Vol. 2 December 2011
CHED Accredited Research Journal, Category A
Print ISSN 2094-5019 • Electronic ISSN 2244-0461
doi: http://dx.doi.org/10.7828/ajob.v2i1.94

Asian Journal of Biodiversity
Art. #94, pp. 103-120

Rapid Assessment and Feeding Guilds of Birds in Selected Rubber and Oil Palm Plantations in North Cotabato

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Date Submitted: June 10, 2011
Final Revision Accepted: July 1, 2011

Abstract - The degradation of tropical rainforests in Mindanao has augmented the interest in the potential value of commercial plantations for the conservation of biodiversity. However, it is not yet apparent how this type of land use affects forest bird fauna since there were no studies conducted yet to document birds in commercial plantations, particularly in North Cotabato. Hence, this study was done to determine occurrence of birds in Carumba Oil Palm Plantation (COPP) and Platinum Rubber Plantation (PRP) in North Cotabato. A combination of mist netting and transect walk technique had recorded 30 birds species belonging to 6 orders, 19 families and 26 genera. Passeriformes was the most represented order having 20 species, six of which were country endemics and two were Mindanao faunal region endemics. Noteworthy was the presence of one threatened species (*Alcedo argentata*) from PRP with a vulnerable conservation status.

Results indicate that oil and rubber agro-forestry systems contribute to conservation efforts by serving as habitats to endemic bird species. In addition, major feeding guilds of birds were also determined. Insectivorous species predominated in both areas. This high number of insectivorous species delivers a natural pest control service in the plantations which is beneficial to farmers and owners.

Keywords - bird fauna, endemism, feeding guilds, rubber plantation, oil palm plantation, North Cotabato

INTRODUCTION

The Philippine archipelago is justly acknowledged as having one of the richest avifauna of any country in the world. It is home to 572 bird species that is currently increasing with further discoveries each year (Kennedy et. al 2000). However, the diversity of these vertebrates is threatened due to several factors such as habitat destruction. Their habitat is decreasing in an alarming rate due to clearing of the forests for commercial plantations. Two of the most rapidly expanding plantations in tropical regions are oil palm (*Elaeis guineensis)* and rubber (*Hevea brasiliensis)* (Clay 2004).

Oil palm agriculture is one the greatest threats to biodiversity nowadays (Koh and Wilkove 2009). According to Butler and Laurance (2009), forested areas in the country are suitable for oil palm which will likely continue to replace tropical forests. Large forests were cut and converted to wide oil palm plantations. The expansion of oil palm plantations will continue especially when the Malaysian oil-palm developers announced plans to establish a 100,000 ha oil-palm plantation and an extraction facility in Mindanao, Philippines (Butler, 2009). In addition, rubber plantations had also been established in some areas in the country to ensure that there is steady source of latex for various rubber products. Joshi et al. (2003) reported that while there had been a tradition of trading various types of resin and latex collected from the forest, the introduction of *Hevea brasiliensis* from Amazone to Southeast Asia formed the basis of a large scale spontaneous adoption of new agroforestry practices at a scale not easily matched elsewhere.

However, according to Christian et al. (1998) plantations still provide habitats favourable for native birds. The rubber agroforest or 'jungle rubber' provides habitat for secondary forest dweller birds as well as other fauna. Oil palm planted on degraded land such as land overgrown by *Imperata* grasslands may also increase bird diversity (Weijdan, Terwan, and Guldemond 2010).

Biodiversity studies on birds are important since birds are very useful indicators of species richness and endemism patterns (Bibby et.al , 1992; Burgess et al. 2002) and they provide a warning sign of environmental changes (Bennun and Fanshawe 1997; Donald et al. , 2001; Gregory et al. 2003). Therefore, assessing birds in plantations could provide information about the existing conditions on this type of ecosystem. Especially commercial plantations are also considered as key areas because some valuable species that were originally found in primary forests are also found in plantations (Fitzherbert et al. 2008). Remnant native vegetations within the boundaries of plantations are also valuable for many which serve as a safe haven for some species (Lindenmayer and Hobbs 2007).

