Feeding and nesting trees of birds of Bucerotidae in Tahura Pocut Meurah Intan, Aceh Indonesia

S Kamal, Djufri, M A Sarong and M Rusdi

1Department of Doctoral Programs of Mathematic and Applied Science, Universitas Syiah Kuala, Banda Aceh 23111, Indonesia
2Department of Biology Education, UIN Ar-Raniry, Banda Aceh 23111, Indonesia
3Department of Biology Education, Universitas Syiah Kuala, Banda Aceh 2311, Indonesia
4Department of Soil Science, Universitas Syiah Kuala, Banda Aceh 23111, Indonesia

E-mail: samsul_80@mhs.unsyiah.ac.id

Abstract. Taman Hutan Raya Pocut Meurah Intan is a natural conservation area located in Aceh Province and functions as research and learning sites. However, the area has been interfered by human activities such as illegal logging, forest conversion, wildlife hunting, and forest burning. These have affected on the availability of feeding and nesting sites of birds belonging to family Bucerotidae. This study was aimed to determine the types of feeding and nesting trees for the hornbill birds in the conservation area. The method used in this research was explorative survey. The trees as feeding and nesting sites of the birds were observed by direct observation in the field. The locations and the types of trees were determined according to footsteps or food residues derived from the bird activities. Data analysis was carried out qualitatively by describing the species of feeding and nesting plants of the birds. The data was displayed by tables and figures. The results showed that there are 9 potential tree species as as feeding and nesting sites for Bucerotidae family birds which belong to Euphorbiaceae, Moraceae and Phyllanthaceae.

1. Introduction

Hornbill (Bucerotidae) is one of the protected animals in Indonesia through Law No. 5/1990 concerning the conservation of biological natural resources and their ecosystems and Government Regulation No. 7/1999 concerning the conservation of plants and animals [1,2]. Bucerotidae family birds vary in size which ranges from 381 to 1600 mm [3,4]. They are called hornbill due to their bill shape which is large and horn-shaped or curvy. There is two common bill color, red or yellow. The birds have strong wings and a long tail. Moreover, they possess short legs with large toes. The feathers also have various colors which are black, brown, white, or black and white. The skin and feathers around the throat are light-colored [5,6,7].

Bucerotidae family birds live in primary forests with an altitude of 1,800 meters above sea level and occupy large and tall trees. Hornbill species which are found in Sumatra, specifically in Aceh Province namely; rhinoceros hornbill (Buceros rhinoceros), wreathed hornbill (Aceros undulatus), oriental pied hornbill (Anthrocoeceros albirostris) and great hornbill (Buceros bicornis) [8]. The birds
also occupy the lowland forest areas of hilly forests (0 - 1000 above sea level) such as the Tahura Pocut Meurah Intan.

Feeding is a crucial activity for the Bucerotidae family birds. They feed mostly on fruits as they have a large and curvy bill, a morphological adaptation, used for picking them. The types of fruits vary from drupaceous fat-rich fruit (fleshy fruit), husked fruit (hard-skinned fruit), and fig (Ficus) which is rich for water, carbohydrates, protein, and calcium. Consequently, Bucerotidae family birds play important roles in preserving the forest and seed dispersal. Besides fruits, some of the birds also get their diet by consuming insects, snakes, lizards and small mammals.

The Taman Hutan Raya (Tahura) Pocut Meurah Intan is a natural conservation area and administratively located in Aceh Besar and Pidie Districts, Aceh Province. Geographically, the area is positioned at 05°24′- 05°28′ (north latitude) and at 95°38′ - 95°47′ (east longitude) which has a total area of approximately 6,220 hectares. The tahura is positioned at an altitude of 500-1,800 m above sea level [9]. As a protected area and home for various plants and animals, the Tahura ecosystem can be distinguished into rivers, forests, grasslands, and peatlands. The dominant plant species in the Tahura are pine (Pinus mercusii Jung Et De Vriese) and ear leaf acacia (Acacia auriculiformis A. Cunn. ex Benth.) (250 hectares of the total area), and cogon grass (Imperata cylindrica (L.) P. Beauv.) which covers 5,000 hectares of the Tahura [10,9].

