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**Cover: Pseudo-flying animals and wind-dependent seed & spore dispersers – made with digital painting in Krita. © Melito Prinson Pinto**

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COMMUNICATION

# Habitats of House Sparrow *Passer domesticus* (Linnaeus, 1758) in Rameswaram Island, Tamil Nadu, India

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**Abstract:** This paper pertains to the nesting habitats of House Sparrow *Passer domesticus* with specific reference to population dynamics, nesting-related habits, nests, behaviours and other threats faced by these birds in Rameswaram Island. A total of 2,988 adult House Sparrows and 407 active nests were counted during the study. Of nests counted, 19% (n = 77) were solitary. The highest number of nests observed in a cluster was 9 (2 clusters). 60% of nests (n = 244) were found in concrete buildings, 39% (n = 159) in artificial nest-boxes, and 35% (n = 144) in cavities/crevices within buildings. House Sparrow population exhibited nesting plasticity, and 2% of nests were found constructed on vegetation. A wide variety of locally available materials, such as pieces of synthetic fishing nets, nylon ropes, and polythene papers were used for construction of nests. Sand and water bathing by birds were observed. Accidental fall of eggs and chicks, predation of nests by House Crows *Corvus splendens*, and unsuccessful attempts to predate adult birds by Black Kite *Milvus migrans* were observed, as well as opportunistic sightings of Shikra *Accipiter badius*.

**Keywords:** Nest boxes, nest colony, nesting plasticity, nest predation, Passeridae, Passeriformes, sand, water bathing.

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## INTRODUCTION

The House Sparrow *Passer domesticus* (Linnaeus, 1758) (Aves: Passeriformes: Passeridae) is the most widespread bird in the world (Anderson 2006); its geographical range extending over Europe, North Africa, and parts of Asia including the Indian subcontinent. The House Sparrow was introduced into Argentina, Australia, Canada, Japan, Mauritius, Mexico, United States, Vietnam, and Zimbabwe (BirdLife International 2016). This species occurs throughout the Indian subcontinent (Ali & Ripley 1987), where breeding occurs from February to September. House Sparrows construct nests within buildings but generally modern construction designs across the world lack sites such as holes or crevices suitable for nesting for the House Sparrow (Vincent 2005; Shaw et al. 2008). Apart from buildings, nesting in trees & bushes is also a common behaviour of House Sparrow (Summers-Smith 1963; Van der Elst 1981) and this change of habitat from buildings to vegetation is indicated as an alternative option of birds in construction of nests (Morris & Tegetmeier 1896). In India, 27% nests in Arakku, Andhra Pradesh, (Dhanya & Azeez 2010), and 8% nests in Arakkonam Taluk, Tamil Nadu (Pandian 2021) occurred in vegetation. Birds exhibit a behavior of mud and water bathing, probably to remove ectoparasites and excess feather oil from plumage (Rothschild & Clay 1952; Van Liere 1992).

Populations of House Sparrows have declined across Eurasia (Leasure 2011; Prowse 2002; Mulsow 2005, 2006; Deepa 2013) due to various causes, such as shortage of food supply, predation (Bower 1999; Newton 2004), and increasing developmental activities (Summers-Smith 2003). Populations are reported to have decreased considerably in Bengaluru, Mumbai, Hyderabad, and West Bengal (Rajashekhar & Venkatesha 2008; Daniels 2008; Khera et al. 2010; Ghosh et al. 2010). According to a Bombay Natural History Society's study, the population of House Sparrow in India is lower at present than in the past and this is consistent across the country (Rahmani et al. 2013). International Union for Conservation of Nature (IUCN) Red List has evaluated the conservation status of House Sparrow as 'Least Concern' (BirdLife International 2016). No systematic account of habitats and nesting biology of House Sparrow in Rameswaram Island exists. The present study was carried out to fill this gap. The objectives of the study included examining: (1) What are the current population dynamics and nesting behaviours? (2) What are the nesting materials used? (3) Do the birds exhibit nesting plasticity? (4) Do they resort to sand or water bathing? and (5) What are the threats to their populations?

