Conservation of the Asian elephant in North-East India

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Introduction

North-east (NE) India comprises the States of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura (21°58'N to 29°27'N, 89°42'E to 97°24'E). The total area of this region is about 255,083km². The elephant habitat in NE India is contiguous with those in Bangladesh, Bhutan, Myanmar and Nepal. For the purposes of this description we should also add the three northern Districts (Darjeeling, Jalpaiguri and Cooch Behar) of the State of West Bengal whose elephant habitat is contiguous with the above region.

About a fifth of the known world population of the Asian elephant (*Elephas maximus)* occurs in this region. Although the general extent of its occurrence has remained almost the same for the past 35-40 years, expansion of human settlements and the consequent destruction of habitat, and poaching for ivory and wild meat have resulted in the decline of the wild population besides severely fragmenting the habitat.

Historical information on the elephant in NE India including capture and training is found in Gee (1964), Shebbeare (1958), Stracey (1963), and Barua and Bist (1995), while information on its status is found in Lahiri-Choudhury (1980), Jackson (1985), and Santiapillai and Jackson (1990). There is an interesting Assamese historical treatise on the elephants, titled *Hastividyarnava* – the manuscript of which was prepared in 1734 AD under the patronage of the Ahom King Siva Singha and Queen Ambika Devi. Brief accounts on a few specific areas of Assam, Arunachal Pradesh and Manipur are found in Choudhury (1991, 1992a,b, 1993a,b, 1995) and Meghalaya in Williams and Johnsingh (1996a,b). Some information is also found in synoptic works such as Sukumar (1989), Menon *et al.* (1997) and Menon and Kumar (1998). The distribution of the elephant in Assam has been mapped by Choudhury (1994, 1997a) while its status in Meghalaya has been dealt with by Lahiri-Choudhury (1980). A detailed account of its distribution, habitat and status in NE India with maps was published recently (Choudhury 1999a).

Physiographically, the region can be divided into five main components: the Himalaya in the north; the hill ranges of the east and south; the Meghalaya Plateau; the plains of the Brahmaputra River; and the Barak Valley. The climate of the region [except for the Himalaya, which may be termed as 'mountain' type (Singh 1976)] is of a tropical monsoon type with a hot wet summer and a cool dry winter. About 75% of the rain falls during the monsoon (May-September). Winter rains are not uncommon all over the elephant-country. The annual rainfall of the region varies from less than 1,000mm to more than 12,000mm. The south-facing slopes of the Meghalaya Plateau receive very heavy rainfall, often recording the highest in the world. Temperature generally ranges from 0°C in winter (minimum) in the high mountains of Arunachal Pradesh to 35°C in summer (maximum) in the plains of Assam.

NE India has diverse habitat ranging from tropical wet evergreen forests to snow-capped mountains. Tropical wet evergreen forests occur mainly in eastern and southern Assam, eastern Arunachal Pradesh, and in small patches in Nagaland, Manipur and Mizoram (up to 900m a.s.l. in the Himalaya, and 1,500m a.s.l. in southern areas). Tropical semi-evergreen forests are widespread in the region especially in the *bhabar* tract of central Assam. A large part of the lower Brahmaputra Valley, the *duars* of northern Bengal and foothills of Meghalaya Plateau is covered by tropical moist deciduous forest. The higher altitudes of the Himalaya, Mishmi Hills, and other hill ranges and the top of Meghalaya Plateau have subtropical forest. Broad-leaf forests generally occur between 800 and 1,900m elevation while conifers are found usually between 1,000 and 1,800m a.s.l. in the Himalaya. In the Barail Range and Manipur subtropical broadleaf forest occurs above 1,200m a.s.l. while in Mizoram it is found slightly higher up to an elevation of above 1,500m. Farther up the Himalaya, and Mishmi Hills occur the temperate forest, both broadleaf (between 1,800 and 2,800m a.s.l.) and conifers (between 2,800 and 3,500m a.s.l.). The latter forms the highest known habitat for elephants in NE India (Choudhury 1999a).

Riparian fringing forest occurs along the banks of most of the larger hilly rivers and streams while mixed secondary jungles are man-made and are found everywhere. Swamp forest and wet savannah grasslands form an important habitat type with the bulk in the floodplains of the Brahmaputra River and its major tributaries, and in the *terai* belt. The major grasslands are in the Protected Areas (PAs) of Jaldapara in West Bengal, Kaziranga, Manas, Dibru-Saikhowa and Orang in Assam, D'Ering memorial and in Dibang Reserved Forests in Arunachal Pradesh (Choudhury 2000).

The human population in NE India is over 42 million, with 26.6 million in Assam alone. The density varies from 340 persons per km² in Assam to 13 per km² in Arunachal Pradesh. About 80% of this population lives in rural areas with agriculture as its main occupation. The population was about 19.5 million in 1971, and has almost doubled in three decades. In case of Nagaland, the increase was phenomenal, from 0.5 million in 1971 to almost 2 million in 2001.

Dense forest cover varies significantly between the states, from 69% in Arunachal Pradesh to 18.5% in Assam. Overall, 95,285km² or 37.3% of the total geographical area of the region is under dense forest while 68,514km² or 26.8% was open and degraded forest (FSI 1999). In addition, about 3,050km² of the northern districts of West Bengal, or about 24% of the geographical area of these districts, is also under forest cover. The position of forest cover in individual states is listed in Table 1.

There are at least 64 notified national parks and wildlife sanctuaries (WLS) in the region covering about 6% of the total geographical area of the region. The Asian elephant occurs in 40 PAs. However, only about a fourth of the known elephant habitat is under these PAs (Choudhury 1999a).

Table 1. Forest cover in different States of NE India (FSI 1999).

State / Region	Dense forest (km²)	% of dense forest to total geographical area	Open forest (km²)	% of open forest to total geographical area
Arunachal Pradesh	57,756	69.0	11,091	13.2
Assam	14,517	18.5	9,171	11.7
Manipur	5,936	26.6	11,448	51.3
Meghalaya	5,925	26.4	9,708	43.3
Mizoram	3,786	18.0	14,552	69.0
Nagaland	5,137	31.0	9,027	54.4
Tripura	2,228	21.2	3,517	33.5
West Bengal	3,051*	24.0*	n/a	n/a
TOTAL*	**98,336***	**37.3**	**68,514**	**26.8**

*The figures for West Bengal refer to total forest cover for three northern districts (see text). Total area under dense forest and its percentage are thus slightly over-estimated.

Status and distribution of elephants

The elephants in NE India together with those in Bhutan, Bangladesh, Myanmar and Nepal had an almost continuous distribution at the turn of the century. Currently, the elephant is discontinuously distributed in about 16 discrete populations/sub-populations (Choudhury 1999a; Choudhury in press) although ecologically many of these may be considered splinter groups. Six elephant groupings are large enough and distinct enough to be referred to as populations.

