

Assessment of the Distribution of Herbivores in the Elephant Corridors, Mettupalayam Forest Range, Tamil Nadu, India

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Abstract

Mettupalayam is located at 11.3000°N 76.9500°E. It has an average elevation of 314 metres (MSL). Mettupalayam is situated on the bank of Bhavani River at the foot of the Nilgiri mountains. Population density, distribution pattern of herbivores is very important for conservation as the presence of herbivore population represents the carnivores' activity of that particular habitat. Both herbivores and carnivore population density are important for management and conserving a particular habitat especially the biodiversity hot spots that sustain the existence of wild animals having a qualified and balanced habitat meeting out the pyramidal quotients that are required for the effective functioning of the bio-system and the flow of energy between the tiers. The line transects and distance sampling methodology was used to estimate population densities of both the carnivores and herbivores in Mettupalayam Forest Range especially in the three elephant corridors, The Jaccanari-Vedar Colony corridor, Kallar-Jaccanari corridor, Kallar-Nellithurai corridor. Hence, considering the potentiality of long term conservation value and existing and growing human population in the Mettupalayam Forest Range it is essential to know the status and distribution pattern of herbivores for conservation management. The aim of this paper was to identify the major herbivore population in the elephant corridors so as to get the overview of the bearing effect of these species, the co-existing interactions and its habitat utilization.

Keywords: Herbivores; Transect; Density; Elephant corridors

Introduction

Mettupalayam range is richly endowed with hills, forests, river and wildlife. Mettupalayam is situated on the bank of the Bhavani river closely enclosed by the foot hills of the Nilgiri Mountains. The assessment of herbivores in a particular landscape gives proper definition of certain qualifying parameters of a particular ecosystem. The number and density of these herbivores is essential to maintain the ecological process and life support systems. The diversified agricultural practises play an important role on the habitat utilization of a particular area. Low numbers and large range requirements mean that very large areas need to be set aside for their conservation. The carrying capacity of a particular habitat ensures sustainability and utilization of a particular species. The physiological variation and the change in feed preferences may result in the variability of the producers in the particular study area [1]. There are three corridors namely, The Jaccanari-Vedar Colony corridor, Kallar-Jaccanari corridor, Kallar-Nellithurai corridor. Elephants use corridors in their transit routes between habitats. The quality of elephant corridors is mostly affected by various anthropogenic pressures and development activities. These pressures on the corridors reduce the resource availability to elephants, which in turn leads to crop raiding and other human-elephant conflicts at the forest fringes. So in an effort understand the other herbivores that co-exist in these corridors were made.

Materials and Methods

Study area

The forests of Mettupalayam range spread over an area of 8283.56 ha. The forests are responsible for the cool weather, the green landscape and clean air of the range. Mettupalayam is located in the foot hills of Nilgiri hills. Mettupalayam is located at 11.3000°N 76.9500°E. It has an average elevation of 314 metres (MSL). Mettupalayam is situated on the bank of Bhavani River at the foot of the Nilgiri mountains.

Mettupalayam is the starting point for two of the Ghat roads into the Nilgiri Hills. The total forest area of Mettupalayam Forest Range is 8283.56 ha.

Geologically, the entire area belongs to the metamorphic terrain of Archean age comprising varieties of rock types. The three major groups of rock types are seen in the area. Economic minerals like limestone, canker, gypsum and feldspars are also present. The soil is generally shallow in depth devoid of humus. Water source for irrigation and drinking purpose supplied by Bhawani River and Pillor Dam. The average summer temperature is 34°C and the average winter temperature is 28°C and the elevation of the place is 1,200 m (3,900 ft) above mean sea level.

Elephant corridors under Mettupalayam forest range

Jaccanari-Vedar colony corridor: The Jaccanari-Vedar Colony corridor, Kallar-Jaccanari, Kallar-Nellithurai corridor lies (76056°20'-76000°4' N and 11023°23'-11019°24' E) in the Mettupalayam Forest Range and is surrounded on the north by steep escarpment of the Jaccanari Mountain and on the east by crop fields.

Kallar-Jaccanari corridor: The Kallar-Jaccanari, corridor lies (76052°5'-76056°5' N and 11021°23'-11019°15' E) in the Mettupalayam Forest Range and is surrounded on the north by steep escarpment of the

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Jaccanari Mountains and on the east by crop fields and developmental activities.

