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Original Article

Study on Declined Breeding Behavior of House Sparrows (*Passer domesticus*) and Factors Affecting its Population in Tando Allahyar, Sindh

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ABSTRACT

In this world, different terrestrial bird species are major factor that contribute significantly to biodiversity, especially in green vegetated areas on land and in marine or freshwater environments. **Objective:** To find out the declined breeding biology of House Sparrow bird, belonging to the *Passeridae* family, worldwide. The female Sparrow has a dull color, while the male is brightly colored and is mostly found in rural areas with human populations nearby. **Methods:** The study was conducted in three different villages in Taluka Jhando Mari from March 2023 to March 2024. **Results:** A total of 108 clutches were observed, with a total of 436 eggs. Out of these, 351 eggs hatched, resulting in an 82% hatching success rate, while 35 (9.34%) eggs were non-fertile and 43 (11.01%) were broken or damaged. The maximum number of populations was recorded in June, and the minimum in December in different Talukas. **Conclusions:** It is concluded that the variation in the population and breeding biology of House Sparrows can be increased by providing artificial nests during the breeding season from March to June.

INTRODUCTION

Birds are ranked based on various criteria and can be considered as "indicator taxa". On local level, the distribution patterns of birds may not always align with the distribution patterns of other species [1]. In terrestrial environments, birds play a crucial role in biodiversity, particularly in well-vegetated areas, compared to freshwater or marine habitats. It is widely acknowledged that birds serve as valuable (albeit imperfect) indicators of

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endemism patterns and species richness within an ecosystem, aiding scientists in assessing ecological degradation [2, 3]. The house sparrow (*Passer domesticus*) is a common bird species found worldwide, often in light wooded areas in both rural and urban environments. It has a symbiotic relationship with humans. The house sparrow, with a typical length of 16 cm, has a pale brown and gray female and a brightly colored black, white, and brown male. It prefers nesting in man-made structures like buildings and street lights and aggressively defends its nest holes. Sparrows play a crucial role in maintaining ecosystem balance by being part of various food chains and webs. They are omnivorous, dimorphic, and adapted to a sedentary lifestyle. Despite once being abundant, sparrow populations have been declining in recent decades, possibly due to environmental changes. Reviews of general biology and breeding of the house sparrow were conducted by various researchers in Pakistan [4-7]. Other studies conducted by Nice and Ali *et al.*, who provided detailed information on the mating time and reproductive pattern in the North America and the Baroda city of district Gujrat, India respectively [8, 9]. In India, the breeding season varies by region, lasting from March to September in the north, October in central India, and throughout the year in the south [10].

This study aimed to fill the gap in understanding the breeding biology of the house sparrow, which is less studied in temperate zones. Research on the breeding biology of the house sparrow was initiated in Tando Allahyar to observe their population and factors affecting it.

METHODS

The study regarding the breeding biology of House Sparrow was conducted at different villages 3 different Talukas Jhando Mari, Tando Allahyar and Chamber district Tando Allahyar. Basically, Tando Allahyar district is an agricultural and mainly associated with rural area within experimental crops of maize, wheat, mustered and pulses. In the study area, there are mostly kutcha houses made up of mixed mud and wheat straw and cattle sheds where the birds took shelter and were used for breeding activities. The climate condition of the study area is of hot type with May to August in summer conditions. The sparrows were seen in the different village areas throughout the year. Many nests in various locations in residential area were selected to record egg laying date, clutch size incubation and nestling periods. No nest boxes were installed and the data were based on observation of natural nest and only fully constructed nests were taken for recording the data. The nests were checked at regular interval.

RESULTS

Size of Egg Cultch and Incubation Period

The eggs were light green or off-white with brown markings, with the brown markings focusing on the base details are in (Table 1). In the study, house sparrows completed 109 clutches in 78 number nests with an average of 3-5 number of eggs per nest. There was a total of 436 eggs (n=436) in the study. The average size of a complete clutch is 380 eggs, and female sparrows lay 2 to 5 eggs per clutch.

Table 1: Average result of clutch and no. of eggs and no. of nests of house sparrow in Tando Allahyar

Parameters	Frequency
Total No. of Clutch	109
Total No. of Clutch	109
Average Clutch Size	3.90 eggs/nest
Total No. of Nest	78
Total No. of Eggs	436
Average No. of Eggs/Nest	3-5

The average egg size was 2-2.3 cm in length and 1.4-1.7 cm in width as shown in figure 1.

(A) (B)

Figure 1: (A) Eggs of House Sparrow in One Clutch Showing Brown Markings; (B) Average Egg Size Showing Brown Spot

Nesting, Hatching and Mortality in Nests of House Sparrow

In the study area, out of the 351 hatched eggs, 202 nestlings flew successfully out of the nests, and 130 were found missing (including dead nestlings), resulting in a mortality rate of 39.16%. Nestlings of the House Sparrow have a high mortality rate, and the most common reasons were found to be falling out of nests. This accidental falling out of the nest was observed when the nestling is 3-10 days old. The breeding success, in the ratio of nestlings fledged out of the nest to the number of eggs laid, and overall breeding success in the House Sparrow was calculated as follows:

$$\frac{\text{Total no. of chick fledge}}{\text{Total no of eggs laid}} \times 100$$

The calculation shows that out of 436 eggs laid, 168 nestlings flew out of the nest, resulting in a breeding success rate of 48.01% (Table 2).

