Frugivorous Birds in Taman Hutan Raya Sultan Thaha Syaifuddin Jambi, Jambi

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Abstract. Frugivorous birds play an important role in forests regeneration by dispersing seeds from the fruit that has been digested by the bird. Taman Hutan Raya Sultan Thaha Syaifuddin is one of the disturbed forests in Jambi Province. In 2015, the province experienced a large fire that nearly devoured its entire area and left very little natural forest. The current land cover includes logged-over secondary forest, a fire-burnt forest and shrubs, oil palm plantation and some rubber plantation. The objective of this study was to document and compare the species composition of frugivorous birds in the four habitat types. Point counts with a radius of 50 m was used to document the birds. Fifteen sample points with 10 min duration were established in each of the four habitats. Fourteen frugivorous bird species belonging to 6 families were identified. Natural forest held the highest richness and diversity of frugivorous birds ($D_{Mg} = 2.484$, $H' = 2.05$), while the oil palm plantation held the lowest richness and diversity ($D_{Mg} = 0.887$, $H' = 0.74$). Sooty-headed Bulbul ($Pycnonotus aurigaster$) and Orange-bellied Flowerpecker ($Dicaeum trigonostigma$) were dominant in every habitat.

1. Introduction
Animalsupported seed dispersal in a changing environment is an important phenomenon in tropical forest [1]. Among vertebrate taxa birds are believed to be able to consume fruit and move the seeds fast and far [2]. Seeds that disperse at ecosystem level are one of the important stages in the plant's reproductive cycle. Besides, the distribution of seeds by birds is one of the major steps in the formation of plant community composition of various habitats [3],[4].

As a seed dispersal, birds have a mutual relationship with plants. That kind of relationship have an important role of the ecosystem [4], especially for the forests restoration through natural regeneration. Birds that disperse seed usually eat and digest the fruits through the gut, after that the seeds will be carried out and that process will help the germination of the seeds [5]. Gomes et al. [6] reported that frugivorous birds has tolerance to degraded habitat, making them a possible agent of natural regeneration.

Sumatran forests have undergone severe disturbance that resulted in many degraded habitats. One of the disturbed forests is Taman Hutan Raya Sultan Thaha Syaifuddin in Batanghari district, Jambi [7]. This tahura mainly functions as a place to preserve the Bulian tree. Unfortunately, this conservation experienced illegal logging, fire and land conversion that caused the decrease in the flora and fauna...
diversity [8],[9]. Based on LULC (Land Use and Land Cover) from 1990-2010 its land area decreased by 15% from the total area of 15.830 hectares [10].

The objectives of this study were to identify frugivorous bird species and compare their diversity among the four habitat types in Tahura Senami.

2. Methods

2.1. Study site and study design

The study was conducted in Taman Hutan Raya Sultan Thaha Syaifuddin, Batanghari District, Jambi Province (01°47'55"-01°57'31" S and 103°08'30"-103°16'40" E). This 15.830 Ha area was established as a grand forest park mainly to protect the bulian tree (*Eusideroxylon zwageri*) that was once abundant in the area. Illegal logging (for bulian) and a big forest fire in 2015 have caused degradation of the existing natural bulian forest. Smaller forest fires occurred in 2016 and 2018. Some of the burnt areas were cultivated by the local people for agricultural plants. The degraded habitat became a shrubland that later was converted into rubber and oil palm plantations.
2.2. Bird Survey and Data Analysis

Surveys were conducted using the point counts method. The bird species were identified, within a radius of 50 meters for 10 minutes per sampling point, with the help of binoculars and numbered. Counts were conducted during a fine weather early in the morning (06.00 - 09.00). Species identification follows that of MacKinnon and Phillipps [11] and Robson [12]. Whenever possible the characteristics of plant used by the birds were recorded (e.g. type of fruit consumed).

Species richness is expressed as the total number of bird species and was also calculated by using Margalef’s Index. Bird diversity is expressed by using Shannon Index [13]. Jaccard similarity indices among four habitat type were calculated to examine whether frugivorous bird communities differ among habitats.

