



# Nest Site Preference of *Lonchura striata acuticauda*, in Semi Urban Areas of Kollam District, Kerala, India: A Case Study

Letha P. Cheriyan <sup>a++\*</sup>, Ammu Devan <sup>a#</sup> and Gigi K Joseph <sup>b†</sup>

<sup>a</sup> Department of Zoology, Mar Thoma College, Tiruvalla- 689103, India.

<sup>b</sup> Department of Zoology, Nirmala College, Muvattupuzha- 686661, India.

## Authors' contributions

This work was carried out in collaboration among all authors. Author LPC designed the study, wrote the protocol, managed the analyses of the study, and wrote the first draft of the manuscript. Author AD did the collected data and managed the literature searches. Author GKJ performed the statistical analysis and managed the literature searches. All authors read and approved the final manuscript.

## Article Information

DOI: <https://doi.org/10.56557/upjoz/2024/v45i124129>

## Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://prh.mbimph.com/review-history/3544>

Original Research Article

Received: 22/03/2024

Accepted: 26/05/2024

Published: 02/06/2024

## ABSTRACT

Disturbances caused by man-made structures significantly influence the nest site selection of birds. However, the remarkable adaptability of *Lonchura striata acuticauda* to such disturbances is a fascinating aspect of its behaviour. This adaptability leads to the unique nest distribution of a bird's community, often favouring human-associated bird species. The present investigation into the nesting preference of *Lonchura striata acuticauda* for garden plants was conducted in a semi-urban

<sup>++</sup> Associate Professor & Research Guide, Postgraduate and Research;

<sup>#</sup> Postgraduate and Research;

<sup>†</sup> Assistant Professor & Research Guide, Postgraduate and Research;

\*Corresponding author: Email: lethapc@gmail.com;

village, Tazhava of Kollam district in Kerala, between August 2021 and September 2022. Nesting affinity of white-rumped munia to different garden plants, the number of nesting attempts and renovation on different plant species, and nesting parameters, such as the number of completed and incompleted nests, clutch size, egg predated, and chick fledged on each plant species were recorded during their breeding period. A total of 45 nests of *Lonchura striata acuticauda* were observed on different garden plant species in 25 homes with well-maintained gardens; thirty-seven were completed, while eight nests were abandoned in the helmet stage. *Lonchura striata acuticauda* showed varying nest site preferences; with the highest nest site preference of 36 % on *Callisia repens*, followed by *Epipremnum aureum* (27%), *Cleodendrum thomsoniae* (18%), *Bambusa multiplex* (7%) and an equal preference of 4% for *Plumeria pudica*, *Ixora taiwanensis* and *Melia azadirachta*. Most of the nests recorded an average clutch size of 3-5 eggs. Eighty-eight percent of the nests constructed on *Callisia repens* were completed, with 87% of eggs hatched and chick-fledged, with a predation rate of 13%. Nesting munias are protected from the dense foliage and vines of the garden plants where the birds build a nest which also minimises the energy wastage in finding materials for nest building. Repeated nesting attempts and nest renovation on the same plant were observed mainly in hanging ornamental plants.

**Keywords:** Nest site; garden plants; urbanisation; *Lonchura striata acuticauda*; *Callisia repens*; *Epipremnum aureum*; *Cleodendrum thomsoniae*.

