

## Population Status of the Asian Elephant (*Elephas maximus*) in the Rakhine Yoma, Myanmar

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### ABSTRACT

Myanmar perhaps supports the second largest remaining populations of Asian elephant in the world. The current survey was carried out in seven forest reserves of the Rakhine Yoma, using indirect method of estimating elephant density. In addition to this, village surveys were carried out to obtain information on the extent of human-elephant conflict. A total of 148 transects covering 296 km was surveyed and the encountered rate of dung piles varied from 0.4 to 2.9 km<sup>-1</sup> with a total dung encounter rate of 1.19 km<sup>-1</sup>. The defaecation rate was 19.04 and overall decay rate for 100 fresh dung piles was 0.0057 d<sup>-1</sup>. The density estimates for different regions in Rakhine varied from 0.008 to 0.2 km<sup>-2</sup> with an average density of elephants for all the regions surveyed being 0.05 elephants km<sup>-2</sup>. Of the 44 villages visited during the survey, 47 % villages had problems with elephant depredation. Although the habitat is disturbed by logging and other means, relatively low human population density, inaccessibility, and large and contiguous forest cover have some hope for the conservation and management of elephants in Rakhine.

*Key Words:* Population Density, Habitat Usage Pattern, Human-Elephant Conflict, Conservation.

### INTRODUCTION

Myanmar perhaps supports the second largest remaining populations of Asian elephant in the world. They represent the most economically important species in the country and they have always been the backbone of Myanmar timber industry (Blower 1980). In contrast to many other countries in Southeast Asia, the elephant habitats in Myanmar have remained reasonably intact for a long time, but due to insurrection and other issues, the habitats of large mammals, particularly the Asian elephant (*Elephas maximus*), face very serious threats (IUCN 1989). The prediction for the long-term survival of the elephant could be good if effective protection of both the animal and its habitat were assured; along with the protection, population numbers also have to be assessed regularly. However, estimating elephant numbers in this country is very

difficult as the visibility within the forests is very poor and the forests in which elephants occur are mostly inaccessible. Elephants in Myanmar are reported to inhabit the evergreen, semi-evergreen, moist deciduous, and bamboo forests. Bamboo is among the elephants' most preferred food items and it is particularly abundant in the Rakhine (formerly known as Arakan) Yoma, Bogo Yoma, and Tenasserim regions. The Rakhine is particularly rich in bamboo forests and so represents one of the largest elephant ranges in Myanmar. According to Sayer's (1983) report, "The Rakhine Yoma as a whole probably supports amongst the world's largest remaining populations of Asian Elephant". The main conservation goal for Rakhine population could be assessing their number and identifying their ground status.

This survey was aimed for assessing the status of the Asian elephant in Rakhine, in particular, estimating

the population number and brief assessment of the status of human-elephant conflict the region.

## STUDY AREA

The Rakhine Yoma region (Figure 1) is a series of hills ranges, which run for nearly 600 km (300 miles) along the west coast of Myanmar. The hill ranges of Yoma are a southward extension of the Himalaya. The average elevation of the Yoma is about 1000 m above msl. The entire area is characterised by steep slopes and narrow ridges, the steep slopes and friable soils result in frequent landslides and the region has many exposed rocks in most of the areas. The Sandoway River (Sandoway Chaung) is the major water source for the region. The average annual rainfall varies from 300 to 1200 mm. Three distinct seasons can be identified and the dry season lasts from January to April. The distinct rainfall gradient results in a diversity of vegetation

types. At low elevation near the coast, the climax vegetation is semi-evergreen forest, while further inland from the coast the vegetation changes to deciduous forest type. Like the other regions of Myanmar, Rakhine also has been subject to intensive management for logging for the past several decades. In many places, past human disturbance has resulted in large areas being invaded by bamboos. The region is known for its variety of wildlife. Major mammal species seen here are: Rhesus macaque (*Macaca mulatta* Zimmermann), Hoolock Gibbon (*Hylobates hoolock* Harlan), Phayres langur (*Trachypithecus phayrei* Blyth), Himalayan black bear (*Ursus thibetanus* Cuvier), Malayan sun bear (*Ursus malayanus* Raffles), leopard (*Panthera pardus* Mayer), tiger (*Panthera tigris* Linnaeus), elephant (*Elephas maximus* Linnaeus), hog deer (*Axis porcinus* Zimmermann), gaur (*Bos gaurus gaurus* smith), wild dog (*Cuon alpinus* Pallas), sambar (*Cervus unicolor* Kerr), tsaine (saing) or banteng (*Bos banteng* Wagner) and serow (*Capricornis sumatraensis* Blyth).

