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How Valuable is Degraded Habitat to Forest Birds? A Case Study in Bachok, Kelantan

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ABSTRACT

Conservationists usually pay less attention to degraded habitats than primary forests since the former areas generally support less number of species. In this study, diversity and abundance of birds inhabiting degraded habitats were recorded in order to assess the capability of these habitats in conserving birds, particularly forest species. For this purpose, five visits were done to the district of Bachok, Kelantan, Malaysia, from June 2008 until May 2009. The study area comprised mainly of small villages intersperse with small trees or shrubs and cash crop areas. A direct observation method was used to record the bird diversity in the study area. A total of 70 bird species were recorded in the study area and most of them are residents and insectivores, indicating that insects are abundant in the study area. In term of habitat utilisation, most recorded species are usually associated with open and country habitats, mangroves, as well as garden and parks. A total of nine species or 13% of the birds recorded in this area have greater association with forest habitats. Some of these forest birds were observed feeding while others having their nests in the area. Although degraded habitat in Bachok area can play important roles in conserving forest birds, the value of these habitats cannot be established since these birds are not exclusively forest dependent and can be commonly found in secondary or disturbed forests. Therefore, further studies on the behavioural aspects of forest birds need to be carried out to determine the level of resources required by forest specialists in degraded habitat.

Keywords: Forest birds, forest disturbance, habitat displacement, bird survival, Peninsular Malaysia

INTRODUCTION

Most studies on tropical birds' diversity have been conducted in primary forests, and this is possibly because many resident species (at least 70%) in this region are partly or exclusively dependent upon this habitat.

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Furthermore, most human-modified areas in the tropics have largely been considered hostile to biodiversity. Consequently, only a few conservation initiatives have focused on secondary forests, agro-forestry, or other human-modified areas. On the contrary, the recent findings suggest that degraded habitats or secondary forests have high conservation potential (Sodhi *et al*., 2005; Sekercioglu *et al*., 2007; Edwards *et al*., 2010), and therefore, demanding more studies to be conducted beyond primary forest for a better preserved biodiversity (Gardner *et al*., 2009). This is because 90% of the world's tropical forests exist outside of the primary forest and 60% of the world's remaining tropical forests are either degraded or secondary forests (Schmitt *et al*., 2009). Globally, it is reported that 42 tropical countries have more secondary forests or degraded habitats as forest covers than primary forests (FAO, 2009). In Malaysia, only 18.3% of its forests were covered by primary forests (out of 20.89 million hectares of forested area) and this figure keeps on deteriorating as deforestation rate is accelerating. In other South–East Asian countries, the remaining primary vegetation varies from 3% in the Philippines, 5% in Indo-Burma, 8% in Sundaland and 15% in Wallacea (FAO 2009).

Therefore, the fate of many species is depending on what happens to the other habitats outside the primary forests. Among the habitats that require further attention are secondary forest, agricultural areas, rural or human settlements areas, and other human-modified landscapes. Several studies have been conducted to assess the capability of degraded habitat in conserving forest birds (e.g., Wong 1986; Zakaria *et al*., 2002; Peh *et al*., 2005, 2006; Sodhi *et al*., 2005; Barlow *et al*., 2007; Sekercioglu *et al*., 2007; Edwards *et al*., 2010). The results indicate that degraded habitats can, in some cases, serve as surrogate habitats for some of the forest birds.

Meanwhile, patterns of habitat use and occupancy suggest that degraded habitat in the region (which is primarily abandoned pasture) may only be valuable to forest birds after a specific level of regeneration and during certain times of the year. Therefore, degraded landscapes could act as good refuges for the forest birds if it were allowed to regenerate. Forest birds are more sensitive to disturbance because their survival depends on the availability of forest's resources (Sodhi, 2002; Sodhi *et al*., 2005; Sekercioglu *et al*., 2007; Zakaria & Zamri, 2008; Ramli *et al*., 2010). Among the required resources are food and water, suitable nesting sites and nest materials, lack of predators and competitors, as well as suitable mating partners. Theoretically, any disturbed habitat will be able to harbour forest birds if they can supply these resources. For instance, a good proportion of the forest birds are able to survive in disturbed habitat in the southern part of Johor (Peh *et al*., 2005).

