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# Assessment of population dynamics, agricultural impact, and conservation challenges facing the Indian Peafowl (*Pavo cristatus*) in Tirupur District, Tamil Nadu, India

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**Abstract**
Indian peafowl, the national bird of India, faces significant threats from various anthropogenic activities. A study was conducted to assess the population status, habitat choice, and conservation challenges faced by the species in Tirupur, Tamil Nadu, India. The study utilized road transects to estimate population, opportunistic surveys to determine tree roosting preferences, and structured questionnaires to assess people's perceptions and conservation threats. The study recorded a total of 807 individuals (1.92 individuals/km) observed during 546 sightings along 420 km of road transects, with adult females having the highest number of sightings. Tree preferences for roosting identified seven species, with Cocos nucifera most preferred. Major conservation risks included habitat modification, food scarcity, hunting, and encroachment onto forest areas. Alarmingly, 93 Indian peafowls were documented as deceased due to poisoning incidents from 2016 to 2022. This study provides valuable data on the ecology and conservation needs of the Indian peafowl, emphasizing the importance of addressing these threats for their long-term survival in the Tirupur district.

**Keywords:** Population dynamics, Roosting ecology, Conservation strategies, Habitat alteration, Wildlife-human conflict, Population monitoring.

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## INTRODUCTION

Indian peafowl (*Pavo cristatus*), commonly called the Blue Peafowl, occupies a significant position in India. In addition to being designated the country's national bird in 1963 (Ali *et al.*, 1987), it is also a prominent character in aesthetics and cultural mythology. The Indian peafowl is a member of the Phasianidae family in the Galliformes order, as classified by Delacour in 1977. This family encompasses many species, including pheasants, partridges, and quails. The family consists of 155 species found in the Old World. They are native to the Indian subcontinent and abundantly distributed inside protected

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reserves and rural landscapes, and found in certain regions in Nepal, Sri Lanka, and parts of Pakistan (Ali *et al*., 1987). These species are essential markers of the health of forests and ecosystems (Johnsgard, 1986). They are renowned for their ecological significance and cultural importance throughout the Indian subcontinent, increasingly leading to conflicts with human populations. The Indian peafowl's diverse diet, consisting of seeds, fruits, insects, small animals, and reptiles (Grimmett *et al*., 2016), highlights its capacity to adapt to many food sources and environments, ranging from deciduous forests to cultivated fields. Despite their abundance, Indian peafowl populations have declined in specific areas, necessitating an assessment of their conservation status and management approaches (Roberts, 1991). However, the major threats they face include habitat degradation, anthropogenic disturbances, illicit trafficking, and the adverse impacts of intensive agricultural practices. *Human activities degrade the peafowl's natural habitat, leading to conflicts from crop damage.* As a result, these issues have pushed the limits of their survival, ultimately resulting in the extinction of species in specific areas, such as Pakistan (Ramesh & McGowan, 2009; Jain & Rana, 2013). Therefore, the aforementioned human activities elucidate the increasing concerns related to conflicts between humans and peafowls. (Grewal *et al*., 2002; Rasmussen, & Anderton, 2005). Thus, comprehensive management strategies are required to ensure its survival to address potential threats.

