota from any year (including 15 unused strikes from the 2003 - 2007 quota) shall be carried forward and added to the strike quotas of any subsequent years, provided that no more than 15 strikes shall be added to the strike quota for any one year. This provision is subject to annual review by the Commission in light of the advice of the Scientific Committee.

The basis for the quota was a joint request by the Russian Federation and the United States, requesting an annual average of 56 landed bowhead whales (or a total of 255 for the Alaska Eskimos and 25 for the Chukotka Natives over the 5-year period). This request was based on the most recent Alaska Eskimo documented nutritional and cultural need of 56 landed whales per year. The annual strike limits and quotas for bowhead whales are determined at the beginning of each year after consultation with the AEWK and renewal of the U.S.-Russia bilateral agreement governing the allocation, between the two countries, of the bowhead whale subsistence quota. However, in no case may the total strike quota exceed the limits specified by the IWC.

This action, then, is for the conveyance through the Federal Government of the U.S. portion of the IWC quota that allows no more than 67 strikes annually and up to 15 unused strikes from any previous year to be added to this total, i.e., 82 total possible strikes. Of the eighty two (82) strikes, five strikes would be allotted to the Russian Federation through annual bi-lateral agreements as described above. Thus, the U.S./AEWC annual quota is not to exceed 77 strikes.

Alaska Eskimo Whaling Commission (AEWC)

The AEWK was formed in 1977 to represent the whaling communities of Alaska in an effort to convince the U.S. Government to take action to preserve the Eskimos' subsistence hunt of bowhead whales. The AEWK also agreed to cooperate with the U.S. in scientific research efforts and to develop a management plan to be followed by all of the whalers to help improve the efficiency of the subsistence hunt. The AEWK bylaws establish the commission's organizational structure and the AEWK management plan provides for enforcement actions, and sets permissible harvest methods to improve strike efficiencies, maintain the bowhead population, and reduce environmental impacts.

The members of the AEWK are the registered whaling captains and their crews from 10 whaling communities: Gambell, Savoonga, Wales, Little Diomede, Kivalina, Point Hope, Wainwright, Barrow, Nuiqsut, and Kaktovik. The AEWK is directed by a board of ten Commissioners, one elected from each whaling village. Federal authority for cooperative management of the Eskimo subsistence bowhead whale hunt is shared with the AEWK through a cooperative agreement between the AEWK and the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA).

Federal Licenses Necessary to Implement the Proposed Action

A license is issued by the AEWK to whaling captains through the procedures set out in NOAA Fisheries' regulations (50 CFR 230.5) for aboriginal subsistence whaling allowed by the IWC. These procedures require that whaling may only be conducted in accordance with a cooperative

agreement between the relevant Native American whaling organization and NOAA Fisheries. NOAA Fisheries must also annually publish aboriginal subsistence whaling quotas and any other limitations on such whaling in the Federal Register (50 CFR 230.6).

Presently, bowhead whale harvest in the United States is restricted to the 10 AEWC whaling villages along the northwest and arctic coastlines of Alaska. This Biological Opinion will address the effects of the subsistence harvest of 255 bowhead whales over a 5-year period, at a rate determined by the AEWC and IWC to be necessary to support the needs of these Alaskan Native communities. It provides an assessment of this harvest on the continued existence of the bowhead whale, as well as to provide measures to further the conservation of the species. This Biological Opinion incorporates information developed through the IWC and its committees, such as the Scientific Committee, the Aboriginal Subsistence Whaling Subcommittee, and the Working Group on whale killing methods and associated welfare issues. Traditional knowledge and the observations of Eskimo hunters are presented, along with information gained through scientific research. This knowledge contributes, along with western science, to a more complete understanding of these issues. A reasonable assessment of potential effects can only be made by considering both these systems of knowledge.

Term of this Biological Opinion

This Biological Opinion will be valid upon issuance and remain in force throughout the 5-year quota period, or until re-initiation of consultation becomes necessary. NOAA Fisheries will re-initiate consultation in accordance with interagency cooperation regulations (50 CFR 402.16), particularly if there are significant changes in the health and status of the bowhead whale, if new information indicates these actions are impacting the bowhead population to a degree or in a manner not considered in this Biological Opinion, if the action is modified in ways not considered in this Biological Opinion, or if new species or critical habitat become listed under the Act and may occur within the action area.

Action Area

The action area for purposes of this Biological Opinion is defined as waters within 50 miles of the coastlines of the Alaskan Bering, Chukchi, and Beaufort Seas. The direct and indirect effects of this action on the endangered bowhead whale are expected to be confined to the action area.

Species Affected by this Action

NOAA Fisheries has determined that the only threatened or endangered species under its jurisdiction that is present within the action area and likely to be adversely affected by the action is the endangered bowhead whale (*Balaena mysticetus*). No critical habitat for this species has been designated.

Climate change is having a dramatic impact on the extent and timing of marine ice in the Alaskan arctic, which will influence the range and distribution of marine mammals, including bowhead whales and other threatened or endangered marine mammals. In addition to the bowhead whale, humpback whales (*Megaptera novaeangliae*) have been recorded in these waters, including the action area. Humpbacks were recently sighted in the Beaufort and Chukchi Seas in 2007. However, humpback whales are unlikely to be adversely affected by this

action, and are not considered in this opinion. There are several reasons supporting this determination. The numbers of such sightings are small, and may represent only a few animals. At this time, we have no data to determine that these whales are now seasonal residents in the action area, as opposed to extralimital occurrences which may have to do with the unusually sparse extent of sea ice experienced in 2007. Additionally, humpback whales are not associated with sea ice as are bowheads, and would not be expected to be present or encountered during spring bowhead hunting along the ice leads. Humpbacks have not been observed east of Smith Bay in the Beaufort Sea, and would not be expected to be encountered by fall whalers from Kaktovik or Nuiqsut. Fall whaling at Barrow, Pt. Hope, and Wainwright would not begin until October, by which time any humpback whales are likely to have moved south in their seasonal migration. Finally, this action is specific to harvests within the Western Arctic population of bowhead whales. No whales other than bowheads are expected to be taken under this harvest quota, and only bowhead whales may lawfully be hunted or harvested. Eskimo whalers are highly specialized and experienced; any whales encountered that are not bowheads would not be pursued or otherwise “taken”.

B. Status of Listed Species Affected by this Action

The bowhead whale was historically found in all arctic waters of the northern hemisphere. Five populations are currently recognized by the IWC (1992). Three of these populations are found in the North Atlantic and two in the North Pacific, some or all of which may be reproductively isolated (Shelden and Rugh, 1995). The Spitsbergen population is found in the North Atlantic east of Greenland in the Greenland, Kara, and Barents Seas. Thought to have been the most numerous of bowhead populations, Woodby and Bodkin (1993) estimate the unexploited population at 24,000 animals. The Spitsbergen bowhead is now severely depleted, possibly in the tens of animals (Shelden and Rugh, 1995).

The Davis Strait population is found in Davis Strait, Baffin Bay, and along the Canadian Arctic Archipelago. This population is separated from the Bering Sea population by the heavy ice found along the Northwest Passage (Moore and Reeves, 1993). The population was estimated to have originally numbered over 11,700 (Woodby and Botkin, 1993) but was significantly reduced by commercial whaling between 1719 and 1915. The population is today estimated at 350 animals (Zeh *et al.*, 1993) and recovery is described as “at best, exceedingly slow” (Davis and Koski, 1980).

The Hudson Bay population, also found in Foxe Basin, is differentiated from the Davis Strait population by their summer distribution, rather than genetic or morphological differences (Reeves *et al.*, 1983). No reliable estimate exists for this population; however, Mitchell (1977) places a conservative estimate at 100 or less. More recently, estimates of 256-284 whales have been presented for the number of whales within Foxe Basin (Cosens *et al.*, 1997). There has been no appreciable recovery of this population.

The Okhotsk Sea population occurs in the North Pacific off the western coast of Siberia near the Kamchatka Peninsula. The pre-exploitation size of this population may have been 3,000 to 6,500 animals (Shelden and Rugh, 1995), and may now number somewhere in the 300-400 range, although reliable population estimates are not currently available. It is possible this

population has mixed with the Bering Sea population, although the available evidence indicates the two populations are essentially separate (Moore and Reeves, 1993).

The bowhead whale was listed as a Federal endangered species on June 2, 1970 (35 FR 8495). The Western Arctic population of the bowhead whale is the only ESA listed species under the jurisdiction of NOAA Fisheries which is known to occur in the action area. All further references to the bowhead whale in this document concern only the Western Arctic population.

The Western Arctic population of bowhead whales was reduced greatly by commercial whaling late in the 19th century, from an estimated original population of 10,400 to 23,000 (Woodby and Botkin, 1993) to a few thousand by about 1910. Whales taken by commercial whaling in the Bering Sea may have been representatives of a population that did not migrate (Bockstoce and Botkin, 1983; Bockstoce, 1986). Shore-based visual surveys conducted at Point Barrow from 1978 through 2001 provided abundance estimates that have risen at a rate of 3.3%. Researchers estimate the current population to be 10,545 whales and believe the stock may now be approaching its carrying capacity. Shore-based counts of bowhead whales along the Chukotka Peninsula estimated 1,000 whales passed between mid-May and mid-June 2001. Because of the timing, many of these whales could not have been subsequently counted at Barrow before the end of that census (IWC, 2002 A).

Bowhead whales are seasonal and transient in the western Beaufort Sea, migrating from west to east in spring and returning in fall. Most of the population winters along the ice front and in polynyas (irregular areas of open water) of the central and western Bering Sea (Moore and Reeves, 1993). About April or May, whales begin moving north past St. Lawrence Island and through Bering Strait into the southern Chukchi Sea, then north through nearshore lead systems to Point Barrow (Moore and Reeves, 1993). Some bowhead whales also move north along the Chukotka coast of Russia (Melnikov *et al.*, 1998). Behavior and timing are fairly consistent with bowheads passing Point Barrow in several "pulses": the first between late April and early May, a second about mid-May, and a third from late May through early June (Moore and Reeves, 1993; A. Brower in USDOI, 1986; B. Rexford in MBC, 1997). Whaling crews have observed that the migrating whales appear to have "scouts" which check ice conditions in advance of the main migration (C. Nageak in NSB 1981; W. Bodfish in NSB, 1981; L. Kingik in NSB, 1981). Whaling crews also have noticed that not all bowhead whales migrate into the Chukchi or Canadian Beaufort Seas, but that some bowheads remain near Barrow in summer (H. Brower, Jr. in USDOI, MMS, 1995).