## 1. INTRODUCTION

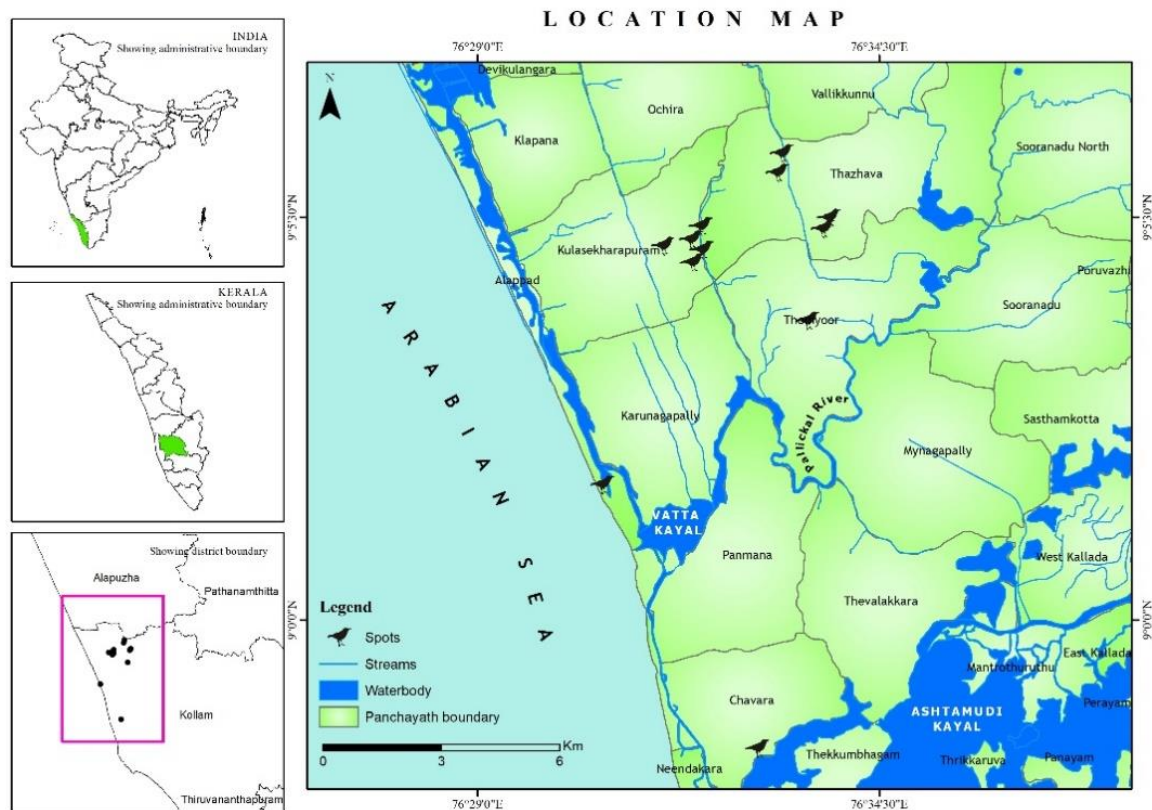
One of the most significant and pervasive global changes to landscapes is urbanisation, defined as transforming natural ecosystems into ecosystems dominated by humans. Urbanisation regularly modifies birds' reliance on various resources, including the type and availability of nesting places [1,2]. The main risks associated with urbanisation are habitat loss and fragmentation, which either cause birds to migrate to more suitable areas or adapt to new circumstances [3,4]. Even though it is commonly believed that urbanisation harms the range and abundance of many native species, more and more bird species are migrating across urban regions worldwide [5,6]. *Lonchura striata acuticauda*, the white-rumped munia, is a reasonably common resident bird found up to 1500 meters above sea level. Belonging to the Estrildidae family, the white-rumped munia [7] *Lonchura striata acuticauda* is a passerine bird with a social character. Its length is roughly 10–12 cm, and its features include a creamy white body, a dark brown throat, pale shaft lines at the mantle on the wings, grey, stubby bills, a light brown vent, and extremely small legs. As to the IUCN Red List, it is under the category of least concern. Like sparrows, *Lonchura striata acuticauda* maintains a unique symbiotic relationship with humans. These urban bird species receive food and shelter from this interaction, emphasised by its educational, recreational, economic, and aesthetic benefits. It also deepens our understanding of urban ecology [8,9]. Besides the species description

and some behavioural details provided by Ali & Ripley [10], scant information about this species' ecology is available.

