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## Notes on the breeding of Black Bittern *Dupetor flavicollis* near Nal Sarovar Bird Sanctuary

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The Black Bittern (*Dupetor flavicollis*) is one of the largest resident bittern species (Family: Ardeidae) in the Indian Subcontinent. The taxonomic status of the Black Bittern is uncertain. It was treated as *Dupetor flavicollis* by Grimmett *et al.* (2011), and put in the monospecific genus *Dupetor*, while recent authorities like Martínez-Vilalta *et al.* (2019) treat it as a part of the genus *Ixobrychus*, in which other bittern species are placed. I follow the taxonomy as per Grimmett *et al.* (2011).

The Black Bittern has blackish upperparts, with yellow malar and sides of neck and dark streaking on underparts; the female is similar, with browner upperparts and chestnut-streaked underparts. The Black Bittern is resident and partly migratory,

and is thinly and patchily distributed throughout the better watered parts of the Indian Subcontinent from Sindh, in Pakistan, to Assam, West Bengal and beyond; it is said to be fairly common in South-west India in Kerala, Karnataka etc. (Ali & Ripley 1981). For Gujarat, Ali (1954) did not record this species in the state. It was seen and confirmed to be breeding around Pariej Tank near Tarapur, Kheda district, in 1990, along with Cinnamon Bittern (*Ixobrychus cinnamomeus*) and Yellow Bittern (*Ixobrychus sinensis*) (Khacher 1996, Mukherjee *et al.* 2002). In the recent Gujarat checklist, the Black Bittern was stated to be 'uncommon to rare monsoon breeding migrant with isolated records from many parts of the state' (Ganpule 2016). A recent study by Patel *et al.* (2018) further confirmed

that the Black Bittern was breeding in some parts of south Gujarat fairly regularly; two chicks were observed in first week of June and juveniles were observed in October. There have been many recent sightings of Black Bittern from the state reported in the social media and also on birding websites.

Little is known about the breeding biology of the Black Bittern in India. It is said to nest from June to September, during the southwest monsoon; the incubation period is not known (Ali & Ripley 1981, Martínez-Vilalta *et al.* 2019). In general, the breeding biology of the Black Bittern has not been studied in detail. Here, I present notes and new information on the breeding biology of Black Bittern in Gujarat, based on a study conducted near the Nal Sarovar Bird Sanctuary.

### Study Area

A total of four nests were found at a large pond near Kayla village, near Nal Sarovar Bird Sanctuary, in Ahmedabad district. The nesting was in reed beds. This study was conducted at an unprotected, manmade pond, with reeds of about 8-10 feet height, spread over 12 acres. The nesting was away from human habitation. The surrounding area had a few more small ponds with water (of about 1 to 2 acres size). These ponds were used daily by the local fishermen for fishing. In the winter and summer seasons, the farmers used the water for farming. The approximate annual rainfall of the area is about 600 mm – 800 mm (weather radar). The minimum water depth is about 1.5 mts and the maximum is 4 mts.

### Methodology

I studied four breeding pairs of Black Bitterns near Kayla village. This study was carried out from 25 June 2018 to 11 September 2018, in order to know the breeding biology of the species. Special attention was given to ascertain the incubation period and feeding habits, prey items and prey delivery rate, and breeding success. I also monitored the species for aspects of parental care. To evaluate the selection of prey, I identified prey brought to the nest by the adult Black Bitterns. A single nest was studied in detail (Nest N1) and monitored by using one auto motion sensor camera (Cuddeback Long Range IR Model E2) fixed near the nest. The camera was fixed at a distance of 1.5 – 2.0 mts from the nest. Three other nests were directly observed and data was collected by visual observations and photographs (nests A1, A2 and A3 – see Table 1).