Most whales move eastward from Point Barrow through offshore lead systems of the central Beaufort Sea (W. Bodfish in NSB, 1981). They appear in leads offshore of the Alaskan Beaufort Sea by early May (W. Bodfish in NSB, 1981), but apparently do not stop along the spring migration route (V. Nauwigewauk in NSB, 1981; A. Oenga in NSB, 1980). However, some whales feed opportunistically during spring migration (Shelden and Rugh, 1995; Carroll *et al.*, 1987), and the lead system may serve as an important feeding area when oceanographic conditions are favorable. Acoustic research associated with census efforts has indicated spring-migrating whales travel in groups that are dispersed over a wide area, separated from each other

by distances (100-3000 m) that preclude the use of vision for coordinating movements, and calling is the vocal mechanism for doing so (Clarke and Bower, 1991).

The bowheads arrive in the Canadian Beaufort Sea from about mid-May through mid-June (Moore and Reeves, 1993:314). During migration, bowheads may swim under the ice for several miles, and can break through relatively thin ice (approximately 7 inches [18 cm] thick) to breathe (George *et al.*, 1989). It is possible that bowheads use ambient light cues and possibly echos from their calls to navigate under ice and to distinguish thin ice from thick, multi-year floes (MMS, 1995). The spring migration ends at Herschel Island in the Canadian Beaufort Sea (V. Nauwigewauk *in* NSB, 1981).

Most of the Western Arctic population is concentrated in the Canadian Beaufort Sea between Herschel Island and Amundsen Gulf during summer (Moore and Reeves, 1993). Whales begin moving westward between late August and early October (Richardson *et al.*, 1987; Miller *et al.*, 1996; I. Akootchook *in* USDO, MMS, 1995). The fall migration, extending into late October some years (Moore and Clarke, 1992), also seems to occur in pulses, although the pattern is not as clear as in the spring migration (Ljungblad *et al.*, 1987; A. Brower *in* MMS, 1996; Treacy, 1988; 1989; 1990; Moore and Reeves, 1993). These pulses may constitute age segregations with smaller whales migrating earlier, followed by larger adults and females with young. The first pulse has been observed to consist of hundreds of bowheads *Ain* schools like fish@ (T. Napageak - Pers. Comm., Nuiqsut Whaling Captains Meeting, August 13, 1996). These whales are not accompanied by calves (J. Tukle *in* USDO, MMS, 1986). The second pulse is thought to consist of females with calves (J. Tukle *in* USDO, MMS, 1986; T. Napageak - Pers. Comm., Nuiqsut Whaling Captains Meeting, August 13, 1996). Similar to the spring migration, Native hunters describe "leader whales" which establish the path for the migration. These lead whales are to be left alone, otherwise the main body of whales may turn around or migrate farther out (Isaac Akootchook *in* Richardson and Thomson, 1999).

Fall migration generally occurs south of the pack ice and closer inshore than the spring migration (Moore and Reeves, 1993). Bowhead whales apparently take their time returning westward during the fall migration, sometimes barely moving at all, with some localities being used as staging areas due to abundant food resources or for social reasons (W. Bodfish *in* NSB, 1981; S. Akootchook *in* USDO, MMS, 1995). Kaktovik residents report offshore areas near that village are important bowhead whale feeding areas, and examinations of stomachs from harvested whales indicate recent feeding activity during fall migrations (Carroll *et al.*, 1987; Richardson and Thomson, 2002)

Fall surveys show that the median water depth at bowhead whale sightings (1982-1995) between 141° W from 146° W longitudes is 138 ft (42 m) (Treacy 1991; 1992; 1994; 1996). During fall migration, whales are found close inshore east of Barter Island and from Cape Halkett to Point Barrow (Moore and Reeves, 1993), generally in water depths less than 164 ft (50 m) (Treacy, 1991; 1992; 1994). Inupiat believe that whales follow the ocean currents carrying food organisms. If the currents go close to Cross Island, whales migrate near there (T. Napageak - Pers. Comm., Nuiqsut Whaling Captains Meeting, August 13, 1996). Bowheads reportedly travel on the inshore side of Cross Island (V. Nageak *in* Shapiro and Metzner, 1979). It has also

been reported that whales are seen inside the barrier islands near Cross Island practically every year and are sometimes seen between Seal Island and West Dock (F. Long Jr. - Pers. Comm., Nuiqsut Whaling Captains Meeting, August 13, 1996). Bowhead whales may swim very close to shore on some occasions (B. Rexford in MBC, 1996a; I. Akootchook in USDOI, MMS, 1979). Bowheads have been observed feeding not more than 1,500 ft (457 m) offshore in about 15 to 20 ft (4.6 to 6 m) of water (A. Brower in USDOI, MMS, 1979; H. Rexford in USDOI, MMS, 1979). Smaller whales may swim in water depths of 14 to 18 ft (4.3 to 5.5 m) (T. Brower in NSB, 1980). Inupiat whaling crews have noticed that whale migration appears to be influenced by wind patterns, with whales moving when winds start up and stopping when they are slow (P. Tukle in USDOI, MMS, 1986). From Point Barrow, whales migrate back west and southward through the Chukchi Sea to wintering grounds in the Bering Sea (Moore and Clarke, 1992).

In general, bowhead whales seemed to migrate closer to shore in light ice years and farther offshore in heavy ice years, with distributions peaking at 19 to 25 miles (30 to 40 km) and 37 to 43.5 miles (60 to 70 km), respectively (Miller *et al.*, 1996). From 1979 to 1986, Ljungblad *et al.*, (1987) observed that fall migration extended over a longer period, and sighting rates were larger and peaked later in the season in years of light ice cover compared to years of heavy ice cover (Moore and Reeves, 1993).

Further evidence that bowhead whales migrate at varying distances from shore in different years is provided by site-specific studies monitoring whale distribution relative to local seismic exploration in nearshore waters of the central Beaufort Sea (Miller *et al.*, 1997; 1998; 1999). In 1996, bowhead sightings were fairly broadly distributed between the 10 m and 50 m depth contours. In 1997, bowhead sightings were fairly broadly distributed between the 10 m and 40 m depth contours, unusually close to shore. In 1998, the bowhead migration corridor generally was farther offshore than in either 1996 or 1997, between the 10 m and 100 m depth contours and approximately 10-60 km from shore. Most recently, Monnett and Treacy (2005) studies found the axis of the migration was relatively close to shore in 2002-2004; all mild ice years in the Beaufort Sea.

Data are limited on the bowhead fall migration through the Chukchi Sea before they enter the Bering Sea. Whales commonly are seen from the coast to about 150 km (93 miles) offshore between Point Barrow and Icy Cape, suggesting that most bowheads disperse southwest after passing Point Barrow and cross the central Chukchi Sea near Herald Shoal to the northern coast of the Chukotsk Peninsula. However, scattered sightings north of 72° N. latitude suggest that at least some whales migrate across the Chukchi Sea farther to the north (Moore and Reeves, 1993). After moving south through the Chukchi Sea, bowheads pass through the Bering Strait in late October through early November on their way to overwintering areas in the Bering Sea (Moore and Reeves, 1993).

Bowheads are extremely long-lived. Recent research has looked at the levels of aspartic acid in bowhead eyeballs (George *et al.*, 1999). This work, along with evidence from stone points and harpoons recovered from recently harvested bowhead whales suggest these animals may be the oldest mammals on earth; some of whom may live in excess of 200 years. Little is known regarding age at sexual maturity or mating behavior and timing for bowheads. It is assumed that

mating takes place in late winter and spring (Koski *et al.*, 1993), perhaps continuing through the spring migration (Ljungblad, 1981; Koski *et al.*, 1993). Most calves are born from April through early June during the spring migration, with a few calves born as early as March and as late as August (Koski *et al.*, 1993). Calves are about 13 to 15 ft (4 to 4.5 m) at birth and reach 42 to 66 ft (13 to 20 m) as adults. Females produce a single calf, probably every 3 to 4 years (Koski *et al.*, 1993).

Bowheads are filter-feeders, sieving prey from the water by means of baleen fibers in their mouth. They feed almost exclusively on zooplankton from the water column, with primary prey consisting of copepods and euphausiids, as indicated from stomach analyses of whales taken in the Alaskan Beaufort Sea (Lowry, 1993; Richardson and Thomson, 2002). Other prey include mysids, hyperiid and gammarid amphipods, other pelagic invertebrates, and small fish. Bowheads feed heavily in the Canadian Beaufort Sea and Amundsen Gulf area during summer and fall migration through the Alaskan Beaufort Sea (Ljungblad *et al.*, 1987; Lowry, 1993). In surveys conducted from 1979 through 1987, concentrations of feeding bowheads were observed east of Point Barrow and just north of Harrison Bay (Ljungblad *et al.*, 1987). However, carbon isotope analysis of bowhead baleen has indicated that a significant amount of feeding may occur in wintering areas of the Chukchi and Bering Seas (Schell *et al.*, 1987; Schell, 1998). The barrier islands all along the Beaufort Sea coast are considered by local residents to be an important resource to the bowhead whale for use as staging and feeding areas (M. Pederson in USACE, 1996).

The summer distribution of bowheads within the Canadian Beaufort Sea is thought to be determined primarily by prey density and distribution, which in turn are responsive to variable current and upwelling patterns (LGL, 1987). Sub-adult bowheads were observed to feed in water depths less than 164 ft (50 m) in the Canadian Beaufort Sea (Richardson *et al.*, 1987). However, little is known about adult feeding behavior in the Canadian Beaufort.

Bowheads have extremely sensitive hearing. For example, they are capable of detecting sounds of icebreaker operations at a range of up to 31 miles (50 km) (Richardson, 1996). It has been suggested that such sensitive hearing also allows whales to use reverberations from their low frequency calls to navigate under the pack ice and to locate open water polynyas where they surface (Ellison *et al.*, 1987). Bowheads exhibit avoidance behavior at many manmade sounds, but there is still considerable debate regarding their range of sound detection (Richardson *et al.*, 1995a:263). It is well known among Inupiat hunters that bowhead whales are extremely sensitive to noise (H. Rexford *in* USDOJ, MMS, 1979; R. Ahkivgak *in* NSB, 1980; H. Ahsogak *in* NSB, 1980; T. Brower *in* NSB, 1980; H. Brower *in* USDOJ, MMS, 1990). Communications among whales during migration and in response to danger also has been observed to alter migration patterns (A. Brower *in* USDOJ, MMS, 1986; T. Napageak *in* USDOJ, MMS, 1995). Whaling crews have observed that disturbances to migration as a result of a strike are temporary (J.C. George *in* USACE, 1996).