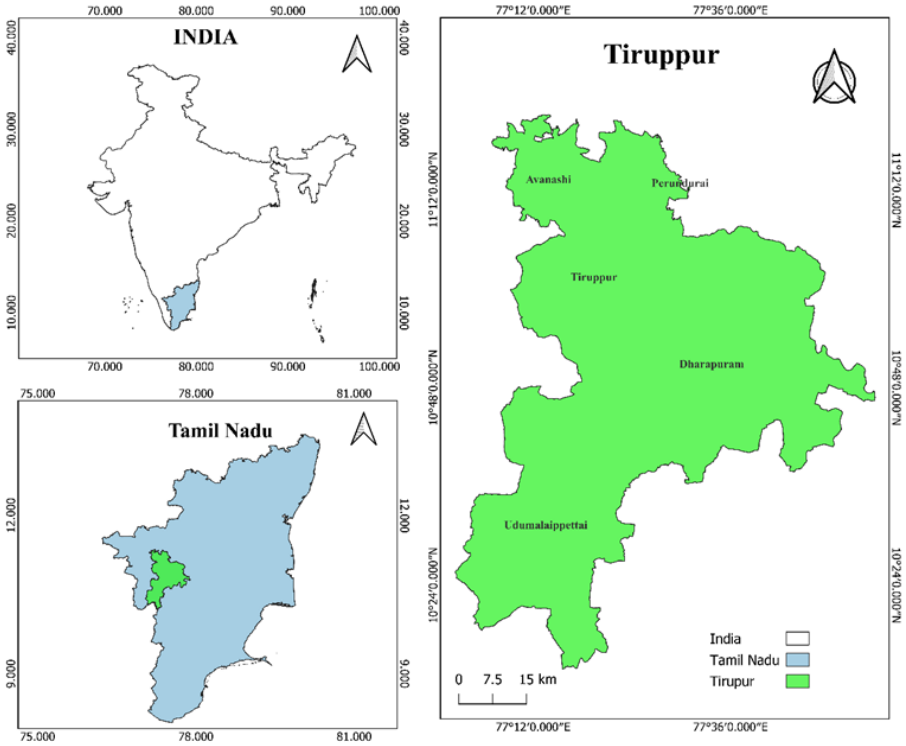


**FIGURE 1.** Study area map of Tirupur District, Tamil Nadu.

Tirupur district in Tamil Nadu has a pleasant climate with noticeable seasonal changes. The winter season spans from September to January and delivers lower temperatures and agreeable weather conditions. In contrast, the monsoon months of June, July, and August bring about a time of increased precipitation and reduced temperatures, providing respite from the hot summer weather. The temperatures from March to June fluctuate between 20°C and 38°C, making it the warmest time of the year. Tirupur receives moderate rainfall during this period, adding to the region's yearly precipitation. The city predominantly experiences precipitation from the Southwest monsoon, crucial for maintaining the local environment and supporting agricultural endeavours. Tirupur has an average annual rainfall of 700 mm, essential for replenishing water supplies and ensuring the sustainability of irrigation and ecological

balance (Thenmozhi & Kottiswaran, 2016). Tirupur's climate changes significantly impact agricultural methods, wildlife behaviour, and human activities (Loganathan & Elangovan, 2017). River Noyyal, originating from the Velliangiri Hills and flowing through the city centre in the Easterly direction and the Western Ghats on the near west, are the major geographical features of this region (Udayakumar *et al*., 2011). Tirupur has 231.28 sq. km of moderately dense forest and 46.65 sq. km of very dense forest (FSI, 2021[1]).

The present study therefore aims to assess the population status of Indian peafowl in Tirupur District, quantify the extent of crop damage attributed to peafowls, investigate the perceptions and attitudes of local communities regarding peafowl presence, and evaluate key threats and conservation risks to this species in the region.

## MATERIAL AND METHODS

### Study Area and Survey Design

The population assessment of Indian peafowl in Tirupur District (Figure 1) was carried out via the road transects method (Buckland *et al*, 2001). Strategically positioned road transects were placed throughout the Tirupur district, covering various habitat types. A four-wheeler was utilized for surveys during the early morning (06:00 to 10:00) and late evening (15:00 to 19:00). A total of 420 km of transects were built, each being examined once. During the surveys, researchers documented the presence of Indian peafowl. They collected data on the number of individuals classified by age and sex (Adult Male [AM], Adult Female [AF], Sub Adult Male [SAM], Sub Adult Female [SAF], and Juveniles [JV]), group size, vegetation type, and topographical characteristics. The sex of the individuals was determined using the method described by Samson and Ramakrishnan (2018).

