POLAR BEAR (*Ursus maritimus*): Chukchi/Bering Seas Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Polar bears are found throughout the circumpolar arctic and occur in 19 subpopulations (http://pbsg.npolar.no/en/status/; Obbard et al. 2010), also known as stocks (Figure 1). Polar bear ranges are extensive and individual activity areas can be large (up to 167,000 km^2) (Garner et al. 1990, Amstrup et al. 2000). Six polar bear stocks have ranges extending into two or more countries (Amstrup et al. 1986, Amstrup and Demaster 1988, Obbard et al. 2010). Two polar bear stocks occur in Alaska, the Southern Beaufort Sea (SBS) and the Chukchi/Bering Seas (CBS) stocks (Figure 1). Together, the two stocks range throughout the Beaufort and Chukchi Seas, including the nearshore habitats. The stocks overlap seasonally in the eastern Chukchi and western Beaufort Seas. The CBS stock is managed by the United States and the Russian Federation (Russia). The CBS stock is also referred to as the Alaska-Chukotka polar bear population in the bilateral *Agreement between the United States and the Russian Federation on the Conservation and Management of the Alaska-Chukotka Polar Bear Population* (U.S.-R.F. October 16, 2000) and the Chukchi Sea subpopulation when described by the International Union for Conservation of Nature, Polar Bear Specialists Group (IUCN-PBSG; Aars et al. 2006).

The distinction between the SBS and CBS stocks was originally determined by: (a) movement information collected from capture-recapture studies of adult female bears (Lentfer 1983); (b) physical oceanographic features which segregate stocks (Lentfer 1974); (c)

morphological characteristics (Manning 1971; Lentfer 1974; Wilson 1976); and (d) variations in levels of heavy metal contaminants of organ tissues (Lentfer 1976, Lentfer and Galster 1987).

An extensive area of overlap between the Southern Beaufort Sea stock and the Chukchi/Bering seas stock occurs between Point Barrow and Point Hope, centered near Point Lay (Garner et al. 1990, Garner et al. 1994, Amstrup 2000, Amstrup et al. 2000, 2001, 2002, 2004, 2005). Telemetry data indicates that adult female polar bears marked in the Southern Beaufort Sea spend about 25% of their time in the northeastern Chukchi Sea, whereas females captured in the Chukchi Sea spend only 6% of their time in the Southern Beaufort Sea (Amstrup 1995).

Despite their overlap in ranges (Figure 2) and uncertainty in the exact delineation, the existence of two stocks is further supported by more recent information on contaminants (Evans 2004a, b; Kannan et al. 2007), movement data from satellite-linked collars (Garner et al. 1994, Amstrup et al. 2004, 2005), and population responses to sea ice loss (Rode et al. 2014). Additionally, very few bears in the CBS stock are observed denning within the range of the SBS stock (Rode et al. 2015a), and similarly, very few bears in the SBS stock are observed denning in the range of the CBS stock (Durner et al. 2010).

Contaminants

Mercury (Hg), selenium (Se), and cadmium (Cd) concentrations in polar bear liver and kidney tissues were significantly higher in the SBS stock than in the CBS (Evans 2004a, Kannan et al. 2007, Routti et al. 2011, while the concentration of vanadium (V) in kidney tissue was

higher in the CBS stock than in the SBS (Evans 2004a). In addition, Kannan et al. (2007) reported concentrations of trace elements of silver (Ag), bismuth (Bi), barium (Ba), copper (Cu), and tin (Sn) were significantly higher in the CBS stock than the SBS stock.

In a separate study, Evans (2004b) analyzed the persistence of organochlorine (OC) contaminants, including polychlorinated biphenyls (PCB) congeners; dichlorodiphenyltrichloroethane (DDT) and its metabolites, including dichlorodiphenyldichloroethylene (DDE); and chlordane-related compounds (CHL) in polar bears from both stocks. While concentrations of OCs in the SBS and CBS stocks were relatively low compared to other polar bear stocks, concentrations of OCs were higher in the SBS than in the CBS stock. Dietz et al. (2015) also found that concentrations of organohalogen contaminants exceeded a toxic effect threshold for bears in Alaska, although the levels found there were the lowest of the stocks considered. Similarly, McKinney et al. (2011) found that polar bears in Alaska tended to have higher levels of DDT contamination than other regions. Bears in the CBS stock have the lowest levels of polybrominated diphenyl ethers compared to 10 other subpopulations (Nuijten et al. 2016).

Genetics

Several modern studies have investigated the genetics of polar bears throughout their range. Analysis of mitochondrial DNA and microsatellite DNA loci indicates little differentiation between the SBS and CBS polar bear stocks (Cronin et al. 1991, 2006, Scribner et al. 1997). Using 16 variable microsatellite loci, Paetkau et al. (1999) observed small differences

in genetic distances between the SBS stock and CBS stock; however, a lack of dramatic genetic variation led researchers to conclude that polar bears belong to a single evolutionary significant unit. More recently, Peacock et al. (2015) and Malenfant et al. (2016) characterized genetic structure of polar bears subpopulations into large clusters. Peacock et al. (2015) identified four clusters, and Malenfant et al. (2016) identified six clusters, with the SBS and CBS occupying the same cluster in both studies. While genetically similar, demographic and movement data indicate a degree of site fidelity, suggesting that the stocks should be managed separately, while recognizing that delineation of the CBS and SBS stocks includes a region of overlap (Amstrup 2000, Amstrup et al. 2000, 2001, 2002, 2004, 2005).

