HORNBILLS

The resonators of forest health

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SACON

Ministry of Environment, Forest and Climate Change

UNDP

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HORNBILLS

The resonators of forest health

MESSAGE

Government of Kerala

Pinarayi Vijayan
Chief Minister

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People's participatory movements are a key component towards sustainable conservation of the ecosystem. The Government of Kerala has recognised the value of the participatory model through many of its successful initiatives. Local knowledge, combined with targeted awareness campaigns have succeeded in boosting the conservatory efforts of landscape, flora and fauna. Understanding a threatened area or species is essential in developing an awareness towards the need for conservation.

The Great Hornbill, the State Bird of Kerala is in the path of extinction. The conservation of Hornbills is vital not just for the species, but for the ecosystem as well. The contribution of the local populations, indigenous groups, conservation activists, students, youth, volunteers and the general public for the conservation of these marvellous birds is welcome.

This book on Hornbills of the Western Ghats is a significant step towards the conservation of our Hornbills. The steps taken by the UNDP-IHRML Project and the Haritha Keralam Mission in the conservation of Hornbills, and the publication of this book is much appreciated.

Pinarayi Vijayan

MESSAGE

Ruchi Pant
Chief–Climate Change, Resilience, NR & Chemicals Management, UNDP India

India is blessed with an immense diversity of flora and fauna. With its varied climatic and geographic conditions, the country features approx. 1361 species of birds.

The Western Ghats is a designated UNESCO World Heritage Site and recognized as one of the world's eight 'hottest hotspots' of biological diversity. 54 species of hornbills are known to date, from Africa, India, Southeast Asia, and Papua New Guinea of the Australasian region. India is home to nine species of Hornbills.

The publication has been developed as a part of the India High Range Mountain Landscape project led by the Ministry of Environment, Forest and Climate Change and United Nations Development Programme, along with the Haritha Keralam Mission and State Forest Department of Kerala and funded by the Global Environment Facility. The project aims to showcase a landscape-based approach for conservation of natural resources, biodiversity, traditional knowledge and community livelihoods in the Western Ghats.

I hope this publication inspires everyone to appreciate the beauty and importance of hornbills and contribute towards their conservation.

Ruchi Pant

FOREWORD

Dr. TN Seema
Coordinator,
Navakeralam Karma Padathi 2
State Project Coordinator,
India High Range Mountain
Landscape Project

Lush green landscape with rivers, forests and mountains. A rich biodiverse world with many species of birds, animals, fishes and butterflies. Kerala boasts of many such peculiarities that not many other places on this world can claim. Most of these peculiarities trace their origin to the forest areas of the Western Ghats.

Around the world, there is a realisation that humanity can survive only through the conservation of biodiversity. Despite being an environmentally literate state, Kerala is also presently facing threat from disasters. In order to overcome this situation, it is highly desired that, one has to consider even the micro level factors for environment conservation and restoration. Each and every aspect of life associated with the environment are significant and knowing about this intrinsic relationship is the first step. This context led to the publication of a knowledge book, covering the ecosystem requirements of hornbills in Kerala.

The uniqueness of their shape, attention grabbing/striking size, strong family ties, habitation in dense forest and nesting in extreme heights are few features that make hornbills stand out from among other bird species.

The Western Ghats are home to a variety of bird species, including the Great Hornbill, the state bird of Kerala. However, many of these species are now under the threat of extinction. Hence, activities for

the conservation of this bird species, which directly and indirectly benefits nature and human beings, are of great importance.

The Haritha Kerala Mission promotes environmental protection and restoration activities involving local bodies, various agencies and communities. The activities in collaboration with UNDP in 11 Grama Panchayats in the Western Ghats region are undertaken with this aim.

This book on hornbills in Kerala is being published as part of these activities. It is expected that this book will help the readers to understand the importance of each components of an ecosystem. This handbook with lessons from nature to understand and practice co-existence is dedicated to the eco-friendly communities of Kerala.

Dr. TN Seema

PREFACE

Hornbills have captured the imagination, and the hearts, of populations across their habitats globally. Legends stem from their unique appearance and behavior, giving these birds a mythical aura. Stories abound that they are the harbingers of rain and good crop.

Their large down-curved beak, size, eyelashes, unique calls, and the strong family bond they share make them an interesting study. They are often considered the indicator of good ecological health, and play a significant role in maintaining the balance in the environment they inhabit.

Hornbills are threatened by hunting and loss of habitats. Although many cultures consider killing hornbills a sin, there are some who hunt them for bushmeat, medicine or their beaks and casque. The habitats of Hornbills are threatened by lumbering, plantation activities, hydel projects and other possible deforestation.

Learning about these extraordinary birds is a key step in protecting them. This work undertakes to throw light on Hornbills of Kerala, with emphasis on those found in Idukki and Thrissur. It is hoped that it will lead to a better appreciation of these unique inhabitants of the forests, and foster good will towards them.

Content

Photo credit: Suresh V Kurup

1. INTRODUCTION

1.1 No Bird Like A Hornbill

Once you have seen a hornbill, you are never going to forget it. The unique huge horn-like beaks, eyelashes that no other birds have, loud call, large tail and size altogether makes a fascinating picture. As you learn more about hornbills, you come across many more characteristics that makes them a special inhabitant of the wilderness.

The horn-like beaks or bills give them the common name hornbill; the scientific name of its family is 'Bucerotidae'; meaning cow's horn in Greek. Certain species of hornbills have an ornamental structure called 'Casque' on their heads, resembling the helmet of a Roman soldier from Ceaser's days. The casque is said to add strength or counterweight to the bills or act as sound chambers to augment vocalizations, as this is larger in males.

The strangeness of the anatomy of hornbills does not end here. They are the only birds to have the two-neck vertebrae (Axis and Atlas) fused and to have kidneys which are bi-lobed. Both these adaptations are understood to have evolved to suit the bill structure; one to add strength to the neck and the second to compensate them for the difficulty in drinking water through such long curved beak.

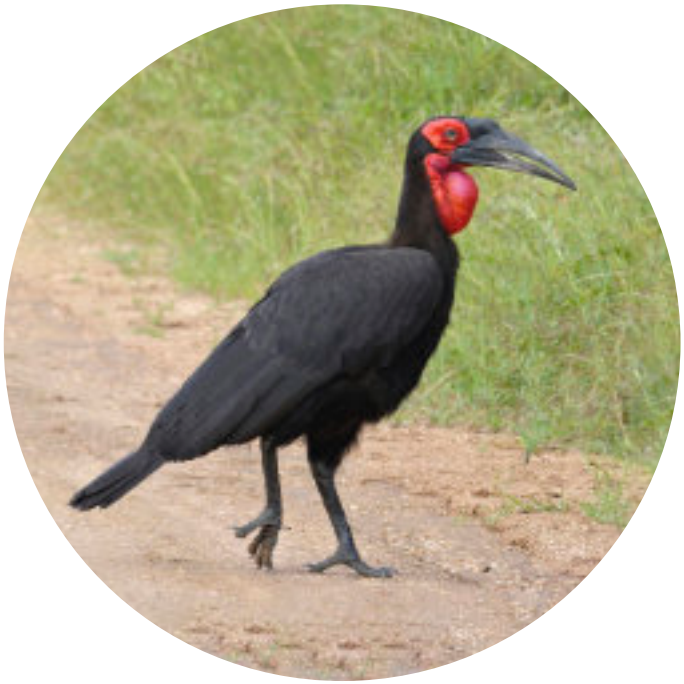
54 species of hornbills are known to date, from Africa, India, Southeast Asia, and Papua New Guinea of the Australasian region. India is home to nine species of hornbills. The largest of the hornbills like the Southern Ground hornbill (*Bucorvus leadbeateri*) found in Africa has a wingspan of about 1.5m and can weigh up to 6 Kg. Some species like our Great Indian hornbill are known to live for more than 60 years. hornbills mature slowly; they do not breed until they are four years old. Hornbills have a unique nesting behavior in which most of the females of the species self-incarcerate within the nest chambers after laying eggs and depend fully on the male partner for food and support. Thus hornbills symbolize the importance of family bonds as they are monogamous, i.e. male and female bond for life. Hornbills are glorified for their commitment as parents and partners.

