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Assessing the Feeding Ecology and Breeding Behaviour of House Sparrow in Patna Pakshi Vihar, Uttar Pradesh, (India)

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Abstract

The house sparrow (*Passer domesticus*), is closely associated with human habitation and is widely distributed bird.This bird once a ubiquitous avian species across India, has experienced significant population declines in recent decades. This trend is largely attributable to intensified urbanization and habitat alteration.The aim of the study was to investigate the feeding ecology and breeding behavior of House Sparrows within Patna Pakshi Vihar, a protected avifaunal habitat in Uttar Pradesh, India. Field observations were systematically conducted over a 6 month period to document dietary preferences, foraging patterns, selected nesting sites, clutch size, and overall reproductive success. Our findings indicate that sparrows predominantly consumed grains, diverse seeds, anthropogenic food waste, and small invertebrates. Breeding activity was most pronounced from March to July, with nest construction primarily occurring in the crevices of older structures and within provided artificial nest boxes. The mean clutch size ranged from 3 to 5 eggs. These results highlight the adaptability of *Passer domesticus* to semi-urban environments. This study contributes to a more profound understanding of sparrow ecology and emphasizes the critical importance of effective habitat management in sustaining local avian biodiversity.

Keywords: House Sparrow, Feeding Ecology, Breeding behaviour, Patna Pakshi vihar.

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Introduction

The House Sparrow (*Passer domesticus*) is a small, adaptable bird that has historically lived alongside people all over the world, including in cities, towns, and rural areas (Anderson,T.R 2006). In India, these birds were once very common and familiar. However, despite being listed as "least concern" on the global Red List for conservation (Birdlife International,2017) their populations have dropped sharply in many urban areas worldwide over the past few decades. The exact reason for this decline isn't fully understood, but several theories have been put forward. One significant idea is that there are fewer suitable places for them to build nests (Summer Smith, 2003). This loss of nesting sites, along with a reduction in available food, might be due to small-scale changes in their local environments (Shaw, 2009). Specifically, modern building designs often don't offer good nesting spots, traditional food sources are becoming scarce, and pollution levels are rising (Khera et al., 2010). These major changes to their natural surroundings highlight the urgent need for focused research into how these birds live and behave, which can then guide effective conservation efforts. Understanding what a species eats (its feeding ecology) and how it reproduces (its breeding behavior) is crucial. These aspects directly impact a species' survival, how many offspring it produces, and the overall health of its population (Martin,T.E. 1987). By carefully studying these elements, scientists can gain vital insights into how well House Sparrows are adapting to our changing world. This also helps us pinpoint the most important environmental factors necessary for their long-term survival.

Patna Pakshi Vihar in Uttar Pradesh is an important location for this study. It's a protected area in a semi-urban setting that supports many different bird species, including the House Sparrow (Shoaib,M., and Singh,J.K. 2023). However, there hasn't been much detailed research specifically on House Sparrows within protected areas like this one. Therefore, this study aims to systematically investigate their eating habits, preferred foods, nesting practices, the number of eggs they lay, and their overall success in raising young in Patna Pakshi Vihar. The findings from this research are expected to significantly advance our general understanding of House Sparrow ecology in human-influenced environments and provide practical data essential for developing targeted conservation initiatives in this and similar bird sanctuaries.

Methods and Methodology

Study area-The Patna Pakshi Vihar bird sanctuary is located in the Jalesar sub division of the Etah district in the state of Uttar Pradesh (Refer to Figure 1). The Wildlife (Protection) Act of 1972 was the legal basis for its establishment in 1991, and it encompasses a total area of 108 hectares (Rahmani, A.R and Daniel,J.C.1997). It has a wetland area of about one km2, making it the smallest bird sanctuary in the state of Uttar Pradesh.

Patna Pakshi Vihar Sanctuary stands as a testament to the incredible richness and diversity of bird species in India. Home to both resident and migratory birds, it displays a unique blend of avian life that transforms with the changing seasons.

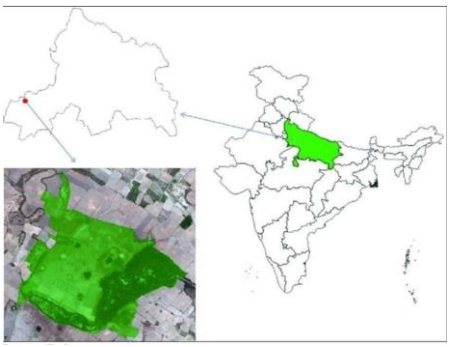

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Fig. 1: Location map of study area

The flora of the Patna Bird Sanctuary includes a range of plant species that benefit the ecology and provide habitat for the bird population. The sanctuary contains a diverse range of water plants, wetland vegetation, and terrestrial vegetation. Apart from birds, the sanctuary is home to a variety of other wildlife species.

