

POLAR BEARS

A SEAWORLD EDUCATION DEPARTMENT PUBLICATION

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POLAR BEARS

SCIENTIFIC CLASSIFICATION

A. Order – Carnivora.

The scientific order Carnivora includes bears, dogs, cats, raccoons, otters, weasels, and their relatives. All typical carnivores have well developed claws, strong facial musculature, and specialized teeth. The canines are long, sharp, and well-developed, and premolars are adapted for cutting.

B. Family – Ursidae.

All eight bear species belong to this family. Ursids are the largest of all terrestrial carnivores. The family is divided into three subfamilies, Ursinae (black bears, brown bears, polar bears, sun bears, and sloth bears), Tremarctinae (spectacled bears), and Ailuropodinae (giant pandas).

C. Genus, species – *Ursus maritimus*.

1. There are five other species in the genus *Ursus*: American black bears, Asiatic black bears, brown (grizzly) bears, sun bears, and sloth bears. Species can be distinguished by size, build, coloration, and habitat.
2. *Ursus maritimus* is Latin for “sea bear.” The polar bear is the only bear considered to be a marine mammal. It is only partially aquatic though, and the least aquatic of all marine mammals.

D. Fossil record.

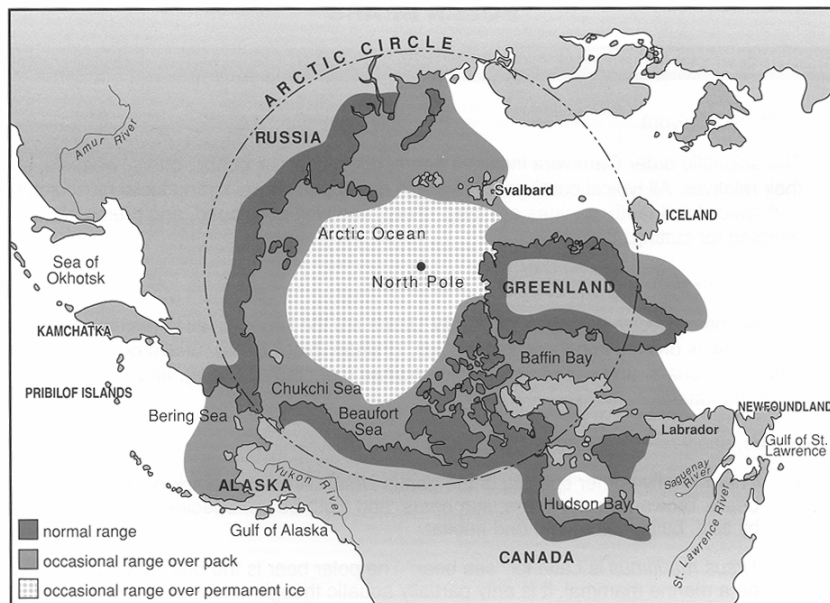
1. Ursids in the fossil record date back to the early Miocene in Asia, and the late Miocene in North America.
2. The oldest known polar bear fossil is less than 100,000 years old. Polar bears probably developed during the Pleistocene era from an ancestral brown bear. Polar bears and brown bears are still closely related; when cross-bred, they produce fertile offspring.

DISTRIBUTION AND HABITAT

A. Distribution.

1. Polar bears are found throughout the circumpolar Arctic.
2. Polar bears, or their tracks, have been reported almost as far north as the pole; however, scientists believe few bears frequent areas north of 88° north latitude. The northern Arctic Ocean has little food for them.
3. The polar bears’ southern range is limited by the amount of sea ice that forms in the winter. Polar bears prefer to travel on sea ice.
 - a. In the south, polar bears are annual visitors to southern Labrador, Newfoundland, Norway, and occasionally to the Gulf of St. Lawrence during years with heavy pack ice.

- b. The most southerly dwelling polar bears live year-round in James Bay, Canada.
4. The majority of polar bears are found near land masses around the edge of the polar basin.
5. Scientists believe there are 15 relatively discrete polar bear subpopulations. A subpopulation is a group of polar bears with a home range independent of but overlapping that of other polar bears. For example, two subpopulations live in the James/Hudson Bay area, one in western Hudson Bay, and the other in northwestern Ontario and James Bay.



Polar bears are found throughout the circumpolar Arctic.

