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## Ecology and Behaviour of Indian Peafowl (*Pavo cristatus*) in Keoladeo National Park, Bharatpur, Rajasthan, India

**Sumit Dookia, Reenu Kumari Singh, Anoop KR**

### Abstract

The Indian Peafowl (*Pavo cristatus*) is national bird of India and currently facing various threats in its entire distribution range. A short study was conducted to understand the general ecology and behaviour of Indian Peafowl, to assess its habitat, roosting preference and activity pattern during breeding time in and around Keoladeo National Park (KNP), Bharatpur, Rajasthan, India. It was found that male peafowl spent their maximum time in walking, calling and displaying in open areas to attract females in the study period. The sex ratio is highly skewed towards females. The roosting pattern reveals that the highest number of female peafowl roost together on the trees of *Acacia nilotica* (babul) and *Neolamarckia cadamba* (kadam), whereas males roost singly on the top of large trees. In the countryside, it is particularly partial to feed on crops and garden plants. Since last 10 years, data suggest that in the KNP, the peafowl population is declining due to increased trading of train-feathers, use of pesticides and herbicides in crop-fields. These are also major causes of the population decline; hence need adequate conservation attention and public participation.

**Keywords:** Keoladeo National Park, conservation, habitat, roosting preference, activity pattern.

### 1. Introduction

The Indian Peafowl (*Pavo cristatus*), also called Blue or Common Peafowl, is the largest among the pheasants. It was declared as the National Bird of India in 1963 due to its 'Flagship' value found on its glorious position in mythology. It belongs to the family Phasianidae (commonly called as pheasant) and order Galliformes (Ali and Ripley, 1989; Johnsgard, 1986) [2, 12]. The physical appearance and behaviour of peafowl have always created interest and intrigued by naturalists since long back. The distribution of peafowl is almost widespread and quite common in northern India, but due to the high demand of its train-feathers, it is presently under threat. It is a bird of scrub-jungles and forest edges, showing affinity to moist, dry deciduous and semiarid biomes. It is also found in agricultural fields, along streams with good vegetation and close to human habitations in a semi-feral condition (Johnsgard, 1986) [12]. It roosts on trees and also uses tall buildings where trees are scarce. Indian Peafowl are reported to be polygamous (Ali and Ripley, 1969) [1], polyandrous (Lank *et al.*, 2002) [15] and have a *lek* like mating system, where males defend small and clumped territories in their breeding season (Hillgarth, 1984, Rands *et al.*, 1984, Loyau *et al.*, 2007) [9, 19]. The Indian Peafowl are omnivorous and eat seeds, insects, fruits, small mammals and reptiles. Around cultivated areas, peafowl feed on a wide range of crops such as groundnut, tomato, paddy, chilly and even bananas (Johnsingh and Murali, 1978) [13]. In the countryside, it is particularly partial to crops and garden plants. In India, it is given the utmost protection by its inclusion in the Schedule I of Wildlife (Protection) Act, 1972. Their activity budget highly depends upon early morning and early evening as most of them rest under shade in summer season and it is also the breeding season in North India. Adult peafowl can usually escape ground predators by flying into trees. Leopards are able to ambush them however, and in some areas such as the Gir forest, peafowl are the common prey of Lion too (Parashrya and Mukerjee, 1999) [17]. Though in KNP there is a complete lack of large predators, but Jackals prey upon adults, young ones as well as on eggs, chicks are highly prone to predation. Adults living near human habitations are sometimes hunted by domestic dogs or by humans in some areas (southern Tamil Nadu) for folk-remedies involving the use of "peacock oil" (Johnsingh and Murali, 1978) [13]. Hence they play an important role in regulating the ecosystem balance and functioning and are of religious importance.

