

**Distribution
and
Status
of
the Asian
Elephant**

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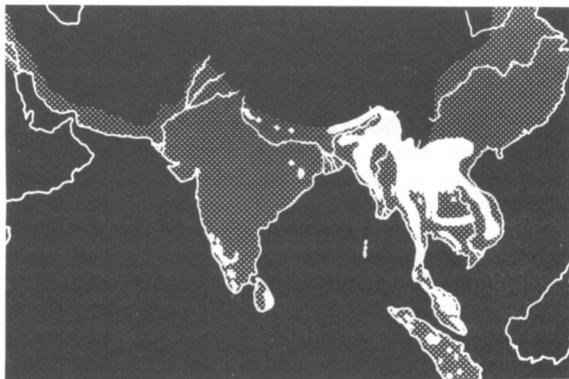
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Photographs and Map 1 courtesy of the World Wildlife Fund

This comprehensive survey of the Asian elephant is the result of an FPS-sponsored project dating from 1973. The author is Co-Chairman (with J.C. Daniel, Curator of the Bombay Natural History Society) of the Survival Service Commission's Asian Elephant Group, created in 1976. He discusses the history of man-elephant relationships in Asia, the animal's status in each country where it occurs, and the reasons both for its disappearance from most of its former range and for its continuing decline. Much of the information is based on reports direct from the field and, in the case of peninsular Malaysia, on the author's own observations while attached to the office of the Chief Game Warden of West Malaysia. He estimates that only 28,000-42,000 Asian elephants remain in the wild.



1. The approximate past (stippled) and present (white) distribution of the Asian elephant

Introduction

The estimates of present distribution and numbers of the Asian elephant are based on data known to me up to March 1978. New information is still coming in, and recent and ongoing field surveys suggest that some estimates, particularly those for India, will have to be revised shortly. The past and present distribution of the elephant is shown in Map 1. The species once ranged from the Tigris and Euphrates (45°E) in the west, east through Asia south of the Himalaya, and north into China at least as far as the Yangtse Kiang (30°N) and probably further. It may also have existed on Java. Elephants are still found in Bangladesh, Bhutan, Burma, China, India (including the Andaman Islands), Indonesia (Sumatra and Kalimantan), Kampuchea, Laos, Malaysia (Malaya and Sabah), Nepal, Sri Lanka, Thailand and Vietnam.

The present distribution is restricted largely to the hilly and mountainous regions that resist human development longest. These regions, not surprisingly, often occur on interstate and international boundaries. In view of the resulting distribution pattern of elephant populations, this report is not based exactly on the countries listed above, but divided according to convenient groups of elephant populations. The resumés presented for each country below show quite clearly that it was with the advent of colonial regimes from Europe that the elephant was put under pressure in areas which were otherwise unlikely to have been developed by the less technologically advanced Asians. Thus technological advances, together with other factors associated with colonial aims and attitudes, led in most countries to a really drastic crash in elephant numbers during the 19th century. Since then few elephants have survived in the lowlands, and where they have done so they are often isolated in islands of forest amid a sea of cultivation. In Sri Lanka this has been called the 'pocketed-herd' phenomenon.¹¹²

Most elephants now share their habitat with shifting human cultivators. Shifting cultivation is characteristic of mountainous regions in the tropics, where it is peculiarly suited to the conditions. Despite the often direct exploitation of elephants by Asian shifting cultivators, elephants continue to survive in close proximity to them, as they have for centuries. Modern technology and machinery now make it feasible and profitable to develop these remnant habitats, and they are currently threatened. Such development, which includes the cultural and agricultural 'improvement' and re-settlement of 'backward' hill tribes, is widely considered, in the short-term view of the politician, as desirable. Consequently elephant populations continue to undergo habitat encroachment and fragmentation, and in the planning stages of development programmes little consideration is given to elephants or other

wildlife. Historical references to the former vast stocks of tame elephants, reflecting former wild populations of a size far greater than those of today, provide the most dramatic illustration of the speed and severity of the man-induced attrition of the Asian elephant.

The numbers of elephants estimated to remain in each of the divisions described in this paper are given below:

1. Indian sub-continent (India, Nepal, Bhutan, Bangladesh): 9,950 - 15,050.
 - (a) West sub-Himalayan foothills: 550
 - (b) Peninsular India (Western Ghats): 4,500
 - (c) Central peninsular India: 900 - 2,000
 - (d) North-Eastern India: 4,000 - 8,000
2. Continental South East Asia: 11,100 - 14,600.
 - (a) Burma: 5,000
 - (b) China: 100
 - (c) Thailand: 2,500 - 4,500
 - (d) Kampuchea, Laos, Vietnam: 3,500 - 5,000
3. Island and Peninsular South East Asia: 7,330 - 12,330.
 - (a) Andaman Islands: 30
 - (b) Borneo: 2,000
 - (c) Malaya: 3,000 - 6,000
 - (d) Sri Lanka: 2,000 - 4,000
 - (e) Sumatra: 300.

From these estimates it appears that between only 28,000 and 42,000 Asian elephants remain today in the scattered distribution described above. In view of these small numbers and the continuing exponential escalation of the human activities responsible for them, as well as certain relevant characteristics of large, long-lived animals, the Asian elephant is now officially considered an endangered species.¹⁷³

Methods

With such a vast range to cover it was impossible to organise a complete field survey. It was decided to distribute a questionnaire, although the limitations of this method were appreciated, and most of the results as regards numbers are merely educated guesses. Estimates of this sort become less accurate the larger the area involved.

The questionnaire was designed to produce the maximum amount of data from each source, and yet remain simple. These two aims tend to be mutually defeating and returns showed considerable ambiguity, particularly in response to general or technical queries, no doubt due partly to the fact that many respondents were not working in their mother-tongue.

But the main drawback of this method is the fact that not only is it impossible to find a single source with comprehensive information on a particular population, but confusion was caused by elephants overlapping the different administrative units, whether based on plantations, states or nations, to which one must inevitably refer for information in a questionnaire survey. In many elephant areas the political situation further complicated matters. A detailed examination of all pertinent literature was made, and enquiries made by correspondence. The result is that the report contains more statements from personally communicated unpublished authorities than is normal in a scientific report. In the text [®] indicates a response to the questionnaire.

WEST ASIA

Elephants are extinct in this region, which, for present purposes, stretches from the Assyria of history through to the Afghanistan of today. The first record of elephants in this area is dated 1700 BC, and from then until the 15th century BC, when Egypt conquered western Asia, a substantial ivory trade is known to have existed with Egypt and Mediterranean countries to the west. However, this came under the control of the conquering Pharaohs, who, no longer able to hunt elephants at home, where they had recently become extinct, liked to hunt them in the Tigris-Euphrates basin and accordingly gave them some protection. The last recorded elephant hunt by a Pharaoh there was in the 9th century BC. Ivory trading was revived in the 10th century BC and is referred to up to the 7th century BC, when it was directly responsible for the elephants becoming extinct in west Asia.

The presence of large stores of ivory, or of tame or war elephants in that area after this date (4th to 2nd centuries BC), cannot actually prove the continued existence of wild elephants there, as Deraniyagala, (1955,) assumes, because there was a lively trade in both with territories further east. At all events the elephant survived longer in the Tigris-Euphrates basin than in areas between there and the Punjab.^{26 27 57}



A. Wright

INDIAN SUB-CONTINENT

Introduction*

Much archaeological evidence and numerous literary references attest to a unique relationship between men and elephants in India since the third millenium BC, when the first records of tame elephants are noted, and presumably going back well before this date. It is hard for us to imagine what might have led to man overcoming his natural fear for so awesome an animal, and also being inspired with the idea of taming it and putting it to work. One essential factor, I believe, was the very large numbers of elephants, particularly in the Indus valley and north-west India.

The earliest records of tame elephants are engravings of not later than 2500 BC, from Mohenjo Daro on the lower Indus. How it all began is pure speculation. Perhaps stray calves taken as pets sparked the idea. Once started, it was obviously much easier to find and capture elephants than it is today, and thus a cultural relationship with elephants grew and became an inseparable part of local religion, mythology, wars and everyday life in a way.

All this is recorded in many ancient documents, particularly the collection known as the 'Gaja Sastre', Sanskrit for elephant lore. Other outstanding documents are the Rig Veda of the 20th-15th centuries BC and the Upanishads of the 9th-6th centuries BC, of which the Chandogya Upanishad displays a considerable ecological knowledge of elephants. These and other

* The source authority for most of this section is Rao (1975).

sources confirm the presence of wild elephants and other large mammals at one time or another in Iran, Baluchistan, Hindu Kush, Punjab, Sind, the Indus Valley, Rajasthan and throughout the Ganges valley, over nearly all of which the elephant is now extinct. Indeed there is abundant evidence that the Punjab was the domestic elephant centre of India right up to the Mogul era in the 13th century AD.⁵⁷

Mogul literature points to a steady eastward retreat of the elephant, induced no doubt by centuries of trapping and hunting for ivory and sport, together with side effects of man's agricultural and pastoral activities, which may also have gradually altered the wider area to today's rather arid conditions.

There are records of elephants occurring in this period throughout Uttar Pradesh up to the Yamuna River near Delhi and of their capture by *kheddah* in the country of the Gonds, near Mandla, in the centre of today's Madhya Pradesh. Digby (1971) records elephant trade and trapping in Bengal, the Deccan, and Orissa. They were also found in the Bombay region and in today's Allahabad area in south central Uttar Pradesh, in the Ganges basin, where enough elephants remained in 1530 to support an elephant-trapping profession. The prize elephant of the Emperor Akbar (1556-1605) had been caught in Rajasthan, from where they were to disappear before 1885.³² However, references to particular elephant catching centres probably obscure the true wider distribution, which in the Mogul era may have been limited in the north-west only by the Thar desert, although in the lush parts of the upper Indus valley itself elephants had probably been wiped out by 1600AD.

Tamil Sangam literature confirms a similar history in South India from 3000 BC to at least the 4th century AD, but the late Mogul distribution seems to have persisted into the 19th century. Jerdon (1874) tells of elephants throughout Assam and the sub-Himalayan *terai* west to Dehra Dun. They had 'recently' disappeared from the Rajmahal Hills in Bihar but were still found in many parts of central India from Midnapore (West Bengal) to Mandla and south to the Godavara River. The Western Ghats population was apparently already distinct, reaching from the extreme south to a latitude of 18°N. Fifty years later Lydekker (1924) mentions similar distribution, and even though the south-eastern extent included the Kistna River, these must have been fragmented populations, as he records then that just three centuries previously elephants had occurred in the forests of Malwa and Nimer and that they had only 'recently' disappeared from Chand district on the upper Godavari.

Since the war and particularly since Independence in 1947, intensive exploitation of forests, creation of plantations and so on have occurred throughout India. Hydro-development projects, irrigation schemes, road building and cultivation, often possible only after diseases such as malaria had been removed from an area, have deforested large tracts. The disturbance created by men and machines and the forest felling caused elephants to take refuge in areas never frequented by them in the recent past, where they increasingly damaged crops and killed humans, so that enormous numbers of 'crop protection' guns were issued. Today elephants remain only in places not yet touched by the tide of human activity, or those which present inherent geographical or topographical obstacles to exploitation.

From its insidious beginnings until today, the exponential increase in human pressures has simply made the elephant a much rarer animal. Its haunts are restricted. Thus elephants are harder and more expensive to catch.



R. Olivier

Former Stocks of Tame Elephants*

In the north Indus area, where the import of tame elephants had begun as early as the 3rd century BC, stocks of war elephants dropped from about 1500 in the Ghaznavid period of the 11th century to 120 in 1398, during the Delhi Sultanate. Indeed, there are no records of supplies from areas in the control of the Sultans; the implication is that, particularly between the 11th and 13th centuries, the North Indian breeding grounds of the elephant were rapidly diminished by over-exploitation, settlement and cultivation. Since some records show that elephants persisted near Delhi up to 1600 AD and that trapping continued not far from there and in other parts of India where they are now extinct, one can accept that a severe decline in local stock had occurred, making local trapping harder. The possession of a large elephant stable, or *pil-kana*, had become the most important symbol of royalty and independent power in Asia. Local wild stocks were therefore insufficient to maintain the vast tame stocks needed for military ascendancy, and it became easier to capture the tame stocks of enemies, or to accept them as tribute from places where the wild stocks remained abundant.

Thus a complex trade in elephants was set up very early on, and the picture is confused because the centres, trading from their own abundant wild stocks, also resold animals imported from similar centres elsewhere. The three major centres for capturing local wild elephants appear to have been Bengal, Ceylon and Pegu (lower Burma). However, Bengal was itself receiving elephants from elsewhere in India, including the Deccan, Orissa and Madras and by sea from Pegu. Ceylon, in addition to its own animals, also imported them from Pegu and was itself serving Indian ports in the south and north-west, whence elephants from both areas could reach Delhi. Madras imported elephants not only from Ceylon, but even from Malaya as late as the 18th century,⁸² part of a separate Far Eastern trade. By such means the Mogul emperors were able to build up a larger *pil-khana* than the Delhi Sultanate—1400 war elephants in 1452 and 3000 between 1463 and 1482. The Emperor Jehangir was reputed to have 12,000, with over 40,000 in his whole empire.⁵⁹ Though these figures are prone to various sources of error, they are quite possible. A distinction was made between the 'war' elephant, to which most statistics refer, and other untrained, weaker or immature animals also held in captivity, and even in the 18th century a record exists of 1026 elephants, of which 225 were war elephants. Confusion between the two types of reference has produced a wide variation in quoted numbers.

