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UNDERSTANDING URBAN SPARROW ECOLOGY: INSIGHTS INTO POPULATION DYNAMICS, FEEDING PATTERNS, AND NESTING PREFERENCES IN THE OOTY ATC MARKET ENVIRONMENT, WESTERN GHATS, NILGIRIS, TAMIL NADU, INDIA

ABSTRACT

This research delves into the ecology and behavior of the house sparrow (*Passer domesticus*) within the bustling urban environment of the ATC market in Ooty, India. Through a comprehensive study conducted between August 20 and October 3, 2023, various aspects of sparrow dynamics were explored, including population demographics, feeding patterns, nesting preferences, and human interactions. The study area, a 150-year-old market nestled in the Western Ghats, serves as a critical habitat for the sparrows, attracting thousands of visitors daily during peak seasons. Population analysis revealed intriguing trends, with male sparrows exhibiting wider population ranges and variability compared to females. Furthermore, female sparrows displayed consistent feeding patterns throughout the day, with slightly higher counts observed in the evening. Sparrows were observed consuming unconventional food items like beef, chicken, and pork alongside traditional sources such as grains and vegetables, highlighting their adaptability to urban environments and diets. Nesting behavior analysis underscored sparrows' preference for artificial structures, emphasizing the importance of providing suitable nesting habitats amidst urban development. However, a questionnaire survey revealed a concerning decline in sparrow awareness and conservation efforts among market visitors, necessitating urgent educational initiatives. The impending demolition of the ATC market poses a significant threat to the local sparrow population, emphasizing the need for immediate action to mitigate habitat loss and raise awareness for long-term conservation. Overall, this research provides valuable insights into the intricate relationship between sparrows and urban environments,

underscoring the importance of proactive conservation measures to ensure the survival of these resilient bird species.

Keywords: House sparrow, Urban ecology, Population dynamics, Feeding behaviour, Nesting preferences, Conservation awareness.

INTRODUCTION

The house sparrow, scientifically known as *Passer domesticus*, belongs to the Passeridae family within the Passer genus and is classified under the species domesticus (Fig. 1). It is recognized as one of the larger sparrow species, characterized by an average length ranging from 160 to 165 mm and a wingspan typically measuring between 210 and 255 mm (Lowther et al., 1992). The house sparrow holds the distinction of being the most widespread bird species across the globe (Anderson, 2006). The sexes exhibit dimorphism, with males displaying striking patterns while females appear relatively plain, characterized by a grey-brown crown, a pale buff eyebrow stripe, two wing bars, and a lack of markings on the throat and breast (Lowther et al., 1992). Birds are frequently employed as indicators in ecological monitoring due to their sensitivity to minor environmental shifts (Newton, 1995). The house sparrow, Passer domesticus, has coexisted with humans since ancient times, thereby making it an excellent indicator of ecological quality (Kheera et al., 2009). The house sparrow has been classified as a Red List species in the Netherlands and is considered endangered in the United Kingdom (Summer-Smith et al., 2003). In studies conducted in various locations in India, including Bangalore (Rajashekar et al., 2008), Kolkata (Modak et al., 2017), Haridwar (Saini et al., 2015), Tamil Nadu (Balaji et al., 2017), Delhi (Khera et al., 2010; Choudhary et al., 2019, 2020), and the State of India's Bird in Dehradun, Uttarakhand (Joshi et al., 2022), there has been evidence indicating a decline in the sparrow population. The house sparrow is experiencing a decline in numerous regions across the globe: Europe (De Laet Summer-Smith, 2007), Canada (Lepage et al., 2002), Australia (Olsen et al., 2003). According to data from the British Trust for Ornithology (BTO), the breeding population of house sparrows in Britain is currently estimated to be around 6 million pairs, marking a decline of approximately 50-60% since 1970. This two-thirds decline is particularly notable in built-up habitats, with half of them in suburban areas. In the Indian subcontinent, house sparrows are commonly found in India, including introduced populations in the Andaman Islands. They are also present in Pakistan, Bangladesh, Sri Lanka, and the Maldives (Ali et al., 1987). Any population experiencing stress and influenced by adverse environmental factors would suffer negative impacts, potentially leading to local extinctions and contributing to the widespread decline of the house sparrow (Baker et al., 2005). It has been noted that the population of house sparrows was significantly higher in the Ooty market (Jayaraman et al., 2017). The objectives of the study include examining:1. To look upon the abundance, distribution, and habitat preference of the sparrow in the market, 2. To analyze several factors including

urbanization, food availability, and nesting sites, 3. To identify the difference in the behavior and ecology between the study sites, 4. To provide recommendations for the conservation of the house sparrow in Ooty.

Fig. 1. Male (right) and Female (left) sparrow *Passer domesticus*

STUDY AREA

The present study was conducted in the Ooty Municipal Market (11.40685, 76.70296), situated in The Nilgiris, part of the Western Ghats (Fig. 2 and 3). Established during the British colonial era, this historic market spans approximately 6 acres in the heart of Ooty and is around 150 years old. It accommodates about 1,500 permanent and 500 temporary shops, attracting between 3,500 to 4,000 visitors on weekdays and 4,000 to 5,000 on weekends. During the peak summer tourist season, the daily footfall exceeds 5,000 visitors. The Market sits at an altitude of 2,240 meters, benefiting from a cooler climate compared to the surrounding plains, with summer temperatures ranging from 10°C to 25°C and winter temperatures from 0°C to 21°C. The annual rainfall is approximately 1,100 mm, contributing to the unique environmental and commercial dynamics of this high-altitude marketplace.

The study was conducted between August 20 to October 3 2023, with fieldwork carried out twice daily, from 7 AM to 8.30 AM and from 4 PM to 5.30 PM. Employing a population study random sampling method, nesting count, and feeding point count methodology, point count method was adopted to estimate the abundance of House Sparrows. The point count method involves an observer standing in a fixed location for a specified period, in this case for 1 minute and record all the sparrows seen within or without a fixed radius (Bibby et al. 2000). Every path of the market was analyzed and

Fig. 2. The study area Ooty municipal market (Map data ©2024 Google, Imagery ©2024 TerraMetrics)

was separated into 39 paths as given below (Fig. 2). Each Count was done with visible radius by following Dhanya (2011). The research focused on assessing population sizes and sex ratios among individuals. Observations included the sparrows' feeding behavior, both from food scraps on the ground and directly from shop offerings, while the total number of nests was meticulously recorded without causing any disturbance to the habitat. Utilizing binoculars for nest location and a 'Canon 200D Mark 2' camera for capturing images of nests and feeding materials, data collection was thorough. Furthermore, the precise locations of nesting sites within the market area were determined using a Garmin GPS device. Mapping was done with Google Earth. Questionnaire survey consists of 21 questions. These questions were asked in 10 days at ATC market stores.

DATA ANALYSIS

The research conducted a comprehensive analysis of the house sparrow population, focusing on their feeding patterns and habitat preferences. Mean and standard deviation calculations for these parameters were performed using Past software (Hammer, 2001), providing valuable insights into the central tendency and variability of the data. Additionally, a questionnaire survey was administered to shopkeepers in the ATC market to gauge their observations, which were reported as percentages. The analysis incorporated formulas such as the mean (μ) and standard deviation (σ) to quantify the central tendency and spread of the data, enhancing the understanding of the house sparrow dynamics in urban environments.

Fig. 3. Ooty ATC Municipal market- the red lines indicate the transect along which the studies were conducted (Map data ©2024 Google, Imagery ©2024 TerraMetrics)

RESULT

House Sparrow sex composition of population and feeding pattern in the ATC Municipal Market

The data provided offers a comprehensive insight into the population dynamics of male and female sparrows within the ATC market across morning and evening periods (Table 1). In the morning, the male sparrow population ranged from a minimum of 99 to a maximum of 140, with an average of 122.5 individuals, displaying a variation with a standard deviation of approximately 12.92. Similarly, the evening male population ranged from 70 to 154, with an average of 109.64 individuals and a slightly higher variation as indicated by a standard deviation of around 18.24. In contrast, female sparrows exhibited a narrower range of population counts, with morning numbers varying from 29 to 78 and evening counts ranging from 40 to 70. The morning female population had an average of 51.21 individuals and a standard deviation of approximately 10.52, while the evening female population had an average of 54.11 individuals and a slightly lower variation with a standard deviation of around 8.93. These statistics highlight fluctuations in sparrow populations throughout the day, with males generally displaying a wider range and higher variability compared to females. The statistics provided offer a comprehensive view of sparrow feeding patterns in the ATC market, divided by gender and feeding times (Table 2). Morning male feeding sessions exhibit a minimum count of 37 sparrows and a maximum of 73, with an average count of approximately 50.79 sparrows. The standard deviation of 10.03 indicates a moderate level of variability around this mean count. Evening male feeding sessions show similar trends, with a slightly higher mean count of around 51.21 sparrows and a maximum count of 78. Female sparrows, both in the morning and evening, demonstrate a consistent trend with higher mean counts compared to males. Morning female feeding sessions have an average count of 51.21 sparrows and evening sessions around 54.11. The variance and standard deviation for females' counts are slightly lower than those of males, indicating a somewhat tighter distribution of counts. Overall, the data suggests that female sparrows tend to feed

Table 1. Male and female sparrow population across morning and evening periods

Male population morning and evening			Female population morning and evening		
N	28	28	**N**	28	28
Minimum	99	70	**Minimum**	29	40
Maximum	140	154	**Maximum**	78	70
Total	3430	3070	**Total**	1434	1515
Mean	122.5	109.64	**Mean**	51.21	54.1
Std. error	2.44	3.45	**Std. error**	1.99	1.69
Variance	167	332.6	**Variance**	110.6	79.8
Stand. Dev	12.92	18.23	**Stand. Dev**	10.51	8.93
Median	125	111	**Median**	51.5	55

Table 2. Male and female Sparrows feeding patterns across morning and evening periods

	Morning male feeding	Evening male feeding		Morning female feeding	Evening female feeding
N	28	28	**N**	28	28
Minimum	37	29	**Minimum**	29	40
Maximum	73	78	**Maximum**	78	70
Total	1422	1434	**Total**	1434	1515
Mean	50.79	51.21	**Mean**	51.21	54.1
Std. error	1.89	1.99	**Std. error**	1.99	1.69
Variance	100.5	110.6	**Variance**	110.6	79.8
Stand. Dev	10.02	10.5	**Stand. Dev**	10.5	8.93
Median	49.5	51.5	**Median**	51.5	55

more consistently throughout the day compared to males, with slightly higher counts observed in the evening sessions. This information could be valuable for understanding sparrow behavior patterns and potentially informing conservation efforts or urban planning initiatives aimed at supporting local bird populations.

