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Contribution of Monuments in Sustaining the Avifauna of Orchha, Madhya Pradesh, India

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ABSTRACT: Orchha is a town in Tikamgarh district of Madhya Pradesh state, India.It is a place of historic importance and has tremendous importance at the national and international level with respect to its architectural, natural and living heritage. It includes, Raj Mahal, Jahangir Mahal, Sheesh Mahal, Ram Raja Temple, Chaturbhuj Temple, Laxmi Temple, Chhatri, and many other monuments. There are fourteen 'Chhatris' or memorials to the rulers of Orchha. Orchha lies 25.35° N and 78.64° E. The imperial monuments are an attraction to the foreign tourists as well as the local public. These monuments come to live with the chirping of different birds that find a safe shelter in them. The study was undertaken to know the avifaunal diversity that is being sustained by the archaeology of Orchha. The observations were done from 2009 to 2015 in Orchha using data sheets and 10 × 50mm binoculars while Photographical and video recordings were done with the help of 7D SLR Canon Camera. The results were remarkable with 51 bird species belonging to 18 families. Archaeological ornithology aimed at obtaining scientific information of birds in relation to monuments and using this information for their management and conservation.

Keywords: Orchha, monuments, birds, conservation

INTRODUCTION

It is vital to keep all existing avian species in balanced numbers in the existing landscapes so as to have a sustained ecosystem. Habitat destruction and food unavailability have resulted in the decline of many bird species to a dangerously low population level such as the vultures in India (Kushwaha, 2014). This has led to an ecological crisis in the avian communities of various landscapes. There has been immense change in conservation approaches during the last few decades. The shift in prominence from single species to the community level has transformed the very inclination of the traditional studies. Avian taxa have fortunately been receiving due attention, since the adoption of modem approach and a string of studies on avian communities have been undertaken recently (Javed, 1996). On the magnitude of literature published, it is apparent that bird community studies is the fastest growing branch of ecology since 1960 and has significantly contributed to the advancement of field ecology. The 2020 EU biodiversity strategy aims to halt the loss of biodiversity and ecosystem services, but this requires effective monitoring to determine whether these aims are achieved. Common bird monitoring continuously assesses changes in the avian community, providing a powerful tool for monitoring temporal changes in the abundance and distribution of these upper trophic level consumers (Heldbjerg *et al*., 2017).

The effect of these improvements is the invention of new thoughts, critical assessment of the presented theories and representations. Avian diversity and richness is also related to the size and existing vegetation i.e patchiness (Beals, 1964; Best and Stauffer, 1980). Birds are also considered to be a good indicator of environmental features and are regularly being used to keep an eye on ecological and bionetwork health (Jarvinen and Vaisanen, 1979). Avian communities are also

prone and approachable to changes in the land use pattern (Daniels *et al.,* 1990). Habitat fragmentation as an outcome of clearance of large tracts of forests leads to changes in the avifaunal structure and composition. Species with narrow habitat ranges respond to such changes either by becoming locally extinct or show a decline, whereas some species adapt to habitat fragmentation (Arnold, and Weeldenburg, 1990).

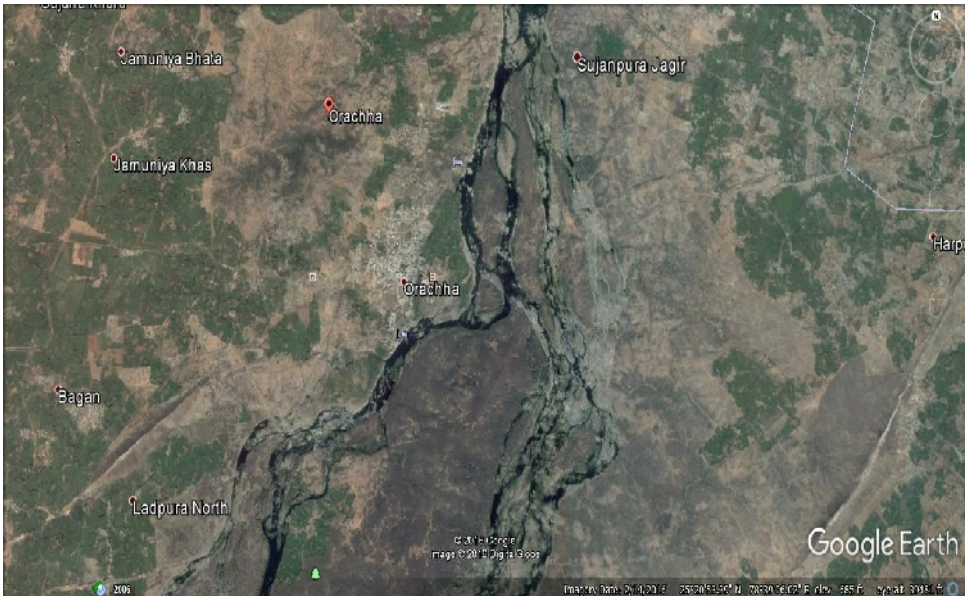
Archaeological ornithology has been in a low priority research area. It is on the whole a new concept in the field of ornithology. Exhaustive information on avian population in archaeological monuments is not available apart from the effect of bird droppings on monuments. The studies mostly focus on the negative impacts of birds on monuments and buildings (Vasiliu and Buruiana, 2010). However, there are several studies that reflect the harmful effects of birds on monuments and buildings. For this there are bird control program. But before going for any bird control program, all potential environmental concerns or ecological impacts should be thoroughly assessed by qualified personnel, especially when toxins or other chemical compounds are used. Birds represent a potential, although low, health or disease risk for humans. Most avian pathogens or parasites only affect other birds and host specificity is often high.

