

RESEARCH PAPER

**Assessment on Bird Conservation Status Found in Rubber Forest
Plantation by Using IUCN and Regional Classification**

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Received: 30 October 2018; Accepted: 19 November 2018; Published: 10 December 2018

Abstract

A wealth of studies have proposed that plantations can be enhanced into an area that is rich in biodiversity, perhaps to the extent of being an off-reserve strategy area for conservation purposes. This study was carried out to evaluate the effectiveness of rubber forest plantation in harbouring and acting as an off-reserve conservation area for birds. By conserving forest fragment areas as a way to improve the heterogeneity of a landscape within a rubber forest plantation, this paper aims to determine the conservation status of birds recorded from Bukit Kuantan rubber forest plantation which adopted forest fragment conservation. A point count observation method was implemented to record any sightings of birds within this plantation landscape. Subsequently, the identified bird species were checked with the Malaysian Wildlife Conservation Act (WCA) 2010 and IUCN Red List Data of endangered species. From the context of WCA 2010, it was found that majority of birds which accounted to 70%, were classified as totally protected, 11% were classified as protected, while remaining 19% were classified as non-protected. This work also highlights observation notes on four near-threatened bird species according to IUCN Red List Data recorded at Bukit Kuantan rubber forest plantation. Through the finding, it can be postulated that the rubber forest plantation might be suitable as an off-reserve conservation area although continuous studies is deemed necessary to determine the resiliency of the birds to continue their existence particularly in this rubber forest plantation.

Keywords: Rubber forest plantation, birds, off-reserve strategy, IUCN, Malaysian Wildlife Conservation Act (WCA)

Abstrak

Terdapat banyak kajian yang mencadangkan agar kawasan perladangan dapat dipertingkatkan kepada kawasan yang kaya dengan kepelbagaian biodiversiti, dengan harapan ia dapat menjadi salah satu strategi rezab-luaran untuk tujuan konservasi. Kajian ini dijalankan dengan tujuan menilai keberkesanan ladang hutan getah sebagai salah satu habitat semula jadi burung and seterusnya menjadikannya sebagai konservasi rezab-luaran. Untuk mencapai tujuan tersebut, sebahagian hutan asal di kawasan ladang hutan getah telah dikekalkan sebagai salah satu cara untuk meningkatkan heterogeniti landskap. Oleh itu, kajian ini telah dijalankan untuk menentukan status konservasi burung yang direkodkan di ladang hutan getah Bukit Kuantan. Kaedah pemerhatian kiraan titik telah dilaksanakan untuk merekodkan sebarang kehadiran burung di ladang hutan getah Bukit Kuantan. Spesies burung yang direkodkan akan disemak dengan Akta Pemuliharaan Hidupan Liar Malaysia (WCA) 2010 dan Senarai Data Merah IUCN. Dari konteks WCA 2010, didapati bahawa majoriti burung yang direkodkan adalah diklasifikasikan sebagai dilindungi sepenuhnya iaitu sebanyak 70%, 11% dikelaskan sebagai dilindungi, manakala selebihnya 19% dikelaskan sebagai tidak dilindungi. Kajian ini juga turut memberikan imej tumpu kepada nota pemerhatian ke atas empat spesies burung terancam yang direkodkan di

ladang hutan getah Bukit Kuantan berdasarkan Senarai Data Merah IUCN. Melalui penemuan ini, dapat dirumuskan bahawa ladang hutan getah berpotensi sebagai kawasan rezab-luaran untuk tujuan konservasi. Walau bagaimanapun kajian berterusan perlu dijalankan untuk menentukan keupayaan burung tersebut untuk terus kekal dan berdaya tahan di dalam ladang hutan getah.

Kata kunci: Ladang Hutan Getah, Burung, Strategi Rezab-luaran, IUCN, Akta Pemuliharaan Hidupan Liar Malaysia (WCA)

INTRODUCTION

In recent years, biodiversity conservation has been highlighted parallel with the demand to increase plantation land (Enters et al., 2003). The concern becomes utmost apparent in Southeast Asia where rate of deforestation for agricultural and plantation practices is considered alarming (Cotter et al., 2009; Peh et al., 2005). The intensification of plantations are usually associated with habitat degradation and reduced species diversity (Achondo et al., 2011; Aratrakorn et al., 2006; Peh et al., 2005). Narrating down on rubber plantation, its increased establishment in countries including Malaysia, Thailand, Philippines and China is at an overwhelming pace. Expansions of rubber plantation areas, legal forest conversion, encroachment of biodiversity hotspots, and status of biodiversity upon plantation opening are greatly emerging and receiving much persistent attention (Warren et al., 2015; Behm et al., 2013; Achondo et al., 2011; Aziz et al., 2010; Cotter et al., 2009; Aratrakorn et al., 2006).