House Sparrows feeding habitat analysis in the ATC Municipal Market (Table 3) (Fig. 6)

Feeding in the Morning:

Pork: Both male and female sparrows showed similar average feeding amounts, with males consuming 1.64 pork meat and females consuming 1.64 pork meat on average. The standard deviation values suggest relatively consistent feeding behavior across genders (Fig. 4).

Fig. 4. Sparrows feeding on pork remnants at market food stands

Beef: Male sparrows consumed an average of 2.16 Beef Meat, slightly higher than females at 1.73 Beef Meat. The variance in feeding amounts was relatively low, indicating consistent consumption patterns.

Chicken: Similar to the evening session, both male and female sparrows showed similar average feeding amounts, with males consuming 1.8 Chicken meat and females consuming 1.7 Chicken meat on average. The standard deviation values suggest relatively consistent feeding behavior across genders.

Vegetable: Male sparrows consumed an average of 12.1 Vegetables, while females consumed 15.07 Vegetables on average. The standard deviation values indicate relatively consistent feeding behavior across genders.

Grain: Male sparrows consumed an average of 17.36 grains, slightly higher than females at 16.96 grains. The standard deviation values suggest relatively consistent feeding behavior across genders.

Table 3. Sparrows feeding habitat analysis in the Morning session

Sparrow feeding morning														
Pork			Beef line			Chicken			Vegetable			Grain		
N	25	25	N	25	26	N	25	24	N	28	28	N	28	28
Minimum	0	0	Minimum	0	0	Minimum	0	1	Minimum	1	4	Minimum	8	8
Maximum	5	6	Maximum	5	4	Maximum	5	3	Maximum	24	25	Maximum	28	35
Total	41	41	Total	54	45	Total	45	41	Total	339	422	Total	486	475
Mean	1.64	1.64	Mean	2.16	1.73	Mean	1.8	1.7	Mean	12.1	15.07	Mean	17.36	16.96
Std. error	0.26	0.28	Std. error	0.26	0.2	Std. error	0.24	0.18	Std. error	1.1	1.09	Std. error	1.04	1.23
Variance	1.66	1.9	Variance	1.72	1	Variance	1.5	0.73	Variance	33.9	33.03	Variance	30	47.1
Stand. Dev	1.3	1.4	Stand. Dev	1.31	1	Stand. Dev	1.22	0.86	Stand. Dev	5.82	5.75	Stand. Dev	5.5	6.9
Median	1	1	Median	2	2	Median	2	1	Median	11.5	15.5	Median	16.5	16

Feeding in the Evening (Table 4):

Pork: The average number of male sparrows fed was approximately 1.32, while for females, it was 1.14. The variability in feeding amounts was relatively low, with a standard deviation of around 0.86 for males and 0.65 for females.

Beef: Male sparrows consumed an average of 2.64 Beef Meat, slightly higher than females at 2.38 Beef Meat. The variance in feeding amounts was higher compared to other feeding materials, indicating greater variability in consumption patterns.

Chicken: Both male and female sparrows showed similar average feeding amounts, with males consuming 1.69 Chicken meat and females consuming 1.58 Chicken meat on average. The standard deviation values suggest relatively consistent feeding behavior across genders.

Vegetable: Male sparrows consumed an average of 12.11 Vegetables, while females consumed 13.04 Vegetables on average. However, the variance and standard deviation values were higher compared to other feeding materials, suggesting greater variability in consumption patterns.

Grain: Male sparrows consumed an average of 19.89 grains, slightly lower than females at 19.43 grains. The standard deviation values indicate relatively consistent feeding behavior across genders, despite the higher average consumption (Fig. 5).

Fig. 5. Sparrow feeding on grains kept in front of the market shop

In both the evening and morning feeding sessions, the highest count feeding for male sparrows were observed in the Grain category. In the evening session, males consumed an average of 19.89 grains, and in the morning session, they consumed an average of 17.36 grains. For female sparrows, the highest count feeding was also observed in the Grain category during the evening session, with an average consumption of 19.43 grains.

Table 4. Sparrows feeding habitat analysis in the Evening session

Sparrow feeding evening														
Pork			Beef line			Chicken			Vegetable			Grain		
N	28	28	N	25	24	N	26	26	N	28	28	N	28	28
Minimum	0	0	Minimum	0	0	Minimum	0	1	Minimum	4	5	Minimum	2	4
Maximum	4	2	Maximum	5	5	Maximum	4	4	Maximum	19	21	Maximum	26	32
Total	37	32	Total	66	57	Total	44	41	Total	339	365	Total	557	544
Mean	1.32	1.14	Mean	2.6	2.4	Mean	1.7	1.6	Mean	12.1	13	Mean	19.9	19.4
Std. error	0.16	0.122	Std. error	0.32	0.24	Std. error	0.16	0.15	Std. error	0.78	0.89	Std. error	1.03	0.89
Variance	0.74	0.42	Variance	2.57	1.46	Variance	0.7	0.65	Variance	17.1	22.4	Variance	29.9	22.4
Stand. Dev	0.86	0.65	Stand. Dev	1.6	1.2	Stand. Dev	0.83	0.8	Stand. Dev	4.13	4.7	Stand. Dev	5.47	4.73
Median	1	1	Median	2	2	Median	2	1	Median	12.5	14	Median	20.5	19

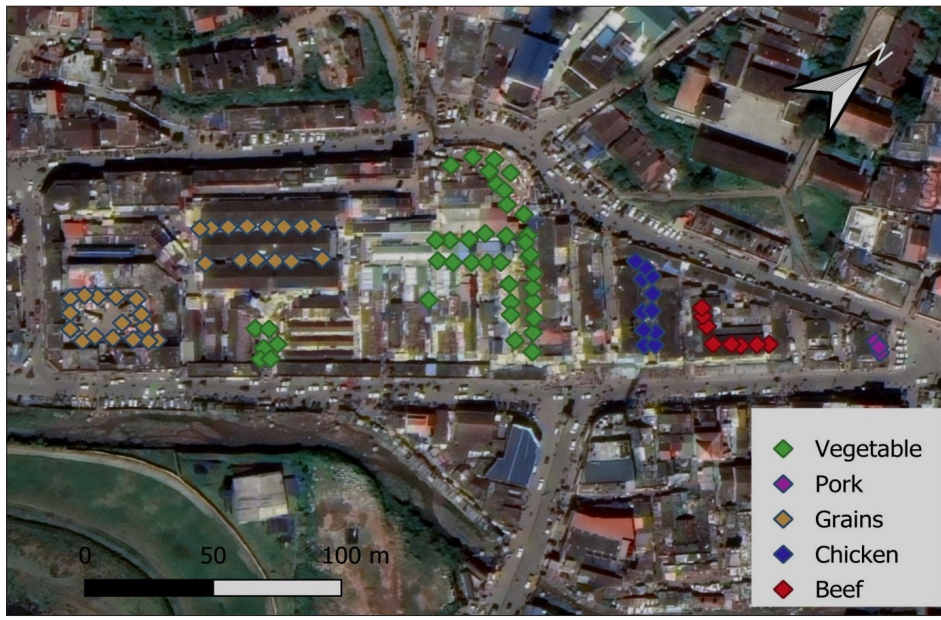

Fig. 6. House sparrows feeding materials in Ooty ATC Municipal market (Map data ©2024 Google, Imagery ©2024 TerraMetrics)

House Sparrows Nesting inside the ATC Municipal Market (Table 5) (Fig. 7 and 9)

Fig. 7. Female sparrow observed occupying an artificial nest box installed by market workers within the market area

In the bustling environment of the ATC market, sparrows have shown remarkable adaptability in nesting preferences. Out of a total of 164 live nests observed, the majority were found in artificial nest boxes (98). Out of the 50 artificial nesting boxes provided

in the market, 38 were occupied by sparrow nests (Jayaraman et al. 2017), showcasing a positive response to provided infrastructure. Mud walls emerged as another favored nesting site, with 25 nests, reflecting the birds' affinity for natural materials. Roof holes and roller shutter gates provided shelter for 20 and 4 nests respectively, suggesting the sparrows' inclination towards elevated spaces. Interestingly, sparrow populations exhibited a propensity for nesting in man-made structures, as evidenced by nests in EB boxes (3), steel pipe holes (12), wooden boxes (1), and plastic pipe holes (1) (Fig. 7). These findings underscore the adaptability of sparrows in urban environments, highlighting the importance of providing suitable nesting habitats amidst anthropogenic landscapes.

