

# Distribution and conservation issues of House sparrow. A review

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## Abstract

The genus *Passer* comprises of 25 species, with *Passer domesticus domesticus* as the nominate species across Europe to northern Asia. Native to most of Europe, the Mediterranean Basin and much of Asia, house sparrow remains associated with human habitation in both urban and rural areas. It mostly feeds on the seeds of grains and weeds. House sparrow is a monogamous bird and nests most frequently on the roof space and other crevices of houses. An estimation of the British trust of Ornithology has shown a decline of 71% of sparrow population between 1994 and 2004 in London alone. Similar cases of decline have been reported from other areas of globe viz. Hamburg, Berlin, Glasgow, Edinburg and Dublin. Although the house sparrow has an extremely large range and population, and also assessed least concern by IUCN, but in India its population decline has also been reported and the decline is attributed to loss of nesting sites, food sources, predation and pollution.

**Key words:** *Passer domesticus*, Status, decline, habitat loss

## 1.Introduction

House sparrow is the member of the order Passeriformes in the genus *Passer* comprising of 25 species. It is almost cosmopolitan in distribution ranging from Europe to Asia (Eurasia), Latin America, South America, South Africa, Middle East, Central Asia with introduced ranges in North and South America, Australia, New Zealand (Fig 1). It tolerates a variety of climates, but prefers drier conditions, especially in moist tropical climates. It has been broadly divided in two groups as Oriental group and Palearctic group (Table 1), with *Passer domesticus indicus* and *Passer domesticus domesticus* as nominate species in each group respectively (Smith and Denis, 2009).



Fig. 1

Source: Blotzheim and Bauer: Birds of Central Europe (1997).

■ Native Range  
■ Introduced Range

<b>Palaearctic <i>P. d. domesticus</i> group:</b>	<b>Oriental <i>P. d. indicus</i> group:</b>
<i>P. d. domesticus</i>	<i>P. d. indicus</i>
<i>P. d. balearoibericus</i>	<i>P. d. hyrcanus</i>
<i>P. d. tingitanus</i>	<i>P. d. bactrianus</i>
<i>P. d. niloticus</i>	<i>P. d. parkini</i>
<i>P. d. persicus</i>	<i>P. d. hufufae</i>
<i>P. d. biblicus</i>	<i>P. d. rufidorsalis</i>

Table 1 depicting the Palaearctic group and Oriental group

It has an extremely vast range and is least concern in the IUCN Red List (BirdLife International 2013). In most of Europe, populations of House Sparrows are decreasing. In the Netherlands, this species is even considered as endangered species (BBC News 2008), and the population has dropped in half since the 1980s. Similarly decline in population have also been recorded in the United Kingdom. House Sparrows in Buckingham Palace Gardens in London have shown a population decrease of 85% (Summers-Smith 2000). House Sparrows in Edinburgh and Dublin have also shown declines. In the centre of Edinburgh, House Sparrows have shown a 90% decline over the last 15 years, while other bird species in the same area have shown no change (Dott and Brown 2000). Local surveys in cities such as Manchester and Glasgow have documented House Sparrow declines on the scale of 80-95% (Summers-Smith 1999). In the city of Hamburg, Germany, the House Sparrow population is thought to have declined by more than 50% in the last 30 years (Mitschke *et al*, 1999). In Paris, a city once thought to have a high density of House Sparrows, now appears to have a declining population with a 36% decline in the last forty years (Galinet 2003). Data from the British Trust of Ornithology covering the period 1994-2000 suggest that while there has been an overall decline of House Sparrows in England, the species has actually increased in Scotland and Wales (Raven *et al*, 2002). The British Trust for Ornithology estimated that the sparrow population in London has declined by 71% between 1994 and 2002. Edinburgh, Dublin, Glasgow, Hamburg, and Berlin are other European cities that have reported a sparrow decline. A study by the conservation biologist, Cagan Sekercioglu (2013), at Stanford had predicted that about 10% of all bird species are likely to disappear and another 15% could be on the brink of extinction by the year 2100. Important processes i.e. decomposition, pollination and seed dispersal will likely decline as a result. North