1.2 The Ancestors of Hornbills

From the fossil records of closely related species like Hoopoes, it has been estimated that hornbills originated in the Eocene era (56 to 33.9 million years ago). Fossil records of hornbills were not known until Mid Miocene (approximately 15 million years ago). Fossil records and phylogenetic studies indicate that hornbills first evolved in Africa. The ancestors of hornbills are known to be large, terrestrial carnivore species like the present-day *Bucorvus* sp (species of Ground hornbills endemic to Africa). The descendants from these *Bucorvus*-like ancestors diverged some 45 million years ago giving rise to endemic African taxa like Tockus and Tropicranus which spread to Asia to form the more forest adapted frugivorous Asian lineages. The group in Asia is believed to have radiated extensively which then re-entered Africa, resulting in frugivorous hornbills like Ceratogymna (found in the humid forests of Central and West Africa) and Bycanistes (found in the forests and woodlands of Sub-Saharan Africa).

Southern
ground hornbill
(carnivorous)

Bucorvus leadbeateri



Tockus
(Southern Yellow-
billed hornbill)

Tockus leucomelas

A group of Great Hornbilll feeding on banyan fig

1.3 Hornbills in Human Culture

The great hornbill is the State bird of both Kerala and Arunachal Pradesh. It is the state bird of Chin State of Myanmar too and also depicted in their flag. Hornbills were always considered unique among birds and have earned their place with the evolution of culture. Many cultures across the distribution range of hornbills consider the bird as sacred; they also signified good fortune, tranquility, peace, and coexistence. In some African tribes killing of hornbills is considered as grave a sin as murder It's said that "if you kill a hornbill, that will bring down deluge so that you may wash your hands away in punishment".

In India, the hornbill festival is conducted in Nagaland from 1st to 10th December every year and for the grandness of the Festival it is known as Festival of festivals. Nishi tribes of Arunachal Pradesh wear the Great hornbills beak as part of their headgear, known as Bopa. They believe that this symbolizes manhood and give them added strength. The feathers of the hornbill also find a place in headdresses of certain tribes. Among Zomi, an ethnic group from Myanmar, festivals without hornbill feathers is incomplete. The Nepal people call the Great hornbill "homrai" and "banrao", both meaning "king of the forest".

1.4 Hornbill - The Myth and the Reality

The myth goes that hornbill is a bird that drinks only rainwater: The image of the hornbill sitting high on a tree branch, gazing longingly at the sky must have captured the imagination of the Malayalee. The folklore is that the hornbill is so thirsty and yearning for rainwater to drink. It is believed that the bird can only drink water drop by drop as it pours down and however thirsty may it be they are incapable of drinking from streams, pools or rivers. The fact is that hornbills are evolved to never need to drink water. They are especially efficient at processing water from their fluid-filled fruit-rich diet. The higher efficiency of their bi-lobed kidneys extract water from diet. This makes their fecal matter more dry compared to other birds. The dryness of their fecal matter helps them to use that as nest-building material. In traditional African cultures, Ground hornbills were believed as harbingers of rain and hence killing them was taboo. But sadly, with the passing of such beliefs, these birds have become increasingly threatened.

According to another myth, the birds are so smelly and unclean and pollute rivers and lakes. Only rainwater can purify these hornbills, by washing them out to sea. In many regions, hornbills appear just before the long rains and the people would

sometimes ritualistically kill the birds in times of drought. They then attach them to stone and throw them into pools or rivers. In reality, Hornbills are one of the bird species that practice nest sanitation by regularly removing waste. Hornbills thrive in the finest of ecosystems and are one of the best indicators of a healthy forest and hence signify good hope.

1.5 Hornbill studies

Numerous studies have been conducted on the charismatic bird species that has fascinated humans for centuries. Most of them were focused on aspects of their biology like diet, breeding, and nesting. But information on distribution patterns and abundance of hornbills is limited. Large-scale modifications of landscapes, fragmentation, and disturbances of the hornbill's habitat pose a threat to their existence. This call for studies that are more focused on understanding the distribution and population status of hornbills, and such studies can assist in formulation of effective management plans which can help these species thrive in their habitat.

A study was conducted by Salim Ali Center for Ornithology and Natural History on hornbills. This study was focused on distribution, preferred nesting locations, nesting trees, and favored food tree species. The study area which comprises of high range landscapes of Idukki, Ernakulam and Thrissur Districts are known for its significant biodiversity richness. The landscape studied an area of 2068.27 sq km which is distributed over Munnar, Devikulam, Chinnakanal, Kanthalloor, Vattavada, Edamalakudi, Marayoor, Mankulam, Adimali, Kuttampuzha and Athirappilly Grama panchayaths.

The study conducted on hornbills in this biodiversity-rich landscapes helped better understand the habitat requirements and threats to hornbills in these landscapes. The landscape of the study area represent many of the habitats and micro habits of Kerala. The threats and habitats requirements of the hornbills in this area would be similar to that for the entire state. Hence the study was taken as a model for the current book.

During the study period three species of hornbills were recorded (Malabar grey hornbill, Malabar pied hornbill, and Great hornbill) and their numbers were considerably good to

A map of study area Landscape

notice a thriving population. Further it was also understood that these landscapes are among the best preferred habitats of hornbills. The records from Ebird indicate the presence of Indian grey hornbill in the lower ranges of these landscapes. Indian grey hornbill is well adapted to human-dominated landscapes including urban areas; hence the species is not a good choice for understanding the ecosystem requirements of hornbills in forest areas compared to its sister species.

2. HORNBILLS OF KERALA

9 species of hornbills are found in India, namely Great hornbill, Malabar pied Hornbill, Indian grey hornbill, Malabar grey hornbill, Oriental pied hornbill, Rufous necked hornbill, Wreathed hornbill, Austen's brown hornbill, Narcondam hornbill. Among them four species of hornbills belonging to three genus are found in Kerala. They are as follows.

A. **Malabar grey hornbill (*Ocyceros griseus*)**

B. **Indian grey hornbill (*Ocyceros birostris*)**

C. **Malabar pied hornbill (*Anthracoceros coronatus*)**

D. **Great Hornbill (*Buceros bicornis*)**

The Malabar Grey hornbill is only known from Western Ghats and hence endemic to the Western Ghats. Whereas the Indian Grey hornbill and Malabar Pied hornbill is distributed from Western Ghats to many pockets in Indian Subcontinent. They are endemic to Indian Subcontinent. The great Indian hornbill is found in Indian subcontinent and also Southeast Asia. Apart from the smaller Indian grey hornbill and Malabar grey hornbill, the other two species are comparatively rare and threatened. Hence they are placed under Schedule I of the Indian Wildlife (Protection) Act, 1972. Though Indian grey hornbill and Malabar grey hornbill are much more adapted, they too face threats from habitat loss.

Illustration of four hornbill species found in Kerala

A Malabar grey hornbill

B Indian grey hornbill

C Malabar pied hornbill

D Great Hornbill

illustration: Biju P B

IUCN RED LIST

The IUCN Red List is a well known way of classifying the status of organisms that are threatened with extinction. The International Union for Conservation of Nature (IUCN) conducts assessment of organism with a group of experts using criteria and categories to classify the conservation status of individual species on the basis of their probability of extinction. In general, the criteria to assess the extinction risk of a given species is as below.

