BAYA WEAVER BIRD

Nest colonies and abnormal nests of *Ploceus philippinus* in Tindivanam Taluk, Villupuram District, Tamil Nadu

Nests of *Ploceus philippinus on B. flabellifer*: (a) Normal nest (scale bar—3.6cm), (b) Two-storeyed abnormal nest (scale bar—11.5cm).

IUCN Red List: Least Concern (BirdLife International, 2016)

Aves
[Class of Birds]

Passeriformes
[Order of Passerine]

Ploceidae
[Family of small passerine birds]

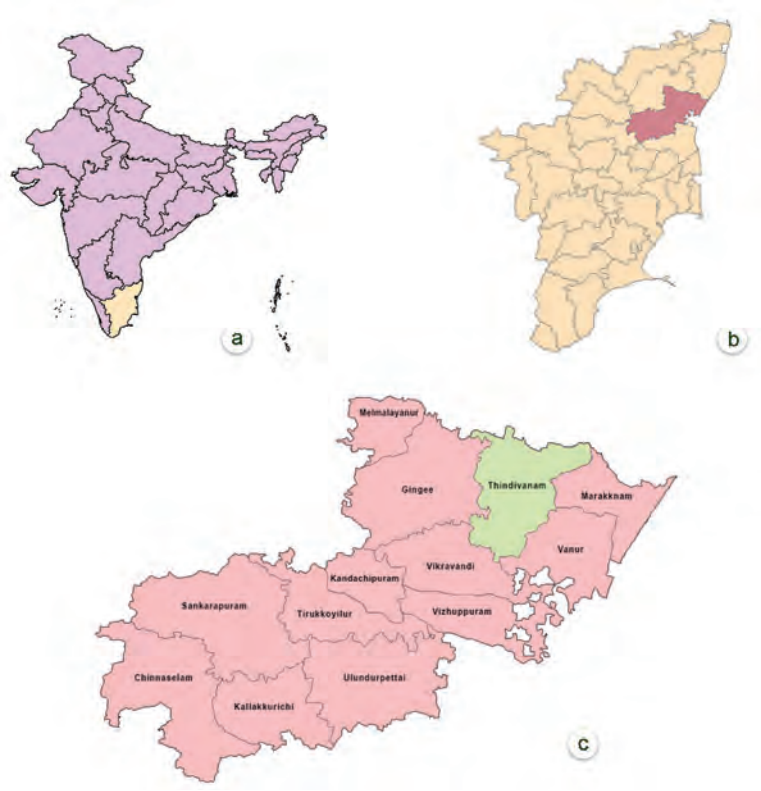
Ploceus philippinus
[Baya Weaver bird]

Species described by Linnaeus in 1766

Ploceus philippinus are social, gregarious, polygamous, and colonial-nesting birds that occur throughout the Indian subcontinent (Ali et al. 1956). These are also known in Java and Sumatra (Indonesia) (Wood 1926), Pakistan, Bangladesh, Thailand, Malaysia, and Sri Lanka (Ali & Ripley 1999). These are common in agricultural and open grassy landscapes (Quader 2005). These birds breed during monsoon months, June—November (Rasmussen & Anderton 2005). *Ploceus philippinus* generally prefer tall, linear trees with dense canopies, more often preferring the taxa of Arecaceae. Davis (1974) has identified 40 nest-supporting plants in India including four species, such as a species of Vachellia (= Acacia), *Borassus flabellifer*, *Cocos nucifera* (Arecaceae), and *Tamarindus indica* (Fabaceae) in Tamil Nadu. Davis (1985) explains *P. philippinus* preference for the Arecaceae as the availability of unbranched trunks and long, swaying foliage, which prevent predators and provide suitable leaf strips for nest

