IMPLICATIONS OF TAHURA POCUT MEURAH INTAN DEFORESTATION ON PLANT DIVERSITY FOR BUCEROTIDAE BIRD FEED IN ACEH PROVINCE

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Abstract: This study investigates the ecological impact of forest destruction within the Pocut Meurah Intan Grand Forest Park, specifically focusing on its implications for food availability for the avian family Bucerotidae. The research aims to examine the practices contributing to forest destruction within the Tahura ecosystem, analyze the consequential effects of this destruction on the diversity of food sources available to Bucerotidae species, and propose potential solutions to mitigate the identified challenges to Bucerotidae sustenance. Employing an exploratory survey methodology, the research utilizes direct observation techniques to gather data at the study site. Qualitative descriptive analysis is employed to interpret the collected data and draw meaningful conclusions. The distribution of deforestation locations was analyzed using ArcGIS software. The distribution of forest damage is displayed in maps, pictures, and tables. The study showed that forest damage in the Tahura Pocut Meurah Intan area resulted in forest conversion into plantations, illegal logging, and forest burning for business purposes. There are nine species of bird feed plants in the Bucerotidae family found in Tahura Pocut Meurah Intan. The implications of forest destruction include decreasing the number of bird feed plants of the Bucerotidae family. The species were Ara Hutan (*Ficus fistulosa* Reinw ex Blume), Beringin (*Ficus benjamina* L), Empanai (*Ficus altassima* L), Ndalai (*Ficus ampelas* Burm.F), Medang (*Litsea glutinosa* (Lour.) C.B. Robinson), Rambai (*Baccaurea bracteata* Müll.Arg), Walen (*Ficus virens* W.A.T.). The remaining nine species are dominated by the Moracea family (77%); in addition, there are also plant species from the Euphorbiaceae (14%) and Phyllanthaceae (9%). Ensuring the sustained availability of food plant resources for the Bucerotidae family necessitates a multi-pronged approach; Habitat restoration through the reclamation of degraded forest areas is crucial; Enhancing community awareness regarding the ecological and economic importance of forest ecosystems is essential for promoting sustainable practices; Bolstering surveillance and enforcement within the Tahura Pocut Meurah Intan forest area, through increased monitoring and the active involvement of Forest Police, law enforcement agencies, local communities, and environmental NGOs, is vital to deter illegal activities and protect existing resources. Consistent application of existing

environmental regulations is paramount to ensuring the long-term preservation of the Bucerotidae food plant supply.

Keywords: Deforestation; Tahura Pocut Meurah Intan; Forage Plants Bucerotidae

Abstrak: Penelitian ini menyelidiki dampak ekologis kerusakan hutan di Taman Hutan Raya Pocut Meurah Intan, khususnya berfokus pada implikasinya terhadap ketersediaan makanan bagi famili burung Bucerotidae. Penelitian bertujuan untuk mengetahui kerusakan hutan ekosistem Tahura Pocut Meurah Intan, implikasi kerusakan terhadap keanekaragaman pakan burung Bucerotidae, dan solusi terhadap ketersediaan pakan burung Bucerotidae. Metode yang digunakan adalah survei eksploratif dengan teknik observasi langsung ke lokasi objek penelitian. Analisis data tentang deforetasi dianalisis dengan software ArcGis. Penyajiannya dalam bentuk peta, gambar dan tabel. Hasil penelitian menunjukkan bahwa kerusakan hutan di kawasan Tahura Pocut Meurah Intan berupa konversi hutan menjadi perkebunan, penebangan liar (*illegal logging*), dan pembakaran hutan untuk tempat usaha; spesies pakan burung Bucerotidae yang terdapat di Tahura Pocut Meurah Intan (TPMI) sebanyak 9 spesies, dan implikasi kerusakan hutan TPMI berdampak terhadap menurunnya jumlah spesies pakan burung Bucerotidae. Spesies yang dimaksud adalah Ara Hutan (*Ficus fistulosa* Reinw ex Blume), Beringin (*Ficus benjamina* L), Empanai (*Ficus altassima* L), Ndalai (*Ficus ampelas* Burm.F), Medang (*Litsea glutinosa* (Lour.) C.B. Robinson), Rambai (*Baccaurea bracteata* Müll.Arg), Walen (*Ficus virens* W.A.T.). Familia yang mendominasi adalah Moraceae (77%), selanjutnya Euphorbiacea (14%), dan Phyllanthaceae (9%). Upaya yang perlu dilakukan untuk menjaga kelestarian tumbuhan pakan burung Bucerotidae adalah; Melakukan reklamasi hutan yang mengalami kerusakan; Penguatan pemahaman masyarakat tentang fungsi hutan; Penguatan dan peningkatan pengawasan kawasan hutan; Penegakan hukum di kawasan hutan Tahura Pocut Meurah Intan dengan melibatkan Polisi Hutan (Polhut), kepolisian, masyarakat, dan LSM pemerhati lingkungan; serta penerapan peraturan lingkungan yang ada secara konsisten sangat penting untuk memastikan kelestarian pasokan tanaman pangan Bucerotidae dalam jangka panjang.