Management and conservation questions can be answered only on the bases of comprehensive knowledge of various ecological aspects of that habitat. Studies are required on the ecology and conservation of' many useful birds whose population is declining in urban landscapes. Studies on bird species diversity in relation to monuments are very few. Archaeological ornithology in Orchha aimed at obtaining scientific information of birds in relation to monuments and using this information for their management.

MATERIAL AND METHODS

A. Study Area

The main study site selected for the present study is located at Orchha, a town in Tikamgarh district of Madhya Pradesh State, India.Orchha is a place of historic importance and has tremendous importance at the national and international level with respect to its architectural, natural and living heritage. Orchha include, the Kanteela Darwaja, Raj Mahal, Jahangir Mahal, Sheesh Mahal, Ram Raja Temple, Chaturbhuj Temple, Laxmi Temple, Chhatri, Palki Mahal and Phool Bagh, Rai Praveen Mahal, Unt Khana, Shahi Darwaja, Panchmukhi Mahadev Temple, Raiman Dauji Ki Kothi, open Theatre of Indrajit Singh, Shyam Daua Kit Kothi, Radhika Bihari Temple, Vanvasi Ram Temple and Ganesh Darwaja (Fig.1a & 1b). There are fourteen 'Chhatris' or memorials to the rulers of Orchha, grouped along the Kanchana Ghat of the river Betwa. Orchha lies 25.35° N and 78.64° E. The imperial monuments are an attraction to the foreign tourists as well as the local public.



(Source: Google Earth)

Fig. 1a. Study area.

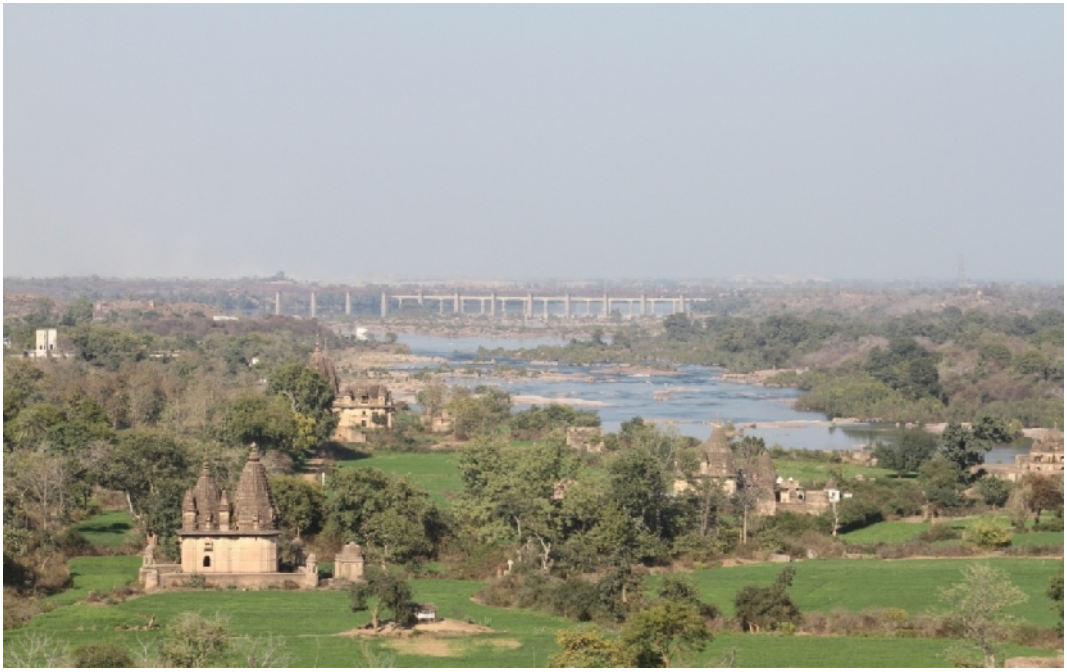


Fig. 1b. View of Study area.

