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Cover: Stripe-necked Mongoose *Urva vitticolla* in poster colours, adapted from photograph by Ashni Dhawale, by Pooja Ramdas Patil.

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COMMUNICATION

Nest construction and repairing habits of Baya Weaver *Ploceus philippinus* (Aves: Passeriformes: Ploceidae) in the agricultural landscape of Villupuram District, Tamil Nadu, India

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Abstract: The intricate nesting habits of Baya Weaver *Ploceus philippinus* were studied on two Palmyrah Palm *Borassus flabellifer* trees in Chendur village, Villupuram district, Tamil Nadu between 20 March and 30 November 2020. Observations concentrated on sources of fibers, developmental stages of nests, re-construction & repairing of nests, deposition of clay in the nest walls, and various threats. A total of 98 nests of various developmental stages (wad stage—4, helmet stage—31, egg-chamber closed stage—5, and complete nests—58) were studied on these two nest colonies. The birds used leaf fibers of Indian date Palm *Phoenix sylvestris* and Sugarcane *Saccharum officinarum* as nest materials, and took 6–48 days for construction of a complete nest. 95% of helmet stage nests (n = 126) contained clay deposits. Analysis of plastered clay revealed it was alkaline with pH 9, and dry weight ranged from 5.1–5.8 g. Males re-constructed new nests from the remnant stalks attached to tips of palm fronds, and also made repairs on damaged nests. Anthropogenic factors, wind, rain, and avian predators, such as House Crow *Corvus splendens*, Long-billed Crow *Corvus macrorhynchos*, Rufous Treepie *Dendocitta vagabunda*, and Shikra *Accipeter badius* posed threats to Baya Weavers. A total of 42 nests, 11 broken eggs, and 14 dead chicks were found fallen under the two nest supporting trees. The detailed systematic survey covering entire district, rapid urbanization, and the anthropogenic pressures will help in drafting an action plan to conserve local populations of Baya Weaver.

Keywords: Clay deposit, nest fall, nest materials, nest re-construction, nest repair, threats.

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INTRODUCTION

Baya Weaver *Ploceus philippinus* (Linnaeus, 1766) is a social, polygamous, colonial nester. It occurs in the Indian subcontinent (Ali et al. 1956), Java, Malacca and Sumatra (Blyth 1845; Wood 1926), China, Indonesia, Laos, Myanmar, Singapore, Thailand, and Vietnam (BirdLife International 2016). The IUCN Red List of Threatened Species classifies *Ploceus philippinus* under 'Least Concern' (Birdlife International 2016). In India, the breeding season of Baya Weaver is from May–November (Ali & Ripley 1987; Rasmussen & Anderton 2005). While weavers select a variety of trees for nesting, they most prefer tall, unbranched trunks, and long-swaying foliage of palm trees to keep away predators and provide convenient leaf strips for building nests (Davis 1974). Males usually build partial helmet stage nests and complete them only after females select them and mate (Ali et al. 1956). Nesting birds prefer *Cocos nucifera* (Arecaceae) along the west coast of the Indian peninsula, *B. flabellifer* (Arecaceae) along the east coast, and *Vachellia nilotica* (Fabaceae) in the arid northwestern region (Sharma 1989). The breeding biology of this species was studied by Ali & Ambedkar (1956), Ambedkar (1964), and Mathew (1977). Several researchers have reported construction of abnormal nests (Ali & Ambedkar 1956; Ambedkar 1964; Crook 1964; Sharma 1989; Pandian 2018). Asokan et al. (2008) studied the timeline of nest construction. No other detailed studies have been carried out on the time taken for construction of various stages of nests, nest repairing, nest reconstruction, and physico-chemical analysis of clay deposited in the helmet stage nests of this species in Tamil Nadu. To fill this gap the present study was carried out.

The following questions were kept in mind: (1) How do weavers select substrata on the trees for nest construction? (2) What are the sources of nesting material? (3) What are the developmental stages of nests like wad, helmet, egg-chamber closed and complete nests, re-construction of nests and repairing of damaged nests? (4) How much time is taken to build various stages of nests? (5) What is the physico-chemical nature of clay deposits? And, (6) what are probable threats to weaver populations?