Regular observations were taken from the auto motion sensor camera. Photographs were taken with DSLR camera and lens (Body: Canon 7D & Lens: Sigma 150 - 600 mm sports version and Canon 100 – 400 mm). Direct observations were made with binoculars (Nikon: 10x50 Aculon A211). One breeding pair was observed from laying of eggs till the chick left the nest and the total period of observation was 79 days, for a total of around 1896 hrs of observation (nest N1 – see Table 1). The nest measurements were taken with the help of Vernier calipers and other instruments. To avoid disturbing the adult birds, this was done when the adult birds had left the nest and was completed as quickly as possible. No egg measurements were taken to avoid disturbance to the nesting birds. All the



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standard rules, protocols and principles for nesting birds / breeding studies were followed.

I also used a meter tape (1 cm – 50 cm), tap scale (1-150 cm), steel scale (graduated up to 1 mm), GPS (Garmin Etrex - 20X) and camouflage hide during the study period for taking measurements and locations. The area was visited every day during the breeding season and once a week during the non-breeding season. More than 48000 photographs from the trap camera, 1300 photographs from DSLR camera and 900 photographs from a compact point and shoot camera were taken. Approximately 50200 photographs were studied and compiled (with micro analysis) with the help of the 'Excel' spreadsheet program.

## Results

### Nest site selection & nest activities



The nest was in medium-sized reed beds, with less height of the nest platform from the water level. The details of the four nests, like height, width, nest measurements etc. are given in Table 1. The birds used leaves and reeds (both dry and green) as nesting materials. The nesting materials were available within 100 mts of the nest and were brought to the nest as and when required and also for repairing of the nest. Such

nest repairing behaviour was observed up to end of breeding season as the adults continued repairing the nest as needed.

### Eggs, incubation & hatching



In Nest N1, three small-sized white eggs, with a bluish or pinkish tinge and darkish patches were laid. The eggs were laid by the female in the last week of June. In the other nests (A1, A2 and A3), eggs were laid in the last week of June and first week of July. The summarized data, including date on which eggs were laid, incubation period and hatching date is given in Table 3. The female laid the eggs at two-day intervals, but incubation typically began at clutch completion.

During the incubation period, both adults were seen changing duties at the nest for feeding, with both sexes sharing the incubation duties. The parents never left the eggs unattended in the nest, except for a few seconds to a few minutes during the changing of duty. Both the parents incubated the eggs continuously, even at night. The male spent more time incubating at night than the female, while during the day, the female was seen incubating more. Usually, at night, one parent bird was on incubation duty while the other parent bird stayed near the nesting site. The majority of incubation was

**Table 1: Details of four nests of Black Bitterns in the study area**

Particulars	Measurements			
	Nest N1	Nest A1	Nest A2	Nest A3
Height of nest	5.56 cm	7.81 cm	6.53 cm	7.52 cm
Width of nest	17 cm	18.52 cm	17.56 cm	17.43 cm
Length of reeds	Smallest - 1.27 cm. Longest - 36.57 cm	Smallest - 36.57 cm. Longest - 54.86 cm	Smallest - 1.52 cm Longest - 48.76 cm	Smallest - 1.27 cm Longest - 48.76 cm
Number of lateral reeds branches	42-44	48-51	47-50	41-43
Height above the water surface	86.36 cm	71.12 cm	55.88 cm	66.04 cm
Water depth	76.2 cm	97.53 cm	85.34 cm	54.86 cm
Distance from open water	15 mts	18 mts	12 mts	14 mts
Distance from terrestrial habitat	5 mts	8 mts	12 mts	6 mts
Width of the reed belt	150 mts	145 mts	130 mts	145 mts
Height of the reed belt	3.2 mts	2.6 mts	2.5 mts	2.6 mts
Temperature during the study	30° C to 34° C	30° C to 34° C	30° C to 34° C	30° C to 34° C
Distance of nest from road	600 mts	700 mts	450 mts	800 mts
Distance of nest from pathway	45 mts	65 mts	48 mts	68 mts
Depth of nest	19.24 mm	20.13 mm	18.25 mm	19.34 mm