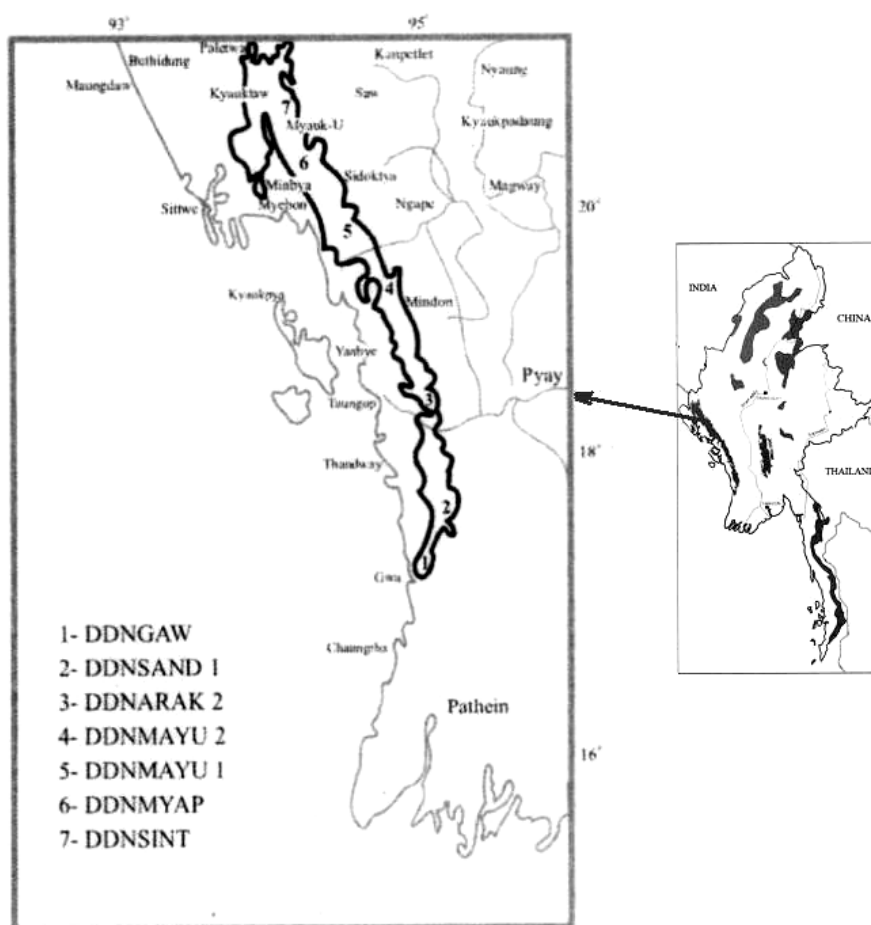


Figure 1. Location of Rakhine Yoma in Myanmar, and location of the survey region in Rakhine Yoma is marked among the areas of elephant distribution in the country.

## METHODS

For the current survey the indirect method of estimating elephant density was used (Barnes and Jensen 1987, Dawson and Dekker 1991, Varman et al. 1995). For this method 3 parameters such as: dung density, estimating defaecation rate and decay rate of dung piles were computed to arrive at the density of elephants. Apart from this, village surveys were carried out to obtain information on the extent of human-elephant conflict.

