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A potential habitat corridor for Western Purple-faced Langur between Forest Reserves in Sri Lanka: GIS as a tool in connectivity modelling

Panagoda P.A.B.G., Weerasinghe V.P.A. *

Department of Zoology and Environmental Management, Faculty of Science, University of Kelaniya, Sri Lanka

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ABSTRACT

Endemic Western purple-faced langur (*Semnopithecus vetulus nestor*) of Sri Lanka, is an exclusively arboreal, critically endangered primate whose habitats are severely fragmented with the human population expansion. Labugama-Kalatuwawa Forest Reserve (LKFR) which is identified as the last strongholds for maintaining viable populations of the species over the long-run and Indikada Mukalana Forest Reserve (IMFR) which is located in a closer proximity to LKFR have no connection with each other at the current status. As there is no assertion of regional habitat connectivity at a metapopulation context, the study aimed to identify a potential habitat corridor for *S. v. nestor* between LKFR and IMFR by using GIS as a tool in connectivity modelling. Study area was first divided into 0.04 km² grids using 'fishnet' tool. Five main resistance criteria for *S. v. nestor* movement were selected namely; land use, road density, canopy cover, human tolerance and Feeding Plant Species Richness and Density (FPSRD). Each grid was assigned with resistance values for above criteria ranging from 1 to 6. Overall resistance layer for *S. v. nestor* movement was created using 'weighted overlay' in GIS environment. The best potential habitat corridor was identified via least-cost modelling. The resultant corridor falls within an area which mainly comprises of forest and rubber (*Hevea brasiliensis*) monoculture. It further accounts for the highest human tolerance, canopy continuity, FPSRD and least road density. Resultant corridor can be improved by bridging existing gaps and enriching the corridor habitats which would play an important role in conservation of *S. v. nestor* by minimizing the isolation of local populations, ensuring the gene flow and maintaining the minimum viable metapopulation in the long run. This study further demonstrates that GIS can be used as an effective tool for least-cost modelling which helps to identify potential wildlife movement corridors at minimum cost.

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1. Introduction

Habitat destruction and fragmentation which is caused by human settlements expansion and large-scale development projects, have become a widespread conservation issue. It has been widely acknowledged as a primary cause of the decline of many species worldwide [1,2]. Habitat fragmentation in particular results in remnants of natural environment which occur as a mosaic of large and small patches [3]. As more land is exploited and suffers land use change, those remnants are becoming increasingly insular and semi-isolated in a sea of human-dominated landscape [4], making the forest biodiversity highly dependable on the ability of species to persist in those "habitat islands" embedded within a mosaic of human land uses [5].

Among all the other species, loss of forest cover and consequent fragmentation directly affect the survival of canopy dwellers such as arboreal primates—a key component of the tropical ecosystems where they

play a major role in structuring the community [6]. More than half of the world's extant non-human primates are currently threatened; one of the major causal agents is habitat destruction and fragmentation due to extensive deforestation [7–11]. The most threatened primate taxa are those with small population size and limited distribution, and/or are vulnerable to the impacts of expanding human populations and large-scale development initiatives [9]. Habitat fragmentation often results in small, genetically and socially isolated populations [6] which are highly susceptible to the problems of diseases, stochastic factors, human pressures and inbreeding depression which leads to genetic erosion [6,12]. All above factors can ultimately lead to rapid local extinctions of the taxa [6,13,14].

Langurs (leaf monkeys) in particular are among the most endangered primates, due to their high dependence on undisturbed forests for survival and the vulnerability of most species to habitat change [8]. The endemic Western purple-faced langur (*Semnopithecus vetulus nestor*) of Sri Lanka is identified as a critically endangered and one of the 25 most endangered primates in the world [15]. It is an exclusively arboreal primate which is confined to areas with high continuous canopy cover [9]. Its geographic range mainly covers the Colombo and Gampaha districts in

* Corresponding author at: Department of Zoology and Environmental Management, Faculty of Science, University of Kelaniya, 11300, Sri Lanka.
E-mail address: primali@kln.ac.lk (V.P.A. Weerasinghe).