### Roosting Tree Preferences

Indian peafowl's roosting tree preferences were identified via opportunistic searches and observations. The identification of roosting trees was conducted through visual estimation throughout the early morning and late evening hours, with additional support from secondary markers, such as droppings and feathers beneath the trees. The presence of Indian peafowl on the roosting tree was verified using high-powered binoculars (10X52 Nikon). The study recorded many attributes of roosting trees, such as the number of trees (n), the height of the trees (m), the height of the roost (m), the girth of the trees at breast height (GBH) in centimetres, the characteristics of the habitat, and the date and time of the observation. Furthermore, it was deduced that the accumulation of droppings indicated the extended use of roosting trees. The tree species were identified using known literature as a reference (Matthew, 1982).

### Newspaper Reports

Incidents of peafowl poisoning were compiled from regional newspaper archives dating from 2016 to 2022. No specific inclusion/exclusion criteria were established for report selection. To improve reliability, this information was supplemented with records and informal communications from the local forest department, offering additional verification for recorded mortality events.

### Community Perceptions and Questionnaire Surveys

A questionnaire-based technique was used to evaluate the opinions of local communities, including residents and agricultural workers, regarding protecting Indian peafowl. Two sets of questionnaires, specifically labelled "Precise and Closed" and "Broad and Open-ended", were created for this objective. The focused communities, primarily composed of individuals with high literacy levels, actively used the local language to ensure clear and efficient communication. Before conducting the survey, the researchers described the study's goal to the participants: to reduce any confusion or uncertainty. Face-to-face interviews were conducted to enhance comprehension of the questions and reduce potential misinterpretations. Data was gathered using open-ended inquiries, enabling participants to articulate their perspectives and concerns about the conservation of Indian peafowl. The research methods employed

[1] https://fsi.nic.in/forest-report-2021-details (Date accessed: 22-01-2025)

were the recommendations put forward by Balakrishnan and Ndhlova, (1992) and Samson and Ramakrishnan, (2020).

**Statistical analysis**

The study used PAST 3.1, a widely used statistical software, to analyse the distribution, abundance, and habitat preferences of Indian peafowl in a specific area. The mean and standard error were computed to determine the average and variability of peafowl sightings. At the same time, the encounter rate was calculated by dividing the total number of individuals observed by the length of the study area transects by km. Correlation and regression analyses were employed to investigate the connections between variables associated with roosting trees and the presence of Indian peafowl.

## RESULTS

The population and demographic status of Indian peafowl in Tirupur district were assessed, revealing 807 individuals observed in 546 sightings across 420 km (1.47±0.87), with an encounter rate of 1.92 individuals/km. The majority of the peafowl (Table 1) were observed in individuals, indicating solitary behavior. The sex ratio of Males was 0.64 and females was 1.54. The number of sightings varied among categories, with the lowest recorded figures being 4 for AM, 26 for AF, 6 for SAM, 21 for SAF, and 6 for JV. The mean sightings and Standard Errors (SE) were used to determine the average value and analyse the variability. The average number of sightings per category was 1.47±0.87, with an overall average of 1.47±0.87 individuals per sighting. The Encounter Rate per Km (ER/Km) was calculated to measure the density of Indian peafowl populations in the research area, with values of 0.40 for AM, 0.68 for AF, 0.30 for SAM, 0.40 for SAF, and 0.13 for JV, resulting in a total ER/Km of 1.92.

Table 2 presented the preferred roosting trees and significant characteristics of the Indian peafowl in Tirupur District. The data includes the count of observed individuals, diameter at breast height (DBH), tree height, and roost height. *Cocos nucifera* was the most frequent roosting place, followed by *Borassus flabellifer* and *Prosopis juliflora*. The average DBH was 323.82 cm, tree height was 17.14 m, and roost height was 10.33 m.