3. Results and Discussion

3.1 Species Richness, Diversity and Composition

Fourteen frugivorous bird species belonging to 6 families were recorded (Table 1.) Natural forest had the highest richness and diversity (D_Mg= 2.484, H’=2.05), while oil palm had the lowest diversity (H’=0.74), and the rubber plantation had the lowest richness (Table 2.).

| Species | Natural Forest | Post-burnt area | Rubber Plantation | Oil Palm Plantation |
|---------|----------------|-----------------|-------------------|--------------------|
| **Anthracoceros malayanus** | Black Hornbill | 8 | 0 | 0 |
| **Calorhamphus fuliginosus** | Brown Barbet | 5 | 3 | 0 |
| **Pycnonotus atriceps** | Black-headed Bulbul | 12 | 29 | 11 |
| **Pycnonotus melanicterus** | Black-crested bulbul | 1 | 2 | 0 |
| **Pycnonotus cyaniventris** | Grey-bellied Bulbul | 1 | 0 | 0 |
| **Pycnonotus aurigaster** | Sooty-headed bulbul | 8 | 9 | 8 |
| **Pycnonotus plumosus** | Olive-winged bulbul | 0 | 6 | 0 |
| **Pycnonotus goiavier** | Pycnonotus goiavier | 0 | 0 | 1 |
| **Pycnonotus simplex** | Cream-vented bulbul | 1 | 8 | 0 |
| **Gracula religiosa** | Common hill myna | 1 | 0 | 0 |
| **Prionochilus percussus** | Crimson-breasted Flowerpecker | 2 | 1 | 0 |
| **Dicaeum trigonostigma** | Orange-bellied flowerpecker | 12 | 12 | 11 |
| **Dicaeum concolor** | Plain flowerpecker | 5 | 0 | 0 |
| **Chalcophaps indica** | Common emerald dove | 0 | 0 | 0 |
Table 2. Species richness and diversity of frugivorous birds in four habitat types.

|               | Natural Forest | Post-burnt | Rubber | Oil Palm |
|---------------|---------------|------------|--------|----------|
| **S**         | 11            | 8          | 4      | 5        |
| **N**         | 56            | 70         | 31     | 91       |
| **H’**        | 2.054         | 1.687      | 1.196  | 0.739    |
| **E**         | 0.709         | 0.675      | 0.826  | 0.4189   |
| **D_{tie}**   | 2.484         | 1.648      | 0.874  | 0.887    |

Black-headed Bulbul and Orange-bellied flowerpecker was the most dominant bird in forests habitat. The same dominant birds goes for Rubber Plant. Black-headed Bulbul are dominant in post burn habitat. For palm oil habitat the Sooty-headed bulbul was the most dominant birds. Orange-bellied flowerpecker and Sooty-headed bulbul are the birds that can be found in all type habitats. The Black Hornbill, Grey-bellied Bulbul, Common hill myna, and Nilgiri flowerpecker only can be seen in forests habitat and Common emerald dove in oil palm habitat.

Based on similarity indices, there were two clusters in which natural forest and post-burnt habitat were the most similar, while oil palm was most similar to rubber plantation (Table 3). The similarity between post burnt area and natural forest might be explained by the close proximity of the two habitats. Purnomo et al (2012) reported that post burnt area in Tanjung Putting, Central Kalimantan held high bird diversity due to its proximity to secondary lowland forest.

Table 3. Similarity indices of frugivorous bird community in four habitat types

|               | Natural Forest | Post-burnt | Rubber Plantation | Oil Palm |
|---------------|---------------|------------|-------------------|----------|
| Natural Forest| 1             | 0.58       | 0.25              | 0.23     |
| Post-burnt    | 1             | 0.33       | 0.30              |          |
| Rubber Plantation | 1         | 0.50       |                   |          |
| Oil palm      |               |            |                   | 1        |

3.2 Species Account

1. *Chalcophaps indica* Common Emerald Dove

This bird was found in palm oil habitat. Was flying low and try to hide because of the human activities. After that just the bird voice was heard. This bird have an average size, have an orange and red breast, the wing are metallic green. The beak and the feet are red. This bird always seen alone but sometimes in pairs.

2. *Anthracoceros malayanus* Black Hornbill

![Figure 3. Black Hornbill](image)

This is the largest frugivorous bird recorded during the study. Only recorded in natural habitat, they often seen perching on Bulian forest. The activities of black hornbill in forest habitat start from the morning and when the sun is up they move to somewhere else and comeback again around the sunset.
time. They like to perch on Ficus tree in pair or with their colony to eat fruit. Have an average size (75 cm), and the color are black. The male have white beak and the female have a black beak.

3. *Calorhamphus fuliginosus* Brown Barbet

![Image of Brown Barbet perched on acacia twigs.](image)

*Figure 4. Brown Barbet perched on acacia twigs.*

This bird always easy seen in acacia tree in forest and post burn habitat. They perch on the twigs of the tree and doing their activity in colony. They like to eat the fruit of the acacia tree and took a long time to stay in that tree (around 5 minutes). This bird have a small size (17 cm). The body have brown color, for the beak and feet have orange color.

4. *Pycnonotus atriceps* Black-headed Bulbul

![Image of Black-headed Bulbul.](image)

*Figure 5. Black-headed Bulbul.*

One of the common birds in taman hutan raya, usually found in forest, post burn and rubber. They like to do in pair or colony in activities. Like to perch on a twigs that have a fleshy fruit or on a bush. They like small, fleshy and red fruit like *Melastoma affine* or *Clidemia hirta*. This bird have an average size (17 cm). The head and neck are black, the body are yellow-olive color. It’s easy to notice them by sound because they often make a sound.

