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Habitat for camouflage is priority in preference besides harsh physical conditions in three species of Nightjar (Aves: Caprimulgiformes)

SP Chavan, Sonali Jondhale, Deepak Walke and Pavan Jadhav

Abstract

Nightjars are important group of nocturnal bird species. From 98 species of nightjar in the world the true nightjar species belong to order Caprimulgiformes are 38. Jungle nightjars take shelter on the tree branches. The nightjar species found in the study area near Nanded, Maharashtra were *Caprimulgus affinis* (Savannah nightjar), *Caprimulgus asiaticus* (Indian nightjar) and *Caprimulgus indicus* (Jungle nightjar). Most of the nightjars are insectivorous prefers moths (Lepidoptera). These are one of the difficult birds to identify and notice due to camouflage of body coloration and plumage pattern with habitat and inactive, calm noiseless behavior during day time. Each species produce typical vocal churring calls. Nightjars are least studied birds in India especially for their breeding activity and habitat use. These three species found to lay 1-3 eggs on open land camouflaged with habitat. To remain camouflage is most preferred strategy adapted by all three nightjar species.

Keywords: *Caprimulgus*, nightjar, ecology, Godavari, Nanded, India

1. Introduction

Nightjars are nocturnal birds mostly active during dawn and dusk. They remain calm and inactive during day time. Nightjars are classified under Order Caprimulgiformes and family Caprimulgidae. These are versatile for breeding season which depend on variation in habitat. In various parts of the world it breeds from January to December. Each species has typical plumage color pattern that camouflage with its habitat and surrounding hence it is one of the difficult land bird to site (Parashar *et al*, 2014) [13]. During daylight survey it may remain unreported though we pass from its close due to its camouflaging habit. From 98 species of nightjars found all over the world except in Arctic and Antarctic continents the species from Indian subcontinent include Indian nightjar *Caprimulgus asiaticus* (Latham, 1790) which was first reported as new species from Bombay region in India. Indian nightjar represents its two subspecies *C. asiaticus asiaticus* and *C. asiaticus eidos* (Peters, 1940). Another commonly occurring and widespread species throughout Indo-Malayan region is Savannah nightjar *Caprimulgus affinis*. From this region about ten species of nightjars are recorded especially from Philippine islands. It is reported that, all species are nocturnal in feeding and become active during dusk and dawn (Jathar *et al.*, 2014) [9]. Feed mainly on insects like moths, beetles, bugs, ants, grasshoppers, crickets, wasps, bees and other minor insects. Few of them also found to feed on flowers (Antoire *et al*, 2001) [1]. But major food composition (80-85%) includes moths.

Majority species rest during day time, prefer to rest on the ground, the jungle nightjars found in sitting posture on large branches of trees with rare canopy. It is little known about breeding and reproduction of nightjar species hence the habitats were searched for structure of nest, characteristics of eggs and incubation process. In hot sunny days also it was found on the ground at 40-44 °C temperature openly exposed direct to sun (Fig. 3, 4), rarely in shade in this study. It is remarkable feature of nightjar to withstand to such a high temperature of environment whereas other animals take shelter in tree shade or thick bushes. Nightjars are one of the important groups of nocturnal birds along with owls and few hawks. Also these are amongst the least studied land birds in the world (Luis *et al*, 2015) [12]. It was our curiosity to know species diversity, difference in vocal calls and breeding of nightjars in savannah and scrublands with rare shrubs and trees of small hilly region.

In the present world of advanced technology, space age and much more that everything related to human needs but the needs of surrounding biodiversity are forgotten by mankind and are

unable to find out how many species of animals living on this globe hence our knowledge is limited to 15% discovered diversity. The remaining untamed habitats and the species living there may get vanished from this globe before they are being discovered; this is high chance because it has not been understood by human being that this mother earth is home for other creatures too. In this context it is important to determine the survival requirements of nightjars hence present investigation was planned.

2. Materials and Methods

Churring calls of nightjars recorded using audio recorder in digital camera (Nikon Cool pix D510, Japan; 42X zoom, inbuilt lens auto setting and 14 Mega pixels) for photo and video recordings. Churring is an indication of breeding activity. The churring call get modified when mating get successful (Bright *et al.*, 2007) ^[4], hence need perfection in pre and post breeding acoustic records to measure breeding population (not done for any species of nightjar). The review of literature states that nightjars are difficult group of nocturnal birds. It is challenging due to its typical features of behavior and habitat selection. Hence to determine their existence in an area the birding trips are essential during dawn and dusk. It many occur during these two specific time period. If it is breeding season then it may be identified by its mating calls or short flights. To collect data on the species diversity, habitat ecology, behavior and breeding of nightjar species the bioacoustics recorders in nightjar survey are useful (Rempel *et al.*, 2005) ^[14] but in present study the survey was conducted in the following sample stations. Based on the photographs, type of calls and habitat selection. To gather primary data is essential for conservation measures of the wild life (Southerland *et al.*, 2004) ^[15] hence this investigation was essential for nightjar conservational measures in future.

a) Study area

Three different areas with varied habitat conditions were selected for the collection of data for observed population number during three different seasons in year 2016-2017. These are as given below (Table: 3).

