

PR86

**ECOLOGY OF INDIAN GREY HORNBILL (*Ocyceros birostris*)  
WITH SPECIAL REFERENCE TO ITS ROLE IN SEED  
DISPERSAL IN SOUTHERN EASTERN GHATS**

SACON Library



PR86

**PRINCIPAL INVESTIGATOR  
Dr. P. BALASUBRAMANIAN**



**RESEARCH FELLOW  
E. SANTHOSHKUMAR**



*Salim Ali Centre for Ornithology and Natural History*

2009

**ECOLOGY OF INDIAN GREY HORNBILL (*Ocyrocus birostris*) WITH  
SPECIAL REFERENCE TO ITS ROLE IN SEED DISPERSAL IN  
SOUTHERN EASTERN GHATS**

**Project funded by the Ministry of Environment and Forests,  
Govt. of India**

**FINAL REPORT**

**Principal Investigator  
Dr. P. Balasubramanian**



**PR86**

**Research Fellow  
E. Santhoshkumar**

SACON Library



PR86



***Salim Ali Centre for Ornithology and Natural History  
Coimbatore***

**2009**

## CONTENTS

List of tables and figures	
Acknowledgement	
Summary	i
<b>Chapter 1. Introduction</b>	<b>1</b>
1.1. Hornbills	1
1.2. Indian Grey Hornbill	3
1.3. Objectives	3
<b>Chapter 2. Study area</b>	<b>4</b>
2.1. Eastern Ghats	5
2.2. Climate	6
2.3. Forests	7
2.4. Southern Eastern Ghats	7
2.5. Sathyamangalam Forest Division	9
2.6. Hasanur Range	10
<b>Chapter 3. Review of literature</b>	<b>11</b>
3.1. Studies on hornbills in India	12
3.2. Studies on Hornbills overseas	13
<b>Chapter 4. Methodology</b>	<b>15</b>
4.1. Breeding season diet	15
4.2. Non-breeding season diet	15
4.3. Phenology of food plants	16
4.4. Nesting ecology	16
4.5. Role in seed dispersal and regeneration	16
4.6. Vegetation studies	17

<b>Chapter 5. Results and discussion</b>	18
5.1. Vegetation in hornbill habitats	18
5.1.1. Dry deciduous forest	19
5.1.2. Riverine habitat	19
5.2. Phenology	24
5.2.1. Results	24
5.2.2. Discussion	28
5.3. Non-breeding diet	29
5.3.1. Results	29
5.3.2. Discussion	32
5.4. Nesting biology	34
5.4.1. Results	34
5.4.2. Discussion	36
5.5. Breeding biology and breeding season diet	38
5.5.1. Results	38
5.5.1. Discussion	43
5.6. Seed dispersal by hornbills	45
5.6.1. Results	45
5.6.2. Discussion	49
5.7. Seed germination experiments	52
5.7.1. Results	52
5.7.2. Discussion	56
<b>Chapter 6. Conservation Implications</b>	58
6.1. Importance of birds in seed dispersal	58
6.2. Distribution of Indian Grey Hornbill in southern Eastern Ghats	60
6.3. Important bird habitats	60
6.4. Threats	60
6.5. Conservation measures proposed	60
<b>7. References</b>	62
<b>8. Appendix – I</b>	
<b>9. Appendix - II</b>	

## Summary

Hornbills are one of the most recognizable groups among birds. They are distributed in Sub-saharan Africa, Australia, South-east Asia and India. Among the 54 species of hornbills in the world, 9 species occur in India. Indian Grey Hornbill (*Ocyrceros birostris*) also known as Common Grey Hornbill is distributed in India, Pakistan, Nepal and North-west Bangladesh. Hornbills have specific food preferences and foraging techniques. As hornbills are primarily frugivorous, they interact with a variety of fleshy-fruited species for their food requirements. Habitat destruction and loss of nest trees are reported to affect the population of this species. Hence, the present study was undertaken to understand the ecology of the species, and to establish its role in seed dispersal and regeneration of its food plants in southern Eastern Ghats.

Based on an earlier survey conducted by the Principal investigator of this project in the Eastern Ghats, Hasanur Range in Sathyamangalam Forest Division (11°40'-12.20' N latitude and 77°07'- 87° 7' E longitude), Tamil Nadu was selected for the present study.

To assess the availability of fruits in the study area, a total of 210 individuals belonging to 21 fruiting plant species were tagged for phenology studies. The flowering and fruiting activity were recorded once in a fortnight. To enumerate the distribution of food and nest trees used by Indian Grey hornbills, a phytosociological assessment was done in the hornbill habitats. A total of 2 ha. was selected to quantify the vegetation.

