
NEST AND NEST CONTENTS OF BLACK IBIS *PSUEDIBIS PAPILLOSA*

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Abstract: For the study, nest and nest contents of Black Ibis, some parts of Mehsana district, Gujarat state, India were selected. Black Ibis is a solitary breeder. It did not associate with the other colonial nesters. Its nest on larger canopy covers large size trees like *Azadirachta*, *Polialthia*, *Ficus sps* and various other species. Total 32 sites were selected. Altogether 08 tree species were used for nesting. Majority of nest sites on *A. indica*. For the study direct observation method was applied. Measurements were recorded using 60 cm long ruler with 1 mm accuracy. The average weight of the nest is about $1430.49 \pm 208.59\text{gm}$ ($n=4$) and the diameter of the nest rim is 43.88 cm ($SD=2.66$, $CV= 6.06\%$, $n=08$). 19 plant species were recorded for nesting materials from the nests. Black Ibis use spiny plant materials more than 50%. The mean maximum size of the nest material used was 77.93 ± 3.08 cm and mean minimum size was 16.43 ± 2.34 cm. The average number of twigs used for nest building was 79. Based on the study it is revealed that, the nesting site is very rich in canopy and large amount of nest materials.

Keywords: *Psuedibis papillosa*, Nest materials, Nest diameter, Nest weight.

Introduction: Family Threskiornithidae includes Ibises and Spoonbill. Distribution of all species of the family is noticeable in Gujarat. The Black Ibis *Psuedibis papillosa* is a dark Ibis about 68cm long distinguished by the head capped with a triangular patch of warty red skin, absent in subspecies *davisonni* and white wing patch that is visible while the bird is in flight [1], [2]. It prefers to feed near water, but uses a wide range of aquatic and terrestrial foraging sites especially lakes, manmade tanks, waste water ponds, sewage, shallow water and sparse vegetation, puddle, cultivated fields, grasslands, forest, manure heaps, carcasses and dumping station and sand dunes close to human habitation [3], [4]. Generally, Black Ibis selects live and unbroken canopies of the tall trees to roost. In some cases, it roost on large electrical pole as an artificial structure [5]. The present study was an attempt to examine the nest and nesting materials of Black Ibis in Mehsana, Gujarat, and Western India.

Study locale: Gujarat state is characterized by a varied topography. One can divide the state based on its geography in the mainland Gujarat and the peninsular Gujarat. These can be again divided into the North, Central and the South Gujarat [6]. Mehsana district is situated in the North part of the Gujarat state. It lies between $23^{\circ} 02'$ to $24^{\circ} 06'$ N and the meridians of longitude $71^{\circ} 56'$ to $72^{\circ} 52'$ E. The length from North to South of its territory is about 118.1km and from east to west is about 94.0km. The study area extends over the some parts of Mehsana district of Gujarat. Climate of study area is almost dry and in the monsoon season, it is semi-dry to humid type. It is periodic and seasonal. For the study of nest and nest contents of Black Ibis, some parts of Mehsana district were selected. It is surrounded by

wetland and cropland ecosystem. For the study 32 sites were selected where the birds breed.

Methods: For the study of nest and nest contents, direct observation method was applied. As the Ibises are known to reuse the nest to certain extent, only one nests from *A. Indica* was examined to observe the nest composition and weight, and eight nests from different nesting trees were examined to observe the nest diameter, cup size and cup depth. The composition included the number and frequency of nesting material to observe the preference towards any particular nesting material. The nesting materials were identified up to species levels when possible. The data were collected on nest diameter, cup diameter, cup depth, type and quantity of nesting material to determine an average nest size and its different dimensions. Measurements were recorded using 60 cm long ruler with 1 mm accuracy. Nest diameter was measured across the middle part of nest periphery from one end of the edge to the widest edge of other end. The depth of the nest cup was measured from the centre of the nest bottom to the horizontal plane of the rim. Besides this the number and length of nesting materials like sticks were also examined on *Azadirachta*.