Although a moderate number of biodiversity studies have been conducted on secondary forests, the least research was carried out in other types of degraded

habitats, such as agricultural area or other human-modified landscapes. This is despite the recent interest in the diversity patterns and conservation strategies for the native species in agricultural area and human-modified landscapes due to the current global changes in land use. It is not known how valuable the agricultural lands and other rural human-dominated landscapes for biodiversity conservation, especially to forest birds. Therefore, this study was designed to assess the significance of degraded habitats (human settlement, cash-crop, and shrubs) in conserving forest birds. To achieve this objective, the abundance and species richness of the birds inhabiting degraded habitats were recorded.

MATERIALS AND METHODS

The study was conducted in the rural area of the district of Bachok in Kelantan. The area is dominated by traditional villages and other human settlements which intersperse with cash-crop areas. There is no forested area within the district but the adjacent district (Pasir Puteh which is located approximately 5 km away) has few fragmented forest reserves (Ramli *et al*., 2010). Eight study sites (identified as site A to site H) with different physical characteristics were established within the study area (Table 1). Among the habitats available in study area are mangroves, open grazing fields (some with electrical pylon and cables), and shrubs (which consist of small and large trees). A total of five visits (comprised three days each) were conducted to the study area

TABLE 1
Location of the study sites and their descriptions

Site	Site Descriptions	Latitude	Longitude
SITE A	Shrubby areas with small trees including small patch of mangrove forest, and some open grazing fields.	N 05° 57.433’	E 102° 26.628’
SITE B	Shrubby areas with small section of mangrove forest, is close to the beach and with some open grazing fields.	N 05° 57.499’	E 102° 26.277’
SITE C	Few tall trees with sparse shrubs, electrical cables and pylons.	N 05° 59.247’	E 102° 26.058’
SITE D	An open area with few tall trees, natural well and grazing fields.	N 05° 59.434’	E 102° 25.537’
SITE E	An open/grassy area with electrical pylon, and the absence of taller trees.	N 05° 59.136’	E 102° 25.422’
SITE F	A swampy area with freshwater supply in small stream and concrete drain.	N 05° 59.390’	E 102° 25.306’
SITE G	An open/grassy area, with few small trees and open grazing fields.	N 05° 59.661’	E 102° 25.188’
SITE H	An open area with a lot of coconut trees, and is adjacent to the beach.	N 06° 00.417’	E 102° 25.583’

from June 2008 to May 2009. The direct observation method (using binoculars of 8 X 40 magnifications) was used to record the bird species diversity at the area. Morning observation session started at 0730 hours until 1200 hours, whereas the afternoon observation session began at 1400 hours until 1830 hours. Each site was visited for 30 minutes before moving to the next site. Three-point count stations were established within each site and each point count lasted for 10 minutes (Sodhi *et al*., 2005; Lee & Marsden, 2008; Ramli *et al*., 2010). Any bird seen or heard within 50 metres radius was recorded. Doubtful sightings were confirmed by repeating the observations involving note-taking and drawings, which were later identified using standard field guides (such as those by Jeyarasingam & Pearson, 1999). Each site was visited twice daily (one each in the morning and afternoon sessions) and a proper schedule was established to ensure that all the sites were visited at different times. All the observed birds were identified up to the species level and secondary information related to each species (including habitat association and feeding guilds) was extracted from Jeyarasingam and Pearson (1999), Zakaria *et al*. (2002) as well as Zakaria and Zamri (2008). In this study, we concurred with Sodhi *et al*. (2005) in defining forest birds, i.e. those that occur mainly in lowland or low-montane forest habitats and used information provided by Jeyarajasingam and Pearson (1999), Zakaria *et al*. (2002), as well as Zakaria and Zamri (2008) in determining the association between the birds and their habitat.

RESULTS AND DISCUSSION

A total of 70 species of birds were recorded in the study area (Table 2). As for the resident species dominating the area (45 species or 64%), there are a few representatives of the introduced birds (three species), while migratory birds and birds that have both migrant and resident populations are represented by 11 species each (16%). Fifty two (52) species recorded in the study area could be commonly found throughout Peninsular Malaysia, whereas ten species were uncommon, and seven species were abundantly distributed. Interestingly, one of Malaysia's rare species, i.e. Javan Pond-Heron (*Ardeola speciosa*), was also recorded in the area. However, the local distribution pattern for some recorded species is different from that of the national distribution. Some species that are abundant or commonly found throughout Peninsular Malaysia, such as Eurasian Tree Sparrow (*Passer montanus*) and White-breasted Waterhen (*Amaurornis phoenicurus*), are uncommon or rarely found in study area. This difference is mainly due to availability of resources in the study area (Sodhi, 2002; Sodhi *et al*., 2005).