MATERIALS AND METHODS

Study Area

The present study was carried out in Chendur Village, Tindivanam Taluk, Villupuram District of northeastern Tamil Nadu. The district spreads over 3,715 km^2, with a human population of c. 2,090,000 (Figure 1). Agriculture is the primary occupation of the people. The major crops of the area are Paddy *Oryza sativa*, Jowar *Sorghum bicolor*, Pearl Millet *Pennisetum glaucum*, Finger Millet *Eleusine coracana*, Sugarcane *Saccharum officinarum*, Groundnut *Arachis hypogaea,* and Green Gram *Vigna radiata*. Three nest-supporting plant species, such as Palmyrah Palm, Indian Date Palm, and Coconut occur abundantly in the agricultural lands. Among them, only two individuals of *B. flabellifer* were chosen for study, considering the past history of Baya Weavers selecting these two trees for nest construction, proximity to road, and location of trees suitable for study by fixing camera. The maximum and minimum temperatures in the district are 36°C and 20°C, respectively. The average annual rainfall is 1,060 mm (Viluppuram 2021).

Methods

With help from field assistants/informants (4), I identified two *B. flabellifer* nesting trees in Chendur village having a history of Baya Weavers constructing nests since 2016. These two nesting trees were surveyed with the help of field assistants on two shifts, i.e., one person each from 0600 h to 1200 h and 1200 h to 1800 h on a daily basis between 20 March and 30 November 2020. All the nests found in these two trees were treated as nest colony-I and colony-II. The height of the trees, gbh, and distances from nesting trees with source of fibers, distance of source of wet clay, and cultivation of grains crop were measured using a 100 m measuring tape. The locations of nesting trees were determined using GPS. Using 10 x 42 field binoculars (Nikon-Monarch-7), the nests, males plucking nest fibers, developmental stages of nests, clay deposits on inner wall of helmet stage nests, and the total number of birds visiting nesting trees were observed. Clay deposits from helmet stage nests were collected separately from each side of inner walls of fallen nests and analyzed. The physico-chemical analyses of collected clay samples including temperature, salinity, dissolved oxygen, oxidation reduction potential, specific conductivity, electrical conductivity, total dissolved solids, and other metals & minerals were carried out by using YSI multiparameter (Model: 600XL-B-O, 650MDS, YSI Incorporated, Yellow Springs, Ohio 45387, USA) and Perkin Elmer Atomic Absorption Spectrophotometer

