

Helarctos malayanus. By Christopher S. Fitzgerald and Paul R. Krausman

Published 5 July 2002 by the American Society of Mammalogists

Helarctos Horsfield, 1825

Ursus Raffles, 1821:254. Type species *Ursus malayanus* Raffles.
Helarctos Horsfield, 1825:221. Type species *Helarctos euryspilus* Horsfield.

CONTEXT AND CONTENT. Order Carnivora, family Ursidae, subfamily Ursinae, genus *Helarctos*. *Helarctos* has hybridized with *Melursus* (Asakura 1969) and therefore may be a subgenus of *Ursus*. *Helarctos* and *Melursus* were proposed to be synonyms (Van Gelder 1977).

Helarctos malayanus (Raffles, 1821)

Malayan Sun Bear

Ursus malayanus Raffles, 1821:254. Type locality "Sumatra."
Helarctos euryspilus Horsfield, 1825:221. Type locality "Borneo."
Helarctos malayanus Horsfield, 1825:234. First use of current name combination.
Helarctos anmamiticus Heude, 1901:1–2. Type locality "Annam, Vietnam."

CONTEXT AND CONTENT. Content as for genus. Distinctions among *H. malayanus*, *H. euryspilus*, and *H. anmamiticus* are contested (Pocock 1932). *H. malayanus* was split into 2 subspecies, *H. m. malayanus* and *H. m. euryspilus*, on the basis of size differences (Chasen 1940; Santiapillai and Santiapillai 1988). However, genetic variability is unknown (Zhang 1996), and we consider *H. malayanus* monotypic.

DIAGNOSIS. *Helarctos malayanus* (Fig. 1) differs from other ursids, particularly *Ursus thibetanus* and *Melursus ursinus*, with which it is most likely confused in its smaller size, short sleek coat, modified rhinarium, more protrusible lips and tongue, and presence of whorls of hair on forehead and behind ears (Lekagul and McNeely 1977; Pocock 1932). Also, forelimbs are more bowed compared with those of *U. thibetanus* and *M. ursinus*, and paws are turned inward (Pocock 1932). Ears are shorter, narrower, and simpler than those of *Ursus americanus*, with distal portion less expanded and height from supratragus to tip less than greatest width (Allen 1938).

GENERAL CHARACTERS. *Helarctos malayanus* is the smallest of the ursids, with length of head and body, 1,000–1,400 mm; length of tail, 30–70 mm; height at shoulder, ca. 700 mm; and mass, 25–65 kg (Dathe 1975). *H. malayanus* has a stocky build, short muzzle, large paws, strongly curved and pointed claws, and naked soles. Ears are small (40–60 mm) and round (Lekagul and McNeely 1977). Hind foot is 180–210 mm (Lekagul and McNeely 1977).

Fur is typically jet-black; adult coat has a very thick black undercoat with lighter guard hairs (Fetherstonhaugh 1940, 1948; Pocock 1932). Muzzle may be orange, gray, or silver (Fetherstonhaugh 1940). Shape of breast patch is variable but typically U-shaped and may be buff, cream colored, white, ochreous, yellow (Allen 1938; Fetherstonhaugh 1940, 1948; Pocock 1932), or entirely absent (Nowak 1991). Such contrasting color patches may be used to intimidate rivals by accentuating a bipedal threat posture (Ewer 1973; Searle 1968). A reddish bear lacking the chest mark occurred in southeastern Sabah, Borneo (Payne and Francis 1985). Paws are often peripherally brown or tan (Fetherstonhaugh 1948; Pocock 1932).

Birth weight was 300 g for a captive-born cub (Dathe 1970) and ca. 325 g on average (Dathe 1975). Pelage of infants is gray-black with a dirty white U-shaped mark on the chest and a white or pale brown muzzle (Feng and Wang 1991). Pelage of young Ma-

layan sun bears may appear dusky-brown, particularly in sunlight (Fetherstonhaugh 1948).

Average cranial (Fig. 2) measurements (in mm; *SD* and *n* in parentheses) of male and female Malayan sun bears, respectively, are: greatest length of skull, 264.5 (10.2, 4), 226.1 (17.6, 3); condylobasal length, 241.3 (4.4, 3), 211.7 (18.7, 3); zygomatic width, 214.6 (6.4, 4), 178.6 (18.7, 3); mastoid width, 170.2 (4.1, 4), 143.1 (16.3, 3); interorbital breadth, 70.5 (2.4, 4), 58.4 (7.6, 3); maxilla width, 76.2 (4.6, 4), 64.3 (9.6, 3—Pocock 1932). Additional measurements are in Allen (1938).

