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STUDIES ON ROOST AND CHARACTERISTICS OF ROOSTING TREE UTILIZED BY INDIAN PEAFOWL (PAVO CRISTATUS L) AT MUSIRI AREA, TRICHY DISTRICT, TAMIL NADU, INDIA

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ABSTRACT

In the present study roost and characteristics of roosting tree utilized by Indian peafowl (Pavo cristatusl) was attempted at Musiri area of Trichy district, Tamilnadu, India from March 2012 to February 2013. It was observed that the Indian peafowl P. cristatus preferred ten roost tree species for night roosting. The roost tree height ranged from 8.0 to 20.0 m (Mean 15.7±3.74) and the roost height varied between 7.0 and 18.0 m (Mean 13.5±3.31). The Indian Peafowl preferred the secondary branches for roosting. It is interesting to note that 300 days of observation of all the roost sites in a year, the peafowl were continuously used the R8 roost site for 260 days (18.21%) in Tamarindus indica tree for night roosting followed by R9 roost site for 250 days (17.51%) in Madhuca indica tree. It was observed that the maximum number of peafowl was recorded roosting in Albiza lebbeck tree (25±4) followed by Azardiracta indica (22±7) and Madhuca indica (18±5). Among seasons the roost site R8 showed the highest proportion (58.33%) in pre-monsoon. On the other hand, the roost site R1 constitutes the lowest proportion (35.23%) in post-monsoon. The roost site R7, however, showed minimum proportion (0.56%) in pre-monsoon and 0.57% in post-monsoon seasons. The frequency of different roost site varied significantly among seasons ($\chi^2 = 8.35$, df 3, $P < 0.05$). In the present study most of the adult males roosted alone or together with one or two adult males. They were found to roost with females and sub-adult males in small groups on the same tree. Majority of the peahens roosted together in small groups of 3-4 along with sub-adult males. The conservation measures are discussed herein.

Key word: Pavo cristatus, Indian peafowl, roosting, Musiri area, Utility tree Southern Tamil Nadu

Introduction

The pheasants are group of birds belong to the Family Phasianidae of the Order Galliformes that includes pheasants, partridges and quails, commonly known as 'game birds' (Delacour, 1977). The family Phasianidae is the largest and the most diverse assemblage (Johnsgard, 1986) and comprises of 38 genera, 155 species and 399 taxa distributed throughout the Old World. Out of 51 species of world's pheasants, 17 species occur in India with very little ecological information (Fuller and Garson, 2000). Three species of peafowl are found in the world, *i.e.*, Burmese peafowl from eastwards to Sumatra, African peafowl in Belgian Congo and Indian peafowl or blue peafowl in Indian subcontinent (Dharmakumarsinhji and Lavkumar, 1981). In India, Peafowl is distributed in Gujarat, Haryana, Madhya Pradesh, Punjab, Rajasthan and Uttar Pradesh. It is protected throughout the country, especially under the Schedule-I of the Indian wildlife protection Act (1972) and its subsequent amendment and Appendix-1of CITES (Dodia, 2011).

The distribution of peafowl in India is patchy but it ranges from Himalayas to the southern most districts. In Tamilnadu, fairly large population can be seen in Ramanathapuram, Madurai, Pudukottai and Nilgiri districts (Sudhahar, 2003). Information on roost selection by bird species is of great importance in planning for its conservation and management. Trivedi and Johnsingh (1996) reported, in birds the roost selection is a vital component in the overall habitat selection process. Gadgil and Ali (1975) concluded that two most significant functions of communal roosting in bird species are the communication of information about the location of food sources and avoidance of predation. According to Thear (1990) the provision of trees offers some environmental protection and can encourage birds to range more widely, although these may also provide fox cover, this enhancing the risk from predation. The roost study of Indian Peafowl is essentially unstudied in Musiri area. It is important to study the distribution of Indian peafowl related to the availability of suitable roosting trees.

Trivedi and Johnsingh (1996) reported that roost selection is a vital component in the overall habitat selection process. The roost site selection is regulated by many factors. The roost site selection has often been a focus of research on many birds (Gadgil and Ail, 1975; Yamin, 1994 and Ramesh, 1995). Therefore, information on roost selection by a species carries immense importance for assassin its conservation need and to design effective management strategies. Therefore, present study was conducted on the roosting sites of peafowl from March 2012 to February 2013 in Groove habitat. This paper focus on roost selection by Indian peafowl in Musiri area of Trichy District, Tamil Nadu (N11^{o} 00.777 and E078^{o}32.241.

