REPORT ON STUDY OF WINTER MIGRATORY WATER BIRDS, THEIR DENSITY, DIVERSITY AND HABITAT USAGE AND IDENTIFICATION OF POTENTIAL BREEDING SITES OF MALABAR PIED HORNBILL

PENCH TIGER RESERVE, MAHARASHTRA

2022

CENTRAL INDIA BIRD ACADEMY

PENCH FOUNDATION
MAHARASHTRA

Pench
Tiger Reserve
MAHARASHTRA

Foreword

The Forests of Central India are rich in biodiversity, be it flora or fauna. Pench Tiger Reserve, Maharashtra is situated at the heart of India and Pench River divides the same vertically. There are various types of habitat, riverine, hilly, rocky, grassland, forest, bamboo etc. The area is fast becoming a hub of activity, not only for tourists but also for all types of denizens two legged, four legged and winged living therein. Whereas the conservation efforts have yielded good results, addition of adjoining areas to the Pench Tiger Reserve has given a further boost to their population.

Since birds are known to create forests their study would provide more insight into the conservation efforts and preparation of Conservation plans and indicatiors to ecosystem. Hence to add more impetus to the conservation efforts taken up by the Forest Department which used to be focused more on herbivores and carnivores it was thought to include birds in the conservation efforts.

Malabar Pied Hornbill is one of the important birds of the Pench Tiger Reserve, Maharashtra and not much study has been done on the habitat and breeding of the bird. Further the details of the winter migratory birds visiting the area were also required to be carried out in order to enable making conservation plans for birds. Central India Bird Academy which had done the work of rapid survey of birds in the Pench Tiger Reserve, Maharashtra earlier, were given the work of study of identification of the breeding sites of Malabar Pied Hornbill and also the study of density and diversity of the winter migratory water birds in the area.

The present report is based on the said study conducted by them in association with the frontline officers of the department, which also helped capacity building of the officers. The breeding sites have been identified which is the first successful effort of this kind.

The report also includes a lot of information on the Malabar Pied Hornbill and their hotspots which would help the department in conservation efforts.

The details of density and diversity of the winter migratory birds thronging various water bodies in the Pench Tiger Reserve have been provided in the report alongwith hotspots which would also help in management of the said areas. The same can also be thought of for creating sites for bird tourism in the area which, in turn would help create jobs for the locals as guides etc.

The report has created a good foundation for detailed scientific study of birds for future which would further help in management as well as for research work.

Central India Bird Academy has done a commendable job, in identifying the breeding sites of Malabar Pied Hornbill, (especially during the hot summer season) as well as in brining out the details in the behaviour of the said bird. The report on the winter migratory water birds would also help the department in taking up conseration activities as far as Wetland biodiversity is concerned.

Smt. Sreelakshmi, IFS
CF and Field Director,
Pench Tiger Reserve,
Maharashtra

Message

Pench Tiger Reserve,Maharashtra, is fast becoming a paradise for flora and fauna of Central India. It is a unique habitat formed due to a combined effect of Pench river, area of it's water divide and Totladoh dam, hills of Satpuda.

Lot of research work on forest management and various issues has been done in Pench Tiger reserve, Maharashtra. However study of breeding sites Malabar Pied Hornbill, which is one of the indicator birds of Pench Forest was required to be done. Likewise there was no previous study on winter migratory water birds visiting Pench Tiger Reserve, Maharashtra.

The present project report gives an excellent insight into the breeding study of Malabar pied Hornbill. This has created a basis for conducting further studies on the breeding ecology of the bird.

Moreover, it is the first such documentary evidence of the breeding of Malabar pied Hornbill in PTR, Maharashtra.

The area under PTR is now comprising of newly acquired /attached forests and in a few cases villages have been relocated . This has helped the flora and fauna to flourish as the same faced less anthropological pressure

This project has been executed very efficiently by the Central India Bird Academy, headed by Dr Anil Pimplapure, a veteran ornithologist and his team of bird experts.

I am sure this project would become a foundation for conducting further studies on the birds in Pench Tiger reserve, Maharashtra

Prabhunath Shukla, IFS
Deputy Conservator of Forest
Pench Tiger Reserve Maharashtra

Contents

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Front cover page Photo - Shri Pushkar Kulkarni, Malbar Pied Hornbill's Next No. 2

Back cover Page Photo- Shri Anant Hingawe, Brown Wood Owl (Juvenile)

All other photos by CIBA team members participating in the project

Preface

This report pertains to the Memorandum of Agreement between Central India Bird Academy, Nagpur and Pench Foundation, Nagpur on 18-12-2021 with reference to the study of winter migratory water birds their density and diversity, habitat usage and identification of potential breeding sites of Malabar Pied Hornbill in Pench Tiger Reserve, Maharashtra.

In this report we present the final part of the deliverables, after completing the given tasks by making field visits, conducting surveys and assessment thereafter of all the seven Ranges under Pench Tiger Reserve, Maharashtra and after discussions with the Forest Officials of the area.

Team CIBA worked hard for achieving positive results and it was not possible without a strong support from the officers of the Pench Tiger Reserve, Maharashtra.

CIBA records its sincere gratitude of appreciation to the authorities of Pench Tiger Foundation, Pench Tiger Reserve, Maharashtra for giving us a chance to conduct this project not only in the interest of these forests but it would be useful for further detailed study of the birds visiting the area in Winter as well as one of the important birds of the area i.e. Malabar Pied Hornbill. The study has resulted in identifying the nesting areas, as well as nests (cavities) of Malabar Pied Hornbill and would help take steps for conservation of the species in our Pench Tiger Reserve, Maharashtra.

Dr. Anil B. Pimplapure
Director
Central India Bird Academy

Acknowledgement

We are grateful to the Maharashtra Forest Department for providing necessary facilities of logistics, accommodation and other arrangements for this project.

We thank Smt. Sreelaxmi, IFS, Executive Director, Pench Tiger Conservation Foundation and Conservator of Forest & Field Director, Shri Prabhunath Shukla, IFS, Deputy Director, Shri Atul Deokar, MFS, ACF, Shri Kiran Patil, MFS ACF and Shri Mahesh Parab, ACF MFS for the encouragement and help as well as all the Range officers and Round Officers, Guards, other subordinate officials, Drivers who rendered us all help on field as and when needed.

We thank all RFOs, ROs, Beat Guards and STPF Guards, the drivers of vehicle for their participation and taking active interest despite their busy field activities.

It would be unfair on our part not to express our gratitude to Shri Mangesh Tathe, RFO for his valuable contribution in the work, as well as for providing all help and logistics support every time throughout the entire period.

We also record our heartfelt thanks to Shri Pancham, Driver for his valuable contribution in the work.

We record our grateful appreciation for the friendly co-operation received, collectively, and individually from the Bird Watching Organisations as well as from individual birders.

Teams

CIBA Team

- Sh. Gopal Thosar- Senior Advisor & Patron
- Dr. Anil Pimplapure- Chief Investigator
- Sh. Nitin Marathe- Project Co-ordinator
- Sh. Aniruddha Bhagat- Joint Project Co-ordinator
- Sh. Pushkar Kulkarni- Field Scientist
- Dr. Manas Badge- Field Scientist
- Sh. Anant Hingwe- Field Scientist
- Dr Dheeraj Patil – Field Scientist
- Sh. Shirish Gajaralwar-Field Scientist
- Sh. Neeraj Sathe- Field Scientist
- Sh Sanjay Kholia- Field Scientist
- Sh Parag Purandare - Field Scientist
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- Sh. Rohit Hazare- Field Scientist
- Sh. Srushti Mehatkar-Field Scientist

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- Sh. Prabhu Nath Shukla, IFS, Deputy Director Pench Tiger Reserve
- Sh. Atul Deokar, MFS, ACF, Pench Tiger Reserve
- Sh. Kiran Patil, MFS, ACF, Pench Tiger Reserve
- Sh. Mahesh Parab, MFS, ACF, STPF, Pench Tiger Reserve
- Sh. Mangesh Tathe, RFO Pench Tiger Reserve

1.0 Introduction

Pench Tiger Reserve Maharashtra (PTR) is located in Central India. It is spread over an area of 741.41 Sq Km. The forest is of Southern Tropical Dry Deciduous type in which Teak is substantially present (TCP, PTR-2013-14 to 2022-2023). The presence of Pench river which cuts through the forest, huge water reservoirs namely, Totladoh, Navegaon-Khairy, streams and nullahs, a number of water bodies, manmade water spots, borewells inside PTR, hilly terrains, sandy areas, rocks, grasslands, Tree Canopies, bushes, all have contributed in making PTR a very unique habitat for all types of animals.

