ROOSTING HABIT OF BLACK IBIS IN URBAN AREA

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Abstract: The Indian Black ibis (Pseudibis papillosa) inhabiting rural and urban area of Gujarat is one of the 23 Ibis specious in the world. Indian Black Ibis are generally communal roosters and this pattern vary from season to season and breeding to non-breeding season. They are have temporary and permanent roosting habitat. It is a general observation that the number of birds roosting in an area vary on the basis of breeding and seasonal variation. However the observation of the roosting habit of Ibis in an urban area like Ahmedabad, lies at 23.03 degree N and 72.58 degree E in western India shows substantial changes from their conventional pattern. From the observation of 18 roosting sites in 4 study areas of the city shows that urban Ibis are changing their conventional roosting behavior and adapting the urban life. Throughout the period of study, April 2013 to March 2014, there are ample evidences that these birds are not shifting roosting sites based on season and only change trees in the same area during breeding season. The regular and easy availability of food from the urban waste, getting accustomed to it and green patches of gardens in the city have been gradually changing the temporary roost to permanent and communal roost to nuclear roosting habits.

Key words: Seasonal variation, adaptation, Black ibis, communal roosting, nuclear, Ahmedabad, India.

Introduction: The word "Roost" derived from German, it mean; 'a sleeping house for fowels'. In general birds settle for taking rest and night but some of them nocturnal birds may however rest during the day time. Gathering before roosting is common in mammals and birds, some mammals like primates (Anderson, 1984); bats (Lewis, 1995) and birds (Eiserer, 1984). Communal roosts of single species assemblages in case Pariah Kite Milvus migrants or mixed types of roosts in which individuals of more than one species with diverse habitats or same to roost together are found in mammals and birds. However some birds are solitary in nature and they stroll singularly for finding food and roost. Communal roosting is comparatively more advantageous than solitary roosting as it provides protection against predation, maintaining thermo-regulation and population regulation in birds (Gadgil, 1972). There is a great variation in the number of individuals roosting together depends on season (breeding or non breeding), food scarcity or abundance, behaviour (whether aggressive or not; territorial or not), climatic change (winter, summer and monsoon) and available number of roosting trees (especially in urban area).

According to Beauchamp (1999), there are three main benefits to participating in roosting: a reduction in thermo-regulative demands on the individual, a decrease in predation risk for the individual, and an increase in foraging efficiency for certain members of the population. Roosting has been explained in the past by the "information center" hypothesis (Ward and Zahavi, 1973). Typically, this explanation has been contingent upon two parameters: foraging success and social rank. For example, not all members of the flock are equally successful at foraging. Less successful conspecifics can recognize successful foragers, and will inadvertently follow them from food patches to roosting sites. In this way, the incoming waves of egrets may represent miniature dominance hierarchies that readjust themselves as new birds integrate themselves into the system.

There is a significant change in the roosting behaviour among birds during breeding and non breeding season and this was very clearly observed among the select wadding birds of an urban city like Ahmedabad. How birds roost in a tree, its duration, numbers in the community and other basic behaviour are closely related to the global process and its impact on the local region. Modeling the roosting surface during the non breeding season is typically different from breeding season. The arrival-departure rhythm, site and tree choice, allocation, pre-roosting gathering and post roosting habitat are very different during the breeding and non breeding roosting. There is a complex behavioral pattern involved during the non breeding roosting where multiple flocks of birds picking a single tree or tree limb to rest for the night. In this process the first incoming waves are initially placed and followed by an interaction with the roosted group of birds as well as the subsequent wave of immigrants. There is a displacement resulted by these interactions and such displacement continue till the last immigrants group have been assimilated, the particular branch is fully occupied or the roosting period ends. The entire processes of placement, displacement and final settlement is a time consuming activity unfolds over a 45 minute interval that roughly correspondents with twilight.

The roosting time settlement pattern from waves of

incoming migration during the non breeding season is well defined through a common mathematical model called *parking lot model* (Kolan et al, 1999). This model represents random absorption that is continuous in time on an *n*-dimensional lattice (Jin *et al*, 1994). In the case of the roosting problem, a set of identical particles (birds) can adsorb onto a surface (branch tips with discrete distributions in space) at a specific rate (*m*) per unit of surface area. Birds can also leave the surface at a rate of *n*, but the size of this parameter is usually infinitesimal (Evans, 1993).

