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Review on Avian Diversity in Johor State, Malaysia

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Abstract. Johor, the 3rd largest state in peninsular Malaysia after Pahang and Perak, has various forest vegetations accommodating a diverse array of avian species. With this endowment, Johor attracts birders all around the globe to come see them closed up. This paper provides review on avian diversity in Johor state with highlighting areas that accommodate importance species and high species richness. Data on bird diversity were extracted from published journals and online resources (Avibase and Birdlife Internaional). To date, a total of 292 species of birds documented in Johor which are representing 41% of birds recorded in Peninsular Malaysia. The highest species richness recorded at Panti Forest Reserve with a total of 248 species recorded dating as early as 2002. Remarkably, 23% of bird recorded classified as Near Threatened and another 7% listed as Threatened under IUCN Redlist. It is hoped that this review would facilitate future planning and management of conservation areas in Johor.

1. Introduction

Diversity of birds are widely studied throughout Malaysia either in primary, secondary forests or in both types of forest. Most studies are focused on primary forest or protected areas; as these areas are where at least 70% of resident bird species are partly or exclusively dependent on [1, 2].

Forested area in Malaysia is dominated by 89% of dipterocarp forest followed by 7% swamp forest and 3% mangrove forest [3]. Tropical rain forest harbors rich biodiversity because it has different kinds of vegetation due to the high in organic material in the soil; to provide food for the various organisms [4].

The lowland tropical rain forest covers the largest terrestrial biome. Well (1976) [5] defined bird inhabiting lowland rainforest into 3 groups. 1) Hornbill, Barbet and Pigeon, feeding mainly on fruits and insect on the top of canopy, 2) Trogon, Woodpecker and Bulbul at the middle canopy and 3) Pittas, Thrushes, Babbler and Pheasant on the lower part of forest. These stratification shows that different species exploited different forest level depending on their feeding and foraging preferences [6, 7].

Johor with an area of 19, 984 km², is the 3rd largest state in Peninsular Malaysia after Pahang and Perak [8]. This state houses large protected areas such as Endau-Rompin National Park, Panti Forest Reserve and Gunung Ledang National Park. However, huge areas of forest cover within this state had been converted rapidly into other land uses such as agriculture, human settlement, and factories to meet socio-economic demand hereby destroying the forest structure and ecosystem. Thus, it is important to have a database of biodiversity for effective management and conservation for remaining forest areas left [9, 10].

With 450 species of bird recorded in Johor [11], this state should be able to attract birders all around the world. Unfortunately, this state had been ignored as one of a hotspot areas for bird watching activity.



Most hobbyists focus more on traditional hotspot of Gombak, Taman Negara, Fraser's Hill and Kuala Selangor in Pahang and Selangor. Panti Forest Reserve and Bird Sanctuary, Endau-Rompin National Park, Gunung Ledang (Mt Ophir), Tanjung Piai and Pulau Kukup National Parks are the lists of birdwatching sites recognized in Johor state where there are many species of birds to attract [8].

2. Materials and Methods

2.1. Data collection

Data were collected from published journals [8][12][13][14][15][16][17] and online resources (Avibase and Birdlife International) that record on species occurrence and diversity within Johor state. Each resource used different technique to census bird mainly by direct observation and mist-netting method. Study sites included primary and secondary forest of National Parks and Forest Reserve.

2.2. Species Diversity Analysis

Species checklist organized in excel form in systematic order. Species arranged by family, common name, scientific name, IUCN Status and their locality. Data extracted from checklist to draw charts and graphs comparing bird species richness between Johor and Peninsular Malaysia (Table 1), number of species documented on each study site (Figure 1) and the division of birds in Johor based on IUCN status (Figure 2). Taxonomy and Nomenclature of birds were done according to [18]. Locality of each study site were mapped using Map Marker Apps.

