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REVIEW

The Importance, Issues and Challenges of Large Mammal's Conservation in Malaysia

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ABSTRACT

Malaysia's biodiversity is one of the most important factors that have made the country a habitat for numerous species. Where the tropical climate and rainforests provide an ideal habitat for numerous plants and animals. Massive mammals are among the most important creatures found in Malaysia, and the Malaysian peninsula is home to unique species of mammals. Due to the modification of their living environment, urban development, urban expansion, and population growth have significantly reduced the number of these mammals. Damage to habitats and a decline in large mammal populations have had far-reaching consequences for the ecosystem, with the potential for the impact to worsen over time. In this study, we shed light on several mammalian species native to the Malaysian peninsula that are in danger of extinction due to an imbalance in their environment and propose several solutions that could mitigate several of the factors that contribute to their population decline.

Keywords: Asian elephant, Biodiversity, Gaur, Large mammals, Malayan tiger, Malayan tapir

1. Introduction

The biological diversity of Malaysia's wildlife is high because the country's land covers large swaths of tropical rainforest, which in turn is home to a wide range of plant and animal life. At least 361 distinct mammal species exist today. Large mammals tend to be rarer and less numerous in Malaysia's rainforests than they are in the country's seasonal and open habitats, and this is largely because of the scarcity of the food these animals need to survive [1, 2]. For survival, these mammals need a lot of food and lots of space, but as land is used for other things, the chances of them surviving and being available decrease [3]. A major threat to natural ecosystems is posed by the global expansion of agricultural lands, which have displaced forested areas and areas rich in biological diversity. This expansion is a result of agriculture and the modern techniques used in agriculture. This effect, caused by the conversion of vast swaths of tropical forest to palm oil plantations, was seen clearly and dangerously in Southeast Asian rainforests [4].

There are about 5.22 million acres (5,220,000 km^2) of palm oil plantations in Malaysia, Because of this, there is a serious risk to the biodiversity of the rainforest if this cultivation is allowed to expand [5, 6]. There has been a decline in biological diversity as a result of the conversion of forestland into palm oil plantations, with a 62% decline in vertebrate species and an 11% decline in invertebrate species between palm groves and forests [7, 8]. About 71 mammal

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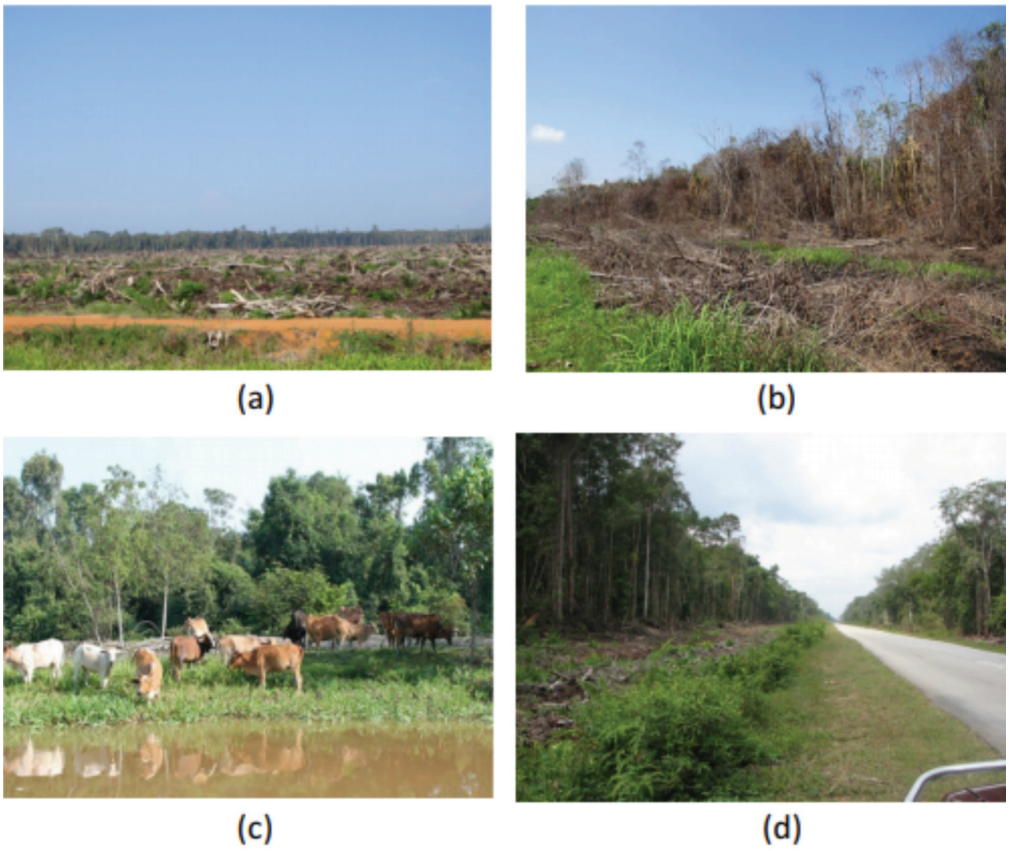