The vast numbers of tame animals held from the 11th to 17th centuries, which easily outnumber estimates for the total *wild* population in the world today, must reflect the fact that there were considerably more in the wild then than now. This is especially true of the original main trapping centres, and so in the following regional reports, trends in tame stocks are quoted as above, particularly where it is believed they originated locally, to suggest probable parallel trends in wild populations.

* Unless otherwise stated the source is Digby (1971).

West Sub-Himalayan Foothills

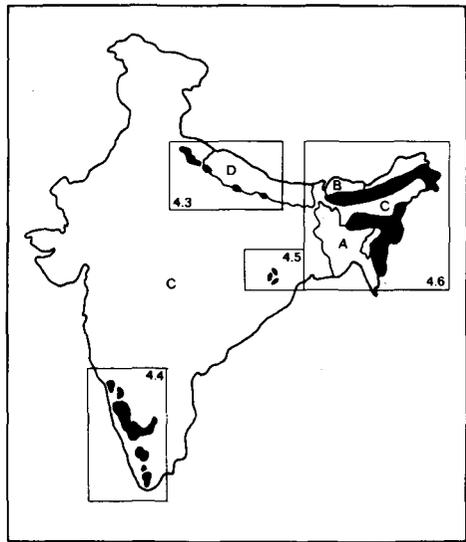
Distribution

The elephant populations here are now severely fragmented relicts, although their westernmost limit is almost the same as it was in Mogul times (see box 4.3 in Map 2). In 1914 Dodsworth reported elephants still in what was then the Sirmur state, near Simla in today's Himachal Pradesh. These have apparently died out, and the westernmost animals are now found in Uttar Pradesh, where in the last two decades, they have been a source of concern because, following habitat reduction, they have raided crops and caused human fatalities. This and the appearance of elephants in 'new' areas gave the impression that they were increasing; the 1879 Elephant Preservation Act was repealed in 1963, and control shooting began, resulting in the deaths of 28 elephants and the wounding of many more. Singh (1969) states that dam construction had ended annual elephant migrations from Nepal into adjoining forest divisions of Pilibhit, but in 1927 Champion remarked on the recent appearance of elephants in Pilibhit out of Nepal forests and stated that the Nepal elephants were already segregated from those in north-west India.

The elephant range can be divided into three regions: the western region, bounded by the Yamuna river in the west and the Ganga river in the east, and incorporating the foothill forests of Siwalik, East and West Dehra Dun, Lansdowne and Bijnor forest divisions; the central region, extending over Kalagarh and Ramnagar forest divisions, including the Corbett National Park; and the eastern region, covering the Haldwani and Tarai and Bhabar divisions up to the Sardar river in the east, near the Nepal border. The elephants in these three regions are apparently not isolated and overlap to a greater or lesser degree. In addition to the Corbett National Park, elephants are found in the small Rajaji and Motichur sanctuaries in Dehra Dun region. Further east, the elephants of Nepal, which Champion (1927) referred to as numerous, are now found only in small, probably isolated groups moving between Nepal and India. The known groups, from west to east, are at Sukla Phanta (proposed reserve at 80°10'E), Karnali Bardia (proposed reserve 81°20'E) and Royal Chitwan National Park (84°30'E). In these places only the tracks of small, non-resident herds are seen, occasionally. Oldfield, 1880, gives one of many old references to the abundance of elephants in the Nepalese *terai*, including the area of today's Chitwan National Park. Although not killed, for religious reasons, they were caught for domestic use in large numbers, and this, followed by opening up of much of the *terai* for cultivation,¹⁷ is probably responsible for the present situation.

Numbers

Before the 1879 Elephant Preservation Act, elephants were greatly persecuted in Uttar Pradesh, and the Act probably saved them from annihilation. Champion, (1927), estimated a total of 250, of which 50 were in Lansdowne Forest division. The recent elephant situation led to two of the only attempts that have ever been made to count elephants in Asia. In 1969 Singh, who arranged simultaneous counts in nine forest divisions, estimated a maximum of 400, with over 130 in Lansdowne at certain times of the year. This was more than in previous years, perhaps due to the cessation of hunting and a reduction in loss of habitat, and was confirmed by Bhatia[®] (1973). More recently Singh (in press), in his latest estimate of just over 500, again notes a steady increase



2. Approximate distribution in Indian sub-continent. *A* is Bangladesh, *B* Bhutan, *C* India, *D* Nepal. Numbered boxes are referred to in text.

despite continued and new threats to the habitat. He notes that Lansdowne and Corbett hold more than two-thirds of the total population in Uttar Pradesh, and that survival in the state depends on the preservation and management of these two areas.

The informed estimates of the Nepalese elephant population are of about 50 animals, but few, if any, appear to be permanently resident (Bolton © 1976).

South Peninsular India (Western Ghats)

Distribution

The Western Ghats is a composite term for the many hill ranges running parallel to the west coast in peninsular India. Elephants are now largely confined to these hills, although some are still found in parts of the Mysore plateau to the east, in the states of Karnataka (Mysore), Kerala, and Tamil Nadu (Madras) (see box 4.4 in Map 2). Formerly their extent on the plateau was much greater. A retreat to the hills was accelerated by bounties offered in Madras and Mysore states until 1871. Nevertheless, in 1894 Pollock recorded elephants still within 50 miles of Bangalore and throughout the area where they are now patchily distributed.

Today elephants are restricted to an area from 15°N in the North Kanara forest to Nagercoil in the extreme south. A major and long-standing division occurs across the Western Ghats near Palghat, Kerala. To the north of the Palghat Gap lie four areas where there are one or more discrete populations. Apart from those in the North Kanara forest, where in 1912 elephants moved freely in and out from Mysore,¹⁷¹ but now are trapped in isolated pockets,⁹⁷ there are the much fragmented populations of the wider Coorg area. Ryley (1913) records these as being periodically numerous in north and east Coorg, moving freely back and forth between there and Mysore and the Wynaad. However, in the 1930s rewards of up to Rs 100 were still being offered for elephants in North Coorg.¹⁷⁰

Another important population ranges more or less continuously (but may now be threatened by the Kabini dam project) from the Nilgiri-Wynaad hills in Kerala east into the deciduous forests of Mudumalai Wildlife Sanctuary in Tamil Nadu and the Bandipur National Park, Karnataka. There may still be some overlap with the fourth set of populations occurring further east, in the

Biligirirungan and Baragur Hills; there certainly was in the celebrated elephant catching days of Sanderson, because the centre of this wider area was his base of operations. To the south of the Palghat Gap lie three more elephant ranges, again more or less fragmented. The first two are in the Anaimallais (Elephant hills), including the Anaimallais Wildlife Sanctuary and the High Range, and the third further south in the so-called Cardomom range, which includes the famous Periyar Wildlife Sanctuary.

Including those reserves already mentioned, Karnataka has three National Parks with a mean area of 516 sq km, and seven wildlife sanctuaries, mean area 1092 sq km, in which elephants have been recorded. Kerala has seven such wildlife sanctuaries, mean 288 sq km, and Tamil Nadu two, mean 639 sq km.⁶⁰ All these areas are under survey by the South Indian Task Force of the IUCN/SSC Asian Elephant Group, which hopes to identify and enumerate all the discrete populations in peninsular India.

Numbers

Nair and Gadgil (1978) estimate only about 360 elephants in all of Karnataka, *excluding* those inhabiting the Mysore plateau, which includes part of Karnataka, Kerala and Tamil Nadu. Here they estimate at least 1300 animals. This agrees with an earlier estimate of about 1500.⁹⁸

The only estimate known to me for the entire south peninsular area is of approximately 4400,⁴² including the 1500 estimate for the Mysore plateau. If one assumes a roughly constant error in these various estimates, then the outstanding importance of the latter area, in that it holds over 30 per cent of all the elephants in this region, is unarguable.

Central Peninsular India

Distribution

Four states in central peninsular India are thought still to harbour elephants: Madhya Pradesh, Orissa, Bihar and South Bengal. Precise boundaries to the ranges have yet to be established accurately, and box 4.5 of Map 2 is only a crude indication of elephant areas in Bihar and South Bengal.

Madhya Pradesh. This, the largest state in India, was 41 per cent forested two decades ago¹⁶¹ and is relatively well forested even today. Thus the apparent disappearance of elephants from the state is a mystery, but it seems that years of trapping, followed by crop protection, must have finally eliminated them. Some may occasionally stray over from Bihar, out of the Palamau National Park area.

Orissa. Like Madhya Pradesh, Orissa was a source of tame elephants until comparatively recently. It is another relatively well-forested state, but very little is known of its elephants. L. Choudhury²⁰, states that they occur in Pur, Angul and Rairakohl Divisions, in the Keonjargarh and Bamra forests, and in Simlipal Tiger Reserve, where they were also noted by Krishnan in 1972. Five wildlife sanctuaries in Orissa, including Simlipal, which is a proposed national park, harbour elephants.⁶⁰

Bihar. The Rajmahal Hills, on the borders of Bengal, where the Moguls trapped elephants,³² was one of the first areas from which they disappeared.

Today elephants are found only in forests of the Palamau National Park and Barasand, and the Dalbhum Forest Division, each of which probably holds a number of sub-populations. To what extent, if any, they overlap is not understood, but evidence suggests they are becoming extremely fragmented. This is reflected mainly in the appearance of elephants in new areas each year, which did not happen before the 1920s. They were not recorded in Palamau district before then, but since 1960 disturbance and dam construction in the Barasand forests have further displaced them. Each year they range further and further into parts of Bihar they are not known to have visited in living memory.^{93 135} Similarly, following disturbance of the forests of Singhhum and the Dalma Hill range in the south-east, elephants have been crossing into Bengal. An elephant sanctuary within the Dalbhum area was created at Dalma Hill in December 1976 and in addition to those mentioned previously, six other small sanctuaries in Bihar are listed as having elephants.⁶⁰

South Bengal. The elephant range here is divided into two apparently separate parts. The first, which includes parts of West Midnapore, Bankura and Puralia Division, is another area where crop raiding increases yearly.¹³⁸ It is contiguous with the Dalma Hills of Bihar, from where the elephants arrive as the rice crop ripens, penetrating further into Bengal each year. It is proposed that all or at least part of this area should be set aside as the South Bengal Sanctuary. The second elephant area is found in the Ayodhya Hills, Purulia Division.²⁰

Numbers

Orissa may hold as many as 2000 elephants: the Simlipal Tiger Reserve alone probably holds nearly 500,²² but no proper census has yet been made. Mishra in 1971 and Shahi in 1977 both estimated 60 animals in the Palamau area of Bihar, whereas Wright¹⁷⁰ estimated half that number. Shahi estimated 50 in the other Bihar elephant area, but more recent surveys by Sinha *et al* (1977) indicate 125-145 elephants there in three possible populations: one of 70 animals in the Dalma Hills, 20-40 in the Ghatsila area, and 35 in the Ruam and Musaboni forests south of the river Subarnrekha. The only elephants resident in South Bengal and therefore not included in the above estimates are the two or three solitaries said to live in the Ayodhya Hills.²⁰ The best hope for the future of elephants in the central peninsular region appears to lie in Simlipal, and possibly other areas of Orissa, and in the successful creation of a South Bengal Sanctuary adjacent to Bihar's Dalma Hill Sanctuary. Such a move would protect most of the range of the same population, but chances for long-term conservation of the remaining small populations are remote.

North-Eastern India

Distribution

The distribution of elephants shown in box 4.6 of Map 2 is only approximate. The westernmost limits of the northern black area, for example, should extend to the Nepal/India border. These populations have probably been separated from the rest in India for a considerable time, due perhaps to the early development of the Ganges and lower Brahmaputra basins, including today's Bangladesh, although this region was once a prime one for catching elephants. The two areas in box 4.6 are examined separately below.

East Sub-Himalayan Foothills. It is not clear just how continuous the range north of the Brahmaputra river is. All questionnaire returns, particularly those from plantations, say elephants have become a real nuisance only in the last decade. They record them as increasing, which seems unlikely and is probably an impression gained from increased crop raiding, which in turn is reflected in the number of appeals to the authorities by those suffering losses and the number of press reports on the subject. The causes of this alarming trend include the establishment of military training ranges and tea estates, extensive deforestation both by authorities and illegal squatters, and the construction of new townships, dams, roads and so on. These have removed elephant habitat and interfered with seasonal movements, which traditionally involved spending the drier winter months (November–April) in the thicker forests in the foothills of Bhutan or Arunachal Pradesh and descending into the open forests and grasslands of the lower areas in North Bengal and Assam in the wetter summer months (May–October). It is in the summer that they become agricultural pests.

