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MAMMALS
of the **WORLD**
4th Edition

Ronald M. Nowak • John L. Paradiso
Volume II

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The first edition of this work appeared under the title *Mammals of the World* by Ernest P. Walker (senior author) and six coauthors: Florence Warnick, Sybil E. Hamlet, Kenneth I. Lange, Mary A. Davis, Howard E. Uible, and Patricia F. Wright. The second and third editions were revised by John L. Paradiso.

Frontispiece: Photograph by Eugene Maliniak

Foreword
 Preface
 World D

Monotreme
Tachy
Ornith

Marsupial
Didelp
Micro
Thylac
Dasyu
Myrm
Peram
Thylac
Notory
Caeno
Vombu
Phasc
Phala
Petau
Burra
Macre
Tarsi

Insectivore
Erina
Solen
Nesop
Tenre
Chrys
Sorici
Talpic
Macro

Dermopt

Chiropt
Ptero
Rhino
Emba
Crase
Nocti
Nycte
Mega
Rhino
Hippe
Morn
Phyll

total protection, such as national parks, the species has become accustomed to humans. It thus can be easily seen and is a popular attraction, but is sometimes a nuisance, raiding campsites or begging for food along roads. Physical attacks are rare, but occur with some regularity, often because the involved persons disregard safety regulations (Cole 1976; Jonkel 1978; Pelton, Scott, and Burghardt 1976). Black bears have killed people on occasion, most recently in Alberta in 1980 (John R. Gunson, Alberta Fish and Wildlife Division, pers. comm.).

People have intensively killed *U. americanus*, because of fear, to prevent depredations on domestic animals and crops, for sport, and to obtain fur and meat. According to Lowery (1974), attacks on livestock are negligible, but the bear does serious damage to cornfields and honey production. The economic loss caused to beekeepers in the Peace River Valley of Alberta was estimated at \$200,000 in 1973, and a government control program is directed against the bear in that area (Gilbert and Roy 1977). In most of the states and provinces occupied by the black bear, it is treated as a game animal, subject to regulated hunting. An estimated 30,000 individuals are killed annually in North America (Jonkel 1978). Relatively few skins go to market now, as regulations sometimes forbid commerce and there is no great demand. The average price per pelt in the 1976/77 season was about \$44 (Deems and Pursley 1978).

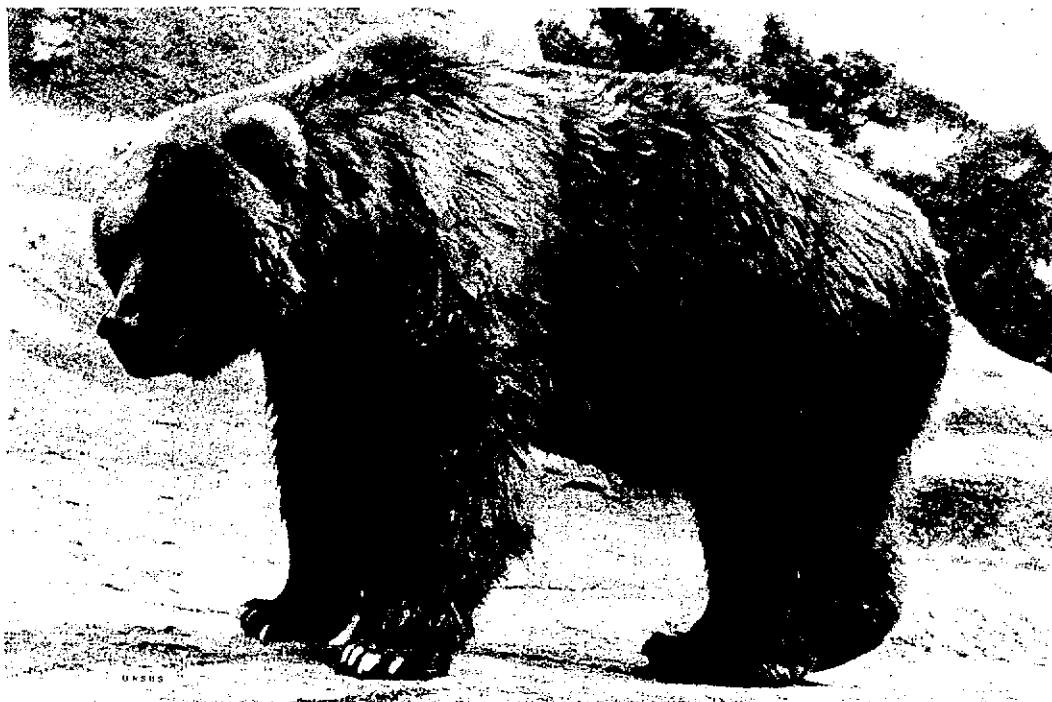
The distribution of the black bear has declined substantially, but the species is still common in Alaska, Canada, the western conterminous United States, the upper Great Lakes region, northern New England and New York, and parts of the Appalachians. Populations also survive in the Ozark region and in coastal lowlands from the Dismal Swamp of Virginia to the Okefenokee of Georgia. Data compiled by Cowan (1972) indicate the presence of about 170,000 black bears in the conterminous United States.

