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# Diversity of Bird Species in the Oil Palm Plantation on Peat

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## ABSTRACT

*Oil palm plantation on peat creates an alternative habitat for birds to live in. In order to find out the diversity of bird species dwelling in this oil palm habitat, surveys were carried out in a seven-year old oil palm plantation established on peat soil near Betong, Sarawak between August 2010 to October 2011. The survey was done by observation and mist netting methods. A total of 463 individual birds belonging to 42 species were recorded and this represents approximately 7% of the total species known to occur in Borneo. More than 50% of the birds recorded in oil palm plantation are feeding on insects. Besides that, wetland birds and birds of prey were also recorded in this habitat. Among the 42 species sampled, Yellow-vented Bulbul (23.3%) was the most dominant species. Twenty-six percent of the birds recorded in oil palm plantation are categorised as protected birds under the Sarawak Wild Life Protection Ordinance (1998). Our results suggest that the seven-year old oil palm plantation in Betong, Sarawak had a reasonably good community of birds. More sampling works are needed in order to study the population gradient over time to gain a better understanding on bird response to dynamic change.*

## ABSTRAK

*Ladang sawit di paya gambut mewujudkan habitat alternatif kepada burung untuk didiami. Dalam usaha untuk mengetahui kepelbagaian spesies burung yang tinggal di habitat ini, kaji selidik telah dijalankan antara Ogos 2010 hingga Oktober 2011 di ladang sawit berusia tujuh tahun yang terletak di kawasan paya gambut, Betong, Sarawak. Kajian ini dijalankan dengan menggunakan kaedah pemerhatian dan jaring samar. Sebanyak 463 individu dari 42 spesies burung telah direkodkan dan ini mewakili lebih kurang 7% daripada jumlah spesies yang telah direkodkan di Borneo. Lebih daripada 50% burung di ladang sawit yang makan serangga. Selain itu, burung tanah paya dan burung pemangsa juga telah direkodkan di habitat ini. Di antara 42 spesies burung ini, Merbah Kapur (23.3%) adalah spesies yang paling dominan di habitat ini. Dua puluh enam peratus daripada burung di ladang sawit dikategorikan sebagai burung yang dilindungi di bawah Ordinan Perlindungan Hidupan Liar Sarawak (1998). Keputusan ini menunjukkan bahawa ladang sawit berusia tujuh tahun di Betong, Sarawak, mempunyai komuniti kepelbagaian spesies burung yang baik. Kajian yang lebih mendalam amatlah diperlukan untuk mengkaji kecerunan populasi burung dari semasa ke semasa untuk mendapatkan pemahaman yang lebih baik mengenai tindak balas burung terhadap perubahan dinamik ini.*


**Keywords:** birds, oil palm plantation, yellow-vented bulbul, protected birds.

## INTRODUCTION

The oil palm plantation in Malaysia creates an alternative habitat for birds to live in besides forest as their original habitat. Besides that, this habitat attracts different foraging guild composition of bird because this habitat provides sufficient food resources (Azhar *et al.*, 2013). Until December 2013, there were about 5.23 million hectares of oil palm planted in Malaysia and mostly located in Peninsular Malaysia (49.5%), followed by Sabah (28.3%) and Sarawak (22.2%) (MPOB, 2014). Due to a high annual demand on oil palm products, the total oil palm planted areas increase continuously. During the early years of its expansion, most of the oil palm was planted on suitable mineral soil, and as this land is diminishing, some of the oil palm is now being planted on marginal soils such as peat soil (Omar *et al.*, 2009). In 2009, 27.57% of the 2.43 million hectares peatland in Malaysia was planted with oil palm, and Sarawak has the largest area of oil palm planted on peat, followed by Peninsular Malaysia and Sabah (Omar *et al.*, 2010). Several studies on bird population in the oil palm planta-

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tion ecosystems have been carried out in Malaysia to identify the species of birds that use this habitat for their survival (Gouk, 2009; Azman *et al.*, 2011; Jambari *et al.*, 2012; Gervais *et al.*, 2012; Azhar *et al.*, 2013). However, our knowledge on bird population in oil palm planted on peat is still inadequate. Thus, there is an urgent need to document not only the diversity of species dwelling in oil palm planted on peat, but also to understand more on the bird responses to the oil palm habitat over time.