B. Methodology

The Observational recordings were from done 2011 to 2016 using data sheets and 10x50 mm binoculars while Photographical recordings and video recordings were done with the help of Digital Kodak 12X Zoom Camera and 7D DSLR Canon Camera. The surveys were done in early morning (6 am-9am), afternoon (12-2 pm) and evening (4-7 pm). This was done to observe maximum bird species that may be active at different time to the day. Data was collected on habitat utilization by the bird species in the monuments.

RESULTS AND DISCUSSION

The results were remarkable with 51 bird species belonging to 18 families (Table 1). Avifauna in the study landscape includes all kinds of birds namely granivores, frugivores, insectivores, nectarivores, omnivores and scavengers. Maximum bird species belonged to family Passeridae (7), followed by Accipitridae (6), Sylviidae (6) and Corvidae (5). The avian species recorded includes the Critically Endangered vulture species (Long-billed vulture and Red-headed Vulture) and the Endangered Egyptian Vulture. The birds are using the monuments and their campus for roosting, nesting and foraging. The pigeons, parrots, Mynas, Rock chat, House Sparrows, Jungle owlets, Spotted owlets, Egyptian Vultures dwell in the holes of the monuments (Fig. 2). The Long-billed vultures on the other hand utilize the space in rooftops of the monuments (Fig. 2). The House swift utilizes the ceilings of the monuments for nesting (Fig. 2). The Red-wattled Lapwing nests on ground of the monuments campus (Fig. 2). The prinias, Tailor birds and bulbuls utilize the shrubs and bushes. These spaces in the monuments provide excellent nesting sites that are protected from the elements and free from predators like jackals, dogs, rodents and birds of prey. The Archaeological department has been active in protecting the Critically Endangered vultures by rescheduling the renovation of the monuments during the non-breeding period. The care-takers from Archaeological Department not only perform their Government jobs but they also render their responsibility towards the environment (Kushwaha *et al*., 2016).

The availability of food in the surrounding sites and from the care-takers means that the survival rate of young chicks is very high. The care-takers from Archaeological department provide grains to the birds' everyday with the help of contributors (Fig 3 A & B). For growth food abundance and diet quality are of particular interest because they represent the energy and nutrients necessary for the development. Different species may show different response to fluctuations in food abundance or quality.

Table 1: List of birds in Orchha Monuments in Tikamgarh district, Madhya Pradesh.

S.No	Common Name	Zoological Name	Local name	Family	R/M	AC	IUCN Status
1.	Peacock	*Pavo cristatus*	Mor	Phasianidae (2)	R	C	LC
2.	Grey Francolin	*Francolinus pondicerianus*	Teetar		R	C	LC
3.	Indian Roller	*Coracias benghalensis*	Neelkanth	Coraciidae(1)	R	C	LC
4.	White-throated kingfisher	*Halcyon smyrnensis*	Kilkila	Halcyonidae (1)	R	C	LC
5.	Rose-ringed Parakeet	*Psittacula krameri*	Tota	Psittacidae (1)	R	C	LC
6.	House Swift	*Apus affinis*	Ababeel	Apodidae (1)	R	C	LC
7.	Spotted Owlet	*Athene brama*	Chughad	Strigidae (2)	R	C	LC
8.	Jungle Owlet	*Glaucidium radiatum*	Jangli choghad		R	FC	LC
9.	Rock Pigeon	*Columba livia*	Kabutar	Columbidae (1)	R	C	LC
10.	Red-wattled lapwing	*Vanellus indicus*	Titeeri	Charadriidae (1)	R	C	LC
11.	Black-shouldered kite	*Elanus caeruleus*	Kapassi	Accipitridae (6)	R	FC	LC
12.	Crested Serpent Eagle	*Spilornis cheela*	Dogra cheel		R	FC	LC
13.	Long-billed Vulture	*Gyps indicus*	Giddh		R	UC	CE
14.	King vulture	*Sarcogyps calvus*	Rajgidh		R	UC	CE
15.	Egyptian vulture	*Neophron percnopterus*	Gobar Giddh		R	UC	E
16.	Eurasian Griffon	*Gyps fulvus*	--		M	UC	LC
17.	House crow	*Corvus splendens*	Kowwa	Corvidae (5)	R	C	LC
18.	Jungle crow	*Corvus macrorhynchos*	Kala kowwa		R	C	LC
19.	Black drongo	*Dicrurus macrocerus*	Bhujanga		R	C	LC
20.	Ashy Drongo	*Dicrurus leucophaeus*	Bhujanga		M	FC	LC
21.	Rufous Treepie	*Dendrocitta vagabunda*	Mahalat		R	C	LC
22.	Oriental Magpie Robin	*Copsychus saularis*	Dhaiyar	Musciapidae (5)	R	C	LC
23.	Indian Robin	*Saxicoloides fulicata*	kalchuri		R	C	LC
24.	Common Stonechat	*Saxicola torquata*	------		M	C	LC
25.	Black Redstart	*Phoenicurus ochruros*	Thirthira		M	FC	LC
26.	Brown Rock-chat	*Cercomela fusca*	Dauma		R	FC	LC
27.	Brahminy Starling	*Sturnus pagodarum*	Brahmini myna	Sturnidae (4)	R	C	LC
28.	Asian pied starling	*Sturnus contra*	Ablak myna		R	C	LC
29.	Common Mynah	*Acridotheres tristis*	Desi myna		R	C	LC
30.	Bank Mynah	*Acridotheres ginginianus*	Ganga myna		R	C	LC
31.	Plain Martin	*Riparia paludicola*	---	Hirundinidae (3)	R	C	LC
32.	Wire –tailed Swallow	*Hirundo smithii*	----		R	FC	LC
33.	Barn/common Swallow	*Hirundo rustica*	----		M	C	LC
34.	Red-vented Bulbul	*Pycnonotus cafer*	Bulbul	Pycnonotidae (1)	R	C	LC
35.	Jungle Prinia	*Prinia sylvatica*	Tot-rungi	Cisticolidae (3)	R	FC	LC
36.	Ashy Prinia	*Prinia socialis*	Kali phutki		R	C	LC
37.	Plain Prinia	*Prinia inornata*	Phutki		R	C	LC
38.	Oriental White-eye	*Zosterops palpebrosus*	Baboona	Zosteropidae (1)	R	C	LC