Results and Discussion: Total 17 nests recorded in 2008 and 32 in 2009. Out of 17 nests in 2008, 02 were recorded in urban area, whereas 15 in rural area. In 2009, out of total 32 nests, 06 were recorded in urban area, whereas 26 in rural area (Table 1).

Breeding season: According to Leck [7] the breeding season is characteristics of geographical area rather than a particular species. According to this, breeding season of Black Ibis varied over different geographical area. Two distinct seasons of the Black Ibis are observed during the study, viz. post-winter (March-April) and pre-winter (September) season (Table 2).

Table 1: Year wise Number of nests in Urban and Rural area			
Nesting area	Black Ibis		
	08	09	Total
Urban	02	06	08
Rural	15	26	41
Total	17	32	49

Table 2: Comparative statement of breeding season	
According to	Species
	Black Ibis
Present Observation	(1) March to July (2) September to December
Soni for Churu (Raj.)	(1) April/ May
Chavda for Rajkot	(1) Post winter (Mar / April) (2) Pre-winter (September)

Some factors determine the onset of breeding in ibises. Rise in temperature in April and May, may stimulate breeding activities [8]. Tropical birds nest somewhat before the sun passes overhead [9]; at study area the sun is over head about mid April. Day length is a significant factor in initiating breeding activities in birds [10]. In April and May *Azadirachta indica*, *Polialthia longifolia*, *Ficus bengalensis* and other tree species are usually used by ibises establishing and defending the pairing territory, come into leaf and may be a factor in nesting [8], [11], [12]. The Black Ibis like in Saurashtra region breeds in the month of October and November [13].

Nesting area: Though the nesting of the black Ibis is recorded at 32 different areas. All nests recorded are reused by the Black Ibis. Total 32 nest sites of the Black Ibis are located within study area. Majority of

the nest sites on *A. indica*. The Black Ibis preferred nest sites having more number of tree species with higher density.

Nesting tree: Out of 41 tree species available at nest site, only 08 species of trees are utilized for nesting. Neem trees are the most frequently used for nesting (62.50%, n=20) than other trees (Table 3). Besides *A. nilotica*, *P. longifolia* and *F. bengalensis* are also used more than available at the nest site. The average nest tree height is 15.06±2.51m above ground (n=32) (Table 4).

The Black Ibis prefers *A. indica*, *P. longifolia*, *F. bengalensis*, *E. globules*, *F. tsiela*, *M. hortensis*, *S. oleioides* and *A. excelsa* for nesting. It also selects artificial object like giant electrical pole for nesting (Fig. 1).

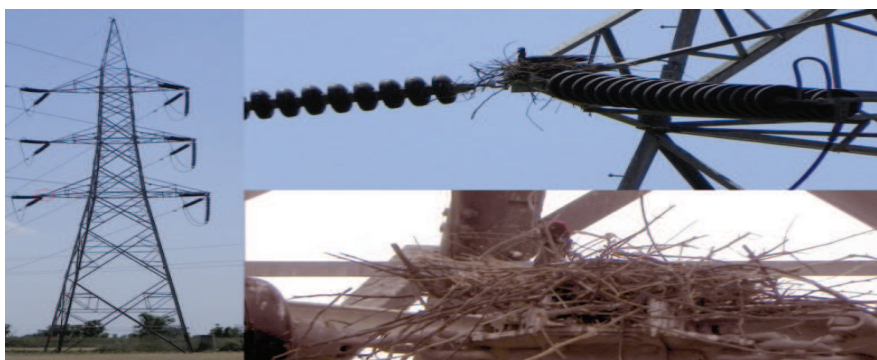


Figure 1: Black Ibis nesting on electrical pole

The reason may be the availability, suitable height and Soni *et al.* [12] states canopy of these trees, the same reason. The selection of nesting trees in birds is also based on the previously performed successful

breeding [14]. Considering the characteristics of the *A. indica* and *F. bengalensis*, their larger canopy covers provide number of crotches to support the nest at the proper locations. The dense cover of the

canopy provides sustained protection by minimizing the direct heat loss in the open sky [15]. As per Burger and Hahn [16], a dense canopy cover reduces the thermal stress to vulnerable young and provides hide from the potential air predators. Moreover, a well-covered nest does not require wing shading provided by parents to their chicks, which considerably reduces energy loss to the parents.