Distribution

While the geographic distributions of the two Alaska stocks of polar bears overlap and the exact boundary between them is uncertain in the western Beaufort Sea and eastern Chukchi Sea (Figure 2), bears of the CBS stock exhibit fidelity to the Chukchi Sea region and the adjacent northern coasts of Chukotka, Russia, and Alaska (Amstrup et al. 2004). Some CBS adult female polar bears move into the Beaufort Sea on a seasonal basis (Garner et al. 1990, Garner et al. 1994, Amstrup 1995, Amstrup et al. 2002, Amstrup et al. 2005). Telemetry data indicate that these bears, collared in the Chukchi Sea, spend about 6% of their time in the southern Beaufort Sea in the area of overlap as far east as Camden Bay, whereas females collared in the southern Beaufort Sea spend about 25% in the northeastern Chukchi Sea (Amstrup 1995). Recent collaring data (i.e., 2008-2013) also indicate minimal use of the area east of Barrow, Alaska by

bears collared in the Chukchi Sea (Rode et al. 2015a). While it remains unclear how capture location influences estimates of the population's distribution, bears captured south of Point Hope from 2008-2015 have occurred extensively throughout the range of the CBS stock defined by earlier capture efforts that were more widely distributed (Garner et al. 1990, 1994).

The CBS stock is widely distributed on the pack ice in the Chukchi Sea and northern Bering Sea and adjacent coastal areas in Alaska and Russia (Figure 2). The western boundary extends north from the mouth of the Kolyma River. In addition, bears of the CBS stock have ranged as far east as Camden Bay in the central Beaufort Sea, Alaska (Figure 1: Garner et al.1990, Amstrup 1995, Amstrup et al. 2005). The CBS stock extends into the Bering Sea; its southern boundary is determined by the annual extent of pack ice (Garner et al. 1990).

Historically, polar bears in this region ranged as far south as St. Matthew Island (Hanna 1920) and the Pribilof Islands (Ray 1971) in the Bering Sea. Presently, however, polar bears in the CBS stock rarely occur further south than St. Lawrence Island (Wilson et al. 2014). The majority of denning and summer/autumn land use of the stock occurs on the Chukotka coast and Wrangel and Herald islands (Rode et al. 2015a).

Responses to Changing Sea Ice Conditions

Sea ice in the Chukchi Sea has exhibited some of the most extensive changes of any region in the Arctic in recent years (Rodrigues 2008, Durner et al. 2009, Markus et al. 2009). The projected changes of sea ice are expected to alter previous polar bear habitat use patterns, both seasonally and regionally. Recent studies indicate that polar bear movements and seasonal

fidelity to certain habitat areas are changing and that these changes are strongly correlated with simultaneous changes in sea ice (Schliebe et al. 2008, Gleason and Rode 2009, Rode et al. 2010, Rode et al. 2015a).

Durner et al. (2009) used locations of radio collared polar bears to identify environmental and sea ice characteristics of habitats selected by polar bears in the Chukchi Sea. They found that the Chukchi Sea has experienced one of the highest rates of decline in optimal polar bear habitat in the circumpolar Arctic between 1985 and 2006. Annual habitat changes were characterized by dramatic losses during the summer with relatively little change during the winter (Durner et al. 2009). They projected a continued rate of habitat decline based on circulation models as 7.8% per decade for the Chukchi Sea through 2050. A recent study found that from 1986-1994 and 2008-2013, polar bears in the Chukchi Sea lost nearly 75% of highly-selected sea ice habitat during summer, and have continued to select for the same habitat conditions that they did prior to significant sea ice loss (Wilson et al. 2016). Thus, continued sea ice loss will lead to continued loss of polar bear sea ice habitat, likely forcing more bears onto shore each summer (Rode et al. 2015b).

In addition, polar bears are generally expected to experience nutritional stress as loss of sea ice continues (e.g., Stirling and Parkinson 2006, Amstrup et al. 2010, Rode et al. 2010, Stirling and Derocher 2012). In some regions ice loss has apparently led to negative demographic effects (Regehr et al. 2007, 2010, Bromaghin et al. 2015), while in other regions polar bear stocks appear stable or increasing (Stirling et al. 2011, Peacock et al. 2013, Rode et al.

2014). In a recent study, Rode et al. (2014) found that CBS stock bears were responding differently to changing sea ice conditions compared to bears in the SBS stock. During the period from 2008 to 2011, bears inhabiting the Chukchi Sea were in better condition, larger, and appeared to have higher reproductive rates than bears inhabiting the Beaufort Sea (Rode et al. 2014). Traditional ecological knowledge also suggests that bears in the CBS stock remain in good physical condition (Voorhees et al. 2014).

Changes in movements and seasonal distributions of polar bears caused by changes in sea ice conditions have also been noted. In the Chukchi Sea, the duration of time spent on shore during the summer and the proportion of the population on shore have increased for the CBS stock (Rode et al. 2015a). Rode et al. (2015a) also documented a shift in land use during summer from a mix of coastal use in Alaska and Russia before sea ice loss, to almost exclusively coastal areas in Russia after sea ice loss. Bears have also been observed to return to coastal communities in northwestern Alaska later than was observed in the mid-1990s (Voorhees et al. 2014).

POPULATION SIZE

Polar bears typically occur at low densities throughout their circumpolar range (DeMaster and Stirling 1981). Obtaining a reliable population estimate for the CBS stock has been difficult, due to the vast and remote nature of their habitat, movements across international boundaries that require logistically challenging surveys in Russian territory, and the relatively high costs of research studies in the Arctic (Amstrup and DeMaster 1988, Garner et al. 1992, Garner et al. 1998, Evans et al. 2003).