Selecting a nest site is a critical decision in a bird's life, influenced by various factors such as social dynamics and the physiognomic features of the surroundings [11,12]. Munia species prefer contemporary homes with garden plants, particularly those suspended from hooking devices in the porches in semi-urban villages for nesting. This study aims to explore the species' inclination to nest closer to human habitations and the effectiveness of their adaptation to different garden plants in semi-urban areas of the Kollam district, Kerala.

## 2. MATERIALS AND METHODS

The study was conducted in Thazhava village, Karunagappally Taluk of Kollam district (Fig.1) (9°3'16"N,76°32'7"E; 180.42 sq. km) between August 2021 and September 2022, following the methodology [13,14]. This location, with its contemporary housing structures, canals, schools, hospitals, and theatres, provided an ideal semi-urban environment for this investigation into the nesting preference of *Lonchura striata acuticauda* to garden plants. The vegetation structure includes both endemic and exotic plants, and modern houses boast a variety of garden plants, especially hanging plants, creepers, and shrubs. Hanging plants are *Epipremnum aureum* and *Cleodendrum thomsoniae*, the shrub *Ixora taiwanensis*, and small trees *Melia azadirachta*,



**Fig. 1. Map of the study area**

*Plumeria pudica* and *Bambusa multiplex*. Creeper plant *Callisia repens* and hanging plant *Epipremnum aureum* were planted in pots hanging on hooking devices in the porches. The climatic conditions, with a maximum temperature of 33 °C in March and a minimum of 22 °C in January and an average rainfall of 2250–2500 mm during the Southwest monsoon and 450–500 mm during the Northeast monsoon, further contribute to the area's unique ecological setting [15].

The identification of birds was made with the help of the field guide developed by Ali & Ripley, 1983 [10]. To find out active nests of white-rumped munia (carrying nest materials to the nest for nest construction and leaving the nest site in search of food or begging calls of nestlings) throughout the breeding period, repeated visits were carried out in 25 households that maintained gardens [16,17,18]. From 7:30 until 11:30 in the morning, nesting bird activity was monitored. Abandoned nests and perching bird activity are searched from 3:30 until 5:30 in the evening. The nest's latitude and longitude were determined using smartphone GPS software. Used a digital camera (Canon 80D) to

capture pictures. Nest height from the ground and the distance to settlements were measured using tape. KREVIA 20×50 Binoculars were used to determine the frequency of this bird's nesting and its favourite vegetation. Different plants in the urban homes preferred by *Lonchura striata acuticauda*, along with the physiognomic characteristics of the plant, were studied. The nesting affinity of *Lonchura striata acuticauda* and the number of nesting attempts and renovations on different plant species were noted. Nesting parameters were also noticed, such as number of completed and incompleting nests, clutch size, egg predated, and chick fledged on each plant species. An analysis of the data was done with Microsoft Excel. Descriptive statistics were used to show the outcome.

### 3. RESULTS AND DISCUSSION

*Lonchura striata acuticauda* showed varying nesting site preferences for different plant species (Fig.2). Out of the 25 homes with well-maintained home gardens in the study region, munia birds preferred the hanging plants (Fig.3), *Epipremnum aureum* (Fig. 6) and *Cleodendrum thomsoniae* (Fig.11), the

creeper plants, *Callisia repens* (Fig. 4a & 4b), the shrub, *Ixora taiwanensis* (Fig.7), and the small trees *Melia azadirachta* (Fig. 9), *Plumeria pudica* (Fig. 8), and *Bambusa multiplex* (Fig. 10), for nest construction. In semi-urban environments, white-rumped munia prefer dome-shaped (Fig.14) nests with single entrance holes and nest material such as grass inflorescence, dry leaves, and roots. As the bird gets protection from the dense foliage and vines of these hanging plants, they build a nest and minimise the energy waste in finding materials for nest

building. A total of 45 nests of *Lonchura striata acuticauda* were observed on different plant species in the study area; thirty-seven were completed, while eight nests were abandoned in the helmet stage. *Lonchura striata acuticauda* showed the highest nest site preference of 36 % for the garden plant *Callisia repens*, followed by *Epipremnum aureum* (27%), *Cleodendrum thomsoniae* (18%), *Bambusa multiplex* (7%) and an equal preference of 4% for *Plumeria pudica*, *Ixora taiwanensis* and *Melia azadirachta*.