Study Area

The study was carried out in Musiri area of Trichy district, Tamilnadu, India (N11° 03.845'; E078° 41.007') from March 2012 to February 2013 (Fig 1). The study area is criss crossed by number of metal and Kutcha Roads. The only water source is rainfall. The river Cauvery flows this area which a non-perennial river supporting farmers the water facility for their agriculture practices. Farmers plant paddy, banana, coconut, ground nut, sugar cane, sunflower, cereals, pulses ete., They use number of pesticides and insecticides for their crops against insect pest attack. People cut the trees as fire wood in some of the areas. This leads to lack of roost trees for the peafowl. The villagers pump out water through motor for their agriculture activities. Topography of the area is mostly flat except for a few knolls. The temperature ranged from 30.0º C to 39.0º C during summer, and 20º C to 26º C during the monsoon and post monsoon periods. The study area receives northeast (October-December) monsoon rains. Failure of monsoon occurs rarely and results in drought.

Materials and Methods

The study on roosting behavior of peafowl was carried out for a period of one year from March 2012 to February 2013 at Musiri area in district Trichy, Tamil Nadu, India at N11^{o} 00.777 and E078^{o}32.241 geographical location. Musiri area has different types of habitats include agricultural habitats of various crops, grooves of coconut, fallow land; prosopis dominated shrub land which supports a very good number of peafowl and other

fauna. To study the roosting habits of peafowl, an extensive survey was carried out in selected habitat of grooves (Fig 2). Three one kilo meter transects were laid in the habitat and was marked on the study area map. The survey was carried out through transects during morning hours (06.00 to 09.00 am) and evening hours 04.00 to 07.00 pm). The roost tree was confirmed seeing the birds directly at dawn hours. The peafowl roosting was confirmed by seeing the bird with a powerful Binocular (7X50 Olympus model-China make). The Indian peafowl *P. cristatus* roosting sites and trees were searched and recorded. The roosting behaviour was also observed and monitored continuously. Details such as roost tree (n), roost tree height (m), roost height (m), tree gbh (cm), habitat, date, time, number of days spent on each tree, and distance between different roost trees (m) were recorded. Presence of drooping in the roost tree also evidenced the birds choosing the same tree for long period. The roost tree species was identified (Matthew, 1982) and recorded. Further the roost trees species were confirmed by means of preparing herbarium and the voucher specimen was identified in the Botany department of Nehru Memorial College (Autonomous), Puthanampatti, Trichy district, Tamilnadu, India. The roost trees were marked with paint.

Statistical Analysis

Chi-Square analysis (Mean and SD), wherever appropriate, were carried out (Sokal and Rohlf, 1981). Results are reported as significant if they are associated with a value of $P<0.05$. Graphical representation of data was done using Microsoft Office excel 2007 version. To assess the difference among the utilization of different trees for roosting, the results were subjected to Chi-Square analysis. The SPSS (Nouris, 1999) version 16 software was used for data analysis.

Results

In the present study area 22 species of trees were recorded. The tree species, common name and vernacular name are mentioned in Table 1.

Table 1. Tree species recorded in the study area

S.No	Tree Species	Common Name	Vernacular

			Name
1	*Acacia leucopholea*	Panicled acacia	Velvelam
2	*Acacia nilotica*	Babul	Karuvai
3	*Aegle marmels*	Walnut	Vilvam
4	*Albiza lebbeck*	Kokko	Vabai
5	*Azardiracta indica*	Margosa	Veppam
6	*Borassus flabellifer*	Palm	Panai
7	*Cassia fistula*	Indian laburnum	Konnai
8	*Cocos nusifera*	Coconut	Thennai
9	*Eucalyptus tereticornis*	Red gum	Neelagiri thailam
10	*Ficus benghalensis*	Banyan	Alai, Ala
11	*Ficus microcarpa*	-------	Ichi
12	*Ficus religiosa*	Peepul	Arasu
13	*Ficus sessile*	--------	Itch
14	*Holoptelea integrifolia*	-------	Aavi
15	*Lannea coromandelica*	Wodier kalasam	Odiya maram
16	*Madhuca indica*	----------	Lluppai
17	*Mangifera indica*	Mango	Maa
18	*Moringa oleifere*	Drumstick	Murungai
19	*Prosopis julifora*	----------	Valikaruvai
20	*Tamarindus indica*	Tamarind	Puli
21	*Thespesia populnea*	Portiatue	Poovarasu
22	*Ziniphus mauritiana*	Jujube	Elandai