S. No	Common Name	Zoological Name	Local name	Family	R/M	AC	IUCN Status
39.	Common Tailorbird	*Orthotomus sutorius*	Darzee	Sylviidae (6)	R	C	LC
40.	Common Babbler	*Turdoides caudatus*	Genga/dumri		R	FC	LC
41.	Yellow eyed babbler	*Chrysomma sinense*	Gulab-chasm		R	C	LC
42.	Large Grey Babbler	*Turdoides malcolmi*	Sat bhaina		R	C	LC
43.	Jungle Babbler	*Turdoides striatus*	Sat bhai		R	C	LC
44.	Tawny-bellied babbler	*Dumetia hyperythra*	Karamadi laledo		R	UC	LC
45.	House Sparrow	*Passer domesticus*	Gauriya	Passeridae (7)	R	C	LC
46.	Chestnut-shouldered Petronia	*Petronia xanthocollis*	Jangli chiria		R	FC	LC
47.	White-browed Wagtail	*Motacilla maderaspatensis*	Khanjan		M	FC	NA
48.	Indian Silverbill	*Lonchura Malabarica*	Pidda		R	C	LC
49.	Scaly-breasted Munia	*Lonchura punctulata*	Seenabaz		R	FC	LC
50.	Black headed munia	*Lonchura malacca*	Pora munia		R	FC	LC
51.	Tree Pipit	*Anthus trivialis*	Charchari		M	FC	LC

(R-Residential; M-Migratory; AC-Abundance Code; C-common; FC-Fairly Common; UC-Uncommon; CR-Critically Endangered; E-Endangered; LC-Least Concern; NA-Not Available)