America witnessed the declines initially and were attributed to the spread of the house finch, but have been most severe in Western Europe (Anderson 2006, Summers-Smith *et al*, 2005). Declines have not been universal, as no serious declines have been reported from Eastern Europe, but have even occurred in Australia, where the house sparrow was introduced recently (Anderson 2006). In Great Britain, populations peaked in the early 1970s (Summers-Smith 1988), but have since declined by 68% overall ("Sparrow numbers 'plummet by 68%'. *BBC News*. 2008) and about 90% in some regions (McCarthy, 2000). In London, the house sparrow almost disappeared from the central city (McCarthy, 2000). In Dutch, since 1980's, its population declined to half (Guus, 2001) so the house sparrow is even considered an endangered species (Gould *et al*, 2004). A number of causes for the dramatic decreases in population have been proposed, including predation, in particular by Eurasian sparrow hawks (Ross *et al*, 2006; Christopher *et al*, 2010; Michael, 2010); irradiation (Alfonso *et al*, 2007); and diseases (Michael, 2008). Urbanization leading to loss of nesting sites is probably a factor, and conservation organizations have encouraged the use of special nest boxes for sparrows (Michael, 2008). A primary cause of the decline seems to be an insufficient supply of insect food for nestling sparrows (Michael, 2008; Peach *et al*, 2008). Declines are also attributed to pesticide use (Vincent, 2005; Vincent *et al*, 2009), exotic plant species introduction and parking areas (Charles 2008; Smith, 2008) and possibly the introduction of unleaded petrol, which produces toxic compounds such as methyl nitrite (Summers-Smith and Denis, 2007). To raise awareness, 20 March is celebrated as world sparrow day across the world since 2010 (Sathyendran, 2012). The house sparrow population has been on the decline in many Asian countries, and this decline is quite evident in India. To promote the conservation of these birds, in 2012, house sparrow was declared

as the state bird of Delhi ("Save our sparrows". *The Hindu*, 2013). Since 1960s House Sparrows have been studied extensively using nest boxes at the M. S. University Campus in Baroda. The population density of House Sparrow in different localities of Haridwar and Uttarakhand was conducted to find out reasons and consequences of changing population pattern of the species (Goyal, 2005). The House Sparrows do not inhabit dense forest and are more abundant in agricultural field as compared to residential colony (Goyal, 2005). Extensive literature survey results that there is a definite decline in their number over the last decade. This is because of loss of nesting sites, food sources, increase in predators and pollution. Box Initiative was performed from Mumbai city by putting up little wooden boxes on trees, which sparrows could use as nests. Little feeders were kept along with grains, insects and water to help the sparrows settle (Parmar, 2008). The Birdlife International, Royal Society for the Protection of Birds (RSPB), a UK-based organization and the Bombay Natural History Society (BNHS) has identified 466 sites for the long-term protection of threatened and common birds of India. These sites are denoted as Important Bird Areas or IBAs. In most of the world, the house sparrow is not protected by law. Researchers need to shift their focus on House Sparrow study and devise conservatory methods in order to deal with the shifting trend or rather declining status of house sparrow in India and in the valley of Kashmir as well. Rapidly converting towns are now not an appropriate habitat for the house sparrow, as the brand new and cutting-edge designs of infrastructure does not deliver any room for the sparrow to nest; pollution induced by microwave radiations and pesticides; house sparrows lose their natural grasslands as neophyte spaces in our cities give way to more concrete buildings (Pandey *et al*, 2020). In the Valley of Kashmir the House Sparrow, *Passer domesticus parkini* is the sub-species of House Sparrow and is distributed all over the Valley of Kashmir (Whistler, 1920). There has been various factors responsible for the decline in population of House Sparrow in Valley which include concrete urbanization, destruction of nests, predation, parasites and diseases, are some of the major factors responsible for decline in house sparrow population in the valley (Irfan *et al*, 2018; Wahied *et al*, 2020).

