Ecological investigation of woody vegetation and nest tree use by birds in the riverine forests of Athikadavu Valley, Western Ghats

Final Report

Submitted to
Ministry of Environment, Forests and Climate Change, Govt. of India

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5. Executive summary of the project

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Background

Birds build nests to protect themselves, their eggs, and their young from predators and from adverse weather. Several types of bird nests are recognized in the wild. These include scrape, mound, burrow, cavity, cup, saucer or plate, platform, pendant and sphere. For some species, a nest is simply a shallow depression made in sand; for others, it is the knot-hole left by a broken branch, a burrow dug into the ground, a chamber drilled into a tree, an enormous rotting pile of vegetation and earth, or a mud dome with an entrance tunnel. Two important tree strata namely bole and canopy are heavily used by birds for nesting. While the cavity nesters such as parakeets, owls, barbets, hornbills, woodpeckers, kingfishers, starlings and mynas use the cavities of live and dead trees, stick-nesting birds such as kites, eagles, vultures, a few owls and some water birds use the tree canopy. Raptors build a large stick nest in a tall, dead or very occasionally live tree, usually in an exposed position close to suitable feeding habitat (rivers, lakes and ocean). Anthropogenic interventions such as tree felling, non-timber forest produces collection, agricultural activities alongside the forest boundaries threatens birds that nest in cavities of tree trunks and canopies. Raptors require tall trees with big canopy for nesting. Cavity nesting birds prefer diseased, dying or dead trees because it is easier to find or excavate cavities in such trees. In India, more than 100 species of tree-cavity nesting birds have been identified, but very little information is available about their breeding habits. In the above background, it was felt that a study on tree diversity and its use by birds in the riverine forests of an important river system-the Bhavani a tributary of Cauvery would be useful for protecting the biodiversity.

Objectives:

i)Quantify the woody vegetation and estimate the abundance of trees in the riverine forests, ii) find out the nest trees used by cavity-nesting birds, assess the characteristics of nest trees and identify preferred nest tree species, iii). find out the nest trees used by stick-nesters, especially raptors and assess the nest tree features and identify preferred nest tree species and iv) assess the human impacts on riverine vegetation and suggest conservation measures.

Study Area:

The study was carried out in Athikadavu valley along the river Bhavani in the south-eastern Nilgiri slopes, Western Ghats. The Valley is situated between 11°12'48.19" N & 76°45'22.94" E in the Western Ghats.

Methodology:

Quantification of vegetation: Woody vegetation along river banks was enumerated by repeated walks along river banks. The woody vegetation of the riverine forest was quantified by using belt-transect method. Sampling was done in two belt transects, each measuring 1 ha (1000x10m). To understand the vegetation composition in the adjoining mixed dry deciduous forests, 1 ha was sampled. All the stems measuring >20 cm gbh (girth at breast height) were enumerated. Observations on cavity-nesters and nest tree and cavity characteristics: Birds were observed using a pair of 10 x 50 binoculars. The birds were identified by their characteristic features in accordance with standard identification manuals and field guides. Nest trees were located by making repeated walks along river banks. The plant species on which nests are placed are identified and recorded. Data on nest characteristics and nest-sites are collectedNest tree preferences of cavity nesting birds were assessed by using Ivlev's Index.

 Observations on stick-nesters, nest trees and canopy features: Raptors (birds of prey) that use tree canopy and tree holes for nesting were studied. Stick-nests of raptors were located by making repeated walks and canopy scanning along river banks. Whenever raptor nest was located, name of the nesting tree, nest location, height, and canopy characteristics were observed and recorded. Nesting pairs were watched from nest construction to the fledgling leaving the nest. Weekly monitoring of nests was done. Ivlev's selectivity Index was used to find out the nest tree species preferences of the stick nesting raptors

Threat Assessment: Potential human disturbances include cutting, lopping and Non-Timber Forest Produces collection. While sampling the woody vegetation, disturbance signs such as cutting and lopping and NTFP collection activities were recorded. Local people accompanying us in the field were interviewed to know the reasons for lopping/cutting etc. Based on the number of use values, individuals with disturbance signs, tree species are grouped into i. highly exploited ii. moderately exploited and iii. mildly used.

