



The Diversity and Potential of Avitourism in Peat Swamp Ecosystem of Ayer Hitam Utara Forest Reserve, Johor

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Abstract: Avitourism is a responsible tourism activity where birdwatchers perform bird-watching, which can be either a hobby or a dedicated practice. Bird-watching is an act of observing and identifying birds in their natural environment. It can be performed by using the naked eye, using binoculars or scope for visual enhancement, listening to bird songs, or using public cams. Ayer Hitam Utara Forest Reserve is a peat swamp forest, a type of tropical moist forest with a dense layer of acidic peat and serves as a habitat for a diverse range of species. This study aims to identify bird species present in Ayer Hitam Utara Forest Reserve and evaluate the potential of avitourism in Ayer Hitam Utara Forest Reserve. A questionnaire was passed to 51 respondents to collect their opinions on developing Ayer Hitam Utara Forest Reserve as an avitourism site. Point count method and mist-netting were performed to record bird species spotted during the sampling period. The sampling has recorded 33 species in total, where there are 2 Vulnerable, 3 Near-Threatened, and 1 Endangered species, and 20 out of 33 species are totally protected under Wildlife Conservation Act 2010. The respondents have given generally positive response and are interested in visiting Ayer Hitam Utara Forest Reserve. Avitourism can potentially benefit Ayer Hitam Utara Forest Reserve economically, socially, and environmentally to local people.

Keywords: Avitourism, bird-watching, Ayer Hitam Utara Forest Reserve, peat swamp forest

1. Introduction

Avitourism refers to the responsible act of observing and identifying birds in their natural environment, which is usually known as bird-watching or birding. It has quickly become the fastest-growing segment of ecotourism, contributing significantly to the socio-economic growth and poverty reduction of many poor local communities and the conservation and development of threatened natural zones around the world [1]. In Malaysia, there are a few active bird-watching clubs and societies, for example, Malaysian Nature Society (MNS), BirdLife Malaysia, and Wild Bird Club of Malaysia. The rapid rise of birdwatching, as well as its significant potential for providing a financial incentive for local people to safeguard natural places, necessitates a full conservation biology evaluation of the activity [2].

Bird-watching has grown in popularity due to a rise in nature-based television programs being created worldwide. The increasing popularity, in turn, attracts potential avitourists to travel abroad primarily as a means of escaping the concrete jungles of modern cities to experience the world's unique place and to see exotic species [3]. Avitourists are eco-tourists who express the purpose of appreciating, learning, and celebrating birdlife by enjoying the concept of

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travelling to relatively undisturbed or unpolluted natural areas. They have the unique opportunity to immerse themselves in nature in a way that most people cannot do in their ordinary, urban lives [4].

Ayer Hitam Utara Forest Reserve (AHU Forest Reserve) in Johor is the last remaining undisturbed natural peat swamp forest. In this place, where the area is gazetted as permanent Forest Reserve, and there are no published bird records. This area's potential as an avitourism destination has also been overlooked. Malaysia has many protected areas intended to conserve local and endemic species in Malaysia by providing a proper habitat for them, and the peat swamp forest in AHU Forest Reserve is one of them. AHU Forest Reserve is a forest reserve, serves as a preserved habitat for flora and fauna. Harvesting any natural resources in a protected area is prohibited [5], but merely observing them and causing no harm to them can be one of the possible economic sources from protected areas.

Therefore, this study aims to identify bird species present in Ayer Hitam Utara Forest Reserve and evaluate the potential of avitourism in Ayer Hitam Utara Forest Reserve.

2. Methodology

2.1 Study Area

Ayer Hitam Utara Forest Reserve is a peat swamp ecosystem. Ayer Hitam Utara Forest Reserve is a forest in Johor and has an elevation of 11 metres, covering with 3,797 hectares. Ayer Hitam Utara Forest Reserve is situated west of Kampung Sri Majujaya, close to Tanah Kurnia Parit Sonto. Sampling is performed within the two trails of AHU Forest Reserve. Figure 1 shows the location of the study area.