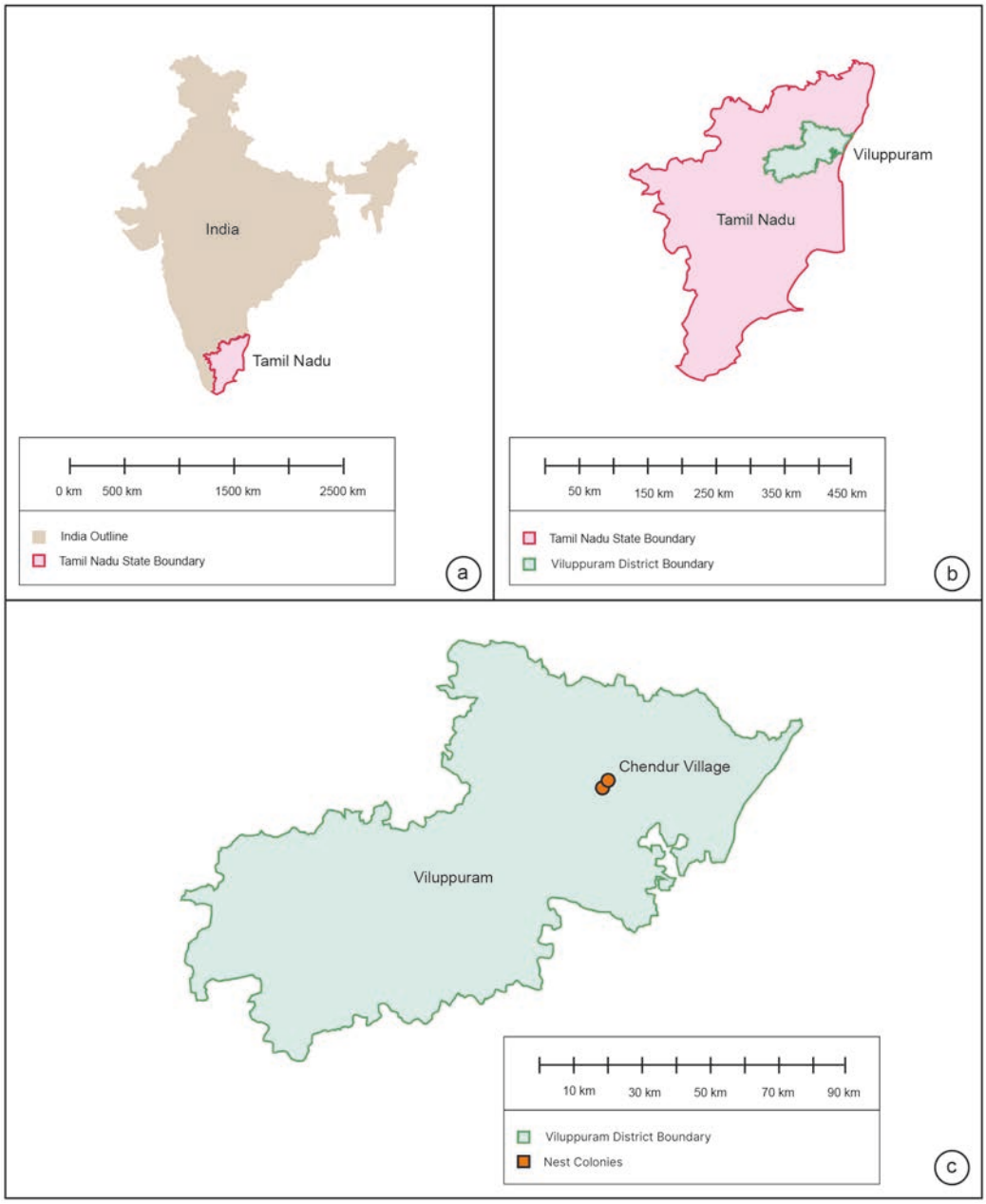

Figure 1. Study area map: a—India map showing Tamil Nadu | b—Tamil Nadu map showing Villupuram district | c—Villupuram district map showing locations of two nest colonies in Chendur village.

Analyst 400. The recorded results were tabulated (SPSS software). Re-constructions of nests, repairing of damaged nests, fall of nests, eggs & chicks, and impact of avian predators were recorded and photographed. Photographs were taken using Nikon P1000 digital camera. Collected data were tabulated, analyzed as total number of fronds used by the birds, average number of nests per frond and shown as tables.

RESULTS

It was observed that no old or torn nests from previous years were found on these two male *B. fabellifer* trees when the study was commenced on 20 March 2020 (Image 1). Baya Weavers constructed a total of 98 nests (Wad stage—4, helmet stage—31, egg-chamber closed stage—5, and complete nests—58) on two male *B. fabellifer* trees. Birds failed to continue constructions on four wad stage nests, and 31 helmet stage nests and

five egg-chamber closed stage nests. The remaining 58 nests were complete nests with entrance tubes. The study revealed that the birds built an average of 1.17 nests per palm frond. Nest colony-I contained 62.24% nests (n = 61) and the remaining 37.76% nests (n = 37) were found in nest colony-II (Table 1).

Commencement of nest construction

All the males had commenced nest constructions on 02 April 2020. From 20 March to 01 April, no Baya Weaver was observed on these two nesting trees. On 02 April between 0600 h and 0830 h, 16 males with partial plumage first visited on these two palm trees probably searching for suitable substrata for construction of nests.

Selection of Palm fronds

Males visited distal ends of palm fronds randomly, except the lowermost dried and the uppermost partially opened young fronds. After selection of the distal ends of fronds, they bit the margins by using their beaks and made the margins serrate/rough and also made punctures on the leaf blades probably to make the knots strong. Out of 248 leaf tips studied, the margins of 232 leaf tips was serrate, and 16 leaf tips had serrate as well as punctures. This process of making frond margins serrate continued for five days, i.e., from 02–06 April and the males were observed on nesting trees between 0600 h and 0830 h. During these periods, no activities of nest construction were noted. After 0830 h, they left the nesting trees for foraging in the crop fields and perching on nearby tress/shrubs. They did not return to the nesting trees till the next morning.