Table 5. Sparrow nesting type

Nesting type	Total no of nests
EB box	3
Mud wall	25
Roof holes	20
Steel pipe hole	12
Wooden box	1
Plastic pipe hole	1
Roller shutter gate	4
Artificial nest box	98
Totel	**164**

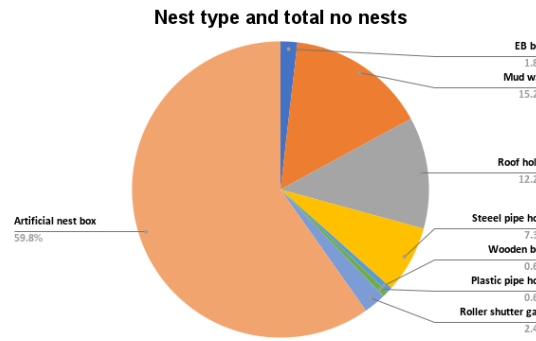

Fig. 8. Nest type and Total no. of nests

Fig. 9. House Sparrows nesting sites inside the ATC Municipal Market (Map data ©2024 Google, Imagery ©2024 TerraMetrics)

House Sparrow Questionnaire Survey inside the ATC market people (Table 6)
A total of 21 questions were asked to ATC market people. These questions are important. The survey reveals a concerning decline in sparrow awareness and conservation efforts, with only 40% of respondents feeding sparrows. Despite acknowledging sparrows as human-friendly (85.71%), there's a lack of action, as indicated by low awareness about biodiversity protection (0%) and prevalent nest removal (91.42%). This highlights an urgent need for education and concerted efforts to reverse sparrow decline.

Table 6. Questionnaire survey

A	B	C	D
S.NO	**QUESTIONS**	**YES**	**NO**
1	Able to identify sparrow?	94.28%	5.71%
2	Differentiate sparrow sex?	48.57%	51.42%
3	Are sparrow[7] seen in you sector?	77.14%	22.85%
4	Is sparrow[7] abundance high in market?	68.57%	31.42%
5	Are the declined comparing previous year?	88.57%	11.42%
6	Do you feed the sparrows and place water?	60%	40%
7	If the bird is about to be predated or any threat to it, do mind helping it in any way?	62.85%	37.15%
8	How do you see this bird (threat /blessing)?	88.57%	11.42%
9	Is the bird seen preadeted ?	54.28%	45.71%
10	Any artificial box kept for sparrow?	45.71%	54.28%
11	Have you cleared away any nest in your shop built by sparrow? (If yes-reason)	91.42%	5.71%
12	Do you believe when you touch a sparrow, their family would deny the bird touched by humans ?	62.85%	37.14%
13	Are nesting seen throughout the year	80%	20%
14	Do they consume meat throughout the year?	22.85%	77.14%
15	Is the uncleaned area in market affect any living?	62.85%	37.14%
16	Which part of the day they are active? Morning/Evening/ Both	62.85%	37.14%
17	SPARROW IS CONSIDERED AS HUMAN FRIENDLY – Do you believe?	85.71%	14.25%
18	Do you believe sparrow declined by Tower | Terrace Building | Pesticides | humans are not friendly with birds?	57.14%	42.85%
19	Have you been given awareness about protecting our biodiversity?	0%	100%
20	Are you worried about the decline?	80%	20%
21	How often do you feed sparrow? Feed dependence/Feed independence	40%	60%

DISCUSSION

The comprehensive analysis sheds light on various aspects of sparrow behavior and ecology within the ATC market environment, focusing particularly on population dynamics, feeding patterns, nesting preferences, and human interactions through a questionnaire survey. This multi-faceted approach offers valuable insights into the

intricate relationship between sparrows and their urban habitat. The population dynamics analysis reveals interesting trends, with male sparrows displaying wider population ranges and higher variability compared to females. This suggests potential differences in behavior or habitat preferences between genders, warranting further investigation. Additionally, the observation of consistent feeding patterns among females throughout the day, with slightly higher counts in the evening, implies a degree of stability in their feeding behavior, which contrasts with the more variable feeding patterns observed in males. The feeding habitat analysis provides detailed information on sparrow dietary preferences, with an unexpected finding that sparrows consume beef, chicken, and pork alongside traditional food sources like grains and vegetables. Rural birds primarily consumed cereal grains and insects, mainly coleopterans. In contrast, urban sparrows had a varied diet, including grains, birdseed, other seeds (primarily mast), and insects (primarily coleopterans). Unlike their rural counterparts, urban sparrows may lack a single abundant and consistently available food source like grains (Gavett et al. 1986). The preference of House Sparrows for introduced cereal grains could elucidate their historical prosperity and potentially contribute to their recent population declines as the supply of agricultural seeds diminishes (Christopher 2015). The abundance of food, including grains, vegetables, and insects particularly caterpillars in vegetables as well as appropriate nesting locations may have a significant role in the sparrow population's high density in rural open spaces and residential buildings (Girish et al. 2012). This observation challenges conventional assumptions about sparrow diets and underscores the adaptability of these birds to urban environments where non-traditional food sources may be abundant. The study's quantification of feeding amounts for different food types further enriches our understanding of sparrow dietary habits, highlighting potential implications for conservation and management strategies. The breeding success of house sparrows in urbanized settings may be limited by a decline in insect prey (which is essential for raising the nestlings), alternative food sources such as grains, and a shortage of suitable nesting locations (Joshi et al. 2022). The nesting behavior analysis emphases sparrows' adaptability to urban landscapes, with a preference for artificial nest boxes Fig. 4 and other man-made structures. This underscores the importance of providing suitable nesting habitats amidst urban development to support sparrow populations, particularly in environments where natural nesting sites may be scarce. The holes in mud walls and compound walls serve as great places for House Sparrows to nest. This suggests that the species is able to adapt to its altered surroundings in GAC Udhagamandalam (Jayaraman et al. 2018). The medium-density urban region has a comparatively greater population of House Sparrows, which may be explained by the abundance of nesting opportunities in the vicinity, such as masonry holes, overhanging roof edges, crevices, etc. (Khera et al. 2010). The questionnaire survey reveals a concerning decline in sparrow awareness and conservation efforts among ATC market visitors. Despite acknowledging sparrows as human-friendly, there

appears to be a disconnect between perception and action, with low awareness about biodiversity protection and prevalent nest removal practices. This highlights the urgent need for educational initiatives and community engagement to raise awareness about sparrow conservation and foster stewardship among the local population. This paper presents a deep and comprehensive research discussion on various aspects of sparrow ecology and behavior within the ATC market environment. The finding of sparrows consuming fresh beef, chicken, and pork (Fig. 2) underscores the complexity of urban wildlife interactions and emphases the importance of further research and conservation efforts to ensure the survival of these adaptable and resilient bird species. By witnessing a house sparrow in a green space in New York City, USA, eat the meat from a discarded chicken "drumstick," we can further our understanding that this species may eat meat as part of its diet (MacGregor-Fors et al 2020). The house sparrow *Passer domesticus* has an atypical feeding habit in the meat market, where it feeds pieces of mutton to its nestlings at Udhagamandalam in the Nilgiris (Karthick et al. 2018).

CONCLUSION

In conclusion, the impending demolition of the ATC market in Ooty poses a significant threat to the local sparrow population, which has thrived in the area due to the availability of food and the presence of artificial nests provided by shopkeepers. With the destruction of their nesting spots, the sparrows face the daunting challenge of finding alternative locations to build their nests, putting their population at risk. Urgent action is needed to mitigate the impact of this disruption on the sparrow community. Efforts should focus on identifying and establishing new nesting sites in close proximity to the former market area to ensure the continued survival and well-being of these beloved birds. Additionally, raising awareness among the local community about the importance of conserving and protecting sparrow habitats is essential for fostering long-term sustainability and coexistence within urban environments.

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ROOSTING BEHAVIOUR OF HOUSE SPARROWS, *PASSER DOMESTICUS* AT KERALA VETERINARY & ANIMAL SCIENCES UNIVERSITY CAMPUS IN WAYANAD, KERALA, INDIA

ABSTRACT

Due to their common urban status and suspected decline, house sparrows are garnering attention worldwide. Ecological studies, particularly those about roosting behaviour, are scarce compared to the abundance of population studies on this species. We studied the flock of sparrows that roost at the Kerala Veterinary and Animal Sciences University campus in Wayanad, Kerala, India, with a focus on the environmental factors that affect roosting behaviour. House Sparrows were found to roost in three different flocks on campus. While seasonal variations were noted within the sites, overall abundance did not differ between the sites. Sparrows were found to choose different species of roosting trees and when disturbed, they have been observed to change their roosting locations. It was found that house sparrows gathered at 4:02 PM, pre-roosting at 4:48 PM, and roosting at 5:56 PM. The chirping ceased at 6:08 PM. Environmental variables are known to affect roosting behaviour in sparrows. While light intensity, temperature, and sunset time all had an impact on pre-roosting and roosting behaviour, the assemblage was influenced by the latter. Changes in environmental variables may have an impact on their roosting pattern, which could then have an impact on their fitness in future.
Key words: House Sparrow, roosting, population, environmental variables

INTRODUCTION

All birds do roosting, which is a period of inactivity comparable to sleep in humans, even though the benefits and motivation is different. Except for nocturnal birds, which roost in the morning, most birds go to sleep during the night (Gadgil and Ali 1975). Roosting can be temporary or permanent, solitary or communal (Kuroda 1961, Counsilman 1974, Gobes and Bolhuis 2008, Johnson 2010, Moleón et al. 2011, Jayson 2018, Shipley et al. 2019, Minor et al. 2020, Perez et al. 2022). The main benefits of communal roosting behaviour are the enhancement of individual foraging success (Ward and Zahavi 1973), facilitation to get partners (Beauchamp 1999), predation dilution effect (Eiserer 1984) and help to maintain body temperature or thermoregulation (Burns et

al. 2013). The transmission of diseases, parasites and increased detection by predators are costs associated with communal roosting (Moore et al. 1988, Kulkarni and Heeb 2007, Buehler and Piersma 2008). Therefore, roosting is an important behavioural aspect of a bird's life.

Different environmental factors such as day length, light intensity, temperature, weather conditions and the roosting substrate influence roosting behaviours (Davis and Lussenhop 1970, Swingland 1976, Everding and Jones 2006, Janicke and Chakarov 2007, Ientile 2014). Examining roost activity and species abundance might help to understand the current state of various bird species in a particular area thus; avian communal roosts can be focal points for scientific research and conservation (Dwyer et al. 2018, Manzoor et al. 2021).

