



भारतीय वन्यजीव संस्थान
Wildlife Institute of India

SACON PR-243

Genetic diversity and phylogeographic patterns of House Sparrow (*Passer domesticus*) from select landscapes in India

Report on a study conducted in
Ahmedabad, Rajkot, and Junagadh districts of Gujarat, India

Project Funded by
SACON Grant-in-Aid
Ministry of Environment Forest and Climate Change (MoEFCC)
Government of India

Principal Investigator
Dr. Ashutosh Singh (Scientist)

Researchers
Yashaswini N (JRB)
Amruth K (JRB)
Anamika Gautam (JRB)

2023

Sálim Ali Centre for Ornithology and Natural History (SACON)
South India Centre of Wildlife Institute of India
Ministry of Environment, Forest and Climate Change, Government of India


© Kathy Adams Clark

Content

Preface

The House Sparrow, *Passer domesticus*, is a widespread bird species found across the globe. There are 28 species in Passer that occur in Europe, North Africa, parts of Asia such as Middle East, Indian subcontinent, and a narrow band from northern Asia toward the Pacific coast. Two subgroups are currently recognized; *P. domesticus* and *P. indicus* (five and six subspecies respectively). Out of them, Indian house sparrows (*Passer domesticus indicus*) are common in both urban and rural areas. In recent years, it is observed that the populations of house sparrows are declining rapidly. Since the population size of this species is extremely large, it does not fall within the threatened category and is listed under Least Concern in the IUCN Red List. However, due to a recent rapid decrease in populations, individuals are prone to inbreeding depression, resulting in a loss of allelic diversity, which gradually decreases the fitness of the population to adapt to the changing environment. A recently concluded study from SACON explored the status of house sparrow populations through extensive field surveys. Genetic information would enhance information on the species and provide an additional perspective that would further aid in its conservation. Since a reference genome for the house sparrow is available, the studies at the genomic level can be used to measure genetic variation within and between populations, gene flow/structure between urban-rural gradients, and check for bottlenecks, especially in urban areas which saw drastic population crashes.

This study aimed to assess the genomic level information of house sparrow populations in select states of India (Gujarat, Rajasthan, Haryana & Uttar Pradesh) with population status and their habitat suitability through GIS modeling which can be used as baseline information for future monitoring of the species to aid its conservation.

The study was initiated in Dec 2021 with a three-year plan; however, has been stopped prematurely (in the first year itself) due to a lack of funding. During the period the team was able to undertake a single field visit in select districts of Gujarat and the report is prepared through the work undertaken during the period.

I/46295/2023

Foreword

House sparrow (*Passer domesticus*) is one of the most widely distributed true synanthropic land birds in the world. The species mostly occupy the farmlands and cities where they feed on food wastes and crops. They serve as a good indicator for assessing environmental changes, and ecological imbalance & also aid in the seed dispersal of plants. Although considered widespread, the "State of India's Birds 2020" reported a gradual decline in the abundance of the species in urban areas (Metro Cities). However, the actual causes of their population decline are still being debated.

This report consists of information on a study conducted in Ahmedabad, Rajkot and Junagadh districts of the Gujarat state during March 2022. As authors were able to undertake single field visits only during the study period, they have highlighted the population status, habitat suitability, and information on genetic variation at a local level. The authors also noted human sentiments and core interest in conserving the House sparrows as they consider sparrows as their family members and provide them suitable nesting sites even inside their household. The information presented in this report on the species will be helpful in preparing appropriate strategies with guidelines for future conservation plans at the local level.

Signed by
Virendra Rambahal Tiwari
Date: 13-06-2023 11:46:10

Virendra R. Tiwari

Director

Acknowledgment

Ministry of Environment, Forest & Climate Change, Government of India

Gujarat Forest Department
Sh. Shyamal Tikadar, Chief Wildlife Warden, Gujarat Forest Department
Sh. Uday Vora, Retd CCF Conservator of Forest, Gujarat Forest Department
Dr. Sakkira Begaum, Deputy Conservator of Forest, Research and Training, Gandhinagar
Sh. Akshay Bal Mukund Joshi, Deputy Conservator of Forest, Junagadh
Dr. S. K. Berwal, Deputy Conservator of Forest, Junagadh
Sh. Tushar Bhailalbhai Patel, Deputy Conservator of Forest, Rajkot
Sh. Jayan Patel, Assistant Conservator of Forest, Junagadh
Sh. Aravindbhai Aatubhai Bhaliya, Assistant Conservator of Forest, Junagadh
Sh. Shailesh Trukambhai Kotadia, Assistant Conservator of Forest, Rajkot
Sh. DD Nayak, OS, PCCF office, Gandhinagar