Sources of fibers

Males plucked fibers from Indian date palm *P. sylvestris* trees (n = 6) and Sugarcane crops *S. officinarum* situated within c.120 m distance from the nest-supporting trees. Males moved to west to puck fibers from *P. sylvestris* and to all directions to get fibers from *S. officinarum* crops. The study revealed that the males had visited *P. sylvestris* trees daily from 0600 h to 1730 h, perched on rachis/leaflets, made incisions on the margins of leaflets near the bases and speedily tears off fine fibers toward the distal ends. The birds tore off fibers in this manner and carried to the nesting trees. Observations on 100 trips from the sources of fibers (*P. sylvestris* and *S. officinarum*) to nest-supporting trees revealed that the birds carried 2–5 fibers per trip. They selected young fronds for peeling fibers and avoided the old fronds on the bottom of the tree crown. Study on 10 fronds from four *P. sylvestris* trees where birds tore off fibers revealed that the mean size of fronds was 106 cm (Standard Error of 4.73) and the birds had selected leaflets from the distal half of rachis, i.e., from middle to distal part of the rachis and never selected hardened leaflets found on the lower half of rachis, i.e., towards leaf bases. Similarly, males tore off fibers from young and green leaf blades of sugarcane crop and no incident of selection of fibers from dried and partly dried leaves were observed (Image 2).

Behaviour of stealing fibers

Thirty-two incidents of males stealing fibers from adjacent nests when the resident birds of the nests were away were observed. Such incidents of stealing fibers from nests of other birds within the colony were observed throughout the breeding season.

Stages of nest constructions

Four developmental stages of nest constructions such as wad stage, helmet stage, egg-chamber closed stage, and complete nest stage were taken into account and studied in detail (Image 5).

Wad stage

The males plait knots round the margins of leaf blades by using legs and beak called wad stage (Image 5a,b). The study on 98 wad stage nests revealed that the time taken for construction of wad stage varied and the males took minimum two hours to maximum of nine days for construction of wads. In an exceptional case, a male plaited knot continuously for nine days and the wad stage became an amorphous ball like structure. The males usually plaited knot on one leaf tip, but in many cases they used up to six leaf tips for plaiting a knot/wad stage (Image 3). The males built 22.45% wad stage nests (n = 22) in 1–2 days, 54.09% wad stage nests (n = 53) in 3–4 days, 19.38% wad stage nests (n = 19) in 5–6 days, and 4.08% wad stage nests (n = 4) in 7–9 days.

Helmet stage

The males took 1–15 days to construct helmet stage nests. Out of 98 wad stage, 94 were developed into helmet stage nests (birds abandoned 4 wad stage nests). When the females reached the nesting colony, the males perched on helmet stage nests and made loud noises by flapping their wings (Image 4 d). The males built 84% helmet stage nests (n = 79) in 1–5 days (including 27 nests were built within one day from dawn to dusk), 13.8% helmet stage nests (n = 13) in 6–10 days, and 2.1% helmet stage nests (n = 2) in 11–15 days.

Table 1. Details of nest colonies of Baya Weaver on Borassus flabellifer trees in Chendur village, Villupuram district.

Nesting trees with GPS	Height (m)	GBH (cm)	Total no. of fronds found in the crown	No. of fronds without nests	No. of fronds used by birds for construction of nests	Total no. of nests (including all developmental stages) counted	Average no. of nests per frond
Borassus flabellifer (colony-I) (12.123446 N 79.591657 E)	7.5	78	54	30	24	61	0.88
Borassus flabellifer (colony-II) (12.113396 N 79.580264 E)	9.5	82	61	25	18	37	1.64
Total			115	55	42	98	1.17 (average)

Image 1. Nest colonies on *Borassus flabellifer* trees in Chendur village: a—Nesting colony-I | b—Nesting colony –II. © M. Pandian.

Image 2. Baya Weaver: a—Male | b—Female | c & d—Male makes Borassus flabellifer frond margins rough around midrib | e & f—Male bird plucking fibers from leaflets of Phoenix sylvestris. © M. Pandian.

Table 2. Details of number of days taken by the birds to construct complete nests.

Number of complete nests	Percentage (%)	Number of days taken
02	3.4	1–5
18	31	06–10
20	34.4	11–15
08	13.8	16–20
03	5.1	21–25
7	12	Above 26

Image 3. Nests attached on tip of palm frond: a—Nest attached with two leaf tips | b—Nest attached with four leaf tips. © M. Pandian.