construction. Within the Arecaceae, *P. philippinus* mostly build nests on *Cocos nucifera* (Arecaeae) along the western coast and on *Borassus flabellifer* (Arecaceae) along the eastern coast of the peninsula. These birds are also known to build nests on *Vachellia nilotica* (= *Acacia nilotica*, Fabaceae) in the arid regions of north-western India (Sharma 1989). Sharma (1987) has identified 47 nest-supporting plants including *Calotropis procera* (Asclepiadaceae), *Cordia gharaf* (Boraginaceae), *Adhatoda vasica* (Acanthaceae), and *Cynodon dactylon* (Poaceae) in Alwar and Bharatpur Districts of Rajasthan. *Ploceus philippinus* prefer the exotic Eucalyptus trees than any Arecaceae in Chorao Island in the Mandovi estuary of Goa (Borges et al. 2002). Trees such as *B. flabellifer*, *Phoenix sylvestris* (Arecaceae), *Pithecellobium dulce*, *Albizia lebbeck* (Fabaceae) are the preferred plants for nest building by *P. philippinus* in West Bengal (Biswas et al. 2010) and, the introduced species of *Callistemon* (Myrtaceae) in Rajasthan (Kumar & Kumar 2015). *Ploceus philippinus* build nests on *Areca catechu* (Arecaceae) planted in rows in traditional home garden agroforestry system in Assam (Yashmita-Ulman et al. 2017).

Global Distribution: Native: Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Singapore, Sri Lanka, Thailand, Viet Nam (BirdLife International, 2016)



Survey area. (a) India map showing Tamil Nadu (yellow); (b) Tamil Nadu map showing Villupuram District (brown); (c) Villupuram District map showing Tindivanam Taluk (pale-green)

Nests of *P. philippinus* predominantly occur as colonies, but isolated nests are not uncommon (Pandey 1991). *Ploceus philippinus* built nests in colonies and the number of nests in each colony varies from 2-250 (Davis 1974). Each colony consists of 5-24 nests and the birds opt for trees standing amidst grasslands, crop fields as well as damp and water-inundated localities (Borkar & Komarpant 2003). However, these birds prefer building nests on plants that overhang a

waterbody (Khan 1799). Nests constructed on branches overhanging waterbodies are believed to be protected from rats and similar terrestrial animals (Ali 1931). In Parbati Hills, Pune, *P. philippinus* built 82.8% of nest colonies over waterbodies and of these, 65.7% were hanging either within wells (Crook 1960). Similar records from Tamil Nadu exist (Davis 1974).

Nests of *P. philippinus* vary from 40 to 100 cm in length (Wood 1926), each with clearly discernible parts, viz., stalk, body, and an entrance tube (Sharma 1995). However, deviations from the above design occur, which could be referred as 'abnormal'. For instance, such nests include either repetition or elaboration of one or more of parts, or lack of one or more of parts, formation of additional sections such as stalk and entrance tube, and even abnormality in the position of the nest on the supporting tree or its parts. These variations include multistoreyed nests, which include more than one egg chamber in a vertical order, and more than one storey built in the same fashion. Ali et al. (1956) have reported on different abnormalities in *P. philippinus* nests in Pune, Maharashtra. Ambedkar (1958, 1980) has described abnormal nests in Parbati Hills ($26^0$20'-$77^0$08'N; $78^0$16'-$78^0$16'E), Pune, and multistoreyed and composite nests in Kumaon Terai ($28^0$44'-$30^0$49'N; $78^0$45'-$81^0$5'E). Sharma (1985) and Borkar & Komarpant (2003) provide detailed notes on abnormal nests in Rajasthan and in southern Goa, respectively. Sixteen types of abnormal nests under the broad categories of structural abnormality, orientational abnormality and mixed abnormality have been noted in Alwar and Bharatpur, Jaipur, and Udaipur districts of Rajasthan (Sharma 1995).

Tindivanam taluk in Villupuram district is largely an agricultural area, where *P. philippinus* populations build nests and breed successfully. Large numbers of nest colonies occur in the farm and fallow lands and in spaces around irrigation wells. A study of the abnormal nests of *P. philippinus* were carried out by Sharma (1995) in Rajasthan, Borkar & Komarpant (2003) in Southern Goa and Ali et al. (1956) and Ambedkar (1958, 1980) in Pune. Other than these no systematic study has been done so far on the qualitative and qualitative aspects of abnormal nests in Tamil Nadu.

Hence by surveying and analyzing nest colonies and abnormal nests on 13 nest-supporting plant species and power cables in 55 villages in Tindivanam Taluk, we sought answers to the following questions: What are the maximum and minimum number of nests in nest colonies? How many of these are preferentially constructed overhanging irrigation wells? How many different types occur among the abnormal nests?