Kallar-Nellithurai corridor: The Kallar-Nellithurai corridor lies between 76042°6'-76052°12' N and 11019°10'-11015°28' E in the Mettupalayam Forest Range and is bounded on the north by a series of hills namely, Kovalkombai (1055 m), Chengalkombai (1200 m) and Melur slope reserve forests and east by settlements (NandavanaPudur, Nellithurai, Sattaiyur and KilChengal). Rain from both Southwest (May to August) and Northeast (September to December) monsoons are recieved. The three major forest types' namely tropical moist deciduous forest (MDF), dry deciduous forest (DDF) and tropical thorn forest (TF) are found in the study area.

Line transects and distance sampling were used to estimate the density level of wild prey species [2,3].

The herbivores were systematically sampled using transect lines. The number of transects lines and replications were determined based on vegetation types and reconnaissance survey and each transect line having 2 km distance.

The individual transects was walked 8 times from November 2013 to January 2014, during the morning hours between 06.00 am to 09.00 am. The transect points were marked with the help of Global Positioning System (Garmin72). The entire length of line transects was 108 km. In the transect line the following details such as time, species, group size, age-sex composition, sighting angle measured using hand held sighting compass (SUNNTO Compass) and sighting distance measured by laser range finder were recorded. Population densities of large herbivores were estimated using the software Distance v.6 Release 2 [4].

Results

Groups and individual density of potential prey species of large

carnivores were estimated along with their percent coefficient of variation (Table 1).

Discussion

The estimation of the various prey species in the study area especially in the three elephant corridors helps us to bring in the co-existences of the individuals in particular ecosystem. The carrying capacity of the ecosystem is very essential in for future sustenance. Also this follows a cycle as the prey species establish the existence of the predators, namely tigers, leopards and wild dogs. The most important factor being the forage availability that qualifies a particular ecosystem to be fit and also the foraging types of the animals such grazing, browsing owing to the species specific palatability of the individual animal species.

Chitals follow a typical "lek" behaviour, that modulates the mating and population check and are known to be on the ecotones where there is a mosaic of two ecosystems. There is a greater preference of them being in forest edges as they crepuscular and this orients with their behaviour. In our present study we observed a density of 68.0/sqkm (Figure 1), the numbers overflowing especially near the waterholes. The animals being most active during dawn and dusk fairly indicated a comparatively high chital population than those recorded by Johnsingh [5], Karanth and Sunquist [6], Varman and Sukumar [7]. Less predator threat and absence of anthropogenic stressors would have contributed to the high density of chitals.

Sambar the next abundant cervid was seen at a density of 7.7/sqkm (Figure 2). Sambar deers are gregarious animals and always follow a herd policy and exhibit typical hierarchy principles. Sambars usually prefer a grassland ecosystem next to watering pools. Sambars have an effective population size that governs the population count, hierarchy is maintained and environmental and climatic factors attribute for

Animal	Density individuals/sqkm	Overall population	Model of best fit	percent coefficient of variation	95% Confidence Interval	
Chital	68.0	21832	Hazard rate/Cosine model	36.33	0.363	1.538
Sambar	7.7	2495	Neg Exp/Cosine	43.91	0.753	0.432
Gaur	8.6	2765	Half-normal/Cosine	24.36	0.115	0.307
Elephant	1.7	538	Uniform/Cosine model	56.43	0.771	11.02
Wild Pig	3.1	994	Neg Exp/Cosine	54.76	0.108	1.070
Black napped hair	5.31	1704	Half-normal/Cosine	41.39	0.937	5.879

Table 1: Density of potential prey species of large carnivores were estimated along with their percent coefficient of variation.