## 2. Habitat preferences

House sparrow is closely associated with human habitation and cultivation (Summers-Smith, 1988). Well adapted to living around humans, it frequently lives and even breeds indoors, especially in factories, warehouses, and zoos. It has been

recorded breeding in an English coal mine 640 m (2,100 ft) below ground, and feeding on the Empire State Building's observation deck at night. It reaches its greatest densities in urban centres, but its reproductive success is greater in suburbs, where insects are more abundant. On a larger scale, it is most abundant in wheat-growing areas such as the Midwestern United States. House sparrows showed preference to areas like parks and places of rubbish bins for feeding as compared to concrete areas like streets and tall buildings (Edgar *et al*, 2018). It tolerates a variety of climates, but prefers drier conditions, especially in moist tropical climates. It has several adaptations to dry areas, including a high salt tolerance and an ability to survive without water by ingesting berries (Walsberg, 1975). In most of eastern Asia, house sparrow is entirely absent, replaced by the Eurasian tree sparrow. Where these two species overlap, the house sparrow is usually more common than the Eurasian tree sparrow, but one species may replace the other in a manner that ornithologist Maud Doria Haviland described as "random, or even capricious" (Summer-Smith, 1988). In most of its range, the house sparrow is extremely common, despite some declines, but in marginal habitats such as rainforest or mountain ranges, its distribution can be spotty. Park remodeling might be linked to a reduction in both habitat suitability and availability of trophic resources, which could harm House Sparrows populations and possibly other species as well. Therefore, new park policies and urban planning measures are urgently needed to preserve urban House Sparrows (Edgar *et al*, 2020). The relationship of House sparrows and man cannot be considered as commensalism, it is a strong mutual affiliation between the two species. The everyday interactions that connect the *Passer domesticus* and *Homo sapiens* are rather simple to understand yet quite complex to bring into action. For best understanding of the house sparrow-human mutual affiliation assessment of a combination of non-environmental (e.g., housing age and income) and environmental measurements is needed that may provide a more complete understanding of the factors influencing House sparrow population in an human dominated setting (Akhilesh *et al*, 2019).

## 3. Food and feeding

Adult house sparrow mostly feeds on the seeds of grains and weeds, but it is opportunistic and adaptable, and eats whatever foods are available (Anderson, 2006). In urban areas, it often searches for food in garbage containers and assemble in the outdoors of restaurants and other eating outlets to feed on leftover food. It requires grit to digest the

harder items in its diet. Grit can be either stone, often grains of masonry, or the shells of eggs or snails; oblong and rough grains are preferred (Anderson, 2006; Gionfriddo *et al*, 1995). Studies in temperate agricultural areas found the proportion of seeds in its diet to be about 90% (Anderson, 2006; Summer-Smith, 1988). It will eat almost any seeds, but where it has a choice, it prefers oats and wheat (Summer-Smith, 1963). In urban areas, house sparrow feeds largely on food provided directly or indirectly by humans, such as bread, though it prefers raw seeds (Summer-Smith, 1988; Gavett *et al*, 1986). It also eats some plant matter besides seeds, including buds, berries, and fruits such as grapes and cherries (Walsberg, 1975; Summer-Smith, 1988). In temperate areas, it has an unusual habit of tearing flowers, especially yellow ones, in the spring (Summer-Smith, 1963). Another important diet for house sparrow are small insects, of which beetles, caterpillars, dipteran flies, and aphids are especially important. Various non insect arthropods are eaten, as are molluscs and crustaceans where available, earthworms, and even vertebrates such as lizards and frogs (Anderson, 2006). Juveniles are fed mostly on insects until about 15 days after hatching (Vincent, 2005). They are also given small quantities of seeds, spiders, and grit. In most places, grasshoppers and crickets are the most abundant foods of nestlings (Anderson, 2006). Study showed that differences at flock level can lead to variable individual benefits when two flocks are briefly together and competing for the same limited resource, even in the house sparrows (Elisa *et al*, 2020).

