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RESEARCH ARTICLE

AN UPDATE ON THE CURRENT STATUS OF HOUSE SPARROW, PASSER DOMESTICUS: A BIRD WITH UNCERTAIN FUTURE

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Abstract

The house sparrow, commonly called goraiya, is a tiny brown bird with black streaks running down its back that is frequently seen in metropolitan settings. Due to their adaption to human settlements, they have spread over the world from their Middle Eastern origins. Nonetheless, their numbers have drastically decreased globally, especially in metropolitan suburbs. The sparrow population in India has plummeted, with declines of up to 70% in some locations. An ornithological survey conducted by the Indian Council of Agricultural Research (ICAR) unveiled a drastic decline of 80% in Andhra Pradesh alone, 20% in Kerala, Gujarat, and Rajasthan, and followed by 70-80% in coastal regions. House sparrow populations in Tamil Nadu, Andhra Pradesh, Karnataka, and Uttarakhand are declining due to environmental stressors, vegetation, and transition from automobiles to horse-drawn transportation. Reproductive potential is influenced by insectivorous food availability, while electromagnetic radiation and power lines pose health deterioration and microwave sickness. Having status of least concern in IUCN, house sparrow is still experiencing a rapid decline in its population at global scale. To protect sparrow populations several national measures and conservation regulations are being implemented. House sparrows have been designated as the “State Bird of Delhi” and the “State Bird of Bihar”, making India the largest sparrow conservation initiative. The current review seeks suggestions for providing alternative nesting sites for House Sparrows, as this could potentially restore them to our lives and allow future generations to enjoy these tiny, singing birds in their homes.

Introduction:-

The house sparrow is a widespread and easily recognizable bird commonly found in metropolitan areas. Also known as the Goraiya, it is a small, stocky passerine measuring 14–16 cm in length, weighing 26–32 grams, and

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The house sparrow is a widespread and easily recognizable bird commonly found in metropolitan areas. Also known as the Goraiya, it is a small, stocky passerine measuring 14–16 cm in length, weighing 26–32 grams, and with a wingspan of 19–25 cm. Belonging to the family Passeridae, it exhibits clear sexual dimorphism between males and females. Considered the world's most abundant and widely distributed bird species (Anderson, 2006), the house sparrow originated in the Middle East and has since expanded across much of the globe. Its range includes large parts of Asia—particularly the Indian subcontinent—as well as Europe and North Africa (Figure 1). Within the Indian subcontinent, the species has also been introduced to the Andaman Islands, Pakistan, Bangladesh, Sri Lanka, and the Maldives (Ali & Ripley, 1983).

Of the 32 sparrow species recorded worldwide, five are found in India: the House, Spanish, Sind, European Tree, and Russet sparrows. Among these, Passer domesticus is the most widely distributed species across the country (Teotia et al., 2018). Its remarkable ability to adapt quickly to human-dominated landscapes has facilitated its widespread establishment (Dandapat et al., 2010). Despite its small size, the house sparrow holds great ecological significance, acting as an indicator of environmental balance. Closely associated with human settlements, it inhabits both urban and rural areas and thrives across diverse climates and habitats, though it generally avoids dense forests, vast grasslands, and deserts.

These adaptive traits make the house sparrow an important model species for studying biological questions such as evolutionary mechanisms, thermal metabolism, and pest control (Kumar et al., 2015). Its diet primarily consists of weed and cereal seeds, supplemented by insects and other small food items. However, sparrow populations have declined drastically in many parts of the world, particularly along the urban–suburban gradient (Chamberlain et al., 2007). In some regions of India, populations have decreased by nearly 70% (Dandapat et al., 2010). Once abundant in cities, towns, and villages, sparrows are now disappearing more rapidly from urban centers compared to rural areas. One proposed factor contributing to this decline is electromagnetic radiation in urban environments (Balmori&Hallberg, 2007).