The presence of forest birds in the study area demands further explanation. Nine species (or 13%) of the forest birds were recorded in Bachok area. These are Chestnut-breasted Malkoha (*Zanclostomus curvirostris*), Greater racket-tailed Drongo

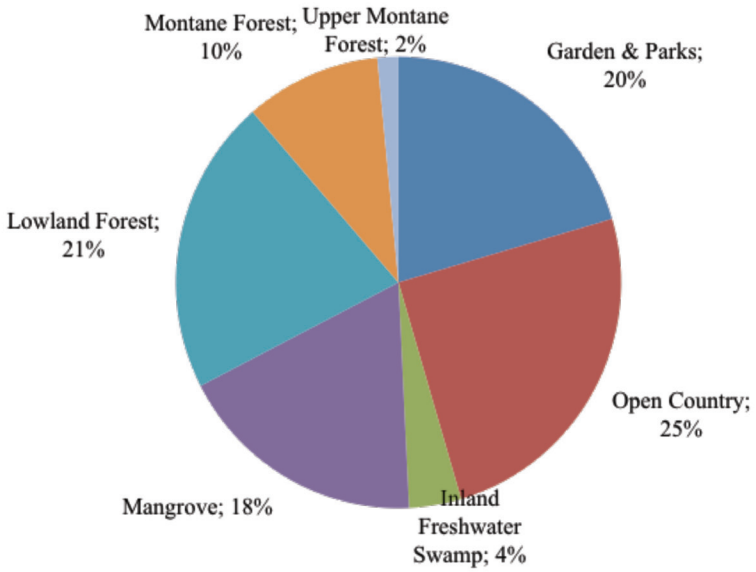

Fig.1: Composition of the bird species recorded in the study area according to their habitats

(*Dicrurus paradiseus*), Green-billed Malkoha (*Rhopodytes tristis*), Grey-breasted Babbler (*Malacopteron albogulare*), Rufous Woodpecker (*Micropternus brachyurus*), Rufous-fronted Babbler (*Stachyridopsis rufifrons*), Stripe-throated Bulbul (*Pycnonotus finlaysoni*), Tiger Shrike (*Lanius tigrinus*), and White-bellied Munia (*Lonchura leucogastra*). All the species are residents (except for Tiger Shrike) and fully protected by the Malaysian law (except for Chestnut-Breasted Malkoha and White-bellied Munia), and also commonly found throughout Peninsular Malaysia (except both species of babblers and White-bellied Munia which are uncommon). However, only Green-billed Malkoha, Chestnut-breasted Malkoha, and Rufous Woodpecker were frequently observed in the study area.

Among all the stations, only station E did not record any forest birds. The station is an open area with electrical pylon. Although it provides a suitable vantage point for carnivores of open area or parks, the station does not have much resource for forest birds. More forest birds were recorded at station H (5 species), which has coconut plantation, river mouth and shrubs. These kinds of habitats attract many insects which will draw insectivorous birds into the area. Other stations that managed to attract forest birds usually have shrubs, freshwater supply (such as small stream), and are close to the beach. This particular result is unfortunately predictable since most recorded species are birds that associate with open country, garden and parks, mangrove and lowland forests (Fig.1). It is understood that the composition of birds that associate with the first three habitats was recorded in higher number since the particular types of habitat are widely available in the study area.

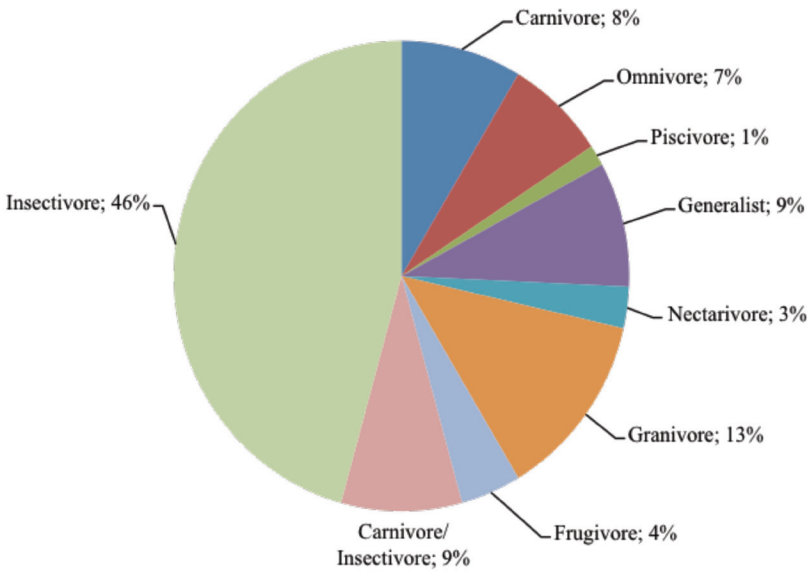

Fig.2: Composition of the bird species recorded in the study area according to their feeding guilds

