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ANALYSIS

Rejoinder of House Sparrows (*Passer domesticus*) to Artificial Nest Boxes in Lucknow District, Uttar Pradesh, India

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ABSTRACT

House Sparrow (*Passer domesticus)* is a symbiotic bird species with human habitation. Since the early 1980s the population of House Sparrow has decreased considerably in rural, urban and semi-urban regions in many parts of the world that attracted the Environmentalists and Researchers to excavate out the conservation measures. The loss of habitat has emerged out as the major reason. Unavailability of nesting site due to emerging trend of new building techniques played a drastic role. Change in life style of the people has further constrained the bonding between the human beings and sparrow leading to unavailability of proper food. The extensive and un-prescribed use of pesticides and trendy tiling of green area cut short the availability of soft insects for their chicks which is the major part of their food. Decreasing roosting sites due to habitat loss further exaggerated the problem. Being a cavity nest bird, use of artificial nest boxes for such bird is an old phenomenon well discussed in literature. Hence an experiment was designed in context to sparrows in Lucknow district of Uttar Pradesh. An exhaustive survey was done in the nine selected sites (Lucknow, Kakori, Malihabad, Itaunja, Mahona, Bakshi Ka Talab, Gosainganj, Amethi, and Nagram) of Lucknow district to find out the actual status of the sparrows in Lucknow. After estimating their population, three types of nest boxes of different materials and design were installed. The scientifically approved wooden nest boxes and traditionally popular earthen pots and shoe boxes were used in the present study. These were installed mainly in maximum populated area of Sparrow i.e. Daliganj (927 individuals) and minimum populated area, Itaunja (07 individuals) to improve the nesting and breeding potential of the Species. They were installed in the study area at appropriate height ranging between 6 to 23 feet and the direction of the entrance of the boxes were opposite to direct sunlight. The safe location for installation was also keenly observed, so that it could not be approached by predators. A total of 180 Sparrow boxes were installed (90 in Daliganj and 90 in Itaunja). A regular monitoring of the nest boxes was done during breeding season (February-July). Nest recordings were done in the morning from 07:00 to 11:00 hrs and 04:00 to 07:00 in the evening by using a pair of 10x50X Binocular and 60

DSLR Camera to record the specific behavior of the sparrow. Highly preferred nest boxes were wooden boxes (90% in Daliganj and 56.66% in Itaunja) in both the sites, followed by shoe boxes (43.33% in Daliganj and 20% in Itaunja). The least preferred were earthen pots (16.66% in Daliganj and 6.66% in Itaunja). Hence this study reveals that the installation of the nest boxes can be an alternative method for bringing back the sparrows in those areas where they are less or absent. Specifically the wooden nest boxes are most preferred amongst all.

Key Words: House Sparrow, Nest Box, Population, nesting.

1. INTRODUCTION

Artificial nest box: It is a man-made enclosure provided for animals to nest in. Nest boxes are most frequently utilized for birds. Placing nest boxes may be used to help maintain populations of particular species in an area. The nest box was invented by the British conservationist Charles Waterton in the early 19th century to encourage more birdlife on the wildfowl and nature reserve he set up on his estate.