Fruit utilization by the hornbills during the non-breeding season was determined by focal animal sampling. Number of hornbills foraging on fruit bearing trees was recorded while walking along transects. In the breeding season, five nests were selected and monitored for 720 hrs. Data on number of visits made by the male, number of fruits delivered by the male to the nest inmates and fruit species were gathered. Fruit utilization was also assessed by identifying the seeds from nest and roost middens. Fruit preference of Indian Grey Hornbill was assessed by using Ivlev's Preference Index. The nest site characteristics such as tree girth at breast height, total tree height, nest height, girth at nest height, inner depth of the cavity, nest entrance length, nest entrance width were recorded to find out the nest site preferences. To establish the role of Indian Grey Hornbill in seed dispersal and regeneration of its food plants, seeds collected from the middens were subjected to germination experiments with control seeds collected from plants, for comparison. Midden depositions under the nest and roost trees were monitored to record the natural regeneration of hornbill's food plants. Seedlings and saplings under the nest trees were recorded by laying 3X3m plots both in front of and behind the nest tree, after the monsoon.

The results of the phytosociological analysis revealed the occurrence of 322 trees belonging to 30 species in the 1 ha plot of the dry deciduous forest with Shannon's Diversity Index of 2.64. A total of 588 trees belonging to 64 species of trees were recorded in the riverine habitat with the Shannon's Diversity Index of 3.40. Dominant trees in the riverine habitat include *Pongamia pinnata*, *Terminalia arjuna* and *Mangifera indica*. Dominant trees in the dry deciduous forest are *Vitex altissima*, *Erythroxylum monogynum* and *Bambusa arundinacea*. Indian Grey

Hornbill used six tree species for nesting; all the six species are confined to the riverine habitat. Density of the nest trees in the riverine habitat was found to be higher than in the dry deciduous forest.

The assessment of fruit availability revealed that at least five species had fruits every month. Fruiting seasonality was observed. Fruiting peak was observed in May and July in both the years. While some species showed seasonal fruiting behaviour, figs were aseasonal.

During the non-breeding season, a total of 3086 feeding observations were made on Indian Grey Hornbill. Thirty eight fruit species belonging to 21 plant families were consumed. Six species of *Ficus* (*Ficus benghalensis*, *F. drupacea*, *F. infectoria*, *F. microcarpa*, *F. racemosa*, *F. religiosa*) constituted 25% of the diet. In addition to *Ficus* spp., fruits of *Diospyros montana* (Ebenaceae) and *Vitex altissima* (Verbenaceae) were also consumed in large quantities. Ivlev's Preference Index showed that *Bridelia crenulata* (0.97), *Ficus religiosa* (0.95), *Solanum erianthum* (0.95), *Drypetes roxburghii* (0.94), *Ficus drupacea* (0.94) were the preferred food plant species.

Thirty two active nests were recorded during the breeding seasons 2007 and 2008. Nest trees included *Melia dubia*, *Syzygium cumini*, *Mangifera indica*, *Albizia odoratissima*, *Terminalia arjuna* and *Terminalia bellirica*. The nest tree characteristics shows that the average nest tree girth at breast height (cm) was  $334.49 \pm 101.05$ , tree height (m)  $23.32 \pm 6.68$ , nest height (m)  $14.63 \pm 6.74$ , girth at nest height (cm)  $177.77 \pm 41.55$ , inner depth (cm)  $51.36 \pm 10.74$ , nest entrance length (cm)  $14.60 \pm 5.11$ , nest entrance width (cm)  $12.23 \pm 2.70$ . Ivlev's Preference



Index showed that Indian Grey Hornbill's most preferred nest tree was *Melia dubia* (Meliaceae) (PI=0.27).

The nesting season lasted for about three months, from March to June and the nesting period averaged 87 days. During the breeding season, nest inmates were fed by loads of food items by the male. Fruits of 26 plant species belonging to 16 plant families were utilized during the breeding season among which 14 species were identified by monitoring the nests and 12 species from nest midden analysis. A total of 13680 observations was made at the focal nests. Food items delivered to the nest inmates comprised both vegetable (64%) and animal (36%) matter. A majority of the vegetable diet comprised figs (26%). The study reveals that the Indian Grey Hornbill is predominantly frugivorous.

Altogether, Indian Grey Hornbill utilized 41 plant species belonging to 22 plant families. In twenty, 3X3 m quadrats laid in front of and behind the nest trees, 44 species of seedlings and saplings were recorded, among which 24 species (54.5%) were found to be the food plant species of Indian Grey Hornbill. The number of seedlings and saplings of hornbill's food plant species in front of the nests was higher than that of non-diet species. Seedlings and saplings of diet species such as *Santalum album*, *Diospyros montana*, *Premna tomentosa*, *Filicium decipiens*, *Syzygium cumini* and *Drypetes roxburghii* were recorded in the majority of the quadrats in front of the nests.

Seeds of various species collected from the nest middens were segregated and sowed in polythene bags with a mixture of soil and sand. Seeds collected from the trees were grouped in to (i) seeds with pulp and (ii) pulp removed seeds, which were as control. Seeds collected from the



hornbill droppings showed higher germination efficiency indicating the role of Indian Grey Hornbill in enhancing the germination percentage of seeds of their food plants. Economically important trees benefited by Indian Grey Hornbill included *Santalum album*, *Drypetes roxburghii*, *Diospyros montana*, *Strychnos potatorum*, *Vitex altissima*, *Celtis tetrandra* and *Syzygium cumini*.

Some conservation measures are suggested for the management of hornbill habitats in southern Eastern Ghats.