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Impact of Urbanization on Nest Site Selection and Fecundity Rate of House Sparrow, *Passer domesticus* Population

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ABSTRACT

Population of house sparrow is fast declining due to danger posed to their survival by the factors, such as, lack of nesting sites due to modern architecture of building, lack of seed food, insect food and predators. Hence the present study was undertaken to study the impact of urbanization on the nest site selection and fecundity rate by the house sparrow population between the rural and urban places of Sivakasi and Rajapalayam Taluks of Virudhunagar District, Tamil Nadu. Among the 111 nesting sites observed 16 nests were found to be present in the urban study sites and the remaining 95 nests were observed in rural study sites. We also investigated the nest height selection by the house sparrows and found that the height of nest observed in urban places was found to be higher when compared with the rural study sites. From the statistical analysis we also found that the number of olden styled architectural buildings show positive correlation with the number of house sparrow population as well as nesting sites. It is affirmed to say that availability of nesting sites in an area determines the number of sparrows due to absence of nesting sites in the modern architecture of buildings.

Key words *: 9rnithologists, Modern architecture of building, Lack of nesting sites, Abundance and sex ratio*

Introduction

Biodiversity is an integral component for the sustainable development of every living organism on the earth. But the pressure on the environment caused by human activities for his economic development and other make it difficult to protect the natural areas from his activity (Graham, 2004). As far as bird diversity is concerned, India has a rich diversity index of birds species. There are more than 1200 bird species which covers 13% of the world bird species found. It is also found that India is the third country which is having the largest number of rare and threatened species followed by Brazil and Indonesia. The major issue concerning the threat of Indian birds is the habitat loss in many regions of our country (Rahmani, 2008).

According to Marzluff (2001) urbanization results in direct and indirect effects on native flora and fauna of a region. This effect affects the birds in their settlement ecosystem processes, habitat, food, predators and competitors, and diseases. These may leads to significant changes in the population biology of birds with resulting effects on the structure and composition of bird communities in urban areas.

As house sparrows are generally associated with human habitation, they tend to stay in the region

with structures built with many holes under the tiles. These sites may use for nest construction and egg laying. It was believed that, with man's dominance of the world, the future would be bright for the house sparrow, because the sparrows followed man everywhere he went, but it is now becoming evident that, this is not the case, particularly in the highly developed region of urban and semi urban areas (Laet and Smith, 2007). According to the latest report by various environmental organizations and research publications, there has been a decline in their numbers (80%) during the past decades in world (Bokotey and Gorban, 2005; Erskine, 2005; Hole *et al*. 2002) Their recent decline around the world has put them in the Red list of the International Union for the Conservation of Nature (IUCN, 2000).

In recent decades India has seen a theatrical decline in the number of house sparrow population in different Indian cities namely Bangalore, Mumbai and Hyderabad (Citizen Sparrow Report, 2012). Researchers from Andhra Pradesh reported that the sparrow population has declined about 80% whereas in West Bengal, Gujarat and Rajasthan the population has dipped by 20% (Ghosh *et al*., 2010; Joshi, 2009; Anjan *et al*., 2010). Hence the present study is undertaken to study the impact of urbanization on the nest site selection and fecundity rate of house sparrow population between the rural and urban regions of Sivakasi and Rajapalayam Taluks.

Materials and Methods

The present study was carried out to survey the current status of house sparrow, *Passer domesticus* population with reference to their distribution, nature of nesting site selection, nesting height preferences by the house sparrow in urban and rural places of Rajapalayam and Sivakasi Taluk, Tamil Nadu, India from December 2019 to December 2020.

Method of sampling

Each study site was visited thrice for a season. A census visit constituted three hours a day between 06:00 am and 09:00 am (IST), when the house sparrows were most active and conspicuous. Based on the experience it was noted that the house sparrow had a separate foraging ground, breeding place and roosting place in an area. Recording were not made during raining or when the wind speed exceeded the limit.

The study area was divided into grids of 1 sq.km based on the size of the study area. In each grid of 1 sq.km, 5 points were selected and the population of house sparrow was counted. In a census grid, the points should be 100 m apart from each other points (Hostetler and Main, 2001). Along with the number of house sparrows, other details such as, number of old and new buildings, number of nesting sites and the eggs laid by the house sparrows were also counted and noted.