Early population estimates of the CBS stock were based on aerial and ground polar bear den surveys conducted by Russian biologists on Wrangel Island (Chelintsev 1977, Belikov et al. 1986, Stishov 1991a, b, Belikov 1992, Belikov 1993), where most of the CBS stock is believed to den (Belikov 1980), and on portions of the Russian mainland (Stishov 1991a) during the 1970s to 1990s. Belikov (1993) used number of dens of breeding females and proportion of breeding females from these surveys to derive an approximate population size of the CBS stock of 2,000 to 5,000 bears. In 1997, IUCN-PBSG revised the population estimate downward to 2,000 bears (Lunn et al. 2002). In 2005, expert opinion among IUCN-PBSG concluded that the population abundance estimate remained at approximately 2,000 polar bears (Aars et al. 2006). This was not based on new data, but rather a continued extrapolation of Belikov's 1990s estimate forwarded in time using a qualitative negative trend due to concerns about over harvest and sea ice loss. In 2009, the IUCN-PBSG concluded that the size of the CBS stock was unknown due to the lack of recent population data. In 2014, the IUCN-PBSG continued to state the CBS stock as unknown, and acknowledged U.S.-based research that indicated the potential for positive population growth (Rode et al. 2014) and concern for the unknown level of human-caused removals in Russia.

The U.S. Fish and Wildlife Service (Service) is currently conducting a habitat use, ecology, and population status study of polar bears in the Chukchi Sea to reduce uncertainty in the status and trends of the CBS stock. Primary objectives of this study include: evaluate annual movement patterns of polar bears and the distribution of high value habitat; quantify

relationships between sea ice and ecological and demographic indices including diet, fasting behavior, reproduction, and survival; and estimate population growth rate based on estimated vital rates and ecological and demographic indices. In addition, the National Oceanic and Atmospheric Administration (NOAA) conducted an aerial survey for ice seals and polar bears in spring 2016 using a combination of thermal imagery and high-resolution digital photography. A similar survey was conducted in Russian territory at the same time. The combined effort has the potential to provide useful estimates of polar bear abundance, and the Service are considering these two efforts in its review of the polar bear stock assessment.

Minimum Population Estimate

Under the Marine Mammal Protection Act of 1972, as amended (MMPA), a "minimum population estimate" (N_{MIN}) is defined as "an estimate of the number of animals in a stock that is based on the best available scientific information on abundance, incorporating the precision and variability associated with such information and provides reasonable assurance that the stock size is equal to or greater than the estimate."

As discussed above, in 2005 the IUCN-PBSG (Aars et al. 2006) estimated the CBS stock to be approximately 2,000 animals based on expert opinion and an extrapolation of the results from maternal denning surveys conducted on Wrangel Island in the 1970s and 1980s (Belikov 1993). Subsequently, the IUCN-PBSG in 2009, and most recently in 2014, concluded the size of the CBS stock was unknown. Hence, for the minimum population estimate, we have used the only recent numerical estimate available (2,000 individuals [Aars et al. 2006]), even though our

confidence in the estimate of 2,000 bears is low due to the lack of current denning estimates and reliable data with measurable levels of precision (Aars et al. 2006). Despite these limitations and because recent studies indicate that bears of the CBS stock seem to be in good physical condition and may be experiencing population growth (Voorhees et al. 2014; Rode et al. 2014), we are reasonably assured that the CBS stock includes at least 2,000 bears. Therefore, the Service considers the above population estimate of 2,000 individuals (Aars et al. 2006) as the N_{MIN} based on the best available scientific information we have at this time.

Current Population Trend

Although no quantitative information is available to estimate population status prior to the 20th century, polar bear harvest during that period was largely conducted by Alaskan Natives for subsistence (Schliebe et al. 2006), and the stock is therefore believed to have existed at or near its environmental carrying capacity.

The CBS stock likely declined due to high hunting levels in both the United States and Russia during the 20th century, including hunting incidental to the whaling industry, sport hunting, and illegal harvest in Russia. Subsequently, the stock increased and/or stabilized following the passage of the MMPA in 1972, which banned sport hunting in the United States. Reports of potentially high but unquantified harvest levels in Chukotka in the 1990s and early 2000s led to concerns about overexploitation and potential population declines (Kochnev 2004; Obbard et al. 2010).

Recent analysis of data from polar bears captured in the spring in the U.S. portion of the

population's range has documented stable or improving body condition and high indices of recruitment (i.e., mean litter size) between 1986-1994 and 2008-2011, where substantial sea ice loss occurred during the more recent period (Rode et al. 2014). These results indicate the potential for population growth despite presumptions of reduced access to food and lower reproduction due to effects of sea ice loss.

In contrast, Ovsyanikov (2012) noted a decrease in number of cubs during autumn-based observations on Wrangel Island for the period 2004-2010. While Ovsyanikov (2012) did not discuss cub mortality factors, he suggested low cub production could be related to reduced maternity denning for the CBS stock. However, interpretation of results from Ovsyanikov (2012) is complicated by an inconsistent study design among years and lack of quantitative analyses to understand the demographic ramifications of the observed recruitment indices.

Although new research indicates the potential for positive growth, uncertainty in the level of human-caused mortality in Russia, apparently lower reproduction on Wrangel Island, and an unknown population size and growth rate contributed to the current determination of "data deficient" for the CBS stock (PBSG 2015).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Polar bears are long-lived, mature at a relatively old age, have an extended breeding interval, and have small litters (Lentfer et al. 1980, DeMaster and Stirling 1981). Data from the CBS stock are not available to estimate a stock specific maximum rate of increase (R_{MAX}); however, the SBS stock is one of several with long-term data sets that provide a reasonable basis

for an estimate of R_{MAX} for the CBS stock. Demographic rates for the SBS stock (Regehr et al. 2010) used in a Leslie matrix model indicate that under favorable sea ice conditions the population is capable of increasing between a range of 6 and 7.5% (Hunter et al. 2010), accounting for human-caused mortality from subsistence harvest and potential environmental influences, such as inter-annual variation in sea ice conditions.