Meanwhile, the availability of resources in each station plays important roles in attracting different bird species, especially forest birds. Sodhi (2002) postulated that frugivorous and insectivorous birds are more vulnerable to extinction after forest disturbance due to the decline in food supply. However, most forest birds that are able to survive in Bachok area are insectivores (32 species or 46%), while other feeding guilds are represented by less than nine species (Fig.2). Only Tiger Shrikes are carnivores, while Green-billed Malkoha predates invertebrates from understory foliage. Most forest birds recorded in the study area utilised the available degraded habitats as their resting and feeding sites but three species (namely, Chestnut-Breasted Malkoha, Green-billed Malkoha, and Stripe-throated Bulbul) were observed to be involved in breeding activities (i.e. they were either recorded close to their nests or bringing nesting materials).

In addition to the general behaviour of the species, higher frequency of detection (most of these forest birds were recorded more than once, either at various sites, or at different times) eliminated the possibility of misidentification or coincidence. For instance, Tiger Shrike was observed at three stations (C, F, and G), even during a single visit. This species had likely used the study area as the stop-over site during its migratory journey. On the other hand, two other forest species were recorded twice but at the same station. For example, Stripe throated Bulbul was recorded twice at station B (4-8 February, 2009 and 12-15 May, 2009), whereas Greater-racket tailed Drongo was observed twice at station H

TABLE 2
List of the species recorded in Bachok, Kelantan.

No.	Species	Distribution Status	Protection Status	Degree of Occurrence	Habitat Associations	Study Sites	Feeding Guilds
1	Ashy Minivet *Pericrocotus divaricatus*	M	TP	C	GP,OC,MG,LF	F	Insectivore
2	Ashy Tailorbird *Orthotomus ruficeps*	R	TP	C	MG,LF	A,B,	Granivore / Insectivore
3	Asian/Common Koel *Eudynamys scolopaceus*	R,M	TP	C	OC,MG	ALL	Frugivore / Carnivore
4	Banded Woodpecker *Chrysophlegma mineaceus*	R	TP	C	MG,LF, LMF	B,H	Insectivore
5	Barred Buttonquail *Turnix suscitator*	M	GB	C	OC	B,G	Granivore
6	Black Drongo *Dicrurus macrocercus*	M	TP	C	OC	E	Carnivore
7	Black-naped Oriole *Oriolus chinensis*	R,M	TP	C	GP,OC	A,B,D,G,H	Frugivore / Insectivore
8	Blue-tailed Bee-eater *Merops philippinus*	R,M	NP	C	OC	A,B,F	Insectivore
9	Blue-throated bee eater *Merops viridis*	R,M	TP	C	OC	A,F,G	Insectivore
10	Brahminy Kite *Haliastur indus*	R	TP	A	MG	C,E,F,G,H	Carnivore
11	Brown Shrike *Lanius cristatus*	M	TP	C	GP,OC	F	Carnivore / Insectivore
12	Brown-throated Sunbird *Anthreptes malacensis*	R	TP	C	GP,OC,MG	A,B,H	Insectivore / Nectarivore
13	Chestnut-breasted Malkoha *Zanclostomus curvirostris*	R	NP	C	LF	A,B,F,G,H	Carnivore / Frugivore

Table 2 (*continued*)