## MATERIALS AND METHODS

### Study Area

Rameswaram Island is the largest island in Tamil Nadu. Located in Ramanathapuram district it spreads over 67 $km^2$ with a human population of c. 82,000 (2011 Census). Tourism, pilgrimage, fishing, and cottage industries involving palm products are the major sources of income for the people here. Cultivation of traditional crops is conspicuous by its absence on this island. The average annual rain fall is 800 mm. The maximum and minimum annual temperatures in the district are 36°C and 20°C, respectively (Figure 1).

**Note:** List of villages are 1. Rameswaram Town (9.288195 N, 79.317409 E), 2. Karaiyur (9.277230 N, 79.31409 E), 3. Puthuroad (9.257055 N, 79.307291 E), 4. Verkodu (9.280038 N, 79.312003 E), 5. Mandapam (9.280970 N, 79.303836 E), and 6. Ponthampuli (9.285429 N, 79.303836 E).

### Methods

With the help of two informants and two other field assistants, I visited Rameswaram island and identified populations of House Sparrows across 259 sites in six town/villages. I targeted sites where House Sparrows were definitely known to be living and which housed active nests. The identified sites, viz., temples, houses, streetlamp posts, sheds, grocery shops selling food grains, garbage bins on roads and streets, sea shore, and vegetation which attracts House Sparrows, were surveyed between 0600 h and 1800 h during the period from January to September 2021. Sizes of flocks, types of nesting locations, types of nesting sites and sizes of nesting colonies were determined by direct visual observation. The number of birds was enumerated by following total count method (Bibby et al. 2000) and analyzing the photographs taken when the birds were foraging or perching/roosting on any substrata. Other biological notes on House Sparrow populations like roosting sites, foraging behaviours, sand, water bathing, mating, type of nest materials, and probable threats to their populations were made by direct observation using field binoculars. No live nests, eggs, chicks or adult birds were handled during the study. Pearson's Correlation Coefficient test was used to test the correlations between the types of buildings/structures and number of nests observed on them and also between the types of nesting sites and number of nests observed on them.