Egg-chamber closed stage

Out of 94 helmet stage nests, 31 helmet stage nests were abandoned by the males and did not develop further probably due to non-selection of helmets by females or abandoning by resident males themselves. The remaining 63 helmet stage nests were developed further into egg-chamber closed stage nests. After construction of helmet stage nests, males wait for arrival of females for selection of their helmet stage nests followed by pairing. Hence, further development of nests depends on the chances of selection of helmet stage nests by females and time taken for such selection followed by pairings. My studies revealed that the number of days taken for development of helmet stage nests including the time taken for arrival of females, selection of helmets, and followed by pairing were found varied from one day to 29 days. Out of 63 helmet stage nests, 35 helmet stage nests were developed into egg-chamber closed stage nests in 1–5 days, followed by 20 nests in 6–10 days, four nests in 11–15 days, three nests in 16–20 days and one nest took 29 days (Image 4e).

Complete nests

The birds abandoned five egg-chamber closed stage nests without any further development. Birds took 1–28 days to complete the construction of entrance tube. Out of 58 complete nests studied, in 69% nests (n=40), the entrance tubes were constructed in 1–5 days, while in 12 nests, it took 6–10 days, 11–15 days for four nests, and 21–28 days for two nests (Image 4f; Table 2). During the entire study period, neither courtships nor mating were observed on the helmet stage nests or source of fibers or on nest-supporting trees.

Deposition of clay in the nests

After completion of construction of helmet stage nests and before arrival of females to select such nests, the males plastered two sides of the inner walls of helmet stage nests with wet clay. Observation on 132 helmet stage nests (94 first time built helmet stage nests and 38 re-built helmet stage nests) revealed that 95 % of nests (n = 126) contained clay deposits. Only a very small percentage (4.65%; n = 6) did not have clay. My studies revealed that the males did not take readily available wet clay from the paddy fields, situated c.300 m from the two nesting trees. Males waited for the frequent spell of rainfall during south west monsoon. Immediately after rainfall, the next day morning between 0600 h and 0730 h the males swarmed to the wet fallow land and mud road situated c.40 m distance from the nesting trees and scooped wet clay through their beaks in many trips and carried it to helmet stage nests. Continuous observations revealed that the males did not take clay directly from wet soil surfaces from all the sites. They selected sites where wet clay was exposed in tire tracks left by vehicles on mud roads and fallow land. The practice of males scooping clay after rainfall was observed from April–October 2020 in the morning between 0600 h and 0730 h. It was not possible to ascertain whether the birds added clay on the inner walls after closing of egg-chamber and construction of entrance tube. Dissection of two fallen nests (helmet stage—1 and egg-chamber closed—1) revealed that the

Table 3. Details of properties of clay deposited in the nests.

Parameters	Soil sample collected from the site where Baya Weaver took soil	Egg-chamber closed stage (Left wall)	Egg-chamber closed stage (Right wall)	Helmet stage (Left wall)	Helmet stage (Right wall)
Weight (g)	25	5.1	5.2	5.4	5.8
Temperature (°C)	25.91	26.01	25.93	26.02	25.92
Specific Conductance (Ms/Cm)	0.048	0.048	0.035	0.051	0.024
Conductivity (Ms/Cm)	0.049	0.049	0.036	0.051	0.025
Resistivity (Ω Cm)	22193.3	19805.2	27440.7	19490.3	40131.3
Total Dissolved Solids (TDS %)	0.031	0.033	0.023	0.032	0.016
Salinity (Sal)	0.02	0.02	0.02	0.02	0.01
Dissolved Oxygen (DO %)	32.4	37.2	23.7	30.7	19.4
Dissolved Oxygen milligrams per litre (DO Mg/L)	2.72	2.94	1.94	2.42	1.89
Dissolved Oxygen charge (DO Ch)	15.5	16.5	13.5	15.5	12.4
Potential of Hydrogen (pH)	9.36	9.30	9.30	9.23	9.30
Potential of Hydrogen in Milli Volt (pHml/)	-179.3	-175.0	-175.9	-172.4	-176.4
Oxidation Reduction Potential (ORP)	-110.4	-103.5	-103.4	-99.7	-102.1

Table 4. Details of month-wise nest fall from two nesting trees.

Month	No. of nests felled down
May 2020	11
June 2020	13
July 2020	17
August 2020	1
Total	42

Table 5. Details of impact of avian predators on Baya Weaver colonies in Chendur village.

