

THE PROBOSCIDEA

Evolution and Palaeoecology of Elephants and Their Relatives

Edited by

JEHESKEL SHOSHANI

Wayne State University, Detroit, Michigan USA and

Elephant Research Foundation, Bloomfield Hills, Michigan, USA

and

PASCAL TASSY

*URA 12. CNRS. Université Paris VI, Laboratoire de Paléontologie des
Vertébrés et de Paléontologie Humaine, Paris, France*

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Elephas maximus: status and distribution

RAMAN SUKUMAR AND CHARLES SANTIAPILLAI

INTRODUCTION

The present-day distribution of the Asian elephant (*Elephas maximus*) (Fig. 33.1) covers only a tiny fraction of its former extensive range. Six thousand years ago, its range extended from the Tigris–Euphrates Basin in Western Asia, eastward up to the Yangtze-Kiang, and perhaps even beyond this, in northern China. This distribution covered present-day Iraq and nearby countries, southern Iran, Pakistan, the entire Indian subcontinent south of the Himalayas, continental South-East Asia, a substantial part of China, and islands such as Sri Lanka, Sumatra, Borneo, and possibly Java.

Since then, it has disappeared from western Asia, a major part of the Indian subcontinent, substantial areas of South-East Asia,

and almost entirely from China. The domestication of the elephant is believed to have been first achieved by the people of the Indus Valley civilization about 4000 years ago, and its regular capture in large numbers on the Asian continent may have played a major role in the decline of wild elephants. The loss of habitat due to expansion of human settlements and agriculture has been the single most important factor causing a decline in elephant population. As settlements spread along river valleys and plains, the elephant was forced into the forested hills which were relatively inaccessible to people. During the twentieth century, even these last strongholds have been settled in many regions.

Elephas maximus is believed to comprise three subspecies (Shoshani and Eisenberg 1982): *E. m. maximus* (habitat, the island of Sri Lanka), *E. m. indicus* (habitat, mainland Asia), and

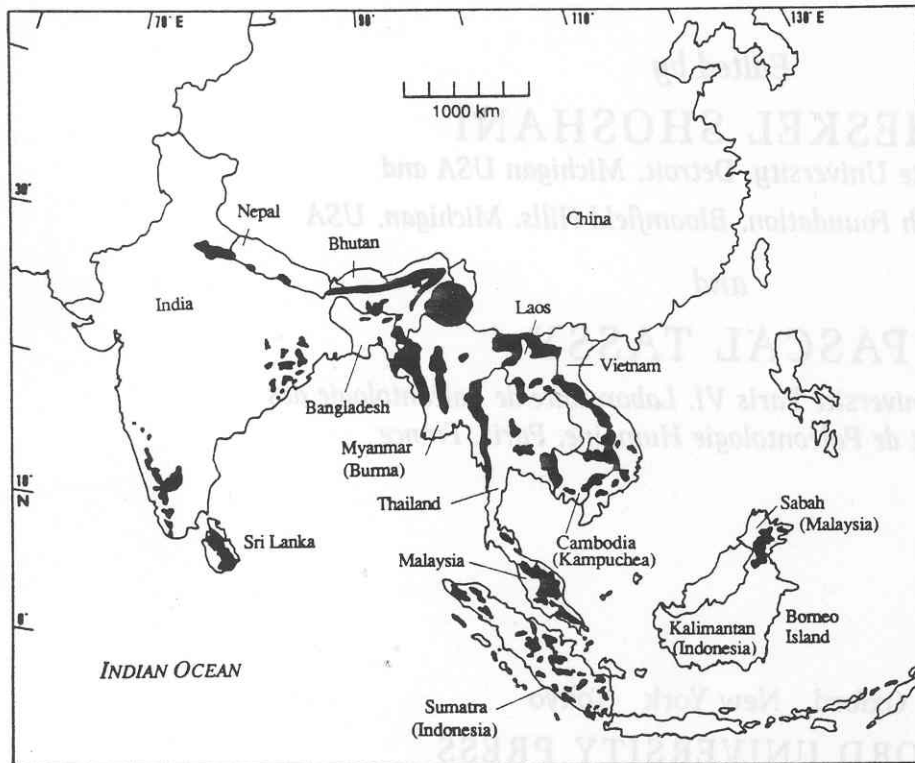


Fig. 33.1 The present-day distribution of the Asian elephant (*Elephas maximus*).