Nonetheless, several studies still believe in the enhancement and benefits of instigating an environmental friendly plantation (Sreekar et al., 2016; Azhar et al., 2013; Bakewell et al., 2012; Achondo et al., 2011). The demand on environmental friendly plantation is growing and at one instance, was exemplified by efforts of several agricultural producers of coffee and cacao in creating a certified bird-friendly plantation (Azhar et al., 2013). Besides the products derived from agricultural and plantation sectors, plantations are proficient in offering secondary transition habitat that can fulfill certain species requirements such as food sources, refugee, and breeding ground (Achondo et al., 2011). Vegetation aspects like number of trees and height of ground vegetation are also known to exhibit an optimistic impact on species diversity and are amongst vital factors at influencing bird diversity in particular (Teuscher et al., 2015). Meanwhile, continuous studies are being carried out to assess the implication of surrounding anthropogenic factors on species diversity which is less known in this regard (Sreekar et al., 2016).

Ample recommendations are made at enhancing the capacity of plantation to become more hospitable towards environment and biodiversity. On a global scale, national strategies should be fostered for land allocation either on identification of land use between biodiversity hotspots and agricultural suitability such as identification of areas with high biodiversity and hotspot areas which might be separated and free from agricultural pressure, or the possible feasibility in integrating conservation within agricultural area (Shackelford et al., 2015; Fitzherbert et al., 2008). Likewise, low conservation areas should primarily be prioritized on its possibilities to direct it into a plantation area rather than selecting forested land (Fitzherbert et al., 2008). Improvements within the plantation matrix like developing understory vegetation, practicing multi-layer vegetation, and planting native vegetation around the edge of plantation are amidst the recommendation yearned that might positively alter the plantation ground into a friendlier farming system and should not be neglected (Li et al., 2013; Najera and Simonetti, 2010). Further, implementation of an environmental friendly plantation could act as an off-reserve conservation area comparable to forest reserve and Natural Park (Najera and Simonetti, 2009).

Though integration of biodiversity into plantation management seems feasible such as the application of agro-forestry concept, mono-crop planting or also referred to as conventional plantation is still the preferred choice and is widely practiced due to economic reasons like yield and productivity (Cotter et al., 2009). While biodiversity research in plantation landscape is at its infancy (Harich and Treydte, 2016), understanding on the biological interaction aspects of biodiversity might be crucial for enhancing biodiversity within plantation areas without having to eliminate the purpose of both establishments. Since the importance of agriculture and its economical prospect cannot be eliminated, current practices of plantation management should be focused and diverted towards enrichment of existing and future plantation areas, into an environmental friendly ecosystem that can harbor as much of the fauna and flora. Moreover, some fauna like reptiles, frogs, and other invertebrate groups only require a small area to co-exist within a plantation (Lindenmayer et al., 2003). Nevertheless, the feasibility of biodiversity to self-sustain its population over time in a plantation landscape is scarce and must continuously be addressed (Peh et al., 2006).

Generally, this study was carried out to evaluate the effectiveness of rubber forest plantation in harbouring and acting as an off-reserve conservation area for birds. Therefore, it was with these lights that one group of fauna species was selected for this preliminary work to investigate the potential capability of rubber forest plantation in acting as an off-reserve strategy area. A bird species study was carried out and birds were chosen as the bio-indicators based on several factors (e.g. easy to sample and identify). In addition, birds are an attractive group of species. This paper aims at ascertaining the bird conservation status centered on the IUCN Red List Data and Wildlife Conservation Act 2010. Evaluation of birds through its conservation status were carried out as an alternative approach in which assessments were rather based on the birds vulnerability status in lieu to the numbers of bird species present.

MATERIALS AND METHODS

Study Sites

The study was conducted at the Malaysian Rubber Board (MRB) Rubber Research Station located in Bukit Kuantan, Pahang, Peninsular Malaysia (3°59'18.3"N 103°14'48.0"E). The locality was formerly a logged forest area before being converted into a rubber forest plantation managed by MRB. Latex and timber are the main produce from this rubber forest plantation.