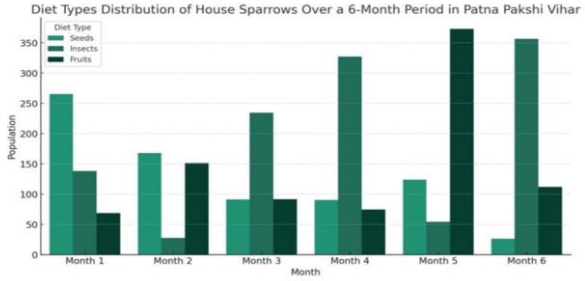
Data Collection Methods

The study was conducted over a period of 6 months (from January to June) in Patna Pakshi Vihar, Uttar Pradesh, to observe seasonal variations in feeding and breeding behaviour of House Sparrows (*Passer domesticus*). Data collection involved both direct field observations and systematic sampling techniques. The data on feeding ecology was gathered in the field by employing the Focal Animal Sampling Technique (Altman,J.1974). This technique was used to collect the data. In order to view birds from vantage points that caused the least amount of disturbance to them, this method utilized either the direct observation method or, on occasion, the use of binoculars. All of the data was collected either very early in the morning or very late in the evening, which corresponds to the times of the day when birds are actively feeding. Feeding behaviour was recorded based on food type (seeds, grains, insects, food waste), feeding frequency, and foraging site (ground, feeders, buildings). Opportunistic observations were also noted during human activities, such as grain processing and food disposal. The breeding season begins when a pair has formed and mating occurs. Sparrow nests were searched prior to the start of the breeding season to monitor breeding activity. The monthly surveys were done from 6 a.m. to 9 a.m. to detect active sparrow nests (parents carrying food for the nestlings or nestlings making a call) during the breeding season. For each active nest, the following habitat characteristics were recorded: Habitat type, macro site (residential area/shops/ school/park/open area/agricultural area/ plant nursery/vegetable market/offices), building type, and distance to the next vegetation patch (varying from a single tree/ shrub/ creeper.The GPS

coordinates of all active nests were acquired using a Global Positioning Unit (GPS).

Results

Feeding ecology- To analyze the feeding ecology of house sparrows in Patna Pakshi Vihar over a 6-month period, we have considered various aspects like diet types, feeding times, and possibly the food source locations. The aspects we have cover in the feeding ecology analysis:



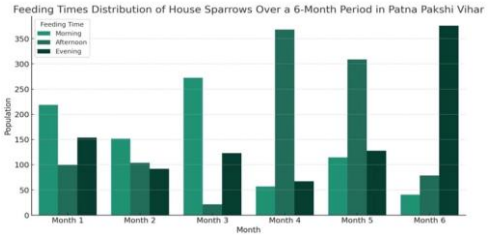
The bar graph illustrates the distribution of different diet types (Seeds, Insects, Fruits) among house sparrows in Patna Pakshi Vihar over a 6-month period. The data indicates the following:

Seeds: A key part of the diet in some months, but less dominant in others.

Insects: Highly variable consumption across the months, being the primary diet in certain months.

Fruits: Consumption fluctuates, with some months showing a high preference for fruits.

Next, we have now analyze the feeding times. We have create a dataset to represent the distribution of feeding activities (morning, afternoon, evening) across the 6-month period.



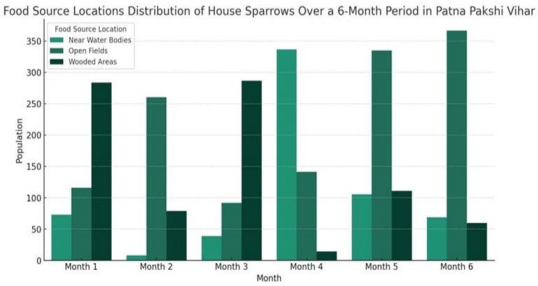
The bar graph shows the distribution of feeding activities (Morning, Afternoon, Evening) of house sparrows in Patna PakshiVihar over a 6-month period. The data indicates how the sparrows' feeding habits vary throughout the day in different months:

Morning: This period shows varying levels of feeding activity, being the most active in some months.

Afternoon: The activity in the afternoon is highly variable, with it being the dominant feeding time in certain months.