3. Results and Discussion

3.1. History of Ornithology in Johor

Specimen of birds in Johor first collected at Mt Ophir (A former name for Gunung Ledang) by William Farquhar sometimes after 1795. Since then, notable naturalists and ornithologists started to collect avian specimens from Gunung Ledang including Alfred Russel Wallace (July-October 1854), Robert Ramsey (1873), John Whitehead (1884-1885), William Davison and Hume [19]. Remarkably, in between 1875-1891, curator of the Raffles Museum, Singapore explored and collected bird specimens in Johor. Besides, Kelham, a military officer explored the northwest and south of Johor and collected specimen at Gunung Pulai in 1879 [20].

In 19s, naturalists start to write and published data on birds inhabiting Johor. Bromley published the first observation of birds in Johor on 1940s and 1950s and there is a written works on woodpecker in Southern Johor done by Hutchinson in 1950. Dennis Batchelor also published a detailed on birds accoutered near Gunung Ledang also in 1950s [8].

The establishment of Malaysian Nature Society (MNS) in 1940 expand the areas of ornithology studies in Johor. Activities of birds observation and ringing was carried out by Royal Air Force Ornithological Society and the Army Birdwatching Club in between 1960 and 1970 and their activities comes to an end in 1971 but continued by MNS members in Johor and Singapore. MNS also collaborated with State Forestry Department to run bird surveys in Endau-Rompin NP in 1980s. They also proposed to the state government in protecting and managing Panti Forest Reserve where in the midst of rapid declination of forest areas. As a result, in 2010 a bird sanctuary opened in Panti FR. Besides, two wetland National Park established at Tanjung Piai and Pulau Kukup as well and a shorebird observation centre opened at Parit Jawa with the encouraged from MNS to the state government as well [8].

3.2. Documented Avian Diversity in Johor

From this survey, a total of 292 species from 62 family recorded in Johor represent 41% of birds in Peninsular Malaysia (AviBase). However, as shown in table 1, Birds from the family(s) of seabird and shorebirds (Laridae, Scolopacidae, Ardeidae), cosmopolitan birds (Rallidae, Anatidae and Collumbidae), and birds of prey (Falconidae) in Johor only had been recorded in a small part from total numbers of species in Peninsular Malaysia. The actual species population from these family(s) in Johor

could be relatively higher than those recorded unfortunately observers might be focusing more to the forest birds rather than seabird/shorebird and it is uncommon to see cosmopolitan birds in forested areas. For birds of prey, it was harder to census them because these species mainly fly at high elevation thus limiting the observation even capturing them. Generally, species from family Accipitridae, Cuculidae (Cuckoo), Muscicapidae (Flycatcher), Picidae (Woodpecker), Pycnonotidae (Bulbul) and Pellorneidae (fulvettas and Ground Babbler) dominate forested areas in Johor.

Nevertheless, 23% from total species recorded in Johor listed as Near Threatened under IUCN redlist. In addition to that, 7% are Threatened with composition of 4% Vulnerable, 2% Endangered and 1% Critically Endangered. The major treat for this population declination is due to habitat destruction as more forested habitat converted into other land uses.

Panti Forest Reserve recorded the highest species richness followed by Gunung Ledang NP. This may be due to several reasons. More journal published documented on species diversity of birds in Panti Forest Reserve than any other sites. Nature Society (Singapore) did bird surveys in Panti FR consecutively to monitor population trends of birds from 2009 till 2010 [13][14][15][16]. On the other hands, due to large and rich assemblage of habitat, combination of lowland and hill dipterocarp forest, fresh water swamp forest and small patch of submontane and heath forest enable Panti FR to accommodate variety of birds depending on their habitat preference [12].

Previously, a rapid assessment on vertebrates had been done at Gunung Ledang NP which includes assessing avian population. Yet, the data was not enough to conclude overall population of avian inhabiting the area as the assessment had been carried out shortly within 7 days in November 2011. Reported by [21] a total of 253 bird species recorded in Endau Rompin NP unfortunately there was no published journal checklist of birds in this area. Only important species highlighted by International Birdlife in their website. There is no data checklist on birds inhabiting Pulau Kukup and Tanjung Piai as well but these areas importance as a feeding ground for certain threatened species [8].