A positive correlation between tree height, canopy and nest height makes nesting successful. The height and higher nest elevation provides easy access to escape when there is a danger by the ground

predator. A choice of the nest height in birds seems to be determined with the consideration of climatic pressures such as wind speed, temperature, sudden and heavy rain pour and potential predation including human disturbance [17].

Nest Position: All the nests on the *A. indica* are positioned on the top of the canopy (n=32) (Fig. 2). Usually nests are supported by average 3.12 twigs (crotches) (n=32). Usually the nests are situated on the upper side of the canopy. The mean distance from the tree trunk to the nest is 2.60m for singly used tree (n = 32) (Table 5).



Figure 2: Black Ibis nesting on *A. indica*

Nest material: The Black Ibis usually collects the sticks from ground to weave large and untidy nest (n=04). A total 19 plant species are recorded from the nests. A few twigs (6.30%) are also collected from same trees in which the nest is built (Table 6). The number of sticks varies from 229 to 246 (237.75 ± 7.37 , n=4). Black Ibis use different length of twigs for nest building. They use small twigs ranged between 6-29cm (16.43 ± 2.34 , CV= 14.24%, n=4), medium twigs ranged between 31-60cm (47.31 ± 3.42 , CV=7.23%, n=4) and large twigs ranged between 63-104cm (77.93 ± 3.08 , CV= 4.39%, n=4). Black Ibis uses different number of twigs for nest building. They use small twigs ranged in between 51-71 (62.00 ± 8.41 , CV= 13.56%, n=4), medium twigs ranged in between 99-113 (104.5 ± 6.19 , CV=5.92%, n=4) and large twigs ranged in between 65-86 (71.25 ± 12.82 , CV=17.99%, n=4) (Table 7).

The Black Ibis uses wide variety of nest material to construct a nest. They collect sticks usually from ground and often returns to same places to do so. Therefore, a few plant species comprises the nest material. As mentioned earlier it shows that availability of nest material of required shape and size is important for Black Ibis to build a nest rather than a species composition of plants matters in the nest building. Both birds collect nest material from nearby area of nesting tree. One brings stick and another arranges it in the nest. This shows division of labour between the pair members.

Black Ibis use spiny plant materials more than

50.00%. The nests lined with grass and leaves. The green leaves of trees were observed in the nest cups. There are several views on green materials used by birds in nesting. According Newton [18] the function of green materials is to provide sanitation by covering the debris. Green materials also protect eggs and nestlings by environmental extreme [18], [19], [20]. Rodgers *et al.* [21] worked on the selectivity of certain green nesting material by avian species and demonstrated the importance of thermal conduction or insulation. The sighted that the greenery may be important in reducing the energetic cost of incubation and provides easy brooding and to some extant green materials act as an insect repellent.

Nest size: The nest size varies from species and is dependent on the size of the birds. The average weight of the nest is about 1430.49 ± 208.59 gm (n=4), the height of the nest is about 11.68 m (SD=0.74, CV= 6.33%, n=32) and the diameter of the nest rim is 43.88 cm (SD=2.66, CV= 6.06%, n=08). The diameter of the nest cup is 21.26 cm (SD=3.05, CV= 14.35%, n=08) and the depth of the nest cup is 3.97 cm (SD=0.25, CV= 6.28%, n=08) (Table 7). Based on the study it is revealed that, the nesting site is very rich in canopy and large amount of nest materials.