E. m. sumatranus (habitat, the island of Sumatra). Currently, the Asian elephant distribution covers an estimated 500 000 km², holding a total wild population of from 37 000 to 55 000 individuals. The population estimates are largely educated guesses. Objective estimates are available only from parts of India and Sri Lanka, and from one or two places in Sumatra and Thailand.

The account, by country, given below is based largely on Olivier (1978), Daniel (1980), Sukumar (1989), and Santiapillai and Jackson (1990), who, in turn, have drawn upon a variety of published and unpublished material, based on the work of the Asian Elephant Specialist Group of the International Union for Conservation of Nature and Natural Resources (IUCN), World Wide Fund for Nature (WWF), and wildlife administrators and researchers in the respective countries. The order in which the countries are discussed follows geographical proximity.

ACCOUNTS OF ELEPHANTS IN ASIA

INDIA

India holds the largest number of Asian elephants in the wild. There are between 20 000 and 25 000 elephants distributed over four widely separated regions — north-western, north-eastern, central, and southern India.

North-western India

The moist forests along the foothills of Himalayas in the state of Uttar Pradesh hold an estimated 750 elephants. Among the important elephant areas are Corbett and Rajaji National Parks and the Lansdowne Forest Division (Singh 1978). The habitat has been fragmented by an irrigation canal and recent human settlements including an army cantonment (Johnsingh *et al.* 1990).

North-eastern India

With 9000–12 000 elephants, this region is believed to hold the largest number in the country (Lahiri-Choudhury 1986). One large population of 3800–5800 elephants ranges along the Himalayan foothills from northern West Bengal, eastward through Assam and Arunachal Pradesh. The vegetation includes moist deciduous and evergreen forest. Key conservation areas include the Manas Tiger Reserve and Namdapha National Park. South of the Brahmaputra River, another large population of nearly 2000 elephants inhabits the alluvial floodplains of Kaziranga National Park and Nagaland hills. A third population of 2500–3500 elephants in the Garo hills and Khasi hills of Meghalaya is under severe threat from habitat loss due to extensive shifting cultivation. Small scattered populations have been observed in the Jainti hills, Tripura, Manipur, and Mizoram.

Central India

The elephants are largely confined to the states of Bihar and Orissa (Shahi and Chowdhury 1986), although, in recent years, they have also been moving into Madhya Pradesh and southern West Bengal, where they have been coming into serious conflict

with people. In Bihar about 65 elephants are found in the Palamau Tiger Reserve, 200 in the Singhbhum tract, and 70 in the Dalbhum tract. Orissa has an estimated 1300 elephants in a number of isolated populations, of which only 375 found in Simlipal Tiger Reserve and 300 in Satkosia Gorge Sanctuary seem to have some measure of security. The elephants of central India face severe threats to their habitat from degradation, shifting cultivation, mining, and replacement of natural forest by monoculture plantations.

Southern India

The elephant is distributed in the hill forests of the Western Ghats and adjoining portions of the Eastern Ghats in the states of Karnataka, Kerala, and Tamilnadu (Nair and Gadgil 1978; Nair *et al.* 1980; Sukumar 1986, 1989). About 10 000 elephants are found distributed as a series of at least 10 distinct populations. The largest population, conservatively estimated at 6000, inhabits the Nilgiri hills and Eastern Ghats. Sizeable numbers are also found in the Anamalai hills (800–1000) and the Periyar plateau (1000+). Elephant densities in some locations are among the highest in Asia and comparable to those for the African bush elephant. Nagarhole National Park, Bandipur Tiger Reserve, and Mudumalai Sanctuary in the Nilgiris, and Periyar Tiger Reserve have densities in the range of 1–3 elephants/km². The diverse vegetation types — evergreen forest, deciduous forest, and thorn scrub — available to elephants within a relatively small area are no doubt an important factor in supporting these high elephant densities. The main threats to the habitat come from developmental projects such as dams, tea and coffee plantations, agriculture, railway lines, and roads.

