



E-ISSN 2347-2677

P-ISSN 2394-0522

<https://www.fauajournal.com>

IJFBS 2024; 11(5): 07-17

Received: 12-06-2024

Accepted: 15-07-2024

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## Nest tree preference by Hornbill Species in Pench Tiger Reserve, Madhya Pradesh

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DOI: <https://doi.org/10.22271/23940522.2024.v11.i5a.1041>

### Abstract

The study was conducted regarding nest tree preference from March 2020 to July 2023 in Pench Tiger Reserve M.P. During the study in PTR, For MPH total 13 nest were recorded belongs to 5 plants species *Madhuca indica*, *Sterculia urens*, *Terminalia arjuna*, *Terminalia tomentosa* and *Adina Cardifolia* while in case of IGH 102 nest were recorded belongs to 16 plants species. Among the 16 plant species *Madhuca indica* was followed by *Terminalia arjuna*, *Terminalia tomentosa*, *Bombax ceiba*, *Bridelia retusa*, *Sterculia urens*, *Hymenodactylon orixense*, *Anogeissus latifolia*, *Syzygium cumini*, *Grewia tiliaefolia Vahl*, *Ficus religiosa*, *Tectona grandis*, *Lagerstroemia parviflora*, *Lannea coromandelica*, *Senegalia catechu* and *Millettia pinnata*. Among the 13 nest of MPH 9 recorded in protected area while 2 nests recorded in buffer area. Out of 102 IGH nest, 68 comes under the protected area while 34 comes under the buffer area. The mean height of the nest trees was  $36 \pm 6$  m, girth at breast height  $3 \pm 1$  m and nest height  $17 \pm 6$  m. Study reveals that the *Madhuca indica* followed *Sterculia urens* and *Terminalia arjuna* was mostly used for nesting by Malabar Pied Hornbill. In case of Indian Grey hornbill *Madhuca indica* followed by *Terminalia arjuna*, and *Terminalia tomentosa* was mostly preferred, because of longevity with maximum height, more resistance to climatic condition, natural cavity formation and better population in study area. These four plant species supports the successful nesting and significant population of Malabar Pied Hornbill and Indian Grey Hornbill in Pench Tiger Reserve.

**Keywords:** Malabar Pied Hornbill, Indian Grey Hornbill, Nesting Tree Preference, Pench Tiger Reserve, Madhya Pradesh

### Introduction

Hornbills are the one of the largest and most conspicuous birds in the old-world tropical forest, adapted to live in trees as arboreal birds. They are large-bodied, wide-ranging birds that play an important role in seed dispersal. Malabar Pied Hornbill distributed in India and Sri Lanka., while the Indian Grey Hornbill is found in India, Pakistan and Nepal ((Kemp 1995, Mudappa 2000) [20, 30]. In India the Malabar Pied hornbill is found in central and eastern India along the western ghat and IGH distributed throughout the country, excepting for Malabar area, some parts of Rajasthan and Assam. In PTR of Madhya Pradesh two species of Hornbills were recorded named as Malabar Pied Hornbill and Indian Grey Hornbill. According to the IUCN Red List (2023), Malabar Pied Hornbill listed as Near Threatened while Indian Grey Hornbill comes under the Least Concern category. It does not excavate its own nests and use available cavities (Poonswad 1995, Poonswad *et al.* 1988) [32, 33]. The female incarcerates itself within nest cavity throughout the breeding season, until the chicks' fledging. The species is known to select nest trees of significantly larger diameter and height (Mudappa & Kannan 1997) [29]. Indian Grey Hornbills breed from March to July (Ali & Ripley, 1983) [1] thus covering the entire summer months and early monsoon. The population of hornbill species is declining very rapidly because of deforestation, habitat degradation, and forest fragmentation. Nesting ecology is one of the interesting aspects in the Hornbill study and present study focus on its one of the part i.e. nests tree preference by two hornbill species in sub-tropical forest.

Very scanty information is available about its breeding behaviour. Few notes are available about the life cycle of the species, about its food and about the nesting behaviour (Charde *et al.* 2011) [35]. Hence, the present study was undertaken to understand the pattern of nest tree utilization, of Malabar Pied Hornbill and Indian Grey Hornbill in Pench Tiger Reserve.

**Study area:** Pench Tiger Reserve M.P. is situated in the districts of Seoni and Chindwara of Madhya Pradesh close to the border of Pench Tiger Reserve in M.S.

