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Preliminary bird diversity study in oil palm plantation suggests positive effects of biodiversity enhancement: Technical Communication

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Abstract

A preliminary survey of bird diversity carried out in an oil palm plantation near Bintulu, Sarawak found that there could be a positive correlation between numbers of birds and proximity to secondary forest. The study also suggested that the presence of riparian buffer zones in the plantation had a positive effect on bird diversity. These findings support what practitioners have been advocating in plantations; namely, more natural habitats, enhanced connectivity amongst riparian and other natural habitats and the protection of remnant tall trees. These preliminary results provide a useful starting point for further research.

Introduction

A two-month study of avian diversity was conducted in an oil palm plantation in Bintulu, Sarawak (3°09'06.79"N 113°33'47.34"E) owned by Keresa Plantations Sdn. Bhd. during July and August 2010¹. The aim of the study was to evaluate the distribution of the biodiversity in the plantation; such information would be useful for oil palm plantation management to make decisions on the need to preserve and enhance biodiversity in the estate.

The study also tested an initial hypothesis that the further the sampling site was from the forest, the fewer species it would contain. Sites with buffer zones of natural vegetation were expected to be faunistically richer than areas which were only populated by oil palms. Buffer zones usually refer to riparian reserves, unplanted areas, road reserves or other areas where natural habitats can exist.

Methods

Regular transect counts of birds were made in seven selected sites within the plantation. The sites were chosen to reflect varying distances from the nearest block of natural habitat (lowland secondary dipterocarp forest), the presence or absence of riparian vegetation along waterways, and whether or not pesticides were applied within the site.

Sites were surveyed on foot between 0600 and 0900 hrs, as the birds are more active at this time of the day, following transects designed to avoid counting the same bird twice (See Figure 1).

Key words

Bird diversity, oil palm plantations, Sarawak, biodiversity enhancement

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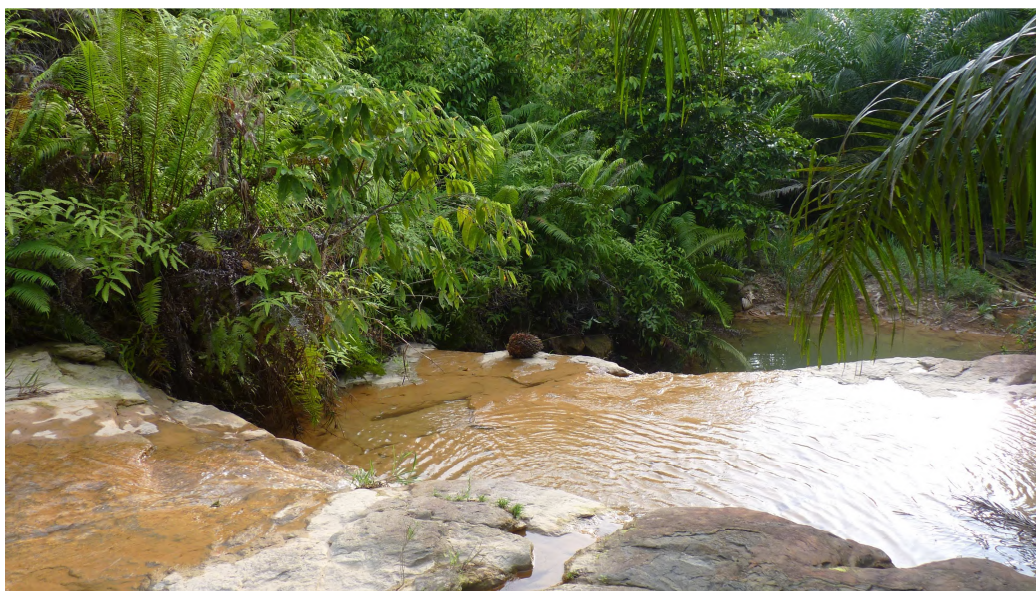
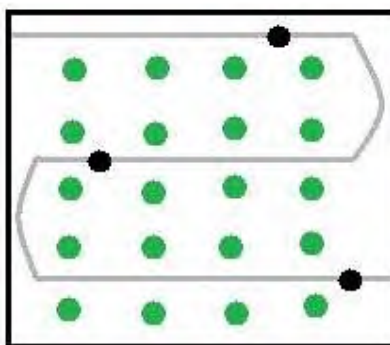