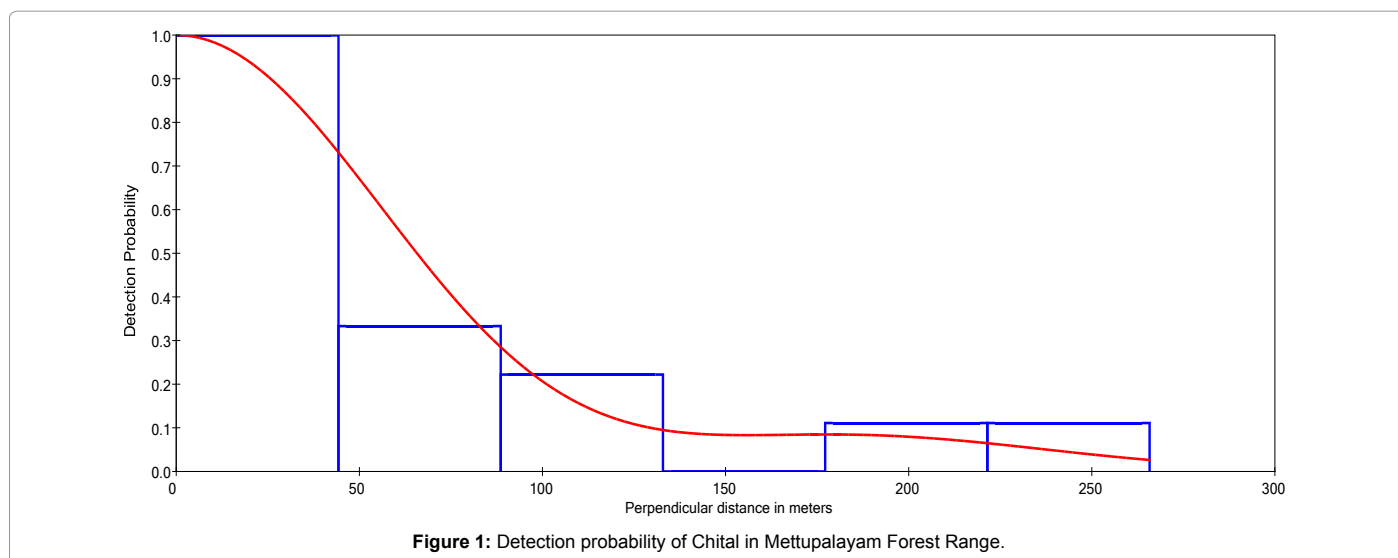


Figure 1: Detection probability of Chital in Mettupalayam Forest Range.

their population regulations. The density of sambars was lower than the density observed by Johnsingh [5] who recorded a density of 10.0/sqkm. The absence of grasslands and stable waterholes pertaining to the study area and also the abundant number of spotted deers explains the low density in the study area.

Gaurs are group living animals and are known to forage a large area owing to their high intake of forage for maintenance. The gaur density was estimated 8.6/sqkm (Figure 3). Higher numbers have been estimated. With the overlap of the elephant corridor the population of gaurs was observed to be very minimum comparing to the other areas with the same climatic cues. Gaurs being crepuscular follow the same tracks as by other animals in the study. It was found that gaurs and spotted deers were seen to be grazing and sharing the same piece of land, without exhibiting aggression signifying co existence phenomenon.

The density of elephants was found to be 1.7/sqkm (Figure 4). There was a slight variation in the elephant population that was governed by their migration and the different herds that were present. The density estimated was higher than the one estimated. Elephants use corridors in their transit routes between habitats. The quality of elephant corridors

is mostly affected by various anthropogenic pressures and development activities. These pressures on the corridors reduce the resource availability to elephants, which in turn leads to crop raiding and other human-elephant conflicts at the forest fringes. Human elephant conflict is also rise mainly due to intensified agriculture production and narrow range of profitable agriculture crops due to increased cost of labour and production, changing land use pattern, increased urbanization, shift of land ownership primarily small scale farmer to large scale farmers, preference of education institutions, spiritual institutions, housing in the forest fringe areas, increase in wildlife population, habitat loss and fragmentation, wildlife behavioural change leading to higher human tolerance, change of forest friendly life style of forest dwelling communities, corridor disturbances. The major problem today remains the exploitation of the elephant's habitat leading to degradation and fragmentation. This is one of the probable reasons that wherever they are present elephants are known to invade croplands causing damage to crops, property and human life prominently in human-wildlife conflict. Also the variation in climatology plays a vital role in their migratory pattern.

The black napped hare density was estimated 5.31/sqkm (Figure 5). This is attributed to the nocturnal activity and their timid nature