Kata kunci: Deforestasi; Tahura Pocut Meurah Intan; spesies pakan Bucerotidae

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Introduction

The Pocut Meurah Intan Forest Park, a nature conservation area in Aceh Province, Indonesia, encompasses 6,220 hectares of land at an elevation ranging from 500 to 1,800 meters above sea level. Characterized by a largely pristine ecosystem, Tahura features a diverse landscape comprising rivers, forests, grasslands, and peatlands. Dominant flora within the park include *Pinus mercusii* and *Acacia auriculiformis*, spanning an area of 250 hectares alongside extensive cogon grass fields covering 5,000 hectares. Geographically, Tahura Pocut Meurah Intan is located between latitudes 05°24′N-05°28′N and longitudes 95°38′E-95°47′E (Chalidad & Subhan, 2022; Fadhli et al., 2021). Administratively, the park

falls within the jurisdiction of Aceh Besar Regency and Pidie Regency in Aceh Province (Daud et al., 2017; Fatahillah, 2014).

Since 2014, deforestation within the Pocut Meurah Intan Grand Forest Park in Aceh Province has significantly impacted the foraging diversity of Bucerotidae birds (Hanafiah, 2014; Anwar et al., 2014). Anthropogenic activities, including the conversion of forests to monoculture plantations, logging, habitat fragmentation, and firewood collection, pose substantial threats to the park's avian biodiversity, which includes 34 bird species. Of particular concern are the seven government-protected species: *Ictinaetus malayensis* (black eagle), *Gracula religiosa* (common hill myna), *Buceros rhinoceros* (rhinoceros hornbill), *Buceros bicornis* (great hornbill), *Anthrococeros albirostis* (white-bellied hornbill), and *Aceros undulatus* (golden hornbill) (Daud et al., 2017; Kamal et al., 2019; USAID, 2007).

The disturbance of bird habitats directly affects the availability of food sources for Bucerotidae species within the Tahura Pocut Meurah Intan ecosystem. Anggraeni (2016) emphasizes that ecosystem damage is a pressing global and national issue, leading to forest degradation and environmental deterioration. Ngo (2016) highlights the alarming rate of global forest loss, estimated at 8,868,000 hectares per year from 1990 to 2000 and 7,317,000 hectares yearly from 2000 to 2005, driven by multifaceted pressures.

Deforestation and forest degradation have profound implications for biodiversity (Bas et al., 2024; Masha et al., 2024; Mugadza, 2022). The availability of resources within a habitat is intrinsically linked to animal populations, with carrying capacity playing a crucial role in determining food availability (Yumoto et al., 2016). Therefore, the ongoing deforestation in Tahura Pocut Meurah Intan raises severe concerns about the long-term survival of Bucerotidae birds and the overall health of this valuable ecosystem (Cliggett, 2019).

Previous studies in Tahura Pocut Meurah Intan have focused on vegetation and fauna diversity. For instance, Djufri (2013) analyzed spermatophyte vegetation in Seulawah Forest Park, Wardiah & Nurhayati (2013) characterized lichens in Pocut Meurah Intan Forest Park, Djufri (2014) monitored the natural food sources of *Elephas maximus* sumatrensis in Cut Nya' Dhien Seulawah Grand Forest Park, and Kamal et al. (2018) investigated bird diversity across various habitat types within Pocut Meurah Intan Grand Forest Park. However, these studies have not addressed the implications of deforestation on the diversity of food sources for Bucerotidae birds in the Tahura Pocut Meurah Intan area, representing a critical gap in the existing research.

This study aimed to investigate the following: (1) the extent of forest ecosystem damage within Tahura Pocut Meurah Intan, (2) the implications of this damage on the diversity of food sources available to Bucerotidae birds, (3) potential solutions to mitigate the issue of food availability for Bucerotidae birds. This research is crucial as it provides valuable information about forest damage and its impact on the availability of food resources for Bucerotidae birds. The findings will

contribute to developing practical solutions to address deforestation within Tahura Pocut Meurah Intan and its consequences for avian biodiversity.