Generally, the vocalizations of bowhead whales are low, less than 400 hertz (Hz), frequency-modulated calls; however, their call repertoire also includes a rich assortment of amplitude-modulated and pulsed calls with energy up to at least 5 kilohertz (Wursig and Clark, 1993).

Calls and songs have been suggested to be associated with different contexts and whale behavior. Observations have been made that support the theory that calls are used to maintain social cohesion of groups. For instance, loud frequency-modulated calls were heard as a mother and a calf rejoined after becoming separated during summer feeding (Wursig and Clark, 1993). Once the two were together again, calling stopped (Wursig and Clark, 1993). During spring migration off Point Barrow, there have been several instances when individual whales repeatedly produced calls with similar acoustic characteristics (Clark *et al.*, 1987). Bowhead whales have been noted to produce signature calls lasting for 3 to 5 minutes each and continuing up to 5 hours (Wursig and Clark, 1993). Different whales produce signature calls as they counter call with other members of their herd. It has been suggested that calling among bowhead whales may aid in migration of the herd and that the surface reverberation of the sound off the ice may allow these whales to discriminate among areas through which they can and cannot migrate (Ellison *et al.*, 1987; Wursig and Clark, 1993; Moore and Reeves, 1993). Although bowheads are morphologically adapted to their ice-dominated environment and can break holes in the ice to breathe, they may use vocalization to assess ice conditions in their path. For example, the intensity of reflected calls is as much as 20 decibels (dB) higher from ice floes with deeper keels than from relatively flat, thin ice (Ellison *et al.*, 1987). Bowheads may use such differences in intensity of reflected calls to differentiate between deep keel ice floes and flat, thin ice.

Bowhead whales have no known predators in the Bering Sea, except perhaps killer whales (*Orcinus orca*). Such attacks in the Bering Sea have occurred, but their frequency is reported as low. The frequency of attacks by killer whales in the Beaufort Sea is not well documented (George *et al.*, 1994). Little is known about naturally occurring disease and death among bowhead whales. While certain viral agents are present in this population, it is unknown how much they may contribute to natural mortality or reduced reproduction (Philo *et al.*, 1993).

In addition to subsistence harvest by Alaskan Natives in the Beaufort, Bering, and Chukchi Seas, other man-induced impacts may contribute to morbidity and mortality. Commercial fishing occurs in the Bering Sea and elsewhere within the range of this population. Interaction with fishing gear is rare, however, whales with ropes caught in their baleen and with scarring caused by rope entanglement have been reported (Philo *et al.*, 1993; NMML, unpubl. data). The North Slope Borough estimates that entanglements or scarring attributed to ropes may include over 20 cases (J.C. George, Dept. Wildlife Management, North Slope Borough, pers. Comm. 2007). The average rate of entanglement in crab pot gear for the period 1999-2003 was estimated to be 0.2 whales per year (Angliss and Outlaw, 2005). George *et al.*, (1994) report three documented ship strike injuries observed among 236 bowheads taken in subsistence hunts. Man-made noise in the marine environment is increasing with industrialization of the Alaskan arctic. Research in the Beaufort Sea has shown bowhead whale behavior is affected by noise, as behavior such as breathing rates, dive times, calling rates, swimming speed, and direction have changed when exposed to various man-made disturbances. Exposure to oil spills could have direct adverse consequences to bowheads, and may predispose some whales to infection or injury.

C. Environmental Baseline

The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area. The occurrence, numbers, and habitat use

of the bowhead whale have been described above. There are several anthropogenic factors which have affected and may continue to affect the bowhead whale within the action area. These include subsistence hunting, commercial fishing, oil and gas activity within Federal and State of Alaska waters and along the Alaskan North Slope, and shipping and vessel traffic.

The hunting of bowhead whales by Alaska Eskimos is believed to date back several thousand years with the use of harpoons and lances fashioned from stone, ivory, and bone. Modern subsistence whale hunting practices in Alaska preserve many of the traditional methods and equipment, while also borrowing from the experience of commercial whalers (e.g., the shoulder gun) and employing modern technologies to increase strike efficiency (e.g. outboard motors, penthrite explosives, radio transmitters in floats attached to the harpoons) and safety (radios, helicopter rescue options). An excellent account of modern whaling is presented in Stoker and Krupnik (1993). Whales are hunted from seal skin or walrus skin-covered whaling vessels known as umiaks, as well as small, motorized aluminum skiffs. Skin boats are quieter than metal boats when operated among ice, and are used primarily during spring hunts.

Once sighted, whales are approached by the whaling crew. When the whale is judged suitable for harvest (not too large and no calf is present), and has not sounded (gone into a deep, long dive), a harpoon with line and float attached is used to strike the whale. This device normally includes an explosive device, triggered by a push-rod and firing an 8-gauge brass-cased bomb (a darting gun). These bombs were traditionally charged with black powder. Once the darting gun is thrown, a shoulder gun to project bombs is almost always used as a back-up.

The AEWG has initiated efforts to improve strike efficiencies and the humaneness of killing techniques. They have developed a penthrite projectile to replace black powder. The penthrite bomb delivers a high-energy concussive shock which results in greater strike efficiency. This device underwent extensive field-testing and modification based on those tests up to 2004. In 2005, this new weapon was approved by AEWG for distribution and use by participating villages (IWC 2007). The penthrite grenade has now been used in several villages, although the use of traditional black powder devices continues.

Bowhead whale meat provides an important source of vitamins and protein. The skin and blubber, known as maktak, are either eaten raw or boiled in salted water. Native handicrafts are still fashioned from baleen. While edible portions of bowhead whales taken in this harvest may be provided to communities outside of the ten AEWG villages, the sale of bowhead meat, maktak, or products other than handicraft, is prohibited by Federal law and the AEWG Management Plan (AEWG, 1995).

Although early historical records were not kept, it is estimated that Alaska Eskimos may have taken 20 whales in an average year (Ellis, 1991). Rice (1964) estimated an annual average of 10 bowhead whales and “poggies” (*Ingutuk*, or yearling bowheads; Jarrell 1981) killed and recovered each year, while another 3-4 whales were struck but lost for each one landed (i.e., 40-50 strikes per year). IWC catch limits began in 1978, allowing 12 landed or 18 struck. The number of whales/strikes provided under the quota has increased steadily, up to the numbers associated with the current action. The average take of Western Arctic bowhead whales by

Alaska Natives over the last ten years, not including struck and lost, was 41.8 (Suydam et al., 2007) Available data indicate that Barrow takes the most whales, followed by Point Hope, and Wainwright.

The harvest consists mostly of immature whales, approximately evenly distributed between sexes (Philo *et al.*, 1993). Eskimo hunters prefer smaller whales (the post-weaned *Ingutuk* is prized), and the harvest of immature animals may have positive consequence on the population; therefore some selection likely underlies these statistics. Larger whales are typically landed in the western (Bering and Chukchi Seas) AEWV villages.

Oil and Gas Activities

There have been approximately twelve Federal oil and gas leases sales within the Alaskan Beaufort and Chukchi Seas beginning with the Joint State Federal Sale held in December 1979. The most recent Federal sale was Sale 202 in July 2007. Prior to 2000, no permanent facilities, or oil production, existed on the Beaufort Outer Continental Shelf (OCS) outside of State waters. The environmental baseline for this Biological Opinion now includes offshore production facilities in the Beaufort Sea. No production facilities exist in the Chukchi Sea at this time.

The potential effects of those projects, and leasing and development of the OCS have been considered in a June 2006 biological opinion regarding Oil and Gas Leasing and Exploration Activities in the Beaufort Sea, Alaska and Authorization of Small Takes Under the Marine Mammal Protection Act, issued to the Minerals Management Service and National Marine Fisheries Service (NOAA Fisheries, 2006). The oil and gas activities introduce noise into the marine environment which may disturb bowhead whales. Based upon the predicted acoustics of the Northstar project, one of the activities covered under the 2006 biological opinion, and the bowhead whales= migrational pathways, NOAA Fisheries estimated up to 1,533 whales per year could be “taken” as they detect and react to this noise during their annual fall migrations. There is considerable variability associated with any such estimate; NOAA Fisheries would not expect this number of whales to be harassed year after year. No estimation of bowhead whale takes due to noise from the Endicott project, another activity covered by the 2006 biological opinion, is available. However, Endicott is near shore and in relatively shallow waters, through which noise propagation into areas used by bowhead whales would be greatly attenuated. Two additional offshore production facilities (Ooguruk and Nikaitchuq Islands) have been constructed in nearshore waters of the western Beaufort Sea. Neither of these facilities is expected to have resulted in takes of bowhead whales. Current State leases with production, such as Endicott, Ooguruk and Nikaitchuq Islands, are well removed from the normal fall migration route of the bowhead whale. Bowhead whales are not likely to be affected by noise from these facilities due to their distance from the bowhead=s fall migration route, and the limited distance into the marine environment that noise travels from gravel structures in shallow water.

There could be a number of effects on bowhead whales as a result of other oil and gas activities. Noise and the effects of an oil spill are the most problematic with respect to the well-being of the Western Arctic population of bowhead whale. Considered individually, these and other anthropogenic events such as aircraft or ship operations would be expected to have low-level

behavioral impacts to bowhead whales which would not have significant biological consequences, while others, such as oil spills, may have injurious or lethal effects.

Bowheads are not affected much by most aircraft overflights at altitudes above 600 meters (Richardson and Malme, 1993). Below this, changes in whale behavior are likely to increase as altitudes decrease, depending on the type of aircraft and the responsiveness of the whales in the vicinity. Marine-vessel traffic, especially between mid-August and mid-to-late September, may disturb bowhead whales. Fleeing behavior from vessel traffic generally stops within minutes after a vessel has passed, but whales may remain scattered for a longer period.

Elevated noise levels in the marine environment could alter the hearing ability of whales, causing temporary or permanent threshold shifts (Finneran *et al.*, 2000). Noise has also been shown to cause avoidance in migrating bowhead whales (Richardson, 1999a)). Seismic actions, and the possible use of ice breakers to support OCS activities, present the highest probability for avoidance of any of the activities associated with oil exploration. Studies have shown noise from ice breakers may be detected at distances exceeding 50 km (Richardson *et al.*, 1995). It is reasonable to assume that bowheads could also detect this noise at this distance, however the distance at which bowheads may react to such noise is poorly understood.