Fig. 1. (a) Cleared forest areas for oil palm expansion. (b) Illegal activities fires. (c) Livestock breeding areas. (d) Roads.

species in Malaysia are in danger due to deforestation and forest fragmentation, especially large mammals that require extensive habitats and large amounts of food [9]. Human population density is a major factor in determining the extinction risk for these mammalian species due to the many ways in which humans reduce their numbers through hunting, habitat destruction, and predation [10, 11]. Many human activities, such as clearing land for palm oil farms, cattle ranches, or roads in the northern Selangor region/Malaysia, and even forest fires, threaten the survival of the forests that are home to these mammals as shown in Fig. 1 [12].

This alteration and fragmentation of habitats increases human access to these rainforests for hunting purposes, disrupts movement patterns near forest edges, and leads to an increase in conflict between humans and these mammals [13]. Numerous large mammals once found in Malaysia, such as the Java rhinoceros (*Rhinoceros sondaicus*) and the banteng (*Bos javanicus*), have vanished. Forest conversion, habitat loss, and rising consumer demand for wild meat all play a role in the illegal trade of mammalian body parts. This review will highlight some species of mammals that are in critical situations and its highly vulnerable to extinction in the coming years.

2. Large mammals threatened with extinction in Malaysia

There are about 6 critically endangered species, 17 endangered species, and 28 vulnerable species in Malaysia, according to the International Union for Conservation of Nature shown in Fig. 2 [14, 15]. The gaur, the Asian elephant, the Asian tiger, and the Malayan tapir are four examples of endangered mammal species that will be discussed in this report.

2.1. The gaur

Among the largest of the Bos genus of mammals is the Guar, also known as the Seladang in its native Malaysia. Malayan tigers are easily recognizable due to their brown fur and broad shoulders. The white coloration of its legs and the white socks it appears to be wearing are both shown in Fig. 3 [16, 17]. The Asian Wild Cattle Assessment and Management

Fig. 2. 10 Endangered mammals in Malaysia.

Fig. 3. Male Malayan gaur.

Plan has identified three distinct subspecies of gaur: *B. gaurus gaurus* in India and Nepal, *B. gaurus laosiensis* in the area spanning from Myanmar to China, and *B. gaurus hubbacki* in Thailand and Malaysia. According to field-based assessments, there are an estimated 15,000–35,000 wild gaurs living in South and Southeast Asia. While the wild gaur is found in South Asia and Southeast Asia, its worldwide population has decreased by almost 80% in the last century [18]. India is home to the greatest population of the gaur in South and Southeast Asia. The center, south, and northeastern regions of India have the highest population densities. Nevertheless, across its geographical ranges in South and Southeast Asia, the gaur population has been shown to encounter several forms of threats, including poaching, introgression, and habitat degradation. As a result, the population of gaurs has reached a vulnerable position [19].