The Bukit Kuantan rubber forest plantation whilst attempting to incorporate mainstream biodiversity into its plantation management, has three distinctive ecological habitats comprising of the rubber planting, forest fragment and wetland area. The rubber planting area represents the largest land-use with two types of indigenous trees left for conservation purposes that are the bayas (*Oncosperma horridum*) and nibong trees (*Oncosperma tigillaria*) found scattered in the area. The forest fragment area, also termed as special management zone (SMZ), is a special area that consists of natural forested areas where land clearing and planting activities are prohibited. Naturally occurring small rivers also lie within this area. The wetland area, which is termed as working for water (WFW), was previously a waterlogged area converted into a stagnant man-made pond. The pond is surrounded by newly planted fruit trees such as mango, durian, jackfruit and naturally grown shrubs such as *Melastoma sp.*

Point Count and Identification Process

A total of 28 sampling points were used throughout an observation period of between August 2014 until March 2016. The rapid bird survey was carried out on twelve sampling points, chosen at random. The rapid bird survey was initiated due to unavailable data that has yet to be established concerning bird diversity at Bukit Kuantan rubber forest plantation. Further, line transect bird survey was also implemented using four line transects that consisted of four sampling points positioned along each of the line transect, that were segmented gradually farther from the forest fragment area, e.g. SMZ (0 m, 300 m, 600 m, 900 m) with 0 m indicating the SMZ area, and all of which accounted to a total of 16 sampling points. The observations were conducted on a monthly basis and initiated for three consecutive days. The sampling points are shown in Figure 1. Observations were carried out using point count observation method following the standards and applications as proposed by Ralph *et al.* (1995). Several adjustments were made like time spent for each sampling points. The time allocated for each sampling point was between 15–20 minutes. Observations were done by recording any presence and activities of birds that were either stationary (resting) or mobile (flying) within 50 m radius of a sampling point (Ralph *et al.*, 1995). Equipment used during observation comprised of binocular (Bushnell 8 x 42), camera binocular (Bushnell 8 x 30), body camera (Canon EOS 70D), lens (Canon 100-400 mm and Tamron 150-600 mm), rangefinder, and Geographical Positioning System (GPS). The birds were observed at two time intervals, early morning (6.30–10.30 am) and late afternoon (3.30–7.30 pm) due to the notion that their movements were considered at maximum during these particular hours of the day. Identification of the bird species were made based on Davison and Fook (2003) and Davison and Aik (2010). The scientific and local names of the identified species were clarified with the Checklist of the Birds of Peninsular Malaysia (Blakewell, 2012). The identified species were further grouped according to the IUCN Red List Data and Malaysia Wildlife Conservation Act 2010 for assessment of its conservation status.



Figure 1. Bird observation sampling points at Bukit Kuantan rubber forest plantation, Pahang

Malaysian Wildlife Conservation Act 2010

The protection and conservation of bird species in Malaysia was previously maintained via establishment of the Malaysian Wildlife Protection Act (WPA) 1972. Thereafter, the legislation act has underwent and subjected to improvement in which a new act was authorized in 2010 under the name of Wildlife Conservation Act (WCA) 2010. Few improvements and strict regulations were enhanced through this new legislation act. Nonetheless, the WCA 2010 is only applicable for Peninsular Malaysia whereas Wildlife Protection Ordinance 1998 and Wildlife Conservation Enactment 1997 are applied for Sarawak and Sabah, respectively. Correspondingly, most of the species listed in this study consisted of the totally protected species. Any species listed as totally protected species are not permitted to be hunted, kept or traded for commercialization purposes. Research activities dealing with the species and their parts are only allowed by permission. For class Aves, the WCA 2010 showed an increase of species from >647 to >947 birds species being listed in the totally protected species category (Mohd-Azlan, 2014).

RESULTS

Composition of Bird Species According to Wildlife Conservation Act 2010

Figure 2 depicts the number of bird species observed in Bukit Kuantan rubber forest plantation that were based on three classifications specified by the Malaysian WCA 2010 encompassing of the totally protected, protected and non-protected species.

