A rapid bird survey to conservation area of industrial Acacia timber plantation, South Sumatra Province; with comparison to three different methods

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ABSTRACT

A rapid bird survey was done in a small conservation area of industrial timber concession of PT BMH (Bumi Mekar Hijau), namely KPPN (Kawasan Pelestarian Plasma Nutfah), South Sumatra Province. The area has 448 ha, dominated by degraded secondary swamp forest surrounded by *Acacia* plantation. Three survey methods were applied to assess bird diversity in this area: transect line, mist-netting and audio-visual station recording. A total of 36 species was recorded during survey. Among three methods applied, transect line is the most effective method to detect more bird species (29 species), followed by audio-visual station recording (26 species) and mist-netting (three species). There are eight species which protected by Indonesian law and two birds are listed as Near Threatened (NT) by International Union for Conservation of Nature or IUCN. Although number of species birds recorded are not significance, but this area still support habitat for various birds diversity, and the forest remaining should be well-managed to support its conservation goals.

INTRODUCTION

Two popular threats of forest in Southeast Asian are conversion to agriculture, particularly Oil Palm (*Alaeis guineensis*), or to industrial forests consisting of fast-growing exotic trees, such as *Acacia mangium* and *Paraserienthis* (*Albizia*) *falcataria*, which are used for pulp, plywood, and other applications (Styring et al. 2006); resulting in massive forest loss and fragmentation (Gibbs et al. 2010, Mantyka-Pringle et al. 2012). Forest fragmentation is a common disturbance affecting biological diversity, yet the impacts of fragmentation on many forest processes remain poorly understood (Flaspohler et al. 2010). Evidence has shown that larger forest, higher quality fragments are better for supporting primary forest species, but there is very little evidence to quantify the importance of small forest patches for improving connectivity or the benefit of enhanced connectivity for conserving populations of species in the landscape (Loong et al. 2016).

Sumatra has 397 resident bird species in total, which counts 73% of 514 species that are seen in Greater Sunda region (MacKinnon & Phillips 1993). While many groups of organisms, and many ecological processes, have been affected by agricultural change, there is little doubt that birds have been among the major foci of research activity and conservation concern (Ormerod & Watkinson 2000). In South Sumatra, declining populations of birds have been reported across the South Sumatra Province through long-term monitoring (Iqbal et al. 2012, Iqbal & Hasudungan 2012). Information of bird diversity in South Sumatra province has been prepared from previous works (eg. Iqbal & Setijono 2011, Nash & Nash 1985; Verheugt *et al.* 1993, Zulkifli *et al.* 2013). Unfortunately, there is only little study on birds in *Acacia* plantation of Industrial timber plantation concessions (HTI or Hutan Tanaman Industri).

In South Sumatra, there are 250,370 ha Industrial timber plantation concessions licenses held by PT Bumi Mekar Hijau or PT BMH (Ekologika 2014). Therefore, a rapid survey focused on birds at *Acacia* plantations in PT BMH has been carried out to gather baseline information in biodiversity and conserved secondary forest which remained among plantation. In this survey, we combine three different methods (transect line, mist-netting and audio-visual station recording) to collect as many as bird species in this area. Notes on the strengths and weakness of the methods are discussed here.

STUDY AREA AND METHODOLOGY

Study Area

The site is located in a small conservation area of PT BMH (03°01' S, E 105°26' E), namely KPPN or Kawasan Pelestarian Plasma Nutfah (Fig. 1). The area has 448 ha in total, allocated for conservation area (Saputra 2016). Administratively, the area is part of Simpang Tiga Sakti village, Tulung Selapang subdistrict, Ogan Komering Ilir district, South Sumatra provice. This area is under management area of PT MBH, covering Air Sugihan and Tulung Selapan subdistrict. The habitat is remaining degraded swamp forest, surrounded by c. five years old Acacia plantation (Fig. 2).

Methods

From 5 to 8 May 2016, three survey methods were apply to rapidly asses bird diversity in KPPN. The survey methods are transect line, mist netting and audio-visual recording. Identification of birds were done with the aid field guides, mainly of MacKinnon & Phillipps

(1993). We adopt methods for conducting survey following standardized protocol for rapid survey of terestrial bird in selected references (eg. Bibby et al., 2000; Herzog et al., 2011).

Transect line. Five fixed-radius 100 m transect line were conducted between sunrise to mid-morning. Walking in the transect line, we recorded the species distance from observer (≤ 50 m or > 50 m, and time of all birds heard or seen. Stopping time depend on bird activity, which varies with weather and habitat.

Mist netting. A total of six mist nets (15 x 3 m, 3-4 cm mesh) has been deployed in research area. The nets were stretched between two poles of about 15 m in length. The nets were checked every two hours, or at least four times a day. Birds caught in the mist nets were removed soon and placed in a cage.