The Guar are represented among the most endangered species on the International Union for Conservation of Nature (IUCN) Red List [19]. In 2001, there were roughly 500 Guar, but by 2007, that number had dropped to between 273 and 333. Statistical data from the Department of Wildlife and National Parks in 2005 (DWNP). Due to their dwindling numbers, the DWNP has instituted a conservation strategy for these mammals in Malaysia, reserving habitat

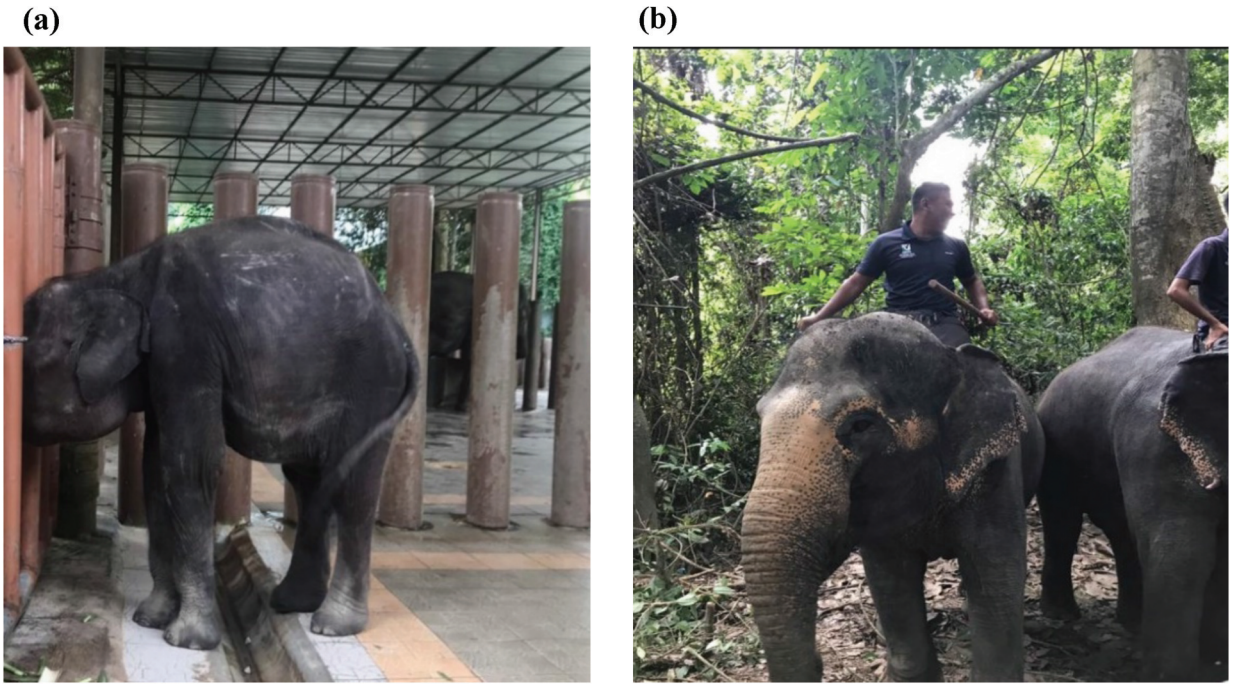

Fig. 4. (a) Baby for Asian elephant inside Kuala Gandah National Elephant Conservation Centre. (b) Asian elephant with the trainer.

for them in protected areas like the Jenderak Selatan Wildlife Conservation Centre (Pahang), the National Zoo, the Taiping Zoo, the Malacca Zoo, and the Sungkai Wildlife Reserve (Perak). There have been multiple efforts to study and hopefully increase the population of this species. Studies on nutrition, inbreeding, insemination, sperm development, and inbreeding, as well as studies on genetics and how they affect reproduction and genealogical relationships, all fall into this category, conservation of the species. The Gaur is currently legally protected across the country and is listed on CITES Appendix I [18].

