

ECOLOGY OF SPOTTED DEER (*AXIS AXIS*) IN MADRAS CHRISTIAN COLLEGE CAMPUS, CHENNAI, INDIA

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ABSTRACT

The Madras Christian College (MCC) campus in Tambaram is home for a great diversity of plants and animals that are unique and unlikely in a suburban environ. The diversity in the flora is unique and shelters a range of fauna including a good diversity in insects, spiders, snakes and birds. A few unlikely fauna seen on campus are the mongoose, porcupine, Toddy cat, and bats. Among these animals on campus, the most enchanting are the peacock and the spotted deer. Presumed to have strayed into the campus from the Vandalur forest, the deer found the scrub jungle of MCC a safe haven and became a part of the campus fauna. The population comprises of adult male & female, subadults, fawns and a few alpha males and is sustainable on campus. The deer census has not been done for years. So, this population study of spotted deer becomes imminent to have a record of their number including their sex ratio using a few standard methods like direct survey method, camera trap method and spot light method (night survey). This study also helped to observe their foraging grounds and foraging route.

Keywords: *Scrub Jungle, Deer Census, Sex Ratio, Direct Survey, Camera Trap, Night Survey*

INTRODUCTION

Extensive survey is important to assess wildlife population to design management and conservation strategies (Langbein *et al.*, 1999). The exercise is usually strenuous and time consuming, cost-effective, reliable and less-invasive methodologies have to be deployed (Nathan, 2011). Madras Christian College, a 320-acre campus in Tambaram, harbours unique flora and fauna that are unlikely in a suburban neighbourhood. The campus is a scrub jungle, one of the lungs of Chennai city is naturally propagated by the fauna around Tambaram. Apart from the avenue trees and a few trees that are exotic, the campus has a rich diversity of plants that provides serene environment in the campus. The scrub jungle is a safe shelter for many animals including a wealth of insects, spiders, snakes, birds, porcupines, Toddy cats, and bats.

Of all these the most captivating animals in the campus are the peacock and the spotted deer. The spotted deer are cursorial ungulates seen in campus for probably more than 50 years. Presumed to have strayed into the campus from the Vandalur forest, the deer found the scrub jungle a safe haven and became a part of the campus fauna. There are incidents of deer straying away from our campus and settling in Selaiyur region. The deer population is sustainable on campus. These herbivores feed on the grass and a few selected plants on campus. They form a very important component in the energetics of this valuable ecosystem.

The spotted deer are ruminates usually seen in small groups of 6 to 8 individuals (Porter *et al.*, 1991) and at times in large groups of 20 to 30 individuals comprising of male, female and fawn. Deer is sexually dimorphic and can be easily distinguished as male and female. The males are relatively larger in their size, weight and presence of antlers. The population comprises of adult male, adult female, sub-adults, fawns and a few alpha males. The males are adorned with antlers varying in size based on age. The males are fewer than the female in any group with the sex ratio being 1:4 in the wild. The average life span is about 9 - 13 years with males becoming adult at 4-5 years and the female at 6 years.

A systematic study on the deer population has not been undertaken for a long time now. The need is pivotal and hence the study was undertaken. The campus was divided into zones for easy survey and to reduce the

overlap error. The counting of the deer population was done by standard census methods at prescribed intervals with necessary observations to arrive at the required data (*i.e.*, population density, sex ratio, age ratio and foraging grounds).

MATERIALS AND METHODS

The Madras Christian College campus spans about 320 acres and is a scrub jungle. The thick vegetation in the campus makes it hard to initiate a survey. Therefore, for easy movement and observation the campus is divided into five zones (Fig.1).