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Table 2: Results for nesting and hatching of house sparrow

Number of Nests	Laid Eggs	Hatched Eggs	Dead Nesting	Number of Nest Flew Outs
1	12	8	4	3
2	18	11	3	2
3	3	1	0	5
4	7	3	1	2
5	22	14	2	4
6	15	11	3	6
7	14	17	5	1
8	6	2	1	7
9	9	3	2	3
10	23	18	3	5
11	13	11	5	7
12	11	7	3	8
13	9	5	1	3
14	17	11	5	9
15	15	14	7	6
16	23	19	2	4
17	16	11	3	1
18	11	13	7	9
19	18	11	5	7
20	12	9	4	6
21	21	17	7	5
22	21	22	4	4
23	25	21	3	0
24	17	15	8	0
25	22	19	3	5
26	15	19	11	3
27	21	17	6	7
28	19	22	3	1
Total	436	351	201	168

Monthly Variation in Population

The result for monthly variation in population was observed that significantly higher (P<0.05) population of House sparrow was recorded during the month of March to June in Taluka Jhando Mari as compsred with other talukas, whereas their population was recorded low during the month of February in Taluka Tando Allahyar as compared with other talukas(Figure 2).

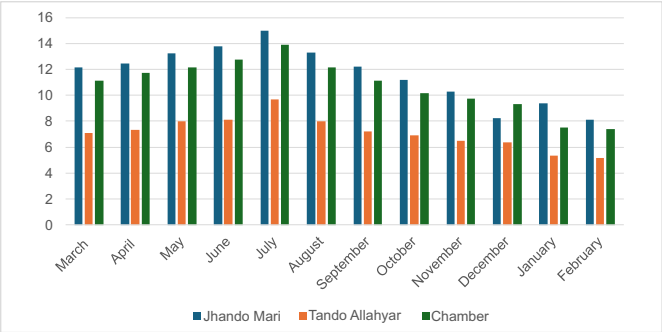

Figure 2: Graphical Explanation of Monthly Variation among the Population Habitat of House Sparrow in Different Taluka of Tando Allahyar

DISCUSSION

In our study various parameters of House Sparrow eggs including egg size, width, clutch size and clutch percentage and ovulation period were recorded. The results showed that size distribution of eggs in the clutches was as follows: 3 eggs in 42 clutches (39.21%), 4 eggs in 36 clutches (33.61%), 5 eggs in 28 clutches (26.24%), and 2 eggs in 4 clutches (3.90%). During the inspection, very few clutches were found, and only one egg was found, which was later determined to be incomplete and not used to determine the clutch size The findings were in accordance with the result of Houde, who reported ovulation period is 19 hours [11]. Nice reported an average egg size of 34 for house sparrows in Vadodara, Gujarat [8]. Bulletin of the British Ornithologists' Club reported that most bird eggs range from 2 to 8 eggs, but in the subspecies *Passer domesticus bactrianus* [12]. Batool *et al.*, found a brood of 10 eggs. The incubation period is the time interval between ovulation and the hatching of the last egg [13]. They opened their eyes at 3-5 days old and develop feathers by 12 days. The nestling period lasts 14-20 days, with an average of 16.30 days [14]. The incubation period of the sparrow begins after the last egg is laid and lasts 13-15 days on average. Incubation work is shared by both parents, with females doing most of the work, especially at night when the female sits on the eggs while the male rests nearby. Rajashekar and Venkatesha noted that sitting on the eggs does not necessarily mean they are actively heating them [15]. Hatching success data were obtained from 436 eggs, with 351 hatching, resulting in a hatching rate of 82%. Of the 456 eggs, 43 were empty (9.34%) and 43 were damaged or broken (11.01%). The result for monthly variation in population was observed that highest population of House sparrow was recorded during the month of March to June, whereas their population was recorded low during the month of February. Similar results were reported by Singh *et al.*, and Hanson *et al.*, in Jammu regarding population of House sparrow which was low during the cold temperature in different areas [6, 7]. Additionally, researchers have previously noted seasonal fluctuations in their number in particular area [16-18]. Bohner *et al.*, reported a significant continuous decrease in ice volume during a certain time period reported that the house sparrow population declined during the winter [19]. Furthermore, Goyal reported that the population density of house sparrows is affected by various climatic conditions and environment influences including, higher temperature, thunder rain, and

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sudden fluctuation in humidity level [17]. In our study the dense population of House Sparrow was found to be declining in rural open spaces during the ice season, rural residential areas, agricultural areas, and fallows during the hot humid and rainy conditions in various, huskers, warehouses, rice and animal sheds. Whereas, the findings of our study reported relatively variation among monthly population and reason was not recognized the birds absent. It has been reported that reduction in population of birds in particular areas including open spaces of villages, animal sheds, Kutcha houses and agriculture lands having tress in Kurukshetra city of India [5]. This declined might be due to spray of different pesticides, damaging of nest due to heavy rain and air or different rays released by mobile towers [20]. Furthermore, in our investigation, interspecific competition with common white wagtail (*Turdoides caudata*) was in areas with high house sparrow density was studied. It may be a contributing factor to the decline in its population due to preference of same type of area by these species of birds [14].

CONCLUSIONS

Our study provides valuable insights for conservation efforts to address the decline of House Sparrow populations in Tando Allahyar, Sindh. It was concluded that House Sparrows prefer to build their nests on the roofs of mud houses, cattle sheds, and crevices of different buildings. Their breeding season was observed to be from April to October, due to the hot and cold weather in the remaining months.

Authors Contribution

Conceptualization: RRK, HAK
Methodology: RRK, HAK, GMS, ZL, RAM, IA
Formal analysis: RRK, HAK, GMS, ZL, RAM, IA, DHJ, HJ
Writing-review and editing: RRK, HAK, GMS, DHJ, HJ, SMS, MN

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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