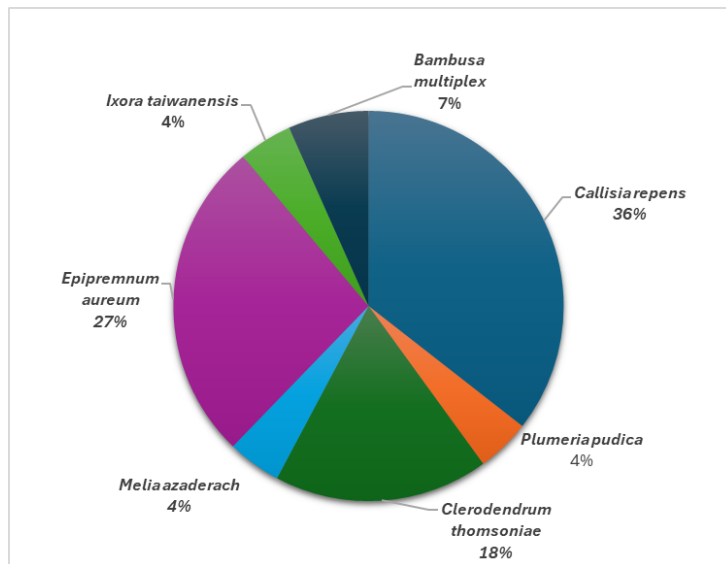


Fig. 2. Nesting site preference of *Lonchura striata acuticauda* to the garden plants in the study area



Fig. 3. Nest site preference of *Lonchura striata acuticauda* to the hanging plants in urban homes