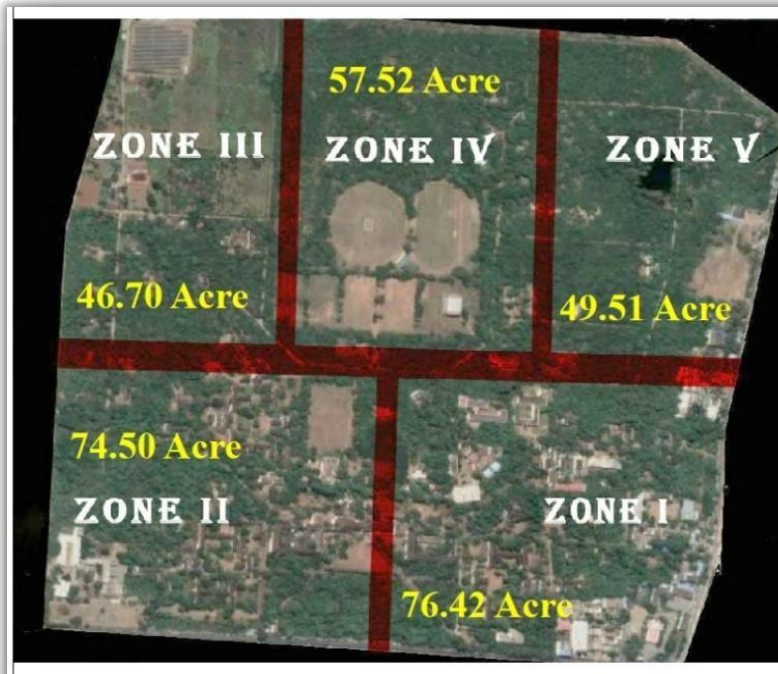


Figure 1: Madras Christian College Campus divided into five zones for the study

Though the zones were marked for convenience, care was taken to access each of the zones for deer survey using all the three methods of observation. The three methods of observation of the deer census are as follows.

Direct survey method (Population density study)

Direct survey method is done by directly venturing into the study area and counting the number of deer individually over a period of time following a certain technique to avoid overlapping. Line transect method is one such method where, the number of deer is counted along a 1- or 2-mile strip twice a day and the population recorded (Darmakumarsinhji, 1959,1960). This method is one of the practicable methods among direct survey. It involves calculating the distance between the observer and the deer spotted in order to calculate the acres covered and to use the data to forecast for the entire stretch of land that has to be monitored (Fig. 2).

To determine the number of acres observed along the route, the distances which deer can be seen to the right and left of the line are measured at regular intervals. Another method by which deer count is done is using an aerial photograph and the deer counted, but this method is not feasible in MCC campus because of the thick canopy. Therefore, the line transect method was deployed without calculating the distance of the animal from the observer.

Trail Camera method (Herd composition, Sex ratio and Animal size)

This method is one the most efficient and non-intrusive method (O'Brien, 2008) where the animals are photographed in their habitat without disturbing them (Fig. 3). It has become one of the most cost-effective

tools for population density estimates in the wild (Pablo *et al.*, 2021). Trail camera method helps with herd composition, accuracy of numbers, age and sex of the animal. The method involves fixing the camera at important paths of the deer. The camera clicks picture and videos on any movement in front of the camera both during the day and in the night. This battery-operated camera goes on for a few days taking pictures of the unsuspecting deer and other animals when it crosses the path of the camera. Detailed analyses of the pictures and videos will provide vital clues on the number of deer, composition of the population, age and sex of the deer population (Mc Collough, 1982).

