

Prioritizing Elephant Corridors in Mudumalai Tiger Reserve, Tamil Nadu

Kannan, G¹ Jayakumaran Thampy, P.S.², Arunachalam³ & B. Ramakrishnan⁴

Abstract

For the better management of elephant conservation between Mudumalai Tiger Reserve and Nilgiri North Forest Division we have studied micro level elephant corridors in Mudumalai Tiger Reserve, connecting adjoining forest division during the year 2012-2013. The primary objective was to identify and map the elephant corridors and prioritize them for management actions and protection. We have identified six bottle necks as elephant corridors, connects adjoining reserve forest of Nilgiri North Forest Division that ultimately ties elephant population between Eastern Ghats and Western Ghats. Conservation Value Index (CVI) was calculated for each corridor in order to prioritize them based on the ecological importance. Out of six corridors identified in Mudumalai Tiger Reserve, Singara – Bokkapuram (20.9%) and Singara – Mavinhalla corridors (20.1%) had maximum value of CVI compare with other corridors. Land acquisition Feasibility Index (FI) was also calculated for each corridor, Chemmanatham – Mavinhalla corridor had a maximum value of (29.5%) among the corridors. Thus, we recommended important corridors would require adequate protection and strengthening thorough acquisition.

Keywords: Corridor, Bottleneck, Western Ghats, Eastern Ghats

Introduction

Steady increase in the human population and their basic requirements forced land clearing in the form of agricultural lands and human habitations. Further, construction of dams and reservoirs submerged the potential river valley habitats of elephants (Santia pillai, 1990), developmental activities such as Hydro electric projects, Highways, Railway tracks, had broken the elephant habitats into fragments and forms various narrow strips of forests connecting two larger habitats are called forest corridors, that facilitates major functions such as exchange of genes between populations, dispersal, provide access to variety of seasonal foraging grounds, and prevention of faunal collapse' (Saunders *et al.*, 1991). During the last few decades negative interaction on corridors threaten many wildlife species (Saunders *et al.*, 1991; Huxel and Hastings, 1999) therefore, elephant corridors have received lot of attention in conservation measures, and are widely used in devising conservation strategies with the reduction of contiguous habitats into islands.

Of late several authors have emphasized the need and urgency for conserving corridors (Davidar, 1972;

Noss, 1987; Simberloff and Cox, 1987; Sunderraj *et al.*, 1995; Baskaran *et al.*, 1995; Ramakrishnan *et al.*, 1997). It is important to note that many species of endangered birds and mammals in world have successfully thrived by establishing and protecting corridors (Danks, 1991), clearly stated that the only way to protect the small areas and their wildlife populations is by establishing corridors between them. Therefore, many Wildlife NGO's and Government organization are involved in the preservation and restoration of corridors that could possibly increase local and regional population persistence and facilitate the colonization (Doak and Mills, 1994, Fahrig and Merriam, 1994, Sjorgen, 1991).

Although, elephant corridors in Southern India is well documented by earlier studies (Sivaganesan *et al.*, 2000, Ramkumar, *et al.*, 2002, Menon *et al.*, 2005, Ramakrishnan, 2008), also identified four major elephant corridors in Mudumalai Tiger reserve namely, Singara – Mavinhalla, Moyar – Avarahalla, Chemmanatham- Mavinhalla, and Vazhathottam – Glencorin. But, they missed out to prioritize and address few bottlenecks that are very crucial. This bottlenecks are essential and it is appropriate to enhance smooth functioning of elephant movements for the sustainability of this species in this region.

Materials and Methods

To identify and map the elephant corridors in the study area, a systematic field survey was carried out in the narrow patches of the forest which connects bigger patches of the forest in the other end. Further, actual area used by the elephants was identified; field surveys and interviews with the concerned forest officials, researchers and local people were also carried out. By noting the forest boundaries on maps and from field visits, the constrictions of forest areas or corridors were identified and marked on the top sheets. An assessment of the corridors was also done based on the direct sightings and indirect evidences such as tracks, dung piles and feeding sign of the elephants. Information on the legal status and extent of the land where connectivity present exists was also collected. Using the **software Map info 7.8** maps of the corridors in the study area was digitized.