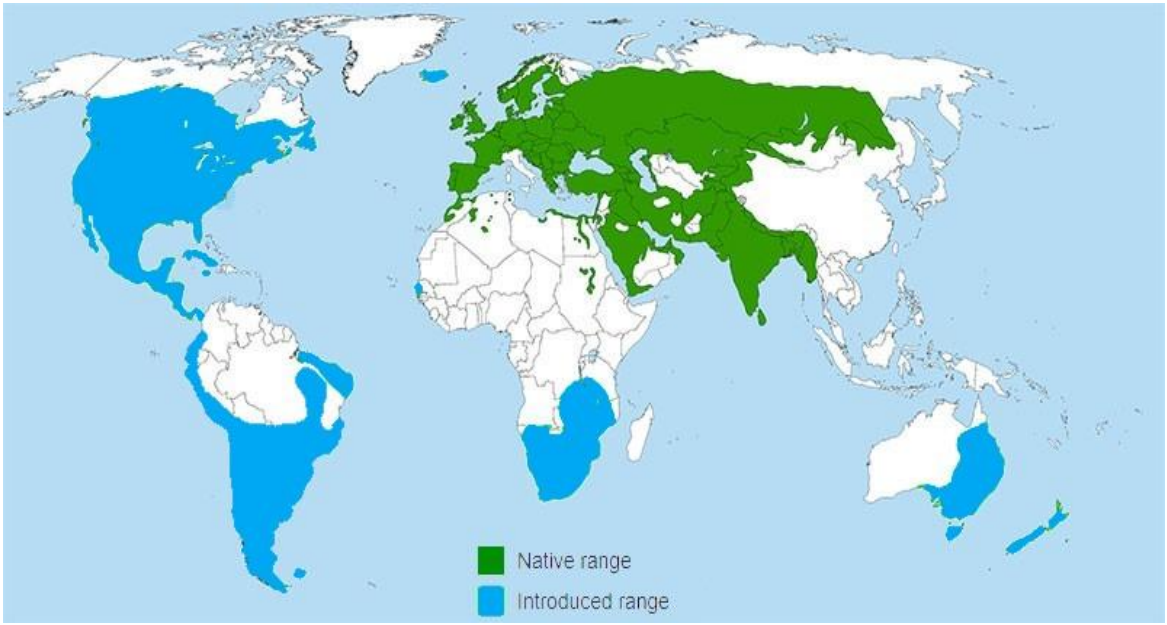

Figure 1.House sparrow range map: green=native, yellow=introduced (map from Wikimedia Commons)

The genus passer:
Summers-Smith's 1988 update on the genus Passer, also known as Old World sparrows, includes 20 species found primarily in Africa, Europe, and Asia, with his findings heavily cited in this narration (Table 1). Summers-Smith (1988) divided the house sparrow genus into two subgeneras and three superspecies groups, including the Spanish sparrow (P. hispaniolensis), the Somali sparrow (P. castanopterus), and the desert sparrow (P. simplex), which are part of the same superspecies group (Anderson, 2006).

Description:-

Compared to female house sparrows, males often weigh more and are bigger (Hanson et al., 2020b). Male Passer species have black stripes, gray crests, and white markings, while females have duller plumage with dark brown crests and light brown lines behind the eyes. Females lack the black marks on their heads and have gray-brown to light brown cheeks, beaks, and feathers. Their morphology resembles juveniles and females of other Passer species, making it difficult to identify them (Anderson, 2006). Subspecies varied in respect to bulk, size, and male plumage as well (Sumers-Smith, 1988). The male sparrow's huge black neck patch is the most obvious physical difference between it and the female. The species' status as a model in behavioural ecology research may have been influenced by this characteristic marking (Sanchez-Tojar et al., 2018).

Diet and Scavenging:-

After hatching, fledgling house sparrows mostly eat insects during the first three days. They then often graze more on cereals following fledging, particularly in rural regions (Anderson, 2006). Adult house sparrows make most of their year-round food opportunistically, especially in urban and suburban regions where there is an abundance of human garbage (Summers-Smith, 1988). A potential cause for house sparrows' skill in taking advantage of a variety of meals might be the release of digestive enzymes with flexibility (Brzęk et al., 2009). The species is used as a model for range expansion due to behavioural reactions to feeding.

