OSPAR COMMISSION

Background Document for Bowhead whale

Balaena mysticetus

Biodiversity Series

2010

OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the “OSPAR Convention”) was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. It has been ratified by Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland and the United Kingdom and approved by the European Community and Spain.

Convention OSPAR

La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. La Convention a été ratifiée par l'Allemagne, la Belgique, le Danemark, la Finlande, la France, l’Irlande, l’Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d’Irlande du Nord, la Suède et la Suisse et approuvée par la Communauté européenne et l’Espagne.

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Photo acknowledgement

Cover page: Bowhead whale©NOAA

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Background Document for Bowhead whale *Balaena mysticetus*

Executive Summary

This background document for the Bowhead whale *Balaena mysticetus* has been developed by OSPAR following the inclusion of this species on the OSPAR List of threatened and/or declining species and habitats (OSPAR Agreement 2008-6). The document provides a compilation of the reviews and assessments that have been prepared concerning this species since the agreement to include it in the OSPAR List in 2003. The original evaluation used to justify the inclusion of *B.mysticetus* in the OSPAR List is followed by an assessment of the most recent information on its status (distribution, population, condition) and key threats prepared during 2009-2010. Chapter 7 provides proposals for the actions and measures that could be taken to improve the conservation status of the species. In agreeing to the publication of this document, Contracting Parties have indicated the need to further review these proposals. Publication of this background document does not, therefore, imply any formal endorsement of these proposals by the OSPAR Commission. On the basis of the further review of these proposals, OSPAR will continue its work to ensure the protection of *B.mysticetus*, where necessary in cooperation with other competent organisations. This background document may be updated to reflect further developments or further information on the status of the species which becomes available.

Récapitulatif

Le présent document de fond sur la Baleine franche boréale a été élaboré par OSPAR à la suite de l'inclusion de cette espèce dans la liste OSPAR des espèces et habitats menacés et/ou en déclin (Accord OSPAR 2008-6). Ce document comporte une compilation des revues et des évaluations concernant cette espèce qui ont été préparées depuis qu'il a été convenu de l'inclure dans la Liste OSPAR en 2003. L'évaluation d'origine permettant de justifier l'inclusion de la Baleine franche boréale dans la Liste OSPAR est suivie d'une évaluation des informations les plus récentes sur son statut (distribution, population, condition) et des menaces clés, préparée en 2009-2010. Le chapitre 7 fournit des propositions d'actions et de mesures qui pourraient être prises afin d'améliorer l'état de conservation de l'espèce. En se mettant d'accord sur la publication de ce document, les Parties contractantes ont indiqué la nécessité de réviser de nouveau ces propositions. La publication de ce document ne signifie pas, par conséquent que la Commission OSPAR entérine ces propositions de manière formelle. A partir de la nouvelle révision de ces propositions, OSPAR poursuivra ses travaux afin de s'assurer de la protection de la Baleine franche boréale, le cas échéant avec la coopération d'autres organisations compétentes. Ce document de fond pourra être actualisé pour tenir compte de nouvelles avancées ou de nouvelles informations qui deviendront disponibles sur l'état de l'espèce..

1. Background information

Name of species

Name of species: *Balaena mysticetus* (Linnaeus, 1758), Bowhead whale or Greenland right whale.
Infra-specific taxa assessed:
Balaena mysticetus (Bering-Chukchi-Beaufort Sea population), *B. mysticetus* (Okhotsk Sea population), *B. mysticetus* (Svalbard-Barents Sea (Spitsbergen) population) and *B. mysticetus* (Hudson Bay-Foxe Basin/BaffinBay-Davis Strait populations).
Bowhead whales are members of the family Balaenidae (suborder Mysticeti, order Cetacea).

Description

Bowhead whales are identifiable by their large size, rotund shape, lack of dorsal fin, dark color, white chins, triangular head (in profile) and neck (concave profile between head and back). The bowed appearance of the mouth gives them their name. Their adult weight varies from 75 to 100 tons. Males grow to 14–17 m in length and females 16–18 m, perhaps as much as 20m. Their baleen may be as long as 4m with 230 to 360 plates on each side of the mouth. They are insulated from the icy water by a thick layer of blubber (5.5 to 28 cm) covered by an epidermis up to 2.5 cm thick (Perrin *et al*., 2002).

Species ecology and breeding biology

Bowhead whales inhabit arctic and sub-arctic waters between 55º and 80ºN (OSPAR, 2008), but sighting records north of 81°N and acoustic records from 82°30'N have been reported recently (communication: Norway).