	Name of the predator	No. of sightings noted	No. of nests damaged	No. of Baya Weaver killed
1	*Corvus splendens*	72	3	0
2	*Corvus macrorhynchos*	27	0	0
3	*Dendrocitta vagabunda*	4	4	0
4	*Accipiter badius*	7	0	1
Total		110	7	1

males smudged two patches of clay on each side of the nest. The surface of dried plaster of clay had many beak marks as scars (Image 5f). It was observed in one egg-chamber closed stage nest that even after plastering of clay, another layer of fresh fibres was found on the patches of clay. It indicates that even after smudging clay, males further added fibres above the layer of clay (Image 6e). No female was seen scooping clay and carrying to nests (Image 5).

Physico-chemical analysis of clay deposits taken from one helmet and one egg-chamber closed stage nests revealed it was alkaline (pH 9). The dry weights of the clay ranged 5.1–5.8 g. The other parameters also showed no major variations. The physical and chemical properties of clay collected from both walls of two nests matched with the soil sample collected from the nearby ground where male birds scooped clay (Table 3).

Falling of nests

Of 98 nests constructed during the study period, 43% (n = 42) of various developmental stages (helmet stage—22, egg-chamber closed stage—03, and complete nests—17) fell from the nest-supporting trees due to biotic and abiotic factors. 31 nests fell after rainfall, and the remaining 11 fell when no rainfall occurred (Table 4).

Re-construction of nests

The males started to rebuild 38 nests from the remnants of wad fibers found attached to the tips of palm fronds. Twenty-three nests were developed into helmet stage nests but did not progress further. The remaining 15 nests were successfully developed into complete nests. When studying the number of days taken to re-built a complete nest revealed that the birds took 6–37 days to re-built complete nests. The study reveals that the birds had constructed 13 complete nests in 6–25 days and for another two nests took 26 days and

Image 4. Various stages of nest development: a —Male individual brought fiber to tie a knot | b—Male bird perching on wad stage nest | c—Ring stage nest | d—Helmet stage nest | e—Egg-chamber closed stage nest | f—Complete nest with entrance tube. © M. Pandian.

37 days, respectively.

One re-built helmet stage nest was again felled down on 21 May and a male had started to construct another helmet stage nest at the same tip of frond on 24 May and completed the construction of helmet stage nest on 25 May. Later the helmet stage nest did not develop further. On 30 June, another re-built helmet stage nest was felled down and a male had again constructed helmet stage nest from the same tip of palm frond within two days i.e., on 01 and 02 July. Later in nine days, i.e., on 11 July and it was developed into a complete nest (Image 6).

Repairing of damaged nests

Incidents of partial damages to seven nests (egg-chamber closed stage—4, and complete nests—3) by House Crow and Rufous Treepie were recorded in the study area. In all these nests the birds brought fresh plant fibers and plait on the edges of damaged walls. Then the birds had continued further construction activities and repaired all the nests. The repaired nests resembled two different colours, i.e., the older part resembled pale colour and the repaired portion resembled green colour due to the addition of fresh green fibers (Image 7).

Image 5. Plastering of wet clay on the inner walls of helmet stage nests: a & b—Males engaged in collection of clay from wet ground | c—Plastering of clay on the inner wall of helmet stage nest | d—Clay deposit found in dissected nest | e—Layer of fibres found above clay deposit | f—Beak marks on clay deposit. © M. Pandian.

Threats

Opportunistic sightings of predatory birds such as House Crow *C. splendens*, Long-billed Crow *C. macrorhynchos*, Rufous Treepie *D. vagabunda,* and Shikra *A. badius* were observed on these two nesting trees. On 24 July at 1240 h, one Shikra had chased the individuals of Baya Weaver from nesting colony-I and when seeing the predator, all the individuals of Baya Weaver fled from the nest colony. One male Baya became a prey to Shikra and later took the victim to a nearby shrub and ate it completely, except feathers (Image 8 j). On 11 June, one Rufous Treepie visited nesting colonies and made punctures on the egg-chambers. The predator had inserted its head into the egg-chamber but we were unable to ascertain whether it prey upon the eggs/chicks from the nests. Individuals of House Crow and Large-billed Crow were found perching on nesting trees and chased the individuals of Baya Weaver but preying adult birds/chicks were not observed during the study period. On 28 May, a House Crow plucked fibers from three nests (complete nests-3) and caused partial damages to the nests (Table 5).

