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Review Article

VALEDICTION OF HOUSE SPARROW (*PASSER DOMESTICUS INDICUS*, LINNAEUS 1758) FROM URBAN LANDSCAPE: A REVIEW

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ABSTRACT
House Sparrows (*Passer domesticus indicus*, r- selected species) are one of the most widely distributed avian species on the earth; it may be due to its excellency at taking advantage supplied by human beings. However, it is stepping towards annihilation from urban landscape across different part of the world. It is widely acknowledged as 'pest', however, its positive role in ecosystem as significant bio indicator species, its educational, recreational, Ethno-zoological importance should not be ignored. Despite having widely distribution and its successful adaptability across different parts of the world, population of House Sparrow is severely declined since last two decades especially in European cities. No significant documentation found regarding the population status of House Sparrow in India. Possible environmental factors contributing to decline in House Sparrow populations include reduced availability of food for both adults and nestlings, loss of nesting sites, loss of Roosting sites, electromagnetic radiation, predation etc. This article summarizes the possible decline in its population reported from different parts of world and various hypotheses discussed which has been put forward to explain the various factors responsible for dwindling population of House Sparrow. Thus, comparable discussion on various study carried out on House sparrow population could help us to plan proper strategies for the estimation of the population status of House sparrow and to determine the key factors affecting the population pattern of House Sparrow in urban landscape.

Keywords: *House Sparrow, Population Pattern, Anthropogenic Activities, Urban Landscapes*

INTRODUCTION
Chaki ben Chaki ben mare gher ramva aavsho k nahi …? (Sparrow o sparrow will you come to play at my home with me or not…?) One of the famous Gujarati Balgeet uttered by every child earlier may become just a fable in near future. It may be possible that our next generation would have only reminiscences of this beautiful active creature in the form of story only.
The House Sparrow (*Passer domesticus*– Latin; *Passer* = active birds, *domesticus* = belonging to house), locally known as 'Chakli' in Gujarat, the star character of many Indian folklore, Balgeet and stories, is stepping towards annihilation from urban landscape across different part of the world. House Sparrows are one of the most widely distributed avian species on the earth; it may be due to its excellency at taking advantage supplied by human beings. It is unique among urban wild avian species in its close association with indeed virtual dependency on human beings and its surroundings (De Laet and Summer-smith, 2007). Hence, House Sparrow can be considered as significant biological indicator of ecological health of any particular area due to its close association with human habitation.
Despite being historically so successful, House Sparrow has been declining rapidly from the urban gradient across different parts of the globe (Gulati, 2005).

Geographical Distribution
Middle East is the native place from where House Sparrow originated and spread to most of Eurasia and North America (Summer-Smith, 1988; Anderson, 2006). It is later on introduced to various parts of the world deliberately or through natural dispersal, which include North America, Central America, Southern

America, Southern Africa, Part of West Africa, Australia, New Zealand, and island throughout the world, making it the most widely distributed bird on the globe (Anderson, 2006). It is successfully adapted to most part of the world, may be due to its adaptability to wide range of conditions (Summer –Smith, 1988) and its robust immune response towards different adverse condition (Lee *et al.*, 2005). The only forbidden habitats for House Sparrow are dense forest and Tundra biome. Generally, House Sparrow can tolerate wide variety of climates, but it prefers arid conditions (Summer-Smith, 1990). It has adapted to live in dry areas by acquiring number of adaptations to dry areas which includes high salt tolerance (Minock, 1969) and ability to survive in scarcity of water by ingesting fruit berries (Walsberg, 1975).

In India it is distributed all over ranging from North-East to South West part extending up to 4000m in the Himalayas. It can survive in all temperatures from the humid coastal area to hot plains to the cold area of Kashmir, and beyond Ladakh, up to 15,000 feet above sea level (Dandapat *et al.*, 2010).

