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# Studies on Hornbill Tree Interactions with Special Reference to Identification and Conservation of "Keystone Mutualists" in Nilgiri Biosphere Reserve

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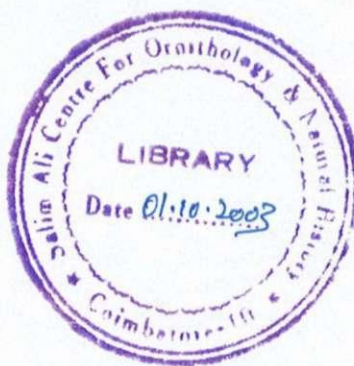
Centre for Ornithology and  
Natural History



# **Studies on Hornbill Tree Interactions with Special Reference to Identification and Conservation of “Keystone Mutualists” in Nilgiri Biosphere Reserve**

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## **FINAL REPORT**



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## SUMMARY

Hornbills (Family: Bucerotidae) are primarily fruit eating birds. Nine species belonging to four genera have been recorded in India of which four occur in the Western Ghats, namely the Great Pied, Malabar Pied, Indian Grey and Malabar Grey Hornbills. As a result of high fidelity for nesting trees and voracity for fruits, hornbills interact with a variety of tree species. Hence, a three years study in the Nilgiri Biosphere Reserve was initiated to document interaction of hornbills with the tree species of their habitats for food and nesting requirements. The study also aimed to assess the anthropogenic disturbances that influence the integrity of the habitat and the hornbills that live therein. We envisaged that the study would ultimately elicit information on the role of hornbills in the maintenance of tropical forest ecosystems and identify the "keystone plant resources" therein.

During the initial phase, a reconnaissance survey was conducted in the Tamil Nadu part of Nilgiri Biosphere to assess the status and distribution of hornbills. Based on the reconnaissance, Benne, a semi-evergreen forest locality in the Mudumalai Wildlife Sanctuary was selected for intensive study. Field research for the study was launched in November 1999. Data gathered included:

- i. Fruit availability at Benne
- ii. Fruit utilization by Malabar Grey Hornbill during breeding and non-breeding season
- iii. Nest tree utilization, species preferences, nest tree and nest site characteristics, and
- iv. Anthropogenic disturbances of hornbill habitat



To assess fruit availability, a total of 1643 fleshy fruited trees belonging to 27 tree species, including 74 individuals belonging to four species of *Ficus* were marked and monitored once in a month in three belt transects totaling 6 ha. of sample. Availability of fleshy fruits in the tea/coffee plantations was assessed by monitoring 149 individuals belonging to 17 species (10 Families) from 6 ha., once a month.

Fruit Utilization during breeding season in the Sanctuary was assessed by continuous monitoring of two nests and regular collection of the seed middens from 12 nests. Fruit Utilization during non-breeding seasons in the Sanctuary and plantations were assessed by scanning trees for foraging birds along marked transects. Role of Malabar grey hornbills in forest regeneration was assessed by observing seedling growth under nest trees. Square plot each of 5-sq. m. was demarcated at the base of the nest tree facing the nest hole and behind the same tree. These sites were visited every week during the post-breeding season to study regeneration of seedlings.

Intensive surveys were conducted during every breeding season, to document the use of nest trees, nest fidelity and the effect of human disturbances on nesting. Nest site and tree characteristics of 40 nest trees were measured. Variables were selected based on factors that were considered to have potential effect on nest-site selection.

Diversity and distribution of food and nest trees used by hornbills were assessed by conducting a phytosociological analysis of the habitat. A total of 3 ha. was sampled. All trees ( $\geq 30$  cm Girth at Breast Height) were enumerated. Anthropocentric activities that could influence food and nest plants of the hornbill were documented.

Assessment of fruit availability revealed that twenty-six tree species belonging to 12 families fruited in the Sanctuary, including four species of figs. April was the peak fruiting month for non-figs during 2000-2001 and 2001-2002, when 101 individuals (7 species) and 144 individuals (8 species) were recorded in fruits respectively. Two fruiting peaks were observed for figs. Both the peaks of fig fruiting synchronized with a decline in fruiting activity of non-fig species.