### Dung Density Estimates

Based on the initial village surveys and discussions with staff of the Myanmar Timber Enterprise (MTE) the survey area was divided into high elephant use, moderate use and low use areas. Line transects of indefinite width (Burnham et al. 1980) were used for estimating dung density in seven forest reserves of the Rakhine Yoma:

#### Reserve

1. Part of Thandwe Reserve forest (TRF)
2. Sabyin & Mindon (SM)
3. Part of Gwa reserved forest (GRF)
4. May Yu reserved forest: North (NMYRF)
5. May Yu reserved forest: South (SMYRF)
6. Part of Miva Pya (MP) and
7. Part of Sin Tanung reserve forests (STRF)

In each reserve several transects of 2 km length were cut afresh and walked by a census team of 3-4 persons to record dung piles.

### Defaecation Rate Experiment

The defaecation study was carried out using free ranging MTE elephants at Thaung Chan elephant camp. Observations on 57 elephants of both sexes and different age classes were made for two days each by Team I and elephant oozis (elephant keepers) from the respective elephant camps. In total the observations covered 1704 elephant hours for the defaecation study.

### Decay Rate Experiment

The estimation of the rate of decomposition of elephant dung was done by monitoring fresh dung piles. Two habitat types were selected and in each habitat 50 dung piles were marked using bamboo

stakes during the last week of December 1995. Two trained staff of MTE continued to monitor the experiment after the departure of the census team. A veterinary inspector of MTE, stationed at the campsite, took the responsibility of supervising the dung decay experiments.

### Village Survey

Villages surrounding and situated close to survey reserves were visited to obtain information on human-elephant conflict. This survey was conducted through interviewing villagers, particularly farmers, through a questionnaire. Information such as name of the village, crop size, crop cultivated, elephant visit to the crop lands, number of animals, frequency of visits, crop damaged, human death and households damaged by elephants, and method of preventing elephant problem were collected.

### Data Processing

The density of dung piles, daily defaecation rate and decay rate, and elephant density were estimated using Programme GAJAH (Santosh and Sukumar 1995). Elephant densities were estimated separately for each reserve.

## RESULTS

A total of 148 transects covering 296 km was surveyed and a total of 345 dung piles were encountered (Table 1). Encountered rate of dung piles varied from 0.4 to 2.9 km<sup>-1</sup> with a total dung encounter rate of 1.19 km<sup>-1</sup>. The encounter rate of dung piles was more in DDNMYU 1 than in DDNMYAP.

The results of dung density, defaecation rate and decay rate for different reserves are summarized in Table 2. The defaecation rate for the wet season was 19.04 (SE = 0.55). Overall decay rate for 100 fresh dung piles was 0.0057 (negligible SE). Elephant densities have been calculated assuming uniform defaecation and dung decay rates for all reserves during the dry season. As sample size for some reserves such as SMYRF, MP and STRF are very low, it is proposed to carry out more transect in these reserves.

The density estimates for different regions in Rakhine varied from 0.008 to 0.2 with an average density of elephants for all the regions surveyed being 0.05 elephants km<sup>-2</sup> (95% CI = 0.04 to 0.05).

DDNMYU 1 and 2 regions appear to have high elephant density zone, followed by DDNGAW and DDNSAN.

Table 1. Forest reserves sampled for elephant density estimation during elephant survey in Rakhine Yoma.

Name of Reserves*	No. of transects	Distance covered (km)	Dung piles recorded
DDNSAND 1	16	32	42
DDNARAK 2	70	140	108
DDNGAW	20	40	66
DDNMAYU 1	12	24	71
DDNMAYU 2	8	16	36
DDNMYAP	12	24	11
DDNSINT	10	20	20
Total	148	296	354

\* Part of Thandwe Reserve forest (DDNSAND 1), Sabyin and Mindon (DDNARAKAN 2), part of Gwa reserved forest (DDNGWA), north of May Yu reserved forest (DDNMAYU 1), south of May Yu reserved forest (DDNMAYU 2), part of Miva Pya (DDNMYAP) and part of Sin Tanung reserve forests (DDNSINT).

Table 2. Elephant density estimates in different reserves of Rakhine Yoma. Dung and elephant densities are expressed in per km<sup>2</sup>. Mean defaecation rate/day is 19.040 and Standard Error (SE) is 0.550 and mean decay rate of elephant dung pile is 0.005 and standard Error (SE) is 0.000.