Birds are the excellent indicator of the ecological balance of a particular habitat because they are sensitive to environmental changes. House Sparrow (*Passer domesticus*) is also one of them. There exists a close bond between man and sparrow, being considered as a domestic species is was nomenclature as *Passer domesticus.* This small bird is a representative member of the Order Passeriformes and Family Passeridae and commonly known as *Gauriya*. It is a symbiotic bird species and closely associated with human habitation (Blondel *et al, 1981*; Ali, 1996; Daniels, 2005; Chamberlain, 2007). It is a crucial bird species as an equilibrant factors in ecosystems which have educational, recreational, economical and aesthetic values (Ghosh *et al.,* 2010). References of House Sparrow in most of the mythologies and folklores also prove the existence of this species in the close proximity of the human dwellings. The House Sparrow is one of the most widely spread and abundant bird in the world (Summer- Smith, 1988; Andorson 2006). Previously the species was so common and widespread that it was once considered to be a pest species in many parts of its range (Crick, 2002). It was often considered to be an urban specialist (Summer-Smith 2003), despite this historical success, the species has been declining since the early 1980s in several part of the World, including various States of India (Heij 1985, Siriwardena *et al.,* 2002). According to Dandapat *et al* .(2010), there has been noticeable decline in the number of House Sparrows in several parts of India particularly across Bangalore, Mumbai, Hyderabad, Panjab, Haryana, West Bengal, Delhi and other cities. According to an ornithological survey conducted by Indian Council of Agricultural Research, the sparrow population in Andhra Pradesh alone has dropped by 80% and in other States like Kerala, Gujarat and Rajasthan, it has fallen by 20%, while the turn down in coastal areas is as sharp as 70% to 80%. Several surveys conducted at different places of India on the occurrences of House Sparrows by Rajashekar and Venkatesha (2008), Daniels (2008), Khera *et al.* (2010), Bhattacharya *et al.* (2010), Ghosh *et al.* (2010) suggest that their population has decreased considerably at present. Drastic decline of House Sparrow has been reported by Rajan *et al.* in 2013 in Urban and Suburban Areas of Jammu Region,. Recent studies in Uttar Pradesh also indicate decline of House Sparrows in rural, urban and semi-urban regions of Uttar Pradesh. Scientist and researchers concluded several reasons for such decline. Unavailability of nesting space, decrease in food availability, sudden change in human living style, pollution, electromagnetic radiation from mobile phone towers and disease were some of the causes. Among all these, one of the foremost reason is the declining nesting sites in urban and suburban region (Raghavendra Rao 2000; Denis Summer-Smith, 2003; Cramp, *et al.,* 1985). Since then strategies and efforts for their conservation are being implemented. Being a cavity bird installation of the nest boxes may be an effective tool to increase the vanishing population of the House Sparrow (Newton, 1998; Nilsson, 1975; Moller, 1989; Bhattacharya *et al.,* 2010; Ghosh *et al.,* 2010). Present study was undertaken to analyze the rejoinder of House Sparrows (*Passer domesticus*) to artificial nest boxes in Lucknow, Uttar Pradesh, India.

Present study was conducted in the Lucknow city which is the capital of Uttar Pradesh. The study area involves in and around Lucknow which includes Mahona, Itaunja and Bakshi Ka Talab to the North, Gosainganj and Amethi to the East, Nagram to the South-East, Malihabad and Kakori to the West and Lucknow itself in the Centre (Fig. 1). Lucknow is situated 123 meter above sea level and along co-ordinates 26°51'N and 80°55'E. In summer temperature ranges from 30-45 °C while in winter from 2-20°C, the average annual rainfall is about 896.2 mm (35.28 inches). It covers an area of 2528 sq.km. well fed by River Gomti enriched with variety of flora and fauna. Population of Lucknow as per census 2001 is 36,81,416 Lacs.

Species Description

House Sparrow is a small, stocky song bird with thick bill, short leg, having a size of 14-16 cm, weight 26-32 gram with 19-25 cm of wing span. The sexes are dimorphic. The male is warm brown above, with a grey crown and nape. It has grey cheeks and grey under parts with black round the eyes (Fig. 2). The mantle and scapulars are boldly streaked black, chestnut and buff, and the tail is dark brown. The bib has black feather with white tips that are gradually abraded so that's why the beginning of the breeding season the bib becomes uniformly black (Summers-Smith, 1988). The female is rather featherless with a grey brown crown, a pale, buff supercilium, to wings bars and an unmarked throat and breast (Fig.2). The bill becomes darker during the breeding season and a few birds have a completely black bill (Lowther and Cink, 1992). The Juvenile looks similar to an adult female.

Akhilesh Kumar et al.
Rejoinder of House Sparrows (*Passer domesticus*) To Artificial Nest Boxes in Lucknow District, Uttar Pradesh, India,
Species, 2015, 15(47), 1-13,