The seasonal distribution is strongly influenced by pack ice (Moore and Reeves, 1993). During the winter bowhead whales occur in areas near the ice edge, in polynyas, and in areas of unconsolidated pack ice. During the spring these whales use leads and cracks in the ice to penetrate areas that were inaccessible during the winter due to heavy ice coverage. During the summer and autumn they concentrate in areas where zooplankton production is high or where large-scale biophysical processes create local concentrations of calanoid copepods (Finley, 1990, Finley *et al.*, 1998).

Today's temperatures are cool enough to keep ice across most of the east-west passages of the Arctic, isolating these whale stocks (Perrin *et al*., 2002). Future changes of this situation might occur due to global warming. The melting of the Arctic sea ice might create passages for migrating whales and the actual genetic isolation thus might come to an end. Recently, ships came from Asia to Europe using the north-east passage (communication: Norway).

Little is known about the specific ecology of the Okhotsk Sea bowhead whale population. Unlike other bowhead whale populations, this one inhabits an area that is ice-free in summer (IUCN, 2008).

The animals migrate to northerly feeding grounds in spring and summer, returning to the southern parts of their range in late autumn (Christensen *et al.,* 1992).

Bowheads probably mate in later winter or early spring. Over a year after mating (13–14 months), calves are born, usually during the spring migration between April and June. Calves are about 4m long at birth. Females become sexually mature at roughly 15 years of age and have calves 3 to 4 years apart.

Bowhead whales may live for more than a century as attested by ancient harpoon points collected in whales recently (Perrin *et al*., 2002). George *et al.* (1999) have studied age determination by aspartic acid racemization in eye lenses. The results indicate that this species may even live for more than 200 years.

Small to medium-sized crustaceans, especially krill (euphausiids) and copepods form the bulk of the bowhead's diet (Lowry *et al.,* 2004). They also feed on mysids and gammarid amphipods, and the diet includes at least 60 species. Bowheads skim feed at the surface and feed throughout the water column. It has recently been suggested that they also feed near the bottom, but probably do not directly ingest sediments as gray whales routinely do (IUCN, 2008).

One should also consider a possible change in food availability related to global warming. Indeed, bowheads are unique among northern hemisphere mysticetes in that they feed mostly in arctic and subarctic regions where sea ice cover may regulate oceanic processes, productivity and access to food. Moreover, as food availability potentially limits population growth, it is important to understand bowhead feeding ecology. Information is also needed on how factors such as oceanographic conditions, trophic competitors and human activities may affect prey populations and bowhead feeding patterns (Burns *et al*., 1993). Furthermore, other zooplankton species with different properties (for example lower energy content) may shift their distribution area northwards and take the place of present species.

Their only natural predators are killer whales.

2. Original Evaluation against the Texel-Faial selection criteria

List of OSPAR regions and Dinter biogeographic zones where the species occurs

OSPAR Region I
Biogeographic zones : Cold-Arctic waters, Norwegian Coast (Finnmark), Northeast Greenland Shelf (incl. NEWP), Barents Sea

List of OSPAR regions where the species is under threat

All where it occurs.

Original evaluation against the Texel-Faial criteria for which the species was included in the OSPAR List

B. mysticetus was nominated for inclusion by one Contracting Party (Norway) citing rarity, decline and sensitivity, with information also provided on threat.

Table 1: Summary assessment of *B. mysticetus* against the Texel-Faial criteria.

Criterion	Comments	Evaluation
Decline	Before hunting started in the 17th century the population of the Spitsbergen stock of the bowhead whale was estimated to be about 25,000 (Klinkowka, 1991). Populations were quickly depleted because of the ease with which this species could be caught. Today there are believed to be only a few tens of individuals (only 24 sightings, including one dead animal, between 1958 and 1983) (Klinkowka, 1991, Zeh *et al.,* 1993). Sightings in the Russian region of the Arctic suggest that there may be more whales in this area but it is unclear whether these are a few remaining individuals from the original Spitsbergen stock or immigration from another stock (OSPAR, 2008).	Qualifies

