

Conference Paper

The Role of *Ficus crassiramea* (Miq.) Miq. for Hornbill Conservation in Borneo Fragmented Tropical Rainforest

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Abstract

Fig plants (*Ficus* spp.) are considered as a key candidate to wildlife conservation in tropical rainforest for its potency on their microhabitat and food supply throughout the years. In this research, we focused only on the *Ficus crassiramea* (Miq.) Miq. To show its role for hornbill conservation, we observed the different species of hornbill which visiting the trees and also we observed time, duration, frequency and activity of visits of the hornbill. For the purpose, four trees of *F. crassiramea* had been observed continuously for 6 d from 06.00 am to 05.00 pm in two fragmented tropical rainforest located in Penajam Paser Utara Regency, Borneo, Indonesia. The result showed, there were three species of hornbill which are visiting the plants in fruiting phase, namely *Anthrococeros malayanus* (Raffles, 1822), *Anthrococeros albirostris* (Shaw & Nodder, 1807), and *Buceros rhinoceros* (Linnaeus 1758) while fig tree in non-fruiting phase is only visiting by *A. malayanus* and *A. albirostris*. There is difference between *A. malayanus*, *A. albirostris* and *B. rhinoceros* in time, duration and frequency of visits on *F. crassiramea*. The most dominant activity of the third hornbill on *F. crassiramea* in fruiting phase are foraging rather than perched like on non-fruiting phase tree. The result convinced the important of *F. crassiramea* as food source for hornbill conservation.

Keywords: *Ficus crassiramea* (Miq.) Miq.; food source; fragmented tropical rainforest; hornbill conservation.

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1. Introduction

Indonesia has 13 hornbill species out of the 54 species found in the world. The eight of these species are endemic to Kalimantan, namely the *Buceros rhinoceros* (Linnaeus, 1758), *Rhinoplax vigil* (Forster, 1781), *Anthracoceros malayanus* (Raffles, 1822), *Anthracoceros albirostris* (Shaw & Nodder, 1807), *Berenicornis coronatus* (Raffles, 1822), *Anorhynchus galeritus* (Temminck, 1831), *Rhyticeros corrugatus* (Coenraad Jacob Temminck, 1832), and *Rhyticeros undulates* (Shaw, 1811) [1]. These iconic frugivore species have seemingly become popular for many researchers. Categorized under the IUCN red list, they emerge as the least concerned and near threatened [2]. However, the reality

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on the field revealed that hornbill species population like *R. vigil* and *B. rhinoceros* are rapidly decreasing each year.

The condition of tropical rain forests will determine the survival of hornbills. In their habitat, hornbills serve as important agents of seed dispersal [3–7]. Various species of hornbill generally occupy forest areas with dense trees. Common hornbill species can be seen in the top of tree canopy, while several others in the mid canopy of trees, and two endemic species in South Africa are ground-dwelling [8–12].

Forest area in Indonesia is currently reducing at an alarming rate. This is largely due to extensive forest fragmentation, plantation, transmigration, logging and mining activities. As such, this will inevitably result in the destruction of forest, affecting the biodiversity to directly and indirectly boost its ecosystem's productivity [13–15]. From the year 2000 to 2012, Indonesia has lost its primary forest of more than 6.02×10^6 ha, and an average increase of 47 600 ha annually [16]. Such conditions of continuous deforestation have been threatening the existence of hornbill population in the event of habitat loss and reduced food sources [17, 19, 20].

The existence of hornbill population in tropical forests is highly dependent on the food availability from trees [17, 21]. Some food trees consumed by hornbills that available in tropical rainforest are Annonaceae, Burseraceae, Meliaceae, Moraceae and Lauraceae family [10, 22, 23]. Fig is one of the most known trees in Moraceae family in which its fruits, is consumed by various animal species as a food resource [24]. *Ficus* spp. is the most prominent food trees which are considered as the main species for hornbill to feed on as they bear fruit throughout the year [25, 26].

Hornbills that feed most of figs in their diet are known to have a wide range of hovering area, approximately 280 and 1 500 ha [27]. Although the fig fruit is widespread from time to time, frugivorous bird species like hornbill generally have the ability to roam over large areas which allows them to search for fruiting fig at any point of time. This ability makes hornbill a good mobile agent that help connect fragmented forest and transfer forest genetic material [6, 28–30]. *F. crassiramea* has been reported as one of food sources for the hornbill [31] and is often found in Borneo fragmented tropical rainforest. Therefore, this research focuses on the role of *F. crassiramea* for hornbill conservation in fragmented tropical rainforest.