Audio-visual station recording. This method is modified from "dawn chorus recordings" (Herzog et al. 2011). We conducted 90 minutes stationary recording at early morning (5.00-6.30 hrs) and around sunset time (17.00-18.30 hrs). Our camp was to be our stationary for collecting data of audio-visual station recording. All birds seen or sound heard during those time are noted.

RESULTS AND DISCUSSIONS

Bird diversity

A total of 36 species (taxonomy, scientific name and English name follow MacKinnon & Phillipps 1993) was recorded during survey (Table 1). From 36 species recorded in KPPN area, eight species are protected by Indonesia law (Noerdjito & Maryanto, 2001), and two birds are listed as Near Threatened (NT) by International Union for Conservation of Nature or IUCN (Birdlife International, 2016). Although the numbers of species protected and Near Threatened birds are not really significance, but these findings shows that KPPN area still support for various bird diversity, and forest remaining should be protected as last habitat for forest birds around this area. Birds are ideal subjects for rapid biodiversity surveys since they are perhaps the best known group of organisms in term of their taxonomy, biology, ecology, biogeography and conservation status (Herzog *et al.* 2011).

Table 1. A list of species recorded during 5 to 8 May 2016, and methods use to detect the occurence of birds in KPPN area. Notes: Prot. = Protected by Indonesian law, NT in bold after scientific name = Near Threatend species based IUCN status, 1 = Transect line, 2 = Mist-netting, 3 = Audio-visual station recording, + = recorded.

No	Scientific Name	English name	Status		Methods		
			IUCN	Prot.	1	2	3
01	*Ixobrychus cinnamomeus*	*Cinnamon Bittern*			+		
02	Unidentified Accipitridae	Unidentified Raptor		P	+		

03	*Microchierax fringgillarius*	Black-thighed Falconet		P			+
04	*Treron curvirostra*	Thick-billed Green-pigeon			+		+
05	*Ducula aenea*	Green Imperial-pigeon			+		+
06	*Streptopelia chinensis*	Spotted Dove			+		
07	*Loriculus galgulus*	Blue-crowned Hanging-parrot			+		+
08	*Psittinus cyanurus*	Blue-rumped Parrot	NT				+
09	*Phaenicophaeus chlorophaeus*	Raffles's Malkoha			+		
10	*Centropus bengalensis*	Lesser Coucal			+		+
11	*Otus lempiji*	Collared Scops-owl			+	+	+
12	*Caprimulgus affinis*	Savanna Nightjar					+
13	*Collocalia* sp	Swiflet			+		+
14	*Halcyon smyrnensis*	White-throated Kingfisher		P	+		+
15	*Alcedo coerulescens*	Small Blue Kingfisher		P			+
16	*Eurystomus orientalis*	Dollarbird			+		+
17	*Megalaima chrysopogon*	Gold-whiskered Barbet			+		+
18	*Megalaima raflesii*	Red-crowned Barbet	NT		+		+
19	*Megalaima australis*	Blue-eared Barbet			+		+
20	*Hemipus* sp	Flycatcher-shrike			+		+
21	*Pycnonotus goiavier*	Yellow-vented Bulbul			+		+
22	*Pycnonotus brunneus*	Red-eyed Bulbul			+		+
23	*Pycnonotus plumosus*	Olive-winged Bulbul			+	+	
24	*Pycnonotus erythropthalmos*	SpectacledBulbul			+		
25	*Malacocincla abbotti*	Abbott's Babbler				+	
26	*Macronus gularis*	Striped Tit-babbler			+		+
27	*Rhipidura javanica*	Pied Fantail		P	+		+
28	*Dicrurus paradiseus*	Greater Racquet-tailed Drongo					+
29	*Prinia flaviventris*	Yellow-bellied Prinia			+		+
30	*Orthotomus ruficeps*	Ashy Tailorbird			+		+
31	*Orthotomus sericeus*	Rufous-tailed Tailorbird			+		
32	*Artamus leucorhynchus*	White-breasted Wood-Swallow					+
33	*Dicaeum* sp	Flowerpecker			+		+
34	*Nectarinia* sp	Sunbird		P	+		+
35	*Nectarinia sperata*	Purple-throated Sunbird		P	+		
36	*Anthreptes singalensis*	Ruby-cheeked Sunbird		P	+		
TOTAL			2	8	29	3	26

Bird study in *Acacia* plantation in South Sumatra still limited. Comprehensive bird study in PT Musi Hutan Persada (PT MHP) *Acacia* plantation in Muara Enim district recorded 160 species (Fujita et al. 2010). A bird survey in various habitats of PT BMH *Acacia* plantation recorded 79 species (Ekologika 2014). Our rapid survey in a small area of KPPN which surrounded by c. five years old *Acacia* plantation recorded 36 species or 22% from PT MHP, and or 45% from previous records of PT BMH *Acacia* plantation. In Borneo, Styring et al. (2006) reported bird diversity in *Acacia* plantation will depend on year old plantation: two years old *Acacia* plantation has 28-29 species of birds, five years old *Acacia* plantation has 32-40 species of birds, and seven years old *Acacia* plantation has 46-50 species of birds. Refer to Styring et al. (2006), it is clear number of 36 species in KPPN area affected by years old *Acacia* plantation nearby (five years old), especially when the forest is very fragmented.

