

THREATENED ELEPHANT CORRIDORS IN GARO HILLS, NORTH EAST INDIA.

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INTRODUCTION

The equilibrium theory of Island biogeography proposed by MacArthur and Wilson (1967) implied that the size of the habitat island could play an important role in survival of the species occupying it. This is so because larger areas contain more individuals of a particular species than smaller areas and hence higher probability of the species persisting over time. There has been much debate over the shape and sizes of reserves (Diamond, 1975; Wilson & Willis, 1975, Diamond & May, 1976; Simberloff & Abele, 1976a, b) but most agree that single large refuges are generally preferable to several smaller ones. But one rarely has a choice in deciding the shape or size of reserve given the ground realities in most developing nations.

A number of wildlife habitats have undergone or are being threatened with fragmentation due to various anthropogenic factors and this has adversely affected the large mammal populations residing in them (e. g. Johnsingh, *et al.*, 1990, Johnsingh, *et al.*, 1991). It was proposed that protection be given to narrow strips of forest, i. e. corridors, connecting two larger habitat islands or reserves as a remedy for fragmentation (Diamond, 1972; Wilson & Willis, 1975). Corridors aid dispersal and movement in individuals between reserves, thus enlarging effective population sizes and in turn decreasing extinction probabilities (Brown & Kordic - Brown, 1977). Corridors also provide animals with access to areas or habitats which would otherwise be denied to them. There has been a long debate about the costs and benefits of corridors (Simberloff & Cox, 1987; Soule & Simberloff, 1986; Noss, 1987). It has been acknowledged that corridors should be considered based on individual merits and the autecologies of the organisms using them (Noss, 1987; Simberloff & Cox, 1987; Soule 1991; Newmark, 1993).

The Asian elephant *Elephas maximus* is a large-bodied animal requiring large areas to range. Since much of the elephant range in India is getting fragmented due to an increasing human need for resources, a network of protected areas connected by corridors has been put forward as a conservation strategy for the elephants (Panwar & Rodgers, 1988; Sukumar 1991). There is an urgent need for identifying elephant corridors, especially in North East

India, which is estimated to harbour ca. 10,000 Asian elephants in the wild (Sukumar, 1991). We also need to evaluate and prioritise these corridors because resources for conservation are limited and the most threatened corridors need urgent attention. In this paper we present the results of an evaluation of seven proposed corridors for elephants in the Garo hills in North East India.

METHODS

Corridors were defined as narrow strips of forests, currently being used by elephants, linking two major elephant areas. Seven corridors were chosen for evaluation based on discussions with Forest Department officials familiar with the elephant range. Foot paths, trails and roads in these corridors were walked extensively to get encounter rates of elephant signs like dung piles, tracks and feeding signs. The corridors were aligned, on a 1:50,000 Survey of India toposheets, along topographical features like ridges and streams. The length, width at the narrowest point, and approximate areas of these corridors were calculated from the toposheets. A suitability classification index based on a combination of indices used in Gelbach (1975) and Mwalyosi (1991) were used to rank elephant use, current and potential land use patterns and other human influenced threats.

Numerical values were assigned to seven categories thought to be important in order of their importance to elephants (Appendix 1). Thus actual elephant use and human influence got a higher ranking than vegetation types or popography. Features were further divided into sub-categories and each of these given a ranking (see Appendix 1). A higher ranking indicates greater suitability and a lower ranking, low suitability. A suitability score was obtained by multiplying each feature value by its appropriate category value and adding the product. In the case vegetation type, if two vegetation types were encountered equally along the corridor, than an average category score was taken.

RESULTS AND DISCUSSION

Only three of the corridors met our definition of corridors. The others were areas between small reserve forests which are a part of a large contiguous elephant range. Only the corridors which met our definition are discussed below.

1. Siju WLS - Rewak RF corridor

1.1 Approach

This corridor can be approached either by road from Baghmara or by along the Simsang river from Siju village. It is located approximately between 90°40' to 90°42' E and 25°18' to 25°20' N. The vegetation in the corridor area consists mainly of secondary forests.