Results

Vegetation assessment

A total of 70 woody plant species belonging to 60 genera and 38 families were recorded in the riverine forests. The family Moraceae was represented by the highest number of species (n=8) followed by Euphorbiaceae and Fabaceae having 5 species each. At the generic level, *Ficus* has the highest number of species (n=7). The dominant tree species were *Pongamia pinnata* (IVI-74.64) *Diospyros peregrina* (41.75), and *Mangifera indica* (41.16). The plant community of the riverine forests in Athikadavu valley can be described as *Pongamia pinnata - Diospyros peregrina - Mangifera indica* community.

The adjoining dry deciduous forest was also sampled to get comparative values of plant species richness and diversity. A total of 67 woody plant species belonging 55 genera and 26 families were recorded. Mimosaceae constituted the largest family with eight species followed by Fabcaceae (6 species) and Euphorbiaceae (5 species). The dominant tree species were *Drypetes sepiaria* (IVI-22.82), *Chloroxylon sweitenia* (22.62) and *Tamarindus indica* (21.30). The vegetation of the dry mixed deciduous forests in Athikadavu valley can be described as *Drypetes seperia-Chloroxylon sweitenia-Tamarindus indica* community. Lowest value was observed for *Diospyros ferrea* (0.34).

Comparison of vegetation features of two vegetation types showed higher species richness and diversity in the riverine forests. Thirty eight plant families, 60 genera, 70 species were recorded in the riverine forests, where as in the dry deciduous forests 26 families, 55 genera and 67 tree species were found.

A total of 36 woody species was utilized used by Irulars for various purposes. It includes fruits for dyeing, leaves for cattle feed, wood for house construction, support poles for fencing and fuel wood. While five plant species are heavily exploited, six are moderately used and remaining species less were exploited. Heavily exploited species include *Diospyros peregrina, Mangifera indica, Madhuca longifolia, Pongamia pinnata* and *Atalantia monophylla.* Of the highly used five tree species, four of them are cavity nesting bird's nesting tree species.

Bird community composition in the riverine forest

A total of 157 bird species belonging to 51 families were recorded. Out of 51 families, Cuculidae constituted the largest family with 12 (8.5%) species followed by Accipitridae 9 (6.2%) and Rallidae 8 (5.5%). Motacillinae, Columbidae, Dicruridae and Sturnidae represented by 6 (4.1%) species each. Out of the 157 species, 32 species are cavity nesting birds, which include woodpeckers, hornbills, barbets, parakeets, mynas, owls and tits. Nine raptor species have been recorded. Among these 157 species, 105 (66.87%) species were residents, 38 (24.20%) species were winter migrants and 14 (8.9%) species were summer migrants.

Cavity nesting bird species in the riverine forest

A total of 32 cavity nesting birds were found in the riverine forests of Athikadavu Valley. Major proportion of cavity nesting birds included woodpeckers, owls and mynas (15.63% each) followed by parakeets and barbets represented by 12.50% each and hornbills (9.38%). In the study area, 257 nest trees belonging to 54 species (23 families) were utilized for nesting by the cavity nesting birds. The 257 nest trees included 226 live trees and 31 dead trees (snags).

Nest tree utilization by cavity nesting birds

A total of 302 active nests of various bird species were located in the riverine forests of Athikadavu. Out of 302 cavity nests, 102 (33.77%) belonged to primary cavity nesters and 200 (66.23%) belonged to secondary cavity nesters. Highest number of cavities was used by Common Myna (55; 18.21%) followed by White-cheeked Barbet (44; 14.57%) and Brown-headed Barbet (30; 9.93%). Highest number of tree species was used by Common Myna (n=22) followed by Brown-headed Barbet (n=20) and White-cheeked Barbet (n=18). In all, species such as *Terminalia arjuna, Mangifera indica*, *Ceiba pentandra* and *Melia dubia* were favoured by several cavity nesting species.

Nest tree conditions, namely live tree, dead tree, live top, dead top were assessed. A total of 302 nests belonging to 20 cavity nesting bird species were examined. Nest tree condition namely live and dead used by cavity nesters in the riverine forests are given in Table 11. Of the 102 nest

cavities excavated by primary cavity nesting birds (barbets and woodpeckers) 89.21% were found in dead branches/dead trees. Hornbill used only live trees.