Currently, the elephant range extends from the eastern border of Nepal in northern West Bengal through western Assam along the Himalaya foothills up to the Mishmi Hills and eastern Brahmaputra plains of Assam and Arunachal Pradesh (Fig. 1). Then it extends into the eastern Arunachal Pradesh, the plains of upper Assam and the foothills of Nagaland. Further west, it extends up to the Garo Hills of Meghalaya through the Khasi Hills, parts of the Brahmaputra plains and Karbi Plateau. Elsewhere in the south, only scattered populations survive.

The major populations and their splinter sub-populations

Northern West Bengal [WEST BENGAL]

The distribution of elephants in the northern West Bengal region begins close to the border with Nepal along the Mechi River, and extends eastward along the Himalaya foothills in the *duars* to the border with Assam State along the Rydak River (Barua and Bist 1995). The habitat is dissected in a north-south direction by several rivers, chief of them being the Teesta and Torsa, and human settlements, cultivation and tea estates; the result is a highly fragmented landscape. From west to east the important Forest Divisions (FDs) and PAs for elephants are the Kurseong Division, Mahananda Sanctuary, Baikanthapur Division, Kalimpong Division, Chapramari Sanctuary, Gorumara National Park,

Cooch Behar Division, Jaldapara Sanctuary and the Buxa Tiger Reserve. The last mentioned reserve is the largest and most compact block of forested habitat in this region, and hence vital for the survival of elephants (Sukumar *et al.* 2003). The distribution of elephants covers about 2,000km² of this region. Overall, there has been a noticeable increase in the elephant population of this region since 1980. The most recent estimates of the elephant population here range from 292 (census figures of West Bengal Forest Department) to about 450-500 based on indirect count (dung density) estimates (Sukumar *et al.* 2003).

North bank of the Brahmaputra [ASSAM and ARUNACHAL PRADESH]

This is a large population extending from western Assam through the Himalaya foothills and the *bhabar-terai* or *duar* tract touching southern Bhutan, northern Assam and Arunachal Pradesh. In eastern Assam, the range also covers part of the floodplains of the Brahmaputra and the Lohit Rivers. This long range (about 600km) is almost continuous; the elephants are able to move across the few gaps easily. Towards the west, this population is contiguous with those of northern West Bengal. Although largely restricted to the north bank of the Brahmaputra in the easternmost part, the pachyderms regularly cross over to the Dibru-Saikhowa National Park on the south bank. This population was separated from the nearest population (South bank-eastern areas) only in the 1970s due to clearing of a strip of land (about 20km wide) for cultivation and habitation in Dibang Valley District of Arunachal Pradesh (Choudhury 1995).

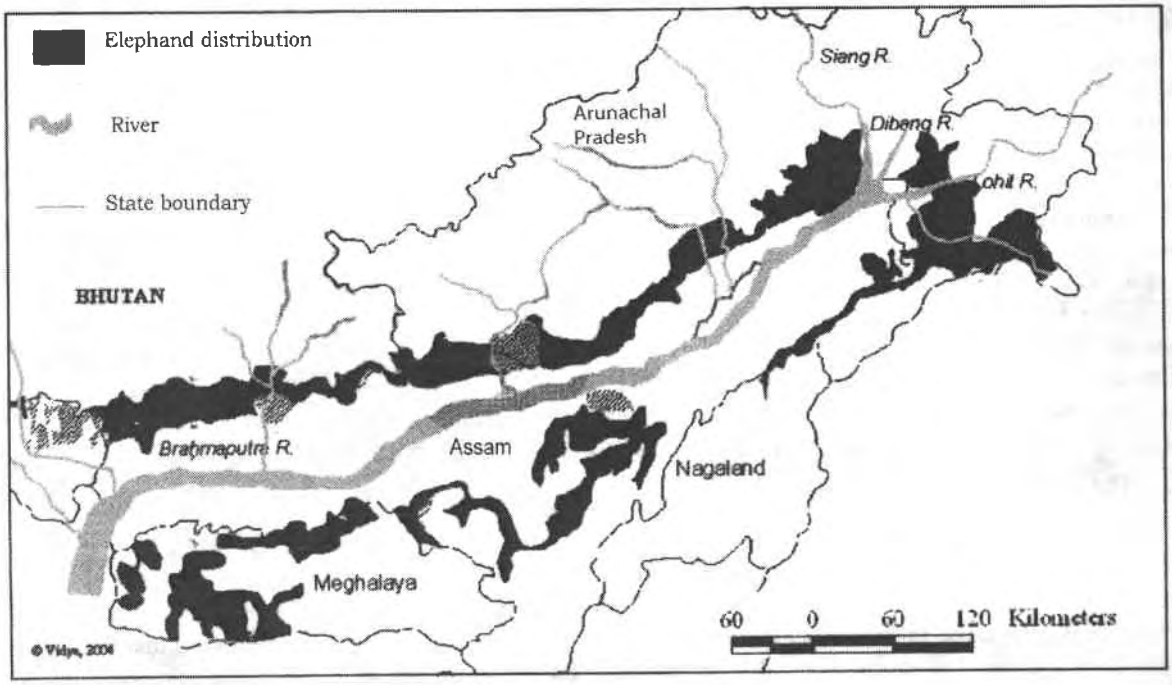
The area covered by this population includes parts of Kokrajhar, Bongaigaon, Barpeta, Nalbari, Kamrup (northern areas), Darrang, Sonitpur, Lakhimpur, Dhemaji, Dibrugarh and Tinsukia Districts of Assam; and West Kameng, East Kameng, Papum Pare, Lower Subansiri, West Siang, East Siang and Lower Dibang Valley Districts of Arunachal Pradesh.

Tropical wet evergreen forest covers the eastern areas as a narrow strip, especially along the foothills of the Himalaya from near the tri-junction of Assam, Arunachal Pradesh and Bhutan to near Pasighat and at the foot of Mishmi Hills. Tropical moist deciduous sal (*Shorea robusta*) forest occurs in parts of western Assam. Tropical semi-evergreen habitat and small pockets of marshy areas with *Alpinia allughas* herbs are found all over the range. Wet savannah grassland with various species of elephant-grass (height up to 5m), a favored and critical habitat of the elephant occurs in patches largely within the PA network, the largest being in Manas National Park of Assam (about 250km²). Other such grassland pockets are found in Barnadi Sanctuary, Kobo Chapori and parts of Dibru-Saikhowa National Park (Assam) and D'Ering Memorial Sanctuary and Dibang Reserved Forest (Arunachal Pradesh). In parts of Dibru-Saikhowa and in Jamjing Reserved Forest, swamps dominated by *Salix tetrasperma*, reed beds dominated by *Arundo donax* and seasonal marshes form an important elephant habitat.