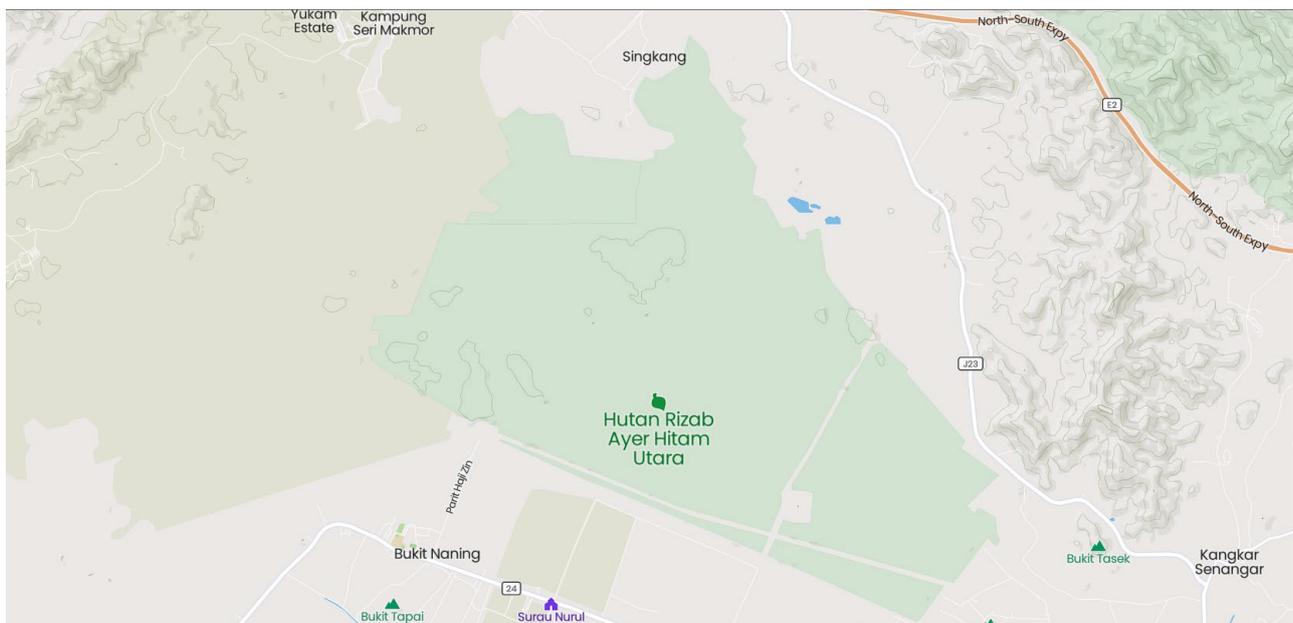


Fig. 1 - Location and approximate area of AHU Forest Reserve

2.2 Sampling Methods

Two methods were used for this study: the active method (point count) and the passive method (mist-netting). A line transects of 800m have been established within the trail of AHU Forest Reserve with four survey stations that distanced 200m from each other. Any birds seen or heard within a 50m radius have been recorded. This method is used because AHU Forest Reserve is a peat swamp forest and making plot transect is not viable. Additionally, this method increased the possibility of encountering shy and hidden species [6]. 7 mist nets were deployed in the left and right trail of AHU Forest Reserve, and the coordinates were recorded. Captured or recorded bird species will be identified using a reliable guide. This method captures small to medium-sized low canopy flying species [6]. The evaluation of the potential of AHU Forest Reserve to be an avitourism site is further perceived via gauging species against criterias of good nature tourism, and using a questionnaire and was given to 51 respondents, as they potentially can become a visitor of AHU Forest Reserve. Interviews were performed with the locals to gather possible information about the landscape, bird species, and others.

3. Results and Discussion

3.1 Bird species composition at Ayer Hitam Utara Forest Reserve, Muar, Johor

The total number of recorded bird species within the sampling period, combine with the list given by Nature Educational Society (NEST) and Jabatan Perhutanan Negeri Johor about the bird species is 33 species. 27 out of 33 species were listed as Least Concern (LC), 3 out of 33 species listed as Near-Threatened (NT), 2 out of 33 species listed as Vulnerable (VU), and one species listed as Endangered (EN), in accordance to IUCN Red List of Threatened Species. A summary of recorded species is shown in table 1.

Table 1 - Recorded species in AHU forest reserve

No	Scientific Name	Name	Local Name	Coodinates	Residential Status (myBIS, 2021)	Conservation Status (IUCN, 2021)	Conservation Status (Act 716, 2010)	Current Study Nov 2021	NEST, JPNJ Feb 2021
Mist-netting									
1.	<i>Copsychus malabaricus</i>	White-rumped Shama	Murai batu	2°3'2"N-102°49'38"E	Native	LC	Protected	√	
2.	<i>Rubigula erythrophthalmos</i>	Spectacled Bulbul	Merbah kecil	2°3'2"N-102°49'40"E	Native	LC	Not Listed	√	
Observation									
1.	<i>Pycnonotus plumosus</i>	Olive-winged Bulbul	Merbah Belukar		Native	LC	Totally Protected	√	
3.	<i>Spilornis cheela</i>	Crested Serpent Eagle	Helang berjambul		Native	LC	Totally Protected	√	√
4.	<i>Nisaetus cirrhatus</i>	Changeable Hawk-eagle	Helang Hindek		Non-native	LC	Not Listed	√	
5.	<i>Aerodramus fuciphagus</i>	White-nest Swiftlets	Layang-layang Gua		Native	LC	Not Listed	√	
Interview									
1.	<i>Cypsiurus balasiensis</i>	Asian Palm Swift	Layang-layang Asia		Native	LC	Totally Protected	√	
2.	<i>Anthracoceros malayanus</i>	Black Hornbill	Burung Kekek		Native	VU	Totally Protected	√	√
3.	<i>Chalcophaps indica</i>	Emerald Dove	Punai Tanah		Native	LC	Protected	√	
4.	<i>Caprimulgus macrurus</i>	Large-tailed Nightjar	Tukang Kubur		Native	LC	Totally Protected	√	
5.	<i>Aegithina tiphia</i>	Common Iora	Kelicap Kunyit		Native	LC	Totally Protected	√	
Sound Recording									
1.	<i>Macronous ptilosus</i>	Fluffy-backed Tit-babbler	Burung Pong Pong		Native	NT	Totally Protected	√	
2.	<i>Psilopogon duvaucelii</i>	Blue-eared Barbet	Takur Akar		Native	LC	Not Listed	√	
3.	<i>Halcyon smyrnensis</i>	White-throated Kingfisher	Pekaka Belukaar		Native	LC	Totally Protected	√	√
List from NEST and JPNJ									
1.	<i>Gracula religiosa</i>	Hill Myna	Tiong Emas		Native	LC	Totally Protected		√
2.	<i>Acridotheres javanicus</i>	Javan Myna	Tiong Jawa		Introduce	VU	Totally Protected		√
3.	<i>Acridotheres tristis</i>	Common Myna	Tiong Gembala Kerbau		Native	LC	Totally Protected		√
4.	<i>Rhinortha chlorophaea</i>	Raffles's Malkoha	Cenuk Kecil		Native	LC	Not Listed		√

