**TD-000017**

**Kumar, E. S. (2010). Studies on frugivory and seed dispersal by Indian Grey Hornbill (*Ocyceros birostris*) in Sathyamangalam forest division, Eastern Ghats. Sálim Ali Centre for Ornithology and Natural History. Coimbatore, Bharathiar University, Coimbatore.**

**SUMMARY**

Seed dispersal refers the removal and deposition of seeds away from parent plants, by which a plant scatter its offspring away from their source of origin to reduce competition. Seed dispersal and its establishment are the crucial moments in the life cycle of plants which determine the success of plant populations. Basic knowledge about fruit-frugivore interactions and especially the seed dispersal process in forest ecosystems is essential for conservation of endangered animals and the forest itself. Fruit consumption by birds is an important species interaction that contributes to seed dispersal in forests.

Hornbills, being primary frugivores of the tropical forest, play an important role in seed dispersal and regeneration of forest trees. Their ability to open and swallow large, ripe fruits and their defecation and regurgitation of undamaged viable seeds make them ideal dispersers. 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 (*Ocyceros 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. A review of literature revealed the absence of detailed research on Indian Grey Hornbill. Hence, a study was undertaken with the following objectives, i. assess frugivory by Indian Grey Hornbil and ii. Establish its role in seed dispersal and regeneration of its food plants. The study was carried out in Sathyamangalam Forest Division (11˚ 29” - 11˚ 48” N latitude and 76˚ 50” - 77˚ 27” E longitude), Eastern Ghats, India.

In the study area, two habitats namely, dry deciduous and riverine forests were found to be used by the Indian Grey Hornbill. Vegetation assessment was done in the above-mentioned habitats and also in a disturbed dry deciduous forest site to assess the loss of food plants by anthropogenic interventions. One ha plots (100 X 100 m) were laid in each of the above-mentioned three habitats. Data collected were analyzed to obtain quantitative structure and composition of plant communities. Fruiting periodicity was monitored by tagging 210 plants belonging to 21 fleshy-fruited species for two years from July 2006 to June 2008 in the study site. Tagged plants were monitored once in a fortnight for fruit availability.

Fruit use by the hornbills was determined in the breeding and non-breeding season. During non-breeding season hornbills mostly forage on fruit trees. In the breeding season, the female and chicks that are confined to the nest holes are fed by the male. Data were gathered in two breeding and non-breeding seasons during 2006-2008. In the breeding season, active cavities of trees were identified by following the breeding pair of hornbills and breeding male carrying fruit to the nest. Middens of nests were collected once in a week during the nesting period. Items collected from the 10 nest middens were analyzed, quantified and recorded. In addition, a total of 720 hours were spent at the hides made aside the nests for monitoring the fruit deliveries by males to the nest inmates. Focal observations were carried out from 06:00 AM to 06:00 PM at 10 nests. Diet during non-breeding was assessed by scan sampling and focal animal sampling method. Observations were done along selected transects, mostly done from 06:00 to 10:00 AM and 04:00 to 06:00 PM when the feeding activity of hornbills was high. During the transect walk, hornbills foraging within 50 m of either side of transects were recorded. During each observation, food item consumed and the tree species in which they were feeding were recorded. Fruits being the major diet, efforts were made to find out hornbill’s preferred fruit species. Preference index (PI) was calculated using Ivlev’s Index of Selectivity.

Role of Indian Grey Hornbill in regeneration of its food plants was assessed by monitoring the seedling abundance in front and behind 10 nest trees. A total of 20 quadrats were laid for sampling seedling abundance. Two 3x3 m quadrats, one each in the front and behind the nest trees were laid. All the seedlings in the 3x3m quadrats were recorded and identified. The plots were monitored weekly for seeding emergence. All seedlings in the 3 m plots were identified and counted.

Seed germination experiments were conducted to compare the germination efficiency of bird defecated seeds with that of control seeds. For the germination experiment, 16 seed species were used. Three categories of seed samples were used for germination experiments, i. bird dispersed seeds collected from the nest middens, ii. Pulp removed seeds and iii. seed with pulp. For each category, 10 seeds were used. Seeds were sown in polythene bags. The bags were filled with soil and sand mixture. The poly-bags were watered regularly and the height of the seedlings was recorded every week for four months from the date of sowing.

In the 1 ha plot of the dry deciduous forest, 322 trees belonging to 30 species, 28 genera and 17 families were recorded. Shannon’s species diversity was worked out to be 2.64. A total of 588 trees belonging to 64 tree species, 49 genera and 25 families were recorded in the riverine forests. Shannon’s species diversity for tree flora was worked out to be 3.40. Among the 41 species of Indian Grey hornbill’s food plants recorded in the study area, 22 species were recorded in the sample plots. Of the 22 food plant species, 20 were recorded in the riverine habitat and 14 in the dry deciduous habitat. Tree species diversity (2.12) was found to be lower in the human impacted site, as compare to the undisturbed forest site.