The approximate total habitat available for this population is about 7,900km², the break-up being: Assam 3,400 km², and Arunachal Pradesh 4,500 km². The contiguous habitat in northern West Bengal is about 1,500 km² and Bhutan is about 1,600 km². The estimated number of elephants in this population is 2,700–3,000 (for details and source, see Table 2).

South bank of the Brahmaputra - eastern areas [ASSAM,

Fig. 1. Elephant distribution in North - East India



ARUNACHAL PRADESH and NAGALAND]

This population extends from the base of the Mishmi Hills through Lohit Valley, Dapha Bam Range, plains of upper Assam to the foothills of the Naga-Patkai Ranges. This population became separated from the north bank during the seventies (Choudhury 1995) and from the south bank-central area in the early 1980s (Choudhury 1999a).

District-wise, this population covers Lower Dibang Valley, Lohit, Changlang and Tirap in Arunachal Pradesh, Tinsukia, Dibrugarh, Sivasagar (Sibsagar), Jorhat and Golaghat in Assam, and Mon, Tuensang, Mokokchung and Wokha in Nagaland.

A large part of the range of this population is covered by tropical wet evergreen rain forest, while tropical semi-evergreen (partly degraded) occurs in patches towards west, along Naga foothills. *Dipterocarpus macrocarpus*, a tall dipterocarp, dominates the vegetation type. Some of the finest remnants of rain forest areas of the Indian sub-continent are found in this area, especially in Namdapha National Park of Arunachal Pradesh and Upper Dihing (west block) and Joypur Reserved Forests of Assam.

The approximate total habitat of this population is 4,500km^2, the break-up being: Assam *c.* 1,100km^2, Arunachal Pradesh *c.* 2,900km^2, and Nagaland *c.* 500km^2. The estimated number of elephants in this population is 1,100-1,200.

South bank of the Brahmaputra - central areas [ASSAM and MEGHALAYA]

This important elephant population extends from Kaziranga National Park through the Karbi Plateau, parts of the central Brahmaputra Plains, basin of the Diyung River to the foot of the Meghalaya Plateau in Assam and Meghalaya. Wide gaps have already been formed in this population although somehow, the elephants have maintained their traditional movement. The population has become separated from the south bank-western population due to expansion of Guwahati City, the capital of Assam, clearing of forest for *jhum* and increased human habitation along the National Highway No. 40 connecting the two State capitals, Shillong (Meghalaya) and Guwahati (Assam). District-wise, this population occurs in Golaghat, Karbi Anglong, Nagaon, North Cachar Hills, Morigaon and Kamrup in Assam, and Ri-Bhoi and Jaintia Hills of Meghalaya. However, stragglers and even herds often wander into Sonitpur District of Assam (usually from Kaziranga National Park) and once to East Khasi Hills District (almost at the edge of Shillong City) of Meghalaya.

The habitat in this range is tropical semi-evergreen in its eastern extremities and moist deciduous (mainly sal) in the southern and western parts. Evergreen forest occurs in patches, especially along the streams. Various species of bamboos are abundant all over the area. Large patches in the deciduous biotope have been converted into teak (*Tectona grandis*) plantations.

In Kaziranga National Park, which supports a very dense elephant population, especially in winter, the habitat is mostly tropical wet savannah grassland with scattered patches of light woodland. The savannah contains tall elephant grass including *Arundo donax*, *Erianthus ravennae*, *Imperata cylindrica*, *Phragmites karka*, *Saccharum arundinaceum*, *S. procerum*, *S. spontaneum*, *Themeda arundinacea*, etc.

The approximate total habitat in this range is 5,000km^2, the break-up being: Assam *c.* 4,500km^2 and Meghalaya *c.* 500km^2. The estimated number of elephants in this population is 2,900-3,000.

South bank of the Brahmaputra - western areas [MEGHALAYA and ASSAM]

A significant elephant population exists in the western areas of the south bank of the Brahmaputra River covering Meghalaya and a small part of Assam. This population extends from near Guwahati, the capital city of Assam, through the foot of the Meghalaya Plateau covering the Garo and Khasi Hills. District-wise, it covers Kamrup (southern areas) and Goalpara in Assam, and Ri-Bhoi, West Khasi Hills, East Garo Hills, West Garo Hills and South Garo Hills, all in Meghalaya (Marak 2002). Occasional seasonal range of this population also covers small areas of Bangladesh (northernmost areas of undivided Mymensingh District) (Choudhury 1999a).

Most of the habitat of this population is tropical moist deciduous (towards the north) and tropical semi-evergreen (towards the south). Tropical wet evergreen forest occurs along the narrow river-valleys especially in the south-facing canyons. The deciduous forests of the northern slopes are dominated by *Shorea robusta*. Small and scattered patches of grassland occur in different areas of Meghalaya Plateau, especially in the Balphakram National Park, the most important of the existing Protected Areas here. Protected Areas constitute only 1.4% of the geographical area of Meghalaya. A large area of forest in Meghalaya designated as Unclassed Forests rests with the Autonomous District Councils of Khasi, Garo and Jaintia Hills. These are mostly under *jhum* or shifting cultivation.

The approximate total habitat available for this population is about 6,700km^2, the break-up being: Assam 700km^2 and Meghalaya 6,000km^2. The estimated number of elephants in this population is 2,800-3,000.

Dhansiri-Intanki [ASSAM, NAGALAND and MANIPUR]

This isolated but viable population covers part of Karbi Anglong District of Assam and Dimapur and Kohima Districts of Nagaland. In Karbi Anglong, the elephants of this population are distributed in Dhansiri and Daldali Reserved Forests while in Nagaland; it is confined chiefly

to the Intanki WLS. In Manipur, a small number of elephants occasionally, but almost annually, cross over from Nagaland to Senapati District. This population was separated from the South Bank - Central Population by the Diphu-Lumding road and subsequent settlements, *jhum* and teak plantations. The habitat in this range is tropical semi-evergreen in eastern areas and tropical moist deciduous in western areas. Large stretches of bamboo breaks are found in Daldali Reserved Forest. Patches of Teak plantations and secondary scrub are also found. The habitat used by this population is about 1,050km^2, the break-up being: Assam, *c.* 800 km^2 and Nagaland, *c.* 250 km^2. The estimated number of elephants in this population is 300 – 350.

