HABITAT ENRICHMENT IN BLOCKS III & IV OF THE RUHUNA NATIONAL PARK, SRI LANKA

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INTRODUCTION

Blocks III & IV (Fig. 1) were incorporated into the complex of Ruhuna National Park in 1967 and 1969 respectively with the view to enlarging the habitat then available for wildlife in general and the elephants in particular. These two administrative Blocks are 67,192 ha in extent and they account for 53% of the total area of Ruhuna National Park (126,782 ha). The Buttala-Kataragama road forms the western border of these two blocks, while the Kumbukkan Oya runs along much of the north and north-eastern border. The elephant population of Ruhuna National Park is estimated to be between 350 and 400 animals, many of which through seasonal movement, maintain a substantial amount of gene exchange with other elephant herds, thereby blurring the boundaries between populations.

Ruhuna National Park

Much of the area of Ruhuna National Park consists of the flat coastal plains, which however show a number of scattered "inselbergs", which are the erosion remnants of quartzofeldspathic gneisses that appear as smooth, usually unvegetated rock mounds reaching in height up to 90 m above the plains (Katz & Comanor, 1969). Two rivers, the Menik ganga and Kumbukkan oya and a number of seasonal streams drain the area and discharge into the sea through a shifting system of sand dunes and brackish lagoons (Woodford, 1979). The main rainy season occurs from mid-October to January, when the park receives rain from the NE monsoon. A short rainy season occurs in March and April from convectional rains, and the rest of the year is characterised by a distinct drought season

(Mueller-Dombois, 1968). The mean rainfall is about 1,100 mm but it can vary from year to year.

Vegetation

The main vegetation cover is woody, mostly scrub, with canopy below 5-m height (Mueller-Dombois, 1972). The secondary vegetation can be characterised as "thorn-scrub" with such species of woody plants as *Manilkara hexandra, Drypetes sepiaria, Bauhenia racemosa, Salvadora persica, Feronia limonia and Cassia fistuala* (Balasubramaniam *et al.* 1980). Shrub vegetation consists of *Dichrostachys cinerea, Randia dumentorum, Cassia spinarum* etc. (IUCN, 1990). Near the coast, the scrub is frequently interrupted by grass covered areas of various sizes, dominated by species such as *Eragrostris viscosa, Dactylotaenium aegyptium, Sporobolous diandrus, Echinochloa colonum, Setiaria pallidifusca and Alloteropsis cimicina* (Balasubramaniam *et al.* 1980).