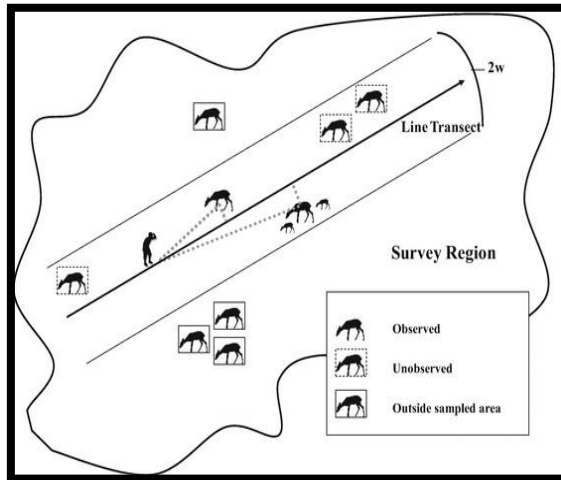


Figure 2: Direct survey methodology



Figure 3: Trail Cameras tied to tree trunk

Spot light method

The spotlight method is one of the oldest methods and effective method especially in open fields (Curtis *et al.* 2009) used for counting the deer in the night using vehicle. One person drives the vehicle and the other person would shine the light, usually high intensity spot lights and count the deer over a distance without agitating them. In the night usually the deer congregate together and this seems to be the best method of precise counting of the deer population.

Using this method, the density of the population can be easily calculated. There are certain precautions that is followed while practicing this method. The count is done usually 45 minutes or 1 hour after the sunset. The vehicle used should not be too loud and should be driven at slow speed (less than 10 km/h). Spot lighting with additional use of binoculars performed better in a comparison of animal age and sex classification (Collier *et al.* 2007).

RESULTS AND DISCUSSION

On analyses of the data through all the three methods of study, the following statistics regarding the deer population is made available (Table 1).

On careful analyses of the data from the pictures in the trail camera and on close observation of the size and gait of the deer, it was concluded that there are five stages of deer based on gender and age. They are mature adult male (Fig. 4a) & adult female (4b), juvenile sub adult male & sub adult female (4c) and the young fawn (4b), male and female. Among the male deer, there are one or two large mature male with robust body, long antlers and heavy gait, they are called the Alpha male. Therefore, the deer population on campus consists of 12 adult males, 41 adult female, 5 sub adult male, 18 subadult female and 5 fawn and the total number deer on campus was estimated at 78 ± 3 .

The males are often found to cluster together, while the adult females cluster together with their young ones. Sub adult male and female are also seen together in groups. Usually, the alpha males are seen independent of

others except during the breeding season. It was observed that about 9 – 13 female deer move in a group and about two or three male deer join the group. The sex ratio of deer on campus is about 1: 3.5 male : female. In the Direct Survey method, since the expanse of our campus is known (320 acres) the distance of the deer from the point of observation was not calculated. The number of deer were noted and divided with the total number of acres. The total number of deer seen at every zone was counted and tabulated. Overlap of data would be there initially, but later avoided on careful analyses of the deer.

In the census, using the two trail cameras installed on tree trunks in the deer path, a total of 120 days and 120 nights were surveyed in the five zones. A total of 10,409 photographs and 3256 videos were recorded in the trail camera over a period of 120 days. On careful analyses of each of the photographs and videos (Fig. 4e), useful data were collected in terms of age, sex and population density (Table 2 & Fig. 5). The deer size and gender were easily identified using the pictures and videos in the trail camera. This was vital in concluding the population, gender and the stages of the deer on campus.

In Night survey method, the headlights of the car and a high intensity torch were used. Night survey using spotlight method was carried out on eight occasions in different zones and the data recorded. Photographs were taken and the deer were counted from the picture (Fig 4f). Counting of the deer was also done by sight and tabulated. Night survey was done usually late in the night at about 11:30 pm or early in the morning in places where they congregate to rest. The count is usually more than 28 deer in one focus of light, with the maximum counted on an occasion was 36 deer at the football ground.

The vast campus with its scrub vegetation is sustainable with the deer population. The number is just adequate to be accommodated in the 320-acre campus. The acres per deer ratio is 4.1 acres/deer and the number of deer per acre is 0.21 (Fig. 6). The acre per deer and deer per acre differ across the zones depending on the foraging grounds and foraging routes. There were about 124 pictures showcasing other animals on campus like the mongoose, toddy cat, porcupine, hare and peafowl. This helps in working out the associated organism or other animals that coexist with the deer population.