Deforestation in Tahura Pocut Meurah Intan carries several fundamental environmental consequences. Deforestation disrupts the delicate balance of the forest ecosystem, impacting various ecological processes and interactions. This disruption is often accompanied by a decline in plant species richness and abundance due to the removal of trees and other vegetation, ultimately diminishing overall biodiversity. Furthermore, deforestation disrupts established food chains and webs, impacting the availability of food resources for various animal species, including Bucerotidae birds. Ultimately, the degradation of the forest environment diminishes its capacity to support flora and fauna, potentially leading to population declines, particularly for specialized species like Bucerotidae birds.

Materials and Methods

This study was conducted in Tahura Pocut Meurah Intan, Aceh Province, Indonesia, from March to October 2019. The park encompasses 6,220 hectares at an altitude of 500-1,800 meters above sea level. Geographically, Tahura Pocut Meurah Intan is located between 05°24′ - 05°28′ North latitude and 95°38′ - 95°47′ East longitude, as documented by Daud et al. (2017). Administratively, the park falls within the jurisdictions of Aceh Besar Regency and Pidie Regency (Fadhli et al., 2021). The specific research location is depicted in Figure 1.

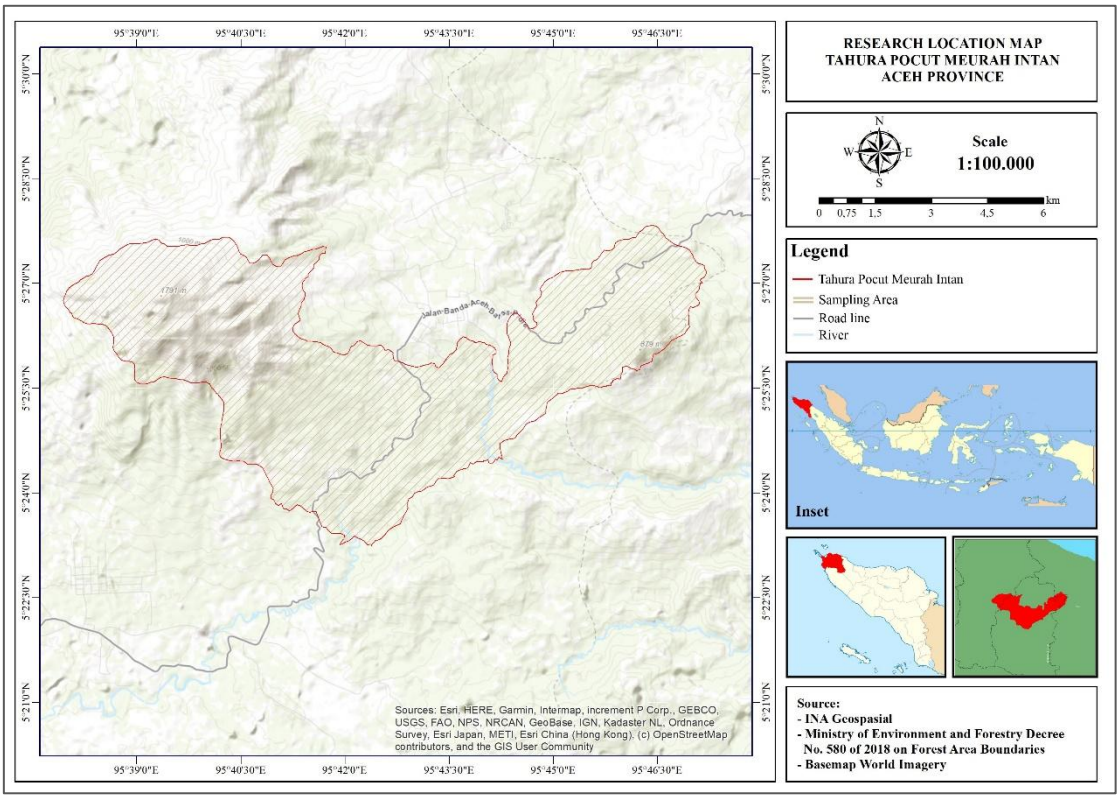

Figure 1. Research Location

This study employed an exploratory survey method, utilizing direct observation techniques to assess the research area (Bibby et al., 2000; Fachrul, 2007; Zulfikar, 2019). Data collection, conducted between March and October 2019, involved using tools such as a camera (Sony Alpha FE 70-200 mm), binoculars (Bushnell 10-70x70), a Global Positioning System (Garmin GPSmap 62sc), a guidebook, a topographic map, and a drone (Phantom 4). The research area is divided into 2 observation stations. Forest damage was assessed through direct observation, with damaged areas measured, recorded, photographed, and geographically mapped using GPS and drone technology. The impact of deforestation on Bucerotidae bird food plants was investigated through observational techniques across five purposively selected locations (Kamal et al., 2020; Krebs, 2014). Observations focused on identifying and quantifying Bucerotidae bird food plant species. Data analysis was primarily descriptive and qualitative, with the spatial distribution of deforestation analyzed and visualized using ArcGIS software to generate maps, images, and tables.