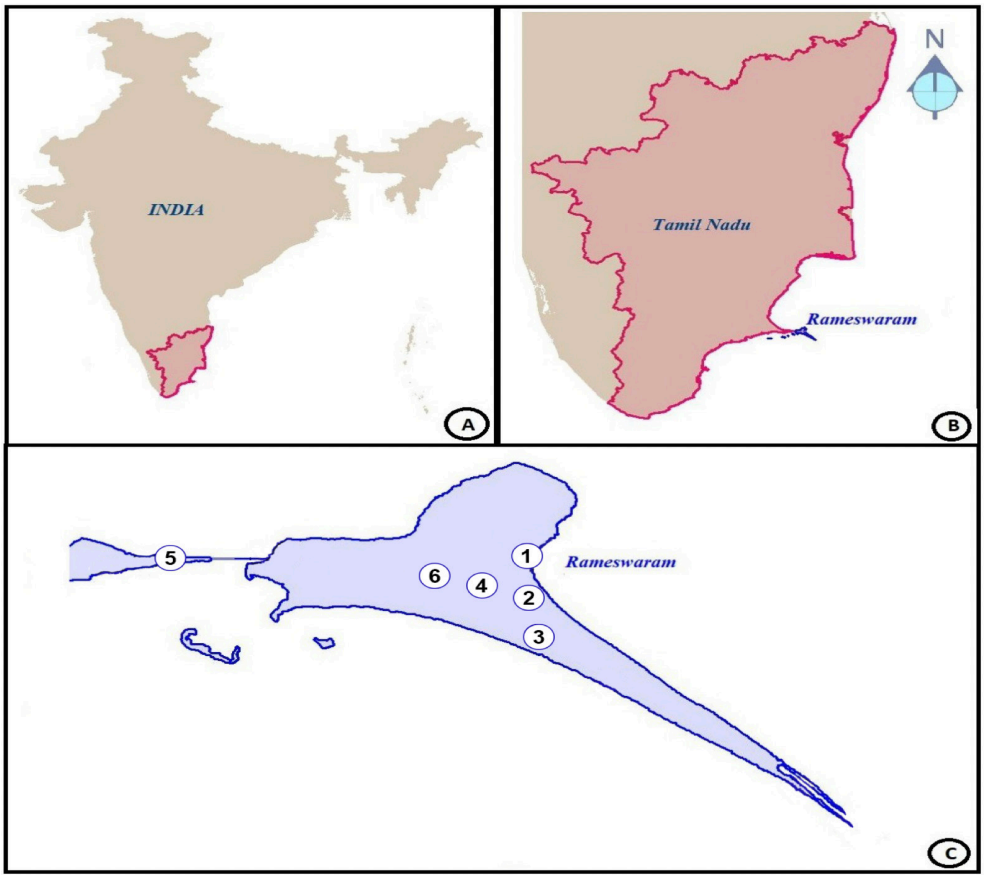


**Figure 1. Study area map: A—India map showing Tamil Nadu | B—Tamil Nadu map showing Rameswaram | C—List of studied town and villages were marked in Rameswaram map.**

Taking utmost care not to disturb the nests or birds, a minimum distance of c. 20 m was maintained during observations. Locations of all the nests and birds were determined using a standard GPS device (Garmin Etrex 20x). Photography and videography were done using a Nikon P1000 digital camera without disturbing the nests and birds. All the collected data were analyzed and presented as graphical representations.

## RESULTS

A total of 2,988 adult House Sparrows (1,683 males & 1,305 females) and 407 nests were enumerated in six town/villages covering various nesting locations, such as concrete buildings, tiled houses, shops, temples, electric lamp posts/meter boxes, wells, thatched houses, culverts, abandoned boats, and shrubs in the island (Table 1). The maximum number of birds (106) in a flock were seen near Muthumariamman temple (9.292399 N, 79.318979 E). The maximum number of nests (9 each) were noticed at a bus stand (9.285616 N, 79.297799 E) and in a concrete building (9.284772 N, 79.311769 E).

### Size of flocks

House Sparrows occurred as small flocks. No solitary bird was found in the study area. The size of flocks varied from 2 to 106 birds. Smaller size flocks were more in number, while larger flocks were rarer (Table 2).

### Nesting locations

Almost 60% of the nests (n = 244) were found in concrete buildings (human dwellings & offices), followed by 13.3% nests (n = 54) in various commercial establishments (shops), 8.8% nests (n = 36) in tiled houses, 8.1% nests (n = 33) in temple buildings, and 4.2% nests (n = 17) in electric lamp posts/meter boxes. The remaining 5.7% nests (n = 23) were found in culverts, wrecked boats, sheds, wall of wells, thatched houses, and shrubs (Figure 2).

### Selection of nesting sites

The study revealed that 39.1% nests (n = 159) were constructed in artificial nest-boxes (including two burnt

**Table 1. Details of adult House Sparrows and nests enumerated in different places in the study area.**

| | Name of town/ village | No. of places | Total no. of adult birds counted | Percentage (%) | Total no. of nests counted | Percentage (%) |
|---|---|---|---|---|---|---|
| 1 | Rameswaram | 171 | 2278 | 76.24 | 256 | 62.90 |
| 2 | Karaiyur | 32 | 171 | 5.72 | 73 | 17.94 |
| 3 | Puthuroad | 26 | 254 | 8.50 | 27 | 6.63 |
| 4 | Verkodu | 21 | 139 | 4.65 | 24 | 5.90 |
| 5 | Mandapam | 6 | 130 | 4.35 | 19 | 4.67 |
| 6 | Ponthampuli | 3 | 16 | 0.54 | 8 | 1.97 |
| Total | | 259 | 2988 | 100 | 407 | 100 |

clay pots) placed in human residences and shops, followed by 35.4% nests (n = 144) in wall cavities/crevices in the buildings, 8.1% nests (n = 33) in pipe holes, 7.9% nests (n = 32) in the cavities/crevices of temples, 3.4% nests (n = 34) in electric lamp-posts, and 2.2% nests (n = 9) occurred in the door shutters of shops. The remaining 3.9% nests (n = 16) were observed in other structures, such as walls of wells, culverts, electric meter boxes, and shrubs (Figure 3).