House Sparrows (*Passer domesticus*) are sedentary species and movement is restricted towards small areas ranging from one to two kilometres (Anderson 2006). House Sparrows are found in most human-inhabited landscapes, such as private gardens, farms, agricultural fields, and markets, even in extreme climates (Summers-Smith 1954, Johnston and Selander 1964, North 1973, Cannon et al. 2005, Murgui 2009, Khera et al. 2010). They are commensals to humans, and this behaviour evolved ten thousand years ago with the spread of agriculture (Saetre et al. 2012, Ravinet et al. 2018). They are known to perish without human presence (Summers-Smith 1959, Ravinet et al. 2018).

Human colonisation and the introduction of House Sparrows to various continents by humans have made them an abundant bird species (Anderson 2006). But, they are experiencing population declines due to a variety of factors which vary depending on the region and circumstances, including increased urbanisation, structural changes to buildings, the removal of gardens and other vegetation from human habitats, the modernization of agricultural systems, and increased use of pesticides (De Laet and Summers-Smith 2007, Tobolka 2007, Roshnath et al. 2018, Angelier and Brischoux 2019). This made the scientific community focus on this species and prompted scientific studies worldwide (Patel and Dodia 2021).

So far, studies on House Sparrows in India have been limited to status assessments and population studies (Rajashekar and Venkatesha 2008, Baskaran et al. 2010, Ghosh et al. 2010, Balaji 2014, Paul 2015, Roshnath et al. 2018, Sharma and Binner 2020) and few ecological works such as habitat preference (Khera et al. 2010, Kanaujia et al. 2014, Deepalakshmi and Salomi 2019, Bijith and Roshnath 2022). The lack of preferred roosting trees and associated vegetative areas in human-inhabited areas are known to contribute to their population declines (Cannon et al. 2005, Singh et al. 2013, Roshnath et al. 2018). This means roosting sites are important for sparrow conservation (Patel and Dodia 2021). Understanding life history traits including the roosting behaviour of a species will aid in their conservation efforts (Gadgil and Ali 1975). Therefore, the present study on the roosting ecology of House Sparrows was conducted with the following objectives:

1. To identify the roosts and estimate roosting flocks of House Sparrows in the Pookode Campus of Kerala Veterinary and Animal Sciences University;
2. To study roosting behaviour and factors affecting such behaviour of House Sparrows.

MATERIALS AND METHODS

Study area

Kerala Veterinary and Animal Sciences University campus (11°32′30″N 76°01′13″E) is located at Pookode, Wayanad district of Kerala state, India. The campus has 40 hector area with mixed vegetation including riparian habitats, evergreen forest patches, coffee plantations, grasslands and rocky habitats and forms a part of the Western Ghats. The man-made structures include administrative and academic buildings, hostels, farm buildings, canteen *etc.*, facilitate nesting and foraging spaces for House Sparrows. Including House Sparrows more than 200 bird species have been reported from the campus as per eBird data source.

Sampling methods

House Sparrows were counted using the point count method (Sutherland 2006) and the total number was estimated from 2022 April to 2023 March at the campus, where all of the roosting sites were surveyed twice a month, from 15:30 to 19:30 hours.

Based on the activity, the roosting period was divided into 3 stages; assemblage, pre-roosting, and roosting. **Assembly** starts with the appearance of a few individuals of House Sparrow in the gathering place which is mostly near the roosting tree and with time more individuals join the flocks (Singh et al. 2013). Opportunities for foraging and sand-bath were found at all gathering places. During assemblage, individuals spent most of their time foraging. After foraging, birds move to a less active stage involving resting, preening and sand bathing and this stage was marked as the **pre-roosting** stage. After pre-roosting, all the birds were found to move to the roosting tree together at the same time. During the starting of the **roosting stage,** House Sparrows make a chirping call (different from normal calls) which lasts until sunset (Patel and Dodia 2021). The start and end times of each stage and chirping were recorded using a stopwatch. Environmental factors like light intensity and ambient temperature at each stage were recorded using HTC LX-103 digital lux meter and HTC-1 digital thermometer cum hygrometer. The relationship between environmental factors and assemblage, pre-roosting, and roosting was studied. All the analyses were done in R software (version 4.3.1) using the packages "dplyr", "ggpubr", "tidyr", "cowplot", "mgcv" and "chron".

RESULTS

House Sparrows roost as three separate flocks on the campus which are at the average 1078 ± 348 m away from each other (Fig. 1). The hospital complex had the highest

abundance (13.31 ± 5.49), followed by the cattle shed (11.19 ± 5.93) and headquarters (10.74 ± 4.76; Fig. 2). Although total abundance did not differ between sites ($p = 0.13$), seasonal variations were observed ($p = 0.01$; Fig. 3) within the sites. The roosting substrate varied between the sites (Table 1) and was observed to change in response to human disturbance.

The roost at the hospital complex was a Golden Dewdrop Tree (*Duranta erecta*), but when disturbed they moved to a Jackfruit Tree (*Artocarpus heterophyllus*) nearby. At headquarters, they roost on a Weeping Fig (*Ficus benjamina*) and the birds were seen to relocate their roost to a bamboo thicket that was 128 metres away when disturbed during garden maintenance, arts festivals, etc. A bamboo thicket was the roosting substrate at the cattle shed during the early study period which got shifted to a Passion Fruit vine (*Passiflora edulis*) grown in the employer's quarters, as the earlier site was disturbed and lit up for some construction works. Thus, sparrows respond to human disturbance by shifting their roost sites.

House Sparrows were found to assemble at 4:02 PM (mean) followed by pre-roosting at 4:48 PM and roosting at 5:56 PM. Chirping stopped by 6:08 PM (average 12 min after mean roosting time). The mean duration of the assembling activities was 55 ± 22 minutes; the pre-roosting activities were 58 ± 21 minutes and the chirp duration of 12 ± 13 minutes. A diagrammatic representation of each activity is given in Fig. 4.

Generally, (considering data from all seasons), except for the roosting time which was affected by weather (p-value < 0.05) and the time of the last chirp which was affected by light intensity ($p < 0.001$) none of the other variables showed any significant relationships (Table 2). But when monsoon data (no or less sparrow activities) was removed, the analysis revealed that the assemblage was affected by time of sunset ($p < 0.001$), pre-roosting was affected by light intensity ($p < 0.001$), temperature ($p < 0.05$) and time of sunset ($p < 0.01$) and roosting was affected by time of sunset ($p < 0.001$), light intensity ($p < 0.001$) and temperature ($p < 0.05$). Environmental variables had varying effects during various seasons (Table.3; supplementary results). During the cloudy and rainy days, pre-roosting and roosting happened earlier while pre-roosting ($t = -3.19$) and roosting ($t = -6.29$) time got delayed with increasing light intensity (-ve t-value). Temperature was found to be positively correlated with the duration of assemblage ($R = 0.28$), pre-roosting ($R = 0.07$) and chirp duration ($R = 0.15$; Fig. 5). The number of individuals and duration of chirping were not related ($R = 0.13$; Fig. 6).

DISCUSSIONS

House Sparrows are indicators of a healthy urban environment and sustainable development (Modak 2015). House Sparrows are distributed all over Kerala (Nameer and Praveen 2021) and are reported to be declining (Dandapat et al. 2010, Raju 2015, Bijith and Roshnath 2022). To conserve them, it is important to know about their life history

traits and the habitat relationship. Especially, it is very essential to understand their roosting behaviour as a life history trait that is less studied of this species.

All roosting populations observed on the campus were small in size. Competition for resources and nesting sites could be the factor limiting the roosting population size. House Sparrows preferred to nest in rural areas even though more nesting cavities were present in urban areas due to the presence of food (Dhanya and Azeez 2010, Angelier and Brischoux 2019). High population abundance was also reported in agricultural fields compared to urban areas (Khera et al. 2010). While some studies reported increased preference towards towns due to increased food availability (Mannasaheb et al. 2019). So it seems that not the location is most important but the availability of food that affects the distribution of the House Sparrow more (Bijith & Roshnath 2022). House Sparrows at headquarters (includes the main administrative and academic buildings, canteen, and garden) mostly rely on food waste from the canteen, nearby men's hostel mess and spillovers from poultry feed of pet birds. They are also found to forage in the university garden looking for live prey such as insects and worms. While at the hospital complex, (which includes a hospital, staff housing, and hostels for students) sparrows are found to be fed by people living at staff quarters and they are found forage food in surrounding weeded vegetation for as live prey. The main sources of food for the sparrow population at cattle sheds (which comprise farm buildings, employee housing, and pasture areas) are cattle feeds, grains from hay, and live prey in cattle dung. Comparative high food availability and less abundance of other competitive granivorous birds such as munias and doves at headquarters might be the reason why the population was found to be high.

After becoming independent, young House Sparrows depart for new locations and create new roosting sites (North 1973). Although we didn't collect data on population demographics, monthly change in the abundance of House Sparrows at each location may be caused by such mobility of juveniles. In South India, House Sparrows have been seen breeding all year round (Chamberlain et al. 2007). Likewise, young individuals were seen throughout the study period, and active nests were seen every month except for June and July when the monsoon season was at its peak.

Roost site selection is an important factor when it comes to the survival and fitness of birds (Yuan et al. 2018, Rao and Babu 2021, Sureshmarimuthu et al. 2023) especially colonial roosting sparrows (Anderson 2006). Sparrows are known to select roosting sites based on the availability of short trees, food availability and less disturbance (North 1968, Bijith and Roshnath 2022). They also use buildings or nest boxes for roosting (Tobółka 2011, Patel and Dodia 2021).

House Sparrows were found to assemble by 4:02 PM (mean) when they were found to be actively foraging before entering the pre-roosting stage. At first, a few birds gather near the roosting tree and with time more birds, join the flock (Singh et al. 2013). We observed birds assemble at multiple sites near the roosting tree and all were found to engage mostly in foraging. The presence of multiple gathering sites associated with each

roosting location could be a method of resource partitioning concerning availability (Elgar 1987, Bernat-Ponce et al. 2018). Assembling was affected by the time of sunset (Patel and Dodia 2021) as we observed sparrows assembling late with delayed sunset and vice versa.