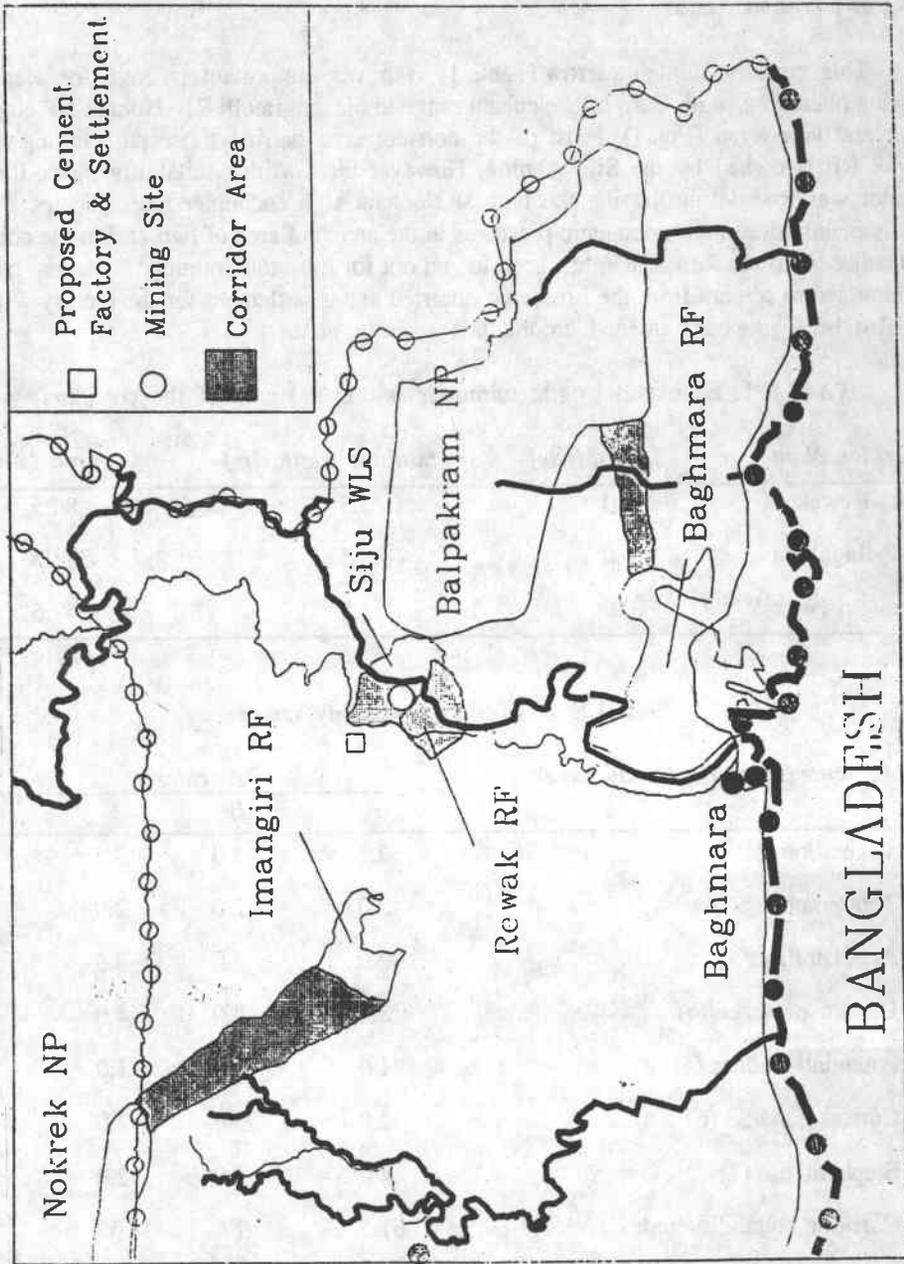


Fig. 1. Map showing the three crucial elephant corridors (see text for details) in Garo hills.

1.2. Conservation Status

This corridor though narrow (Table 1) is a very important passage for elephants crossing over from south Garo hills elephant range to the Angratolli RF-Nokrek NP elephant range and *vice-versa* (Fig. 1). Most of the corridor area barring those parts falling inside Rewak RF is owned by the Siju Akhing. However the corridor suitability index for this corridor was low despite having the highest elephant sign encounter rates (Tables 2 & 3). This is mainly due to anthropogenic pressures in the area. An area of two km² in the corridor area, adjacent to the Rewak RF, has been leased out for limestone mining. A cement factory to manufacture cement from the limestone quarried and a settlement for the factory workers has also been proposed in and around this corridor area.

TABLE 1. Estimated length, minimum width and area of the corridors

| <i>Corridor Name</i> | <i>Length(Km)</i> | <i>minium width(Km)</i> | <i>area (Km²)</i> |
|----------------------|-------------------|-------------------------|------------------------------|
| Siju - Rewak | 2.0 | 3.5 | 8.25 |
| BNP-Baghnara | 6.0 | 4.5 | 31.25 |
| Emangiri-Nokrek | 10.0 | 3.5 | 47.5 |

TABLE 2. Corridor suitability rating

| <i>Attribute (Numerical weightage)</i> | <i>corridor</i> | | |
|--|-------------------------|----------------------------|----------|
| | <i>A</i> | <i>B</i> | <i>C</i> |
| Vegetation (1) | 2.5 | 3.0 | 3.5 |
| Topography (2) | 2.0 | 2.0 | 2.0 |
| Accessibility (3) | 2.0 | 3.0 | 3.5 |
| Human presence (4) | 1.0 | 3.0 | 4.0 |
| Potential landuse (5) | 1.0 | 2.0 | 1.0 |
| Current landuse (6) | 2.0 | 3.0 | 2.0 |
| Elephant use (7) | 4.0 | 3.0 | 2.0 |
| Corridor suitability index | 61.5 | 77 | 65 |
| <i>A - Siju-Rewak</i> | <i>B - BNP-Baghnara</i> | <i>C - Imangiri-Nokrek</i> | |