DISTRIBUTION. *Helarctos malayanus* inhabits Laos, Malaysia, Thailand, Myanmar (Burma), Kampuchea (Cambodia), Sumatra, Borneo, Vietnam, and perhaps Bangladesh (Fig. 3; Mills and Servheen 1991). *H. malayanus* formerly inhabited the southern part of Yunnan Province of China, where an adult female was captured in 1972 (Yi-ching 1983), but the Malayan sun bear's existence in China is doubtful (Servheen 1990). It reportedly occurred in Tongking just south of the southern Yunnan border (Allen 1938). The Malayan sun bear was formerly a resident of India (Cowan 1972) but is now believed to be extinct there (Mills and Servheen 1991). Malayan sun bears formerly occurred in the eastern forests of Bangladesh along the borders with India and Myanmar, but they no longer inhabit the area (Khan 1984). However, a few sightings have occurred in the Chittagong Hills of Bangladesh (Servheen 1993). *H. malayanus* is found throughout the forests of Thailand

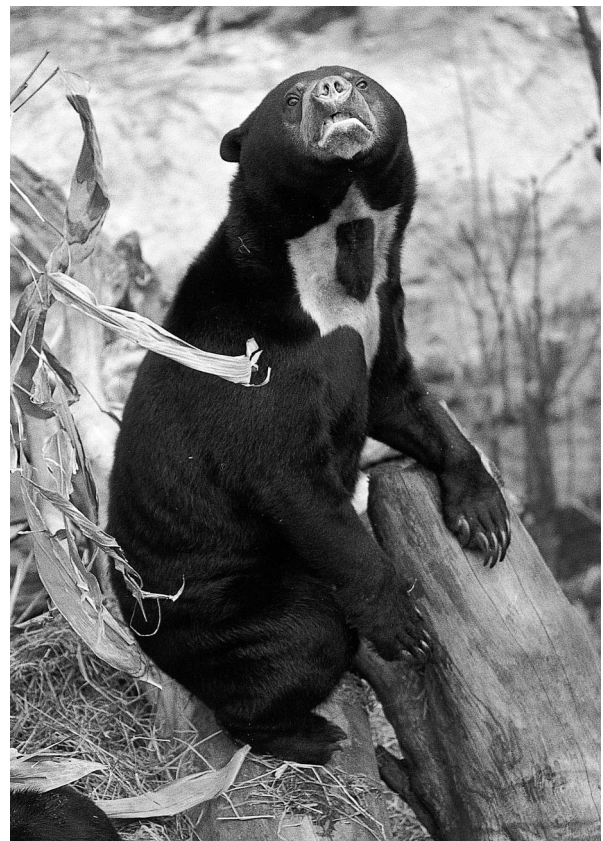


FIG. 1. Adult *Helarctos malayanus* at Woodland Park Zoo, Seattle, Washington. Photograph by C. Fredricks.



FIG. 2. Dorsal, ventral, and lateral views of skull and lateral view of mandible of *Helarctos malayanus* (#54316, Chicago Field Museum, Chicago, Illinois). Greatest length of skull is 232 mm. Photograph by Y. Ptersyzan.

but is most common in the south (Lekagul and McNeely 1977), and its distribution may be restricted by limited forest areas and seasonal burning (Rabinowitz and Walker 1991). In Myanmar, *H. malayanus* is most numerous in densely forested areas of the far north and far south (Cowan 1972). The Malayan sun bear was reported as common in northern Sarawak, Borneo, based on 3 observations made by T. Harrison and the frequent harvest for its skin by Kelabits (Davis 1958). The species also occurs on Borneo in the states of Sarawak and Sabah and on Sumatra in the state of Kalimantan (Servheen 1990). Laos may be one of the last strongholds for the Malayan sun bear because of its rugged terrain, sparse human population, and extent of forested land (Mills and Servheen 1991). Two Malayan sun bears, including a headless corpse, were observed in semievergreen forest study areas in Xe Piane, Dong Hua Sao, and Phou Xang He, Laos; scratch marks attributed to this species were

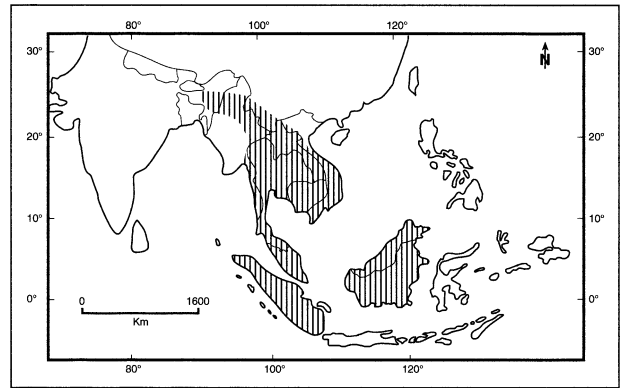


FIG. 3. Distribution of *Helarctos malayanus* (modified from Servheen 1990).

