POLAR BEAR

TAXONOMY

Scientific name: *Ursus maritimus* (Phipps, 1774)
Common name: Polar bear
Family: Ursidae

Taxonomic comments:
Ursus maritimus appears to share a common ancestor with the present-day Grizzly/brown bear (*Ursus arctos*), branching off the brown bear lineage during the late Pleistocene (Amstrup 2003). Various evidence sources indicate these species are sister taxa, more closely related to each other than either is to the black bear (*Ursus americanus*); mtDNA sequences of brown bears from the Alexander Archipelago, southeast Alaska, were even found to be more closely related to mtDNA of polar bears than of other brown bears (Cronin et al. 1991). Cronin et al. (1991) found low divergence in mtDNA haplotypes among polar bear populations from Alaska and Canada.

DESCRIPTION

Basic description: A large white bear.

General description:
The largest of bears, with large body, smallish head, long neck; dense fur is uniformly white, yellow, grey, or almost brown; nose, skin, and lips black (DeMaster and Stirling 1981, Hall 1981). Adult males weigh 300 to 800 kg and measure 200 to 285 cm in length from tip of nose to tip of tail; adult females weigh 150 to 400 kg and measure about 180 to 247 cm (DeMaster and Stirling 1981, Amstrup 2003). Sexual dimorphism is more pronounced in polar bears than in other ursids; male bodies and canine teeth are much larger than female.

Length (m): Max. 2.85
Weight (kg): Max. 800

Reproduction:
Males 4-5 years (3 years in Alaska) are able to breed but must compete with prime males (>10 years), who reach sexual maturity at age 4 in many parts of the Canadian Arctic, age 5 in the Beaufort Sea (Stirling et al. 1976, 1977b, 1980, 1984 in Amstrup 2003); few males breed successfully until about 6 years. Females sexually mature in 3-6 years. Breeds late March to mid-May; delayed implantation until autumn; gestation 195-265 days (De Master and Stirling 1981). Two cubs (sometimes 1 or 3) born December-January (mid-November to mid-December along

western Hudson Bay). Newborn cubs are totally helpless, among the least developed of placental mammal young, weighing 600-700 g. Emergence from maternity dens occurs toward the end of March in Hudson and James bays, in April in Alaska. Young are weaned at approximately 24-28 months. Adult females produce young every 3 years in most areas, in alternate years at lower Hudson Bay (Stirling 1991). Low reproductive rate. Along western Hudson Bay, there was a high degree of reproductive failure; 33% of females classified as pregnant were not accompanied by cubs the following year; annual pregnancy rate of solitary females was 82-100%; pregnancy rates drop off for most females of 21 years or older, but some older females retain reproductive competency through life (Derocher et al. 1992).

Ecology:
Generally solitary or in female-offspring groups; aggregations of adult males occur during ice-free period along western Hudson Bay. Sometimes wanders long distances but usually stays in one general area from one year to the next (Reeves et al. 1992). Few predators except man, sometimes killer whale. Unlike other bears, only pregnant females winter in dens; denning is seen as a reproductive strategy (providing a protective environment for young) as opposed to a foraging strategy as it is with other bears, since seal prey is available year-round (Amstrup 2003).

Migration:
Movements associated with distribution and movement of sea ice. In some areas makes extensive north-south migrations (De Master and Stirling 1981) that are dependent on seasonal melting and freezing of nearshore ice (Amstrup 2003). Moves south with drifting ice flows in spring/summer, north along shore in summer after ice breakup. See Amstrup (1995) for extensive information on movements in the Chukchi and Beaufort Seas.