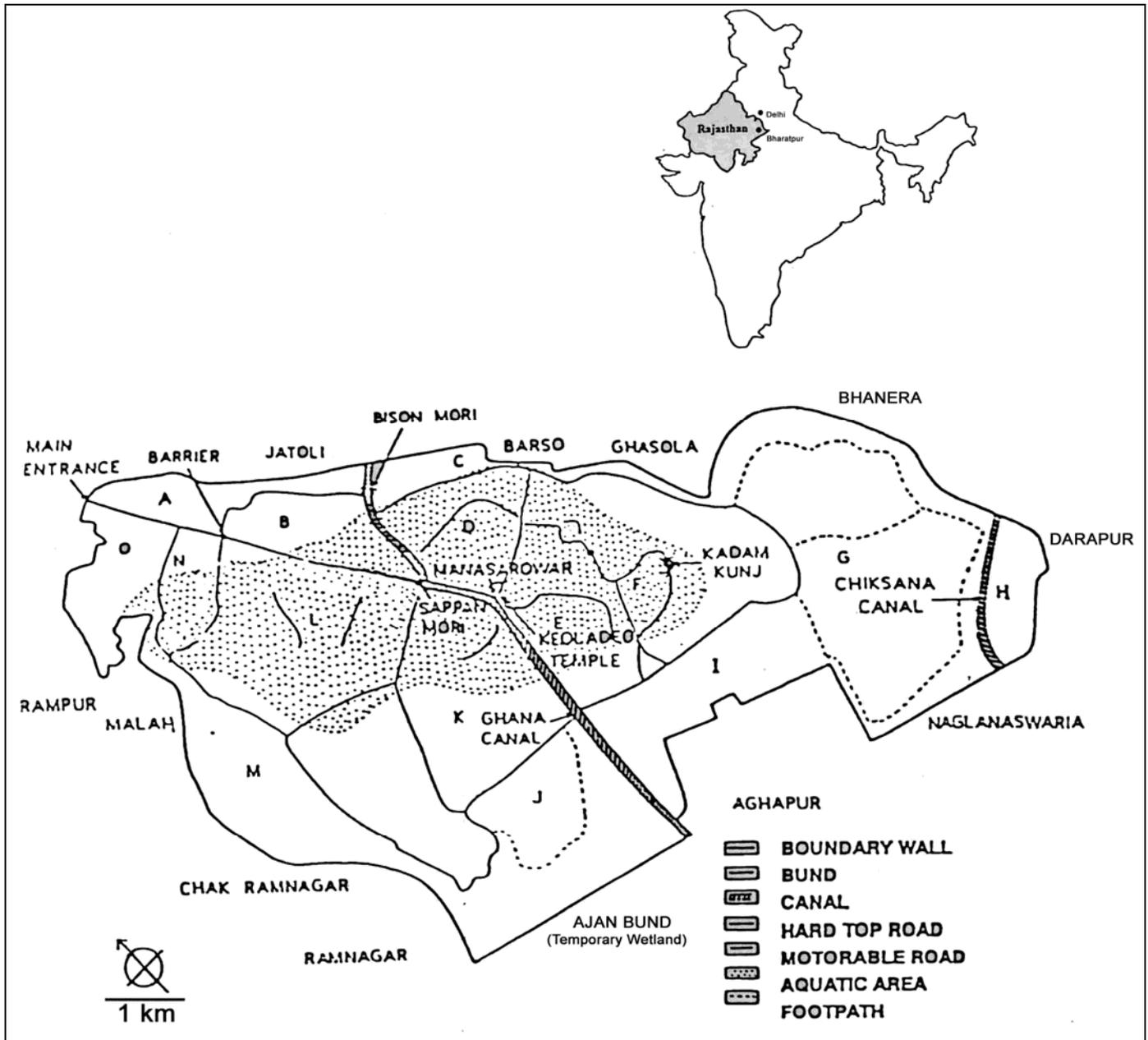


Fig 1: Study area with all the blocks in Keoladeo National Park, Bharatpur, Rajasthan, India

**2. Materials and Methods**

This study was conducted during June and July months of 2011. Standard methods of Scan sampling and *ad-libitum* sampling were followed as per Altman (1973) [4]. During present study, all individuals of peafowl were classified into three categories: Adult males, sub- adult males and females. The age-classification of Johnsgard (1986) [12], combines the first and second year males as sub-adults because of possible errors in assigning individuals to these two categories. The term “display court” as defined by Armstrong (1947) [5] is used to describe the site used by an adult male during display, *i.e.*, a small area that is used for displaying. These displaying male were located through direct search and long observations through scan and focal sampling (Altmann, 1973) [4]. Scan sampling is a technique of observing and recording animal behaviour with time intervals. Under this method, one records the activity of individuals at pre selected time intervals. In this case, three types of data recording were carried out. First, continuous monitoring of displaying/roaming of peafowl for

20 minutes and recorded for activity and time budget, secondly, trail survey was carried out during early morning and early evening hours. During walk on the forest trails, all the sightings of peafowl were recorded on data sheet. The male and female peafowl were distinguished by their neck colour appearance, *i.e.*, males recognized by blue neck and female recognized by green neck. Sub-adult males were recognized by the tail feather’s length. Thirdly, age and sex of all sightings, each and every sighting of peafowl individuals were counted and sex was recorded by neck colour and age by the length of the tail feathers of males only. Additionally, photographs were also taken of displaying males from front side. Habitat wise peafowl status evolved through regular monitoring in and around 1 km radius of KNP. Both direct (walking along the study area during late evening and early morning to flush the roosting birds and locate the trees) and indirect methods (searching the piles of drooping under the big trees) were used to locate and identify the roost trees. The species of tree, GBH (girth at breast height) and canopy cover was measured and

noted on the data sheet for further establishing the correlation with the roosting preference by peafowl.