House sparrows from an older invading population in New Jersey consume unusual foods less quickly than those from a 40-year-old Panama population. An inclination to explore novel meals may be advantageous for birds in circumstances where supplies are limited or unpredictable. But there are hazards associated with this activity as well, such as the immune system being triggered by tainted food or exposure to foreign poisons (Martin & Fitzgerald, 2005). It has been found that populations vary substantially in the composition of their immune systems and the parasites they harbor throughout their entire lives lends credence to this idea (Kilvitis et al., 2019; Martin et al., 2015; Martin et al., 2014; Coon & Martin, 2014; Coon et al., 2014).

Table 2. House sparrow of India

Name	Description	Distribution	References
Passer hispaniolensis (Spanish sparrow)	16cm, a chestnut and black sparrow with a stout bill. Sexes are dimorphic.	Erratic winter visitor to plains of Northwest India mainly east to Haryana and south to Rajasthan. Vagrant in Uttar Pradesh.	Modak, 2017
Passer pyrrhonotus (Sind sparrow)	12cm, slim, brown and grey sparrow with neat, rectangular black bib. Sexes are dimorphic.	Local breeding restricted to areas of Punjab and Haryana.	IrshadChandio et al., 2019.
Passer rutilans (Russet sparrow)	15cm, a bright chestnut sparrow with usually yellowish-buff underparts. Sexes are dimorphic.	Locally common breeding resident in northern mountains from north Pakistan to east Myanmar.	Naithani et al., 2012
Passer montanus (Eurasian Tree sparrow)	15cm, brown and buff sparrow with a rounded, chest-nut crown. Sexes alike.	Locally common breeding resident in Uttaranchal.	Kumar et al., 2015
Passer domesticus (house sparrow)	15cm, brown and grey sparrow with stout bill. Sexes are dimorphic.	Common breeding resident throughout plains and foothills. Rare in parts of the Northwest and the Northeast.	Swami & Kumar, 2022

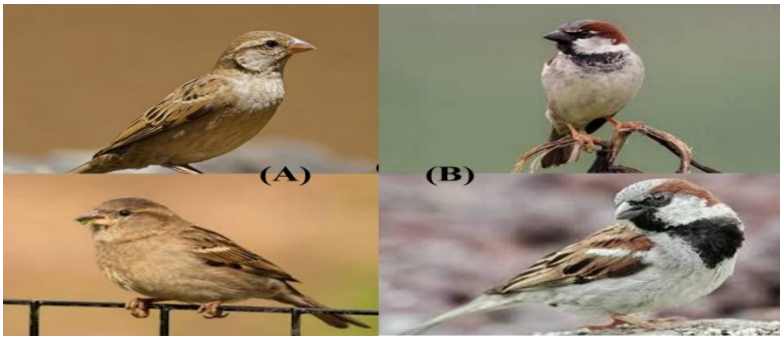

Figure 2. (A) Female and (B) Male House Sparrow(Images from Wikimedia commons)

Behaviour:-
House sparrows are outgoing birds that roost in groups and are recognizable throughout the year. Their nest-building preferences are diverse; they often choose to construct their homes in cracks and crevices in cliffs and banks, residential rooftops, and streetlights. Their food sources include insects, grains, seeds, flower nectar, and, in urban areas, leftover human food. Limited migration is conceivable in many parts of the world.

The breeding season in northern India extends from March to June. In central India, it is from September to October and in southern India, it is observed all year round (Dandapat et al., 2010). While not in the breeding season, they come together as massive flocks; otherwise, they are seen in couples or small groups. Despite some assistance from the female, the male chooses the nest site and builds the majority of the nest. March–April is when nesting starts (Dandapat et al., 2010). Male house sparrows fiercely defend their nesting grounds throughout the mating season, and both sexes actively assist in rearing the young. These birds live for twelve years on average. In order to find food on the ground and protect their nesting grounds, house sparrows employ wing flapping and skipping. To attract possible mates, fend off intruders, and notify others, they communicate through postures, gestures, and vocalizations, maintaining a safe and secure habitat (Paul, 2015).