Results and Discussion

Forest Damage in Tahura Pocut Meurah Intan

Forest destruction within Tahura Pocut Meurah Intan has reached a critical level, posing a significant threat to the integrity of the ecosystem. Several factors contribute to this alarming situation, including illegal logging, forest and land burning, conversion of forest land for plantations and community trading areas, and the development of tourist attractions. Among these, forest burning for land clearing represents the most dominant form of destruction. The spatial distribution of forest destruction within Tahura Pocut Meurah Intan is illustrated in Figure 2.

As depicted in Figure 2, the distribution of forest damage within Tahura Pocut Meurah Intan is concentrated in two primary locations: the core area and the buffer zone. Within the core area, forest destruction activities primarily consist of illegal logging and forest burning. Conversely, the buffer zone experiences forest conversion activities, primarily for plantation development and community trading areas. Sixteen distinct forest destruction locations were identified within the core area, while the buffer zone exhibited two such locations.

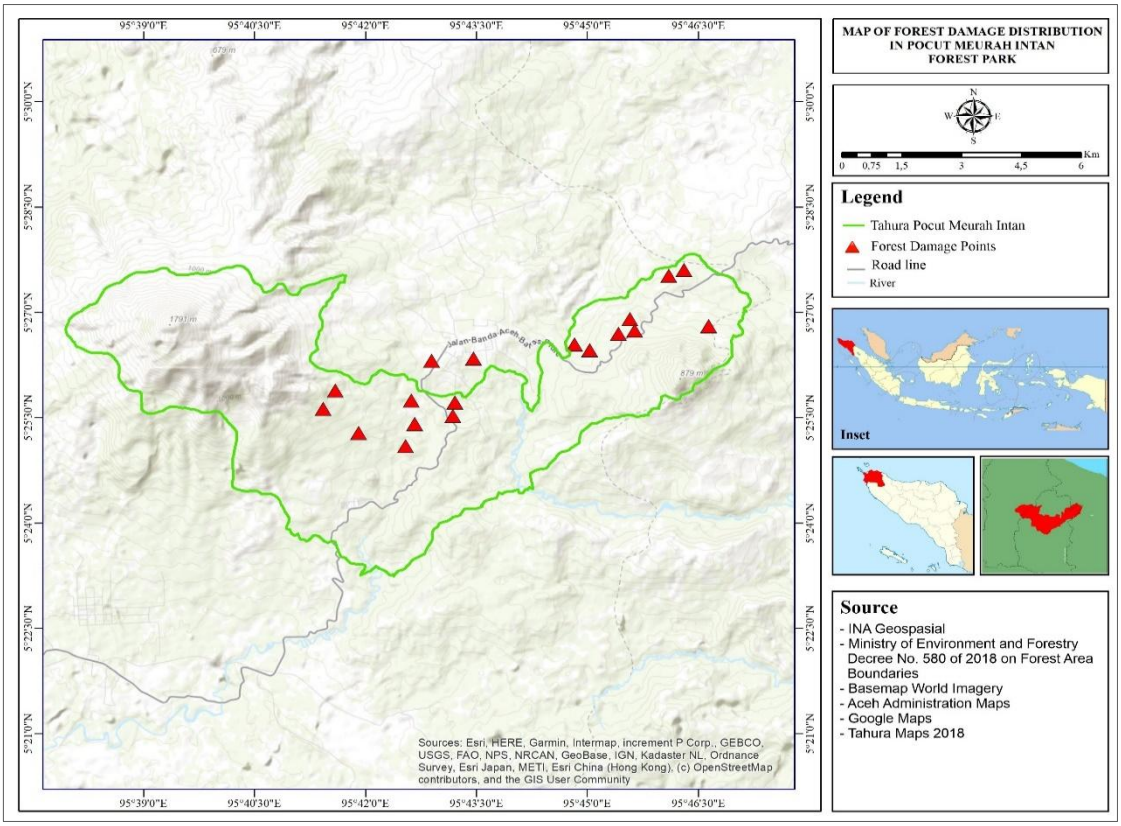

Figure 2. Distribution of Forest Destruction Sites in Tahura Pocut Meurah Area

Forest damage within Tahura Pocut Meurah Intan is mainly concentrated along the national road that bisects the park. This degradation pattern is primarily attributed to economic activities undertaken by local communities, notably the establishment of commercial enterprises such as stalls and tourist attractions within the park's boundaries. The financial incentives driving encroachment and a desire to enhance crop productivity have encouraged farming communities to expand their agricultural activities, often at the expense of Tahura Pocut Meurah Intan land. This encroachment is exacerbated by inadequate law enforcement, which has created an environment where the conversion of forest land for plantations occurs openly. As Hanafiah (2019) noted, Pocut Meurah Intan Grand Forest Park, located in Aceh Besar Regency and Pidie Regency, continues to experience significant damage due to encroachment. Despite its protected status, the forest, primarily composed of pine trees, is actively converted into agricultural land for crops such as cocoa, banana, corn, and palm oil.

Deforestation in Indonesia is primarily attributed to systemic deficiencies in the political and economic spheres, where natural resources, particularly forests, are often perceived as commodities to be exploited for personal gain and profit (Forest Watch Indonesia–Global Forest Watch, 2001, 2013; Nursanti, 2008; Wahyuni, 2021). This perspective is further corroborated by Anggraeni (2016), who posits that deforestation is perpetuated by a corrupt governance system that views

resources, especially forests, as sources of exploitable income. Table 1 details the geographical coordinates of the identified deforestation locations.