For descriptive convenience, the elephants of the sub-Himalaya are divided below into two separate sets of populations and within each set are considered from west to east.

North Bengal. According to L. Choudbury,²⁰ there are two populations here, the westernmost of which occupies an area between the river Torsa and the Dhulabari area of Nepal across the river Mechi. Depredation by these elephants became increasingly serious from 1967, reaching a peak in 1974 when they killed more than 30 people. Since then, 20–25 people have lost their lives to elephants every year, and damage to property and crops has been considerable. Over this period large scale deforestation has taken place along the northern edge of the area in Bhutan, and in Nepal to the west. At least six times in 1977, elephants from North Bengal entered their former range within Nepal, where natural vegetation is so limited that in November the authorities shot four elephants in an attempt to curb crop damage and drive the animals back to India; but they later re-entered Nepal further south.²¹ A change in behaviour has been noted in other groups from this population: seasonal movements that had been observed annually until 1976 did not take place in 1977, and while some sub-populations have appeared trapped, others have opened up entirely new ranges.²⁰

The eastern population in North Bengal ranges from the river Torsa across the river Sankosh into the Goalpara district of Assam. L. Choudhury believes that the two ranges might overlap at the Titi Forest Reserve on the west bank of the Torsa, but this cannot be confirmed as there has been no systematic survey of the eastern population. In 1977 Jayal listed three sanctuaries as having elephants—Jaldapara, Chapramari and Gorumari—but the only permanent residents are a few solitary males. Cow-calf groups usually pass through Chapramari and Gorumari seasonally, but none did so in 1977.²⁰

Assam. The districts north of the Brahmaputra, are, from west to east, Goalpara, North Kamrup, Darang and North Lakhimpur. The questionnaires elicited no information about the first two, although elephant numbers are known to be good in both⁸ and also in Manas Wildlife Sanctuary. In fact all the sub-Himalayan forests of Goalpara and North Kamrup east of the Pagla



F. Vollmar

River have come under the management of Project Tiger, and elephants are protected there. For Darang district the returns were quite comprehensive. Elephants appeared occasionally throughout the foothill tract, and still reached the Brahmaputra in places such as in the Orang Wildlife Sanctuary; they were also recorded in the Sonai Rupa Sanctuary to the north-east. According to L. Choudhury,²⁰ the loudest hue and cry against elephant damage in Assam in recent years has been raised in Darang district, particularly by tea planters. Because of its proximity to the city of Gauhati, Darang has also become the main operational area of deeply entrenched, politically influential elephant-catching interests. In the Assam valley, elephant trapping and shooting occurs only in Darang and North Lakhimpur. The questionnaire survey produced little information on North Lakhimpur itself, but a review of the elephants' winter range in the encircling state of Arunachal Pradesh suggests their presence throughout the district (Bathew[®] 1975, Tessier-Yandell[®] 1974).

Clearly many of India's elephants north of the Brahmaputra are shared with Bhutan, where they are totally protected. They are recorded in four Bhutanese sanctuaries: Mochu Game Reserve; Manas Wildlife Sanctuary, adjacent to its namesake in Assam; the nearby Goley Game Reserve on the Tongsa, a tributary of the Manas; and the Khaling Game Reserve in the southeast corner, bordering Assam's Darrang district.³⁴ But reports of extensive village construction all along the Indian side of the border raise concern for their freedom of movement between the two countries.¹⁴³ Some have already been cut off in the far west, between Bhutan and North Bengal, and the same fate appears imminent in the eastern border area, where forest felling in Bhutan has also recently been reported.¹⁷⁰ Ironically, a treaty between the Governments of India and Bhutan, concluded after the Bhutan War in the 1880s, declared the entire sub-Himalayan area straddling their boundary as one elephant territory

and stipulated that Bhutan would receive 50 per cent of all royalties from elephants captured in the Indian part of this zone; Assam and West Bengal still claim to honour this treaty. A modern equivalent of this zone, and an elephant conservation area of immense potential importance, would be created in the Manas sanctuaries of Bhutan and Assam, and the areas of Goalpara and North Kamrup, where elephants currently enjoy some protection under Project Tiger, could be unified.

South of the Brahmaputra Strictly speaking this river is not a barrier to elephants, as they have been known to cross it. But it is becoming increasingly rare for them to do so.¹⁴³

Populations whose ranges apparently overlap with the Brahmaputra catchment area. Elephants are still to be found in the Tirap Frontier division of Arunachal Pradesh, for which a national park was proposed as long ago as 1950. However, in 1975 the Namdapha-Tirap Wildlife Sanctuary was notified in its place, and this contains elephants in its lower regions.⁸ In adjacent Nagaland, a few may remain in the Intangki Wildlife Sanctuary.¹⁴³ West of Nagaland elephants are still found in the Mikir hills and migrate seasonally into the Brahmaputra floodplain, like those to the north of the river. Between January and May they appear in the Kaziranga National Park, but return to the hills when the Park is flooded and for the winter months. They are also occasional visitors to the small Garampani Sanctuary to the east. Lahan and Sonowal (1973) counted 430 elephants in Kaziranga in March 1972, but pointed out that elephant movements into and out of the Park had been greatly reduced in the recent years by the opening for cultivation of the valley lands and lower hills. Even on steep hills the Mikir tribes had started cutting and burning large areas of forest, and elephant depredation of crops was increasing proportionately. Stracey on a recent visit confirmed that this has continued unabated, and that, unless a corridor is established, movements into and out of the Park may soon be impossible.¹⁴³

West of the Mikir hills, elephants are found in the Khasi and the Garo hills of Meghalaya state. The Garo hills in particular appear, formerly at least, to have provided a good habitat for elephants, as there is little evidence of seasonal movement caused by fluctuations in food availability, and aggregations of up to 60 or 70 have been reported from some areas. Within the Garo hills the Darugri range is the most important elephant area, but much of it, including the Rangrengri Reserve, is to make way for a large new town. The proposed sanctuary at Balphagram in the Nongstoin area between the Garo and Khasi hills is supposed to compensate for this loss of elephant habitat, and although there are good numbers in the area, the sanctuary itself appears to be relatively unimportant for elephants.²⁰ Throughout Meghalaya, plans to create large monoculture plantations and resettle shifting cultivators threaten the existing elephant range.¹⁴⁴

Other populations. Elephants still occur in a few places outside the Brahmaputra catchment. The Barail Range, roughly at the junction of Nagaland and Manipur with Assam's North Cachar district, apparently still holds a fair amount of wildlife, and an elephant reserve has been suggested for the area of the upper Jiri and Barak rivers. However, elephants from these hills recently started raiding crops in Cachar,¹⁶⁹ which suggests new constraints on



Left: Type of riverine habitat preferred by elephants: forest gives way to grassy swamp.

A. Laurie

Right: Elephant habitat islanded by cultivation.

R. Olivier



their former movements. The North Cachar district also suffers damage from elephants moving south out of the Khasi hills of Meghalaya and the Lushai hills of Mizoram. They are recorded in the Mizoram's Dampa Wildlife Sanctuary and probably still inhabit the unpopulated areas of both this state and Tripura, where elephant catching is practised and control shooting licences are issued. However, their presence here is largely seasonal.²⁰

The assumption regarding Tripura and Mizoram is supported by the seasonal occurrences of elephants in neighbouring Bangladesh. Though only a few may be permanently resident there, in the Himchari and Pablakhali Sanctuaries, their numbers are swelled by seasonal visitors from the Chittagong Hill tracts on the Mizoram and Burmese borders. Others are reported in Bangladesh's Sylhet district, particularly along the Tripura border, but also the border with Meghalaya in the north-east.⁶⁵ Manipur, on the Burmese border, is the only Indian state for which I have no information.

In Upper Assam elephants have been under pressure for over a century. In the early 19th century the tribes hunted them for ivory¹⁵ and for meat, which resulted in their almost total destruction.¹³⁴ Legislation forbidding hunting seems to have come too late. Nevertheless, Stracey (1963) in the Intangki area, was able to make one of the record catches for the entire region, but such operations probably also contributed to the low elephant numbers in Nagaland today. The tribesmen of the Lushai Hills in Mizoram had similar habits, and the slaughter there reached such proportions that the tribesmen had to move to Cachar to obtain elephants.¹³⁴ This probably accounts for the increases in crop-raiding noted recently in adjacent areas of Cachar and suggests that there are no longer many elephants in Mizoram.

According to L. Choudhury,²⁰ poaching for ivory is still rife south of the Brahmaputra. In Meghalaya, ivory hunting intensified after 1960, when new roads opened up hitherto inaccessible areas. The situation took a critical turn in the early 1970s when the price of ivory shot up, partly because of a ban on the import of African ivory, and the number of professional hunters in the Garo hills rose from two in the 1960s to about 14 in 1971. Much poaching is masterminded by corrupt and powerful officials, often under cover of a so-called elephant control licence. In the more remote districts the game laws imposed by the central or state governments do not operate. Many tribal chieftains are patrons of an illegal ivory trade, keeping paid hunters. It seems

that if it was not for the fact that so few males, and no females, carry ivory, the elephant would already be extinct over most of north-east India. The same may apply to much of continental south-east Asia.

Numbers

Shot on control. The only figures available are for North Bengal. According to L. Choudhury 15 elephants have been shot as 'rogues' since 1974, 13 of them from the westernmost population, to which the four shot in Nepal late in 1977 must now be added. In Choudhury's opinion, few elephants in this population are without gunshot wounds, which almost certainly accounts for their aggressive tendencies.

Captured. Trapping on permit has always been allowed, but in recent years catches have failed to meet the quotas. This must reflect to some extent the fact that it is no longer easy to trap elephants in the numbers required to show a profit, because the populations are smaller, more inaccessible, more fragmented, more mobile and less predictable than formerly. In the 19th century in Assam up to 500 elephants were caught every year by nooses, and another 100 per year were being caught by khedda in Chittagong areas.¹⁵ Deraniyagala (1955) quotes an annual average of 340 elephants caught in Assam between 1937 and 1950, nearly 500 being taken in the latter year. Barua[®] (1975) gives an annual total of only 200 in recent years. At the elephant-trapping camp I visited, the owner confirmed a recent drop in the number of such camps due to decreased profitability.¹¹⁹ About 80 elephants were captured in the three years 1974-1977, in North Bengal.²⁰

Numbers in the wild. Assessment of numbers is particularly difficult in an area involving two small nations and seven Indian states, the two largest having numerous districts or divisions, and the whole split by a more or less effective geographical barrier, the Brahmaputra. According to L. Choudhury, 150-170 elephants use North Bengal. No estimates are available for the Assam districts of Goalpara and North Kamrup, but from the estimate of up to 600 animals in Bhutan (Dorji, Doley[®] 1975) from where elephants move seasonally into North Bengal, Goalpara and North Kamrup, one may deduce that up to 500 may occur in the last two districts in the summer. This figure agrees roughly with the combined estimates of Wrangham,[®] Wilmot[®] (1973) and Robertson[®] (1974), based on many years planting experience in Darang district. These suggest up to 300 there seasonally. Although there are again no estimates for North Lakhimpur, Bathew[®] (1976) estimated 2000 elephants in adjacent Arunachal Pradesh, suggesting that a fair number may still commute between the two areas.

To summarise, there is an estimated maximum of 3000 elephants in Bhutan, Assam and Arunachal Pradesh north of the Brahmaputra.

Estimates for the area south of the Brahmaputra are even more difficult. Numbers in the Namdapha-Tirap Sanctuary of Arunachal are unknown, and in Nagaland's Intangki Reserve elephants are possibly extinct. The records of Lahan and Sonowal (1973) indicate that at least 500 move north out of the Mikir hills, and L. Choudhury feels that an equal number may use the southern slopes. He also considers 400 a conservative estimate for the Khasi hills and confidently suggests 600-700 for the Garo hills. There are no estimates even as crude as these for the remaining elephant areas south of the Brahmaputra, but

in view of the historical relationship between men and elephants in the area, the number is probably relatively small (e.g. Mizoram). This fear is supported by press reports of only 60–80 entering Cachar out of the Barail range. Similarly most of the seasonal maximum of 250 elephants estimated in Bangladesh are assumed to be visitors from Tripura, Mizoram and Burma.⁶⁵

Thus the once rich Brahmaputra valley almost certainly has fewer than 4000 elephants visiting at one time or another. I doubt whether those either permanently resident in the hills or visiting Cachar, Sylhet or the Chittagong Hill borders of Bangladesh would be enough to raise the figure to 6000 for the entire North East Indian region, let alone double it to 8000, but I take the last figure as an outside working maximum pending proper surveys. These are urgently required, particularly in Arunachal Pradesh, which Bathew⁶ believes to be the only place in the region where the annual ranges of large, viable populations could still be conserved.