Marine geophysical research is now ongoing within the Alaskan Chukchi and Beaufort Seas. Multiple seismic operations have occurred in recent years, some of which operate simultaneously in common areas. Activities involving seismic airguns may introduce significant levels of noise into the marine environment and have been demonstrated to alter the behavior of bowhead whales (Richardson and Malme, 1993). Research on the effects of offshore seismic exploration in the Beaufort Sea, supported by the testimony of Inupiat hunters based on their experience, has shown bowhead whales avoid these operations when within 20 km of the source and may begin to deflect at distances up to 35 km (Richardson, 1999a). Davies (1997) concludes bowheads avoided an active drilling rig at a distance of 20 km. Sound levels received by bowhead whales at 20km ranged from 117-135 dB re $1 \mu\text{Pa rms}^1$ and 107-126 dB re $1 \mu\text{Pa rms}$ at 30km (Richardson, 1999a). The received sound levels at 20-30km are considerably lower levels than have previously been shown to elicit avoidance in bowhead or other baleen whales exposed to seismic pulses. High noise levels may cause temporary or permanent effects to bowhead whale hearing, or impact their use of sound to communicate or navigate (Richardson and Malme, 1993). Recent monitoring studies indicate that bowhead whales during the fall migration avoid an area around a seismic vessel operating in nearshore waters by a radius of about 20 km (Richardson, 1999a). Avoidance did not persist beyond 12 hours after the end of seismic operations. This work also found that bowhead whales may begin to deflect around a seismic source at distances up to 35 km.

It appears that the reaction and persistence of any disturbance to bowhead whales is heavily influenced by the whale's current behavioral state. Fall-migrating whales exposed to seismic

¹ The decibel (dB) is a logarithmic comparison of intensities whose value is relative to a reference sound intensity level or pressure. The in-water reference standard is one micro-pascal ($1 \mu\text{Pa}$). In-air standards are normally referenced to $20 \mu\text{Pa}$. This means a measurement of 80dB in air has less energy than 80 dB in water. Roughly, the in-water equivalent of 80 dB in air would be 142dB.

impulse noise in the U.S. Beaufort Sea have been shown to avoid these sources at distances of 20 km and received levels between 116 and 135dB re 1 μ Pa rms depending on ambient noise conditions. Some avoidance was observed at distances up to about 30 km (Richardson, 1999). However, monitoring of bowhead whales in the Canadian Beaufort Sea has indicated those whales have a smaller zone of reaction (e.g. 2 km) to similar noise levels (Miller and Davis, 2002). This difference in reaction may have to do with behavior, as the bowhead whales in Canadian waters may have been feeding, rather than migrating, at the time the observations were made. During seismic operations in 2007, bowhead whales were observed on three occasions within 2km of an active array. At these distances, these whales would have been exposed to noise exceeding 180 dB re 1 μ Pa rms. These also may have been feeding whales with lowered sensitivity to noise and disturbance. Feeding activity by bowhead whales was regularly observed in the U.S. Beaufort Sea in 2007 (MMS, pers. comm.); however the specific behavior of these whales at the time they were observed is unknown.

Though these observations indicate behavioral responses to anthropogenic sounds, the most common effects are expected to be temporary and unlikely to prevent the survival and recovery of this species. This is because the majority of bowhead whales which may encounter seismic noise are migrating to summering or wintering habitats. While feeding does occur in the U.S. Beaufort Sea, it seems to occur primarily during fall migrations and does not appear to be critical to survival. Research has found that most of the annual metabolic budget of bowhead whales is derived from the Bering Sea, and that the contribution of prey from feeding within the U.S. Beaufort Sea is small. A multi-year research effort of bowhead feeding within the U.S. Beaufort Sea concluded that bowhead whales derive 2.4% of their annual energetic requirements from these waters in an average year, and 7.5% or more in one of the five years studied (Richardson and Thompson, 2002). The study noted that utilization of the study area varies widely in time and space depending on zooplankton availability and other factors. 2007 appears to have been a particularly important year for bowhead feeding in the eastern Beaufort Sea, as recorded by aerial surveys (MMS, pers. comm.).

Oil Spills

Oil spills are a significant concern with regard to offshore oil and gas development. It is difficult to accurately predict the effects of oil on bowhead whales (or any cetacean) because of a lack of data on the metabolism of this species and because of inconclusive results of examinations of baleen whales found dead after major oil releases (Bratton *et al.*, 1993; Geraci, 1990). Nevertheless, some generalizations can be made regarding impacts of oil on individual whales based on present knowledge. Oil spills that occurred while bowheads were present could result in skin contact with the oil, baleen fouling, ingestion of oil, respiratory distress from hydrocarbon vapors, contaminated food sources, and displacement from feeding areas (Geraci, 1990). Actual impacts would depend on the extent and duration of contact, and the characteristics (age) of the oil (Albert, 1981). Bowhead whales could be affected through residual oil from a spill even if they were not present during the oil spill. Also, response actions may impact whales due to intensive vessel traffic or specific technologies, such as *in situ* burning of oil.

If an oil spill were concentrated in open water leads, it is possible that a bowhead whale could inhale enough vapors from a fresh spill to affect its health. The effects of oil contacting skin are largely speculative, but may include pre-disposing whales to infection. It has been suggested that if oil gets onto the eyes of bowhead whales it would enter the large conjunctival sac (Zhu, 1996) and move “inward” 4 to 5 inches (10 to 13 cm) and get “behind” most of the eye (Albert, pers. comm., 1997). The consequences of this event are uncertain, but some adverse effects are expected.

Bowhead whales may ingest oil encountered on the surface of the sea during feeding, resulting in fouling of their baleen plates. Albert (1981) suggests that broken off baleen filaments and tar balls are of concern because of the structure of the bowhead's stomach; causing a blockage within the very narrow passages of the digestive system.

Engelhardt (1987) stated that bowhead whales are particularly vulnerable to effects from oil spills due to the whales' use of ice edges and leads where spilled oil tends to accumulate. The impacts of oil exposure to the bowhead whale population would also depend upon how many animals contacted oil. If oil found its way into leads or ice-free areas frequented by migrating bowheads, a significant proportion of the population could be affected.

Contaminated food sources and displacement from feeding areas also may occur as a result of an oil spill, but NOAA Fisheries has concluded (NOAA Fisheries, 2001) it is unlikely that the availability of food sources for bowheads would be affected if there was a limited oil spill, given the abundance of plankton resources in the Beaufort Sea (Bratton *et al.*, 1993).

The Inupiat view an oil spill, especially within the spring lead system or under broken ice conditions, as having serious consequences to bowhead whales based on knowledge that most of the bowhead whale population travels to and from the Canadian Beaufort Sea in a relatively narrow migration corridor during a fairly short time. That a large number of bowheads could be affected by even a relatively small oil spill is illustrated by observations of a whaling captain from Barrow. During a bowhead whale hunt off Barrow in 1976, about 150 to 200 whales were observed in one spot (J. Tukle *in* USDO, MMS, 1987). Residents have recorded seeing 300 bowhead whales migrating past Barrow in a day, and in 1980, 95% of the population came through in 6 days (G. Carroll *in* USDO, MMS, 1986). There is general agreement among Inupiat people testifying at various hearings since 1979, that an oil spill would have severe consequences to the bowhead whale population because effective cleanup methods of oil spill in ice-covered waters have not yet been developed and proven (J. Loncar *in* USDO, MMS, 1983). One elder hunter has stated AI believe the only thing that is going to destroy the bowhead is oil - oil spill during migration@ (Hopson, 1990).

D. Effects of the Action

Issuance of a quota, as proposed, would result in the setting of target limitations for both the landing and striking of the endangered bowhead whale. The IWC has established the 5-year block quota for this population, allowing a total of 280 bowhead whales to be landed. Annual strike quotas would be established at 67 bowhead whales struck, with an allowance for the carry-over of 15 unused strikes from any previous year (or 15 unused strikes from the 2003-2007 block

quota). Thus, it would be possible for as many as 82 strikes to occur in any given year, unless the landed limit of 280 had been met. The IWC has sanctioned the aboriginal harvest of whales from this population by both the United States and Russia. Through separate agreements, Russia is expected to receive an annual strike limit of 5, and the AEWG will receive 77 ($82 - 5 = 77$) annual strikes.

The ESA defines “take” as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct. The harvest of bowheads will result in several types of “takes.” Up to 82 (but more probably 77 or fewer) whales might be “struck” annually. The term “strike” means hitting a whale with a harpoon, lance, or explosive device (50 CFR 230.2). Secondly, an undetermined number of whales might be “taken” while being actively pursued by whaling crews during a hunt, but not “struck.” Finally, bowhead whales might be harassed by the noise created by hunting vessels or detonation of explosive bombs/grenades during hunting.

Direct Effects on Bowhead Whales

This action will directly affect bowhead whales as Native hunting crews pursue, strike, kill, and process the whales as previously described. Individual whales might be lethally taken through the use of explosive devices and/or harpoons. Some whales will be struck (i.e., hit with a harpoon or explosive device) but subsequently lost. A portion of these struck and lost whales would be expected to survive, depending on the severity of the strike injury. Aerial photography has revealed several whales with healed wounds that appear to have been caused by bombs that did not penetrate deeply (NMFS, unpubl. data). Several records exist of harvested bowhead whales found to have old wounds from previous hunting efforts. Some of these discoveries are remarkable; a bowhead whale landed at Barrow in 1992 was found with a healed wound, beneath which a slate point was found (George *et al.*, 1999). A 17.7 meter bowhead whale taken near Wainwright in 1981 had an ivory harpoon head imbedded in the blubber behind the blowhole (Philo *et al.* 1993).

Strike efficiency is a major determinant in the AEWG’s Management Plan. The 2001 harvest resulted in a 65.3% efficiency, while the 10 year average efficiency was 76.5% (IWC, 2002). It was noted that the 2001 efficiency was reduced by poor ice conditions. Records on strike efficiencies have been kept since 1977, and show that recent hunts are much more efficient than in the past (Suydam *et al.*, 1997; O’Hara *et al.*, 1999). In 2006 the efficiency of the hunt reached 79.5 % (Suydam *et al.*, 2007).