2. MATERIALS AND METHODS

An experiment was conducted in Lucknow district of Uttar Pradesh from February 2013 to August 2014. All the selected nine sites were surveyed thrice to find out the actual status of the sparrows in Lucknow district. These nine areas were selected on the basis of their eco status i.e. urban, semi-urban and rural. They were randomly selected from five different directions of Lucknow district i.e. in Mahona, Itaunja and Bakshi Ka Talab to the North, Gosainganj and Amethi to the East, Nagram to the South-East, Malihabad and Kakori to the West and Lucknow City in the Centre. Regular field trips were made throughout the period at intervals of 5 days. Line Transect and Point Count methods were used for Sparrow counting at appropriate time of the day i.e. in morning from 07:00 to 11:00 hrs and 16:00 to 19:00 hrs in the evening with the aid of 10x50 binocular and 60D SLR Camera to record the specific behaviour of the species. Secondary data survey sheets were also used for secondary data collection. Minimum three villages or areas from each site were surveyed to make the equal areas of 4 Km Square in all the sites. After perceptive the actual status of the House Sparrows in the study area three types of scientifically approved artificial nest boxes of different materials and design i.e. wooden nest box, traditionally popular earthen pots and shoe boxes were used in the present study. Nest boxes were installed in the study area at appropriate height i.e. 6-23 feet and the direction of the entrance of the boxes were kept opposite to direct sunlight. The safe location for installation was also keenly observed, so that it could not be approached by the predators. The nest boxes were also assigned with a unique code. Regular monitoring of the installed nest boxes was also done during breeding season (February-July).

Point Count Method:

Point Counts can be used to provide estimates of the relative abundance of each species. A Point Count is a count undertaken from a fixed location for a fixed time period. The point count stations are laid within the study plot either in a systematic manner or in a random manner. A sensible minimum distance is 100-200 m. Count for a fixed amount of time (5-10 minutes) at each station. Point counts are widely used to census Passerine birds. It can be undertaken at any time of the year, and is not restricted to the breeding species.

Scientific Measurements of the Installed Nest Boxes

1. **Wooden nest boxes-** Wooden nest boxes are made following the design of British Trust of Ornithology (Bernhard, 2002) with some modifications in context with the environment of tropical regime like Uttar Pradesh, India. They were constructed using water proof plywood following the scientific measurements (Fig.3). The height of the box was 20 cm and width was 16 cm. An entrance hole of 3.2 cm was kept to assure the entrance of only House Sparrows. The hole of the entrance was at a height of 9.2 cm from the base of the box. Ventilation slits and drainage hole were also made in the boxes to keep it airy and dry, where as drainage hole at the bottom, help in removing and cleaning the broken egg materials from the nest. No painting was done except the top of the boxes to give the natural look. The roof of the nest box was painted with green colour so as to protect from the water as well as dew. An opening provision was also made in the box for monitoring inside the boxes and they were closed by using lock and key (Fig 4a).

2. **Shoe box Sparrow nests:** The unused shoe boxes were used for the sparrow nest having length of 27 cm, width 14.5 cm and height 9 cm. The size of the entrance hole was same as in the wooden nest box i.e. 3.2 cm. The shoe boxes were wrapped with the help of the water proof brown colour sealing tape to give a natural look as well as to increase the durability of the boxes. Opening provision was again made in the shoe boxes by cutting the upper portion of the boxes and they were temporarily sealed by sealing tape (Fig 4b). Ventilation slits were also made in bottom of the boxes to keep them airy and dry.

3. **Earthen pot as nest boxes:** small earthen pots with diameter of 13 cm and depth of 13 cm were purchased from the market. The entrance hole of earthen pot measured 8.5cm in diameter. The earthen pots were used as it is without applying any paints (Fig.4c).

Installation of nest boxes: the following points were considered while installing nest boxes (fig 5):

- Nest lofts were installed only in those houses where the owners were interested in conservational measures.
- All three types of boxes were set up in each selected house so as to know the priorities and preference of nest selection (Fig.6).
- The safe location for installation was keenly observed so that it could not be approached by predators.
- The assembling and the nailing were done systematically to provide required strength to it. Installation was done with proper drilling and heavy nails with holder. It was then tied up with metallic wires so that it cannot be removed from its fixed place by just giving jerk, which ensured the safety from the attack of the predators as well as windy and stormy weather.
- The boxes were fixed at an average height of 6-23 Feet.
- The nest boxes were fixed under shaded portion of the house so as to prevent the direct effect of rainfall, dew and direct sunlight.
- All the boxes were fixed such that they were supported by wall. This was done to reduce the free movement of the nest box when approached by the nesting birds.
- Nest boxes were never installed on tree as House Sparrows are strictly restricted to human dwellings for nesting.