B. Habitat.

1. Polar bears inhabit arctic sea ice, water, islands, and continental coastlines.
2. Polar bears prefer sea ice habitat with *leads* and *polynyas*, next to continental coastlines or islands.
 - a. *Leads* are water channels or cracks through ice which may remain open (ice free) for only a few minutes to several months, depending upon weather conditions and water currents. Polar bears hunt seals in the leads, using sea ice as a platform.
 - b. *Polynyas* are areas of water, surrounded by ice, that remain open throughout the year due to winds, upwellings, and tidal currents. Polynyas are important breathing and feeding areas for wintering or migrating marine mammals and birds.
3. Some polar bears follow the lower edge of the ice pack year-round, making extensive migrations as the ice recedes and advances.

4. Some polar bears spend part of the year on land. They have been found as far inland as 200 km (124 mi.).
 - a. Polar bears in warmer climates may become stranded on land. In summer, sea ice melts along the coastlines, and pack ice (floating sea ice, or floes, not connected to land) moves north.
 - b. Most pregnant females spend the autumn and winter on land in maternity dens.
5. Air temperatures in the Arctic average -34°C (-29°F) in winter and 0°C (32°F) in summer. The coldest area in winter is northeastern Siberia, where the temperature has been recorded as low as -69°C (-92°F). The warmest areas in summer are inland regions of Siberia, Alaska, and Canada where temperatures can reach as high as 32°C (90°F).
6. The ocean temperatures in the Arctic are about -1.5°C (29°F) in summer. In winter the ocean temperatures can drop to -2°C (28°F), at which point seawater begins to freeze.

C. Migration.

1. Polar bears travel throughout the year within individual home ranges.
 - a. Home range size varies among individuals depending upon access to food, mates, and dens.
 - b. Home ranges tend to be larger than for other mammal species because sea ice habitat changes from season to season and year to year.
 - (1) A small home range may be 50,000 to 60,000 sq. km (19,305–23,166 sq. mi.). Small home ranges can be found near Canadian Arctic islands.
 - (2) A large home range may be in excess of 350,000 sq. km (135,135 sq. mi.). Large home ranges can be found in the Bering or Chukchi seas.
 - c. Polar bears don't mark or defend their home ranges.
2. Polar bears show "seasonal fidelity": they remain in the same area during the same season.
3. Polar bears undergo seasonal migrations, following the movements of the ice pack. Some bears prefer to remain at the edge of the ice pack year-round, making extensive migrations as the ice advances and recedes. On the southern shores of Hudson Bay, some bears move onto land for summer and disperse over ice for the winter.
4. Polar bears are capable of traveling 30 km (19 mi.) or more per day for several days. One polar bear was tracked traveling 80 km (50 mi.) in 24 hours. Another polar bear traveled 1,119 km (695 mi.) in one year.

D. Population.

1. The world polar bear population is estimated to be between 21,000 and 25,000 individuals.

2. Due to governmental regulations on hunting, the population has increased from an estimated 10,000 polar bears in 1968.
3. The ratio of males to females is approximately one to one.

PHYSICAL CHARACTERISTICS

A. Size.

1. The polar bear is among the largest land carnivores, comparable in size to the grizzly bear.
2. Male polar bears (boars) grow two to three times the size of females (sows). Boars weigh about 350 to more than 650 kg (772–1,433 lb.) and are about 2.5 to 3 m (8.2–9.8 ft.) long.
3. Sows weigh about 150 to 250 kg (331–551 lb.) and are about 2 to 2.5 m (6.6–8.2 ft.) long. Pregnant females can weigh as much as 500 kg (1,102 lb.).
4. The largest polar bear ever recorded was a male weighing 1,002 kg (2,209 lb.) and measuring 3.7 m (12 ft.) long.

B. Body shape.

Compared to other bears, polar bears have more slender bodies and longer necks and heads.

C. Coloration.

The coat can vary from pure white to yellow to light brown depending upon season and angle of light.

D. Limbs.

1. The hind limbs are longer than the forelimbs. This makes the large, muscular hind end stand higher than the shoulders.
2. Polar bear legs are large and stocky.
3. Feet are five-toed paws.
 - a. Polar bears have large paws compared to body size, reaching 30 cm (12 in.) in diameter. The large paws of a polar bear act like snowshoes, spreading out the bear's weight as it moves over ice and snow.
 - b. The forepaws are round and partially webbed. The hind paws are elongated.
 - c. Each toe has a thick, curved, nonretractile claw. The claws are used for grasping prey and for traction when running or climbing on ice.
 - d. The sole of a polar bear's foot has thick, black pads covered with small, soft papillae (dermal bumps). The papillae create friction between the foot and ice to prevent slipping. Long hairs growing between pads and toes also help prevent slipping.