The minor populations and their splinter sub-populations

Barail - Jaintia Hills [ASSAM and MEGHALAYA]

About 35-40 elephants, now scattered, occur in the southern faces of the Barail Range of Assam and Jaintia Hills of Meghalaya. The Barail population in Cachar was extirpated in late 1998 (Choudhury 2001) and now only animals on the Jaintia Hills are surviving with only an occasional straggler in Cachar near its border with former. The link between Jaintia Hills with that of the south bank-western population ceased at least four and half decades back due to clearing of forests for settlement and cultivation in the northern areas of Sylhet (Bangladesh) while very steep slopes made it difficult for the animals to move through southern Khasi Hills. The main habitat type of this population's range is tropical wet evergreen and semi-evergreen forest with bamboo breaks.

Karimganj [ASSAM and TRIPURA]

A small herd of nine elephants occurs in Tilbhum, Longai and Patharia Hill Reserved Forests of southern Assam, adjoining area of Tripura and Bangladesh (Sylhet area). The link with the nearest group (Hailakandi) ceased around the mid-1970s (Choudhury 1991). The habitat in the range is mostly semi-evergreen with patches of teak plantations and stretches of bamboo. The total area of the habitat is *c.* 140km^2, the break-up being, Assam *c.* 80km^2, Tripura *c.* 20km^2 and Bangladesh *c.* 40km^2.

Hailakandi [ASSAM]

Only two individuals, a mother and her grown-up calf were left in the Katakhal Reserved Forest of Hailakandi District in southern Assam in 1996-1997. However, a small group of 3-4 joined them in late 1997 from an unknown destination only to disappear again (A. Majid Choudhury pers. comm.).

The habitat type is mostly tropical evergreen and semi-evergreen with abundant bamboo.

Laokhowa-Burhachapori [ASSAM]

A small population of 10-15, which increases to >20 during the paddy season, ranges in two adjacent reserves, Laokhowa WLS of Nagaon District and Burhachapori WLS of Sonitpur District in central Assam. The main link of this population was with those of Kaziranga National Park and Bagser-Kukurakata Reserved Forests, however, due to clearance for cultivation and habitation, and development of a major road with a long bridge across the Brahmaputra River, the movement has virtually ceased except for some during the paddy season. The habitat type is wet savannah grassland with deciduous and semi-evergreen woodland.

Orang [ASSAM]

An interesting all-male group of 6-7 elephants occurs in this small park of Darrang and Sonitpur Districts of central Assam. These elephants move about singly or as *maljurias* (bachelor duos) and breed freely with the captive female elephants stationed at the national park. The habitat type is wet savannah grassland with tall elephant grass and patches of deciduous woodland and some marshy areas. The total area of the range is *c.* 80km^2.

Amcheng [ASSAM]

About 30-40 elephants are found in Amcheng Hill Reserved Forest and adjacent areas of Kamrup District, very close to Guwahati City. These elephants were part of the larger south bank-central population but are cut off by National Highway 37 and clearance of forest and subsequent settlements on both sides of the highway (Choudhury 1985). The habitat type is tropical semi-evergreen and moist deciduous with bamboo.

Hollongapar (Gibbon Sanctuary) [ASSAM]

A group of 10-15 elephants is pocketed in the 19km^2 Gibbon [Hollangapar] Sanctuary of Jorhat District. This population was part of the larger south bank - eastern areas population but habitat loss between it and Desoi Valley forests near the Assam-Nagaland border has isolated it. The habitat type is largely semi-evergreen with evergreen trees.

East Manipur [MANIPUR]

A group of around 50 elephants occurs in the Anko Range on the Indo-Myanmarese border in Manipur. District-wise, this range falls in Ukhrul and Chandel. This population is continuous with those of the Somra Tract of Myanmar (Burma). Within India, this population occurs in two disjunctive parts; however, the habitat in Myanmar is contiguous and hence, are treated as one population. The habitat type is tropical semi-evergreen and moist deciduous. The total area of the habitat, i.e., potential elephant range is about 250km^2.

Tripura and northwest Mizoram [TRIPURA and MIZORAM]

Another group of around 50 elephants occurs in the forests of Tripura and north-west Mizoram. This population was continuous with those of the Chittagong Hill Tracts of Bangladesh. These elephants are now concentrating mostly in the PAs such as Gumti WLS in Tripura and Dampa Tiger Reserve in Mizoram. The forest type is of tropical semi-evergreen with large stretches of bamboo. The area of the total elephant range is *c.* 2,100km^2, the break-up being: Tripura *c.* 1,600km^2 and Mizoram *c.* 500km^2.

South Mizoram [MIZORAM]

Recent surveys have confirmed the presence of two small splinter groups of eight animals in the Ngengpui WLS of the Lawngtlai District and two to three in the Palak Dil area of Saiha District of Mizoram (Choudhury in press). The forest type is tropical evergreen with some fine tracts of mature primary forest dominated by *Dipterocarpus turbinatus*. The area of the total elephant range is *c.* 300km^2.

Table 2 Habitat availability and populations/sub-populations of wild elephants in NE India.

Table 9.2. Habitat availability and populations/sub-populations of wild elephants in NE India.

Name of the population/ sub-population	Approx. potential habitat in km^2	Notified Protected Area in km^2	Estimated number of elephants	Remarks
Northern West Bengal	2,000	1,276	300 - 500	The lower estimates of elephant population are from the census of the forest department in 2002, while the higer estimates are based on Sukumar *et al.* (2003). Some of the differences could be possibly due to in flux of elephants into northern Bengal from western Assam.
North bank of the Brahmaputra	7,900	3,137	2,7000 - 3,000	2,799 estimated during joint census by the Forest Departments in Assam and Arunachal Pradesh in 1993; c.280 in north Bengal; additional 1,600km^2 of habitat in Bhutan (Choudhury 1999a).
South bank - eastern areas	4,500	2,270	1,100 - 1,200	1,150 estimated during joint census by the Forest Departments in Assam and Arunachal Pradesh in 1993; >50 in Nagaland (Choudhury 1999a).
South bank - central areas	5,000	835 [+376*]	2,900 - 3,000	2,950 estimated during joint cernsus by the Forest Departments in Assam and Meghalaya in 1993 (Choudhury 1990a).
South bank - western areas	6,700	418	2,800 - 3,000	3,001 estimated during joint census by the Forest Departments in Assam and Meghalaya in 1993 (Choudhury 1990a).
Dhansiri-Intanki	1,050	207	300 - 350	232 estimated during census by the Forest Department in Assam in 1993; 141 counted during a census by the Forest Department in Nagaland in 1978; maximum possible in the entire Dhansiri-Intanki area is 4100 elephants (Choudhury 1999a).
Barail-Jainta Hills	150	0	35 - 40	37 estimate d during joint census by the Forest Departments of Assam and Meghalaya in 1993 (Choudhury 1999a). Barail populaiton extirpate; only Jaintia Hills survice.
Karimganj	140	0	9	8 counted during census by the Forest Department of Assam in 1993 (Choudhury 1999a).
Hailakandi Laokhowa-Burhachapori	80 110	0 114	1 - 2 10 - 15	2+ in Choudhury (1999a). 13 estimated during census by the forest Department of Assam in 1993 9Choudhury 1999a).
Orang	80	79	6 - 7	10 estimated including Singri Hills RF during census by the Forest Department of Assam in 1993 (Choudhury 1999a).
Amcheng Hill	80	0	30 - 40	36 estimsyrf during census by the Forest Department of Assam in 1993 (Choudhury 1999a).
Hollongapar (Gibbon Sanctuary)	20	21	10 - 15	12 estimated during census by the Forest Department of Assam in 1993 (Choudhury 1999a).
Eastern Manipur	500	185	<50	Choudhury 1999a.
Tripura-NW Mizoram	2,100	870	<50	194 estimated in Choudhury (1999a).
South Mizoram	300	110	11+	Forest Department of Mizoram
Total	31,600	9,948	10,300 - 11,300	Figures have been rounded.