5.	<i>Meiglyptes tristis</i>	Buff-rumped Woodpecker	Layang-layang Gua	Non-native	EN	Not Listed	√
6.	<i>Dryocopus javensis</i>	White-bellied Woodpecker	Belatuk biji Nangka	Native	LC	Protected	√
7.	<i>Anthracoceros albirostris</i>	Oriental Pied Hornbill	Eggang Kelingking	Native	LC	Not Listed	√
8.	<i>Pycnonotus brunneus</i>	Red-eyed bulbul	Merbah Mata Merah	Native	LC	Not Listed	√
9.	<i>Pycnonotus simplex</i>	Cream Vented Bulbul	Merbah Mata Putih	Native	LC	Not Listed	√
10.	<i>Muscicapa dauurica</i>	Asian Brown Flycatcher	Sambar Asia	Migrant	LC	Totally Protected	√
11.	<i>Merops viridis</i>	Blue-throated Bee-eater	Beberek Ekor Biru	Native	LC	Totally Protected	√
12.	<i>Eurystomus orientalis</i>	Dollar bird	Tiong Batu	Native	LC	Totally Protected	√
13.	<i>Geopelia striata</i>	Zebra Dove	Merbuk	Native	LC	Totally Protected	√
14.	<i>Spilopelia chinensis</i>	Spotted Dove	Tekukur	Common	LC	Totally Protected	√
15.	<i>Dicaeum trigonostigma</i>	Orange-bellied Flowerpecker	Sepah Bunga Perut Jingga	Native	LC	Totally Protected	√
16.	<i>Dicrurus paradiseus</i>	Racket-tailed Drongo	Hamba Kera	Native	LC	Totally Protected	√
17.	<i>Chloropsis cyanopogon</i>	Lesser Green Leafbird	Burung Daun Kecil	Native	LC	Totally Protected	√
18.	<i>Eurylaimus ochromalus</i>	Black-and-Yellow Broadbill	Takau Hitam-Kuning	Native	LC	Not Listed	√

Keywords: LC = Least concern, BT = Near Threatened, VU = Vulnerable, EN = Endangered

Footnotes: √ = Present

3.2 Evaluation of Potential of Avitourism in AHU Forest Reserve Based on Bird Species

The flagship species were identified using the checklist of bird species found in AHU Forest Reserve. As flagship species, birds that met most of the requirements for good nature tourism products were chosen [7]. The summarised result is shown in Table 3. The chosen flagship species are white-rumped shama, crested serpent eagle, black hornbill, white throated kingfisher and oriental pied hornbill, as they all have at least achieved 4 criteria and all of them are either protected or totally protected. The criteria were modified as there is no species are really endemic to the forest, so ‘Endemic’ was omitted.

Table 2 - Evaluation of flagship species based on modified criteria of good nature tourism product by WTO and UNDP (2021)

Criteria	Species				
	White-rumped Shama (<i>C. malabaricus</i>)	Crested Serpent Eagle (<i>S. cheela</i>)	Black hornbill (<i>A. malayanus</i>)	White throated kingfisher (<i>H. smyrnensis</i>)	Oriental pied hornbill (<i>A. albirostris</i>)
Safety	√	√	√	√	√
Reliability of sighting	√	√	√	√	√
Morphological Attractiveness	√	√	√	√	√
Behavioural Enticement	√	√	√	√	√
Rarity			√		
Cultural Linkages	√		√		√
Conservation Status	Protected	Totally Protected	Totally Protected	Totally Protected	Totally Protected

3.2.1 White-Rumped Shama (*Copsychus Malabaricus*)

White-rumped Shama (*C. malabaricus*) has met 5 out of 6 criteria: safety, reliability, morphological attractiveness, behavioural enticement, and cultural linkages. This species is classified as protected species under Wildlife Conservation Act 2010 [8]. White-rumped shama is safe to watch, as their diet is made out of insects such as cockroaches and grasshoppers and are not aggressive toward humans. This species is native to the Indian subcontinent, Southern China, Southeast Asia, and the Greater Sunda's scrub and secondary forests, but were introduced to Kauai, Hawaii, in early 1931 by Alexander Isenberger and OAHU Forest Reserve in 1940 by the Hui Manu Society. [9] [10]. They can be found in overgrown orchards and plantations and dense lowland and hill forests, forest edges [11]. During the sampling period, one individual was successfully captured in Denai Interpretasi, and the coordinate is shown in Table 1, where the mist net is placed under a low canopy. The individual is captured in a relatively crowded low canopy. Thus it has a higher chance to spot them in the forest.