- 1) Hilly area and scrubland with thorny bushes rarely spread various tree species in Swami
- 2) Ramanand Teerth Marathwada University campus, Nanded.
- 3) Hilly area with rare deciduous tree cover and thorny bushes at Ratneshwari Hilly area,
- 4) Near Derla Village 12 Km. from Nanded City.
- 5) Deciduous forest and scrub lands near Walkewadi, Himayatnagar Forest range, Nanded District.

b) Survey Method

Bird monitoring methods, special reference to Nightjar survey (Gilbert *et al.*, 1998; Zwart *et al.*, 2014) ^[7, 17] were followed to collect data on species distribution in the selected study area in year 2016-2017. Present data was collected by the authors with a team of volunteer students along with professional and amateur trackers for nocturnal survey to rescue the animals. A team of volunteer students along with trackers for nocturnal survey to rescue the animals participated in the field trips. All the participants were informed before the field trips about type of churring calls of nightjar species (Table 1.) by running the audio records. That helped to track the nests distributed in the area. Mobile phone communications were used to report

the fledging movements. All the nesting sites identified were flag marked.

3. Results and Discussion

Three species were identified by following the database from Internetbirds.org (2016) ^[8].

1) Habitat Preference and habitat ecology

This is the first report on species diversity, population and habitat preference of three species of nightjars in the selected study area. Savannah nightjar was found in the grass land area with rare to moderately spread thorny bushes. The growth of the grass was 1-2 ft. in height. The grass remained seasonally green during monsoon season from June to September but later on start drying in winter season and fully dried and collapsed in the summer season from month of February to May. During the monsoon and summer season Savannah nightjar and Forest nightjar were found to overlap their preferred habitats from savanna to forest area and vice versa. The common Indian nightjar found in grasslands during summer and along road sides. In the checklist of Birds from various areas in Nanded district of Maharashtra presence of Night jar species are reported based on the calls heard during their study (Kulkarni, 2010; Balkhande *et al.*, 2012; Chavan *et al.*, 2015) ^[11, 2, 5] but this is first report with photoplates of three species of nightjar from the same region. No movements and no any kind of calls from three species of nightjars were found in the day time from early morning 8.00 a. m. to evening 5.30. p. m.

During survey of herpetofauna in Swami Ramanand Teerth Marathwada University Nanded (Table 3) in year 2016 and nearby hilly region especially Ratneshwari Hills our attention gets disturbed by sudden flights of perfectly camouflaged owl like birds with calm flight during day time and typical calls during night time especially dusk and dawn. When we identified that these are calls of nightjar (Internetbirds, 2016) ^[8] we planned to conduct special survey of these nocturnal birds to determine the population number, types of nest, nesting material and nesting habitat and its relation to the species specificity. First time some details on nightjar species from its region was recorded. Total number of nests found were varied from species to species in three different season. Seasonal variation in average number of nests (Table. 2.) Show that in the study area Site-A were higher as compare to other two areas for all three species of nightjar. Average of total number of nests of Indian nightjar in Area-A was 6.66, in the same area for Savannah nightjar was 09 whereas 1.66 number was found for forest nightjar. It indicates that area-A support the nesting of Savannah nightjar because the ecological habitat conditions for this species to camouflage are available in rich in the area. Area-A is the University area having various buildings of the Academic Departments that has CFL light Bulbs or LED lights all along the building interconnecting roads and in the building premises. Towards these lights the insects, moths, beetles get attracted hence the area was rich in Insect fauna especially at night time. All the nightjars are nocturnal feeders. Therefore probably the nightjars prefer to build the nests in S. R. T. M. University area. It was also found that the Savannah nightjar nests were more in number (Average 21.00) as compare to other two species. During the study period 11 nesting sites of all three species of nightjars were found in Site-A (S. R. T. M. University area), followed by 06 at Site-C and 05 at site-B.

Total 22 nesting sites of all the species were found in the selected study area (Table 3.).

In our routine field observations the three nightjar species were found during day time to rest in three different conditions. The Indian nightjar and Savannah nightjar was found on the open ground were the forest nightjars rest on large branches of trees perfectly camouflaged with the tree bark. We observed the forest nightjar species also rest temporarily during dusk on the electric wires. Along roadsides during dusk and late night 2-3 individuals at 1-3 meters distance apart were also spotted due to their reflecting eyes in the torch focus light or vehicle headlight focus. But we heard mixed calls of Savannah nightjar and Indian Nightjar from Site-A. Each call was approximately 200-400 meter long distance apart each other.