The foraging routes of the deer was analyzed through the study and it corresponded to the availability of food and non-disturbance from human activities. The deer move from Zone I to Zone II and Zone III through the vegetation primarily comprising of shrubs and woody climbers. Another route is from Zone I to the lake (Zone V) through the forest cover. Play fields (Zone IV) are usually preferred by the deer only during the night as there would be no human activity there. Movement of deer other than these major foraging routes were also observed in various locations of the campus. The deer rest in the night usually near the football ground and the playing fields.

Table 1: Census of deer on campus

Sex	Adult Male	Adult Female	Sub adult male	Sub adult female	Fawn
Number	12	41	5	18	5

Table 2: Age-wise classification of deer population on campus

Zone	Adult male	Adult female	Sub adult male	Sub adult female	Fawn	Total	Acre/deer	Population Density
Zone I	14	28	8	17	5	72	1	0.9
Zone II	33	30	6	28	8	105	0.7	1.4
Zone III	14	30	12	19	10	85	0.5	1.8
Zone IV	8	8	9	8	5	38	1.5	0.6
Zone V	4	10	9	12	7	42	1.1	0.8

Deer population is a key component of any ecosystem therefore estimating their abundance and distribution is crucial to determine their role in the ecosystem (David *et al.*, 2022) and to find if the population are declining or increasing or stable (Williams *et al.*, 2002) Conservation biologists require density estimates to facilitate management and conservation strategies (Rachel *et al.*, 2021).