The white outer feathers and white rump distinguish this thrush-like bird with a long, black wedge-shaped tail. Males have a glossy black upper body and a bright chestnut underbelly. Females, though similar to males, are paler. Juveniles have rusty wing bars and are reddish-brown. [10]. Figure 2 shows the photo of the white-rumped shama. White-rumped shama is a shy bird with a strong voice that sings low perch. It has a loud, unique, and rich fluty melodic singing with much diversity in its voice. It could also be a sequence of sharp chaks. They are excellent imitators of other birds' and noises' songs, and it is usually assumed that at least half of their song comes from mimicry. They frequently jump around on the ground while holding their tails high. [10]

In Iban culture, white-rumped shama is viewed as the eighth omen bird and has the name 'Nendak'. Nendak is the son of Sibal Ibal, who lives in the valley at the waterfall foot, surrounded by trees and streams. Nendak is interpreted as an omen bird in farming, family matters, hunting, and travelling. One of the examples of the omen is that it is a good omen if one hears the voice of Nendak birds three times as they move into a new longhouse, one from the right side of the road and the others from the left. They expect living in this house will keep one healthy [12].

3.2.2 Crested Serpent Eagle (*Spilornis Cheela*)

Crested Serpent Eagle (*S. cheela*) has met 4 out of 6 criteria: safety, reliability, morphological attractiveness, and behavioural enticement. This species is classified as totally protected under Wildlife Conservation Act 2010 [8]. Crested Serpent Eagle is safe to watch, as they usually soar in the sky or within canopy and crowns and are usually not aggressive to human presence. This species is spread from the Indian subcontinent and southern China to the Greater Sundas, Bali, and the Philippines. They are ubiquitous residents from low elevations up to 1900 metres. They usually reside at mangroves, scrub, forests, and forest edges. [10]. Multiple individuals of this species were spotted at the forest edge and soaring in the sky in AHU Forest Reserve, where most were seen to fly in pairs. They are relatively easy to spot as they have a wide wingspan and recognisable underwing pattern.

Crested Serpent Eagle has quite recognisable characteristics, as it is a dark eagle with blackish nuchal crest and white patches, stocky, short-tailed, and short-necked. Wings are kept in a shallow 'V' during soaring. Dark brown plumage with white dots on lower breast and belly, slightly paler below (not visible when feathers are ruffled on wet birds). The tail is patterned with a broad white centre tail band and a tiny sharp white tip with alternating black and white bands. Bill is blackish with a yellow cere. Legs are bright yellow. Dark brown larger wing-coverts dotted white and white band bordering the thin black trailing edge of the wing in the underwing flight pattern. [10] Figure 3 shows the photo of the crested serpent eagle.

According to Forest Research Institute Malaysia [13], this bird prefers to hunt from a high perch among clearings, open woodlands, and wet grassland habitats. However, although the occurrence is rare, it is possible to observe it strolling on the ground in quest of food at FRIM. Snake hunting can be perilous, but this fearsome and yellow-faced hawk has armour-like scales on its legs to protect it from snake bites. This hawk will usually be hovering and soaring in the air about noon, rising on a thermal. It usually makes a harsh whistle that sounds like a bicycle pump, "iluii..kii-kii-kii-kiiluii." When disturbed, this giant bird makes much noise and raises its crest.

3.2.3 White-Throated Kingfisher (*Halcyon Smyrnensis*)

White-throated kingfisher (*H. smyrnensis*) has met 4 out of 6 criteria: safety, reliability, morphological attractiveness, and behavioural enticement. This species is classified as totally protected under Wildlife Conservation Act 2010 [8]. White-throated kingfisher, also known as white-throated kingfisher, is safe to watch. Their diet comprises insects, crustaceans, and amphibians and is generally not aggressive to humans [14] [15]. Although no individuals were captured or observed, multiple instances of sound recordings of this species were recorded. The recordings were obtained in the morning around 10 a.m. when the weather remained sunny. The location is mainly around the forest edge of AHU Forest Reserve.

The white-throated kingfisher can be found throughout Turkey, the Middle East, southern China, South and Southeast Asia, and Sumatra, Java, and the Philippines. They are common and widespread at low levels but have also been seen at 830 metres below the Genting Highlands (Pahang). Inland throughout Peninsular Malaysia, this species is the most frequent kingfisher. Their primary habitats are scrub, mangrove and forest borders, rice fields, cultivated land, plantations, gardens, and extensive forested river courses. Despite being kingfishers, they are not particularly attached to water [10] [15].

The white-throated kingfisher's back, wings, and tail are all vivid blue. The unmistakable large bill and legs are brilliant red. It has a bright chocolate brown head, shoulders, flanks, and lower abdomen, with a white throat and breast. Large white patches can be seen on the blue and black wings in flight. The white-throated kingfisher flies quickly and directly by whirring its tiny, rounded wings. [10] [16]. Figure 4 shows the photo of the white-throated kingfisher.

Several unusual behaviours can be observed from this species, one of them being their feeding method. To catch giant insects, reptiles, and amphibians, they frequently use bare branches, fence posts, and telephone wires as vantage positions. To properly consume its captured prey, it will first make sure its prey stops struggling, such as hitting it on a hard surface like a rock. Then, it will toss its prey mid-air and swallow it using its oversized beak. Bathing, grooming, and perching are also observed [17].

3.2.4 Black Hornbill (*Anthracoceros Malayanus*)

Black hornbill (*A. malayanus*) has met 6 out of 6 criteria: safety, reliability, morphological attractiveness, behavioural enticement, rarity, and cultural linkages. This species is classified as a totally protected species under Wildlife Conservation Act 2010 [8]. Black hornbill is safe to watch, as their diet is mainly made out of fruits, especially nutmeg and fig, and are not aggressive to humans. This species is also the critical seed dispenser of a durian species, *Durio graveolens*, which earned its name durian anggag by Kenyah and Dayak people [17] [19]. An instance of the sound of this species was heard at the forest edge. The sound was unable to be recorded due to disturbance. Around two individuals were spotted around the upper canopy, and they reached the trees, which were assumed to be their nests. Figure 5 shows the photo of a male black hornbill.