Human-Elephant problems

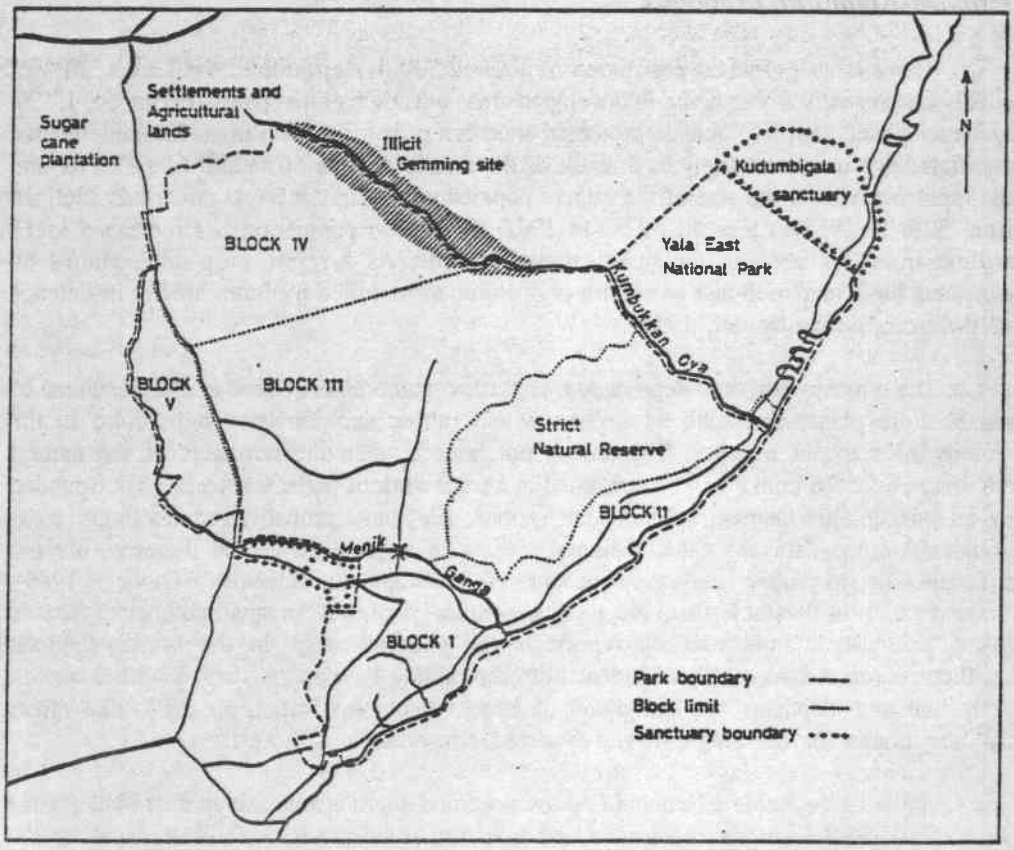
There is an estimated population of about 2,500 + elephants in Sri Lanka, 70% of which are presently free-ranging in developed areas outside national parks (Fernando, 1993). These elephants that live outside protected areas are in conflict with man. Human-elephant conflicts have increased lately as a result of the drastic decline of natural forest cover and the rapid increase in the size of the human population. While the forest cover has declined from 52% in 1952 to less than 22% in 1992, the human population has increased to 17 million from 7 million in the same interval of time. As a result, crop depredations by elephants have increased and so elephants continue to be killed by irate farmers in defence of their crops (Santiapillai, 1994).

The problem of crop-depredation is further compounded by the establishment of monoculture plantations such as sugarcane and rubber and intensive agriculture in the vicinity of elephant reserves. The day is not far off when the remnants of the natural environment of Sri Lanka will be contained in a patchwork of parks and reserves surrounded by an inhospitable landscape dominated by man. Elephants probably require larger areas of natural range than any other mammal species in tropical Asia, and therefore are the first animals to suffer the consequences of development activities (Olivier, 1980). Fragmentation of habitat leads to elephants becoming "pocketed" in small patches of forests. Such "pocket-herd" phenomenon represents the extreme stage in the human-elephant conflicts, characterised by high incidence of crop-raiding by elephants and fatalities among both man and elephant. The mitigation of human-elephant conflicts in Sri Lanka offers the best hopes for the long-term survival and conservation of elephants.

As far as the Ruhuna National Park is concerned, there are at least about 150 elephants west of Blocks III and IV moving to and from the Handapanagala tank attracted by the year long availability of water and grazing areas. Unfortunately, this area borders the sugarcane plantations, which act as "supermarkets" for elephants, given their high palatability

and nutritional value. These elephants have been the centre of conflict in this area and have attracted substantial media attention and public concern. The population of elephants in the Handapanagala area represents one of the few populations left in Sri Lanka having a number of tuskers. Tuskers account for 10.2% of the adult bulls in the Southern region (Hendavitharana *et al.* 1994). The Handapanagala elephants with their high percentage of tuskers, therefore represent a very valuable population that needs to be protected. Left where they are, surrounded by sugarcane, it is inevitable that conflicts with man and elephant will escalate in the years to come. Therefore the long-term survival prospects of these elephants in this area appear grim unless they are relocated to the Ruhuna National Park, which the elephants seasonally utilize and so is a part of their annual home range. The Department of Wildlife Conservation has identified Blocks III and IV as the target areas for these elephants in the event of their relocation.

Fig. 1. Map of Ruhuna National Park, Sri Lanka, showing Blocks I - V.



Cautionary note on Translocation

However, it must be strongly emphasized that before such a translocation is even envisaged, the habitat in these two Blocks must be enriched in such a way as to support, maintain and contain the elephants. Many translocations in the past did not achieve the desired level of success because well meaning conservationists did not give much thought to how the animals will fare in their new habitat after they were translocated.