Another method carried out was, *Ad-libitum* sampling which is subjective and not focused or controlled in any way or bound by any time constraint. It helps in observing a wide range of behaviours and learns what is normal and what is not. The secondary source of data as well as census data of the past 10 years was obtained from KNP Office of State Forest Department.

**3. Results**

The habitats used by Indian peafowl was categorized as follows: ‘river bed/canal bed’ which was rocky and dry throughout the period of study, with only few scattered waterholes; ‘open flat’ areas supporting short or tall grass with scattered trees termed ‘grassland’. Occasionally, such areas had profuse growth of *Cassia tora*, a herb. This area was dominated by the exotic weed *Lantana camara*; ‘Miscellaneous forest’ surrounded the slopes around the grassland and it had trees such as *Salvadora* species, *Acacia nilotica*, *Cassia fistula* etc.

As a general case, it was presumed that they were found in pairs/family. It was calculated by regular direct monitoring in the park. In the present study of 2011, estimated peafowl count is 357 individuals with 56% females and 44% males inside the park and it is counted along with block-wise. Since, the study coincided with the onset of monsoon and the breeding period of the peafowl, the peahens and sub-adults were also included in the density estimation.

The daily activity of the Indian peafowl was studied through the process of scan sampling. The day was divided into time intervals of 20 minutes each. Further, in each time interval every minute was divided into two time intervals of 30

seconds. The activity of the Indian peafowl was noted every 30 seconds and taken into account. Other activities include chasing, running, moving, drinking, dropping and flying (Fig. 2). The displaying activity of Indian Peafowl was studied by the process of Scan sampling in which continuous monitoring of displaying/roaming peafowl was carried out for 20 minutes. The highest display activity was performed in block O, it was considered due to openness of the vegetation and high visibility at the eye level of peafowl in this block (Fig. 3).

The sex and age structure of the Indian peafowl was studied through the process of trail survey of all sightings. Each and every sighting was counted and their sex was identified through neck colour and age by the tail feathers of males only. Age is determined by the length of their train-feathers. Adult males train-feathers were observed under length more than 3 feet and sub-adult male’s train-feathers observed under more than 2 feet and between 2-3 feet. The highest number of peafowl were recorded in the block O and highest number of adult males with more than 3 feet of train-feather were also found in block O (Fig. 4 and 5).

The trees were counted in roosting region of peafowl through regular monitoring in and around 1 km radius of KNP. Both direct and indirect methods were used to locate and identify the roost trees. The species of tree, GBH (girth at breast height) and canopy cover was measured and noted on the data sheet for further establishing the correlation with the roosting preference by peafowl. The roosting preference of peafowl was studied through the direct method of walking along the study area during late evenings and early mornings to flush the roosting birds and locate the trees and also through indirect method by searching the piles of droppings under the big trees. The tree for roosting was also preferred with good canopy cover and tree height (Fig. 6 and 7).

