

BIRD DIVERSITY OF THE CROCKER RANGE NATIONAL PARK, SABAH, MALAYSIA

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ABSTRACT

A study of bird fauna was conducted at Park Headquarters of Crocker Range Park and its vicinity from 16-22 October 1999. Crocker Range Park Headquarters is located about 8 km from Keningau town. Mist-net and transect study were conducted in secondary and primary forest. A total of 840 net/hr were deployed with total capture of 32 birds of 17 species from seven families. Of 17 species, seven species were caught in secondary forest and 13 species in primary forest. Three species were caught in both secondary and primary forests. A total of 51 species were recorded from 24 families in the transect study. Thirty species were recorded in secondary forest, 33 species in primary forest and 13 species in both secondary and primary forests. There was no marked difference in species composition and diversity between secondary and primary forests. Some endangered and vulnerable species categorised under international conservation status were present in the study area. It is, therefore, pertinent that protection and conservation programmes for the park should be based on the presence of these species.

INTRODUCTION

Crocker Range Park is located in the west-central side of Sabah (5°24'N, 116°05'E). To the north of the park is Mount Kinabalu, the highest peak in Southeast Asia. It consists of a mixture of both primary and secondary (disturbed) lowland and hill dipterocarp forests. Approximately, 290 species of birds have been documented within 712 km² Kinabalu National Park (Davison 1992), which is more than half of the bird species in Sabah (514) and roughly half of the entire number of bird species present in the island of Borneo. Of the 290 species, 255 are residents and the rest are passage migrants (Davison 1992). In contrast to the comprehensive information about bird community of Kinabalu National Park, little is known about the avifauna of the Crocker Range Park area. The objectives of this study were to compile an inventory of bird species diversity found at Crocker Range National Park headquarters area based on brief mist-netting work, visual and vocal records. This information will be used to identify any species or group of birds which should be given priority in future research and management.

MATERIALS AND METHODS

Study Sites

Two study sites were selected for this study. The first site was categorised as secondary forest and the second site was primary forest. The first site was located east of the park headquarters. Mist-nets were erected along a stream flowing from north to south. The habitat was made up of riparian forest species, such as *Baringtonia* spp., *Dipterocarpus* spp.,

Eugenia spp., Zingiberaceae (wild ginger) and palmae. The second study site was located about 10 km west of the park headquarters. Mist-nets were deployed on the hill slopes and along a seasonal creek running north to south across the study site. The site was dominated by large dipterocarp trees including *Shorea* spp., *Dipterocarpus* spp. and *Arthocarpus* spp.

Survey Methods

At the first study site (secondary forest), 10 mist-nets with four shelves (2.5m x 12m, 36mm mesh) were deployed starting from afternoon of 16-18 October 1999. Thirty-six mm mesh size mist-nets were used because the size is most efficient in catching passerine birds (Pardieck and Waide 1992), which is the dominant group of birds in tropical rain forest. At the second study site (primary forest), 10 mist-nets were deployed from 19-22 October 1999. The mist-netting work was limited to three to five days at each study site because usually the rate of recapture increased dramatically if the mist-nets were deployed more than five days (Okia 1976, Wilson and Moriarty 1976, Greig-Smith 1980, Wong 1985, Wong 1986, Meyers and Pardieck 1993). The distance between each net was about 20m and they were erected 0.5m above the ground. As far as possible the nets were set under close canopy to avoid sunflecks and thus silhouette the mist nets. Cuttings of undergrowth were kept to a minimum along the net line.

The nets were activated in the morning at 0630 hrs until 1830 hrs in the evening. They were checked every hour. Even though the capture rate was low in the afternoon (Karr 1979), we continued to activate the nets throughout the day until evening since our base camp was located not far from netting stations. Net units were calculated from the total number of netting hours multiply by the number of mist-net deployed which is equivalent to one 2.5m x 12m mist-net activated for one hour. The captured birds were immediately identified after each collection with the aid of King et al. (1975), MacKinnon and Phillipps (1993), Smythies (1981) and Lekagul and Round (1991). All captured birds were weighed with a Pesola spring balance. The external morphological characters measured include tarsus length, bill length, bill depth, bill width, wing length, tail length, total length and wing shape. The measurements were made using Mitoyo electronic digital calipers (Mitoyo Corporation) and a steel ruler. The birds were sexed and ringed before released at the captured sites. The numbered (each ring has a unique number) aluminum rings belong to University Malaysia Sarawak (UNIMAS). The date and time of capture were also recorded. The recaptured birds were recorded and released.