3.3. Sites and their species highlight

3.3.1. Panti FR. Panti FR (13410 ha), had been gazetted as a Permanent Forest Reserve since 1979. Panti FR located in southeast of Johor lies near the centre of ‘Sundaland Biodiversity Hotspot’, where this place is the second in rank after Tropical Andes for their rich diversity of species diversity and high endemism[22]. Panti FR is covered by various forest ecosystems including lowland and highland dipterocarp forest, freshwater swamp, sub-montane forest, heath forest and riparian ecosystem. Bunker trail in Panti FR is an attraction for bird lovers; where through this trail, various kinds of bird species could be found. Thus the Malaysian government decided to gazette this area as a bird sanctuary and recognized it as one of the birding hotspots in Johor [23]. In total, 59 species recorded in Panti listed as Near Threatened and 9 species listed Threatened comprise of 7 Vulnerable [Greater Green Leafbird (*Chloropsis sonnerati*), Lesser Green Leafbird (*Chloropsis cyanopogon*), Short-toed Coucal (*Centropus rectunguis*), Malay Crestless Fireback (*Lophura erythrophthalma*), Malay Peacock-Pheasant (*Polyplectron malacense*), Great Slaty Woodpecker (*Mulleripicus pulverulentus*) and Javan Myna (*Acridotheres javanica*)], 1 Endangered [Buff-rumped (Woodpecker *Meiglyptes tristis*)] and 1 Critically Endangered [Helmeted Hornbill (*Rhinoplax vigil*)].

3.3.2 Gunung Ledang NP. Gunung Ledang NP lies inside Johor’s border with the Melaka state, approximately 12 km from Tangkak Town in Muar district. This national park was gazette on 3rd October 2003 which covers an area of 8675.2 ha. The highest point is at an elevation of 1276m (4186ft). Gunung Ledang NP ranked 64th highest mountain in Malaysia which is the highest point of southern Peninsular Malaysia. Gunung Ledang NP have four different types of vegetation comprises of lowland dipterocarp forest, high dipterocarp forest, montane forest and arecaceous forest [24]. By having diverse range of habitat, this National Park rich in biodiversity of animals yet poorly explored by the ecologists. Although Gunung Ledang is catogorised as mid-sized forest but it accommodates big sized birds which is Helmeted Hornbill (*Rhinoplax vigil*) listed as Critically Endangered under IUCN. Besides, another

Critically Endangered species also recorded here which is Blue banded Kingfisher (*Alcedo euryzona*). In addition, another 5 species listed Near Threatened can be found here namely Black-bellied Malkoha (*Phaenicophaeus diardi*), Chestnut-bellied Malkoha (*Phaenicophaeus sumatranus*), Moustached Hawk-cuckoo (*Hierococcyx vagans*), Striped Wren-Babbler (*Kenopia striata*) and Fluffy-backed Tit-Babbler (*Macronous ptilosus*).

3.3.3 Endau-Rompin NP. Endau-Rompin NP encompasses an area of 87,000 ha, located across the southernmost of Bajaran Titiwangsa in between Pahang and Johor states. This National Park comprised of lowland mixed and hill top dipterocarp forest, flood plains and riparian environment. Gunung Tiong (1014 m) stands near the Centre of the park is the highest peak inside Johor section followed by , Gunung Bekok (953 m) in the west, and Gunung Besar(1036 m) in the northwest [25]. Endau-Rompin NP rich in biodiversity and supports importance threatened species of big mammals which require large space to live in. Three bird species listed as Critically Endangered noticed in Endau Rompin NP including Masked Finfoot (*Heliopais personatus*), Storm's stork (*Ciconia storma*) and Straw-headed Bulbul (*Pycnonotus zeylanicus*). While another four species listed as Vulnerable. They are Short Toed Coucal (*Centropus rectunguis*), Malay Peacock-pheasant (*Polyplectron malacense*), Lesser Adjutant (*Leptoptilus javanicus*) and Wallace's Hawk Eagle (*Nisaetus nanus*) [21].