METHODS APPLICATON

Among three methods applied, transect line is the most effective method to detect more bird species (29 species), following audio-visual station recording (26 species) and mist-netting (three species). Transect line and mist-netting recorded 30 species, transect line and audio-visual station recording are 35 species, and mist-netting and audio-visual station recording are 28 species. It is only one species (Collared Scops-owl *Otus lempiji*) recorded in all three methods.

Compare to mist-netting and audio-visual station recording, transect line usually detected more species of birds than using mist-netting at any level of effort (Whitman et al. 1997). Records of 29 species using transect line from a total of 36 species (80% from total species listed) during study indicate transect line is priority method for asessing bird diversity in KPPN area. Application of audio-visual station recording recorded 26 species or (72% from total species recorded). Application of both transect line and audio-visual station recording look very significance to detect bird species in KPPN Area.

Transects line are better than mist-netting for estimating species richness and abundance since they are less costly, less invasive, and less time-consuming (Arizaga et al. 2011); but mist-nests deployed in bird study are a useful additional tool in avifauna surveys because they detect species commonly missed by other techniques (Rahman 2002). Our mist-nets application in KPPN are detect three species which absent in other techniques: Collared Scops-owl *Otus lempiji*, Abbott's Babbler *Malacocincla abbotti* and Olive-winged Bulbul *Pycnonotus plumosus*. From this study, Abbott's Babbler *Malacocincla abbotti* is a good sample of succesful of mist-netting method here where this species is not detected by transect line and audio-visual station recording. Overview of common ornithological survey methods, their strengths and caveats have been reviewed (Bibby et al. 2000, Herzog et al. 2011), but its examinations in forested or plantation area in South Sumatra are still lacking. Further works are needed to look lesson learn of its strength and weakness from local experiences in the field.

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Figures

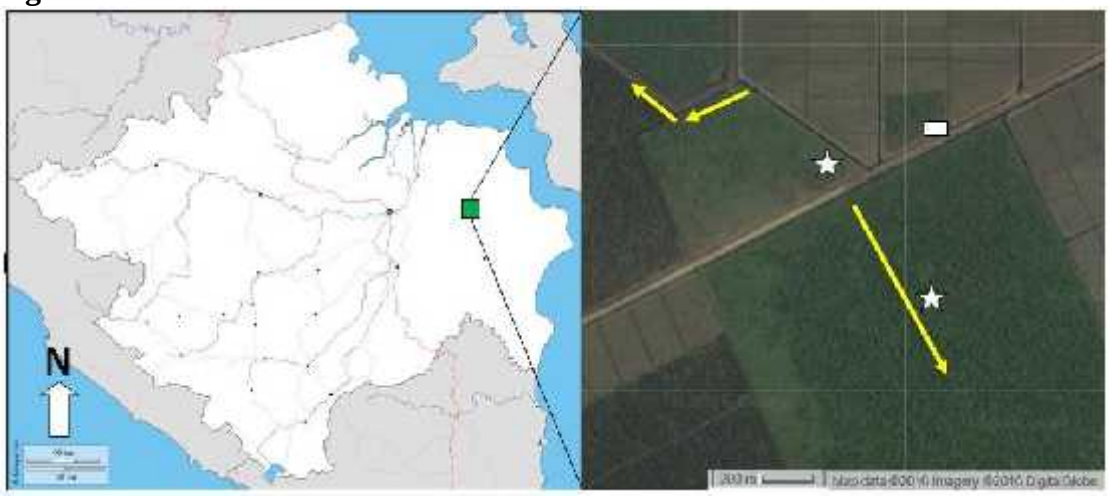

Figure 1. Location of survey area. Yellow line is transect line, white star is mist-net stations, and white rectangular is audio-recording station.

Figure 2. The condition of survey area of conservation area of PT BMH (©Muhammad Iqbal).

Figure 3. Birds recorded during survey: **a.** White-throated Kingfisher *Halcyon smyrnensis*; **b.** Yellow-vented Bulbul *Pycnonotus goiavier*; **c.** Thick-billed Green-pigeon *Treron curvirostra*; **d.** Striped Tit-babbler *Macronus gularis*; **e.** Dollarbird *Eurystomus orientalis*; **f.** Collared Scops-owl *Otus lempiji*; **g.** Spotted Dove *Streptopelia chinensis*; **h.** Abbott's Babbler *Malacocincla abbotti*; **i.** Olive-winged Bulbul *Pycnonotus plumosus* (©Muhammad Iqbal).