E. Head.

1. A polar bear's head is oblong and relatively small compared to body size. The muzzle is elongated with a "Roman-nosed" (slightly arched) snout.
2. The nose is broad and black.
3. Teeth.
 - a. Polar bears have 42 teeth, which they use for catching food and for aggressive behavior.
 - b. Polar bears use their incisors to shear off pieces of blubber and flesh.
 - c. Canine teeth grasp prey and tear tough hides.
 - d. Jagged premolars and molars tear and chew.
 - e. Polar bears swallow most food in large chunks rather than chewing.
4. A polar bear's eyes are dark brown, set relatively close together, and face forward.
5. The ears are small compared to those of other bears – an adaptation that enables them to conserve body heat.

F. Tail.

The tail is small, about 7 to 12 cm (2.8-4.7 in.) long.

G. Hair.

1. Polar bears are completely furred except for the nose and footpads.
2. A polar bear's coat is about 2.5 to 5 cm (1-2 in.) thick. A dense, woolly, insulating layer of underhair is covered by a relatively thin layer of stiff, shiny, hollow guard hairs. Guard hairs may be as long as 15 cm (6 in.).
3. Though really translucent, the hairs appear white because of their highly reflective quality. Oxidation from the sun, or staining, can make the hairs look yellow or brown.
4. Polar bear fur is oily and water repellent. The hairs don't mat when wet, allowing the polar bears to easily shake free of water and any ice that may form after swimming. Ice forms when the wet fur is exposed to air temperatures at or below freezing.
5. Polar bears completely molt (shed and replace their fur) annually, in May or June. The molt can last several weeks.

H. Skin.

A polar bear's skin, visible only on the nose and footpads, is black. The black color enables the bear to absorb sunlight energy to warm its body.

SENSES

A. Hearing.

Little is known about hearing in polar bears. However, in air it is probably as sensitive as human hearing. Humans can hear sounds with frequencies as low as 0.02 kHz and as high as 20 kHz.

B. Eyesight.

The eyesight of polar bears appears to be similar to humans. Polar bears have a protective membrane over their eyes that may help shield the eyes from ultraviolet light.

C. Tactile.

Little is known about a polar bear's sense of touch; however, polar bears have been observed delicately moving or touching objects with the nose, tongue, and claws.

D. Taste.

Polar bears prefer certain foods, but researchers don't know how acute the sense of taste is or how important it is in food preference.

E. Smell.

A polar bear's sense of smell is acute, and it is the most important sense for detecting prey on land. A polar bear can smell a seal more than 32 km (20 mi.) away.

ADAPTATIONS FOR AN AQUATIC ENVIRONMENT

A. Swimming.

1. Polar bears are strong swimmers; they swim across bays or wide leads without hesitation. They can swim for several hours at a time over long distances. They've been tracked swimming continuously for 100 km (62 mi.).
2. A polar bear's front paws propel them through the water dog-paddle style. The hind feet and legs are held flat and are used as rudders.
3. A thick layer of blubber (fat), up to 11 cm (4.3 in.) thick, keeps the polar bear warm while swimming in cold water.
4. Polar bears can obtain a swimming speed of 10 kph (6.2 mph).
5. A polar bear's nostrils close when under water.

B. Diving.

1. Polar bears make shallow dives when stalking prey, navigating ice floes, or searching for kelp.
2. Polar bears usually swim under water at depths of only about 3 to 4.5 m (9.8-14.8 ft.). They can remain submerged for as long as two minutes.
3. No one knows how deep a polar bear can dive. One researcher estimates that polar bears dive no deeper than 6 m (20 ft.).

C. Thermoregulation.

1. Body temperature, which is normally 37°C (98.6°F), is maintained through a thick layer of fur, a tough hide, and an insulating layer of blubber. This excellent insulation keeps a polar bear warm even when air temperatures drop to -37°C (-34°F).
2. Overheating.
 - a. Polar bears are so well insulated they tend to overheat.
 - b. Polar bears move slowly and rest often to avoid overheating.
 - c. Excess heat is released from the body through areas where fur is absent or blood vessels are close to the skin. These areas include the muzzle, nose, ears, footpads, inner thighs, and shoulders.
 - d. Polar bears also swim to cool down on warm days or after physical activity.