2.2. Asian elephant

Elephus Maximus, also called the Borneo pygmy elephant, is a small species of elephant found in parts of Malaysia and Indonesia. It was declared an endangered species in 1986. Where its population has dropped by half in the span of three generations [20, 21]. However, *Elephus Maximus* is in danger of going extinct because of deforestation and rainforest degradation and fragmentation [22]. The Asian elephant, *Elephus maximus*, is one of the largest terrestrial animals in the world. However, it is considerably smaller than its African counterpart [23, 24].

The destruction and fragmentation of natural habitats and the degradation of vegetation in the Malaysian peninsula have put Asian elephants at risk of extinction. These animals require large areas to roam freely, and the loss of rainforests has brought them into conflict with humans and made them easy targets for poachers. As a result, they have taken to destroying crops and directly confronting farmers to compensate for the shrinking size of their natural habitats [25]. Animal Conservation and National Parks Department, Malaysia translocation of elephants from areas converted to palm oil plantations to protected areas and thriving forests began in 1974 [26]. One of the most effective means of preventing the extinction of these elephants is translocation, which entails changing their habitat and relocating them to a more secure location, as well as increasing their numbers through careful management and limited reproduction. The primary objective of translocation is to reduce wildlife conflicts [27]. The fact that it must share habitats with humans, putting it in constant danger of conflict with humans, is one of the greatest challenges this species of elephant faces. As of now, they only exist in scattered pockets across 13 different Southeast Asian states, and 78% of them have gone extinct [28]. When visiting the Kuala Gandah National Elephant Conservation Centre, can observed that a herd of well-trained elephants assists the staff in preparing a new elephant for its new home. Kuala Gandah, in the Malaysian state of Pahang, is home to a conservation center that is well-equipped to relocate Asian elephants and monitor their reproduction and care for their young Figs. 4a and 4b.

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Fig. 5. The Malayan tiger (*Panthera tigris jacksoni*).

2.3. The Malayan tiger

The Malayan tiger (*Panthera tigris jacksoni*), one of the distinct species of tigers located on the Malaysian peninsula, is regarded as one of the smallest species of tigers in the world showed in Fig. 5 [29, 30]. This tiger inhabits the forests of the Malaysian states of Pahang, Perak, Kelantan, and Terengganu [31, 32]. According to the National Action Plan in Malaysia, efforts are currently concentrated on the Belum-Temangor Forest Complex, Taman Negara, and the Endu-Rompin Forest Complex, all of which are home to the Malaysian tiger. According to Appendix I of the Wildlife Conservation Act of Malaysia, the Malayan tiger is totally protected because it is on the International Union for Conservation of Nature (IUCN) Red List of endangered species [33].

From around 3,000 in the early 1950s to around 250 in the early 1980s, the number of tigers on the Malaysian peninsula dropped dramatically. For this reason, the Wildlife Protection Act of 1976 was enacted to save tigers [34]. Prior to 1997, there are no accurate records of the tiger's whereabouts. The confrontation between humans and tigers, as well as their presence on agricultural grounds, was the subject of these reports from 1997 to 1999. Within the aforementioned four states, the territories of the tiger have been discovered, and the estimated number of tigers ranges from a few hundred to 500. Inasmuch as the habitats on the Malaysian peninsula are optimal (lack of hunting, plenty of prey), they can house between 493 and 1480 adult tigers [35, 36].

Tigers have an important and key role in the ecosystem, as they have a vital and effective role as a predator located at the top of the food chain, and scarcity of tigers leads to an increase in many species such as ungulates and cause an unbalanced growth of plants. The insufficient awareness of this vital role and the overhunting of these tigers led to this noticeable decrease in their numbers (WWF, 2017). Due to overfishing and a shortage of prey, the population of tigers in Belum-Temengor dropped by approximately 60% within 7–8 years, from 60 to only 23 individuals in 2019 [37]. Many initiatives have been employed to conserve and safeguard these tigers from extinction, including monitoring tigers and their prey as well as preventing interaction with humans. Typically, camera traps and tiger feces are collected to determine the type of feeding and track their mobility when attempting to halt the trafficking of tigers [38].