Sensitivity	Ice-associated animals, such as the bowhead whale, may be sensitive to changes in Arctic weather, sea-surface temperatures or ice extent. Like other marine mammals they are generally characterized by low annual mortality and long life spans. There are believed to be less than 50 mature individuals in the Spitsbergen stock, which makes the whole stock very vulnerable to extinction. Baleen whales, such as the bowhead use sound to provide information about the physical environment and to communicate between individuals. They emit low frequency sound that can travel hundreds of kilometers (Evans, 2000). This makes them sensitive to acoustic disturbance from military activities such as naval sonars (particularly low frequency acoustics), as well as other sources such as seismic exploration. The whales will be particularly vulnerable if the zone of influence coincides with migration and breeding areas (OSPAR, 2008).	Qualifies - very sensitive
Threats	In the past the main threat to this species was commercial whaling whereas today it is pollution. Oil pollution is of particular concern because oil spilled in polar regions tends to accumulate at the ice edges, the preferred habitat of these whales. One of their main methods of feeding involves skimming the water at the surface, making them more likely to ingest oil. Synthetic toxins such as DDT and PCBs are another threat. High levels of these compounds have been found in the blubber of several whale species. Although the detrimental effects of chlorine compounds on whales has not been proven, birth abnormalities have been reported in seals in association with high levels of these chemicals. The population may also be exposed to radionuclides in the food chain in Arctic waters. Any shifts in regional weather patterns which affect sea-surface temperature and the extent of sea ice, are another potential threat but it is not possible to make reliable predictions of the effects of Arctic climate change on bowhead whales at the present time. Acoustic disturbance from shipping, military and research activities adds to the pressures on this species (OSPAR, 2008).	

Relevant additional considerations

Sufficiency of data: Data from past whaling activities in the Arctic confirm that large numbers of bowhead whale were taken by whalers. There is some uncertainty about the precise size of the population today as the species is very rare (OSPAR, 2008).

Changes in relation to natural variability: The large numbers of bowhead whales that were hunted during earlier centuries will have masked any changes in the population caused by natural variability. With such a small number remaining, natural variability may however become a major contributory factor in its local extinction (OSPAR, 2008).

Expert judgement: Information on the catches of bowhead whale in the Arctic reveal the historic decline in this species, its vulnerable status today, and the threat of it becoming extinct in the OSPAR Maritime Area (OSPAR, 2008).

ICES evaluation: The ICES Advisory Committee on Ecosystems (2003) concluded that there is good evidence of a long-term decline in populations of the Bowhead Whale but rather little evidence of current direct threat (OSPAR, 2008).

3. Current status of the species

Distribution

Geographic range (IUCN):

Range description:

Bowhead whales are found only in Arctic and subarctic regions. They spend much of their lives in and near the pack ice, migrating to the high Arctic in summer, and retreating southward in winter with the advancing ice edge (Moore and Reeves, 1993).

The International Whaling Commission currently recognizes four stocks: Bering-Chukchi-Beaufort Seas (US (Alaska), Canada, and Russian Federation); Hudson Bay-Foxe Basin (Canada) and Davis Strait-Baffin Bay (Denmark (Greenland) and Canada) [now: East Canada-West Greenland stock]; Svalbard-Barents Sea (Spitsbergen) (Denmark (Greenland), Norway, and Russian Federation); and the Okhotsk Sea (Russian Federation and Japan) (Rugh *et al,.* 2003).

Distribution in OSPAR maritime area

The **Svalbard-Barents Sea (Spitsbergen) stock** occurs from the east coast of Greenland across the Greenland Sea, the Barents Sea and the Kara Sea as far as Severnaya Zemlya (Russian Federation), and as far south as the ice front, exceptionally reaching Iceland and the coast of Finnmark (Norway). The IUCN assed this stock as “Critically Endangered” in 2008 for the following reasons: there is no quantitative estimate of current population size, and there have been only 41 sightings between 1940-2008, of which only 3 were sighted prior to 1980 (IWC 2009). However there has been an increase in the number of sightings in the last decade (IWC 2009; Wilg *et al*., 2009).. . The lack of any calf sightings in recent decades, together with the general paucity of sightings overall (seven sightings totaling 17-20 individuals during a systematic survey in 2006), indicates that CR remains appropriate (Assessors: Reilly, S.B., Bannister, J.L., Best, P.B., Brown, M., Brownell Jr., R.L., Butterworth, D.S., Clapham, P.J., Cooke, J., Donovan, G.P., Urbán, J. & Zerbini, A.N.; Evaluators: Taylor, B.L. & Notarbartolo di Sciara, G. (Cetacean Red List Authority)).

General distribution

The **Bering-Chukchi-Beaufort Seas stock** occurs from Chaunskaya Guba (Russian Federation) in the western Chukchi Sea east to Amundsen Gulf (Canada), and the northern Bering Sea south to Karaginskiy Zaliv (Russian Federation), St. Matthew Island, and Norton Sound (US (Alaska)) (Rice, 1998).

The range of the **Hudson Bay-Foxe Basin stock** was traditionally taken to include northern Hudson Bay close to Southampton Island, Hudson Strait, Foxe Channel and Foxe Basin. The animals observed in the Hudson Strait linking Hudson Bay to Labrador Sea are supposed to migrate between these two areas (IWC, 2008).