Plate 1: Riparian buffer zone in Keres plantation. Credit: Muriel Gervais

Figure 1: Diagram of a bird transect (grey line) with points of observation (black dots) in an oil palm field



Observations were made at approximately 500 metre intervals, with all birds heard or seen for a 10-minute period being recorded. This methodology was the most suited to the behaviour of the local avifauna, which are mostly small, shy and difficult to observe. Each site was visited three times to obtain a representative average sample of the number of species and birds present at the site. Birds were identified using Myers 2009², based on sightings and calls.

Descriptions of the survey areas are given in Table 1. Pesticide-free trial plots, ranging in size from 10 to 20 ha each, were established in June 2010. In these areas, pesticide usage was phased out and natural vegetation was encouraged to grow in the inter rows, to attract

natural predators which prey on pests such as bagworms.

Results

The results showed that bird species diversity and abundance were slightly greater at sites with natural habitat nearby (either forest fragments or buffer zones along streams or rivers) than at sites more than 1,000m from natural habitat, as can be seen in Table 2. Pesticide-free sites recorded more individual birds (64 in number) than areas where pesticide was regularly used (50 birds), although species diversity was slightly less (11 and 13 species respectively). Overall, results for all four habitat types were surprisingly uniform, and species diversity recorded was unexpectedly low.

Table 1: Description of survey sites

Sites	Block code	Distance from the forest boundary (m)	Main feature
N ¹	J1	0 - 200	No buffer zone
N ²	J3	1,100 -13,000	Presence of buffer zone; a wide river lined by dense vegetation
N ³	J8	1,500 -1,900	No buffer zone
N ⁴	S06K2	0 - 300	No buffer zone
N ⁵	S05K1	1,000 - 1,400	Presence of buffer zone; a network of streams and patches of dipterocarp forest
N ⁶	9910	2,100 - 2,500	No buffer zone
N ⁷	S07K1	1,820 - 2,110	Pesticide and weedicide-free block

Table 2: Species occurrence according to habitat type

No	Common Name	Scientific Name	<300m from forest	>1000m from forest with buffer zone	>1000m from forest with no buffer zone	Pesticide and weedicide-free sites
1	Little Egret	<i>Egretta garzetta</i>				
2	White-breasted Waterhen	<i>Amauornis phoenicurus</i>				
3	Spotted Dove	<i>Streptopelia chinensis</i>				
4	Indian Cuckoo	<i>Cuculus micropterus</i>				
5	Greater Coucal	<i>Centropus sinensis</i>				
6	Swiflet sp	<i>Aerodramus sp</i>				
7	Pacific Swallow	<i>Hirundo tahitica</i>				
8	Yellow-vented Bulbul	<i>Pycnonotus goiavier</i>				
9	Slender-billed Crow	<i>Corvus enca</i>				
10	Bold-striped Tit-Babbler	<i>Macronous bornensis</i>				
11	Oriental Magpie-Robin	<i>Copsychus saularis</i>				
12	Rufous-tailed Tailorbird	<i>Orthotomus sericeus</i>				
13	Yellow-bellied Prinia	<i>Prinia flaviventris</i>				
14	Pied Fantail	<i>Rhipidura javanica</i>				
15	Crimson Sunbird	<i>Aethopyga siparaja</i>				
16	Little Spiderhunter	<i>Arachnothera longirostra</i>				
17	Black-sided Flowerpecker	<i>Dicaeum monticolum</i>				
18	Eurasian Tree Sparrow	<i>Passer montanus</i>				
19	Dusky Munia	<i>Lonchura fuscans</i>				
20	Black-headed Munia	<i>Lonchura malacca</i>				

Most species were present in more than one habitat type, with 9 species recorded in all habitat types sampled. Species which were

recorded in just one habitat type were: Little Egret and White-breasted Waterhen (only in riparian habitat – both species are waterbirds) ,

Little Spiderhunter and Black-sided Flowerpecker (all recorded close to forest edge only), and Eurasian Tree Sparrow (recorded only in oil palm area with no buffer zone and situated 1,000m away from the forest edge)

An average of 82 birds of 16 species was recorded at two sites within 300m of secondary forest edge, as shown in Figure 2. No true forest specialist species were observed, although Little Spiderhunter and Black-sided Flowerpecker (the only two species not recorded elsewhere) are dependent on native trees and parasites for their food source.