**Fig. 4a.** Nest of *Lonchura striata acuticauda* in *Callisia repens*



**Fig. 4b.** *Lonchura striata acuticauda* in *Callisia repens*



**Fig. 5. Clutch size**



**Fig. 6. Nest of *Lonchura striata acuticauda* in *Epipremnum aureum***



**Fig. 7.** Nest of *Lonchura striata acuticauda* in *Ixora taiwanensis*.



**Fig. 8.** Nest of *Lonchura striata acuticauda* in *Plumeria pudica*



**Fig. 9.** Nest of *Lonchura striata acuticauda* in *Melia azadirachta*



**Fig. 10.** Nest of *Lonchura striata acuticauda* in *Bambusa multiplex*





Fig. 11. Nest of *Lonchura striata acuticauda* in *Cleodendrum thomsoniae*

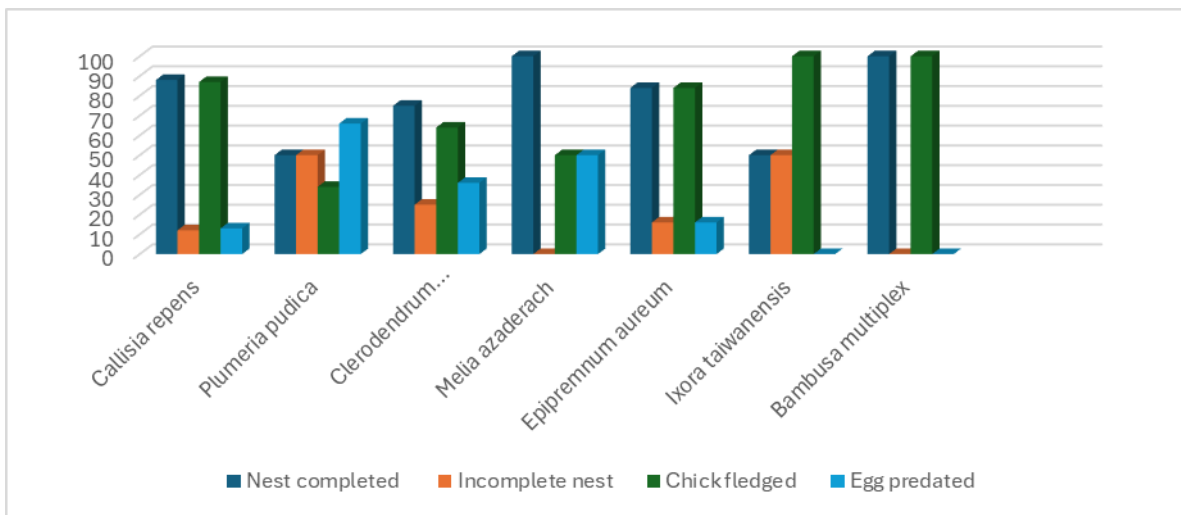


Fig. 12. Nesting parameters of *Lonchura striata acuticauda* in different garden plants

Nesting parameters (Fig. 12) of white-rumped munia on different plants during their breeding were recorded for the one-year study period. Most of the nests from different plant species recorded an average clutch size (Fig. 5) of 3-5 eggs. Due to the rapid growth of its dense foliage, the perennial plant *Callisia repens* forms creeping mats and spreads very quickly [19]. As the ornamental plants are grown in hanging pots, the stem with fleshy, delicate leaves extends

down and forms a thick green carpet-like hanging structure, attracting the munias for nesting. Eighty-eight percent of the nests constructed on *Callisia repens* were completed, and the remaining 12 % were abandoned in the helmet stage. The highest nesting success, with 87% of eggs hatched and chick-fledged, was also recorded in *Callisia repens*, with a predation rate of 13%. *Clerodendrum thomsoniae* is a weak-stemmed, evergreen shrub with a more or less

climbing habit. As a shrub, it is often no more than 1 meter tall, though when adopting a twining habit, it can produce stems up to 7 metres long on supports like a trellis. The evergreen, bushy climbing nature of this ornamental plant with dark green leaves provides a nesting attraction for munias in home gardens [20]. Seventy-five percent of the nests constructed on *Clerodendrum thomsoniae* were completed, and the remaining 25% were abandoned in the helmet stage. 64% of eggs hatched and chick-fledged, with a predation rate of 36%. Yellow-marbled foliage is produced in abundance by the naturally variegated climbing vine *Epipremnum aureum*. When utilized as hanging baskets, it is one of the most often used tropical ornamental plants. The trailing and climbing vines can grow as long as 40 feet, making this ornamental plant a preferable site for nesting munias. Long-lasting, broad evergreen leaves with slender petioles that are shorter than the leaf blade and grooved to grasp the stem add to the benefits of successful nesting [21]. Eighty-four percent of the nests constructed on *Epipremnum aureum* were completed, and the remaining 16% were abandoned in the helmet stage. 84% of eggs hatched and chick-fledged, with a predation rate of 16%. *Bambusa multiplex* is a semi-evergreen, medium-sized woody shrub with arching stems and a rapidly spreading nature suitable for hedges and live fences in urban gardens. Since the stems and foliage form dense growth, it creates nesting sites for urban birds. As the height of the stems is 10 ft. 0 in. - 25 ft. 0 in. *Bambusa multiplex* gives protection from

common domestic predators in accordance with (Fig.13) [22]. Even though only three nests were found in *Bambusa multiplex*, 100% were completed, 100% of the eggs hatched and the chick fledged with no predation. *Ixora taiwanensis*, the Dwarf Ixora plant, has showy flowers that make it a fabulous accent plant and small accent shrub. Even though tiny, lance-shaped leaves grow densely on a small, compact bush, munias show the least preference for nesting in these garden plants [23]. Fifty per cent of the nests constructed on *Ixora taiwanensis* were completed, and the remaining 50% were abandoned in the helmet stage; 100% of the eggs hatched and chick-fledged with no predation. *Melia azedarach* is a small to medium-sized shrub often planted as an ornamental shade tree. Its branches are stout, and the leaves are dark green above, often with sparse hairs along the veins, and lighter green and generally smooth below. *Melia azedarach* has deciduous leaf retention, which does not contribute to the success of nesting. Table 1[24]. Nesting preference is less, and the success rate is low compared to other garden plants in the study area, as the predation rate is high (Fig. 13). Although 100% of the nests observed were completed in *Melia azedarach*; only 50% of eggs hatched and chick-fledged, with a high predation rate of 50%. *Plumeria pudica* is a small, evergreen shrub common in semi-urban home gardens. Its dark-green, unusual spoon-shaped evergreen leaves and branches or forks low on the trunk result in a slightly spreading crown that