- ***The rate at which population of a species is declining***
- ***The area across which a species occurs in wild***
- ***Whether the species already possesses a small population size***
- ***Whether the species is very small or lives in a restricted area***
- ***Whether the results of a quantitative analysis indicate a high probability of extinction in the wild***

Subjected to these criteria each of the species is thoroughly evaluated and placed in to 9 categories

Extinct (EX)

A species in which the last individual has died or not reported with systematic and time-appropriate surveys.

Endangered (EN)

Species that possess a very high risk of extinction

Least Concern (LC)

Species that are abundant after careful assessment

Extinct in the Wild (EW)

Species whose members survive only in captivity

Vulnerable (VU)

Species that possess a high risk of extinction

Data Deficient (DD)

Species for which the amount of available data related to its

risk of extinction is lacking in some way.

Critically Endangered (CR)

Species that possess an extremely high risk of extinction

Near Threatened (NT)

Species those are close to becoming threatened.

Not Evaluated (NE)

Include any of the nearly 1.9 million species described by

A

Malabar grey hornbill

Ocyceros griseus (Latham, 1790)

Photo credit: Jayakrishnan S

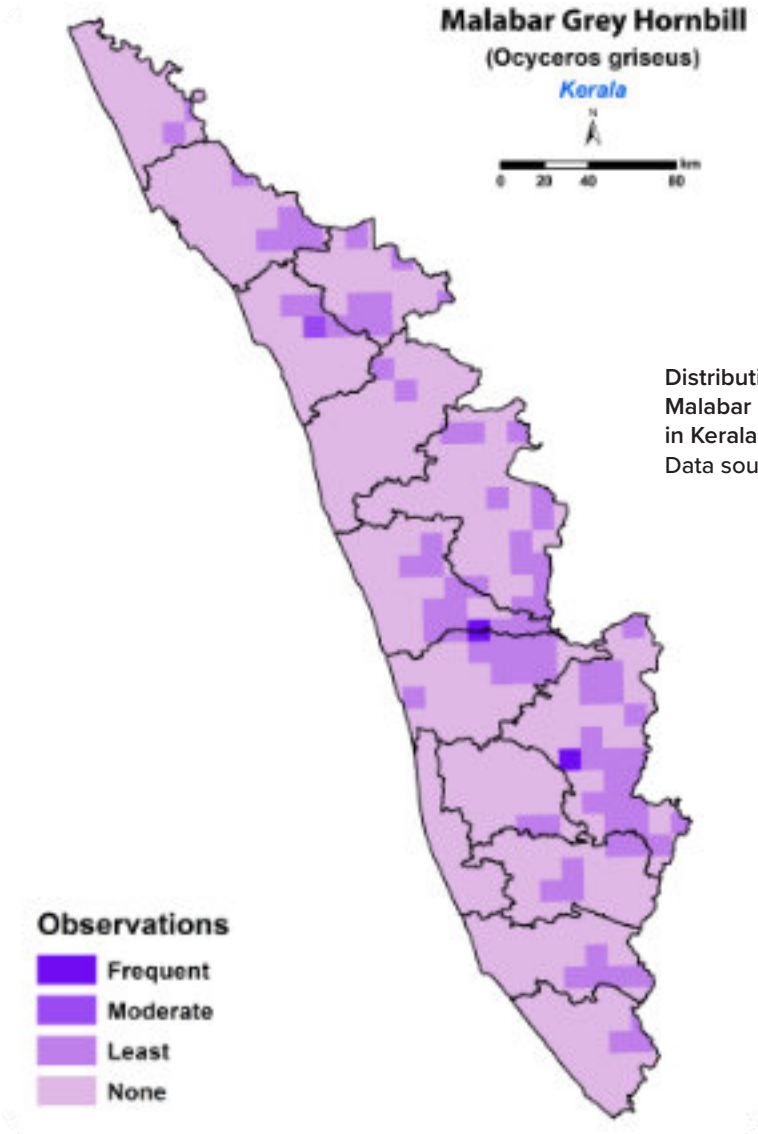
Malabar grey hornbill is found only in the Western Ghats. Typical of the family Bucerotidae, they too have a large beak. But unlike other species of hornbills found in Kerala, they lack a casque on the upper mandible. The lack of casque, the orange coloured iris and the colour of the beak can help identify Malabar grey hornbill from its sister species, the Indian grey hornbill which looks similar and have a partial range overlap.

The species is found in pairs or in small groups. They feed largely on figs and other fruits in the forest. The loud cackling and laughing calls of the Malabar grey hornbill is very distinctive and recognizable. This is the smallest of all hornbill species found in Asia growing to a maximum size of 58 cm. The males of the species have a reddish bill with a yellow tip, while the females have a plain yellow bill. This species is undoubtedly the most widespread in the Western Ghats. They are well-adapted to a range of forest types from moist deciduous, riverine, and semi-evergreen forests to tropical wet evergreen forests. Malabar grey hornbill has been recorded in a wide altitudinal range from about 50M from sea level to almost 1500 M.

Photo credit: Suresh V Kurup

Malabar grey hornbill,
Female and Male

LEAST CONCERN	NEAR THREATENED	< VULNERABLE >	ENDANGERED	CRITICALLY ENDANGERED
LC	NT	VU	EN	CR



Distribution map of Malabar grey hornbill in Kerala.
Data source: Ebird

B

Indian grey hornbill

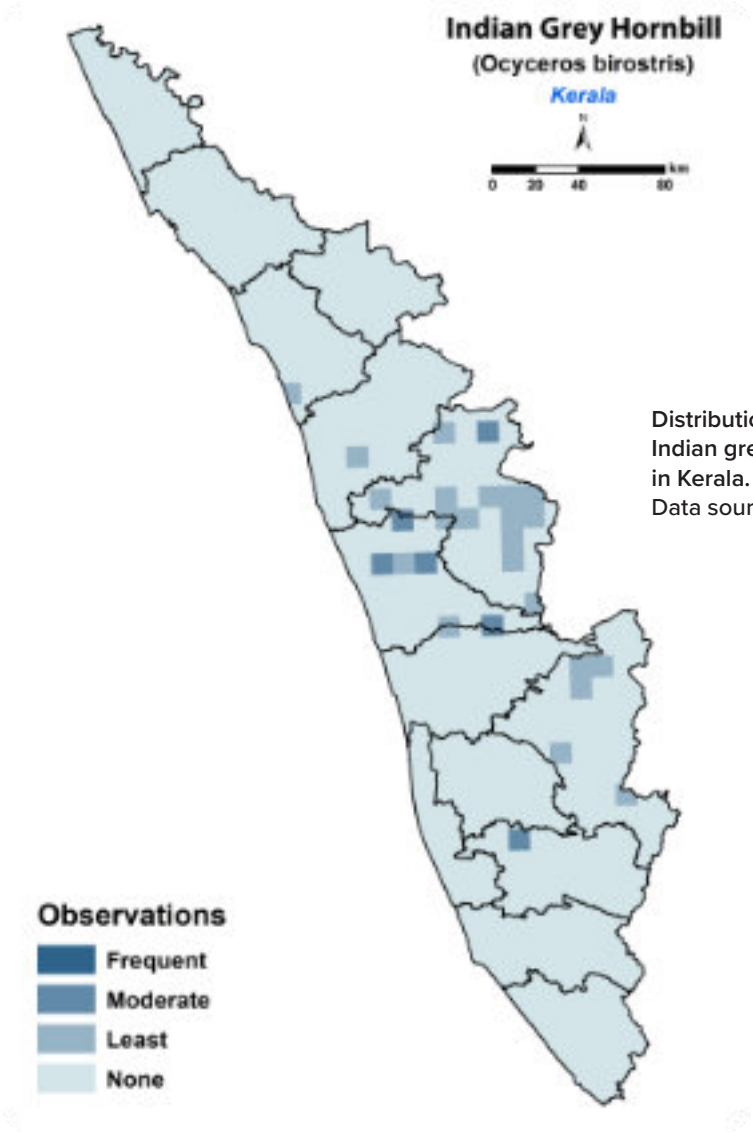
Ocyceros birostris (Scopoli, 1786)

Indian grey hornbill is the most common and widely distributed species in the Indian subcontinent. They are slightly larger than their sister species Malabar grey hornbill, growing to a maximum length of 61 cm. They have been reported from India, Pakistan, Nepal & Bangladesh. Indian grey hornbill is more abundant in plains and plateaux as the species is more adapted to drier and open habitats. In southern India, this species is recorded in dry deciduous conditions of Eastern Ghats and few records from the foothills of the Western Ghats. Hence they do not have much range overlap with their sister species, Malabar grey hornbill. Unlike other species of hornbills found in India, they are adapted to live in urban areas with old avenue trees. The species is found mainly in plains up to an altitude of 600M from sea level. They are also found in the foothills of Himalayas at about 1600 meters above sea level.