Some whales will be seen and pursued by whaling crews, but not struck (this results in a “take” as defined by the ESA and MMPA, but not a strike under this proposed 5 year quota). This may happen due to the whale diving or otherwise avoiding the whalers, or because of a decision by the whaling captain not to take a particular animal, e.g., if the whale is determined to be a calf or female with calf, or in a situation where the whale might be lost after striking. The number of whales which are hunted but not struck varies by village, ice conditions, safety concerns for the crew, and other circumstances. In Barrow, it was estimated that 5 bowhead whales are hunted for every 1 struck (E. Brower, pers. com.)

The impact of the proposed action (i.e., the effects of this level of harvest) on the Western Arctic population of bowhead whales has been assessed (NMFS, 2007; IWC, 1995). The effect of any harvest is determined by the population's present abundance and productivity (a stock assessment output). Recent IWC stock assessments have been based on age- and sex-structured population models and incorporate density-dependence. Management-related parameters such as replacement yield, RY, and the related but slightly different quantity, Q_0 , (Wade and Givens, 1997) have been estimated using the Bayesian method. RY is the number of animals that can be removed from the population which leaves the population at the end of the year the same size as at the start of the year. Q_0 accounts for populations above Maximum Sustainable Yield Levels (MSYL), the population level which results in the maximum sustainable yield and is defined to be 90% of MSY when a population is above MSYL. Bayesian methods provide a framework for using prior information in an assessment and allow different types of data to be incorporated in the assessment. With Bayesian methods, realistic probability statements can be made with respect to the various output parameters from population modeling (e.g., historical abundance, population growth rate, and replacement yield (RY or Q_0)).

Stock assessments of bowhead whales usually provide estimates for a number of parameters associated with population productivity (e.g., rate of increase, ROI, and a measure of population productivity, MSYR, the maximum sustainable yield as a fraction of the MSYL). The most important parameter used by the Scientific Committee (SC) of the IWC to provide management advice to the Commission is the replacement yield, since it estimates the number of animals that can be taken. This value keeps the population at the same size at the end of the year as it was at the start of the year. The 1998 management advice of the IWC SC was based on the lower 5th percentile of the RY and Q_0 values (thus implying that there is an equal or greater than 95% probability that the true RY or Q_0 is equal to or greater than the 5th percentile value). This was based on four combinations of assessment methods from two assessments of the status of the Western Arctic bowhead population. Therefore, the assessment is a conservative estimate of RY. The lowest RY value was 108 (range: 108-123), and the lowest Q_0 value was 102 (range: 102-120). The SC reported that the population "appears to be near MSY, and would very likely increase under catches of up to 108 animals" (IWC, 1999). It further noted that "in terms of subparagraph 13(a) of the Schedules, appropriate catch levels in these circumstances should not exceed 90% of MSY. The calculations reported therefore indicate that it is very likely that a catch limit of 102 whales or less would be consistent with the requirements of the Schedule" (IWC, 1999). Any takes less than 102 should therefore allow the Western Arctic bowhead population to continue to increase and will have relatively minor impact on the health of the population.

Indirect Effects on Bowhead Whales

Hunting actions have the potential to harass bowhead whales which are not being pursued, by the presence of vessels or underwater noise. The sound of one or more bomb detonations during a strike is audible for some distance. Acousticians listening to bowhead whale calls as part of the census report that calling rates drop after such a strike (IWC, 2002). The range at which whales may be affected is unknown, and is likely to vary with environmental conditions (e.g., depth of water, ambient noise levels, ice conditions, bottom structure) and the depth at which the bomb detonates.

Whaling crews have observed that whales may act Askittish@ and wary after a bomb detonates, or may be displaced further offshore (E. Brower, pers. comm.). However, disturbances to migration as a result of a strike are temporary (J. George *in* USACE, 1996), as evidenced when several whales may be landed at Barrow in a single day. There is some potential that migrating whales, particularly calves, could be forced into thicker offshore ice as they avoid these noise sources. The experience of Native hunters suggests that the whales would be more likely to temporarily halt their migrations, turn 180 degrees away from the disturbance (i.e. move back through the lead systems), or become highly sensitized as they continue moving (E. Brower, pers. com.).

Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as (Interagency Cooperation on the Endangered Species Act of 1973, as amended): "...those effects of future State or private activities not involving Federal activities that are reasonably certain to occur within the action area of the Federal action subject to consultation." Reasonably foreseeable future Federal actions and potential future Federal actions that are unrelated to the proposed action are not considered in the analysis of cumulative effects because they would require separate consultation pursuant to section 7 of the ESA. Most structures and major activities within the Beaufort Sea Outer Continental Shelf (OCS) require Federal authorizations from one or more agencies, such as the MMS, Army Corps of Engineers, and the Environmental Protection Agency. Such projects require consultation under the ESA on their effects to the bowhead whale, and are therefore not addressed here as cumulative impacts.

The State of Alaska is currently leasing State lands for oil and gas exploration and production, including approximately 2,000,000 acres within the Beaufort Sea. There have been several State sales in the Beaufort Sea. Beaufort Sea Area wide Sale 2002 resulted in the sale of 35,000 acres. Future sales are anticipated annually. If any of the scheduled sales occur, additional effects similar to those described below for OCS lease sales could occur.

Bowhead whales will likely be disturbed during the summer in the Canadian Beaufort Sea, if more offshore oil and gas exploration and development and production activities occur there in the future. The main area of industry interest to date has centered on the Mackenzie River Delta and offshore of the Tuktoyaktuk Peninsula. Research activity in this area has been on-going. A geophysical (seismic) program was conducted during the late summer and fall of 2001 (LGL, 2002), in 2006, and 2007. At this writing at least two seismic geophysical exploration projects are expected to occur in the Canadian Beaufort during the summer and fall of 2008; one by GXT, Inc, and a second by Imperial Oil, Ltd. and ExxonMobil Canada, who propose to survey 205,000 hectares. Additionally, development and production of natural gas reservoirs in the McKenzie Delta is being pursued, with pipeline corridors presently being evaluated. This may induce additional oil and gas development offshore. Possible disturbance to bowhead whales from helicopters, vessels, seismic surveys, and drilling would be as previously described.

Some effects on bowhead whales may occur because of lease sale activities within State waters (within 3 miles of shore). Bowhead whales remain far enough offshore to be found mainly in

Federal waters, but they may occur in State waters in some areas, such as the Beaufort Sea southeast of Kaktovik and near Point Barrow. If exploration and development and production activities occur on leases from previous or proposed State sales, noise effects on whales may occur as described previously. These effects could include behavioral responses, including local avoidance to noise from aircraft and vessel traffic; seismic surveys; exploratory drilling; construction activities, including dredging; and development drilling and production operations that occur within several miles of the whales.

Future exploration and development within the Canadian Beaufort Sea would present concerns beyond those associated with leasing in the Alaskan Beaufort Sea. The main area of industry interest has been the Mackenzie River Delta and offshore of the Tuktoyaktuk Peninsula (MMS, 1995). The large estuarine front associated with the Mackenzie River Delta and upwellings near the Tuktoyaktuk Peninsula provide conditions which concentrate zooplankton (Moore and Reeves, 1993). These areas are important feeding habitat to the Western Arctic population of bowheads.

These projects would require equipment and supplies to be transported to the site by barge or sealift if development and production plans proceed. The process modules and permanent living quarters and other equipment and supplies likely would be transported to these sites on seagoing barges during the open-water season. Barge traffic around Point Barrow is likely to be limited to a short period from mid-August through September and should be completed before the bowhead whale migration reaches this area unless it encounters severe ice conditions. Barge traffic continuing into September is likely to disturb some bowheads during their migration. Whales may react briefly by diving in response to low-flying helicopters and would also avoid vessels as previously discussed.

In the event an oil spill occurred on State leases during the fall bowhead migration, the effects of an oil spill on bowheads would be as have been described earlier in this document. These effects include inhalation of hydrocarbon vapors, a loss of prey organisms, ingestion of spilled oil or oil-contaminated prey, baleen fouling with a reduction in feeding efficiency, and skin and/or sensory organ damage. These effects could lead to death and would be most pronounced whenever whales were confined to an area of freshly spilled oil. Of course, if the spill occurred over a prolonged period of time, more individuals could be contacted. Some individuals could be killed as a result of prolonged contact with freshly spilled oil, particularly if spills were to occur within ice-lead systems.

An oil spill reaching into the spring lead system has the potential to impact a significant number of whales within the Western Arctic population. Several coincidental events would be necessary for this scenario: the spill would have to coincide with the timing of the seasonal migration; the spill would have to occur in or be transported to the area the whales occupy (e.g., the migrational corridor or spring lead system); and clean-up or response efforts would have to have been at least partially unsuccessful. The impact of such an event would be significant, yet the statistical probability for the coincident occurrence of these events would be low. It must also be recognized that the spring lead system is not static, as leads open and close and whales navigate

not only through the leads but surrounding ice (Clark and Ellison, 1988). Because of this, it is difficult to assess the potential number of whales which could be impacted.

Activities that are not oil and gas related could also continue to affect bowhead whales, although the incidental take of bowhead whales associated with such activities is uncommon. A young bowhead was reported to have died after being entrapped in fishing net in Japan and another in northwest Greenland in a net used to capture beluga whales (Shelden and Rugh, 1995). Between 1976 and 1992, only three ship-strike injuries were documented out of a total of 236 bowhead whales examined from the Alaskan subsistence harvest (George *et al.*, 1994). The low number of observed ship-strike injuries suggests that bowheads either do not often encounter vessels or they avoid interactions with vessels, or that interactions usually result in the death of the animals.

The cumulative effects of noise on bowheads from offshore oil and gas activities would be similar to that described for existing projects (see biological opinion of oil and gas leasing activities in the Beaufort Sea (NOAA Fisheries, 2006)). Some bowhead whales could be exposed to spilled oil, resulting in temporary, nonlethal effects, although some mortality might result if there was a prolonged exposure to freshly spilled oil. Overall, bowhead whales exposed to noise-producing activities and oil spills associated with future and existing projects within the Arctic region, combined with the other activities within the range of the migrating bowhead whale, most likely would experience temporary, nonlethal effects. However, exposure to oil spills could result in lethal effects.

Since offshore oil and gas activities in State waters are generally well shoreward of the bowheads main migration route, and some of the activities occur inside the barrier islands, the overall effects on bowheads from activities on State leases is likely to be minimal. These impacts could be magnified, however, if construction activity associated with additional development projects were to occur simultaneously, rather than consecutively.