Black hornbills can be found all across the Malay Peninsula and in Sumatra and Borneo. They are primarily found at low elevations of up to 200 metres in the Johor region. Forests or forest edges are their natural habitats [10]. Although this species does not become endemic to specifically a country, according to MyBis, black hornbills are endemic to Sundaland, where they are not found outside of this region. The black hornbill is a smoky black bird with a vast, heavy bone-white bill and casque in males and dark in females. Most have a complete blackhead, while some have a prominent white supercilium. Females have a weaker, lighter eyebrow stripe and reddish skin around the eyes, all-black wings and underparts with white tail tip outer margins in underwing flight pattern [10].

Black hornbills can be seen in a singular individual, in small loose groups of up to five in the canopy, while bigger groups have been known to form. The black hornbill is a self-governing pair during the breeding season. They will occasionally descend to the ground to feed [10]. The pair will build a nest in a hollow trunk using various materials such as wet soil, pellets, figs, and more. The female will build from the inside, and the male will build from the outside and cover the hole until only the beak of the female fits the slit. When the female is nesting, she becomes entirely reliant on the male to give food through the nest's slit hole [20].

3.2.5 Oriental Pied Hornbill (*Anthracoceros Albirostris*)

Oriental pied hornbill (*A. albirostris*) has met 5 out of 6 criteria: safety, reliability, morphological attractiveness, behavioural enticement, and cultural linkages. This species is classified as a totally protected species under Wildlife Conservation Act 2010 [8]. Oriental pied hornbill is safe to watch as it predominantly eats insects and tiny vertebrates that it finds on the ground. At the same time, it also collects to feed in fruiting trees and is tame and adaptable towards humans. This species' range extends from the Indian subcontinent and southern China to the Greater Sundas and Bali. They are mostly found at low elevations but have been as high as 150 metres. They can be seen in couples or loose groups on the canopy and middle stories [10] [21].

Oriental pied hornbill has a whitish-yellow bill and casque and is smaller with black-and-white feathers. The majority of the bird is black, but it has a complimentary white belly, face patch below the eye, and the edges of its wings and tail. Males and females have identical casque, but males have a significantly larger casque than females, while the casque of the females has more blackish markings than males. Oriental pied hornbill has black breast and wings with a white trailing edge contrast with a striking white belly and tail in the underwing [10].

Oriental pied hornbill has similar nesting habits to black hornbill, but the nest has a rounder cavity entrance shape and is more tolerable in disturbed habitats [22]. They are usually noisy and social with their flockmates, where they often give out high-pitched cackling bray with voice patterns like 'kek- kek- kek- kek...' [10]. Figure 6 shows the photo of the oriental pied hornbill.

3.2.6 Hornbills in Malaysian Culture

For the people of Sarawak, particularly the Dayak groups, the hornbill is both a vital bird and a cultural emblem. Hornbills represent the spirit of God to the Dayaks, and they must be treated with care. If a hornbill is observed flying over or visiting their homes, it is thought that the town will be blessed with good luck and fortune. Their arts, dances, carvings, and ceremonial clothing all have hornbill motifs [23] [24] [25].

Datun Julud, or Hornbill Dance, is a traditional dance performed by the Orang Ulu tribes, including the Kelabit, Kayan, and Kenyah. The female dances while wearing a hornbill feather headdress. The dancer also carries hornbill feather fans, which she deftly sweeps up and down to symbolise the hornbill in flight. Up to four women may dance together on occasion. The sape, a traditional lute instrument, is used to accompany the dancing [26]. There is no limit to the number of dancers who can perform for tourists nowadays.

3.3 Evaluation of Potential of Avitourism in AHU Forest Reserve Based on Survey

The potential of avitourism in AHU Forest Reserve is also evaluated using a survey. 51 respondents answered a set of questionnaires in the public as they are potential visitors of AHU Forest Reserve. Table 4 shows the demography of the respondents.

Table 3 - Demography of the respondents

Demographic information	Item	Total Number	Percentage (%)
Gender	Male	41	80.4
	Female	10	19.6
Age group	<21	4	7.8
	21-30	44	86.3
	31-40	2	3.9
	>51	1	2
Race	Malay	40	78.4
	Chinese	10	19.6
	Other	1	2

For Section B, the questions are meant to evaluate the knowledge of the public about birds, peat swamp forest, ecotourism and avitourism, and AHU Forest Reserve. Table 5 shows summarise the results of the section.

Table 4 - Summary of general knowledge on avitourism and AHU Forest Reserve among the respondents

Question	Option	Total Number	Percentage (%)
Do you think birds are interesting animals?	Yes	48	94.1
	Maybe	3	5.9
Do you think birds are important to the environment and local community?	Yes	51	100
Do you know what is peat swamp forest?	Yes	42	82.4
	No	6	11.8
	Maybe	3	5.9
Do you think peat swamp forest is an important ecosystem to Malaysia?	Yes	45	88.2
	Maybe	6	11.8
Have you visited Ayer Hitam Utara Forest Reserve?	Yes	17	33.3
	No	34	66.7
Do you aware that are tourism activities in this forest reserve?	Yes	28	54.9
	No	24	45.1
Do you know about ecotourism and avitourism?	Yes	38	74.5
	No	13	25.5
If yes, have you experienced them before?	Yes	23	50
	No	23	50

For Section C, the questions evaluate the respondents' interest in avitourism in AHU Forest Reserve. Table 6 shows the summarised results of the section.