OBJECTIVES OF THE STUDY

This rapid assessment was conducted to provide information on birds in selected rubber and oil palm plantations in North Cotabato. Specifically, this study aimed to identify and list species of birds in the areas; determine the conservation and distribution status of the identified birds; classify them based on feeding guilds; and, discuss their importance in the maintenance of this man-made ecosystem.

MATERIALS AND METHODS

Study Areas

Sampling for birds was conducted on May 2010 in two selected commercial plantations: Carumba Oil Palm Plantation (COPP) and Platinum Rubber Plantation (PRP).

Oil palm plantation (Fig. 1.a) is situated in Sitio Culasi, Village Lampagang, Tulunan ($06^{0}48.972$N and $124^{0}54.201$E), North Cotabato. It is a monoculture type of plantation owned and managed by the Carumba family. The plantation covers an area of 8 hectares and is

planted with 6 year-old mature African oil palm (*Elaeis guineensis*), with a height of 10-20 m. It has an elevation of 109-125 meters above sea level (masl). The terrain is rolling, undulating to moderately slopy especially on the dried tributaries where some of the remaining and existing hardwood tree species thrive. The whole study area is surrounded by grass and sedges of various species that developed and thrive well after its conversion into plantations.

Platinum Rubber Development Corporation, Inc. (Fig. 1.b), is in New Cebu, Makilala ($07^{0}06.795$N and $124^{0}49.427$E), North Cotabato. It is one of the major rubber plantations in the Municipality with an elevation of 58-338 masl. On the basis of species composition and vegetation type, two cultivation practices exist in the area. Most of the previously lowland dipterocarp forests are now covered by rubber (*Hevea brasiliensis*) plantation using monocropping method. However, agro-forestry system was also practiced as one type of land use in the area. This study used the rubber agroforest as survey area.

a. b.

Fig. 1. (a) Carumba Oil Palm Plantation in Lampagang Village, Tulunan, North Cotabato. (b) Platinum Rubber Plantation, New Cebu Village, Makilala, North Cotabato.

Field Sampling

Rapid survey was done following the sampling techniques described by Haribon Foundation (2001):

Mist Netting Technique

Mist nets (12 m x 2.6 m, 33 mm mesh-size with five pockets) were used primarily to sample birds. These were installed at least 0.5-3 m above the ground to catch ground and understory dwellers. Sky nets were positioned strategically as high as 15 m above the ground to catch canopy species. Nets were tended for 24 hr (to capture both diurnal and nocturnal species) and were checked regularly at 2-3 hr interval. Captured birds were gently taken from their entanglement using hands protected with gloves and were placed separately in specimen bags made of cloth as temporary storage. Upon arrival in the camp site, birds were processed immediately to reduce stress. A total of 102-net days were spent in each study area to meet the standard netting procedure (Heaney and Heideman 1989).

Transect Walk Technique

Transect walk was done to supplement the identification of birds not captured in the nets. A 1 km transect line was established in the study areas. Each transect line was passed twice, 5-7 in the morning and 4-6 in the afternoon. The walk was accompanied by a parabiologist, a local resident who is an expert on birds in the area. Individuals seen or heard (calls) were recorded in the data sheet using species local name.

Sampling in rubber plantation is complicated by the internal variability of this land use type that is why we disregard counting of birds in this study.

Measurement and Identification

Notable characteristics and standard biometric measurements of all captured birds such as total length (TL), wing length (WL), bill length, tarsus length, tail length and the weight, were taken and recorded in the data sheets designed by Haribon (2001). Samples were identified based on "A Guide to the Birds of the Philippines" by (Kennedy et al. 2000). All birds were photographed and released. Pre-identified samples were confirmed by Prof. Joselito Baril, an expert from the University of the Philippines- Los Baños.