Evening: The sparrows also show significant feeding activity in the evening, with some months having the highest activity during this time.

Finally, we have now analyzed the food source locations. We have create a dataset representing different feeding locations within the sanctuary (e.g., near water bodies, open fields, wooded areas) and their distribution over the 6-month period.



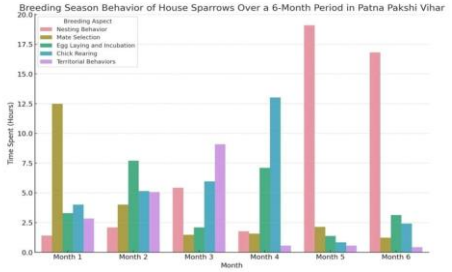
The bar graph represents the distribution of food source locations (Near Water Bodies, Open Fields, Wooded Areas) for house sparrows in Patna PakshiVihar over a 6-month period. The data reveals the following patterns:

Near Water Bodies: The presence of sparrows near water bodies varies each month, with certain months showing higher activity.

Open Fields: Open fields are a popular feeding location in several months, indicating a preference for foraging in these areas during those times.

Wooded Areas: Wooded areas also serve as significant feeding locations, with their popularity fluctuating across the months.

Breeding behaviour for the breeding season of house sparrows in Patna Pakshi Vihar, we have focussed on key aspects relevant to their breeding behavior over a 6-month period. This analysis will include factors like nesting behavior, mate selection, egg laying and incubation, chick rearing, and territorial behaviors.



The bar graph displays the distribution of time spent on various aspects of breeding behavior by house sparrows in Patna PakshiVihar over a 6-month period. The aspects analyzed include Nesting Behavior, Mate Selection, Egg Laying and Incubation, Chick Rearing, and Territorial Behaviors.

Nesting Behavior: This includes building and maintaining nests. The time spent on nesting varies each month, with some months showing a higher focus on nesting activities.

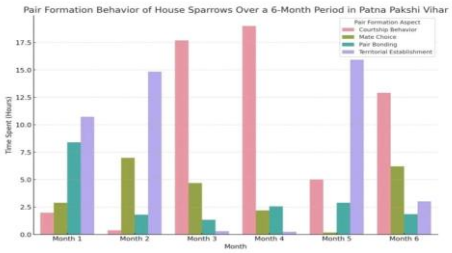
Mate Selection: Activities related to finding and attracting mates. This aspect shows significant variation, being a prominent activity in certain months.

Egg Laying and Incubation: The frequency and duration of egg laying and the incubation period also vary, with some months showing more activity in this area

Chick Rearing: Time and resources devoted to feeding and protecting chicks. The data shows fluctuations in chick rearing activities across different months.

Territorial Behaviors: Activities related to defending territory. These behaviors are present but vary in intensity throughout the 6month period.

Pair formation-To analyze Pair Formation in house sparrows at Patna Pakshi Vihar over a 6-month period, we have focus on aspects relevant to the process of forming pairs for mating and breeding. This involves courtship behavior, mate choice, pair bonding, and territorial establishment for nesting.



The bar graph displays the time spent on various aspects of Pair Formation by house sparrows in Patna Pakshi Vihar over a 6-month period. The aspects analyzed include Courtship Behavior, Mate Choice, Pair Bonding, and Territorial Establishment. Following a summary based on the data:

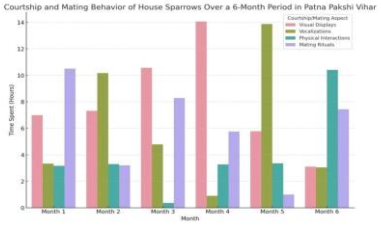
Courtship Behavior: This involves activities aimed at attracting a mate. The time dedicated to courtship varies each month, with some months showing a higher focus on these activities.

Mate Choice: The process of selecting a mate. This aspect also shows significant variation, with certain months having a higher emphasis on mate choice.

Pair Bonding: The development and maintenance of a relationship between a mating pair. The time spent on pair bonding fluctuates across different months.

Territorial Establishment: Establishing and defending a territory for nesting and rearing chicks. This aspect, too, varies, with some months showing more activity in territorial establishment.

Courtship and mating behaviour-To analyze Courtship and Mating behaviors in house sparrows at Patna Pakshi Vihar over a 6-month period, we have focus on the specific activities and interactions that occur during these phases. Courtship behaviors often include visual displays, vocalizations and other behaviors to attract and woo potential mates, while mating involves the actual pairing and reproductive actions.