Statistical analysis showed a weak, negative correlation between the diameter at breast height (DBH) of roosting trees and the height at which Indian peafowls roosted ($r=-0.277$, $r^2=0.08$, $p=0.054$; Figure 2). However, this relationship was only marginally non-significant at the conventional threshold ($p<0.05p<0.05$) and explained little of the observed variation. In contrast, a positive correlation was found between the height of the roosting trees and the height of the peafowl roost ($r = 0.708$, $p < 0.074$; $r^2 = 0.5025$), as depicted in (Figure 3). These findings indicate that Indian peafowl prefer taller roosting trees with higher perches. Additionally, the diameter of the trees decreases as the height increases, suggesting specific habitat preferences and utilisation patterns of the species.

A total of 360 participants were questioned for the study. Of these, 195 included individuals of both genders, with females (n=108) outnumbering males (n=87). The average age for males was 45.44±1.65, while for females, it was 47.11±2.34. In terms of educational attainment, the survey revealed that the most significant proportion of participants were unable to read or write (40%; n=145), followed by those who had completed primary education (1-5 STD) (26%; n=92), secondary education (5th STD to 10th STD) (23%; n=84), and a smaller percentage who had attained higher education (12th STD to Degree) (11%; n=40).

The crops that observed the most substantial harm were onions (*Allium cepa*), with a damage rate of 14%. Chillies (*Capsicum annuum*) followed with a damage rate of 11%, while groundnuts (*Arachis hypogaea*) and cluster beans (*Lablab purpureus*) both had a damage rate of 9%.

The region's agricultural landscape faces crop loss year-round, where 180 farmers cultivate between four to 18 crop types, primarily due to wild boar (*Sus scrofa*) and Indian peafowl (Table 3). Survey data reveals that a significant majority of farmers, ranging from 80% to 90%, recognize the influence of Indian peafowl on crops. This impact is most significant during the post-growth period, followed by the pre-growth stage, while the growth stage is least susceptible to their effects. The extent of damage caused by