MATERIALS AND METHODS

Survey area

The survey was conducted in 55 villages (Table 1) in Tindivanam Taluk, Villupuram District ($11^0$12'-$11^0$93'N; $78^0$65'-$79^0$48'E), Tamil Nadu, covering 80 km^2 overall. Human population in the survey area is *c.* 5,00,000 with agriculture being the principal occupation. Soil is made of red-sandy loam and black-cotton soil. The major crops of this area are *Oryza sativa*, *Sorghum bicolor*, *Pennisetum glaucum*, *Eleusine coracana*, *Setaria italica*, *Saccharum officinarum* (Poaceae), *Vigna radiata* and *Arachis hypogaea* (Fabaceae). Monoculture of *Casuarina equisetifolia* (Casuarinaceae) and *Manihot esculenta* (Euphorbiaceae) is common in the water-scarce parts of Tindivanam. The maximum and minimum temperatures in the district are 36^0C and 20^0C, respectively. The average annual rainfall of the district is 1000 mm. About 95% of the normal rainfall occurs because of north-east monsoon in October-December and south-west monsoon in June-August (Annon, 2017).

Table 1. List of villages surveyed for *Ploceus philippinus* nests in Tindivanam Taluk (Villupuram District)

	Name of the village
1.	Alagiramam
2.	Andipalayam
3.	Anganikuppam
4.	Annamputhur
5.	Athikuppam
6.	Avvaiyarkuppam
7.	Chendur
8.	Chendur Chettipalayam
9.	Chinnanerkunam
10.	Chinnavalavanur
11.	Deevanur
12.	Edapalaiyam
13.	Ellai
14.	Erayanur
15.	Ganapathypattu
16.	Gopalapuram
17.	Kannigapuram
18.	Kanniyam
19.	Keel Edaiyalam

	Name of the village
20.	Kenipattu
21.	Kenipattu Colony
22.	Kodima
23.	Konamangalam
24.	Koralur
25.	Kothamankalam
26.	Kovadi
27.	Kutteripattu
28.	Madurapakkam
29.	Mailam
30.	Melperadikuppam
31.	Molachur
32.	Muppuli
33.	Nallamur
34.	Nallamur Colony
35.	Padirappuliyur
36.	Palapattu
37.	Panjaalam
38.	Panthamangalam

	Name of the village
39.	Pearani
40.	Peramandur
41.	Periyathachoor
42.	Rettanai
43.	Sendiyam Pakkam
44.	Sithani
45.	Sozhiyasorkulam
46.	Thenkalavai
47.	Thenkolapakam
48.	Thennalapakkam
49.	Thenpasiyar
50.	Veedur
51.	Vengai
52.	Venkanthur
53.	Vikravandi Nallalam
54.	Vilagambadi
55.	V. Panchalam