Sampling sites

The present investigation was carried out in Sivakasi and Rajapalayam Taluks of Virudhunagar District, Tamil Nadu, India. Sivakasi Taluk is located at 9.45°N 77.8167°E. The town is known for crackers and match factories that produce 70% of the country's produce. Rajapalayam is located at 9° 272 N to 77° 332 E. It is located 85 km southwest of Madurai in the state of Tamil Nadu. The economy is based on the manufacture of textiles, and there are mills for spinning and weaving cotton, as well as a large cotton market. Both the Taluks contains many villages and towns where the socio-economic status of people differs. In each Taluk three rural and urban sites were selected for the present investigation.

Results

The present investigation aimed to study the nature of nesting site selection, nesting height preferences by the house sparrow population, *Passer domesticus* in Rajapalayam and Sivakasi Taluk, Virudunagar District, Tamil Nadu. From the Table 1 it was inferred that 111 nesting sites were observed in the present investigation sampling sites. Out of 111 nesting sites 16 nests were found to be present in the urban study sites and the remaining 95nests were observed in rural study sites. The maximum numbers of nests were observed in the rural study site of Atchamthavilthan (24) and low number of nest was observed in Sivakasi Town (1), Rajapalayam Town (2) and Satchiyapuram (2). The heights of the nest were measured and it was found to be maximum in Sivakasi town (18.41m) followed by Rajapalayam Town (16.21m). The height of the nesting sites were found to be minimum in rural study sites of Saminatham (5.84m) and Atchamthavilthan (6.38m) when compared with urban study sites.

According to our investigation we also found that the ratio of olden and modern styled architectural

Table 1. Survey of house sparrow nesting site and its height with number of old and modern architectural buildings in the sampling sites

Name of the Sampling Site	Number of nest observed[a]	Mean height of the nest site (in meters)	Number of olden styled architectural buildings	Number of modern architectural buildings	Number of House sparrow population[b]
Rajapalayam Taluk					
Urban study sites					
Rajapalayam town	2	16.21	12	48	8
Thalavaipuram	4	14.23	21	52	12
Muhavoor	4	12.46	24	41	18
Rural study sites					
Meenachiapuram	10	8.12	42	12	46
Mangudi	12	7.84	38	8	58
Sundaranachiyarpuram	14	7.68	48	6	52
Sivakasi Taluk					
Urban study sites					
Sivakasi town	1	18.41	6	64	6
Thiruthangal	3	12.26	14	52	12
Satchiyapuram	2	14.66	11	74	2
Rural study sites					
Narnapuram	14	6.72	62	8	68
Saminatham	21	5.84	68	6	72
Atchamthavilthan	24	6.38	72	4	64
Total	111				

[a] Positive correlation between the Number of nest observed and number of olden storey buildings within the study area
[b] Positive correlation between the number of olden storey buildings and number of house sparrow population within the study area

buildings plays important role in determining the number of house sparrow population. From the Table 1 it was found that all the urban study sites having more number of modern architectural buildings found to have a low number of house sparrow population when compared with the rural study sites (Figure 1).

While studying the fecundity rate of house sparrow population between the rural and urban regions of sampling sites it was found that the average fecundity rate in rural study areas was maximum when compared with the urban fecundity rates. The maximum fecundity average was found in Meenachipuram (3.6) rural sampling site and minimum fecundity average was found in urban sampling site of Thiruthangal (1.3) (Table 2).

Discussion

We all know that the status of house sparrow is found to be decline in different parts of our country as well as in different part of the world. There are many factors involved in the decline of house sparrow population such as availability of nesting sites, food source, competition and predation. Among these factors, non availability of nesting sites is an important phenomenon for reproducing its progeny. Hence the present study focus to study the