Taxonomy

Kingdom: Animalia *Phylum:* Chordata *Class:* Aves
Order: Passeriformes *Family:* Passeridae *Genus:* Passer
Species: P. domesticus Sub Species: P. domesticus indicus (Linnaeus 1758)
Vernacular Name: House sparrow, English sparrow
Local Name: Chakali (Gujarati)

General Features of Passer domesticus indicus

House Sparrow is member of old world sparrows, considered by many as relative of weaver finch family (Srivastava and Sinha, 2010). *Passer domesticus indicus* belongs to the Oriental indicus group (Kurhade *et al.*, 2013). It is one of the larger sparrows with length typically of 14-16 cm and weight of 26-32 gm. (Dandapat *et al.*, 2010). It is rather large head, heavy billed, racy passerine. It is sexually dimorphic with the male being darkly coloured head markings having grey crown, white cheeks, black bibs and Rufus neck. In breeding plumage male is brightly coloured having dark black bill. Female has bluffy brown body with gloomy grey brown under parts while juvenile are deeper brown with dull yellowish bill. It produces cheep-chirrup sound, sing year-round, although less frequently in cold and rainy days (Joshi, 2009). They mainly depend on seeds but also eat insects especially during breeding season (Lowther and Cink, 1992). Insects constitute important diet of the nestling for its survival. However, they are also opportunistic feeder of the back yard too. In Agricultural areas, an average of 60% of food comes from livestock feed, 36% from weed seeds while insect constitutes 4% of the diet (Joshi, 2009).

House Sparrow is a social bird (Vincent, 2005). Generally, they are gregarious live in large flock which sometimes include more than 100 individuals and roosts inside the dense bushy vegetation. During breeding season it forms small colony and generally, do not spread distantly from the natal colony (Balaji *et al.*, 2013). They are monogamous, peak breeding period includes March –June. They built their nests in the crevices of thatched roofs, electric poles, in ventilation holes and space available on the electricity meters and sometimes in natural trees too (Ali, 1996). Female lays eggs having clutch size of 4-5 most frequently. Both male and female take part in incubation. Incubation period lasts for 10-14 days.

Males and females both feed the hatchling through regurgitation (Bharucha and Padate, 2009). Average 25- 27 days required to complete the cycle of nest occupancy (Bhattacharaya *et al.*, 2011). House Sparrow make up to 3- 4 nesting attempts per year (Summer Smith, 1963). House Sparrows are sedentary birds, living out their lives within an area of 1-2 km. (Summer- Smith, 1988).

Economic Significance

It is widely acknowledged as ‘pest’ as it feeds on seeds, damaging important crop, responsible for transmitting diseases, and large aggregation produce annoying sound and create nuisance. However, its positive role in ecosystem should not be ignored. It is one of the significant bio indicator species in urban landscapes; besides this it has educational, ethno- zoological, amateur significance. It feeds on insects from surroundings and hence, helpful in getting rid from harmful insects. Traditionally, droppings of

house sparrow is used in the treatment of Asthma in Children reported in Kachhchh district (Gupta *et al.*, 2003), while faecal matter is applied in the anus of baby to treat constipation as per ethno zoological knowledge of the inhabitants surrounding the Ranthambhor National Park, Rajasthan (Mahawar and Jaroli, 2006), as per traditional healers of Theni district of Tamil Nadu chicken pox can be cured by consuming eggs of *Passer domesticus* mixed with rice flour, while its meat is consumed by assuming that it has aphrodisiac property (Chellappandian *et al.*, 2014). *P. domesticus* is often associated with lewdness one of the possible reason for their high citation as aphrodisiac (Chellappandian *et al.*, 2014).