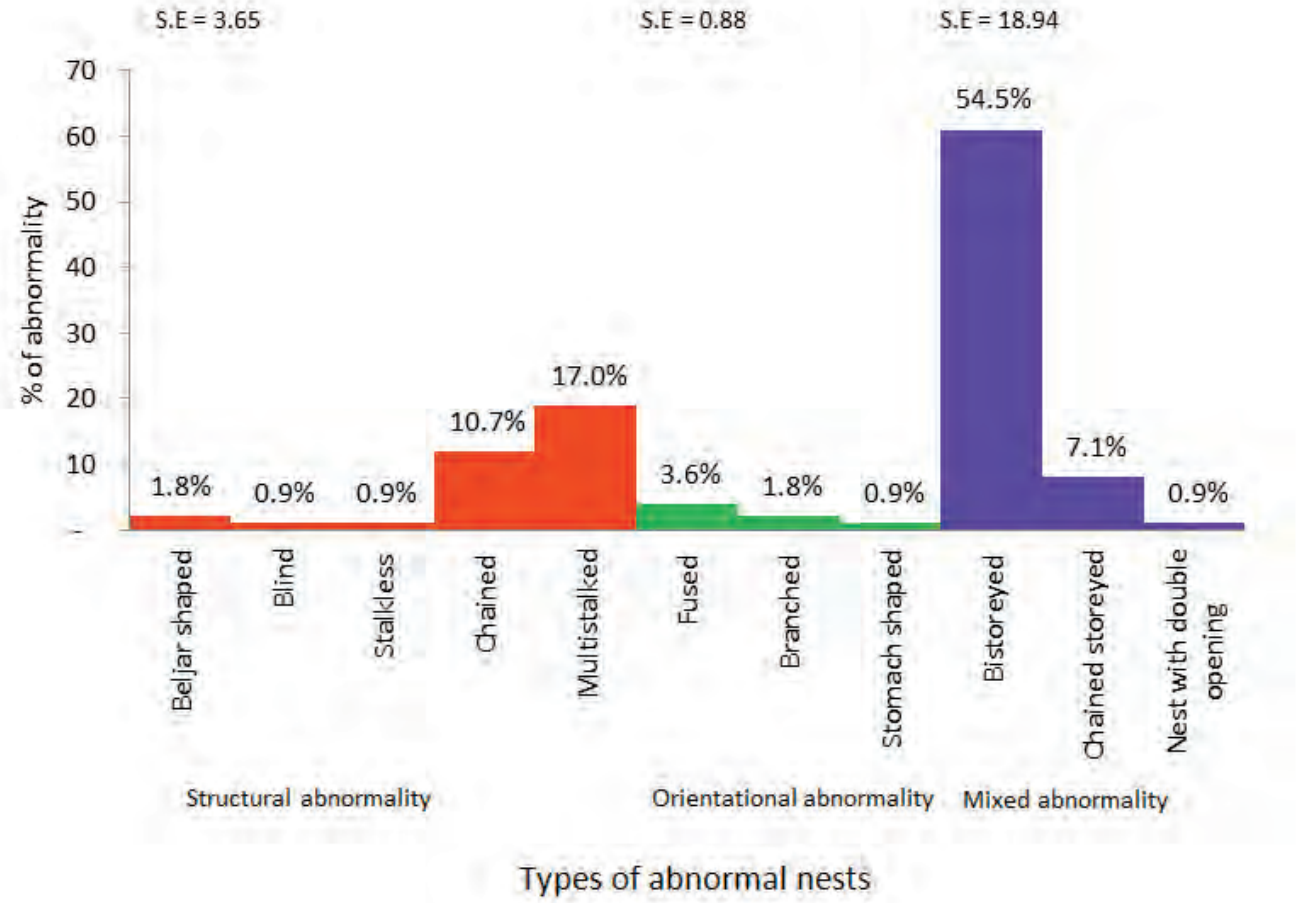
Methods

A total of 4408 nests of *P. philippinus* were examined in and around cultivating fields. The total numbers of nest-supporting plants, nests on power cables, nests, nest colonies, abnormal nests, and nests hanging over irrigation wells were considered. Because *P. philippinus* populations are active between 0600 and 1100 h and 1500 and 1800 h, the survey sites were visited between 0600 and 1100 h and 1500 and 1800 h every day in May-November 2017. Normal and abnormal nests were censused visually when they occurred proximally. When they were at a distance, census notes were made using a pair of Super Zenith field binoculars (Model No. 20x50 Field 3^0, Jack Berg, El Paso, Texas,

Nest colonies drooping into irrigation wells in crop fields: (a) Normal nests on *Cissampelos pareira* and *Phyllanthus reticulatus* (scale bar-80cm), (b) on *Prosopis juliflora* (scale bar—80cm), and (c) on *Morinda tinctoria* (scale bar—80cm), (d) Abnormal nests on *Ficus benghalensis* (scale bar—66cm).

USA), not disturbing nests and inhabiting birds. Locations of the nest-supporting plants and power lines were determined using a standard GPS (Garmin Etrex 20X). Photographs and videographs of nest colonies and abnormal nests were made on the spot using a digital camera (HDR—CX13, Sony). Nest-supporting plants were identified using Nair & Henry (1989). Abnormal nests were classified following Sharma (1995).

Types and percentages of abnormal nests of *Ploceus philippinus*



Collected data were tabulated, analyzed and shown as graphical representations. Pearson's χ^2 test was used to verify differences in means of variance between various habits of nesting plants with normal and abnormal nests using SPSS (Statistical Packages for Social Sciences). The level of significance was assessed at 0.05%.

RESULTS

The censused nest-supporting plants (n=270) belonged to 13 species and 10 families. Nine of them were trees, two shrubs, one herb, and one twiner. In total, 4408 nests were counted on nest-bearing plants and power cables in 55 villages. Abnormal nests constituted 2.5% (n=112) of total number of nests (4408).