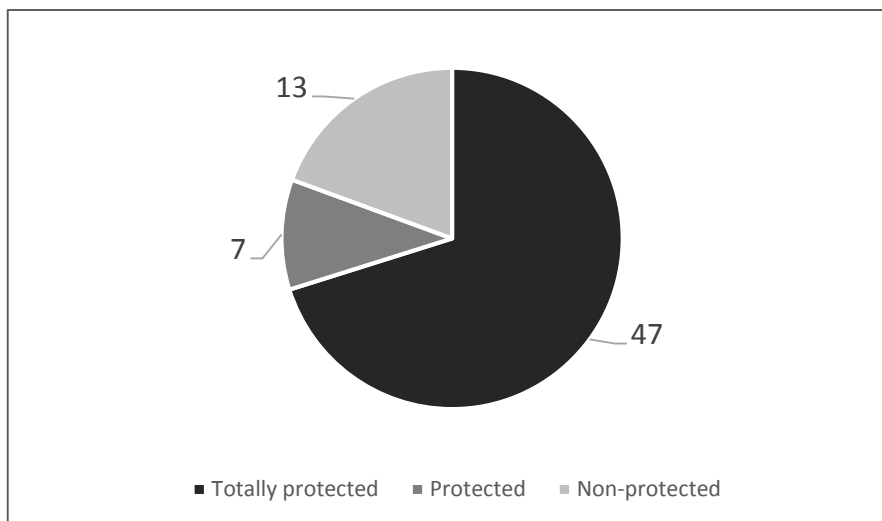


Figure 2. Number of bird species classified based on the Malaysian Wildlife Conservation Act 2010 observed in Bukit Kuantan rubber forest plantation

It was found that the largest composition of an estimated 70% out of the total bird species at Bukit Kuantan rubber forest plantation are from the totally protected species. Examples of birds that are listed in the totally protected species are *Spilornia cheela* (Crested Serpent-eagle), *Buceros bicornis* (Great Hornbill), *Anthracoceros malayanus* (Black Hornbill), *Pelargopsis capensis* (Stork-billed Kingfisher), *Caprimulgus macrurus* (Large-tailed Nighthjar), *Phaenicophaeus chlorophaeus* (Raffle's Malkoha), *Phaenicophaeus curvirostris* (Chestnut-breasted Malkoha), *Dicaeum trigonostigma* (Orange-bellied Flowerpecker), *Dicrurus paradiseus* (Greater Racket-tailed Drongo), *Microhierax fringillarius* (Black-thighed Falconet), *Platysmurus leucopterus* (Black Magpie),

Megalaima rafflesii (Red-crowned Barbet), *Eurylaimus javanicus* (Banded Broadbill), *Pycnonotus plumosus* (Olive-winged Bulbul), *Pycnonotus brunneus* (Red-eyed Bulbul), *Picus puniceus* (Crimson-winged Woodpecker), *Picus mineaceus* (Banded Woodpecker), *Dinopium javanense* (Common Flameback /Goldenback Woodpecker), *Meiglyptes tristis* (Buff-rumped Woodpecker) and *Celeus brachyurus* (Rufous Woodpecker). Birds that are not listed under the category of protected and non-protected species are categorized into this classification.

In the meantime, birds listed under the protected species were mostly the game birds permitted for hunt and trade and these birds are continuously being observed. Based on WCA 2010, class Aves had shown a reduction of species listed under this category from >1103 to >309 birds species because majority of them were upgraded to totally protected species under the new legislation act. It was found that the protected bird species at Bukit Kuantan rubber forest plantation accounted the least bird composition comprising of only 11% out of the total bird species. The birds are *Treron vernans* (Pink-necked Green-pigeon), *Treron olax* (Little Green-pigeon), *Chalcophaps indica* (Emerald Dove), *Gallus gallus* (Red-jungle Fowl), *Loriculus galgulus* (Blue-crowned Hanging-parrot), *Gracula religiosa* (Hill Myna), and *Turnix suscitator* (Barred Buttonquail).

Species considered as the non-protected species are the generalist species that can be found in abundance and their commercialization may not affect bird population. Most of the species listed as non-protected species are the open country birds which can easily be seen in human settlements, parks, and open spaces. The non-protected bird species was found to have comprised 19% out of the total bird species at Bukit Kuantan rubber forest plantation. The species are *Geopelia straita* (Zebra Dove), *Streptopelia chinensis* (Spotted Dove), *Corvus enca* (Slender-billed Crow), *Lonchura striata* (White-rumped Munia), *Lonchura punctulata* (Scaly-breasted Munia), *Lonchura malacca* (Chestnut Munia), *Muscicapa latirostris* (Asian-brown Flycatcher), *Anthus rufulus* (Paddyfield Pipit), *Arachnothera modesta* (Grey-breasted Spiderhunter), *Ploceus philippinus* (Baya Weaver), *Pycnonotus goiaver* (Yellow-vented Bulbul), *Acridotheres fuscus* (Jungle Myna), and *Copsychus saularis* (Oriental-magpie Robin).

