CHAPTER VII

GENERAL CONCLUSION AND MANAGEMENT RECOMMENDATIONS

Bird communities in the thorn and dry deciduous forests of Mudumalai Wildlife Sanctuary was studied during 1994-1997 with the following objective:

to identify the patterns and processes of bird communities in the thorn and dry deciduous forests.

It was achieved through studies on population, foraging patterns and nest-site selection. These aspects were studied in detail with the supporting data on the habitat structure (vegetation physiognomy) and the general avifauna of Mudumalai Wildlife Sanctuary.

1. Avifauna of Mudumalai Wildlife Sanctuary

Regardless of habitat types, 265 bird species belonging to 17 orders were recorded in Mudumali Wildlife Sanctuary. It included nine of the 15 species endemic to the Western Ghats. In general, insectivorous birds dominated in all the habitats followed by nectarivores/frugivores. Among the major habitat types (thorn, dry deciduous and moist deciduous), the number of birds sighted were more in the thorn forest and low in the moist deciduous forest.

Birds were classified as generalists (if sighted in more than one habitat) and specialists (if sighted in only one habitat). Among the habitats, specialists were more in the thorn forest and low in the dry deciduous forest.

The thorn and moist deciduous forests harboured greater number of specialists, endemics of Western Ghats, waterfowl as well as raptors.

2. Vegetation physiognomy and impact of human interference on plant community .

Vegetation of the thorn and dry deciduous forests was enumerated to identify the density, species richness, and diversity of plant species and to identify the human impact on them. Both the habitat types considerably varied in the plant species composition due to the changes in the environmental factors between habitats. Although tree diversity was more in the thorn forest, there was almost a fourfold increase in the number of trees available in the dry deciduous forest. Both the availability and diversity of snags were also greater in dry deciduous than in the thorn forest, so also the foliage height diversity (FHD). In both the habitats, a few individuals of one or more species were either in flowering or fruiting stage in a given month of the year.

Informal interviews with the people who regularly exercise wood-cutting inside the protected area revealed that plant species were largely preferred for fuelwood purposes as majority of the local communities are dependant upon wood as their primary energy source. A total of seven plant species were preferred by the local people. Number of plant species exploited by the people varied between habitats. It was more in the thorn forest than in the dry deciduous forest. In total, based on informal interview, inspection of wood bundles, and

vegetation survey, 17 plant species were identified as used extensively by the local people for various purposes.

3. Bird community

Abundance of birds in the thorn and dry deciduous forests was estimated in dry and wet seasons between 1995 and 1996. Species richness, abundance and diversity of birds were more during the dry season than in the wet season in both the habitats throughout the study period. The presence of migrants and breeding season of the resident birds resulted in the higher diversity in dry season. In general, the insectivores and frugivores dominated in both the habitats. Both of them showed distinct seasonal fluctuation in their abundance in both the habitats.

No relationship was found between FHD and BSD in both the habitats. However, in order to understand the relationship between FHD and the functional aspects of birds (foraging), foraging observations (see chapter V) collected were used. Since the foraging observations were collected for the dry season, the FHD measured in dry season alone was considered. Here bird diversity correlated positively with foliage height diversity both in the thorn (r_s = 0.9048, P= 0.001) and dry deciduous forest (r_s = 0.6164 P= 0.022). Comparison of population of avifauna between habitats revealed that species richness and diversity were more in the thorn forest during dry and in the dry deciduous forest during wet season.

4. Foraging pattern of birds

Foraging patterns of birds in the thorn and dry deciduous forests were studied during the dry season (January to April) in 1995 and 1996 in Mudumalai Wildlife Sanctuary.

Thorn forest

In total, 1386 foraging observations were made on 33 bird species in the thorn forest. A total of 6 substrates, 9 methods, and 3 layers were found used predominantly by the 33 bird species. Among the foraging dimensions (foraging height, method and substrate), highest niche overlap was found in the vertical strata (height) followed by the substrate and method. Specialists were found more in the substrate category followed my method and height. The cluster analysis (based on foraging dimensions) separated the birds of thorn forest mainly by the foraging height into two guilds (ground, and shrubs/trees). Further, birds were separated based on the foraging method and substrate.