The **Baffin Bay-Davis Strait stock** is centered in summer in the eastern Canadian High Arctic archipelago and along eastern Baffin Island. The whales move to wintering areas in polynyas (Holst

and Stirling, 1999), unconsolidated pack ice, and open water near the ice edge off West Greenland (Reeves and Heide-Jørgensen, 1996) and eastern Baffin Island.

Recently, it was recognized that these two stocks actually constituted a single demographic unit and were therefore merged together as one stock, herein provisionally called East Canada-West Greenland stock.

The **Okhotsk Sea stock** occurs in the Sea of Okhotsk from Shantarskiye Zaliv east to Zaliv Shelikova, Gizhiginskaya Guba and Penzhinskaya Guba (Moore and Reeves, 1993, Rice, 1998). Genetic analyses have confirmed that the Okhotsk Sea bowheads are distinct from the Bering-Chukchi-Beaufort Sea bowheads and are a separate, isolated population (LeDuc *et al,.* 2005).

Population (current/trends/future prospects)

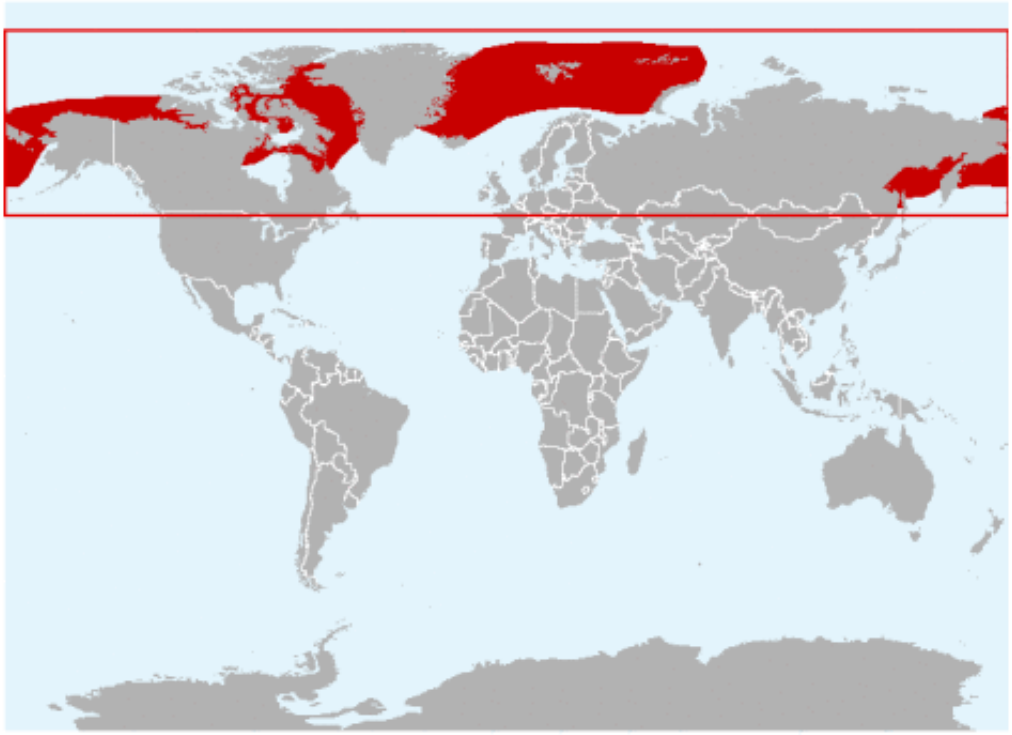
Abundances (N) and actual conservation statuses (N/K) differ greatly between different stocks (see table 2). The largest remnant stock is the Bering Sea stock. This is the only stock that appears to be recovering from commercial whaling. Its effectives reach 63% of the carrying capacity estimation with an annual growth rate of 3.2% between 1978 and 2001. Very little is known about other stocks of bowheads (Perrin *et al*., 2002).

The Hudson Bay-Foxe Basin and the Baffin Bay-Davis Strait stocks considered together also seem to be in a satisfying state with effectives close to 60% of their carrying capacity. On the other hand the Okhotsk Sea and Svalbard-Barents Sea (Spitsbergen) stocks are in a bad conservation status with annual effectives estimated at only 10% and 1% of their carrying capacities respectively (IWC, 2008).

Table 2: stocks, carrying capacity (K), actual abundance (N) for *B. mysticetus*. §: estimation validated by the IWC.