Table 1. Coordinate Point of Tahura Pocut Meurah Intan Damage Location

Locations		
Coordinate Points	**Village**	**District**
05°025'04,5” 095°043'03,8”	Pulok, Suka Damai	Leumbah Seulawah
05°023'41,5” 095°041'36,4”		Leumbah Seulawah
05°026'05,4” 095°044'55,9”	Alue Glima, Suka Mulia	Leumbah Seulawah
05°026'08,10” 095°042'51,7”	Tower Telkom Suka Damai	Leumbah Seulawah
05°026'11,4” 095°044'44,2”	Batu Hitam, Suka Mulia	Leumbah Seulawah
05°024'13,9” 095°042'02,3”	Seunapet	Leumbah Seulawah
05°027'16,9” 095°046'41,7”	Seulawah Inong foothills, Sukamulia	Leumbah Seulawah
05°024'11,5” 095°042'08,4” 05°024'10,4” 095°042'04,9”	Seunapet	Leumbah Seulawah
05°026'11,3” 095°045'03,9”	Alue Glima, Suka Mulia	Leumbah Seulawah
05°026'46,7” 095°046'09,5”	Seulawah Inong foothills, Sukamulia	Leumbah Seulawah
05°026'49,1” 095°045'41,0”	Path to the waterfall	Leumbah Seulawah
05°026'11,4” 095°044'44,2”	Batu Hitam, Suka Mulia	Leumbah Seulawah
05°024'16,0” 095°042'18,0”	Seunapet	Leumbah Seulawah
05°024'16,4” 095°042'18,1”	Seunapet	Leumbah Seulawah
05°026'02,0” 095°042'40,8”	Saree Green Saree	Leumbah Seulawah
05°026'02,0” 095°042'40,8”	Saree /Green saree	Leumbah Seulawah
05°024'44,4” 095°042'55,7”	Palapa	
05°024'22,6” 095°042'24,7”	Seunapet	Leumbah Seulawah

Locations		
Coordinate Points	**Village**	**District**
05°024'34,5" 095°045'35,6"	Suka Mulia (Around the Office)	Leumbah Seulawah

Table 1 reveals that forest damage is concentrated in two distinct zones: the Tahura core area and the buffer zone. A total of 16 instances of forest damage were identified within the core area, compared to two in the buffer zone. This disparity highlights the inadequate supervision and law enforcement efforts targeting those responsible for forest destruction, enabling the continued encroachment upon forest areas for agricultural purposes. This finding aligns with Sadino (2011) assertion that illegal logging operates as a sophisticated, organized, transnational criminal enterprise. The lack of robust and unambiguous legal frameworks to prevent and combat illegal logging further exacerbates this issue. Muhammad et al (2014) corroborate this observation, identifying illegal logging, forest encroachment for shifting cultivation, and forest fires as Aceh's primary drivers of forest destruction.

A complex interplay of multidimensional pressures drives deforestation (Nawawi & Evangs, 2024; Wahyuni, 2021). Yumoto et al., (2016) comprehensively analyze these pressures, attributing forest loss to factors such as export-oriented timber exploitation, population growth leading to land clearing for rice cultivation and permanent crops, transmigration policies, and deregulation that incentivizes foreign investment. This influx of foreign investment often results in a global imbalance between timber and palm oil demand and production, fueling illegal and unsustainable logging practices.