Reserves	Dung density (+SE)	Mean elephant density (95% CI)
DDNSAND 1	132 (22.4)	0.03 (0.03-0.04)
DDNARAK 2	71 (8.9)	0.02 (0.01-0.02)
DDNGAW	165 (20.3)	0.04 (0.04-0.05)
DDNMAYU 1	452 (66.0)	0.17 (0.12-0.14)
DDNMAYU 2	225 (37.5)	0.06 (0.05-0.07)
DDNMYAP	27 (21.5)	0.008 (0.004-0.01)
DDNSINT	83 (18.6)	0.023 (0.0215-0.028)
		Mean 0.05 (0.04-0.05)

## Status of Human-Elephant Conflict

A total of 44 villages were visited during our survey and most of the villages (98%) visited were surrounded by forests. Agriculture was the major income for these villages. Crops such as paddy (*Oryza sativa*), sugar cane (*Saccharum* spp), banana (*Musa* spp), maize (*Zea mays*), groundnut (*Arachis hypogaea*) and vegetables were cultivated. Of the 44 villages visited during the survey, 47% villages had problems with elephant depredation. The frequency of visits varied from almost daily during the crop season to just once in a year. According to the farmers, the crop damaged by elephants ranged from 1 acre to 20 acre and the most frequently visited crop was paddy. Elephant numbers ranging from 1 to 20 animals visited the fields. Human casualties, such as number of people killed and injured were very low; only two deaths were recorded during the past ten years. Catapult was mainly used for chasing elephant from the fields and human habitation. Other animals such as wild boar, sambar deer, barking deer, porcupine and capped langur were also reported to visit agricultural land for paddy and other crops.

## DISCUSSION

The density estimates for different regions in Rakhine varied from 0.008 to 0.2 with an average density of elephant for all the regions surveyed being 0.05 elephants/km<sup>2</sup>. Based on FAO survey in Rakhine, Sayer (1983) reported that elephant signs were seen throughout the area and southern Rakhine Yoma may support a large population of wild elephants. According to the report (Sayer 1983), this area is of national significance for elephant conservation and this could be one of the main considerations in determining management objectives. However, elephants in Rakhine are subjected to many threats, including poaching for meat and ivory, According to Salter (1983), poaching incidents have been reported on the eastern and western slopes of the Rakhine Yoma. The extent of death due to poaching is not well known, but according to Salter (1983), poaching could be more than the total removal of elephants by government controlled capture operations. However, according to Sayer (1983), elephant population continue to exist in Rakhine because the rugged topography and dense vegetation cover make it difficult to hunt them. The rugged terrain with dense bamboo cover could work negatively for the species, as physical protection by traditional law

enforcement methods would have limited effectiveness because of the difficulty of patrolling the area. Sayer (1983) suggests that the most cost-effective way of protecting elephants and preventing the establishment of settlements would be enlisting the co-operation of the local township councils in enforcing existing legislation.

Although the habitat is disturbed by logging and other means, relatively low human population density, inaccessibility, and large and contiguous forest cover have some hope for the conservation and management of elephants in Rakhine. However, habitat conversion, habitat fragmentation and poaching for ivory could still be prime conservation issues but human-elephant conflict could be still of secondary importance. As in other regions of Asia the human-elephant conflict is one of the conservation problems, the issue at present is not a major conservation concern in Myanmar, including Rakhine. It is likely that the conflict might worsen with the steady growth and increase of the human population or the reduction or disturbance of the present forest cover. As predicted by Salter (1993), the major drawback to some part of the Rakhine was the difficulty in controlling human land use, especially the spread of permanent cultivation, which would lead to increased human elephant conflict in future. Salter (1983) concluded that the bamboo forests of the region appeared to contain one of the largest populations of elephants in Myanmar, and thus provide a logical setting for one or more protected areas to ensure the conservation of the species. He also had proposed for establishing a number of large extensive Managed Elephant Reserves in Myanmar for the long-term viability of the species, and Rakhine has been identified as one such area.

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