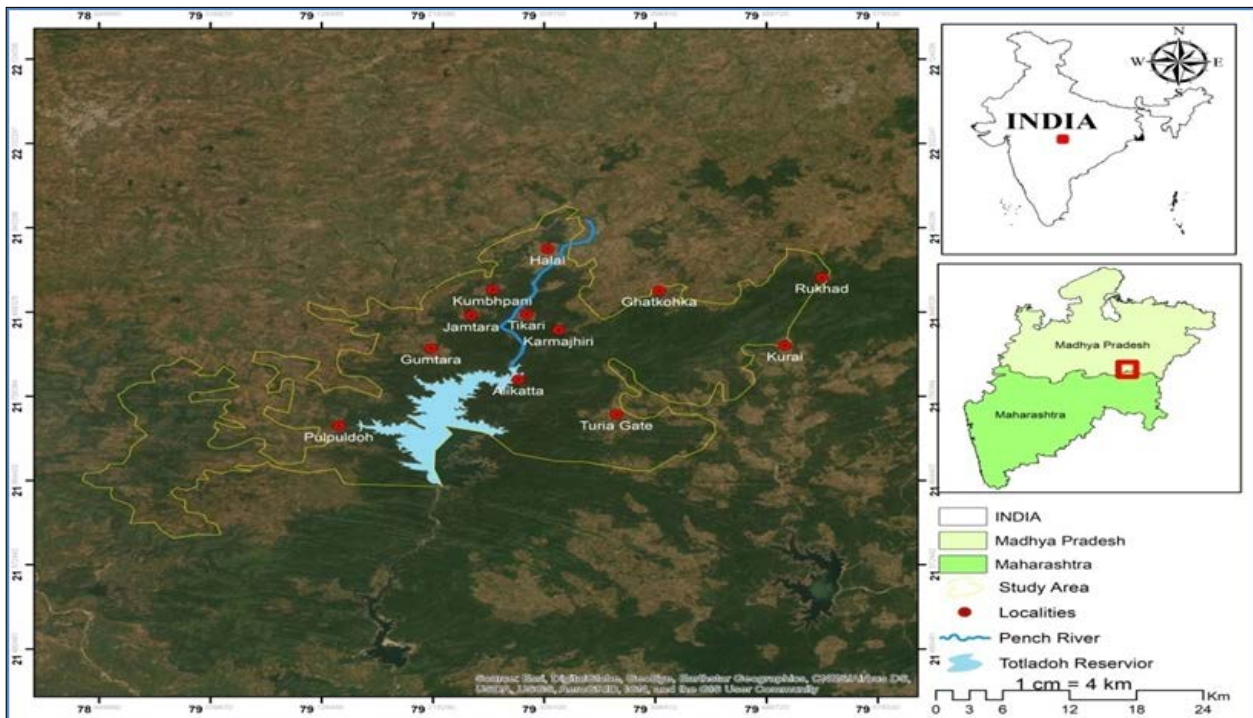
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This Tiger Reserve covers an area 757.920 sq. Km. this lies between 21° 38' to 21° 50' 30" N and 79° 09' to 79° 22' 03" E. The forest types found in the area are classified as the Sub-tropical Hill Forest, the Tropical Moist Deciduous Forest, and the Lush Green Deciduous Forest. The mean annual rainfall is around 1400 mm, with the south-west monsoon accounting for most of the rainfall in the region. The tiger reserve belongs

to indo-malayan phytogeographical region. Ecologically, Pench is categorized as tropical moist deciduous (TMD) tiger habitat. Floristically, Pench Tiger Reserve can be classified, according to Champion and Seth (1968) [7]. Evergreen tree species like *Madhuca indica*, *Terminalia arjuna*, *Bridelia retusa*, are prominently found in the proposed study area.



Map of study area

### Material and Methodology

For the purpose of this study the study region classified in two forest areas protected area and buffer area. Data were collected during the three breeding season March 2020 to July 2023. At intensively watch nest and nest chronology. Standardized survey was conducted for three hours in the morning (06:00-9:00) and two hours in evening (04:00-06:00) when hornbills are most easily detected. All data was recorded on a standardized survey sheet. Visual scanning method was used for the observation. Observations were made using monocular and binocular. Photographic documentation done using Nikon DSLR camera, other instruments like lessor meter, diameter tape also used during study. The positions of the nests were determined via the Garmin GPS device (Table 1 & 2). For determination of the tree species, native guides were asked for the local names and also used available literature. Data analysis was done by using excel and past software.

### Results

The selection of nest sites by hornbills may depend on characteristics of the nest cavity itself and of the surrounding habitat. The availability of suitable cavities is likely to be limited (Kemp 1995) [20]. Current study focus on the nest tree preference and habitat used by Malabar Pied Hornbill and Indian Grey hornbill. For Malabar Pied Hornbill total 13 nest were recorded belongs to 5 plants species *Madhuca indica* (46.15%), *Sterculia urens* (23.07%), *Terminalia arjuna* (15.38%), *Terminalia tomentosa* (7.69%) and *Adina Cardifolia* (7.69%) while in case of Indian Grey hornbill 102

nests were recorded belongs to 16 plants species. Among the 16 plant species *Madhuca indica* was (46%) followed by *Terminalia arjuna* (9.80%), *Terminalia tomentosa* (9.80%), *Bombax ceiba* (6.86%), *Bridelia retusa* (5.88%), *Sterculia urens* (4.90%), *Hymenodyctyon orixense* (3.92%), *Anogeissus latifolia* (3.92%), *Syzygium cumini* (1.96%), *Grewia tiliaefolia* Vahl (0.98%), *Ficus religiosa* (0.98%), *Tectona grandis* (0.98%), *Lagerstroemia parviflora* (0.98%), *Lannea coromandelica* (0.98%), *Senegalia catechu* (0.98%) and *Millettia pinnata* (0.98 %). Study reveals that the *Madhuca indica* followed *Sterculia urens* and *Terminalia arjuna* was mostly used for nesting by Malabar Pied Hornbill (Table 1, Graph 1).

In case of Indian Grey hornbill *Madhuca indica* followed by *Terminalia arjuna*, and *Terminalia tomentosa* was mostly preferred (Table 2, Graph 1). Forest area wise data was also recorded and forest area categories into 2 types i.e. protected area and Buffer area. Among the 13 nest of Malabar Pied Hornbill 9 recorded in protected area while 2 nests recorded in buffer area. Out of 102 Indian Grey hornbill nest, 68 comes under the protected area while 34 comes under the buffer area (Graph 4). Nesting tree also categories according to family, Malabar Pied Hornbill preferred total 5 plants species belongs to 4 families Sapotaceae (6) and Combretaceae (3), Malvaceae (3), Rubiaceae (1) and For Indian Grey hornbill among the 102 trees 47 comes under the Sapotaceae followed by Combretaceae (24), Malvaceae (13), Phyllanthaceae (6), Rubiaceae (4), Myrtaceae (2), Fabaceae (2), Moraceae (1), Lamiaceae (1), Lythraceae (1), and Anacardiaceae (1) Nest tree character like mean height of the nest trees 36±6 m, girth

at breast height  $3\pm 1$  m and nest height  $17\pm 6$  m was also recorded during the study (Table 3, Graph 2, Graph 3).