Dry deciduous forest

In total, 1176 foraging observations were made on 30 bird species in the dry deciduous forest. A total of 6 substrates , 8 methods, and 3 vegetation layers were used predominantly by the 30 bird species. Among the foraging dimensions (foraging height, method and substrate), highest niche overlap was found in the height followed by the substrate and method. Specialists were found more in the substrate category followed my method and height. The cluster analysis (based

on foraging dimensions) separated the birds of dry deciduous forest mainly by the height into three guilds (ground, shrub/short trees, and trees). Further, birds were separated based on the foraging method and substrate.

Comparison of foraging pattern between forests

The foraging patterns of birds of these two forests differed largely by vegetation layer rather than other dimensions i.e., method and substrate. Of the 28 bird species studied in both the forest types, 20 species differed significantly in their height use while only seven species differed in their foraging method between forests. As the use of foraging method and substrate may be constrained by morphology, no difference was found in most of the birds.

4.Nesting and nest-site characteristics

Nesting and nest-site characteristics of breeding birds in the thorn and dry deciduous forests of Mudumalai WLS were studied in 1995 and 1996. A total of 302 nests of 30 species of birds was observed; 200 nests of 22 species in the thorn forest and 102 nests of 20 species in dry deciduous forest.

In both habitats, cup-nests were more. The dry deciduous forest harboured more number of hole-nests while the thorn forest harboured more number of dome-nests. Regardless of habitats, birds had the major breeding season from February to June with a peak in May.

A total of 24 plant species were used for nesting by various bird species. Diversity of nests were found more in *Anogeissus latifolia* and snags. Among the

nine birds studied for the nest-plant selection, Whitebrowed Fantail Flycatcher showed some level of consistency while Whiteheaded Babbler used a wide variety of plants.

Nest-site selection was studied on only five bird species, namely Crested Hawk Eagle, Baybacked Shrike, Whitebrowed Fantail Flycatcher, Spotted Munia, and Paradise Flycatcher. Tree height, tree GBH, tree density, shrub cover and canopy cover were found crucial in various levels in the nest-site selection of these species. All the species except Baybacked Shrike preferred undisturbed areas and plants for nesting.

MANAGEMENT RECOMMENDATIONS

1. The thorn and moist deciduous habitats are important as they support more number of specialists. Moreover, these are the two habitats facing severe anthropogenic pressures in Mudumalai Wildlife Sanctuary. Although the dry deciduous habitat is not much disturbed like other habitats, it supports lower number of habitat specialists as it is structurally less complex. However, it is a good nesting habitat for the hole-nesters because of the availability of more trees and snags. These snags have to be preserved from illegal removal. Late II wet season to early I wet season (November to July) is the crucial period for most of the birds as it is the season for migrants and nesting of resident birds. Human pressure has to be minimized at least during this period throughout the sanctuary.

2. Special effort has to be made to preserve the places such as Ompetta and Game Hut for the waterfowl. The quality of these sites may be improved and proper record of the wintering and breeding population of waterfowl maintained every year. Bird census should be exercised at least every year in every habitat type. Fire should be controlled as it affects the breeding birds and vegetation dynamics.

3. The comparison of the foraging guild of birds between habitats showed the importance of some of the resource dimensions. The availability and distribution of food resources at different levels of heights seemed to be very crucial for discriminating the birds between habitats. Hence any sort of selectivity in the plant species in terms of lopping, wood cutting, or removal of trees would lead to the change in the structure of bird community and should therefore be stopped.

4. Species such as *Anogeissus latifolia, Acacia spp, Randia duometorum* are predominantly utilized for nesting by birds. Similarly, all these species are preferred by the local people as firewood. Hence, a proper programme has to be made to preserve these tree species for the survival of the birds. Raising fire-wood plants outside the sanctuary and supplying firewood through the Forest department to the local people would reduce the human impact on these tree species. In the thorn forest, among the microhabitats, nullahs and riparian patches act as nesting habitat for many of the rare species of this area. These

are the places where sand removal is severe which should be stopped and given protection. The Crested Hawk-Eagle, Paradise Flycatcher, and Whitebrowed Fantail Flycatcher showed some level of fidelity to the nest-site and nest-tree. Hence, proper attention has to be given to minimize disturbance to their nesting areas or microhabitats. Large trees are essential in the dry deciduous forest for the Crested Hawk Eagle to nest. Hence, felling of these or disturbance in these areas should be stopped.