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A CHECKLIST OF THE WINTER BIRD COMMUNITY IN DIFFERENT HABITAT TYPES OF ROSEKANDY TEA ESTATE OF ASSAM, INDIA

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Abstract: This study was aimed at preparing an inventory of the avifauna and to document the species composition of birds during winter in different habitat types of Rosekandy Tea Estate of Cachar District of Assam. Four habitat types, viz., tea plantation, ecotone zone, secondary growth forest and water bodies were selected within the tea estate and surveyed from mid-December 2010 (early winter) to mid-April 2011 (late winter) covering four months of survey. A total of 88 species were recorded during the survey period with the highest number of species in ecotone zone (n=63), followed by secondary forest (n=60), tea plantation (n=48) and water bodies (n=17). The species were further categorized into different feeding and habitat guilds to study the distribution of bird species in different habitat types according to various guilds.

Keyword: Avifauna, ecotone, habitat, secondary growth forest, tea plantation.

Habitat destruction in the tropics in the late 20th century was characterized by high rates of conversion of natural landscapes to agricultural landscapes (Stotz et al. 1996). Often overlooked, however, is the fact that the conversion of tropical forests for agricultural use is rarely complete, and often not permanent. Within the agricultural landscape, one can find a significant amount of forested area in the form of managed multistorey agroforestry systems, or agroecosystems, whose features of structural complexity, microclimate buffering, and diversity of canopy food plants retain high biodiversity and contribute to the protection of forest

biota (Beer 1987; Alcorn 1990; Perfecto et al. 1996).

In the past decade, a growing number of studies have focused on biodiversity in shaded agroforestry systems using birds as indicators of biodiversity (Parrish & Petit 1996; Wunderle & Latta 1996; Greenberg et al. 1997). Bird species diversity in shaded plantations is nearly always reported to be considerably higher than in other types of monoculture cultivation (Wunderle & Latta 1996; Petit et al. 1999; Tejada-Cruz & Sutherland 2004). Most pieces of research found shaded plantations to support only a few particular guilds of the bird population. Generally, more omnivorous, frugivorous and nectivorous, but fewer insectivorous species occupy plantations than natural forests (Canaday 1996; Shahabuddin 1997; Petit et al. 1999); generalist and open-grassland species are abundant in plantations than forest species (Hughes et al. 2002; Naidoo 2004).

As for tea plantations, very little research has been conducted regarding biodiversity assemblage in the tea gardens. Shaded tea plantations strictly follow monoculture cultivation of the tea plant supported by very few species of deciduous shade trees. The sensitivity of tea plants to water, shade and pest also further complicate the functioning of the tea gardens and are thus to a large extent dependent on human intervention. However, tea plantations accompanied by

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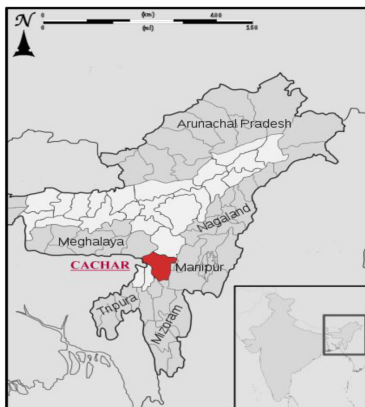
neighboring patches of forest and water bodies greatly contribute in maintaining a high diversity of animal species in the tea gardens. The variety of forest areas, water bodies and other vegetation cover along with the tea plantation thus forms the actual driving factor for biodiversity of the tea estates. The 'hard' edges of tea plantation, which are formed by abrupt changes from tea shrubs to other vegetation cover such as forest or agricultural crop may also effect the movement and distribution of wildlife.

Northeastern India supports some of the rarest, least known and most sought-after birds of the oriental region. The numerous tea estates in northeastern India thus provide a potential habitat to the diverse bird community of the region. Barak Valley in Assam, which has very few pristine forestland but a large number of

tea estates has an opportunity to sustain its avifaunal diversity within these tea plantations. A proper management of shade trees, forest patches and water reservoirs in the tea estates, keeping in view the needs of the bird community as well as human needs can form an effective strategy to secure the avian diversity of the region.