After assemblage, they move to the less active stage called pre-roosting (by 4:48 PM mean) during which they perch near the roosting tree and engage in preening. Occasionally they are found to do sand bathing. Sparrows started pre-roosting activities 2 hours before sunset (Anderson 2006) and we observed the same (1hr 34min before sunset) on the campus. After the pre-roosting stage, all the non-breeding sparrows move to their regular roosts while nesting pairs roost at their respective nests (Patel and Dodia 2021).

Roosting behaviour is a function of light intensity and the time of sunset (Davis and Lussenhop 1970, Swingland 1976, Peh 2002). We found that light intensity, temperature, weather and time of sunset had a direct effect on the pre-roosting and roosting time of House Sparrows when monsoon data were removed from the analysis. These results support the observations from the previous studies (Singh et al. 2013, Patel and Dodia 2021). In rainy weather, sparrows restrict all activities and are active only in the break period of rain. Pre-roosting and roosting behaviours were delayed by increased light intensity, but they were quickened or early during cloudy weather. Thus, the environment variables such as the intensity and duration of light play a significant role in roosting behaviour. For small birds and birds in northern areas, thermoregulation has an influence on the evolution of communal roosting (Beauchamp 1999) and sparrows are known to stay closer and huddle when temperature decreases (Burns et al. 2013). But, the present study did not evaluate the positioning of sparrows in the roost. Hence, behavioural changes related to the change in temperature could not be observed. However, it was observed that the duration of assembling, pre-roosting and chirping have a positive correlation with ambient temperature i.e., the duration of these activities increases with the increasing temperature.

CONCLUSION

Our roosting flocks are small, and they fluctuate between seasons. The House Sparrow's roosting stages are directly influenced by the intensity and duration light, temperature, and the weather. The influence of different environmental variables reflects that climate change can affect their roosting pattern and other life-history traits including breeding and survivability of chicks (Dybala et al. 2013, Jesus and Jimenez 2022).

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SUPPLEMENTARY RESULTS

During Pre-monsoon; Pre-roosting is affected by weather (p-value < 0.001), and Light intensity (p-value < 0.001), roosting is affected by weather (p-value < 0.001), and Light intensity (p-value < 0.01) and time of last chirp is affected by weather (p-value < 0.01) and light-intensity (p-value < 0.001). Assembling was not affected by any variable like weather, temperature, and light-intensity and sunset.

During Monsoon none of the activities were affected by observed variables.

During Post-monsoon; assembling is affected by time of sunset (p-value < 0.01), pre-roosting is affected by weather (p-value < 0.01), roosting is affected by weather (p-value < 0.001), light-intensity (p-value < 0.001) and time of sunset (p-value < 0.05) and time of last chirp is affected by weather (p-value < 0.01), light-intensity (p-value < 0.001) and time of sunset (p-value < 0.05).
by time of sunset (p < 0.001), light intensity (p < 0.001) and temperature (p < 0.05).

Table 1. List of roosting trees species used by House Sparrows

Tree species	Location	Height (m)	Roosting height (m)
Weeping Fig (*Ficus benjamina*)	Head Quarters	4.57	3.5
Bamboo (Bambusoideae)	Head Quarters	12.8	7.5
Golden Dewdrop Tree (*Duranta erecta*)	Hospital Complex	7.3	4
Jackfruit Tree (*Artocarpus heterophyllus*)	Hospital Complex	10.97	7
Bamboo (Bambusoideae)	Cattle Shed	7.3	5.1
Aporosa cardiosperma	Cattle Shed	9.1	7
Passion Fruit vine (*Passiflora edulis*)	Cattle Shed	2.7	2

Table 2. Range of environmental variables (Mean ± SD) across different roosting activities (*p < 0.05)

Data	Activity	Temperature (°C)	Light intensity (lux)	Time of Sunset (PM)
Full season	Assembling	26.9 ± 2.6	22062 ± 13588	06:33 ± 0:17
	Pre-roosting	25.5 ± 2.3	8386 ± 4763	06:33 ± 0:17
	Roosting	23.4 ± 1.9	1872 ± 1190	06:33 ± 0:17
Excluding Monsoon	Assembling	27.9 ± 2.3	26565 ± 10715	06:24 ± 0:15*
	Pre-roosting	26 ± 2.2*	9157 ± 4840*	06:24 ± 0:15*
	Roosting	24.1 ± 2.1*	1905 ± 1335*	06:24 ± 0:15*

Table 3. Season wise range of environmental variables (Mean ± SD) across different roosting activities (*p < 0.05, **p < 0.005)

Variables		Temperature (°C)	Light intensity (lux)	Time of Sunset (PM)
Season	Activity			
Pre-Monsoon	Assembling	29.4 ± 1.9	26222 ± 9760	06:37 ± 0:03
	Pre-roosting	27.3 ± 2.1	8899 ± 5495**	06:37 ± 0:03
	Roosting	25.5 ± 1.8	16089 ± 1100*	06:37 ± 0:03
Monsoon	Assembling	25.6 ± 2.6	15976 ± 14785	06:45 ± 0:12
	Pre-roosting	24.5 ± 2.4	7343 ± 4512	06:45 ± 0:12
	Roosting	22.6 ± 1.3	1826 ± 976	06:45 ± 0:12
Post-Monsoon	Assembling	26.4 ± 1.6	26968 ± 11950	06:09 ± 0:10*
	Pre-roosting	24.8 ± 1.3	9461 ± 4039	06:09 ± 0:10
	Roosting	22.5 ± 1.1	2253 ± 1518**	06:09 ± 0:10*

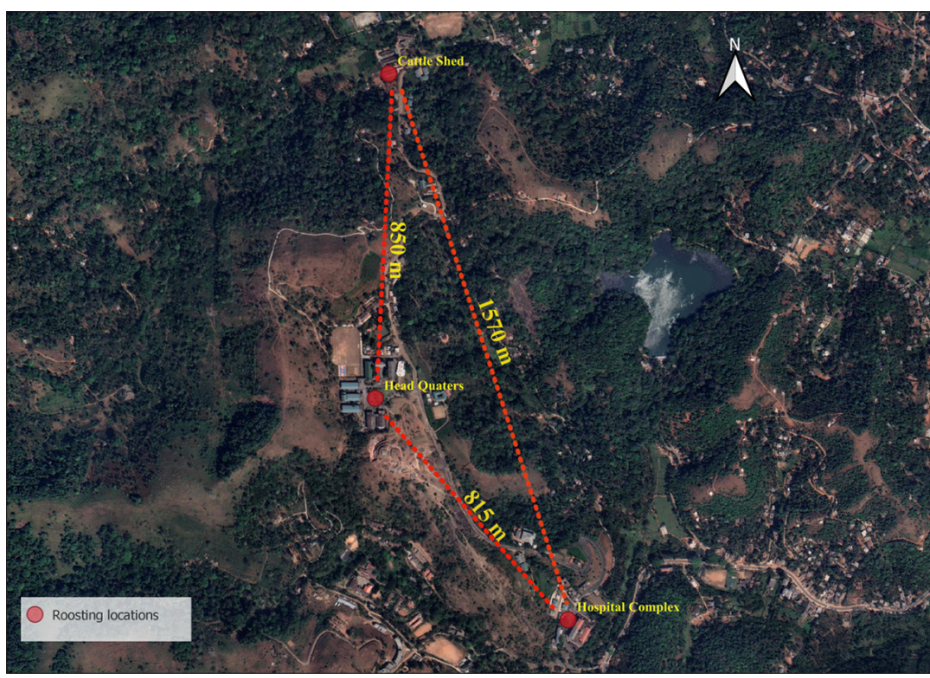

Fig. 1. Study site showing the roosting locations (Map data ©2024 Google, Imagery ©2024 Terra-Metrics)

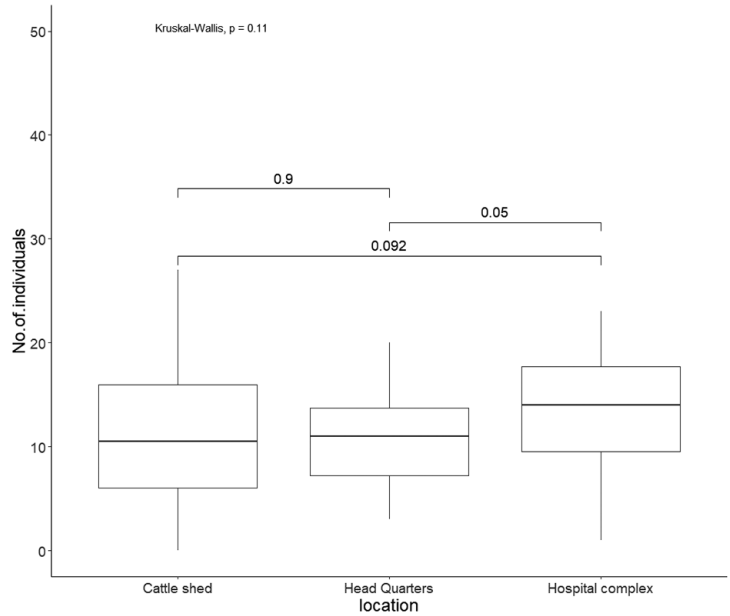

Fig. 2. Box plot showing the roosting House Sparrow population at three different locations