3. RESULTS AND DISCUSSION

After an exhaustive survey in all the nine sites maximum House Sparrows were recorded in Daliganj areas while minimum in Itaunja. The nests were installed only in maximum populated area of Sparrow i.e. Daliganj and minimum populated area i.e. Itaunja to improve the nesting and

Akhilesh Kumar et al.
Rejoinder of House Sparrows (*Passer domesticus*) To Artificial Nest Boxes in Lucknow District, Uttar Pradesh, India,
Species, 2015, 15(47), 1-13,

breeding potential of the Species (Table 1). The surveys reveal an uneven distribution of House Sparrows. The reason for the maximum population of House Sparrow in Daliganj was suitable place for their survival i.e. presence of nesting space and food availability. In Daliganj the existing peoples are poor and have low socioeconomic status. Most of the people in the Daliganj are vender and fisherman and their houses are without plaster with lot of breeding intensive areas such as holes and crevices for nesting. The foods such as domestic leftovers are also present in plenty that support highest population of House Sparrows. While in case of Itaunja the people are rich and they have plastered houses in which there are no place and holes for nesting. The drainage are advanced and well constructed that don't support the food availability that results a very low population of House Sparrow. Daliganj, area with the maximum population of Houses sparrow was selected to find out whether sparrow choose the artificial nest box even when there are optimum natural spaces available while in Itaunja the motive was to find out that whether the unavailability of the nesting place was the main cause of the low population of the Sparrows or not. Three types of artificial nest boxes were installed to find out the response of House Sparrow to artificial nest boxes. A total of 180 Sparrow boxes were installed i.e. 90 in Daliganj and 90 in Itaunja (Table 2).

Further the supplementary feeds were also distributed to the house owners to overcome with the problem of the food unavailability.

During the breeding season the nest boxes were monitored regularly to record the behaviour and response of the bird (Table 3 and 4). There was variation in preference and adoption of artificial nest boxes depending on the material, size of entrance hole and safety. All the three type of artificial nest boxes were adopted but the preference varied (Fig.7).The highly preferred nest boxes were wooden boxes (90% in Daliganj and 56.66% in Itaunja) at both of the sites, followed by shoe boxes (43.33% in Daliganj and 20% in Itaunja). The least preferred were earthen pots (16.66% in Daliganj and 6.66% in Itaunja). Study states that the wooden nest boxes were most preferred amongst all (Graph 1 and 2). The reason might be that the wooden nest boxes were the safest of all the three type of nest boxes. The wooden nest boxes were more spacious than the other two types of nest boxes. One of the reasons for least preference to the earthen pots might be the large size of entrance as compared to Wooden and Shoe nest box. Thus they were more prone to predatory attacks. The Hose Sparrows prefer low illumination that was fulfilled by the wooden and shoe box. The illumination was high in the earthen pots. The response of house Sparrows to artificial nest boxes also varied with the area. The response of House Sparrow to the artificial nest boxes was higher for boxes installed in Daliganj i.e. the area of the low socioeconomic status. House Sparrow is especially connected with urban areas of lower socioeconomic status, for the reason that buildings in shoddier condition support more nest sites. Moreover, being lithe in choice of nesting sites, House Sparrow is known to build the nests in other available places (including nest-boxes), when those in buildings are lacking (Shaw *et al*., 2008). Similar kinds of results were found by Anderson (2006) who reported that the availability of nest sites is one of the most important factors influencing sparrow abundance in urban places. In India, a similar kind of response by House Sparrows towards artificial placed nest boxes was reported by Balakrishnan *et al.* (2011) from Manjeri municipality, Kerala. They studied the nest site characteristics of House Sparrow and found that majority of the nests (89.3%) were placed above the roller shutter boxes followed by the artificial boxes provided by the shop keepers (4.8%), shelter boards in front of the shops (3.57%) and the ventilators (2.4%). House Sparrow clearly prefers nesting in buildings, and uses other sites only when those in buildings are not available (Shaw *et al*., 2008). A study by Wegrzynowicz (2012) in suburban housing estate of Wrzecion in Warsaw, Poland, reported that the number of House Sparrows decreased in the years of the study from 53 pairs in 2005 to 20 in 2012. This decline was caused by the renovation of buildings (insulation) that was carried out gradually in the time of the study and resulted in loss of nest sites for House Sparrows. In the present study some of the boxes were occupied by honey bee, yellow wasps and sometimes also by house lizards that also destroyed the eggs (Fig. 8a and 8b). Sometimes the nest boxes were also disturbed by other small birds like Rock Chat. Similar kinds of disturbances were reported by Bhattacharya *et al.* (2011), that the artificial nest boxes were disturbed by woodpeckers at several sites and a pair of Pied cuckoo was trying to enter the box but were defeated by a pair of House Sparrow in competition. Some of the house owners had removed the earthen and shoe box nests from their houses. The House Sparrow prefers shaded and low illuminated areas because the nest boxes were not occupied by Sparrows that were installed in an open place. Same behaviour was also recorded by (Bhattacharya *et al* 2011) in his study.

