

HABITAT ALTERATIONS IN TROPICAL FOREST AND ITS IMPACT ON DIVERSITY OF BIRDS IN NORTHEAST INDIA

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Abstract - Anthropogenic activities on account of traditional practices are devastating natural forest in tropical countries. The local government rehabilitates natural habitat through monoculture plantations and altering their structure and composition. This is affecting local biodiversity severely. A study was conducted in Sialsuk community reserve forest in Mizoram, India. A natural forest and a plantation forest site was undertaken to assess this aspect on avian diversity. Vegetation composition with 7 tree species, tree diversity, 0.04 tree/m², and tree diversity (H=0.708) at plantation site was recorded very low. Natural forest had vegetation composition with 23 tree species, diversity H = 2.669 and average tree density was 0.057/ m². Avian diversity in natural forest site was represented by 33 bird species that belong to 8 taxonomic order. Order Passeriformes was represented by 24 species of birds. Avian diversity in plantation forest site was represented by one taxonomic order (Passeriformes) and three species of birds in this order only. Drastic loss of avian fauna was evident due to alteration of habitat. Same could also apply be true for other faunal groups.

Running title: Habitat change and avian diversity

Key words - Tropical forest, Habitat alteration, Avian biodiversity.

I. INTRODUCTION

The conservation of biological diversity on earth has emerged as one of the most important environmental issues of this time (Turner et al., 1990; Ehrlich and Wilson, 1991). Tropical forest ecosystems, especially rain forests, are home for the greatest concentration of species diversity on earth (Myers, 1984). More than 9,600 species of birds occur all over the world, where 2,100 species and subspecies, 22% of world species occur in the Indian subcontinent with 176 endemic species. India alone has 1,200 species (Ali and Ripley, 1987). With 13% of the world's avian diversity, India designated diversity rich nations in the world and rank a "Mega diversity" country along with 11 other countries (Javed and Kaul, 2002). Northeast India probably harbors the highest bird diversity within the Oriental region, about 7% known birds belongs to the Indian subcontinent (Birand and Pawar, 2004). Twenty four species are restricted to the region, in their occurrence in the Eastern Himalayas and Assam Plains are recognized as Endemic Bird Areas (ICBP, 1992). The varied physiographic condition of north-east India harbors a range of habitats and a highly diverse and endemic biota (Mani 1974). The richness of the region's avifauna largely reflects the diversity of habitats associated with a wide altitudinal range.

Human pressure has caused alterations in the ecosystem and for the past two centuries rate of destruction has accelerated and as a result forests structure is rapidly changing losing biodiversity therein (Allen and Barnes, 1985; Brown and Lugo, 1990). Traditional practices such jhum cultivation in hilly regions have added dimension in conversion of habitats that still common in

northeastern part of India (Raman, 2001), changing the forest into fragmented land mass. Forest department of Mizoram rehabilitates such landscapes by undertaking monoculture plantation and thereby creating a different habitat. Such rehabilitation program increases the green cover over the land but degrade the quality of habitat. In Mizoram such programs has increased the green cover to 42% in 2001 owing to development of plantations (FSI, 2003). Natural forest, plantation forest and replenished degraded (secondary) habitat vary with quantity and quality of food and nesting sites for birds. Such alterations in habitat in turn influence the birds assemblage and their composition. Therefore this study was initiated to understand the impact of alteration of habitat in the form of monoculture plantation on the diversity of birds in Mizoram.

II. MATERIALS AND METHODS

Study was conducted in Sialsuk in state of Mizoram, Northeast part of India. Mizoram falls in the Indo-Burma global biodiversity hotspot (Myers et al., 2000; Mittermeier et al., 2004) and the Eastern Himalaya Endemic Bird Area (Stattersfield et al., 1998). The entire state is hilly and mountainous. Annual rainfall generally varies from 2000 to 4000 mm. Sialsuk is located on 23°23'04.7"N latitudes and 92°44'55.3"E longitudes, elevation ranges from 1077m to 1395m above sea level. The average temperature ranges from 7°C minimum in winter to 37°C maximum in summer (Choudhury, 2008). Two sites were selected on the study area; Monoculture plantation Forest of 74.13 acre and Natural forest of 98.85 acre. Study was conducted in year 2012 during winter. Line transects (Sutherland et al., 2004, Hosetti, 2003) and point count method was adopted for survey