also observed throughout these areas (Duckworth et al. 1994). The status of *H. malayanus* in Cambodia is unknown, but illegal trafficking of Cambodian sun bears into Thailand has been documented (Mills 1991). No information was available on *H. malayanus* in Vietnam (Servheen 1990), but the species may inhabit that country (Servheen 1993).

FOSSIL RECORD. Although no fossils of *H. malayanus* are known, the species descended from *Ursus minimus*, a widespread Late Pliocene bear that was similar in size to *H. malayanus* (O'Brien 1993).

FORM AND FUNCTION. Zygomatic arch is wide, but jugal is slender (Allen 1938). A distinct sagittal crest occurs in adult animals. Paraoccipital process is large, blunt, and protrudes downward. Upper alveolar line may extend posteriorly and cut upper portion of glenoid cavity and upper edge of auditory meatus (Allen 1938). Rhinarium extends to upper lip, with its lateral portions extending beyond and concealing the septum when viewed laterally (Pocock 1917). Lips are protrusible (Pocock 1932), and tongue is long (Yin 1967). Both these features may be adaptations for extraction of honey and larvae from bees' nests (Morris 1965). *H. malayanus* has the highest cephalization within Fissipedia (Röhrs et al. 1989).

The shortened snout of *H. malayanus* may be related to contraction of upper toothrow and loss of P2 (Allen 1938). P3 abuts posteroinferior base of canine, and their sockets are continuous. Canines are extremely stout and powerful and have a narrow compressed ridge on their posteroexternal border. M1 is nearly square, with its outer cusps higher than inner cusps. M2 is slightly longer than M1, with a contracted posterior heel (Allen 1938). *H. malayanus* often lacks some premolars; thus, dental formula is $i\ 3/3, c\ 1/1, p\ 3-4/3, m\ 2/3$, total 38–40 (Allen 1938; Lekagul and McNeely 1977). Tooth enamel of *H. malayanus* exhibits only undulating Hunter-Schreger bands (Stefen 2001).

Forelimbs of *H. malayanus* are bowed, and paws turn inward, a likely adaptation for arboreality (Pocock 1932). On the basis of multivariate analyses of the morphology of the shoulder girdle, *H. malayanus* may be closest to *Ailuropoda melanoleuca* with respect to its arboreal adaptations (Oxnard 1968). This includes the degree to which the shoulder can withstand tension.

A 27-year-old Malayan sun bear had mild to severe multifocal ballooning of myelin sheaths within dorsal and ventral lumbar intradural nerve rootlets (Anderson et al. 1993). Ursodeoxycholic acid of gall bladder bile averaged 8% for *Helarctos* compared with 17%, 19%, and 39% for *Ursus maritimus*, *Ursus arctos*, and *Ursus americanus*, respectively (Hagey et al. 1993).

ONTOGENY AND REPRODUCTION. First estrus in a captive *H. malayanus* was at 3.5 years, but 1st conception was 3 years later (Dathe 1970). Sexual maturity occurs at 2–3 years of age (Feng and Wang 1991), and females can enter estrus and mate year-round (Dominico 1988). Behavioral estrus usually lasts 1–2 days but will range up to 5–7 days (Johnston et al. 1994). Litters consist of 1 or 2 young (Medway 1969). At the Fort Worth Zoo in Texas, 3 pregnancies lasted 174, 228, and 240 days (McCusker 1974). At the East Berlin Zoo in Germany, all gestation periods

were 95–96 days (Dathe 1962, 1970). Two gestation periods resulted in successful pregnancies within a single year possibly because the 1st cub was removed and hand-reared after 7 weeks (Dathe 1962). Gestation for a hybrid *H. malayanus* × *M. ursinus* cub born at the Tama Zoo in Tokyo was 95 days (Asakura 1969). The prolonged gestation and altricial development of young suggest delayed implantation (Johnston et al. 1994; McCusker 1974).

Malayan sun bears are born deaf, with eyes closed. Eyes open at 25 days of age, but cubs remain blind until 50 days old (Feng and Wang 1991). Hearing gradually becomes sharper over the first 50 days (Feng and Wang 1991). In captivity, milk canines were shed in the 7th month, and complete adult dentition was acquired at ca. 18 months (Medway 1969).