BEHAVIOR

A. Daily activity cycle.

1. Polar bears are most active the first third of the day and least active the final third of the day.
2. In the Canadian Arctic, adult female polar bears with cubs hunt about 19% of their time during the spring and about 38% of their time during the summer. Adult male polar bears hunt about 25% of their time during the spring and about 40% of their time during the summer.
3. When not hunting, polar bears are often sleeping or resting. From July to December in Canada's James Bay region, when lack of ice prevents seal hunting, a polar bear may spend up to 87% of its time resting.
 - a. On warm days polar bears sprawl out on the ground or ice, sometimes on their backs with their feet in the air. They may also make temporary snow or earthen pits to lie in.
 - b. On cold days polar bears curl up and often cover their muzzle area. During the winter, some polar bears excavate temporary dens or find natural shelters to stay warm. They may use these shelters for several months at a time.

B. Walking and running.

1. Like humans, polar bears have a *plantigrade* stance: they walk on the soles of their feet with their heels touching the ground first. Like other bears, they can also stand on their hind feet and walk upright for short distances.
2. Polar bears generally walk with a steady, lumbering gait. The front paws swing outward with each step, landing slightly pigeon-toed. The head swings gently from side to side. The walk has a four-beat pattern – first the

right front foot touches the ground, then the left hind foot, then the left front foot, and lastly, the right hind foot.

3. Their bulky build and swinging gait cause polar bears to use more than twice as much energy to move at a given speed than most other mammals.
4. The average walking speed of a polar bear is 5.5 kph (3.4 mph).
5. When being chased or charging prey, polar bears can run as fast as 40 kph (25 mph) for short distances.

C. Social structure.

1. Polar bears are basically solitary. Usually, only two social units exist: (1) adult females with cubs and (2) breeding pairs.
2. Polar bear aggregations.
 - a. Polar bears may aggregate to feed on large whale carcasses and at dump sites.
 - b. In some southern regions, like Hudson Bay, bears aggregate on land during the ice-free summer and autumn months.
3. On occasion, adult and subadult (ages 30 months to five or six years) polar bear males will feed and travel together for short periods of time.

D. Social behavior.

1. The most constant social interaction occurs between mother and cubs. Polar bear mothers are attentive, frequently touching and grooming their cubs.
2. Polar bear breeding pairs remain together for one week or more, mating several times.
3. Aggression occurs between males during the breeding season and when males attempt to steal food caught by other polar bears.
4. Play fighting has been observed between aggregating subadult and adult male polar bears.
5. Young polar bear cubs chase and tackle their siblings.

E. Hibernation.

1. Hibernating means to pass the winter in a dormant or lethargic state. Animals that hibernate store body fat when food is plentiful. When food is scarce, they hibernate, living off their stored body fat. Deep hibernation, or winter sleep, generally occurs in smaller mammals. In deep hibernation, an animal's body temperature can drop to a few degrees above freezing for a period of days or weeks. It is also characterized by a marked drop in heart rate and a decreased respiratory rate. Deep hibernators are slow to awaken when disturbed.
2. Polar bears aren't deep hibernators, but enter a state of carnivore lethargy. Their body temperatures do not drop substantially, and other body functions continue. Scientists, however, use the term "hibernation" when referring to carnivore lethargy, and the term is used in this booklet as well.

3. Only females, especially pregnant females, enter into a state of carnivore lethargy, or “hibernation.” They do so from about October or November through March or April.
 - a. The female polar bear’s heart rate slows to about 27 beats per minute from a normal resting heart rate of about 46 beats per minute.
 - b. When hibernating, a female’s body temperature may drop slightly, perhaps to 35°C (95°F), or it may remain normal at 37°C (98.6°F).
 - c. Females fast throughout hibernation. They may lose most or all of their fat stores.
 - d. Unlike most other hibernators, female polar bears give birth while hibernating. High body temperature is needed to meet the demands of pregnancy, birth, and nursing.
 - e. Though hibernating females sleep soundly, they’re easily and quickly aroused.
 4. Researchers have found that nonhibernating polar bears, during times of food scarcity, can efficiently utilize their energy reserves much like hibernating bears.
- F. Attacks on humans.
1. Humans may encounter polar bears wherever human and polar bear habitats overlap. Polar bear attacks occur most often at sites of human habitation, such as hunting camps, weather stations, and towns. Compared to other bears, polar bears are more willing to consider humans as prey. Consequently, the person attacked is usually killed unless the polar bear is killed first.
 2. Polar bear subadults and females with cubs attack most often. They’re also the chief scavengers (among polar bears) of human dump sites. Both groups tend to be thinner and hungrier; subadults are inexperienced hunters, and females with cubs must feed themselves and their young.