NEPAL

Nepal has few elephants that are resident. The present estimate is about 50–100 elephants in the country, of which most are migratory from the adjacent Indian state of Uttar Pradesh (Mishra 1980). Shukla Phanta Wildlife Reserve in the extreme west and Royal Chitwan National Park in the south are two areas where it may be possible to maintain viable populations. Expansion of agriculture along the sub-Himalayan tract in recent decades has been mainly responsible for the contraction of the elephant's range.

BHUTAN

Bhutan's elephants are partly or entirely shared with the Indian state of Assam. There has been no survey carried out but there are no more than 150 elephants that cross the border between the two countries. The Manas Wildlife Sanctuary is the most important area for elephants (Santiapillai and Jackson 1990).

BANGLADESH

Most of Bangladesh's elephants are found in the Chittagong Hills bordering India and Myanmar (formerly Burma). Estimates of

elephant numbers vary from 200 (Reza Khan 1980) to about 350 (Gittins and Akonda 1982). Some of these elephants undoubtedly move across international borders. Two reserves, one in the Chittagong tract and another in Cox's Bazaar, are being planned by the government for the protection of elephants.

SRI LANKA

As in other Asian countries, the elephant population on the island of Sri Lanka has declined drastically during the past century. The most recent estimate by A. B. Fernando (personal communication) is between 2500 and 3200. Elephants are found in the drier habitats to the north and eastern half of the country. The vegetation includes dry deciduous woodland, scrub, grassland, and marshes called *villus* in the floodpans of rivers. The highest densities of elephants probably occur in the south-east of the country in places such as the Ruhuna National Park and its environs.

The decline in elephant numbers can be traced largely to agricultural development, which has led to the pocketed herd phenomenon in many areas. The on-going Accelerated Mahaweli Development Scheme, involving the construction of a number of dams and the opening up of new areas for agriculture, is expected to further constrict the habitat for elephants. To cope with the anticipated fragmentation of habitat, the country has established a network of protected areas, linked wherever possible by corridors. Well-known reserves, where elephants can be seen, are Wilpattu in the north-west, Somawathiya, Wasgamuwa, and Maduru Oya in the Mahaweli Basin to the east, and Gal Oya, Uda Walawe, Lahugala, and Ruhuna in the south-east.

MYANMAR (FORMERLY BURMA)

Elephants are widespread in Myanmar as a large proportion (about 50 per cent) of the country is still under forest. Although elephants are seen over a wide variety of habitats, they are most plentiful in teak and bamboo forests that are extensive in many regions. Precise information on distribution is not available, but elephants are known to occur in five regions (Blower 1985). The Northern Hill ranges probably support the largest populations, including one of about 1600 in Myitkynia-Bhamo and another of about 1800 in the Irrawady and Chindwin Valleys. Sizeable numbers are also seen in the Western Hill ranges, particularly the Arakan Yoma and Chin hills, the Pegu Yoma in the central region, the eastern Shan states, and the Tenasserim Yoma in the south-west, bordering on Thailand.

Although information on population sizes is subjective, it is certain that Myanmar has the largest number of elephants after India. Considering the relatively extensive area still available to elephants, a conservative estimate of 5000–8000 elephants can be made for the wild population. One estimate by the government, however, puts the figure at 6520 elephants.

Myanmar still continues to capture elephants and this seems to be a cause for depletion of the wild population. In recent years the poaching of elephants on a large scale and the smuggling of

their products, including ivory and skin, into Thailand for sale seem to be common.

CHINA

The elephant which once extended further north of the Yangtze-Kiang has retreated entirely into the southern part of the province of Yunnan along the border with Myanmar and Laos (Gao 1981). The habitat here consists of broad-leaved mixed forest, bamboos, and grasslands. Only about 300–500 elephants seem to survive, largely in the Xishuangbanna Reserve (Santiapillai *et al.* 1991).

THAILAND

Thailand has lost a substantial amount of forest cover during recent decades, from 80 per cent of the country's area during the 1930s to only 30 per cent at present. The elephant populations have also declined and suffered in the process. Since Lekagul and McNeely's (1977) estimate of 2600–4450 elephants made in 1977, it seems that they have been further reduced (Dobias 1987).

