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UTILIZATION OF ARTIFICIAL NEST BOXES BY HOUSE SPARROW *PASSER DOMESTICUS* IN URBAN AREAS OF UDHAGAMANDALAM, THE NILGIRIS, INDIA

ABSTRACT

The study was conducted from June 2015 to May 2016 in the Udhangamandal urban areas of The Nilgiris, Tamil Nadu, India. Artificial nests were placed in three different habitats namely Market area, Residential area, and Institutional areas. In each study site 50 next boxes were erected which includes Wooden boxes (n = 10), Paper boxes (n = 10), Bamboo piece (n = 10), PVC pipes (n = 10) and Mud pots (n = 10). Among the three different habitats, the nest box results shows that Market area had a number of nesting attempts in nest boxes (n = 39). The most used type of nest boxes by house sparrows were the mud pots (n = 23). The nest box productivity was highest in the market area (n = 26). Of the different types of nest boxes, the mud pot (n = 16) recorded the highest productivity. A total of 48 successful nests produced 67 chicks while an additional 39 chicks fell out of the nest and died. The market area produced 37 fledge chicks from the 26 nests, while the mud pot nests contained 31 fledged chicks from 16 nests.

Key Words: Artificial nest boxes, House Sparrow, Udhagamandalam, Nilgiris, Tamil Nadu, India

INTRODUCTION

House Sparrows *Passer domesticus* is the commonest and widest distributed bird species in nature. It is primarily associated with human habitation e.g., agricultural land, village and urban areas (Lowther and clink 1992). The optimum habitat for house sparrow in temperate regions is a combination of buildings with holes under tiles or eaves to provide suitable nesting sites and sufficient green areas to provide insect food for the young (Summer-smith 1988). House Sparrow numbers have declined by about 60% in urban and suburban areas and the habitat composition and quality in urban-suburban landscapes is likely to have changed over this period (Dott 2006). In large

cities, the number of House Sparrows decreased significantly in recent decades. A large reduction in the sparrow population in London (60%), Glasgow (99%) and Hamburg (77%) have resulted in the inclusion of this species on the UK Conservation Red List (Crick *et al.* 2002, Prowse 2002, Smith 2003). The main reasons for the decline of this species in the urban-suburban landscape has been the loss of suitable foraging habitat (Robinson *et al.* 2005) and the loss of suitable nesting sites. According to a survey on the occurrences of the house sparrow in India, the population has also decreased considerably in recent years (Rajashekar & Venkatesha 2008, Daniels 2008, Khera et al. 2010, Ghosh *et al.* 2010).

The study of bird ecology and urbanization is poorly reported in ecological research, but is of increasing importance given the proliferation and magnitude of anthropogenic effects today (McDonnell & Pickett 1990). Urbanisation has complex direct and indirect effects on native flora and fauna. With respect to birds, Marzluff (1997) suggested that settlement can change ecosystem processes, habitat, food, predators and competitors, and disease. These effects lead to significant changes in the population biology of birds in urban areas with resulting effects on the structure and composition of bird communities (Marzluff 2001). Karthick *et al.* (2016) studied the population of house sparrow in Ketty Valley, The Nilgiris. Karthick et al (2017) reported House Sparrows feeding on dressed meat. However these studies concentrated on population and feeding ecology and none of the studies considered the utilization of artificial nest boxes by house sparrow in the Nilgiris. Thus, this present study researched the use of artificial nest boxes by house sparrows in the urban areas of the Udhagamandalam Taluk.