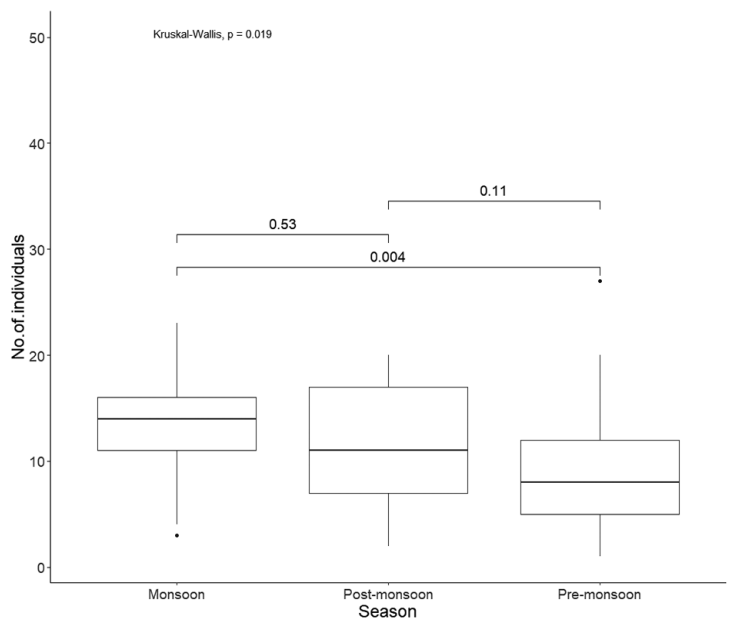

Fig. 2. Box plot showing the roosting House Sparrow population at three different locations

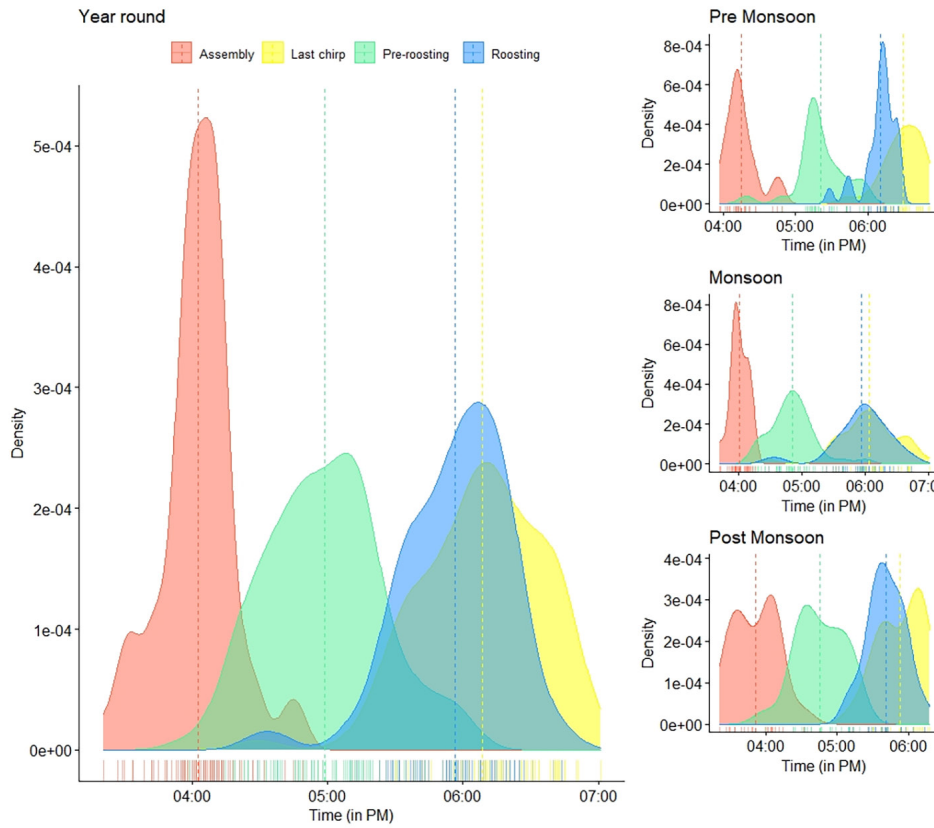

Fig. 4. Roosting pattern of House Sparrow

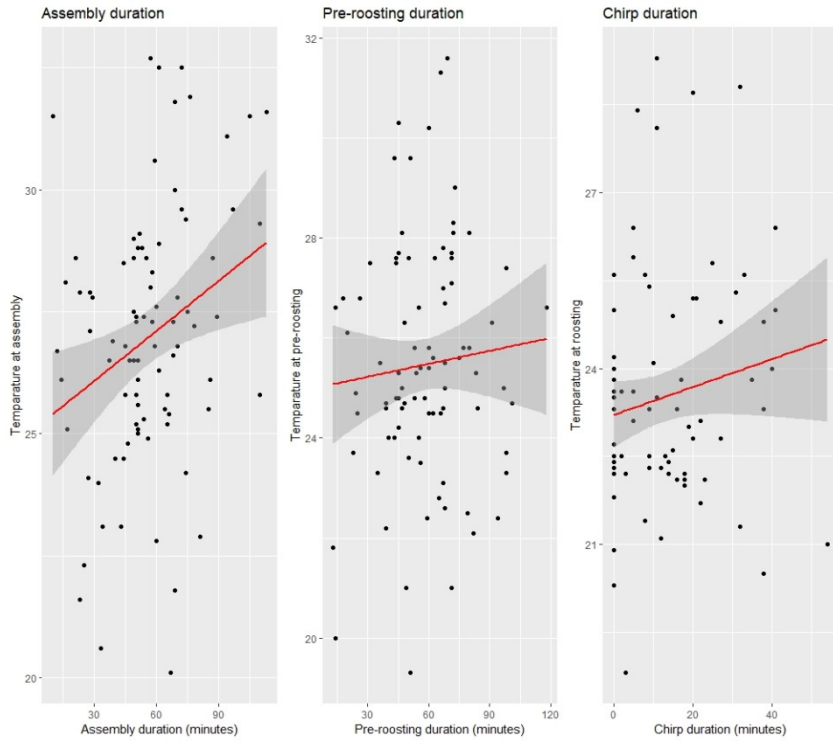

Fig. 5. Correlation of temperature and duration of activities

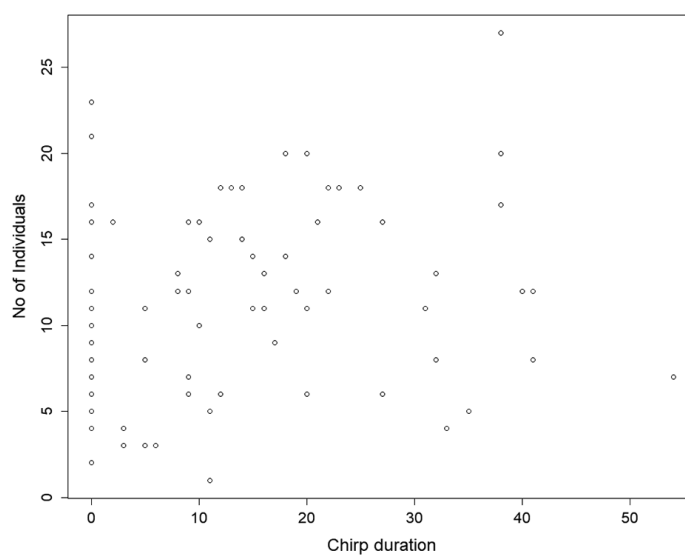

Fig. 6. Correlation between duration of chirp and number of individuals in the roost (year round data)

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WINTERING REED BUNTING *EMBERIZA SCHOENICLUS* IN LUBUSKIE VOIVODESHIP, POLAND

ABSTRACT

In Poland, wintering Reed Buntings *Emberiza schoeniclus* have been recorded in all provinces, and are considered common in the west of the country. It is believed that the main Reed bunting wintering habitats in Western Europe (including Poland) are weedy fields and stubble, less often other habitats. In national faunal monographs, wintering Reed buntings are recorded in a variety of habitats, among which are listed: agricultural landscapes (fields, stubble fields, fallow land), river valleys, various water bodies (lakes, fish ponds), rubbish-damps, orchards, bogs. The aim of the study is to characterize winter observations of Reed Buntings in Lubuskie Voivodeship, in the context of habitats and size of bird concentrations. The paper uses 146 observations of Reed Buntings collected in Lubuskie Voivodeship during spontaneous ornithological observations carried out in 1996-2024. A total of 654 individuals of Reed Buntings were recorded in 146 inspections. Most observations came from January (51.4%), followed by December (35.6%), and the least from February (13.0%). Reed Bunting observation sites were assigned to five habitat types (wasteland (weedy), grassland, ditch/trash, stubble fields and reeds). The most common habitat was wasteland (weedy), with a total of 47.3%. In this habitat, the Reed Buntings were observed most often in every winter month. The size of the concentration of wintering Reed Buntings ranged from 1 to 50 individuals (mean 4.48, SD = 8.49, N = 146). Single birds were recorded most often – a total of 48.6% of all observations. Groups of 2 to 10 individuals accounted for 41.8%, and flocks of more than 10 birds accounted for 9.6% of all observations. The environments in which wintering Reed Buntings were most often observed in Lubuskie Voivodeship and the abundance of bird groupings are similar to other regions of the country.
Key words: wintering, Reed Bunting *Emberiza schoeniclus*, habitat, flock size, Lubuskie Voivodeship (Western Poland)

INTRODUCTION

Changes in agriculture, particularly the use of herbicides, the simplification of crop structures and the elimination of weeds and the disappearance of stubble fields are affecting the decline in winter food resources used by many bird species (Chamberlain

et al. 2000, Moorcroft et al. 2002). This includes many grain-eaters, for which these resources are important during the wintering season. Included in this group of birds is also the Reed bunting *Emberiza schoeniclus*, for which common weeds are the main food during the winter (Cramp 1998, Trnka and Matoušek 1999, Matessi et al. 2002). In Poland, wintering Reed Buntings have been recorded in all regions, and in the west it is considered common (Tomiałojć and Stawarczyk 2003). It is recognized that the main wintering habitats of the Reed Bunting in Western Europe (including Poland), are weedy fields and stubble, less frequently other environments (Górski 1976, Wilson et al. 1996, Buckingham et al. 1999, Perkins et al. 2000, Moorcroft et al. 2002). Regional national ornithological monographs mention that wintering birds were seen in a variety of habitats, among which the following are given: agricultural landscape (fields, stubble fields, fallow land), river valleys, various water bodies (lakes, fish ponds), rubbish-dumps, orchards, bogs (Dyrcz et al. 1991, Jermaczek et al. 1995, Bednorz et al. 2000, Walasz 2000, Chmielewski et al. 2005, Tryjanowski et al. 2009). Studies in Lower Silesia have shown that in agricultural landscapes, fallow farmland is a particularly important habitat for wintering Reed Buntings (Orłowski 2005). The phenomenon of Reed Bunting wintering in Poland has only exceptionally been studied more thoroughly (Orłowski 2005). The diet of Reed Bunting wintering in the agricultural landscape of western Poland has also been studied (Orłowski & Czarnecka 2006).