The area under PTR has hills, plateaus, rivers, streams, lakes, ecotone areas, artificial water spots, borewels near van-kutis (camp sites inside PTR) and a few human settlements and their farmlands. Thus each of these habitats are suitable for different birds species. The areas in PTR have different bird habitats, Forest, Wetland, Grassland, riparian, ecotones etc.

The earlier study undertaken in Pench by CIBA indicated that there are about 310 birds of 64 families and pertained to the area under the PTR at the relevant time. Out of which 29% i.e. 89 bird species are winter migratory.

Bird migration is the regular seasonal movement, wherein birds fly between north and south hemisphere along flyways, between breeding and wintering grounds. Birds migrate during winter season to warmer places in south to escape the harsh winters and scarcity of food during winters in the north. About 370 species of migratory birds visit the Indian subcontinent mostly the wetlands of India as staging sites. India is an integral part of 3 flyways namely: Central Asian Flyway, East Asian-Australasian Flyway, Asian East African Flyway. Flyways are flight path used by large numbers of birds while migrating between their breeding grounds and their overwintering quarters.

Among different water bodies present in PTR the Totladoh, Navegaon Khairy, Wagholi, Pipariya, Bandra lake are of utmost importance due to its size and ecosystem. These water bodies attract many migratory birds.

Malabar Pied Hornbill is endemic to Indian Subcontinent and listed as Near Threatened bird species (Criterion NT C1) due to habitat loss resulting in decline in population.

The Malabar pied hornbill (*Anthracoceros coronatus*) is a large hornbill, at 65 cm (26 in) in length. It has mainly black plumage, apart from its white belly, throat patch, tail sides and trailing edge to the wings. The bill is yellow with a large, mainly black casque. Females have white orbital skin, which the males lack. The Malabar Pied Hornbill is an important indicator bird for the PTR Maharashtra. It prefers well wooded areas having riparian zones and huge trees including those having casque. Some breeding sites of the Malabar pied hornbill were identified during the earlier survey.

The Malabar pied hornbill is a resident breeder in India and Sri Lanka. Its prefers evergreen and moist deciduous forests. It is distributed across three main regions within the Indian sub-continent: Central and Eastern India, along the Western Ghats, and in Sri Lanka. In Central and Eastern India, it ranges from western West Bengal through parts of Jharkhand, Chhattisgarh, Odisha, Madhya Pradesh, Northern and Eastern Maharashtra, Northern Andhra Pradesh, and North-East tip of Telangana (Rasmussen & Anderton, 2005).

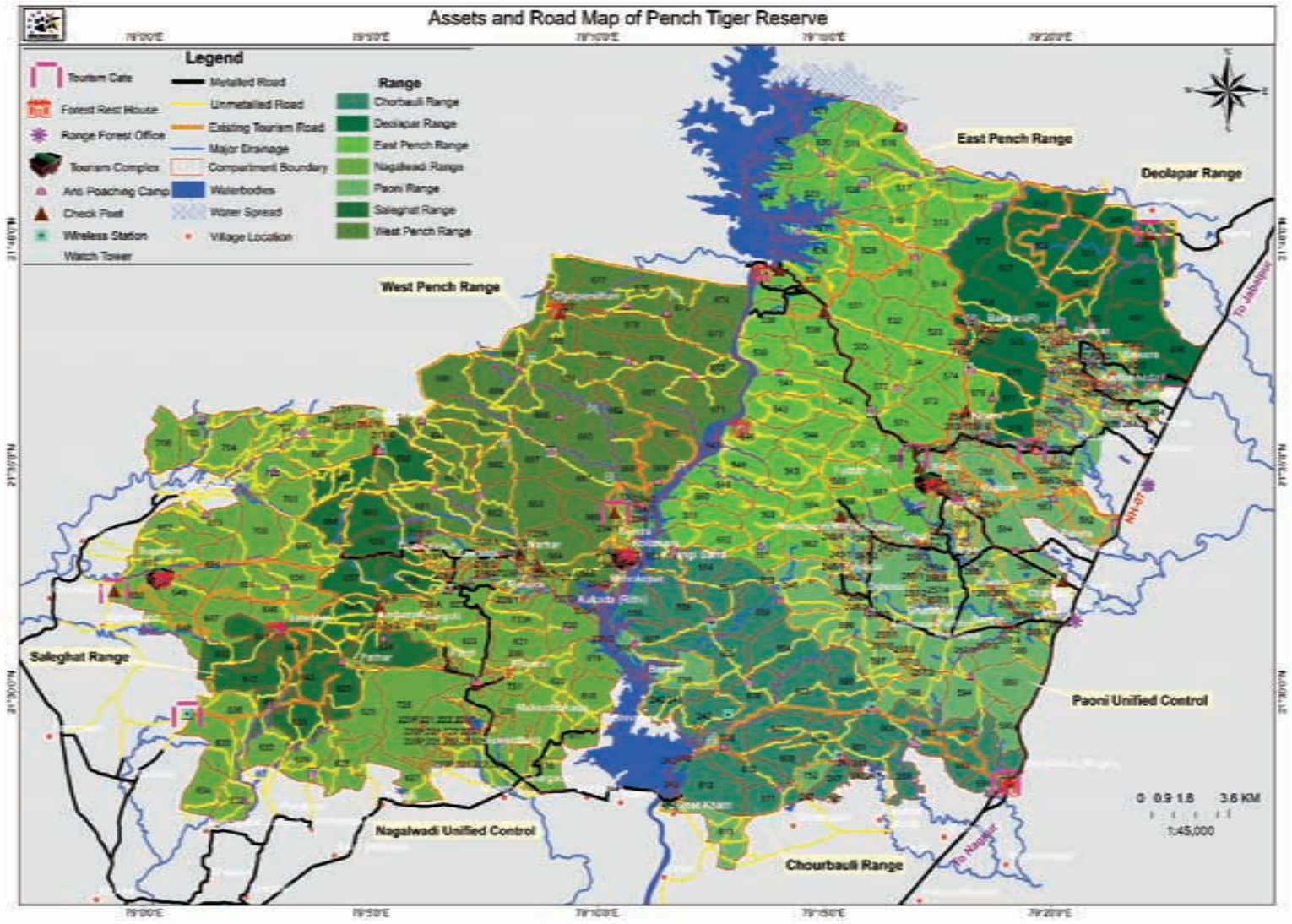


Figure 1: Asset map showing water bodies in PTR Maharashtra
(Source: TCP, PTR Maharashtra)

2.0 Objectives

- Study of density and diversity of Winter Migratory Water Birds in Pench Tiger Reserve, Maharashtra
- Habitat usage of the Winter Migratory Water Birds in Pench Tiger Reserve, Maharashtra
- Identification of potential breeding sites of Malabar Pied Hornbill in Pench Tiger Reserve, Maharashtra

3.0 Review of Literature

The Pench National Park came into being when the Government of Maharashtra declared its intention to constitute this area of 257.26 sq. km. vide gazette notification No. PGS 1375/121758-F I. dated 22nd November 1975. Later on Pench National Park has been declared as 25th Tiger Reserve of India vide Government of India letter F No. 1-1/96-PT, dated 18 February 1999 and Government of Maharashtra Resolution No. WLP-1095/CR-110/F-1, dated 23rd February 1999.

Diversity in the wealth of avifauna in the park is quite remarkable. According to the TCP 2013-14 to 2022-23 there are around 170 species of birds belonging to 50 families of 17 different orders have been recorded here. These include some migratory and endangered birds.

A study carried out by Central India Bird Academy (CIBA), 2022 on Rapid Survey of Birds and Their Habitat in Pench Tiger Reserve in Maharashtra showed the presence of 310 birds from 64 families present in PTR, Maharashtra. Out of these 310 birds, 89 birds are reported as migratory birds.