Composition of Bird Species According to IUCN Red List Data

Observation notes on four near-threatened bird species were also highlighted in this work in hopes of better understanding the occurrence and utilization of rubber forest plantation by the bird species. The IUCN Red List Data is an inventory data on the conservation status of a particular species. The IUCN Red List Data is considered the most comprehensive approach scrutinized by experts to evaluate the conservation status of a particular species. In Malaysia, a total of 48 out of 786 bird species are listed by the IUCN Red List Data under various classifications. A total of four bird species observed at Bukit Kuantan rubber forest plantation were found to have been listed as the near-threatened species under the IUCN Red List Data, while the rest were classified as the least concern. In addition, Black Magpie (*Platysmurus leucopterus*) was formerly listed into the near-threatened species but later removed from the classification based on the recent IUCN Red List Data assessment conducted in 2016. A cross-check was also done with other literatures for the species listed by IUCN Red List Data and in relation to rubber plantation. One species listed as vulnerable by the IUCN Red List Data is the Silvery Kingfisher (*Alcedo argentata*) while eight endemic species to the Philippines had been observed in rubber plantation (Achondo *et al.*, 2011). The list of the near-threatened species of Bukit Kuantan rubber forest plantation is discussed as the following:

Family: Bucerotidae

Species: *Buceros bicornis* (Great Hornbill)

The Great Hornbill as shown in Figure 3 was first sighted in September 2014 at sampling point FA, which is located slightly near the man-made pond of working for water (WFW) area. In 2015, the first record of the species was in August at sampling point C2, at the rubber planting area. In November and December 2015, the species was found again at the rubber planting area in sampling point B2, respectively. In 2016, the species was first sighted in February at sampling point C which is the forest fragment area, and in March the species was sighted at sampling point B1, located approximately 300 m from the forest fragment area. Majority of the Great Hornbill can be sighted in Bukit Kuantan rubber forest plantation both in the rubber planting and forest fragment area. Within the rubber planting area, the bird can be seen perching on the nibong or bayas tree (*Oncosperma sp.*) as well as on rubber trees. The last sighting of the bird in March 2016 was considerably interesting as the bird was followed by a Slender-billed Crow from one tree to another tree. Ironically, sighting of the Slender-billed Crow alongside the Great Hornbill was only recorded once throughout the entire observation period.



Figure 3. Great Hornbill

Family: Bucerotidae

Species: *Anthracoceros malayanus* (Black Hornbill)

The Black Hornbill (Figure 4) was first sighted in 2014 in September and October at sampling point FA and FB, respectively, in which sampling point FA is located slightly near to the presence of water of the WFW area. The species was later sighted in January 2015 at sampling point AB, which is the forest fragment area. In August 2015, five individuals were sighted in motion at sampling point B and C. Both sampling points B and C are located at the forest fragment area. Again, sampling point C recorded the occurrence of the species in February and March 2016. Compared to the Great Hornbill, the Black Hornbill was mostly

seen hiding on trees at the forest fragment area only. No observation of this species was recorded at the rubber planting area. Majority of the time, the Black Hornbill was recorded in motion as compared to the Great Hornbill which was often sighted resting in the vicinity of Bukit Kuantan rubber forest plantation.



Figure 4. Black Hornbill

Prominent bird species such as the Hornbills were sighted either in motion or stationary while resting on tree remnants, matured and large trees like the bayas, nibong and rubber trees. Compared to the Great Hornbill which can be sighted both under the canopy of rubber trees as well as open space area and spotted perching on the bayas or nibong trees, the Black Hornbill occurrences were mostly recorded at the forest fragment proximity and none was recorded resting at the open space area of the Bukit Kuantan rubber forest plantation. The existence of these bird species was assumed to be related to the presence of the preserved forest fragment area. The existence of Great Hornbill is largely influenced by the density of large trees in which the species are more commonly found in unlogged and old growth forest (Datta, 1998), while Black Hornbill is usually influenced by resource availability (Peh et al., 2005). This would stipulate to these two hornbills found in considerable numbers at Bukit Kuantan rubber forest plantation in which their presence was regarded as locally uncommon.