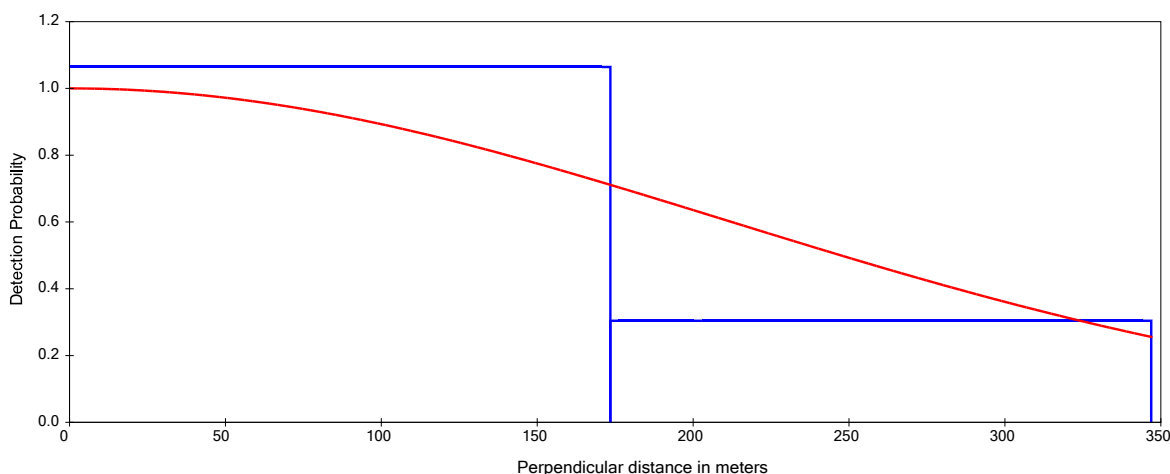


Figure 2: Detection probability of Sambar in Mettupalayam Forest Range.

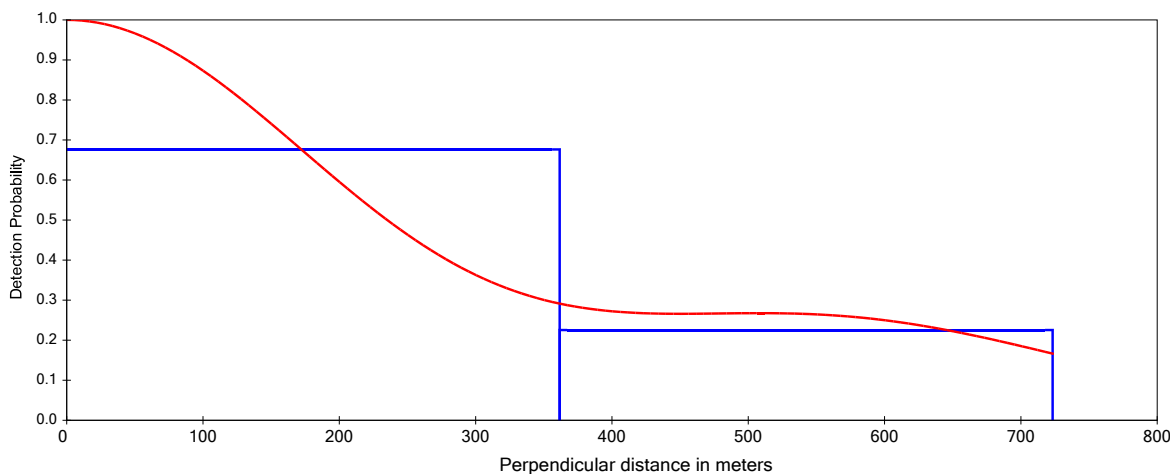


Figure 3: Detection probability of Gaur in Mettupalayam Forest Range.

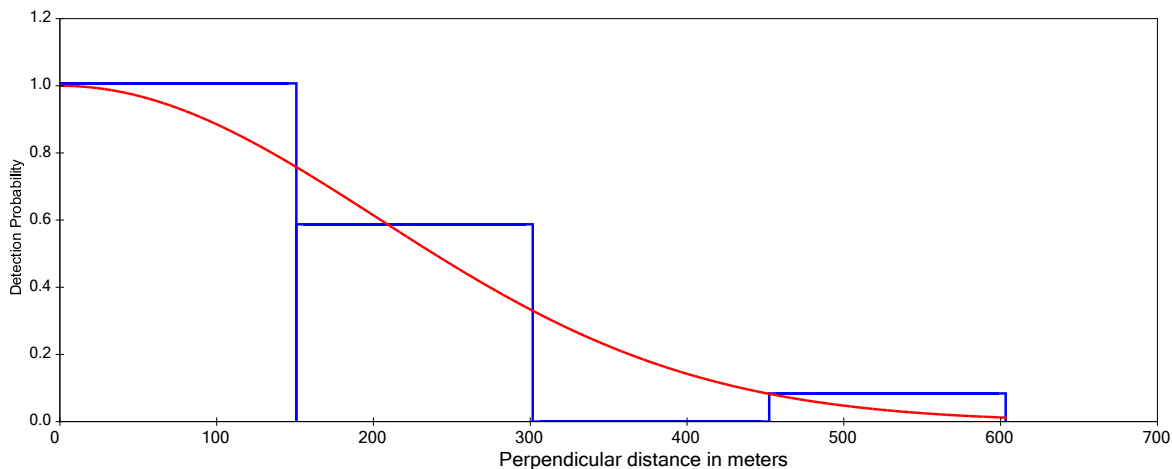


Figure 4: Detection Probability of Elephants in Mettupalayam Forest Range.