The largest numbers of elephants occur in the north and west in the Tenasserim hill range along Thailand's border with Myanmar. The estimate for this region is 1300–2100 elephants. The hills have a diversity of vegetation types, including evergreen forest, but dry deciduous forests, bamboo forests, and grasslands predominate. Two protected area complexes, one in the north comprising Om Koi, Maetuen, and Mai Ping Reserves, and another in the west including the Huai Kha Khaeng, Thung Yai, Sri Nakin, and Erawan Falls Reserves, seem to offer the best hope for the elephants.

In the Petchabun mountains to the north, a population of 200–500 elephants is estimated to range over a mosaic of temperate and tropical forests. The important protected area complex for elephants includes Phu Kradung, Nam Nao, and Phu Khieo.

With 325–425 elephants, the Dangrak mountain range along the border with Cambodia (Kampuchea) to the south-east is another important elephant belt. At the western edge of the range, the complex of Khao Yai, Thapan Lan, and Pang Sida National Parks is one of the best protected. Khao Yai is probably the only place in Thailand where some objective information on elephant ecology and numbers is available. A density of 0.15 elephants km² or 225 elephants for the park has been estimated by Dobias (1985).

A significant population of 900–1500 elephants also occurs in peninsular Thailand to the south. These are believed to be scattered as numerous isolated populations. The Khlong Naka and Khlong Saeng Sanctuaries and Khao Sok National Park seem to be the most important elephant reserves.

Dobias (1987) estimates that only 1300–1700 of Thailand's elephants are found in the protected area network extending over some 25 000 km². The future of elephants seems largely tied to this network.

LAOS

About 40 per cent of Laos is still under forest, and thus it could be expected that elephants are still widespread in the country. There have been, however, no surveys of elephant distribution in Laos. It is believed that elephants are more widely distributed in the south, which has better forest cover (Sayer 1983). Significant populations also occur in central Laos, particularly in the provinces of Sayabouri (west of the Mekong River), Vientiane (Phou Khao and Khouly Massif), Balikhsamsay, and Khammouane (Nakai plateau). Some of these are shared with Vietnam. In the north, where shifting cultivation is extensive, elephants are seen only around Hong Sa, along the border with China.

A recent estimate by Venevongphet (1988) puts the wild elephant population in Laos at 2000–3000. This should only be taken as a rough approximation as it is not based on any objective census (Phanthavong and Santiapillai 1992).

CAMBODIA (ALSO KNOWN AS KAMPUCHEA)

As with some of the other countries, very little is known about the status of elephants in Cambodia. Elephants are found in three regions. The forests to the east, along its border with Vietnam, seem to be the most important habitat for them. Potentially, the Dangrak mountains to the west, along the Thailand border, are also a good elephant habitat. Similarly, one would expect elephants to be present in the rainforests of the Cardamon and Chuor Phum Damrei (Elephant) mountains to the south. Only an estimate of 1000–2000 elephants is available for this country.

VIETNAM

Elephants are found mainly along the western boundaries with Laos and Cambodia, and a series of isolated populations exists in interior southern Vietnam (Tuoc and Santiapillai 1991). As in the two neighbouring countries, both elephants and people face a risk from unexploded bombs and mines in the forests. Estimates range from 1500–2000 elephants (Vu Khoi 1988) to 500+ elephants (S. Dawson, unpublished).

PENINSULAR MALAYSIA

The clearing of peninsular Malaysia's equatorial rainforests for the commercial rubber and oil palm plantations has severely fragmented the elephant's habitat. Fewer than 1000 elephants may survive in the peninsula according to one estimate (Mohd Khan 1985). Many of these seem to exist as isolated herds which have no hope for the future. A well-organized programme of relocating such small elephant herds to more viable areas is in operation. Taman Negara, with its estimated 150–200 elephants in the central region, and Endau Rompin to the south offer the best prospects for conservation.