Cubs require external stimulation of their alimentary systems for urination and defecation during the first 2 months. In the wild, this stimulation is provided by the mother bear's licking, but in captivity cubs must be sponged several times a day to stimulate elimination (Shepard and Sanders 1985).

In the wild, cubs are typically sheltered between the buttress roots of large trees in dense evergreen forest (Medway 1969; Yin 1967). In Tenasserim, Myanmar, cubs are born at the onset of the hot weather (Yin 1967). Cubs are carried by the head in the mother's mouth (McCusker 1974). *H. malayanus* spends a large portion of time above ground to feed and to escape predators such as tigers (*Panthera tigris*—Servheen 1993) and may sleep in trees (Fetherstonhaugh 1940) 2–7 m above ground (Nowak 1991). *H. malayanus* builds mats or nests in trees by breaking or bending tree branches (Lekagul and McNeely 1977). Malayan sun bears climb freely and leave characteristic claw marks on trees (Medway 1969).

ECOLOGY. In Thailand, *H. malayanus* inhabits dense forests up to 2,500 m (Lekagul and McNeely 1977). In Borneo, it occurs up to 2,300 m (Corbet and Hill 1992) and in Indonesia, up to 2,800 m (Santiapillai and Santiapillai 1988). In Sabah, Borneo, *H. malayanus* is predominantly in dipterocarp forests but may also be in lower montane and swamp forests (Payne and Andau 1991).

Helarctos malayanus is the most arboreal of the ursids and feeds on fruits, small vertebrates, and honey (Ewer 1973). A pet Malayan sun bear dug up and consumed termites, larvae and their eggs, various other insects, wood lice, and earthworms (Fetherstonhaugh 1940). *H. malayanus* uses its claws to tear open hollow trees to obtain honey and bee larvae (Cranbrook 1991). *H. malayanus* is opportunistic (Servheen 1993) and will eat almost anything, including crops such as manioc and sweet potatoes (Harrison 1949). Malayan sun bears also eat the heart of coconut palms and may cause serious damage in coconut plantations (Dathe 1975; Lekagul and McNeely 1977).

Lifespan in captivity is 20 years, 6 months (Medway 1969), and up to 24 years, 9 months (Jones 1982).

BEHAVIOR. *Helarctos malayanus* may attack humans, particularly when injured or when with young (Harrison 1949; Medway 1969). *H. malayanus* in Thailand may charge without apparent warning or provocation (Lekagul and McNeely 1977); however, Malayan sun bears are inoffensive and timid if not bothered, and even a female with cubs will avoid a human if possible (Fetherstonhaugh 1940). Unprovoked *H. malayanus* attacks on humans may result from its poor vision, its timidity, or sudden confrontations, where flight appears impossible (Fetherstonhaugh 1940). *H. malayanus* often stands bipedally to get a better view of distant objects, when it encounters a threat (Lekagul and McNeely 1977), or to get a better scent of distant objects (Fetherstonhaugh 1940).

The Malayan sun bear in the wild may be solitary (Ortolani and Caro 1996). It is largely nocturnal (Lekagul and McNeely 1977; Medway 1969), but its activity may respond to human perturbations (Griffiths and van Schaik 1993). Malayan sun bears were largely diurnal (18%, $n = 28$) in an unperturbed area and strictly nocturnal (100%, $n = 4$) at a heavily traveled site on the basis of percentage of camera detections classified as nocturnal (Griffiths and van Schaik 1993).

Helarctos malayanus makes grunting and snuffling noises while searching for larvae and adult insects (Fetherstonhaugh 1948). Occasionally, it produces hoarse grunts or loud roars that may be confused with those of the adult male orangutan (*Pongo pygmaeus*). Rarely, Malayan sun bears give short barks like those

of muntjac (*Muntiacus*) or rhinoceros (*Dicerorhinus sumatrensis*—Payne and Francis 1985).

GENETICS. *Helarctos malayanus* has a diploid number of 74 chromosomes (Nash and O'Brien 1987). Chromosomes of *H. malayanus* differ from those of other ursines in having a paracentric inversion in chromosome 14, having a pericentric inversion in chromosome 18, lacking a negatively stained stalk with a light terminal satellite on chromosome 25, and having a reduced short arm of chromosome 34 (Nash and O'Brien 1987). The latter 2 chromosomal traits are shared by *U. arctos*.