COMMUNICATION

- A. Vocalizations.
1. Adult polar bears vocalize most when they’re agitated or threatened. Sounds include hissing, growling, champing of teeth, and soft chuffing.
 2. Cubs vocalize more often and for diverse reasons. Sounds include hissing, squalling, whimpering, lip smacking, and throaty rumblings.
 3. Mothers warn cubs with a chuffing or braying sound.
- B. Other communication.
1. Polar bears also communicate through sight, touch, and smell.
 2. A male polar bear initiates play fighting by approaching another male with its head down, mouth closed, and eyes averted. The bears usually make

contact by gently touching or “mouthing” each other around the face and neck. They then proceed to rear up on their hind legs and try to push each other over with their forepaws.

3. A mother polar bear can comfort, protect, or punish her cubs by using her body, muzzle, or paws.

FOOD AND FORAGING

- A. Food preferences and resources.
 1. Polar bears feed mainly on ringed and bearded seals. Depending upon their location, they also eat harp and hooded seals and scavenge on carcasses of beluga whales, walruses, narwhals, and bowhead whales.
 2. On occasion, polar bears kill young beluga whales and walruses.
 3. When other food is unavailable, polar bears eat reindeer, small rodents, seabirds, waterfowl, fish, eggs, vegetation (including kelp), berries, and human garbage.
- B. Food intake.
 1. A polar bear’s stomach can hold an estimated 15% to 20% of its body weight. A polar bear generally eats this much only when its energy demands are high. A bear can assimilate 84% of the protein and 97% of the fat it eats.
 2. Polar bears need an average of 2 kg (4.4 lb.) of fat per day to survive. A ringed seal weighing 55 kg (121 lb.) could provide up to eight days of energy for a polar bear.
 3. At SeaWorld, polar bears averaging 220 kg (485 lb.) eat about 4.5 to 9 kg (10–20 lb.) of food per day.
 4. Hibernating polar bears do not eat.
- C. Foraging and eating.
 1. Still hunting.
 - a. Still hunting is the most common method of hunting year-round.
 - b. The polar bear remains motionless beside a breathing hole or lead edge waiting for a seal to surface. When a seal surfaces, the polar bear bites onto the head or upper body, then flips the entire seal onto the ice.
 - c. Still hunting usually takes less than one hour, but polar bears will wait much longer.
 2. Stalking on land.
 - a. Stalking is a hunting method used when seals haul out on sea ice.
 - b. Once spotted, the seal is slowly and steadily stalked by the polar bear. At 15 to 30 m (49–98 ft.) away, the polar bear suddenly charges the seal. With its claws or teeth, the polar bear grabs the seal before the seal can leave the ice.

3. Aquatic stalk.
 - a. The aquatic stalk is a method also used to hunt seals hauled out on sea ice.
 - b. The polar bear swims toward a hauled-out seal. Once the polar bear reaches the ice edge, the bear quickly emerges from the water and grabs the seal with its claws or teeth.
4. Stalking birth lairs.
 - a. Stalking ringed seals at their birth lairs is a hunting method polar bears use in spring, when ringed seals give birth to their pups.
 - b. Ringed seal birth lairs are caves built under snow drifts next to a hole in the ice. The snow drifts are on stable sea ice attached to land.
 - c. Once a polar bear identifies a birth lair, it slowly and quietly positions itself next to the lair. If a polar bear smells or hears a seal in the lair, it slowly raises up on its hind legs and crashes down with its front paws to break through the lair's roof.
 - d. To break the roof's hard surface, several tries are sometimes needed, which may allow the seal to escape into the water.
 - e. This method is most commonly used by polar bear females with cubs under one year old.
 - (1) Mother seals and pups have the high fat content needed for hungry polar bear mothers and their growing cubs.
 - (2) Male polar bears that may attack young polar bear cubs don't normally hunt seals in birth lairs.
 - (3) Birth lairs are usually on sea ice attached to land, allowing young cubs (who have little protective fat) to avoid crossing water.
5. Eating.
 - a. Once a seal is captured, a polar bear bites it several times on the head and neck before dragging it several meters from the water to feed.
 - b. A polar bear eats the skin and blubber first, then the meat.
 - c. Polar bears often stop to wash during feeding, using water nearby or rubbing in the snow.
 - d. Polar bears don't always eat the entire kill. Carcass remains are scavenged by other bears, arctic foxes, and gulls.