## Discussion

Cavities are an important source in forests for numerous birds and mammals which use them for nesting, roosting, and escaping from predators. To a certain scope, the preference of cavities may also depend on the faunal community, particularly in provisions of keep away from interspecific antagonism for nest sites and food (Kalina, 1988; Li & Martin, 1991; Conway & Martin, 1993) [18, 24, 11], predation (Kemp, 1976; Cody, 1985; Martin, 1988) [21, 9, 11], and the occurrence of sufficient foraging habitat (Conner, 1976) [10]. The nesting trees of the MPH were observed at a lower altitude ( $< 450$  m) in riverine habitats of the Pillur valley. Reddy *et al.* (1990) [37] and Balasubramanian *et al.* (2004) [6] stated that the importance of riverine habitats for the conservation of the MPH has been clearly underlined over the years. Mudappa & Raman (2009) [31] recorded the MPH most recurrently at lower altitude ( $< 600$  m) in moist deciduous and riverine areas on the Western Ghats. Balasubramanian *et al.* (2004) [6] observed that the distribution and variation in a number of the MPH in the Athikadavu valley region were strongly governed by the availability of fruit trees, their fruiting season and the availability of suitable roosting habitat.

For the MPH, a total of five nesting trees were identified in the Pillur Valley, namely *Madhuca longifolia*, *Spondias pinnata*, *Terminalia bellirica*, *Syzygium cumini*, and *Dysoxylum binectariferum* (Prabakaran Girikaran *et al.* 2019). Balasubramanian *et al.* (2004) [6] reported that *Madhuca longifolia* and *Terminalia arjuna* (Roxb. Ex DC.) Wight & Arn. were utilised as nesting trees by the MPH in the Athikadavu valley in the Western Ghats. Bachan *et al.* (2011) recorded that MPH nests were observed on *Tetrameles nudiflora* R. Br. And one on *Terminalia bellirica* in the

Anamalai Hills of Southern Western Ghats, India. Among the five nesting trees in the Pillur Valley, *Madhuca longifolia* was the highest utilised species by the MPH. The significance of single preference of nesting tree species (*Tetrameles nudiflora*, *Palaquium amboinense* Burck, *Syzygium spp.*, and *Pangium edule* Reinw) was reported in other studies in and outside India (Kinnaird & O'Brien, 1993; Mardiasuti *et al.*, 1996; Marsden & Jones 1997; Chimchome *et al.*, 1998) [22, 25, 26, 8]. In the Pillur valley, *Madhuca longifolia* is the dominant nesting tree for the MPH. This tree species is a hardwood tree, but is susceptible to heart rot that enhances cavity formation.

However, nest-tree and nest cavity factors may be the most important primary factors influencing the nest habitat choice in hornbills (Kannan, 1994) [5]. Raju Kasambe and Ajay Gadikar (2021) [36] reported their study for nesting in cavities in dead trees and He found that the Bhingri tree in Central Jail area in Nagpur city, in which one pair nested, was dead. In 2021, AG observed a hornbill pair a hornbill nest in a branch of a dead GoldMohur (*Delonix regia*) tree. Hornbills are known to breed in tree cavities in living trees. However, recently AG reported a pair nesting in a cavity in a concrete wall in Indore city, Madhya Pradesh (Gadikar, 2017) [15]. Indian Grey Hornbill has been reported to nest in artificial nest boxes recently at Okhla Bird Park in Noida, Uttar Pradesh (Anon 2012) [3].

Our study added total 17 plants species belongs to 11 family in nesting tree preference of Malabar Pied Hornbill and Indian Grey Hornbill. Out of 17 plant species Malabar Pied Hornbill preferred total 5 plants (*Madhuca indica*, *Terminalia arjuna*, *Terminalia tomentosa*, *Adina cordifolia* and *Sterculia urens*). Indian Grey Hornbill preferred total 16 plant species. *Adina cordifolia* was the only one of the 17 species for whom an IGH record was not found. It was found that both the hornbills species preferred *Madhuca indica*, for MPH (N=6) and for IGH (N=47) in maximum number as nesting tree.

**Table 1:** Nesting tree and habitat preferred by Malabar Pied Hornbill in PTR (M. P.), (n=13 nest)

Plant Species	Area	Locality	GPS	Elevation (m)
Mahua ( <i>Madhuca indica</i> )	Chhedia Ghat	Protected Area	N21 <sup>049</sup> '22.87'' E79 <sup>016</sup> '30.14''	520
	Alikatta	Protected Area	N21 <sup>048</sup> '351'' E79 <sup>018</sup> '941''	510
	Jamun Nala	Protected Area	N21 <sup>049</sup> '26.77'' E79 <sup>018</sup> '15.65''	542
	Halal	Buffer	N21 <sup>052</sup> '22.47'' E79 <sup>017</sup> '41.30''	537
	Chindwani	Protected Area	N21 <sup>046</sup> '51.20'' E79 <sup>012</sup> '39.40''	506
	Totladoh	Protected Area	N21 <sup>046</sup> '51.20'' E79 <sup>012</sup> '39.40''	472
Arjun ( <i>Terminalia arjuna</i> )	Dongakassa	Protected Area	N21 <sup>048</sup> '22.89'' E79 <sup>017</sup> '22.45''	528
	Jamtara	Protected Area	N21 <sup>050</sup> '21.44'' E79 <sup>016</sup> '01.85''	439
Ghost Tree ( <i>Sterculia urens</i> )	Chindwani	Protected Area	N21 <sup>047</sup> '12.51'' E79 <sup>013</sup> '22.80''	523
	Chindwani	Protected Area	N21 <sup>047</sup> '17.18'' E79 <sup>014</sup> '51.70''	536
	Karmajhiri	Protected Area	N21 <sup>049</sup> '24.34'' E79 <sup>019</sup> '24.32''	561
Saja ( <i>Terminalia tomentosa</i> )	Sakata	Buffer	N21 <sup>049</sup> '31.48'' E79 <sup>042</sup> '08.14''	498
Haldu ( <i>Adina cordifolia</i> )	Gumtara	Protected Area	N21 <sup>047</sup> '44.50'' E79 <sup>015</sup> '09.03''	531