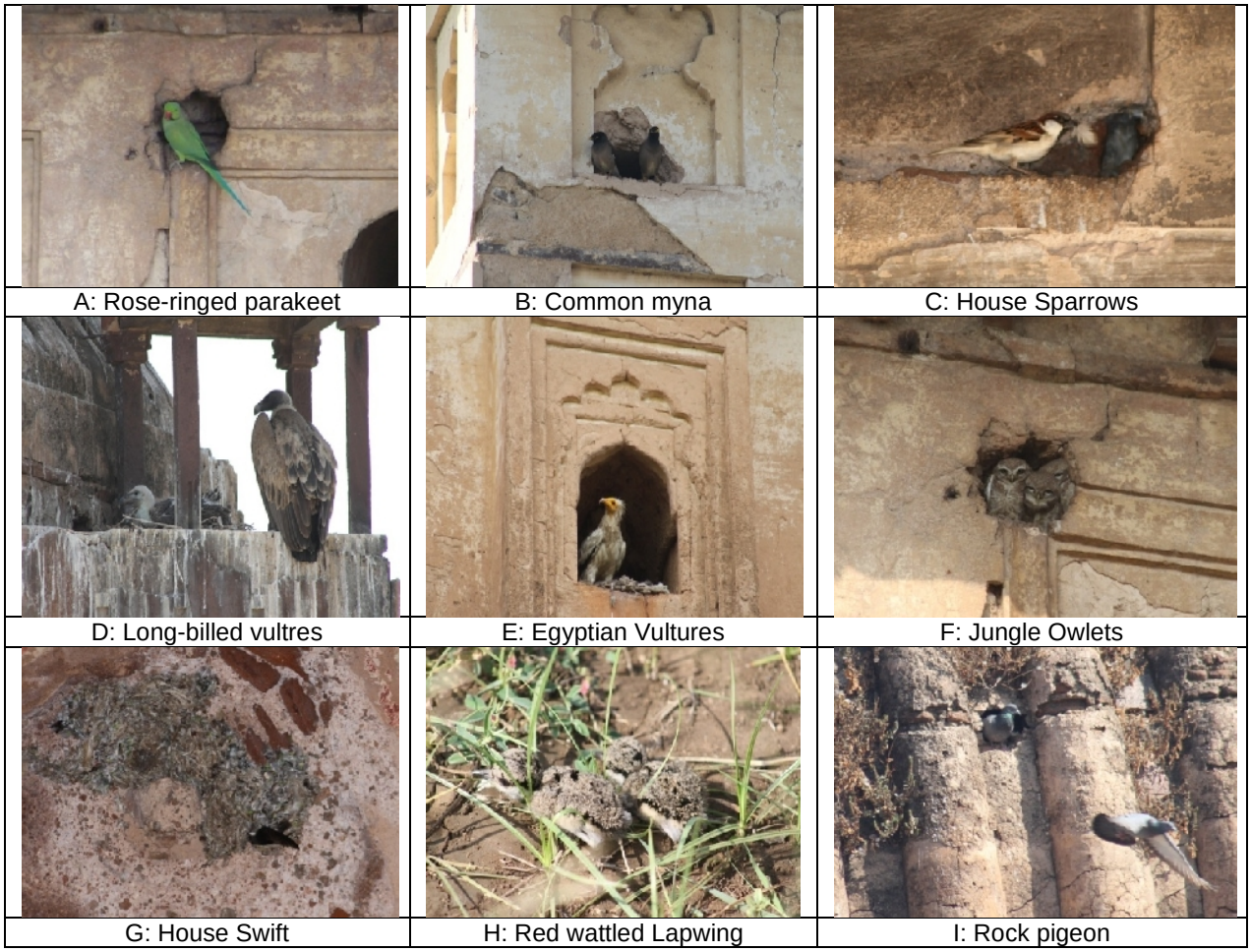


Fig. 2A-H. Nesting birds.

For example, studies of European Robins (*Erithacus rubecula*) and Carrion Crows (*Corvus corone*) have shown that transient periods of poor food availability resulted in abnormal growth, permanent stunting, lower fledging mass, and/or increased mortality (Lees, 1949; Richner *et al*.,1989). The birds are also provided water in Earthen pots (Fig. 3C).

Fig. 3A. Parrots and Rock Pigeons feeding on Pearl millet (*Pennisetum glaucum*).

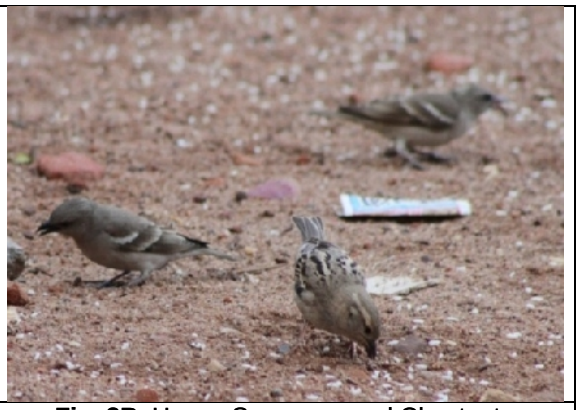


Fig. 3B. House Sparrows and Chestnut-shouldered Petronia feeding on rice (*Oryza sativa*).