The behavioral dynamics of birds in roost especially interaction and replacement are depend of scarcity – contention and abundance – harmony. During the non breeding season the contention is based of the density and breeding season it includes density and other breeding ecology aspects. However on of the fundamental question remains the degree of density (globally) at which the harmony turned to contention and aggression.

The research conducted on selected wadding birds in the city of Ahmedabad at selected 4 sites, observed, analyzed and documented the roosting behaviour dynamism along with factors influencing roost site selection, tree preferences for roost in breeding and non-breeding seasons, pre-roosting and immediate post-roosting activities and roosting hours and its variation based on global changes. The data collected and presented here, will lend and important reference of roosting behaviour and habitat selection of wadding birds and their conservation in urban area.

Methodology: The study is carried out April 2013 to March 2014. As a sudden expanding city like Ahmedabad, there are only few patches left undisturbed for wadding birds to roost. Following the wadding birds in the evening as well as visiting the undisturbed patches during twilight helped in tracing the roosting site. There was a requirement to continuously following them at twilight during the non-breeding season as birds kept on changing the roosting site according to the availability of forage site and water availability. However during the breeding time there were only few patches of safe canopy for wadding birds to breed, so finding they were easy. A regular weekly visit to pre-roosting area, following birds to roosting site, observing roosting site behaviour, interaction and pre-leaving roosting site in the morning and following birds to first post roosting site helped in collecting data and notes on activities. Special notes were made on immediate habitat of pre-roosting, arrival and departure in corporation with sunset and sunrise, roosting surface models, waves of immigration, sleeping call, waking calls, pre-departure behaviors, departure rhythms and post departure immediate habitat. For the purpose of collecting detailed data all visits were conducted in the evening (1600hr – 2000hr IST) and morning (500hr- 800hr IST) are conducted as per the available visibility. To observe further data few night visits also were conducted to the roosting sites. Roosting sites are divided into temporary and permanent – breeding roosting ground and non-breeding roosting grounds. The flock size is determined by recording departing and arriving birds at the interval of every 5 minutes.

The timing of the sleeping and waking call at roost is recorded to determine the roosting hours during different climatic seasons. Further the Student's t-test was applied to determine the significance of the variation in roosting hours depending upon the photos. To assess the social rituals of mornings, the average time between the first call and sunrise and period is compared to the time of first call and start of departure from the roosts by applying Student's t-test.

Equal or Unequal sample sizes, unequal variances:

$$t = \frac{X_1 - X_2}{s_{\overline{X}_1 - \overline{X}_2}}$$

where

$$s_{\overline{X}_1 - \overline{X}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}.$$

Roosting trees of selected birds were indentified as per Shah (1978). Heights of each tree for roosting during breeding and non breeding season are measured using abney level and measuring tape. Number of roosting trees and birds per trees are also recorded.

India is a land of monsoon climate, the three prominent seasons, monsoon (July to September), winter (October to February)and summer (March to June) and variation of roosting behaviour during this time is collected.

Results: Specific change in the roosting behavior observed among Black ibis in Ahmedabad city.

- **Classification of roosting sites:** Among the four study area except Kankaria, 18 roost sites are found in study area. These roost site are divided into sub areas like; urban and urban outskirt. It is a clear observation that comparing to other wadding birds black ibis in urban area very well adjusted to the urban life and preferred to stay in small group of 2 to 8 in each municipal parks. So out of the 18 roosts 16 (88.8%) are at the centre of the city and 2 (11.1%) are outskirt. However there is a combined roosting of more than 48 birds at a single tree in NID campus in the study area.

The roosts are further classified into permanent and

temporary. Out of the 18 roots sites 15 (77.7%) are found permanent and 3 (16.6%) are found temporary. This is a specific and may be surprising observation that all the 15 permanent roosts are found in the city out of 16 and both roost of the outskirt of the city are temporary. During the breeding season except 1 all the roosting trees are changed.