Family: Aegithinidae

Species: *Aegithina viridissima* (Green Iora)

The Green Iora (Figure 5) was first sighted in August 2015 at sampling point B at the rubber planting area. The species was sighted again in September at sampling point A1, located approximately 300 m from the forest fragment area. The last sighting of the species was in March 2016 at sampling point C, which is the forest fragment area. Since the Green Iora is a relatively small bird with a green colored body that resembles the surrounding vegetation, this species might be either under-represented or has a small population in the rubber forest plantation area. The Green Iora was seen both within the forest fragment and rubber tree area. A study carried out by Teuscher et al. (2015) reported the presence of Green Iora in an

oil palm plantation investigation conducted in Sumatera, Indonesia, when coinciding this to a plantation landscape. Green Iora is a sensitive species and its abundance increases with the availability of dead trees, larger trees, and increase of canopy cover (Peh et al., 2005).



Figure 5. Green Iora

Family: Megalaimidae

Species: *Megalaima rafflesii* (Red-crowned Barbet)

The Red-crowned Barbet (Figure 6) was only sighted once in January 2015 at sampling point AB, which is the forest fragment area. Hence, it was relatively complicated to assume the bird had a stable population in the Bukit Kuantan rubber forest plantation. However, the Red-crowned Barbet was proposed to be occasionally found in rubber plantation as it is considered one of their preferred habitats (Birdlife International, 2016). Despite that, the species remains largely dependent on primary forest to continue its existence persistently in a changing landscape. To date, the ability of the Red-crowned Barbet to exist in a changed landscape without the presence of primary forest is still being investigated (Lok et al., 2009). The existence of this species is somewhat dubious as it was only sighted once during the first few observation periods and no sighting of the species was able to be recorded since then. As the species was first found in the forest fragment proximity, it can be postulated that the species might be dependent on the true forested area (untouched forest) rather than the forest fragment area in which forest edge effect might influence their presence at the Bukit Kuantan rubber forest plantation (Bakewell et al., 2012). Similar to the Green Iora, the Red-crowned Barbet is also suggested to respond positively towards increased availability of dead trees, larger trees, and presence of canopy cover (Peh et al., 2005).



Figure 6. Red-crowned Barbet

DISCUSSION

Conservation efforts are known to be carried out in forest reserve, sanctuaries, rehabilitation center, zoo and etc. With rapid development taking place, the need to alleviate conservation commitments should be taken into a larger context, where it might be integrated with our daily life and all land use. Few publications have already mentioned about different land utilization especially for agricultural purposes such as for plantation, and in pertinent to implementing the plantation landscape to become more hospitable and environmental friendly towards biodiversity (Azhar et al., 2013; Norton, 1998). Moreover, considering the importance of agriculture, it can be expected that land demand and threats to protected areas will continue to arise (Mohd-Azlan and Lawes, 2011). Thus, the requirement of creating a favorable plantation management system towards biodiversity and environment becomes more evident.

Without neglecting the necessity for agriculture and its yield performance, the conservation of forest fragment areas in the vicinity of Bukit Kuantan rubber forest plantation contributed to a significant finding. A total of four near-threatened bird species under the IUCN Red List Data were recorded at this rubber forest plantation. The notable finding at Bukit Kuantan rubber forest plantation might indicate on the positive implication of forest fragment conservation. This acknowledges the substantial initiatives put forth to conserve forest fragment within the rubber plantation ecosystem. The finding may not be new since other literatures have also projected similar results, but to some extent was encouraging and imparted to useful preliminary information about bird diversity in a rubber plantation ecosystem. For instance, a study managed to record the vulnerably Silvery Kingfisher (*Alcedo agrestata*) in a rubber agroforest ecosystem (jungle rubber) and concluded that the presence of a stream aided the vulnerable bird species to thrive there

(Achondo et al., 2011). The Bukit Kuantan rubber forest plantation also contained preserved stream flow in the forest fragment area which would support the near-threatened bird species existence and survival.