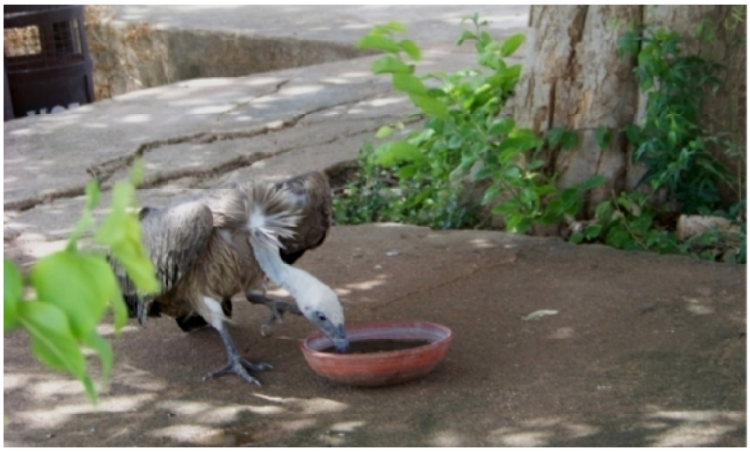
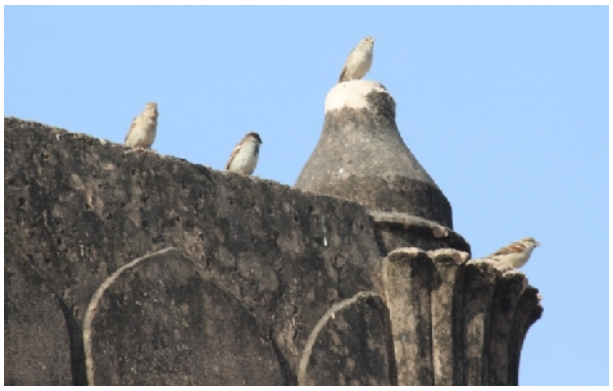


Fig. 3C. Vulture juvenile in taking water from earthen pot.

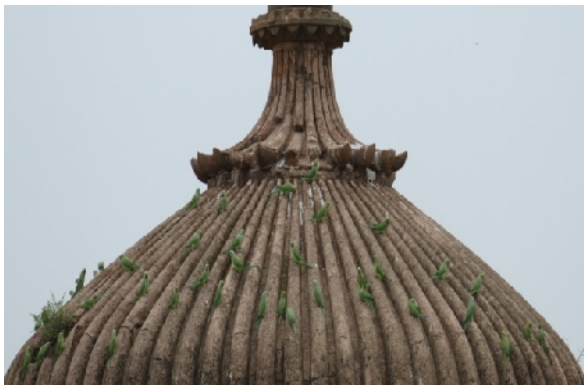
From the conservation point of the species the importance of roosts is remarkable. Roosting sites are defined as the sites where most of the non-breeding population meets. During the study the birds that have been seen roosting in the monuments include parrots, Mynas, Rock pigeon, House Sparrows, House swift and vultures (Fig. 4A-D). The conservation strategies should consider the protection and monitoring of all the breeding and roosting sites. Feral pigeons constitute serious health risks to humans and also lead to high economic loss due to costly damage to buildings, historic monuments, statues and even vegetation (Stock and Wackernagel, 2014). In Orchha however there is no such problem in the Monuments.

Apart from nesting, foraging and roosting opportunities, the bird species are observed sun basking safely on the monuments (Fig.5 A & B). *Gyps indicus* were seen spending hours in the sun, sitting and preening. Sunning and preening combined together have more adverse effect on ectoparasites (Kushwaha, 2014). Sunning is thought to control ectoparasites, either by killing them directly or by increasing their vulnerability to preening as they try to escape from the heat (Moyer and Wagenbach, 1995).

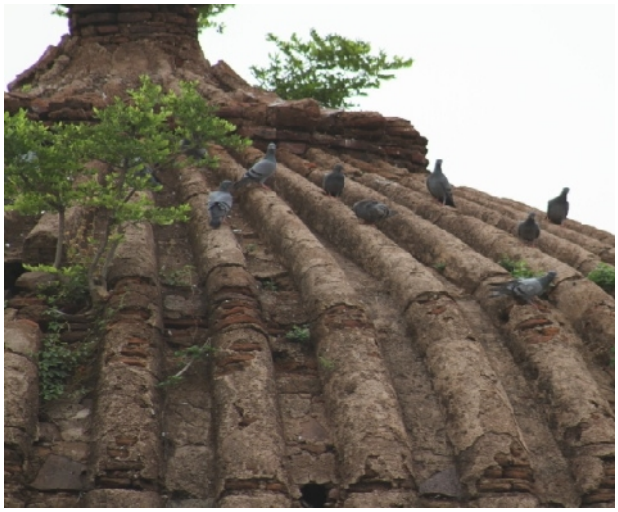
The vulture species like Long-billed vultures and Egyptian Vultures also collect the nesting material from the monuments (Fig.6 A & B; Fig.7 A & B). During the rainy season, different types of weeds and shrubs grow on the monuments.



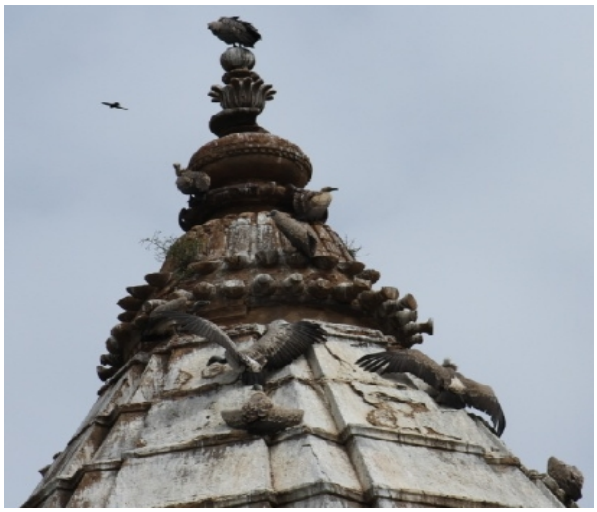
A: House Sparrow.