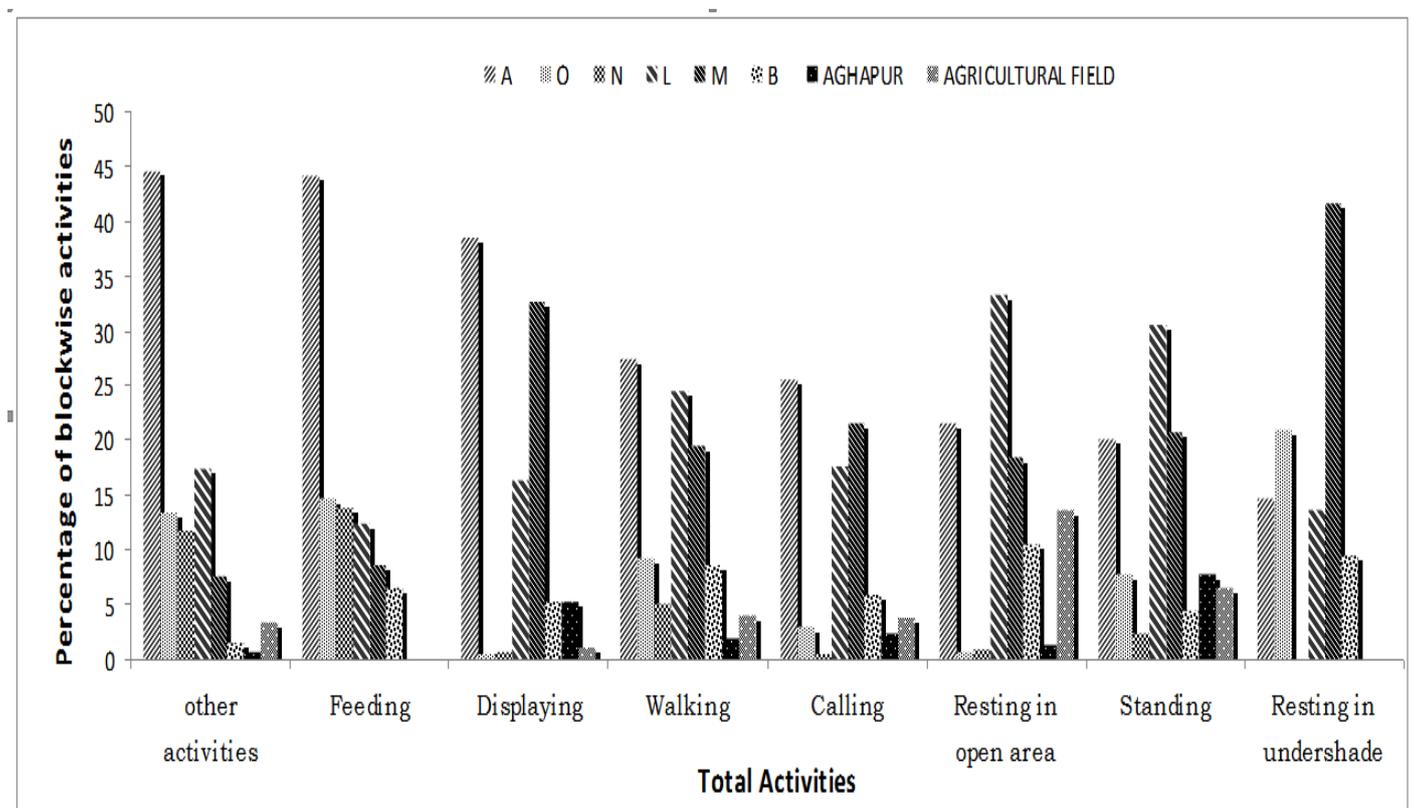


Fig 2: Daily activity budget of peafowl in KNP

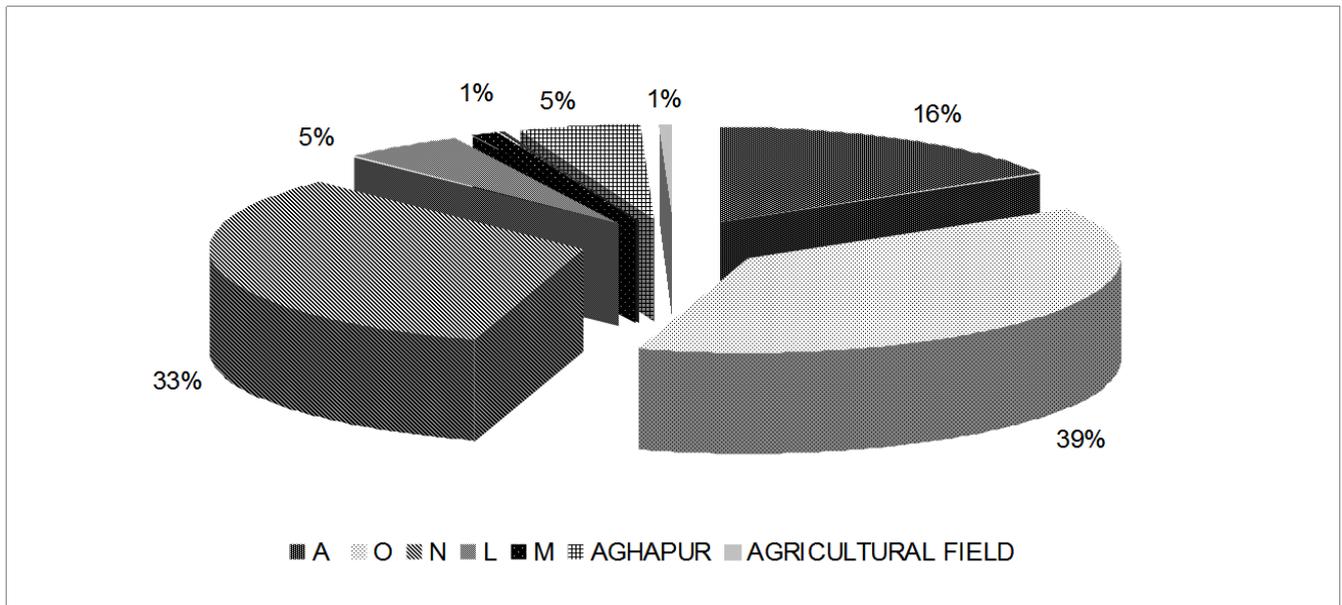