**Table 2:** Nesting tree and habitat preferred by Indian Grey Hornbill in PTR (M. P.), (n= 102 nest)

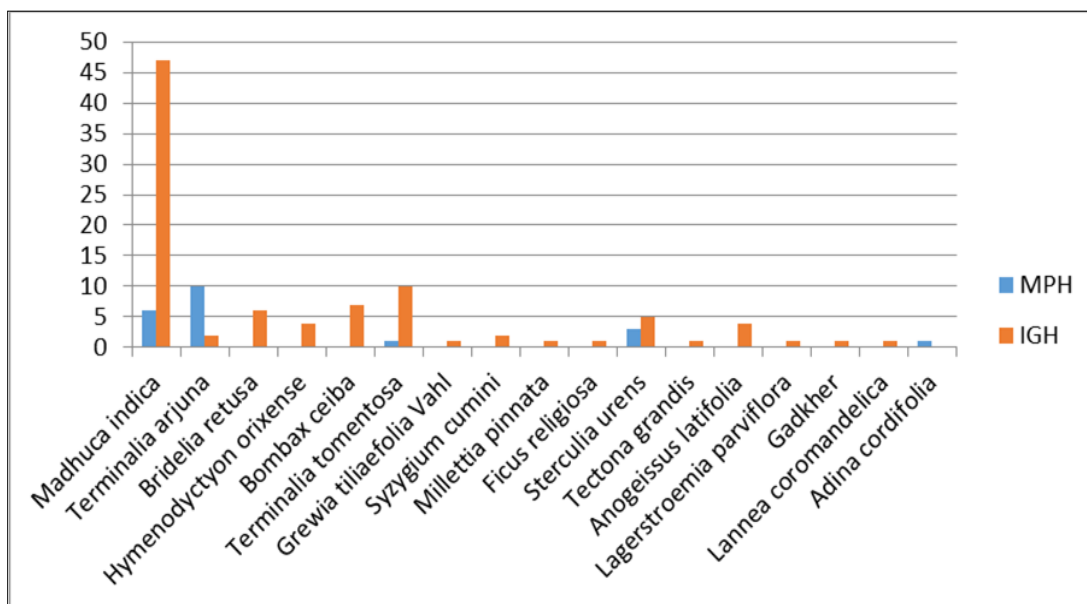
Plant Species	Localities	Forest area	GPS	Elevation
Mahua ( <i>Madhuca indica</i> )	Barelipar	Buffer	N21 <sup>050</sup> '07.51'' E79 <sup>020</sup> '28.73''	512
	Alikatta area	Protected Forest	N21 <sup>046</sup> '10.34'' E79 <sup>017</sup> '15.41''	501
	Near Turia Gate	Buffer	N21 <sup>044</sup> '19.79'' E79 <sup>020</sup> '12.63''	467
	Kumbhpani Range	Buffer	N21 <sup>052</sup> '24.75'' E79 <sup>017</sup> '45.73''	539
	Near Kumbhpani Village	Buffer	N21 <sup>052</sup> '21.01'' E79 <sup>016</sup> '15.43''	551
	Kumadeo	Protected Forest	N21 <sup>049</sup> '07.84'' E79 <sup>018</sup> '22.03''	537
	Raiyakassa	Protected Area	N21 <sup>048</sup> '43.86'' E79 <sup>017</sup> '54.83''	524
	Halal	Buffer	N21 <sup>050</sup> '57.31'' E79 <sup>011</sup> '02.01''	530
	Bakodikassa	Protected Area	N21 <sup>049</sup> '51.92'' E79 <sup>015</sup> '56.94''	532
	Bakodikassa	Protected Area	N21 <sup>049</sup> '51.96'' E79 <sup>015</sup> '59.02''	535
	Bakodikassa	Protected Area	N21 <sup>050</sup> '08.27'' E79 <sup>015</sup> '44.45''	536
	Jamtara	Protected Forest	N21 <sup>051</sup> '01.98'' E79 <sup>014</sup> '40.61''	541
	Sajpani	Buffer	N21 <sup>055</sup> '21.74'' E79 <sup>017</sup> '32.82''	577
	Sajpani	Buffer	N21 <sup>055</sup> '11.22'' E79 <sup>017</sup> '41.89''	564
	Chiklakassa	Protected Forest	N21 <sup>051</sup> '01.98'' E79 <sup>014</sup> '40.61''	541
	GhosalGhat	Protected Forest	N21 <sup>049</sup> '45.32'' E79 <sup>018</sup> '24.94''	524
	Alikatta	Protected Forest	N21 <sup>046</sup> '15.62'' E79 <sup>017</sup> '46.95''	522
	MannuTalab	Protected Forest	N21 <sup>048</sup> '21.93'' E79 <sup>019</sup> '09.78''	555
	Chindwani Check Post	Protected Forest	N21 <sup>047</sup> '03.53'' E79 <sup>013</sup> '28.61''	538
	Pathra	Protected Area	N21 <sup>047</sup> '21.22'' E79 <sup>013</sup> '01.90''	518
	Pathra	Protected Area	N21 <sup>047</sup> '35.12'' E79 <sup>012</sup> '24.79''	539
	Chindwani Check Post	Protected Forest	N21 <sup>047</sup> '04.23'' E79 <sup>014</sup> '07.38''	513
	Chindwani	Protected Area	N21 <sup>046</sup> '36.34'' E79 <sup>014</sup> '17.49''	496
	Jamtara Check Post	Buffer	N21 <sup>050</sup> '56.97'' E79 <sup>016</sup> '12.76''	524
	Jamtara Check Post	Buffer	N21 <sup>050</sup> '53.83'' E79 <sup>016</sup> '24.63''	541
	Kumbhadeo	Buffer	N21 <sup>049</sup> '08.40'' E79 <sup>018</sup> '22.70''	531
	ChhediaGhat Camp	Protected Forest	N21 <sup>049</sup> '32.62'' E79 <sup>017</sup> '40.95''	517
	Khamba	Buffer	N21 <sup>046</sup> '26.22'' E79 <sup>022</sup> '31.45''	552
	Pulpuldoh	Core	N21 <sup>074</sup> '64.01'' E79 <sup>018</sup> '79.77''	557
	Sakata	Buffer	N21 <sup>049</sup> '11.55'' E79 <sup>040</sup> '15.56''	470
	Kokiwada	Core	N21 <sup>043</sup> '52.06'' E79 <sup>012</sup> '02.95''	501
	Kumbhpani	Buffer	N21 <sup>052</sup> '26.58'' E79 <sup>016</sup> '07.01''	557
Naharjhiri	Core	N21 <sup>050</sup> '14.33'' E79 <sup>014</sup> '30.59''	566	