Due to the huge space requirements of tigers, WWF has conducted multiple studies to identify and create biological corridors that will connect the fragmented tiger habitats. Together, WWF and TRAFIC, a global network monitoring wildlife trade, devised plans to reduce tiger-parts trading and eliminate criminal wildlife trade networks [39]. All countries with tiger populations have signed on to the Global Tiger Recovery Program (GTRP), which aims to more than double the number of wild tigers by the year 2022. The GTRP will fund the National Tiger Recovery Priorities and the tiger CONSERVE plan outlined in Malaysia's National Tiger Conservation Action Plan (NTCAP), which established 'net loss and forest benefit' as a metric for tracking conservation activities, among other measures like tiger occupancy (prey or absence of tiger occupancy) [40].

2.4. Malayan tapir

One of the four largest species of tapir, the Malayan tapir *Tapirus indicus* is found exclusively in Asian locations Fig. 6. It is also known as the Asia tapir, the Oriental tapir, and the Indian tapir. The regions of eastern India are indicated by the scientific name given to Malayan tapir Tapirus [41]. As well as consider one of the major mammals in danger of extinction is the Malayan tapir, which can be found in great numbers on the Malaysian peninsula, especially in the areas of wetlands and forests with lowlands where the Asian elephant and tiger are also located [12]. According to the Department of Wildlife and the National Park (DWNP), which is making concerted efforts to protect the Malayan tapir, there are between 1100 and 1500 Malayan tapirs on the Malaysian peninsula. About 15 tapirs were saved thanks to translocation and subsequent isolation from the human forces that risk their survival. The cost of the translocation process has been high, but it has been justified by the need to save the animals. Providing new and secure habitats for endangered species, as well as working to increase existing species within the new habitat or create new groups, is an

Fig. 6. The Malayan tapir.

important part of the translocation strategy used to conserve endangered species and reduce the likelihood of extinction for the species involved [42].

The tapir is classified as a species in danger of extinction. Since this tapir is a strong swimmer and can traverse rivers with ease, its inclusion has hastened the development of swift protection measures that will assist it in safely maintaining a stable internal temperature. DWNP studies in the Krau Wildlife Sanctuary and elsewhere have found that tapirs are more commonly spotted in the vicinity of water sources like rivers and wetlands than they are in forests. On average, 44 tapirs were killed and relocated per year from 2012 to 2014 as a result of road killings and conflict between humans and wildlife (WHC) caused by the conversion of rainforests on the Malaysian peninsula to palm oil plantations and rubber plantations [43].

3. Suggested solution

To save endangered mammalian species indigenous to the Malaysian peninsula, a comprehensive strategy including habitat preservation, anti-poaching initiatives, community engagement, and scientific investigation is needed [44]. Here are some solutions:

1. Increase the protected areas: Enhance and establish more national parks and wildlife reserves with restricted human activity to safeguard crucial ecosystems. Establish wildlife corridors to link fragmented habitats, enabling animals to move, locate mates, and access resources [45].
2. Habitat Restoration: Reforestation and rewilding include the restoration of damaged ecosystems by the planting of indigenous plants and the reintroduction of important species to restore ecological balance. Encourage sustainable agriculture techniques and land-use planning that limit the degradation of habitats in order to achieve sustainable land use [46].
3. Anti-Poaching and Law Enforcement: Efforts to combat poaching and enforce laws related to it and enhance the legal frameworks by implementing more stringent penalties and enforcing them rigorously to discourage those involved in poaching and illicit wildlife trading. Global collaboration: Engage in cooperation with adjacent nations to prevent the illegal trade of wildlife across national borders. Enhance patrols and surveillance, augment ranger training and equipment: Provide more resources to equip and educate a greater number of park rangers, enabling them to effectively monitor protected areas. Utilize cutting-edge technology like drones, video traps, and satellite surveillance to identify and deter poaching operations [47].
4. Community Involvement and Education Community-Based Conservation: Community responsibility Engage local populations in conservation endeavors via the provision of incentives and ecologically friendly alternative means of earning a living. Ecotourism advocates for the promotion of tourism activities that provide economic advantages to local people,

while also prioritizing the protection of wildlife and habitats [48].