Assessment of Conservation and Distribution Status and Feeding Guild

The International Union for the Conservation of Nature (IUCN) Redlist (IUCN 2010) was used as reference for the assessment of the conservation and distribution status of all captured birds. Feeding guild of each species identified was determined using published literature and guides.

RESULTS AND DISCUSSION

Identified birds

Rapid survey of birds in selected commercial plantations in North Cotabato identified a total of 30 species (Table 1). These species belong to 6 orders, 19 families and 26 genera. Passeriformes was the most represented order with 20 species of all captures. The remaining species where distributed under five orders namely, Columbiformes and Coraciiformes both with 3 species, Cuculiformes with 2 species, and Apodiformes and Psittaciformes both have 1 species. Of these, 3 species were recorded under family Alcedinidae, Columbidae, and Pycnonotidae; 2 species in family Cuculidae, Dicaeidae, Estrildidae, Muscicapidae, and Nectariniidae. The rest of the families were only represented by a single species. More species could have been identified if the sampling period was increased, covering different seasons in a year.

Table 1. List of identified birds at the two sampling sites with their conservation and distribution status.

Scientific Name	Common Name	Family	Conservation status	Distribution Status	Occurrence	
					Oil Palm Plantation	Rubber Plantation
Apodiformes *Collocalia esculenta* Linn.	Glossy Swiftlet	Apodidae	Least concern	Resident	x	x
Columbiformes *Chalcopaps indica* Linn.	Common Emerald Dove	Columbidae	Least concern	Resident	x	x
Geopelia striata Linn.	Zebra dove	Columbidae	Least concern	Resident	x	x
Phapitreron amethystinus Bonaparte	Amethyst Brown-Dove	Columbidae	Least concern	Philippine Endemic		x
Coraciiformes *Alcedo argentata* Tweeddale	Silvery Kingfisher	Alcedinidae	Vulnerable	Mindanao Endemic		x
Halcyon chloris Boddaert	White-collared Kingfisher	Alcedinidae	Least concern	Resident	x	x
Halcyon smyrnensis Linn.	White-throated Kingfisher	Alcedinidae	Least concern	Resident	x	
Cuculiformes *Cacomantis merulinus* Scopoli	Plaintive cuckoo	Cuculidae	Least concern	Resident	x	
Centropus viridis Scopoli	Philippine Coucal	Cuculidae	Least concern	Philippine Endemic	x	x
Passeriformes *Aplonis panayensis* Scopoli	Asian Glossy Starling	Sturnidae		Resident	x	x
Arachnothera longirostra Latham	Little Spiderhunter	Nectariniidae	Least concern	Resident		x
Artamus leucorynchus Linn.	White-breasted woodswallow	Artamidae	Least concern	Resident	x	
Copsychus saularis Linn.	Oriental Magpie Robin	Turdidae	Least concern	Resident	x	
Corvus macrorhynchus Wagler	Large-billed Crow	Corvidae	Least concern	Resident	x	x
Cyornis rufigastra Raffles	Mangrove blue flycatcher	Muscicapidae	Least concern	Resident	x	
Dicaeum australe Cuvier	Red-keeled Flowerpecker	Dicaeidae	Least concern	Philippine Endemic	x	x

Continuation of Table 1

Dicaeum trigonostigma Scopoli	Orange-bellied Flowerpecker	Dicaeidae	Least concern	Resident		x
Hypsipites philippinus Forster	Philippine Bulbul	Pycnonotidae	Least concern	Philippine Endemic		x
Lalage nigra Forster	Pied Triller	Campephagidae	Least concern	Resident	x	x
Lanius cristatus Linn.	Brown shrike	Laniidae	Least concern	Resident	x	
Lonchura leucogastra Blyth	White-bellied Munia	Estrildidae	Least concern	Resident	x	x
Lonchura malacca Linn.	Black-headed Munia	Estrildidae	Least concern	Resident	x	x
Macronous striaticeps Sharpe	Brown-tit Babbler	Timalidae	Least concern	Mindanao Endemic	x	x
Megalurus palustris Horsfield	Striated grassbird	Sylvidae	Least concern	Resident	x	
Nectarinia jugularis Linn.	Olive-backed Sunbird	Nectariniidae	Least concern	Resident	x	x
Passer montanus Linn.	Eurasian Tree Sparrow	Ploceidae	Least concern	Resident	x	x
Pycnonotus goiavier Scopoli	Yellow-vented Bulbul	Pycnonotidae	Least concern	Resident	x	x
Pycnonotus urostictus Salvadori	Yellow-wattled Bulbul	Pycnonotidae	Least concern	Philippine Endemic		x
Rhipidura javanica Sparrman	Pied Fantail	Muscicapidae	Least concern	Resident	x	x
Psittaciformes						
Bolbopsittacus lunulatus	Guaiabero	Psittacidae	Least concern	Philippine Endemic		x