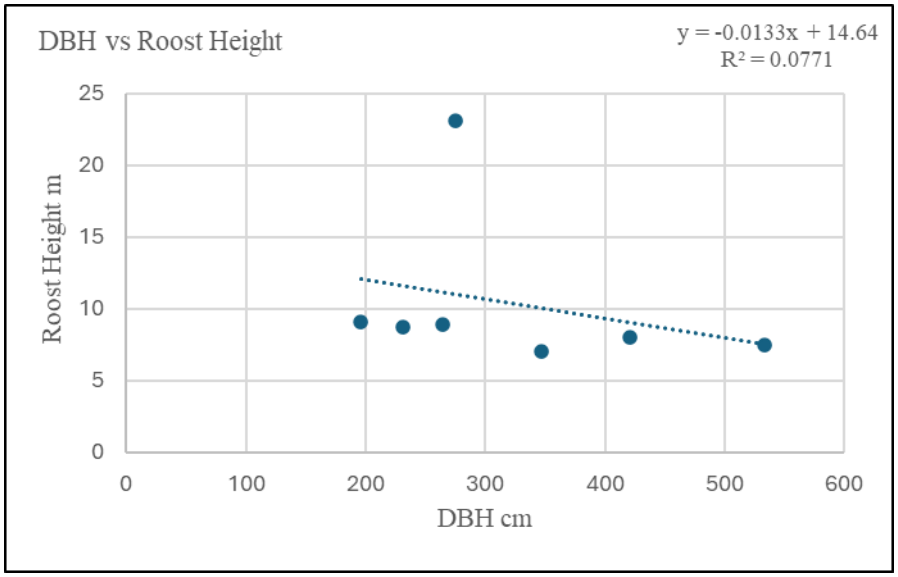


**FIGURE 2.** Relationship between tree diameter (DBH, cm) and roost height (m) for Indian peafowl in Tirupur District.

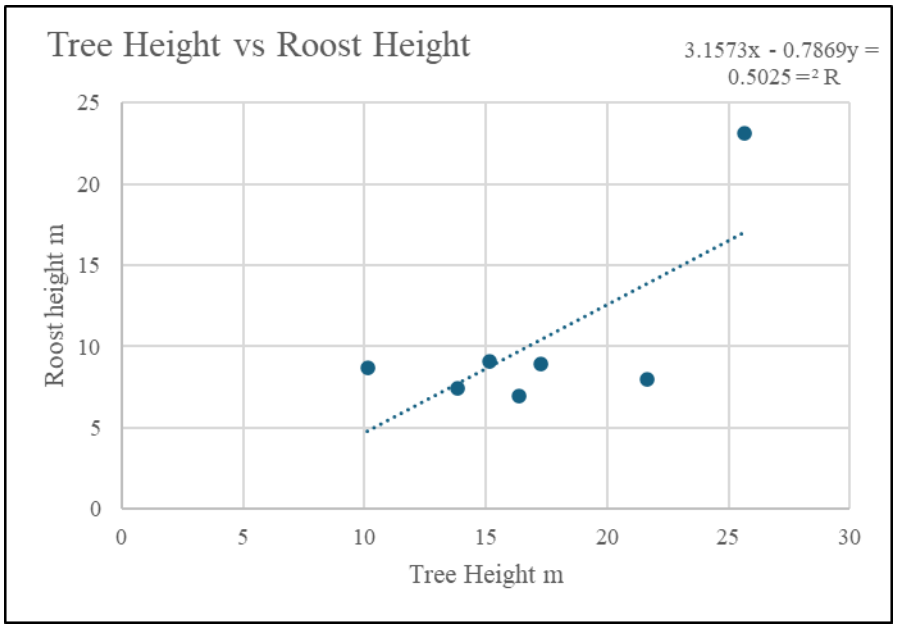


**FIGURE 3.** Relationship between tree height (m) and roost height (m) for Indian peafowl in Tirupur District.

peafowl intake varies greatly, affecting essential crops such as onion, chilli, peanuts, beans, ragi, maize, and tomato.

Although crop damage causes distress, many farmers (n=40) consider the hazards associated with agriculture in forested environments acceptable. Farmers universally endorse Indian peafowl conservation activities, emphasizing the importance of addressing populations in decline caused by habitat modification, scarcity of food, and expansion into forested regions. Local perceptions indicate that Indian peafowl do not harm settlements, highlighting the intricate relationship between human-wildlife interactions and conservation efforts in the Tirupur area.

**TABLE 1.** Population and demographical status of Indian Peafowl in Tirupur district.

| | Variables | AM | AF | SAM | SAF | JV | Total |
|---|---|---|---|---|---|---|---|
| 1 | **Sightings** | 147 | 172 | 97 | 106 | 24 | 546 |
| 2 | **Individuals** | 169 | 288 | 126 | 168 | 56 | 807 |
| 3 | **Maximum** | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | **Minimum** | 4 | 26 | 6 | 21 | 6 | 46 |
| 5 | **Mean SE** | 1.14±0.15 | 1.67±0.34 | 1.29±0.27 | 1.58±0.17 | 2.33±0.68 | 1.47±0.87 |
| 6 | **ER/Km** | 0.40 | 0.68 | 0.3 | 0.4 | 0.13 | 1.92 |

**TABLE 2.** Roosting tree preference and its characteristics of Indian Peafowl in Tirupur district.

| | Tree Species | No | DBH | Height | Roost Height |
|---|---|---|---|---|---|
| 1 | *Cocos nucifera* | 56 | 275.45 | 25.65 | 23.12 |
| 2 | *Borassus fabellifer* | 47 | 195.76 | 15.14 | 9.12 |
| 3 | *Prosopis juliflora* | 39 | 231.10 | 10.12 | 8.7 |
| 4 | *Azadiracta indica* | 35 | 264.3 | 17.25 | 8.9 |
| 5 | *Tamarindus indica* | 32 | 346.36 | 16.34 | 7.0 |
| 6 | *Ficus benghalensis* | 4 | 533.57 | 13.82 | 7.47 |
| 7 | *Ficus religiosa* | 3 | 420.23 | 21.66 | 8.0 |
| | **Total/ Mean** | **216** | **323.82** | **17.14** | **10.33** |