**Table 2. Details of flock sizes of House Sparrows in the study area.**

| Flock size grouping | Number of birds | Percentage of birds in the grouping |
|---|---|---|
| 2–20 | 1260 | 42.17% |
| 21–40 | 572 | 19.14% |
| 41–60 | 524 | 17.54% |
| 61–80 | 352 | 11.78% |
| 81–100 | 174 | 5.82% |
| >100 | 106 | 3.55% |

### Size of nest colonies

The number of nests in a nest colony varied from 1 to 9. Out of 407 nests enumerated, 51.35% nests (n=209) were found in clusters of 1–2 nests (including 77 solitary nests), 29.48% nests (n = 120) were found in cluster ranges of 3–4 nests, 9.09% nests (n = 37) were in the cluster ranges of 5–6 nests, and 5.65% nests (n = 23) were in the cluster ranges of 7–8 nests. The clusters containing highest number of nine nests each occurred in two places.

### Nesting plasticity of House Sparrow

A small percentage (2%) of the total 407 nests was found in natural vegetation, such as *Ficus benghalensis* (Moraceae), *Tecoma stans* (Bignoniaceae), *Punica granatum* (Lythraceae), and *Citrus limon* (Rutaceae) in the study area. These nests were found woven into the inaccessible foliage parts of the plants and the nests were found spherical in shape with entrance on the sides. Another two nests were found in a damaged iron pipe of wrecked mechanized boat in the sea shore.

### Nest materials

Observations through binoculars revealed that House Sparrows had used a wide variety of materials for construction nests. Dried grass and dried compound leaves, fibers peeled off from banana leaf sheaths in garlands (found abundantly around places of worships and markets), hay, jute fiber, pieces of rope made of jute, nylon ropes, synthetic fiber from bags, polythene papers, and tissue papers found in garbage bins or streets or backyards of human residences were used by the birds. Feathers of fowls were also observed in the nests. While constructing nests in culverts near sea shore and abandoned boats, the individuals of House Sparrows utilized pieces of torn fish nests made of synthetic fiber. The study also revealed that both male and female were engaged in the construction of nests (Image 3a–d, 3i).

### Foraging behaviours

During the study period, a total of 1,079 birds were found foraging, of which 30.58% birds (n = 330) were found foraging in the garbage by the side of streets, 16.03% birds (n = 173) were found foraging kitchen scraps in the backyards of human residences, and 11.58% birds (n = 125) were found foraging on spilled grains and food materials in the temple premises. People used to offer nine varieties of dry grains/pulses to Rameswaram temple and put them in a hundiyal (steel barrel with small opening). It was observed that individuals of House Sparrows had adapted to freely enter into the barrel, consume the grains, and come out after 3 to 5 minutes. Another 36.23% birds (n = 391) were found foraging on spilled food materials on the roads having