Dwindling Population of House Sparrow across Different Parts of the World

In accordance with increasing urbanization and Anthropogenic activities ecological conditions are also likely to change, ultimately influencing demography and population pattern of animals. Despite having widely distribution and its successful adaptability across different parts of the world, population of House Sparrow is severely declined since last two decades especially in European cities. The decline in population of House sparrow in urban gradient did not become obvious until about 1990, where in centres of some large towns of Britain, which is severe in urban area unlike farmland, where in some cases virtually House Sparrow became extinct (Summer-Smith, 2005). Onwards number of study has been reported decline in population of House Sparrow across world. This phenomena is well documented in London where Sparrow population declined by 60 % during the period of 1994-2004 (Raven *et al.*, 2005). Survey carried out on small scale reported 85% decline in Kensington Gardens, London(1925-1995), 99% in Galsgow (1959-1997), 90% in Edinburgh park (1983- 1998), 75% in Hamburg (1991-1999) (Summer Smith 1999; Dott and Brown, 2000; Mitschke *et al.*, 2000). While 70% decline were reported in Valencia (Spain) between the period of 1998 to 2008 (Murgui *et al.*, 2010). The decline in House sparrow population is wide spread enough to classify it as the species of special concern in UK (Eaton *et al.*, 2008), and of conservation concern in Europe (Bird life International, 2004).

Status of House Sparrow in India

No significant documentation found regarding the population status of House Sparrow in India. However, dramatic decline has been observed by ornithologist in different parts of country like Banglore, Mumbai, Hyderabad and other cities in India (Dandapat *et al.*, 2010). A survey conducted by the Indian council of Agricultural reported 80 % decline in House Sparrow population in Andhra Pradesh only while in Gujarat and Rajasthan it is 10 to 20 % decline, while the decline in coastal area was as sharp as 70- 80%. Dwindling population of House Sparrow has rung an alarming call which has engendered deep public concern. In India numbers of NGOs and Institutions have started campaign to conserve the status of House Sparrow in different parts of the country but there is lack of authenticate data to actually evaluate the population status of House Sparrow periodically. Like in Bhavnagar (Gujarat) Jivdaya Premi “Jay Malnath” Group has started campaign to save the Sparrow since 1992 and distribute artificial nest box and water pot for sparrow. Similarly, so many people are active in this field and has joined hands together to save this little creature like, Jagat Kinkhabwala better known as ‘Chakliwala’ for his passion to save House Sparrow has done marvellous job by distributing 50,000 nest till date and over 4,500 of those have become homes for the birds (TOI News-2017) one of the appreciated job done by him. But scientific documentation regarding the actual status of House Sparrow is lacking. Till date the study carried out on House sparrow is not consistence, there is lack of proper documentation on the recordings of local bird monitoring at regular time interval which constitute a kind of hurdle to actually compare and analyse the rate of declining of the species.

The Nature club, Surat (Gujarat), in coordination with Bird Conservation Society has decided to actually record the head counting of Birds in different area of the city (TOI News 2017). The scientifically proper bird survey techniques could help us to collect the authenticate data regarding the actual status of the bird in different area which is still lacking in India. However, In India BNHS and ICBN, with the aid of RSPB, have programmed a scheme to monitor local birds in India. This would provide a base line data on

common birds and their population trends which could aid in planning essential strategies for the maintenance of population of local birds which is one of the appreciated steps.

Factors Influencing Population Pattern of House Sparrow

House Sparrow is considered as an r-selected species (Daniels, 2008), which is intimately associated with civilization however increased urbanization has changed the population pattern of House Sparrow.

Various hypotheses have been put forward to determine the key factors responsible for the population decline. Possible environmental factors contributing to decline in House Sparrow populations include reduced availability of food (Hole *et al.,* 2002), Predation (Thomas *et al.,* 2012; Bell *et al.,* 2010) and loss of nesting sites(Summer-smith, 2003), 'Allee effect'(Allee, 1938), loss of roosting site, electromagnetic radiation (Memon *et al.,* 2013) etc.