**Table 2: Details of other avian species near the nests**

List of bird species observed near the nest area during the study (in 79 days)	Little Cormorant ( <i>Phalacrocorax niger</i> ) Indian Cormorant ( <i>Phalacrocorax fuscicollis</i> ) Little Grebe ( <i>Tachybaptus ruficollis</i> ) Painted Stork ( <i>Mycteria leucocephala</i> ) Asian Openbill ( <i>Anastomus oscitans</i> ) Woolly-necked Stork ( <i>Ciconia episcopus</i> ) Little Bittern ( <i>Ixobrychus minutus</i> ) Yellow Bittern ( <i>Ixobrychus sinensis</i> ) Cinnamon Bittern ( <i>Ixobrychus cinnamomeus</i> ) Indian Pond Heron ( <i>Ardeola grayii</i> ) Grey Heron ( <i>Ardea cinerea</i> ) Little Egret ( <i>Egretta garzetta</i> ) Shikra ( <i>Accipiter badius</i> ) Black-shoulder Kite ( <i>Elanus caeruleus</i> ) Osprey ( <i>Pandion haliaetus</i> ) Black Kite ( <i>Milvus migrans</i> ) Eurasian Marsh Harrier ( <i>Circus aeruginosus</i> ) Ruddy-breasted Crake ( <i>Porzana fusca</i> ) White-breasted Waterhen ( <i>Amauornis phoenicurus</i> ) Purple Swamphen ( <i>Porphyrio porphyrio</i> ) Common Moorhen ( <i>Gallinula chloropus</i> ) Eurasian Coot ( <i>Fulica atra</i> ) Steppe Gull <i>Larus (heuglini) barabensis</i> Caspian Tern ( <i>Hydroprogne caspia</i> ) River Tern ( <i>Sterna aurantia</i> ) Whiskered Tern ( <i>Chlidonias hybrida</i> ) White-winged Tern ( <i>Chlidonias leucopterus</i> ) House Crow ( <i>Corvus splendens</i> ) Clamorous Reed Warbler ( <i>Acrocephalus stentoreus</i> ) Red Avadavat ( <i>Amandava amandava</i> ) Tricoloured Munia ( <i>Lonchura Malacca</i> ) Indian Silverbill ( <i>Euodice malabarica</i> ) Black-breasted Weaver ( <i>Ploceus bengalensis</i> )
Predator species (avian and reptile) within the nest environment during the study (in 79 days)	<b>Avian</b> Eurasian March Harrier ( <i>Circus aeruginosus</i> ) Shikra ( <i>Accipiter badius</i> ) Black-winged Kite ( <i>Elanus caeruleus</i> ) Black Kite ( <i>Milvus migrans</i> ) <b>Reptile</b> Cobra ( <i>Naja naja</i> ) Checkered Keelback ( <i>Xenochrophis piscator</i> ) Rat Snake ( <i>Ptyas mucosa</i> ) Common Indian Monitor ( <i>Varanus bengalensis</i> )
Avian species which were regularly seen perching in the area surrounding the nest	Yellow Bittern ( <i>Ixobrychus sinensis</i> ) Cinnamon bittern ( <i>Ixobrychus cinnamomeus</i> ) Black-breasted Weaver ( <i>Ploceus bengalensis</i> ) Tricoloured Munia ( <i>Lonchura Malacca</i> ) Purple Swamphen ( <i>Porphyrio porphyrio</i> )

done by the male compared to the female. This conclusion was derived on the basis of trap camera data. During changeovers in incubation, the parent bird slightly rotated the egg and changed the position of the egg with the help of beak and feet, before settling down for incubation.

The incubation period was around 23 to 25 days. I kept a tight vigil on the nest during the last week of incubation, to observe the behaviour of the adult birds and to see the egg-hatching. In nest N1, a small crack/hole was observed in one egg in the late afternoon (on the 25<sup>th</sup> day) and the chick came out completely from the egg on the next morning, with the whole process taking almost 14 hours. During this period, the parent birds did not incubate the other eggs and only covered the eggs partially for the chick to hatch easily.