The Tahura area has been used for research and learning sites. However, the area has been affected and changed due to human activities such as illegal logging, forest conversion, wildlife hunting, and forest fires. Deforestation not only disturbing the area but also producing habitat fragmentation. This has threatened the Bucerotidae family birds in the area since the number of feeding and nesting trees decreases significantly. Moreover, the lack of food is the main reason for the birds to abandon the site or find food substitutes. It is assumed that it changes their feeding behavior. Those circumstances lead to the reduction of the bird population.

2. Method
This research was conducted in the Tahura Pocut Meurah Intan, Aceh Province and collecting data was done from April to July 2019. The research location has been shown in Figure 1. The tools and materials used were binocular binoculars, a GPS (Global Position System), a digital zoom camera, a timer, sketching point of research area, hand-counter, gauge, stationery, and alcohol 70%. The method used in this research was explorative survey [11,12,13]. Feeding and nesting tree species were observed by direct observation at the study site which was determined by purposive sampling consisting of 5 locations/observation points. Feeding and nesting trees species were determined according to food remains and traces (wood fractures). The parameters were species and number of feeding and nesting tree species. Data was analysed qualitatively by describing plant species which was displayed by tables and figures.

Figure 1. Research site
3. Results and Discussion

3.1. Species of feeding and nesting trees for Bucerotidae family birds in the Tahura Pocut Meurah Intan Aceh Province

There were 10 potential plant species used for eating and home sites for the hornbill birds. From the total number of plant species, 7 species belong to Moraceae and 1 species for each family namely Euphorbiaceae, Lauraceae and Phyllanthaceae. The feeding and nesting plant species is shown in Table 1.

**Table 1. Potential species of trees for the hornbill bird’s feeding and nesting sites**

| No | Familia         | Latin name                        | Local name |
|----|-----------------|-----------------------------------|------------|
| 1  | Euphorbiaceae   | *Blumeodendron kurzii* J.J.Sm. (Hook.f.) | Kulobon    |
| 2  | Moraceae        | *Ficus benjamina* L.               | Beringin   |
|    |                 | *Ficus fistulosus* Reiw. ex Blume  | Ara hutan  |
|    |                 | *Ficus variegata* Blume            | Gondang    |
|    |                 | *Ficus hispida* L.                | Luwingan   |
|    |                 | *Ficus altissima* L.              | Empanai    |
|    |                 | *Ficus ampelas* Burm.F            | Ndalai     |
|    |                 | *Ficus virens* W.A.T.             | Walen      |
| 3  | Phyllanthaceae  | *Baccaurea bracteata* Müll.Arg.   | Rambai     |
| 4  | Lauraceae       | *Litsea glutinosa* (Lour.) C.B. Robinson | Medang    |