Legend: x-present

Findings of this study revealed that the same number of species (23) had been identified in both study areas (Fig. 2). It indicates that there is relatively low species richness of birds in the agro- forests being sampled. Laiolo (2010) stated that species richness and diversity of birds may have been affected by vegetation structure and floristic composition. The occurrence of some common species could be due to the presence of mixed vegetation, as well as the abundance of ground cover plants in close proximity with COPP while the surrounding areas of PRP are vegetated by agricultural plants like banana, mangosten and coconut trees with patches of dipterocarp forests. Common species such as Asian Glossy Starling (*Aplonis panayensis),* White-collared Kingfisher *(Halcyon chloris),* White bellied-munia (*Lonchura leucogastra),* Black-headed munia (*Lonchura malacca),* Olive-backed Sunbird (*Nectarinia jugularis)*, Eurasian Tree Sparrow (*Passer montanus),* and Yellow-vented Bulbul (*Pycnonotus goiavier)* were recorded by (Kennedy et al. 2000) to be widespread and could readily adapt to disturbed areas. Some of these birds were also referred as generalist. As reported by Aratrakorn, Thunhikorn and Donald et al. (2006), birds in plantations such as those in the sampling areas were usually outnumbered by common, generalist species of lesser conservation concern.

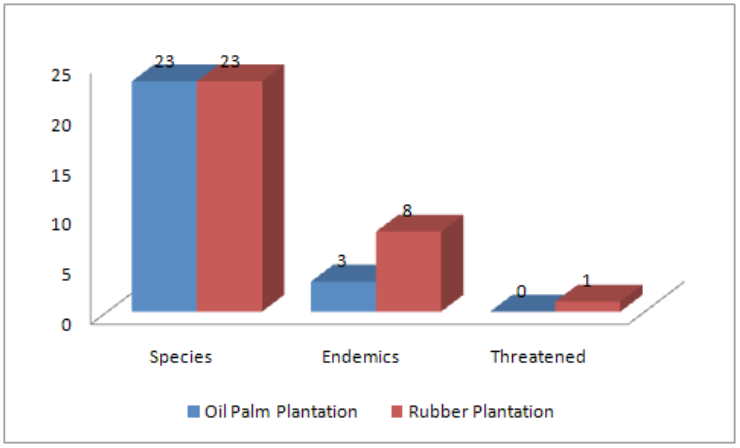

Fig. 2. Comparison of birds in a COPP and PRP.

Conservation and Distribution Status

Of the 30 species recorded, 29 are of least concern and one threatened species, Silvery Kingfisher (*Alcedo argentata)* Fig. 3, captured only in PRP. This species is currently categorized as vulnerable by IUCN, threatened by habitat destruction. The occurrence of this threatened species in PRP maybe associated to the presence of streams in the area. This species appears to be dependent on forested streams below 1000 masl and tolerates secondary, selectively logged forest, and streamside vegetation within coconut plantations (Birdlife International 2008; Kennedy, et al. 2000). Extensive lowland deforestation threatens this species, thus, it requires for an urgent conservation measures.