It was observed that the Indian peafowl *Pavo cristatus* preferred roost tree species viz., *Cocos nusifera, Azardiracta indica, Eucalyptus tereticornis, Borassus flabellifer, Albiza lebbeck, Mangifera indica, Prosopis julifora, Tamarindus indica, Madhuca indica* and *Palm tree* in Musir area in Groove habitat. The roost tree height ranged from 8.0 to 20.0 m (Mean 15.7±3.74) and the roost height varied between 7.0 and 18.0 m (Mean 13.5±3.31). The minimum and maximum gbh (cm) of roost tree was 25 and 250 cm. respectively (Mean 127±74.28). The Indian Peafowl preferred the secondary branches for roosting. In the present study the peafowl preferred ten (R1, R2, R3, R4, R5, R6, R7, R8, R9 and R10) roost sites for night roosting (Table 2, Fig 3).

It is interesting to note that 300 days of observation of all the roost sites in a year, the peafowl were continuously used the R8 roost site for 260 days (18.21%) in *Tamarindus*

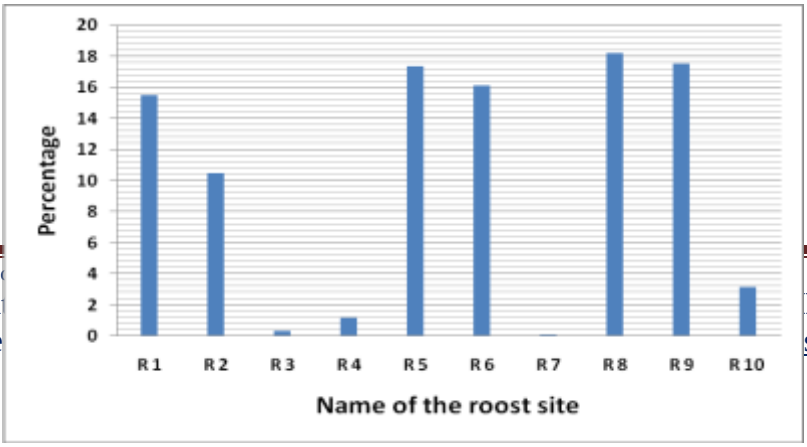
indica tree for night roosting followed by R9 roost site for 250 days (17.51%) in *Madhuca indica* tree, R5 roost site for 248 days (17.37%) in *Albiza lebbeck* tree, R6 roost site for 230 days (16.11%) in *Mangifera indica* tree and R1 roost site for 221 days.(15.48%) in *Cocus nusifera* tree. In these roost sites the peafowl followed strict site fidelity throughout the year. It was observed that the maximum number of peafowl was recorded roosting in *Albiza lebbeck* tree (25±4) followed by *Azardiracta indica* (22±7) and *Madhuca indica* (18±5). The minimum numbers of peafowl were recorded roosting in *Borassus flabellifer* tree (3±0.5) and *Eucalyptus tereticornis tree* (6±1.5).

Table 2. Indian Peafowl (*Pavo cristatus*) roost tree species, roost tree characteristics, number of days roosted each roost site and roost height recorded at Musiri area, Trichy district during March 2012 to February 2013.

Roost site	Number of days roosted	%	Tree species	Number of Peafowls roosted	Tree ht. (m)	GBH (cm)	Roost ht. (m)	Roost Branch
R 1	221	15.48	*Cocos nusifera*	15 ± 3	18	75	17	canopy
R 2	150	10.50	*Azardiracta indica*	22 ± 7	12	120	10	Secondary
R 3	05	0.35	*Eucalyptus tereticornis*	06 ± 1.5	18	45	15	-
R 4	17	1.19	*Borassus flabellifer*	03 ± 0.5	15	102	14	Secondary
R 5	248	17.37	*Albiza lebbeck*	25 ± 4	20	250	15	Secondary
R 6	230	16.11	*Mangifera indica*	17 ± 5	17	185	15	Secondary
R 7	02	0.14	*Prosopis julifora*	04 ± 0.1	8	25	7	Secondary
R 8	260	18.21	*Tamarindus indica*	15 ± 2	15	180	12	Secondary
R 9	250	17.51	*Madhuca indica*	18 ± 5	14	205	12	Secondary
R 10	45	3.15	*Palm tree*	07 ± 2	20	85	18	canopy
Total		**100.00**						

R = Roost site; GBH Girth at Breast Height

Fig 3. Indian Peafowl (*Pavo cristatus*) roosting in different roost sites at Musiri area, Trichy district during March 2012 to February 2013.