Food:
Seals are primary food source; especially ringed, also bearded and harp seals. May hunt larger animals such as beluga whales and walruses and consumes fish, small mammals, bird eggs and sometimes vegetation, especially in summer when other food is unavailable. Pregnant females may fast for 8 months while in maternal dens (Derocher et al. 1992, Amstrup 2003). Reportedly are surplus killers, but do not normally cache prey they have killed. They consume the highest-fat portions of seals first and young or smaller bears may be driven away from kills by larger bears (Amstrup 2003). This species apparently digests fat more easily than protein and uses metabolic water released from fat metabolism, an efficient adaptation to the arctic environment where energy is otherwise required to melt ice and snow to make water available (Amstrup 2003).

Phenology:
Most active during the first third of the day (De Master and Stirling 1981). Pregnant females are dormant in winter dens from autumn to spring, when young are able to survive outside. Variable snow and ice conditions determine when females enter and exit den sites (Amstrup 2003). In the Beaufort Sea, den entry dates averaged mid-November and den exit dates were late March/early April (Amstrup and Gardner 1994 in Amstrup 2003). Mean den entry for the Canadian Arctic was September 17 and mean den exit March 21 (Messier et al. 1994, in Amstrup 2003). Molting commences in April to May and shorter summer coats are achieved by late summer (Amstrup 2003).

Habitat:
Closely tied to arctic pack ice. Prefers areas with ice that is periodically active; at interface of landfast ice and drifting pack ice along the arctic coasts or near polynyas. Sometimes wanders inland as much as 150 km from coast. In the Bering and Chukchi Seas, Alaska, where sea ice melts in summer, bears migrate up to 1000 km to remain with the southern ice boundary (Garner et al. 1990, 1994 in Amstrup 2003); in Hudson Bay, James Bay and parts of the Canadian Arctic, bears may be forced onto land for up to several months when sea ice melts in summer (Jonkel et al. 1976, Lunn et al. 1997 in Amstrup 2003). During ice-free period along western Hudson Bay, adult males occupy the coast while family groups and pregnant females occur farther inland. Pregnant females remain on or near land in dens through winter while males and non-breeders winter on sea ice. On land, range of subadults overlaps that of adult males (Derocher and Stirling 1990).

Female denning habitat may be found in mountain, fjord or even relatively flat tundra areas, but is generally near the coast and contains microhabitats which catch and collect snow in fall and early winter (Amstrup 2003). While most denning occurs on coastlines, may also den on drifting pack ice and on land-fast ice adjacent to shore (Amstrup and Gardner 1994). Females typically dig maternity dens in a hillside snowbank (in southwestern Hudson Bay, however, pregnant females commonly overwinter in earth dens 20-100 km from the coast). Dens often built within 8 km of coast and rarely more than 48 km offshore (though sometimes in active offshore pack ice as much as 550 km north of Alaskan coast). Exhibit a general fidelity to denning areas and even after months of long-distance passive transportation on sea ice females often return to specific den habitats (Amstrup 2003).

STATUS

Global rank: G4 (1996-11-18)
Global rank reasons:
Global rank reasons currently unavailable.

State rank: S3 (2004-08-20)
State rank reasons:
Two stocks recognized in Alaska: the Southern Bering Sea stock is shared with Canada, the Chukchi/Bering Seas stock is shared with Russia. Approximately 2,200 animals in Southern Beaufort Sea stock, no reliable estimate available for Chukchi/Bering Seas stock, although may exceed 2000. Trend apparently stable. Protected under international treaties. Denning habitat in Artic National Wildlife Refuge could be opened to oil exploration. Threatened by increasing contact with humans and human-caused habitat change, subsistence harvest, airborne contaminants; potential effects of global warming unknown, but of concern.

DISTRIBUTION AND ABUNDANCE

Range:
Global range:
Circumpolar in the northern hemisphere with distribution in most areas changing with seasonal extent of sea-ice cover. Found in the Chukchi and Beaufort Seas north of Alaska, the East Siberian, Laptev, and Kara Seas of Russia, the Barents Sea of Europe, the northern part of the Greenland Sea, Baffin Bay, and the Canadian Arctic Archipelago (Amstrup 2003). In this general range, 19-20 relatively discrete populations are recognized by movement patterns and spatial segregation with

limited interchange (Stirling 1991, Amstrup 2003). Excluded by humans from some parts of the historical southern portion of the range.