The subspecies *U. a. floridanus* is widespread in Florida, but is considered threatened through habitat loss and persecu-

tion by beekeepers (Layne 1978). The subspecies *U. a. luteolus*, formerly found from eastern Texas to Mississippi, was by the mid-20th century reduced to a few individuals along the Mississippi and Atchafalaya rivers in eastern Louisiana. It is now probably in imminent danger of extinction, if it survives at all. During the 1960s the wildlife agencies of both Louisiana and Arkansas imported a number of bears from Minnesota (within the range of the subspecies *U. a. americanus*) to their respective states (Lowery 1974; Sealand 1979).

Ursus arctos. Head and body length is 1,700 to 2,800 mm, tail length is 60 to 210 mm, and shoulder height is 900 to 1,500 mm. In any given population, adult males are larger, on the average, than adult females. The largest individuals—indeed, the largest of living carnivores—are found along the coast of southern Alaska and on nearby islands, such as Kodiak and Admiralty. In this area weight is as great as 780 kg. Size rapidly declines to the north and east. In southwestern Yukon, for example, Pearson (1975) found average weights of 139 kg for males and 95 kg for females. In the Yellowstone region, Knight, Blanchard, and Kendall (1981) found weights of full-grown animals to average 181 kg and to range from 102 to 324 kg. In Siberia and northern Europe, weight is usually 150 to 250 kg. In parts of southern Europe, average weight is only 70 kg (Grzimek 1975). Coloration is usually dark brown, but varies from cream to almost black. In the Rocky Mountains, the long hairs of the shoulders and back are often frosted with white, thus giving a grizzled appearance and the common name grizzly or silvertip. From *U. americanus*, *U. arctos* is distinguished in having a prominent hump on the shoulders, a snout that rises more abruptly into the forehead, longer pelage, and longer claws.

The brown bear has one of the greatest natural distributions of any mammal. It occupies a variety of habitats, but in the New World seems to prefer open areas, such as tundra, alpine meadows, and coast lines. It was apparently common



Alaskan brown bear (*Ursus arctos*), photo by Ernest P. Walker.

on the Great Plains, prior to the arrival of European settlers. In Siberia the brown bear occurs primarily in forests (Stroganov 1969). Surviving European populations are restricted mainly to mountain woodlands (Van Den Brink 1968). Even when living in generally open regions, *U. arctos* needs some areas with dense cover (Jonkel 1978). It shelters in such places by day, sometimes in a shallow excavation, and moves and feeds mainly during the cool of the evening and early morning. Egbert and Stokes (1976) noted that activity in coastal Alaska occurs throughout the day, but peaks from 1800 to 1900 hrs. Seasonal movements are primarily toward major food sources, such as salmon streams and areas of high berry production (Jonkel 1978). In Siberia, individuals may travel hundreds of kilometers during the autumn to reach areas of favorable food supplies (Stroganov 1969).

According to Banfield (1974), the usual gait is a slow walk. *U. arctos* is capable of moving very quickly, however, and can easily catch a black bear. Its long foreclaws are not adapted for climbing trees. It has excellent senses of hearing and smell, but relatively poor eyesight. The brown bear has great strength. Banfield saw one drag a carcass of a horse about 90 meters. In another case, a 360-kg grizzly killed and dragged a 450-kg bison.