B: Rose-ringed parakeet.



C: Rock Pigeon.



D: Vultures.

Fig. 4A-D. Roosting birds.

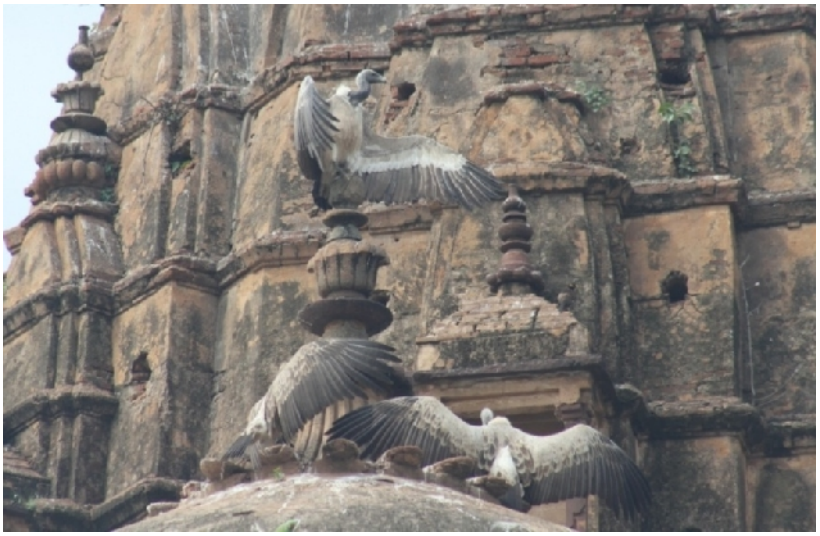


Fig. 5A. *Gyps indicus* sun basking on cenotaphs.

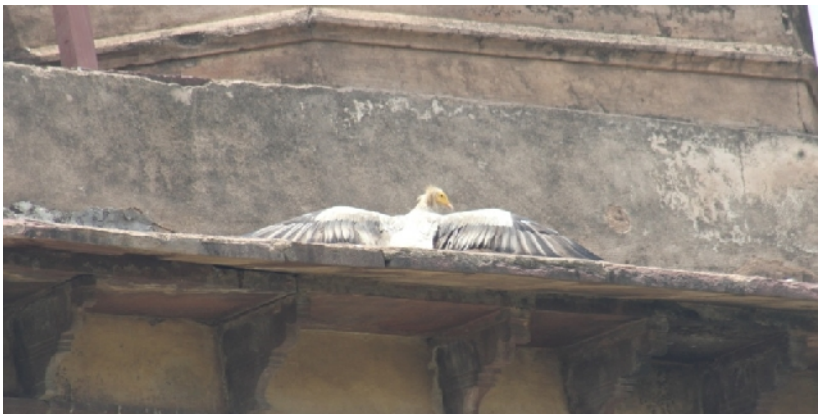


Fig. 5B. Egyptian vulture sun basking on monuments.

These are collected by Long-billed vultures for nest construction. The breeding period of Long-billed vultures start soon after the monsoon is over *i.e* in September. The size and diameter of the nest is about 60-90 centimeters and a single nest consists of about 2000-4000 sticks that may vary according to the availability of nesting material as well as the requirement by the breeding pair. The nest construction is a tedious work for vultures due to its large size as well as the types and number of sticks and twigs used by them (Kushwaha, 2014). So the availability of nesting material from nearby monuments save the time and energy of the breeding pairs as well as helps in the cleaning up of the monuments. Historic buildings and monuments are liable to be affected by a wide variety of 'vegetation growth' ranging from roots of mature trees that form part of design or natural landscape to microorganisms that can grow on the external and internal surfaces of building materials (Hunter and Berry, 1995). Small plants may not cause serious damage to the masonry, but all the woody rooted vegetation damages the structure, hence should compulsory be removed (Report on Research Commissioned, 1995; Najera and Brenes, 2014). So in Orchha the nesting birds help in the removal of the vegetation on the monuments.

According to Carr in 2009, statistical analysis reveals that an expected 92% of urban population growth will be observed in the developing countries during the next twenty years. The direct consequence will be the lost of many bird habitats. Since the monuments of Orccha are protected by the Ancient Monuments and Archaeological Sites and Remains Act. 2010, they will serve as a safe abode to the bird species. It is now essential to meet the demands of the cultural heritage field ecologically, economically and socially with aims of a completely green approach for conservation. When planning a restoration or conservation intervention, besides the safety of the artifacts, the main goal should be to consider all the phases that characterise a restoration project.