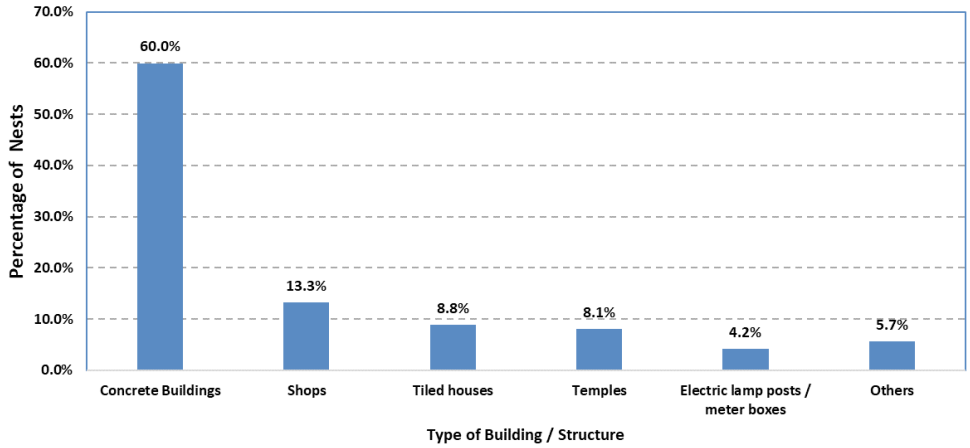


**Figure 2. Percentage of nests of House Sparrows observed on various buildings/structures.**

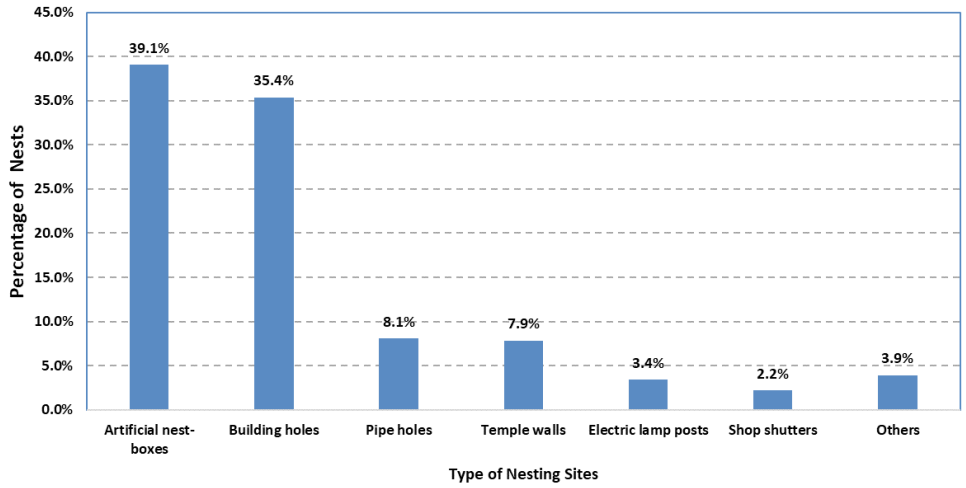


**Figure 3. Percentage of nests of House Sparrows observed on various types of nesting sites.**

busy vehicular traffic. The remaining 5.58% birds (n = 60) were observed in the hedges probably searching for worms, insects, and also in the vicinity of nests carrying prey to their chicks (Image 2).

**Roosting behaviour**

A total of 1,838 adult birds were found roosting on different substrata during the study period. Among the roosting birds, 45.64% birds (n = 839) were found roosting on various concrete buildings/tiled houses, 20.62% birds (n = 379) were found perching on overhead power transmission cables and lamp posts, 17.3% birds (n = 318) were found on temple towers, idols, walls, and grill gates in the premises of temples, and the remaining 16.44% birds (n = 302) occurred on trees and shrubs. Hence, the maximum number of birds were found roosting on concrete buildings, such as human residences, commercial establishments (shops), and tiled houses (Image 2a).

**Sand and water bathing**

The study revealed that individuals of House Sparrows used to take sand baths in the sandy beach and in the vacant sites of residential areas. A total of 12 incidents of sand baths involving 63 birds were observed. Four sand baths occurred between 1000 h and 1130 h in the forenoon and eight baths occurred between 1530 h and 1700 h in the afternoon. Each bird creates a small depression/pit in the sand using its beak and legs. Then the birds lower their breasts to the sand and flap their wings to spread sand particles over their entire bodies. They also use legs to spread sand and rub their heads on sand. Each sand bath took 2–7 minutes. Out of 63 birds, 27 took baths in more than one pit by frequently

changing the pits. Small groups consisting of 2–5 birds were found taking sand baths.

Eight birds were found taking baths in the stagnant water near a water tap. The duration of baths varied 3–5.5 min. Incidents of water baths were observed between 1500 h and 1630 h. After water baths, all the eight birds engaged in foraging on the ground (Image 3e,f).

**Mating**

Opportunistic sightings of twelve mating pairs were observed, the duration of mating varying 3–7.5 minutes. During every mating process, the pairs continued 4–7 copulations. All the mating process occurred within the building and no mating occurred on open places. In one instance, a male bird had attempted to do courtship/copulation in an open lawn but ended in vain due to the resistance of female (Image 3g,h).