Indian grey hornbills are normally found in pairs; the males can be distinguished from females by the larger size of the body and the larger casque on the beak. The females have more yellowish beak and the bare skin around the eye is pale reddish compared to dark in the males.

Indian grey hornbill male

Photo credit: Abhiram G Sankar



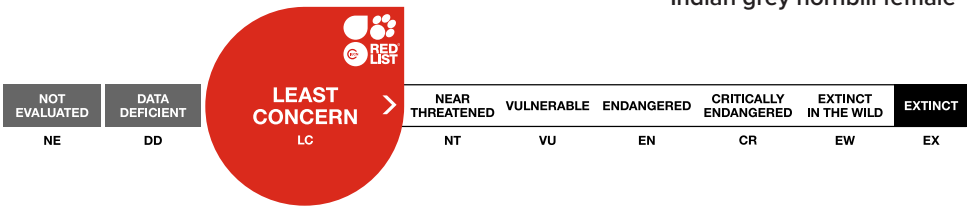
Distribution map of Indian grey hornbill in Kerala.
Data source: Ebird

Their squealing call is similar to that of the Black Kite. The flight pattern of Indian grey hornbill is unique with heavy flapping of wings, interspersed with glides.

The nesting season for Indian grey hornbills starts early in March and ends in June. The nesting period is 87 days on average. The female is sealed in the nest cavity for around 76 days and the nestlings emerge around 13 days after the female emerged. The pair breeds every year and shows affinity to the same nesting hollow year after year. It has been observed that Indian grey hornbills tend to reuse the nest almost 80% of the time in the second breeding season.

Photo credit: Abhiram G Sankar

Indian grey hornbill female



C

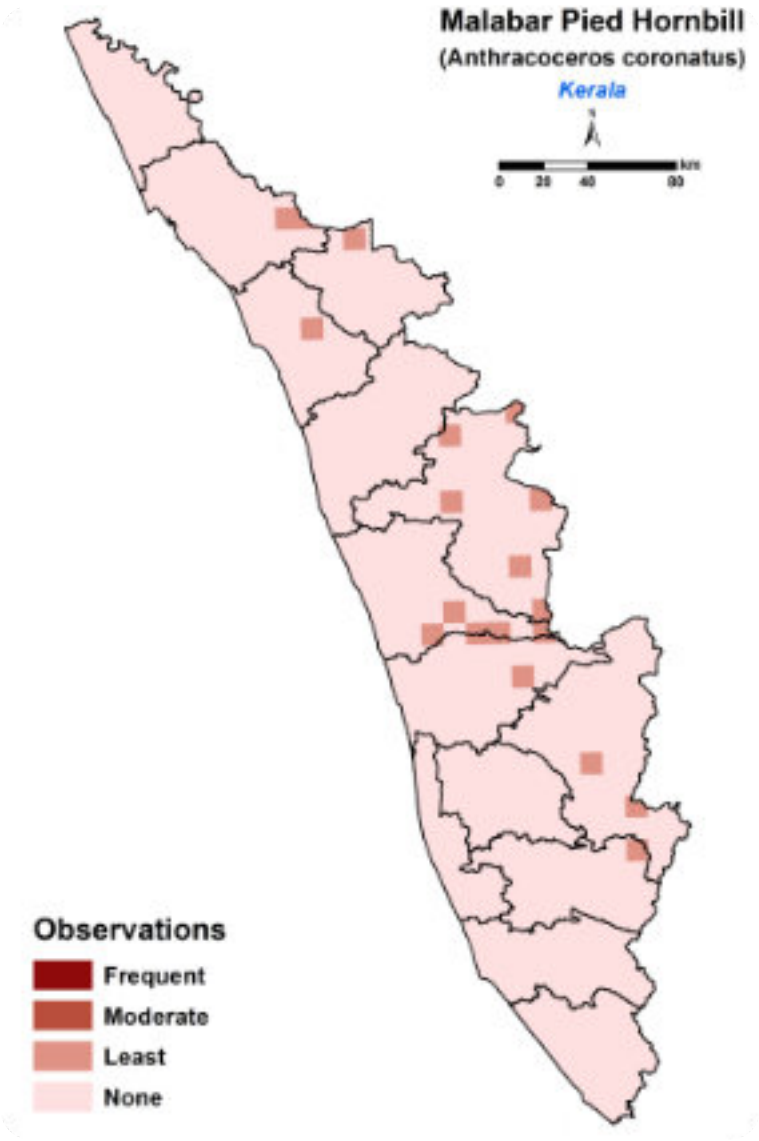
Malabar pied hornbill

Anthracoceros coronatus (Boddaert, 1783)

The Malabar pied hornbill is a near-threatened species endemic to the Indian subcontinent. The distribution range of the species includes The Western Ghats, Eastern Ghats, and Central India. They have a scattered population in the Western Ghats, The birds are more known from Central Western Ghats, while in southern Western Ghats they are mostly found in Vazhachal Reserve forest and adjacent Athirapilly area. The species is also recorded sporadically from low elevation forests in Kerala, like in Kannur District. They prefer moist deciduous and riverine ecosystems at an elevation less than 600MSL.

Malabar pied hornbill is a larger bird compared to the Indian Grey and Malabar grey hornbill and is quite distinct in morphology. As the name suggests, it is a blackbird with white underparts. The bird is very similar to its sister species the Oriental pied hornbill and can be distinguished with the help of outer tail feathers.

Malabar pied hornbill male



Distribution map of Malabar pied hornbill in Kerala.
Data source: Ebird

The Malabar pied hornbill has white coloured outer tail feathers while the Oriental pied hornbill has black coloured outer tail feathers with white tips. The Oriental pied hornbill is known to be widely distributed from the northern, eastern, and northeastern part of India to South East Asia. The two sister species have a range overlap in Jharkhand, Bihar, Odisha, and north-eastern Andhra Pradesh.