4. Conclusion

Large mammals play a crucial role in the food chain and regulate the existence and availability of numerous plant and animal species; any imbalance in the preparation of these creatures will result in an imbalance in the ecosystem. This effect may not be obvious now, but it will manifest in the future. The primary issue is that people are unaware of the value and significance of these creatures' presence. However, its significance must be defined in order to comprehend the gravity of its decline or extinction. We notice that humans played a huge and influential part in causing the extinction and demise of many of these mammalian species, which is mirrored by a limited positive role attempting to save the remaining species. There are numerous strategies and methods currently in use that have proven their worth in preserving many species at risk of extinction, but they require additional logistical and financial support, as the amount of money spent on these strategies, no matter how high, is considered insignificant compared to what we take from nature, which is considered real wealth.

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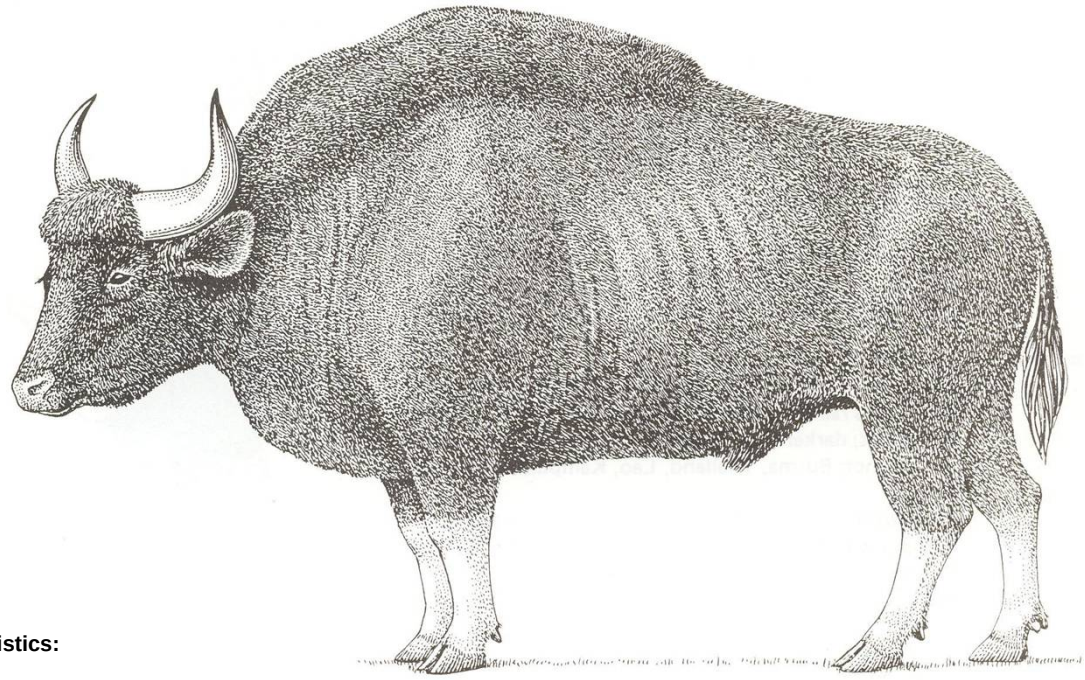
Order Artiodactyla / Family Bovidae / Subfamily Bovinae **APPENDIX I**

Bos gaurus

H. Smith, 1827

Common names:	engl.:	Gaur, Indian Bison	hindi:	gaur, gaur gai
	esp.:	Gaur	tamil:	kadu yethu, karthee, kattu erumai
	fr.:	Gaur	burm.:	katu poth, peoung
	de.:	Gaur, Dschungelrind	malay:	seladang
	ital.:	Gaur	thai:	krating