Hibernation begins from October to December and ends from March to May. The exact period depends on the location, weather, and condition of the animal. In certain southerly areas, hibernation is very brief or does not take place at all. In most cases the brown bear digs its own den and makes a bed of dry vegetation. The burrow is often located on a sheltered slope, either under a large stone or among the roots of a mature tree. The bed chamber has an average volume of around two cubic meters. A den is sometimes used repeatedly, year after year. During winter sleep there is a marked depression in heart rate and respiration, but only a slight drop in body temperature. The animal can be aroused rather easily and can make a quick escape, if necessary (Craighead and Craighead 1972; Stroganov 1969; Slobodyan 1976; Ustinov 1976; Grzimek 1975).

The diet consists mainly of vegetation (Jonkel 1978). Early spring foods include grasses, sedges, roots, moss, and bulbs. In late spring, succulent, perennial forbs become important. During the summer and early autumn, berries are essential, and bulbs and tubers are also taken. Banfield (1974) wrote that *U. arctos* consumes insects, fungi, and roots at all times of the year, and also digs mice, ground squirrels, and marmots out of their burrows. In the Canadian Rockies, the grizzly is quite carnivorous, hunting moose, elk, mountain sheep and goats, and even black bears. In Mount McKinley National Park, Alaska, Murie (1981) found *U. arctos* to feed mostly on vegetation, but to also eat carrion whenever available, and occasionally to capture young calves of caribou and moose. During the summer, when salmon are moving upstream along the Pacific coasts of Canada, southern Alaska, and northeastern Siberia, brown bears gather to feed on the vulnerable fish (Banfield 1974; Egbert and Stokes 1976; Kistchinski 1972). Perhaps because of this abundant food supply, the bears of these areas are larger and are found at greater densities than anywhere else.

Some approximate reported population densities are: Carpathian Mountains, one bear per 20 sq km; Lake Baikal area, one per 60 sq km; coast of Sea of Okhotsk, one per 10 sq km; Kodiak Island, one per 1.5 sq km; Mount McKinley National Park, one per 30 sq km; northern parts of Alaska and Northwest Territories, one per 150 sq km; and Glacier National Park, Montana, one per 21 sq km (Harding 1976; Martinka 1974, 1976; Slobodyan 1976; Dean 1976; Kistchinski 1972; Ustinov 1976). In the Yellowstone region of the western United States, overall average density is about one bear per 88 sq km. In summer, however, individuals have concen-

trated by night at feeding sites, so densities have reached about one per 0.05 sq km. Daytime dispersal has reduced density to about one per 0.36 sq km. In the Yellowstone, individual home range averages about 80 sq km, and varies from about 20 to 600 sq km, with respect to the area used in the course of a year. Lifetime individual range has been as great as 2,600 sq km (Craighead 1976; Knight, Blanchard, and Kendall 1981). The home ranges of males are generally substantially larger than those of females. In the northern Yukon, Pearson (1976) found averages of 414 sq km for males and 73 sq km for females.

Home ranges overlap extensively and there is no evidence of territorial defense (Craighead 1976; Murie 1981). Although generally solitary, the grizzly is the most social of North American bears, occasionally gathering in large numbers at major food sources, and often forming family foraging groups with more than one age class of young (Jonkel 1978). At a salmon stream in southern Alaska, Egbert and Stokes (1976) sometimes observed more than 30 bears at one time. Considerable intraspecific tolerance was demonstrated in such aggregations, but dominance hierarchies were enforced by aggression. The highest-ranking animals were the large adult males, which most other bears attempted to avoid. The most aggressive animals were females with young, and the least aggressive were adolescents. Overt fighting was usually brief, and no infliction of serious wounds was observed, but the researchers suspected that killing of young individuals by adult males was a factor in population regulation.