Breeding Biology:-
House sparrows establish enduring mate ties and are monogamous. Although they have several broods, it is uncommon for more than two of them to succeed. Males select a nest site and remain there while they advertise by calling, which is a quiet chirrup that they repeat once every one to two seconds. They may also shiver their wings and raise their tails. If a falcon approaches and expresses interest in the nest, the male gets excited and jumps around, holding his head up and holding his wings out slightly.

During this period, the male enters and exits the nest site, occasionally blocking the female's entry for two to three days. Males may offer nest materials to females and even touch bills during the construction of the nest; bill contact also triggers copulations. Five to six eggs, profusely powdered, speckled, or blotched with black, brown, or ash-grey, are laid by the house sparrow on a creamy white or blue-tinted background. Every bird takes between 10 and 12 days to incubate. Older birds breed earlier in the season, which is the only way that the reproductive success rises with age. 4-5 eggs, ranging from 1 to 8, typically make up a clutch (Dandapat et al., 2010).

Figure 3. Potential nesting sites of the house sparrow in India (Images from Wikimedia commons

Figure 4. (A) Birds having sunbath and rest (B) Birds perching on wire and Socializing

Status in world:-

Approximately 1/8th of the world's bird species are under threat of going extinct, meaning that 1,226 of the 9,856 bird species are closer to going extinct. Worldwide, the population of sparrows is dropping (Crick et al., 2002; Summers-Smith, 2006). According to recent studies, the House Sparrow population is drastically declining in several regions of the world. The population of most of Europe is dwindling dramatically. In fact, this species is listed as endangered in the Netherlands. In the United Kingdom, population declines in rural regions have been 47% and in urban and suburban areas 60% since the mid-1970s (Robinson et al., 2005). Reports of this species' population reduction also exist for northwest Europe (Prowse, 2002). The House Sparrow is now included on the European Conservation Concern species list as a result (Shaw et al., 2008). Special conservation concern (Red List) in Britain (Baillie et al., 2010).

According to the British Trust for Ornithology, between 1994 and 2002, there was a 71% decrease in the sparrow population in London. Other European cities that have observed a fall in sparrow populations include Edinburgh, Dublin, Glasgow, Hamburg, and Berlin (Dandapat et al., 2010). Based on an investigation conducted four years ago at Stanford University by conservation scientist CaganSekercioglu, around 10% of all species are expected to become extinct and an additional 15% may be in danger of doing so by the year 2100. As a result, critical processes like seed distribution, pollination, and decomposition are probably going to diminish (Dandapat et al., 2010). The species is classified as least concern on the 2019 IUCN Red List, and the population trend is currently declining.

Status in India:

Over the past few decades, house sparrow populations have shown a marked decline across several regions of India, including West Bengal, Bangalore, Punjab, Rajasthan, Delhi, and Haryana (Bandel, 2010). Limited studies from Uttarakhand, Karnataka, Tamil Nadu, and Andhra Pradesh have also documented reductions in population (Ghosh et al., 2010; Balaji et al., 2013; Hussain et al., 2014; Paul, 2015; Naik, 2018; Deepalakshmi&Salomi, 2019; Sharma &Binner, 2020; Renukadevi et al., 2021). Research from Kerala further suggests that house sparrows may already be locally extinct in Trivandrum City (Raju, 2015).

In Andhra Pradesh alone, sparrow numbers have fallen by nearly 80%, while states such as Kerala, Gujarat, and Rajasthan have recorded declines of about 20%. Coastal regions appear to be most affected, with reductions as high as 70–80%, according to an ornithological assessment by the Indian Council of Agricultural Research. Multiple surveys carried out in different parts of the country also confirm this downward trend (Rajashekar&Venkatesha, 2008; Daniels, 2008; Khera et al., 2010; Bhattacharya et al., 2010; Ghosh et al., 2010).The Bombay Natural History Society (BNHS) has reported decreases in both nest numbers and overall sparrow populations. Supporting this, a joint survey by the Central Ministry of Environment and Forests and BNHS revealed a sharp decline in sparrow numbers in the Hyderabad–Ranga Reddy region beginning around 2005 (Sharma &Binner, 2020).