In the study area, 257 nest trees belonging to 54 species were utilized for nesting by cavity nesting birds. A total of 864 cavities comprising 376 natural cavities and 488 bird excavated cavities were recorded. Highest number of cavities were found in *Terminalia arjuna* followed *Mangifera indica, Melia dubia* and *Ceiba pentandra.*

Snag species use by cavity nesting birds

In the study area, 31 snag nest trees belonging to 13 species (10 families) were used for nesting by cavity nesting birds. A total of 43 nests were recorded in snag trees. Highest number of nests was located on *Mangifera indica* followed by *Ceiba pentandra* and *Terminalia arjuna.*

Nest tree features and nest orientation

Nest heights of cavity nesting birds were recorded for 302 nests. Nest cavities were located on varying heights from as low as 2m to a height of 23m. Nest heights were grouped into five types namely, upto 5 m, 5-10m, 10-15m, 15-20m and 20-25m. Largest proportion of nests (48.01%) was located in the 5-10m category.

Orientation of nest entrances is grouped into eight compass directions, namely South, North, East, West, North-east, South-west, South-east and North-west. A large proportion of nests of both the primary (67.4%) and secondary cavity nesters (56.4%) were facing North and South.

Highest number of cavity nesting bird nests was recorded during summer in both the years (2012-13 and 2013-14) of study.

Nest tree species preference by cavity nesting birds

A total of 54 tree species were utilized for nesting. Cavity nesting birds showed preference towards certain tree species. Ivlev's Index of selectivity was used to estimate nest tree species preference for cavity nesters. Abundance values of trees were used for availabilty of resource and for the utlization, number and percent of individuals of various tree species used for nesting

by cavity nesting birds was taken. Cavity nesting birds showed preference to *Terminalia arjuna* (PI=0.95) followed by *Mangifera indica* (PI=0.93) and *Melia dubia* (PI=0.91). A total of 302 nests were recorded during the study period. Out of the 302 nests, 71 bird nests were reused in the riverine forest. Cavities in *Gyrocarpus americanus, Terminalia arjuna, Sterospermum personatum* and *Mangifera indica* were reused.

Stick-nesting Raptors in the Riverine forests

Nine species of raptors belonging to Accipitridae family were recorded in the riverine forests. This included Brahminy Kite, Black Kite, Jerdon's Baza, Greater Grey-headed Fish Eagle, Crested Serpent-Eagle, Black Eagle, Changeable Hawk Eagle, Shikra and Bonelli's Eagle.

Nest tree use by stick nesting raptors

A total of 13 raptor nests were located in the riverine forest of Athikadavu valley. Two Brahminy Kite nests were found on a *Terminalia arjuna* tree. Five Greater Grey-headed Fish-Eagle nests (3 in the first year and 2 in 2nd year) were located. Three tree species viz. *Mangifera indica, Calophyllum apetalum* and *Terminalia bellirica* were used by the Grey-headed Fish Eagle. Two nest tree species viz. *Albizia lebbeck* and *Hardwickia binata* were used by Jerdon's Baza. Bonnelli's Eagle's nest was found on *Terminalia arjuna*. Two nests of Changeable Hawk Eagle were located, one nest on *Albizia lebbeck* and another on *Hardwickia binata*.

Nest tree species preference by stick nesting raptors

A total of six tree species were utilized for nesting. Raptors showed preference towards certain tree species. Ivlev's Index of selectivity was used to estimate nest tree species preferences. Highest preference was observed for *Albizia lebbeck* (PI=0.50) and *Hardwickia binata* (PI=0.50) followed by *Terminalia bellirica* (PI=0.33).

<u>General Observations</u>

Generally the cavities used by hole-nesters had narrower entrance and were situated at greater heights (Carlson *et al*. 1998). Alatalo *et al* (1991) opined that the small entrance holes and location high up in trees are important for reducing predation risk. According to Schepps *et al*. (1999) the nest tree hardness decline with increasing height which may be the reason for cavity nesters choosing locations high up the tree.

Keeping the anthropogenic disturbances and data gathered on ecological observations on birds and trees in the riverine forest, some recommendations are offered for conservation and management of the habitat.