Blood and feather samples for future genetic analysis were obtained by non-destructive methods (Taberlet and Luikart 1999). Blood samples were collected by gently clearing the feathers on the underside of the wing over the humerus, radius and ulna to expose the brachial vein, and moistened the vein with 70% ethanol. Then, the brachial vein was gently pierced with 25G (0.45 x 13mm) needle and, on formation of a blood droplet, blood was drawn into a 50 μ l heparinised microcapillary tube (Drummond Microcaps). The bleeding was stopped by pressing cotton wool on top of the puncture site. The blood was then released into a sterile 1.5ml screw-capped eppendorf tube containing "the Queen blood lysis buffer" (0.01M Tris, 0.01M NaCl, 0.01M sodium-EDTA, and 1.0% nlauroylsarcosine, pH 7.5) recommended by Seutin et al. (1991). The blood was gently mixed by shaking. A tail feather was extracted from the birds and soaked in 70% ethanol in 1.5ml screw-capped eppendorf tube. The tubes were labelled according to the ring (band) number with permanent ink marker pen and

securely sealed. Both blood and feather samples were kept at room temperature during the field work and at -80°C in the laboratory.

Transect study based on visual and vocal records were also carried out at both study sites. Binoculars (7 x 42) were used during visual observations and bird identification was aided by MacKinnon and Phillipps (1993). Transects were conducted in the morning from 0600 hr to 0800 hrs.

RESULTS AND DISCUSSION

During the seven-day netting period, a total of 840 net units (360 net units in secondary forest and 480 net units in primary forest) were deployed. Thirty-two birds were caught comprising 17 species of seven families (Table 1). Of 17 species, seven species were caught in secondary forest and 13 species in primary forest. Three species were caught in both secondary and primary forest. One migrant species, Mugimaki flycatcher (*Ficedula mugimaki*) and two species endemic to Borneo, White-browed shama (*Copsychus stricklandi*) and Dusky munia (*Lonchura fuscans*) were included in mist-net captures.

Table 1: Systematic list of bird species diversity mist-netted in primary and secondary forest at Crocker Range Park Headquarters

Ring no.	Family/Species	Habitat	Sex	Resident/migrant
	Columbidae			
C0040	Emerald dove (<i>Chalcophaps indica</i>)	sec	F	Resident
D0019	Emerald dove	sec	M	Resident
	Timaliidae			
A1186	Sooty-capped babbler (<i>Malacopteron affine</i>)	pri	F	Resident
A1188	Striped-tit babbler (<i>Macronous gularis</i>)	pri	un	Resident
A1193	Striped-tit babbler	pri	un	Resident
Escaped	Short-tailed babbler (<i>Malacocincla malaccensis</i>)	pri	un	Resident
Escaped	Short-tailed babbler	pri	un	Resident
Escaped	Short-tailed babbler	pri	un	Resident
A1197	White chested babbler (<i>Trichastoma rostratum</i>)	pri	un	Resident
C0049	Sunda whistling thrush (<i>Garrulax palliatus</i>)	pri	un	Resident
	Turdidae			
B1501	White-browed shama (<i>Copsychus stricklandi</i>)	sec	M	Resident
B0750	White-browed shama	sec	un	Resident
B0902	White-browed shama	pri	un	Resident
B0901	Chestnut-capped forktail (<i>Enicurus ruficapillus</i>)	sec	M	Resident
A1190	Siberian blue robin (<i>Erithacus cyane</i>)	pri	F	Migrant
A1194	Siberian blue robin	pri	un	Migrant
A1198	Siberian blue robin	pri	F	Migrant
A1401	Siberian blue robin	pri	F	Migrant
Escaped	Siberian blue robin	pri	M	Migrant
	Sylviidae			
A1199	Yellow-bellied warbler (<i>Abroscopus superciliaris</i>)	pri	un	Resident
A1185	Rufous-tailed tailorbird (<i>Orthotomus sericeus</i>)	sec	un	Resident

Escaped	Rufous-tailed tailorbird	pri	un	Resident
	Muscicapidae			
A1200	Rufous-chested flycatcher (<i>Ficedula dumetoria</i>)	pri	M	Resident
A1184	Mugimaki flycatcher (<i>Ficedula mugimaki</i>)	sec	un	Migrant
A1189	Pied fantail (<i>Rhipidura javanica</i>)	pri	un	Resident
A1191	Pied fantail	pri	un	Resident
Escaped	Black-naped monarch (<i>Hypothymis azurea</i>)	pri	M	Resident
	Nectariniidae			
A00236	Little spiderhunter (<i>Arachnothera longirostra</i>)	sec	un	Resident
A1187	Little spiderhunter	pri	un	Resident
A1192	Little spiderhunter	pri	un	Resident
A1195	Little spiderhunter	pri	un	Resident
	Ploceidae			
A1196	Dusky munia (<i>Lonchura fuscans</i>)	pri	un	Resident

F = female, M = male, un = undetermined, asterisk (*) = endemic to Borneo, sec = Secondary Forest, pri = Primary Forest.