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Table 3: Tree species wise nest characteristics

Sr. No.	Name of the nesting tree	No. of Nest	Nest diameter (cm)	Depth of the nest (cm)	Weight of the nest (gm)
1.	<i>Azadirachta indica</i>	20 (62.50%)	46.71 ± 0.0	4.11 ± 0.0	1456 (n = 2)
2.	<i>Eucalyptus globules</i>	01 (3.13%)	41.37 ± 0.0	4.17 ± 0.0	-
3.	<i>Polyathia longifolia</i>	04 (12.50%)	43.85 ± 0.0	3.97 ± 0.0	1298 (n = 1)
4.	<i>Salvadora oleioides</i>	01 (3.13%)	42.07 ± 0.0	3.54 ± 0.0	-
5.	<i>Ficus tsiela</i>	01 (3.13%)	42.46 ± 0.0	3.72 ± 0.0	-
6.	<i>Millingtonia hortensis</i>	01 (3.13%)	40.95 ± 0.0	3.91 ± 0.0	-
7.	<i>Ailanthus excelsa</i>	01 (3.13%)	45.39 ± 0.0	4.14 ± 0.0	-
8.	<i>Ficus bengalensis</i>	03 (9.38%)	48.24 ± 0.0	4.26 ± 0.0	1516 (n = 1)

Table 4: Nesting trees characteristics

Species	Characteristics of tree		
	Tree Height (m)	Canopy Diameter (m)	GBH (m)
Black Ibis	15.06 ± 2.51 (n = 32)	7.59 ± 2.44 (n = 32)	3.33 ± 1.12 (n = 32)

*= The distance considered of where maximum number of nests found
 # = The distance between two tree at trunk level

Table 6: Composition of nesting material (%)

Sr.No.	Nesting materials of plant species	Species of nesting tree and % of sticks / leaves used
		<i>A. indica</i>
1.	<i>Azadirachta indica</i>	6.30
2.	<i>Acacia nilotica</i>	7.60
3.	<i>Calostrophis gigantia</i>	3.36
4.	<i>Abutulum indicum</i>	3.78
5.	<i>Brasica junsia</i>	2.52
6.	<i>Triticum aestivum</i>	7.14
7.	<i>Syzygium cumini</i>	3.05
8.	<i>Prosopis julifera</i>	9.66
9.	<i>Achyranthes aspera</i>	11.76
10.	<i>Xanthium stomarium</i>	6.61
11.	<i>Capparis sepiara</i>	3.78
12.	<i>Cynodon dactylon</i>	8.82
13.	<i>Prosopis specigera</i>	4.62
14.	<i>Polyalthia longifolia</i>	3.32
15.	<i>Gossipium herbasium</i>	2.59
16.	<i>Apuda</i>	2.10
17.	<i>Cyprus rontudus</i>	1.68
18.	<i>Lupha cilendria</i>	7.98
19.	<i>Citrus lemon</i>	3.39
20.	Total no. of species	19
21.	No. of sticks	238

Species	No. of nest	Distance between two tree (m) [#]	Distance from nearest wetland (m) [*]	Nest height (m)	Distance of nest from tree trunk (m)	No. of crotches supporting nest
Black Ibis	49	113.24	319.24	12.42 ± 2.01 (n = 32)	2.60	3.12

Statistical Parameters	Nest size					Length of twigs used for nest building (in cm)(n = 04)			Number of twigs used for nest building (n = 04)		
	Nest weight (in gms) (n= 4)	Nest Height (in meter) (n= 32)	Nest diameter (in cm) (n= 8)	Cup Diameter (in cm) (n= 8)	Cup Depth (in cm) (n= 8)	Small	Medium	Large	Small	Medium	Large
Min.-Max.	1282 - 1530	8.16 - 13.22	40.95 - 48.24	18.95 - 23.31	3.54 - 4.26	6 - 29	31 - 60	63 - 104	51 - 71	99 - 113	65 - 86
Mean ± SD	1430.49 ± 208.59	11.68 ± 0.74	43.88 ± 2.66	21.26 ± 3.05	3.97 ± 0.25	16.43 ± 2.34	47.31 ± 3.42	77.93 ± 3.08	62.00 ± 8.41	104.5 ± 6.19	71.25 ± 12.82
CV (%)	14.58	6.33	6.06	14.35	6.28	14.24	7.23	4.39	13.56	5.92	17.99

CV = Coefficient of Variation, Min. = Minimum, Max. = Maximum

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