The numbers of nests in each nest colony varied: 55.5% of nest-supporting plants (n=150) bore nests between one and 10, whereas 17% of nest-supporting plants (n=46) bore 11—20 nests, 11% (n=30) bore 21—30 nests, 6.3% (n=17) bore 31—40 nests. A total of 93 nests occurred on one well-grown tree of *B. flabellifer* in Anganikuppam ($12^0$4'N-$79^0$35'E). Solitary nests occurred on 18 plants. Pearson's χ^2 test was applied to

Table 2. Association between habits of nest-supporting plants / power cables and nests (Chi-Square tests) of *Ploceus philippinus*

Habits of nest-supporting plants/ power cables	Nest-supporting plants	Total no. of plants/ power cables bore nests	Total no. of normal nests	% of total of normal nests	Total no. of abnormal nests	% of total of abnormal nests	Total nests	% of total of nests
Unbranched Trees	*Borassus flabellifer*	247	3984	90.38%	87	1.97%	4071	92.35%
	Cocos nucifera							
	Phoenix sylvestris							
Branched trees	*Casuarina equisetifolia*	12	94	2.13%	6	0.14%	100	2.27%
	Ficus benghalensis							
	Azadirachta indica							
	Morinda tinctoria							
	Prosopis juliflora							
	Pithecellobium dulce							
Shrubs	*Phyllanthus reticulatus*	7	47	1.07%	1	0.02%	48	1.09%
	Securinega leucopyrus							
Twiner	*Cissampelos pareira*	3	51	1.16%	2	0.05%	53	1.20%
Herb	*Ruellia prostrata*	1	1	0.02%	0	0%	1	0.02%
Power cables		4	119	2.70%	16	0.36%	135	3.06%
Total		**274**	**4296**	**97.46%**	**112**	**2.54%**	**4408**	**100%**

***Statistically significant value 1.205E-10 ($p<0.05$) is arrived in χ^2 test**

determine preferences of *P. philippinus*, such as unbranched or branched trees, shrubs, twiners, herbs, and power cables. A significant difference among the various habits of nest-supporting plants, such as unbranched trees, branched trees, shrubs, herbs, twiner, and power cables with respect to the normal and abnormal nests was noticed. The level of significance was found at less than 0.05% (Table 2).

Frequency of nests overhanging waterbodies

Of the total nests surveyed (n=4408), 3.2% (n=144) of them, including nine abnormal nests, were hanging over waterbodies, i.e., irrigation wells occurring within crop fields in seven villages, viz., Thenkolapakkam, Gopalapuram, Kizhedayalam, Edapalayam, Sendiambakkam, Koothamangalam, and Vikravandi Nallalam. The overhanging nests were attached to five species of plants, viz., *Ficus benghalensis* (Moraceae), *Morinda*

Table 3: Percentage of abnormal nests of *Ploceus philippinus*

	Type of nest abnormalities	Total number of abnormal nests counted	% of abnormal nests
1	Structural abnormalities	35	31.3%
2	Orientational abnormalities	7	6.2%
3	Mixed abnormalities	70	62.5%

tinctoria (Rubiaceae), *Cissampelos pareira* (Menispermaceae), *Phyllanthus reticulatus* (Phyllanthaceae), and *Prosopis juliflora* (Fabaceae), which were growing around the walls of irrigation wells.