A Committee in 1984, headed by Mr D. B. I. P. S. Siriwardhana, Secretary to the Minister of Public Administration at that time, and consisting of Mrs Iranganie Serasinghe, Mr D. C. W. Kannangara, Prof. B. M. O. A. Perera and Dr Ranjan Fernando concluded that *"the preferred method, wherever possible, of translocation to be adopted should be the Elephant drive"......"Driving the elephant is the most practical method of dealing with large numbers"*..... and sensibly added that, *"Bringing the elephants to the new location is not the end of the problem and the essence of translocation lies in the extent to which we can keep the elephants in the new habitat"* (Anon, 1984).

It is to address this last recommendation of the Committee that this report was prepared with the view to improving and enriching the habitat in Blocks III and IV as a prelude to elephant translocation in the future if and when such an operation takes place. Unless the habitat in the target areas (Blocks III & IV) can provide the required food, water and cover to elephants throughout the year, the translocated elephants will return to their original feeding grounds and the translocation would be a failure. So the principal management concern must be in improving the carrying capacity of the target areas for elephants. This should be done before any elephants are moved from outside. Even with improved habitat in the new areas, it would be difficult to ensure that the translocated elephants remain where they are if suitable barriers such as electric fences are not erected simultaneously along the western border of Blocks III & IV. Elephants with their strong sense of attachment to their traditional feeding grounds are likely to return in the absence of safeguards such as electric fences or other forms of barriers to their movement.

Habitat enrichment in Blocks III & IV

The Block IV has been identified for development with NORAD aid. However, as Fernando (1993) cautions, development of Block IV without first developing Block III, which is bordered by Block IV and V on the north and west respectively will attract elephants from the core areas to the edges and to the adjoining cultivations and settlements, and will only help escalate the human-elephant conflicts.

Elephant habitats can be enriched through activities such as restoration of tanks and pasture lands to improve the grazing opportunities for elephants. But such activities must be carried out first in Block III and only then, in Block IV. In considering elephant problems in Sri Lanka, it is important to realize that wide variations in environments exist, even in areas geographically close to one another, and hence in different environments different

problems exist. The passing of time can allow new factors to develop, old ones to diminish or disappear and this in turn may be reflected in changing attitudes towards animal problems (Riney, 1982).

The maintenance of appropriate habitat for elephants can only be done if one knows what is appropriate. If we wish to maintain the habitat for the elephants, we need to have a knowledge of the habitat needs of elephants. Riney (1982) suggests a number of questions that need to be asked before habitat enrichment can be done.

1. What elements of the habitat are required to maintain the desired number of animals, and how are they best interspersed.

2. What is the present status of the vegetation?

3. In what direction is the vegetation changing?

4. Is the habitat changing as a result of an ecological succession? What agency has set this succession in motion?

5. Is the habitat changing as a result of pressure by domestic or wild animals? Which animals?

Fortunately, much information on the habitat preferences of elephants in Sri Lanka exists as a result of the previous investigations of Wickremasinghe (in de Alwis, 1970), Eisenberg & Lockhart (1972), McKay (1973), Nettasinghe (1973), Vancuylendberg (1977), Olivier (1978), Ishwaran (1979), Santiapillai *et al.* (1984), and Dissanayake *et al.* (1992). Three factors appear to have limited elephant populations to their vegetation types: (1) the need for water, (2) the need for shade, and (3) the preference for grass as forage.

Water requirements:

Asian elephants drink once or twice a day when water is readily available. The availability of surface water restricts the dry season distribution of elephants (Owen-Smith, 1988). During drought, elephants are known to make extensive journeys in search of water. Elephants seem able to smell water and move towards a large body or an area receiving rain (Allaway, 1979). The unpredictable availability of water in semi-arid areas in Africa may contribute to relatively large home ranges. Home ranges of over 2,000 km² have been reported during the dry season in the Tsavo region of Kenya (Leuthold, 1977). In Sri Lanka, even much smaller home ranges of about 40-50 km² would mean the movement of elephants out of the protected areas since they are small. Some old bulls are able to exist away from water for quite long periods, but the daily cycle of the family unit is closely tied to water (Laws, 1970). The trunk makes it possible for elephants to dig down to water under the dry river beds. Besides drinking, elephants need water for wash and wallow.