With respect to the understory bird, the overall relative density was 0.04 bird/net unit. The result was comparable to that obtained at Gunung Silam, 0.03 bird/net unit (Rahman et al. 1996 - unpublished). Further breakdown of mist-netting efforts according to habitat types showed that the relative density of captured birds in secondary and primary forests were 0.03 bird/net unit and 0.05 bird/net unit, respectively.

A total of 51 species were documented in the transect study comprising 24 families (Table 2). Of the 51 species, three species are endemic to Borneo and one migrant species. Thirty species were recorded in secondary forest, 33 species in primary forest and 13 species in both secondary and primary forests.

Both mist-net captures and transect studies showed that bird diversity between secondary and primary forests does not show a marked difference. Qualitatively, we could infer that some birds in this area utilised both secondary and primary forests (generalists). For example, species like White-browed shama (*Copsychus stricklandi*) and Little spider-hunter (*Arachnothera longirostra*) were captured in both primary and secondary forests. In addition, we also recorded species that occur in both primary and secondary forests, such as Crested serpent eagle (*Spilornis cheela*), White-breasted waterhen (*Amaurornis phoenicurus*), Pied horn-bill (*Anthracoceros albirostris*), Red-crowned barbet (*Megalaima eximia*), Yellow-vented bulbul (*Pycnonotus goiavier*), Yellow-bellied bulbul (*Alophoixus ochraceus*), Ashy drongo (*Dicrurus leucophaeus*), Scaly-crowned babbler (*Malacopteron cinerium*), Magpie robin (*Copsychus saularis*), White-rumped shama (*C. malabaricus*), Little spider-hunter (*Arachnothera longirostra*), and Dusky munia (*Lonchura leucogastra*).

The local distributional patchiness emphasised by Diamond (1973, 1975), MacArthur (1972) have some influence on the diversity and distribution of birds in the study areas. Even though no statistical methods were employed to differentiate the diversity and distribution of birds between the two habitat types due to small sample size, qualitatively birds that were captured and recorded in secondary forest during this secondary forest also showed that the forest fragmentation due to agriculture development in the area has some influences on the diversity and distribution of bird species.

Table 2: Systematic list of bird species diversity recorded according to habitat types at Cracker Range Park Headquarters.

Family/Species	Identification mode	Habitat
Accipitridae		
Black eagle (<i>Ictinaetus malayensis</i>)	S	sec (1)
Crested serpent eagle (<i>Spilornis cheela</i>)	S	sec (1), pri (1)
Phasianidae		
Great argus (<i>Argusianus argus</i>)	V	pri (8)
Rallidae		
White-breasted waterhen (<i>Arnaurornis phoenicurus</i>)	V,S	sec (>10), pri (>10)
Columbidae		
Emerald dove (<i>Chalcophaps indica</i>)	S	sec (>1)
Green imperial pigeon (<i>Ducula aenea</i>)	V	pri (6)
Jambu fruit-dove (<i>Ptilinopusjambu</i>)	S	pri (1)
Little cuckoo-dove (<i>Macropygia ruficeps</i>)	S	pri (1)
Spotted dove (<i>Streptopelia chinensis</i>)	V,S	sec (>10)
Ruddy cuckoo-dove (<i>Macropygia emiliana</i>)	S	sec (1)
Psittacidae		
Blue-crowned hanging-parrot (<i>Loriculus galgulus</i>)	V,S	sec (3)
Cuculidae		
Chestnut-bellied malkoha (<i>Phaenicophaeus sumatranus</i>)	S	pri (2)
Raffles malkoha (<i>P. chlorophaeus</i>)	S	pri (1)
Bucerotidae		
Pied hornbill (<i>Anthracoceros albirostris</i>)	S	sec (2), pri (2)
Capitonidae		
Brown barbet (<i>Megalaima eximia</i>)*	S	pri (1)
Red-crowned barbet (<i>M. rafflesii</i>)	V,S	sec (5), pri (4)
Picidae		
Rufous woodpecker (<i>Celeus brachyunis</i>)	S	pri (1)
Eurylaimidae		
Green broadbill (<i>Calyptomena viridis</i>)	S	pri (1)
Campcphagidae		
Large woodshrike (<i>Tephrodornis gu/aris</i>)	S	pri (1)
Chloropseidae		
Lesser green leafbird (<i>Chloropsis cyanopogon</i>)	S	pri (2)
Pycnonotidae		
Black-headed bulbul (<i>Pycnonotus atriceps</i>)	S	sec (3)
Yellow-vented bulbul (<i>P. goiavier</i>)	S	sec (>10), pri (>10)
Ochraceous bulbul (<i>Alophoixus ochraceus</i>)	S	sec (1)
Yellow-bellied bulbul (<i>A. phaeocephalar</i>)	S	sec (1), pri (4)
Dicruridae		
Ashy drongo (<i>Dicrurus leucophazeus</i>)	S	sec (2), pri (2)
Bronze drongo (<i>D. aeneus</i>)	S	sec (4)
Oriolidae		
Asian fairy-bluebird (<i>Irena puella</i>)	S	sec (1),