Malabar pied hornbill, Male and Female

Photo credit: Ashwin H P

D

Great hornbill

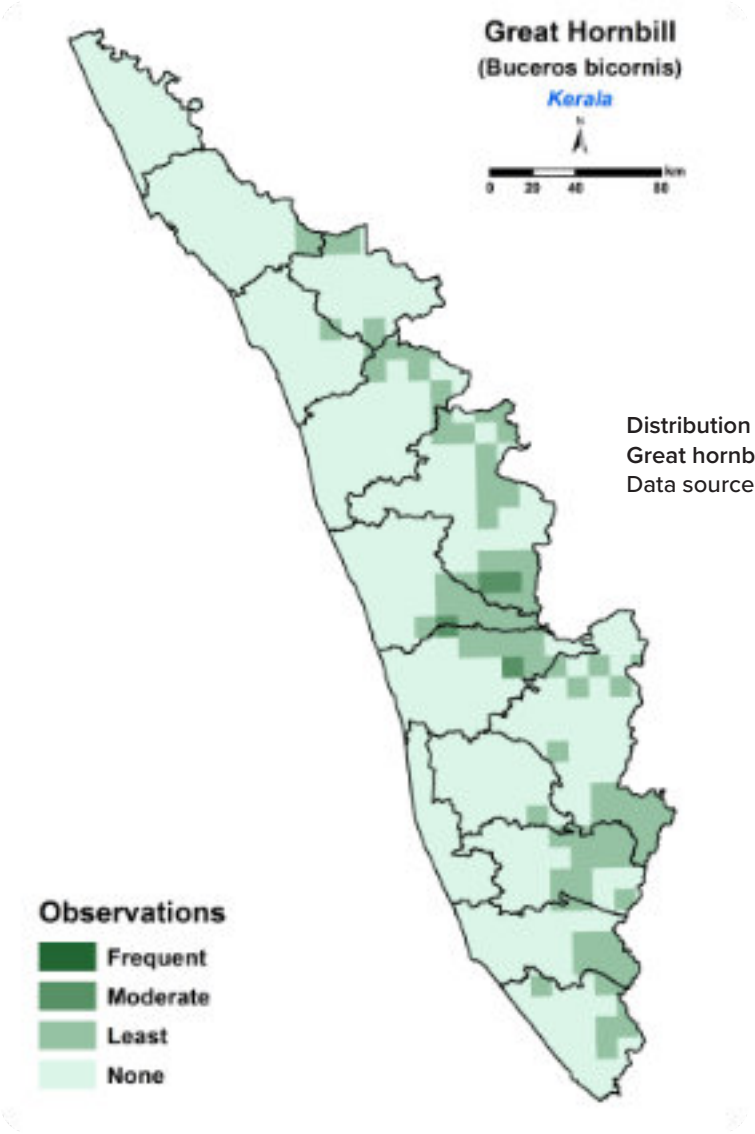
Buceros bicornis (Linnaeus, 1758)

The bird is also known as the Great pied hornbill. The Malayalam name of the species is “malamuzhakki” for the heavy sound produced by the birds in flight that can be heard from a distance and echoes in the mountains. This is one of the large species of hornbill and the largest in India. The species is the heaviest of the Asian hornbills, weighing up to 3Kg and second only to the helmeted hornbill in terms of length. The species is very unique for the prominent bright yellow and black casque on top of its massive bill. The casque appears to be U-shaped when viewed from the front. The males of the species are larger and more brightly coloured than females. The eye colour of the male is red while that of the female is bluish-white.

Though the bird is widespread from the Indian subcontinent to Southeast Asia, its population is largely fragmented and they have evolved to be different subspecies throughout its distribution range. Unlike other species of hornbills found in the Western Ghats, this species is a bird of dense forests and thrives well in a large stretch of rainforest.

Photo credit: Sujith V Gopalan

Great hornbill Male

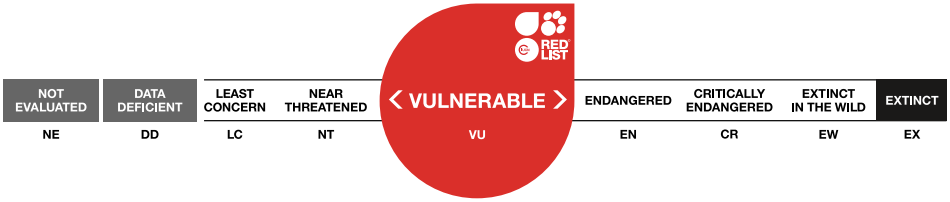


Distribution map of Great hornbill in Kerala.
Data source: Ebird

The sound of the Great hornbill is unique and they become quite vocal in the breeding season with the loud “Kok” sound at regular intervals. They are known to be found in pairs and at times in small to large groups when they aggregate on fruiting trees. The Great hornbill as in other hornbills is known to forage along the branches of the tree by hopping along and tearing apart the barks. They are known to do so in look for insects, lizards, nesting birds, and small mammals. Once caught the prey is tossed and swallowed.

Photo credit: Suresh V.Kurup

Great hornbill Female



3. SPECIES IN STUDY

Ecosystem Requirements, Distribution and Abundance in Kerala

Though four species of hornbills are recorded from the state, the study documented only three species from the landscape studied, namely Great hornbill (*Buceros bicornis*), Malabar pied hornbill (*Anthracoceros coronatus*), and Malabar grey hornbill (*Ocyceros griseus*). To get an overview of the density and distribution of hornbills, the Ebird data of three species were plotted onto the map of Kerala.

The Malabar grey hornbills are known to use a wide variety of forest habitats in the Western Ghats, from moist deciduous Forest, oil palm and coffee plantations, Semi-evergreen Forest, Riparian Forest to Evergreen Forest. Hence they are a regular sight throughout The Western Ghats in Kerala from an elevation of 20 to 1000m.

Photo credit: David V Raju

The Malabar pied hornbill has a very restricted distribution in Kerala. They are mostly recorded from the low-elevation riparian forest of Vazhachal Forest Division. Since the Evergreen riparian forest from this elevation gradient is being replaced at certain places by Oil palm Plantation, the hornbills are documented from the oil palm plantation too. Other than the Vazhachal forest division, the Ebird documents the species from Low elevation semi-evergreen forest in Kannur District. The Malabar pied hornbill is recorded from the lowest altitude of 20 M to that of 250 M.

Photo credit: Suresh V.Kurup

The Great hornbills are mostly distributed in the evergreen and semi-evergreen forests and in the non-breeding season, they visit moist deciduous forest patches for foraging. The species density is more in large stretches of Evergreen and semi-evergreen patches of the Western Ghats which is recorded in an elevation of 500 to 1000M.

FOOD HABIT -
Foraging Tree and Fruits

The hornbills are omnivorous. They depend on a wide variety of fruits found in their habitat and vary their dietary habitat in different seasons based on food availability and diversity. Much of the diet shift is also associated with the behavior changes such as breeding. Studies suggest that, the presence of favored fruit may also influence the diet selection, dietary time, and also habitat of feeding. In general, the diet composition of all three species of hornbills combined is 22.58 % fig fruits, 64.52 % non-fig fruits, and 12.90 % small animals. Recent studies indicate that hornbills consume about 60 different kinds of fruit species. The major fruit consumed by hornbills is arranged in descending order of their priority, with the indication of hornbill species that consume the fruit, and the habit of the fruit tree.

Major Fruit Species Consumed by hornbills in Southern Western Ghats

GH
MPH
MGH
IGH

Brown-woolly fig
Fiscus drupacea
© Dinesh Valke

GH
MPH
MGH
IGH

Jamun
Syzygium cumini
© Vinayaraj

GH
MGH

Kambilivirinji
Actinodaphne malabarica
© Mrinalini K Siddhartha

GH
MGH

Malabar Ebony
Diospyros assimilis
© Vinayaraj

GH
MGH

Wild Olive
Elagnus conferta
© Vinayaraj

GH
MGH

Karal Fig
Ficus tsjahela
© Dinesh Valke

LEGEND: GH - Great hornbill | MPH - Malabar pied hornbill | MGH - Malabar great hornbill | IGH - Indian gray hornbill

GH
MGH
IGH

White fig
Ficus virens
© Dinesh Valke

GH
MGH

Fern tree
Filicium decipiens
© Vinayaraj

GH
MGH

Dhaman
Grevia tilifolia
© Vinayaraj

GH
MGH

Rose Sandalwood
Olea dioica
© Vinayaraj

GH
MGH

Native olive
Olea paniculata
© Mark Marathon

GH
MPH
IGH

Mountain persimmon
Diospyros montana
© Vinayaraj

Major Fruit Species Consumed by Hornbills in Southern Western Ghats

GH
MPH
MGH
IGH

Indian Bat tree
Ficus amplissima
© S.C. Gladwin Joseph

GH
MPH
MGH
IGH

Banyan
Ficus benghalensis
© P Jeganathan

GH
MGH

Cluster fig
Ficus racemosa
© Vinayraj

GH
MGH

Strychnine tree
Strychnos nux-vomica
© Vinayraj

GH
MGH

Pithraj tree
Aphanamixis polystachya
© Prenn

GH
MGH

Anavananki
Casearia ovata
© Dinesh Valke

LEGEND: GH - Great hornbill | MPH - Malabar pied hornbill | MGH - Malabar great hornbill | IGH - Indian gray hornbill