¹ Ph.d scholar, Manonmaniam Sundaranar University, Tirunelveli

² Associate professor, K.G.S. Arts and Science College, Srivaikuntam

³ Head of the Dept. Sri Paramakalyani centre for Environment Sciences, Tirunelveli

⁴ Asst Prof of WL Biology, Dept of Zoology & Wildlife Biol., Govt Arts College, Udthagamandalam

Results and Discussion

During our present survey, we have identified and mapped six elephant corridors in and around Mudumalai Tiger Reserve (Table: 1). Conservation Value Index was calculated for each elephant corridor in order to prioritize them for acquiring, the results showed that Singara-Bokkapuram corridor obtained more attention with the higher CVI value of 20.9% followed by Singara - Mavinhalla corridor (20.1%) and Chemmanatham - Mavinhalla (17.2%) (Table: 2). The land acquisition Feasibility Index (FI) was also calculated for each corridor and the results showed that the Glencorin corridor and Singara - Bokkapuram - corridor has less feasibility (22.5%) followed by Singara - Mavinhalla corridor (25.3%) and Chemmanatham - Mavinhalla (29.3%) corridors (Table: 3). Therefore the Glencorin Corridor needs more efforts for land acquisition unlike other two corridors. Considering these corridor's conservation values (Table: 2) in terms of elephants, the land acquisition is urgently warranted.

Of these six corridors were identified, Moyar - Avarahalla, Theppakadu - Mandradiyar and Chemmanatham - Mavinhalla corridors have forest connectivity. But other corridors such as Singara - Bokkapuram, Singara - Mavinhalla, and Glencorin have connectivity through private forested estates. Except Singara - Bokkapuram corridor, all other corridor having a problem of vehicular traffic. The highest CVI was obtained by Singara-Bokkapuram and Singara - Mavinhalla corridors, because of the intensity of elephant use and undisturbed forest patches. Moreover the corridor land is under the controlled of private owning estates. Land acquisition Feasibility Index (FI) was low in Glencorin and Singara - Bokkapuram corridor is related to the highest Market value and non availability of Government lands. Hence, more efforts should be needed to acquire those corridors.

Brief Description of Corridors

1. Moyar - Avarahalla corridor

This corridor is located in the Eastern part of the Mudumalai Tiger reserve. It is bounded in the north by Moyar gorge and south by Sigur reserve forests. The revenue village of Masinagudi and non revenue village of Moyar are located in west and east side of the corridor respectively (Ramakrishnan, 2008), therefore the forest between Moyar and Avarahalla reserve forests is acting as a narrow corridor between Mudumalai Tiger reserve and Sigur Plateau. The strip of forest between Moyar road and right bank of the Singara flume channel is used by animals to disperse from the Mudumalai Tiger Reserve to Jayadev Avenue and subsequently to Sigur Plateau.

It is also referred to "Moyar-Avarahalla road side corridor" (Sivaganesan, 2000). The average length

and width of the corridor is 9km and 3.5km respectively.

2. Singara - Mavinhalla corridor

This corridor is located at the southern part of the Mudumalai Tiger Reserve. The major portion of the corridor is surrounded by Singara private estates and reserve forests of the Nilgiri North Forest Division. This corridor is crucial for Elephants disperse between Mudumalai Tiger Reserve and Nilgiri North Forest Division. The length of the corridor is 0.5km and average width of the corridor is 3km. In many places the corridor is open due to severe biotic pressure, expansion of unplanned tourism and developmental activities. Singara flume channel and Kallalah River are the perennial water sources in the corridor. The predominant vegetation types are tropical open thorn forests in the plains, mixed deciduous and dry deciduous forests in hill slopes (Champion and Seth, 1968). Weed species such as *Stachytarpheta indica*, *Dodonaea viscosa*, *Euphorbia antiquorum*, and *Opuntia dillennii* are widely distributed and are invading and affecting the quality of the corridor.

3. Chemmanatham - Mavinhalla corridor

This is a narrow corridor connecting the Mudumalai Tiger Reserve and Nilgiri North Forest Division in the place between Chemmanatham and Mavinhalla villages. The length of the corridor is about 0.5km and width is 1km. This corridor is facing severe problem of cattle grazing, fuel wood collection and holiday resorts on either side of the corridor. The vegetations are predominantly thorn forest. Sigur pallam is the main river flowing throughout the year in this corridor.