Fruit production occurs year round in the dry deciduous forest. A fruiting peak was recorded in May and July of both the years, indicating the occurrence of seasonality. Of the 21 plant species tagged for phonological studies, four species of Moraceae (*Ficus benghalensis*, *Ficus drupacea*, *Ficus microcarpa* and *Ficus racemosa*) fruited throughout the year. All other species showed seasonal fruiting activity. Fruit abundance also had fluctuation between the years.

The nesting period of Indian Grey Hornbill lasted for about three months from March to May. The nesting period averaged 87 days. In the breeding season, the food items delivered to the nest inmates (female and chicks) include both vegetable (63.65%) and animal matter (36.35%). During nest monitoring, a total of 13,680 food items were delivered to the nest inmates. The vegetable diet included mainly fruits (98.30%) and a small proportion of *Melia dubia* leaves. Fruits of 36 plant species belonging to 16 families were consumed during the breeding season among which 14 species were identified by monitoring the nests and 12 species from the nest middens. Seeds of all the 26 species were found in middens. A total of 3,303 large/medium seeds were recorded in the middens of 10 nests. Seeds of *Premna tomentosa* (38.66%), *Drypetes roxburghii* (19.59%), *Filicium decipiens* (12.75%), *Diospyros montana* (9.87%) and *Santalum album* (6.18 %) formed the predominant species. The nine species with minute seeds include *Ficus* spp (6), *Solanum* spp (2) and *Morus* *alba*. No physical injury was noticed in the seeds dispersed by Indian Grey hornbills.

Food habits during non-breeding season were assessed by walking along transects and observing foraging activities of hornbills. Of the 3086 feeding observations made, 82.98% were on fruits and the remaining included leaves (8.82%), insects (7.70%) and flowers (0.50%). Of the 38 fruit species belonging to 21 families consumed, *Ficus* constituted 25.26% of the non-breeding season diet. In all, fruits of 41 species belonging to 22 families were consumed by Indian Grey hornbill. Both figs and non-figs formed the diet of Indian Grey Hornbill in Eastern Ghats.

Ivlev’s preference index (PI) showed that all the six *Ficus spp.* were preferred by Indian Grey hornbills both in breeding and on-breeding season with the PI value > 0.9. During breeding season, hornbill prefers *Ficus microcarpa* and *Premna tomentosa* (PI = 0.99) followed by *Santalum album* (PI = 0.98) and *Ficus benghalensis* (PI = 0.97). During the non-breeding season, *Bridelia crenulata* (PI=0.97) followed by *Ficus religiosa* (PI=0.95) and *Solanum erianthum* (PI=0.95) were preferred.

Regeneration of hornbill’s food plants under the nest trees were recorded for 10 nests. Twenty 3x3 m quadrats were laid in front and behind the nest trees for comparison. A total of 44 species of seedlings were recorded among which 24 species (54.5%) were found to be food plant species of Indian Grey hornbill.

Predominant diet species found in front of the nest trees were *Diospyros montana* (23.97%) and *Drypetes roxburghii* (17.47%). The number of seedlings of hornbill diet species (plants) was higher than that of non-diet species in front of the nests. Quantification of seedlings under the nest trees showed that the abundance of the hornbill’s food plants were higher in front of the nest trees than behind the nest trees. The number of seedlings in front of the nest trees was nearly four times more than the seedlings behind the nests. Regeneration of hornbill’s food plant species was also quantified under the roost trees. Prominent seedlings include *Syzygium cumini*, *Diospyros montana*, *Drypetes roxbughii*, *Premna tomentosa,* *Santalum album* and *Filicium decipiens*.

Of the 16 seed species subjected for germination experiment, 15 species of bird defecated seeds showed enhanced germination. Species such as *Syzygium cumini*, *Premna tomentosa*, *Diospyros montana* and *Drypetes roxburghii* showed 100 percent germination. The percentage of germination was less than 30 percent for *Zizyphus mauritiana* and *Filicium decipiens* and more than 60 percent for the remaining species. Of the 16 control species experimented, nine species of pulp removed seeds and four species of intact fruit alone germinated, indicating the importance of hornbill’s scarification and deinhibition effect on seeds. Germination trials indicated that majority of the seeds dispersed by the Indian Grey hornbill show enhanced germination.

Study shows that Indian Grey Hornbill is mainly a frugivorous bird, 64% of the breeding season diet and 92% of the non-breeding season diet constituted fruits. In all, Indian Grey Hornbill consumed 41 fleshy fruited species belonging to 22 plant families. Seed germination trials showed enhanced germination percentage of hornbill defecated seeds. Food habits and regeneration of hornbill’s food plants all the nest and roost sites point out that Indian Grey Hornbill plays an important role in seed dispersal.

\*\*\*\*