An average of 67 birds of 17 species was recorded at two sites comprising buffer zones

of native vegetation alongside streams, as shown in Figure 3. White-breasted Waterhen and Little Egret are waterbirds which were found only in this habitat type. Other species were all common to at least one other habitat type.

An average of 50 birds of 13 species was recorded from two sites in this habitat with oil palm area with an absence of a buffer zone and located 1,000 m away from the nearest secondary forest (Figure 4). Recorded bird abundance was lower here than in any other habitat type.



Plate 2: Black-sided Flowerpecker *Dicaeum monticolum* is a submontane and montane Bornean endemic. It was found only in proximity to secondary forest during the survey. Credit: David Bakewell

Figure 2: Species abundance at sites situated <300m from secondary forest edge

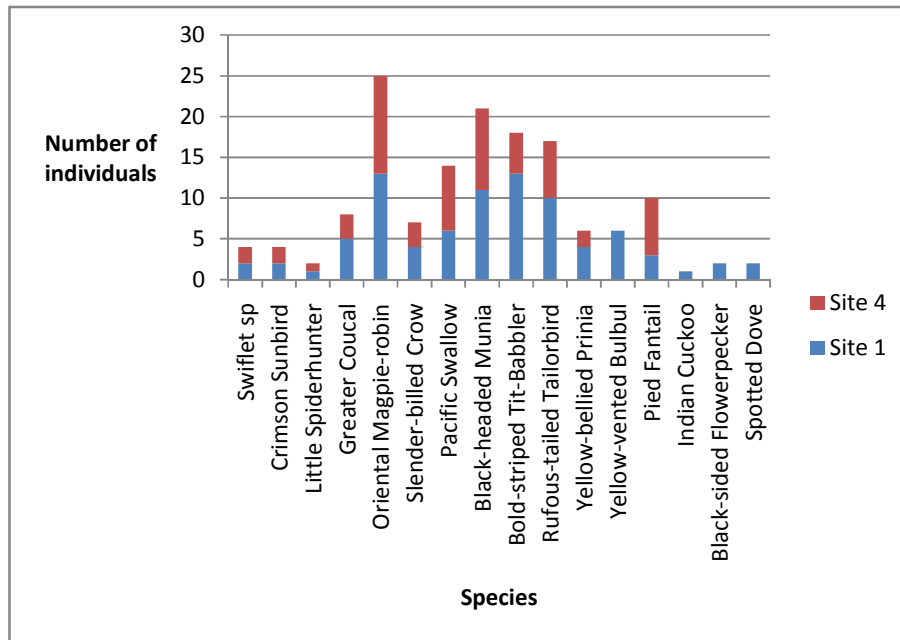


Figure 3: Species abundance at sites with buffer zone located >1000m from secondary forest.