of birds (Javed and Kaul, 2002). Predetermined vintage point, and line transect were laid on both sites that were visited for recording birds on either side of transects and from the point up to visible range of observer were recorded. A total of 16 transect line of one kilometer each, 8 in Natural forest and 8 in monoculture forest were nested. Data collected by the two methods was pooled for further analysis of composition, diversity and dominance of the birds. Birds were identified with the help of field guide/pictorial guide and other material available for identification of birds (Grimmett et al., 1999; Choudhury, 2008; and Sawmliana, 1998). Vegetation of the study was done also with the quadrat method as per the methods given by Mishra (1968). Total no of quadrats studied were twenty; ten from each category of site. All the trees in the quadrat were counted and pooled for vegetation analysis. It was done separately for both the sites. The size of quadrat was 10m x 10m along line transect in each site. The quantitative analysis for density, frequency, and abundance of trees were performed as per Curtis and McIntosh (1950). Species diversity and dominance for bird and plants were evaluated by

using Shannon's diversity index and Simpson's index of dominance as described by Magurran (2003).

III. RESULTS AND DISCUSSION

Vegetation analysis

The natural forest area was comprised of 23 tree species (table 1) where four plant species namely Schimawallichi, Macaranga indica, Engelhardtia speciosa and Cantanopsis stribulodes exhibited 100% frequency of occurrence and Ostodes paniculata, Syzygium cumini, Helicia excelsa had 90%. Average tree density for all these species was also high rank varied from 5.7, 4.5, 3.3, 1.5, 3.3, 2.1, and 1.3 densities/10 m². In plantation forest Pines khasiana showed high frequency (100%) and density 4.5/10 m² being the planted species as compared to other six species in plantation forest. Seven species were recorded in plantation forest (table 2). Plant diversity and dominance index in natural forest was H=2.669, and D=0.075, and plant diversity and dominance index in plantation forest was H = 0.708, D = 0.6403.

1	Macaranga indica	9	Styrax serrulatum	17	Trema orientalis
2	Engelhardtia speciosa	10	Zyziphus incurva	18	Eurya cirasfolia
3	Schimawallichi	11	Sapium baccatum	19	Schimawallichi khasiana
4	Cantanopsis stribulodes	12	Cinnamomum verum	20	Wendlandia grandis
5	Ostodes paniculata	13	Castanopsis lanceifolia	21	Callicarpa arborea
6	Helicia excelsa	14	Fingerlindia fasciculata	22	Artocarpus lacucha
7	Syzygium cumini	15	Duabanga grandiflora	23	Trema orientalis
8	Premna racemosa	16	Lindera racemosa		

Table 1. Plants species recorded in natural forest

Sl.No	Name of Species	4	Ostodes paniculata
1	Pinus kesiya	5	Helicia excelsa
2	Macaranga indica	6	Lindera racemosa
3	Schimawallichi	7	Terminalia myrocarpa

Table 2. Plant species recorded in plantation forest

Avian analysis: 33 species of birds which belongs to 8 taxonomic order and 17 families were recorded in natural forest (table 3) and order Passeriformes included highest number of species (23). Three species which belongs to one order and two families were observed in plantation forest site (table 4). Plantation forest could harbor bird species 10 times lesser than the natural forest site. This impact is quite

visible. Most diverse family recorded in natural forest site is family Corvidae, represented by five species followed by family Muscicapidae, Pycnonotidae, Passeridae with four species each. Other families were represented by single species each. Diversity and dominance index for birds in natural forest site was H = 2.635 and D = 0.412.