Implications of Tahura Pocut Meurah Intan Deforestation on Bucerotidae Bird Food Species

Deforestation within Tahura Pocut Meurah Intan destroys critical forest ecosystems and animal habitats. This ecological degradation has profound implications for the foraging patterns and food availability of Bucerotidae birds inhabiting the area. The study's findings indicate a decline in the diversity of food species available to Bucerotidae birds within the degraded environment. However, some favored food species remain present within Tahura Pocut Meurah Intan. Table 2 provides a detailed inventory of the plant species consumed by Bucerotidae birds observed within the study area.

Table 2. Bucerotidae Bird Food Plant Species in Tahura Pocut Meurah Intan

Location	Family	Local Name	Scientific Name	H (m)	FT	Σ
Location 1	Moraceae	Beringin	*Ficus benjamina* L	16	✓	4
		Ara Hutan	*Ficus fistulosa* Reinw ex Blume	10	✓	3
		Empanai	*Ficus altassima* L	12	✓	2

Location	Family	Local Name	Scientific Name	H (m)	FT	Σ
	Lauraceae	Medang	*Litsea glutinosa* (Lour.) C.B.Robinson	15	✓	3
Location 2	Moraceae	Ara Hutan	*Ficus fistulosa* Reinw ex Blume	13	✓	4
		Beringin	*Ficus benjamina* L	20	✓	3
		Gondang	*Ficus variegata* ex Blume	16	✓	2
		Luwingan	*Ficus hispida* L	14	✓	2
Location 3	Moraceae	Luwingan	*Ficus hispida* L	10	✓	3
		Ara Hutan	*Ficus fistulosa* Reinw ex Blume	11	✓	5
		Beringin	*Ficus benjamina* L	18	✓	4
		Empanai	*Ficus altassima* L	14	✓	3
Location 4	Moraceae	Ara Hutan	*Ficus fistulosa* Reinw ex Blume	10	✓	4
		Beringin	*Ficus benjamina* L	15	✓	4
		Ndalai	*Ficus ampelas* Burm.F	11	✓	3
	Lauraceae	Medang	*Litsea glutinosa* (Lour.) C.B. Robinson	10	✓	2
	Phyllanthaceae	Rambai	*Baccaurea bracteata* Müll.Arg	19	✓	2
Location 5	Moraceae	Beringin	*Ficus benjamina* L	16	✓	3
		Walen	*Ficus virens* W.A.T.	17	✓	2
		Ara Hutan	*Ficus fistulosa* Reinw ex Blume	12	✓	3
	Lauraceae	Medang	*Litsea glutinosa* (Lour.) C.B.Robinson	12	✓	3
	Phyllanthaceae	Rambai	*Baccaurea bracteata* Müll.Arg	20	✓	1
Total (Σ)						**65**

Notes: H (m): Height (meters), FT: Feed Tree, Σ: Total.

Table 2 reveals the presence of nine plant species within Tahura Pocut Meurah Intan that serve as food sources for Bucerotidae birds. These species include *Ficus benjamina*, *Ficus virens*, *Ficus fistulosa*, *Baccaurea bracteate*, *Litsea glutinosa*, *Ficus ampelas*, *Ficus altassima*, *Ficus hispida*, and *Ficus variegate*. The dominance of the Moraceae family among these species aligns with Sherub (2017) findings, which highlight the Moraceae family as a significant food source for Bucerotidae birds, alongside plants from the Euphorbiaceae, Fagaceae, Magnoliacea, Leguminosae, and Anacardiaceae families.

Deforestation within Tahura Pocut Meurah Intan has significant implications for the decline in the population of Bucerotidae bird food species. The availability of food resources within a habitat is a critical determinant of population dynamics for all living organisms, including Bucerotidae birds. These birds primarily consume fruit, with a preference for species such as *Ficus fistulosa*, *Ficus benjamina*, *Ficus virens*, *Litsea glutinosa*, *Baccaurea bracteata*, *Ficus altassima*, *Ficus hispida*, *Ficus ampelas*, and *Ficus variegate* (Dipika, et al., 2024; Kamal et al., 2020; Pratama et al., 2021; Sherub, 2017). The decline in the populations of

these key plant species has cascading effects on the availability of food resources for Bucerotidae birds. Consequently, these birds face increased challenges in obtaining sufficient sustenance, ultimately impacting their survival rates.

