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Original article

Some aspects of breeding habits of the red-vented bulbul (*Pycnonotus Cafer*) in the Cauvery delta region of southern India

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ABSTRACT

Breeding habits of the Red-vented Bulbul (*Pycnonotus cafer*) was studied in a portion of Cauvery delta region of Nagapattinam District, Southern India during 2012 to 2013. A total of 52 active nests were located in the study area out of which majority of nests (56.5%) were in the fork of trees followed by middle of the trees (28.3%) and the top (15.2%) of the trees. Preferred nest height (60%) by the Red-vented Bulbul was 2-4m from the ground. Plant species used for nest building by the Red-vented Bulbul was Azadirachta indica, Hibiscus rosasinensis, Morinda tinctoria, Lawsonia inermis, Commiphora caudate, Croton bonplandianum and Musa paradisiaca. The clutch size varied from 2 to 4. Mean incubation period was 12.5 ± 0.85 days and both sexes took part in the incubation. The mean hatching, fledgling and breeding success was 79.3%, 80% and 63.4% respectively.

1. Introduction

The bulbuls (Family Pycnonotidae) are one of the large groups of passerines of the Old World tropics, widespread in southern Asia, Africa, Madagascar, islands of the Western Indian Ocean (Fishpool and Tobias 2005). They occupy a broad range of habitats from semi-arid deserts to rainforests, with centre of diversity in the

Afrotropical and Sundaic regions. Of the 27 genera currently treated within the Family Pycnonotidae, 11 are exclusively Asian, 14 are restricted to Africa and islands of the Western Indian Ocean while the remaining 2 occur in both continents. The Family comprises nearly 140 species and 355 subspecies (Fishpool and Tobias 2005; Woxvold et al. 2009) with several complex taxonomic uncertainties (Pasquet et al. 2001; Fishpool and Tobias 2005; Moyle and Marks 2006). Of the 22 species of bulbuls recorded in India (Rasmussen and Anderton 2005), 8 are seen in southern or peninsular India. Most of these species are common in their habitat and are open-cup nesters. Detailed examination of the breeding ecology of these birds is important to understand the evolution of life history strategies of open-cup nesting birds in the tropics.

The Red-vented Bulbul (Pycnonotus cafer) is native to India, Pakistan and Sri Lanka eastward to Viet Nam through southern China (Ali and Ripley 1971). The Red-vented Bulbul is described as common or Least Concern in IUCN Red list of avian species (IUCN 2013). It inhabits a variety of habitats including villages, urban gardens, cultivation, secondary growth and forest edge (Fishpool and Tobias 2005). It is a non-territorial species living in pairs to large flocks (Grimmett et al. 1998). It has a blackish crest on head, neck and throat. Its tail is black in colour with a narrow white tip, but its rump and lower belly is pale greyish white. The under-tail coverts are bright crimson in colour. Presently there is scarcity of information on the Red-vented Bulbul in Pakistan and the only existing data refer to general biology and distribution (Kumar and Bhatt 2000; Bhatt and Kumar 2001; Kumar 2004; Kumar 2010; Manjunath and Joshi 2012). The systematic investigation on breeding biology of the Red-vented Bulbul is less. Scattered notes on some of the features of the breeding biology of the Red-vented Bulbul are given by Ali (1930), McCann (1931), Dutt (1932) and Lamba (1968). Vijayan (1980) gives detailed information of breeding biology of the Red-vented Bulbul. Recently, Prajapati et al. (2011) provided some information on breeding biology of this species. However, ecology of this species in southern India is sporadic and hence the present study was designed to investigate the breeding habits by studying characteristics of nest sites and nests, clutch size, incubation hatching and fledging success of the Red-vented Bulbul in a portion of the Cauvery delta region of Nagapattinam District, southern India.

2. Materials and methods

This study was conducted in two different villages, namely Manganallur (11°.10′N, 79°.65′E) and Vazhuvoor (11°.04′N, 79°.63′E) of Cauvery delta region in Nagapattinam District of Tamil Nadu, India. Agriculture is the major industry of this area, and contributes a high share of the rice production in the state. Sugarcane, groundnut, green gram, black gram, cotton, etc. are other major crops cultivated in the area. The river Cauvery and its tributaries are major perennial water sources used for irrigation. Woody vegetation is sparse in the form of groves and roadside trees. The predominant tree species found in the study area are Cocos nucifera, Borassus flabellifer, Madhuca indica, Mangifera indica, Enterolobium saman, Tamarindus indicus, Ficus benghalensis, Ficus religiosa, Thespesia populnea, Acacia arabica, Odina wodier and Azadirachta indica. Important shrub species are Prosopis juliflora, Jatropha glandulifera and Adhathoda vesica. Plantations of Casuarina equisetifolia, Tectona grandis and Bamboosa arundinacea are also found in the study area. Based on the north-east monsoon the study area is divided into four seasons, namely post-monsoon, summer, pre-monsoon and monsoon. Summer ranges from April to June (with mean maximum temperature of 38° C) and north-east monsoon starts between October and December. The cold season starts in November and may last until January.