4. Vazhaithottam - Glencorin corridor

This corridor connects elephant habitats of the Kalhatti slopes reserve forest and the Sigur reserve forest and essentially comprises of one estate called Glencorin. This estate, the only flat land in the area, facilitates the seasonal movement of elephants. The length of the corridors is about 0.5 -0.75 and the width is 0.1km. This corridor is crucial for elephants disperse between Nilgiri North Forest Division to further Coimbatore Forest Division. The threats to the corridor are expansion of development activities, legal status of the corridor, livestock grazing, fuel wood collection and vehicular traffic particularly during night hours. Vazhaithottam revenue village and agricultural lands are acting as serious impediments for the free movement of elephants in the flat terrain.

5. Singara -Bokkapuram

These corridors connects elephant habitats of the Kalmalai reserve forest and the Kalahatti reserve forest and essentially comprises patta lands of Bokkapuram and Westbury estate. This Bokkapuram

Table 1. Status of Elephant corridor

Elephant corridor	Avarahalla - Moyar	Singara-Mavinhalla	Singara-Bokkapuram	Chemmanatham -Mavinhalla	Glencorin	Theppakadu-Mandradyar
Connectivity	within MTR	MTR - NNFD	MTR - NNFD	MTR - NNFD	MTR - NNFD	BTR-MTR
Average Length	9000m	500m	5000m	500m	750m	800m
Average Width	3500m	3000m	500m	1000m	100m	-
Land status	Tiger Reserve	Private land	Private land	Tiger Reserve	Private land	Tiger Reserve
Forest type	Thorn forest	Thorn forest	Thorn forest	Thorn forest	Thorn forest	Dry deciduous
Human habitation	Present	Present	Present	Present	Present	Present
Ecological priority	Moderate	High	High	Moderate	High	Moderate
Dependant village	1	3	2	2	1	1

*MTR - Mudumalai Tiger Reserve, NNFD - Nilgiri North Forest Division and BTR - Bandipur Tiger Reserve

Table 2. Conservation Index Value for Elephant corridors in Mudumalai Tiger Reserve

Elephant corridors	Moyar-Avarahalla	Singara - Mavinhalla	Singara - Bokkapuram	Chemmanatham - Mavinhalla	Glencorin	Theppakadu - Mandradyar
Connectivity	1	1	1	1	1	2
Average Length	1	1	2	1	1	1
Average Width	2	1	2	2	2	2
Approximate elephant population	3	2	2	1	1	3
Availability of elephant food species	2	3	3	2	2	2
Availability of fruit bearing trees per Km.	3	2	2	3	3	1
Availability of shade trees per Km.	1	3	3	1	1	2
Availability of natural saltlicks per Km.	2	3	3	2	2	3
Constructions emerged in the past 10 years	0	3	3	3	1	0
Corridor dependent villages	1	3	3	2	1	1
Traffic intensity	3	3	1	2	3	0
Development activities under proposal	1	2	3	3	1	0
	20	27	28	23	19	17
Conservation Value Index (CVI)	14.9	20.1	20.9	17.2	14.2	12.7

Table 3. Land acquisition Feasibility Index (FI) for Elephant corridors in and around Mudumalai Tiger Reserve

Elephant corridors	Moyar-Avarahalla	Singara - Mavinhalla	Singara - Bokkapuram	Chemmanatham - Mavinhalla	Glencorin	Theppakadu - Mandradyar
Extent of area for acquisition	-	1	1	3	2	-
Percent availability of Government lands	-	2	1	1	1	-
Percent of people willing to sale	-	1	1	1	-	-
Guide line value	-	3	3	3	3	-
Market value	-	1	1	1	1	-
Total	-	8	7	9	7	-
Percentage	-	25.8	22.5	29.3	22.5	-

patta land and Westbury estate, the only flat land in the area, facilitates the seasonal movement of elephants. The length of the corridors is about 5km. This corridor is crucial for elephants disperse between Nilgiri North Forest Division to further Coimbatore Forest Division. The threats to the corridor are expansion of development activities, legal status of the corridor, livestock grazing, fuel wood collection and vehicular traffic particularly during night hours. Bokkapuram village and agricultural lands are acting as serious impediments for the free movement of elephants in the flat terrain.