**Threats to House Sparrow populations**

Five incidents of House Crow damaging nests in lamp posts (2) and human residence (3) were observed during the study period. In four instances, damaged eggs (7) and dead chicks (3) were found on the ground, probably having fallen down from the nests. One incident of an unsuccessful attempt of Black Kite preying adult House Sparrow while the latter engaged in sand bathing was observed. Opportunistic sightings of Shikra in the vicinity of roosting sites at three places were observed, however, killing of House Sparrows by Shikra was not observed.

## DISCUSSION

**Nest colonies**

Summers-Smith (2003) claims that the House Sparrow is a colonial nester and even a small decrease in the size of its nest colony can affect its reproduction in the UK. A study in Guwahati (Nath et al. 2015) shows that 64% nests were solitary and 36% of the nests were in colonies consisting of more than two nests. More than 90% of the nests were solitary in Arakkonam taluk of Tamil Nadu (Pandian 2021)., however, in the present study, 18.91% of nests were solitary. When compared to Guwahati (Assam) and Arakkonam taluk (Tamil Nadu) the number of solitary nests in the present study area was found to be minimal (18.91%). It indicates that majority of nests colonies (81.09%) contained more than two nests, however, the existence of solitary nests and their impacts on the reproduction of House Sparrows in the study area as stated by Summers-Smith (2003) requires further study.

**Nesting plasticity of House Sparrow**

Of the 407 nests examined, 39.7% of them (n = 159) were found in artificial nest-boxes placed by human residents. House Sparrows show greater tolerance to human presence, choose nest sites not in a rigid manner and can build nests in any random place including artificial nest-boxes, particularly when buildings lack suitable nesting sites as shown in north-western Europe (Munro & Rounds 1985; Shaw et al. 2008). House Sparrows have been shown to nest in artificial nest-boxes in urban, suburban, and rural areas of West Bengal (Bhattacharya et al. 2011). Rahmani et al. (2013) have stated that next to wall cavities in houses, the birds preferred artificial nest-boxes hung by people. The birds building nests in nest-boxes or crevices of buildings have greater reproductive success because of less mortality and emigration (Cink 1976). In the present study, the birds preferred to nest (39.7%) in artificial nest-boxes probably due to the non-availability of holes/cavities in the modern buildings and nest-boxes may offer safety to nests, eggs and chicks from wind, rain, and predatory animals as stated by Munro & Rounds (1985), Shaw et al. (2008), Bhattacharya et al. (2011), and Rahmani et al. (2013), but the rate of reproductive success in artificial nest-boxes as stated by Cink (1976) needs further study. Ali (1996) observed that House Sparrows also built nests in the spaces available on electricity meter boxes within human residences. The present study also confirms his findings that a small percentage of nests (1.23%) were constructed in the electricity meter boxes in five human residences. In Tasmania (Australia), House Sparrows have been found to exhibit nesting plasticity with a high rate of nesting (43%) in vegetation (Sheldon & Griffith 2017), challenging the previously held thoughts that the habit of constructing nests in the vegetation is an alternative nesting option when buildings lack cavities (Barrows 1889; Morris & Tagetmeir 1896; Summers-Smith 1963; Kulczycki & Mazur-Gierainska 1968; Van der Elst 1981; Salek et al. 2015). House Sparrow had been found to construct 8% nests on vegetation in Arakkonam taluk, Tamil Nadu (Pandian 2021). In the present study, the birds had constructed 2% nests in the vegetation, viz., *Ficus benghalensis* (Moraceae), *Tecoma stans* (Bignoniaceae), *Punica granatum* (Lythraceae), and *Citrus limon* (Rutaceae). This indicates that House Sparrows utilize every available platform to build nests. However, it requires further studies to verify the reasons for the incidence of non-cavity nesting behavior of House Sparrows in the study area. The present study also