One of the key factor responsible for the lower reproductive success in avian species is food limitation in urban than other Landscapes (Chamberlin *et al.,* 2009). Invertebrate constitute important part of nestling's diet for their better survival, although adults are largely seed eaters (Anderson, 2006). Hence, invertebrate availability limits the reproductive success (Peach *et al.,* 2015). Studies in England and Hungary have reported high rates of chick starvation and lower BMI (Body Mass Index) correlated with the local availability and quality of invertebrate prey (Peach *et al.,* 2008, Seress *et al.,* 2012). So that when there is availability of larger invertebrate prey such as Lepidopteran Larvae and Orthoptera in diet of nestlings, fledgling has higher body mass, this in turn is positively related to the likelihood of recruitment as healthy breeding adult individual (Ringsby *et al.,* 1998; Schwagmeyer and Mock, 2008). Small scale studies of a declining House sparrow population in Hamburg, Germany suggested brood starvation might have been caused due to no availability of aphids (Aphidioidea) and Ants (Formicidae) as part of nestling's diet near nesting site (Bower, 1999; Mitschke *et al.,* 2000). It has been reported that 84% of Sparrow nestlings were comprised insects, with caterpillars constituting 38% (Simvat, 1977). Hence, invertebrate prey availability is one of plausible demographic factors responsible for decline in urban-suburban House Sparrow population. Coverage of exposed soil by concrete, different planting pattern in modernized garden, improved street hygiene, unleaded petrol etc., play important role in reducing invertebrate availability. Similarly, seed constitute the important diet of the adult birds, with increasing dependence of birds on kitchen scrapes may reduce the fitness of the species, which could result in failure of female to come into breeding condition or reduction in breeding attempts per pair (Summer-Smith, 2005).

Study carried out by Murgui *et al.,* (2010) in Valencia (Spain) has suggested that the absence of holes and Crevices in new buildings could make them unsuitable for nesting, one of the key factors responsible for reducing population due to lack of nesting sites.

The House Sparrow being a social bird, forms loose colony during breeding seasons, which depend on social stimulation for successful breeding. It is suggested that the colony size when falls below threshold size, the bird stop to breed due to lack of social stimulation and the colony collapses ('Allee effect') (Allee, 1938). In urban centre where lack of nesting sites has been one of the significant factor, while in case of suburban areas the buildings are fairly separated on which bird prefer to build nest, lead to lack of social stimulation than in case of other residential areas (Summer-Smith, 2005). However, habitat needs do not end with finding suitable nesting sites only, other ecological behaviour like 'dust bath', not common to other passerine birds require a sandy ground, in modern architecture there is paved garden with no mud to bath in (Dandapat *et al.,* 2010; Daniels, 2008). It require hedges or bushes formed of different shrubs, as their suitable roosting sites which is also reducing now a days could also affect the population pattern of the species directly or indirectly.

Many considered increasing effect of Electromagnetic radiation as one of the possible factors responsible for the declining population of House Sparrow (Memon *et al.,* 2013). It is believed that increased microwaves released from tower are responsible for reproductive and coordination problems and aggressive behaviour in birds such as Sparrow (Sri Suci *et al.,* 2001). However, it also raised a reasonable

question that if electromagnetic rays used in telecommunication are deleterious or harmful to birds then other avian species should also be affected living in urban area together with House Sparrow (Daniels, 2008). Lacking of comparable studies with other avian species as well as studies on effect of electromagnetic radiation on physiology with natural life exposure than amount used during experimental study could shed more light on the electromagnetic radiation as possible factors for reducing Sparrow population in urban area.

Variation in the development and maintenance of urban landscapes elucidates that decline in sparrow population is lower in area with lower socioeconomic status, localities that have livestock in and around their neighbourhood (Girish *et al.*, 2012).

CONCLUSION

No single study could provide all the necessary baseline data for planning proper strategies to maintain the population of House Sparrow in different area having different habitat characteristics. However, basic data for any study provide a framework on which detailed analysis may be conducted and an efficient protocol could be adopted at different places having different habitat characteristics influenced by different environmental factors. However, availability of variety of food resources for both adults and nestlings and essential nesting sites around the food sources are fundamental key factors which play an important role in demography and abundance of House Sparrow.

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