5. *Pycnonotus melanicterus* Black-crested bulbul

Black-crested bulbul was found in forest and post burn habitat. Their appearance a bit similar like Black-headed bulbul. Like other bulbul they like to eat a fleshy red fruit. Have an average size (18 cm). They have yellow body with black head with a crest. The iris are red. They have a black beak and feet. Sometimes it can be mistaken by other species like black headed bulbul if we not see this bird carefully.
6. *Pycnonotus cyaniventris* Grey-bellied Bulbul
This bird was found in forest habitat. They size is about 16 cm. The head a bit dark with the body have an olive color. They have a grey chest. The iris, beak and feet are black color. It is a bit hard to spot this bird because they always perch under the dense canopy and it’s easy to mistaken this species to other.

7. *Pycnonotus aurigaster* Sooty-headed Bulbul
![Sooty-headed Bulbul](image)

Sooty-headed bulbul was easily to be seen in all habitat types. This common bird always perch in place that easy to spot. They like to colonize to other species. This bird’s size is about 20 cm. Have a black cap with crest. The chest and the stomach are white. The iris are red, neck and feet are black.

8. *Pycnonotus goiavier* Yellow-vented Bulbul
![Yellow-vented Bulbul](image)

This bird was spotted in rubber and oil palm habitat. This bird was spotted when he perched on a top of oil palm tree. They can be easily notice by their voice too. The size is about 20 cm. the upper body are brown. The throat, chest and stomach are white. Have a brown iris, black beak and pink feet.

9. *Pycnonotus plumosus* Olive-winged bulbul
Olive-winged bulbul was spotted in post burn habitat. This bird is easily to be seen on a shrub. The size is about 20 cm. The upper part is brown and green color. Chin and throat are white. The low part are yellow and tail are brownish a bit yellow.

10. *Pycnonotus simplex* Cream-vented Bulbul
Cream-vented Bulbul was found in forest, post – burn, and oil palm habitat. This bird was spotted when they perched on a tree. The size are about 17 cm. They have brown and greyish color. This species a bit look like Olive-winged bulbul but smaller. The throat and chin are white.
11. *Gracula religiosa* Common Hill Myna
This bird was spotted in forest habitat. The body size is 30 cm with a black body and white spotting in their wings. They have a yellow color on the side of the head. The iris are black brown, orange beak and yellow feet. It’s easy to spot this bird by the unique voices. When this bird was spotted. They on a same tree as a Black Hornbill and they try to disturbed them.

12. *Prionochilus percussus* Crimson-breasted Flowerpecker

![Figure 8. Crimson-breasted Flowerpecker](image)

Crimson-breasted Flowerpecker was spotted in forest and post burn habitat. Their body have a small size (10 cm). They have colorful body. For the male they have dark blue upper body, black forehead, red crown, and yellow color for the lower body. They have a little white stash near the beak. This bird like to perch on a small tree that have figs or small fruit. They fly fast and such an agile birds.

13. *Dicaeum trigonostigma* Orange-bellied Flowerpecker

![Figure 9. Orange-bellied Flowerpecker](image)

This bird was spotted in all habitat types. This bird are common in taman hutan raya. Like other Dicaeidae they like to perch on a small tree. They have a small size (8 cm) with orange and blue color of body. Adult male have blueish head, wings, and tail. Back, rump, and stomach are orange. The throat are greyish. Sometimes it can be mistaken by other species like Crimson-breasted Flowerpecker if we not see this species clearly. Other than that, this species have a unique sound and it’s easily to recognize. The people around taman hutan raya call this species ‘incit’ because of the sound.

14. *Dicaeum concolor* Plain flowerpecker
This species was spotted in forest habitat. They were spotted when perch on a tree. Have a small size (8 cm). The upper part are green – olive color. The lower body are pale grey and in the middle of the stomach they have crème color. They have brown iris, beak and feet are black.
4. Conclusion

Natural forest held the highest richness and diversity of frugivorous birds, including large frugivorous such as hornbill species. And the lowest richness and diversity of frugivorous birds are oil palm habitat. Bulbuls are dominant frugivorous in all habitat types, especially Sooty-headed Bulbul. Other than bulbuls, we can find Orange-bellied Flower-pecker in all habitat type too. Birds like Black Hornbill and Common-hill Myna can only be found in forest habitat. Olive-winged bulbul easily be found in post-burn habitat. For oil palm habitat you can spot so many Sooty-headed Bulbul there. Therefore these birds are potentially helpful for forest regeneration.

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