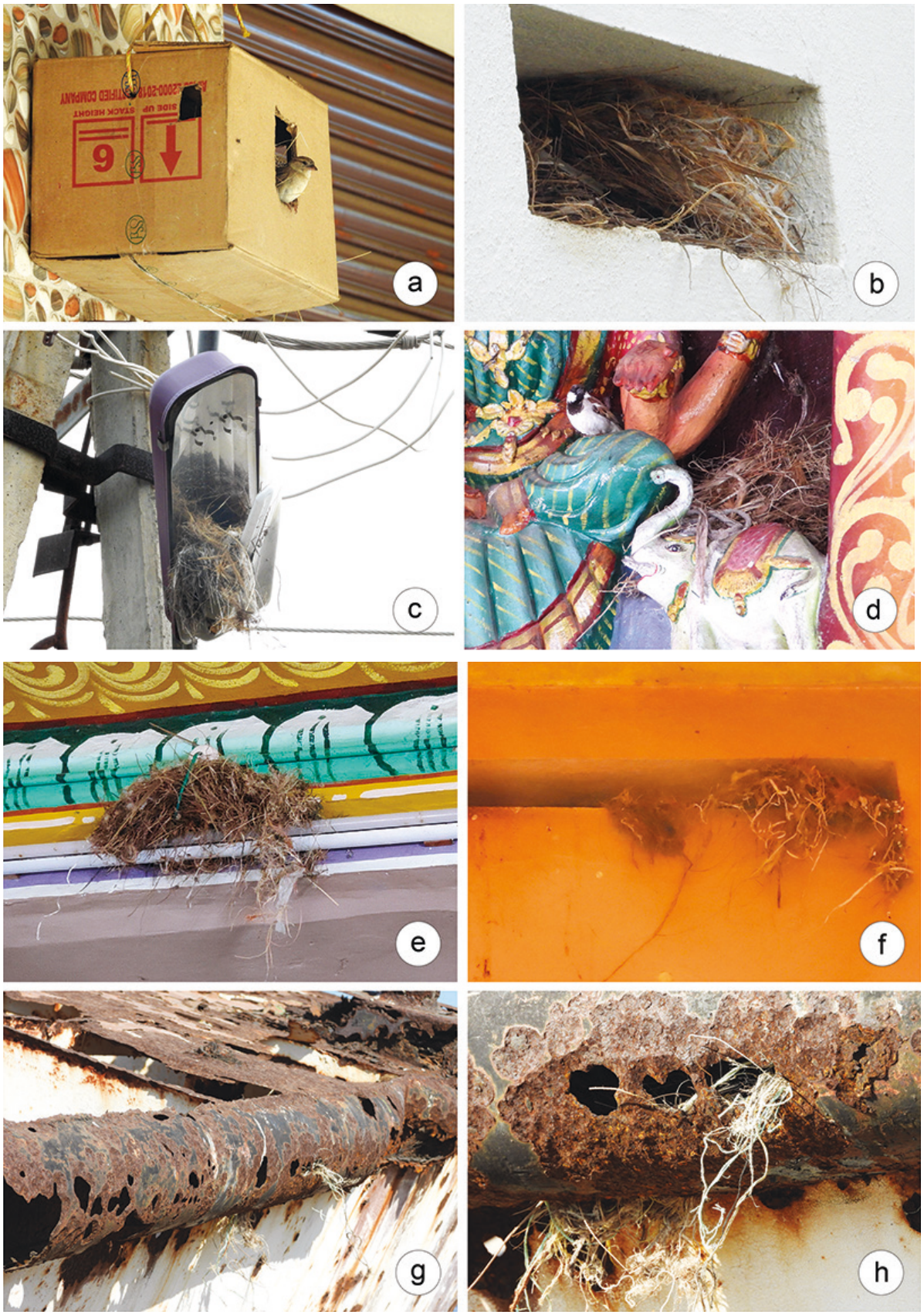


**Image 1. Various nesting sites of House Sparrow: a—Artificial nest-box | b—Cavity in the wall of a human dwelling | c—Street lamp post | d—Idol in a temple | e—Temple wall cavity | f—Damaged pipe of a residential building | g–h—Abandoned fishing boat. © M. Pandian.**


**Image 2. Pictures show various foraging behaviours of House Sparrow: a—A male bird perched on traffic sign board | b—A male bird foraging in a fishing hamlet | c—A female bird foraging at a vacant site near temple premises | d—A male bird foraging near a cattle shed. © M. Pandian.**

revealed that apart from nest-boxes, cavities/crevices in the buildings, and vegetation, the birds also utilized cavities found in the abandoned mechanized boats.