2. Materials and Methods

This descriptive exploratory research was conducted during rainy season in fragmented tropical rainforest in Penajam Paser Utara, East Kalimantan using purposive sampling. The forest lies on hilly karst areas. The one fragmented forest patch to another was separated by plantations and residences (Figure 1).

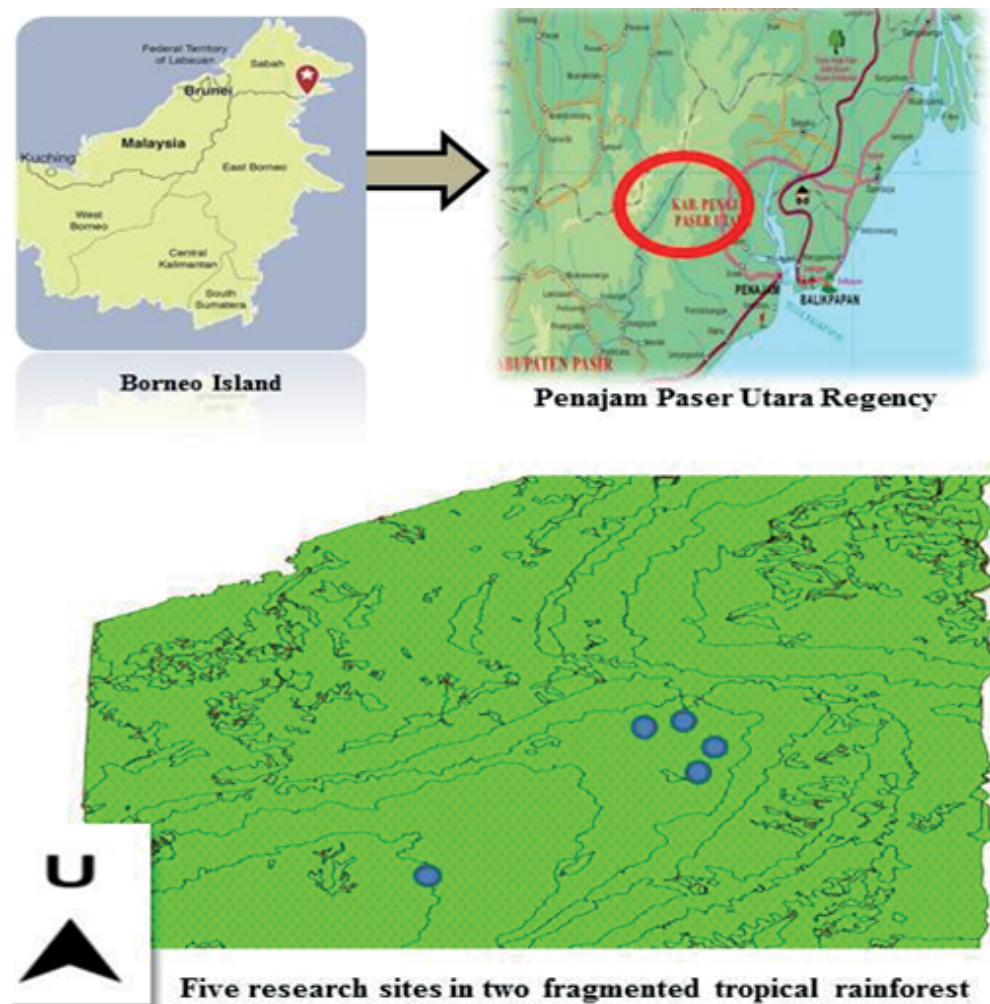


Figure 1: Sampling sites at some fragmented tropical rainforest in Penajam Paser Utara.

The five trees of *F. crassiramea* with different phenology was observed continuously for six days from 06.00 am to 05.00 pm. The four trees of the *F. crassiramea* observed was bearing fruits while the other one was still in vegetative phase. To shows the role of *F. crassiramea* for hornbill conservation, we observed the diversity of hornbill which visiting the tree. We also recorded the time, duration, frequency and activity of visits of the hornbills to each tree.