In terms of distribution range (see Table 1), the study had recorded 8 endemic species (27%) of which 6 were country endemics, Guaiabero (*Bolbopsittacus lunulatus)* Fig. 4, Philippine Coucal (*Centropus viridis),* Red-keeled Flowerpecker (*Dicaeum australe)* Fig. 5, Philippine Bulbul (*Hypsipites philippinus),* Amethyst Brown Dove (*Phatpitreron amythystina)* Fig. 6, and Yellow-wattled Bulbul *(Pycnonotus urostictus*) Fig. 7; 2 were Mindanao faunal region endemics, Silvery Kingfisher (*Alcedo argentata)* and Brown-tit Babbler (*Macronous striaticeps*) Fig. 8; and and 22 non-endemic resident breeders. No migratory species were recorded since time of sampling did not cover the migratory season. Further, PRP (58-338 masl) was found to have all of the 8 endemic species recorded while there were only three species found in COPP (109-125 masl). The low capture of endemic species could be attributed to the lower elevations of the sampling areas. This conforms to the study of (Peterson et al. 2008) that most of the endemic birds in Mindanao are concentrated at higher elevations. Studies of Goodman, Willard and Gonzales (1995) on patterns of bird species diversity along elevational gradients have documented a general pattern of inverse correlation between species richness and endemism. Species richness decreases with elevation but endemism increases at higher altitudes.

3

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Figs. 3-8 are some of the endemic and vulnerable birds recorded: 3) Silvery Kingfisher (*Alcedo argentata*) 4) Guaiabero (*Bolbopsittacus lunulatus*) 5) Red-keeled Flowerpecker (*Dicaeum australe)*, 6) Amethyst Brown-Dove (*Phapitreron amythystina*), 7) Yellow-wattled Bulbul (*Pycnonotus urostictus*) and 8) Brown-tit Babbler (*Macronous striaticeps*).

Feeding Guilds of Birds and their Importance to Commercial Plantations

Simberloff (1991) defined feeding guild as a group of species that exploit similar kinds of food resources. It is usually based on the kind of food they eat. In this study, the recorded birds were categorized into six major feeding guilds: insectivorous, species which feeds on insects; carnivorous, which feeds on other vertebrates and other small invertebrates; granivorous which feeds on grains; frugivorous, on fruits; nectarivorous, on plant nectar; and omnivorous which are feeding both plant parts and other animals (see Table 2). Insectivorous birds were the most common in both commercial plantations. Frugivorous species on the other hand, were high in rubber plantation compared to that of the oil palm plantation. Omnivorous species, which were considered by Townsend, Begon, and Harper (2003) as mostly the generalist species, ranked second and third in oil palm and rubber plantation, respectively.

The high number of insectivorous species could be beneficial to farmers and owners of the plantations. These birds generally play an important role in maintaining insect population. According to Koh (2008), the removal of these in oil palm plantations significantly increases the herbivory damage to oil palm. The feeding of insectivorous birds (Plaintive Cuckoo *Cacomantis merulinus,* Philippine Coucal *Centropus viridis,* Oriental Magpie Robin *Copsychus saularis,* Mangrove Blue Flycatcher *Cyornis rufigastra,* Brown-tit Babbler *Macronous striaticeps,* Striated Grassbird *Megalurus palustris* and Pied Fantail *Rhipidura javanicai*) on caterpillars, weevils and other insect pests deliver a natural pest control service for both oil palm and rubber plantations. In addition, rodents as one of the recorded pests in oil palm damaging on fruit bunches (Min 1985) and feeding on young shoots of rubber, can also be controlled by the presence of a predatorial bird, Large-billed Crow *Corvus macrorhynchus.*

Table 2. Feeding guilds of birds recorded in selected commercial plantations of North Cotabato.