#### 4. Nesting and breeding

Nest sites differ, though cavities are preferred. Nests are most frequently built on the roof space and other crevices of houses. Holes in cliffs and banks, or tree hollows, are also used (Summer-Smith, 1963; Indykiewicz, 1990). It sometimes excavates its own nests in sandy banks or rotten branches, but more frequently uses the nests of other birds such as those of swallows in banks and cliffs, and old tree cavity nests (Summer-Smith, 1963). Deserted nests are usually used, though sometimes it grabs active ones. Hollows in trees are more commonly used in North America than in Europe, putting the sparrows in competition with bluebirds and other North American cavity nesters, and thereby contributing to their population declines (Franklin, 2007). House sparrow is monogamous, and typically mates for life. Birds from pairs often engage in extra-pair copulations, so about 15% of house sparrow fledglings are unrelated to their mother's mate

(Anderson, 2006). Many birds do not find a nest and a mate, and instead may serve as around the nest for mated pairs, a role which increases the chances of being chosen to replace a lost mate. Lost mates of both sexes can be replaced quickly during the breeding season (Summer-Smith, 1988; Anderson, 1990). The formation of a pair and the bond between the two birds is tied to the holding of a nest site, though paired house sparrows can recognize each other away from the nest (Summer-Smith, 1988). Open nests are preferred in warmer localities, on tree branches, especially evergreens or in the nests of storks or magpies (Haverschmidt, 1949; Summer-Smith, 1988). Storms can damage the nests in open thereby affect the breeding success (Moris and Tegetmeier, 1896; Summer-Smith, 1963). The nest is usually domed, barring enclosed sites (Summer-Smith, 1963). Nest has outer layer of stems and roots, a middle layer of dead grass and leaves, and a lining of feathers, as well as of paper and other soft materials (Indykiewicz, 1990), with external dimensions of 20 × 30 cm (8 × 12 in) (Summer-Smith, 1988), but their size varies greatly. Male initiates the nest building as a display to females. Female assists in nest making but is less proactive (Summer-smith, 1963). Some nest building occurs throughout the year, especially after moult in autumn. In colder areas it forms nests at the roof or aggregates near street lights to avoid chill (Summer-Smith, 1963; Jansen, 1983). They are not territorial, but they defend their nests aggressively against intruders of the same sex (Summer-Smith, 1963). Following their hatching, they sometimes breed again in breeding season. In tropical areas juvenile breeding successfully have been seen (Anderson, 2006). As the breeding season approaches, hormone changes trigger enormous increases in the size of the sexual organs and changes in day length lead males to start calling by nesting sites (Whitfield-Rucker, *et al*, 2000; Birkhead, 2012). The timing of mating and egg-laying varies geographically, and between specific locations and years because a sufficient supply of insects is needed for egg formation and feeding nestlings (Summer-Smith, 1988).

Prior to breeding season, males occupy the nesting sites, frequently calling beside them. Females are usually attracted by unmated males. When a female approaches a male during this period, the male displays by moving up and down while drooping and shivering his wings, pushing up his head, raising and spreading his tail, and showing his bib (Summer-Smith, 1988). The male displays in front of her, attracting other males, which also pursue and display to the female. This group display usually does not immediately result in copulations. Other males usually do not copulate with the female (Summer-Smith, 1988). Female

initiates the copulation giving a soft *dee-dee-dee* call to the male. Frequent copulation happens until the female is laying eggs (Summer-Smith, 1988).