* 376km^2 have been added to Kazirang as the 6th addition but a case has been filed in Gauhati High Court against it.
\# In many Protected Areas only a part is suitable for elephants.

NB:The census of 1993 jointly undertaken by the Forest Deparments of Assam, Arunachal Pradesh and Meghalaya has been taken although there were subsequent estimates. This census was done elaborately and many of the ex-ahouts and phaandis were also involved besides NGOs. The later exercises were not done jointly and also not in the same year. A similar joint exercise was conducted in March 2002.

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9.3 Conservation problems and issues

The following is a summary of the conservation problems and issues that pose a threat to the survival of the elephant populations of NE India.

Habitat destruction

Habitat destruction through logging, encroachment, *jhum*, and monoculture forest plantation is a major threat to the survival of the elephants. The forest cover in NE India is disappearing at an alarming rate. More than 1,000km² of forest were destroyed annually in the 1970s and 1980s (derived from data from the National Remote Sensing Agency). The alarming decrease in forest cover is evident from examples such as Meghalaya where the dense forest cover has declined from 33.1% in 1980-1982 (National Remote Sensing Agency, Hyderabad) to 18% in 1993 (FSI 1997). In just two years, from 1989-1990 to 1991-1992, Arunachal Pradesh has lost 334km² of dense forest (FSI 1993, 1995). In the latter half of the 20th century, more than 2,200km² of prime elephant habitat in Assam have been cleared for tea plantations alone (Choudhury 1999a). Some of the important reasons were:

Logging

Both legal and illegal logging has affected the elephant habitat all over the region. There are extreme examples such as Disoi Valley, Tiru Hill and Geleky RFs in eastern Assam where virtually no forest of any significance is left.

Expansion of *jhum*

In the hilly areas, *jhum* (shifting or slash-and-burn cultivation) is an important cause for loss of elephant habitat. In Manipur, *jhum* covers more than 1,800km² or 8.2% of the total geographical area. Even in the hilly areas of Assam, the area under current *jhum* is more than 2,600km².

Unplanned clearance for human settlements

The ultimate cause of habitat destruction is the very rapid growth of the human population; more than 500,000 people are added annually to NE India. As a very high percentage of population (*c.* 84.5%) lives in rural areas with farming as the main occupation, the large-scale destruction of forest and wetland seems inevitable.

Encroachment

Three Reserved Forests (RFs) in Sonitpur District of Assam illustrate the problem of encroachment in elephant habitats. In Balipara RF more than 100km² of 188km² is under encroachment and forest villages. There is also an extreme case, in Gohpur RF, where almost the entire forested area of 133km² in under encroachment and forest villages. Almost the entire 900km² of rainforest, comprising Nambor (south block), Diphu, and Rengma RFs in Golaghat District (Assam), is badly degraded due to the border problem with Nagaland, and subsequent felling and encroachment (Choudhury 1999b); this happened in the 1970s and 1980s.

Developmental projects

Construction of roads and railways through forests has caused the death of many elephants. As recently as November 2001, at least seven elephants died in collision with a train in Tinsukia District of upper Assam. Large-scale, unplanned bamboo harvesting for two large paper mills (Jagiroad in Morigaon District, and Panchgram in Hailakandi District of Assam), and oil mining and exploration in upper Assam and adjoining areas of Arunachal Pradesh, have also opened up large forested areas.

Poaching and trade

Elephants are poached in NE India for tusk and meat. Adult and sub-adult males are targeted for meat irrespective of sex or age. Although the exact number of elephants poached in the region is not known, available records show that at least 150 animals were killed between 1987 and 1997. The worst record in a single year was 30 elephants killed in Meghalaya in 1995.

At present, poaching of tuskers is serious along the Assam-Arunachal Pradesh border (especially Lakhimpur-Dhemaji and Papum Pare, Lower Subansiri-West Siang sectors), the Assam-Nagaland border, eastern Karbi Anglong, and the Garo Hills (see Table 3).

Although the ivory trade is the main motivation of poachers, for many hill tribes elephant meat is a delicacy. While some wait for natural and accidental death of elephants, others kill them deliberately for food. Major tribes fond of elephant meat are, the Nagas (all tribes), Kukis (all tribes including the Hmars), Mizos (or Lushais), Nishis (or Dafflas), Adis (or Abors), Chakmas and Dimasa Kacharis. There are also instances when Assamese settlers have been known to eat meat, such as that in February 1993 when an immature elephant that died due to accidental electrocution in Upper Dihing (west block) RF of Assam was eaten. Poaching has played a key role in decimating the elephant population in parts of North Central Hills, almost all of Mizoram,

the bulk of Manipur, parts of Nagaland, and the southern Assam Districts of Cachar, Hailakandi and Karimganj (Choudhury 1999a).

Methods of poaching

Shooting with rifles and automatic guns is the most widely-used method although occasionally, muzzle-loaders are also used. Killing elephant with poisoned arrows and spears is still practiced, although with the easy availability of modern firearms such primitive methods survive only in some areas. Traps made of spears including 100mm galvanized pipes filled with sand (for weight) and pointed at one end are in use in Garo Hills and western Khasi Hills of Meghalaya. These 'spears' are hung high (4-6m) so as to penetrate deeper resulting in death of the elephant. Often, tips of such spears are poisoned. Pits are also used in different areas, where pits 2m deep are dug where some spears or pointed bamboo are struck at the bottom. Such pits are usually dug along known elephant-trails and are covered with vegetation. In 1987, the Dimasa Kacharis of N.C. Hills killed one elephant in this way. Such killings have also been reported from southern Garo Hills area.