2) Nest Characters

It is an important study to determine some basics of nest characters and nesting site selection. Nightjars are one of the least studied birds in the world hence data deficient. After careful observations of possible nesting sites we found some nests (Table 2.). In first instance it was very unpredictable area that to call it as a nest but during breeding season some active nests with eggs were found (Fig. 5). The nests with eggs (1-2) or with nightjar in egg incubation position. In one of the nest on the ground one young one (Chick) was also found. It was a day time observation. At one of the nesting site at Ratneshwari Hilly area (Area-B) one of the author of this article (PJ) participated in field trip at night with the volunteer organization (Animal Rescue and Rehabilitation, Nanded) as an active member of the team and observed the Indian nightjar (Fig. 2).

During this study we never used any type of mist nets to catch the nightjars (Bibby *et al.*, 1992)^[10]. Our observations were based on direct visits to the nesting sites. Nightjars need required soft food for rearing young ones and suitable

scrubland, semi wooded forest and savannah covers. Hence in this area three species were found similarly the Savannah Nightjars also prefers such habitats with pastures, bushes and rare woody area for diurnal roosting and egg laying. Tiwari and Dadul (2010)^[16] studied the nesting of Sykes's nightjar *Caprimulgus mahrattensis* in the Great Rann of Kuchchh, Gujrat, India; the study indicates that this species also prefers habitat conditions suitable for camouflage in first priority besides harsh physical conditions like accumulated water, plant debris with mud, saline soil with silt etc. The same kind of breeding behavior and egg laying pattern was observed in the three species of nightjar from the study area. It also indicates that the nightjars get adapted to the available food in the selected habitat for their own consumption and to feed the developing young ones. In one of the observation from the nest of Savannah nightjar that the single chick was fed by the parent nightjars for 16 days because it was in the same habitat in its cryptic nest on the ground. It was wonder that the chick survive in the bright day light with day temperature ranged 40-42 °C. because the nest and chick was fully exposed to sunlight, there was no any bush or shrub for shade and moreover there was very rough and irregular gravels and stones in and around the nest that might have made more hot conditions. Therefore we conclude that the nightjars try to survive under camouflage cover of habitat which was most preferred factor for nesting, roosting and breeding; in doing so they get adapt with harsh conditions of the habitat. There is maximum chance of having nightjars in the scrub lands with hot, barren, dried habitats during month of March to June which apparently seems bird free area but nightjars may be there. It was the first report on existence of three species in the study area. What % of insect diet it prefers including Lepidoptera (Moths), Coleoptera (Beetles), Diptera and Neuroptera, Hymenoptera (Bees, Wasps) is the further scope of this study.

Table 1: Nesting, nest characters and behavior of three species of nightjars in Nanded region, Maharashtra.

Sr. No.	Characters	Savannah Nightjar (<i>Caprimulgus affinis affinis</i>)	Indian Nightjar (<i>Caprimulgus asiaticus</i>)	Forest Nightjar (<i>Caprimulgus indicus</i>)
01.	Nesting season	Summer (March-May)	Summer (March-May)	Summer (March-May)
02	Churring and calls recorded	Chweep.....Chweep	Chuk.....Chuk.	Chuk....Chuk....K-k-kru..kroooo
02	Nesting site	Dried grassland with exposed ground	Scrubland with small to medium thorny bushes	Rare deciduous to semi-deciduous forest in Hilly region
03	Nest material	Stones, gravels	Plane ground with/without gravels and small boulders	Near dry foliage of local trees
04	Nest shape	Irregular, round, rare, gathering of gravel	No particular	Very shallow rounded depression on ground prepared by foot scratching
05	Incubation time of continuous seating	4-5 hrs.	3-4 Hrs.	4-5 Hrs.
06	Nest structure	Gravels in single layer with central depression	Spherical, shallow depression with dry grass sticks.1	Shallow scattered depression near bushes with dried fallen foliage
07	Nest dimension	15-20 cm. diameter	Roughly rounded. 15 cm. diameter	Roughly rounded depression. 20 cm. diameter
08	Distance of disturbance (Fly away from nest)	Before notice- 01 ft. After notice: 08-09 ft.	Before notice- 1-2 ft. After notice: 08-8-10 ft.	Before notice- 81-5 ft. After notice: 08-5-10 ft.
09	Time of re-attending the nest for incubation after fly away	5-6 Min.	5-10 Min.	5-8 Min.
10	Where it go after disturbance?, To what distance?	20-40 ft. in the nearby area, in the bushes	50-200 ft. away from nest in to nearby savanna area	10-150 ft. away fro nest to dry foliage on the ground in the forest
11	Behavior during fly away	Suddenly flyaway without noise	Suddenly flyaway without noise	Suddenly flyaway without noise