On 30 September, one land holder had uprooted and removed *P. sylvestris* trees (n = 14) found on bunds of fallow lands situated 60 m from nesting trees while clearing the land for cultivation. The males had plucked fibers from these trees for construction of nests. A total of 42 fallen nests, 11 broken eggs, and 14 dead chicks

Image 6. Re-construction of nest: a—Stalk of the fallen nest | b—Plaiting green fresh fibers on pale old stalk | c—Remnant stalk of old nest | d—Male plaiting green fresh fibers around old stalk | e—Re-construction of new helmet from old stalk | f—Re-constructed complete nest. © M. Pandian.

were observed under the nesting trees. In one instance, farmer burnt bushes around nesting tree which caused temporary driven of birds from nesting tree (Image 9).

Roosting

During the entire breeding period from April–November, no Baya Weaver was found night roosting on the nest-supporting trees. Between 1745 h and 1810 h all the birds used to fly away from the nest colonies and roost on the shrubs found 1–1.5 km from nest colonies and return to their nest colonies the next morning. Continuous observations revealed that some females entered their nests during the evening hours did not come out and stayed in the nests itself. These females might have incubated their eggs or nestlings.

DISCUSSION

Commencement of nest construction

The study revealed that starts of the breeding season of Baya Weaver vary from area to area in India. For example, date of commencement of nest construction was 22 May 1930 in Kolaba district of Maharashtra (Ali 1931), early June in Parbati Hill, Poona city (Ali et al. 1956), mid-June in Chorao Island, Goa (Borges et al. 2002), and mid-April in Rajampet Taluk of Cuddapah district, Andhra Pradesh (Mathew 1972). In the present

Image 7. Nest damage and repair: a—Male perching on damaged nest | b—View of damaged nest | c—Repairing of damaged nest | d—Further growth of nest. © M. Pandian.

study, breeding commences in the first week of April which corroborate the observation of Mathew (1972). It indicates that the breeding of Baya Weaver is related to South-West monsoon in Tamil Nadu.

Selection of Palm fronds

Baya Weavers construct nests from the distal ends of midribs of the coconut palm in South Goa (Borkar & Komarpant 2003). The birds wrap considerable amounts of fibers around a chosen frond and makes a strong base for further development of the nest (Wood 1926). Also in the present study nests were found attached at the distal ends of the midribs of *B. flabellifer* fronds. This indicates that the males selected the distal ends of palm fronds for construction of nests. No nest was found in the middle or basal parts of fronds in the two nest colonies.

Source of fibers

Except in northern India, the birds used leaf fibers of *C. nucifera* and *P. sylvestris* for nest construction in other parts of the country (Dewar 1909). Baya Weaver used pliant grass and fibers from palm fronds in the Northern Province of Sri Lanka (Wood 1926), and leaves of *Phoenix* sp., coarse grass and paddy in Kolaba district, Maharashtra (Ali 1931) as nest materials.

The present findings of Baya Weaver using fibers from *P. sylvestris* for construction of nests matches with the observations of Dewar (1909), Wood (1926), and Ali (1931). Apart from that the birds also used sugarcane leaves as nest material in the study area.

Time taken for construction of nest

Asokan et al. (2008) stated that the birds took 18 days to construct one complete nest in Nagapattinam and Tiruvarur districts of Tamil Nadu. Achegawe et al. (2016) had also found similar results in Nanded region of Maharashtra. The present study revealed that the time taken for construction of a complete nest was not uniform for all the nests. The birds took 6–48 days for construction of complete nests. The study also revealed that the males had capable of constructing helmet stage nest in one day, i.e., from dawn to dusk. Hence, the present findings of number of days taken to construct complete nest in Villupuram district found differ with the observations of Asokan et al. (2008)

Plastering of inner nest walls with wet clay

The habits of smudging of clay in the nests are observed only in Asian weavers (*P. manyar, P. benghalensis,* and *P. philippinus*) and not found in African

Image 8. Various threats to Baya Weavers: a & b—Nests dangling from the stalk | c & d Fallen nests | d—Broken egg near fallen nest | e–g—Dead chicks under the nesting tree | i—Bushes burnt under nesting tree | j—Shikra eating a male Baya Weaver individual. © M. Pandian.

weavers and the quantity of mud varies from region to region in India (Crook 1963; Davis 1973). Plastering of inner walls of nest with wet clay is done when the nest construction reaches the helmet stage prior to pairing with females (Dewar 1909; Ali 1931; Ambedkar 1964; Borkar & Komarpant 2003).