This article reveals the changes in the diversity of bird species inhabiting a seven-year old mature oil palm plantation on peat over time. This information can be used as baseline data for future studies and monitoring the bird species in oil palm plantation.

## MATERIALS AND METHODS

The Durafarm Plantation is an oil palm plantation on peat, which belongs to WTK Sdn Bhd (*Figure 1*). It has an area of about 5054 ha and located approximately 35 km from Betong town, Sarawak. The sampling site was located in Block 88 (N 01°23'50'' E 111°24'37'') and situated about 200 m from a neighbouring forest (Peat Swamp Forest). The surveys were carried out in a seven-year old oil palm in Block 88 for four times between 2010-2011 (August 2010, March 2011, July 2011 and October 2011).

The survey was done by observation and mist netting methods. Fifteen mist-nets of 36 mm mesh-size and measuring 9 x 2.5 m with four shelves were used to capture birds. The mist-nets were erected in the morning at 0600 hr until 1800 hr in the evening for three days and were checked every 2 hr (Rahman and Tuen, 2006). Captured birds were identified, measured, tagged and released in the study areas. External morphological measurements of the captured birds were recorded. Species identification was based on Myers (2009) and Smythies (1981).

The observation method involved walking along trails (field road in Block 88) in the early morning (6:30-8:30 am) and late afternoon (4:03-6:30 pm) when the birds are most active and easier to spot. Birds were identified through sightings and vocalisations (Rahman, 2004). The *Pocket Guides to the Birds of Borneo* (Smythies, 1981) and *Birds of Borneo, Java, Bali and Sumatra* (MacKinnon and Phillipps, 1993) were used to aid identification.

## RESULTS AND DISCUSSION

*Table 1* shows the relative abundance of mist-netted and observed birds in Block 88 at Durafarm Plantation, Betong, Sarawak. In this study, 463 birds representing 42 species were mist-netted and observed (*Figure 2*). This represents approximately 7% of the total species known to occur in Borneo. In this study, sampling in March 2011 recorded a high number of species and individuals with 26 species and 297 individuals. According to Chenon and Susanto (2006), the number of birds was high from January until March due to the beginning of the breeding season, and the oil palm plantation offers suitable conditions such as shelter, food and nesting site.