There are no lasting social bonds, except those between females and young. During the breeding season males may fight over females. Successful males attend one or two females for 1 to 3 weeks. Mating takes place from May to July, implantation of the fertilized eggs in the uterus is usually delayed until October or November, and births generally occur from January to March, while the mother is in hibernation. The total period of pregnancy may last from 180 to 266 days. Females remain in estrus throughout the breeding season until mating, and do not again enter estrus for at least 2, usually 3 or 4, years. The number of young in a litter averages about two and ranges from one to four. Each weighs 340 to 680 grams at birth, and is naked and blind. They are weaned at about 5 months of age. They remain with the mother at least until their second spring of life, and usually until their third or fourth. Litter mates sometimes maintain an association for 2 or 3 years after leaving the mother. Puberty comes around 4 to 6 years of age, but growth then continues. Males in southern Alaska may not reach full size until they are 10 to 11 years old. Females in the Yellowstone region are known to have lived 25 years and still be capable of reproduction (Craighead, Craighead, and Sumner 1976; Egbert and Stokes 1976; Murie 1981; Jonkel 1978; Glenn et al. 1976; Pearson 1976; Slobodyan 1976). Potential longevity in captivity may be as great as 50 years (Stroganov 1969).

The brown bear has the reputation of being the most dangerous animal in North America. If we disregard venomous insects, disease-spreading rodents, domestic animals, and people themselves, this may be true. Three persons were killed by grizzlies in Glacier National Park, Montana, in 1980 (*Washington Post*, 25 July 1980, p. A-14; 9 October 1980, p. A-54; 20 October 1980, p. A-5). Another was killed in Canada (John R. Gunson, Alberta Fish and Wildlife Division, pers. comm.). That was an unusually tragic year, but injuries and an occasional death have been reported from the western national parks since around 1900 (Herrero 1970, 1976; Cole 1976). During the 19th century, attacks on people apparently occurred with some regularity in California (Storer and Tevis 1955). According to Ustinov (1976), over 70 attacks and 17 deaths have been attributed to *U. arctos* in

the Lake Baikal area of Siberia. Many such incidents have probably been provoked by an effort to shoot or harass the animal, as the brown bear normally tries to avoid humans. It is unpredictable, however, if startled at close quarters, especially when accompanied by young or engrossed in a search for food. Jonkel (1978) cautioned that there may be more difficulties as recreational and commercial activity increases in areas occupied by the grizzly. He suggested that problems could be reduced by improved education and planning, and by not locating campsites, trails, and residential facilities in places that are regularly used by bears.

The brown bear has long been persecuted as a predator of domestic livestock, especially cattle and sheep. Those parts of North America from which it has been eliminated correspond closely to areas of intensive ranching and grazing. In the 19th and early 20th centuries there were apparently some remarkably destructive bears (Storer and Tevis 1955; Hubbard and Harris 1960), and their activities earned the entire species the lasting enmity of cattle ranchers and sheepherders. The brown bear also has been widely sought as a big game trophy, and is currently subject to regulated sport hunting in most of its range. There is now little commercial demand for its meat and hide (Banfield 1974).

The original eastern limits of *U. arctos* in North America are not certain. A skull found in a Labrador Eskimo midden dating from the late 18th century supports earlier stories that the grizzly used to occur to the east of Hudson Bay (Spiess 1976). The decline of the species on the Great Plains may have begun when the Indians of that region obtained the horse and hence an improved hunting capability. A precipitous drop in grizzly numbers came in the 19th century as settlers and livestock filled the West, thereby setting up confrontations that usually ended to the detriment of the bear. This process was intensified by logging, mining, and road construction, which increased human presence in remote areas. In the early 19th century there may have been 100,000 grizzlies in the western conterminous United States. There are now probably fewer than 1,000. Of these, about 200 are in Glacier National Park (Martinka 1974) and several hundred more are in nearby parts of northwestern Montana, northern Idaho, and extreme northeastern Washington. The population in Yellowstone National Park and vicinity has been estimated at 136 (Craighead, Varney, and Craighead 1974) and 247 (Knight, Blanchard, and Kendall 1981). There may be very small remnant groups in south-central Colorado and northwestern Mexico. The grizzly has been extirpated from the Great Plains of Canada, except for an isolated group in west-central Alberta (Banfield 1974). The species also has declined on the barrens of the Northwest Territories (Macpherson 1965). In the mountainous regions of western Canada, and in Alaska, *U. arctos* is still relatively common, perhaps numbering about 30,000 individuals (Cowan 1972). In Eurasia there are an estimated 100,000 brown bears, about 70,000 of them in the Soviet Union (Vereschagin 1976). To the west of Russia, the only substantial surviving populations are in the Balkans and northern Scandinavia. There are small, isolated groups in Poland, Czechoslovakia, Austria, Italy, southern France, northern Spain, and southern Norway (Smit and Van Wijngaarden 1976; Elgmork 1978). *U. arctos* apparently disappeared from northwestern Africa around the middle of the 19th century (Harper 1945).

