

SUMMARY

Utilization of habitat resources, particularly fruit and nest trees, by an endemic bird species, Malabar Grey Hornbill (*Ocyrceros griseus*) was studied in a tropical semi-evergreen forest and the adjoining tea/coffee plantations at Mudumalai Wildlife Sanctuary, Western Ghats. This bird species is mainly distributed in the moist forests of southern Western Ghats. Though some aspects of Malabar Grey Hornbill in an evergreen forest at Anamalai Hills have been studied during the breeding season, fruit utilization during the non-breeding season is not known. Also, the preference of this endemic hornbill for food and nest tree species is unknown. This study aimed to assess the food preferences of Malabar Grey Hornbill during breeding and non-breeding seasons, nest-tree preferences and to identify the keystone resources for the Malabar Grey Hornbill in the semi-evergreen forest

A total of 1643 individuals of fleshy fruited trees belonging to 27 species were marked and monitored once in a month for fruit availability in three belt transects totaling 6 ha of sample. The 27 species included 4 figs and 23 non-figs. Availability of fleshy fruits in the tea/coffee plantations was also 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 periodic 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 (≥ 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.

Twenty-seven fruit species belonging to 17 families were consumed by Malabar Grey Hornbill. Fruit utilization during breeding season was assessed by monitoring two nests. Seventeen species of 13 families were delivered by the male hornbill to the nest inmates. Two species namely *Actinodaphne malabarica* (30 %) and *Olea dioica* (24 %) contributed for about 55% of the 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 %) and *Persea macrantha* (26 %).

During the two non-breeding seasons, sixteen species belonging to 10 families were consumed by the Malabar Grey Hornbill. Two species of figs, *Ficus drupacea* and *Ficus tsjahela*, both of Moraceae accounted for 58. % 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 species

(P.I.= 0.91) and *Ficus drupacea* (P.I. = 0.93) were the preferred fruit species during breeding and non-breeding season respectively.

Studies on regeneration at the midden site 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.

Role of plantations as supplementary habitat for Malabar Grey Hornbill was investigated. Analysis of the fruiting pattern during the two-year study period revealed a major fruiting peak in January. 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 emeni* (Rhamnaceae) together accounted for 80.6% of feeding in the plantations.

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 %), followed by *Terminalia bellirica* (21 nest trees; 25.93%) and *Terminalia crenulata* (9 nest trees; 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). Nest site and tree characteristics of 40 nest trees were studied. Thirty-five (67.30 %; n = 52) nests were re-used in 2001 while 21 (40.3 %; n = 52) were re-used in 2002.

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

A total of 36 species belonging to 23 families were used by Malabar Grey Hornbill for food and nesting. While 24 species were food plants belonging to 15 families, sixteen species belonging to 14 families were nest trees. The phytosociological analysis of the study sites 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 richness, Simpson's index and Evenness index 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 %) affected by cutting were utilized by Malabar grey hornbills either for food or nesting.

Thus, the present study infers that fruit and nest trees are lifeline for Malabar Grey Hornbill in Mudumalai Wildlife Sanctuary. While figs are keystone fruit resources in the habitat, tall trees with large girth, namely, *Lagestroemia microcarpa* and *Terminalia* spp. are indispensable for the hornbills here. Plantations adjacent to the Sanctuary also 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.