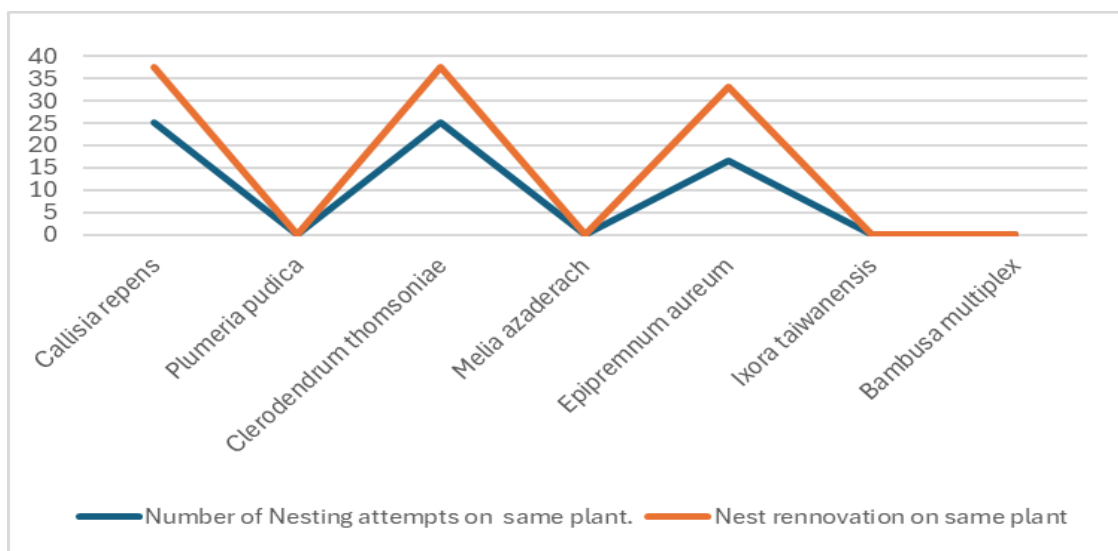


Fig. 13. Nesting affinity of *Lonchura striata acuticauda* to different garden plants



Fig. 14. Dome shaped nest of *Lonchura striata acuticauda*

Table 1. Physiognomic characteristics of the plants preferred by *Lonchura striata acuticauda*

Plant Species	Type of vegetation			Phyllotaxy		Leaf colour	Foliage persistence/retention	
	Climber	Creeper	Shrub/ small tree	Alternate	Opposite	Green	Evergreen	Deciduous
<i>Callisia repens</i>	x	√	x	x	√	√	√	x
<i>Plumeria pudica</i>	x	x	√	x	√	√	√	x
<i>Cleodendrum thomsoniae</i>	√	x	x	x	√	√	√	x
<i>Melia azaderach</i>	x	x	√	√	x	√	x	√
<i>Epipremnum aureum</i>	√	x	x	√	x	√	√	x
<i>Ixora taiwanensis</i>	x	x	√	x	√	x	√	x
<i>Bambusa multiplex</i>	x	x	√	√	x	√	√	x

attracts munias for nesting [25]. Even though the branching points of the plant stem provided a proper substratum for the nest, they failed to provide further protection from predators due to sparse, dense coverage. [13] reported a similar observation in the nesting preference of Baya weaver birds. Predator behaviour can have an impact on the choice of nest sites in urban environments. Birds in urban areas have modified their nesting techniques to reduce the risk of predation and have adopted a number of ways to reduce the number of lost nestlings [26]. During the study, it was observed that *Plumeria pudica* was utilised by the bird to finish construction of the nest only up to the helmet stage and abandoned the nest before egg laying. Fifty percent of the nests constructed on

*Plumeria pudica* were completed. 34% of eggs hatched and chick-fledged, with a higher predation rate of 66 % (Fig. 11). Nesting failure during incubation happened mainly due to predation by *Rufous treepi*, *Centropus sinensis*, and *Felis catus*.