4. CONCLUSION

The artificial nest-boxes are playing very important role in providing the nesting space for House Sparrows in Lucknow City. Hence this study discloses that the installation of the nest boxes is an alternative method for bring back to the sparrows in those areas where they are not in attendance. The artificial nest boxes were utilized by the House Sparrows in both the areas where nesting sites were optimal i.e. Daliganj as well as in Itaunja where nesting sites were insufficient. This study hence reflects the response to artificial nest boxes at different habitats. The House Sparrow prefers low illumination in nesting sites. This may be one of the causes of least preference of earthen pot in both the sites. Another reason may be that earthen pots were more prone to be attacked by predatory birds. The installation of the preferred nest boxes may be a way out to improve the declining trend of House Sparrow population. The availability of a variety of food sources for both adults and nestlings and essential nesting sites around the food sources primarily play an important role in the abundance of house sparrow populations. The study also recommends the Housing Development Authorities to make provision for the little bird right from the inception of passing of the house maps and designs as being done for rain harvesting to conserve water.

SUMMARY OF RESEARCH

- House Sparrow (*Passer domesticus)* is a symbiotic bird species with human habitation. Since the early 1980s the population of House Sparrow has decreased considerably in rural, urban and semi-urban regions in many parts of the world. The changing life style of human beings,

Akhilesh Kumar et al.
Rejoinder of House Sparrows (*Passer domesticus*) To Artificial Nest Boxes in Lucknow District, Uttar Pradesh, India,
Species, 2015, 15(47), 1-13,

increased use of pesticides leading to unavailability of invertebrates for the chicks and loss of nesting site proved a major cause of disappearance of House Sparrow.

- To overcome with the problem of unavailability of nesting space an experiment was conducted in Lucknow district of Uttar Pradesh to find out the rejoinder of House Sparrows (*Passer domesticus*) to Artificial Nest Boxes in Lucknow, Uttar Pradesh, India
- The highly preferred nest boxes were wooden boxes (90% in Daliganj and 56.66% in Itaunja) in both of the sites, followed by shoe boxes (43.33% in Daliganj and 20% in Itaunja). The least preferred were earthen pots (16.66% in Daliganj and 6.66% in Itaunja). Specifically the wooden nest boxes were most preferred amongst all.
- The responses of House Sparrow to the artificial nest boxes were higher for boxes installed in Daliganj i.e. the area of the low socioeconomic status. House Sparrow is especially connected with urban areas of lower socioeconomic status, for the reason that buildings in shoddier condition support more nest sites.
- In the study area the artificial nest-boxes are playing very important role in providing the nesting space for House Sparrows in Lucknow City. Hence this study discloses that the installation of the nest boxes is an alternative method for bring back to the sparrows in those areas where they are not in attendance.
- The study also recommends the Housing Development Authorities to make provision for the little bird right from the inception of passing of the house maps and designs as being done for rain harvesting to conserve water.

FUTURE ISSUES

With increasing urbanisation the House Sparrows may not find the nesting sites in Suburban areas also. The areas with low socioeconomic human population will also get developed slowly, leaving no nesting space for House Sparrows. Therefore In future these nest boxes will help in the nesting and breeding of the House sparrows. It is essential to focus on the endorsement and popularisation of artificial nest boxes among the local people as well as Government and Non-government organizations to prevent the rapid decline of *Passer domesticus indicus*.