Table 5 - Summary of the interest among the respondents toward avitourism in AHU forest reserve

Question	Option	Total Number	Percentage (%)
Do you know what is birding/birdwatching?	Yes	46	90.2
	No	3	5.9
	Maybe	2	3.9
Do you think these birds are interesting?	Yes	51	100
Many other birds are found in AHU Forest Reserve, do you think they have the potential to attract visitors to visit AHU Forest Reserve?	Yes	49	96.1
	Maybe	2	3.9
Do you interest in visiting AHU Forest Reserve for birdwatching?	Yes	48	94.1
	Maybe	3	5.9
Do you think avitourism is beneficial for the birds and the environment?	Yes	47	92.2
	Maybe	4	7.8
What types of behavior should be prohibited in the reserve?	Destroying the trees	48	94.1
	Littering	42	82.4
	Catching animals without permission	49	96.1
	Smoking	30	58.8
	Making unnecessary noises	33	64.7

From the data collected from the respondents, in general, they are relatively knowledgeable on birds and peat swamp forests about their role and importance towards the environment. Most respondents know ecotourism and avitourism, but half have yet to experience them. Most respondents have raised interest in visiting AHU Forest Reserve for avitourism and would like to view the birds in AHU Forest Reserve in the future. Even though most respondents had yet to visit AHU Forest Reserve, half of them are aware of the tourism activities in reserve.

To summarise the findings, many bird species were found in AHU Forest Reserve during the sampling period. Among the recorded species, five species that have met the most criteria of good nature tourism products were chosen to become flagship species of avitourism in AHU Forest Reserve potentially. The other recorded species can also attract visitors for various reasons, appearances, behaviour, and rarity. According to the survey, the respondents generally show interest in visiting AHU Forest Reserve and the bird species that reside with the reserve. Thus, based on the responses and findings, AHU Forest Reserve can be developed as an avitourism site.

3.4 Benefits of Avitourism

Avitourism, when appropriately managed, can bring benefits to Ayer Hitam Utara Forest Reserve via three aspects: economic, social, and environmental. Bird watchers are generally wealthy and willing to travel to other regions and nations to search for their targeted species. Moreover, they tend to stay at one location for an extended period and spend more money. With a good partnership with private companies or NGOs, avitourism can generate new job opportunities for the local community surrounding Ayer Hitam Utara Forest Reserve either directly, such as being a nature tour guide, forest ranger, or indirectly, such as providing transportation and accommodation for the visitors [1] [4] [27].

Avitourism can also benefit in terms of social. Ecotourism development is frequently followed by improvements in infrastructure, telecommunications, and other public utilities, all of which can improve residents' living standards. It can also be used as part of a strategy to reduce poverty and unemployment. Any money earned thus provides a significant incentive for locals to protect the environment and improve their wellbeing [1] [4]. Maldonado and his colleges have reported that in Columbia, bird-watching tourism can act as a very effective method for the recovery of the war victims through training local people to gain essential skills via local bird-based tour companies and tour agencies. They also suggested that bird watching tourism can encourage investment in food, handicrafts, housing, and transportation improvement for locals and visitors.

Avitourism is a method for generating economic income that, when adequately reinvested, can help advance natural species conservation [28]. Bird-watching tourism can raise cash for government and privately managed protected areas, educate the public about the importance of natural ecosystems, and give alternative livelihoods to unsustainable extractive industries [29]. For conservation, non-monetary benefits, such as local ownership and property rights, education, equity, and empowerment for the local communities, are frequently more essential than monetary incentives [27].

Bird watchers also play a role in the conservation effort, as in general, birders are viewed as environmentally aware. They are aware of the environmental importance of birds, show their desire to understand more about the birds, environmental appropriation towards the birds, as well as concern towards them, and they are willing to contribute to conservational efforts for the birds [28] [30] [31]. Given that bird species appear to be drivers of preference among avitour enterprises' choice of sites, there is potential to enhance awareness of their conservation status among avitour operators and their clients [31].

An example of a successful avitourism site is Mingxi County, China. According to Liu and her colleges [32], in ecotourism, ecological advantages are translated into social and economic benefits. The social benefit is represented by consumer surplus, which is the trip cost that these passengers are willing and able to pay, but the actual payment is less than this part; that is, the benefit acquired by birdwatchers without accurate payment is fundamentally a form of social welfare. The higher the consumer surplus, the greater the resulting societal benefit. Mingxi County has acquired better social, economic, and environmental benefits from eco-birdwatching tourism, thus pushing local tourism into advanced development level.

AHU Forest Reserve has species listed in Vulnerable, Near Threatened, and Endangered in IUCN Red List, and most of the species were listed as Protected or Totally Protected under Wildlife Conservation Act 2010. Therefore, promoting AHU Forest Reserve as an avitourism site can act as a conservation method for the bird species and the reserve as a whole. There are a few examples that have proven to help not only the environment but also the communities surrounding it when ecotourism is developed. The study of Prentice has proven that a properly planned ecotourism is able to generate new job opportunities for the local communities around Tasik Bera, as well as preserving biodiversity within the environment of Tasik Bera. [33]

3.5 Potential of AHU Forest Reserve to be Avitourism Site

In AHU Forest Reserve, there are already some trails that are ready to be use as a walkway for birdwatchers or general visitors. A bird watching package can be planned where AHU Forest Reserve can hire professional bird watching guides where the guide guides a group of people to enter AHU Forest Reserve and choose the most optimal route for the visitors to have higher chance of spotting more bird species. There can have different group size, which can be one to one, 3 people or 5 people, where each size will have different price points. A small stall can be open as a renting spot for the visitors to rent binoculars and spotter scope. Packages that includes a number of binoculars, and suitable bird feed can be designed as well.