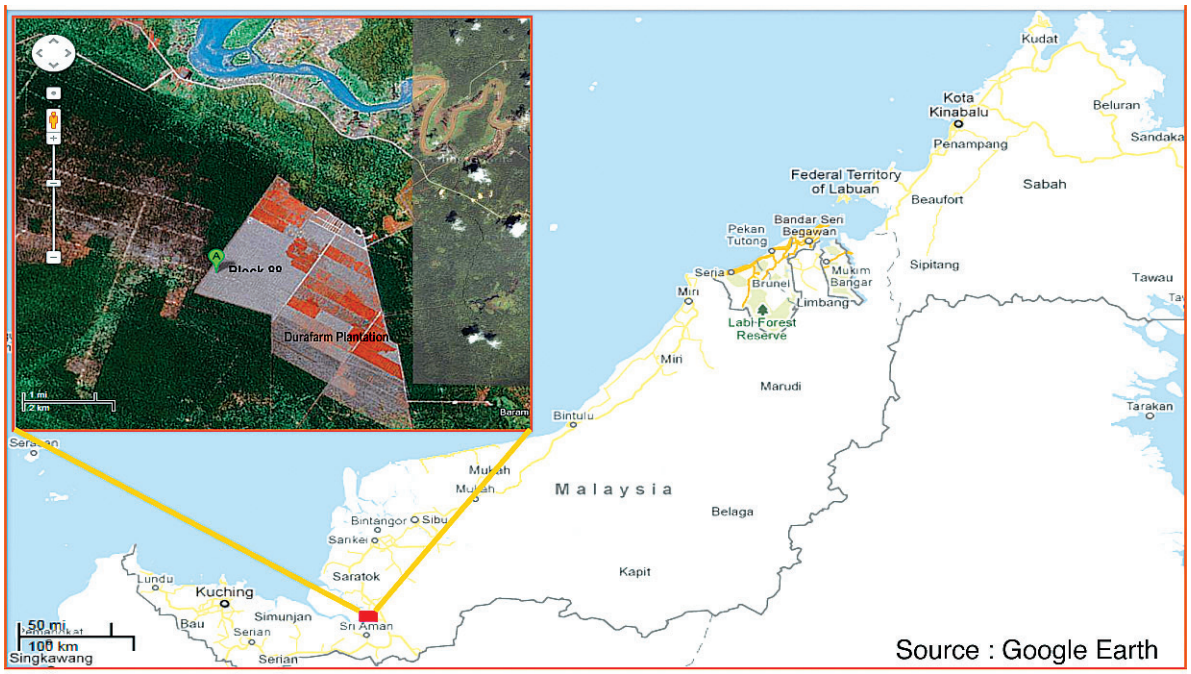


*Figure 1. Map of Sarawak showing the study site at Block 88 in Durafarm Plantation, Betong, Sarawak.*

**TABLE 1. SPECIES AND RELATIVE ABUNDANCE (RA) OF BIRDS RECORDED THROUGH OBSERVATION (OB) AND MIST-NETTING (MN) METHODS AT BLOCK 88 IN DURAFARM PLANTATION, BETONG, SARAWAK**

| Family | Species (common name) | Oil palm plantation on peat | | RA (%) |
|---|---|---|---|---|
| | | MN | OB | |
| Nectarinidae | *Arachnothera longirostra* (Little Spiderhunter) | √ | √ | 0.63 |
| | *Anthreptes malacensis* (Brown-throated Sunbird) | √ | - | 0.63 |
| Timaliidae | *Stachyris erythroptera* (Chestnut-winged Babbler) | - | √ | 0.44 |
| | *Macronous gularis* (Bold Striped tit-babbler) | √ | √ | 3.59 |
| Pycnonotidae | *Pycnonotus goiavier* (Yellow-vented Bulbul) | √ | √ | 23.3 |
| | *Pycnonotus brunneus* (Red-eyed Bulbul) | - | √ | 0.21 |
| | *Pycnonotus erythrophthalmos* (Spectacled Bulbul) | - | √ | 1.05 |
| | *Pycnonotus melanoleucos* (Black and White Bulbul) | √ | - | 0.21 |
| Alcedinidae | *Ceyx rufidorsa* (Rufous-backed Kingfisher)* | √ | - | 0.21 |
| | *Pelargopsis capensis* (Stork-billed Kingfisher)* | √ | √ | 0.42 |
| | *Lacedo pulchella* (Banded Kingfisher)* | - | √ | 0.42 |
| Rhipiduridae | *Rhipidura javanica* (Pied Fantail) | √ | √ | 1.48 |
| Strigidae | *Otus rufescens* (Reddish Scops-owl)* | - | √ | 0.21 |
| | *Ninox scutulata* (Brown Hawk-owl)* | - | √ | 0.21 |
| Accipitridae | *Spilornis Cheela* (Crested Serpent-eagle) | - | √ | 0.21 |
| Picidae | *Sasia abnormis* (Rufous Piculet)* | √ | √ | 0.84 |
| Cisticolidae | *Orthotomus ruficeps* (Ashy Tailorbird) | √ | √ | 1.90 |
| | *Orthotomus sericeus* (Rufous-tailed Tailorbird) | √ | √ | 8.23 |
| | *Prinia flaviventris* (Yellow-bellied Prinia) | √ | - | 2.53 |
| Cettiidae | *Abroscopus superciliaris* (Yellow-bellied Warbler) | √ | √ | 5.06 |
| Megaluridae | *Locustella certhiola* (Rusty-rumped Warbler) | √ | - | 0.21 |
| Cuculidae | *Cacomantis merulinus* (Plaintive Cuckoo) | √ | √ | 2.53 |
| | *Cacomantis sonneratii* (Banded Bay Cuckoo) | - | √ | 0.42 |
| | *Centropus sinensis* (Greater Coucal) | - | √ | 0.84 |
| Sturnidae | *Aplonis panayensis* (Asian Glossy Starling) | √ | √ | 0.63 |
| Hirundinidae | *Hirunda rustica* (Barn Swallow) | √ | - | 0.42 |
| | *Hirundo tahitica* (Pacific Swallow) | - | √ | 2.32 |
| Estrildidae | *Lonchura fuscans* (Dusky Munia) | √ | √ | 1.48 |
| | *Lonchura Malacca* (Chestnut Munia) | - | √ | 1.69 |
| Muscicapidae | *Copsychus saularis* (Oriental Magpie Robin) | √ | √ | 5.49 |
| Phasianidae | *Coturnix cinensis* (Blue-breasted Quail) | - | √ | 0.21 |
| Rallidae | *Amaurornis phoenicurus* (White-breasted Waterhen) | - | √ | 1.48 |
| Columbidae | *Streptopelia chinensis* (Spotted Dove) | √ | √ | 6.96 |
| Psittacidae | *Psittacula longicauda* (Long-tailed Parakeet)* | - | √ | 8.44 |
| Ardeidae | *Egretta garzetta* (Little Egret)* | - | √ | 1.69 |
| | *Mesophoyx intermedia* (Intermediate Egret)* | - | √ | 0.63 |
| | *Bubulcus ibis* (Cattle Egret)** | - | √ | 3.59 |
| Scolopacidae | *Actitis hypoleucos* (Common Sandpiper) | - | √ | 0.42 |
| Caprimulgidae | *Caprimulgus macrurus* (Large-tailed Nightjar) | √ | √ | 1.27 |
| Apodidae | *Aerodramus salanganus* (Mosy-nest Swiftlet)* | - | √ | 0.42 |
| Aegithinidae | *Aegithina tiphia* (Common Iora) | √ | - | 0.21 |
| Dicruridae | *Dicrurus paradiseus* (Greater Racket-tailed Drongo) | - | √ | 0.21 |
| | Total species | 22 | 35 | 100 |