Fig 3: Display activity of peafowl in KNP.

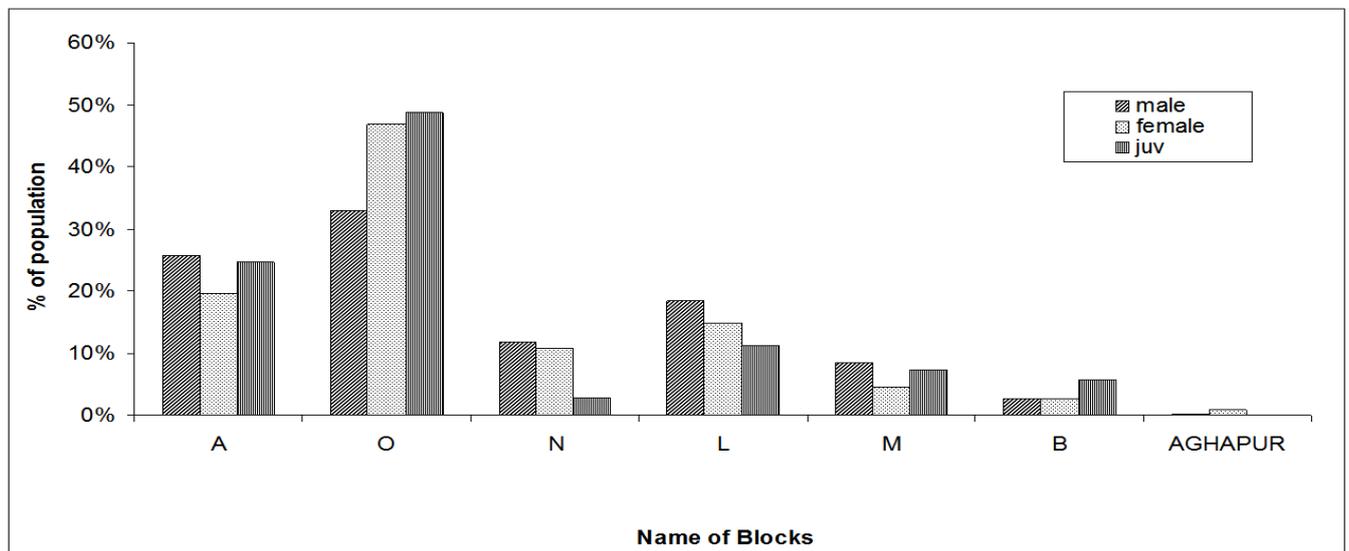


Fig 4: Sex-wise distribution of peafowl population.