State range:
Occurs in most ice-covered seas; off Alaska coast, ranges as far south as the northern Bering Sea south of St. Lawrence Island. Occasionally found as far south as St. Matthew Island and on the mainland of the Yukon-Kuskokwim Delta (USFWS 1994).

Two stocks currently recognized in Alaska: the Southern Beaufort Sea stock, whose eastern boundary occurs south of Banks Island, Canada, and western boundary is near Point Hope, Alaska; and the Chukchi/Bering Sea stock, which occurs in the east from Point Barrow, sporadically in the Beaufort Sea, and the western boundary is the Eastern Siberian Sea. An area of overlap between the two stocks occurs between Point Barrow and Point Hope, centered near Point Lay (USFWS 2002a and 2002b).

Abundance:
Global abundance:
Total population 21,500- 25,000, with about 15,000 + in Canada (Lunn et al. 2002).

State abundance:
The IUCN Polar Bear Specialist Group (PBSG) estimated the Southern Beaufort Sea population at 1,800 bears with good certainty, and the Chukchi/Bering Sea population at 2,000+ bears with poor certainty (Lunn et al. 2002).

Trends:
Global trend:
Most stocks are believed to be stable and many are managed under protection or managed harvests (Reeves et al. 1992, Lunn et al. 2002). Populations in Baffin Bay and Davis Strait may be decreasing (current estimated abundance of 2,200 and 1,400, respectively) while populations in the southern and northern Beaufort Sea may be increasing (estimated abundance of 1,800 and 1,200, respectively) (Lunn et al. 2002). Alaska population apparently declined during the early 1970s, recovered somewhat during mid- and late 1970s, apparently stable (but small) since then (Amstrup et al. 1986).

State trend:
Alaska population declined during the early 1970s as a result of excessive harvest in the 1950s and 1960s; recovered somewhat during mid- and late 1970s, and apparently stable, although small, since then (Amstrup et al. 1986).The southern Beaufort Sea population shows an increasing trend, while the Chukchi/Bering Sea population is likely stable (trend uncertain) (Lunn et al. 2002).

EXISTING PROTECTION

Global protection:
In the U.S., protected and monitored under the Marine Mammal Protection Act (MMPA) of 1972, managed by the U.S. Fish and Wildlife Service. No harvest is allowable in Alaska except Native subsistence harvest. The United States along with Russia, Canada, Denmark and Norway signed the

International Agreement on the Conservation of Polar Bears in 1973. In October 2000, the U.S. and Russia signed a bilateral agreement for population and habitat conservation of the Chukchi/Bering Seas stock (Schliebe et al. 2002). U.S. Congress must pass "The US-Russia Polar Bear Act" before the agreement is formally ratified (Schoen and Senner 2002).

State protection:
Protected and monitored under the Marine Mammal Protection Act (MMPA) of 1972, managed by the U.S. Fish and Wildlife Service (USFWS). No harvest is allowable in Alaska except Native subsistence harvest. However, in 1993 the USFWS issued regulations which authorized the incidental, but not intentional, take of small numbers of polar bears by U.S. citizens engaged in oil and gas exploration, development and production activities in the Beaufort Sea and adjacent northern coast of Alaska (USFWS 1995a). The USFWS developed a habitat conservation strategy for Alaska's polar bears in 1995 to minimize adverse impacts of oil and gas activities on polar bears (USFWS 1995a).

Polar bear conservation falls under the Coastal Zone Management Act (CZMA), which was enacted to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone". The North Slope Borough and Alaska Coastal Management Programs also assist in protection of polar bear habitat (USFWS 1995a).