Source: Research data, 2019

Tabel 1 shows that potential tree species have dominated by species belonging to Moraceae namely *F. benjamina* L. (Beringin), *F. fistulosus* Reiw. ex Blume (Ara hutan), *F. variegata* Blume (Gondang), *F. hispida* L. (Luwingan), *F. altissima* L. (Empanai), *F. ampelas* Burm.F (Ndalai), and *F. virens* W.A.T (Walen). Sherub (2017) stated that the Moraceae-member plants are one of the main foods for hornbills followed by plant species from the Euphorbiaceae, Fagaceae, Magnoliaceae, Leguminosae, and Anacardiaceae [14,15]. Fig species which belong to plant family of Moraceae was chosen and consumed by the birds to fulfill the need for calcium functioning in bone formation [16]. Ashari [17] reported that Moraceae family plants are tropical-region species which prefer wet area. Therefore, the distribution has covered wet tropical rain forest areas such as South America, Central America, Mexico, India, Sri Lanka, Indonesia, Thailand, and Malaysia [17]. The tree species belonging to Euphorbiaceae, Lauraceae and Phyllanthaceae are potential species for the birds as their feeding and nesting sites. However, there were few species which are the member of those families in the Tahura Pocut Meurah Intan consisting of Lauraceae (1 species) namely *Litsea glutinosa* (Lour.) C.B. Robinson (Medang), Euphorbiaceae (1 species) namely *Blumeodendron kurzii* (Hook.f.) J.J.Sm. (Kulobon) and Phyllanthaceae (1 species) namely Baccaurea sp (Gastric). Medang tree fruit has round-shaped, soft and fleshy when ripen. Ecologically, the medang tree grows on hillsides and mountains and the distribution including the peninsulas of Malaysia, Thailand, Philippines, Sumatra, Kalimantan and Java. The stomach tree is a family of Phyllanthaceae. Having small-round shape fruits and yellow when ripen make the tree of *Baccaurea bracteata* Müll.Arg. become one of potential homes and food sources for the bird species. The data of the distribution of plant species found in Tahura Pocut Meurah Intan is shown in Table 2.

**Table 2. Distribution of plant species potential for feeding and nesting sites for hornbill species in each station**

| No | Location | Family  | Latin name                  | Local name | T (m) | Σ |
|----|----------|---------|----------------------------|------------|-------|---|
| 1  | Station 1| Lauraceae| *Litsea glutinosa* (Lour.) C.B. Robinson | Medang     | 22    | 4 |
|    |          | Moraceae| *Ficus altissima* L.        | Empanai    | 24    | 3 |
Table 2 shows that the average height and the total number of the Bucerotidae family bird feed tree found in the research area were 22 meters and 84 individuals respectively. Moreover, it has been shown that the tree species have not distributed evenly indicating that Station 4 and 5 had the highest number of species among the other station (5 species). However, only the species belong to Moraceae were found in each station indicating that they are evenly distributed in the Tahura. It is assumed that the environmental factors have supported the life and growth of the Moraceae family which were 30-31°C (air temperature), 25.5-27.7% (humidity), and altitudes reaching 493 to 643 meters above sea level. Hasanuddin [18] stated that Moraceae family plants live at an altitude (300-700 meters above sea level), temperature (21-32°C), soil pH (3.67 -5.24), light intensity (60x10 to 258x10), humidity (25-40%). Moreover, the ideal humidity for Moraceae plants ranges from 50% to 90% and rainfall 2400 mm / year [18]. The tree species as food sources for hornbills in the Tahura is shown in Figure 2.
Figure 2. Tree species as the food sources for Bucerotidae family birds in the Tahura Pocut Meurah Intan. a) Ficus fistulosa Reinw. ex Blume; b) Ficus benjamina L.; c) Blumeodendron kurzii (Hook.f.) J.J.Sm.(Hook,f.) J.J.Sm.(Hook.f.) J.J.Sm.; d) Ficus ampelas Burm.F; e) Ficus altassima L., and f) Baccaurea bracteata Müll.Arg.

3.2. Composition of feeding and nesting site tree for hornbill birds in the Tahura Pocut Meurah Intan Aceh province

According to research findings, species of Moraceae have dominated the research area. The composition of tree species according to the family is shown in Figure 3.

Figure 3 shows that the feeding and nesting trees for hornbill birds in the Tahut Meurah Intan Tahura were dominated by the Moraceae family (77%) followed by Euphorbiaceae (14%) and Phyllanthaceae (9%). Therefore, it is assumed species from the Moraceae have grown vigorously and spread evenly in the Tahut Meurah Intan Tahura. The Moraceae, Euphorbiaceae and Phyllanthaceae
are a group of plants occupying the tropical-rain forest. Daud [9] stated that that based on climatology data (based on meteorology and geophysics agency 1876-2006), the average of Q-value was 0.3952 indicating that the Tahura area is classified as wet the Schmidt and Ferguson climate classification, the Greater Aceh region was relatively wet area (Classification C). The Tahura area is located on the slope of Mount Seulawah with different microclimate to the surrounding area, so more specifically the area of Tahura is grouped into climate type B [9]. Climatic factors and soil conditions control plant growth. The climate consists of temperature, humidity, the intensity of light and wind whereas soil factors include the characteristic of soil, physical and biological, and soil moisture [19]. The presence of plants in an area is influenced not only by physical and chemical conditions but also by animals and human activities [20,21].