This finding aligns with Hadi et al., (2023) assertion that biodiversity decline is intrinsically linked to carrying capacity, where an upper limit exists that constrains further population growth. Jackson et al. (2015) emphasize the interconnectedness of environmental change and ecological processes, highlighting the importance of understanding resource consumption patterns in predicting the trajectory of such changes. The consumption of forest resources, particularly timber extraction driven by economic incentives, often leads to deforestation (Shvidenko, 2008; Sierra, 2001). This exploitation of natural resources triggers a cascade of ecological changes, altering the environment as an environmental shaping variable. For instance, deforestation directly reduces the spatial extent of forest ecosystems. Figure 3 provides a detailed illustration of the family composition of plant species that serve as food sources for Bucerotidae birds.

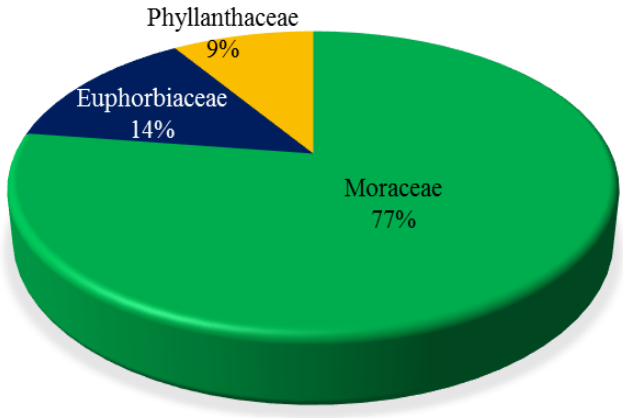

Figure 3. Composition of Bucerotidae Bird Food Plant Families in Tahura Pocut Meurah Intan

Figure 3 reveals that the dominant family of Bucerotidae bird food species in Tahura Pocut Meurah Intan is Moraceae, comprising 77% of the total. Euphorbiaceae and Phyllanthaceae constitute smaller proportions, representing 14% and 9%, respectively. Deforestation significantly impacts the diversity of plant families that serve as food sources for Bucerotidae birds. As depicted in Figure 3, Bucerotidae bird food species primarily belong to three family groups: Moraceae (77%), predominantly from the Ficus genus, Euphorbiaceae (14%), and Phyllanthaceae (9%). These families exhibit high adaptability to environmental conditions and are typically found in tropical regions. Yusuf (2011) highlights the remarkable species diversity within the Ficus genus, noting that most tropical Ficus species inhabit lowland and lower montane forests at altitudes below 1500 meters. However, a limited number of Ficus species also occur in mountainous areas at elevations ranging from 1500 to 2500 meters above sea level (Sahromi, 2020).

Hasanuddin (2017) provides further insights into the habitat preferences of Moraceae plants, stating that they thrive at altitudes between 300 and 700 meters above sea level, with temperatures ranging from 21 to 32 °C, soil pH values between 3.67 and 5.24, light intensities from 600 to 25,800 lux, air humidity levels between 25% and 40% (with an ideal range of 50% to 90%), and annual rainfall of 2400 mm/year.

Solution Model for Bucerotidae Feed Availability and Environmental Supportability

Bucerotidae birds are afforded protected status in Indonesia under Law No. 5 of 1990 concerning the Conservation of Natural Resources and Ecosystems and Government Regulation No. 69 of 1999 on the Preservation of Plant and Animal Species. These birds are readily identifiable due to their distinctive features. Bucerotidae birds are generally characterized by their substantial size, with a total body length ranging from 381 to 1600 mm (Ayat, 2011; Liang et al.,2024; Jarulis et al., 2024; Pradhan et al, 2024; MacKinnon et al., 2010). Bucerotidae birds are crucial in maintaining forest ecosystems through their seed dispersal activities. Figure 2 indicates that the dominant families of Bucerotidae bird food plants in Tahura Pocut Meurah Intan are Moraceae (77%), followed by Euphorbiaceae (14%) and Phyllanthaceae (9%). Notably, the data reveal a lower species richness within Euphorbiaceae and Phyllanthaceae than Moraceae.

Effective conservation strategies are essential to ensuring the persistence of Bucerotidae bird food species. Forest reclamation emerges as a viable solution to enhance the availability of food resources for these birds within Tahura Pocut Meurah Intan. This practice aims to restore degraded forest areas, thereby promoting the stability of carrying capacity. Recommended plant species for reclamation efforts should possess specific characteristics, including fruit production, a robust root system, a substantial stem, and a tendency to develop dense branching. Table 3 lists suitable plant species for inclusion in reclamation activities, considering their presence in Tahura Pocut Meurah Intan and the attributes mentioned above.