Stocks or areas	K	N	Census year
BCB	10.400 – 23.000 Retro projection of capture historics	11.800 § (CV=0,255 ; IC95% : 7200-19300)	2004
HB-FB	580	6344 (IC95% : 3119-12906)	2007
BB-DS	11700		
		1230 § (IC95% : 490-2940)	2006
Okhotsk	3000	300-400	
Spitsbergen	24000	20 observations registered	April 2006

Range map (IUCN):



General IUCN assessment information:

Red List category & criteria: Least Concern (but an analysis of the different stocks shows important differences)

Year assessed: 2008

Assessors: Reilly, S.B., Bannister, J.L., Best, P.B., Brown, M., Brownell Jr., R.L., Butterworth, D.S., Clapham, P.J., Cooke, J., Donovan, G.P., Urbán, J. & Zerbini, A.N.

Evaluators: Taylor, B.L. & Notarbartolo di Sciara, G. (Cetacean Red List Authority)

Justification: The global population appears to be increasing, due primarily to the increase in the large Bering-Chukchi-Beaufort stock, even though the trends in the remaining populations are unclear. The BCB stock size is well above the Vulnerable threshold for a non-declining population, and current assessments suggest that this stock has recovered to close to its pre-whaling level. The estimate of over 7,000 animals for part of the range of the Hudson Bay-Foxe Basin and Baffin Bay-Davis Strait stocks combined is still provisional, but it is unlikely that the final numbers would be so low that these subpopulations (or the single combined stock) would qualify for a threatened category. Bowhead whale numbers in eastern Canada and West Greenland are probably still below their pre-whaling levels, although the main reductions occurred before the three-generation time window that would trigger the population reduction (A) criterion. For all these reasons, the species is listed as Least Concern (IUCN, 2008).

History:

1996 – Lower Risk/conservation dependent (Baillie and Groombridge 1996)
1994 – Vulnerable (Groombridge 1994)
1990 – Vulnerable (IUCN 1990)
1988 – Endangered (IUCN Conservation Monitoring Centre 1988)
1986 – Endangered (IUCN Conservation Monitoring Centre 1986)

Current population sizes

The range-wide abundance is not known with precision but numbers over 10,000 individuals, with the accepted 2004 abundance estimate for the Bering- Chukchi-Beaufort Seas stock totaling 11800 (IWC 2009), and provisional estimates of 3,633 (1,382-9,550) (Koski et al., 2006) and 7,300 (3,100–16,900) for parts of the range of the Hudson Bay-Foxe Basin and Baffin Bay-Davis Strait stocks (Cosens et al., 2006).

There are no reliable abundance estimates for the small Okhotsk Sea and Svalbard-Barents Sea (Spitsbergen) stocks.

The Svalbard-Barents Sea (Spitsbergen) stock might be in critical danger of extinction (less than 50 adult individuals), the Okhotsk Sea and Baffin Bay-Davis Strait stocks also seem to be endangered (less than 250 adult individuals). The Hudson Bay-Foxe Basin stock might still be vulnerable (about 1000 adult individuals) (IWC, 2008).

Population trends

The Bering-Chukchi-Beaufort (BCB) stock has been monitored for more than 30 years and has been increasing over this period at an estimated rate of 3.4% (1.7–5%) per year in the presence of subsistence hunting (Zeh and Punt, 2005). No quantitative estimates of trends in the other bowhead populations are available, but Inuit hunters and elders report that they are observing more bowheads in the eastern Canadian Arctic and West Greenland than they did in the 1960s–1970s, and that the geographic distribution of the whales has expanded in recent years (Koski et al., 2006).

No estimates of trends in population size are available for the Svalbard-Barents Sea (Spitsbergen) and Okhotsk Sea stocks (IUCN, 2008).

Pre-whaling population sizes

All bowhead subpopulations were severely depleted by commercial whaling, which had begun in the northeastern Atlantic by 1611 (Ross, 1993). Basque whalers took bowheads in the northwest Atlantic (Labrador in Canada) in the 16th century, but ambiguities over the species identity of whales taken in early commercial whaling make pre-1600 catch records difficult to interpret (IUCN, 2008).

Minimum pre-whaling stock sizes are estimated to have been 24,000 for the Svalbard-Barents Sea (Spitsbergen) stock, 12,000 for the Hudson Bay-Foxe Basin and Baffin Bay-Davis Strait subpopulation(s), and 3,000 for the Okhotsk Sea stock (Woodby and Botkin, 1993). Brandon and Wade (2004) estimate the initial abundance of the BCB subpopulation at 10–20,000 (IUCN, 2008).