F. Vollmar

CONTINENTAL SOUTH-EAST ASIA

Introduction

The elephant story in the states of north-east India resembles that for much of continental south-east Asia. Much of this region has always been both physically and politically inaccessible, particularly the areas in which elephants remain today, and to which they have probably been largely restricted for over a century. These are the remote hill forests of Burma, South China, Thailand, Kampuchea, Laos and Vietnam (see Map 3). These places are renowned as a baffling melting pot of languages and cultures. The people have never been fully subject to the governments theoretically in control. As a result they have retained a variety of animistic or spirit-based religions and not adopted the great Asian faiths of Hinduism or Buddhism, which teach a special, even sacred, regard for the elephant. Many, like the Nagas and Lushai tribesmen on the northeast frontiers of India, do not share this regard and have always hunted elephants for meat, skins and ivory, to protect crops and for domestication. This factor, together with the inherent separatism of many of these tribes, whose rebel activities are funded through trade in opium, gems, and ivory, must have been and must still be significant for the elephant.

It is hard to establish as clear an historical picture as there is for India. There are no ancient local texts equivalent to the Sanskrit *Gaga-Sastre* devoted to the elephant, but other historical sources indicate that the elephant has been known, caught and used for almost as long as in India, though McNeely, (1975a) suggests that this only began with the advent of Hindu influences. The elephant has certainly moved into a dominant place in the work, wars and religion of the region's Buddhist powers. This is noticeable in the well-known reverence for white elephants which always had political importance. In the 16th century AD there was a protracted war between Siam, Pegu and Arakan in

which five kings were killed, and the white elephant, the bone of contention, survived them all.

The picture of colonial times is also less informative than for India, because many of the remoter areas were never well known, and the *shikar* or sport literature is smaller than for India. I have not had access to whatever French sources exist for the Francophone countries, and Thailand, of course, never came under European administration. (*Countries follow in alphabetical order.*)

Burma

Distribution

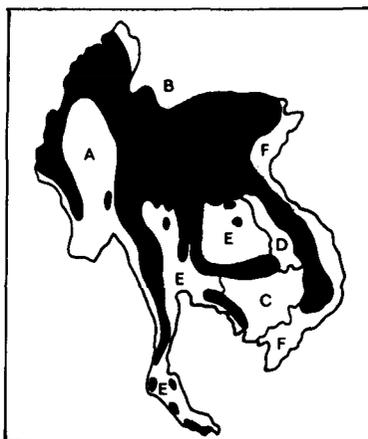
Elephants are found throughout Burma, particularly in the great expanses of unknown and hilly country¹⁵² and in the remaining forests,¹⁴⁹ where the distribution is not known but can be assumed to be largely in the hills (see map). The Burmese forests occupy some 149,000 square miles and in Asia are second in size only to those in Indonesia.

The status of elephants in the far north of Burma is not clear. It is possible that the tribes there, like those in parts of northeast India, have virtually exterminated them. During a 1936 expedition among the Nagas of the upper Chindwin, Morris⁹⁴ noted the presence of elephants, and they still survive on the Burma-Manipur border, where, according to Burmese press reports, some were caught in 1976 (*Guardian*, June 3). Thom (1914) describes the Chin hills, said by Marco Polo¹²² to be 'teeming with animals', as the worst part of Burma for wildlife slaughter, but we have no recent information for north Kachin State. The literature suggests that the south Kachin, in the northern Shan area, was and still is good elephant country. Between 1928 and 1940 elephants were such a nuisance that special control measures were set up in Shwebo and Katha districts.^{150 151 152} A 1976 Burmese press report indicates that Katha is still a good elephant-catching area.³

For the southern Shan States, Ryley¹³¹ was already able to state in 1914 that though elephants were found in the north, they were scarce in the south, and a 1974 press report (*Working People's Daily*, June 18) describing the seizure of 40 tusks destined for nearby Thailand suggests that they are still found on the Shan-China border. To the south of Shan is Kayah, where the inhabitants were described in 1914 as 'inveterate hunters' by Thom,¹⁴⁷ who also noted great persecution of elephants in the north of their range in the Arakan Yoma, the long tongue of hills separating Burma and India. But despite this persecution they still survive there; the *Working People's Daily* of June 18 1974 reported over 200 elephants killed in the Arakan Yoma between 1968 and 1974 for ivory, skins and meat and said that Bangladeshi 'insurgents' were poaching near their border. In 1975, in the nearby town of Akyab, 20 tusks were seized,¹⁵⁵ but figures for seized ivory from any area must be only the tip of the iceberg.

When I was in Akyab in 1976 the presence of elephants was confirmed by locals, and press reports³ mentioned recent captures in the Arakan. Elephants certainly existed at the southern limit of the Arakan, at the latitude of Rangoon, up to 1940.^{151 152}

The kingdom of Pegu in lower Burma, near the mouths of the Irrawaddy and Sittang rivers, was once a major elephant capture centre. Before 1658 elephants were being exported to South India and to Gujarat in north-west India. After 1650 many of them went to Ceylon as well.³² Pollock (1894) records shooting of elephants on the Irrawaddy delta in 1876, not far south-east of Rangoon, and U Tun Yin (1967) mentions a shooting in 1896 further east, near the mouth of the



3. Approximate distribution in continental south-east Asia. A is Burma, B China, C Kampuchea, D Laos, E Thailand, F Vietnam.

Sittang. By the early 20th century elephants had probably disappeared from these lowlands and retreated into the central range, known as the Pegu Yoma. They were caught in the south of the range in this century, but not after 1959.¹⁵¹ Fry (1929) indicates elephants at the north of the range, but their status there today is unknown. The history of elephants in the extreme south, in the Tenasserim range on the Thai border, is equally vague. In 1915 Wroughton noted elephants in the extreme south of Burmese Tenasserim, and Bradley (1877) crossed the Tenasserim further north into northern Thailand, finding large herds, one of 60, between the Salween and Thaungyin rivers in 1869; some of the people he met ate elephant meat. The elephant's present status there is unknown, but the picture from Thailand suggests they still exist in fair numbers in this range. In the rest of the country, little is known of the pressures on the remaining populations.

Elephants were first protected in Burma under the 1879 Elephant Preservation Act, and the exploitation came under further control with the creation of a Kheddah Department which existed until 1912, after which captures were permitted to lessees. In 1927 the Burma Game Rules were revised, and between 1928 and 1935 increased crop damage caused 770 elephants to be destroyed,¹⁵¹ which led to a review of the situation and the setting up of the Elephant Control Scheme in 1935. The country was divided into 60 large kheddah blocks, to be intensively exploited at three-year intervals. The elephants were protected in five large elephant sanctuaries and 25 existing or proposed game sanctuaries.⁵⁶ I have been unable to determine the whereabouts of either the keddah blocks or the sanctuaries, only 11 of which are listed in the World Directory of National Parks 1975. Elsewhere elephants were severely controlled in protection of crops. Between 1935 and 1941 well over 3000 were destroyed and over 1000 captured.^{56 151 152} The scheme was never revived after the war, even though in 1962 a proposal to do so was made by Hundley.⁵⁶ Today the elephant is still protected and all capturing operations are controlled by the State Timber Corporation.¹⁴⁹ Weatherbe¹⁶³ mentions the existence of over 40,000 'crop protection' guns in 1940 and an alarming onslaught on wildlife. This and a deterioration in administrative control must have caused a drastic decline in all wildlife in the past 40 years.

Numbers

In captivity. All Burma's ancient rulers held stables of war elephants. In 1277 the King of Burma kept 2000 elephants,⁷⁸ and in 1586 the King of Pegu had an impressive stable that included four white elephants.¹⁵² Before World War II there were over 6000 captive elephants in British Burma,¹⁶⁷ which had apparently increased to 6396 by 1970,¹⁵³ but this figure would seem to be inaccurate, as Burmese press reports of 1974 and 1976 put the stock at 3400 in 1973. According to U Hla Aung,¹⁴⁹ stocks now stand at around 3500.

Captured. Figures from before and after World War II indicate falling levels of capture. Between 1910 and 1927, 7000 were captured, an average of over 400 a year. Between 1935 and 1941, 1286 were captured, or 140 a year, and 238 killed.¹⁵¹ ¹⁵² From 1962 to 1973 the average rose to 165 a year,⁵⁶ and according to U Tun Yin¹⁵⁴ 272 were taken in 1969 and 227 in 1970. In 1968 the Burmese started using immobilising drugs, which probably reflects the difficulties of capturing in recent years, as well as the increased expense, because the figures available show very low catches. Between 1968 and 1976 apparently about 90 elephants were caught with drugs, but nothing more is known about these operations. Between 1968 and 1972, 64 were taken in this way, 11 in 1969, 12 in 1970 and nine in 1974. The Burmese press reported 18 captures in May 1976 and eight in the first three months of 1978—five by immobilisation and three by traditional methods. According to Ranjitsinh,¹²⁶ from 100 to 150 are caught every year, but now the authorities wish to capture 600 *more* per year to meet teak export targets.

Numbers in the wild. In 1933 Peacock¹¹⁴ estimated 3000 for the whole of Burma, but a count in 1935 in order to compute the yearly crop under the new Control Scheme put the population at 10,000,¹⁵¹ with 8500 in Burma and 1500 in the Federated Shan States. However, Smith (1944) estimated the population to have already fallen to 5000. Indeed, U Tun Yin (1959) using assumed reproductive and population parameters and known losses by death or capture, extrapolated from 1935 and computed 6250 for 1945. Williams (1950) estimated about 6000 around that time. The records then become confused, because, continuing to compute from probably incorrect parameters and incomplete statistics, U Tun Yin¹⁵⁴ gives 9050 in 1962, with 5430 inside the 'reserves' and 3620 outside. It is not clear what sort of reserve is referred to, nor the source of the information.

At this time Hundley proposed to the Government that it restart the Elephant Control Scheme. Again a rough survey was made. The 1962 official figure was 6500, divided among the following six 'Circles': Northern 2543, Sittang 620, Maritime 1042, Chindwin 1223, Hlaing 1017 and Shan and Kayah 343.⁵⁶ Significantly, the lowest numbers were in lower Burma. The 6500 figure appeared in official Forest Department statements and in the press. In 1974 Hundley⁵⁶ estimated, in view of known cropping, about 8500 to be in the country. The latest estimate, for 1977, is 5000.¹⁴⁹ Although these figures must be treated with caution, the inaccuracies are probably relatively constant, and the wild elephant population of Burma may well have halved in the past 42 years. With continued ivory poaching in remote hill districts, a high demand for both working elephants and the teak in the forests, and no known elephant reserves, the elephant's future in Burma appears very insecure.



R. Olivier

China

Ancient Records

The former existence of elephants in China is well authenticated by linguistic, pictographic, historical and archaeological evidence. In the beginnings of history the Chinese were restricted to what is now north China, in the valley and floodpath of the Yellow River, and the physical and climatic conditions were then to some extent different from those of today; the hills were covered in dense forests inhabited by great numbers of wild animals, including elephants.^{18 78} They do not occur in the natural climax forest of this region now, but there seems little reason to doubt the early records. That elephants could have withstood the low winter temperatures is well established,³⁶ and provided there was enough food in winter, it is quite possible that they did range as far as the Yellow River. The broad-leaved deciduous forests there would have included, among other foods, dwarf bamboos and grasses, the latter particularly abundant in the great flood. It is also possible that the elephants were different from today's and adapted to the regional conditions. In fact the literature continually refers to the Chinese elephants' dark colour and red ivory. On this evidence, Deraniyagala (1955) went so far as to ascribe a separate subspecies to the area, *E.m. rubridens*.

As the Chinese, a nation of farmers, gradually advanced and cleared the forest, the elephants 'retreated' south, probably as a result of progressive extermination. This may have happened by the middle of the first millennium BC, when the elephants' habitat became restricted to the Yangtse Valley, from west Szechwan to the sea, and in the regions further south and west.⁷⁸ In the old Book of Songs, the earliest collection of Chinese poetry, an allusion is made to elephant tusks brought as tribute by the wild tribes bordering the river Hwai, which flows through Honan and Anhwei provinces, north of the Yangtse (33°N). Other provinces in the Yangtse area also sent tusks and teeth as payment for taxes. While the ancient Chinese used ivory for innumerable purposes, they do not seem to have taken a 'deeper' interest in the elephant. Like their descendants, they were entirely practical, considering elephants only as a source of trouble to crops, and their elimination had the added advantage of supplying valuable materials. Together with deforestation, this led to a pattern similar to that now underway in India: extermination over vast areas of former range and a retreat into the more inhospitable and inaccessible habitats. Unlike most other Asian peoples, they gave the elephant almost no role in their mythology nor any profound religious meaning.

It is doubtful that elephants were ever hunted for sport, and neither was any effort made to tame them. The nearest reference to hunting⁷⁸ is of an 1105 BC ruler 'driving far away the tiger, leopard, rhinoceros and elephant to the great joy of all people', again implying their nuisance value. Elephants were probably hunted by aboriginal 'barbarous' tribes, who sold the ivory to the Chinese or with it paid their taxes to the Imperial Government. It was only in 121 BC that the first tame elephant was sent by peoples of south-east China to the court of the Emperor Wu. Later elephants became frequent gifts or tributes from vassal tribes and neighbouring nations to the emperors, who maintained large stables from the Han Dynasty (206 BC) on. Some Mongol sovereigns, such as Kubilai

(1214–94 AD), had a reputed 5000 elephants while the Manchus at the end of the eighteenth century had about 60. In 1834 there were eight to ten at court in the capital, but by 1901 there were none.⁷⁸ Again, as with India, this suggests a parallel dwindling of wild stocks, and for similar reasons.