Although these values represented estimates of actual population growth rate, rather than theoretical maximum intrinsic growth rates, they were derived for years with positive environmental conditions during which the population was likely not experiencing negative density effects (Regehr et al. 2010). Furthermore, Regehr et al. (2015) suggested that for polar bears, population growth rate at maximum net productivity level is approximately 85% of the intrinsic maximum growth rate. Previous work by Amstrup (1995) also projected an annual intrinsic growth rate (including natural mortality, but not human-caused mortality) of 6.03% for the SBS. For the purpose of this assessment, we use R_{MAX} of 6% as the current productivity rate for the CBS stock recognizing that this estimate may be moderately conservative for polar bears under favorable environmental conditions, on the basis that the CBS stock could be experiencing density-independent reductions in R_{MAX} associated with lower temporal availability of sea ice.

POTENTIAL BIOLOGICAL REMOVAL (PBR)

Under the MMPA, the Potential Biological Removal (PBR) level is defined as the product of the minimum population estimate of the stock, one-half the maximum theoretical or estimated net productivity rate of the stock at a small population size, and a recovery factor (F_R)

of between 0.1 and 1.0: PBR = (N_{MIN})(½ R_{MAX})(F_R). Wade and Angliss (1997) recommend a default F_R of 0.5 for a threatened population or when the status of a population is unknown. Thererfore, for the CBS stock of polar bears, PBR is 30 animals, where (2,000 [N_{MIN}] x 0.03 [½ R_{MAX}] x 0.5 [F_R]).

ANNUAL HUMAN CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Currently, polar bear stocks in Alaska have no direct interaction with commercial fisheries activities. Consequently, the total fishery mortality and serious injury rate for the CBS stock is zero.

Total Mortality

1. **Native Subsistence Harvest**

Past differences in management regimes between the United States and Russia have made coordination of harvest studies on the shared CBS stock difficult. In the former Soviet Union hunting of polar bears was banned nationwide in 1956. Russia's ability to enforce that ban has been difficult due to logistical and financial constraints. The total number of human caused removals, including those by subsistence hunters, is currently unknown in Russia, but was estimated by Kochnev and Zdor (2015) to be 32 bears annually, based on interview data. Subsistence harvest in the United States is managed under the MMPA, and data for subsistence harvest of polar bears in Alaska are collected by a mandatory Marking, Tagging and Reporting Program administered by the Service since 1988.

Polar bear harvest numbers in Alaska reported for this document correspond to the boundary recognized by the IUCN-PBSG for the CBS stock, where the eastern boundary is Icy Cape, Alaska (Obbard et al. 2010). For the most recent 10-year period, 2006-2015, an average of 28 bears per year were removed from the U.S. portion of the CBS stock (see Figure 3, which provides the annual estimated removals above each graph bar). The average sex composition of removals during this period was 29% female, 57% male, and 14% unknown. Because take of polar bears in Russia has been banned since 1956, there are a no official estimates of harvest from the Russian Federation, although anecdotal reports indicate that illegal harvest does occur (see discussion below).

Bilateral Agreement

The Chukchi/Bering Seas stock of polar bears is also managed under the *Agreement between the Government of the United States of America and the Government of the Russian Federation on the Conservation and Management of the Alaska-Chukotka Polar Bear Population* (Agreement). The Agreement was signed in 2000 because of our shared interest in this population of polar bears, which readily move between United States and Russian Federation jurisdictions. Importantly, the Agreement works to improve polar bear conservation and safeguard the cultural and traditional use of polar bears by Native peoples in both countries. For Native peoples of Chukotka, this treaty, once fully implemented, would lift the 1956 ban on take of polar bears, allowing for the resumption of legal harvest in Russia for subsistence purposes.

Significantly, the treaty also establishes a management authority that determines sustainable harvest levels for the population delineated under Article III. For Alaska Natives,

this annual sustainable harvest level/annual taking limit constitutes federally enforceable polar bear harvest limits when such harvest levels had been previously unregulated under U.S. law. The Service is currently working with the Alaska Native community and the Alaska Nannut Co-Management Council to establish a program of enforceable ordinances for polar bear harvest and has determined it is appropriate to delay issuance of regulations to administer the annual taking limit. The Service believes additional work in establishing local, on-the-ground co-management structures will greatly improve compliance with the annual taking limit.

The Agreement established a U.S.-Russia Polar Bear Commission that is responsible for making management decisions concerning polar bears in this region. The Commission is composed of a native and federal representative from each country, each country has one vote, and all decisions of the Commission are only binding when both countries agree. In 2010, the Commission, based on advice from its scientific advisors, agreed that no more than 58 polar bears per year, of which no more than 19 animals may be females, should be removed from the Alaska-Chukotka polar bear population. This limit is split evenly between the United States and Russia, and while it applies to any bear removed due to human activity, it is primarily a quota for subsistence harvest. At the tenth annual meeting of the Commission, which was held with full participation of Russian and U.S. Commissioners in Egvekinot, Russian Federation, July 27-28, 2018, the Commissioners determined that new biological information was available on the abundance of polar bears in the Chukchi Sea. Based on this information, the Commissioners voted unanimously to adopt an annual taking limit of 85 polar bears per year to be shared equally between the United States and the Russian Federation, of which no more than

one-third are female. During their 2019 meeting, the Commissioners determined, based on recommendations from the scientific working group, that there was no new information available to change this limit and it was adopted by unanimous vote of the Commissioners. Due to challenges resulting from the COVID 19 pandemic, the Commissioners did not meet in 2020, but are planning a meeting for 2021.