True cinnamon tree
Cinnamomum verum

MGH

Jamun Arabian coffee
Coffea arabica

Mountain Sweet Thorn
Flacourtia montana
© Rison Thumboor

GH
MGH

Beechwood
Gmelina arborea
© A. J. T. Johnsingh, WWF-India and NCF

Joseph's Laurel
Litsea stocksii
© Rohit Naniwadekar

MGH

Simple-Leaved Meliosma
Meliosma simplicifolia
© Vinayaraj

Tree | Small tree | Thorny climber | Shrub | Scandent shrub | Climbing shrub

Major Fruit Species Consumed by Hornbills in Southern Western Ghats

MGH
IGH

Malabar Neem
Melia dubia
© Vinayaraj

MGH

Spanish cherry
Mimusops elengi
© Vinayaraj

Bitter Nutmeg
Myristica dactyloides
© Vinayaraj

MGH

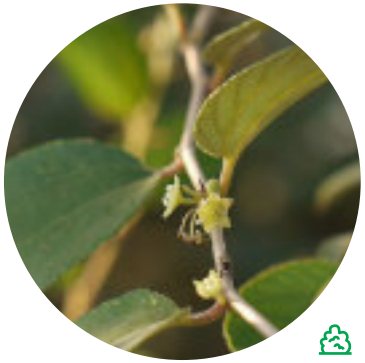
Nag Kuda
Tabernaemontana heyneana
© Sugeesh

Orange climber
Toddalia asiatica
© Vinayaraj

MGH

Indian Heynea
Trichilia connaroides
© Vinayaraj

LEGEND: GH - Great hornbill | MPH - Malabar pied hornbill | MGH - Malabar great hornbill | IGH - Indian gray hornbill



Wild jujube
Zizyphus nummularia
© Dinesh Valke

MGH

Nelthare
Alseodaphne semecarpifolia
© Vinayaraj

Bishop wood
Bischofia javanica
© Vinayaraj

MGH

Nagamaram
Beilschmedia wightii
© Mrinalini K Siddhartha

GH
IGH

Spinous Kino Tree
Bridelia retusa
© Dinesh Valke

GH

Black dhup
Canarium strictum
© Rohit Naniwadekar

Tree Small tree Thorny climber Shrub Scandent shrub Climbing shrub

Major Fruit Species Consumed by Hornbills in Southern Western Ghats

GH
IGH

Nilgiri elm
Celtis tetrandra

GH

Warty Marble Tree
Elaeocarpus tuberculatus
© Vinayaraj

Potato plum of Mysore
Scolopia crenata
© Vinayaraj

MPH
IGH

Indian lilac, Neem
Azadirachta indica
© Rajib Ghosh

MPH
IGH

Lucky Bean Tree
Drypetes roxburghii
© Dinesh Valke

MPH

Sacred fig
Ficus religiosa
© Shagil Kannur

LEGEND: GH - Great hornbill | MPH - Malabar pied hornbill | MGH - Malabar great hornbill | IGH - Indian gray hornbill

Indian Butter Tree
Madhuca longifolia
© Dinesh Valke

MPH

Clearing-nut tree
Strychnos potatorum
© Vinayaraj

Indian berry
Anamirta cocculus
© Shagil Kannur

MPH

Lindley's Aporosa
Aporosa cardiosperma
© Vinayaraj

Siamese Yellowleaf
Xanthophyllum arnottianum
© Vinayaraj

MPH

Jackal jujube
Ziziphus oenoplia
© JM Garg

Tree | Small tree | Thorny climber | Shrub | Scandent shrub | Climbing shrub

Photo credit: Ajit Hota

Other than the fruit diet, the hornbills are known to consume insects, reptiles, birds and small mammals. The Great hornbill is known to feed on squirrels, owls, owlets, barbets, chicks of birds, lizards and a variety of insects. They are more omnivorous during their nesting season.

Photo credit: Jayakrishnan S

Breeding and Nesting Behaviour

The hornbills build nests by occupying the natural hollows in trees or tree hollows built by other faunal groups. They require large trees for nesting and each hornbill species have different criteria in selecting nesting hollows based on safety, habitat, tree type, height, and girth of the nesting tree, etc. As hornbill male and female bond for life, they prefer using the same nesting hollow year after year. The nesting behavior is more or less similar in much of the hornbill species found in the Western Ghats. The female of the species is known to build a nest after selecting a tree cavity and self-incarcerates in the tree hollow by sealing the nest entrance with her excreta and fruit pulp, leaving only a tiny gap for receiving food and removing excreta. The females of many hornbill species shed all their flight feathers of wings and tail by the time of egg incubation. Since the female is confined to the nest cavity, the male becomes completely responsible for providing food for his mate, and chicks in the later stage. The males tap the tree to announce their arrival to females. The flight feathers are regrown in females and she breaks open when the chicks are too big to share the nest cavity. After breaking free, the female rebuilds the nest entrance. The male and female take turns to feed the chicks until they are grown enough to come out and find food themselves. hornbills practice nest sanitation during the nesting period. The incarcerated female ejects her excreta from the nest cavities. The male of the species assist the inmates by removing the excreta near to the nest cavity opening. In species like Indian grey hornbill the males supply pieces of barks to the cavity inmates to ensure removal of excreta by absorption and maintaining the microhabitat condition inside the nest. Despite these measures large pieces of excreta remain inside the nest by the end of nesting season. Asian hornbills are generally frugivorous, but turn more omnivorous in the breeding season, where the males supply more animal matter in the later stages of nesting. 59 species of trees are used for nesting by different hornbill species.

Photo credit: KV Uthaman

MALABAR PIED HORNBILLS

The Malabar pied hornbills breed during March and April. The female goes into the nest to rear 2 or 3 chicks. Though the species is known to be mostly frugivores, they feed more on insects, lizards, and snakes during the breeding season.

Photo credit: Suresh V.Kurup

GREAT INDIAN HORNBILL

The Great hornbill breed from March to July in North-East India and February to May in the Western Ghats. The nesting cycle ranges from 102 to 114 days. Although two eggs are laid at a time, the Great hornbills usually produce only one chick a year. They roost often along rivers/perennial streams in open habitat with scattered trees or on trees along steep cliffs.

Photo credit: Jayakrishnan S

MALABAR GREY HORNBILL

Malabar grey hornbill starts breeding in January and may extend up to May. The female is known to lay 2 to 4 eggs in the nest in January and chicks come out by early April.

An interesting behavior in hornbills - Dust bathing

Photo credits: Sarvesh Revankar

Dust bathing in birds is a commonly observed behavior. They do this by vigorously wriggling their bodies and flapping their wings while rolling on the dust. By doing this, the fine particles of dust are worked into feathers. Birds are known to dust bath for various reasons like to maintain the plumage and condition of feathers by absorbing excess oil in them, and also to shed off the dead skin, parasites and the oil absorbed dust. Many hornbill species have been noted to dust their bodies and Malabar pied hornbills are documented to be employing this technique more often.

4. HOW SAFE ARE HORNBILLS

Hornbills are threatened worldwide by hunting and habitat loss. These birds require vast areas of primary forest to thrive, but due to human intervention, the forest cover has declined drastically over the past decades. Most of the hornbill species are classified as threatened by IUCN. Certain species like the Sulu hornbill, which is restricted to the Philippines, have less than 40 mature individuals left in the wild. They are one of the rarest bird species of the world and is in immediate threat of extinction. The subspecies of the Visayan hornbill called the Ticao hornbill is probably extinct in wild. The Helmeted hornbill is critically endangered due to uncontrolled hunting and trade for the hornbill ivory.