	Naharjhiri	Core	N21 <sup>050</sup> '10.38'' E79 <sup>014</sup> '30.60''	569
	Gumtara	Protected Area	N21 <sup>048</sup> '34.10'' E79 <sup>014</sup> '26.36''	541
	Gumtara	Protected Area	N21 <sup>048</sup> '04.08'' E79 <sup>014</sup> '09.97''	540
	Naharjhiri	Protected Area	N21 <sup>050</sup> '16.19'' E79 <sup>014</sup> '40.16''	518
	Naharjhiri	Protected Area	N21 <sup>050</sup> '12.60'' E79 <sup>013</sup> '58.92''	574
	UpasiyaNala, Gumtara	Protected Area	N21 <sup>048</sup> '04.17'' E79 <sup>014</sup> '17.04''	532
	Gumtara	Protected Area	N21 <sup>047</sup> '36.51'' E79 <sup>014</sup> '54.28''	525
	Baghdeo	Protected Area	N21 <sup>047</sup> '39.15'' E79 <sup>014</sup> '42.58''	525
	Gumtara	Protected Area	N21 <sup>047</sup> '42.57'' E79 <sup>014</sup> '07.64''	540
	Pirababa	Protected Area	N21 <sup>039</sup> '42.09'' E79 <sup>012</sup> '20.76''	545
	Kumadeo	Protected Area	N21 <sup>047</sup> '55.01'' E79 <sup>018</sup> '39.12''	
	Jamtara	Buffer	N21 <sup>050</sup> '20.30'' E79 <sup>014</sup> '42.49''	551
	Mahadeo Ghat	Protected Area	N21 <sup>047</sup> '13.30'' E79 <sup>016</sup> '85.86''	505
	Mannu Talab	Protected Area	N21 <sup>047</sup> '84.82'' E79 <sup>019</sup> '31.74''	564
Arjun ( <i>Terminalia arjuna</i> )	ChhediaGhat Camp	Protected Forest	N21 <sup>049</sup> '26.09'' E79 <sup>017</sup> '04.95''	503
	Tekari Road	Protected Forest	N21 <sup>048</sup> '25.74'' E79 <sup>017</sup> '24.14''	512
	JamunNala	Protected Forest	N21 <sup>049</sup> '52.14'' E79 <sup>018</sup> '27.48''	532
	Kurai	Protected Forest	N21 <sup>046</sup> '07.62'' E79 <sup>026</sup> '18.91''	426
	Kurai	Buffer	N21 <sup>048</sup> '50.04'' E79 <sup>029</sup> '21.94''	435
	Halal	Buffer	N21 <sup>052</sup> '55.20'' E79 <sup>017</sup> '59.99''	518
	Jamtara-Dongakassa	Protected Forest	N21 <sup>049</sup> '37.10'' E79 <sup>027</sup> '14.18''	522
	Baghdeo	Protected Forest	N21 <sup>048</sup> '03.03'' E79 <sup>022</sup> '14.53''	436
	Pathra	Protected Area	N21 <sup>047</sup> '18.64'' E79 <sup>012</sup> '24.77''	527
	Baghdeo	Protected Area	N21 <sup>047</sup> '19.62'' E79 <sup>011</sup> '57.07''	498
Kasai ( <i>Bridelia retusa</i> )	Alikatta	Protected Area	N21 <sup>046</sup> '13.38'' E79 <sup>017</sup> '31.79''	509
	Kumadeo	Protected Forest	N21 <sup>049</sup> '08.36'' E79 <sup>017</sup> '03.16''	554
	Kumadeo	Protected Forest	N21 <sup>049</sup> '03.57'' E79 <sup>018</sup> '30.43''	545
	Kumadeo	Protected Forest	N21 <sup>049</sup> '20.61'' E79 <sup>019</sup> '01.12''	559
	Kumadeo	Protected Forest	N21 <sup>048</sup> '58.24'' E79 <sup>018</sup> '26.48''	548
	Chindwani Check Post	Protected Forest	N21 <sup>047</sup> '11.72'' E79 <sup>013</sup> '43.53''	516
Bhormal ( <i>Hymenodictyon orixense</i> )	Karmajhiri-Tekari Road	Protected Forest	N21 <sup>049</sup> '55.64'' E79 <sup>017</sup> '47.83''	535
	Richi	Buffer	N21 <sup>052</sup> '33.85'' E79 <sup>019</sup> '49.93''	561
	Sajpani	Buffer	N21 <sup>055</sup> '29.68'' E79 <sup>019</sup> '01.52''	563
	Bodanala	Protected Forest	N21 <sup>046</sup> '41.06'' E79 <sup>020</sup> '33.77''	487
Red Silk cotton tree ( <i>Bombax ceiba</i> )	Nayagaon	Buffer	N21 <sup>053</sup> '20.93''	583