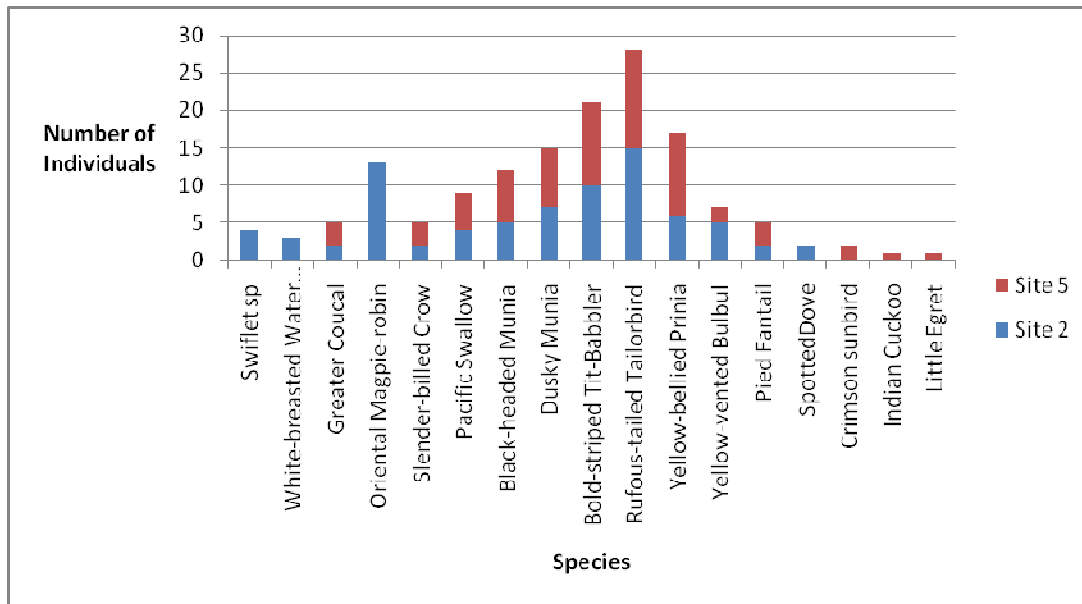


Figure 4: Species abundance at sites with no buffer zone located >1000m from secondary forest.

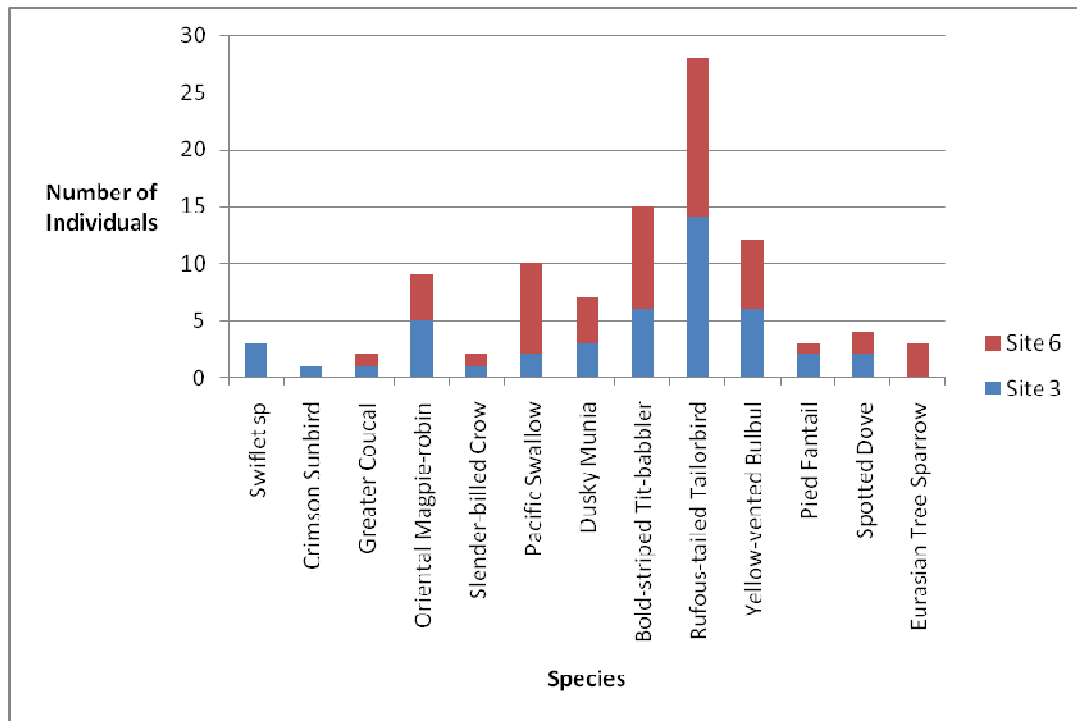


Plate 3: Rufous-tailed Tailorbird *Orthotomus sericeus* was found to be widespread in all habitats sampled. Credit: David Bakewell



Plate 4: Little Egrets *Egretta garzetta* require wetland habitats for survival. Credit: David Bakewell