2. Other Mortality

Under the MMPA, species considered depleted may not be removed from the wild for the purposes of public display; however, removal may occur in some limited circumstances. The Service retains a Federal Marine Mammal Scientific Research Permit through our agency's Division of Management Authority. Under this permit, the USFWS has captured and released 356 polar bears in the CBS from 2008 to 2016, with no known injuries or mortalities.

Under section 109(h) of the MMPA, orphaned cubs are occasionally removed from the wild for the protection or welfare of the mammal. Because the Service does not have the means to provide for long- term care of such animals, and because returning young animals to the wild is typically not feasible, cubs taken from the wild are placed in facilities capable of providing long-term care. Such a situation occurred in 2013, when one orphaned male cub of the year from the CBS stock was recovered after its mother was harvested. It was subsequently sent to a facility that has a MMPA Section 112 (c) cooperative agreement with the Service for long-term care and maintenance of the bear.

Since 2010, there has been one known illegally taken polar bear in Alaska (the adult

female mentioned above), whereas the illegal harvest of polar bears in Russia from the CBS stock continues to be an issue of concern. The magnitude of illegal harvest in Russia from the CBS stock in the past has been unquantified, but reports indicated that as many as 70 to 300 bears per year were taken from the mid-1990s to the mid-2000s (Ovsyanikov 2003, Kochnev 2004, Belikov et al. 2006, Kochnev 2006, Ovsyanikov 2006, Kochnev and Zdor 2015).

Belikov et al. (2006) indicated that this estimated level of illegal harvest in Russia posed a serious threat to the CBS polar bear stock. In 2010, Russian scientists initiated a study using historical interviews and village-based surveys to provide updated information of polar bear use by humans in the Chukotka region including estimating the Russian harvest (Kochnev and Zdor 2015). Kochnev and Zdor (2015) concluded that a steep increase in the illegal harvest of polar bears during 1994 – 2003 (with an estimated annual removal of 209 bears) was related to economic hardships of village life and the increased occurrence of polar bears in coastal habitats. Surveys indicated that illegal harvest levels subsequently declined to an average of 32 bears/year (range=18-56 bears/year) during 2010 – 2011. Kochnev and Zdor (2015) suggested that the main reason for this recent decline in the harvest is an increase of the quality of life in the villages and self-regulation of polar bear hunting by ethnic communities. It is important to note, however, that these numbers are likely biased low because harvest is an illicit activity and subject to severe penalties. Additional biases exist because surveys were not consistently applied over time and should be used only to help assess the trends in harvest and use of polar bear.

STATUS OF STOCK

On May 15, 2008 (73 FR 28212), the Service listed the polar bear as a "threatened species" in its entirety under the Endangered Species Act of 1973, as amended (ESA). Due to this listing under the ESA, the polar bear is considered "depleted" under the MMPA, and the CBS stock is considered to be a strategic stock under the MMPA.

OTHER FACTORS THAT MAY BE CAUSING A DECLINE OR IMPEDING RECOVERY OF THE STOCK

1. Climate Change

Climate change has been identified as the primary threat facing polar bear populations, with the CBS stock occurring in an ecoregion with a high probability of becoming greatly decreased by mid-century (Atwood et al. 2016). Polar bears have evolved over thousands of years to live in a sea ice environment. They depend on the sea ice-dominated ecosystem to support essential life functions. Sea ice provides a platform for hunting and feeding, for seeking mates and breeding, for movement to terrestrial maternity denning areas, for maternity denning, for resting, and for long-distance movements (Stirling and Derocher 2012). The sea ice ecosystem supports ringed seals (*Phoca hispida*), the primary prey for polar bears, and other marine mammal prey (Thiemann et al. 2008, Rode et al. 2014). In 2012, the National Marine Fisheries Service (NMFS) listed two prey species of polar bears, the Arctic subspecies of ringed seal (*Phoca hispida hispida*) and the Beringia distinct population segment (DPS) bearded seal (*Erignathus barbatus nauticus*), as threatened species under the ESA (77 FR 76706 and 77 FR 76740; December 28, 2012). Both species were listed due to climate change and declines in population of either or both of these important prey species may have deleterious impacts on

polar bears.

Sea ice is rapidly diminishing throughout the Arctic (Stroeve et al. 2012) and large declines in optimal polar bear habitat have occurred in the southern Beaufort and Chukchi Seas between 1985 and 2006 (Durner et al 2009). In addition, the greatest decline in 21st century optimal polar bear habitat is predicted to occur in the Chukchi and southern Beaufort Seas (Durner et al. 2009, Douglas 2010). Patterns of increased temperatures, earlier onset of and longer melting periods, later onset of freeze-up, increased rain-on-snow events, and potential reductions in snowfall are currently occurring. In addition, positive feedback systems (i.e., the sea-ice albedo feedback mechanism) and naturally occurring events, such as warm water intrusion into the Arctic and changing atmospheric wind patterns, can operate to amplify the effects of these phenomena. The following changes have been documented: fragmentation of sea ice; a dramatic increase in the extent of open water areas seasonally; reduction in the extent and area of sea ice in all seasons; retraction of sea ice away from productive continental shelf areas throughout the polar basin; reduction of the amount of heavier and more stable multi-year ice; and declining thickness and quality of shore-fast ice (Parkinson et al. 1999, Rothrock et al. 1999, Comiso 2003, Fowler et al. 2004, Lindsay and Zhang 2005, Holland et al. 2006, Comiso 2006, Serreze et al. 2007, Stroeve et al. 2008).