Covidae		
Bornean treepie (<i>Dendrocitta cinerascens</i>)*	S	sec (3)
Crested jay (<i>Platylophus galericulatus</i>)	V	sec (2)
Timalidae		
Chestnut-backed schimitar-babbler (<i>Pomatorhinus montanus</i>)	S	pri (2)
Chestnut-winged babbler (<i>Stachyris erythroptera</i>)	S,V	sec (5)
Scaly-crowned babbler (<i>Malacopteron cinerium</i>)	V	sec (2), pri (2)
Sunda laughingthrush (<i>Garrulax palliatus</i>)	S	pri (1)
Turdidae		
Chestnut-capped thrush (<i>Zoothera interpres</i>)	S	pri (1)
Magpie robin (<i>Copsychus saularis</i>)	S,V	sec (>10), pri (>10)
White-browed shama (<i>C. stricklandi</i>)	V	sec (1)
White-rumped shama (<i>C. malabaricus</i>)	S,V	sec (2), pri (1)
Sylviidae		
Ashy tailorbird (<i>Orthotomus ruficeps</i>)	S	pri (1)
Rufous-tailed tailorbird (<i>O. sericeus</i>)	V,S	sec (5), pri (5)
Yellow-bellied warbler (<i>Abroscopus superciliaris</i>)	V	pri (4)
Muscicapidae		
Pied fantail (<i>Rhipidura javanica</i>)	S	sec (5)
Laniidae		
Brown shrike (<i>Lanius tigrinus</i>) ^m	S	pri (1)
Nectariniidae		
Little spiderhunter (<i>Arachnothera longirostra</i>)	V,S	sec (7), pri (4)
Grey-breasted spiderhunter (<i>A. affinis</i>)	S	pri (2)
Long-billed spiderhunter (<i>A. robusta</i>)	S	sec (2)
Spectacled spiderhunter (<i>A. flavigaster</i>)	S	pri (2)
Plain sunbird (<i>Anthreptes simplex</i>)	S	sec (1)
Dicaeidae		
Yellow-breasted flowerpecker (<i>Prionochilus maculatus</i>)	S	sec (1)
Scarlet-headed flowerpecker (<i>Dicaeum trochileum</i>)	S	sec (1)
Ploceidae		
Dusky munia (<i>Lonchura leucogastra</i>)*	S	sec (>10), pri (>10)

Note: S = sighted, V = vocal, sec = secondary forest, pri = primary forest, (*) denotes endemic to Borneo, ^mdenotes migrant species and numbers in brackets represent number of birds

The presence of Great argus (*Argusianus argus*) within the study area (especially in primary forest) revealed that a major portion of primary forest has not been disturbed. This species is listed in the totally protected species in local Wildlife Protection Ordinance (Department of Wildlife and National Park) and endangered in international conservation status, International Union for Conservation of Nature and Natural Resources (IUCN), Red Data Book (Kiew and Davison 1982). Two species, Black eagle (*Ictinaetus malayanus*) and Crested eagle (*Spilornis cheela*) recorded in the study area are listed as totally protected and protected species in local Wildlife Ordinance respectively and are classified as vulnerable in IUCN Red Data Book (Kiew and Davison 1982).

CONCLUSIONS

Our study showed that there is no marked difference in bird species diversity and distribution between primary and secondary forests. Majority of the species captured in mist-nets and recorded in the transect study area are generalists (utilised both primary and secondary forests). The pattern of distribution could also be due to local patchiness caused by the fragmentation of historically contiguous habitat due to agricultural development in the area. Crocker Range Park conservation and protection programmes for this area should be prioritised based on records of some endangered and vulnerable bird species

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