The area now comprising the provinces of Hupei and Hunan, on both banks of the middle Yangtse, was once peopled by a warlike nation, the Chu, who unlike the Chinese seem to have tamed elephants to a certain extent, and in 506 BC the King of Chu even used them in a battle. Other facts which confirm that in early times the Yangtse Valley swarmed with elephants are that they were hunted by non-Chinese, for their ivory and hides, and were caught, tamed and kept.⁷⁸ Elephants must have survived in the Yangtse basin until the end of the tenth century AD and are recorded at 30°N in 962, in Hupei, where they 'subsisted on the crops of the people'. In 963 they were captured at 33°, in Honan, and in 964 elephants appeared in the same locality and were 'killed by foresters'. In the same year, around latitude 29°, in Hunan, three observations were made, including one of a 'crossing of the Yangtse'. Records continue to 966.⁷⁸

In the western part of the Empire, the present province of Szechwan, they lasted until at least 220 AD, when they were still being sent as tribute by native chiefs to the emperors. In the south, the present province of Yunnan was inhabited by the Tai people until they were conquered by the Mongols in 1252 AD. As early as 200 BC the Tai were known as an 'elephant-riding nation', and the animal, kept by almost every family, played an important part in the life of both rulers and people, in court pageantry and as a riding and draught animal, whose work included ploughing. Laufer (1925) gives two references, AD 860 and 1799, both stating elephants to be plentiful in the region. Marco Polo, on his way from Yunnan to Bengal, travelled for two weeks through more or less uninhabited country 'swarming with elephants and other wild beasts'.¹²² Elephants survived quite a long time in the south-eastern provinces, particularly in the heavier rainforests of the coastal zone. In the 7th century AD they were plentiful in the Tongking (Kwangtung) area where the natives hunted and ate them. In the 11th century they were still 'numerous, encountered in groups of ten' on the Fukien/Kwangtung border.

Recent Records

In 1925 Laufer⁷⁸ was able to write that the elephant had survived longer in Yunnan than anywhere else in China, and 'may still occur here and there in outlying jungles'. Recently it has been assumed that this remnant had also died out,⁵⁷ but the present survey has found that this may not be so.

Through the British Embassy in Peking a translation was obtained of the elephant section (p.418) of *Economic Fauna of China: Mammals*.¹⁷⁶ This is based on a 1958 survey by the Yunnan Tropical Biological Resources joint investigation team of the Chinese Academy of Science. Groups of elephants were still to be found in China, near the borders with Burma and Laos, in valleys at Meng Yang of Hsi Shuang Pan Na, Yunnan province, a mixed forest region of sparse broad-leaved trees, bamboos and grasslands, with elephant traces mainly below 1000m. Lone bull elephants are mentioned, as well as at least three 'groups' of 7, 20 and 52 animals respectively. Although the elephants in this area, apart from raiding melon crops, were not a great agricultural pest, the restriction of their movements by road building was noted, as was continued hunting for ivory, meat and items of supposed medicinal value by

the locals, who used special guns firing poisoned arrows. The remnant population, apparently under 100 animals, was therefore deemed highly endangered, and protection was called for. The outcome and their present status is not known, although Gerson⁴³ believes they still exist in China.

Kampuchea (Cambodia)*

Distribution

Cambodian historical and travel literature is sparse, but what there is suggests that elephants were once ubiquitous, and there are elephant reliefs in the Angkorwat Temples. Today, however, they are restricted to forest areas, which in 1974 constituted 12 million hectares, or about 73 per cent of the country. There were five game reserves then, but whether elephants occurred in these is not clear; they were certainly much depleted in the highly developed south-eastern area. Recent political upheavals and war make it very hard to assess distribution and numbers today. In 1975, Pfeffer,¹¹⁶ who left the country in 1969, said that elephants were still numerous on the Vietnam frontier but were being bombed by American planes to deprive the Vietcong of a means of transport. Many elephants were moving deeper into Cambodia, to die there. Since then other conflicts must have continued to upset distribution, although some elephants probably survive on the Vietnam border.

The Dangrek Range on the Thai border is potential elephant habitat up to about the Laos border. Other potential, but unsurveyed, elephant refuges are the Cardamom and Elephant mountains, nearer the coast and stretching from Khao Soi Dao, Thailand, eastwards. Covered in rainforest, they are probably the least disturbed habitat in continental south-east Asia.⁸⁸ These three areas are respectively to the east, north and south of the letter C in Map 3.

Elephants were widely used for transport and work, and probably still are. Since 1958 elephant hunting has been forbidden, and trapping allowed under permit only. Present legislation is unknown.

Numbers

According to McNeely⁸⁸ there were once 200,000 war elephants at the height of the Khmer Empire. In his 1975 report⁸⁷ he cites only 582 tame elephants in Cambodia. This probably reflects a comparably drastic crash in wild populations. In 1974 Pan Leang Cheav[®] made a guess of 10,000 wild in the country in 1969, but noted that they had been declining for 20 years, mainly because of poaching, habitat degradation and the war.

Laos

Distribution

All efforts to obtain information from Laos failed. The diplomatic mission in London had promised to help, but in December 1975 the Pathet Lao government took over. In 1965 there were ten 'protected forest reserves' set up by royal decree. Elephants occurred in three of them and perhaps in others too. The reserves are not easy to locate on available maps. Prior to 1975 there was a FAO project to establish a national park, presumably at Phon Khao Khuay, where elephants are known to occur.²

No doubt the once ubiquitous elephant is now restricted to the remaining forests. It may therefore survive in Hodrai Son and the Bolovens Plateau, but in

* The bulk of the information for this country, unless otherwise stated, comes from Pan Leang Cheav,[®] 1974.

the highland monsoon and rainforests of the north, where hunters and gatherers live, it may have been exterminated, except in the Nam Ngum basin.⁸⁷ There may even be some overlap with the Yunnan elephants in the upper Mekong. Additional information from McNeely⁸⁸ has helped to compile the distribution in Map 3. Past and present legal status is not known.

Numbers

Tame elephants have always been a feature of life in Laos. McNeely, 1975b, cites 902 tame animals, suggesting a wild stock possibly greater than in Cambodia, though many must have perished in recent wars and disturbance. The former name, 'Land of a Million Elephants', now seems incongruous.

Thailand*

Distribution

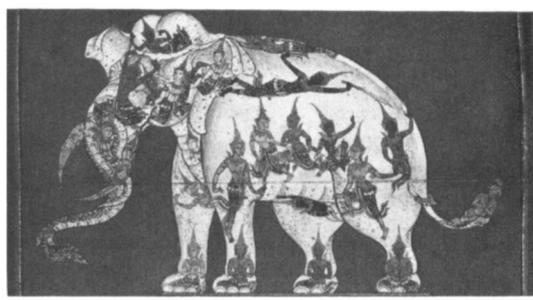
Elephants were originally found throughout the country, when it was about 80 per cent forested. This can be confirmed by early writers such as Mouhout (1864) who travelled from Bangkok to Luang Prabang, Laos, in 1861, and Bradley (1876), who in 1869 travelled to Siam from Rangoon, meeting on the Thai side of the border a 'rajah' who hunted elephants regularly and kept 63 tame ones. Elephant hunters, a distinct profession, killed considerable numbers with guns. Bradley then followed what he calls the 'Menam' river, probably the *Mae Nam Ping* or Ping river, seeing elephants until quite close to Bangkok, where large areas of forest were going under the axe. Later in that year he walked across the extreme south of peninsular Thailand to Penang in Malaya and saw elephants several times in what are relatively large herds by modern standards. A few still remain in the Yala area near the Malaysia border.

The distribution shown in Map 3 has been compiled from information supplied by McNeely⁸⁸ and a distribution map by Boonsong and McNeely (1977).⁸¹ Typically elephants are becoming confined to the hilly areas that support the remaining forests, now less than 15 million hectares, or 29 per cent of the country, and declining by nearly two million hectares a year. Only a few good elephant areas remain. In central Thailand these include the Petchabun Range from Chaiyaphum to Loei, Khao Yai National Park and the Dangrek Range. There do not seem to be many elephants between Khao Yai and Chaiyaphum, but the stretch from Khao Yai along the Dangreks to the Laos border includes much potential habitat. No survey has been made, but it seems the populations there are being reduced, so much so that the local elephant people have recently had to get their domestic elephants from Cambodia, and hunting pressure is great.⁸⁸ In the far south-east of Thailand, near Cambodia, the Khao Soi Dao Game Reserve still holds a lot of elephants, and further south, in the peninsular area near Malaysia, there are populations in the mountains scattered between Ranong and Trang. In western Thailand the forests along the Tenasserim range and the boundary with Burma are considered outstanding elephant area, particularly from the Mae Hong Son south to Chumphon and including important wildlife reserves such as Huay Kha Khaeng and Salak Phra.

Elephants have been protected in Thailand for centuries, and once there was a Department of Royal Elephants directly responsible to the king, to whom all

* Most of this data, unless otherwise stated, is taken from Boonsong and McNeely's 1977 paper and constitutes a summary of its relevant parts.

MYTHICAL THAI ELEPHANT composed of 24 minor divinities and with a snake as the trunk. From a 19th century treatise on mythical and natural elephants
British Library.



elephants belonged. The Wild Elephant Protection act of 1921, updated in 1960, made all wild elephants the property of the Government. But Boonsong⁸⁰ reports that conditions for wild elephants are steadily worsening in Thailand. In the eastern region traditional migration routes to and from Cambodia have been permanently blocked by roads and agricultural developments. Elephants in Khao Yai National Park and Khao Soi Dao Wildlife Sanctuary are confined to the forested parts, and in the west, highways and other developments threaten to create barriers to seasonal migration in and out of Burma.

Numbers

In captivity. Records of tame elephants in Thailand go far back in history and are found frequently in the Buddhist Jataka tales and in both lay and royal Thai literature. As war animals they helped to form the modern state of Thailand, playing particularly important roles in the 13th—16th centuries. They still play an important economic role in remote areas, and are still common possessions among the Karen hill tribe on the Burma border.⁷⁴ Mouhout (1864) noted that in 1861 every village in the east Petchabun area possessed 50 to 100 tame elephants. In 1884 there were more than 20,000 domestic elephants in northern Thailand alone and at the turn of the century 1000 were used on one trade route between Chiangmai and Chiengsaen on the Mekong river.¹³³ From 13,397 domestic elephants in 1950, their population gradually fell to 11,022 in 1969 and then dropped catastrophically to 8438 in 1972. Only 245 elephants were exported between 1967 and 1971.⁸⁷

Once again, this must mean an inability to replace losses from a wild stock that has similarly crashed. Also, since many replacements came from Burma and Cambodia, and only relatively few from Laos, recent political changes may have virtually cut off the elephant trade, besides making the migrations and general security of the wild herds hazardous, due to landmines, booby traps and hunters or soldiers living off the land.

In the Wild. The wild population in Thailand has never been estimated, but Boonsong and McNeely (1977) make tentative informed guesses of between 2600 and 4450, distributed as follows: Petchabun Range 200—500, south-east Thailand 200—350, north and west Thailand 1300—2100 (including seasonal immigrants from Burma) and 900—1500 in the peninsula.

Vietnam

Distribution

No data has been obtained for Vietnam as a whole or for the North and South when it was divided, but Nguyen (1971) summarised the conservation situation in 1969. He proposed four large parks, but without referring to elephants. Under existing laws, elephants were not totally protected; only the shooting of females was forbidden. Elephants probably survive in remaining forests,

5,620,000 hectares in South Vietnam, and in the hills on the Laos and Cambodian borders. The distribution in the map was reckoned by noting hilly terrain and centres of population. Several sites have wildlife potential, but whether elephants are there is not known.⁵⁸

As in other countries, elephants, once populous in the lowlands, have been driven back to the hills. Bazé (1955) gives a wonderful account of the very large population (up to 3000 in the wet season) that appeared seasonally in the La Nga river floodplain, an area of some 650 sq km. There are no longer any elephants in this densely populated area, but the vivid picture he paints must be a good account of elephants ecologically dependent on the floodplains, not only of small rivers like the La Nga, but of others the size of the Mekong, Yangtse Kiang, Irrawaddy and Ganges. This is how the Khmer empire could hold 200,000 tame animals, five times today's estimated population. Bazé also refers to the large elephant stables of the rulers in his day, and, of course, to much shooting of elephants.

Numbers

No estimates for tame or wild elephants have been obtained. A long history of poor law enforcement, together with the war, must have drastically affected most wild animals, particularly elephants. The Moi people, for example, eat them,⁹ and no doubt troops were not averse to taking such a mountain of food if they could. Secondly, because of their potential as transport, elephants were directly attacked, sometimes even napalmed.¹⁰³ However, indirect threats to wildlife, such as widespread defoliation, though probably initially harmful may in the long run have benefited surviving elephants and animals in similar ecological niches, because defoliation was generally followed by an invasion of bamboos and shrubs.^{113 148}

Elephants still exist in what was South Vietnam. In 1976 I received a cutting from a North Vietnamese English-language propaganda magazine, claiming that elephants could at least 'graze undisturbed in their native grasslands' (as they were doing in an accompanying picture), that they were 'especially numerous' in Buon Don on the Cambodian border, and that up to a hundred were caught every year and used for work.