MATERIALS AND METHODS

Udhagamandalam Taluk is located has an average elevation of 1800m above mean sea level. The study was conducted from June 2015 to May 2016. Artificial nests were placed at three different sites namely Market area, Residential area and Institutional areas in Udhagamandalam town. Five types of artificial nests were erected, namely Wooden box, Paper box, Bamboo pieces, PVC pipe and Mud Pots. Straw, fur and moss raked from the lawn were also supplied to the sparrow as nesting materials (Chetan 2012). In each study site 50 next boxes were erected, Wooden boxes (n = 10), Paper boxes (n = 10), Bamboo piece (n = 10), PVC pipes (n = 10) and Mud pots (n = 10). The boxes were placed at heights of approximately 4-7 meters above ground level. The nest boxes examined at five days interval during the study period. Nest monitoring was done in the early morning (07:00 to 09:00 hrs) and late evening from 16.00 to 18.00 hrs) (IST) at regular intervals. The entry and exit of sparrows was noted by visual observations while nest activities were recorded by the use of camera and binocular (Balaji *et al.* 2013).

DATA ANALYSIS

A t-test was performed to measure the degree of success of artificial nest boxes with respect to habitat and nest box type. Similarly, χ^2 was usedto obtain the degree of success of artificial nest boxes with respect to productivity by habitat and nest box type. GraphPad Prism 5 is used to the analyze the data

RESULTS

Among the three different habitats the market area shows significantly high number of nesting attempts in nest boxes (n = 38) (t = 5.4214, p = 0.0006) compare with the other two habitats (institutional area (n = 26; t = -0.6963, P = 0.5059) and residential area (n = 24; t = 1.0445, p = 0.3268). Among the different type of nest boxes mud pots (n = 23) were highly utilized by house sparrows followed by paper boxes (n = 20) and PVC pipes (n = 18). Bamboo nest boxes were the least attractive to house sparrows. Significantly more nesting attempts were make in the Mud Pots (t = 11.314 p = 0.003) compared to the other nest boxes (Table 2). The nest productivity was highest in the market area (n = 26) followed by the residential area (n = 14) and institution area (n = 8). The utilization of nest boxes by sparrow was significantly different between habitats (χ^2 = 16.58 df = 4 p = 0.0023) (Table 3). In addition, different types of nest boxes had differing productivity with mud pots (n = 16) recording a significantly higher productivity than by wooden and paper boxs (n = 10), PVC pipe (n = 8) and Bamboo (n = 4) (χ^2 = 15.61 df = 8 p = 0.0483) (Table 4). However, the response to an artificial nest box is also influenced its position within a particular site. A total of 48 productive nests successfully produced 67 chicks. However an additional 39 chicks fell from the nest and died (Table 5). The market area produced 37 fledged chicks from 26 nests, while mud pots produced 31 of these chicks from the 16 nests (Table 6).

DISCUSSION

Loss of nest sites especially in modern architectural style buildings plays a vital role in the decline of House Sparrow populations (Pineda *et al.*, 2013). In addition, lower socioeconomic status in urban areas results in buildings in worse condition thus providing more nesting sites for House Sparrows. However, the house sparrow is flexible in its choice of nest sites and will nest in other available places (including nest-boxes), when those in buildings are lacking (Shaw *et al.* 2008). Being a cavity-nesting bird, the use of artificial nest boxes may help to slow the population decrease of House sparrow in the urban-suburban environment. This work highlights the positive response of the House Sparrow *Passer domesticus* to artificial nest boxes in different habitats of Udhagamandalam town. The present study found that the market area had the highest use of artificial nest box by House Sparrows in an urban area of Udhagamandalam. Balaji *et al.*(2013) and Balaji (2014) found that residential areas had the highest number

of utilized nest boxes in Virudhunagar District, Tamil Nadu. A similar response by House Sparrows towards artificially placed nest boxes was reported by Balakrishnan *et al.* (2011) from Manjeri municipality, Kerala. The availability of nest sites is one of the most important factors influencing Sparrow abundance in urban environments (Anderson 2006). The high use of boxes observed in the market area may be due to the availability of food, such as grains, insects, especially caterpillars, which contribute to the high density of Sparrows in the market area. Rana and Idris (1989) also reported a high density of house sparrows in the grain markets in urban areas. Habitat quality is known to have a major influence on Sparrow populations, through the availability of food sources. The feeding grounds of sparrows in the market area are the grains and larva of aphids and various insects which they used to feed their young. Simwat (1977) reported that availability of a variety of food sources for both adults and nestlings and essential nesting sites around the food sources play an important role in the abundance of House Sparrow populations.