**Feeding behaviour, feeding frequency and parental care**

It was very surprising to note that only one type of food item – different sized fish – was recorded during the study period.



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The fish were identified mainly as spotted snakehead (*Channa punctata*) by expert Andrew Rao from Kolkata. Both the male

**Table 3: Breeding summary of four pairs of Black Bitterns**

Nest site code	Location of Nests	Date of first egg laid	Number of Eggs	Incubation period in days (taken as date on which the first egg hatched)	Date of sightings of chicks	No. of chicks hatched	Whether breeding successful? Yes/No	No. of chick(s) fledged	Reasons for failure
N1	Near Kayla village (All other nests were located around 5-9 mts from nest N1)	25 June 2018	3	25	19 July 2018 to 21 July 2018	2	Yes	1	One egg destroyed by natural causes & one chick predated by Indian monitor
A1		27 June 2018	3	23	19 July 2018 to 21 July 2018	3	Yes	1	One chick predated by Indian monitor and one juvenile dead due to natural causes
A2		2 July 2018	2	-	-	-	No	0	All eggs destroyed by natural causes or predated upon
A3		2 July 2018	3	-	-	-	No	0	All eggs predated upon by predators

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and the female were seen feeding the chicks. The parents would bring back fish and disgorge it out for the chicks. The majority of the feeding was done by the female even when the male brought food. But, the male also used to feed the chicks several times. After hatching, parents fed the chick 56 times before it left the nest. The male brought food only 16 times. Generally, both the parents brought food but the female was more active in feeding the chicks. Usually, one parent was busy with feeding the chicks, while the other roosted nearby the nest site. As soon as the chick hatched, it was fed first by the female. After that, the parents used to feed the chick regularly - not one after the other. The highest feeding frequency was observed between 08:30 - 12:45 hrs. I even recorded the Black Bittern feeding chicks during the night at around 20:45 – 22:30 hrs. Though the Black Bittern is crepuscular, the feeding of chicks in the night was somewhat unexpected. It shows that the parent birds feed the chicks late into the night.

Both parents actively brought suitable sized fish for the chicks, so that they could feed it easily. Whenever a large sized fish was brought, a considerable amount of time was spent in regurgitating it. The parents never left the chicks alone in the nest, especially during the noon, when the female was always present on the nest, providing cover and protected the chick from direct sunlight and rain by spreading its wings. The male was also observed doing this type of behaviour. Whenever any large birds/ birds of prey appeared in the sky near the nest site, immediately, the parent bird (which was on the nest), covered the chick(s) with half or full spread wings. The parents also brought water in their beak for the chick to drink. After one hatchling was predated by a common monitor lizard, the other hatchling left the nest but was seen very near the nest site. However, whenever the parents came to feed, they used a booming call to attract the chick to the nest. The chick was observed to move outside the nest, in nearby areas, as it started to grow. On 29 August 2018, at 18:30 hrs, the chick left the nest for the last time and after that, it never came back to the nest again. The chick was around 22 days old when it left the nest. I could observe the chick after it left the nest for a further 2 weeks. Both parents were feeding the chick outside the nest. I could not see the chick after this period as it did not remain in this area.

### Predation of eggs and chicks

In nest N1, one egg was destroyed by natural causes during the incubation period and one chick was predated by an Indian Monitor, although there were other potential predators like House Crow and Shikra in the vicinity. This was recorded in the motion sensor camera. In the other nests (A1, A2 & A3), the eggs or young had disappeared and eggshells or nestling remains were found. I observed that one hatchling



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and four eggs were predated and one egg was destroyed by natural causes. In nest A1, one juvenile died due to natural causes. The summary for all the four nests is given in Table 3.