The purpose of this paper is to characterize winter observations of Reed Buntings in Lubuskie Voivodeship, in the context of environments and size of bird concentrations.

STUDY AREA AND METHODS

146 observations of Reed Buntings collected in Lubuskie Voivodeship during spontaneous ornithological observations conducted in 1996-2024 were used. The data collected during the winter months (December, January, February) were used. Observations of birds were carried out in various habitats, mainly in river valleys, agricultural landscapes and other water bodies. For each observation, the number of individuals and the type of habitat in which the birds resided were recorded. The species habitats were assigned to five main categories: wasteland (fallow land, weeds), stubble fields, meadows, ditches and wastewater – vegetation overgrowing the banks, reeds (lakes, fish ponds, oxbow, river banks) and others.

RESULTS

A total of 654 Reed Buntings individuals were recorded in 146 observations. The highest number of observations was recorded in January – 51.4% (Fig. 1), followed by December (35.6%), and the lowest in February (13.0%).

Wintering Reed Buntings were observed in a variety of habitat types. Most often in wastelands (weedy areas) – a total of 47.3% of all observations and 60.2% of observed

birds. A high percentage of observations were also recorded in reeds (ponds, lakes banks) – 24.7%. The number of observations, individuals and their proportion, as well as the maximum flock counts in each type of environment are shown in Table 1. In all three months, the highest number of observations were recorded in wasteland (weedy areas). The percentage of observations in other types of environments varied from month to month (Fig. 2).

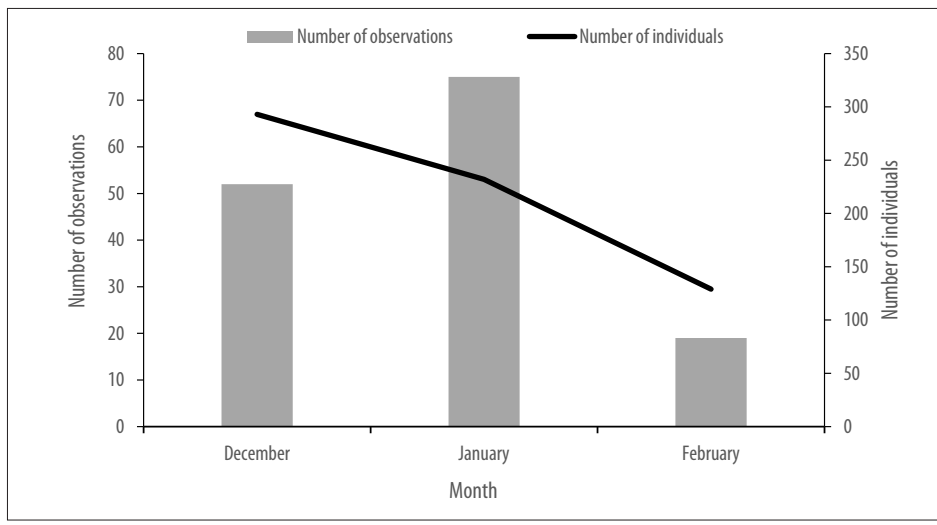

Fig. 1. Distribution of the number of observations and the number of individuals of Reed Buntings *Emberiza schoeniclus* by winter months in Lubuskie Voivodeship

Table 1. Occurrence of Reed Buntings *Emberiza schoeniclus* in winter in different types of habitats in Lubuskie Voivodeship

Habitat	Number of observations	% observations	Number of individuals	% individuals	Maximal recorded flock
Wasteland (weeds)	69	47.3	394	60.2	50
Meadows	14	9.6	20	3.1	2
Ditches/wastewater	17	11.6	66	10.1	20
Stubble field	7	4.8	17	2.6	6
Reeds	36	24.7	65	9.9	9
Others	3	2.1	92	14.1	50
Total	146	100.0	654	100.0	

The magnitude of concentration of wintering Reed Buntings ranged from 1 to 50 individuals (mean 4.48, SD = 8.49, N = 146). Single birds were recorded most often – a total of 48.6% of all observations. Groups of 2 to 10 individuals accounted for 41.8%, and flocks of more than 10 birds accounted for 9.6% of all observations. The distribution of the number of observations of each abundance category of observed Reed Buntings groups is shown in Fig. 3.

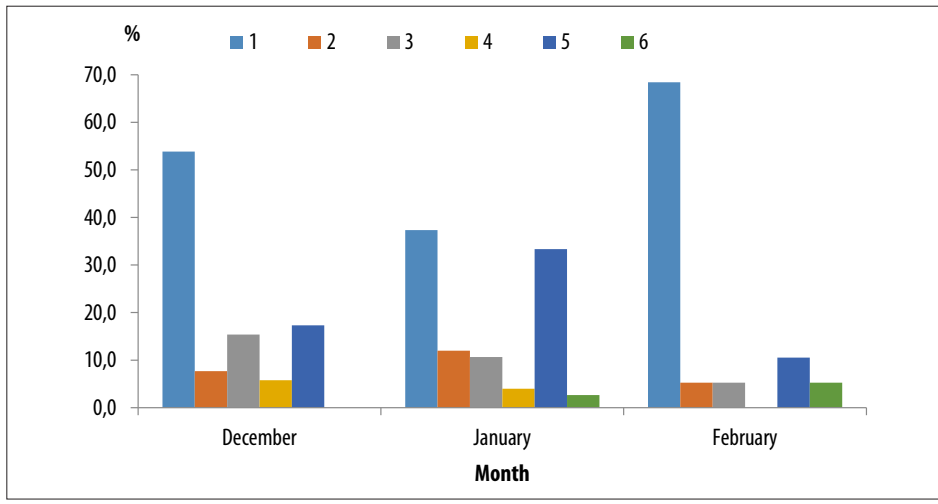

Fig. 2. Number of Reed Buntings *Emberiza schoeniclus* observations in a given environment by month in Lubuskie Voivodeship. 1 – wasteland (weeds), 2 – meadows, 3 – ditches/wastewater, 4 – stubble fields, 5 – reeds, 6 – others

All three months had the highest number of observations of 1 and 2 individuals, where the sum was XII – 67.3%, I – 74.7% and II – 47.4%. The proportion of the other abundance categories varied by month (Fig. 4), but groups of 3-5 birds had a similar proportion in all three periods (range 13.3-17.3%). The most numerous flocks of Reed Buntings numbering more than 20 individuals were observed most often in December (7.7% of all finds).

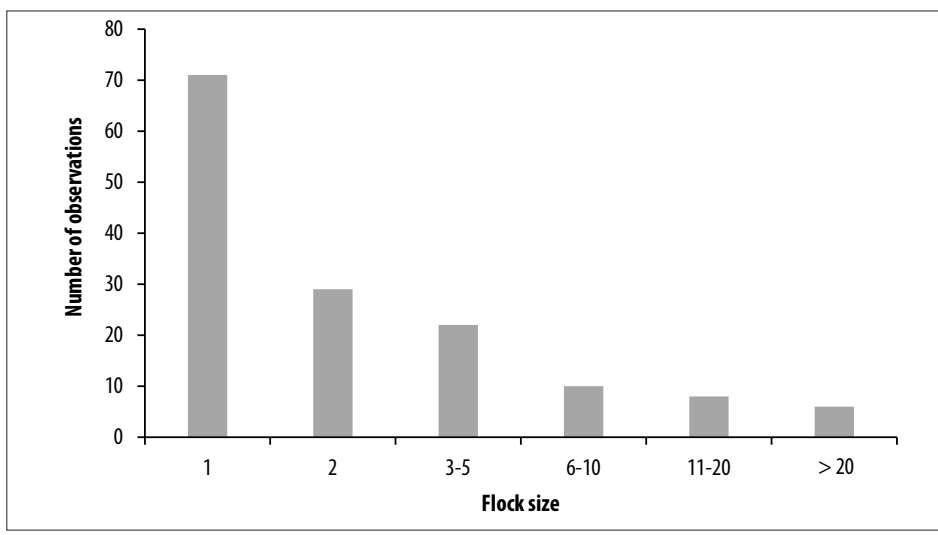

Fig. 3. Distribution of winter flock sizes (n = 146) of Reed Buntings *Emberiza schoeniclus* in winter in Lubuskie Voivodeship

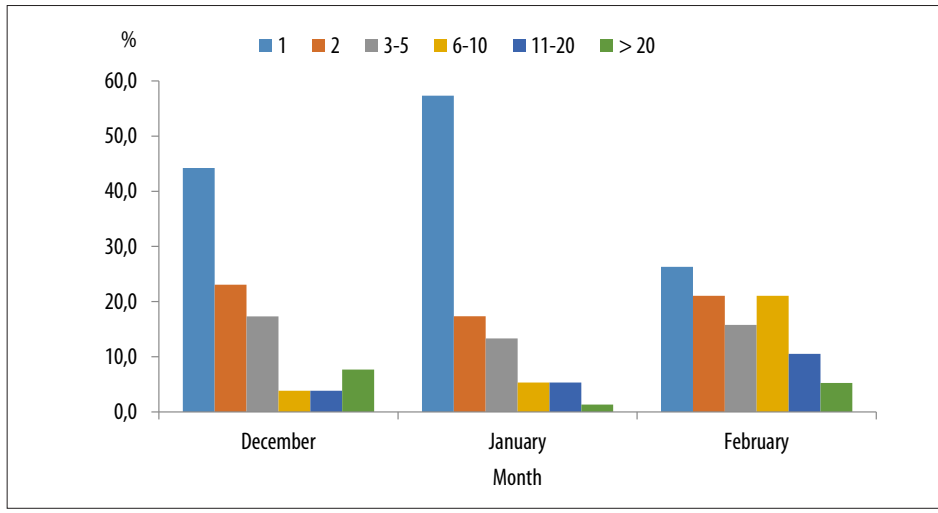

Fig. 4. Number of individual count categories of Reed Buntings *Emberiza schoeniclus* by month in Lubuskie Voivodeship