- **Factors influencing of the selection:** Food availability and aquatic forage are found to be important factor in the roosting site selection. What is a typical aspects or urban park is there is lawn and water fountains in most the parks. Regularly watered lawns in the parks are favorite forage of black ibis in the early morning as these are the sources of a lot of let-out eateries as well as the wet surface is suitable for shallow probing. There are urban waste dumps as a food source within one to two km radius of the parks and also good canopy of trees in these parks. There are also a number of developed and underdeveloped urban ponds in the surrounding region. The Sabrmati River that flow through the city is also main aquatic forage for 7 of the roosting sites. Birds are found foraging at the urban waste in the morning and left for outskirt farm field in the midday.

Land fill/ urban waste deposit located near roosting ares	Aquatic Habitat located nearby roosting site	Land fill/ urban waste deposit located near roosting area
Kankaria	2	3
Gujarat University	1	4
NID Campus	1	2
SP Rind Road	3	3
Total	7	12

The above table gives a clear idea about the forage patterns of the urban ibis. It is a clear observation that these birds have changed from their traditional food habits to urban waste as the main sources of food. Availability of landfill or waste deposit has become one of the reason for the roosting site due to the availability of food. Black Ibis are found the near the aquatic area only during the afternoon and just before the roosting time for drinking. There is substantially proving that Ibis at cities are adjusting towards the new food habits and also developing a new roosting habit of micro living of nuclear family living. Except the NID campus the birds are in pairs chosen to live in small urban parks in the study area.

- **Roost tree and factors influencing of the selection:** Availability of tall tree in the parks and closure of the park at night are giving a right harmony to roost. The educational campuses and parks are undisturbed after twilight is most favorable for these birds to choose the roosting sites. Trees of different species with 15 to 25 m height are available in all 16 (9 urban parks and 7 at educational campus) with close proximity of micro forage favoured roosting sites.

Further, it is observed that ibises at all 18 (permanent+ temporary) communal roosts with in the study area are occupied 28 roosting trees of 5 species. The maximum occupations are found on Azadirachta indica (52%), Polialthia longifolia (16%), Albizzia lebbek (14%), Peepal, Ficus religiosa (12%), *Mangifera Indica (6%).* One of the specific observations is 70% of the Black Ibis choose Asopalav *Polyalthia longifolia* for breeding or roosting may be because of the canopy where the nest is totally invisible from outside. 22% of breeding roosts are found in *Albizzia lebbek* and rest are shared among other trees. It is also observed that non of the *Polyalthia longifolia* are used for non breeding roosting that are used in breeding roost as well as other breeding trees are temporarily emptied after the breeding roosting. They above observation shows that the seasonal abundance of trees are higher immediately after breeding and lowest in the non breeding season. In summer season few black ibis roost on large electric pole which are near to the huge landfills of the city.

The biggest communal roosting is found on *Albizzia lebbek in N*ID campus, however during the breeding season this tree is completely abandoned. One of the major reasons for this may be the excess disturbance of huge number of **Black Kite** (*Milvus migrans*) in this region.

The ibis selected live and unbroken canopies of the tall trees to roost. Though height was one of the considerations for roosting but only tall trees of Neem, Peepal, and *Albizzia lebbek* with good canopy preferred for roosting. Considering the other selected number of birds it is found that black ibis used the tallest trees of the location for roost. Thus a combination of height, canopy and DBH were found to influence the roosting of the Black ibis on trees.

As mentioned above the urban parks are suitable condition for the availability of tall trees. However the nuclear family system is very visible in these area

too. Most of the parks it is observed that is only one pair at the vicinity of 1 km radius. During the early morning Black Ibis of the nearby area gather at the tallest electricity lines like evening near the aquatic habitat. But in case of roosting either in breeding or non-breeding season the new behavioural change of nuclear roosting is observed.

Reflections and summary: The specific observation from communal roosting to nuclear roosting is new development that is observed among urban Ibis. It is also found that during the breeding or nonbreeding season hardly any change in the area of roosting other than shifting the trees to nearby. The above observation states that one of the basic reason for this kind of a transformation in roosting habit is the abundance food availability from urban waste and black Ibis got familiar with these kind of food habit. They no more gather for flying long distance in a group for forage. The need to information sharing about the availability food is required as well as there is hardly any thread of wild life in cities. Due to pollution the city like Ahmedabad is hardly cold at night even at winter where birds need communal roosting. As the basic needs for communal roosting disappears this taking a new turn in forage and roosting habits of urban birds, especially Ibis.

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