E. Summary of the Effects of the Action

This Biological Opinion has considered the effects of issuance of annual quotas over a 5-year period for the subsistence harvest of bowhead whales by Alaska Natives, as well as the contribution of this action to cumulative impacts to this population. The proposed action will result in direct, indirect, and lethal impacts to bowhead whales.

The effects of subsistence harvests from this population have been assessed by the IWC, who determined a catch limit of 102 whales annually was sustainable without causing the population to decline. The proposed action would allow a level of take well below 102. Annual quotas would be set at a maximum of 67 to 82 strikes for the United States (most probably 77 strikes). Often, this limit is not reached due to the success of the hunters or shortened hunting seasons due to the limitations of weather and ice. Not all strikes result in the death of the whale. Hunting activities result in a number of whales being pursued but never struck. This harassment is not likely to result in injury. Similarly, some whales will be exposed to increased noise due to detonation of bombs or operation of vessels during whale hunting. Again, it is unlikely this exposure would cause injury, although individual whales may alter their behavior for a brief period of time.

An accounting of the probable level of removals associated with other anthropogenic actions, and a projection of the cumulative impacts to this population, does not suggest the current trends in this population would be altered. While it is not possible to accurately predict the level of removals which might be associated with these non-hunting factors, there is little to support a conclusion that they would, along with the proposed harvest quotas, exceed the RY for the Western Arctic bowhead whale population. Indeed, the IWC Strike Limit Algorithm incorporates a factor for other removals due to ship strikes, gear interaction, and the like, providing further confidence in that conclusion.

F. Conclusion

After reviewing the current status of the Western Arctic population of bowhead whales, the environmental baseline for the action area, the biological and physical impacts of subsistence harvests, and cumulative effects, it is NOAA Fisheries' biological opinion that issuance of annual quotas to the Alaska Eskimo Whaling Commission for the subsistence harvest of bowhead whales over the 5-year period 2008-2013 is not likely to jeopardize the continued existence of the species. No critical habitat has been designated for this species, therefore none will be affected.

G. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying-out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the ESA provided that such taking is in compliance with the terms and conditions of an incidental take statement.

Native subsistence hunting may result in the incidental taking of bowhead whales, largely by harassment due to noise from vessels and explosive devices. However, the level of this incidental take cannot be quantified. Furthermore, section 10(e) of the ESA exempts subsistence hunting by Alaska Natives from the "take" prohibitions of the ESA. Therefore, an Incidental Take Statement will not be included under this consultation.

H. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. NOAA Fisheries recognizes the voluntary efforts of the AEWG to develop improved means of harvesting bowhead whales through their Weapons Improvement Program to increase efficiency and reduce time to death. The AEWG Management Plan has promoted additional means to conserve these animals, such as prohibiting the sale of edible portions and requiring whales to first be stuck with a harpoon and

attached float to improve chances of recovery, rather than to be shot at prior to harpooning. We believe these programs and efforts should continue, and present the following additional conservation recommendations:

1. NOAA Fisheries and the AEWG should continue to cooperatively manage the Western Arctic population of bowhead whales and continue efforts to improve strike efficiencies. NOAA Fisheries should review other Marine Mammal Protection Act and ESA programs to reduce individual and cumulative impacts to this population.
2. The AEWG should restrict the use of motorized vessels during the hunt whenever practical. In particular, the use of motorized vessels in the spring hunt at Barrow (i.e. within the spring lead system) should be limited to that necessary to establish or supply hunting camps and to retrieve struck whales and tow these to the flensing site.
3. The AEWG should fully implement the distribution, training, and use of the penthrite grenade under the Weapons Improvement Program throughout the AEWG villages at the earliest time allowable by safety concerns.
4. Upon learning of any unauthorized take of bowhead or other endangered whales which occurs as a result of subsistence hunting activities (e.g. exceeding annual quotas, striking a calf, striking a cow accompanied by a calf), the AEWG should immediately notify the assistant Regional Administrator for Protected Resources at (907) 586-7235 of this taking to determine the appropriate and necessary course of action.

I. Reinitiation of Consultation

This concludes formal consultation on this action. As provided in 50 CFR '402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained and if: (1) new information reveals effects of this action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this biological opinion; (2) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this biological opinion; or (3) a new species is listed or critical habitat designated that may be affected by the identified action. Normally, in instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending reinitiation. However, because Alaskan Natives participating in the traditional subsistence harvest of bowhead whales are exempted from the "take" prohibitions of the ESA, including prohibition of incidental take, this requirement would not apply.

J. Literature Cited

Alaska Eskimo Whaling Commission. 1995. Alaska Eskimo Whaling Commission Management Plan, as amended on February 15, 1995.

Alaska Clean Seas and Beaufort Sea Members Companies. 1983. Alaskan Beaufort Sea coastal region: Alaska Clean Seas contingency planning manual supplement. Volumes 1 and 2. Anchorage: ACS.

Albert, T.F. 1981. Some thoughts regarding the possible effects of oil contamination on bowhead whales, *Balaena mysticetus*. In: Tissue Structural Studies and Other Investigations on the Biology of Endangered Whales in the Beaufort Sea, T.F. Albert, ed. Vol. II. Anchorage, AK: USDOI, BLM.

Angliss, R.P., A. Lopez and D.P. DeMaster. 2001. Alaska Marine Mammal Stock Assessments, 2001. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-124, 203p.

Angliss, R.P., B.S. Outlaw. 2005. Alaska Marine Mammal Stock Assessments, 2005. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-AFSC-161, 250p.

Bockstoce, J.R. 1986. Whales, ice, and men: the history of whaling in the western Arctic. Univ. Wash. Press, Seattle, 400p.

Bockstoce, J.R. and D.B. Botkin. 1983. The historical status and reduction of the western arctic bowhead whale (*Balaena mysticetus*) population by the pelagic whaling industry, 1848-1914. Rep. Int. Whal. Comm., Spec. Iss. 5:107-141.

Bratton, Gerald R., Charles B. Spainhour, Wayne Flory, Mark Reed, and Katherine Jayko. 1993. "Presence and potential effects of contaminants." In: The Bowhead Whale. Eds. J.J. Burns, J.J. Montague, C.J. Cowles. The Society for Marine Mammalogy. Special Publication Number 2. Lawrence: Allen Press, Inc., 1993. 764.

Brower, Eugene. Personal communication. December 17, 2002.

Burns, John J., J. Jerome Montague, and Cleveland J. Cowles. 1993. The Bowhead Whale. The Society for Marine Mammalogy. Special Publication Number 2. Lawrence: Allen Press, Inc.

Carroll, G. C., J.C. George, L.F. Lowry, and K.O. Coyle. 1987. Bowhead whale, *Balaena mysticetus*, feeding near Point Barrow, Alaska during the 1985 spring migration. Arctic 40(2):105-110.

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. Rept. Int. Whal. Comm. 38:365-370.

Clark, C.W. and J.L. Bower. 1991. Intercall intervals and acoustic tracks of bowhead whales off Point Barrow, Alaska, based on passive acoustics. IWC Doc. SC/43/PS20, International Whaling Commission, Station Rd., Histon, Cambridge, U.K. 20pp.

Clark, C.W., and W.T. Ellison. 1990. Acoustic behavior of bowhead whales off Point Barrow, Alaska during the spring migration. *In*: Fifth Conference on the Biology of the Bowhead Whale, *Balaena mysticetus*, Anchorage, Alaska, April 1-3, 1990.

Clark, Christopher W., William T. Ellison, and Kim Beeman. 1987. "Acoustic Tracking of Migrating Bowhead Whales." Oceans 86 Conference Record. Hosted by the Washington D.C. Section of the Marine Technology Society, 23-25 Sept. 1986, Washington, D.C. 86CH2363-0. Vol. 1: Systems, Structures and Analysis. N.p.: Marine Technology Society, 1987.

Cosens, S.E. T.Qamukaq, B.Parker, L.P. Dueck and B. Anardjuak. 1997. The distribution and numbers of bowhead whales, *Balaena mysticetus*, in northern Foxe Basin in 1994. *Can Field-Nat.* 111:381-388.

Davies, Jeremy Rhys. 1997. The Impact of an Offshore Drilling Platform on the Fall Migration Path of Bowhead Whales: A GIS-Based Assessment. Diss. for Western Washington University. N.p.: WWU.

Davis, R., and W. Koski. 1980. Recent observations of the bowhead whale in the eastern Canadian high Arctic. *Rep. Int. Whal. Comm.* 30:439-444.

Ellis, Richard. 1991. *Men and Whales*. The Lyon Press, New York. 543p.

Ellison, William T., Christopher W. Clark, and Garner C. Bishop. 1987. "Potential Use of Surface Reverberation by Bowhead Whales, *Balaena mysticetus*, in Under-Ice Navigation: Preliminary Considerations." Thirty-Seventh Report of the International Whaling Commission. N.p.: Cambridge, 1987.

Engelhardt, F. R. 1987. "Assessment of the Vulnerability of Marine Mammals to Oil Pollution." Fate and Effects of Oil in Marine Ecosystems. Proceedings of the Conference on Oil Pollution Organized Under the Auspices of the International Association on Water Pollution Research and Control (IAWPRC) by the Netherlands Organization for Applied Scientific Research. TNO Amsterdam, 23-27 Feb. 1987, The Netherlands. Eds. J. Kuiper, and W. J. Van Den Brink. Boston: Martinus Nijhoff Publishers, 1987.

Finneran, James J., C. E. Schlundt, D.A. Carder, J.A. Clark, J.A. Young, J.B. Gaspin, and S.H. Ridgway. 2000. Auditory and behavioral responses of bottlenose dolphins (*Tursiops truncatus*) and a beluga whale (*Delphinapterus leucas*) to impulsive sounds resembling distant signatures of underwater explosions. *J. Acoust. Soc. Am.* 108(1), July 2000.

George, John C., Christopher Clark, Geoff M. Carroll, and William 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 (1989): 24-30.

George, J.C., L.M. Philo, K. Hazard, D. Withrow, G.M. Carroll, and R. Suydam. 1994. Frequency of killer whale (*Orcinus orca*) attacks and ship collisions based on scarring on bowhead whales (*Balaena mysticetus*) by Alaskan Eskimos. Rep. Int. Whal. Comm. 42:479-483.

George, J.C., J. Bada, J. Zeh, L. Scott, S. Brown, T. O'Hara, and R. Suydam. 1999. Age and growth estimates of bowhead whales (*Balaena mysticetus*) via aspartic acid racemization. Can. J. Zoo. Vol. 77, 1999.