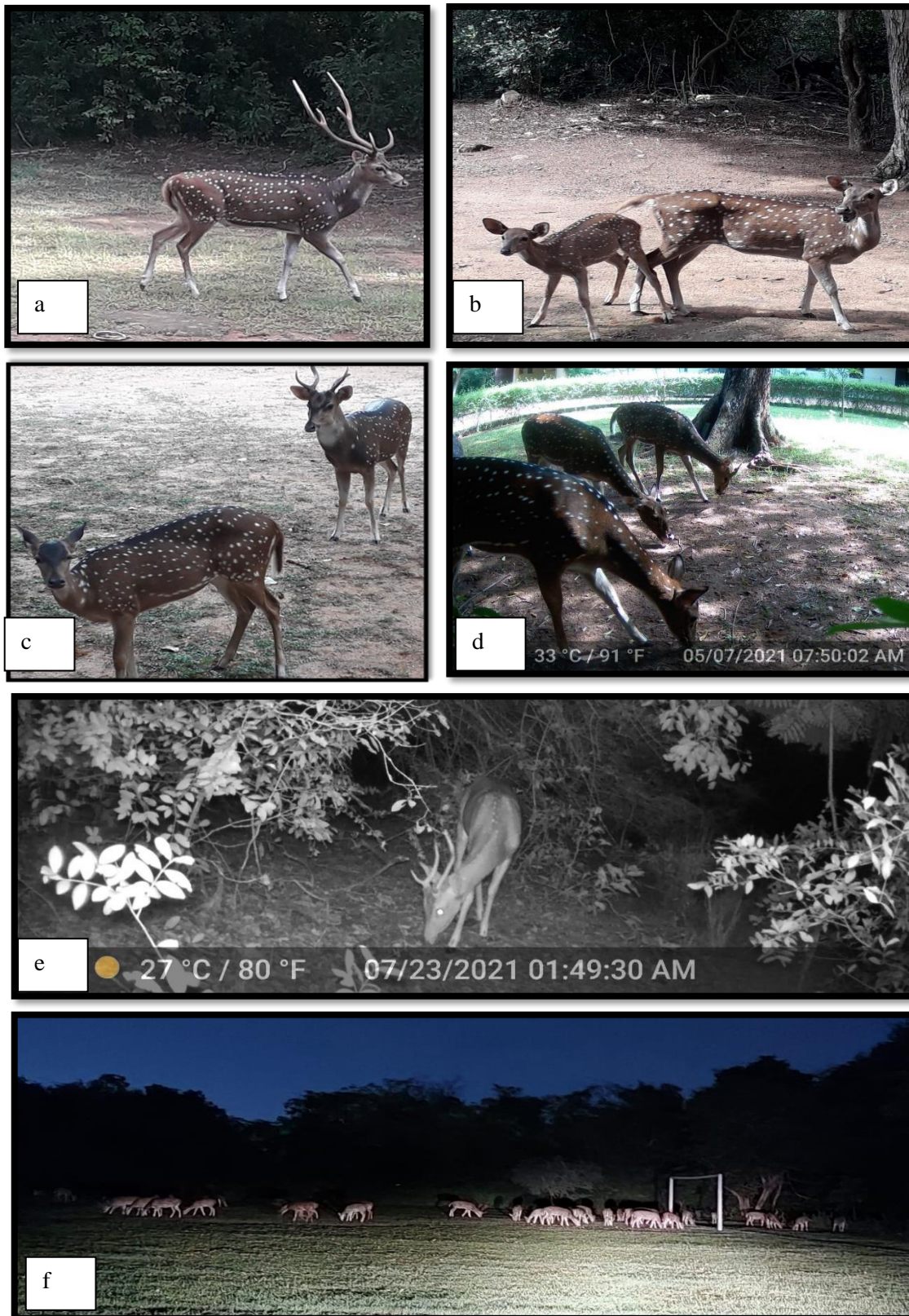


Figure 4: a. Adult male b. Adult female & Fawn c. Sub adult male & female

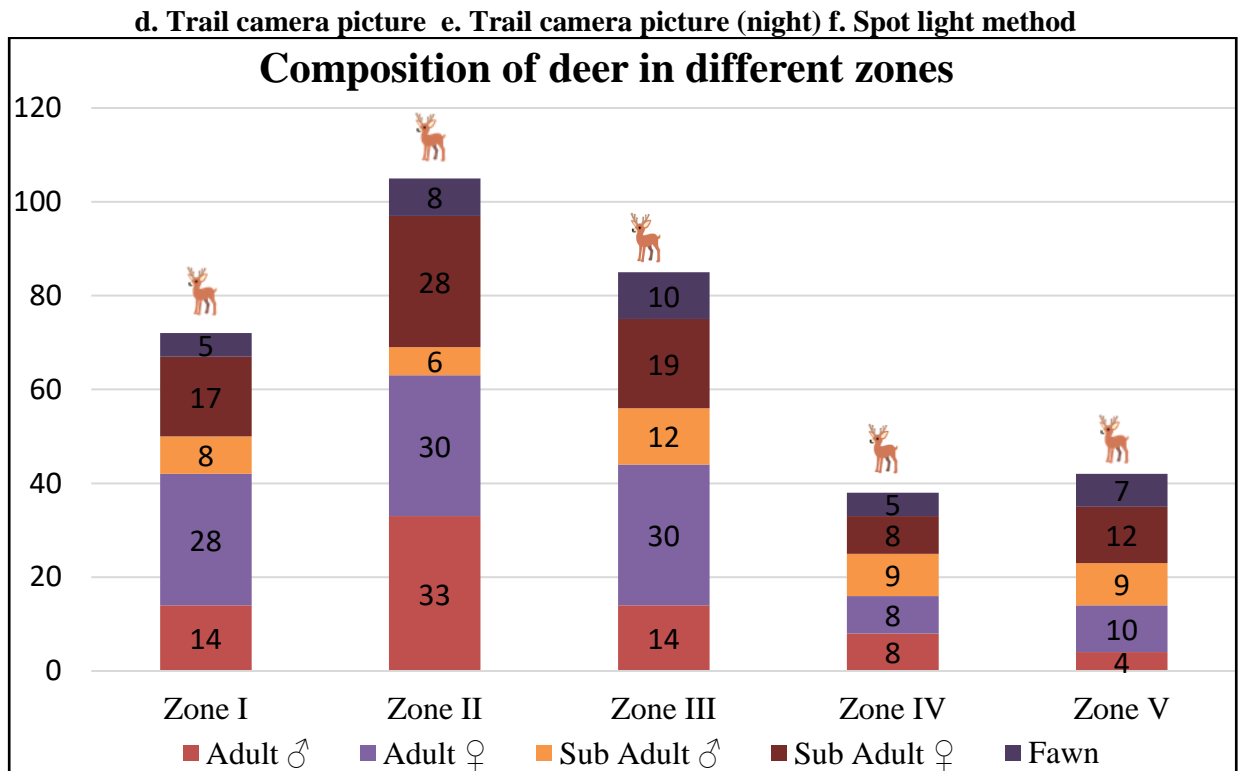


Figure 5: Age-wise deer population in the different zones on campus

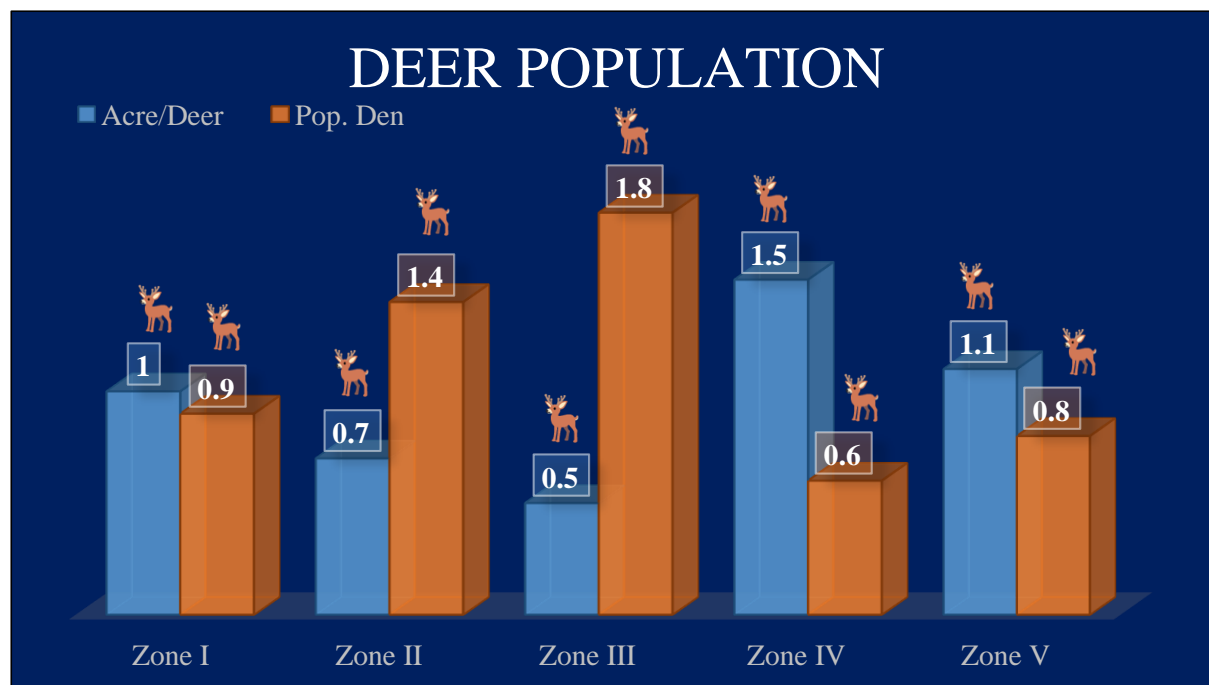


Figure 6: Number of Acres/deer and number of deer/acre

The deer are herbivores that feed primarily on the grass and other vegetation on campus. The population of deer does not decrease even in low food availability conditions in less vegetated forests (Ueno *et al.*, 2018). Their search for grass leads them to wander along the grass patches across the campus. While carefully

monitoring their movement through the direct survey and the photographs from the trail camera, we find distinct foraging routes. Camera traps helps in allowing surveys to be conducted deeper into the forest and allow for passive monitoring (Roberts *et al.*, 2006). The movement of deer corresponds with the presence of food mainly grass and short shrubs across zones. The group size is influenced by the availability of food resource and rainfall (Shankar Raman, 1997). The movement of deer across the zones were through the vegetation primarily comprising of shrubs and woody climbers. Another route is through the forest