The overall result revealed, out of 300 days of observation (March 2012 to February 2013) that the peafowls preferred the roost site R8 roost site mostly (18.21%) when compared to other sites. Among seasons the roost site R8 showed the highest proportion (58.33%) in pre-monsoon. On the other hand, the roost site R1 constitutes the lowest proportion (35.23%) in post-monsoon. The roost site R7, however, showed minimum proportion (0.56%) in pre-monsoon and 0.57% in post-monsoon seasons. The frequency of different roost site varied significantly among seasons ($\chi^2 = 8.35$, df 3, $P < 0.05$).

Roosting

In the present study most of the adult males roosted alone or together with one or two adult males. They were found to roost with females and sub-adult males in small groups on the same tree. Majority of the peahens roosted together in small groups of 3-4 along with sub-adult males. The roost tree height ranged from 8.0 to 20.0 m (Mean 15.7±3.74) and the roost height varied between 7.0 and 18.0 m (Mean 13.5±3.31).

Discussion

At Musiri area *Cocos nusifera, Azardiracta indica, Eucalyptus tereticornis, Borassus flabellifer, Albiza lebbeck, Mangifera indica, Prosopis julifora, Tamarindus indica, Madhuca indica* and *Palm tree* were the most preferred tree species for roosting in groove habitat by Indian peafowl (*Pavo cristatus*). The preference of these tree species may be due to the fact that they would provide suitable canopy cover for hiding and to protect from over cold, rain and from predators. Similar observations were also reported by Navaneethakannan (1981) and Sathyanarayana and Veeramani (1993). On the other hand, Rajadurai (1988) observed preference of peafowl on *Tamarindus indica* in semi-wild condition; in contrast, Trivedi and

Johnsingh (1996) found maximum roosting on *Pongamia pinnata* and *Holoptelia integrifolia* at Gir Forest, Gujrat, India.

Ramesh and Sathyanarayana (2002) reported that the canopy cover and thorny nature of trees are preferred by Grey Junglefowl at Srivilliputtur Grizzled Giant Squirrel Wildlife Sanctuary. In the present study the roost tree height ranged from 8.0 to 20.0 m (Mean 15.7±3.74) and the roost height varied between 7.0 and 18.0 m (Mean 13.5±3.31). These results are in accordance with the results of Priya (2009) and Meenatchi (2011). Zacharias (1997) observed that the Peafowl roosted on small trees, such as *Acacia,* often encircled by climbers and at a height of about 20-25 feet when going to roost the birds fly to the lower branches and then move up to the upper branches by jumping. Priya (2009) and Meenatchi (2011) emphasized that the tall trees give lot more protection for the most of the galliformes species. In their findings the C*ocos nucifera, Albizea amara* tree was the preferred roost tree. In the present investigation, the Peafowl preferred the same trees for night roosting purposes. Subramanian and John (2001) stated certain tree species possess the necessary structural features of an ideal roost tree and the height of the roost tree and the canopy cover might have played a role in choosing the roost trees by most of the Gallinaceous birds.

Trivedi and Johnsingh (1996) opined that the preference for the roost trees is an antipredatory strategy against nocturnal predators. These authors further stated that any tree which satisfies the structural requirements for avoiding predators may be preferred by birds for roosting. Only those tree species possess the necessary structural features of an ideal roost tree are preferred. According to Lack (1954) and Hill and Robertson (1988) the predation is common in Gallinaceous birds. The height of roost tree, roost height, canopy cover and habitat plays a vital role in choosing the roost trees by Indian peafowl. Roosting site may enhance the survival of birds, by virtue of reduced heat loss, information sharing and better protection from predators (Gadgil and Ali, 1975). Beebe (1922) also mentioned roosting is apparently done non-socially, even though several birds may be found in the same tree or in neighboring ones.

According to Baker and Inglis (1930) Peafowl is said to roost in high, open trees so that they could see in all directions; when roosting in forests, they select one of the highest trees, well out in the open. This is a good precaution against the tree-climbing, night predators such

as the leopard and other cats. Johnsingh and Murali (1980) found five banyan trees *(Ficus bengalensis)* serving as the roosting site for about 100 birds. However, such mass roosting trees were seldom observed during the present study and the maximum number observed to roost in any one tree was 15 and minimum was 06. When such mass roosting occurs, according to Ali and Ripley (1978), groups break up in the morning into smaller' groups which for much of the year consist of a male and harem of three to five females. After leaving the roosting areas the birds move into forest clearings, cultivated fields, or other areas to forage during the early morning hours. The middle of the day is spent in shady sites, often very close to water, where the birds drink and preen at length. Late in the afternoon, they forage a second time, and return for another drink at dusk before going to roost in the evening.