Sl.No.	Order	Family	Species	
1	Galliformes	Phasianidae	Kalij Pheasant	Lophura leucomelanosthalmi
2	Piciformes	Picidae	Greater Yellow-nape	Picus flavinucha
		Megalaimidae	Lineated Barbet	Megalaima lineate
3	Coraciiformes	Meropidae	Chestnut-Headed Bee-Eater	Merops leschenaulti
4	Cuculiformes	Centropodidae	Greater Coucal	Centropus sinensis

5	Apodiformes	Apodidae	House Swift	Apusaffinis
6	Columbiformes	Columbidae	Emerald Dove	Chalcophapsindica
			Thick-Billed Green Pigeon	Treroncurvirostra
7	Ciconiiformes	Accipitridae	Besra Sparrow Hawk	Accipiter virgatus
8	Passeriformes	Lanidae	Long-Tailed Shrike	Laniusschach tricolor
		Corvidae	Maroon Oriole	Oriolustrailii
			Black Drongo	Dicrurusmacrocerus
			Greater Racket-Tailed Drongo	Dicrurusparadiseus
			Scarlet Minivet	Pericrocotusflammeus
			White-Throated Fantail	Rhipiduraalbicollis
		Muscicapidae	Blue Whistling-thrush	Myophonuscaeruleus
			Grey-Headed Canary Flycatcher	Culicicapaceylonensis
			Rufous-Bellied Niltava	Niltavasundara
			Asian Brown Flycatcher	Muscicapadaurica
		Sturnidae	Hill Myna	Graculareligiosa
		Aegithalidae	Common Iora	Aegithinatiphia
		Pycnonotidae	Red vented Bulbul	Pycnonotuscaferhumayuni
			White-Throated Bulbul	Alophoixusflaveolus
			Ashy Bulbul	Hemixosflavala
			Black Bulbul	Hypsipetesleucocephalus
		Nectarinidae	Purple Sunbird	Nectariniaasiatica
			Streaked Spider hunter	Arachnothera magna
		Passeridae	Eurasian Tree Sparrow	Passer montanus
			White Wagtail	Motacilla alba dukhunensis
			Grey Wagtail	Motacillacinerea
			White-Rumped Munia	Lonchurastrataacuticauda
		Sylviidae	Common Tailorbird	Orthotomussutorius

Table 3. Profile of the birds species recorded in natural forest

Sl.No.	Order	Family	Species	
1	Passeriformes	Muscicapidae	Asian Brown Flycatcher	Muscicapadaurica
		Pycnonotidae	Black Crested Bulbul	Pycnonotusmelanicterus
			White-Throated Bulbul	Alophoixusflaveolus

Table 4. Profile of the birds species recorded in plantation forest

High diversity value indicates the rich quality of habitat that supported large number of birds. Diversity and dominance index for birds in plantation forest site was $H = 0.797$ and $D = 0.4762$. Only White-Throated Bulbul (*Alophoixusflaveolus*) was observed common to both sites. No feeding activities of birds were observed in plantation forest site; it can be concluded on the basis that habitat has been degraded and no food is available for birds. Trees were used only for roosting.

The diversity of trees is fundamental to total forest biodiversity, because trees provide resources and habitat for almost all other forest species (Huang et al., 2003). At large scales, species diversity generally was found related to climate and productivity (Rahbek, 2005). Franklin et al. (1989) proposed that long-term productivity of natural forest ecosystems with high tree species diversity may be greater than that of forests with low diversity as a result of increased ecosystem resilience to habitat disturbance.

The natural forest in Sialsuk greatly enhanced bird diversities due to the presence of feeding trees and also due to a high population of insects as compare to monoculture plantation forest. Bird diversity is important in maintaining a healthy and sustainable forest landscape. The succession of vegetation in the early stages is usually dominated by pioneer herb species and tree species that are fast growing and replace each other in rapid succession. In the tropics these pioneer plants generally produced numerous small seeds that are dispersed by birds. In conservation activity we must consider the relationship between bird diversity and human-caused forest landscapes in mountain areas. The economic and ecological benefits also relate to land use and landscape planning. Dynamic and susceptible changes in the forest landscape and structure are impending factors for loss of animals' diversity in the forest (Wang, 1995; Wang et al., 2000). The created monoculture systems are really working for the

greenery of any site but not for the diversity of animals and birds in particulars.

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