Undeniably, agricultural area dominantly favors less specialized bird species than the high important ones (Sekercioglu, 2012). In general, birds in Bukit Kuantan rubber forest were also suggested to have similarities with most agricultural birds in which they mostly have bigger habitat range and greater diet niche and are commonly widespread (Bing et al., 2013; Peh et al., 2006). According to the literature, one forest reserve locality can hold as much as 31 near-threatened and two vulnerable bird species which were recorded in one of the forest reserves in Peninsular Malaysia (Ramli et al., 2009). For that matter, the four near-threatened species observed at Bukit Kuantan rubber forest plantation were considered negligible as compared to what forest ecosystem can actually offer. However, without being ethically utilitarianism, the number of protected and high valued bird species might still be used as an indicator to suggest the outcome of the management approach and effort done at Bukit Kuantan rubber forest plantation. This finding provided additional support that plantation could be enhanced as an off-reserve strategy area for bird conservation. The forest fragment area conserved in this plantation landscape is assumed to have the ability to support several high valued bird species while the distance of the forest fragment also played its part in supporting bird diversity (Azhar et al., 2013; Hashim and Ramli 2013; Sheldon et al., 2010).

While this investigation managed to determine few near-threatened and protected bird species, the long-term sustainability of the birds to reside in Bukit Kuantan rubber forest plantation remains obscure and is also of considerable interest. The information on the present day available bird species found at Bukit Kuantan rubber forest plantation may be useful to determine the effectiveness of this plantation landscape as an off-reserve area for birds in future. In comparison to the literature which studied the pattern of bird diversity based on data recorded from 1982-2005 (Sheldon et al., 2010), the investigation initiated at Bukit Kuantan rubber forest plantation was still regarded in its initial stage of evaluating the presence of birds during the first few years after its opening. Although, the previous prolong assessment (Sheldon et al., 2010) found that 50% of the birds can still be found despite reduction in terms of its bird diversity, it is worthwhile to note that our concern and effort in establishing an environmental friendly rubber forest plantation is to maintain the viability of the high valued protected species rather than the common low conservation species. From the conservation aspects, focusing both on maintaining the viability of primary forest species (birds) and their diversified functional group species should not be overlooked (Hashim and Ramli, 2013; Sekercioglu, 2012).

The monitoring of an environmental friendly plantation is deemed essential and a similar view was also shared in the literature (Azhar et al., 2013) where it was stated that “no scientific work has been completed so far on different management regimes in plantation”, when referring to the establishment of an environmental friendly palm oil plantation; Roundtable Sustainable Palm Oil (RSPO). Such monitoring investigations were denoted to assist in identifying and highlighting the possible cause of changes such as a decline in species composition that occurs in an area (Zakaria and Rajpar, 2010). Likewise, the Bukit Kuantan rubber forest plantation which is regarded as a model plantation that integrates biodiversity conservation method, still warrants continues monitoring. Since this matter is relatively new particularly in the Malaysian rubber industry, extended monitoring of the conservation scheme should highly be considered to discover the potential of rubber forest plantation in conserving biodiversity, specifically focusing on bird diversity. The information on bird’s conservation status obtained in Bukit Kuantan rubber forest plantation

might be in contradiction when compared to the literature by Aratrakorn et al., (2006), stating that “given the lack of management options within plantations, it would appear that protecting pristine habitats and reducing the need to clear new land by maximizing yield within existing plantation system would appear to be more effective strategies than trying to increase the biodiversity value of plantation”. Overall, it can be suggested that the Malaysian rubber industry is directed positively towards founding an environmental friendly rubber forest plantation approach.

CONCLUSIONS

The high percentage of totally protected bird species found at Bukit Kuantan rubber forest plantation was a good indication that this plantation landscape had the potential of becoming an off-reserve strategy area for bird conservation. The presence of near-threatened bird species found at this rubber forest plantation also further recognizes the advantages taken at adopting an environmental friendly plantation landscape via certain conservation strategies is worthwhile the effort without having to compromise the need for agriculture.

ACKNOWLEDGMENTS

This work was supported by the Malaysian Rubber Board (MRB) internal SEAC grant (Reference No: S2014/CMP/2015(22)/563). Special acknowledgment and gratitude goes to MRB especially the Director of Production and Development Division, Dr. Mohd Nasaruddin Mohd Aris. Extended appreciation also goes to Mr. Muhammad Izzat Husna, Mr. Shaardan Shariff, Mr. Mohd Syolahuddin Mokhter, Mr. Subraham Salehludin, and other research colleges of MRB Bukit Kuantan Rubber Research Station for rendering their technical support.

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