The evaluation of the risk posed by Indian peafowl in Tirupur district, as determined from public newspaper reports, indicates a concerning sequence of poisoning deaths. Between 2016 and 2022, 93 Indian peafowl individuals died due to poisoning, as shown in Table 4. These incidents emphasize the danger that poisoning poses to the Indian peafowl population in the Tirupur district.

## DISCUSSION

The current study carried out in the Tirupur district in Tamil Nadu revealed a significant presence of robust peafowl populations in their natural habitat, as determined by population assessment. There were 807 individuals observed in a surveyed area of 420 km, with a total of 546 sightings. This provides us with an encounter rate of 1.92 individuals per km. Furthermore, the adult peafowls had a sex ratio that was rather equitable, with one AM observed for every fourFM. This suggests a consistent and stable reproductive pattern within the community. Similar patterns were found in investigations undertaken by Deepan *et al*., (2021) in the Karur district and Veeramani *et al*., (2019) in the rural parts of Annur and Avinashi in the district. A total of 1356 peafowls were observed in the Karur district, leading to an encounter rate of 2.26 individuals per km. The AM-to-FM sex ratio was about equal, suggesting a well-balanced demographic makeup. In addition, the research conducted by Veeramani *et al.* (2019) focused on the observation patterns and frequency of encounters in the rural regions of Annur and Avinashi Kongu districts. The study also emphasised the high occurrence of AM among the population. In contrast, research carried out by Samson and Ramakrishnan (2018), Veeramani (1990), Sharma (1979), Johnsingh and Murali, 1981, and Rajadurai (1988) in various areas of Tamil Nadu and India revealed differences in population dynamics and gender ratios. The observed differences might be attributed to a range of reasons, including the suitability of the habitat, anthropogenic pressure , and the individual ecological conditions in each research region.

The correlation between the abundance of peafowls and water presence supports studies highlighting water sources' role in population density, especially during reproduction periods in arid seasons (Brickle, 2002). Riparian environments, which are located near water bodies, are ideal habitats for bird populations

because they have plentiful food sources, such as a variety of insects and plants that produce fruit. In riparian ecosystems, the existence of large trees is crucial as they offer necessary shade, which helps Indian peafowls to roost and also acts as a strategy to avoid predators (Gadgil & Ali, 1975; Gadgil, 1972). Agricultural fields also substantially impact the successful survival of Indian peafowl populations (Jain &Rana, 2013). The presence of diverse food sources, such as insects and cultivated crops, as well as water sources and sufficient shade in these locations, contributes to the high population of peafowls observed in fields like those in the Tirupur district. In contrast, the Tirupur district has the fewest peafowls in areas where humans live. This is in line with research that suggests that Indian peafowls are less likely to thrive in areas with human presence since they are naturally cautious around humans (Brickle, 2002).