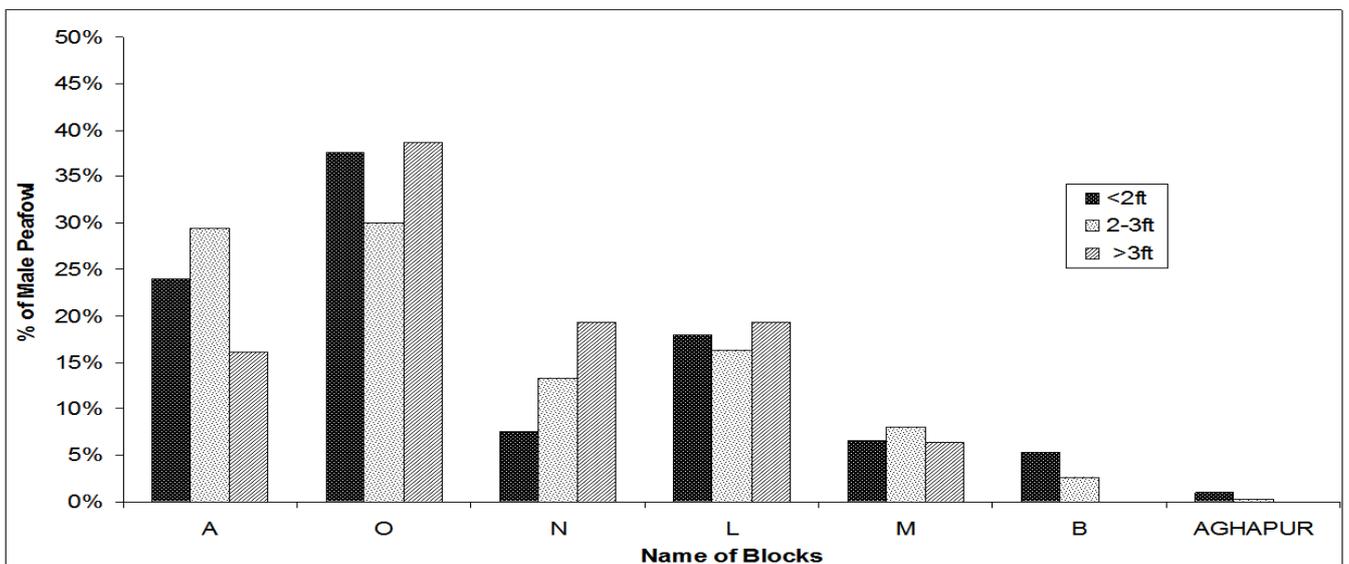


Fig 5: Age classes of male peafowl in KNP.

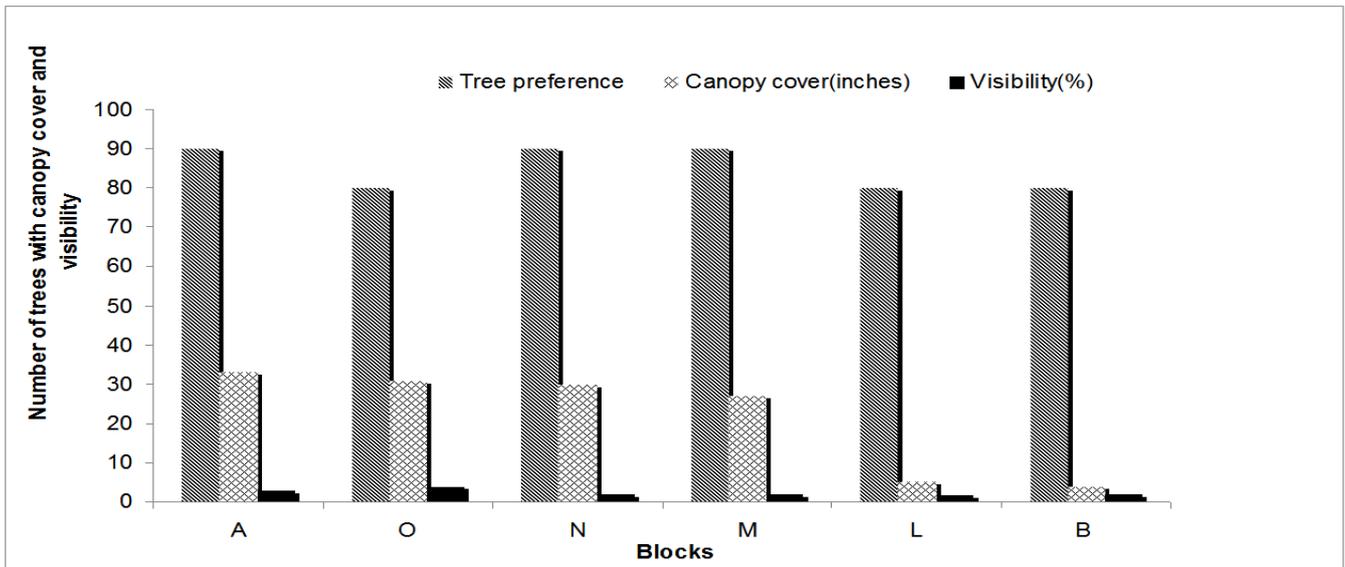


Fig 6: Tree and canopy cover preference by peafowl in KNP.