Quite a few elephants have died of electrocution that includes both accidental as well as deliberate, i.e., poaching. In Kaziranga National Park and Pabitora WLS, this method is occasionally used by the poachers to kill rhinos. The only case where deliberate electrocution of elephants was suspected was in Garo Hills of Meghalaya where an entire group of seven animals was electrocuted in 1995.

Trade in elephant parts

Trade in elephant products is largely centered on ivory, although wild meat and other parts often form an insignificant amount. Ivory craft is an age-old practice and originally thrived mainly on the raw materials from naturally dead animals or captive elephants. In India the main use of ivory was for the making of ornaments such as bangles, rings, ear-rings and bracelets, artifacts such as toys, statues, sculpture, chess pieces, combs, etc. Recently, the ivory trade has been fuelled by the demand in the Far East for *hankos* (signature seals) and *netsukes* (small carved figurines). Most of the ivory is smuggled out and domestic trade in ivory is negligible in the NE India. In parts of NE India, elephant meat also forms part of the trade. However, it is mostly for domestic consumption. There are recent instances of dried meat being taken in trucks from Garo Hills, West Khasi Hills and Ri-Bhoi areas of Meghalaya to Mizoram. Unreported local trade is prevalent in parts of Nagaland and Arunachal Pradesh. Other uses of elephant products include legs, which are made into sitting stools.

The main trade routes of elephant products inside the north-east and those leaving the region are listed in Table 4.

Table 3. Main recorded areas of poaching.

Name of Area	State
Balpakram NP, Siju WS and adjacent areas of South Garo Hills and West Khasi Hills	Meghalaya
Manas NP and adjacent forests of Bongaigaon and Kokrajhar Districts	Assam
Nambor (north and west blocks) RFs of Karbi Anglong and Golaghat Districts	Assam
Barnadi WS, Nanoi Range and adjacent areas of northern part of Darrang District	Assam
Dulung, Kakoi and Ranga RFs of Lakhimpur District and Panir RF and Doimukh proposed RF of Papum Pare District	Assam and Arunachal Pradesh
Gandachara Sub-division of South Tripur District	Tripura
Abhoypur, Dilli and Geleky RFs of Sibsagar District and adjacent areas of Tirap, Mon and Mokokchung Districts	Assam, Arunachal Pradesh and Nagaland
Northern parts of Karbi Anglong District	Assam
Wokha District	Nagaland
Intanki WS of Kohima District	Nagaland

Illegal capture

Although not common, elephants are illegally captured in the region. There were two recorded cases of single individuals captured in 1987 and 1993 from a small herd in Katakhal RF of Hailakandi District. More audaciously, in 1992 a herd of 16 elephants was captured by Nagas close to the Assam-Nagaland border. Although difficult to prove a number of calves are captured in Arunachal Pradesh to supply the captive elephant trade in southern India, particularly Kerala.

Disease

Outburst of bacterial diseases, such as *anthrax*, occasionally affects elephant populations, although most cases go unreported. One reason is that the carcasses are usually located after a few days of death and a post-mortem becomes difficult. Moreover, in most of the interior areas veterinary facilities to diagnose the diseases are not available. *Anthrax* is normally transmitted by domestic animals that graze in or near the forests. In the mid-1940s, two outbreaks of *anthrax* in epidemic form devastated the elephant population of N.C. Hills (Choudhury 1991).

Elephants also occasionally catch foot-and-mouth disease from cattle.

Human-elephant conflict

Conflict between elephant and people is a major conservation problem throughout this region. With the decrease in forest cover due to ever-increasing human population, the conflict is becoming more serious daily. Raiding of crops by wild elephants is a familiar phenomenon all over the area. Elephant depredation in human settlements is another cause for conflict. However, most such cases occur near small and disturbed forest pockets (e.g., near Hollongapar RF), within encroached areas in prime elephant habitat (northern Sonitpur), along migratory paths, and where lone bulls go in search of granaries and stored liquor. The worst case of depredation ever recorded was in northern areas of Darrang District (Dimakusi area, Bornadi-Nonoi tract) of Assam in October 1992 when about 4,000 people (900 families) had to flee their villages and take shelter in relief camps set up by the government. A recent study carried out in parts of Assam found that a hamlet between Karbi Anglong and Kaziranga National Park looses a third of its annual paddy production to

Table 4. Main trade routes (The main destinations for ivory are the Far East, Southeast Asia, and Middle East).

Centre of Poaching	Route
(a) Ivory	
E and S Garo Hills, W Khasi Hills	Guwahati-Joygaon-Phuntsholing (Bhutan)
E and S Garo Hills, W Khasi Hills	Guwahati-Siliguri-Dhulabari (Nepal)
E and S Garo Hills, W Khasi Hills	Guwahati-Siliguri-Calcutta
E and S Garo Hills, W Khasi Hills	Mahadeo/Rongara/Baghmara/Ranikor-Mymensingh-Dhaka (Bangladesh)
W Garo Hills	Phulbari-Dhubri-Siliguri-Calcutta
W Garo Hills	Phulbari-Dhubri-Siliguri-Dhulabari (Nepal)
W Garo Hills	Phulbari-Dhubri-Joygaon-Phuntsholing (Bhutan)
Karbi Anglong, Golaghat, Kohima	Dimapur-Imphal-Moreh-Tamu (Myanmar)
Lakhimpur, Papum Pare	Guwahati-Joygaon/Siliguri-Phuntsholing/ Dhulabari (Bhutan/ Nepal)
Lakhimpur, Papum Pare	Bhalukpong-Bomdila-Tawang-Lhasa (Tibet)
E Siang, Dibang Valley	Dibrugarh-Guwahati-Joygaon/Siliguri-Phuntsholing/ Dhulabari (Bhutan/ Nepal)
N Bengal	Joygaon/Siliguri-Phuntsholing/Dhulabari (Bhutan/Nepal)
Jaintia Hills, Cachar	Silchar/Badarpur-Imphal-Moreh-Tamu (Myanmar)
Jaintia Hills, Cachar	Silchar/Badarpur-Karimganj-Sylhet (Bangladesh)
Jaintia Hills, Cachar, Karimganj	Silchar/Badarpur-Aizawl-Myanmar / Bangladesh
North-eastern India (as a whole)	Mumbai (Bombay)- Middle-East (mainly Dubai)
(b) Meat	
Garo Hills, W Khasi Hills, Ri-Bhoi	Shillong-Jowai-Silchar-Mizoram
Lower Assam	Guwahati-Shillong-Silchar-Mizoram
Karbi Anglong, Golaghat and Central Assam	Dimapur-Kohima/Imphal

wild elephants (Choudhury 1997b). The northern Bengal region, especially the western part, is also one of serious elephant-human conflict. On average about 50 people are killed each year by elephants, mostly within settlements or crop fields, in northern Bengal.