DISCUSSION

The phenomenon of Reed Bunting wintering in Poland is described differently in regional faunistic monographs. In the Lubuskie region, until the end of the 1980s, it was exceptionally found wintering in fields (Jermaczek et al. 1995). In the region of Zielona Góra in the first decades of the 20th century it was recorded only from March to October (Gruhl 1929). After 100 years, it has been found annually in winter within cultivated fields and rush vegetation (Czechowski et al. 2016). Single birds were regularly found in the valleys of Noteć and Warta rivers and at many lakes in Wielkopolska region (Bednorz et al. 2000). In Silesia, Reed Bunting is a regular wintering bird (Dyrcz et al. 1991). More detailed observations from Wrocław indicate consistent wintering, but the authors emphasize that this is a relatively new phenomenon – at the turn of the 20th century, wintering observations involved only a few individuals. At present, it occurs more frequently in winter, both in wetland biotopes and in cultivated fields (Tomiałojć et al. 2020). In Świętokrzyskie Mountains it wintered annually, being an extremely rare bird in harsh winters and rare during moderate winters. There it was encountered on fish ponds, dam reservoirs and in river valleys. It is more common in fields, fallow fields and rubbish dumps, but also in orchards (Chmielewski et al. 2005). The phenomenon of Reed Bunting wintering is better understood in Małopolska region, where the species has the status of a rare wintering bird, with the highest numbers in December, decreasing markedly in January and February (Walasz et al. 2000). Despite the fact of mentioning the Reed Bunting in regional ornithological monographs, as a regularly wintering species, in detailed studies of the wintering avifauna of different

environments, Reed Bunting belongs to the birds occurring marginally or is completely absent (reviewed in Tryjanowski et al. 2009). It was also not included in the group of dominant species (more than 5% of the assemblage) in winter in various field environments in different regions of Poland (reviewed in Tryjanowski et al. 2009). On the other hand, a detailed study of the winter assemblage of farmland birds in the agricultural landscape of southwestern Poland showed that Reed Bunting was found in five of the seven types of fields studied. In total, it was found in 43 of 117 controlled plots and was the most common species – 37% of the surveyed fields and the third most abundant (Orłowski 2006). Particularly important field types for wintering buntings were young fallows (1-2 years old) and stubbles after root crops, where the highest numbers and densities of wintering birds were recorded (Orłowski 2005).

In the present study, almost half of the observations took place precisely in fallow, weedy areas. Also, some of the observations of Reed Buntings took place near ditches located within agricultural fields and involved birds feeding on vegetation growing on the banks of the ditches. In the described research, a permanent Reed Buntings wintering site was also found on a small fragment of an unused area overgrown with American black cherry *Prunus serotina*. Flocks of Reed Buntings numbering up to 50 individuals were observed there throughout the winter period. In the works cited above, similar types of habitats (e.g., orchards) are also mentioned as wintering sites for this species. Winter observations of Reed Buntings usually involve 1-2 birds (Walasz 2000, Orłowski 2005, the present study). In Małopolska, 53% of observations were of single birds (Walasz 2000), in Lower Silesia about 35% (Orłowski 2005), and in the present study almost 49% of all observations. Groups of 2-5 birds are most common: Lubuskie Province – 35% (this study), Małopolska – 39% (Walasz 2000), Lower Silesia – 28% (Orłowski 2005). Larger flocks of birds, numbering more than 20 individuals, are observed less frequently. In Silesia, flocks of up to 30-50 individuals have been observed, and under favorable food conditions, groups of 100, 200, and even 230 birds (Dyrcz et al. 1991, Tomiałojć et al. 2020, Orłowski 2005, 2006). In Małopolska, the largest recorded flocks numbered up to 50 birds (Walasz 2000). Data on the number of Reed Buntings in winter also come from Świętokrzyskie Mountains, where up to 34.5 individuals per 100 km^2 were recorded in the Nida valley in mild winters, and up to 33 individuals were recorded on ponds in Górki (Chmielewski et al. 2005).

Studies of the food composition of wintering Reed Buntings showed that the seeds of annual weed species *Chenopodium album* (the dominant species – 74%), *Amaranthus retroflexus*, *Setaria viridis*, *Stellaria media* and *Fumaria officinalis* formed the basis of the Reed Bunting's diet. The proportion of dominant weed species in the diet of the Reed Bunting varied according to field type. The most varied food composition was found for birds feeding on root crops, and the least varied in fallow fields (Orłowski & Czarnecka 2007).

The above arguments indicate that the occurrence of Reed Buntings in agricultural landscapes in winter depends on the presence of suitable plant species (weeds) in the fields, the seeds of which the birds feed on (Trnka and Matoušek 1999, Moorcroft et al. 2002, Orłowski 2005, Orłowski and Czarnecka 2007). More detailed studies are still needed of other habitats for winter sightings of Reed Buntings, especially riparian areas – reeds, where the species is regularly seen in winter in many regions of Poland.

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SHORT NOTE

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FADING FEATHERS: DOCUMENTING THE PROGRESSIVE GREYING HOUSE SPARROW (*PASSER DOMESTICUS*) FROM KARNATAKA, INDIA

Color aberrations in birds are relatively common (Guay et al., 2012; van Grouw, 2013). Such aberrations may arise due to reduced genetic diversity stemming from population isolation and inbreeding (Bensch et al., 2000; van Grouw, 2014), exposure to chemical mutagens or radiation (Ellegren et al., 1997; Bonisoli-Alquati et al., 2006), as well as environmental conditions, nutritional deficiencies, diseases, parasitic infestations, injuries, or aging (Guay et al., 2012). One such aberration, progressive greying, is characterized by the gradual loss of melanin pigment with each successive molt. In its early stages, progressive greying manifests as randomly distributed white feathers, often on the head, back, and flanks. Over time, the entire plumage may turn white (van Grouw, 2013). This is the most prevalent color aberration and is frequently misidentified as leucism (van Grouw, 2012, 2013). These color aberrations are hypothesized to negatively impact individual fitness, as evidenced by reduced mating success and heightened predation risk, among other factors (Parsons & Bondrup-Nielsen, 1995; Ellegren et al., 1997; Møller & Mousseau, 2003).

The House Sparrow (*Passer domesticus*), a synanthropic species, is a small songbird in the family Passeridae. Native to Eurasia, it has been introduced worldwide (eBird, 2023). It is listed as a species of Least Concern (IUCN, 2016), yet its populations are declining due to factors such as pesticide and herbicide use, pollution, reduced food availability, and habitat loss (Summers-Smith, 2003; Anderson, 2006; BirdLife International, 2019).

This study documents an observation of a progressive greying House Sparrow (*Passer domesticus*) from Karnataka, India. On January 12, 2022, at approximately 14:43 h, during a casual walk, PC observed an unusually colored sparrow near a flock of 10-12 sparrows in Esthur Hosahalli (13.22°N, 77.86°E), a village in Bengaluru Rural District, Karnataka. The sparrow was perched on the roof of a washroom adjacent to a house on a sunny day. Two photographs of the individual were taken using a mobile phone

before it flew away. Initially misidentified as leucistic, the sparrow was later confirmed to exhibit progressive greying with assistance from Hein van Grouw (Figure 1). The bird was identified as female due to the absence of the black throat bib characteristic of adult males and displayed pale brown plumage. White feathers were scattered randomly, with the highest concentration on the head (van Grouw, 2013). Additionally, feathers on the belly and flanks were worn, exposing underlying down feathers. This represents the first documented instance of a progressive greying House Sparrow in Karnataka and potentially in India. Observations of this kind are rare in India, with only two prior records eliciting skepticism regarding their classification as progressive greying or other color aberrations (Tiwari, 1930; Sankpal, 2023).

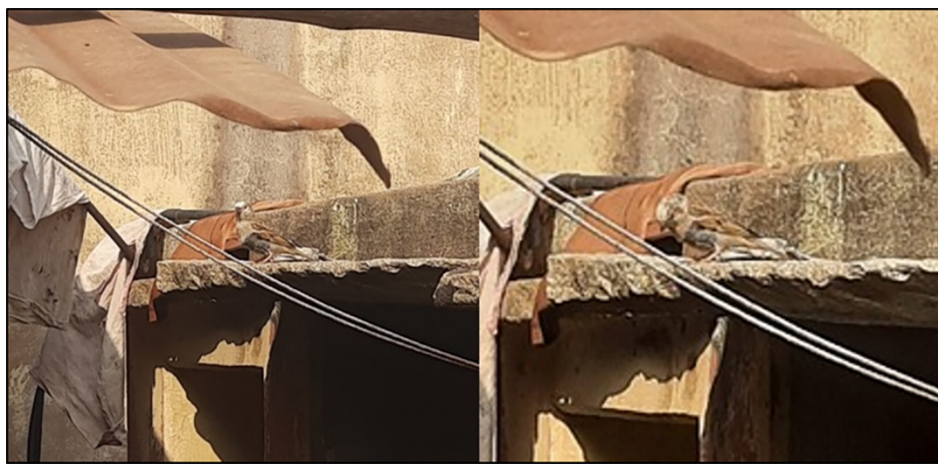

Fig. 1. Photographs of the female progressive greying House Sparrow

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