A souvenir shop can be opened near the entrance/exit of AHU Forest Reserve, not only this will minimize the disturbance that could imbue on AHU Forest Reserve, but also a strategic position to boost sales as visitors would like to buy something to commemorate their experiences and memories in AHU Forest Reserve before leaving the reserve. A suitable logo should be design for better promotion and recognizable image. One of the ideas for the souvenirs is light wooden bookmark made from the woods found in AHU Forest Reserve and has carvings of the bird species found in AHU Forest Reserve. Other ideas can be tote bags with printings of bird species or logo of AHU Forest Reserve, refrigerator magnets with bird species or the logo, special photo frames and printing services, and much more.

4. Conclusion

The evaluation from this study has shown that Ayer Hitam Utara Forest Reserve has a substantial number of bird species that can become an attraction to pull visitors and bird watchers to Ayer Hitam Utara Forest. Moreover, most recorded birds were protected or totally protected under Malaysian law. Therefore, making Ayer Hitam Utara Forest Reserve an avitourism site can be an effective method to share the awareness of the importance of the birds and peat swamp forest. The respondents are very aware of the importance of bird species and peat swamp. Although they have not visited Ayer Hitam Utara Forest Reserve before, almost all respondents have shown interest in visiting the reserve. In a nutshell, Ayer Hitam Utara Forest Reserve has the components and potential visitors to be developed as an avitourism site.

4.2 Limitation of The Study

Due to nationwide quarantine and lockdown has occurred in the past year, the sampling time was extremely constrained, which results to only performing sampling for 4 days. Though same data about the bird species that occurred in Ayer Hitam Utara Forest Reserve was obtained, this is not a very complete data due to the limited sampling period. Moreover, during one of the sampling days, heavy rain occur which discouraged the presence of any bird species, as well as hindering any sampling activities for safety reasons. In addition, during one of the sampling days, workers who are assumed from the nearby palm tree plantation site was encountered. They use motorized device to obtain water from the river, which generates loud noises, and became one of the disturbing factors as the noise discouraged the appearance of bird species.

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References

- [1] Asefa, A. (2016). Avitourism in Ethiopia: Potential Socio-Economic and Environmental Benefits, Current Status and Suggestions for Future Development. *Ethiopian Journal of Environmental Studies and Management*, 8(2), 983. <https://doi.org/10.4314/ejesm.v8i2.12s>
- [2] Sekercioglu, C. H. (2002). Impacts of birdwatching on human and avian communities. *Environmental Conservation*, 29(3), 282–289. <https://doi.org/10.1017/s0376892902000206>
- [3] Rodger, K., Moore, S. A., & Newsome, D. (2007). Wildlife Tours in Australia: Characteristics, the Place of Science and Sustainable Futures. *Journal of Sustainable Tourism*, 15(2), 160–179. <https://doi.org/10.2167/jost619.0>
- [4] Nicolaides, A. (2013). Promoting Avitourism as a special niche area of Ecotourism in South Africa. *African Journal of Hospitality, Tourism and Leisure*, 2(3).
- [5] Department of Wildlife and National Parks Peninsular Malaysia. (2021). FAQ - Protected Areas. <https://www.wildlife.gov.my/index.php/en/13-awam/121-faq-protected-areas>.
- [6] Whitworth, D., Newman, S., Mundkur, T., & Harris, P. (2007). Wild birds and avian influenza: an introduction to applied field research and disease sampling techniques. Food and Agriculture Organization of the United Nations.
- [7] Jien, L. T., Abdul-Halim, N. S., Hasmi, N. A., & Norazlimi, N. A. (2021). Potential of avitourism in Tanjung Laboh, Johor. *IOP Conference Series: Earth and Environmental Science*, 736(1), 012028. <https://doi.org/10.1088/1755-1315/736/1/012028>
- [8] Malaysia (2010), Wildlife Conservation Act 2010: Act No. 716
- [9] Aguon, C. F. & Conant S. (1994). "Breeding biology of the white-rumped Shama on OAHU Forest Reserve, Hawaii" (PDF). *Wilson Bulletin*. 106 (2): 311–328
- [10] Jeyarajasingam, A. (2012). Field guide to the birds of peninsular Malaysia and Singapore. Oxford University Press.
- [11] Hails, C., & Jarvis, F. (2018). *Birds of Singapore*. Marshall Cavendish Editions.
- [12] Nyanggau Mawar, G. (2008, July 24). Nendak. Iban Cultural Heritage. Retrieved December 24, 2021, from <https://gnmawar.wordpress.com/the-house-of-sengalang-burong-page-1/the-people-of-tansang-kenyalang/nendak/>
- [13] Forest Research Institute Malaysia (2019). Crested Serpent Eagle: The snake hunter. Forest Research Institute Malaysia (FRIM). Retrieved December 24, 2021, from <https://www.frim.gov.my/colour-of-frim/crested-serpent-eagle-the-snake-hunter/>
- [14] Tenshin, R. (1989). *Journal of the Bombay Natural History*. Retrieved December 25, 2021, from <https://www.biodiversitylibrary.org/page/48710848>.
- [15] Gulshan, A. (2019, October 9). Why the white throated kingfisher isn't like any other Kingfisher. *The Hindu*. Retrieved December 25, 2021, from <https://www.thehindu.com/sci-tech/energy-and-environment/why-the-white-throated-kingfisher-isnt-like-any-other-kingfisher/article29628131.ece>
- [16] Fry, C. H. (1999). "Kingfishers, bee-eaters and rollers: A handbook". Christopher Helm.
- [17] Guy, G. (2012, August 15). Hunting white-throated kingfishers. *Hunting White-throated Kingfishers*. Retrieved December 25, 2021, from <http://malaysianwildlifephotography.blogspot.com/2012/07/hunting-white-throated-kingfishers.html>
- [18] Nakashima, Y., Lagan, P., & Kitayama, K. (2007). A study of fruit-frugivore interactions in two species of durian (*Durio*, Bombacaceae) in Sabah, Malaysia. *Biotropica*, 40(2), 255–258. <https://doi.org/10.1111/j.1744-7429.2007.00335.x>
- [19] Rangkong Indonesia. (2018). Black Hornbill. Rangkong Indonesia. Retrieved December 25, 2021, from <https://rangkong.org/en/enggang-in-indonesia/black-hornbill>