Variations among abnormal nests

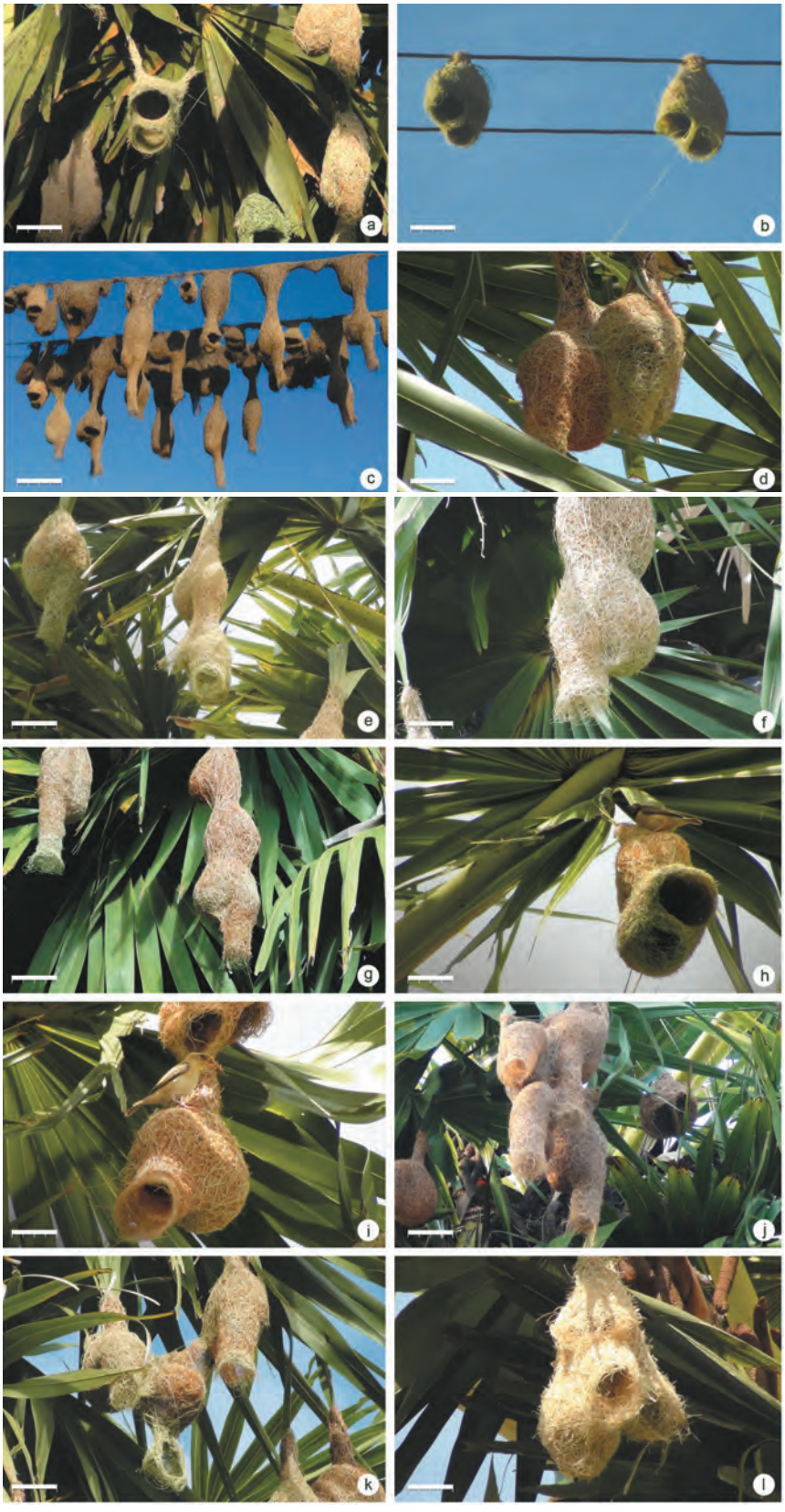
Of the total of 112 abnormal nests, 77% (n=86) occurred on *B. flabellifer*, 14% (n=16) on electric power lines, 3% (n=3) on *M. tinctoria*, and the remainder (n=7) on five plants viz., *Phoenix sylvestris*, *F. benghalensis*, *P. reticulatus*, *C. pareira*, and *P. juliflora*. Fifteen types of abnormal nests were observed and all of them belonged to three major categories: those with structural abnormalities (31.3%; n=35), those with orientational abnormalities (6.2%;n=7), and nests had mixed abnormalities (62.5% n=70) (Table 3). Thirty-five structurally abnormal nests were censused and the same consisted of bell-jar shaped-2, blind-1, stalkless-1, multistalked-19, and chained-12 types. The orientational abnormal nest type includes fused nests-4, branching nests-2, and stomach shaped nest-1. Third category mixed-abnormal nests consisted of bistoreyed-61, and chained nests-9. Among the two-storeyed nests 54.4% (n=61), complete two-storeyed were 16.9% (n=16), 1+1 type—9.8% (n=11); 1+1/2 type—26.7% (n=30); ½+1 type—2.6 % (n=3), and ½+1/2 type—0.9% (n=1). One nest was found with two openings. Pictures of abnormal nests are given. All the multistalked nests (n=19) were found on *B. flabellifer* trees. Chained nests occurred only on power cables.