Working from McNeely's 2000—10,000 estimate for the entire Mekong basin⁸⁷ and the estimates of Boonsong and McNeely (1977) for Thailand, one can suggest possibly 3500—5000 wild elephants in Laos, Cambodia and Vietnam.

P. Jackson



ISLANDS AND PENINSULAR SOUTH-EAST ASIA

Andaman Islands

According to Whittaker¹⁶⁵ about 50 feral descendants of escaped timber elephants live on the Andaman Islands; Ranjitsinh¹²⁵ believes there are 30. In 1931 Williams confirmed that the Andamans had sufficient natural fodder, and he even found a feral animal in the North Andamans that had escaped from the timber camps in the south seven years before and had moved 200 miles in that time, swimming from island to island.¹⁶⁷ It seems that over the years, escapes have been able to establish a breeding nucleus.

Borneo

Distribution

The history of elephants in Borneo is something of a mystery. It is thought that those present today originated from elephants given in 1750 to the Sultan of Sulu by the East India Company and then liberated in North Borneo.⁷ The peculiar distribution today, limited entirely to the north-east corner (see map in de Silva 1968, for example), supports this view. However, there seems little doubt that elephants occurred in Borneo before 1750. While Pigafetta's account of tame elephants at the time of Magellan's visit to Brunei in 1521 and Laufer's reference to a China-Borneo ivory trade in the Middle Ages⁷⁸ are not in themselves conclusive proof, much stronger evidence of wild *E. maximus* during the Pleistocene comes from Hooijer (1972). The elephant would therefore join the ranks of Borneo's strange losses of modern species that were native to the region in prehistoric times, along with the tiger, tapir and others. As Harrison (1961) who also quotes a possible Bornean fossil of *E. maximus*, points out, man was once more numerous and powerful in Borneo than has usually been supposed, and had an often decimating influence on the local fauna. This may explain the demise of these species.

In 1961 Burgess published the first account of the modern distribution in North Borneo and noted that elephants were being seen further west than previously, probably due to human disturbance. Davis (1962) and Medway (1965) give the same distribution—the east coast south of the Sugut River and south into Kalimantan, with limits in this direction imprecisely known. Western limits were also indefinite, but records of elephants at Penangah on the Kinabatangan were described as 'recent' by Burgess (1961) who also said they were occasionally seen near Pensiangan, perhaps having come from Kalimantan. De Silva (1968) largely concurs with this distribution, but extends the range north beyond the Sugut to Paitan. These references to expansion are additional evidence for an original distribution localised in the north-east. Various Dutch sources—Jentinck (1884), Muller (1916), Witkamp (1932), Vander Meer Mohr (1932), Habbema (1934) and particularly Westermann (1939)—report a limited distribution in the extreme north-east of Kalimantan also. Before 1934 Kalimantan's few elephants lived only in the upper-Sembakung River in Tindung district. Unfortunately there is no recent information on Sabah or Kalimantan for comparison or to show whether expansion has continued, as seems likely.

The elephant has had some sort of protection since the 1936 Wild Animals and Birds Preservation Order, but development inland from the prime lowland sites near the coast appears to have displaced the elephants. De Silva (1968) records that numbers in such areas have dropped since the early post-war years;

while herds of 100 were recorded in 1946, Davis (1962) mentions herds of only 20 or more as not uncommon. Throughout Sabah crop damage has increased along with increased development, as have deaths due to crop protection. Six thus died in 1964, 20 in 1965 and 30 in 1966.³⁰

Numbers

In 1949 Keith estimated Sabah's elephant population as 2000, the same number Burgess gave in 1963, and de Silva (1968) accepted this with reservations. It may be that no reliable estimate has been made since 1949, if ever. If the distribution in north Borneo were better known, an estimate could be computed from densities in similar habitats in Malaya, but until proper surveys are done 2000 has to stand.

Java

Evidence of a representative of the genus *Elephas* co-existing with man on Java comes from a cave deposit dated 1000 BC, described by Dammerman (1934). That this fragment was *E. maximus* seems likely, as the species had already been identified from Java from a Pleistocene deposit.⁸⁹ In 1961 Erdbrink described an Indian elephant fossil molar from West Java, and in 1977 there was a report of an elephant fossil over 500,000 years old from the Pati region in Central Java.⁴ How long it existed into historic times remains a question. Early Chinese records of Javan kings riding on elephants are inconclusive, because they post-date Hindu influence, and trade in large animals is recorded elsewhere. However, there is linguistic evidence that ivory imported by China originated in Java.⁴⁴ ⁷⁸ Today Java is one of the world's most densely populated places and probably has been long enough for the elephant to have suffered very early in history (see also Deraniyagala 1955).

Malaya

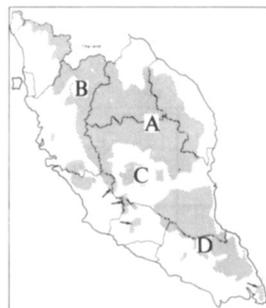
Distribution

As in other places the history of tame elephants has important implications, but Malaya and Sumatra are exceptional because a former cultural involvement with elephants has died out.

From as early as the first century AD a trade in elephant tusks within south-east Asia, including Malaya and China, was later extended to other countries, and it is recorded that Malaya sent white elephants overland to Yunnan in 1103. When the Portuguese attacked Malacca in 1511, the Malays fought with the aid of 20 war elephants, but considering the busy maritime trade then passing through Malacca, this in itself does not confirm that the elephants were locally caught. However, all chiefs in Malaya at that time considered the possession of elephants indispensable to their dignity. In 1651 Valentijn wrote that Java imported them from Kedah, and in 1682 from Johore.¹⁴ These records and the ancient account of Pahang trapping knowledge quoted by Maxwell (1905) suggest elephants were hunted at an early date in Malaya.

The evidence of both Indian and Siamese influence can be confusing; the many Sanskrit words for elephant (*gajah*) in the Malay language, and associated activities and items, suggest a strong Indian influence, perhaps, as Maxwell (1905) believed, coming indirectly from Sumatra, but there is also a more recent Siamese influence, as suggested by the non-Malay *mantras* used in Malaya for catching, training and keeping elephants. These were passed down orally for generations and only put on paper in 1879. The language seems to be a

4. Approximate distribution in Malaya. Arrows indicate areas where populations are unconfirmed. *A* is Taman Negara, *B* Grik Game Reserve, *C* Krau Game Reserve, *D* proposed Endau-Rompin National Park.



corrupt form of Thai,⁹¹ but the introductory *om* to most of the charms and the mention of various deities again suggest a Hindu influence, which of course Siam itself had undergone. The Malays believed this ‘ancient’ lore to have come from Siam, but it seems to have been relatively recent; the Siamese, who protected the north-western states of Kedah and Perlis until 1909, organised elephant-catching there in the 18th century,¹⁴ and Low (1836) mentions that Madras had once imported elephants caught in Kedah. This Siamese influence rubbed off on the adjacent areas of northern Perak, whose rulers possessed ‘large numbers’ of elephants in the 19th century, and up to 1905 the words of command were still Thai, as they were in the north-eastern state of Kelantan, which had also been under Siamese protection.⁹¹ There may also be an ecological reason for the area’s high elephant densities and good capture conditions: an ecotone there varies between tropical lowland evergreen and semi-evergreen rainforest, and a distinct dry season provides the possibility of fire sub-climax forests. But by 1935, catching in these areas had long ceased,¹⁴ and they now have the lowest estimated wild stock of all Malayan states.

In the 19th century elephants were found throughout Malaya. Kelsall (1894) refers to them as common in Johore, and Ridley (1894) says the same about Pahang. Flower (1900) records wild elephants everywhere except Penang and Singapore, with tame elephants still in Kedah and Perak but not in southern Malaya. Maxwell (1905) confirms that tame elephants were still used in Perak and Kelantan and describes a system of elephant catching. The abundance of wildlife in the 19th century is reflected in the sporting proclivities of the early colonials and recorded in 1905 by Hubback, who found elephants throughout Malaya, with Pahang and Negri Sembilan apparently holding the most, and Perak and Selangor the least; he mentions elephant-shooting in 1898 in Selangor—in Damansara and Puchong districts, both now in the middle of Kuala Lumpur. He also refers to elephants between Kuala Selangor and Klang, areas they are also long gone from.

Rubber was widely planted in the first quarter of the 20th century and the elephant suddenly became a pest, whose destruction, along with other wildlife, commenced. Some control was embodied in the 1911 Wild Animals and Birds Protection Act, but it was highly inadequate and, due to the efforts of wildlife enthusiasts, was revised in 1921 to permit elephant hunting under licence only and to extend total protection to females. However, destruction by Europeans and Malays in the intervening years had been heavy, particularly in Negri Sembilan and Pahang.⁵³ The laws varied somewhat after 1922, and Hislop, in his 1961 history of the legal status of game, notes that not until 1960 was there satisfactory legislation for the whole Federation of Malaya. Hubback (1942) mentions an increase in firearms in ‘the last few decades’ and the many elephants shot in crop defence, 36 in Perak’s Plus Valley alone, where, between

Table 1. Number of properties reporting elephant damage

	Negri Sembilan	Trengganu	Kelantan	Pahang	Kedah	Selangor	Total
1971	1	7	11	9	1	0	29
1972	5	18	32	51	1	1	108

1910 and 1930, elephants had done £20,000 damage to rubber trees. He points out that in Malaya, unlike India, there are no people who have made a living for generations by tending elephants, and thus there is not the same desire to conserve them for useful purposes. Instead, for years they have been looked upon as a menace to progress, and in 1949 'Pelandok' rejoiced in 'the demise of the elephant' as contributing to 'the further security of the country' and 'sustained production'. By 1935, the few remaining tame elephants were used only on the occasion of royal marriages.¹⁴ Thus in 1942 Hubback described how, after only 50 years of widespread land development and inadequate wild-life protection, elephants were in a marked decline in both distribution and numbers, a process that has gone on since, with elephants retreating into the undeveloped mountainous areas. The ecological and management significance of this is discussed in Olivier (1978).

Foenander (1952) gives a fuller description of elephant distribution prior to 1945, confirming Hubback's observation that only a few were left on the west coast and, in the light of public sentiment, were probably doomed. The elephant was gone from Malacca, Province Wellesley and Penang. The 1952 situation was worst in Selangor, where elephants had recently been wiped out on Carey Island, and next worst in Negri Sembilan; very few were left west of the railway between Gemas and Penang, notably the ones between Kuala Selangor district and Kuala Konyor. From Burkill (1961) it would appear that pre-war distribution in Negri Sembilan was limited to the north-east corner abutting the vast jungles of Johore and Pahang. Foenander also records elephants as still numerous in Pahang (except to the west of a line between Raub and Ginting Simpah), Kelantan, Trengganu, east Kedah, upper Perak, parts of Negri Sembilan, and Johore. In 1960 Harrison records only two captive elephants left in Malaya, and despite the country still being two-thirds forested, expresses pessimism for the future of the remaining wild ones, due to the human population increase. Foenander (1961) who researched an up-to-date distribution and published the first map thereof, considered the future of the elephant outside reserves and mountainous areas to be not only insecure but unacceptable.

Khan (1965) has given a good illustration of the results of the pressures in the western lowlands by referring to Perak, where indiscriminate land development, with shooting of elephants and incidental poisoning with weed killer, led to fragmentation and 'pocketing' of herds. In one 'herd', four were shot and seven poisoned in less than a year in 1954/55, an irrigation scheme threatened another 'herd', and the future of all elephants appeared 'bleak' except in the Upper Perak undeveloped hill country; but even there the same story was

Table 2. Number of elephant raids reported

	Negri Sembilan	Trengganu	Kelantan	Pahang	Kedah	Selangor	Total
1971	1	7	12	19	1	0	40
1972	13	27	72	105	1	2	220

considered only a matter of time.

Medway,¹⁷⁴ collecting data in 1960-63, published the first attempt at a comprehensive survey of elephants and other big game. His map is limited to contact points between elephants and Game Department staff and did not suggest any major differences in distribution from that of Foenander (1961). He found the elephants to be declining in the more densely populated areas and recorded 127 killed by the Game Department between 1960 and 1963. Stevens (1968) does not indicate precisely where in each state elephants remain. Control shooting continued at a rate of about 15 a year, with 174 elephants shot between 1960 and 1968—70 in Pahang alone; he predicted this would go on, there and particularly in Johore, where the most forest was to be cleared. Khan (1969) updates the Perak distribution, recorded in a map that also marks recently extinct 'herds'. He refers to the continued persecution of the elephant, with a drop of 19 to 14 'herds' since 1949. Between 1948 and 1969, 80 animals died by shooting, and eight were poisoned.