- [20] Poulsen, H. (1970). Nesting behaviour of the black-casqued Hornbill *Ceratogymna Atrata* (TEMM.) and the Great Hornbill *Buceros Bicornis* L. *Ornis Scandinavica*, 1(1), 11. <https://doi.org/10.2307/3676330>
- [21] BirdLife International. (2021). Oriental pied hornbill (*anthracoceros albirostris*). BirdLife International. Retrieved December 25, 2021, from <http://datazone.birdlife.org/species/factsheet/oriental-pied-hornbill-anthracoceros-albirostris/text>
- [22] Shukla, U., Prasad, S., Joshi, M., Sridhara, S., & Westcott, D. A. (2015). Nest site characterization of sympatric hornbills in a tropical dry forest. *Current Science*, 108(9), 1725–1730.
- [23] Apau, M. (2015, July 13). The magnificent hornbills of Sarawak. *Borneo Post Online*. Retrieved December 25, 2021, from <https://www.theborneopost.com/2015/07/12/the-magnificent-hornbills-of-sarawak/>
- [24] Ng, W. L. (2018, April 4). Hornbill: 11 facts about Malaysia's National Bird. *Culture Trip*. Retrieved December 25, 2021, from <https://theculturetrip.com/asia/malaysia/articles/hornbill-11-facts-about-malaysias-national-bird/>
- [25] Pengiran, P. (2021). Into the world of hornbills. *WWF Malaysia*. Retrieved December 25, 2021, from <https://www.wwf.org.my/?28465%2FInto-the-World-of-Hornbills>
- [26] *Borneo Talk*. (2020). Allure, mysticism, folklore in the dances of Sarawak. *Borneo Talk*. Retrieved December 25, 2021, from <https://www.borneotalk.com/allure-mysticism-folklore-in-the-dances-of-sarawak/>
- [27] Biggs, D., Turpie, J., Fabricius, C., & Spenceley, A. (2011). The value of Avitourism for conservation and job creation-an analysis from South Africa. *Conservation and Society*, 9(1), 80. <https://doi.org/10.4103/0972-4923.79198>
- [28] Jorge, A., Mora, F. & Pérez Rodríguez, A. C. (2021). Community-based Avitourism as a tool for Environmental Appropriation. 10.34190/IRT.21.015
- [29] Ocampo-Peñuela, N., & Winton, R. S. (2017). Economic and conservation potential of bird-watching tourism in postconflict Colombia. *Tropical Conservation Science*, 10, 194008291773386. <https://doi.org/10.1177/1940082917733862>
- [30] Conradie, N. (2010). International Market Potential of Avitourism in South Africa.
- [31] Steven, R., Morrison, C., Arthur, J. M., & Castley, J. G. (2015). Avitourism and australian important bird and biodiversity areas. *PLOS ONE*, 10(12). <https://doi.org/10.1371/journal.pone.0144445>
- [32] Liu, T., Ma, L., Cheng, L., Hou, Y., & Wen, Y. (2021). Is ecological birdwatching tourism a more effective way to transform the value of ecosystem services? —a case study of birdwatching destinations in Mingxi County, China. *International Journal of Environmental Research and Public Health*, 18(23), 12424. <https://doi.org/10.3390/ijerph182312424>
- [33] Prentice, C., Surut, Z., Christiansen, C., & Sinniah, P. (1998). Community Development Including Ecotourism at Tasek Bera, Malaysia's First Ramsar Site. *Strategies for Wise Use of Wetlands: Best Practices in Participatory Management*, 47–55.

Appendices



Fig. 2 - Photo of White-rumped Shama (taken from ebird, 2017)



Fig. 5 - Photo of male Black Hornbill (taken from ebird, 2009)



Fig. 3 - Photo of Crested Serpent Eagle (taken from ebird, 2015)



Fig. 6 - Photo of Oriental Hornbill (taken from ebird, 2019)



Fig. 4 - Photo of White Throated Kingfisher (taken from ebird, 2009)