Wagh et. al., 2015 reported the presence of 12 individuals of Malabar Pied Hornbill at four sites namely Ambakhori, Totladoh, Kantra-Utar Nala and Sillari Gate at PTR.

4.0 Methodology

CIBA planned execution of the aforesaid tasks by adopting the following modus operandi. A core group of the CIBA team was formed for the purpose. A detailed plan was prepared for execution of the project and the work was started on the project at once.

Survey of the area undertaken: Upon the execution of the MOU, all the seven Ranges in the PTR Maharashtra were visited alongwith the frontline officers of the department in order to plan the tasks in a methodical manner. The water bodies and hot spots for winter migratory birds were identified.

Documents and previous studies were referred: The Tiger Conservation Plan for Pench Tiger Reserve, Maharashtra for the period 2013-14 to 2022-23 was also referred for enlisting the waterbodies and lakes situated in the PTR Maharashtra for the purpose of the study. The rapid survey of the birds in Pench Tiger Reserve, Maharashtra conducted by CIBA was also referred

Water bodies in PTR Maharashtra visited: The important water bodies, such as the Totladoh, Navegaon Khairy, Wagholi lake, Pipariya, Bandra lake were visited in addition to the other hotspots in the Pench Tiger Reserve for a preliminary assessment of the winter migratory water birds.

To calculate the density of the birds in an area following formula was used.

Density = Number of individuals of a species/ Total number of plots

Diversity of the birds is the number of bird species found in the area.

The bird diversity is calculated using Shannon Wiener Index (1949). Shannon Wiener Index of diversity takes into account not only the species richness (count of species) but also the number of individuals of a species. It provides information on the rarity or commonness of a species in a particular region.

Shannon Wiener Index = $-\Sigma$ pi ln(pi)

Where pi = the proportion of species i relative to the total number of species

Riparian zones visited for identification of roosting and resting places of Malabar Pied Hornbill. In order to ascertain the potential breeding sites of the Malabar Pied Hornbill, riparian zones were identified. -The bird was found to have a liking for the areas near Ambakhori, Lamandoh, Gavali Ghat, Rani Doh, Power house etc. Malabar Pied Hornbill, being a frugivorous bird, the areas having clusters of fruiting trees such as Ficus varieties, Jamun, Dhaman, Ber, Dhawda, Putranjeeva etc were searched.

5.0 Observations

5.1 Study of density and diversity of visiting Winter Migratory Water Birds in Pench Tiger Reserve, Maharashtra

PTR, Maharashtra has a number of large and small water bodies, some in clusters and some isolated. The lakes have different surroundings, altitudes and vegetations. Some are located on the fringes of villages, some are surrounded by the forest. The PTR, Maharashtra has large sized lakes such as Totladoh Dam, Navegaon Khairy Dam, smaller lakes such as Pipariya, Wagholi, Nandpur, water holes at various places, Borewells near Kutis, riverine areas, Kund, backwater, Lamandoh area, Gavli Ghat area, Futka Talao near Kolitmara is a manmade small pond which holds water throughout the year.

Winter migration of birds starts from the month of September -October with the onset of winter in the northern hemisphere. The early birds which start arriving are Black Redstart, Warblers etc from Himalayas. The same are followed by Wagtails, Snipes, Sandpipers, Pochards, Bar Headed Geese, Rudy Shelducks, Garganeys, Northern Pintails, Shovellers, Gadwals, Knob Billed Ducks etc. Hawks, Harriers, Ospreys follow these birds.

Among the birds migrating to PTR different waders and waterfowls are dominant. Waders and waterfowls constitute 77% of the migratory birds with waders having maximum share of 44% followed by waterfowls constituting 33% of the migratory birds (Figure 2).

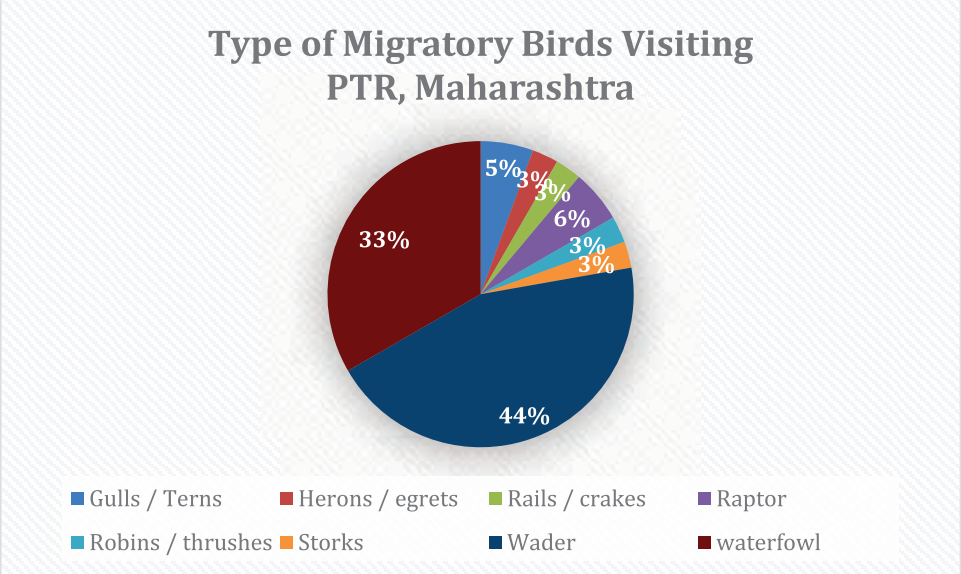


Figure 2: Type of Migratory Birds visiting PTR, Maharashtra

The migratory birds visiting PTR, Maharashtra are dominated by Northern Pintail and Red crested Pochard (Figure 3). Different lakes of PTR, Maharashtra have highest density of these birds. The reason being, these birds migrate in groups, so different lakes are colonised by different groups of Pintails and Pochards for three to four months.

The density of migrators like wagtail, plover, harrier, terns, storks herons etc. is less at these water bodies.

The migratory birds stay till the end of winter and by mid-March most of the migratory birds return. The last ones to leave are Red Starts, Rudy Shelducks, Wagtails, and a few warblers.

During the study period a total number of 36 winter migratory water bird Species were sighted in the area covered by Pench Tiger Reserve, Maharashtra.