Despite these concerns and observations about sea ice loss, CBS polar bears do not seem to be responding currently to those changes in the same way as other stocks, such as the SBS stock (Rode et al. 2014). As mentioned above, bears of the CBS stock appear to be in good body condition and stable/increased cub production contrary to SBS bears. Additional

information is necessary concerning the linkages between bears of the CBS stock to changes in the environment, including how they are responding to sea ice loss. Recent research indicates that bears in the CBS stock prefer the same habitat conditions that they did prior to significant sea ice loss (Wilson et al. 2016), suggesting that continued loss could lead to population declines and a continued shift towards land use during summer (Rode et al. 2015b).

2. Oil and Gas Extraction

In 2006 oil exploration interests expanded into the Chukchi Sea within range of the CBS polar bear stock and in high value polar bear habitat identified in the Chukchi Sea lease area (Wilson et al. 2014). The last substantial interest in the Chukchi Sea region occurred in the late 1980s and early 1990s. From 2006 to 2015, 28 offshore projects conducted or supported exploration activities in the Chukchi Sea associated with exploratory drilling programs (USFWS, unpublished data). These included multiple seismic, shallow hazards and site clearance surveys; and numerous onshore and offshore environmental studies. While no oil and gas exploration is currently occurring in the Alaskan or Russian regions of the Chukchi Sea, future activities could occur. However, since 2014, market mechanisms, such as a decline in the value of oil and increased oversight has led to a decline in pursuing petroleum development at this time in the Chukchi Sea. This has also resulted in cancellation of future lease sales (80 FR 74797; November 30, 2015) and the relinquishment of lease holdings by companies back to the U.S. government.

While current interest in hydrocarbon exploration is low, the risk of an oil spill from oil

and gas activities remains a heightened concern for bears of the CBS stock in the future. To date, no significant oil spills have occurred during the operation of the five exploratory wells that were drilled in the Chukchi Sea from 1989 to 1991; nor the well drilled in 2015. However, a large, offshore oil spill could cause significant impacts to polar bears or their habitat, especially given the challenges of cleaning up spills in arctic waters (National Research Council 2014).

The Service works to monitor and mitigate potential impacts of oil and gas activities on polar bears through Incidental Take Regulations (ITRs) as authorized under the MMPA. Activities operating under these regulations must adopt measures to: ensure that impacts to small numbers of polar bears remain negligible; minimize impacts to their habitat; and ensure no unmitigable adverse impact on their availability for Alaska Native subsistence use. The ITRs also specify monitoring requirements that provide a basis for evaluating potential impacts of current and future activities on marine mammals. The Service has concluded that at current levels, oil and gas exploration posed a relatively minor threat to the bears of the CBS stock (78 FR 35364; June 12, 2013). However, the Service noted that a large oil spill could significantly impact the population depending on issues such as timing, location, amount and type of oil, and efficacy of response efforts. Monitoring of polar bears in relation to oil and gas activity in the Chukchi Sea suggests that activities have resulted in only minimal interactions with polar bears due to the fact that most offshore activities occur during the open water season when few bears are present. The majority of interactions observed between polar bears and industrial activity have led to short-term behavioral changes of the animal. There has been no evidence of injury or lethal take as a result of oil and gas activities in the Chukchi Sea. Regulations authorizing the

incidental take of polar bears in the Chukchi Sea expired in 2018, and the Service has received no requests to issue new regulations for the incidental taking of polar bears in the Chukchi Sea since their expiration.

Although the probability of an oil spill affecting a significant portion of Alaska's polar bears in the foreseeable future is low, the Service recognizes that the potential impacts from such a spill could be significant, particularly if subsequent clean-up efforts were ineffective. The greatest potential impacts would occur where polar bears aggregate around food sources, such as Barter and Cross Islands in the southern Beaufort Sea, during the autumn open water period. At present, the Service is working with industry, oil spill response agencies, zoos, and others to increase response capabilities for dealing with oiled or compromised bears in the event of a spill. In addition, the Service has updated its polar bear oil spill response plan. This plan is meant to help prepare and improve the Service's response capabilities by describing appropriate response strategies, clarifying response roles, obtaining the necessary training, and improving our capability for holding and treating oiled bears.

3. Shipping

Declines in the Arctic sea ice may result in increased vessel traffic, including oil and gas tankers, as new routes become available and the Arctic shipping season expands. Shipping along the Northern Sea Route (NSR), along Russia's northern coast that links Europe and East Asia, is predicted to grow more than 30-fold by 2021 (http://www.maritime-executive.com/article/Ice- Levels-Rule-Changes-to-Boost-Arctic-Northern-Sea-Route-2013-

05-29). Subsequently, shipping activity through the Chukchi and Bering Seas will also increase as a transportation corridor to southern markets.

Increased vessel traffic increases the chance of an oil spill from a ship or tanker accident, ballast discharge, or discharges during the loading and unloading of cargo at ports. Shipping involving tanker transport of crude oil or oil products increases the likelihood of small to large volume spills and corresponding oiling of polar bears, as well as potential effects on prey species (AMAP 2005). For example, hydrocarbon shipments are predicted to account for the majority of the vessel cargo along the NSR as increases in circumpolar Arctic oil and gas development and increases in shipping traffic occur for this area. This will increase the potential for oil spills.

Additional potential impacts of Arctic vessel traffic include ship strikes on marine mammals, the introduction of alien species, disruption of migratory patterns of marine mammals, and anthropogenic noise produced from marine shipping activity (Arctic Council 2009).