6. Theppakadu – Mandradiyar corridor

This corridor is situated in the South eastern part of Mudumalai Tiger Reserve. This is crucial elephant corridor that connects elephant from Mudumalai Tiger Reserve (Mudumalai & Kumbarakolli reserve forest) and Bandipur Tiger Reserve (Bandipur reserve forest) to Eastern side of the Mudumalai Tiger Reserve and further Sigur plateau. Moyar gorge in the Northern side and Morgan betta peak in the southern side naturally constructed this corridor. Theppakadu tribal settlements, Forest elephant camp and lodges are exactly located in the centre of the corridor and naturally preventing free movement of the elephants. The width of the corridor is 800m. The legal status of the corridor is forests.

Conclusion

Elephant corridors are crucial in terms of connectivity between the forest patches. Strengthening and protecting corridors through acquisition of corridor lands would be far more important for conserving the mega herbivore and whole biodiversity. Few corridors have prioritized based on our present survey; hence, management intervention is necessary for protecting these corridors without further delay.

References

Baskaran, N., M. Balasubramanian, S. Swaminathan and A.A. Desai (1995). Home range of elephants in the Nilgiri Biosphere Reserve, South India. In: *Proceedings of the International Seminar on the Conservation of Asian Elephants*, (eds., J.C. Daniel and H.S. Datye), Bombay Natural History Society, Mumbai.

Champion, H.G. and S.K. Seth (1968). *A revised survey of the forest types of India.* Government of India.

Danks, A. (1991). The role of corridors in the management of an endangered passerine. In: *Nature Conservation 2: The Role Of Corridors.* (eds. D. A. Saunders and R. J. Hobb), Survey Beathy and Sons, Clipping Norton, Australia, Pp 291-296.

Davidar, E.R.C. (1972). Investigation of elephant migration paths in the Nilgiri Hills and inquiry into impediments to the free movement elephants there and recommendations for the provision of corridors for their movement. unpublished report to IUCN/SSC Asian Elephant Specialist Group, Bombay Nat.Hist.Society.20pp

Doak, D.F. and L.S. Mills (1991). A useful role for theory in conservation. *Ecology* 75: 615-626.

Fahrig, L. and G. Merriam (1994). Conservation of fragmented Populations. *Conser.Biol.* 8:50-59.

Huxel, G.R. and A. Hastings (1999). Habitat loss, fragmentation restoration. *Restoration Ecology* 7: 309-315

Menon, V., S.K. Tiwari, P.S. Easa and R. Sukumar (2005). In: *Right of Passage: Elephant Corridors of India.* (Eds). Conservation Reference Series 3. Wildlife Trust of India, New Delhi.

Noss, R.F. (1987). Protecting Natural Areas in Fragmented Landscape, *Nat. Areas. Tr., 7*, Pp 2-18.

Ramkumar, K., K. Manimozhi and S. Paulraj (2002). Status of the elephant corridors in and around Mudumalai Wildlife Sanctuary, Tamil Nadu, South India. *Indian Forester* 128(2): 197-206.

Ramakrishnan, B. and P. Durairasu (2004). Human-Elephant Conflict issues in Crucial Elephant Corridors in Coimbatore Forest Division, Tamil Nadu, India. OSAI Technical Report No.2, Coimbatore.

Santiapillai, C. and P. Jackson (1990). *The Asian elephant. An Action Plan for its Conservation.* Compiled by Charles Santiapillai and Peter Jackson, IUCN, Gland, Switserland

Saunders, D.A. and R.J. Hobbs, (eds.) (1991). *Nature conservation 2: The role of corridors.* Surrey Beatty and Sons, Chipping Norton, Australia

Simberloff, D and J. Cox (1987). Corridors for conservation. *New Scientist*, 1642, Pp 63-68.

Sivaganesan, N. and R. Sukumar (2000). A Brief documentation of Elephant corridors in Southern India.

Sjorgen, P. (1991). Extinction and isolation gradients in meta-populations; the case of the pool frog (*Rana lessonae*). *Biological Journal of the Linnean Society* 42: 135-147.