One of the establishing purposes of the Arctic National Wildlife Refuge (ANWR) under the Alaska National Interest Lands Conservation Act (ANILCA) was to conserve polar bears. However, the coastal plain of ANWR, which provides important denning habitat, could be opened for oil and gas development by Congress (USFWS 1995a).

CHALLENGES

Global challenges:
Threatened by increasing contact with humans and human-caused habitat change, industrial development, overharvest and unchecked hunting, and the effects of global warming on sea ice. Human activity near maternal dens may be less of a threat than previously believed (Amstrup 1993), but is still a concern which could increase with development of arctic areas. Industrial development may hinder natural movement, feeding and breeding patterns, and could expose bears to chemical contaminants. Hunting is prohibited or restricted to subsistence and sustainable harvest permit systems in most countries; although subsistence hunting is unrestricted in parts of Alaska. Shooting by local hunters accounted for 85% of documented deaths of adult females from the Beaufort Sea in the 1980s/1990s (Amstrup and Durner 1995). In Russia, shooting bears is illegal but unmonitored and management laws not enforced (Amstrup 2003). Low reproductive rate makes this species slow to recover from declines (Stirling 1991). Global warming may directly influence availability of hunting and denning habitat, and thus polar bear range and abundance. Effects of global warming on distribution of sea ice unknown, but of concern.

State challenges:
Affected by disturbance and habitat change caused by human activities and industrial development, overharvest and unchecked hunting, and the effects of global warming on sea ice. Other concerns

include disturbance from domestic and international shipping using icebreakers, overharvest, both legal and illegal, and harassment.

Human activities in the Arctic, such as those related to oil and gas exploration and development, pose a risk, particularly to denning females (Amstrup and DeMaster 1988, Amstrup 1993, Amstrup and Durner 1998, Amstrup et al. 2002). Although ANWR is currently off limits to oil/gas development, the coastal plain, Section 1002, provides denning habitat for polar bears (Amstrup and Durner 1998, Amstrup et al. 2002) and could be opened for development by Congress (USFWS 1995a). Arctic oil development has the potential to affect bears in numerous ways; a single large oil spill in the Beaufort Sea could affect as many as 30 polar bears; direct contact with oil could result in loss of insulation, direct consumption of oil, and/or consumption of tainted foods (i.e. oiled seals) (Durner et al. 2000). Low reproductive rates make this species slow to recover from declines (Amstrup et al. 1986, Stirling 1991).

Increased human contact also results in greater exposure to human garbage. Polar bears will eat parts of lead/acid batteries, plastic, styrofoam, and other potentially hazardous items. A female bear died as a result of ingesting a combination of ethylene glycol (antifreeze) and the dye, rhodamine B (USFWS 1995a and 2003).

Arctic environments appear to collect airborne contaminants which break down slowly at low temperatures (USFWS 1995a). Contamination by organochlorines, mercury, radionuclides, cadmium and other heavy metals, and other toxins are a concern (Amstrup et al. 1986, USFWS 1995a, Schliebe et al. 2002). Exposure to contaminants may be magnified in the food chain.

Hunting is restricted to subsistence and sustainable harvest permit systems in Alaska, but subsistence hunting is not limited in some parts of the state. Shooting by local hunters accounted for 85% of documented deaths of adult females from the Beaufort Sea in the 1980s/1990s (Amstrup and Durner 1995).

Climatic warming is also of concern (Stirling and Derocher 1993). Satellite data indicate the summer Arctic sea ice pack has shrunk 10% per decade since 1980; the winter ice pack has also decreased significantly (D'Oro 2004). Global warming could affect polar bear hunting success by limiting access to seals, reducing seal distribution and/or abundance, and by changing the productivity of the marine ecosystem (Stirling and Derocher 1993). It could also change access to denning habitat for pregnant females (USFWS 1995a). Changes in ice pack conditions could also increase problematic human-bear interactions and possibly increase harvest numbers, as harvest tends to be reflected by availability of bears near coastal settlements (Amstrup and Durner 1995, USFWS 1995a).