4. Conclusions
The study of potential feeding and nesting tree species in Tahura Pocut Meurah Intan has determined nine tree species which are under Euphorbiaceae, Moraceae, and Phyllanthaceae. However, species belong to Moraceae have dominated the area among the other species.

5. References
[1] Sukmantoro W, Irham M, Novarino W, Hasudungan F, Kemp N and Muchtar M 2007 Daftar burung Indonesia No. 2 (Bogor: Indonesian Ornithologists’ Union)
[2] Kamal S 2014 Conservation status of birds traded in Banda Aceh 1st Ed (Banda Aceh: Araniry Press)
[3] Taylor B and Johnson J 2014 Mini Encyclopedia Birds (Miles Kelly Publishing)
[4] Ayat A 2011 Burung-burung agroforest di Sumatera (Bogor: World Agroforestry Centre-ICRAF SEA Regional Office)
[5] MacKinnon J, Phillipps K and van Balen B 1991 Field Guide to the Birds of Java and Bali (Yogyakarta: Gadjah Mada University Press)
[6] MacKinnon J, Phillipps K and van Balen B 2010 Birds in Sumatra, Java, Bali and Kalimantan (Bogor: LIPI Burung Indonesia)
[7] WWF 2018 Factsheet Indonesia Rangkong Badak
[8] Kamal S, Agustina E, Azhari, Ahadi R and Falah N 2018 Proc. Int. Conf. of The Southeast Asia Biodiversity, Science Education and Humanity International Conference pp 120–124
[9] Daud M 2017 KPH Profile Tahura Pocut Meurah Intan (Yogyakarta: Penebar Media Pustaka)
[10] Fatahillah 2014 Management of the Tahura Pocut Meurah Forest Geunong Seulawah, as the lungs of the world. Lhokseumawe (Aceh: Unimal Press)
[11] Fachrul M F 2007 Bioecological Sampling Method (Jakarta: Bumi Aksara)
[12] Bibby C, Jones M and Marsden S 2000 Expedition Field Techniques Bird Surveys (Cambridge: BirdLife International.)
[13] Kumar P 2018 Fundamentals of Ecology and Environment Second Ed (New Delhi: Pathfinder Publication)
[14] Sherub K 2017 Foraging Behavior, Food Resources, and Habitat Use of Rufous-Necked Hornbill (Aceros nipalensis) in Jigme Singye Wangchuck National Park, Bhutan, Dehradun, India Theses
[15] Dew J L and Boubli J P 2005 Tropical Fruits and Frugivores (Netherlands: Springer Netherlands)
[16] O’Brien T G, Kinnaird M F, Dierenfeld E S, Conklin-Brittain N L, Wrangham R W and Silver S C 1998 What’s so special about figs? Nature 392 668
[17] Ashari S 1995 Horticulture: Cultivation Aspects (Jakarta: UI Press)
[18] Hasanuddin 2017 Proc. national Conf. on biology (Biotik) 4 (Banda Aceh) pp. 45–50.
[19] Yunianti A D and Muin M 2009 Textbook on Tree Growth and Wood Quality (Makassar: Fakultas Kehutanan Universitas Hasanuddin)
[20] Loveless A R 1989 Principles of Plant Biology for the Tropics 2 (Jakarta: Gramedia)
[21] Djufri 2003 Biodiversitas, *J. Biol. Divers* 4 p 30–34