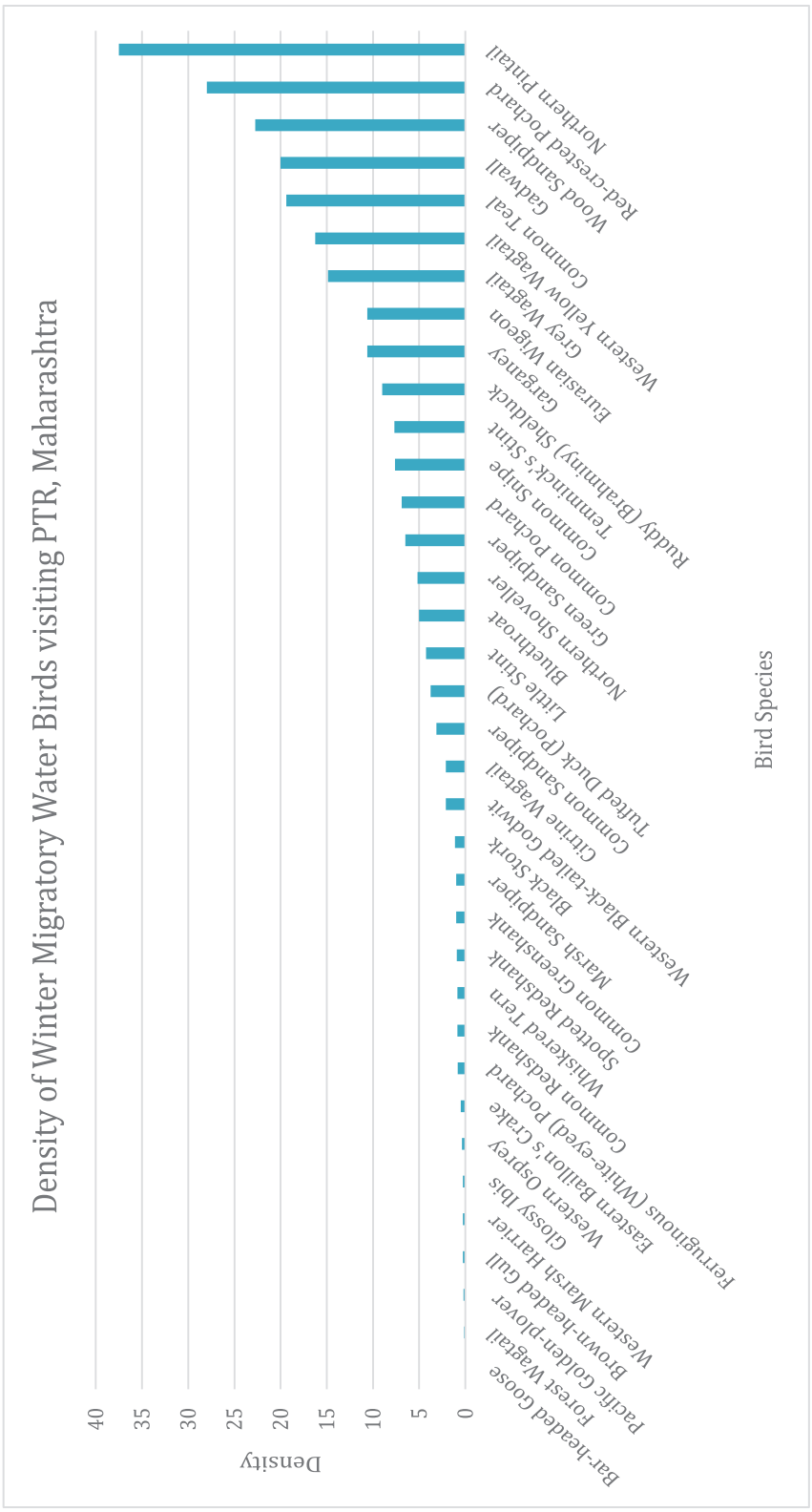


Figure 3: Density of Winter Migratory Water Birds visiting PTR, Maharashtra

5.2 Habitat usage of the Winter Migratory Water Birds in Pench Tiger Reserve, Maharashtra

The birds come from long distances for foraging. Winter migratory water birds do not breed here. They gain weight and after they leave they would breed in their original habitat. Thus the presence of the migratory water birds on a water body depends fully on the foods availability, safe roosting areas, and places having low threat perception. The food types are varied. Some are vegetarians, others have fish, molluscs, crustaceans etc. waders find small insects on the shores.

The study carried out shows that most of the migratory birds are attracted towards Navegaon Khairy, Wagholi, Totladoh and Bandra lake. The diversity index for these lakes was found to be above 2.5. Whereas water Gavli Ghat and Ambakhori attracted a smaller number of migratory birds. Their diversity index was found to be less than 1.5 (Figure 4).

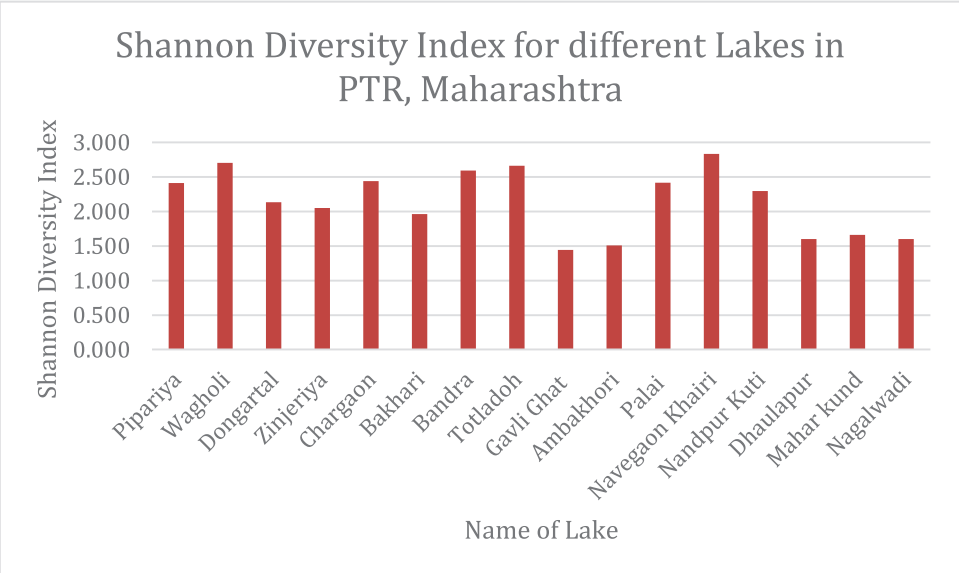


Figure 4: Shannon Diversity Index for different Lakes in PTR, Maharashtra

Some lakes attract more birds than others due to the following reasons: abundance of food, human interference, presence of predators, quality of water, vegetation surrounding and in the lake etc.

Some lakes have lots of reeds and aquatic vegetation for ducks to feed, Pipariya, Chargaon, Wagholi, etc. which are favourites amongst winter migratory birds. Some water bodies have flow of water intermittently due to the release of water from the dam at Gauli Doh, where Rudy Shelducks are noticeably found in large numbers. Black Storks preferred newly revamped water bodies near NAFCC area on the way to Ambakhori, whereas Osprey was found to have a choice for the lakes inside the core forest areas such as Palai.

Bandra lake also has a unique habitat comprising of reeds, grasses, tall trees, connecting stream, and a few fingers and mounts and is a preferred destination of rare migratory birds, such are Ferruginous Ducks, as it has all the ingredients needed.

Vegetation on the water bodies differ at different places. The areas which have frequent water level changes due to dam water release are either having rocky areas or have sandy areas, or at places there are reeds (Borban, Chorbauli) at the downstream.

The presence of Khus, Deodhan, Ipomea etc. attract some birds, and would also be preference by grebes, rails, crakes, moorhens, swamphens, as well as shovellers etc

The presence of birds on a waterbody depends heavily on food availability, threats, anthropological pressure, area of the lake and the clusters of lake around to hop from one lake to another. Area or the size of the lake is also one criterion.