The study was carried out during 2012 and 2013 breeding seasons of the study area. Breeding season was determined from the nesting records of each month during the study period. Nests and nesting sites were checked from all the study sites during breeding season at 2 days interval, with a minimal disturbance to a bird. The length, outer diameter and inner diameter, depth and weight of the nests were recorded. Nest site characteristics like nesting tree, nest height from ground, DBH, nest position and the type of nesting materials were recorded. In order to quantify the factors determining the nest site preference the distance from each nest to the agriculture land, water source, grove, human habitation, road, nearest tree and electric line were measured around 500m radius centered at each nest site. The length and width of egg was measured with a Vernier caliper and weighed to the nearest 500mg with a spring balance. The egg shape index (ESI) was computed by using the formula breadth x 100 / length (Prasanth et al. 1994). The number of eggs in each nest was enumerated for clutch size. The incubation period was determined from the date in which the first egg was laid till the first egg hatched. The hatching success (number of eggs hatched / total number of eggs laid x 100), fledging success (number of nestlings

fledged / total number of nestlings hatched x 100) and breeding success (number of nestlings fledged / total number of eggs laid x 100) was calculated following Balant (1993) and Dabert (1987).

3. Results and discussion

3.1. Breeding season

A total of 52 active nest sites were monitored in the study area during 2012 (24 nest sites) and 2013 (28 nest sites) breeding seasons. First egg laying dates were 20th March and 14th March during 2012 and 2013 breeding seasons respectively. Peak egg laying was observed during April. The breeding season of the Red-vented Bulbuls varied from region to region and year to year. Prajapati et al. (2011) reported breeding season between April and October. Year to year variation in the breeding season and peak of breeding was reported by Newton (1964).

3.2. Nest sites

The Red-vented Bulbuls preferred small bushes and trees for nest construction. They used 7 plant species as nest substrates, comprising of 37% of the nests in Neem trees (Azadirachta indica) followed by Hibiscus (Hibiscus rosasinensis, 15.4%), Indian Mulberry trees (Morinda tinctoria, 11.5%), Henna trees (Lawsonia inermis, 11.5%), Hill Mango trees (Commiphora caudate, 9.6%), Croton (Croton bonplandianum, 9.6%) and Banana trees (Musa paradisiaca, 5.8%).

The height of plant species used for nesting by the Red-vented Bulbuls ranged from 1.8 to 12m with a mean of 3.4 ± 2.42m. The location of nest from ground varied from 1.5 to 5.0m with an average of height of 2.3 ± 1.83m (Table 1), and nearly 60% of nests were located between 2 and 4m. These findings appear to be partially similar to the findings of Watling (1983), Vijayan (1980) and Prajapati et al. (2011) who reported that Red-vented Bulbuls prefer to make nests 2-4m high. Recently, Zia et al. (2014) reported that 53% of nests were placed height between 1 and 2m. The micro-habitats such as distance to nearest agriculture land, water source, grove, human habitation, road, tree and electric line were closer (<50m) to the nest site (Table 1).

Table 1
Nest site characteristics of the Red-vented Bulbul in the study area (N = 52).

Variables	Range	Mean ± SD
Tree height (m)	1.8-12	3.4 ± 2.42
DBH (cm)	8.0-100.0	38.8 ± 31.48
Nest location height (m)	1.5-5.0	2.3 ± 1.83
Total no. of branches	1.0-15.0	7.8 ± 3.34
Distance to agriculture land (m)	5.0-150.0	46.1 ± 34.33
Distance to water source (m)	8.0-90.0	25.1 ± 14.42
Distance to grove (m)	4.0-75.0	29.6 ± 16.90
Distance to human habitation (m)	1.0-100.0	34.3 ± 32.89
Distance to road (m)	1.0-100.0	17.8 ± 21.06
Distance to nearest tree (m)	2.0-25.0	7.3 ± 3.99
Distance to electric line (m)	0.5-20.0	7.2 ± 4.80

3.3. Nests

The Red-vented Bulbuls preferred to build nest on the forks (56.5%) of the trees followed by middle (28.3%) of the trees as compared to top (15.2%) of the trees. These finding are in agreement with that of Vijayan (1980) who reported that Red-vented Bulbul preferred to build nest in thorny trees and bushes and mostly nested in central position. Zia et al. (2014) reported that 44% nests on the forks followed by middle (27%) and top (16%) of the trees.

The Red-vented Bulbuls build cup-shaped nests out of small dried sticks (48.3%), plant roots (28.7%), grasses (13.1%), dead leaves of various plant species (8.4%) and rarely small pieces of polythene materials (1.5%). Prajapati et al. (2011) stated that Red-vented Bulbuls preferred materials such as small branches of stems and roots of herbs and grasses for nest building. Mean length of nest was 7.2 ± 0.46cm. Mean outer diameter of nest was 11.1 ± 3.51cm and mean inner diameter of nest was 9.5 ± 3.34cm . The nest depth ranged from 4.3 to 8.6cm with a

mean of 6.3 ± 0.92cm. The weight of nest varied between 5 and 16g with an average of 12.9 ± 2.22g (Table 2). Our findings regarding nest characteristics are in agreement with the results of Watling (1983), Vijayan (1980), Ali and Reply (1987), Balakrishnan (2007, 2010), Prajapati et al. (2011) and Zia et al. (2014).