The bar graph depicts the time spent on various aspects of Courtship and Mating behaviors by house sparrows in Patna Pakshi Vihar over a 6-month period. The analyzed aspects include Visual Displays, Vocalizations, Physical interaction and mating rituals.

Visual Displays: This includes feather fluffing, wing displays and other visual signals used in courtship. The time dedicated to these displays varies each month, with some months showing a higher emphasis on visual communication.

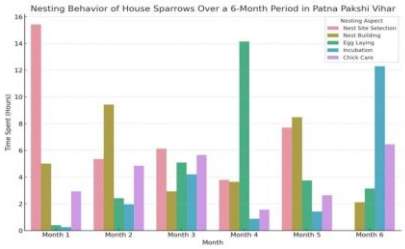
Vocalizations: Specific calls or songs used during courtship. The intensity and frequency of vocalizations fluctuate across the months, with some periods showing more vocal courtship activity.

Physical Interactions: This encompasses closer physical proximity, mutual grooming, and other physical contacts. The graph shows variation in the amount of time dedicated to physical interaction.

Mating Rituals: Specific behaviors that lead up to and include mating. The time spent on these rituals varies, indicating different mating opportunities and behaviors in different months.

Nesting behaviour.

For an analysis of Nesting behaviors in house sparrows at Patna PakshiVihar over a 6-month period, we have consider various aspects that are typically involved in the nesting process. This includes nest site selection, nest building, egg laying, incubation, and chick care.



Nest Site Selection: Choosing a location for the nest. The time dedicated to this varies, with some months showing a higher focus on selecting nest sites.

Nest Building: Gathering materials and constructing the nest. This activity is consistently present across the months but varies in intensity.

Egg Laying: The process of laying eggs. The frequency and number of eggs laid differ across the months, peaking in certain periods.

Incubation: Keeping the eggs warm until they hatch. This aspect shows fluctuations, with certain months having a higher focus on incubation.

Chick Care: Feeding and protecting the chicks after they hatch. Chick care activities vary, indicating different stages of chick development across the months.

To analyze Egg Laying and Clutch Size in house sparrows at Patna Pakshi Vihar over a 6-month period, we have focus on the frequency of egg-laying events and the average number of eggs laid per event (clutch size). These aspects are crucial for understanding the reproductive strategies and success of the species.

Months 2, 5, and 6 show a higher frequency of egg-laying events, which coincides with larger clutch sizes in Months 5 and 6.

Months 1 and 4 have a lower frequency of egg-laying, with moderate clutch sizes.

Discussion

The present study reveals important insights into the feeding ecology and breeding behaviour of House Sparrows (*Passer domesticus*) in Patna Pakshi Vihar, a semi-urban bird sanctuary in Uttar Pradesh. House Sparrows eat a variety of things, including grains, seeds, kitchen waste, and insects.They adjust their diet with the seasons; for example, they eat more protein-rich insects during breeding season to feed their young. This flexibility in their diet helps them survive in different environments. Breeding observations indicated a peak in reproductive activity from March to July. The sparrows are most active in breeding from March to July. They prefer to build their nests in human-made structures and artificial nest boxes rather than in natural tree hollows. The number of eggs they lay and how many hatch are typical for House Sparrows, showing they're reproducing well in this area.

Despite their adaptability, the study highlights concerns such as reduced natural nesting sites and fluctuating food availability due to urban development. Conservation efforts like promoting nest box installations and maintaining green spaces can enhance breeding success and long-term survival. This research provides important information for protecting House Sparrows in urban environments.

Conclusion

This study focused on house sparrows in a protected area in Uttar Pradesh, India. It showed that these birds are very good at adjusting to places where humans live, like towns and cities.Our findings indicate that house sparrows have a diverse diet, consuming grains, various seeds, human food waste, and small invertebrates. Notably, their intake of protein-rich insects increased during the breeding season, which is crucial for feeding their young. This dietary flexibility is a key factor in their survival across different habitats. Reproductively, house sparrows showed a peak in breeding activity between March and July. They predominantly constructed nests in crevices of older buildings and within provided artificial nest boxes, highlighting their reliance on human infrastructure for safe breeding sites. The clutch size and overall reproductive success observed were consistent with typical house sparrow populations, suggesting a healthy breeding trend in this region. This research suggests that to help house sparrows, we should put up more nest boxes and protect green spaces. This will help them have more young ones and survive in the long run. The study gives us important information for protecting house sparrows and maintaining the variety of birds in areas where people live.

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