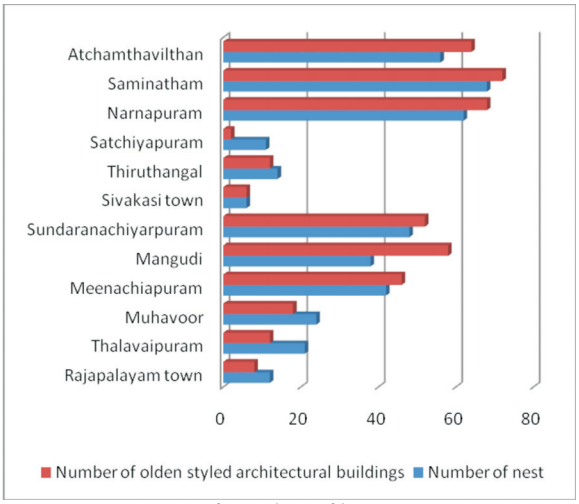

Fig. 1. Comparison of number of house sparrow nest and the number of olden styled architectural buildings in the sampling sites

nesting site selection and preferences by the house sparrow population in selected places of Sivakasi and Rajapalayam Taluk.

Based on our oral investigation and recordings in the sampling sites we found that the density of house sparrow population has begins to lower in numbers than in the previous decades. Similar kind of findings was supported by Murgi and Macias (2010) whom studied the population in Valencia, Spain from 1998 to 2000 and found that there is a 70% decline in the number of house sparrow population in the wider inbox landscape when they conducted the survey. They reported that this decline has coincided with highintensity urban development i.e. an increase in the building density and a reduction in the amount of wastelands and other feeding habitats.

The present investigation supports that agriculture in an area can play an important role in maintaining the number of house sparrow population. Because in all the rural sampling sites agriculture is prime business of the people. This is supported by Monika (2005) who said that, the population of house sparrow in the Haridwar, Uttarkhand was found to be more in the areas where large hectares of agriculture was taking place when she compared with the highly developed residential areas. Similarly Ramachandra and Sudhira (2011) who studied the changes in land use pattern in Bangalore and observed that the human population is significantly rise in number from 27.3% in 1992 to 35.37% in 2009 and thus leads to emergence of built-up areas and multi-storey buildings which may affected the distribution of house sparrows population in Bangalore recently. They also reported that in some place there is a absence of house sparrows in several blocks of Jayanagar, parts of Malleshwaram, Indiranagar, Vidyaranyapura in Bangalore where the traditional buildings has been replaced or renovated with new architecture of buildings. These studies support the present investigation where we also reporting the presence of low number of house sparrow population in urban areas of the sampling sites.

Observation on the nesting site during the present investigation revealed that the house sparrow population prefers to nest more in rural sampling sites then in the urban study sites. Bhattacharya *et al*. (2011) also reported that the sparrow has good response towards the artificial nest boxes erected in different urban places of West Bengal, India.

The nesting site study was supported by Wooton *et al*. (2020) who found that house sparrow prefer older property building which had a nest site availability when compared with the new property buildings in London. Similarly in the present inves-

Table 2. Comparison of fecundity rate of house sparrow population between the rural and urban study sites

Name of Sampling Site	Number of nest observed	Number of eggs observed	Average number of eggs	Average Number in rural/urban sites
Rajapalayam Taluk				
Urban study sites				
Rajapalayam town	2	4	2	2.25
Thalavaipuram	4	9	2.25	
Muhavoor	4	10	2.5	
Rural study sites				
Meenachiapuram	10	36	3.6	3.46
Mangudi	12	42	3.5	
Sundaranachiyarpuram	14	46	3.3	
Sivakasi Taluk				
Urban study sites				
Sivakasi town	1	2	2	1.76
Thiruthangal	3	4	1.3	
Satchiyapuram	2	4	2	
Rural study sites				
Narnapuram	14	48	3.4	3.33
Saminatham	21	73	3.4	
Atchamthavilthan	24	78	3.2	

Plates: a & b – Nesting sites in olden styled architectural buildings; c & d - number of eggs laid in rural and urban study sites; e – opportunity nesting site in urban sampling site; f – response of house sparrow to artificial nest boxes in urban study sites.

tigation we also found that the modern architecture of building does not have adequate spaces for house sparrow to build its nest in emerging suburban area of investigation. While comparing the fecundity rate of house sparrow population between rural and urban study sites it was revealed that the abundance of food in rural sampling sites makes them to lay more eggs.

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Conflict of Interest

The author doesn't have any conflict of interest in publishing this manuscript.

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