Malabar Grey Hornbill utilized twenty-seven fruit species belonging to 17 families as food. Fruit utilization during breeding season was assessed by monitoring two nests. The male hornbill delivered 17 fruit species of 13 families to the nest inmates. Two species namely *Actinodaphne malabarica* (30.31%) and *Olea dioica* (24.99%) contributed for the maximum of fruits delivered at the nests. The analysis of seeds collected from middens revealed the presence of 16 species (9 families). Majority of the seeds found in the middens belonged to two species namely, *Olea dioica* (45.24%) and *Persea macrantha* (26.42%).

During the two non-breeding seasons, the Malabar Grey Hornbill consumed 16 species belonging to 10 families. Two species of figs, *Ficus drupacea* and *Ficus tsjahela*, accounted for 58.01% of feeding. Ivlev's Index of Selectivity was used to determine preference Index (P.I.) for the diet species utilized during breeding and non-breeding season at the Sanctuary. *Actinodaphne malabarica* (Lauraceae), a lipid-rich fruit species (P.I.= 0.91) and *Ficus drupacea* (P.I. = 0.93) were the preferred fruit species during breeding and non-breeding season respectively.



Figs (*Ficus tsjahela* and *F. drupacea*) formed the keystone resources for Malabar grey hornbills at Mudumalai. Apart from the Malabar Grey Hornbills, numerous other birds and mammals were recorded consuming fig fruits. In addition to figs, fruits of *Aphanamixis polystachya* (Meliaceae) sustained hornbill population during the lean season and hence considered as a 'pivotal' species.

The Malabar Grey Hornbill plays an important role in forest generation. Studies on regeneration at the midden sites showed that while 13 species consisting of 280 regenerated seedlings were recorded behind the nest, 18 species consisting of 761 seedlings regenerated opposite to the nest site. All the nest sites, barring one, showed a significantly greater number of regenerated seedlings opposite to the nest site compared to behind the nest.

Study revealed that the tea/coffee plantations adjacent to the Sanctuary forms a supplementary habitat for Malabar Grey Hornbills. Malabar grey hornbills utilized fruits of nine species in plantations during the two non-breeding seasons. Four species (*Ficus drupacea*, *F. tsjahela*, *F. virens* and *Streblus asper*) of the family Moraceae and *Maesopsis emenii* (Rhamnaceae) together accounted for 80.6% of feeding in the plantations.

Study revealed that Malabar Grey Hornbill had preference to certain tree species for nesting. Malabar Grey Hornbill utilized eighty-one nest trees belonging to 19 species (14 families) for nesting. Maximum number of nesting trees belonged to *Lagerstroemia microcarpa* (26 nest-trees; 32.10%), followed by *Terminalia bellirica* (21 nest trees; 25.93%) and *Terminalia crenulata* (9 nest trees; 11.11%). Ivlev's index of selectivity estimated for various nest trees revealed that Malabar Grey Hornbill

preferred *Lagerstroemia microcarpa* (P.I = 0.92) most followed by *Terminalia bellirica* (P.I = 0.91) and *Terminalia crenulata* (P.I = 0.76).

A total of 36 species belonging to 23 families were used by Malabar Grey Hornbill as food and nest trees. This formed 51.4% of the tree flora of the site. While 24 species were food plants belonging to 15 families, sixteen species belonging to 14 families were nest tree species. The phytosociological analysis revealed that greater number of species, 53 and 49 were recorded from the relatively undisturbed site and moderately disturbed site respectively, while the highly disturbed site had a species richness of 37 only, an average reduction of 33%. Shannon-Weiner, Simpson's and Evenness indices decreased with increasing disturbance.

A total of 68 individuals belonging to 17 species were affected by cutting. All the cut-signs were documented in the highly disturbed site, which was located close to the forest settlements. Fourteen of the 17 species (82.35%) affected by cutting were utilized by Malabar grey hornbills either for food or nesting.

The present study infers that, fruit and nest trees are lifeline for Malabar Grey Hornbill in Mudumalai Wildlife Sanctuary. Lipid-rich fruits formed the preferred food during breeding season. While figs are keystone fruit resources in the habitat, tall trees with large girth, such as *Lagerstroemia microcarpa* and *Terminalia* spp. are indispensable for nesting. Plantations adjacent to the Sanctuary supplement fruit resources for Malabar Grey Hornbill. Restraining human activities in the study site would be the key for the conservation of the habitat as diversity and species richness decreased with increasing human incursions.