Material and Methods

Study site: The Rosekandy Tea Estate is situated at Barjalenga in Cachar District of Assam. It is geographically located within 24°42'29"–24°41'31"N and 92°41'52"–92°42'39"E (Image 1). The maximum temperature in the study area ranged from 23–34.4 °C; minimum temperature from 11.4–26 °C; and relative humidity from 60.4–96 %. The total area under the tea



Map of Assam showing Cachar



Location of Rosekandy Tea Estate in Cachar

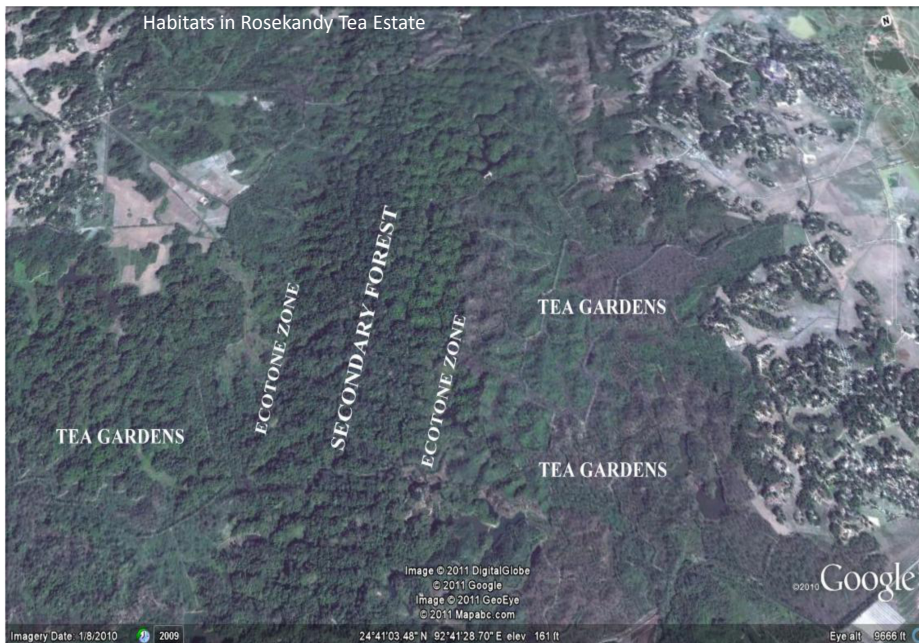


Image 1. Study area

estate is about 1702.01ha out of which, 562.80ha is used at present for tea plantation while the remaining 1309.78ha consists of uncultivated lands, secondary forest growth and water reservoirs. The different vegetation types and plantation patterns result in the formation of various microhabitats in the tea gardens where different species of birds reside according to their habitat preferences. Therefore, the study area was classified according to their physiognomic and floristic composition into four different habitat types:

Tea Plantation (TP): The plantation areas contains tea shrubs (*Camellia sinensis*) that reaches a height of 0.5–1 m with uniformly interspaced shade trees which generally consists of species of *Albizia odoratissima*, *Albizia lebbec*, *Deris robusta*, *Dalbergia sisu*, *Albizia chinensis* etc. This habitat type has an open canopy and two storied vegetation structures.

Secondary Growth Forest (SF): The areas that are not cultivated are covered with secondary semi evergreen forest and marsh lands. The prominent species consists of *Dysoxylum* sp., *Saprosma ternatum*, *Vitex* sp., *Vatica lancaefolia*, *Castanopsis* sp., *Mesua floribuanda*, *Pterygota alata*, *Vatica lancaefolia*, *Glochidion* sp., *Knema linifolia*, *Ficus* sp., *Artocarpus chama*, *Cynometra polyandra*, *Mangifera indica*, *Bombax ceiba*, *Xerospermum glabratum*, *Macaranga peltata*, *Litsea monopetala* etc. Bamboo patches and reed growth near the edges of the forest are also common.

Ecotone Zone (EZ): The third habitat type is the ecotone zone between the secondary forest and tea plantation. This zone is formed at the areas where the tea plantation abruptly ends and the forest cover begins. Contrasting to conventional ecotone, this area does not show a gradient in floral community but displays an abrupt switch from one habitat type to another.

Water Body (WB): The tea estate contains many large water reservoirs and ponds which store water during the rainy seasons. This stored water is used during the dry season to irrigate the tea gardens. These water bodies form an ideal habitat for aquatic fauna and aquatic birds and hence are selected as the fourth type of habitat. Along with this, the natural streams and tea gardens irrigation canals also form other sources of water bodies.

Methods

The sampling was carried out during the winter months starting from mid-December 2010 (early winter) to mid-April 2011 (late winter) covering four months of survey. Birds were sampled using the line transects method (Buckland et al. 1993) and identification was done using standard field guides (Grimmett et al. 2001;

Ali 2002). Three fixed transects of 700m in each habitat type were surveyed every 15 days during the morning hours between 0600–1000 hr. The opportunistic counts during other times of the day are also included in the checklist. We followed the nomenclature and taxonomic sequence of Manakadan & Pittie (2001). To explore species composition in terms of the feeding guilds and habitat guilds, bird species are classified accordingly to various feeding and habitat categories based on observations and scientific literature (Grimmett et al. 2001; Ali 2002).