The BCB stock may be approaching its pre-whaling levels (IWC, 2005). The Svalbard-Barents Sea (Spitsbergen) and Okhotsk Sea stocks are each at a small fraction of their pre-whaling levels, while the status of the Hudson Bay-Foxe Basin and Baffin Bay-Davis Strait animals relative to pre-whaling levels is unclear(IUCN, 2008).

The Svalbard-Barents Sea (Spitsbergen) stock was originally by far the most abundant of the bowhead whale subpopulations, but was heavily depleted by pre-modern commercial whaling from

1611 to the last recorded capture in 1911 (Ross, 1993). The only record of catches by modern whaling refers to four taken by modern whaling near Svalbard in 1932 (Ruud, 1937). Based on the catch record, a minimum initial population size was estimated by Woodby and Botkin (1993) at 24,000 whales. A modeling exercise (Allen and Keay, 2006) resulted in an estimate of 52,000 but this may be too high given it assumed a net reproductive rate considerably lower than that currently observed in the Bering-Chukchi-Beaufort Seas stock. There is no quantitative estimate of current subpopulation size, but the available evidence suggests that it is small. Jonsgård (1982) reported no live sightings on surveys between Greenland and Svalbard and around Svalbard in 1980, but one dead probable bowhead. Based on post-war sightings of only seven individuals in Norwegian and adjacent waters up to 1990, Christensen *et al*. (1992) suggested that the subpopulation numbered “in the tens”. However, the Norwegian record may have given a somewhat exaggerated impression of rarity, due to lack of coverage within the pack ice. Moore and Reeves (1993) list 37 sightings between 1940 and 1990, mainly near Svalbard and Franz Josef Land (Russian Federation). The records include two sightings (Belikov *et al*., 1989) of apparently quite large winter aggregations near Franz Josef Land in 1981 (“several tens of individuals”) and 1983 (“about 66 animals”). Gilg and Born (2005) list 23 definite and probable sightings off East Greenland during 1940–2004, including a probable sighting of ten individuals in 2003. Wiig *et al.* (2009) report 37 “confirmed”, 3 “probable” and one “possible” bowhead whale sightings in the Svalbard area during 1940-2008. Seven sightings totaling about 20 individuals were reported in the Greenland Sea in April 2006 (Wiig *et al*., 2007). While the number of sightings records has increased over time this may reflect increased effort rather than increasing abundance. Among the recently reported observations, no calves or small individuals have been reported. The proportion of the subpopulation that comprises mature animals is unknown. A value of 44% has been estimated for the Bering-Chukchi-Beaufort Seas stock. Anecdotal evidence from historical whaling accounts suggests the possibility of whales from a stock to the east, possibly the Bering-Chukchi-Beaufort Seas stock, entering into these waters at times (Shelden *et al*., 1995), which would complicate the interpretation of the sightings data with respect to the size of the remnant Svalbard stock. Whether the current subpopulation is a remnant of the original Svalbard stock, a recolonization, or a mixture of both, is currently unclear, but ongoing analyses of DNA from old bones might throw light on this question (Borge *et al*., 2005).

Demographic parameters

A long lifespan (>100 years) is suggested by biochemical methods and the finding of old-fashioned stone harpoon heads in hunter-killed animals (George *et al.,* 1999). If this is confirmed, it would be among the longest known for a mammal.

For the BCB subpopulation, an estimated 44% (SE 1%) of the total population consists of reproductively mature animals, given that the age at maturity is at least 20 years (Koksi *et al.,* 2004). The calving interval is 3–4 years (Rugh *et al.*, 1992). No specific data are available for other stocks.

Taylor *et al.* (2007) estimate the generation time for bowhead whales to be around 52 years.

Population Trend: Generally increasing, but unknown for the Svalbard-Barents Sea (Spitsbergen) and Okhotsk Sea subpopulations (IUCN, 2008).

Condition (current/trends/future prospects)

Even a century after commercial whaling ceased, two of the four bowhead stocks are still considered endangered.

Limitation in knowledge

Research on bowhead whales is difficult to be conducted, due to the remoteness of this species from human habitation, often necessitating airplane-based observations of whales far from land, or long

over-ice treks to open-water leads. As a result, except for the BCB bowhead stock which has been monitored annually for many years, only short-term studies have been conducted on the other stocks (Burns *et al*., 1993).