Elephants also cause several human deaths in Assam. In just one week at least 50 people were killed, more than half of which were by a lone 'rogue' bull near Burhachapori and Laokhowa Sanctuaries of Assam in August 1993. From 1980 to 2001, more than 900 people had been killed by elephants in the entire Assam. The figures speak of the magnitude of the problem. Affected persons/families are usually paid relief money by the governments but lack of adequate funds, delay in processing, and the tendency among many villagers to submit false claims, exacerbate the problem.

Preventive measures against elephant depredation include beating of tins, shouting, brandishing fires and bursting of crackers; however, these may not work in certain places. Capture of live elephants was also considered a mode to decrease depredation. For instance, 1,298 elephants were captured in Meghalaya between 1960 and 1981. Large-scale capture programmes would certainly decrease the population size of the elephants in the wild. Twelve elephants were captured in Assam in 1994-1995 after obtaining special permission from the Government of India. All elephants were captured by traditional *mela shikar* (capture through noosing from the back of trained elephants) method.

Villagers often retaliate by killing elephants; usually elephants are either shot or electrocuted, but most of them are poisoned. Four animals were poisoned near Barnadi WLS in 1993 and a lone *mukhna* (tuskless bull) in Nanoi Range, both in Assam's Darrang District (Choudhury 1999a). However, the worst case was recorded in Sonitpur District of Assam and adjacent areas of Arunachal Pradesh when at least 27 elephants were poisoned, 20 in July-August 2001, and seven in October of the same year.

Other problems

Pollution of water bodies by pesticides such as Dieldrin, Thiodan and DDT, occasional poisoning for fishing, opencast coal mining in eastern Assam and Meghalaya, and by industrial effluents (paper mills, oil installations, etc.), are serious problems. Power lines passing through forest also cause accidental deaths of elephants by electrocution, especially when high velocity wind or fallen trees damage the lines. Digging of ditches inside forests for oil exploration and by the electricity departments often become death traps for many elephant-calves.

Table 5. Recommended Protected Areas for elephants in NE India.

Name of area	State	Area in km² (Core area in km²)
Amcheng Hill	Assam	53 (40)
Dhansiri #	Assam	1454 (800)
Lumding-Kaki	Assam	350 (100)
Nambor-Daigrung	Assam	100 (60)
Patharia Hill	Assam	75 (40)
Ripu-Chirang #	Assam	750 (400)
South Kamrup	Assam	160 (100)
Upper Dihing #	Assam	440 (267)
Dibang River #	Arunachal Pradesh	202 (100)
Manabum-Tengapani #	Arunachal Pradesh	650 (200)
Papum #	Arunachal Pradesh	450 (250)
Dadengiri-Damalgre #	Meghalaya	550 (00)
Narpuh-Saipung	Meghalaya	300 (80)
Anko Range #	Manipur	400 (250)

(# = high priority areas)

Legal status and past and present conservation measures

The wild elephant is protected under Schedule I of the Indian Wildlife (Protection) Act of 1972, which prohibits its killing or capture. This is in fact the highest level of protection accorded to any species in the country. Most of the villagers, including the hill tribes of remote areas, are aware of its protected status. However, it is often difficult to enforce the Act in remote areas due to delayed information, inaccessibility and problems of insurgency. In cases of arrests of poacher and seizure of ivory/meat, the lengthy judicial process often makes it difficult to convict the accused persons. This is mainly due to slow process in the courts, rather easy bail to the accused, lack of sufficient evidence and subsequent lack of perusal on the part of prosecution side.

Habitat protection

Sixteen notified PAs in Assam, nine in Arunachal Pradesh and four in Meghalaya, two each in Nagaland and Mizoram, and one each in Tripura and Manipur have either permanent or temporary elephant populations. Although the measures taken by the respective State governments offer some degree of protection to elephant habitat, the total forest cover available within the PA system in most States is still inadequate.

Under the Government of India's Project Elephant (launched in 1991-1992; Anon 1993), five Elephant Ranges have been declared in NE India. However, this project has yet to make its impact in the region. The reserves have not yet been notified nor is there any clear boundary demarcation. In one such reserve (Kameng-Sonitpur) large-scale encroachment has taken place over the past five years (1999-2003), thereby indicating the ground reality.

Between 1999 and 2003, wild elephants and their habitats benefited to some extent by the conservation efforts by some NGOs. These included provision of infrastructure for better management and enforcement, awareness and motivation and lobbying. At least 15 vehicles, six motorcycles, three motorboats, a large number of wireless sets, clothing for the patrolling staff, torch lights for night patrolling, etc., have been donated by NGOs since 1995 to different PAs of Assam, all important elephant habitat. In addition, more than 20 anti-poaching camps were also constructed with support from NGOs and U.S. Fish and Wildlife Service. The NGOs which made these donations included The Rhino Foundation for Nature in NE India, WWF-India's Tiger Conservation Programme, Fauna and Flora International, US Wildlife Foundation (through Ranthambore Foundation), Environmental Investigation Agency, Rhino Rescue, UNESCO (only to Manas and Kaziranga as World Heritage Sites) and Aaranyak. Another NGO, Early Birds, conducted a series of veterinary care camps in the border areas, while The Wildlife Trust of India, with funding from Ministry of Social Justice, has set up a rescue center near Kaziranga.

Recommendations

Creation of new Protected Areas

With only about a fourth of elephant habitat in NE India included in the network of PAs, there is an urgent need to bring more areas under the system. The areas recommended for PA status are listed in Table 5.

Extension of existing Protected Areas

Balpakram–Siju [Meghalaya]

This very important elephant habitat of Garo Hills needs to be enlarged significantly to cover Baghmara, Rewak and Emangiri RFs, the corridor between Nokrek National Park and Siju Sanctuary, and the unclassed forests of West Khasi Hills. The total area will should be *c.* 750km^2.

Nongkhyllem Wildlife Sanctuary [Meghalaya]

This small sanctuary of 29km^2 should be extended to cover the adjacent RF areas totaling 149km^2. Since this is the only PA in the entire northern slopes of Meghalaya, its extension is very important.

Dibru-Saikhowa National Park [Assam]

An area of 196km^2 of Kobo *chapori* and Poba RF of Dhemaji District is recommended for addition to Dibru-Saikhowa. This is a vital route for the elephant between eastern Siang and western Dibang Valley of Arunachal Pradesh and Dibru-Saikhowa.