Causes of decline:-
Many theories have been developed to explain why House Sparrow populations in urban and suburban areas may be declining, including predation, ecological factors, competition, a lack of nesting places, disease, a shortage of food, and pollution (Summers-Smith, 1999; Daniels, 2008). Several theories have been proposed as potential reasons for the decrease in House Sparrow populations in rural, urban, and suburban areas are:

Predation:
House sparrows are a common food source for owls and hawks. These include Eurasian Sparrow Hawks **(**Accipiter nisus**)** and domestic cats **(**Feliscatus**).** However, the domestic cat is a significant predator of house sparrows. Several snakes, raccoons, and domestic dogs are other house sparrow predators. Predators including black kites, shikra, and crows also attack the chicks (Sharma &Binner, 2020).

The lack of food:
Insects and grains are both consumed by house sparrows. The introduction of pre-cleaned food grains has reduced the availability of these foods; washing grains in a garden has become uncommon. Thus, the ensuing grain spillage that these birds were pecking at have vanished. The decorative plants and crotons that sustain less insect life the primary food source for sparrows have supplanted the vegetable gardens in old world homes (Kumar et al., 2015). Uncontrolled Pigeons The primary competitors for food in the two urban environments are Columba livia and gulls Larus, especially Lesser Black-backed Gulls L. fuscus. However, it is doubtful that either species would have a distinct impact (Sharma &Binner, 2020).

Absence of nest sites:
Hundreds of shrubs and trees are being cut down to make way for large structures. The lack of cracks and holes in the terraced structures, which are favoured over tiled homes, has resulted in a sharp decrease in house sparrow nesting locations (Kumar et al., 2015).

Diseases:
In urban and suburban environments, house sparrows can serve as reservoirs of disease (Juricova et al., 1998). Among free-ranging wild sparrows, salmonella infections are particularly common during the winter and spring seasons (Macdonald, 1978). Infected birds often exhibit enlarged and congested livers and spleens, along with abscesses on the skin, muscles, and liver. Communal feeding practices-such as the use of garden bird tables and feeders-can further facilitate the spread of infection (Macdonald, 1978).

As the disease progresses, affected birds become weaker and increasingly susceptible to secondary infections. Immunocompromised individuals are also at greater risk of contracting a variety of illnesses from such pathogens. Disease is now recognized as being influenced not only by parasite infection but also by the host's overall health status. This makes it difficult to separate the effects of food scarcity and environmental stressors from those of disease. Consequently, disease-related mortality is generally considered unlikely to contribute significantly beyond other existing causes of sparrow mortality (Newton, 1998).

Environmental Pollutants:
Pesticides, industrial effluents, and combustion emissions are among the many harmful substances continually released into the environment. Several of these chemicals are now recognized as major factors contributing to bird population declines worldwide, as they influence distribution and abundance patterns (Newton, 1998). A study conducted in urban Warsaw, Poland, showed that mortality in House Sparrow nestlings was linked to the presence of polychlorinated biphenyls (PCBs) and chlorinated hydrocarbons, which enter the environment through industry, sanitation, and agriculture (Karolewski et al., 1991).

Similarly, Romanowski et al., (1991) reported that concentrations of zinc and lead in the livers of sick and dead sparrow nestlings were higher than in healthy ones. Nestlings with stunted growth (low body weight) also had elevated levels of zinc, cadmium, and lead compared to those with normal growth. Summers-Smith (2006) further noted that pollutants such as MTBE, emitted from cars, can reduce populations of invertebrates like aphids, indirectly threatening sparrow nestling survival. Although MTBE levels in the UK are not yet monitored, there is currently no conclusive evidence that pollution alone is responsible for the decline of House Sparrow populations.

Owing to Shifts in Human Lifestyle:
Contemporary lifestyles have brought about significant modifications to housing architecture. Because terraced constructions are chosen over tiled homes because they lack gaps and cracks, house sparrow nesting grounds have drastically decreased (Kumar et al., 2015).