Nest box structure also plays a role for occupancy by House Sparrows in the present study. Mud pots were highly used by House Sparrows. Chetan (2012) reported that sparrows made use of any available material in the area for nesting, opting for a safe nesting sites and a properly designed nest box. A total of 39 chicks fell from the nest and died due to disturbance and unfavorable nest box design. Thus improved nest box design will increase nesting and breeding performance of the House Sparrow. The present study suggests that the retention of old thatched roof buildings and native buildings in the city can contribute to sustaining House Sparrow populations. These reports were supported by (Baskaran *et al.* 2010). Due to the increasing globalization, large acres of land have been transforming into modern cities and as a result, there is a loss of habitat for House Sparrow populations. This present study found that there was a quick response by House Sparrows to artificial nest boxes due to urbanization that resulted in the absence of natural nesting sites in the modern architecture of buildings. Hence artificial nest boxes seemed to be a suitable measure to increase the dwindling House Sparrow population, especially in the urban environment.

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Table 1. Use of artificial nest boxes in selected habitat by House Sparrows

S.no	Habitat	Total Nest	Used Nest	Unused Nest	T test	LS 0.05
1	Market Area	50	38	12	*t = 5.4214, p = 0.0006*	S
2	Institution Area	50	23	27	*t = -0.6963, P = 0.5059*	NS
3	Residential Area	50	28	22	*t = 1.0445, p = 0.3268*	NS

Table 2. Use of artificial nest boxes with respect to type of nest box by House Sparrows

S.no	Type of nest boxes	Total Nest	Used Nest	Unused Nest	T test	LS 0.05
1	Wooden Box	30	17	13	*t = 1.069, p = 0.3452*	NS
2	Paper Box	30	20	10	*t = 1.4142, p = 0.2302*	NS
3	Bamboo pieces	30	11	19	*t = -1.5689, p = 0.1917*	NS
4	PVC Pipe	30	18	12	*t = 2.4495, p = 0.0704*	NS
5	Mud Pot	30	23	7	*t = 11.314, p = 0.0003*	S

Table 3. Nest activity and productivity within the selected habitats by House Sparrow

S.no	Habitat	Active Nest	Unused Nest	Successful Productivity	Total Nest
1	Market Area	12	12	26	50
2	Institution Area	15	27	8	50
3	Residential Area	14	22	14	50

$\chi^2 = 16.58$, df = 4, p = 0.0023, LS = 0.05

Table 4. Nest activity and productivity with respect to the type of nest box used by House Sparrow

S.no	Type of nest boxes	Active Nest	Un Attempted Nest	Productivity	Total Nest
1	Wooden Box	7	13	10	30
2	Paper Box	10	10	10	30
3	Bamboo pieces	7	19	4	30
4	PVC Pipe	10	12	8	30
5	Mud Pot	7	7	16	30

$\chi^2 = 15.61$, df = 8, p = 0.0483, LS = 0.05

Table 5. Fledging success in selected habitats by House Sparrow

S.no	Habitat	No of Nest	Successful fledged out	Number of chicks left from the nest	Total number of chicks
1	Market Area	26	37	21	58
2	Institutional area	8	8	8	16
3	Residential area	14	22	10	32
Total		**48**	**67**	**39**	**106**

Table 6. Fledging successwith respect to type of nest box by House Sparrow

S.no	Type of nest boxes	No. of nests	Successful fledged out	Number of chicks left from the nest	Total number of chicks
1	Wooden Box	10	13	13	26
2	Paper Box	10	12	15	27
3	Bamboo pieces	4	3	3	6
4	PVC Pipe	8	8	8	16
5	Mud Pot	16	31	0	31