In 1973, my first task was to compile a country-wide survey of distribution and numbers, both to update previous records and to search for areas suitable for detailed ecological research. This is recorded in my monthly reports to the Game Department^{105 106 107 108} and was summarised and incorporated into Khan and Olivier (1974). Map 4 shows the 1973-74 distribution.

The rate described by Stevens of 15-20 elephants shot a year¹⁴⁰ continued until 1970, when Mohammed Khan bin Momin Khan became acting Chief Game Warden. He was not only an elephant enthusiast but also the first noteworthy local naturalist and conservationist to emerge in Malaya or its Game Department. Realising that a modern Game Department must grow from a purely law-enforcing body to one responsible for long-term conservation, he began by clamping down on elephant control, and between 1970 and 1976 only about 36 were shot. But the situation continued to worsen, and the Department was under pressure to resume full-scale shooting. In response to this Khan implemented a scheme to trap and translocate troublesome elephants and to set up an Elephant Welfare Unit, which has continued operations since, though no very recent data are available.¹⁰⁹

That the increase in elephant damage to crops can be predicted by the increase of area under such crops has been borne out in recent years. Khan and Olivier (1974) reviewed Game Department records for 1971 and 1972; the number of properties suffering elephant damage are shown in Table 1 and reports received by the Game Department of elephant crop raids in Table 2. Records for other years are not available. Those for Johore and Perak are available only for 1971, so these states are omitted.

The figures for one year show not only a large increase in the number of properties complaining of elephant damage, but also a rise from an average of 1.4 to 2.0 reports per property per year, representing an increase in the level of damage as well as in the number of damaged estates. Pahang, Kelantan and Trengganu, in that order, show the greatest increases, probably reflecting similar relative amounts of new jungle felled or land planted. Conversely, Selangor and Kedah, with least change, had least new jungle clearing or planting. I have no doubt these trends have continued to escalate since 1972. While in Malaya, I collected many press reports, particularly in 1975, of elephant damage to rubber, oil-palm, bananas, coconut, padi, sugar-cane and smallholdings, and on many occasions I saw the effects first-hand. So despite the Elephant Welfare Unit, the Department has been forced to continue shooting a few elephants, largely to placate other authorities and public opinion. Game Department papers record the shooting of 10 animals between 1970 and 1974 in Kelantan, Perak, Pahang and Trengganu. Several were reported in the press for 1974-1976, but I do not have official figures. Some recent press reports⁵ imply that, whatever its successes, the Elephant Welfare Unit is unable to keep pace with demands for its services, and express concern that there may be no alternative to destruction of three elephant herds in Lower Perak, long isolated in small patches of forest that are due to be cleared for cultivation by 1980.

The elephant occurs in all wildlife sanctuaries of sufficient size, most significantly Taman Negara, Grik Game Reserve, Krau Game Reserve and the proposed Endau-Rompin National Park (see Map 4). The long-term security of these and other reserves remains uncertain under present legislation and current political attitudes to wildlife. Also, the military situation in some areas has probably had a deleterious effect on elephants. Army patrols have found evidence that terrorists shoot elephants for meat, and other reports tell of them being killed or wounded in booby traps set against the security forces in the Grik area of Perak.

Numbers

In 1942 Hubback guessed that less than a tenth of Malaya's 'original' number of elephants survived. Since then various attempts have been made to give population estimates a more precise numerical value. Two independent methods of estimating numbers of elephants in Malaya have been used.

Numbers derived from indirect registration of herds. In using this method attempts are made to count the animals in known elephant groups by recording all the footprints of different sizes. The method contains inherent sources of error that render it totally unreliable,¹¹³ though some measures can be taken to counter bias towards overestimation (Khan and Olivier 1974). While the technique cannot provide accurate total population assessments, it can reveal trends from year to year.

Table 3 compares findings of Khan and Olivier, corrected according to the method above, with those of previous estimates based on the indirect registration of known herds.^{92 140} These did not make any corrections to the raw data. Owing to the nature of the raw data it is unwise to analyse more than superficially the differences between these estimates, especially their grand totals. Nevertheless, the comparative study of these results can reveal interesting trends.

Table 3. Numbers of elephants in those states in which they occur, based on indirect registration data. Human densities are given for comparative purposes.

Year Authority	1960-1963 (Medway 1965)	1966-1968 (Stevens 1968)	1970-1974 (Khan and Olivier 1974)	1970 persons/mile ²
Perlis	12	3	5	390
Kedah	c.90	23	10-33	260
Perak	87	97	105	196
Kelantan	115	111	61	119
Trengganu	57	36	43	80
Pahang	236	127	287	36
Selangor	14	5	9	516
N. Sembilan	38	8	14	187
Johore	43	53	74	174
*GRAND TOTALS	682	443	601	
*Corrected for herds believed to cross state boundaries.				

It is probably fair to say that states with lowest human population density will undergo the most rapid new opening of land. Figures for human population density are shown in the last column of Table 3, but there remain various sources of confusion in the relationship between elephant and human density. For example, although Perak appears highly populated, the people are concentrated in the long-developed lowlands, while the elephants are largely left in hills of Ulu Perak and, as predicted by Khan in 1965, are being 'exposed' by new developments, which explains the overall increase in known elephants in the state. Thus it is probably significant that Perak, Pahang and Johore, which show an increase in 1974, might be the states with the most new development in the intervening period. I would predict increased elephant estimates by this method in Kelantan and Trengganu as development proceeds there. Considerable trouble in the face of new developments was indeed met in Trengganu in 1975 (pers. obs.). This overall appreciation is supported by the trends indicated in Tables 1 and 2. Finally, the trends would be even more marked had Khan and Olivier's 1974 data *not* been corrected for possible over-estimation.

As the method is based on known elephant/human contact points, increases in the estimates in an area over time will be biased to be least in areas where there was the least extensive and rapid new development in the interval between estimates. This is borne out by the trends apparent in the long-developed states of Perlis, Kedah, and Selangor. Conversely, changes in estimated numbers can be expected to be greatest in areas where there was the most new development between estimates. Unfortunately it was not possible to include in Table 3 a state by state breakdown of Khan's 1977 estimate of a total of 556 elephants in Malaya. The table in which this data was presented did not appear in the paper as published, although it was referred to in the text, which gave no indication that any corrections had been applied to the raw data.

Numbers derived from densities and the extent and nature of the remaining elephant range. Although raw indirect registration data can be

adjusted for overestimation, it remains impossible to correct for the underestimation when such data are used to estimate the total number of elephants in a country. This is because data for elephants that never contact man or his crops are not included. Olivier (1978) attempted to make an estimate for Malaya that makes allowance for such elephants by applying ecological elephant densities to remaining primary and secondary forest. By this procedure, in which I made every effort to avoid bias towards overestimation and vice versa, I concluded there that between 3000 and 6000 elephants may still survive in Malaya. This new estimate, although representing a considerable increase over previous ones, is nevertheless no cause for complacency.

Sri Lanka

Distribution

Despite prehistoric paintings and etchings of elephants, there is no evidence that the animal was caught and tamed in Ceylon as long ago as in India, although the records we do have, which all attest to both the abundance of elephants and the skill of trappers on the island, suggest that Ceylon was probably not far behind. Kurt (1969) states that Ceylon was exporting elephants by 600 BC; so skills must have been well-established before then. Any lack thereof would have been corrected after Vijaya invaded from India and his Indian bride arrived in 483 BC with elephants as part of her dowry.²⁶ In the 3rd century BC the Greeks knew of trade in elephants from Ceylon, and Digby, 1971, mentions their export to Bihar at that time.

According to the ancient Ceylonese chronicle of history, the Mahavamsa, in the 2nd century BC, but possibly before, the Sinhalese Kings established a royal elephant stable, the *ath-panthiya*, equivalent to the Indian *pil-khama*. This was staffed by a complex hierarchy: a *gaja nayake nilame*, usually a prince, was in charge of various overseers, noosers, cutters of lianas, scouts who located wild herds, mahouts, trainers, food and water collectors, an elephant vet and a special caste of rope-makers. The *ath-panthiya* existed right up to 1815, when the Kandyan Kings finally ceded to the British, but the title of *gaja nayake nilame* still exists. The Mahavamsa describes royal war elephants, nearly all tuskless or those showing depigmentation, and the methods of capturing them. Indeed, it was an integral part of all princes' upbringing to learn the arts of the elephant.

In 44 AD Pliny recorded information on Ceylon's elephants from the Sinhalese ambassadors to the Emperor Claudius, and in 151 Ptolemy drew a map showing that the elephants were taken chiefly in the far south, in the area of today's Ruhunu National Park. In the 6th century the elephant trade became very large, and elephants from Ceylon were popular in India.³² Imports included animals from Burma, and although it is not known when this was started, it was well established by 1165, because in that year the Burmese stopped the trade and the Ceylonese invaded in response.²⁶ The trade with South India continued to be extensive between 1250 and 1450 and is recorded with Gujarat in 1518-1520.³² By this time the elephant had become entrenched as part of royal culture. In the 12th century a king issued one of the first edicts to protect elephants and other game,¹⁶⁶ and as an apparent result 'wild elephants were so abundant that they could be driven into stockades with little difficulty'. Elephant fights in arenas, involving whole herds, were one of the more popular Sinhala sports, called *gaja kelia*, a term still used for 'great

ANNUAL SRI LANKAN ceremony in Kandy. The tooth relic of the Buddha is carried in a procession involving up to 100 elephants. The white elephant, centre bears the shrine containing the tooth. Wakeford



event'.²⁶ Deraniyagala refers to at least seven different mediaeval documents on types of elephants and their training, control, health and management (see also Nicholas 1954). In 1505 the King of Portugal ordered a fort to be built in Ceylon, 'where are all the elephants of India' were; as if to confirm this, the Sinhalese King mustered 2200 *war* elephants for his siege on Fort Colombo in 1588.²⁶ The Portuguese seem to have introduced the *kraal* system of capture¹⁰⁰ and in their later years were exporting about 37 elephants annually.

Throughout the 17th century and after the advent of the Dutch in 1638, the trade with India continued, and elephants were imported from Pegu in Burma.³² Petrus Plancius's map of 1650 indicates elephant capture in the northwest, where elephants are now absent except in the Wilpattu National Park. They were also found in other areas from where they have long since gone, and McKay (1973) gives several references for their occurrence between 1669 and 1744 in the Kandy, Colombo and Ratnapura areas. Numerous Dutch sources refer to elephants used by the Sinhalese armies, whose kings in Kandy continued to hold large stables. In 1671 the King had 300 tuskers,¹²⁰ and in 1681 Knox records many details of the capture and use of elephants (even as executioners). His is also perhaps the first reference to their destruction of crops.

As elephants continued to be taken from the King's lands, the Dutch began using forced labour to catch elephants on the land they controlled, and the animals became a significant export item. The following are catches from certain kraals, of which there were many in the country: in 1666, 96 elephants



AN ELEPHANT HUNT
P. Jackson

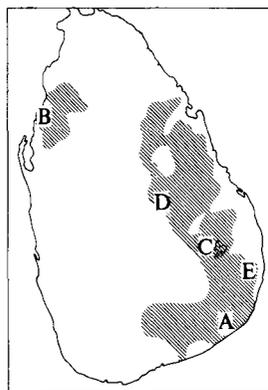
from one kraal; 1681, 357 from two kraals; 1690, 160 from one kraal. These references come from Deraniyagala, who also mentions a map dated 1730 showing a kraal site in the middle of modern Colombo.²⁶ Two centuries ago elephants were common in the Western Province, where none exist today, and kraals were held in Labugama and Negombo, not far north of Colombo.

Changes came even more rapidly with the advent of the British around 1769. The Kings of Kandy continued in their previous style, e.g. holding *gaja kelia*, until their secession to the British in 1815. However, elsewhere on the island the British started large-scale trapping for export, and in 1787 elephants were still going to South India. De l'Isle's map of 1792 still describes the far south as '*le pays où l'on chasse les elephants*'; indeed, until 1829, kraals were held near Matara,²⁶ where elephants are no longer found. Two kraals in 1797 and two in 1850 accounted for 576 and 370 elephants respectively. The last recorded kraal at Matara in 1829 took 149 elephants,²⁶ and kraaling continued until 1952. In the 20 years prior to 1884, 1875 elephants are recorded as actually exported.³¹ A milestone in the history of the Ceylon elephant was the taking of Kandy in 1815. D'Oyly (1929) describes the details of the King's elephant establishment, protection laws, elephant fights, and methods of capture up to that time, when the British took over all elephant capture. The taking of Kandy also indirectly signalled the start of a relentless campaign against the elephant in the name of crop protection. The advent of the coffee bush and the opening of the hills in which to plant it coincided with relatively modern rifles, giving British so-called sportsmen an extraordinary heyday, sanctioned by a colonial spirit 'battling against the environment'.