REPRODUCTION

- A. Sexual maturity.
 - 1. Female polar bears reach sexual maturity at about four to five years.
 - 2. Male polar bears reach sexual maturity at about six years.
 - 3. Most male polar bears don't successfully mate until 8 to 10 years and older.
- B. Mating activity.
 - 1. Breeding takes place from March to June on the sea ice, but most occurs during April and May.
 - 2. During the breeding season, males and females find each other by congregating in the best seal-hunting habitats.
 - 3. Male polar bears have been seen following the tracks of breeding female polar bears for more than 100 km (62 mi.). Scientists are uncertain what signals males use to track breeding females.
 - 4. Competition for females is intense. Females breed about once every three years; therefore, there are about three adult males to every breeding female.
 - 5. Before mating, a female polar bear may be accompanied by several males. The males fight fiercely among themselves until the strongest or largest male succeeds in chasing the others away.
 - a. A polar bear threatening to attack another polar bear usually lowers its head, flattens its ears back, and gives an open mouth threat with a hiss-like roar.
 - b. Fights are rarely fatal, but do result in broken canines and scars on the head, neck, and shoulders.
 - 6. Dominant males may succeed in mating with several females in a season.
 - 7. Once paired, the male and female stay together for a week or more.
 - a. Females are induced ovulators – the act of mating causes a female to release an egg for fertilization.
 - b. Several days of mating interactions may be required to stimulate ovulation and guarantee fertilization of the egg.
 - 8. Polar bears may have many different mates over their lifetime.

BIRTH AND CARE OF YOUNG

A. Gestation.

1. The total gestation period is about eight months.
2. Gestation includes a period of delayed implantation.
 - a. The fertilized egg divides into a hollow ball of cells one layer thick (a blastocyst), then stops growing and lies free-floating in the uterus for about four months. The blastocyst then implants in the uterine wall and continues to develop.
 - b. Delayed implantation assures that the cub is born during the best time of the year for survival and allows the female to get into good physical condition and use her energy for nursing her newborn cubs.
 - c. The actual embryonic development is estimated to be four months.

B. Denning.

1. Once mated, females begin depositing fat in preparation for cubbing. Females need to gain at least 200 kg (441 lb.) for a successful pregnancy.
2. Some females may seek out maternity dens as early as late August, but most enter dens in mid to late October. Dens protect newborn cubs from winter's temperature extremes.
3. Females usually dig dens in snowdrifts on southerly facing slopes. Some dig earthen dens that later become covered by snow.
4. Most dens are on land, within 16 km (10 mi.) of the coast. In some areas, dens are more than 100 km (62 mi.) from the coast. A few polar bears make dens on the sea ice.
5. Den elevations range from sea ice level to 548 m (1,800 ft.) above sea level.
6. Most dens consist of a single chamber slightly elevated from a short entrance tunnel. On average, the chamber is 2 m (6.6 ft.) long, 1.5 m (4.9 ft.) wide, and 1 m (3.3 ft.) high. Polar bears maintain a ventilation hole through the chamber ceiling to provide fresh air.
7. Because of the bears' body heat and snow insulation, the den stays warmer than the outside air temperature.

C. Birth seasons.

Polar bear cubs are born November through January in a den. Mother and cubs emerge from their den in late March or April.

D. Frequency of birth.

1. Most adult females give birth once every three years. In some populations, birth occurs once every two years.
2. The most frequent litter size is two, followed by litters of one. Litters of three are less common than twins or singles, and litters of four are rare.

- E. Cubs at birth.
 - 1. At birth, polar bear cubs weigh about 454 to 680 g (16–24 oz.) and are about 30 cm (12 in.) long. Males are born slightly larger than females.
 - 2. Polar bear cubs are born small and helpless, with their eyes closed.
 - 3. The fur is very fine at birth, making the cubs look hairless.
- F. Care of young.
 - 1. Nursing.
 - a. Female polar bears have four mammary glands. Mothers nurse their cubs in a sitting position, or lying down on their side or back.
 - b. During their first few weeks of life, polar bear cubs nurse most of the time and stay close to their mother to keep warm.
 - c. For the next three or four months the cubs nurse as often as six times a day. The length and number of nursing bouts gradually decreases as the cubs grow older.
 - d. Mother polar bears nurse their cubs for as long as 30 months. Some cubs stop nursing as young as 18 months of age, but remain with their mothers for survival until they are 30 months old.
 - e. The average fat content of polar bear milk is 33%, similar to the milkfat of other marine mammals.
 - 2. Mother polar bears are extremely protective of their young, even risking their own lives in their cubs' defense.
- G. Cub growth and development.
 - 1. Cubs open their eyes within the first month.
 - 2. The cubs begin walking while in the den at about two months. By this time, they also have thick, whitish fur and their teeth have erupted.
 - 3. By the time the mother and cubs emerge from the den in late March or April, the cubs weigh 10 to 15 kg (22–33 lb.).
 - 4. Mother and cubs remain around the den for about 12 more days, sometimes longer.
 - a. This enables the cubs to acclimate to the colder weather and develop their walking muscles.
 - b. During this time the cubs still spend about 85% of their time in the den, sleeping there at night.
 - 5. When ready, the mother polar bear leads her cubs to sea ice. Travel is slow with frequent rest and nursing stops. A mother sometimes carries her cubs on her back through areas of deep snow or water.
 - 6. Cubs begin eating solid food as soon as their mother makes her first kill on the sea ice (about three to four months of age).