DISCUSSION

Maximum and minimum numbers of nests in nest colonies

Ploceus philippinus populations build nests in colonies. The numbers of nests in one colony could vary from 5 to 24 (Borkar & Komarpant 2003) and occasionally more than 200 in some. But solitary nests also occur (www.weavers.adu.org). The present survey revealed that 55.5% of nest colonies include nests from 1 to 10. Another 17% plants bore nests from 11 to 20. A majority of the nest colonies included nests less than

Pictures of abnormal nests of *Ploceus philippinus*. (a) Multistalked nest on *B. flabellifer* crown, (b) Stalkless nests on power line, (c) Chained and wide stalked nests on power lines, (d) Fused nests, (e) Fused branching nest, (f) Two storeyed nest, (g) Chain storeyed nest, (h) 1+½ nest type, (i) ½+1 nest type (j & k) Mixed abnormal nests, (k) Nest with double openings.



20. A rare observation was that 93 nests were found on a single *Borassus flabellifer* in Anganikuppam Village. This reveals that *P. philippinus* live and build nests in colonies. Solitary nests were observed on 18 nest-supporting plants belonging to five species, such as *B. flabellifer*, *M. tinctoria*, *P. reticulatus*, *P. sylvestris* and *R. prostrata*. The existence of less than 10 nests in 55.5% nest colonies including solitary nests on 18 nest-supporting plants reveals that the nest colonies of these colonial birds in the study area indicate that continuous monitoring is necessary to know whether the number of nests in every colony increase or not in future.

Nests overhanging waterbodies

Borkar & Komarpant (2003) observed that *P. philippinus* populations built nests hanging over water bodies in South Goa. In Assam, nest-supporting trees occur around water

sources and agricultural fields (Yashmita-Ulman et al. 2017). The present study has revealed that 144 nests including nine abnormal nests attached to nest-supporting plants were drooping into irrigation wells matching with the observations of Khan (1799), Ali (1931), Crook (1960), Davis (1974), Sharma (1987) and Borkar and Komarpant (2003). Sharma (1987) has identified four nest-supporting plants viz., *C. procera*, *C. gharaf*, *Adhatoda vasica*, and *Cynodon dactylon* which bore nests found overhanging on wells and water bodies in Rajasthan. But in the present study five plants such as *F. benghalensis*, *M. tinctoria*, *C. pareira*, *P. reticulatus*, and *P. juliflora* growing adjacent to irrigation wells supporting *P. philippinus* nests, bore nests and found overhanging on water. Apart from the cultivating areas, irrigation wells in cultivable lands also provide habitats for these birds. *Ploceus philippinus* select nest-supporting trees close to waterbodies for safety; safety of nests and broods (Davis 1974).

Abnormal nests

Of the total abnormal nests (n=112) enumerated, 76.7% nests (n=86) were found on *B. flabellifer* trees. Borkar & Komarpant (2003) had listed 13 distinct types of anomalous nests in South Goa. The abnormal nests (n=112) have been categorised in to 15 types based on the classifications proposed by Sharma (1995) and the different types of abnormal nests are given. Out of 13 nest-supporting plants, abnormal nests were found on seven plant species and on power lines. Among the total (n=112) abnormal nests, 62.5% were mixed abnormal types, 31.3% nests had structural abnormalities and 6.2% nests had mixed abnormalities.

The present study reveals that 92.3% of nests (n=4071) occurred on unbranched trees viz., *B. flabellifer*, *C. nucifera* and *P. sylvestris*, 3.06% nests (n=135) on power cables, 2.3% nests (n=100) on branched trees, such as *C. equisetifolia*, *F. benghalensis*, *A. indica*, *M. tinctoria*, *P. juliflora* and *P. dulce*, 1.2% nests (n=53) on twiner *C. pareira*, 1.09% nests (n=48) on shrubs like *P. reticulatus* and *S. leucopyrus*.