The slaughter in the last half of the 19th and first half of the 20th centuries is well recorded by such sources as Marshall (1846), Tennent (1867), Storey (1907) and Walker (1923), and its effects are summarised by de Silva 1969. Rewards were given for shooting elephants, and thousands were shot; in the three years up to 1848, 3500 were shot in the Northern Province, and from 1851 to 1855, 2000 in the Southern Province. One man named Rogers alone accounted for 1300. Elephants could still be shot near Colombo in 1849,²⁶ and so the pressure was not only felt in the hills, though it was severest there. Hill populations must have slowly become fragmented, but elephants were still found between Kandy and Bandarawela in 1915¹⁷² and in the highest areas near Nuwara Eliya 1924.⁸⁴ A few survived in the Kandy area perhaps up to 1950.²⁶ This long survival was probably only possible as a result of an 1891 Government Ordinance to prevent 'wanton destruction' of elephants. Control did not cease, but Phillips was able to remark in 1929 that the lack of 'slaughter' had led to elephants becoming a severe nuisance and that there was no room for both them and man.¹¹⁷

Elephants have continued to be a nuisance and men to have such opinions ever since.¹¹⁸ ¹²⁴ The onslaught seems to have had an almost irrevocable effect on numbers, as implied by Nicholas (1955) and by current estimates of the wild population. A further indication is that there were only 532 tame animals in Ceylon in 1969, according to Jainudeen and Jayasinghe (1970), whereas Deraniyagala (1955) had been able to 'examine' 670. It has also resulted in today's rather peculiar distribution (see Map 5), unique in Asia in that, except for a small remnant in the currently threatened but previously inaccessible Sinharaja rainforest, all elephants are restricted to lowlands, not highlands. The pattern of elimination was typical of Asia in the wet, fertile, south-western

5. Approximate distribution in Sri Lanka. *A* is Ruhunu National Park, *B* Wilpattu National Park, *C* Gal Oya National Park, *D* Wasgomuwa Strict Natural Reserve, *E* Lahugala Tank.



lowlands—the ‘wet zone’—but lowlands of the ‘dry zone’ to the north, east and south were not opened up as much; in the south-east diseases and severe seasonal drought conspired to keep man out until recently. Thus when the mountains were fully opened up for coffee, and then tea, elephants continued to survive in the dry lowlands. The fact that the area had formerly been occupied by the ancient Sinhalese, who before the advent of malaria had irrigated it, probably also made it good elephant habitat; when malaria came under control, the elephants began to suffer increasing pressure. Although totally protected since 1937, their habitats are being reduced and fragmented indiscriminately. The first human competitors are shifting or *chena* cultivators, whose land practice in its initial stages probably produce beneficial ecological effects, which can result in a false impression of increasing numbers.^{50 117}

In its extreme stages the land-use patterns, together with local legal and religious attitudes, have led to the ‘pocketed herd phenomenon’. This was investigated in Sri Lanka and reported in Olivier 1977c. It is not unique to that country, but it is perhaps more pronounced than anywhere else,³¹ and has led to various attempts, partially successful, to capture and relocate ‘pocketed herds’.⁶⁴ These problems, once created, are extremely difficult to solve, and Sri Lankan elephants face the same threat as those in other Asian countries. It is hoped that these countries can learn from Sri Lanka’s experience and that new ideas for conservation and management, based on recent studies,¹¹³ can be tested in Sri Lanka.

Prior to my own studies there, the distribution shown in Map 5 was also documented or summarised by Norris in 1959, McKay in 1973 and Hoffmann in 1975, and it does not seem to have changed much. Elephants, as shown, still occur in a fairly large part of the country, but they are threatened by some 17 large hydro-development projects, which will bring large-scale permanent agriculture to the sparsely populated dry zone. None of the three national parks, Wilpattu, Gal Oya or Ruhunu (see map), protect elephants over the whole of their annual seasonal ranges.

Numbers

Before the massive 19th century destruction of elephants, there were possibly 12,000, a figure McKay reached in 1973 by applying his calculated elephant densities to total land area. Quite apart from probable inaccuracies in his required estimates for different areas, his figures apply only to the lowland dry

zone to which elephants are limited today. It is possible that elephants once lived in the also seasonal, but wetter, south-western lowlands, at greater densities than anywhere on the island now, and if this is true, then 12,000 was an underestimate. Nicholas (1955) was the first to attempt to estimate wild elephants in Sri Lanka, and he gave a figure of between 850 and 950, 1000 at the outside. Later Norris (1959) estimated 1500. With the benefit of hindsight, these estimates were obviously low, but they attracted local and international attention, the major outcome of which was the studies sponsored by the Smithsonian Institution. Of the resultant publications to date, only McKay (1973) estimates total numbers in the wild—at between 1600 and 2200—but despite taking Norris to task on similar grounds, McKay used methods of surveying and censusing that are not very significant improvements, least of all outside his one main study area. Consequently, he himself stresses that his estimate of the total Sri Lankan elephant population is a ‘first approximation’.

In 1975, Hoffmann, with a background of over 20 years’ intense interest in the matter, concentrated on the areas least known to McKay and made an independent informed estimate of 4000. Although I must emphasise that I consider Hoffmann, wrong in his belief that elephants have *increased* over the last 20 years, I do agree that Norris’s 1959 and McKay’s 1973 figures are too low.

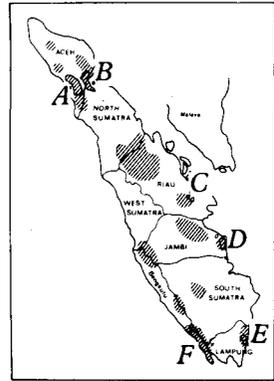
While in Sri Lanka I did not attempt to survey the distribution and numbers there, but I did become familiar with McKay’s study area and its wider surrounds, where I got the impression of much wider and more evenly dispersed evidence—tree damage, tracks and droppings—for higher elephant densities than suggested by McKay’s ‘herd’ ranges (whose objective bases I personally find unclear anyway). In one locality well outside McKay’s area I estimated, from track counts and the directions of two river crossings made in one night, 200 animals, and also saw one aggregate unit of about 80 elephants on the borders of the Wasgomuwa Strict Natural Reserve (see map) in McKay’s little known area III, suggesting that even his upper guess of 300 elephants for that area may err on the low side. I also visited other areas^{111 112} and in the final analysis I would agree with Hoffmann that there are probably nearer 4000 than 2000 elephants in Sri Lanka, although the true number probably lies somewhere in between. As Hoffmann points out, this is no cause for complacency: the elephant population has probably been cut by over 67 per cent in 200 years, and *proper* censuses are long overdue.

Sumatra

Distribution

As Poniran has pointed out in 1974, there was a rich population of wild elephants in Sumatra in and before the 17th century, something particularly well-documented for the northern province of Aceh, where the kings caught, tamed and kept large numbers of elephants until the 19th century. Those in the wild today are only a fraction of former tame stocks, a story that applies to the whole island. Until recently there were chiefs who maintained empty elephant stables as part of their heritage, so great was the dignity of possessing these now unattainable animals. In the first half of the 20th century a vast number of publications on Sumatran elephants appeared in Dutch literature, partly reflecting the great number of interested observers but also probably the large number of elephants.* (*Opposite*)

6. Approximate distribution in Sumatra.
A is Gunung Leuser, *B* Sikundur and
 Langkat, *C* Kerumatan, *D* Berbek, *E* Wai
 Kambas, *F* Sumatera Selatan and
 Lampung.



For Aceh, Poniran notes a distribution much more restricted than that recorded by Carpenter (1938). He also believes that herd size, which was about 20 in the 1930s dropped to only 2-7 on average. Although this must be connected to an overall decline, I believe that it particularly points to a drop in the amount of prime habitat available, and my own observations in Malaya would support this. Both Poniran (1974) and Borner state that the area where Aceh's elephants are most frequently recorded is along both sides of the lower Alas and Bengkong rivers on the boundary with North Sumatra, but such habitats are increasingly denied to elephants. Their range is partly inside the Gunung Leuser Reserve (see map), but from time to time they penetrate shifting cultivations in the Alas and Renun river valleys, where they were recorded by MacKinnon (1973) and observed by me.^{106d} In addition to the areas noted by Poniran, Borner found elephants in the Mamas valley in the centre of the Gunung Leuser Reserve, although he felt these might be the same animals, and near the west coast. Elephants are also listed as occurring in the Kluet Reserve. Throughout the province the laws are not well enforced. Several are killed each year by police or army personnel in response to crop-raiding complaints. In some areas ivory poaching is blatant, and elsewhere elephants are victims to spear-drop traps set by frightened fishermen who merely do not wish to have elephants in the same forest.

In North Sumatra elephants have largely disappeared, though Kurt states in 1970 that they were occasionally seen as far south as Berastagi. They are limited mostly to the lowlands around the Besitang River in the north-east near the Aceh border, which includes the Sikundur reserve, the area best-known for elephants and where Borner and I observed them.^{106d} Part of the range of these elephants lies in the northern and north-eastern parts of the adjacent Langkat reserve, e.g. the Kapi-Ulung river area. According to Borner, they do not use the southern part of the reserve or the high mountains of the western and north-

*Other notable references are Van Heurn (1929) — which has an extensive bibliography — Vantleurn (1937), Groenevelt (1938) and Rappard (1946). Van Strien's 1975 bibliography of the Asian elephant gives many other references to elephants in Sumatra, notably several by Pieters. Since the war the situation has become very poorly understood. It was not until Kurt's 1970 survey, Borner's island-wide survey of Sumatran rhino from 1972-75, and Rappard's revisit in 1973, which led to the publication in English of Poniran's original Indonesian-language report of that year in 1974, that any re-assessment has been possible. The distribution shown in the map is compiled from all these sources, but particularly from Borner's 1976 personal communication to me of an unpublished document on elephant distribution and status in Sumatra, on which most of this present summary is based. For this I am extremely grateful.

central parts. Despite causing considerable crop damage on the periphery of their range, these elephants are possibly the best protected in Sumatra.

In the densely populated province of West Sumatra elephants have been exterminated, except perhaps an unknown number in the north-western part along the coast and at the boundary to Jambi province. The largest numbers remain in Riau province, where they can still be found in all the drier, less swampy places, such as the Barumun and Rokan River areas, along the Bukit Barisan foothills to the west and at the boundary with Jambi in the east. They are recorded as occurring in the Kerumantan Reserve (see map), but the law is not enforced, permits to shoot can be obtained from the police, and oil, timber and plantation schemes are opening up the forest at an incredible speed. In Jambi province also the law, of which most people are unaware, is not enforced. Expatriate oilmen are known to shoot elephants, as do policemen, soldiers and other people with guns. According to Borner, the plateau south of Kerinci is the province's best elephant area. Laurie and McDougall⁷⁹ also noted much elephant evidence here. It appears ideal for elephants, with open forest and lots of bamboo, and should be made a reserve, but this apparently would not be easy. Elephants are officially recorded in Jambi's Danau Gunung Tujuh reserve, but it would appear unsuitable, being small, high—all above 2000m—and steep, and Borner found no signs of any in two visits. Elephants are found in unknown numbers north and south of Jambi town (Telanaipura), and the Berbek reserve (see map) to the south is listed as containing elephants in its south-western, less swampy part. A management programme that included elephants was part of the WWF South-east Asia Programme.⁵⁸

The elephants of southern Sumatra, whose migrations Groeneveldt (1938) described and which up to 1957 were apparently more numerous than in other parts of the country (Hoogerwerf¹⁷⁵), are now fragmented and few. The laws are not well known or enforced, and the reserves are poorly protected. Deforestation is widespread, with large areas either cultivated or under infertile *Imperata cylindrica* grass. Some may exist on the northern and southern boundaries of the province of Bengkulu (Bencoolen). In the province of South Sumatra only a few are left on the northern boundary with Jambi and in the south-east near the Wai Kambas Reserve. The elephants in the remaining forest pockets of the central part of the province are on the verge of extinction, but Borner saw tracks in small forest patches near Pendopo. In Lampung, elephants appear restricted to two poorly protected reserves, both of which have been and continue to be heavily logged. Provided they are not clear-felled, elephant habitat could improve, but there is some evidence of hunting in the Wai Kambas Reserve and the Sumatera Selatan, or Lampung, Reserve in the extreme south-west.

Numbers

Rappard in Poniran, (1974) working from information in Carpenter, (1938) estimates more than 300 elephants in Aceh in the 1930s, basing this on an assumed average herd size of 20, with large ones of 60. Poniran estimates about 95 in 1973, but this is probably high due to some inaccurate informants and probable counting of the same animals more than once. Estimates based on tracks tend to have an inherently high bias anyway.¹¹³ Borner makes an informed estimate of between 20 and 30 animals in all of Aceh, with 10-15 of them in the lower Alas area, and goes on to estimate between 20-30 in the Sikundur and Langkat reserves of North Sumatra. He accepts the official

figure of 100 in Riau as reasonably good, and estimates over 30 in the Kerinci area of Jambi. In Lampung the official estimate is 50, and for South Sumatra he estimates under 30, giving less than 80 for the province.

Not counting the unknown numbers scattered or suspected elsewhere, this gives a minimum total of 250, and I doubt that the maximum is much over 350, even accepting Poniran's 1974 Aceh total. This may be compared to Van Heurn's (1929) estimate of 3000 for Sumatra. The elephant would appear to be more endangered in Sumatra than in any other territory in Asia.



R. Olivier

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