Increased shipping may also cause behavioral disturbances to polar bears and their prey (Belikov et al. 2002, Skjoldal 2009). While polar bears exposed to shipping traffic may have a higher likelihood of human conflicts as well as increased likelihood of exposure to oil, waste products, or food wastes that are intentionally or accidentally released into the marine environment, it is unclear to what level that shipping would impact the CBS stock.

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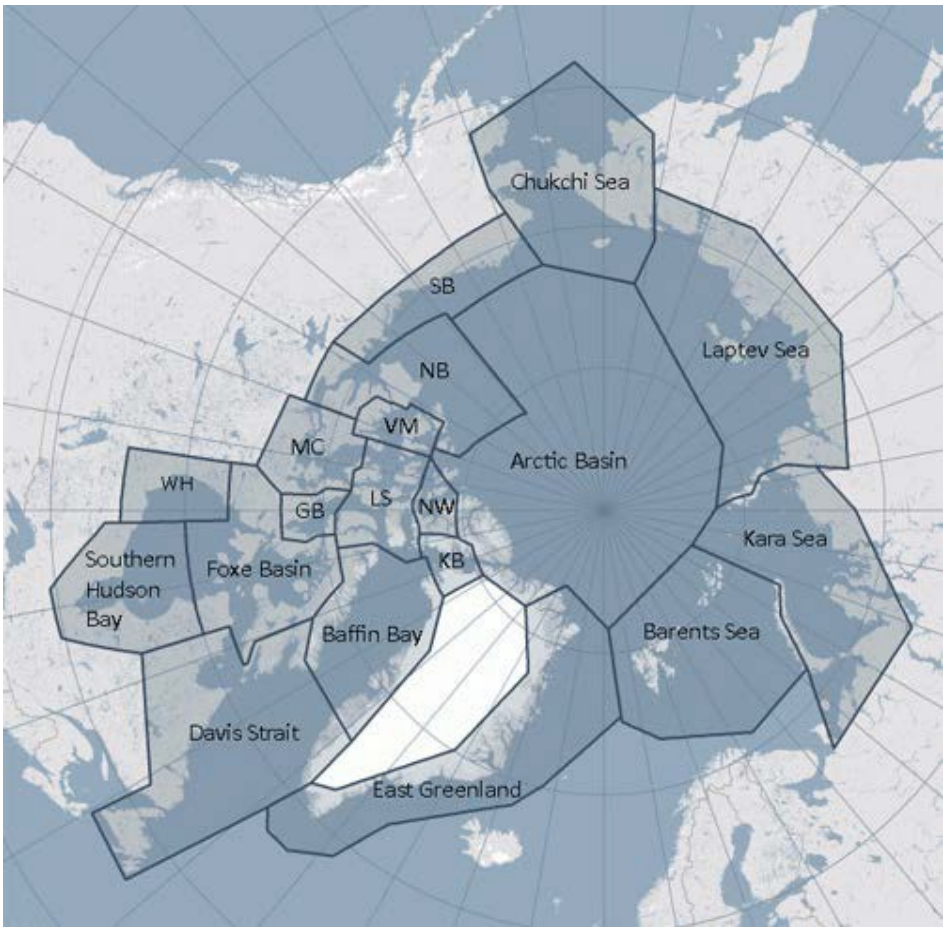

Figure 1. Map of the polar bear subpopulations: Southern Beaufort Sea (SB), Chukchi Sea, Laptev Sea, Kara Sea, Barents Sea, East Greenland, Northern Beaufort (NB), Kane Basin (KB), Norwegian Bay (NW), Lancaster Sound (LS), Gulf of Boothia (GB), McClintock Channel (MC), Viscount Melville (VM), Baffin Bay, Davis Strait, Foxe Basin, Western Hudson Bay (WH), and Southern Hudson Bay (source: Polar Bear Specialist Group: http://pbsg.npolar.no/en/status/population-map.html).