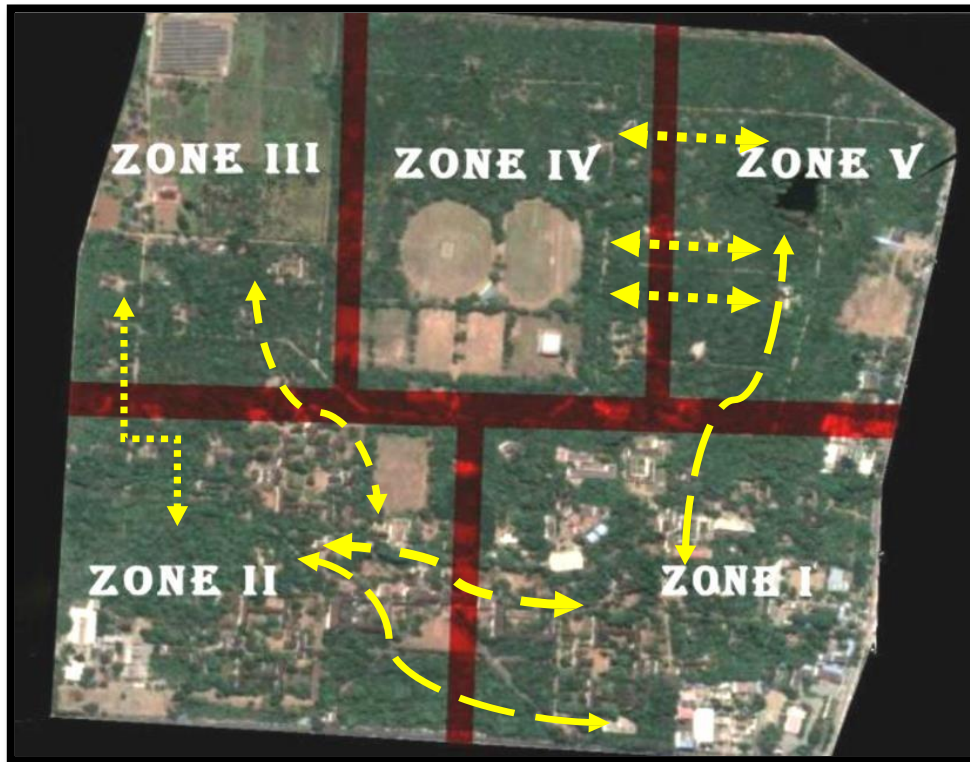


Figure 7: Foraging routes of deer on campus

cover. Unlike the natural forest, where the feeding frequency is high around dawn and dusk (Rajawat and Chandra, 2020), the deer on campus are seen grazing even in the night and are seen to be resting till 7:15 the next morning. This could be due to constant supply of food and lack of natural predators that they are not vigilant in the night or during day time (Zeke *et al.*, 2023). The deer can adapt and live even in fragmented and depleting habitats probably because of human protection in the residential areas in urban landscape (Shuster, 2004) where hunting is prohibited.

Areas of non-availability of grass and small plants were identified and the cause for the same was identified and steps taken to ensure continued nutrient supply to the deer on campus. The absence of natural predators leads to increase in population. It is presumed that the deer have a control over their population depending on the availability of resources. Only once was it noted (though not recorded) that the population of the deer was higher than the carrying capacity of the campus. Periodic check on the carrying capacity and the health of the ecosystem and of the deer is vital to sustain the population on campus.

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