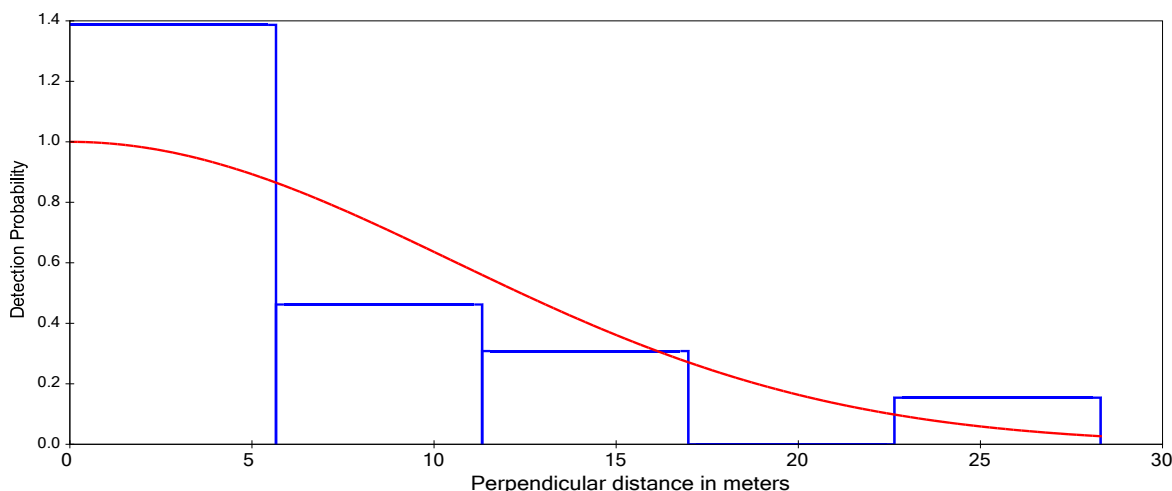


Figure 5: Detection Probability of Black napped Hare in Mettupalayam Forest Range.

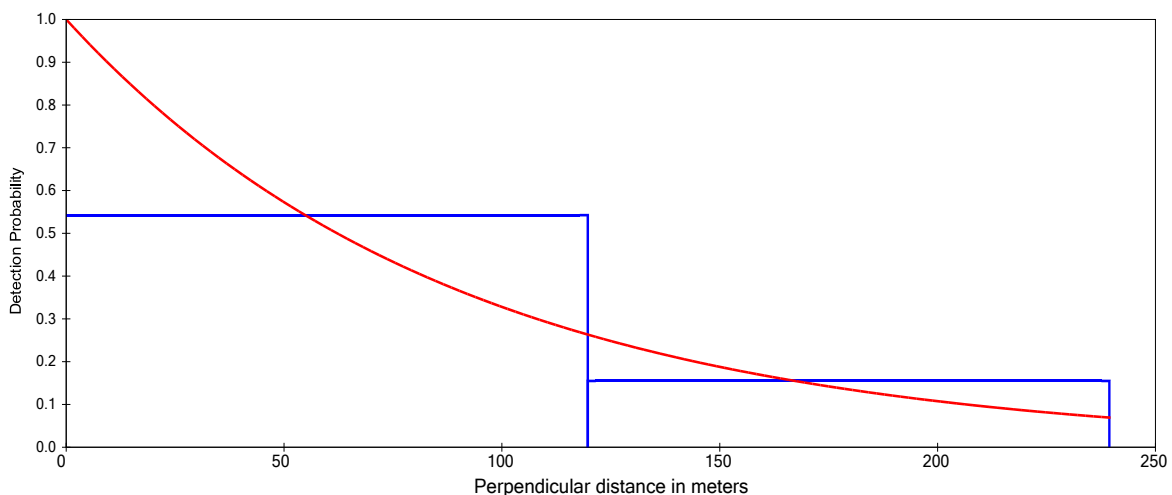


Figure 6: Detection Probability of Wild pig in Mettupalayam Forest Range.

as observed by Varman and Sukumar [7]. The density of wild pig was 3.099/sqkm (Figure 6) lower than estimates reported by Rao, the reason being wild pigs have shifted their base to the fringe areas co-existing with human settlements and it hard to find wild pigs in forest regions [8]. They are found to be in constant conflict with the humans [9-12].

Conclusion

The distribution and the density of herbivores give a brief scenario of the situation of how a habitat is governed. However, the individual animal counts should be carried out with appropriate marking techniques. Further, importance to individual species with the specifics including the day to day meteorological, physiological concerns and telemetry may be pivotal in arriving rigid conclusions.

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