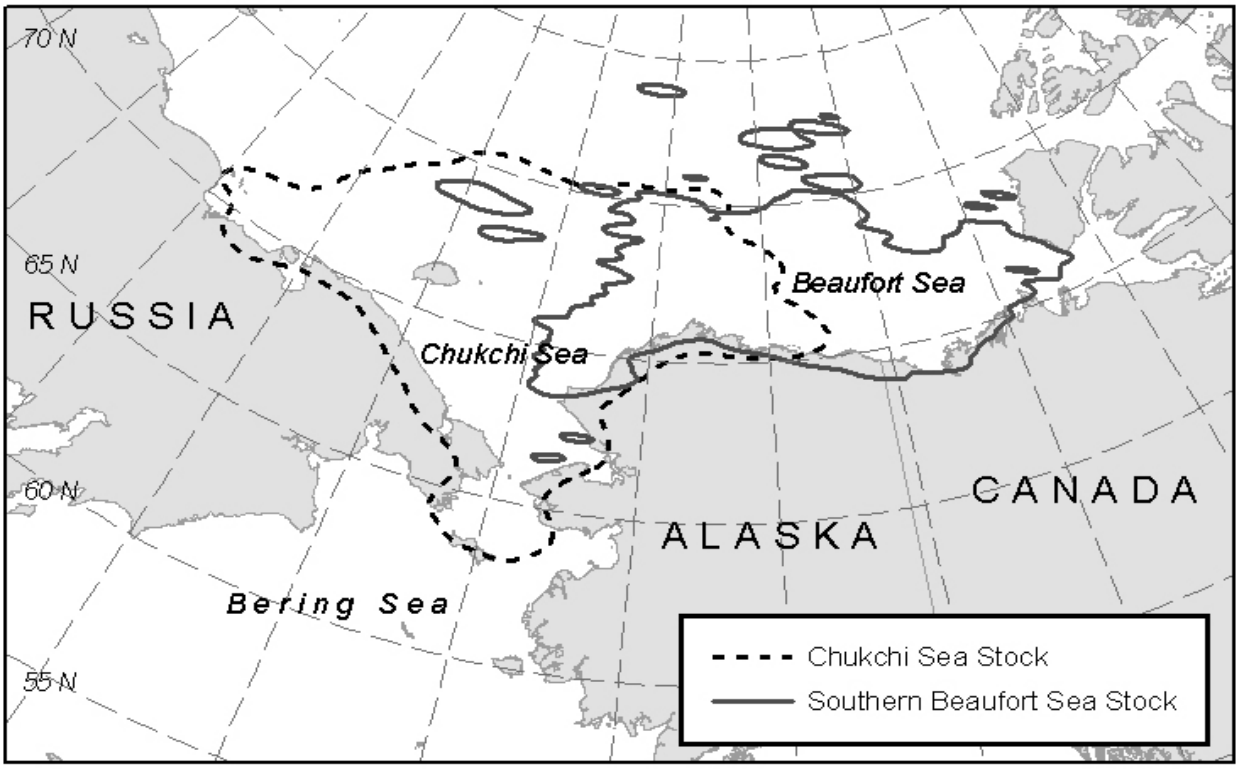

Figure 2. Approximate distribution of polar bears (the Southern Beaufort Sea and Chukchi/Bering Sea polar bear stocks) in Alaska. Distributions are based on the 95% annual contours of utilization distributions developed from 1985 to 2003 satellite-collar data (Amstrup et. al 2004).

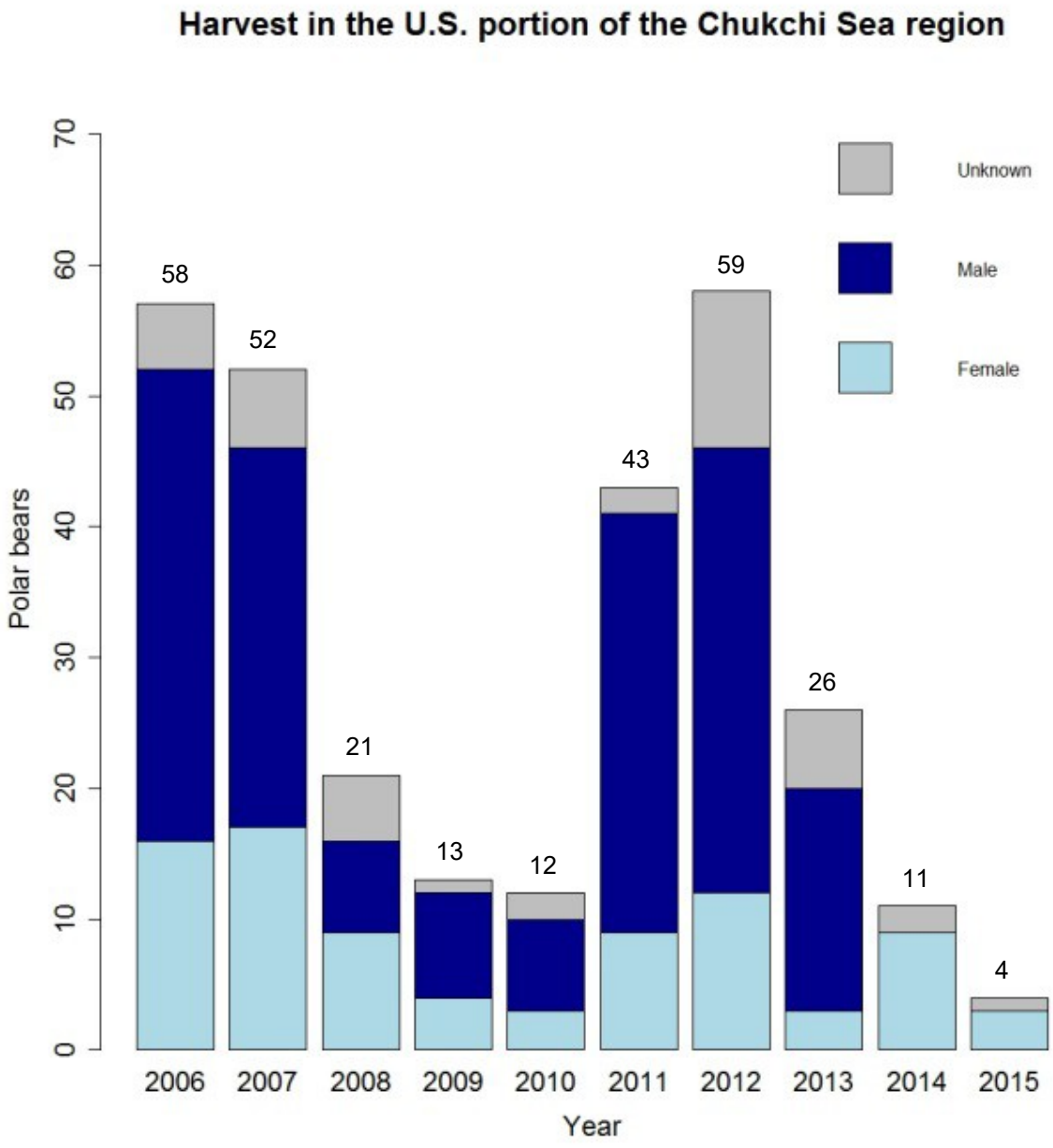

Figure 3. Polar bear harvest in the U.S. portion of the Chukchi Sea stock, 2006-2015.