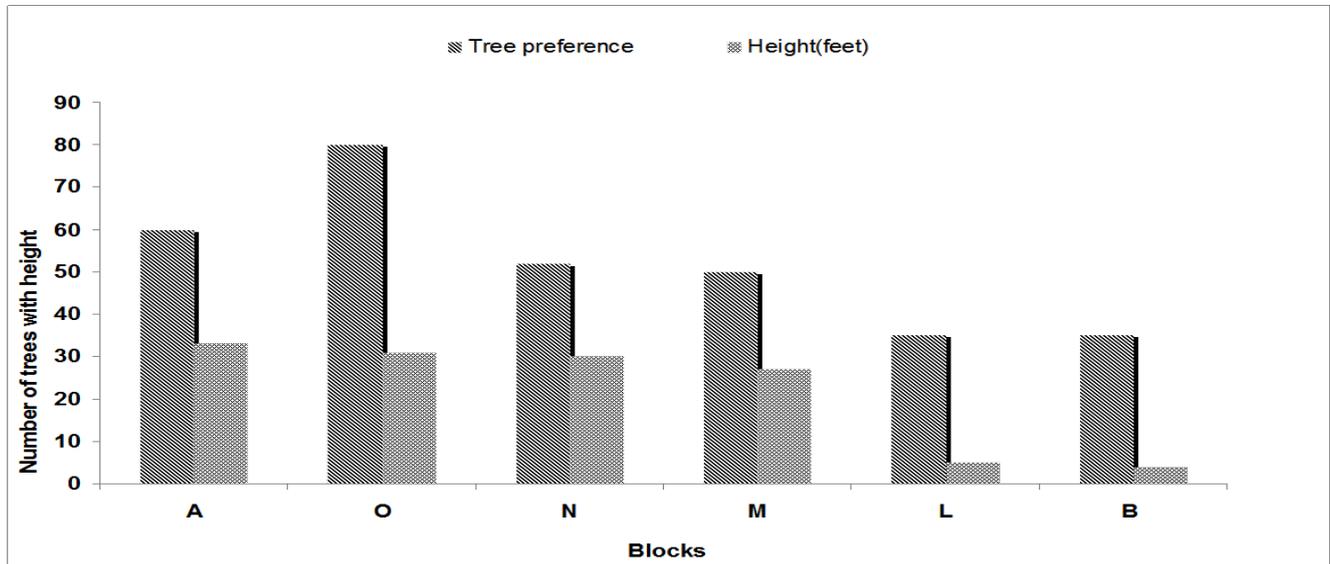


Fig 7: Tree choice and height preference by peafowl in KNP.

**4. Discussions**

In the present study, the estimated peafowl count was 357 individuals with 56% females and 44% males inside the park and it was counted block-wise. Verma and Verma (2009) [24] also studied the population status, sex structure and habitat use of peafowl in the Keoladeo National Park and its adjoining 19 villages during 2006-2007, with 65% females and 35% males, suggests a female biased sex ratio.

The behavior of Indian peafowl was strongly influenced by age and sex. Adult males spent only about half as much time as females in feeding. This could be attributed to greater amount of time spent in standing, displaying and preening by adult males than by females in breeding season. Adult males spent significantly more time in preening than sub-adult males and females, suggesting they incurred a high maintenance of being a handicap because of the elaborate ornamentation of trait feathers (Walther and Clayton, 2005) [25]. Reduced feeding and increased display and maintenance activities are energetically costly for a male, and therefore, ensure that only for long periods of time, resulting in greater mating success. In the present study, it was found that adult males spend more

time in displaying than sub-adult males whereas, females spend more time in feeding and roaming around displaying adult males. Sub-adult males are more difficult to distinguish from females as they both do not have long train-feathers as in adult males but females are determined by green neck colour and males by blue neck colour.

The Indian Peafowl are omnivorous and eat seeds, insects, fruits, small mammals and reptiles. They feed on small snakes but keep their distance from larger ones (Johnsingh, 1976) [14]. The plant matter constituted the bulk of the diet of Indian Peafowl and the animal matter was found only in low proportions (Navaneethakannan, 1981). Around cultivated areas, peafowl feed on a wide range of crops such as groundnut, tomato, paddy, chilly and even bananas (Johnsingh and Murali, 1978) [13]. In the present study, it is particularly found that peafowl diet is mainly paddy, bajra, other grain seeds and partial to agricultural crops and garden plants as revealed by villagers and priests.