Sálim Ali Centre for Ornithology and Natural History
Dr. S. Muralidharan, Former Director-in-charge
Dr. Riddhika Ramesh, Senior Scientist
Mr. Kunal Mahobia, Field Assistant
Mr. Surendra. T., Field Assistant

Other Contributors
Mr. Sherwin Everett, Hospital Curator, Jivdaya Charitable Trust
Dr. Shashikant, Veterinarian, Jivdaya Charitable Trust
Mr. Manish Panchal, Wildlife Photographer

Executive Summary

House Sparrows (*Passer domesticus*), comprise 28 species of Old-World sparrows that are distributed across Eurasian and the Afrotropical realms (Päckert et al., 2021). They are human-commensal species since historic times (Vincent, 2005). Over the past few decades, the population of the species has been reported to be declining at an alarming rate worldwide (Mahesh & Lanka, 2021). A few possible factors proposed for this cause are suggested to be a lack of suitable nesting sites, paucity in the availability of invertebrate food, the advent of phone towers, and electromagnetic radiation (Balmori et al. 2007, Murgui and Macias, 2010, Modak 2017, Pandian 2018, Ravinet et al., 2018, de Montaigu and Goulson, 2020). Their conservation is important because they are one of the best indicator species to detect the impacts of urbanization on avifauna (Hanson et al., 2020). The current study aimed to document the occurrence and abundance of House Sparrows & identify the probable factors responsible for their decline in select states of India. Further, to develop a conservation plan for House sparrows it is also very important to assess the suitable habitat, genetic fitness, diversity and phylogeographic of the species. In the present study, we aimed to assess the population status, habitat suitability, genetic diversity and phylogeographic patterns of the House Sparrow (*Passer domesticus*) from select landscapes in India (*i.e*. Gujarat, Rajasthan, Haryana and Uttar Pradesh). The study was initiated with a plan of three-year; however, has been stopped prematurely (in the first year itself) due to lack of funding. During the period the team was able to undertake a single field visit in select districts of Gujarat and the report describe the work undertaken during the period.

The fieldwork was conducted during the study in Gujarat's Ahmedabad, Junagadh, and Rajkot districts from 04th-21st March-2022. To estimate the abundance of House sparrow we laid 72 fixed-width point counts in three districts in Gujarat. In each point count sampling, data collected on gender, cluster size, detection distance & angle from perch or flight height, etc. We also conducted a questionnaire survey to gather information on people's perceptions on the importance of the species, its current status, and also the reasons for population decline at a regional scale. In total, we recorded 652 individuals (11.54 individuals/ha) across the four states. The highest density of House sparrow was recorded in Rajkot (15.41 individuals/ha) followed by Ahmedabad and Junagadh which had densities of 10.23 and 9.76

individuals/ha respectively. Interestingly, house sparrows were not observed in the city limits of Junagadh.

The habitat suitability of the House sparrow was mapped in Gujarat, Rajasthan, Haryana and Uttar Pradesh by applying species distribution models for summer, winter, and monsoon seasons using eBird.org India records. for nine years (2014-2022). Further, biological samples (blood and shed feathers) were collected from Gujarat to measure the genetic diversity. Looking at the suitability in winter for the nine years the high suitability area in these years was almost in a similar area. In summer (Fig 8), the majority of the area comes under low suitability, and the high suitability is only limited to the settlement regions. Across all years, most of the high suitability areas were observed in and around settlement areas. It appears that the House sparrow has a narrow niche breadth in summer than in winter. Such, niche dynamics explain that summer months are probably linked with the breeding time of house sparrows thereby showing contracted niches in comparison to the winter season.

For the genetic analysis the concatenated data of 1855 base pairs yielded from Cyt *b* , ND2 and 16S. Number of haplotypes in Ahmedabad was 5 (n=5), Junagadh 7 (n=7) and Rajkot 4 (n=4). Nucleotide diversity for Ahmedabad, Junagadh and Rajkot was 0.084, 0.054, 0.128 respectively. From the pairwise distance analysis from obtained sequences, we have seen individuals from Junagadh population (P=0.04) have greater gene flow as compared to individuals from Ahmedabad population (0.09). Further, the genetic diversity is comparatively higher in Junagadh population as compared to Ahmedabad.

Overall, house sparrows abundant in rural areas may be attributed to the availability of nesting sites, such as roof cavities, eaves, walls, and nest boxes. In urban areas of Ahmedabad and Rajkot, house sparrows were seen thriving, particularly in old buildings and open scrub areas, however, they were less common in areas with high-rise built-up structures. Nesting and roosting were recorded in nest boxes installed at tea shops and eateries. The questionnaire survey highlights the need for open scrub patches, feeders, and water baths, along with pesticide regulation and regular population monitoring, to maintain the House Sparrow population in urban and rural areas. It is important to monitor nest success and failure of house sparrows using artificial nest boxes for designing regional recovery plans for the species in areas where their populations have declined.