### Discussion

The Black Bittern is a not well studied species in India. In general, bitterns are crepuscular and active during dawn and dusk; during the day time, they sit silently in Typha or reed beds and are so well camouflaged that they are difficult to detect. This seems to be one of the main reasons for the lack of sightings and paucity of information regarding their breeding biology. The secretive lifestyle of the Black Bittern has prevented people from studying it and so almost no information is available regarding its breeding biology. It is extremely difficult to study the Black Bittern without highly special, technologically advanced equipment. I could carry out studies on the breeding of the Black Bittern only because of electronic gadgets like the auto motion sensor camera.

Ali & Ripley (1981) mention the nesting season of Black Bittern as extending from May to September, and is dependent on the southwest monsoon. This is similar to what was observed here as the eggs were laid at the end of June and in the first week of July. Martínez-Vilalta *et al.* (2019) state that normally four eggs are laid but clutch size is 3-6. Here, it was observed that clutch size was two in one nest and three in the rest of three nests. The incubation is shared by both sexes. Here, it is important to state that the incubation period of 23 days in one nest and 25 days in the second nest is being reported for the first time

for the Black Bittern. The incubation period for this species was unknown and due to this study, it can be stated that the Black Bittern has an incubation period of about 23 to 25 days. This is similar to what has been reported for other bittern species like Cinnamon Bittern and Yellow Bittern by Wells (1999) and Kulshan & Hancock (2005), who give the incubation period for these two species as 23 days and 20 days respectively. Though more studies should be conducted to know the incubation period for the Black Bittern at large.

The preferred habitat of Black Bittern is reed beds, and submerged bushes mixed with clumps of reeds and sedges. The habitat here was reed beds. The Black Bittern takes fish, frogs, lizards, crustaceans and insects (Martínez-Vilalta *et al.* 2019). Here, the diet was mainly fish. Further study, especially regarding the diet of the Black Bittern is required. It is possible that in different areas, the diet would be dependent on the prey available in the surrounding habitat. It should be noted that four nests of Black Bitterns observed here were very close to each other and would suggest communal nesting. However, more data is required to know whether the species nests communally or in small groups.

There were many potential predators surrounding the nesting site. I documented the Black Bittern eggs and chick being predated by the Common Indian Monitor. The Indian Monitor is well capable of taking small birds, eggs, chicks and larger sized injured birds. Though not unexpected, the predation of Black Bittern eggs and chick by an Indian Monitor is quite interesting and shows that the Indian Monitor is a great threat to the Black Bittern eggs and their nestlings.

This study reveals that the percentage of fledging success for the Black Bittern was two chicks from 11 eggs (from four nests), which is about 18%. This breeding success is very less and the scale in which the eggs and chick(s) are predated by the Indian Monitor and by other potential predators is very high. This is of great concern and shows that the reproductive success of the species is quite low in this area. It is necessary to know if the breeding success is low in other parts of its range or whether this is an exception. More studies, from different parts of its range, would help in getting data on the breeding of Black Bittern. Though the Black Bittern is not a threatened species, such a low breeding success would suggest that the species is facing a threat here, mainly from the Indian Monitor. A creative solution would be needed to address this problem.

Much work needs to be done regarding the Black Bittern in Gujarat. Preserving reed beds and providing a good habitat for the species to breed here, should be a top priority. There are now very few areas in which such large and undisturbed reed beds exist, especially in Saurashtra. It is quite possible that the nest site selection by the Black Bittern depends on the area

(size) of the reed beds and lack of disturbance by humans. A clear management plan needs to be worked out for the conservation of the Black Bittern in Gujarat. I have provided preliminary information regarding the breeding biology of the species. This is probably the first proper compilation of the breeding biology of the species from the Indian Subcontinent. This study also shows that technology / advanced electronic equipment can be used positively to know more about the breeding biology of a secretive bird species. However, it should be used judiciously, always keeping the welfare of the birds in mind.