14	Chestnut-headed Bee-eater *Merops leschenaulti*	R	TP	UC	OC	A,C,F	Insectivore
15	Chinese Pond-Heron *Ardeola bacchus*	M	TP	C	IS,MG	A	Pisicivore / Invertebrate
16	Cinnamon Bittern *Ixobrychus cinnamomeus*	R,M	TP	C	IS	F,G	Pisicivore / Invertebrate
17	Collared Kingfisher *Todiramphus chloris*	R,M	TP	C	MG	B,E,H	Pisicivore
18	Common Flameback *Dinopium javanense*	R	TP	C	GP,OC,MG,LF	H	Insectivore
19	Common Iora *Aegithina tiphia*	R	TP	C	GP,OC,MG	A,F	Insectivore
20	Common Kingfisher *Alcedo atthis*	R,M	TP	C	IS,MG	H	Pisicivore
21	Common Myna *Acridotheres tristis*	R	NP	A	GP,OC	ALL	Frugivore / Insectivore
22	Common Tailorbird *Orthotomus sutorius*	R	TP	C	GP,OC,MG,LF,LMF	A,B	Frugivore / Nectarivore
23	Crested Serpent-Eagle *Spilornis cheela*	R	TP	C	MG,LF,LMF,UMF	B	Carnivore
24	Crimson breasted Flowerpecker *Dicaeum percussus*	R	TP	C	MG,LF	A	Nectarivore
25	Crow-billed Drongo *Dicrurus annectans*	M	TP	UC	MG,LF	E,F	Insectivore / Carnivore
26	Dark-necked Tailorbird *Orthotomus atrogularis*	R	TP	C	GP,MG,LF,LMF	B	Insectivore
27	Dollarbird *Eurystomus orientalis*	R,M	TP	C	OC	C,F,H	Carnivore / Insectivore

Table 2 (*continued*)

28	Eastern Cattle Egret *Bubulcus coromandus*	R,M	TP	C	OC	E,F,G	Pisicivore / Invertebrate
29	Eurasian Tree Sparrow *Passer montanus*	R	NP	A	GP,OC	B,H	Granivore
30	Glossy Swiftlet *Collocalia esculenta*	R	TP	C	OC,LF,LMF,UMF	ALL	Insectivore
31	Greater Coucal *Centropus sinensis*	R	TP	C	OC,LF	A	Carnivore
32	Greater Flameback *Chrysocolaptes lucidus*	R	TP	C	MG	H	Insectivore / Frugivore
33	Greater Racket-Tailed Drongo *Dicrurus paradiseus*	R	TP	C	LF,LMF	H	Insectivore / Carnivore
34	Green-billed Malkoha *Rhopodytes tristis*	R	TP	C	LF,LMF	A,B,C,D,F,H	Frugivore / Carnivore
35	Grey-breasted Babbler *Malacopteron albogulare*	R	TP	UC	LF	B	Insectivore / Granivore
36	Grey-faced Buzzard *Butastur indicus*	M	TP	C	OC	F	Carnivores
37	House Crow *Corvus splendens*	I	NP	A	GP,OC	A,B,C,E,H	Carnivores /Omnivores
38	House Swallow *Hirundo tahitica*	R	TP	C	OC	ALL	Insectivores
39	House Swift *Apus affinis*	R	TP	C	GP,OC,LF,LMF	ALL	Insectivores
40	Indian Roller *Coracias benghalensis*	R	TP	UC	OC	D,E,G	Insectivores
41	Japanese Sparrowhawk *Accipiter gularis*	M	OPB	C	OC,MG,LF	F	Carnivore
42	Javan Munia *Lonchura leucogastroides*	I	NP	C	GP,OC	G	Granivore

Table 2 (*continued*)

43	Javan Myna *Acridotheres javanicus*	I	NP	A	GP,OC	ALL	Frugivore / Insectivore
44	Javan Pond-Heron *Ardeola speciosa*	M	NP	Ra	IS,MG	F	Pisicivore / Invertebrate
45	Lesser Coucal *Centropus bengalensis*	R	TP	C	OC	D,E,G,H	Carnivore
46	Lineated Barbet *Megalaima lineata*	R	TP	C	GP,OC	A	Frugivore / Granivore
47	Long-tailed Parakeet *Psittacula longicauda*	R	OPB	C	GP,OC	A	Frugivore / Granivore
48	Olive-backed Sunbird *Cinnyris jugularis*	R	TP	C	GP,OC	B,D	Nectarivore
49	Oriental Magpie Robin *Copsychus saularis*	R	NP	C	GP,OC,LF,LMF	B,C,G,H	Insectivore / Invertebrate
50	Pied Fantail *Rhipidura javanica*	R	TP	C	MG,LF	A,B,D,F,G,H	Insectivore
51	Pied Triller *Lalage nigra*	R	TP	C	GP,OC	A	Insectivore
52	Plain-backed sparrow *Passer flaveolus*	R	NP	UC	GP,OC	G	Granivore / Insectivore
53	Purple-throated Sunbird *Leptocoma sperata*	R	TP	UC	GP,MG,LF	A,B,C,E,F,G	Isectivore / Nectarivore
54	Richard's Pipit *Anthus richardi*	R,M	NP	C	OC	A,B,E,F	Insectivore
55	Rufous Woodpecker *Micropternus brachyurus*	R	TP	C	LF	B,H	Insectivore / Invertebrate
56	Rufous-fronted Babbler *Stachyridopsis rufifrons*	R	TP	UC	LF,LMF	B	Insectivore / Frugivore
57	Rufous-tailed Tailorbird *Orthotomus sericeus*	R	TP	UC	MG,LF	A,B,G	Insectivore