Figure 5: Identified bird hotspots in PTR, Maharashtra

Winter migratory birds on Pipariya lake

Winter Migratory Birds on Wagholi Lake

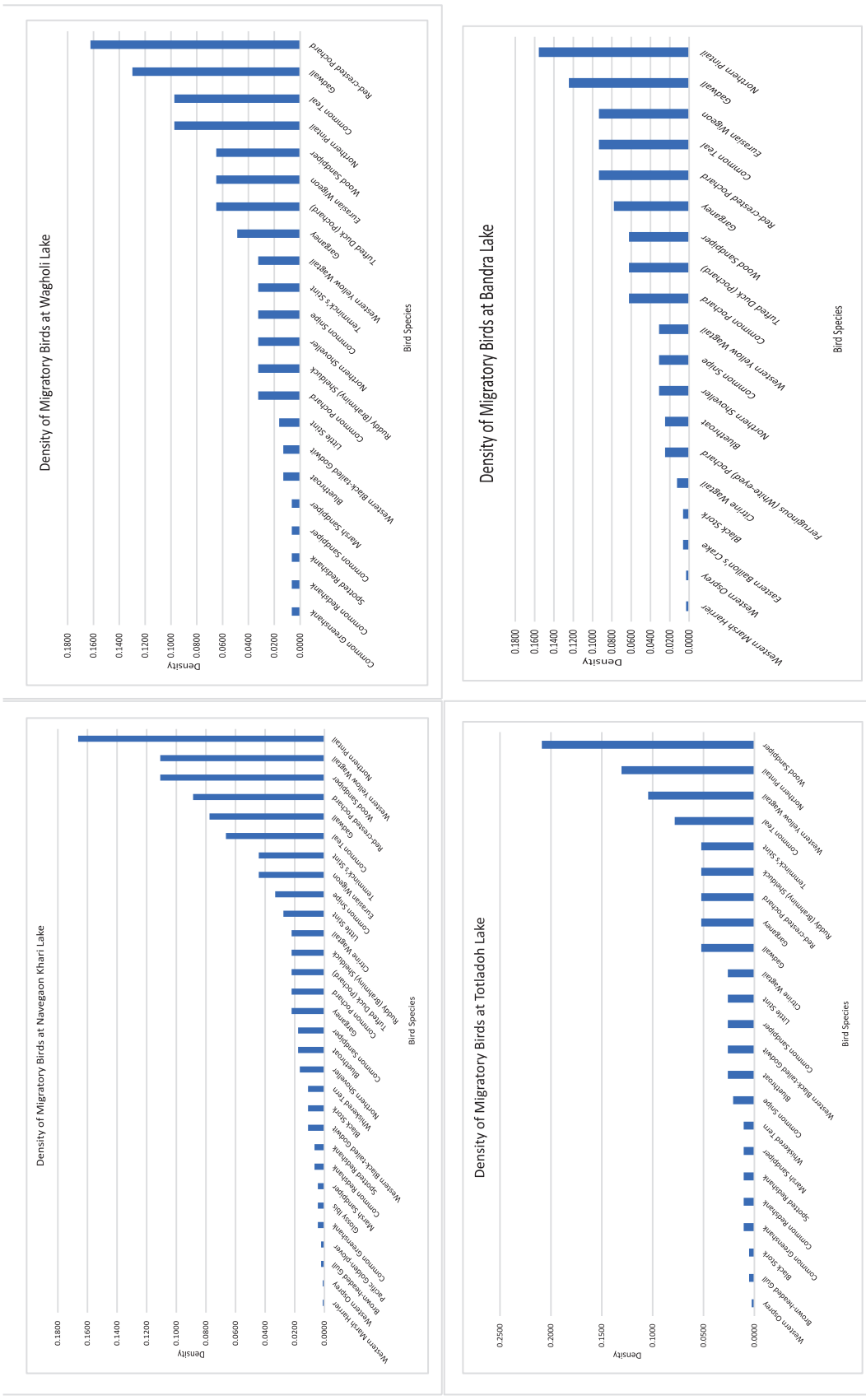


Figure 6: Density of Bird Species at four lakes with maximum diversity

Table 1: Period of stay of the winter migratory birds at Pench Tiger Reserve Maharashtra

		Month											
SN	Name of the winter migratory water bird	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	Bar-headed Goose		●	●	●	●	●	●					
2	Black Stork	●	●	●	●	●	●	●					
3	Black-backed Gull						●						
4	Black-tailed Godwit		●	●	●	●	●	●	●				
5	Bluethroat	●	●	●	●	●	●	●					
6	Brahminy (Ruddy) Shelduck		●	●	●	●	●	●	●				
7	Brown-headed Gull			●	●	●							
8	Citrine Wagtail		●	●	●	●	●						
9	Comb Duck		●	●	●	●	●						
10	Common Greenshank		●	●	●	●	●	●					
11	Common Pochard	●	●	●	●	●	●	●					
12	Common Redshank		●	●	●	●	●	●					
13	Common Sandpiper		●	●	●	●	●	●					
14	Common Snipe	●	●	●	●	●	●	●	●				
15	Common Teal	●	●	●	●	●	●	●					
16	Eastern Baillon's Crake			●									
17	Eurasian Curlew Spotted				●	●							
18	Eurasian Wigeon		●	●	●	●	●	●					
19	Ferruginous Pochard		●	●	●	●	●						
20	Forest Wagtail			●									
21	Gadwall		●	●	●	●	●	●					
22	Garganey		●	●	●	●	●						
23	Glossy Ibis	●	●	●	●	●	●	●	●	●			
24	Green Sandpiper		●	●	●	●	●	●					
25	Grey Wagtail		●	●	●	●	●	●					
26	Little Stint		●	●	●	●	●	●	●				
27	Marsh Sandpiper			●	●								
28	Northern Pintail		●	●	●	●	●						
29	Northern Shoveler		●	●	●	●	●						
30	Pacific Golden-plover					●							
31	Red-crested Pochard		●	●	●	●	●						
32	Redshank		●	●	●	●	●	●					
33	Temminck's Stint	●	●	●	●	●	●	●	●				
34	Tufted Pochard		●	●	●	●	●						
35	Western Marsh Harrier	●	●	●	●	●	●						
36	Western Osprey	●	●	●	●	●	●	●	●				
37	Whiskered Tern			●									
38	White Wagtail		●	●	●	●	●	●					

		Month											
SN	Name of the winter migratory water bird	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
39	Wood Sandpiper		•	•	•	•	•	•					
40	Yellow Wagtail		•	•	•	•	•	•					

Table 2: Specie wise sex ratio count of the birds in Pench Tiger Reserve, Maharashtra

Waterfowl Species count sex-wise (Winter Migrant Water birds showing sexual dimorphism)				
	Total	M	F	Juvenile
Northern Pintail	600	120	420	60
Gadwall	320	65	225	30
Garganey	170	35	120	15
Common Pochard	110	25	75	10
Ferruginous (White-eyed) Pochard	13	6	7	0
Red-crested Pochard	448	180	225	43
Tufted Duck (Pochard)	60	25	30	5
Ruddy (Brahminy) Shelduck	144	70	70	4
Northern Shoveller	83	15	60	8
Common Teal	310	80	210	20
Eurasian Wigeon	170	50	105	15
Bluethroat	80	30	45	5

5.3 Identification of potential breeding sites of Malabar Pied Hornbill in Pench Tiger Reserve, Maharashtra

- Field Identification - Malabar Pied hornbill is a medium sized , (65 cm) hornbill. It has a white belly, trailing edge to wings and outer tail feathers. The Male has yellowish bill with black cutting edges and base. There is a characteristic huge casque with flattened and projecting front-edge marked with yellow and black colour and has bare skin around eye- which is dark blue. Skin of the throat is pinkish and it has red eyes. It can be distinguished from Oriental Pied hornbill (not found in Pench) by its bigger size, bigger casque and with more black pink throat skin. Female of the Malabar Pied hornbill is smaller, with casque less black than male, skin around eye is white with pink tinge. Juvenile has smaller bill with plain dull yellow.

Photos of adult male (Left) and female (right) of Malabar Pied hornbill

Location : 21.625885, 79.2328443 Ambakhori Road

Classification –

The Malabar Pied Hornbill is classified as follows–

Kingdom - Animalia
Phylum - Chordata
Class - Aves
Order - Bucerotiformes
Family - Bucerotidae
Genus - Anthracoceros
Species - *Anthracoceros coronatus*