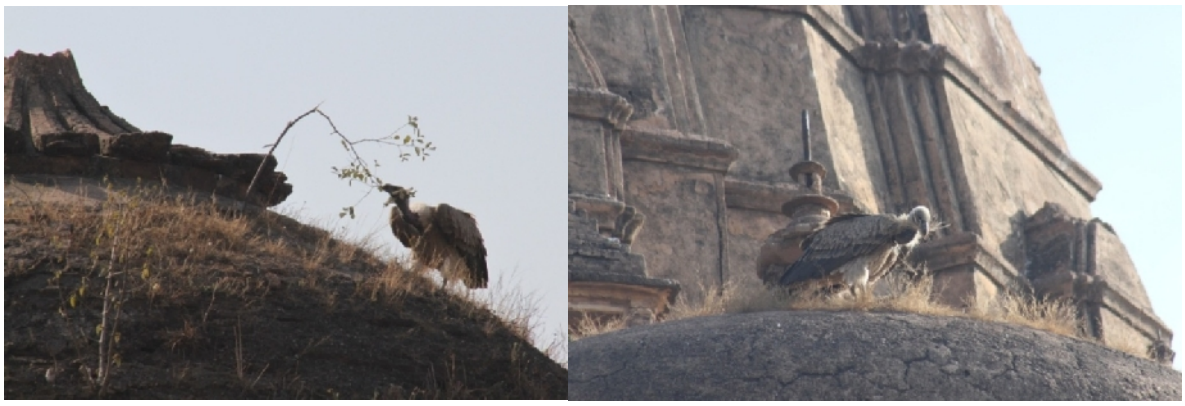


Fig. 6 A & B. Long-billed Vultures collecting nesting material from rooftops of monuments.

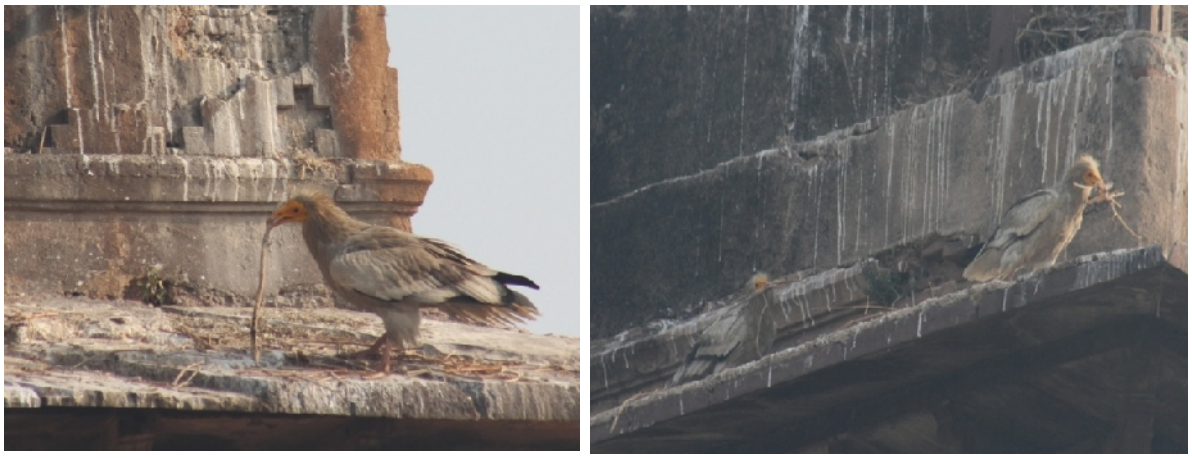


Fig. 7 A & B. Egyptian Vultures collecting nesting material from rooftops of monuments.

The focus should be on a completely green and holistic direction, fulfilling social, cultural, economical and environmental needs (Eleonora *et al*., 2016).

CONCLUSION

The study concludes that with rapid urbanization, the monuments are serving as a significant habitat for the bird species. They are providing the nesting, roosting and foraging sites for 51 bird species. The local people as well as tourists can donate for the grains that are fed to the birds. They can also help in maintaining the habitat through plantation and maintenance. While visiting the monuments, there should be no disturbance to the bird species and other fauna. The visitors should be in awe of the exquisiteness of living (birds) and non-living (monuments). The birds are also taken care of by the care-takers and volunteers. Urbanization is an emerging process through which the landscapes are going through. This is leading the agricultural landscape to develop into an industrial civilization. With this change many birds are losing their habitats. In such situations the Orchha monuments are ideal for supporting the avian species including the Critically Endangered vulture species.

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