Table 2 (*continued*)

58	Scaly-breasted Munia *Lonchura punctulata*	R	NP	C	GP,OC	F	Granivore
59	Scarlet-backed Flowerpecker *Dicaeum cruentatum*	R	TP	C	GP,OC,MG,LF	A,B	Nectarivore
60	Spotted Dove *Streptopelia chinensis*	R	NP	C	GP,OC	ALL	Frugivore / Granivore
61	Stripe-throated Bulbul *Pycnonotus finlaysoni*	R	TP	C	LF,LMF	B	Insectivore / Frugivore
62	Tiger Shrike *Lanius tigrinus*	M	TP	C	LF,LMF	C,F,G	Carnivores
63	Western Yellow Wagtail *Motacilla flava*	M	TP	C	OC	H	Insectivore/Invertebrate
64	White-bellied Munia *Lonchura leucogastra*	R	NP	UC	LF	C	Granivore
65	White-breasted Waterhen *Amaurornis phoenicurus*	R,M	GB	A	IS	G,H	Insectivore / Pisicivore
66	White-headed Munia *Lonchura maja*	R	NP	C	OC	E,G	Granivore
67	White-rumped Munia *Lonchura striata*	R	NP	UC	OC,LF,LMF	A,C	Granivore
68	White-throated Kingfisher *Halcyon smyrnensis*	R	TP	C	GP,OC	A,B,C,E,F,G,H	Pisicivore
69	Yellow-vented Bulbul *Pycnonotus goaivier*	R	NP	A	GP,OC	ALL	Frugivore / Insectivore
70	Zebra Dove *Geopelia striata*	R	NP	C	GP,OC	A,B,C,E,F,G,H	Granivore

Legend: Distribution status (I = introduced, R = resident, M = migrant); Protection Status (NP = not protected, TP = totally protected, GB = game birds, OPB = other protected birds); Degree of occurrence (A = abundant, C = common, UC = uncommon, RA = rare). Habitat association (GP = garden and parks; OC = open country; MG = mangrove; LF = lowland forest; LMF = lowland montane forest; UMF = upper montane forest; IS = inland swamp)

(17-19 June, 2008 and 12-15 May, 2009). Only babblers were recorded once (both on 10-13 March 2009 at station B).

The existence of the forest birds in Bachok indicate that they can survive in a degraded habitat with increased human activities, as long as the resources are available. A similar response was also shown by the forest birds in the tropical countryside of Costa Rica (Sekercioglu *et al*., 2007). Perhaps, prolonged destruction on the forested area surrounding the study area might have forced the forest birds to fully utilise any remaining habitat available for their survival. Consequently, they become less specific in choosing the habitat for survival and will eventually become more resilient to survive better in human dominated areas. Some of the forest birds that were recorded in this study, such as Chestnut-breasted Malkoha and Rufous Woodpecker, are commonly associated with degraded habitat like secondary forests in Johor (Peh *et al*., 2006) and Negeri Sembilan (Wong, 1986).

Degraded habitat generally supports fewer species than primary forest, especially in the short term; however, it is reasonable to expect that restoration of secondary habitat will allow some ameliorations of biodiversity loss. Tropical forest regeneration can be accelerated by planting fast-growing, fruit-producing trees, like figs, in the formerly forested areas. These trees attract birds and bats which will deposit seeds from the nearby forests onto the ground below. The dropping of these seeds will, in effect, return native forest species to the deforested patch.

Perhaps some degraded habitats (including those in Bachok) have high potential conservation values as in Costa Rican agricultural countryside (Sekercioglu *et al*., 2007) and are capable in providing adequate resources such as food, covers and nesting site for the survival of forest birds. If this is true, degraded habitat can significantly contribute towards the forest bird conservation programme where appropriate restoration measures are taken (Sekercioglu *et al*., 2007). However, without information on the nesting behaviour, feeding and foraging activity, as well as resource utilisation, a comprehensive conclusion about the value of the degraded habitat for forest birds cannot be made.

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