Results

A total of 88 species belonging to 38 families (Table 1) were recorded in the Rosekandy Tea Estate during the four-month survey. The highest number of species were recorded in the ecotone zone (n=63), followed by secondary forest (n=60), tea plantation (n=48) and water bodies (n=17). According to the various feeding guilds, out of the 88 species, the highest number of species were omnivores (n=32), followed by insectivores (n=26), phytophage (n=16), piscivores (n=9) and carnivores (n=5). Habitat wise, most of the species were generalist (n=30) and forest inhabitants (n=24). Aquatic (n=17) and openland inhabitants (n=17) form the rest of the surveyed population.

Discussion

The Rosekandy tea estate consists of different habitat types which are capable of sustaining a diverse population of avifauna. The study demonstrated a rich diversity by the presence of a total of 88 species within the different habitat types of the tea estate. A similar study by Deb & Gupta (2010) recorded a total of 76 species in four different landscape types of Cachar District.

The study presented signifies the potential of tea agroforestry systems along with their adjoining forest patches in conserving the bird population of the region. The study shows similar trends of species richness as studied in other tea plantations (Githiru et al. 2009) and different agroforestry systems (Greenberg et al. 1997; Tejeda-Cruz & Sutherland 2004) around the world. This study recorded similar species of birds from the tea plantation as has been observed in other bird surveys in this area (Deb & Gupta 2010; Dev et al. 2010).

The variation in species richness in different habitat types within the tea estate contrasted with results from previous studies. In this study, species richness was higher in secondary forest growth as compared to tea plantation while earlier studies (Deb & Gupta 2010)

Table 1. List of bird species recorded in four habitat types of Rosekandy Tea Estate along with their respective feeding and habitat guilds.

Species	Habitat Type				Feeding Guild	Habitat Guild
	EZ	SF	TP	WB		
Podicipediformes: Podicipedidae						
Little Grebe <i>Tachybaptus ruficollis</i>	-	-	-	+	I	A
Pelecaniformes: Phalacrocoracidae						
Little Cormorant <i>Phalacrocorax niger</i>	-	-	-	+	Pi	A
Ciconiiformes: Ardeidae						
Cattle Egret <i>Bubulcus ibis</i>	-	-	-	+	Pi	A
Little Egret <i>Egretta garzetta</i>	-	-	-	+	Pi	A
Median Egret <i>Mesophox intermedia</i>	-	-	-	+	Pi	A
Indian Pond-Heron <i>Ardeola grayii</i>	-	-	-	+	Pi	A
Anseriformes: Anatidae						
Cotton Teal <i>Nettapus coromandelianus</i>	-	-	-	+	O	A
Lesser Whistling-Duck <i>Dendrocygna javanica</i>	-	-	-	+	O	A
Falconiformes: Accipitridae						
Black Baza <i>Aviceda leuphotes</i>	-	+	+	-	C	O
Black Kite <i>Milvus migrans</i>	+	+	+	-	C	O
Crested Serpent-Eagle <i>Spilornis cheela</i>	+	+	-	-	C	F
Falconiformes: Pandionidae						
Osprey <i>Pandion haliaetus</i>	-	+	-	-	Pi	F
Galliformes: Phasianidae						
Kaleej Pheasant <i>Lophura leucomelanos</i>	-	-	+	-	O	O
Red Junglefowl <i>Gallus gallus</i>	+	+	+	-	O	O
Gruiformes: Rallidae						
Common Moorhen <i>Gallinula chloropus</i>	-	-	-	+	O	A
White-breasted Waterhen <i>Amaurornis phoenicurus</i>	-	-	-	+	O	A
Charadriiformes: Jacanidae						
Bronze-winged Jacana <i>Metopidius indicus</i>	-	-	-	+	O	A
Charadriiformes: Scolopacidae						
Common Sandpiper <i>Actitis hypoleucos</i>	-	-	-	+	I	A
Charadriiformes: Charadriidae						
Red-wattled Lapwing <i>Vanellus indicus</i>	-	-	-	+	I	A
Columbiformes: Columbidae						
Emerald Dove <i>Chalcophaps indica</i>	-	+	-	-	P	F
Spotted Dove <i>Streptopelia chinensis</i>	+	+	+	-	P	G
Yellow-legged Green-Pigeon <i>Treron phoenicoptera</i>	-	+	-	-	P	F
Psittaciformes: Psittacidae						
Red-breasted Parakeet <i>Psittacula alexandri</i>	+	+	+	-	P	F
Rose-ringed Parakeet <i>Psittacula krameri</i>	+	+	-	-	P	G
Cuculiformes: Cuculidae						
Asian Koel <i>Eudynamis scolopacea</i>	+	+	+	-	O	G
Common Cuckoo <i>Cuculus canorus</i>	+	+	+	-	O	G
Greater Coucal <i>Centropus sinensis</i>	+	+	+	-	O	O
Pied Crested Cuckoo <i>Clamator jacobinus</i>	+	+	-	-	O	F
Large Green-billed Malkoha <i>Phaenicophaeus tristis</i>	+	+	-	-	O	F