4. Evaluation of threats and impacts

Table 3: Summary of key threats and impacts to *B. mysticetus.*

Type of impact	Cause of threat	Comment
Death or injury	Hunting	Aboriginal subsistence whaling on the BCB stock still takes place, but the OSPAR area Svalbard-Barents Sea (Spitzbergen) stock is not subject to hunting.
Death or injury by ship strikes	Shipping and navigation	Increasing ship traffic in the Arctic regions increases this kind of threat for bowhead whales.
Disturbance	Research	If too invasive.
Entanglement in fishing gears	Fishing	Can cause mortality or serious injury.
Noise disturbance	Military activities (sonars)	Hearing damage, inter-individual communication affected, habitat loss, …
Noise disturbance	Shipping and navigation	Hearing damage, inter-individual communication affected, habitat loss, …
Noise disturbance	Oil and gas exploration and extraction activities	Hearing damage, inter-individual communication affected, habitat loss, …
Health, fertility problems	Chemical pollution	Persistent organic pollutants bio-accumulate in lipid rich tissues (blubber).
Prey decline	Global warming	Consequences are still largely unknown, further studies are needed.
Habitat disturbance and loss	Noise pollution, reduction of sea surface ice (global warming), disturbance, removal of target species	Bowhead whales depend on Arctic habitats, habitat loss would be a major threat.

Cross-reference to checklist of human activities in OSPAR MPA Guidelines

Relevant human activity: Shipping & navigation, military activities; fishing, hunting, harvesting, research.
Category of effect of human activity: Physical – Noise disturbance, Biological – removal of target species, removal of non-target species, physical damage to species (OSPAR, 2008).

Major threats: Commercial whaling, and therefore human activity, is known to have caused the significant decline of the bowhead whale. Heavy commercial hunting, beginning in the 1500s, depleted all populations of bowheads. The Bering-Chukchi-Beaufort Seas stock has recovered substantially since the end of commercial whaling in the early 20th century, while recent provisional estimates of the Hudson Bay-Foxe Basin and Baffin Bay-Davis Strait stocks also suggest significant recovery. There is no reliable evidence of recovery of the Svalbard-Barents Sea (Spitsbergen) and Okhotsk Sea stocks (IUCN, 2008). The IWC set an annual quota of 64 whales to harvest by Native Alaskans and the Chukotka Natives of Siberia have been allotted 5 bowheads per year from the Alaska quota. The

Canadian government has allowed a limited hunt of bowheads in the Bering Sea stock as well as from the stocks in Hudson Bay and Davis Strait. Statistically the Native Canadians killed less than one bowhead whale per year until recently (Perrin *et al*., 2002). In 2008, three bowhead whales were killed in the Canadian Arctic by Inuit hunters (IWC SC report 2009).

There is evidence of incidental mortality and serious injury caused by entanglement in fishing gear and ship strikes (Philo *et al.* 1992, 1993; Finley 2000).

At least one case of fatal entrapment of an Okhotsk Sea bowhead whale in fishing gear has been documented (Brownell, 1999) but this population is not currently subject to hunting.

As far as the Svalbard-Barents Sea (Spitsbergen) subpopulation is concerned, incidental mortality or serious injury from entanglement in fishing gear and ship strikes has not been reported. There are no known specific threats to this subpopulation which is not hunted (IUCN, 2008).

Limited aboriginal subsistence whaling on the BCB stock (by native peoples of Alaska, and the Russian Federation (Chukotka) is permitted by the IWC on the basis of advice from its Scientific Committee (most recently under its new aboriginal subsistence whaling management procedure). These takes have not impeded the recovery of the stock. Very small takes by aboriginal hunters are allowed in Canadian waters. So far these have been too few to impede recovery of the stocks, but there will be pressure to increase take levels given the recent, higher population estimates in the eastern Canadian Arctic (IUCN, 2008).

There has been concern since the 1970s that disturbance from oil and gas exploration and extraction activities in the Arctic region might affect bowhead whales. At present bowhead whales are exposed to ship noise (oil-industry supply ships and icebreakers, seismic vessels with air gun arrays, …) (Burns *et al*., 1993) which might intensify as the Arctic sea ice reduction will offer new navigation routes to large vessels. There might also be exposure to drilling and dredging as Arctic natural resources will become more easily accessible. During this century, a profound reduction in the extent of sea ice in the Arctic is expected, and possibly a complete disappearance in summer, as mean Arctic temperatures rise faster than the global average. The implications of this for bowhead whales are unclear but warrant monitoring (IUCN, 2008).

Environmental threats, such as pollution (Bratton *et al.* 1993) and disturbance from tourist traffic (Finley 2000), may affect bowhead whales but the impacts have not yet been well characterized or quantified.