3.3.4 Pulau Kukup and Tanjung Piai. Mangrove areas are natural barriers protecting coastline from harsh waves and coastal wind/storm that could lead to coastal erosion [26]. Besides, mangrove is also significant in nutrient retention, toxicant removal, micro-climate stabilization, as a reserve for viable forest product such as fisheries and energy resources, example firewood. Mangroves are also for recreation and tourism, research and education and supporting various species of flora and fauna. Tanjung Piai and Pulau Kukup Mangrove Forest Reserves, located in Southwest of Johor are well-known important mangrove areas in Malaysia. These areas were declared on 31st January 2003 as part of the Ramsar Site and the only protected mangrove areas in Southwest Johor region occupying 35% of a total mangrove cover (including Sungai Pulai waterway) within Johor [26]. Pulau Kukup and Tanjung Piai serve as important feeding ground for Lesser Adjutant (*Leptoptilus javanicus*) and migratory shorebird thus recognized as an Important Bird Area (IBA) of South-west Johore, extends from Parit Jawa to Tanjung Piai [27]. The mangroves areas support several globally Near Threatened species including Long-tailed Parakeet (*Psittacula longicauda*), Chestnut-bellied Malkoha (*Phaenicophaeus sumatranus*), White-chested Babbler (*Trichastoma rostratum*), and Mangrove Pitta (*Pitta megarhyncha*) [21].

4. Conclusion

As a conclusion, this study helps to review diversity of avian in Johor. Panti FR recorded highest species richness compared to other localities. However, data sets in Gunung Ledang NP, Endau Rompin NP, Belumut, and Pulau Kukup Tanjung Piai were not well documented compared to data from Panti FR. The actual numbers of birds inhabiting Johor are more to discover because many areas in Johor are lack in term of bird diversity data checklist. It is hoped that in the future, further documentation of avian diversity in other areas could be made not only restricted in forested areas but also in other types of landscapes.

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Appendices

Table 1. Numbers of species in each bird family recorded in Johor and their percentage of the total bird in Peninsular Malaysia.

Bil	Family	No of species recorded in Peninsular Malaysia	No of species recorded in Johor	%	Bil	Family	No of species recorded in Peninsular Malaysia	No of species recorded in Johor	%
1	Acanthizidae	1	1	100%	50	Megalaimidae	13	5	38%
2	Accipitridae	42	18	43%	51	Meropidae	4	3	75%
3	Acrocephalidae	4	0	0%	52	Monarchidae	5	2	40%
4	Aegithinidae	3	1	33%	53	Motacillidae	11	3	27%
5	Alaudidae	1	0	0%	54	Muscicapidae	47	16	34%
6	Alcedinidae	13	10	77%	55	Nectariniidae	18	12	67%
7	Anatidae	11	1	9%	56	Oceanitidae	1	0	0%
8	Anhingidae	1	0	0%	57	Oriolidae	6	1	17%
9	Apodidae	16	11	69%	58	Pachycephalidae	1	1	100%
10	Ardeidae	20	8	40%	59	Pandionidae	1	0	0%
11	Artamidae	2	0	0%	60	Paridae	1	0	0%
12	Bucerotidae	10	9	90%	61	Passeridae	2	0	0%
13	Burhinidae	1	0	0%	62	Pelecanidae	2	0	0%
14	Cacatuidae	1	0	0%	63	Pellorneidae	21	13	62%
15	Calypomenidae	1	1	100%	64	Phalacrocoracidae	2	0	0%
16	Campephagidae	11	5	45%	65	Phasianidae	15	6	40%
17	Caprimulgidae	5	2	40%	66	Phylloscopidae	12	2	17%
18	Charadriidae	13	2	15%	67	Picidae	26	16	62%
19	Chloropseidae	4	3	75%	68	Pittidae	7	3	43%
20	Ciconiidae	6	3	50%	69	Platylophidae	1	1	100%
21	Cisticolidae	8	6	75%	70	Ploceidae	1	0	0%
22	Columbidae	21	8	38%	71	Pnoepygidae	1	0	0%
23	Coraciidae	2	1	50%	72	Podargidae	4	2	50%
24	Corvidae	6	4	67%	73	Podicipedidae	1	0	0%
25	Cuculidae	30	18	60%	74	Procellariidae	4	0	0%
26	Dicaeidae	11	6	55%	75	Psittacidae	4	3	75%
27	Dicruridae	6	4	67%	76	Pycnonotidae	26	18	69%
28	Dromadidae	1	0	0%	77	Rallidae	12	0	0%
29	Emberizidae	4	0	0%	78	Recurvirostridae	1	0	0%
30	Estrildidae	10	2	20%	79	Rhipiduridae	3	2	67%
31	Eupatidae	1	1	100%	80	Rostratulidae	1	0	0%
32	Eurylaimidae	6	4	67%	81	Scolopacidae	39	4	10%
33	Falconidae	6	1	17%	82	Scotocercidae	3	0	0%
34	Fregatidae	3	0	0%	83	Sittidae	2	1	50%
35	Fringillidae	1	0	0%	84	Stenostiridae	1	1	100%
36	Glareolidae	2	0	0%	85	Stercorariidae	3	0	0%