The status of hornbills in India is no better as there are numerous records of hornbills being hunted for meat, medicine, feathers, beak, and casque. Apart from hunting, habitat loss has been a major reason for the decline in the number of hornbills. There have been reports of local extinction even in the case of the more widespread Indian grey hornbills. Local extinction of Indian grey hornbill in Northern extremities of the Western Ghats indicates that hornbills are highly sensitive to habitat alteration.

The status of hornbills in Kerala

One of the largest threats to Great hornbills in India is concerning hunting for casque and feathers in the decoration of traditional headgear of many tribes, this is more common in the Northeastern states states of India. Elsewhere they are also hunted for bushmeat and supposed medicinal value of their fat. One of the common factors for decline throughout the distribution range of the Great hornbill is the recent accelerated habitat loss and land-use change pattern. In Kerala, the Vazhachal forest division is known to harbor a great population of Great hornbills, and the proposed power project at Athirapally in the Chalakkudy river basin by Kerala State Electricity Board (KSEB) can submerge loss of forest cover in the area and can bring adverse effect to the Great hornbill population of the areas. This Project can also cause considerable change in the riparian forest of the Chalakudy river basin which will adversely affect the population of Malabar pied hornbills. Malabar pied hornbill is well documented from the riparian habitat of Chalakudy river basin, ranging from Vettilapara to Vazhachal falls, noted to be a stronghold for the species in Kerala. There are encroachments along with the riparian forests of this region, where there is the conversion of natural habitat to the oil palm plantations. These reduce and restrict the habitat availability for the Malabar pied hornbills in the region.

When compared to its larger cousins, Malabar grey hornbill is much less threatened because of their ability to adapt to wider habitat conditions. The species is common throughout the areas that they are found.

5. FRIENDS OF FARMERS

Birds are not only pest to agriculture but also friends to farmers. Birds are well - known pollinators, but the most important role played by birds is as a biological control agent. As any other organism, birds are also part of nature's food chain. Apart from fruits and seeds, they are known to feed on a variety of insect species and rodents that are known to bring drastic decline in crop yield by destroying them. Birds have been known to inflict economic losses in agriculture crops especially during the vulnerable seasons like ripening, sowing and seedling stage. This has been happening around different agro-ecological regions. Certain bird species like pigeons, parrots, weavers, munias etc are known to make most of the damage and the extent of damage is largely based on the local population of the birds. Though hornbills are known to feed on variety of fruits, they are not reported as pests for any of the cultivated fruit species. Among the four species of hornbills, only the Malabar grey hornbill is reported to feed on any of the cultivated crops, the Arabica coffee that is widely planted in the Western Ghats. But the population of Malabar grey hornbills is comparatively less to make a considerable damage to these cultivars. The affinity of these hornbills to coffee is comparatively less considering other wild variety of fruits available in their habitat. The other larger species of hornbills like the Malabar Pied hornbill and Great hornbill hardly venture out in to plantation for feeding.

The Malabar grey hornbill species, when it visits a coffee plantation, may consume a variety of insects in the plantation, acting as a biological control mechanism that benefits farmers in two ways; one, that they get the insect pest eradication service done with no cost and second that it is a chemical free eradication that will benefit the soil; in addition, the organic produce fetches better price in market. Nature has a well balanced mechanism to control each of its agents, for example Malabar grey hornbill act as a predator by consuming insects and rodents controlling their population in the ecosystem. On the other hand they also act as a prey; predators like Rufous-bellied eagle prey on Malabar grey hornbill and keep a check on their population.

KEYSTONE SPECIES

Keystone species are organisms that play a very important role in the ecosystem or habitats in and around them and as a keystone, the removal of them will tumble the entire ecosystem. The role of a keystone species may be to help control the population of other species, or perhaps help the growth of certain types of plants in an ecosystem, or to shape their ecosystem. Most apex predators like, tiger, lions, and wolves maintain the population of herbivores preventing the forest or grasslands from being overgrazed thus maintaining the ecosystems. In other cases, birds like hornbills help in seed dispersal and germination which helps in maintaining the forest. In other cases, species like beavers build dams that, in turn, create a wetland habitat in which many other species thrive or like elephants that make ways through the forest so that other animals move about to make use of the ecosystem. Apex predators, hornbills, beavers, and elephants are perfect examples of Keystone species.

Hornbills as Predator of Insects

Malabar grey hornbill

Feeding on

(A) Scorpion

(B) Long horned grasshoper

(C) Spider

(D) Praying Mantis

(E) Cricket

(F) Short Horned Grass Hopper

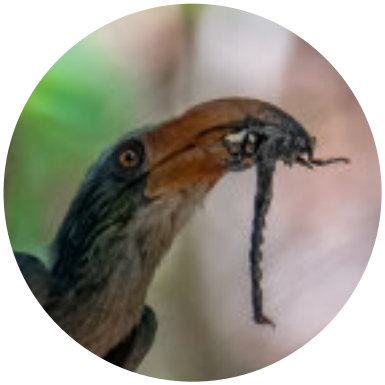


Photo credit: Jayakrishnan S

Hornbill as Prey

Rufous-bellied eagle with a Malabar grey hornbill kill.

Photo credit: Sujith V Gopalan

6. THE ECOLOGICAL ROLE OF HORNBILLS

Plant-bird interaction plays a crucial role in maintaining structure of an ecosystem and the ideal way of how it functions. The seed dispersal process is essential for maintaining plant populations and is also a mechanism for the organisation and maintenance of species richness. Frugivores affect the germination success of seeds, as the gastrointestinal juices and acids act on the seeds in the gut softening the hard seed coat, thus breaking the seed dormancy and enhancing seed germination. Hornbills are the major avian frugivores and seed dispersers in the ecosystem they occupy. They earn this position not only by their large size, which makes them capable of breaking up and swallowing large fruit, but also for many reasons, like their capability to regurgitate the fruit seed undamaged, the diverse fruit species they feed on, and also the long distance they travel in search of food, thus capable of moving viable seeds to distant locations. Hornbills are also known as the Farmers of Forest for the same reason. These birds have evolved with their habitat and have played a crucial role over the millions of years in maintaining the forest cover of the landscape where they fly. The age-old mutual benefit mechanism between the forest trees and Hornbills is the key for sustaining not only hornbills and trees but also the vast biodiversity that surrounds them. The trees are not only a source of food but also the nesting place for hornbills to breed and rear their generations. An imbalance in this can spell disaster for the biodiversity in the region.

Hornbills are identified as keystone species and also an indicator of ecosystem health. A fall in the hornbill population will reduce the dispersal of tree seeds, which will in the long run reduce the forest cover of the area. The reduced forest cover will lead to dryness in the region and that would, in turn, affect all biodiversity forms and a total collapse of the ecosystem.

7. TRIBALS AND HORNBILLS

Many tribal groups consider it a sin to kill hornbills, especially during the breeding season and there is much tribal folklore associated with hornbills. Almost all species are protected at the highest level under Schedule I of the Wildlife Protection Act, but these beliefs, folklores, or laws could not save the hornbill population from decline. The Hornbills are poached for meat, fat, feather, beak, and casque by local people and tribals across India; this has been one of the major reasons for the rapid decimation of the Hornbill population. Some tribal groups in North East India use Hornbill beak and casque as headgears, as it is mandatory for these tribal men, for that it is a sign of tribal identity and manhood. Some tribals uses the feathers in cultural festivals to decorate their head. Hornbills that were targeted had their population reduced drastically.