Barnadi Wildlife Sanctuary [Assam]
This small sanctuary should be extended towards east to include Khalingduar RF (70km^2). The presence of the 273km^2 Khaling Sanctuary across the international boundary in Bhutan is an added advantage.

Legal protection and augmentation of corridors

Besides protecting elephant habitat, corridors, which are regularly used by the elephants, need to be given some legal protection and in many cases further strengthened through land acquisition. It is therefore recommended that provisions for 'Protected Elephant Movement Corridors' be incorporated in the Indian Wildlife (Protection) Act of 1972 by suitably amending it. In case of tea estates, cultivations and *jhums*, the land will continue to be with the private owners but the Act would make sure that no changes in the land-use pattern take place within the narrow corridors (as has been done in case of oil pipelines and power lines). At places, the governments can also acquire such strips under the Land Acquisition Acts prevalent in different states and pay suitable compensation. A list of some of the important corridors used by elephants in the north-eastern region is given below.

Northern Bengal corridors

Several corridors have been identified across northern West Bengal that need protection as well as possible augmentation (Chowdhury *et al.* 1997; Sukumar *et al.* 2003). Mahananda Sanctuary in the west is connected to the Apalchand RF further east across the Teesta Chaur. Several human settlements and an army firing range are the present threats to the movement of elephants across the Teesta. The Apalchand RF is itself connected to the Gorumara NP through the Damdim and Baradighi tea estates. The Apalchand RF is also connected to the Kalimpong Division in the north through a tenuous corridor straddled by settlements, tea estates and an army camp. Several elephant routes connect this division to Jaldapara Sanctuary; these pass mainly through tea estates and include the Bhuttabari-Chapramari, Rethi-Central Diana, Rethi-Moraghat, Rethi-Dumchi, and Titi-Dumchi. Between Jaldapara Sanctuary and Buxa Tiger Reserve the two important corridors used by elephants are through Beech/Barnabadi tea estates and across the Torsa River. Buxa Tiger Reserve is itself connected to Kochugaon FD of Assam across the Sankosh River. These corridors have been described in more detail in the above cited publications.

North Bank of the Brahmaputra corridors

The contiguity of the landscape for elephants along the Himalaya foothills to the north of the Brahmaputra (between Sankosh and the Brahmaputra itself) is poorly understood. A large number of potential corridor-like situations have been mentioned in several reports but a detailed survey and documentation of these corridors is urgently needed before priorities are set.

Kaziranga- Karbi Anglong corridor

To the south of the Brahmaputra, the Kaziranga National Park located on the floodplains of this river maintains only tenuous links with the Karbi Anglong Hills to the south. These links are essential for the very survival of not only elephants but also a host of other species including rhino during the monsoon period because of flooding of Kaziranga and the movement of animals to safer ground in the hills. The national highway running along this stretch, tea estates and cultivation are the main obstructions. Three crossing points have been identified – Amaguri, Kanchanguri and Panbari. The strengthening of corridors for the movement of elephants and other animals between Kaziranga and Karbi Anglong is essential.

Meghalaya corridors

Only a small fraction of the elephant habitat in Meghalaya is under the PA system. Thus, maintaining existing links between these and possibly strengthening these corridors would be important for the long term survival of elephants in this region. The important links include the Siju-Rewak, Baghmara-Balphakram, and Imangiri-Nokrek corridors.

Controlling poaching

Poaching of elephants for ivory and meat and occasional illegal capture should be checked immediately. Anti-poaching staff should be well trained and better equipped in all the PAs (Kaziranga National Park could be a model). Areas that have poaching problems should have anti-poaching plans in place as part of their management plans. Special courts to deal with wildlife offences should be set up in the north-east for speedy justice. All unlicensed arms should be confiscated.

Control of jhum cultivation

While it is not possible to completely stop *jhum* cultivation as it is a way of life and deeply imbedded in culture, some effective measures should be taken to control it especially near the prime elephant habitats and movement routes. Schemes such as IJDP (Integrated Jhumiya Development Programme) and WDPSCA (Watershed Development Projects for Shifting Cultivation Areas), both funded by the Government of India, may be implemented with greater commitment and areas where human-elephant conflict is severe should be given high priority.

Check on encroachment and clearing of encroachers

No new encroachments should be allowed to take place in the RFs. Fresh encroachments, especially those inside the important elephant habitats such as Nambor (northern block), Charduar, Balipara, Naduar, Behali and Biswanath RFs of Assam should be stopped.

Ban on commercial felling

Considering the poor tree cover left in different parts of the north-east, commercial felling in the remaining natural patches should not be allowed. Uncontrolled cutting of grass in the grasslands (e.g., Kobo *chapori*) should also be checked.

Modification of Project Elephant

This centrally-sponsored scheme now needs to be modified slightly to suit the ground reality in the NE India. Instead of the present system of 'loose' reserves, compact areas as in the case of Project Tiger should be taken up in conjunction with recommended protection for elephant corridors (see Recommendation 9.5.3). It is a well-known fact that unless a compact and viable area is administered as a single unit from a single headquarters, enforcement will never be effective, and even management will be difficult. However, joint committees may oversee inter-state reserves.

Effective protection and management of the existing Protected Areas

All areas already under the PA network should be

adequately protected. Communication system should be improved with the introduction of wireless in all the important reserves. Fund flows to the park must be better managed so that management decisions taken can be implemented.

Review and rectification of some of existing development projects in elephant habitats

To avoid accidental electrocution, technical persons should regularly check power lines passing through the forests. At places these should be diverted outside the forest.

All the ditches and trenches dug by the electricity departments and oil miners should be filled up immediately. A large number of such features, usually concealed under vegetation, are found abandoned inside forests, which virtually become death traps for many elephant calves. The severely polluted ponds near existing oilrigs should be treated by the oil industry.

Two roads, 15km of Highway Number 39 between Silonijan and Thorajan, and 10km between Barlangpher and Lumding, need to be diverted. The former passes through Garampani and Nambor Wildlife Sanctuaries and Nambor (northern block) RF while the latter through Lumding RF. Both these stretches have created serious human-elephant conflict. Uncontrolled and unscientific harvesting of bamboo for the paper mills should be checked effectively.

Other measures

Conservation education is needed among locals, including the hill tribes of remote areas, with the active involvement of local NGOs.

Concrete measures should be taken to reduce depredation; expeditious relief to be given for loss of life and property.

Steps should be taken to reduce the dependency of fringe villagers on the forest. One method is large-scale installation of bio-gas (the Deenbandhu Model is recommended) that will greatly reduce pressure on firewood.

Capture and translocation of elephants may be necessary at places; however, these should be given low priority.

Further research on ecology, behavior and movement in different habitat types of NE India is needed.

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Photo: Charles Santiapillai (Thailand)