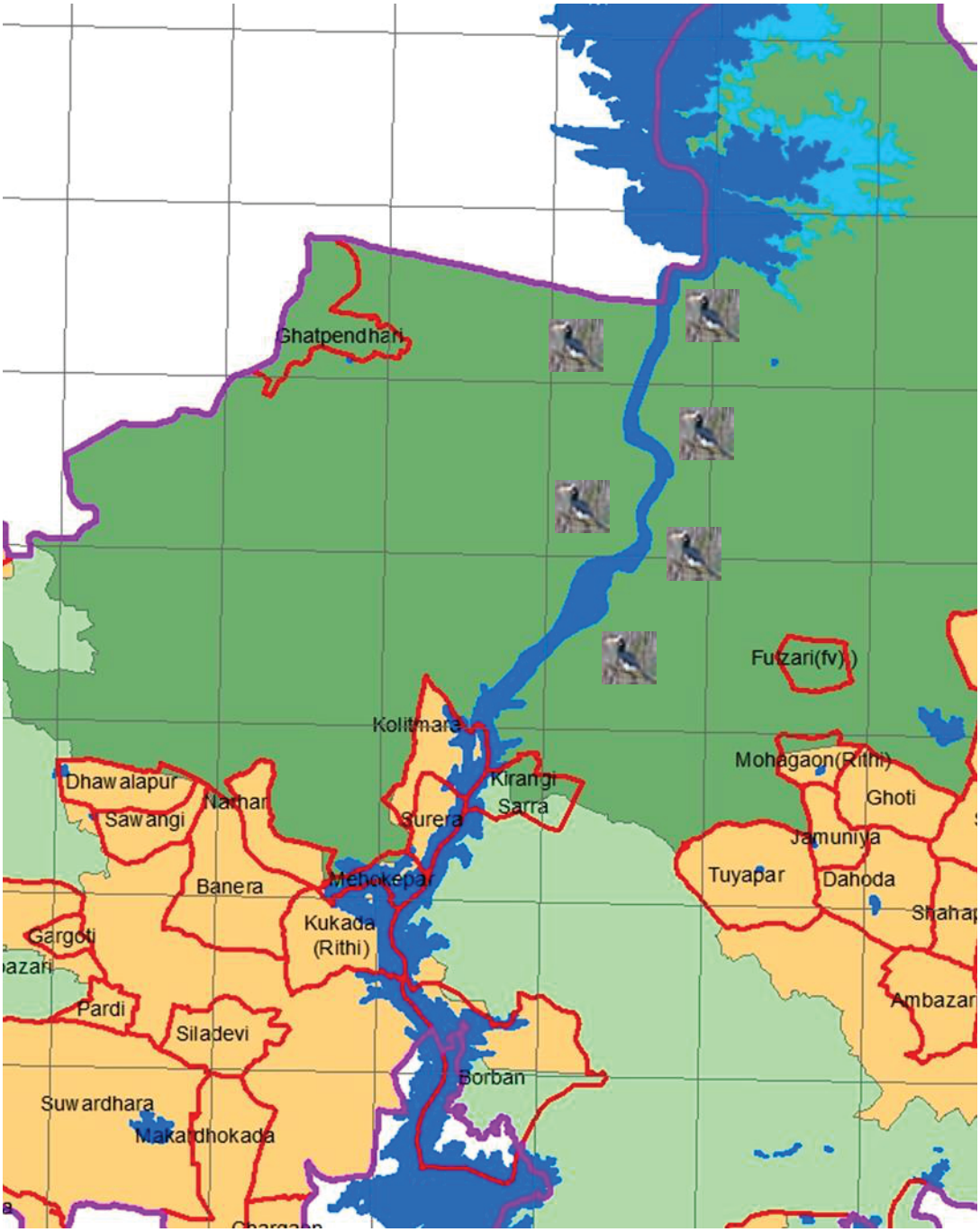
- It is placed under the IUCN category as **Near Threatened** (Criterion NT C1)**.**
- **Distribution and habitat**- Malabar Pied Hornbill is found in Central India and in Western Ghats. It is a frugivorous bird, having a special liking for fruits (figs) of Ficus trees. It is found in well wooded forest areas having fruiting trees, as well as high trees and near riparian zones. The bird will nest in cavity during summer season. The

breeding pair would isolate itself from others of the same feather as the season approaches. The pair would move together and would select suitable cavity for nesting. The trees preferred are large trees having good girth having no branches at low height. The habitat of Pench Tiger Reserve Maharashtra is very conducive for the Malabar Pied Hornbill and also the Indian Grey Hornbill.

- **Breeding biology** – The mating season starts from about Mid- March and lasts up to mid July. The breeding pair separates itself from the others of the same species. The pair selection occurs during February. The non breeding males compete with each other for a female of their choice. It was observed that in the Pench Tiger Reserve Maharashtra, the population of females in the non breeding group was less than the males. The females are offered fruits by males who also display their feathers in flights to attract the female. Bill grappling is common in this season. These Birds become very vocal since morning and the calls can be heard from long distances. The male usually perches on high trees and calls. The female inspects various cavities shown by the male during February to March and also receives various fruits and other food from the male. A suitable cavity usually in a big tree is finalised by the female which enters and inspects it from the. Around Mid-March the female enters the cavity and the male brings mud which is used to partially close the entrance of the cavity leaving small space for the female for receiving food brought by the male. The female stays there till the chicks emerge from the eggs and start growing. When the female is left with very less space due to the growth of the chicks, female breaks the mud wall at the entrance of the cavity and comes out. The opening is again sealed by the juveniles with the help of parents. Till that time the breeding male takes care of the needs of the family including himself. The male brings about 20-25 things in its beak which include fruits, wood chips, lizards small birds etc to feed the family.

- The trees on which nests made are usually Arjuna, Moha, Yen, Mango, Jamun, Karu (Ghost Tree) etc and for foraging the birds relishes fruits of various plants including Ficus varieties, Putranjeeva (which is commonly found from Dam side area till Lamandoh on either sides of the river).
- In Pench Tiger Reserve, Malabar Pied hornbill is found mostly in the areas near Ambakhori, Rani doh, Gauli ghat, Pench Dam Area -Tiger Top Hill, Lamandoh, Salama mostly along the banks of the Pench River and a few major streams flowing through the Pench Tiger Reserve and joining the River. Further during non-breeding season the bird was sighted near Pipariya village and Khapa Village as well.

Figure 7: Map showing the locations of Malabar pied hornbill



- **Daily routine of Malabar pied hornbill** – The bird starts the day at about 5.30 in the morning. It makes calls initially and then starts foraging on fruiting trees. They take short rest during noon for about two hours or so in summer months, in a shade, under a tree. They get

active again in the afternoon about two hours before sunset and start feeding again. It was observed that the bird was also eating tender leaves of trees, perhaps to absorb moisture. The birds was never seen drinking water.

- **Roosting** – During the breeding season non breeding pair separately roosts, and the breeder birds roost together. Usually their roosting places are fixed. It was observed that the roosting places are decided by two or three adult individuals who lead the group to the roosting place by perching atop a high tree in the direction of the roosting area and start calling others to follow. The group soon follows the direction. Two roosting places of nonbreeding Malabar Pied Hornbill were identified. One is behind the power house, between the abandoned mine and "Bhukamp" hill and the other was identified behind hill of Ambakhori on the east side. The breeding pair roosts on trees near their selected breeding site before the female enters the cavity and after she emerges. The breeding male roosts at some distance on a high tree near the cavity when the female with chicks is inside.
- The Malabar Pied Hornbill faces competition for occupation of cavities for nesting from various other cavity nesters. The details thereof are as under -

Table 3: Cavity nesters

SN	Name of Bird	Scientific Name
1.	Common Grey Hornbill	*Ocyceros birostris*
2.	Brown headed Barbet	*Psilopogon zeylanicus*
3.	Common Myna	*Acridotheres tristis*
4.	Spotted Owlet	*Athene brama*
5.	Indian Scops Owl	*Otus bakkamoena*
6.	Coppersmith Barbet	*Megalaima haemacephala*
7.	Alexandrine Parakeet	*Psittacula eupatria*
8.	Rose ringed Parakeet	*Psittacula krameria*
9.	Woodpeckers	*Picidae sp.*

Table 4: Food preference of Malabar Pied Hornbill

SN	Plant food		Animal Food
1.	Banyan	*Ficus benghalensis*	Lizard
2.	Pipal	*Ficus religiosa*	Frog
3.	Gular, Umbar	*Ficus racemose*	Snail
4.	White Fig / Pakhad	*Ficus infectoria*	Beetle,
5.	Black Fig/ Hairy Fig (Kala Umbar)	*Ficus hispida*	Grasshopper
6.	Jamun	*Syzygium cumini*	Termites
7.	Haldu	*Adina cordifolia*	Squirrel
8.	Kusum	*Schleichera oleosa*	Small birds
9.	Dhaman	*Grewia tiliifolia*	
10.	Putranjiva	*Putranjiva roxburghii*	
11.	Kasod	*Cassia siamea*	
12.	Maharukh	*Ailanthus excelsa*	

In search of nesting sites

- During the study period large trees with cavities were kept under watch for possible breeding site of Malabar Pied hornbill. Certain locations which were frequented by the birds were also watched constantly.
- In the evenings and early mornings the directions from where the birds would come and go were watched. It was observed that the breeding pairs roost as late as at about 7 pm in the evening in the months of April and May and start the day at about 5.15 to 5.30 am. The nonbreeders were observed to also follow the same schedule.
- The discussion with front line staff of forest department, Vanmazoor & Tourist Guides helped long way to identify nesting sites.