3. Result and Discussion

3.1. Diversity of hornbill visiting on *Ficus crassiramea*

The result showed, there are three species of hornbill which are visiting *F. crassiramea* in fruiting phase, namely *A. malayanus*, *A. albirostris* and *B. rhinoceros* while non-fruiting fig tree is only visiting by *A. malayanus* and *A. albirostris* (Figure 3). The density of

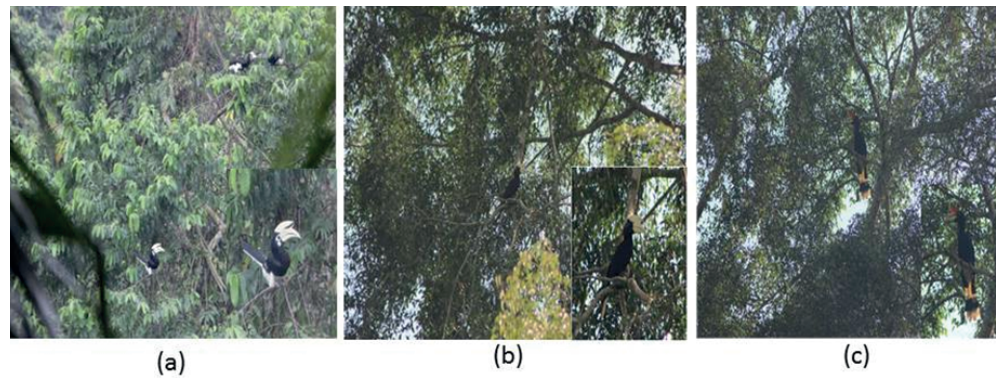


Figure 2: Hornbill diversity on *F. crassiramea*: (a) *A. albirostris*; (b) *A. malayanus*; (c) *B. Rhinoceros*.

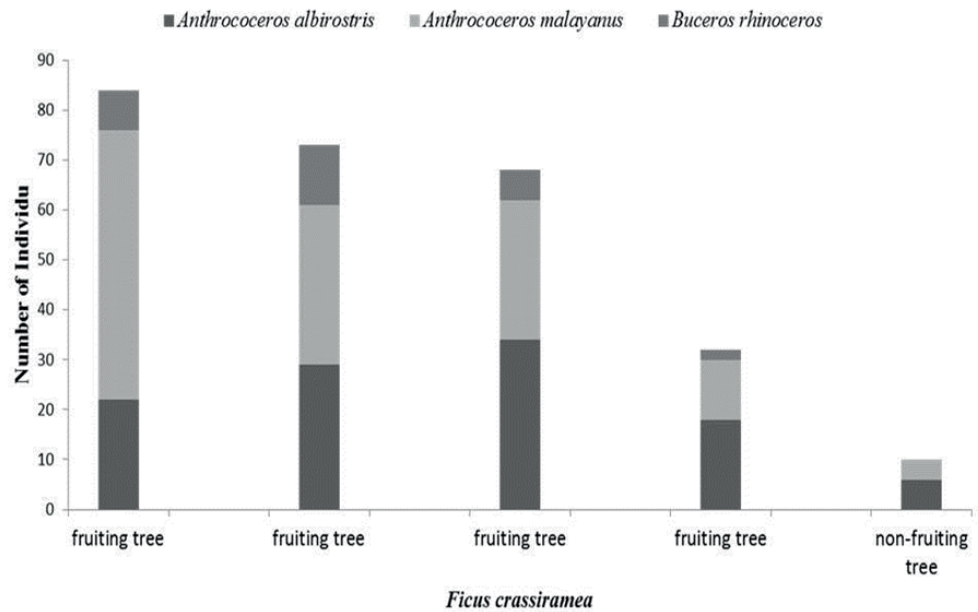


Figure 3: Species richness of hornbill visiting *F. Crassiramea*.

frugivore species is close related to their food source plant phenology [32]. The high abundance of these yellow *F. crassiramea* fruits in fruiting season attracted the high number of hornbill species to visit this trees. It is caused by this fig species is one of the feed source for hornbill. In specific, hornbill species has higher preference in yellow, red and violet fruits than brown and green colour [33].

Furthermore, the abundance of *A. malayanus* and *A. albirostris* visiting *F. crassiramea* were higher than *B. rhinoceros* (Figure 3). The number of individual of hornbill species visiting the fig trees is related to their population abundance in the forest. Based on the previous research, the population of *A. malayanus* and *A. albirostris* in Penajam Paser Utara fragmented forest reached 13 and 15 individu/km² respectively while *B. rhinoceros* just reached three individu/km² [34].