DISCLOSURE STATEMENT

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Table 1

Occurrence of House Sparrow in the selected sites of the study areas

Sr. No.	Study area	Covered villages during the survey	No. of Male	No. of Female	Total Sparrow
1	**Lucknow (Core of the City)**	Triveninagar	**83**	**63**	
		Khadra	**208**	**186**	
		Daliganj	**107**	**64**	**927**
		Niralanagar	**37**	**44**	
		Gomti Nagar	**65**	**70**	
2	**Nagram**	Nagram Town	**03**	**04**	
		Asalamnagar	**06**	**07**	**20**
		Kasaibada	**00**	**00**	
3	**Kakori**	Kakori, Durgaganj	**19**	**25**	
		Hata Hajarat Shaheb	**05**	**04**	**71**
		Katra Bajar	**11**	**07**	
4	**Malihabad**	Malihabad Town	**09**	**12**	
		Munshiganj	**33**	**41**	
		Choudhirana	**04**	**05**	**180**
		Amaniganj	**23**	**24**	
		Himarapur	**13**	**16**	
5	**GussainGanj**	Shivlar	**35**	**45**	
		Dalkhera	**19**	**22**	**178**
		Kharora	**25**	**32**	
6	**Amethi,**	Sahjadpur	**49**	**52**	
		Karodigarhi	**30**	**40**	
		Munsiganj	**04**	**07**	**211**
		Bashrahiyan	**14**	**15**	
7	**Bakshi Ka Talab**	Kotawa	**01**	**01**	
		Magath	**01**	**01**	**215**
		Chandra Kotar	**37**	**42**	
		Bargadi	**11**	**12**	
		Kathwara	**48**	**61**	
8	**Itaunja**	Itaunja main	**02**	**03**	
		Akadariya kala	**01**	**01**	**07**
9	**Mahona**	Mahona	**28**	**30**	
		Nagar Chougnwa	**02**	**04**	
		Keshav Mau Khurd	**00**	**00**	**64**
		Chandanapur	**00**	**00**	
		Total	**933**	**940**	**1873**

Table 2

Total Number of nest boxes installed in Study areas

Sr.No.	Nest installed in Daliganj			Nest installed in Itaunja		
1	Wooden Box	Shoe box	Earthen pot	Wooden Box	Shoe box	Earthen pot
2	30	30	30	30	30	30
Total	**90**			**90**		

Table 3

Sparrow Nest Box Installation at Daliganj (January-March)

Wooden box	Shoe Box	Earthen Box	Other occupied	Removed by owner	Total installed	Total remaining	Unoccupied
27	**13**	**5**	**2**	**2**	**90**	**86**	**41**

Table 4

Sparrow Nest Box Installation at Itaunja (January-March)

Wooden Box	Shoe Box	Earthen Box	Other occupied	Removed by owner	Total installed	Total remaining	Unoccupied
12	**3**	1	2	7	**90**	**81**	**65**