- Ciba teams kept watch from diffrent places simultaneously watching for Malabar Pied Hornbill
- Movement of the bird early in the morning and in the late evenings
- Breeding pairs which stayed aloof from other non breeders were watched throughout the day to lead to the nesting sites
- The CIBA team with the help of the frontline officers were able to identify four nesting cavities of the Malabar Pied Hornbill in the Pench Tiger Reserve, Maharashtra.
- The identification of the nesting place is quite a difficult task as the birds are very shy of human beings. The nest is also selected in such a way that the same remains hidden from human eyes, and can be detected with great efforts. The nest is usually at a height of more than 30 feet.
- The birds become very vocal during the start of the breeding season.
- The male becomes silent once the female enters nesting cavity selected.
- Constant watch and daylong efforts started getting desired results from the month of April and three nesting sites were identified, two in East and one in West Pench.
- All the three nesting trees were watched throughout the breeding period till early July.
- Further observations about breeding activity could not be done due to unprecedented heavy rains coupled with dense vegetation making it impossible to visit nesting trees.
- Noting of various important parameters such as height and girth of the nesting trees, height of the nest, direction of the nest and the surrounding vegetation upto 15 meters from the nesting trees were taken and the same are as under :

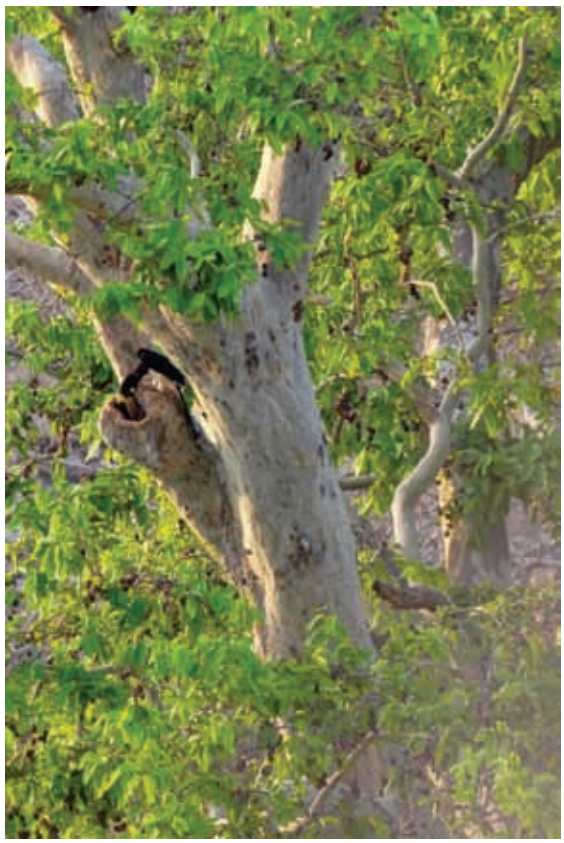
Table 5: Details of Nests of MPH

Sr. No.	Description	Nest 1	Nest 2	Nest 3
1	Location	21.63307, 79.25475	21.65513, 79.22481	21.62385, 79.21594
2	Beat number	CN No. 536 South Salama East Pench	Totladoh Beat Cn. No. 537 East pench	South Ghatpendri Lamandoh West Pench Range
3	Tree	Karu (Ghost Tree) *Sterculia urens*	Arjuna Tree *Terminalia arjuna*	Arjuna Tree (twin) *Terminalia arjuna*
4	DBH	08 feet	21 feet	34 feet
5	Height of the tree	52 feet	120 feet	70 feet
6	Nest Height from Ground	28 feet	80 feet	40 feet
7	Branch	Third Branch	Fourth Branch	First Branch
8	Nest Direction	South- East	South- East	North-East
9	Nearby Trees	Three Karu trees, Teak, Bherra, Dhawda	Peepal, Umbar, Bori, Dhaman, Neem	Umbar, Putranjeeva and Arjuna
10	Distance from road	140 feet	500 feet	Approx one Km
	Remarks	On a hill top, Nullah on the South, Tar road on the North, Indian Grey hornbill nest	On the river bank, river on the South, near Forest colony, Fish Eagle nest (on the east on Arjuna Tree) and Common	Nesting tree is ten feet from river, Nearby a nest of Grey headed Fish Eagle on

		within 50 feet . On the South side there is Bhumakdev lake which gets water from Bhumakdev nala flowing from the East side of the nest	Crow nest within 50 feet.	Arjuna Tree

Nest 1

Nest 2



Male seen feeding the occupants of the cavity on 27-04-2022

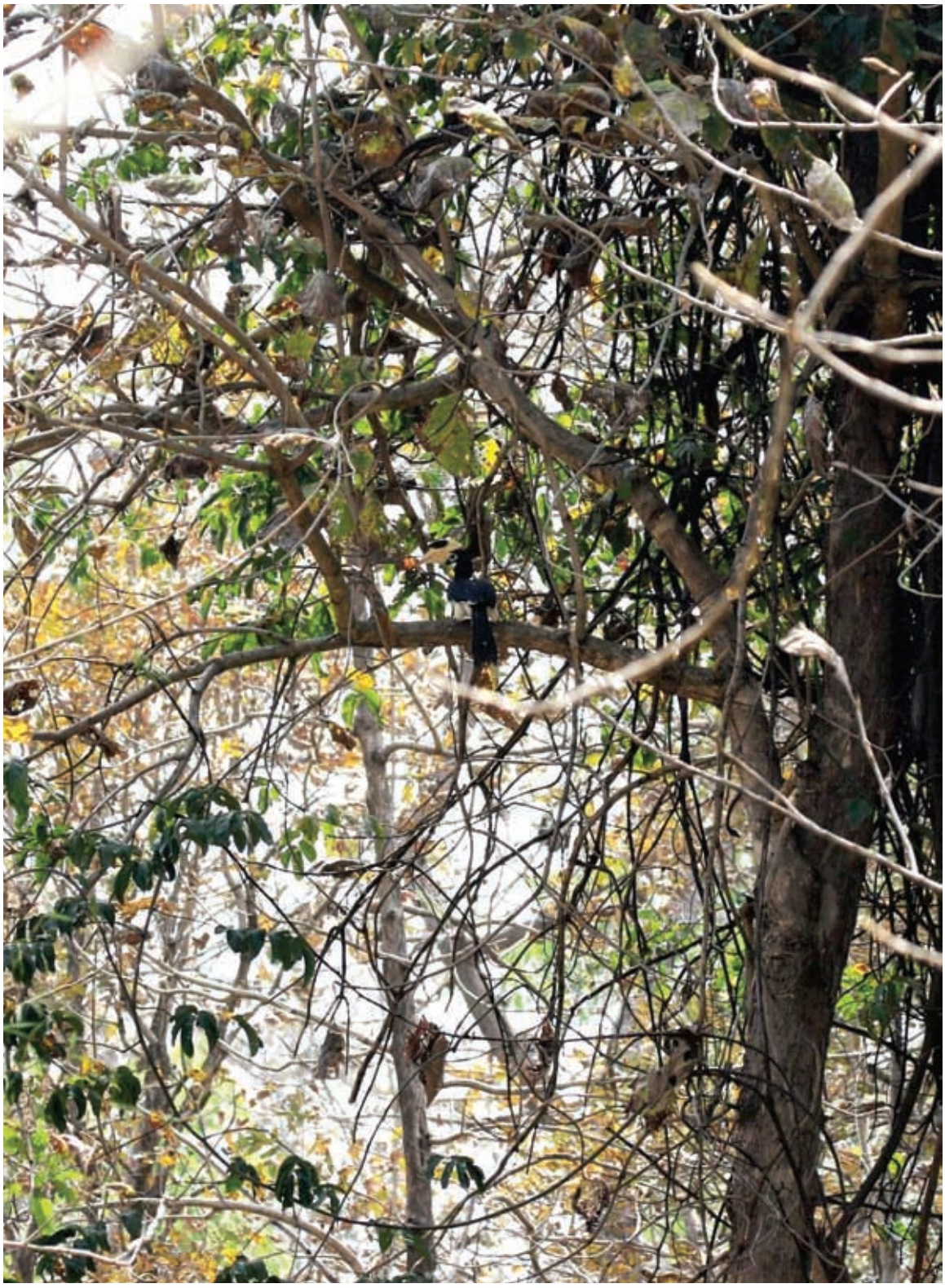
Both Pictures taken on 07-05-22 evening at five pm , first showing beak of female protruding out of the cavity and the second showing the beak is withdrawn.