Table 2
Nest dimensions of the Red-Vented Bulbul in the study area.

Nest dimensions	N	Range	Mean ± SD
Length (cm)	52	6.5-9.0	7.2 ± 0.46
Outer diameter (cm)	52	5.2-15.8	11.1 ± 3.51
Inner diameter (cm)	52	3.5-14.8	9.5 ± 3.34
Depth (cm)	52	4.3-8.6	6.3 ± 0.92
Weight (g)	52	5.0-16.0	12.9 ± 2.22

3.4. Eggs

The eggs of the Red-vented Bulbuls were pinkish white and blotched with small red brown dots. Eggs averaged 2.2 ± 0.14cm in length, 1.8 ± 0.14cm in width and 3.2 ± 0.60g in weight. The average egg shape index was calculated 81.1 ± 7.55 (Table 3). The morphometric measurements of the Red-vented Bulbuls eggs were relatively similar compared to the descriptions of Vijayan (1980), Ali and Ripley (1987) and Prajapati et al. (2011).

Table 3
Egg dimensions of the Red-vented Bulbul in the study area.

Egg dimensions	N	Range	Mean ± SD
Length (cm)	145	2.0-2.6	2.2 ± 0.14
Breadth (cm)	145	1.5-2.1	1.8 ± 0.14
Weight (g)	145	2.4-4.1	3.2 ± 0.60
Egg shape index	145	61.5-95.2	81.1 ± 7.55

3.5. Clutch size

In 52 active nests the clutch size ranged from 2 to 4 and 48.1% nests were found with 3 clutches, 36.5% nests with 2 clutches and 15.4% nests with 4 clutches. These findings were similar to previous reports of Prajapati et al. (2011) and Zia et al. (2014). Ali and Reply (1987) reported that the clutch size in Pycnonotids is 2 and rarely 3. These findings were also partially similar to the previous studies of Balakrishnan (2007, 2010) and Fishpool and Tobias (2005), which indicated that 96% of the nests in this species have 2 eggs and the remaining have 3 eggs. Zia et al. (2014) recorded highest percentage (51%) of nests with clutch size 3 followed by clutch size 2 and 4. The variation of the clutch size is correlated with the availability of food; the larger clutch is laid when the food for the young is most abundant (Vijayan 1980).

3.6. Incubation period

Incubation started after laying the 1st egg and mean incubation period for all clutches was 12.5 ± 0.85 days (range 11 – 14 days). Both partners involved in incubation. During incubation, while one bird incubates, the other partners either male or female perches nearby the nest within the vicinity and watching over the nest. Ali and Ripley (1987) have recorded the incubation period as 14 days. Prajapati et al. (2011) reported that incubation period of the Red-vented Bulbul was 11 to 14 days. Incubation period (11-13 days) recorded in the Red-vented Bulbuls were similar to all species of Asian and African Bulbuls (Vijayan 1980; Watling 1983; Hsu and Lin 1997; Kruger 2004; Fishpool and Tobias 2005; Balakrishnan 2007, 2010). The length of incubation period is generally dependent upon the ambient air temperature (Patel 1986).

3.7. Hatching and fledgling success

Of the 145 eggs laid in 52 clutches, 115 eggs were hatched and thus gave a mean hatching success of 79.3% (Table 4). In the present study, the hatching success was slightly lower when compared to Zia et al. (2014); who have reported 82%. The hatching success in the present study was higher than those reported on other

Pycnonotids: only 47% in the Red-vented Bulbul in Fiji (Watling 1983), 46.06% in Square-tailed Black Bulbul (Balakrishnan 2010), 31.97% in Square-tailed Black Bulbul (Balakrishnan 2007), 17.21% in Yellow-throated Bulbul (Fishpool and Tobias 2005) and 10.79% in Grey-headed Bulbul (Balakrishnan 2007). Of the 115 hatched, 92 nestlings were successfully fledged which yielded a mean fledging success of 80% (Table 4). The overall breeding success of the Red-vented Bulbul during the study period was 63.4% (Table 4). The predation rate of eggs and nestlings in present study was 8% and 13% respectively which is lower than reported for other Pycnonotids as 70% (Watling 1983; Kruger 2004; Fishpool and Tobias 2005; Balakrishnan 2007, 2010). The birds like Indian Treepie, House Crow and Shikra were major predators for egg and nestling losses of the Red-vented Bulbul. Other than predator's factors like temperature, rainfall, wind velocity and human intervention also reported to influence the breeding success of the Red-vented Bulbul (Prajapati et al. 2011; Zia et al. 2014).

Table 4
Hatching and fledgling success of the Red-vented Bulbul in the study area.

Year	No. of nests	Total eggs	No. of eggs hatched		No. of chicks fledged	
			N	%	n	%
2012	24	69	52	45.2	39	42.4
2013	28	76	63	54.8	53	57.6
Total	52	145	115	100	92	100

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