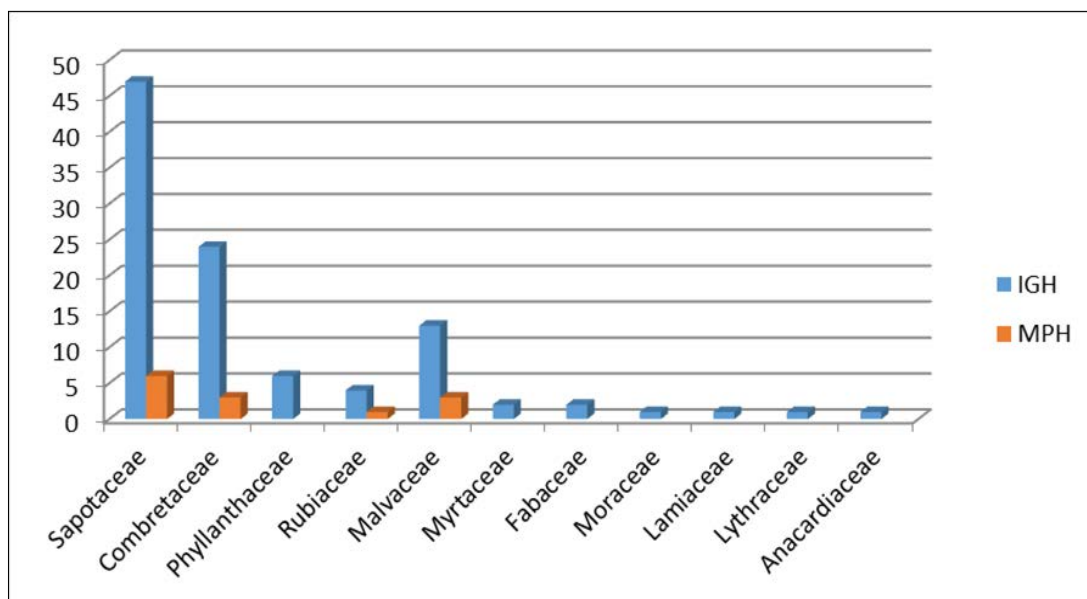
			E79°35'00.02''	
	Chindwani	Protected Forest	N21°46'33.15'' E79°13'32.85''	518
	Chindwani	Protected Forest	N21°46'55.60'' E79°13'03.00''	503
	Chindwani Check Post	Protected Forest	N21°46'50.01'' E79°13'43.85''	534
	Near JamunNala Camp	Protected Forest	N21°49'49.58'' E79°18'54.88''	540
	Bakodikassa	Protected Area	N21°50'29.54'' E79°15'55.31''	534
	Kumbhpani	Buffer	N21°51'37.03'' E79°15'30.96''	546
Saja ( <i>Terminalia tomentosa</i> )	Kumbhpani	Buffer	N21°51'40.85'' E79°17'26.34''	519
	Chindwani Check Post	Protected Forest	N21°46'53.68'' E79°14'11.75''	510
	Near Kumbhpani Village	Buffer	N21°52'09.90'' E79°17'58.45''	526
	Halal	Buffer	N21°52'09.95'' E79°17'59.45''	535
	Halal	Buffer	N21°51'41.03'' E79°17'25.75''	511
	Halal	Buffer	N21°52'14.84'' E79°17'59.82''	529
	Chindwani	Protected Area	N21°46'51.48'' E79°14'14.89''	503
	Mahadeo Ghat	Protected Area	N21°48'04.92'' E79°16'48.01''	497
	Chindwani	Protected Area	N21°47'25.39'' E79°13'30.22''	534
	Karmajhiri	Buffer	N21°50'18.50'' E79°19'19.12''	561
	Dhaman ( <i>Grewia tiliae folia Vahl</i> )	Kumadeo	Protected Forest	N21°49'18.83'' E79°19'06.89''
Jamun ( <i>Syzygium cumini</i> )	JamunNala	Protected Forest	N21°49'50.85'' E79°18'14.69''	517
	Nariyal Camp	Buffer	N21°49'06.87'' E79°35'42.90''	432
Karanji ( <i>Millettia pinnata</i> )	Rukhad	Buffer	N21°51'38.74'' E79°32'12.27''	525
Dhawda ( <i>Anogeissus latifolia</i> )	Gumtara Check Post	Protected Area	N21°48'33.65'' E79°13'38.94''	540
	Gumtara	Protected Area	N21°48'29.66'' E79°14'20.26''	533
	Gumtara	Protected Area	N21°48'04.42'' E79°14'12.79''	530
	Runi Zuni Trail	Protected Area	N21°49'24.34'' E79°19'24.82''	561
Pipal ( <i>Ficus religiosa</i> )	Pathra	Protected Area	N21°47'43.41'' E79°15'08.91''	521
Ghost Tree ( <i>Sterculia urens</i> )	Chindwani	Protected Area	N21°47'25.74'' E79°14'00.54''	544
	Totla Doh	Protected Area	N21°39'09.52'' E79°13'04.93''	440
	Pathra	Protected Area	N21°47'19.93'' E79°12'36.70''	525
	Pathra	Protected Area	N21°47'05.53'' E79°13'04.01''	549
	Pathra	Protected Area	N21°47'24.28'' E79°12'35.45''	533
Teak ( <i>Tectona grandis</i> )	Halal	Buffer	N21°52'35.61'' E79°17'48.14''	540
Lendia ( <i>Lagerstroemia parviflora</i> )	Pathra	Protected Area	N21°47'06.16'' E79°17'35.47''	526
<i>Senegalia catechu</i>	Halal	Buffer	N21°52'37.09'' E79°17'46.93''	510
Mahin ( <i>Lannea coromandelica</i> )	Datfadia	Protected Area	N21°45'37.03'' E79°13'14.37''	509