**Nest materials**

House Sparrows use a wide range of materials for construction of nests like, grass, stalks, plant roots, barks, inflorescences, threads, feathers, strings, yarn, wool, and pieces of paper (Indykiewicz 1991). However, the composition of nest materials may vary according to the local availability of the materials (Wimberger 1984). The present study also reveals that the birds used locally available materials for construction of nests, such as banana fibers from garlands around places of worships, dried leaves, grass, synthetic and jute fibers and pieces of rope around commercial establishments, pieces of polythene papers, tissue paper, and even pieces of torn synthetic fishing nets.

**Sand and water bathing**

Birds exhibit a behavior of mud bathing probably to remove excess feather oil from plumage (Van Liere 1992). Dusting with fine clay particles may reduce lice but dusting with sand or litter had little effect or no effect on ectoparasitic mites (Martin & Mullens 2012). In the present study also, individuals of House Sparrows took sand baths as stated by Van Liere (1992) and Martin & Mullens (2012).

Bathing in water and the subsequent preening helps the birds to get rid of parasites (Rothschild & Clay 1952). On the contrary, Moyer et al. (2002) stated that high humidity due to water bathing favours flourishing of ectoparasites ranging from feather lice to bacteria (Butt & Ichida 1999). The present observations of birds taking water bath corroborate the findings of Rothschild & Clay (1952) and Moyer et al. (2002); however, whether sand or water bath helps in removing of excess feather oil and ectoparasites requires further study.

**Threats to House Sparrow populations**

The analysis of data from six metro cities, such as Bengaluru, Chennai, Hyderabad, Kolkata, and Mumbai indicate a gradual decline in abundance of House Sparrows in urban centers. Reasons for the suspected


**Image 3. Pictures showing various behaviours of House Sparrow: a—A male carries tissue paper as nesting material | b—A male carries dried leaf | c—A male collects fine synthetic fibers | d—A female plucks fibers from nylon rope | e—A pair takes sand bath | f—A female bird takes water bath |g—Male attempts to mate | h—Mating pair. © M. Pandian.**

decline of House Sparrows in India may be due to decreasing populations of insects, environmental toxins and lack of suitable nesting sites (http://stateofbirdsofindia.in/wp-content/uploads/2020/02/SOIB_Web-version_Final_.pdf). During Citizen Sparrow study, Rahmani et al. (2013) had observed that in India, the House Sparrow populations were higher in the past (<2005) compared to the time period 2005–2012 and this trend was consistent in all the regions. In eastern Africa, House Crows are known to cause disturbance to nests of perching birds (Lim et al. 2003). House Crows are nuisance to House Sparrows because of their habit of nest predation in India (Khera et al. 2010). House Crow, rats, and domesticated cats have been found to predate on the eggs, chicks and adult birds in Chennai (Daniels 2008). The present study confirmed the views of Lim et al. (2003), Daniels (2008), and Khera et al. (2010) that House Crows predate the nests of House Sparrows, however, the impacts of other avian predators like Black Kite, Shikra and the reasons for declining populations of House Sparrows require further studies.

## CONCLUSION

An investigation of nesting habitats of House Sparrow in Rameswaram island (active nests – 407 and adult birds – 2,988), revealed that nesting plasticity was strongly evident. Birds adapted to various aspects of architectural designs of houses by utilizing many available sites, including artificial nest boxes, wrecked boats, cavities/crevices found in the places of worships, and the vegetation around. They utilized locally available materials, including pieces of fishing nets and fibers from garlands available around places of worship. The habits of sand and water bathing occur among this species. The study area being an island and an important pilgrimage centre, the nesting habitats are under stress due to different kinds of land uses. Efforts needs to be made to create awareness among the local residents about the need to conserve declining populations of House Sparrows and establish more nesting sites in the newly constructed buildings. Continuous study is required to monitor the population dynamics of House Sparrows in this island. The detailed systematic survey covering the entire Ramanathapuram district will throw more light on the actual population status of House Sparrows in the district and help in drafting an action plan to conserve and widen their habitats to rural and urban areas.

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