George, J.C., J. Zeh, R. Suydam, and C. Clark. 2002. Population size of the Bering-Chukchi-Beaufort Sea stock of bowhead whales, *Balaena mysticetus*, based on the 2001 census off Point Barrow, Alaska. Report prepared for the Scientific Committee of the IWC, 2002.

Geraci, J.R. 1990. Physiologic and toxic effects on cetaceans. pp. 167-192. In: J.R. Geraci and D.J. St. Aubin, Editors. Sea Mammals and Oil: Confronting the Risks. First ed., Academic Press, Inc. San Diego, California: 239 p.

Hill, P.S. and D.P. DeMaster. 1999. Alaska Marine Mammal Stock Assessments, 1999. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-110, 166p.

Hopson, Edward E. 1990. Some memories from 50 years hunting the bowhead whale. In: Fifth Conference on the Biology of the Bowhead Whale, *Balaena mysticetus*. April 1-3, 1990. Anchorage, Alaska.

International Whaling Commission Scientific Committee (IWC). 1995. "Report to the Sub-Committee on Aboriginal Subsistence Whaling." Forty-Fifth Report of the International Whaling Commission. N.p.: Cambridge.

IWC. 1992. Chairman's report of the forty-third annual meeting. Rep. Int. Whal. Comm. 42: 11- 50.

IWC 1995. Chairman's report of the forty-sixth annual meeting. Rep. Int. Whal. Comm. 45:15-52.

IWC. 1998. 48th Report of the International Whaling Commission. Cambridge, UK.

IWC. 1999. Report of the sub-committee on aboriginal subsistence whaling. Annex G. J. Cetacean Res. Manage. 1 (suppl.):179-194.

IWC. 2002 A. Annex: Report of the sub-committee on bowhead, right, and gray whales; BRG Report to the International Whaling Commission, May 5, 2002. Unpublished. 21 pp.

IWC, 2002 B. Report of the working group on whale killing methods and associated welfare issues. IWC/54/6. May, 2002.

IWC, 2007. Report on weapons, techniques, and observations in the Alaskan bowhead whale subsistence hunt. IWC/59/WKM&AWI4. May, 2007.

Jarrell, G.H. 1981. Cytogenetic and morphological investigation of variability in the bowhead whale, *Balaena mysticetus*. pp. 213-31, *In*: T. Albert (ed.) Tissue Structural Studies and Other Investigations on the Biology of Endangered Whales in the Beaufort Sea. Vol. 1. Final Rep. Prepared for the US Dept of the Interior, Contract No. AA851-CTO-22.

Koski, William R., Rolph A. Davis, Gary W. Miller, and David Withrow. 1993. "Reproduction." *In*: The Bowhead Whale. Eds. J.J. Burns, J.J. Montague, C.J. Cowles. The Society for Marine Mammalogy. Special Publication Number 2. Lawrence: Allen Press, Inc.

LGL, Ltd., and Greeneridge Sciences Inc. (LGL and Greendridge). 1997. Responses of Bowhead Whales to an Offshore Drilling Operation in the Alaskan Beaufort Sea, Autumn 1986. Prepared for Shell Western E & P Inc. by LGL, Ltd. and Greeneridge Sciences, Inc. N.p.: n.p., 1987.

LGL, 2002. Marine mammal and acoustical monitoring of Anderson Exploration Limited=s open-water seismic program in the southeastern Beaufort Sea, 2001. Prepared for Devon Canada Corporation by LGL, Ltd and Jasco Research. Ltd. LGL Final Rep. TA2618-1. May, 2001.

Ljungblad, D. K. 1981. Aerial Surveys of Endangered Whales in the Beaufort Sea, Chukchi Sea, and Northern Bering Sea, Final Report: Fall 1980. NOSC Code TD 449, Technical Document 449. Prepared for the U.S. Department of the Interior Bureau of Land Management by Naval Ocean Systems Center. San Diego: Naval Ocean Systems Center, 1981.

Ljungblad, D.K., S.E. Moore, J.T. Clarke, and J.C. Bennett. 1987. Distribution, Abundance, Behavior, and Bioacoustics of Endangered Whales in the Alaskan Beaufort and Eastern Chukchi Seas, 1979-86. OCS Study, MMS 87-0039. NOSC Technical Report 1177. Anchorage, AK: USDOI, MMS, 362 pp.

Lowry, Lloyd F. 1993. Foods and feeding ecology. *In*: The Bowhead Whale. J.J. Burns, J.J. Montague, C.J. Cowles (eds). The Society for Marine Mammalogy. Special Publication Number 2. Lawrence: Allen Press, Inc., 1993. 764.

MBC Applied Environmental Sciences (MBC). 1997. Arctic Seismic Synthesis and Mitigating Measures Workshop, Draft Proceedings. OCS Study MMS 97-0014. Sponsored by U.S. Department of Interior, Minerals Management Service, 5 - 5 March 1997, Barrow, Alaska. Proceedings prepared for U.S. Department of Interior, Minerals Management Service by MBC Applied Environmental Sciences. Costa Mesa: MBC, 1997.

Melnikov, V., M. Zelensky, and L. Ainana, 1998. Observations on distribution and migration of bowhead whales (*Balaena mysticetus*) in the Bering and Chukchi Seas. IWC Paper SC/50/AS3, IWC Scientific Committee, Oman, 1998. 31p.

Miller, G.W., R.E. Elliott, and W.J. Richardson. 1996. Marine Mammal Distribution, Numbers and Movements. *In*: 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. King City, Ontario, Canada: LGL Ecological Research Associates, Inc.

Miller, G.W. and R.A. Davis, eds. 2002. Marine mammal and acoustical monitoring of Anderson Exploration Ltd.'s open-water seismic program in the southeastern Beaufort Sea. Final report by LGL Ltd., King City, Ontario, Canada and JASCO Research Ltd., Victoria, B.C. for Devon Canada Corporation, Calgary, AB. 199p.

Mitchell, E.D. 1977. Initial population size of bowhead whale (*Balaena mysticetus*) stocks: cumulative catch estimates. *Int. Whal. Comm. Unpubl. Doc. SC/29/33*. 113p.

Monnett, C. and Stephen D. Treacy. 2005. Aerial surveys of endangered whales in the Beaufort Sea, fall 2002-2004. USDO, Minerals Management Service, Alaska OCS Region. OCS Study MMS 2005-037. 153p.

Moore, S.E. and R.R. Reeves. 1993 Distribution and movement of bowhead whales. *In* J.J. Burns, J.J. Montague, and C.J. Cowles (ed), *The bowhead whale*, p. 313-386. *Soc. Mar. Mamm. Spec. Publ. 2*.

Moore, Sue E., and J. T. Clarke. 1992. Final Report: Distribution, Abundance and Behavior of Endangered Whales in the Alaskan Chukchi and Western Beaufort Sea, 1991: With a Review of 1982-91. OCS Study, MMS 92-0029. Prepared for the U.S. Department of the Interior Minerals Management Service, Alaska OCS Region by SEACO, a Division of Science Applications International Corporation. San Diego: SEACO.

Moore, Sue E., and R. R. Reeves. 1993. Distribution and Movement. *In*: *The Bowhead Whale..* J.J. Burns, J.J. Montague, C.J. Cowles (Eds). *The Society for Marine Mammalogy. Special Publication Number 2*. Lawrence: Allen Press, Inc.

National Marine Fisheries Service. 2001. Biological opinion for oil and gas leasing and exploration activities in the Beaufort Sea, Alaska; and authorization of small takes under the Marine Mammal Protection Act. Issued to Minerals Management Service and National Marine Fisheries Service, May, 2001.

National Marine Fisheries Service. 2007. Draft Environmental Impact Statement for Issuing Annual Quotas to the Alaska Eskimo Whaling Commission for a Subsistence Hunt of Bowhead Whales for the Years 2008-2012. USDOC, Nat. Mar. Fish. Serv. 152p.

North Slope Borough. 1981. Commission on History and Culture. Puiguitkaat. 1978 Elder's Conference, 22-26 May, 1978, Barrow, Alaska. Barrow: NSB, 1981.

---. Commission on History and Culture. Qiniqtuagaksrat Utuqqanaat Inuuniagninisiqu (The Traditional Land Use Inventory for the Mid-Beaufort Sea). Barrow: NSB, 1980.

North Slope Borough Science Advisory Committee. 1987. A Review of the Report: Importance of the Eastern Beaufort Sea to Feeding Bowhead Whales, 1985-86. NSB-SAC-OR-109. Barrow, AK: North Slope Borough, 53 pp.

Philo, Michael L., E.B. Shotts, Jr., and J.C. George. 1993. AMorbidity and Mortality@. In: The Bowhead Whale. Eds. J.J. Burns, J.J. Montague, C.J. Cowles. The Society for Marine Mammalogy. Special Publication Number 2. Lawrence: Allen Press, Inc., 1993. 764.

Raftery, A., and J. Zeh. 1998. Estimating bowhead whale population size and rate of increase from the 1993 census. Journal of the American Statistical Association 93(442): 451-463.

Reeves, R.R., E. Mitchell, A. Mansfield, and M. McLaughlin. 1983. Distribution and migration of the bowhead whale, *Balaena mysticetus*, in the eastern North American Arctic. Arctic 36:5-64.

Rice, Dale W., 1964. Eskimo whaling in arctic Alaska. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Seattle, Wash.

Richardson, W.J., ed. 1987. Importance of the eastern Alaskan Beaufort Sea to feeding bowhead whales, 1985-86. Report by LGL Ecological Research Associates Inc. to U.S. Minerals Management Service. NTIS No. PB 88 150271/AS. 547 p.

Richardson, W.J. 1996. Acoustic effects on bowhead whales: overview. Pp. 107-110 In: Proceedings of the 1995 Arctic Synthesis Meeting. Sheraton Anchorage Hotel, October 23 to 25, 1995, Anchorage, AK. Prepared for the USDOI MMS, Alaska OCS Region by MBC Applied Environmental Sciences, Costa Mesa, CA. OCS Study MMS 95-0065. 206 p.

Richardson, W.J. (Ed) 1999. Marine mammal and acoustical monitoring of Western Geophysical=s open water seismic program in the Alaskan Beaufort Sea, 1998. LGL Rep. TA2230-3. Rep. from LGL Ltd., King City, Ont., and Greeneridge Sciences Inc., Santa Barbara, CA, for Western Geophysical, Houston, TX, and NMFS, Anchorage, Ak. and Silver Springs, Md. 390 p.