SUMATRA (INDONESIA)

Though widespread, the elephant is believed to be distributed as 44 distinct, small populations on the island of Sumatra (Blouch and Haryanto 1984; Blouch and Simbolon 1985; Santiapillai and Suprahman 1985). The habitat is almost entirely dense rainforest, often in hilly, inaccessible terrain. As in Malaysia, agricultural development in the form of rubber and oil palm, and the migration of people from Java, have been largely responsible for the reduction in forest cover.

Only 15 populations in Sumatra are believed to consist of over 100 elephants. The total population on the island is estimated at 2800–4800 elephants with a maximum of 2500 in the 28 protected areas. The most important of these reserves for elephant conservation are Gunung Leuser, Way Kambas, Kerinci-Seblat, and Barisan Selatan.

BORNEO (MALAYSIA AND INDONESIA)

Fossil evidence indicates that elephants once occurred in Borneo (van den Bergh *et al.*, this volume, Chapter 23), but it is not clear if the present-day elephants are native or are descended from captive elephants brought to the island in 1750 and later set free. Today, elephants are confined to the north-east, largely in Sabah (Malaysia) and a small area in Kalimantan (Indonesia). Between 500 and 2000 elephants may occur in the dense rainforests in hilly country (Andau and Payne 1985).

A NOTE ON CONSERVATION AND MANAGEMENT

The best way to manage smaller isolated populations in the short term would be to ensure a genetically effective population size of at least 50 elephants in order to keep loss of heterozygosity below 1 per cent per generation (Franklin 1981). In many cases, this may be achieved by artificial translocation of individuals between populations (Sukumar 1989). Very small herds may have to be captured and retained in captivity or released in more viable habitats.

Poaching of males for ivory has been a problem in southern India and parts of South-East Asia, including Myanmar and Thailand. Control of the illegal trade of tusks in Asia has to be linked to the international efforts to curb the ivory trade under the umbrella of CITES (Convention in International Trade in Endangered Species of Wild Fauna and Flora).

Elephants also come into conflict with people by damaging crops and houses, and killing people. This creates antagonistic feelings towards elephant conservation among people. It is thus important to promote schemes such as digging trenches or erecting electrified barriers along the forest–cultivation boundary or compensating farmers for losses in the elephant ranges (Sukumar 1989).

Table 33.1 Population estimates for wild Asian elephants (arranged as they are discussed in the text)

Country/region	Population		Minimum habitat area (km ²)
	Minimum	Maximum	
India	20 000	25 000	82 000
Nepal	50	100	2500
Bhutan	100	150	2000
Bangladesh	200	350	2000
Sri Lanka	2500	3200	8000
Myanmar (formerly Burma)	5000	8000	100 000
China	300	500	2500
Thailand	1500	3000	35 000
Laos	2000	3000	20 000
Cambodia	1000	2000	15 000
Vietnam	500	1000	15 000
Peninsular Malaysia	1000	1500	20 000
Sumatra (Indonesia)	2800	4800	100 000
Borneo (Malaysia and Indonesia)	500	2000	35 000
Total	37 450	54 600	439 000

SUMMARY

Estimates of the wild Asian elephant population range between 37 000 and 57 000 individuals, and their habitat covers an area of about half a million km² (Table 33.1). The elephants are found, however, in perhaps as many as a hundred or more distinct populations, with little or no possibility of natural genetic exchange. For many Asian elephant populations, viability is thus severely constrained by small population numbers and insufficient habitat for expansion. Only about 10 populations seem to consist of over 1000 elephants each. These include Nilgiri–Eastern Ghats in southern India; Arunachal–Assam, Kaziranga and Garo–Khasi hills in north-eastern India; south-eastern Sri Lanka; Myitkynia–Bhamo and Irrawady–Chindwin in Myanmar (formerly Burma); Tenasserim mountains along the Myanmar–

Thailand border; and possibly Anamalai–Periyar in southern India. Laos–Cambodia–Vietnam borders, and Sabah in Borneo. In addition, some of the smaller populations, including Taman Negara in peninsular Malaysia and those in Sumatra, are important as they may represent genetically distinct subpopulations that have evolved in the species-rich rainforests. Initiatives for long-term conservation should pay special attention to these populations.

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