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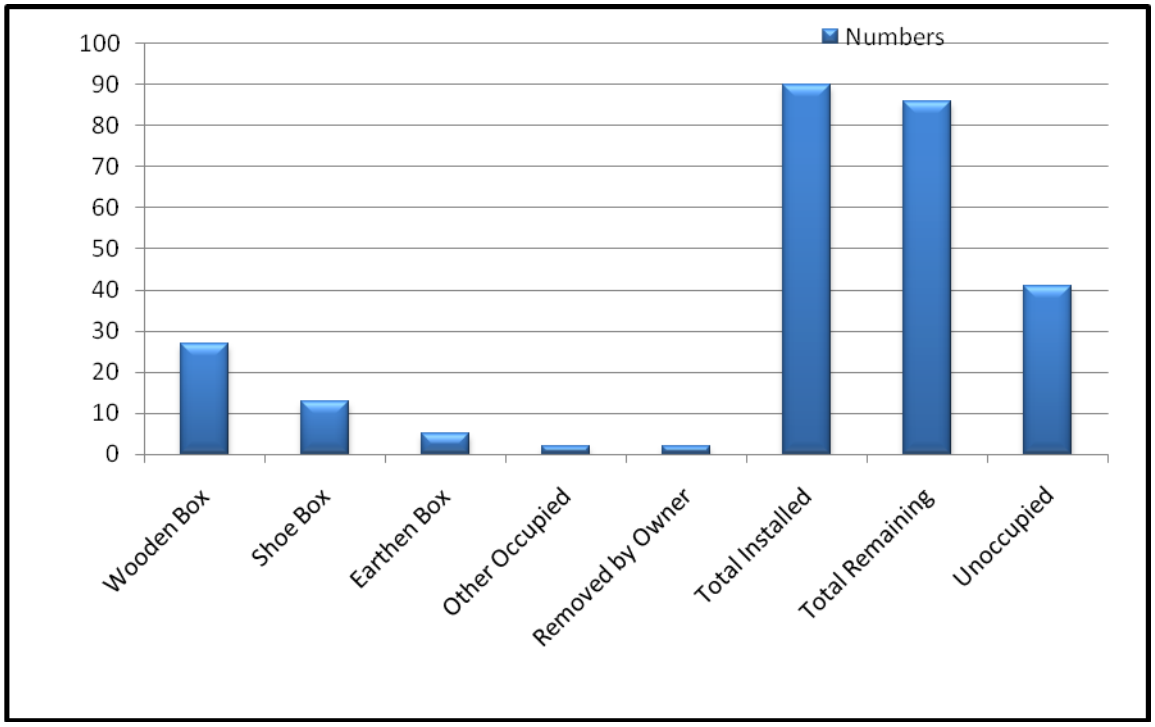
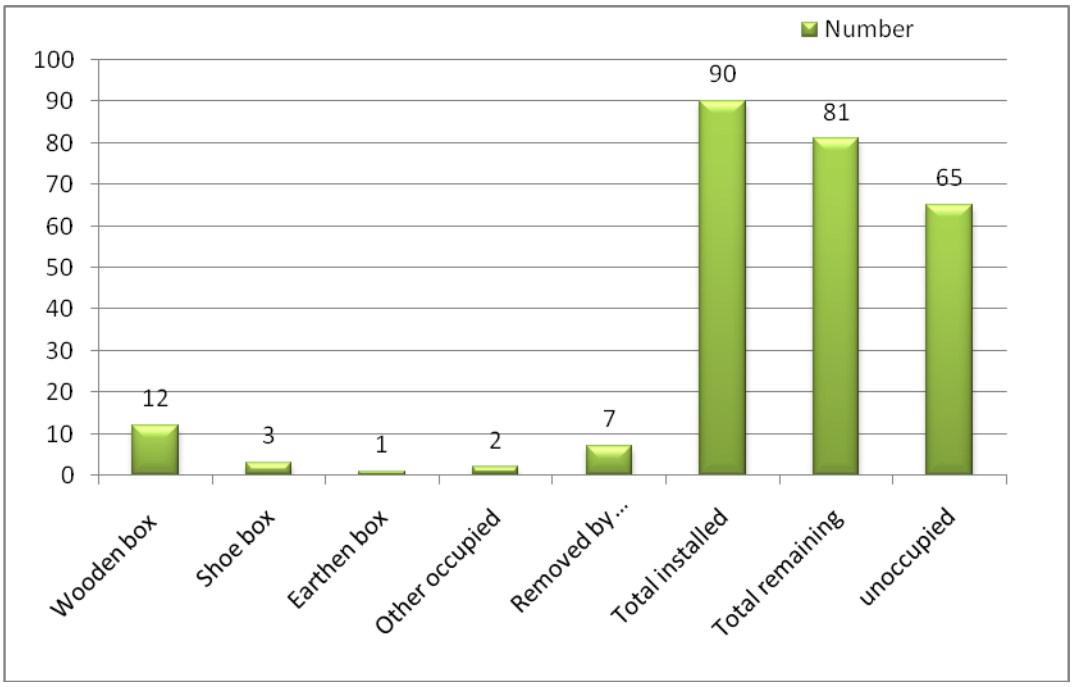
Species, 2015, 15(47), 1-13,