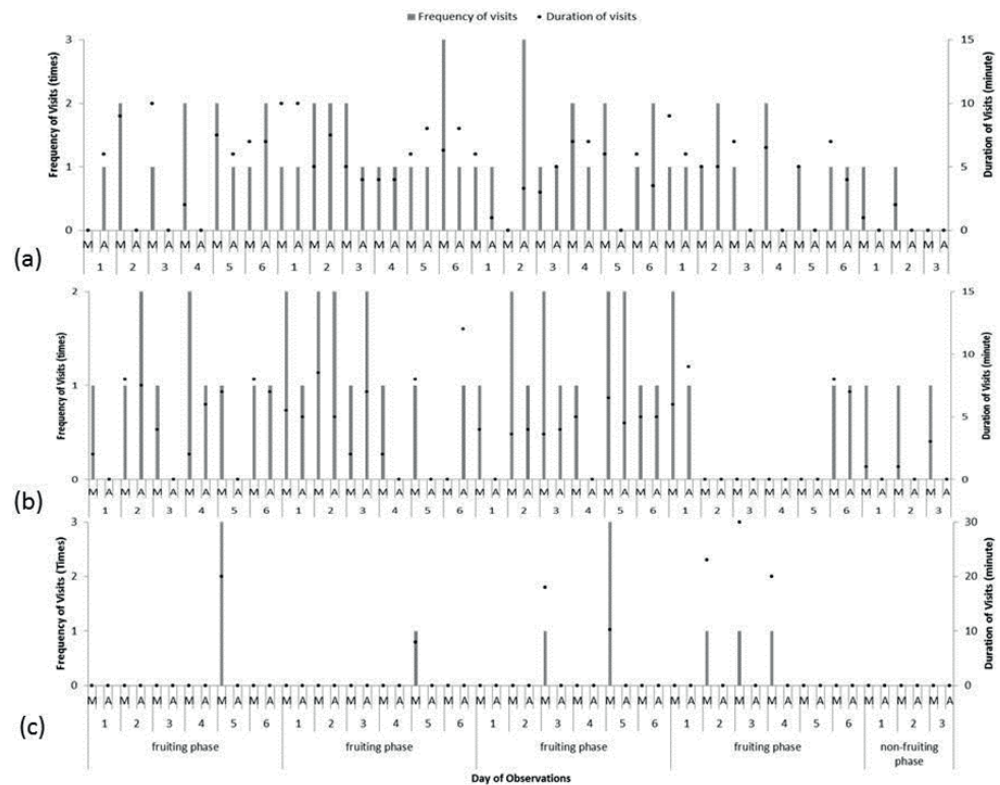


Figure 4: Duration and frequency of visits of the hornbill in the morning, 06.00–10.00 am (M) and afternoon, 02.00–05.00 pm (A) on *F. crassiramea*: (a) *A. malayanus*; (b) *A. albirostris*; (c) *B. rhinoceros*.

3.2. Time, duration, frequency and activity of visits of the hornbill on *Ficus crassiramea*

There is a difference between *A. malayanus*, *A. albirostris* and *B. rhinoceros* in time, duration and frequency of visits on *F. crassiramea*. The big hornbill, *B. rhinoceros*, tend to visit the fig trees in the morning rather than the afternoon while *A. malayanus* and *A. albirostris* is present at the both time (Figure 4). Conversely, there was no significant differences in the time of visits of hornbill species in Buton Wildlife Reserve, Southeast Celebes [35]. In addition, *A. malayanus* and *A. albirostris* also have high frequency of visits than *B. rhinoceros* (Figure 4).

The differences between *A. malayanus*, *A. albirostris* and *B. rhinoceros* in time preference and frequency of visits can be linked with the duration of their visits. The duration of visits of *B. rhinoceros* on *F. crassiramea* is three times longer than two other hornbill species (Figure 4) so that this big hornbill has a limited time and frequency of visits. The most dominant activity of the third hornbill on *F. crassiramea* in fruiting phase are foraging rather than perched like on non-fruiting phase tree (Figure 4). The foraging proportion of hornbill is based on the body size [36]. Therefore, *A. malayanus* and *A. albirostris*, the small hornbill, visit the fig tree in high frequency rather than the big hornbill like *B. rhinoceros*.

4. Conclusions

F. crassiramea is one of the food sources for hornbill species like *A. malayanus*, *A. albirostris* and *B. rhinoceros* in fragmented tropical rainforest in Borneo. The small hornbill, *A. malayanus* and *A. albirostris*, have high frequency of visits on both of trees phenology of *F. crassiramea*, that is fruiting and non-fruiting trees, while *B. rhinoceros* just visit *F. crassiramea* in fruiting phase. It convinced the important of *F. crassiramea* as food source for hornbill conservation.

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