In the present investigation, the peafowl were observed roost on tall trees of different species. The selection of *Ficus bengalensis, Maduca indica, Cocus nucifera, Acacia sp. Albizea lebbeck* and Palm tree could be to avoid the predation pressure and could be that the roost trees provided proper refuge against predator and weather. Apart from that the nearby areas probably providing proper food materials and water facilities to the peafowl.

Roosting site selection plays a pivotal role in the nesting success of any species. Judicious selection of the roosting site may enhance the survival of birds, by virtue of reduced heat loss, information sharing, accountability of population, and better production from predators (Gadgil 1972 ;Tast and Rassi 1973, Gadgil and Ali 1975 ; Gyllin *et al.*, 1977). The Indian Blue Peafowl, a common bird in India, is known to roost in trees and large buildings at night. Through several papers have been written on the roosting behavior of peafowl, detailed studies on the roost site selection have only recently been carried out by Trivedi and Johnsingh (1996) in Gir forest. They further emphasized that within the Gir National Park, peafowl preferred high trees. In view of their findings, that all peafowl of the area roosting on the poles (the safest site in view of the height).

Johnsgard (1986) stated that the Red Junglefowl roosts socially in trees. In the present investigation the peafowls were recorded roosting socially in trees. At Musiri area the jungle cat, jackal and python, would be predators for Indian peafowl. It seemed that the Indian peafowl require protection from both the predators at day and night. Hence, the advantage of

a roost site in trees is obvious. The Indian peafowl preferred the secondary branches especially thin anterior portion of the roost tree to avoid the predation. The reason probably could be to escape from over cold and predation. During night the predator may enter the posterior part of the roost tree branch, the Indian peafowl would easily detect the predator in the roost tree due to shaking of the anterior portion. It can easily fly off and perch on near-by trees for roosting.

Ali and Ripley (1978) have reported that large birds need tall trees and small birds need small trees for roosting. In the present study, peafowl, being the large bird, was found to prefer large trees for roosting. According to Bergmann (1980) and Johansgaurd (1986), blue peafowl (*Pavo cristatus)* has been observed on the tall trees for roosting, and nesting under dense bushes with open areas having feeding grounds. In the present study also, peafowls were observed on most dominant species of the trees in groove habitat. In the present study, variability in the vegetation provided adequate habitats for various behavioral activities such as roosting, feeding, nesting etc. In the conclusion, the Musiri area harbors a good population of Indian peafowl, however, the farmers using dangerous pesticides as deliberate poison to kill birds especially Indian peafowl. Apart from this people cut fuel wood trees for their daily need. Hence most of the roosting trees are being removed by the local people. At present a conservation measure is essentially needed to safe guard the hardiest species (Indian peafowl) among birds.

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Fig 1. Musiri study area map

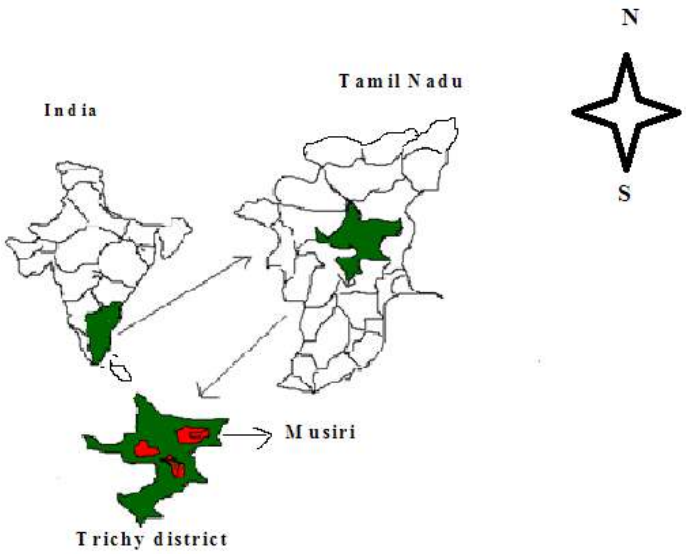

Fig 2. Different Grooves – in Musiri study