**Table 3:** Species wise nest tree preference by Malabar Pied Hornbill and Indian Grey Hornbill

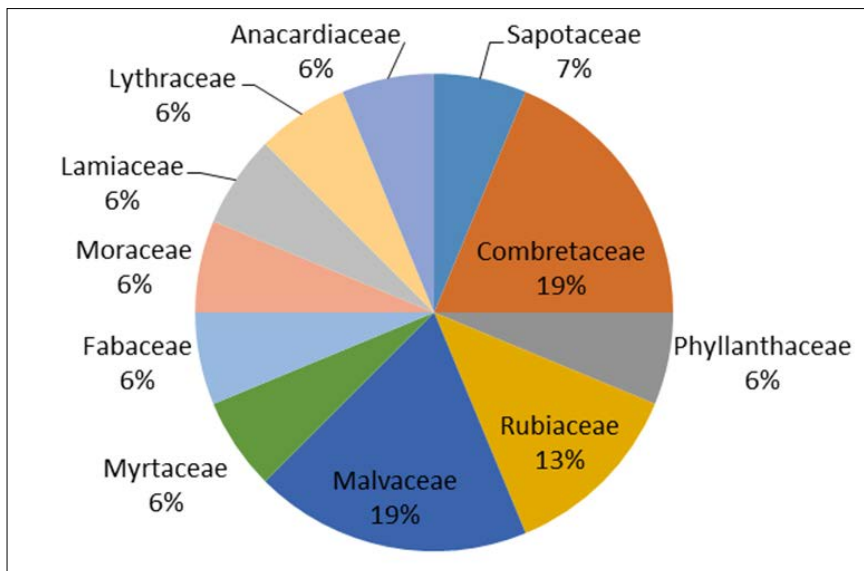
Family	Plant Species	MPH	IGH
Sapotaceae	<i>Madhuca indica</i>	6	47
Combretaceae	<i>Terminalia arjuna</i>	2	10
	<i>Terminalia tomentosa</i>	1	10
	<i>Anogeissus latifolia</i>	-	4
Phyllanthaceae	<i>Bridelia retusa</i>	-	6
Rubiaceae	<i>Hymenodyctyon orixense</i>	-	4
	<i>Adina cordifolia</i>	1	-
Malvaceae	<i>Bombax ceiba</i>	-	7
	<i>Grewia tiliaefolia Vahl</i>	-	1
	<i>Sterculia urens</i>	3	5
Myrtaceae	<i>Syzygium cumini</i>	-	2
Fabaceae	<i>Millettia pinnata</i>	-	1
	<i>Senegalia catechu</i>	-	1
Moraceae	<i>Ficus religiosa</i>	-	1
Lamiaceae	<i>Tectona grandis</i>	-	1
Lythraceae	<i>Lagerstroemia parviflora</i>	-	1
Anacardiaceae	<i>Lansea coromandelica</i>	-	1
Total		13	102



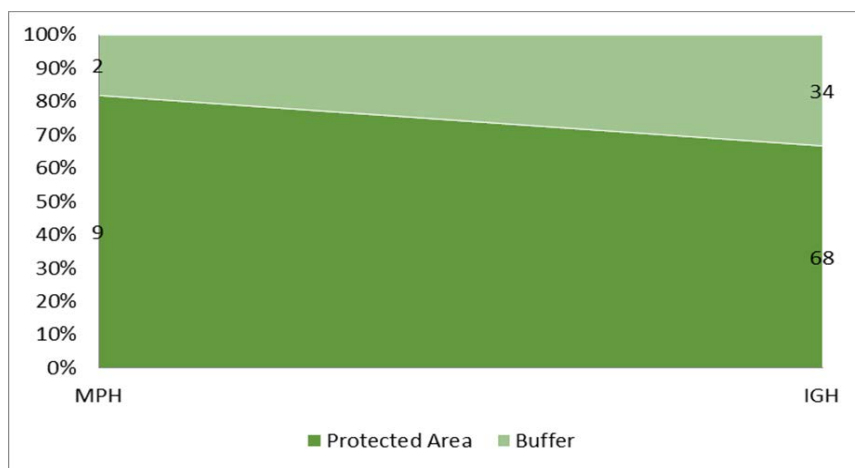
**Graph 1:** Showing species wise nest tree preference by Malabar Pied Hornbill (MPH) and Indian Grey Hornbill (IGH)



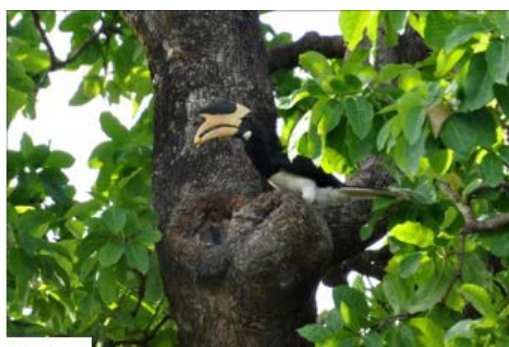
**Graph 2:** Family wise nest tree preference by Malabar Pied Hornbill (MPH) and Indian Grey Hornbill (IGH)



**Graph 3:** % wise number of nest trees in particular family



**Graph 4:** Forest area wise distribution of total nest



(a)



(b)

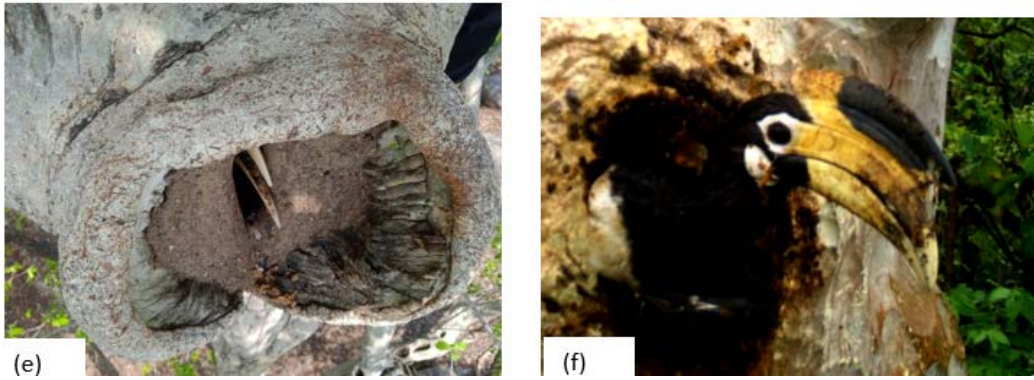


(c)