Note: ** Totally protected and * protected bird under Sarawak Wild Life Protection Ordinance (1998).

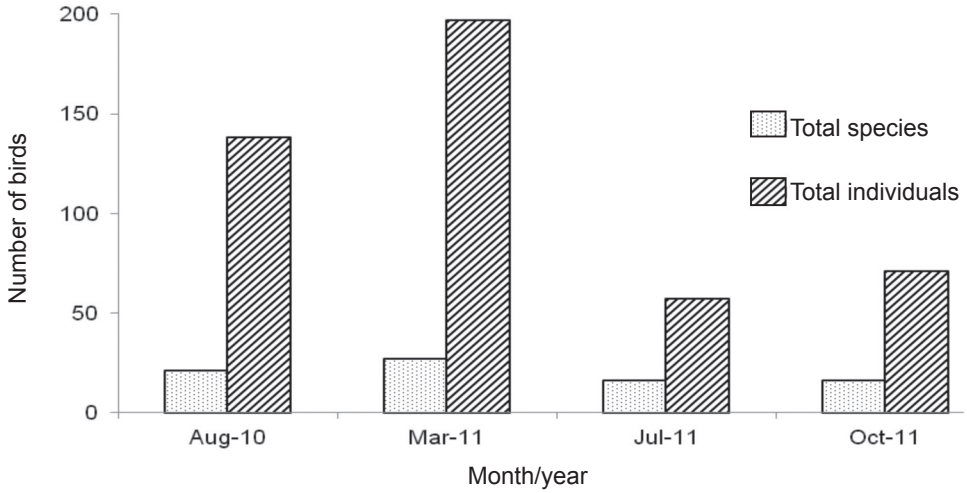


*Figure 2. Total species and individual birds recorded for different times of sampling at Block 88, Durafarm Plantation, Betong, Sarawak.*

A total of 140 individuals from 22 species of birds have been captured by using 15-mist-nets while 323 individuals from 35 species were detected during the observation survey. In most studies, mist-netted survey technique which is restricted to catching birds that use the understory between 0.2 to 3 m above the ground level will catch fewer number of birds compared to the observation survey (Rahman and Tuen, 2006).

The family Pycnonotidae (bulbuls) was the most diverse with four species, followed by Alcedinidae (kingfishers), Ardeidae (egrets), Apodidae (swifts) and Cuculidae (cuckoos) with three species each. The most abundant species was yellow-vented bulbul (*Pycnonotus goiavier*) represented by 112 individuals followed by long-tailed parakeet (*Psittacula longicauda*) with 40 individuals, rufous-tailed tailorbird (*Orthotomus sericeus*) with 39 individuals and spotted dove (*Streptopelia chinensis*) with 33 individuals. *Pycnonotus goiavier* (*Figure 3*) is an omnivore which feeds on insects, small fruits, berries and small invertebrates and usually foraged near the ground (Chenon and Susanto, 2006; Myers, 2009). *Psittacula longicauda* is a frugivore which commonly feed on fruits. This bird was reported to damage oil palm fruit mesocarp in Malaysia (Ward and Wood, 1967) but not in Indonesia (Chennon and Susanto, 2006). At this moment, this parrot species does not seem to cause any damage to oil palm fruits at Durafarm Plantation.