**TABLE 3.** Damage caused by Indian peafowl in agricultural fields in Tirupur district.

| | Scientific Name | Common Name | Local Name | Damage % |
|---|---|---|---|---|
| 1 | *Allium cepa* | Onion | Vengayam | 14% |
| 2 | *Capsicum annuum* | Chilli | Milagai | 11% |
| 3 | *Arachis hypogaea* | Groundnut | Verkadalai | 9% |
| 4 | *Lablab purpureus* | Cluster beans | Avarai | 9% |
| 5 | *Eleusine coracana* | Ragi | Kelvaragu | 8% |
| 6 | *Zea mays* | Maize | Makka Kollam | 8% |
| 7 | *Solanum lycopersicum* | Tomato | Thakkali | 7% |
| 8 | *Abelmoschus esculentus* | Ladies finger | Vendai kai | 6% |
| 9 | *Solanum melongena* | Brinjal | Kattari | 6% |
| 10 | *Manihot esculenta* | Tapioca | Maravalli | 5% |
| 11 | *Curcuma longa* | Turmeric | Manjal | 4% |
| 12 | *Beta vulgaris* | Beet Root | Beet Root | 3% |
| 13 | *Brassica oleracea* | Colliflower | Pookosu | 3% |
| 14 | *Cocos nucifera* | Coconut | Thengai | 2% |
| 15 | *Jasminum sambac* | Jasmine | Malli | 2% |
| 16 | *Musa paradisiaca* | Banana | Vazhai | 1% |
| 17 | *Saccharum officinarum* | Sugar cane | Karumbu | 1% |
| 18 | *Phyllanthus emblica* | Gooseberry | Nelli kai | 1% |

The conservation needs of Indian peafowls are greatly affected by their roosting behaviour. Research indicates that peafowls primarily roost at dawn and dusk on robust branches, exhibiting distinct preferences for particular tree species that differ depending on the geographical area. Parasharya and Mukherjee (1999) observed that the main tree species that roost in the Tirupur district are *Cocos nucifera* and *Borassus fabellifer*. Deepan *et al*., (2021) determined that *Tamarindus indica, Tectona grandis, Thespesia populnea,* and *Syzygium cumini* are the most prevalent species in Karur. In contrast, Veeramani *et al*. (2019) observed that *Cocos nucifera*, *Borassus fabellifer*, and *Azadirachta indica* are the preferred species in the Annur and Avinashi areas. Samson and Ramakrishnan (2018) conducted a study in the Sigur Plateau where they observed various species, including *Tectona grandis, Erythroxylum monogynum,* and *Cassine glauca*, which were particularly noticeable. Veeramani (1990) emphasised the presence of *Acacia sundra* in Mudumalai, while Rajadurai (1988) recorded *Tamarindus indica* as the prevailing species in semi-wild areas. Trivedi and Johnsingh (1995) observed that the peafowl chose *Pongamia pinnata and Holoptelia integrifolia* in Gujarat's Gir forest for roosting. Gaining knowledge of the specific roosting preferences of animals is crucial for conservation efforts as it helps to guide the development of methods to preserve their habitats.

**TABLE 4.** Indian peafowl Threats assessment in Tirupur district.

| | Date | Reason for death | No of Peafowl dead | News Paper Source |
|---|---|---|---|---|
| 1 | 26/10/2016 | Poisoning | 14 | https://timesofindia.indiatimes.com/city/coimbatore/another-farmer-poisons-14-peafowls-to-death-arrested/articleshow/55059439.cms |
| 2 | 12/11/2016 | Poisoning | 16 | https://www.newindianexpress.com/states/tamil-nadu/2016/nov/12/farmer-arrested-for-poisoning-peacocks-to-death-1537826.html |
| 3 | 18/07/2021 | Poisoning | 54 | https://www.thehindu.com/news/national/tamil-nadu/54-peafowl-poisoned-near-tiruppur-in-nine-days/article35391007.ece |
| 4 | 15/03/2022 | Poisoning | 9 | https://www.instanews.city/tamil-nadu/tiruppur/avanashi/peacocks-dead-near-avinasi-1118238 |
| | **Total** | | **93** | |

During this study, it was observed that the Indian peafowl primarily foraged at a height ranging from 7 to 23 m, with an average height of 10 m. Trivedi and Johnsing (1995) observed that the optimal rooting height for Indian peafowl in the Gir forest is 15 m above ground level. The study revealed that Indian peafowls exhibit activity patterns at specific times of the day: 0640 and 1000 hours, as well as 1600 and 1830 hours. There is a significant amount of research that corroborates our current observation. Hillgarth (1984) observed that Indian peafowls exhibited their highest levels of activity throughout the time intervals of 0900 to 1100 hours and 1700 to 1800 hours. Navaneethakannan (1984) discovered that peafowls had the highest level of activity during the early morning and afternoon. Rathinasabapathi (1987) noted that peafowls exhibit peak activity between 0600 and 1100 hours and 1600 and 1800 hours. They repose between 1100 and 1500 hours in the shade of *Prosopis juliflora* scrub. The present study supports the study conducted by Rathinasabapathi (1987) where he recorded Indian peafowls roosting in *Prosopis juliflora* in the Tirupur district.