## 5. Threats

A number of hypotheses have been put forward to explain the decline in suburban and urban House sparrow populations (Smith, 1999 and Moss, 2001). The causes of decline of sparrows have been categorized separately for rural and urban areas (Summers-Smith, 1999). In the rural areas the decline of sparrows has been attributed to changes in the farming practices by the usage of pesticides and herbicides, changes from spring to autumn sowing, reduced grain spillage and improved storage of grains to meet EU norms. In urban areas, the causes of decline is mainly attributed to increased predation by Magpies (*Pica pica*), Sparrow Hawks (*Accipiter nisus*) and domestic cats (*Felis catus*); competition for food by other urban species, Feral Pigeons (*Columba livia*) and gulls, particularly Lesser Black-backed Gulls (*Larus fuscus*); loss of potential breeding sites; spillover from the farmland decline; disease (caused by *Salmonella typhimurium*: Pennycott, 2004); increased traffic (MTBE of the unleaded petrol causes decline in aphid densities affecting the sparrow nestling diet (Vincent, 2005). Use of insecticides might have decreased food availability for house sparrow (Crick *et al.*, 2002). Urbanization has led to decline in house sparrow nesting sites (Balaji *et al.*, 2017). The electromagnetic fields and radiation created by mobile towers are known to affect sparrows (Everaert *et al.*, 2007; Balmori *et al.*, 2007). Other threats include increase in predator numbers and in pollution levels (Dandabat, 2010; Egdar *et al.*, 2019). Roadkill is another common cause of its threat (Pratibha *et al.*, 2020). On European roads, it is the bird most frequently found dead (Erritzoe *et al.*, 2003). Use of different type of organo-chemicals in gardens, parks and change in agricultural patterns is also a reason for the decline of this species (Irfan *et al.*, 2018).

### Parasites and Diseases

House sparrow is host to a huge number of parasites and diseases, and the effect of most is unknown. The commonly recorded bacterial pathogens of the house sparrow are often those common in humans, and include *Salmonella* and *Escherichia coli* (Summer-Smith, 1963). *Salmonella* is common in the house sparrow, and a comprehensive study of house sparrow disease found it in 13% of sparrows tested. *Salmonella* epidemics in the spring and winter can kill large numbers of sparrows (Macdonald, *et al.*, 1978; Anderson, 2006). House sparrow hosts avian pox and avian malaria, which it has

spread to the native forest birds of Hawaii (Riper *et al.*, 2002). Many of the diseases hosted by the house sparrow are also present in humans and domestic animals, for which the house sparrow acts as a reservoir host (Juricova *et al.*, 1998; Anderson, 2006). Arboviruses like West Nile virus, which commonly infect insects and mammals, survive winters in temperate areas by going dormant in birds including house sparrow (Anderson, 2006; Young, 2000). In case of fatality, the birds show enlargement and congestion of the liver and spleen with liver, lung, muscle and skin abscesses. As disease spreads between individual birds, they will become more prone to more diseases (Wahied *et al.*, 2020).

## 6. Recommendations

Several threats to house sparrow have been identified globally and if these threats continue unabated, they will have serious implications for house sparrow and potentially for other birds as well thereby disturbing the whole ecological balance. Following recommendations are suggested for house sparrow conservation:

- 1) Study of population dynamics of house sparrow wherever, the decline has been reported.
- 2) Use of insecticides should be avoided as they feed mainly on insect population.
- 3) Artificial nest boxes should be made available for these birds whenever and wherever possible.
- 4) Wires passing through cities and urban areas are must for development. But now we should pass these electric wires through an area in such a way that they cause little damage to birds in general and sparrows in particular.
- 5) Awareness programmes regarding importance and conservation of passerines should be conducted.
- 6) Extensive study should be conducted to find out effect of electromagnetic radiations mainly due to mobile towers.
- 7) Various laws which can provide protection to house sparrow should be framed and implemented on ground.

## 7. Conclusion

House sparrow decline has serious impacts not only for species themselves but on whole ecological balance as well. The possible irradiation by mobile towers and use of insecticides, besides the mass urbanization is taking heavy toll on house sparrow. Loss of its nesting sites due to anthropogenic and various other factors needs to be checked in order to save this species from getting declined. More research work needs to be worked out regarding

possible irradiation effect on house sparrow using molecular mode of study at genetic level.

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