Nei's genetic distance estimated between *H. malayanus* and *U. arctos* (0.026) was smaller than that between *H. malayanus* and *U. thibetanus* (0.037) and that between *H. malayanus* and *M. ursinus* (0.050—Goldman et al. 1989). Thus, morphological divergence of *H. malayanus* and *M. ursinus* is likely because of recent adaptive change ca. 5–7 million years ago (Goldman et al. 1989). Hybridization of *H. malayanus* and *M. ursinus* further illustrates the genetic proximity of these bears (Van Gelder 1977).

Helarctos malayanus may be the closest relative of *U. americanus*, as inferred from mitochondrial DNA sequences of D-loop region, cytochrome *b*, 12S rRNA, tRNA^{Pro}, and tRNA^{Thr} (Zhang and Ryder 1994). Alternatively, the Malayan sun bear may be closest to the *U. arctos*–*U. maritimus* clade, the most recently derived ursines, on the basis of complete sequences of cytochrome *b*, tRNA^{Pro}, and tRNA^{Thr} (Talbot and Shields 1996). *U. americanus* and *U. thibetanus* have been placed as sister taxa diverging from the ursine lineage ca. 6 million years ago, with *H. malayanus* diverging ca. 5 million years ago (Talbot and Shields 1996).

CONSERVATION STATUS. Malayan sun bear numbers are declining drastically because of habitat destruction and poaching for bear parts used in exotic foods, medicines, or aphrodisiacs (Mills and Servheen 1991). *H. malayanus* may be threatened by demand from Japan and Korea for bear gall bladders for medicinal uses (Payne and Andau 1991).

Helarctos malayanus is an Appendix I species of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); thus, all international trade is prohibited (Mills and Servheen 1991). However, not all countries within the bear's range accept CITES. *H. malayanus* is listed as Vulnerable according to the International Union on the Conservation of Nature and Natural Resources (Corbet and Hill 1992).

Throughout its range, wildlife law enforcement is limited or nonexistent (Mills and Servheen 1991). Malayan sun bears are protected in Laos (Mills and Servheen 1991). In peninsular Malaysia, capture or trade in Malayan sun bears is prohibited under the Wildlife Act of 1972 (Mills and Servheen 1991). In Sabah, the Malayan sun bear is listed as a game species despite its Vulnerable status (Mills and Servheen 1991). The Wild Animals Reservation and Protection Act prohibits hunting, buying, selling, and consumption of Thailand's native bears without the government's permission. The same act allows every Thai to keep as pets 2 of any wild species (Mills and Servheen 1991), thus allowing a legal loophole for wildlife trafficking (Mills 1991; Mills and Servheen 1991). The Burma Wildlife Protection Act of 1936 protects all species within reserve forests; however, neither *H. malayanus* nor *U. thibetanus* was protected outside those reserves as of 1988. The Wildlife Protection Ordinance of 1931 prohibits hunting, capture, trade, transit, export, and possession of Malayan sun bears in Indonesia. In China, the Malayan sun bear is a Class I protected species under the Wildlife Protection Law and therefore is protected by the central government (Mills and Servheen 1991).

REMARKS. The Bornean *H. euryspilus* was separated from the Sumatran *U. malayanus* described by Raffles (Horsfield 1825). Specimens from China were named *H. annamiticus* on the basis of slight differences in muzzle slope and cheek teeth compared with the Sumatran bears (Heude 1901). A subspecific epithet *wardi* was applied to an actual *Helarctos* skull on the basis of a similar skull previously reported from Tibet with a thicker coated skin (Lydekker 1906). However, this Tibetan skull and skin specimens were clearly *Selenarctos* (presently *U. thibetanus*); therefore, the epithet *wardi* is unfounded (Pocock 1932).

Etymology of the generic name is *hela* (Greek meaning sun) and *arcto* (Greek meaning bear), therefore *Helarctos* refers to sun bear. The Malayan sun bear is also called Malayan bear (Fetherstonhaugh 1940, 1948), Malay bear (Davis 1958), sun bear (Corbet

and Hill 1992; Cranbrook 1991; Mills 1991), and honey bear (Harrison 1949). In German, the species is Malaienbär and in French it is Ours de Malaisie (Trense 1989). In Malay, an adult *H. malayanus* is known as Bruan (Trense 1989), Bruang (Trense 1989; Yin 1967), or as Beruang Orang, meaning man-bear. Small or young bears are Beruang Anjing, meaning dog-bear (Fetherstonhaugh 1940). In Burmese, *H. malayanus* is called Khwe-wun or Wat-wun, in Chinese it is Yun-king, in Kachin it is Tsap, in Karen it is Ta-thu or Mu-thu, in Mongolian it is Men-kloit, in Shan it is Mi-kong (Yin 1967), and in Thai it is Mi-Maa or Mi-Khon.

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