Nyishi tribe - (top) Natural hornbill beak headgear
(bottom) Artificial headgear

Photo credit: Doniv79

Photo credit: Jaba Debbama

But recent action plans and awareness program has worked wonders in Northeast India. An artificial replacement provided for the hornbill beaks and casque and feathers became popular and were widely accepted by the tribal people. The tribals were also trained in the art of making artificial beak and casque from wood and other available materials. By this venture the culture is being preserved and the magnificent but fast vanishing species of the hornbill are reprieved, giving them an opportunity to recuperate as the tribals stand guard for the hornbills.

Indigenous people and hornbill conservation in Kerala

The scenario in Kerala was no different a decade ago when there were reports of tribal and local hunting hornbills for bushmeat. But the awareness programs conducted in different forest divisions of Kerala by various environmental NGOs turned the tribal people into protectors of hornbills. Today tribals of Athirapilly and Vazhachal are the fiercest protectors of both hornbills and the ecosystem they live in.

A project to study hornbills of Vazhachal focusing on their nesting habit and habitats was conducted jointly by Hornbill Foundation and Forest Department of Kerala and this was done with participation of the tribal youth in the area. The program helped researchers better understand the hornbill behavior, as the Tribals could better track nesting sites and regularly monitor the nest and the habitat with much ease. For the tribal youth, other than the incentives received for the project, the awareness they gained through the project brought them to the lead in hornbill protection.

The Athirappilly-Vazhachal landscape is a unique low elevation riparian ecosystem in Kerala where all four species of hornbills can be found, namely the Great Indian hornbill, Malabar pied hornbill, Indian grey hornbill, and Malabar grey hornbill. The Kadar community owns the forest right act to the area. This community has been involved in protecting the forest landscape from various intrusions by their tribal forest right act, as no projects or activities can be implemented in the area without the approval of Tribal Gramasabhas.

8. HOW CAN WE HELP HORNBILLS

The hornbill population is critical for the survival of not only the ecosystem they inhabit but also entire life forms associated with it. Hornbills support forest and forest support water, the elixir of life. Hornbills are considered as indicators of ecosystem health, so there is a need for regular monitoring of their populations and nests by experts, trained amateurs, and forest staff. Management plans are to be designed based on these observations. With examples from Kerala and much of Northeast India, it is now well understood that hornbills are better protected by the indigenous communities who share the ecosystem with hornbills for centuries, and hence all programs should be envisaged involving the tribals as they are an inseparable part of the ecosystem.

Human intervention into the ecosystem should be done with utmost caution and care, taking a base on studies and examples in the past. All projects aimed at the welfare of human beings should be first studied not only considering the immediate ecosystem that is to be impacted but also indirectly to the ecosystems and life forms that are connected to them. Hornbills are not only found in forests but certain species like the Malabar grey hornbill and Indian grey hornbill nest outside forest areas that makes them vulnerable. Proper management plans are to be designed by the Biodiversity Management committees at Panchayath levels to monitor and provide adequate protection. The rare Hornbill species found in Kerala, the Malabar Pied Hornbill, is known to occupy the riparian forest belt in Athirapilly and nearby areas, which have been losing natural habitat to plantations and other anthropogenic activities on a large scale. There is a tremendous need for Panchayat in these areas to envisage ecosystem restoration programs to sustain the population of Malabar pied hornbills in Kerala.

Indian Grey Hornbill Female-
Photo credit: Abhiram G Sankar

Awareness programs need to be conducted regularly for students, local community and in these areas and bring them into the frontline to protect hornbills and thereby securing the future for them and their next generations.

Selective planting of native fruit and nest trees can be encouraged as a long-term goal to enrich the hornbill habitat. The selection of tree saplings to plant should be based on the forest habitat and the species of hornbills found in the area. Saplings of fruit trees preferred by multiple hornbill species can be prioritized for planting. Hornbills are known for their high nest fidelity, hence community-based programs have to be designed for the effective protection of the existing nesting trees. In addition to nesting trees, conservation of existing fruits is also important in maintaining a good population of hornbills.

9. Acknowledgements

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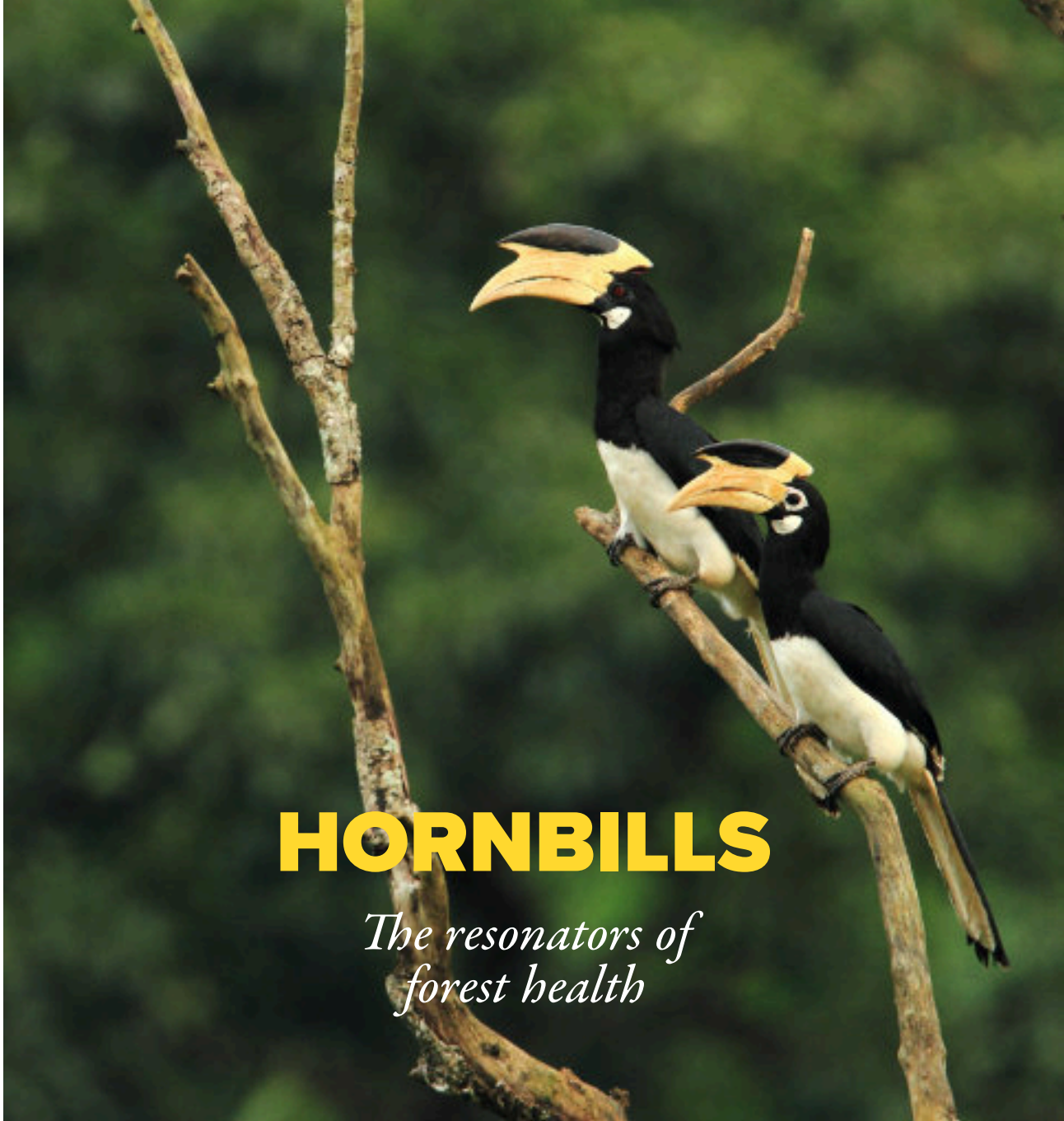

HORNBILLS

The resonators of forest health

Photo credit: Ashwin HP

Ministry of Environment, Forest and Climate Change