7. The cubs grow quickly on their mother's fat rich milk and on seal blubber. By eight months of age, they weigh more than 45 kg (99 lb.).
8. Polar bear cubs learn to hunt by watching their mother. Cubs try hunting in their first year, but don't seem to be successful until they're over one year old. Even then, they only spend about 4% of their time hunting. By the time they're two years old they spend about 7% of their time hunting and can catch a seal every five or six days.
9. When her cubs are about 30 months old, a female polar bear is ready to breed again. At this time, an adult male may begin following her. Either the mother bear or the male chases away the cubs.

LONGEVITY AND MORTALITY

A. Longevity.

1. Polar bears can live 20 to 30 years, but only a small percentage of polar bears live past 15 to 18 years.
2. The oldest known polar bear in the Arctic lived 32 years. The oldest known polar bear in a zoological park lived 45 years.

B. Aging studies.

Each year, as a polar bear grows, a thin layer of cementum is added to each tooth. Age can be estimated by examining a thin slice of tooth and counting the layers. To estimate the age of a live polar bear, researchers can extract one small, vestigial premolar tooth.

C. Predators.

1. Adult polar bears have no natural predators.
2. Cubs less than one year old sometimes are prey to wolves and other carnivores.
3. Newborn cubs may be cannibalized by malnourished mothers or adult male polar bears.

D. Intraspecific mortality.

On rare occasions, males kill other males while competing for mates. Males also periodically kill females protecting cubs.

E. Human impact.

1. Hunting.
 - a. Polar bears have been hunted for thousands of years.
 - (1) Evidence of human polar bear hunts have been found in 2,500- to 3,000-year-old ruins. Arctic peoples have traditionally hunted polar bears for food, clothing, bedding, and religious purposes.
 - (2) Commercial hunting of polar bears for hides began as early as the 1500s and flourished by the 1700s.

- (3) Kills increased substantially in the 1950s and 1960s when hunters began using snowmobiles, boats, and airplanes to hunt polar bears. Public concern about these hunting methods led to an international agreement in 1973 banning the use of aircraft or large motorized boats for polar bear hunts.
 - b. Hunting is the greatest single cause of polar bear mortality.
 - (1) Today, polar bears are hunted by native arctic populations primarily for food, clothing, handicrafts, and sale of skins. Polar bears are also killed in defense of people or property.
 - (2) Hunting is government-regulated in Canada, Greenland, and the United States. Hunting is currently banned in Norway and parts of Russia.
- 2. Environmental threats.
 - a. Oil spills from drilling platforms or tankers potentially threaten polar bears.
 - (1) A polar bear's fur loses its insulating properties when covered with oil.
 - (2) Oil spills could diminish or contaminate polar bear food sources.
 - b. The presence of toxic chemicals in polar bears may have long-term effects on their health and longevity.
 - (1) Toxic chemicals from worldwide industrial activities are carried to the Arctic by air, rivers, and oceans.
 - (2) Arctic animals in higher food chain levels concentrate greater amounts of toxic chemicals in their tissues than those below them. Because polar bears are top predators in the arctic, they are exposed to especially high levels of toxic chemicals.
 - (3) Human-made toxic chemicals such as polychlorinated biphenyls (PCBs), dichlorodiphenyltrichloroethane (DDT), and organochlorines are present in the Arctic. Arctic seals have particularly high levels of organochlorines concentrated in their blubber. Since polar bears mainly feed on seals, organochlorines become even more concentrated in the fat layer of polar bears. This potentially leads to a higher than normal mortality rate of polar bear cubs who acquire these toxins from their mother.
 - (4) Scientists continue to monitor the levels of toxic chemicals in polar bears to determine their long-term effects.
 - c. Radionuclides, from nuclear waste dumping in the Russian Arctic, may have detrimental effects on polar bears, and the arctic ecosystem as a whole.
 - d. Climate changes in the Arctic, including increasing temperatures and changes in precipitation patterns, pose a potential threat to polar bear

populations. Increasing temperatures are associated with a decrease in sea ice (both the amount and the length of time sea ice forms). Since polar bears mainly prey on ice-associated ringed and bearded seals, changes in ice formation can lead to less prey availability and an increase in malnourished or starving bears.