Table 2: Seasonal Population abundance of three species of Nightjar in the selected study area,

Sr. No.	Area	Indian Nightjar				Savanna Nightjar				Jungle Nightjar			
		M	W	S	Av.	M	W	S	Av.	M	W	S	Av.
01	Season												
02	A	05	05	10	6.66	08	07	12	09	02	01	02	1.66
03	B	04	02	07	4.33	05	03	09	5.66	03	03	05	3.66
04	C	02	03	05	3.33	05	04	10	6.33	04	03	06	4.33
05	Total	11	10	22	14.33	18	14	31	21.0	09	07	13	9.66

(A, B, C: Refer Table 3. Area code details, M: Monsoon season, W: Winter season, S: Summer season)

Table 3: Number of nests/Roosting sites of Nightjar species in selected study area.

Sr. No.	Area Code	Area and Lat. Long. coordinates	Indian Nightjar	Savanna Nightjar	Jungle Nightjar	Total number of nests
01	A	S. R. M. Univ. Nanded Campus. (19° 5' 53, 35" N, 77° 17' 18, 27" E)	04	04	03	11
02	B	Ratneshwari Hilly area, Near SRTMUN. (19° 5' 24, 90" N, 77° 18' 20, 34" E)	02	02	01	05
03	C	Walkewadi Forest area near Himayatnager Range, Nanded (19° 19' 34, 22" N, 77° 50' 17, 99" E)	01	03	02	06
		Total	07	09	06	22



Fig 1: Study area A) SRTM University, Nanded; B) Ratneshwari Hill area. C) Walkewadi Forest, Himayatnagar Range, Nanded District, Maharashtra.



Fig 2: To the extent one can reach close to the Nightjar when it incubates eggs. It remains undisturbed till it gets disturbed by observer. (One of the authors PJ could observe it closely).



Fig 3: Savannah Nightjar (*Caprimulgus affinis*) in S. R. T. M. University, Nanded.

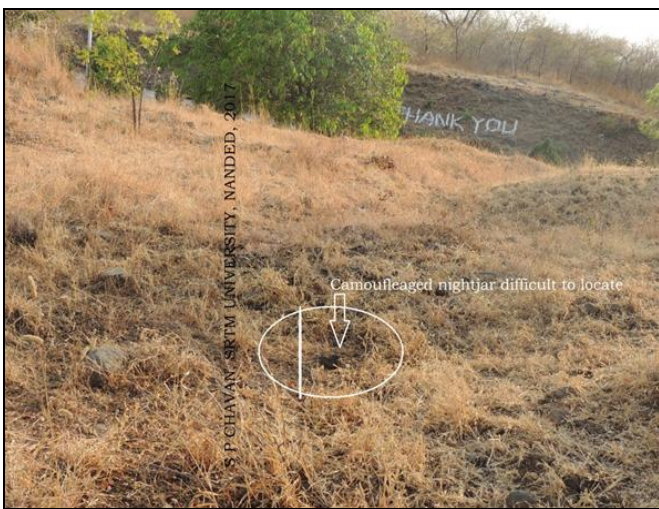


Fig 4: Camouflaged *Caprimulgus affinis* (Savanna nightjar): One of the difficult land birds to site in the Savannah and scrublands (Habitat: near Nalanda Gate, S. R. T. M. University, Nanded Campus) Photo: Date: 22 April, 2017, time: 15.30 hrs. Temp.: 42 °C. Disturbance distance: 12 ft.

Fig 6: Common Indian Nightjar (*Caprimulgus asiaticus asiaticus*) in study area B. See the perfect camouflage with stones and weed in the habitat.



Fig 5: Single Egg of Forest Nightjar (*Caprimulgus indicus*) in open ground nest (Study area C). See the similarity with leaf color.



Fig 7: Highly Camouflaged Young one of Savanna nightjar in the scrubland with boulders and gravels.

4. Conclusion

It is the first report on presence of three species of nightjar *Caprimulgus affinis*, *Caprimulgus indicus* and *Caprimulgus asiaticus* identified from three different habitats from Nanded area in Maharashtra State, India. Need of camouflage with habitat conditions for survival in adults and young ones was found important. Hot summer, bright daylight, barren open nest with rough and hot gravels or open cryptic nests on cryptic ground is secondary preference to which they get adapted. Nightjars are special groups of avifauna that need careful observations of habitats to know their life. Nightjars are important nocturnally active insectivorous birds. They are important components in Savannah, woodland-forest and scrubland ecosystems that need further investigations to plan their conservation.

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