Species	Habitat Type				Feeding Guild	Habitat Guild
	EZ	SF	TP	WB		
Strigiformes: Strigidae						
Spotted Owlet <i>Athene brama</i>	+	+	+	-	C	O
Brown Hawk-Owl <i>Glaucidium radiatum</i>	+	+	-	-	C	O
Apodiformes: Apodidae						
Common Swift <i>Apus apus</i>	+	+	+	-	I	G
Coraciiformes: Alcedinidae						
Small Blue Kingfisher <i>Alcedo atthis</i>	+	+	+	+	Pi	A
White-breasted Kingfisher <i>Halcyon smyrnensis</i>	+	+	+	+	Pi	A
Lesser Pied Kingfisher <i>Ceryle rudis</i>	-	-	-	+	Pi	A
Coraciiformes: Meropidae						
Blue-bearded Bee-eater <i>Nyctornis athertoni</i>	+	+	-	-	I	F
Chestnut-headed Bee-eater <i>Merops leschenaulti</i>	+	+	+	-	I	G
Small Bee-eater <i>Merops orientalis</i>	+	+	-	-	I	G
Coraciiformes: Coraciidae						
Indian Roller <i>Coracias benghalensis</i>	+	+	-	-	I	F
Coraciiformes: Upupidae						
Common Hoopoe <i>Upupa epops</i>	+	-	+	-	I	O
Piciformes: Capitonidae						
Blue-throated Barbet <i>Megalaima asiatica</i>	+	+	-	-	P	G
Coppersmith Barbet <i>Megalaima haemacephala</i>	+	+	+	-	P	G
Lineated Barbet <i>Megalaima lineata</i>	+	+	+	-	P	G
Piciformes: Picidae						
Common Golden-backed Woodpecker <i>Dinopium javanense</i>	+	+	+	-	I	O
Fulvous-breasted Pied Woodpecker <i>Dendrocopos macei</i>	+	+	+	-	I	O
Large Yellow-naped Woodpecker <i>Picus flavinucha</i>	-	-	+	-	I	O
Eurasian Wryneck <i>Jynx torquilla</i>	+	-	+	-	I	O
Rufous Piculet <i>Sasia ochracea</i>	+	-	-	-	I	F
Passeriformes: Alaudidae						
Bengal Bush-Lark <i>Mirafra assamica</i>	+	+	-	-	O	O
Large Cuckoo-Shrike <i>Coracina macei</i>	+	+	+	-	O	F
Passeriformes: Motacillidae						
White Wagtail <i>Motacilla alba</i>	-	-	-	+	I	A
Passeriformes: Pycnonotidae						
Black-crested Bulbul <i>Pycnonotus melanicterus</i>	+	+	-	-	O	F
Red-vented Bulbul <i>Pycnonotus cafer</i>	+	+	+	-	O	G
Red-whiskered Bulbul <i>Pycnonotus jocosus</i>	+	+	+	-	O	G
Passeriformes: Irenidae						
Asian Fairy-Bluebird <i>Irena puella</i>	-	+	-	-	P	F
Orange-bellied Chloropsis <i>Chloropsis hardwickii</i>	+	+	-	-	O	F
Common Iora <i>Aegithina tiphia</i>	+	+	+	-	I	G
Passeriformes: Laniidae						
Brown Shrike <i>Lanius cristatus</i>	+	+	+	-	I	G
Rufous-backed Shrike <i>Lanius schach</i>	+	+	+	-	I	O
Passeriformes: Muscicapidae: Turdinae						