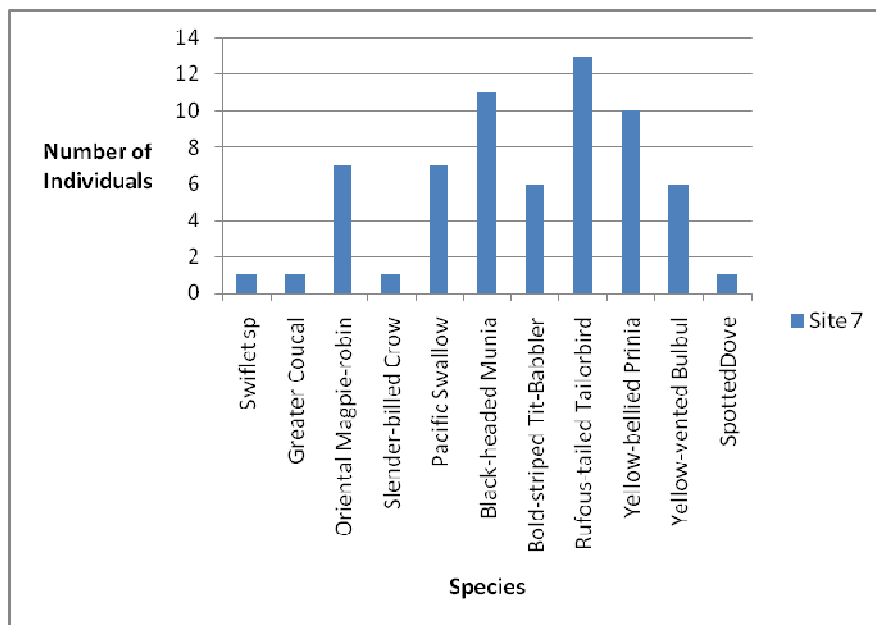


Figure 5: Species abundance at pesticide and weedicide-free sites

An average of 64 birds of 11 species was found in this habitat type, where pesticides and weedicides usage was stopped and observations made 2-3 months later (Figure 5). All the species recorded here were also found

in the other habitat types. Compared with other sites >1000m from forest without buffer zones, recorded abundance was slightly higher in pesticide and weedicide-free sites than at sites where these were still in use.

Table 3: Summary of species diversity and abundance at all sample site categories

	Sites <300m from forest edge	Sites with buffer zone located >1000m from forest	Sites with no buffer zone located >1000m from forest	Pesticide and weedicide- free sites
Number of species (maximum)	16	17	13	11
Number of birds (average)	82	67	50	64

Discussion

Bird Distribution

Although bird diversity was not very different between the different categories of sites, the abundance of birds was higher in the sites located near the secondary forest boundary, with an average of 82 birds against an average of 67 birds at the sites which had buffer zones and an average of 50 birds at the sites far from the forest edge but without buffer zones. For the sites situated inside the oil palm plantation, the presence of a buffer zone in the site appeared to increase the number of birds found.

The birds recorded during the survey were all common residents in Borneo and in oil palm plantations, and no specialized or threatened species were found. Some species were closely associated with particular habitat types, such as White-breasted Waterhen, which live near rivers, streams and ponds. The presence of tall trees in a buffer zone enabled arboreal birds which usually live in lowland dipterocarp forest, such as the Indian Cuckoo, to perch and hunt.

According to John Howes³, an expert in bird diversity who has carried out ecological surveys in Malaysian and Indonesian oil palm plantations, no true forest-dependent species were recorded in this survey. All the species noted are forest edge or open country species and all are relatively common and widespread throughout the region. Specialist species which are highly dependent on specific habitat types need an effective Protected Area system which secures sufficiently large areas of all representative natural habitat types. Nevertheless, the more natural areas there are within an estate, the more that can be done to enhance biodiversity. The study suggests that even small steps taken to enhance habitat

within an estate can be effective in enhancing bird life in the area.

This study highlights the fact that a buffer zone (riparian reserves, unplanted areas, road reserves or other areas where natural habitats can exist) benefits birds, as it constitutes a living, foraging and breeding habitat for birds. Higher benefits of buffer zones are derived if they are larger in size and if they are connected to other natural habitats.

In order to facilitate the environmental management of the plantation, one of the planning steps required would be to know, spatially, where these forest fragments and buffer zones are. This would need to be viewed in relation to the distribution of rivers and other natural areas that extend outside of the plantation boundary. One goal for management would be to explore ways of enhancing (a) connectivity of these forest fragments and (b) increasing the effective size of the forest fragments.

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