5. Existing Management measures

All the species range States are members of the International Whaling Commission (IWC) and three of them (Norway, Iceland and Greenland) are also members of the North Atlantic Marine Mammal Commission (NAMMCO). Commercial whaling of the bowhead whale has been banned since the 1930's, however some aboriginal whaling does take place on the Bering-Chukchi-Beaufort stock and more recently on the East Canada-West Greenland stock. Apart from protection from whaling, other measures that would help safeguard this species are more indirect such as minimizing the risk of marine pollution and ensuring a high water quality in the Arctic. OSPAR does not deal with whaling issues directly but can communicate an opinion on it to the IWC as well as the North Atlantic Marine Mammal Commission (NAMMCO) (OSPAR, 2008).

Conservation actions: The International Whaling Commission has protected bowhead whales from commercial whaling since its inception in 1946; all range states except Canada are members of the IWC. Limited aboriginal subsistence whaling is allowed by the IWC on bowhead whales from the BCB stock on the basis of scientific advice. Aboriginal hunting in Canada is co-managed by the federal

government and provincial bodies created under land-claim agreements. This species has been included in CITES Appendix I since 1975; Canada had a reservation against this listing until 1978. The species is listed in CMS Appendix I. Bowhead whales are also protected by the Bern Convention (annex II).

6. Conclusion on overall status

As mentioned above, the Svalbard-Barents Sea (Spitsbergen) stock which is situated in the OSPAR area is in a bad conservation status (IWC, 2008). This stock might be in critical danger of extinction. Estimates of trends of this subpopulation, as well as population structure studies are critically needed, even if research on these remote animals is very difficult to conduct. Indeed, if it was established that there is a genetic connection to the other subpopulations, a broader conservation view comprising all the areas could be taken.

7. Actions to be taken by OSPAR

Actions/measures that OSPAR could take, subject to OSPAR agreement

As set out in Article 4 of Annex V of the Convention, OSPAR has agreed that no programme or measure concerning a question relating to the management of fisheries shall be adopted under this Annex. However where the Commission considers that action is desirable in relation to such a question, it shall draw that question to the attention of the authority or international body competent for that question. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them. For the avoidance of doubt, in the context of the OSPAR Convention, the management of fisheries includes the management of marine mammals.

OSPAR recognizes that the IWC is the main international organization in charge of protecting large whales in the world and assessing their status. Therefore OSPAR could contact the IWC to notify its deep concern about the status and conservation of the Svalbard stock of the Bowhead whale and request that issues relative to assessing the status of this stock and the current level of the threats that it is currently facing would be placed as priority issues in the IWC Scientific Committee agenda. OSPAR recognizes that NAMMCO is a regional organization in charge of protecting marine mammal stocks in the north Atlantic. Therefore OSPAR could contact NAMMCO to notify its deep concern about the status and conservation of the Svalbard stock of the Bowhead whale and request that issues relative to assessing the status of this stock and the current level of the threats that it is currently facing would be placed as priority issues in the NAMMCO agenda.

Actions/measures for relevant Contracting Parties

OSPAR could ask bowhead whale range Contracting Parties (Norway, Iceland and Denmark) to report on a regular basis on any available information regarding the status of the species in the OSPAR range as well as the extent and levels of potential threats in the species habitat.

OSPAR could request Contracting Parties to consider the critically endangered status of the Svalbard bowhead whale stock in the planning of any activity in the species habitat (*e.g.* shipping lanes, seismic surveys, fisheries, etc), notably because global warming and associated sea-ice retreat is likely to favor the development of industrial and commercial activities in the area (called tertiary effects of global warming on cetaceans).

Table 4: Summary of key priority actions and measures which could be taken for *B.mysticetus*. Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.

Key threats	Death or injury by ship strikes, entanglement in fishing gears, noise pollution, chemical pollution, habitat loss	
Relevant Contracting Parties	Denmark, Norway, Iceland	
Other responsible authorities	NAMMCO; IWC; CITES	
Already protected? **Measures adequate?**	IWC (fully protected) Bern Convention Annex II Bonn Convention (CMS) Annex I CITES Appendix I IUCN Red List (Least Concern (but an analysis of the different stocks shows important differences))	Current measures mostly ban hunting and international trade of Bowhead whale. No measure is designed to protect habitat against identified threats such as global warming, ecosystem shifts and associated effect on prey stocks, pollution, man-made noise, ship strikes…

Suggestions for further research

Given the paucity of recent data on bowhead whales in the OSPAR range, it is not really possible to make recommendations on priority research actions to be conducted by Contracting Parties. It would be extremely useful for OSPAR to convene a joint meeting with IWC and NAMMCO in order to examine all available knowledge on this stock and formulate priority research and monitoring objectives from this review, in the view of establishing an assessment strategy for the bowhead whale in the OSPAR range.

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