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## Wintering of Sykes's Nightjar *Caprimulgus mahrattensis* in Vadodara

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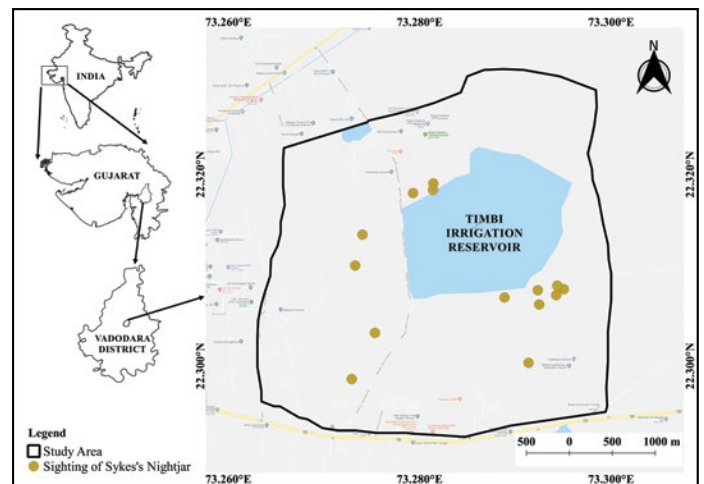


The Sykes's Nightjar (*Caprimulgus mahrattensis*) is a summer visitor to SW Afghanistan (Seistan), mostly resident in Pakistan and Mekran Coast and winter visitor from central to south and east India. It has been reported to breed from SE Iran, S Afghanistan, Pakistan and Kachchh in western India. It probably also breeds in Saurashtra, Rajasthan and parts of north Gujarat (Ali & Ripley 1983, Holyoak 2001, Cleere 2010, Grimmett *et al.* 2011, Rasmussen & Anderton 2012). This species is an uncommon winter visitor and has been recorded from different parts of Gujarat; Velavadar National Park, Little Rann of Kachchh, Great Rann of Kachchh. There are isolated records from other parts of the state (Ganpule 2016).

Owing to its extremely large range and stable population trend, this species has been listed as 'Least Concern' (Birdlife International 2016). It can be found in varied habitats such as arid and semi-deserts with scattered thorn scrub, in dry and stony scrubland, on clay or gravel plains, saltpans and stony wastelands and sandy areas with tamarisk bushes, mostly camouflaged in the midst of the sandy ground (Kazmierczak 2000, Holyoak 2001, Cleere 2010, Grimmett *et al.* 2011, Rasmussen & Anderton 2012). This small and short-tailed, sandy-grey nightjar has lightly spotted blackish-brown crown, scapulars with blackish spots and cinnamon markings, large white patches on either side of lower throat, occasionally extending across whole of throat, and irregular buff spotting on nape forming indistinct collar (Holyoak 2001, Cleere 2010, Grimmett *et al.* 2011, Rasmussen & Anderton 2012). Here we report the wintering of this species at Timbi Irrigation Reservoir, Vadodara, Gujarat.

### Observations

On 3 December 2018, while surveying for mammals around Timbi Irrigation Reservoir (22° 18' 29" N, 73° 17' 42" E), at 20:12 hrs, we came across a bird, which was resting besides grass tussocks. This small bird was totally camouflaged, with upperparts having sandy colouration with light brown spots all over the body. We took some photographs, from which we identified it as a nightjar. Later, the bird was identified as a Sykes's Nightjar with the help of standard field guides such as Grimmett *et al.* (2011) and Rasmussen & Anderton (2012). The literature as well as 'eBird' data indicated this species to be new to the area and hence, an extensive search was initiated immediately. On 4 December 2018, at 19:07 hrs, we found it again, resting on a mud road in the same area. When we tried to move closer to the bird, it stood and started bobbing its head and moved away. Subsequent to this, it moved a short distance to the side of the mud road and settled down. A small video of the same was also recorded (Naria 2019).



Later, on 10 December 2018, again while surveying nightjars around Timbi, at 21:22 hrs, we saw another nightjar but at a different location. While we were observing it for some time, it suddenly flew and landed on the path somewhere ahead of its earlier location with a small moth in its beak. Within no time, it gulped the protein rich meal.