Graph 1

Sparrow Nest Box Installation at Daliganj



Graph 2

Sparrow Nest Box Installation at Itaunja

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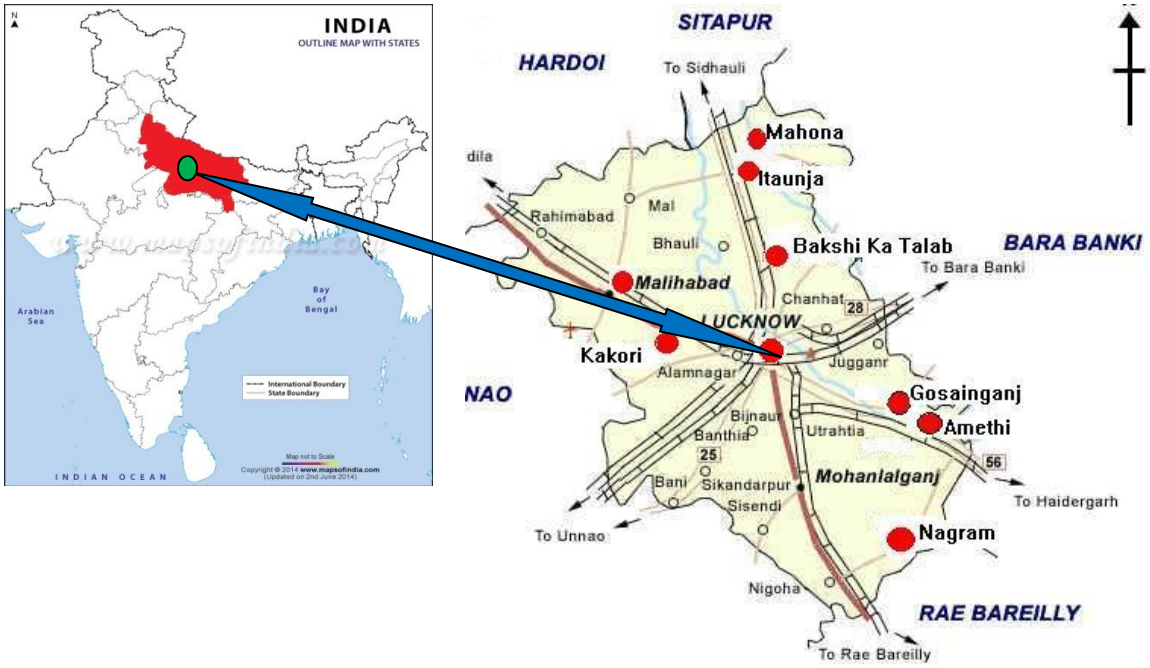

Figure 1
Map of the Study area

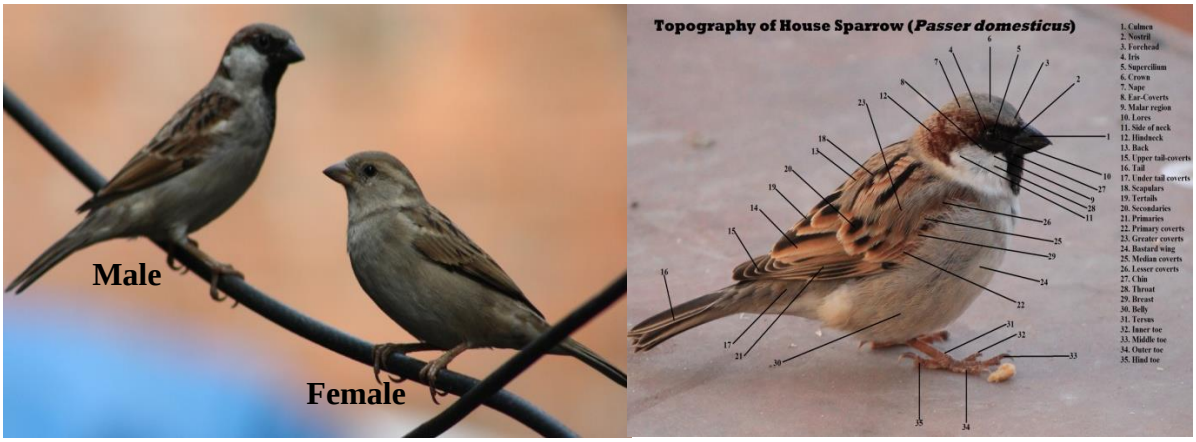

Figure 2
Topography of House Sparrow

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Figure 3
Preparation of nest boxes

Fig 4a:Wooden nest box **Fig.4b: Shoe nest box** **Fig 4c:Earthen pot nest box**

Figure 4 (a,b,c)
Three types of nest boxes installed in the study area

Figure 5
Nest Installation in the study areas

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Species, 2015, 15(47), 1-13,

Figure 6
Set of all three type of Nest boxes

Wooden nest boxes adopted by House Sparrows

Shoe box as nest adopted by House Sparrows

Earthen pot as a nest adopted by House Sparrows

Figure 7
All type of artificial nest boxes adopted by House Sparrows

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Figure 8 (a & b)
Artificial Nest Boxes adopted by yellow wasp and lizard

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