RESEARCH AND INVENTORY NEEDS

Global research needs:
Research needed on movements of male bears; currently, no satisfactory method for long-term attachment of radio transmitters has been designed. Better estimates of abundance and harvest are also necessary, especially harvest counts for Russia and Greenland.

Relationships between polar bears, seals, and sea ice needs study (Amstrup and DeMaster 1988). Effects of industry should be assessed, particularly the effects of seismic exploration on denning bears. An evaluation of direct and indirect effects of marine oil spills should be conducted.

State research needs:
A reliable abundance estimate for the Chukchi/Bering sea stock is needed, and methods for estimating population bounds in the Southern Beaufort Sea should be reviewed (Lunn et al. 2002). Population parameters for all stocks should be refined and an index of population abundance developed so that significant trends in abundance, reproduction, and survival can be reliably documented (Amstrup and DeMaster 1988). Relationships between polar bears, seals, and sea ice need study as a basis for understanding polar bear ecology and designing meaningful population trend surveys (Amstrup and DeMaster 1988).

The following research needs were summarized in the Conservation Plan for the Polar Bear in Alaska (USFWS 1994): Design genetic studies to define subpopulations in and adjacent to Alaska; identify seasonal habitat use and rates of exchange between populations; examine environmental contaminants; determine sex/age-specific mortality factors; monitor health, feeding ecology, and vital parameters; evaluate food habits, prey availability, and energetics.

The effects of industry need to be assessed, particularly the effects of seismic exploration on denning bears. An evaluation of direct and indirect effects of marine oil spills should be conducted.

Global inventory needs:
See State inventory needs below.

State inventory needs:
Determine the size of the Alaska polar bear population in the Bering/Chukchi Seas and Beaufort Seas (USFWS 1994). Monitor population changes and level of harvest (Lunn et al. 2002). Movement and distribution of adult males should be monitored to determine effects on subpopulations (Amstrup 2000).

CONSERVATION AND MANAGEMENT NEEDS

Global conservation and management needs:
Management requirements: Harvest management should focus on protecting females (Amstrup et al. 1986).

Management programs: Harvest has been managed under the International Agreement on the Conservation of Polar Bears and Their Habitat, which took effect in 1976; all nations inhabited by polar bears are party to this agreement (Reeves et al. 1992). See Stirling (1991) for a discussion of protection and management regulations and agreements. See also Reeves et al. (1992) for discussion of various protection measures.

See USFWS 1995band 1997 for proposed and final rules allowing the importation of polar bear trophies from Canada into the U.S. and for information on management programs in Canada.

Monitoring programs: See USFWS 1995b for information on population monitoring in Canada.

Management Needs: The following management needs were identified in "Alaska's Western Arctic: a summary and synthesis of resources": (Schoen and Senner 2002): Cooperative management between USFWS, Alaska Natives, and other nations, including joint international studies with Canada and Russia would facilitate more complete conservation efforts. Management should endeavor to fully implement the International Polar Bear Agreement, the Habitat Conservation Strategy for Polar Bears in Alaska (USFWS 1995a), and the pending U.S. and Russia Polar Bear Agreement. Polar Bear and human interactions should be minimized. Important habitats should be protected, including "ice-edge" habitats and polynyas, barrier beaches, and denning sites.

State conservation and management needs:
Basic management recommendations include: 1. Managing in conformity with the International Polar Bear Agreement and Agreements between U.S. and Russia and U.S. and Canada; joint international studies with Canada and Russia would facilitate more complete conservation efforts. 2. Monitoring changes in population size; harvest reporting should be made mandatory so that sex and age composition and size of the harvest can be documented. 3. Important habitats should be conserved, including "ice-edge" habitats and polynyas, barrier beaches, and denning sites. 4. Polar bear and human interactions should be minimized; reducing bear-human interactions through education and careful development should be implemented (Schoen and Senner 2002).

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