Species	Habitat Type				Feeding Guild	Habitat Guild
	EZ	SF	TP	WB		
Oriental Magpie-Robin <i>Copsychus saularis</i>	+	+	+	-	I	G
Passeriformes: Muscicapidae: Timaliinae						
Common Babbler <i>Turdoides caudatus</i>	+	+	+	-	O	G
Lesser Necklaced Laughingthrush <i>Garrulax monileger</i>	-	+	+	-	O	O
Passeriformes: Muscicapidae: Sylviidae						
Chestnut-headed Tesia <i>Tesia castaneocoronata</i>	+	-	-	-	I	F
Graceful Prinia <i>Prinia gracilis</i>	+	-	-	-	I	O
Common Tailorbird <i>Orthotomus sutorius</i>	+	+	+	-	I	G
Passeriformes: Muscicapidae: Monarchinae						
Black-naped Monarch-Flycatcher <i>Hypothymis azurea</i>	+	+	-	-	I	F
Passeriformes: Paridae						
Great Tit <i>Parus major</i>	+	+	+	-	O	G
Passeriformes: Dicaeidae						
Fire-breasted Flowerpecker <i>Dicaeum ignipectus</i>	+	+	-	-	P	F
Scarlet-backed Flowerpecker <i>Dicaeum cruentatum</i>	+	+	+	-	P	F
Thick-billed Flowerpecker <i>Dicaeum agile</i>	+	+	-	-	P	F
Passeriformes: Nectariniidae						
Purple Sunbird <i>Nectarinia asiatica</i>	+	+	+	-	P	G
Passeriformes: Fringillidae						
Scarlet Finch <i>Haematospiza sipahi</i>	-	+	-	-	P	F
Passeriformes: Estrildidae						
Black-headed Munia <i>Lonchura malacca</i>	+	-	+	-	P	G
Spotted Munia <i>Lonchura punctulata</i>	+	-	+	-	P	G
Passeriformes: Passeridae: Passerinae						
House Sparrow <i>Passer domesticus</i>	+	-	+	-	O	G
Passeriformes: Oriolidae						
Black-headed Oriole <i>Oriolus xanthornus</i>	+	+	+	-	O	G
Passeriformes: Sturnidae						
Asian Pied Starling <i>Sturnus contra</i>	+	-	+	-	O	G
Common Hill-Myna <i>Gracula religiosa</i>	+	+	+	-	O	F
Common Myna <i>Acridotheres tristis</i>	+	-	+	-	O	G
Jungle Myna <i>Acridotheres fuscus</i>	+	+	-	-	O	G
Grey-headed Starling <i>Sturnus malabaricus</i>	+	+	+	-	O	G
Passeriformes: Dicruridae						
Black Drongo <i>Dicrurus macrocercus</i>	+	+	+	-	I	O
Bronzed Drongo <i>Dicrurus aeneus</i>	+	+	-	-	I	F
Greater Racket-tailed Drongo <i>Dicrurus paradiseus</i>	+	+	+	-	I	F
Passeriformes: Corvidae						
House Crow <i>Corvus splendens</i>	+	+	+	-	O	G
Indian Treepie <i>Dendrocitta vagabunda</i>	+	+	+	-	O	G
Jungle Crow <i>Corvus macrorhynchos</i>	-	+	+	-	O	F
Common Raven <i>Corvus corax</i>	+	-	+	-	O	G

Habitat Type: EZ - Ecotone Zone; SF - Secondary Forest; TP - Tea Plantation; WB - Water Body; **Feeding Guild:** I - Insectivores; P - Phytophagous; Pi - Piscivorous; O - Omnivore; C - Carnivore; **Habitat Guild:** F - Forest habitant; G - Generalist; O - Openland habitant; A - Aquatic habitant

reported higher species richness in tea plantations than the adjacent secondary forest. However, the results coincide with studies in most of the coffee plantation where neighboring forest patches contained more species than plantation areas (Wunderle & Latta 1996; Greenberg et al. 1997; Petit et al. 1999). The ecotone zone with the highest species richness denoted an edge effect of this zone.

Feeding guilds in all four habitats were largely composed of insectivore and omnivore species with a small number of phytophagous, carnivore and piscivore species. Similar studies in coffee (Greenberg et al. 1997; Tejada-Cruz & Sutherland 2004) and cocoa (Reitsma et al. 2001; Harvey et al. 2007) plantations showed a higher abundance of omnivore species than insectivore species. However, studies in other tea plantations revealed a higher proportion of insectivore and less omnivore guilds as they were able to adapt to different habitat types and food resources (Githiru et al. 2009).

The habitat guild in the studied site showed a similar pattern with the studies in other agroforestry systems (Greenberg et al. 1997; Reitsma et al. 2001; Tejada-Cruz & Sutherland 2004) which recorded the higher number of generalist species. Open-habitat species are more abundant in tea plantation coinciding with studies in cocoa and banana plantation (Harvey et al. 2007).

Further studies and monitoring of bird populations in different tea estates can reveal a more complete description of patterns of bird assemblage and species composition in the tea agroforestry systems and hence contribute to the conservation effort for birds in tea gardens.

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