Use of chemicals:
When pesticides and insecticides are used excessively in gardens and agricultural fields, insects are killed. The mortality rate for chicks and yearlings can be elevated because of a deficiency of insects high in protein and contamination of grains and insects they ingest (Kumar et al., 2015).

Conservation strategies:-
House sparrows, being opportunistic in nature, can thrive wherever there is adequate food, suitable nesting sites, and safe roosting places. However, their numbers have recently declined in India, raising concern for their conservation. To prevent urbanization from driving them toward the category of Critically Endangered, various initiatives have been launched across the country. Since 2006, Mohammed Dilawar, through the Nature Forever Society (NFS), has been working to protect common species such as sparrows.

The society has introduced impactful programs like the Adopt a Feeder and Nest Program, World Sparrow Day, Common Bird Monitoring of India, Project Save Our Sparrows, and the Nature Forever Society Sparrow Award. These initiatives have contributed to noticeable improvements in sparrow presence in urban areas.In collaboration with the Uttar Pradesh State Biodiversity Board, the Biodiversity and Wildlife Protection Lab at the University of Lucknow has also taken steps to spread awareness on sparrow conservation. One of their unique approaches has been gifting artificial nest boxes as souvenirs to dignitaries during awareness campaigns (Sharma &Binner, 2020).

To further emphasize its cultural and ecological importance, the House Sparrow was declared the “State Bird of Delhi” in 2012 by then Chief Minister Sheila Dikshit under the Rise for the Sparrows campaign. Following this, in 2013, Bihar’s Chief Minister Nitish Kumar also recognized the sparrow as the state bird. The NFS’s first celebration of World Sparrow Day in 2009 marked a milestone in spreading awareness about protecting common birds and biodiversity. The aim was to bring together nature lovers and sparrow enthusiasts to foster a global conservation movement.

Ultimately, creating alternative nesting opportunities for sparrows is a simple yet effective way humans can contribute to their survival, ensuring that future generations may continue to experience the charm of these small, melodious birds (Sharma &Binner, 2020).

Discussion:-
The decline in the Passer domesticus (house sparrow) population in India has alarmed environmentalists and specialists alike. This phenomenon has been connected to several changes in the environment and human impacts. A primary cause of this decline is the evolution of human behavior, particularly the modifications made to house architecture. Modern construction lacks the openings and cracks that sparrows need to construct their nests; thus, they opt for terraced homes rather than classic tiled homes. Furthermore, the misuse of chemicals such as herbicides and insecticides in gardens and agricultural areas has resulted in a major decline in the availability of protein-rich insects, which are vital for the diet of sparrow chicks and yearlings.

Another factor contributing to the decline in sparrow populations is the widespread use of catapults, which pose a direct threat to their numbers. Urbanization and the associated increase in electromagnetic radiation from communication towers have also been linked to the decline in population. House sparrows are being protected via national programs. The Nature Forever Society (NFS), founded by Mohammed Dilawar in 2006, has been in charge of these conservation efforts. Initiatives such as "Adopt a Feeder and Nest Program," "World Sparrow Day," and "Project Save Our Sparrows" have positively impacted the population of sparrows in urban areas. The importance of sparrow conservation has been highlighted by state-level initiatives like the recognition of the house sparrow as the "State Bird" of Delhi and Bihar.

Conclusion:-

Tackling the decline of house sparrow populations in India demands joint efforts from researchers, conservationists, and the wider community. The primary factors driving this decline include rapid urbanization, intensive chemical usage, and modifications in modern building designs. Studies indicate that initiatives by state governments and organizations such as the Nature Forever Society can play a significant role in stabilizing sparrow populations through targeted conservation programs.

Nonetheless, consistent and long-term action remains crucial, as sparrows are important indicators of ecological balance. Future research should focus on identifying additional contributing factors and formulating comprehensive conservation strategies that can be applied on a broader scale. Promoting public awareness and restoring habitats represent effective steps toward protecting sparrows, ensuring their survival for future generations, and reversing current population declines.

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