Appendix 2 of the CITES includes all North American populations of *U. arctos* except *U. a. nelsoni*, the Mexican grizzly bear. Appendix 1 includes *U. a. nelsoni*, *U. a. pruinosus* of Tibet, *U. a. isabellinus* of the mountains of Central Asia, and those populations occurring in Italy. The IUCN (1972) classifies *U. a. nelsoni* as endangered and *U. a. richardsoni*, the barren ground grizzly of the Northwest Terri-

ries, as rare. The USDI (1980) lists *U. a. nelsoni*, *U. a. pruinosus*, and the Italian populations of *U. arctos* as endangered. Those populations of *U. arctos* in the conterminous United States are listed as threatened by the USDI.

Ursus maritimus. Head and body length is 2,000 to 2,500 mm, tail length is 76 to 127 mm, and shoulder height is up to 1,600 mm. DeMaster and Stirling (1981) gave the weight as 150 to 300 kg for females and 300 to 800 kg for males. Banfield (1974), however, wrote that males usually weigh 420 to 500 kg. The color is often pure white following the molt, but may become yellowish in the summer, probably because of oxidation by the sun. The pelage also sometimes appears gray or almost brown, depending on season and light conditions. The neck is longer than that of other bears, and the head is relatively small and flat. The forefeet are well adapted for swimming, being large and oarlike. The soles are haired, probably for insulation from the cold and traction on the ice. Females have four functional mammae (DeMaster and Stirling 1981).

The polar bear is often considered a marine mammal. It is distributed mainly in arctic regions around the north pole. The southern limits of its range are determined by distribution of the pack ice. It has been recorded from as far north as 88° N and from as far south as the Pribilof Islands in the Bering Sea, the island of Newfoundland, the southern tip of Greenland, and Iceland. There also are permanent populations in James Bay and the southern part of Hudson Bay. Although found generally in coastal areas or on ice hundreds of kilometers from shore, individuals have wandered up to 200 km inland (Stroganov 1969).

According to DeMaster and Stirling (1981), the preferred habitat is pack ice that is subject to periodic fracturing by wind and sea currents. The refreezing of such fractures provides places where hunting by the bear is most successful. Some animals spend both winter and summer along the lower edge of the pack ice, perhaps undergoing extensive north-south migrations as this edge shifts. Others move onto land for the summer, and disperse across the ice as it forms along the coast and between islands during winter. The bears of the Labrador coast sometimes move north to Baffin Island, and some individuals have traveled as far as 1,050 km to the islands of northern Hudson Bay (Stirling and Kiliaan 1980). The population that summers along the southern shore of Hudson Bay spreads all across the partly ice-covered bay in November and returns to shore in July or August (Stirling et al. 1977). Despite such movements, the polar bear is not a true nomad. There are a number of discrete populations, each with its own consistently used areas for feeding and breeding (Stirling, Calvert, and Andriashek 1980).

The polar bear can outrun a reindeer for short distances on land, and can attain a swimming speed of about 6.5 km/hr. It swims rather high, with head and shoulders above the water. If killed in the water, it will not immediately sink. According to DeMaster and Stirling (1981), it has been reported to swim for at least 65 km across open water. It is capable of diving under the ice and surfacing in holes utilized by seals. It seems to be most active during the first third of the day and least active in the final third. From July to December in the James Bay region, when a lack of ice prevents seal hunting, *U. maritimus* spends about 87 percent of its time resting, apparently living off of stored fat (Knudsen 1978). Depressions or complete earthen burrows are sometimes excavated on land during the summer, in order to avoid the sun and keep cool (Jonkel et al. 1976).

Any individual bear may make a winter den for temporary shelter during severe weather, but only females, especially those that are pregnant, generally hibernate for lengthy periods. As with other bears, winter sleep involves a depressed