Roost selection is a vital component of the over all habitat selection process, therefore information on roost selection by a species carries immense importance for assessing its

conservation needs. Judicious selection of roosting sites enhances the survival of birds by virtue of reduced heat loss, information sharing accountability of population and better protection from predators (Gadgil and Ali, 1975, Gadgil, 1972, Dodia, 2011) <sup>[7, 8]</sup>. In the present study, it was found that most of the time in presence of sun, peafowl rest under shades and in the evening time they rest in open areas. Those tree species they select for roosting may or may not coincide with the resting tree species in daytime. Peafowl preferred stout branches trees which can bear their weight and also have convenience to move as branches of these trees are sparse enough (Parasharya and Mukherjee, 1999; Sharma, 1983) <sup>[17, 21]</sup>. Sathyanarayana and Veeramani (1993) <sup>[20]</sup> investigated the activity patterns, food habits and use of roost trees by the Indian Peafowl in scrub jungle and dry deciduous Forests of Mudumalai Wildlife Sanctuary, Tamilnadu and found that the Peafowl roosted largely on eight tree species which includes species such as *Acacia sundra*, *Cordia obliqua*, *Bombax malabaricum*, *Zizphus jujuba*. As revealed in present study, the peafowl's are very conscious about their roost site selection. They prefer large trees to roost in order to get enough space with their long train-feathers. They move on the trees from branches to top branches of the roost trees and finally select their position to roost mostly at the top branches. The peafowl select live and unbroken canopies of the trees for roosting purpose. The most important features for roost tree selection are the physical characteristics like structure of a tree. Any tree for that matter should satisfy the structural requirements (Trivedi, 1993) <sup>[23]</sup>. In the present study, it was found, peafowl choose those trees which are either having large canopies cover for their hiding purposes so that large predators could not recognize them on trees or those trees which are having spines on overall branches so that wild cats or any predators could not reach to them by climbing. In the park, the peafowl used 6 species of trees with *Acacia nilotica* being the dominant followed by *Mitragyna parvifolia* whereas around the park they used 13 species of trees with *Ficus religiosa* being the dominant followed by *Azadirachta indica* (Verma and Verma, 2009) <sup>[24]</sup>. In the present study, found that peafowl widely used 4 species of trees in which the dominant trees are *Acacia nilotica* (babul), *Neolamarckia cadamba* (kadam) and *Mitragyna parvifolia* inside the park. They dominate in select roost trees for roosting which are close to human habitation because they are more protective from predators. *Azadirachta indica* in the agricultural fields, are less selected for roosting as they are of short height and more adherent to predation.

In India, it is given the utmost protection by inclusion in the Schedule I of Wildlife (Protection) Act, 1972. Although the train feathers of the Indian peafowl are traded for various reasons, it is not included categorized in Convention on International Trade of Endangered Species (CITES) perhaps on the claim that these feathers are naturally fallen ones during annual molt of the species and also that the scale of trade across international border is still to be understood (Ramesh and McGowan, 2009) <sup>[18]</sup>. An adult peafowl has about 200 train-feathers, which it sheds from august onwards; fully-developed new feathers appear February onwards (Sharma, 1974; Ali and Ripley, 1980) <sup>[22, 3]</sup>. The fallen feathers are collected and sold in local markets and the birds are also killed to increase revenue return. Other threats include habitat degradation and loss more significantly from conversion of their habitat to agriculture, habitation and industrial growth, poisoning to counter crop damage, consumption of eggs and

fat extracts for alleged medicinal values, and killing for wild meat (Hoyo *et al.*, 1994; Chakkaravarthy, 2002) <sup>[10, 6]</sup>. But, illegal trading of train-feathers for selling in the local markets is still being done in most of the places. Around KNP, the mortality records of peafowl are very high and this is because of trading of train-feathers mostly. The reasons of their mortality could also be human intervention in their habitat patterns. Vehicles on the roads inside the park and in adjoining villages roads, also could be the reason of their mortality because they used to cross the roads and their heavy long train-feathers weight unable them to fly very soon and leads to death. Their heavy loaded weight of their train-feathers could be the reason of their death as they cannot fly as soon as possible when predators catch them. The other reason could be the poisoning to counter crop damage and villagers add more amounts of fertilizers in their crops for high yielding and resistance to diseases but as peafowl eat the agricultural crops as food grains and it leads to their mortality rate higher. Their call activity during roosting is the most negative aspects and get more prone to predation. As, state forest department revealed that peafowl mortality rates is mostly through predators like wild cats, jackal, python and many more.

It is critical that urgent efforts are made to understand the habitat and population status of the species through field based research and in situ conservation projects. The present study may be useful in order to increase the information's regarding peafowl habitat and distribution status inside the Keoladeo National Park which is a protected area.

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