Davis (1973) stated that about 18.33% nests did not show presence of mud blobs on the inner walls of nests in South Goa. He added that females were never found bringing mud. In the present study also, 4.54 % of helmet stage nests did not have clay deposits, and no female was observed carrying clay. This matches with the findings of Davis (1973). Ali (1931) had observed 0.5–1 oz of mud in the nest. Davis (1973) also found that the average dry weight of mud deposit per nest was 66.2 g. But in the present study, the dry weight of clay ranged from 5.1–5.8 g. Average weight of mud blobs on left side was greater in comparison with right side (Borkar & Komarpant 2003). The present study on two nests revealed that there was no major variation in the weight of clay deposited on the right and left side of the inner walls. In the present study, the clay collected from nests and in the original sites where birds took clay was found alkaline (pH 9). The exact causes of plastering of mud in the nest walls require further studies.

Fallen nests

The practice of male cutting down the nest of rival cock was common when the owner had gone to fetch building materials (Ali et al. 1956). Pandian (2021) had observed that male Baya Weaver cut down a complete nest occupied by White-rumped Munia *Lonchura striata* in Villupuram district. In the present study, 42.85% nests (n = 42) of various developmental stages were found fallen under the nest-supporting trees. Apart from rain and wind, these might have also occurred due to rival males as stated by Ali et al. (1956). Falling of such a great number of nests (42.85%) from two nest colonies in a single breeding season is of great concern and it needs further study.

Re-construction of nests

The study indicates that the birds are capable of constructing complete nests from the same stalks from where the earlier nests were detached. It was not possible to differentiate whether the same male commences construction of nest from the torn stalk or different male uses the stalk for further construction of nest. However the birds have the intelligent to re-construct their nests from the stalk of detached nests.

Repairing of damaged nests

Baya Weavers have the capacity to repair their damaged nests with fresh green strips of fibers, i.e., various types of artificial nest mutilations (Ali & Ambedkar 1957; Collias & Collias 1959, 1962). In the present study also the birds had repaired heavily damaged nests by using fresh fibers and hence it matches with the findings of Ali & Ambedkar (1957) and Collias & Collias (1959, 1962).

Threats

Ali (1931) had stated that agitated behaviour of Baya Weaver was observed when Crow Pheasants *Centropus sinensis* appeared in close proximity of the nesting tree. He also observed a Shikra making an unsuccessful stoop on nest colony. In the present study also, Baya Weaver had exhibited agitated behaviours when House Crows visited nesting trees and all birds fled away from tree crown when they saw Shikra and a Rufous Treepie near the nesting trees.

Ali et al. (1956) had observed that many completed nests were blown down due to recurring spells of bad weather during June–August in Bombay area and was major natural mortality factor of nest colonies. He also noted accidental drowning of chicks from nests. Similarly in the present study also, 31 nests were found fallen down immediately after rainfall. Out of 14 dead chicks, five were found under the nesting trees after rain and wind. Hence, the present observations match with the findings of Ali et al. (1956).

CONCLUSION

This is a systematic study on the nesting habits on Baya Weaver on two Palmyrah Palm trees in a confined geographical area of one village in Villupuram district. Increasing urbanization by conversion of cultivated lands into residential areas, expansion of roads, abandoning cultivations along with indiscriminate felling of principal nest-supporting palm plants, such as Palmyrah Palm *B. flabellifer*, Coconut *C. nucifera*, and Indian Date Palm *P. sylvestris* that are vital for Baya Weaver is a conservation issue in this landscape. Increasing practices of monoculture of *Casuarina*, Sugarcane, and flower crops, declining areas of cultivation of cereals and millets also causes shortage of grains to birds. Fall of viable nests due to various anthropogenic factors, winds, rain and avian predators cause severe stress on the breeding of Baya Weaver. Therefore, it is essential to conduct sustained surveys and monitor the nesting sites

during the subsequent breeding seasons and efforts should be taken to create suitable nesting habitats by not destroying the nesting trees. Based on the above the following could be options for securing the bird's habitat from the area.

(a) Establish a special management plan for the area, considering the anthropogenic and natural stresses that the habitat is currently subjected to.

(b) Local community, particularly land holders, and agricultural workers should be sensitized to understand the need to preserve the precious nesting sites.

(c) The detailed systematic survey covering the entire Villupuram district will help in drafting an action plan to conserve the populations of Baya Weaver.

(d) The impact of abiotic factors such as rain and wind on the nest fall need further studies.

(e) The exact causes of males depositing wet clay on the inner walls of nests during helmet stage, fall of large number of nests, and mortality to chicks require further studies.

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