Richardson, W.J. (Ed) 1999a. Marine mammal and acoustical monitoring of Western Geophysical=s open water seismic program in the Alaskan Beaufort Sea, 1999. 90-day report. LGL Rep. TA2313-2. Rep. from LGL Ltd., King City, Ont., and Greeneridge Sciences Inc., Santa Barbara, CA, for Western Geophysical, Houston, TX, and NMFS, Anchorage, Ak. and Silver Springs, Md. 121 p.

Richardson, W.J. and D.H. Thomson, eds. 2002. Bowhead whale feeding in the eastern Alaskan Beaufort Sea: update of scientific and traditional information. Prepared for the USDOI MMS, Alaska OCS Region by LGL Ltd., King City, Ont. OCS Study MMS 1435-01-97-CT-30842.

Richardson, W. J., C. R. Greene Jr., M. A. Smultea, B. Wursig, J. S. Hanna, W. R. Koski, G. W. Miller, N. J. Patenaude, R. Blaylock, and R Elliott. 1995a. Acoustic Effects of Oil Production Activities on Bowhead and White Whales Visible During Spring Migration Near Pt. Barrow, Alaska--1991 and 1994 Phases: Sound Propagation and Whale Responses to Playbacks of Icebreaker Noise. OCS Study MMS 95-0051, LGL Report TA954, Contract 14-12-0001-30412. Prepared for U.S. Department of the Interior Minerals Management Service, Procurement Operations by LGL, Ltd. and Greeneridge Sciences Inc.

Richardson, W. J., D. B. Fissel, J. R. Marko, J. R. Birch, G. A. Borstad, D. N. Truax, R. Kerr, W. B. Griffiths, D. H. Thomson, B. Wursig, G. W. Miller, D. M. Schell, S. M. Saupe, N. Haubenstock, J. Goodyear, and D. R. Schmidt. 1987. Importance of the Eastern Alaskan Beaufort Sea to Feeding Bowhead Whales, 1985-86. OCS Study MMS 87-0037, Contract no. 14-12- 0001-30233. Prepared for the U.S. Department of the Interior Minerals Management Service by LGL, Ltd., Arctic Sciences Ltd., BioSonics, Inc., G.A. Borstad Associates Ltd., and University of Alaska, Fairbanks. Bryan: LGL, Ltd.

Richardson, W.J. and C.I. Malme. 1993. Man-Made Noise and Behavioral Responses *In: The Bowhead Whale Book*, Special Publication of The Society for Marine Mammology 2, D. Wartzok and Lawrence. KS: The Society for Marine Mammology, pp. 631-700.

Richardson, W. J., C. R. Greene, Jr., C. I. Malme, D. H. Thomson, S. E. Moore, and B. Würsig. 1995. *Marine Mammals and Noise*. San Diego: API, 1995.

Schell, D. M. 1998. Habitat usage as indicated by stable isotope ratios. Report to U.S. Minerals Management Service, MMS Contract 1435-01-97-CT-30842. 10 p.

Shell, D.M., S.M. Saupe, and N. Haubenstock. 1987. Bowhead whale feeding: allocation of regional habitat importance based on stable isotope abundances. Pages 369-415 in W. J. Richardson, ed. *Importance of the eastern Bering Sea to feeding bowhead whales, 1985-86*. Report by LGL Ecological Research Associates Inc. to U.S. Minerals Management Service. NTIS No. PB 88 150271/AS. 547 p.

Shapiro, L.H., and R. C. Metzner. 1979. Historical References to Ice Conditions Along the Beaufort Sea Coast of Alaska. NOAA Contract 03-5-022-55, Task No. 6. Prepared by Geophysical Institute, University of Alaska Fairbanks. Fairbanks: UAF, 1979.

Shelden, K.E.W. and D.J. Rugh. 1995. The bowhead whale, *Balaena mysticetus*: its historic and current status. *Marine Fisheries Review* 57(3-4):1-20.

Stoker, S.W. and Krupnik, I.I. 1993. Subsistence whaling. Pp. 579-630. *In: J.J. Burns, J.J. Montague and C.J. Cowles (eds.), The Bowhead Whale*. Spec. Publ. No. 2, Soc. Marine Mammology, Lawrence, KS. 787pp.

Suydam, R., J.C. George, T.M. O'Hara, and T.F. Albert. 1997. Efficiency of the subsistence harvest of bowhead whales by Alaskan Eskimos, 1973 to 1996 with observations on the 1995, 1996 and spring 1997 subsistence harvests. Report SC/49/AS19 presented to the Scientific Committee of the International Whaling Commission.

Suydam, R., J.C. George, T.M., C. Rosa, B. Person, C. Hanns, G. Sheffield, and J. Bacon. 2007. Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Eskimos during 2006. Report SC/59/BRG4 presented to the Scientific Committee of the International Whaling Commission.

Treacy, S.D. 1988. Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1987. OCS Study, MMS 88-0030. Anchorage: USDO, 1988.

---. Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1988. OCS Study, MMS 89-0033. Anchorage: USDO, 1989.

---. Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1989. OCS Study, MMS 90-0047. Anchorage: USDO, 1990.

---. Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1990. OCS Study, MMS 91-0055. Anchorage: USDO, 1991.

---. Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1991. OCS Study, MMS 91-0055. Anchorage: USDO, 1992.

---. Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1993. OCS Study, MMS 91-0055. Anchorage: USDO, 1994.

---. Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1996. OCS Study, MMS 97-0016. Anchorage: USDO, 1997.

USDOC, National Marine Fisheries Service. 1999. Endangered Species Act Section 7 Consultation (Biological Opinion) for the Proposed Construction and Operation of the Northstar Oil and Gas Project in the Alaskan Beaufort Sea. Anchorage AK: USDOC, NMFS, 75 pp.

United States Army Corps of Engineers (USACE). 1996. Transcript of Proceedings, Environmental Impact Statement for Beaufort Sea Oil and Gas Development, Northstar Environmental Impact Statement Project, Public Scoping Meeting, Monday, March 25, 1996, Barrow, Alaska. Prepared by Alaska Stenotype Reporters. Anchorage: ASR, 1996.

USDO, MMS, Alaska OCS Region. 1986 Public Hearings, Official Transcript of Proceedings, Oil and Gas Lease Sale 97, Nuiqsut, Ak. Anchorage, AK: USDO, MMS, Alaska OCS Region.

USDO, MMS, Alaska OCS Region. 1995 Public Hearing, Official Transcript of Proceedings, Beaufort Sea Sale 144 Draft EIS, Barrow, Ak. Anchorage, AK: USDO, MMS, Alaska OCS Region.

---. Transcript of Proceedings, Draft Environmental Impact Statement for the Proposed Oil and Gas Lease Sale 97 in the Beaufort Sea. Nuiqsut, Alaska, December 12, 1986. Anchorage: Accu-Type Depositions, Inc., 1986.

Wade, P.R. and G.H. Givens. 1997. Designing catch control laws that reflect the intent of aboriginal subsistence management principles. Rep. Int. Whal. Comm. 47:871-874.

Woodby, D.A. and D. B. Botkin. 1993. "Stock Sizes Prior to Commercial Whaling." *In*: The Bowhead Whale. J.J. Burns, J.J. Montague, C.J. Cowles, (Eds). The Society for Marine Mammalogy. Special Publication Number 2. Lawrence: Allen Press, Inc., 764.

Würsig, B. and C. Clark. 1993. "Behavior." *In* The Bowhead Whale. Eds. J.J. Burns, J.J. Montague, C.J. Cowles (eds). The Society for Marine Mammalogy. Special Publication Number 2 Lawrence: Allen Press, Inc., 1993. 157-99.

Zeh, J.E., C. W. Clark, J. C. George, D. Withrow, G. M. Carroll, and W. R. Koski. 1993. "Current Population Size and Dynamics." *In*: The Bowhead Whale. J.J. Burns, J.J. Montague, C.J. Cowles, (Eds). The Society for Marine Mammalogy. Special Publication Number 2. Lawrence: Allen Press, Inc.

Zhu, Q. 1996. Studies on the eyes of the Bowhead whale (*Balaena mysticetus*), ringed seal (*Phoca hispida*), and caribou (*Rangifer tarandus*). Ph.D. thesis. 382p. Institute of Oceanology, Chinese Academy of Sciences, Qingdao 266071, Peoples Republic of China.

Subject: Re: IWC BO
From: Roger B Eckert <Roger.B.Eckert@noaa.gov>
Date: Thu, 03 Jan 2008 14:25:32 -0500
To: Angela Somma <Angela.Somma@noaa.gov>

Angie, I am clearing this BO on the issuance of annual ASW quotas to the AEWC for 2008 through 2012. Thanks, Roger

Angela Somma wrote:

Roger, I accepted your edits and revised the document. It's attached. Would you please send me back an e-mail stating that you clear the BO for me to put in the package for Jim's signature. Thanks.

BowheadBiOp final jan03.rtf Name: BowheadBiOp final jan03.rtf
 Type: WINWORD File (application/rtf)
 Encoding: base64
Download Status: Not downloaded with message

1/3/07

TRANSMIT/ROUTE SLIP

NAME	BUILDING, ROOM OR REFERENCE NO.	TAKE ACTION BELOW	INITIALS AND DATE
Somma	FPR3		AS 1/3/07
Eckert	GCF	See attached e-mail	
Div. Support	FPR3		RTV 1/3/07
Lecky	FPR		LP 1/4/08
Goide	FPR		MW 1/3/07

EXPEDITE

ACTION ITEMS

- | | |
|------------------------------|-------------------------------------|
| 1. APPROVAL/SIGNATURE | 9. YOUR INFORMATION |
| 2. CLEARANCE/INITIALS | 10. PER OUR CONVERSATION |
| 3. RECOMMENDATION OR COMMENT | 11. AS REQUESTED |
| 4. RETURN WITH MORE DETAILS | 12. NECESSARY ACTION |
| 5. INVESTIGATE AND REPORT | 13. CIRCULATE AMONG STAFF |
| 6. NOTE AND SEE ME | 14. ANSWER DIRECTLY |
| 7. NOTE AND RETURN | 15. PREPARE REPLY FOR SIGNATURE OF: |
| 8. NOTE AND FILE | _____ |

COMMENTS

BiOp on the Issuance of Ann's Quotas Authorizing Harvest of Bowhead Whales; 2008-~~2009~~ 2012

Continued on reverse

FROM (Name)	BUILDING, ROOM OR REFERENCE NO.	CODE AND EXTENSION
Somma	F/PR3	