Feeding Guild	Oil Palm	Rubber Plantation	All Areas
Carnivore	2	2	3
Frugivore	2	6	6
Granivore	3	3	3
Insectivore	11	6	12
Nectarivore	1	1	1
Omnivore	4	5	5

In addition, the presence of frugivorous species is also important in the maintenance of the man-made ecosystem. They act as seed dispersers and pollinators. Most of the frugivorous species like *Pycnonotus* spp. (Yellow-vented Bulbul and Yellow-wattled Bulbul) and some species of doves (Common Emerald Dove *Chalcopaps indica* and Amethyst Brown Dove *Phapitreron amethystina*) help regenerate secondary forests nearby through seed dispersal. Nectarivorous species (Olive-backed Sunbird *Nectarinia jugularis*) could also be economically helpful, pollinating important fruit bearing trees. However, birds considered as competitors to farmers were also recorded. White-bellied Munia *Lonchura leucogastra* and Black-headed Munia *Lonchura malacca* are example of two bird pest in rice fields nearby.

CONCLUSION AND RECOMMENDATIONS

A rapid survey was done following the sampling techniques described by Haribon Foundation (2001): It primarily used the mist netting technique with a total of 102 mist net days of operation in each study areas. Transect walk was also done to supplement the identification of birds, with the active participation of local experts (parabiologists) on birds. All the samples were photodocumented and identified using the guide to the birds of the Philippine Islands by Kennedy, et al. (2000) as reference. Captured birds were confirmed by Prof. Joselito Baril of the University of the Philippines- Los Baños.

There were 30 species recorded, which belong to 6 orders, 19 families and 26 genera. The most represented order was Passeriformes with 20 species. Six were country endemics (*Bolbopsittacus lunulatus, Centropus viridis, Dicaeum australe, Hypsipites philippinus, Phatpitreron amythystina* and *Pycnonotus urostictus*) and two were Mindanao endemics (*Alcedo argentata* and *Macronous striaticeps*). The rapid survey also showed that both study areas had the same number of species (23) recorded. However, the rubber plantation had a higher number (8) of endemic species. Noteworthy was the presence of one threatened species (*Alcedo argentata*) recorded, with a conservation status of vulnerable. The relatively low species richness of birds occurring in the agroecosystem sites could be affected by the availability of food plants. The proximity of the area to mixed parang vegetation, as well as the abundance of ground cover plants explains the presence of some common species that enable them to successfully thrive even in a non-forest area.

In terms of feeding guilds, there were six major groups identified: carnivore, insectivore, granivore, fruigivore, nectarivore and omnivore. Insectivorous birds predominated in both commercial plantations. Frugivorous species on the other hand, were higher in the rubber plantation compared to the oil palm plantation. Omnivorous species, which were considered by Townsend et al. (2003) as mostly the generalist species, ranked second and third in oil palm and rubber plantation, respectively. The high number of insectivorous species delivers a natural pest control service which could be beneficial to farmers and owners of the plantation. On the other hand, the presence of frugivorous and nectarivorous species is also important in the maintenance of the man-made ecosystem. They act as seed dispersers and pollinators.

To maximize biodiversity in commercial plantations, forested "buffer zones" should be established along or nearby the area. More sustainable use of existing plantations must be observed to enhance or at least maintain bird's diversity. Further, the presence of a threatened and endemic species is of significant interest and their importance in maintaining ecosystem balance must be considered. Thus, promoting biodiversity conservation by creating awareness among the managers/ owners of plantations could be of big help in their conservation. Moreover, since this is only a rapid study, it is highly recommended

that a long term avifaunal survey must be conducted to fully document and monitor the population of birds. Hence, we can have a better understanding on the contribution of commercial plantations as a land use type to the conservation of bird species.

ACKNOWLEDGMENTS

This work is part of the joint project of Colegio de Kidapawan and the Department of Biological Sciences of the University of Southern Mindanao funded by the Commission on Higher Education- Zonal Research Center (CHED-ZRC). Special thanks to Dr. Emma K. Sales, CHED-ZRC Director for her guidance and concern; to the owners of the plantations: Carumba family (oil palm plantation) and Platinum Rubber Development Corporation, Inc. (rubber plantation); and to Prof. Joselito Baril, a bird expert from the University of the Philippines at Los Banos, for the help extended in confirming the samples.

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