The Indian peafowl, renowned for its omnivorous feeding habits, ingests a diverse range of food sources such as seeds, insects, fruits, small animals, and reptiles (Johnsingh, 1976). Observations indicate that there is a tendency to favour plants, whereas snakes and animal-based products make up a lower proportion of their diet (Navaneethakannan, 1981). Peafowls have been seen to consume a wide variety of crops in agricultural fields. The survey identified 18 cultivated crop species that were included in the diet, with Onion, Chilli, Groundnut, Beans, Ragi, Maze, and Tomato being the most prevalent (Samson & Ramakrishnan, 2018). Veeramani (1990) observed similar behaviour in the Mudumalai Wildlife Sanctuary, while Johnsingh and Murali (1981) reported the same in other areas. Peafowls were reported to feed on various crops, including paddy, bajra, tomato, chilly, and bananas. Indian peafowls are considered agricultural pests due to their feeding habits, which cause substantial crop damage despite their natural diet. McGowan and Garson (1995) emphasised the danger presented by the utilisation of pesticides and insecticides, specifically to young peafowl. In addition, peafowls are confronted with risks posed by human activity, including shooting for their plumage, and flesh, and the extraction of 'peacock oil'. The encroachment of human settlements and the increase of agriculture intensify clashes between peafowls and farmers. Human-wildlife conflicts and habitat degradation have grown in the Tirupur district as a result of the conversion of fallow lands into agricultural fields. Preserving the connection between habitats and ensuring uninterrupted access to water sources are crucial strategies for the conservation of Indian peafowl populations (Johnsingh, 1976; McGowan & Garson, 1995).

## CONCLUSION

In conclusion, this study in Tirupur district, Tamil Nadu, reveals significant insights into the population status and conservation challenges of the Indian peafowl (*Pavo cristatus*). The results of our study, which included a total of 807 individuals, indicate that the population structure is imbalanced, with a higher proportion ofAM. Additionally, we observed a distinct predilection for roosting in *Cocos nucifera*. The

study notably emphasises significant crop destruction caused by peafowls and severe occurrences of poisoning, resulting in 93 deaths documented over a span of six years (Table 4). The presence of these problems highlights the immediate requirement for comprehensive conservation plans that tackle both the safeguarding of wildlife and the involvement of local communities in order to reduce conflicts between humans and wildlife. This research offers crucial data for conservation plans that seek to guarantee the survival of the Indian peafowl in landscapes that have been altered by human activity.

Therefore, it is recommended to a) conduct more longitudinal surveys along the same transects in order to precisely track the population trend of Indian peafowls in the Tirupur district of Tamil Nadu; b) Implementing compensation schemes for crop damage caused by Indian peafowls could be a useful technique to reduce conflicts and prevent more deaths resulting from poisoning occurrences; c) Specific awareness programs designed for agricultural communities are essential to promote comprehension and collaboration. This will ultimately decrease the number of deaths caused by poisoning and ensure the preservation of this iconic species.

**Limitations**

The documentation of peafowl poisoning incidents was based on newspaper reports supplemented with forest department records; while this approach provided valuable information into a difficult-to-monitor threat, some cases may remain unreported. The survey period (December 2023–March 2024) provides a focused snapshot of peafowl populations and crop damage, though it may not represent seasonal differences. Road transects were used for population assessments, a method widely employed for large, ground-dwelling birds in agricultural landscapes; while effective, this may slightly favor detections closer to human-modified areas.

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