CIBA Team taking Measurments of No. 2 Nest Tree

CIBA Team taking Measurments of No. 2 Nest Tree

Nest 3 :

Pictures showing male feeding the nest occupants at Lamandoh riverside taken on 04-05-2022, 2 pm.



Afternoon siesta in hot summer afternoon under shade

Breeding male seen alone, away from the crowd

Hornbills eating leaves of Cassia Siamia

- In Central India some tribals believed that hanging of skull of the bird brings fortune. But the said faith was not observed in the tribals / residents of the villages on the edges of the Pench Tiger Reserve. (Hislop, Stephen, 1866).

6.0 Conclusion –

6.1 Winter Migratory Water Birds -

PTR Maharashtra attracts a good number of migratory birds during winters. These are mostly water birds that travel from the Northern hemisphere to escape the harsh winter season. The water bodies at the PTR Maharashtra attracts large number of waders and waterfowls. The most common visitors being the Northern Pintail, Red crested Pochard, Sandpiper, Gadwall, and Common Teal. The presence of large number migratory bird, indicates good condition of water bodies. The lakes provide good amount of food and a safe place for the birds to spend the winters in the area.

Out of all the lakes studied in PTR Maharashtra Navegaon Khairy lake has the maximum diversity of migratory birds. The lake is home during winter season to Waders, Terns, Gulls, Storks, Plovers, Darters, Pratincoles, Sandpipers, Stint, Stilt, Whistling ducks, Teals, Snipes. The lake has lot of shallow areas that allows the birds to find easy food in the area. The lower areas of Navegaon Khairy are well connected to the farmlands and villages and hence the birds which are usually associated with human settlements are also found.

Wagholi, Totladoh and Bandra lakes also entice a lot of migratory birds. Northern pintails, Shovellers, Pochards, Teals can be easily found in these lakes, this indicator of presence of good number (of seeds from) aquatic plants, worms, snail crustaceans, aquatic insects, and grains at the lake.

Presence of aquatic vegetation and shallow water in lakes at PTR is the reason for the abundance of Lesser Whistling Ducks and Spot Billed Ducks. Plovers, Lapwings, Snipes, Stint, Wagtails, Pratincoles, Sandpipers indicate a good shoreline with wet soil, and presence of insects, crabs etc.

It is observed that vegetation across the bank is ample and the birds find it a safe place to roost. The food availability is plenty, be it fish or aquatic vegetation. Furthermore, it is also observed that the Winter Migratory Water

Birds have very few threats to their life by way of hunting or predation and hence this explains the presence of the winter migratory birds in large numbers.

6.2 Malabar pied hornbill - The study on Malabar pied hornbill proved that the bird is a resident breeder in PTR, Maharashtra and nests located at three locations were recorded. The population of Malabar Pied Hornbill is in PTR, Maharashtra when compared to Western Ghats, the possible reason being the dependence of the bird on the type of vegetation availability of riverine habitat, temperature, and availability of food. Although the number of Malabar Pied Hornbills observed have increased as compared to some earlier studies, as no cases of poaching or illegal hunting were recorded. The absence of any natural predators of Malabar Pied Hornbill in the area can also be an important reason for the rise in the number of the bird. Pench is also rich in flora and Fig trees form a major part. There is presence of many trees with bigger girth in the area, such as Dhoban, Arjun, Mango, Mahua, etc This makes it an ideal habitat for Malabar Pied Hornbill.

It is observed during the survey that all the nests are found in cavities on large trees, facing in north east or south east direction.

All the nests are near water streams at places where there are trees with massive girths. Malabar pied hornbills need large trees with good height and cavities at a height of about 30 feet from ground with enough space to accommodate the female so that it can turn around. Such trees being hollow are prone to threats such as storms, lightening strikes, getting washed away due to proximity with river current etc .

7.0 Suggestions

The study on winter migratory waterbirds showed that some water bodied in PTR Maharashtra like Wagholi, Totladoh, Navegaon Khari and Bandra lakes provide good habitat for the migratory birds, but this is not the case with all the water bodies. Water bodies like Nagalwadi, Ambakhori, Dhaulapur and

other lakes must be identified that can be developed as good bird hot spots and developed accordingly. Rejuvenating the lakes by removing the weeds must be done, which will increase the availability of food in the lakes eventually attracting more birds. Mud flats of shores can be developed around the lakes, this will help to attract waders.

Suggestions for conservation of Malabar Pied Hornbill in PTR Maharashtra: The bird is a cavity nester, and requires big trees to nest, protecting the old trees and old forest patches is important. Conduct a systematic survey to locate the nests of the bird in entire PTR (both Maharashtra and Madhya Pradesh), regular monitoring and protection of the nesting trees is very important.

Create awareness among the forest staff, locals and all the other stakeholders about the bird and its importance. Conduct long term study on the breeding biology of the bird is suggested for PTR Maharashtra.

Further study of ecology of Malabar pied Hornbill is required.

8.0 Photo gallery-

Trees with hole

Trees with hole

Plant photos

Pakhad-*(Ficus infectoria),*

Peepal on figs and Malabar Pied Hornbills in large numbers –

Putranjeeva *(Putranjeeva roxburghii*)

Banyan *(Ficus benghalensis)*

9.0 References

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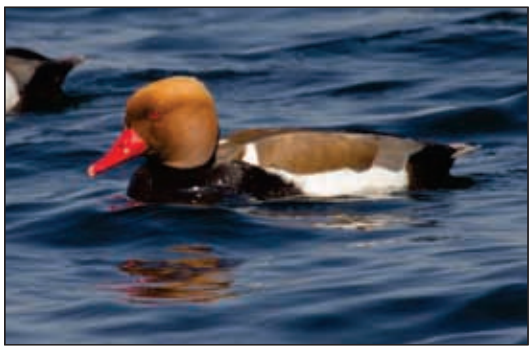
Bar headed Geese

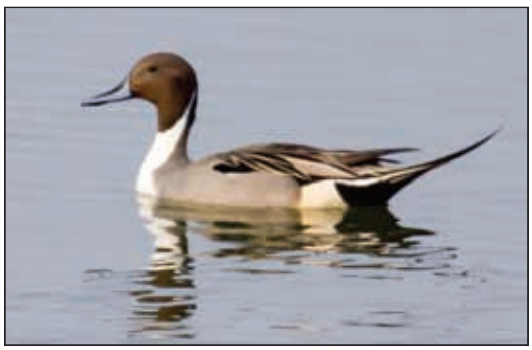
Knob billed duck

Red Crested Pochard



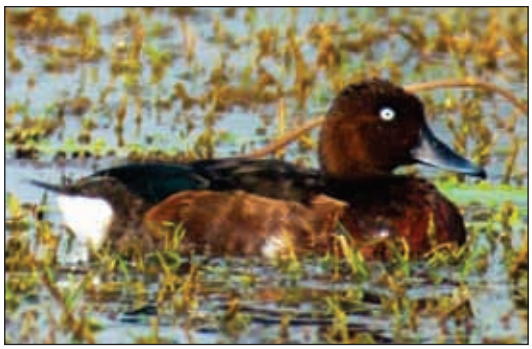
Osprey

Northern Pintail

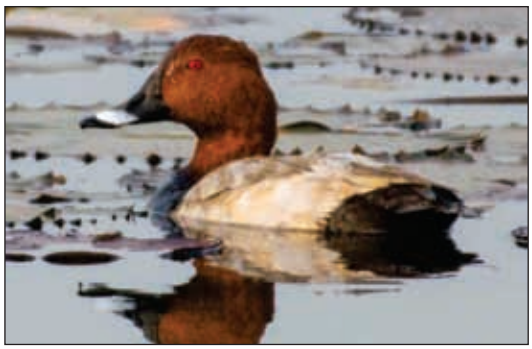


Gadwal

Ferruginous Duck



Common Pochard



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