TABLE 3. Relative usage of corridors in Garo hills by elephants

| Corridor Name | Km Walked | Signs /Km |
|-----------------|-----------|-----------|
| Siju-Rewak | 0.75 | 33.3 |
| BNP-Baghmara | 12.8 | 6.95 |
| Imangiri-Nokrek | 21.5 | 3.12 |

Elephant use of the corridor would not be possible if the proposals are approved and implemented. This could result in the elephants trying to cross the river Simsang south of the Rewak RF, areas in which large human settlements lie, and could result in increased rates of elephant human conflict. The survival of this corridor area seems to be bleak given the economic and political situation on ground.

2. Balpakram NP-Baghmara RF corridor

2.1 Approach

This corridor can be approached by road from Rongara town on the eastern side and on the western side by the road running from Baghmara to Raongru Asim village. It lies approximately between $90^{\circ}43'$ to $90^{\circ}50'$ E and $25^{\circ}13'$ to $25^{\circ}17'$ N (Fig. 1.). The vegetation in this corridor area consists of secondary forests of various ages interspersed with jhum cultivation.

2.2 Conservation Status

This is a very vital corridor as it helps maintain a large contiguous tract of about 600 km of elephant habitat, much of it under the Forest Department control. However the Forest Department does not control any part of the corridor area. This corridor has rich deposits of coal and therefore could potentially be disturbed in the future. A few elephants were poached in the corridor area during the study period. Since the suitability of this corridor is relatively high (Table 2), utmost priority should be given to bring the area under Forest Department control. The survival of a single large elephant population in Maghalaya is very much linked to the continued viability of this corridor.

3. Imangiri - Nokrek corridor

3.1 Approach

This corridor area can be approached only by foot from Jetragiri village on the north-western side, and by vehicle from the Kharlukagiri-Imangiri road on the south-eastern side.

It lies approximately between 90°30' E and 25°20' to 25°25' E (Fig. 1.) The vegetation in the corridor area is dominated by tropical evergreen forests along the southern boundary of Nokrek NP and by moist deciduous forests with patches of degraded secondary forests in and around Imangiri RF.

3.2. Conservation status

This corridor connects a vast stretch of forests in and around Imangiti RF with Nokrek NP and areas adjacent to the southern boundary of the Park. Most of the elephant signs encountered in the Angratolli-Nokrek elephant range was in and around this corridor area. The inaccessibility of the corridor area by roads and low human densities till now was probably the reason for its survival. Coal mining on a small scale is already taking place in the southern portion of the corridor. A road is being laid from Kharulkhagiri to Chokpot (Fig.1.) and when completed will open up the area for timber exploitation and coal mining on a larger scale. This would affect the elephant usage of the corridor and could result in the fragmentation of the elephant population in this range. The problem is compounded by the fact that very little of the area under this elephant range is controlled by the Forest Department (see Table 1). The future of this elephant corridor is uncertain due to non-availability of funds to acquire the area.

CONCLUSION

It can be seen that barring the Baghmara-BNP corridor, the others face an uncertain future. Much of this uncertainty over their future stems from the lack of funds for elephant conservation. Economic activities like coal and limestone mining and logging are unlikely to be stopped given the current economic backwardness of the area. Any elephant conservation programme in this area should have tangible benefits for the local populace, such as better health care or access to schools, better preventive measures against elephant depredations, etc.. In a region where income generation is very low and funding for priority areas like health care and creation of more jobs is hard to get, it is unlikely that the local Government can find the money for elephant conservation. Thus conservation of elephants over much of Garo hills may ultimately depend on the conservation priorities of the Indian Government.

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Appendix : Attribute and category ranking**Vegetation (1)**

Primary forests - 4

Secondary forests > 15 yrs - 3

Secondary forests < 15 yrs - 2

Open forests (with little shade) - 1

Topography (2)

Gently undulating - 3

Hilly (movement possible along certain trails only) - 2

Steep (dissected by ravines and limestone formations) - 1

Accessibility (3)

No roads - 4

Fair weather roads - 3

Metalled all weather roads - 2

Surfaced all weather roads - 1

Human presence (4)1 Village/6 km² - 41 Village/5 km² - 31 Village/4 km² - 21 Village/2 km² - 1**Potential landuse (5)**

No possibility of logging or mining - 4

Logging possible - 3

Mining possible - 2

Logging and mining possible - 1

Current landuse (6)

Not used for any purpose - 4

Only shifting cultivation - 3

Shifting cultivation and logging - 2

Coal mining - 1

Current elephant use of the corridor (7)**(Based on elephant signs encountered in 0.5km segments of the trails walked in the corridor)**

75% to 100% of the 0.5 km segments - 4

50% to 75% of the 0.5 km segments - 3

marauding elephants, wherever possible, was established by locating tracks and enquiring