Out of all abnormal nests (n=112), 77.6% (n=87) of abnormal nests occurred on unbranched trees, such as *B. flabellifer* and *P. sylvestris*, followed by power cables 14.2% (n=16), and intensely branched trees, such as *F. benghalensis*, *M. tinctoria*, *P. juliflora* and *C. pareira* 5.4% (n=6). It attributes that the birds preferred to construct both normal as well as abnormal nests on unbranched nest-supporting plants. Next to the unbranched trees, birds preferred power cables in the crop fields for building nests. All the noted multistalked nests 16.9% (n=19) were found attached to the fronds of *B. flabellifer* trees. To reinforce swaying nests, the birds connect a portion of nest with the leaf terminals nearby, possibly

to minimize the swing. Multistalked nests were not found on any other plants and power cables. In normal instances, *P. philippinus* maintain a distance between two successive nests hanging on the same branch. Since the surface of power cables are smooth in texture and slippery, the *P. philippinus* might have connect adjacent nests by mesh of woven fibres fabricating along the wire and makes the nests as chains. Twelve such chained nests (10.7%) existed on power cables.

In India the abnormal nests of *P. philippinus* were studied by a few in Pune, Maharashtra (Ali et al. 1956; Ambedkar 1958, 1980), Southern Goa (Borkar & Komarpant 2003), and Rajasthan (Sharma 1985, 1988, 1995). Other than these no systematic study was carried out on abnormal nests of *P. philippinus*.

Apart from *P. philippinus*, abnormal nests also occur in other species of *Ploceus*. For example *Ploceus benghalensis* builds a nest bearing an unusually long entrance tube of 1 m length (Mishra 2004) and *P. ocularis* constructs nests with entrance tubes of 2 m length in southern Africa (Maclean 1985). The African weaver bird *P. cucullatus* usually constructs kidney-shaped nests, but abnormal supernumerary antechambers are also built by these. Sometimes the males of *P. cucullatus* build either bottomless or canopied nests (Collias & Collias 1962) with variations in either the presence or the absence of a tube (Crook 1963). In South Africa, Angola, Zambia, and Mozambique, the Southern-Masked Weaver *P. velatus* constructs significantly abnormal nests among the weaver birds of the world. Intraspecific variations in the length of entrance tubes also occur in the nest-building behaviour of *Ploceus*. *Ploceus manyar* build nests with short entrance tubes in reed stands (species of *Phragmites*, Poaceae) in India and with long entrance tubes in trees in Java, Indonesia (Delacour 1947). In Madagascar, *P. sakalava* constructs nest with shorter entrance tubes in the arid habitats than in the non-arid habitats. (Moureau 1960)

Other genera of Ploceidae also build abnormal nests. Sociable weaver *Philetairus socius* (Aves: Passeriformes: Ploceidae) endemic to South Africa, Namibia, and Botswana build the largest, compound community nests in the Savannah regions. Grey-capped social weaver *Pseudonigrita arnaudi* (Aves: Passeriformes: Ploceidae) constructs nest with two entrance tubes on the ventral side of the nest (Collias & Collias 1977).

CONCLUSION

This is perhaps the first systematic study on nesting status and abnormal nests of *P. philippinus* in agrarian landscapes of Tindivanam taluk, Tamil Nadu. Survey found that *P. philippinus* preferred non-branching palm trees and power cables over branching trees for nesting. I further found that the irrigation wells also serve as potential nesting

habitats for these birds. But increasing conversion of cultivated lands into housing areas and subsequent urbanization along with the loss of Arecaceae, such as *Borassus flabellifer*, *Phoenix sylvestris*, and *Cocos nucifera* that are vital nest supporting plants for *P. philippinus* is a conservation issue in this landscape. Increasing practices of monoculture of *Casuarina equisetifolia* and *Saccharum officinarum*, abandoning cultivation of cereals and millets, also causes shortage of grains to these birds. It is pertinent to involve common people in monitoring of weaver populations and to garner their support in the preservation of nesting sites. The fact that survey was restricted only to a small geographical area that included 55 villages could locate and count over 4000 nests means that this region has an enormous potential to support significantly high nesting populations of these *P. philippinus*. I feel compelled to say that a detailed systematic survey covering the entire region, involving local communities, will help in drafting an action plan to conserve the declining *P. philppinus* populations, which are widely recognized as the indicators of the health of agroecosystem.

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Citation: Pandian, M. (2018). Baya Weaver Bird: Nest colonies and abnormal nests of *Ploceus philippinus* in Tindivanam Taluk, Villupuram District, Tamil Nadu, India. Bird-o-soar #24. In: *Zoo's Print* 33(12): 15-27