*Lonchura striata acuticauda* showed varying degrees of nesting affinity for different garden plants (Fig. 13), such as the number of times the birds prefer the same plant or the number of times the same nest is renovated and reused. Out of the different garden plants studied, the *Callisia repens* and *Cleodendrum thomsoniae* were most preferred by *Lonchura striata acuticauda* for nesting, followed by *Epipremnum aureum*. Repeated nesting attempts and nest

renovation on the same plant were observed mainly in hanging ornamental plants, including *Callisia repens*, *Epipremnum aureum* and the climber, *Cleodendrum thomsoniae*. *Lonchura striata acuticauda* showed maximum nesting attempts on the same plant and nest renovation on *Callisia repens*.

#### 4. CONCLUSION

Urbanization, along with climate change, is considered a major threat to the persistence of many birds. The passerines have shown a drastic decline in population in urban centres all over the world in recent decades. Urbanization may have caused small-scale habitat alterations, which could have decreased the number of appropriate areas for foraging and breeding, contributing to the drop. A successful conservation strategy largely depends on acquiring an accurate understanding of the habitat requirements of the species. Based on the present study's findings, in urban contexts, a relatively novel habitat for bird conservation, different varieties of hanging garden plants, *Callisia repens*, *Epipremnum aureum*, and *Cleodendrum thomsoniae*, can be provided to protect the passerine finch *Lonchura striata acuticauda*, but not all bird species. Allowing a wider variety of plants could lessen the harm done to avian biodiversity, even if it would not replace natural plant habitations and their biological abundance. Similar to other passerine finches experiencing a population decline due to recent climatic changes and urbanization, *Lonchura striata acuticauda*'s present IUCN status of "Least Concern" could eventually change to "Vulnerable" or "Threatened" if adequate conservation strategies aren't adopted.

#### ACKNOWLEDGEMENT

I am very grateful to Dr. Sugathan, Senior Ornithologist at Thattekkad Bird Sanctuary, and Mumtaz, Ornithologist, for their valuable suggestions. I am also thankful to Dr. Jacob Thomas, Assistant Professor at the Department of Botany at Mar Thoma College, Tiruvalla, for helping me identify plant species in nests. We also express our sincere gratitude to the villagers who let us visit their home gardens to gather data.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

#### REFERENCES

1. Blair RB. Land use and avian species diversity along an urban gradient. *Ecological Applications*. 1996;6(2):506-519.
2. Marzluff JM, Ewing K. Restoration of fragmented landscapes for the conservation of birds: A general framework and specific recommendations for urbanising landscapes. *Urban ecology: An international perspective on the interaction between humans and nature*. 2008;739-755.
3. Luniak M. Synurbization—adaptation of animal wildlife to urban development. In *Proceedings 4th International Urban Wildlife Symposium*. Tucson: University of Arizona. 2004:50-55.
4. Ditchkoff SS, Saalfeld ST, Gibson CJ. Animal behaviour in urban ecosystems: Modifications due to human-induced stress. *Urban ecosystems*. 2006; 9:5-12.
5. Beissinger SR, Osborne DR. Effects of urbanization on avian community organization. *The Condor*. 1982;84(1):75-83.
6. Lim HC, Sodhi NS. Responses of avian guilds to urbanisation in a tropical city. *Landscape and urban planning*. 2004;66(4), 199-215.
7. Joshi KK. Distribution of White Rumped Munia (*Lonchura striata acuticauda* Hodgson, 1836) at Doon Valley (Lower Garhwal Himalaya) of Uttarakhand, India. *International Journal of Ecology and Environmental Sciences*. 2018;44(1):11-15.
8. Choudhary S, Chauhan NPS, Kalsi R. Finding clues in cities. *Current Science*. 2020;118(8), 1304-1309.
9. Ghosh S, Ki HK, Bhattacharya R. A survey on house sparrow population decline at Bandel, West Bengal, India. *J. Korean Earth Sci. Soc.*, 2010;31(5):448–453.
10. Ali S, Ripley SD. Handbook of the birds of India and Pakistan. Compact edition. Oxford University Press and BNHS, Mumbai. Ali, S. and SD Ripley (1995). The Pictorial Guide to the Birds of Indian Sub-continent. Oxford University Press and BNHS, Mumbai. Baskaran, ST (1992). Sighting of Dusky Horned Owl. *Newsletter for Birdwatchers*. 1983;32 (9):10.