F. Starvation.

1. Starvation is the greatest threat to subadult polar bears. Subadults are inexperienced hunters, and often are chased from kills by larger adults.
2. Older, weaker bears also are susceptible to starvation.

G. Disease and parasitism.

As in any animal population, a variety of diseases and parasites can be responsible for polar bear illnesses. Polar bears are especially susceptible to the parasitic roundworm *Trichinella*, which they contract by feeding on infected seals. *Trichinella* larvae encyst in various parts of the polar bear's body, usually muscle tissue. If enough larvae encyst in one area, such as the heart, the tissue becomes severely damaged. Death may result.

CONSERVATION

A. First International Scientific Meeting on the Polar Bear, 1965.

Growing public concern about polar bear hunting and other human activities in the Arctic, such as oil exploration, led to the First International Scientific Meeting on the Polar Bear in 1965. Attending were representatives from all five polar bear countries: Canada, Greenland (territory of Denmark), Norway, the United States, and the (former) Soviet Union. The meeting set the stage for additional international conferences and research efforts, which eventually led to an international agreement on polar bear conservation.

B. The International Agreement on Conservation of Polar Bears and their Habitat, 1973.

1. This agreement states that the five polar bear nations (Canada, Greenland, Norway, the United States, and the former Soviet Union) shall protect polar bear habitat, especially denning areas, feeding areas, and migratory routes; ban hunting of bears from aircraft and large motorized boats; conduct and coordinate management and research efforts; and exchange research results and data.
2. The agreement allows the taking of polar bears for scientific purposes, for preventing serious disturbances in the management of other resources, for use by local people using traditional methods and exercising traditional rights, and for protection of life and property.
3. Each nation has voluntarily established its own regulations and conservation practices using the knowledge gained from the international community as a whole.

C. United States Marine Mammal Protection Act, 1972.

1. Polar bears are protected under the U.S. Marine Mammal Protection Act (MMPA).
 2. The primary objective of the MMPA is to maintain the health and stability of the marine ecosystem and to obtain and maintain an optimum sustainable population of marine mammals.
 3. The MMPA prohibits taking and importing marine mammals unless a permit is issued for the purposes of public display, native subsistence, scientific research, or sustaining a depleted species. MMPA revisions in 1994 allow U.S. citizens to import polar bear “trophies” acquired in Canadian hunts. Polar bears in Alaska can be hunted only by Alaskan natives.
- D. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
- In 1975, the polar bear was placed on CITES Appendix II. Appendix II includes species identified as threatened, or likely to become endangered if trade isn’t regulated. International trade of polar bears, or their parts, is permitted with proper documentation issued by the government of the exporting country.
- E. IUCN/The World Conservation Union.
1. IUCN/The World Conservation Union is a worldwide conservation organization. This organization links together government agencies, non-government agencies, and independent states to encourage a worldwide approach to conservation.
 2. The Polar Bear Specialist group works under the guidance of IUCN/The World Conservation Union’s Species Survival Commission. This group helps to coordinate and identify the management and research efforts of the five polar bear nations (Canada, Greenland, Norway, the United States, and the former Soviet Union).
 3. The polar bear is listed as “Lower Risk/conservation dependent” by IUCN/The World Conservation Union. This means the species is likely to move into the vulnerable, threatened, or endangered category if conservation efforts are discontinued.
- F. Research.
1. Scientists use radio collars to track the movements of polar bears.
 - a. Once a polar bear is fitted with a radio collar, the collar sends signals to a receiving station via satellite. Scientists can enter the data into a computer program that plots the polar bear’s path.
 - b. Only female polar bears can be tracked using radio collars. Male polar bears have necks wider than their heads, and the collars simply fall off.
 2. The movements of polar bears can also be studied by following their tracks in the snow, usually by aircraft.
 3. Other behaviors are recorded by observing polar bears directly, or finding evidence of polar bears, such as a partially eaten seal.

4. Most polar bear research is conducted in the spring or summer when weather conditions are more favorable to humans.
- G. Zoological parks.
1. Having polar bears at zoological parks provides the opportunity for the public to learn about these animals and how human activities may impact their survival.
 2. In the protected environment of a zoological park, scientists can examine aspects of polar bear biology that are difficult to study in the wild. Areas of study include polar bear reproduction, birth and care of young, physiology, and communication.