37	Gruidae	1	0	0%	86	Strigidae	16	7	44%
38	Haematopodidae	1	0	0%	87	Sturnidae	16	5	31%
39	Heliornithidae	1	1	100%	88	Sulidae	3	0	0%
40	Hemiprocidae	2	2	100%	89	Threskiornithidae	1	0	0%
41	Hirundinidae	8	3	38%	90	Timallidae	13	11	85%
42	Hydrobatidae	1	0	0%	91	Trogonidae	6	4	67%
43	Indicatoridae	1	1	100%	92	Turdidae	6	1	17%
44	Irenidae	1	1	100%	93	Turnicidae	2	0	0%
45	Jacaniidae	2	0	0%	94	Tytonidae	2	1	50%
46	Laniidae	3	1	33%	95	Upudidae	1	0	0%
47	Laridae	22	0	0%	96	Vangidae	5	5	100%
48	Leiotrichidae	11	1	9%	97	Vireonidae	3	1	33%
49	Locustellidae	2	0	0%	98	Zosteropidae	2	2	100%
Total							718	292	41%

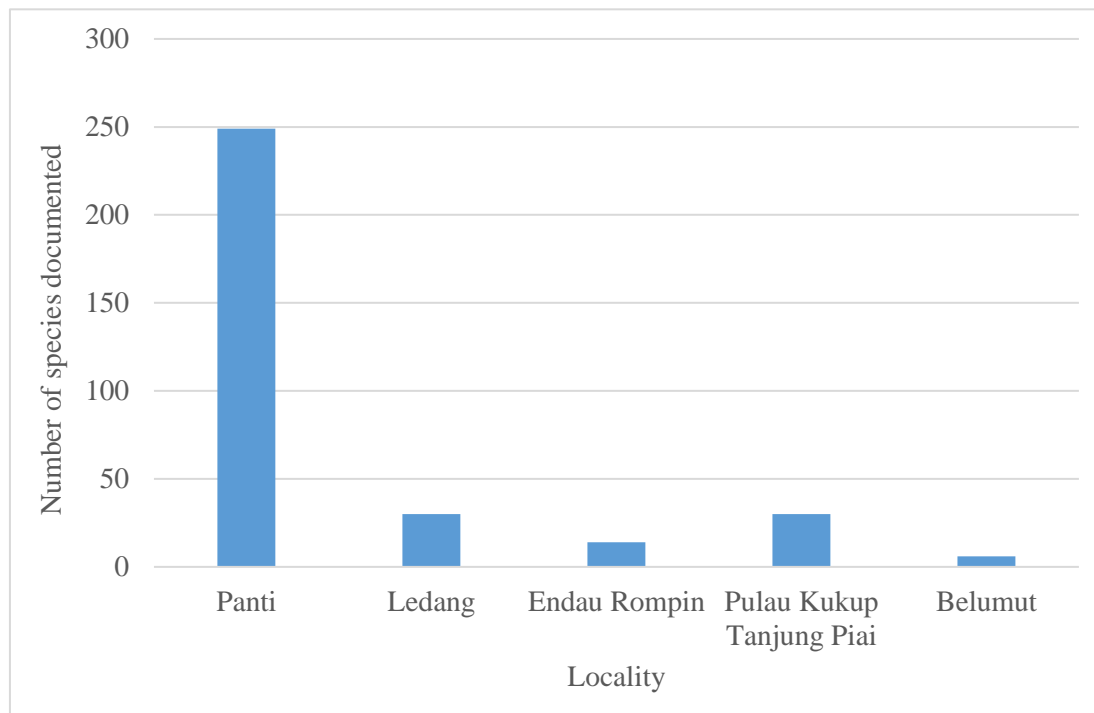


Figure 1. Graph shows total of species documented in Johor within each Locality

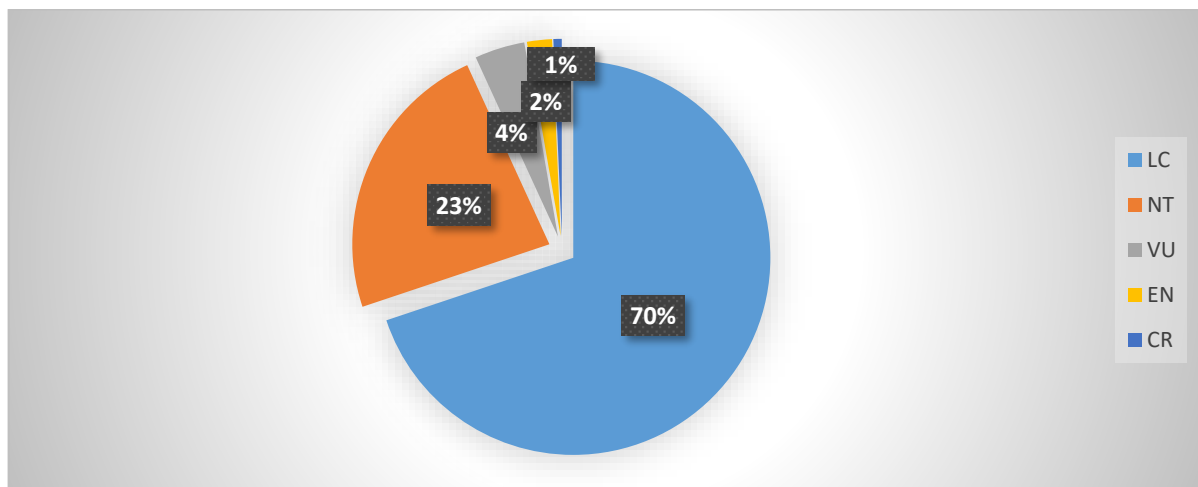


Figure 2. Chart shows division of birds in Johor based on IUCN status.

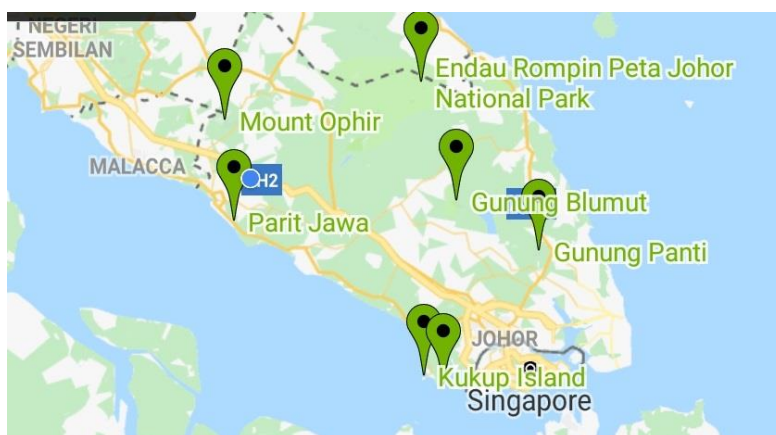


Figure 3. Locality map in the State of Johor