In terms of the number of water holes in Ruhuna National Park, there is some variation. Much of the coastal area of Block I is dotted with numerous water holes of various sizes. However, the number of water holes in Blocks III and IV are few in comparison to their areas. Ruhuna National Park in the distant past was a heavily cultivated area and hence there are numerous abandoned tanks or water holes dotted throughout the entire area. A vast majority of them in Blocks III and IV need extensive restoration if they are to regain their water holding capacity.

However, the improvement of water holes should not be done with religious zeal, as in Block I, where there are in fact too many of them today, leading to other problems of over grazing of grasslands by buffalo and the spread of distasteful annuals particularly near these water holes. In Block I, there has been one continuing exception to a policy of non-intervention in the functioning of the ecosystem, which is the digging of additional water holes with the object of attracting game for viewing by visitors to the park. Given their wallowing habit, the water buffalo *(Bubalus bubalis)* have been particularly attracted and favoured by this development (Ashby & Santiapillai, 1984). The number of water holes the buffalo can use there in the dry season appears to have doubled (Cooray, 1968). There is evidence of overgrazing since the programme of construction began.

Water hole development in Blocks III and IV must avoid such proliferation of small tanks. Instead, much attention must be directed towards the construction of a few water holes that are large and deep enough to retain water even at the peak of the drought. What must be kept in mind is that additional water would be particularly liable to cause overcrowding of a gregarious, non migratory herbivore such as the buffalo, with no serious predators which is strongly attracted to water irrespective of the need to drink (Ashby & Santiapillai, 1984).

Given the size of Block III, construction or renovation of four large water holes the size of either Heenwewa or Buttuwa wewa in Block I is recommended. Block IV must have at least three large water holes. In addition to these large water holes, a few shallow wells (not deeper than 4 m) could be dug in areas where water tables are high. Such wells are mainly to provide clean drinking water to elephants and hence must be protected against buffalo by log barriers. Hardwood tree trunks must be used to construct such barriers around the wells. If the hardwood trees are toppled along the periphery of the wells, with their roots still jutting out, there is little danger of elephants dragging them off.

Elephants need not just food but also water in large quantities. Elephants are known to be prone to sodium deficiency (Benedict, 1936), and to prefer water and soils rich in sodium (Weir, 1973). Their movement would also be governed by the spatio-temporal availability of water (Sukumar, 1989a). Studies on the seasonal distribution of elephants in Africa have shown high density strata along water sources during the dry spell and a dispersal after the rains (Allaway, 1979; Leuthold, 1977). This is precisely what is happening to the elephants in the Handapanagala area in Sri Lanka: concentration during the dry season and dispersal during the rainy season.

Food requirements

An animal's range of movement can increase with greater body size and energy requirement (McNab, 1963). Even if water is not a limiting resource, the availability of food and the diversity of habitat types may determine the size of the home ranges in elephants. The more diverse an area, the smaller would be the home range since elephants would be able to meet their varied seasonal requirements within a relatively restricted area (Sukumar, 1989a).

Elephants in Sri Lanka are known to spend 89% of their foraging time in grassland, and in Gal Oya grass formed just over 50% of the diet (McKay, 1973). In Ruhuna National Park Block I, elephants forage preferentially in the open scrub and make little use of the evergreen vegetation along the river. Wickremasinghe (in de Alwis, 1970) provides a comprehensive list of all grasses and shrubs eaten by elephants in and around the Lahugala tank (see Appendix 1). Two species namely, *Cynodon dactylon and Sacciolepis interrupta* are known to be preferred by elephants and therefore would be worth considering for use in the enrichment of Blocks III and IV of Ruhuna National Park.

Brachiaria sp. is particularly suitable as a tough grass to be propagated in Blocks III & IV to improve the grazing areas for elephants. *Brachiaria sp.* can be grown in dry areas as it does not need much water to survive. It can also be grown in marshy areas. *Brachiaria sp.* is eaten by elephants in Ruhuna and Lahugala National Parks. It is recommended that *Brachiaria sp.* be grown in the vicinity of the water holes that are planned for restoration. Before the grass is planted, the area must be ploughed with a tractor. The planting must be done soon after the rains. Once the grass is established, it can withstand heavy grazing by elephants and so needs minimum management (Vasantha Nugegoda, *pers. comm*).