11. Burger J. Habitat selection in temperate marsh-nesting birds. *Habitat selection in birds* 1985;253-281.
12. Sohi GK, Kler TK. Adaptations in avian nesting behaviour in relation to indigenous trees and housing structures in Punjab. *J. Entomol. Zool. Stud.* 2017;5(5):1045-1051.
13. Kaur M, Kumar M. Nesting preferences of birds in relation to exotic trees in Ludhiana, Punjab. *Journal of Animal Research.* 2020;10(1):105-109.
14. Gokula V. Nesting ecology of the Spotted Munia *Lonchura punctulata* in Mudumalai Wildlife Sanctuary (Southern India). *Acta ornithologica.* 2001;36(1):1-5.
15. Available:<http://kerenvis.nic.in>>Climate-829.
16. Martin TE, Geupel GR. Nest-Monitoring Plots: Methods for Locating Nests and Monitoring Success (Métodos para localizar nidos y monitorear el éxito de estos). *Journal of field Ornithology*, 1993: 507-519.
17. Reale JA, Blair RB. Nesting success and life-history attributes of bird communities along an urbanization gradient. *Urban Habitats.* 2005;3(1):1-24.
18. Peach WJ, Vincent KE, Fowler JA, Grice PV. Reproductive success of house sparrows along an urban gradient. *Animal conservation.* 2008;11(6):493-503.
19. Available:<https://doi.org/10.1079/cabicompendum.13501>
20. Tropical Plants Database, Ken Fern. [Tropical.theferns.info](http://tropical.theferns.info).2024-04-24.&lt;
21. Meshram A, Srivastava N. Molecular and physiological role of *Epipremnum aureum*. *International Journal of Green Pharmacy (IJGP).* 2014;8(2).
22. Prospero J, Lamxay V, Hallé F, Bompard JM, Blanc P, Ramesh BR, Cardinal S. New records in the flora checklists of Laos, resulting from a survey of phou hin poun national biodiversity conservation area. *Edinburgh Journal of Botany.* 2018;75(1): 91-106.
23. Plants of the World Online. Royal Botanic Gardens, Kew. Retrieved 29 November 2022. "Ixora L." World Flora Online. The World Flora Online Consortium. 2022. Accessed on: 1 June 2022.
24. Yasin M, Noorani H, Anwar F, Siddiqui M, Safdar ME, Andreasen C. Non-composted chinaberry (*Melia azedarach* L.) sawdust mixtures as growth medium for okra (*Abelmoschus esculentus* (L.) Moench). *Agriculture.* 2022;12(3):354.
25. Oliveira LE, Moita LA, Souza BS, Oliveira NM, Sales AC, Barbosa MS, Oliveira JS. Latex proteins from *Plumeria pudica* reduce ligature-induced periodontitis in rats. *Oral Diseases.* 2022;28(3):786-795.
26. Ding Z, Guo A, Lian M, Wang Y, Ying W, Jiang H, Cao J. Landscape factors influencing bird nest site selection in urban green spaces. *Frontiers in Ecology and Evolution.* 2023;11.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:

<https://prh.mbimph.com/review-history/3544>