Table 3. Plant Species Recommended for Planting in Reclamation Activities

Family	Scientific Name	Local Name
Moraceae	*Ficus benjamina* L	Beringin
	Ficus fistulosa Reinw ex Blume	Ara Hutan
	Ficus altassima L	Empanai
	Ficus variegata ex Blume	Gondang
	Ficus hispida L	Luwingan
	Ficus ampelas Burm.F	Ndalai
	Ficus virens W.A.T.	Walen
Lauraceae	*Litsea glutinosa* (Lour.) C.B. Robinson	Medang
Phyllanthaceae	*Baccaurea bracteata* Müll.Arg	Rambai
Myristicaceae	*Knema globularia* (Lam.) Warb	Kamburu kalauki

Family	Scientific Name	Local Name
Burceraceae	*Santiria oblongifolia* Bl., Mus. Bot	Kabu-kabu
Dipterocarpaceae	*Shorea stenopthera* Burck. F	Meranti
	Dryobalanops sumatrensis (J.F. Gmelin) Kosterm.	Kapur
	Dipterocarpus kunstleri King	Kruing
Anacardiacea	*Gluta aptera* Wood	Rangas

The managers of Tahura Pocut Meurah Intan have implemented a comprehensive environmental management policy that divides the area into four distinct blocks. The Protected Block is strictly reserved for research activities and is inaccessible to the public, requiring a special permit for entry. The Flora and Fauna Development Block serves as a sanctuary for wildlife, providing habitat for shelter, foraging, breeding, and rearing offspring. The Intensive Utilization Block allows for the controlled and sustainable use of natural resources for research, educational, and limited tourism purposes. Lastly, the Buffer Area is a transitional zone between the protected areas and surrounding communities, mitigating potential anthropogenic pressures on the reserve's resources.

Beyond the measures above, several additional efforts are crucial to maintaining environmental integrity and carrying capacity, particularly regarding the availability of food plants for Bucerotidae birds. These include the reclamation of degraded forest areas, enhancing public awareness and understanding of forest functions, strengthening monitoring and surveillance systems, and intensifying law enforcement within the Tahura Pocut Meurah Intan forest area. Effective law enforcement necessitates collaboration among various stakeholders, including forest police, local police, community members, and non-governmental environmental organizations. Furthermore, it is imperative to strengthen legal action against individuals or entities responsible for forest destruction.

The proposed model for addressing food availability for Bucerotidae birds is specifically tailored to the environmental context of Tahura Pocut Meurah Intan, particularly considering the deforestation that has occurred in certain areas. Reclamation efforts are essential to restore these degraded areas to their natural state. Table 3 lists recommended plant species for reclamation activities within Tahura Pocut Meurah Intan, prioritizing those that serve as food sources and nesting sites for Bucerotidae birds. These include species from families such as Moraceae, Lauraceae, Phyllanthaceae, Myristicaceae, Burseraceae, Dipterocarpaceae, and Anacardiaceae. The selected plants are locally sourced, characterized by rapid growth rates, and readily available (Safaruddin, 2022). This selection aligns with the criteria outlined by (Setyowati, 2017 & Taqiyuddin et al., 2020) for reclamation plant species, which emphasize the use of local pioneer species with rapid growth, low maintenance requirements, high litter production, and decomposition rates, robust root systems capable of symbiotic or reciprocal relationships with microbes, the ability to attract seed dispersers, and ease of propagation, planting, and maintenance.

Conclusion

The findings of this study indicate that forest destruction within Tahura Pocut Meurah Intan is primarily driven by the conversion of forest land for plantations, illegal logging activities, and forest fires intentionally set to clear land for commercial purposes. This deforestation has resulted in a decline in the availability of food plants for Bucerotidae birds, with only nine species remaining, predominantly from the families Moraceae (77%), Euphorbiaceae (14%), and Phyllanthaceae (9%). Ensuring the sustained availability of food plant resources for the Bucerotidae family necessitates a multi-pronged approach: Habitat restoration through the reclamation of degraded forest areas is crucial; Enhancing community awareness regarding the ecological and economic importance of forest ecosystems is essential for promoting sustainable practices; Bolstering surveillance and enforcement within the Tahura Pocut Meurah Intan forest area, through increased monitoring and the active involvement of Forest Police, law enforcement agencies, local communities, and environmental NGOs, is vital to deter illegal activities and protect existing resources; And consistent application of existing environmental regulations is paramount to ensure the long-term preservation of the Bucerotidae food plant supply.

Conflict of Interest

All authors declare no conflict of interest. Contributions to this research were distributed equitably among all authors, thus justifying co-authorship. While the first author led data acquisition regarding forest degradation within the Tahura Pocut Meurah Intan ecosystem, all authors contributed equally to methodological design, analysis, conclusion formulation, manuscript preparation, and revision.

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