Oil palm on peat provides a conducive habitat for wetland birds such as little egret (*Egretta garzetta*), intermediate egret (*Mesophoyx intermedia*), cattle egret (*Bubulcus ibis*), common sandpiper (*Actitis hypoleucos*) and white-breasted waterhen (*Amaurornis phoenicurus*). These birds are attracted to this ecosystem due to the presence of ponds and flood-controlled drainage system that are common in this ecosystem; this finding was similar to that reported by Azhar *et al*. (2013). The ponds and flood-controlled drainage provide sufficient foods such as fish and animals living in the water for wetland birds. This oil palm plantation offers food resources for bird of prey such as the crested serpent-eagle (feeds on snakes, frogs, small mammals and large grasshoppers) and brown-hawk owl (feeds on large insects and small mammals). However, these birds were regularly observed only in very small numbers in the oil palm plantation. The oil palm plantation also provides habitat for insectivorous birds such as bulbuls, babblers, tailorbirds, prinias, swallows, warblers, cuckoos, nightjars, ioras, robins, starlings, drongos, woodpeckers and swiftlets. Most of the birds detected in this study are insectivorous birds. According to Koh (2008), bird offers ecosystem services in terms of natural pest control to oil palms against herbivorous insects.

*Figure 3. Yellow-vented bulbul* (Pycnonotus goiavier)*, the dominant species of bird in Durafarm Plantation, Betong, Sarawak.*

**TABLE 2. TOTALLY PROTECTED AND PROTECTED BIRDS UNDER SARAWAK WILD LIFE PROTECTION ORDINANCE, 1998**

| Status/family | Ardeidae (Egrets) | Alcedinidae (kingfishers) | Strigidae (owls) | Picidae (woodpeckers) | Apodidae (Swiftlet) | Psittacidae (Parrot) |
|---|---|---|---|---|---|---|
| Totally protected | 1 | - | - | - | - | - |
| Protected | 2 | 3 | 2 | 1 | 1 | 1 |

Comparatively, the species richness of Durafarm Plantation was relatively higher than the findings reported by Peh *et al.* (2005; 2006) in Peninsular Malaysia and Chenon and Susanto (2006) in North Sumatra, Indonesia. These studies were not comparable because of different sampling periods, efforts and locations but in general, the data revealed the diversity of bird species dwelling or residing in the oil palm plantation as their alternative habitats at different locations. Out of the 42 species, eight were also recorded by Chenon and Susanto (2006) namely yellow-vented bulbul, crested serpent-eagle, ashy tailorbird, yellow-bellied prinia, greater coucal, oriental magpie robin, white-breasted waterhen and spotted dove. Six species, *i.e*. little spiderhunter, bold striped tit-babbler, red-eyed bulbul, spectacled bulbul, banded bay cuckoo and long-tailed parakeet were also recorded by Peh *et al.* (2005; 2006).

About 26% or 11 species (*Table 2*) of the total 42 bird species recorded in Durafarm Plantation are categorised as totally protected and protected birds under the Sarawak Wild Life Protection Ordinance (1998). These birds are species of high conservation value, and they are protected in Sarawak because of their rare existence and having the potential of becoming extinct. Therefore, the oil palm plantation management needs to maintain ground layer vegetation, canopy pruning and establishment of native fruit trees and promote the retention of natural or secondary forest patches within and surrounding oil palm areas for biodiversity-friendly plantations as well as for oil palm yield (Azhar *et al.*, 2013). The existence of protected animal in oil palm plantation increases its conservation value, hence ensuring the sustainability of the oil palm plantation with the provision of environmental-friendly habitats for these birds.

## CONCLUSION

The investigation of bird species in a seven-year old oil palm plantation had recorded 42 species and 463 individual birds that have been adapted to this environment. About 13% of the total birds are categorised as protected birds under Sarawak Wild Life Protection Ordinance (1998). More sampling needs to be conducted to study the bird population and species gradient over time in order to understand how the birds respond to the oil palm habitat over time.

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