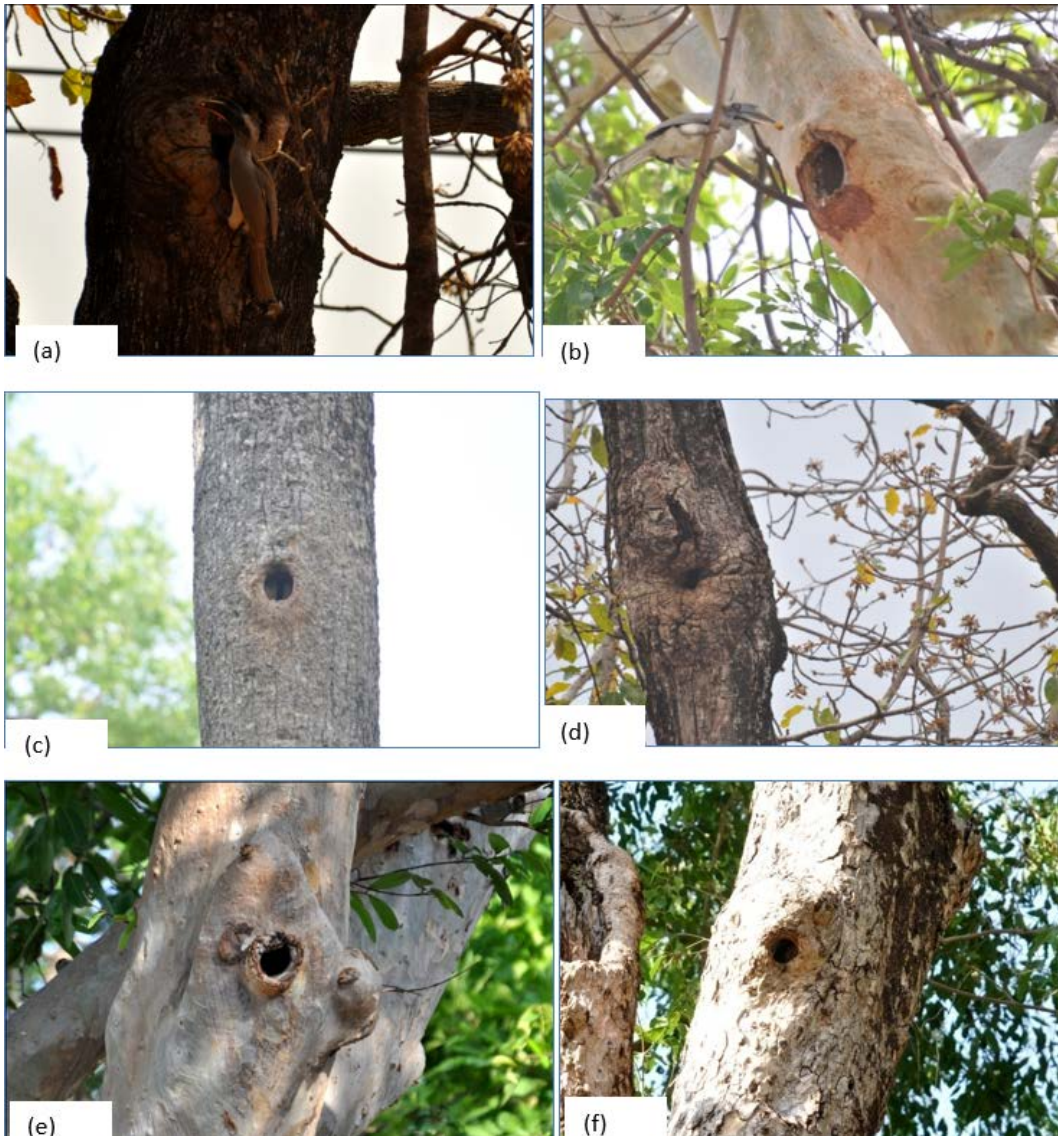
(d)





**Active Nest of Malabar Pied Hornbill:**

(a) *Madhuca indica* (b) *Terminalia arjuna* (c) *Madhuca indica* (d) *Madhuca indica* (e) *Adina cordifolia* (f) *Sterculia urens*



**Active nests of Indian Grey Hornbill:**

(a) *Madhuca indica* (b) *Terminalia arjuna* (c) *Terminalia tomentosa* (d) *Madhuca indica* (e) *Terminalia arjuna* (f) *Syzygium cumini*

**Conclusion**

*Madhuca indica*, *Sterculia urens*, *Terminalia arjuna* and *Terminalia tomentosa* mostly preferred by both the Hornbill species for nesting in study area, because of longevity with maximum height, more resistance to climatic condition, natural cavity formation and better population in study area. These four-plant species supports the successful nesting and significant population of Malabar Pied Hornbill and Indian

Grey Hornbill in Pench Tiger Reserve.

**Acknowledgement**

Sincere appreciation must be extended to the PCCF Wildlife, Forest Department, Madhya Pradesh for granting permission for our research in Pench Tiger Reserve. We are also grateful to Madhya Pradesh Biodiversity Board, Madhya Pradesh for their financial assistance. We would like to thank all the field

members Mr. Mithlesh shirsam, Mr. Sumit Ambulkar, Mr. Pratik Chaudhari and special thanks to Mr. Shubham Wagh for his efforts toward study area map designing. I also very thanks full to Principal Dr. G. V. Korpe for their time to time support.

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