Although grass forms the bulk of elephant's daily diet in Sri Lanka, during the dry season in particular, browse plants may become more important as they have a higher crude protein content than grasses. While crude protein in browse is about 6-18% of the dry weight, it is much lower, between 1.5-2.5% in the grasses (Sukumar, 1989a).

It appears therefore that over browsing may be a far more serious management problem than over grazing. Here the crucial factor is that these food resources (browse plants) are *k*-selected (relative to grass) and their replacement is slow, even in the absence of browsers. Adult elephants may continue to maintain feeding pressures of bushes and trees for years. This effect is enhanced in drier areas, in dry seasons and in drought years. The proportion of browse required in the diet is greater in the dry season when the grass is low in nutrition. African elephants in semi-arid environments may be totally dependent on browse for their food for several months of the year. Thus there can be a situation where elephant population may be declining say at 2% annually, while the standing stock of trees may be declining more rapidly at 6% per annum.

Although elephants obtain much of their sodium requirements from the water they drink, some of it may come from the vegetation. However, all the wild plants analyzed by Sukumar (1989b) in southern India had a relatively low sodium content, while certain cultivated crops had significantly higher amounts of sodium. This may partly explain the preference of elephants to some of the cultivated crops.

The degree of interspersion of edges (the transition zone between forests and grasslands) and the density and richness of habitat food patches are important determinates of habitat suitability, and thus density of elephants.

Fire management

Although fire has been used as a management tool in several African and Asian counties to improve the grazing opportunities for grazers, it is not recommended in the case of Blocks III and IV in Ruhuna National Park, given the nature of the grasslands. Fire is usually effective in tall grass situations which offer very poor dry season grazing to herbivorous mammals. An early season fire in such areas will remove the coarse, dry grass and stimulate a flush of green growth that is rich in crude protein and palatable to grazing animals (Rodgers, 1979). Burning of indigenous grasslands in Blocks III & IV may lead to the elimination of many saplings. Besides, the short grass community in these areas do not respond well to a fire regime.

CONCLUSION

It is recommended that habitat enrichment activities be carried out from the core area (Block III) outwards, to minimize contact between man and wildlife. A few large water holes need to be restored in both Blocks to assure year round availability of water to elephants and other wildlife. Establishment of too many smaller water holes would only help build up buffalo numbers and thus lead to overgrazing. *Brachiarai sp.* can be used to establish grazing grounds in the vicinity of water holes that are restored. Some other species of plants preferred by elephants (given in Appendix I) can also be propagated. Fire management is not recommended for the area as it is not appropriate for the types of short grass available. In the absence of permanent supply of water and fodder in Blocks III & IV, it would be unwise to translocate large number of elephants from outside. Even with an assured supply of water and fodder, many elephants will certainly try to return to their former range.

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Appendix 1; List of plants consumed by elephants in Lahugala.

Alloteropsis simicina
Axonopus affinis
Brachiaria distachya
Brachiaria remota
Brachiaria reptans
Cynodon dactylon
Chloris barbata
Dactylotaenium aegyptium
Digitaria stricta
Digitaria adsendens
Digitaria longiflora
Echinochloa colonum
Eriochloa porcera
Eleusine indica
Eragrostis diplachnoides
Fimbristylis argentea
Fimbristylis falacata
Hymenachne pseudo- interrupta
Leersia hexandra
Panicum repens
Panicum trypheron
Panicum psilopodium
Paspaladium flavidum
Paspaladium punctatum
Paspalum metzii
Paspalum scrobiculatum
Perotis indica
Oplismenus compositus
Stenotaphrum dimidiatum
Sacciolepis interrupta
Oryza rufipogon
Oryza perennis
Cyperus pygmaeus
Cyperus brevifolius
Cyperus exaltatus
Cyperus compressus
Cyperus distans
Desmodium triflorum
Commelina diffusa
Murdannis spirata
Molochia corcherifolia
Berreria hispida
Alternanthera sessilis
Mulluge oppositifolia
Urena lobate
Hydrocera triflora