Scientific synonyms:
Bos frontalis Lambert, 1804
Bos gour Hardwicke, 1827
Bibos subhemachalus Hodgson, 1837
Bos cavifrons Hodgson, 1837
Bos gaur Sunclevall, 1846
Bos asseel Horsefield, 1851



Characteristics:

Adult:

General appearance:	Huge head, massive body, sturdy limbs. On their shoulders gaur have a striking muscular ridge that slopes down to the middle of the back, where it ends in an abrupt dip. Among the largest of bovines.
Measurements:	HB 260-330 cm, H (shoulder) 160-210 cm, T 85-100 cm, horns 60-115 cm.
Weight:	600-1000 kg.
Hair:	Short and glossy; adults, especially bulls are almost hairless except on the head, chest, underparts and the lower parts of the legs.
Colour:	Deep brown, old bulls tending to jet black, cows to reddish; underparts brownish black to yellow earth; upper part of the forehead and the nape buffy grey or whitish; white stockings from the wrists and heels down.
Ears:	Large and broad.
Horns:	Crescent shaped, curving upward and backward and tapering to a sharp point; creamy yellow with black tips; distinct hairy ridge between the horns.
Tail:	Tufted.
Sexual dimorphism:	Cows are about 10 cm shorter in height, 150 kg lighter; horns are less strong, tending to different colouration.
Juvenile:	Coat reddish brown with black dorsal stripe and light legs.

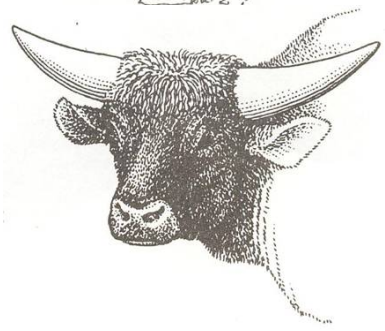
Distribution: India (three widely separated areas), Nepal, Burma, Thailand, PR China (extreme south of Yunnan only), Lao, Kampuchea Dem., Viet Nam, Malaysia (Malay Peninsula only).

Population:

Wild population: Numbers in the thousands; declining throughout due to habitat destruction and disturbance (agricultural development, human settlement, extensive logging etc.), indiscriminate hunting and exposure to diseases of domestic cattle; IUCN Red Data Bock: vulnerable.

Captive population: The international Zoo Yearbook reports 50.72.3 *B. gaurus* in 20 collections in 1982.

Trade: 8 live specimens recorded by CITES Parties in 1982/83 (zoo exchanges).



Intraspecific variation: Four subspecies:
B.g. gaurus: Characteristics see above; India, Nepal.
B.g. readi possesses a dewlap and a fringe of hair at the throat; darker than *B.g. gaurus;* ridge between horns is less distinct; Burma, Thailand, Lao, Kampuchea Dem., Viet Nam.
B.g. hubbacki (seladang) has no ridge between the horns; a whitish band may appear over the muzzle; Malay Peninsula.
B.g. frontalis (gayal, mithan) is the domesticated form; smaller than the wild forms; shorter legs; less distinct ridge along the back; head shorter, forehead broader and more flat; horns shorter and sturdier, with little upward curvature; interbreeding with wild gaur produces intermediate forms; India (Assam), Bhutan, Bangladesh, Burma.

Similar species: *Bos sauveli* (kouprey) (sheet A-119.009.002.005): Ridge on back is smaller; well-developed dewlap from throat to mid. chest; white stockings on legs have a streak of dark hair down the front; horns more curved, especially on cows, tips surrounded by rough, frayed tissue on adult bulls.

Bosiavanicus (banteng) is smaller and lighter in build; dorsal ridge much less prominent; bases of the horns are connected by a horny mass on old bulls; characteristic white rump patch; the most cowlike of all the wild bovines; domesticated forms abundant.

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