

# Small Island Avifauna Diversity at Sebatik Island of Sabah, Malaysia

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**ABSTRACT** Preliminary study was commenced to investigate the avifauna diversity presented on Sebatik Island in Sabah. Opportunistic sampling was conducted at four villages and along Sungai Haji Kuning for three days. A total of 28 avifauna individuals belonged to 13 different species were observed on Sebatik Island, which were mainly comprised of carnivorous and non-threatened resident species. All recorded migratory avifauna species, as well as the five avifauna species sighted along Sungai Haji Kuning, were determined as carnivores, hence indicating the relationship between migratory behaviour and habitat type with feeding guild of local avifauna. Since that there were no significant differences in avifauna species composition and abundance, thus both human settlement and riverine mangrove habitats were vital to the survival of both migratory and resident species. Because of that, conservation effort is required to preserve this small island habitat and its avifauna inhabitants from being threatened by anthropogenic disturbances.

**KEYWORDS:** Avifauna Diversity; Sebatik Island; Small Island; Specie Richness; and SIRC

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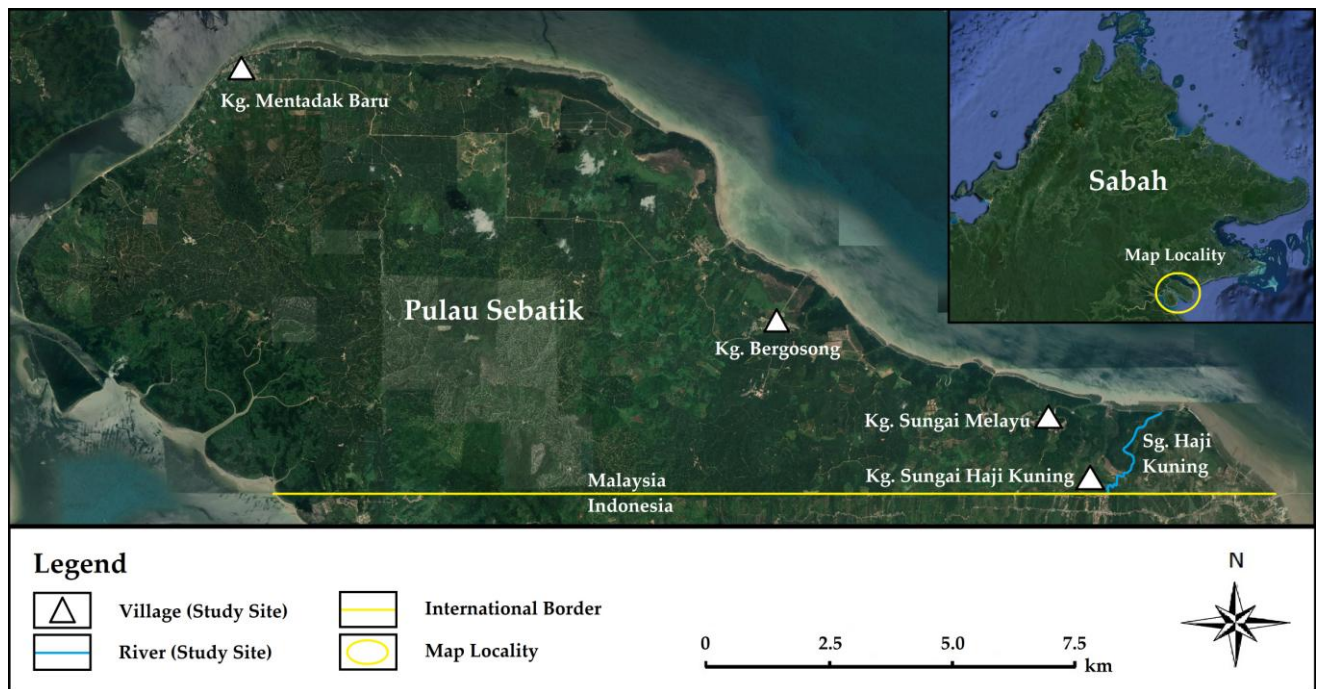
**Short Communication**

## Short Communication

Rich and endemic wildlife diversity can be found on small island ecosystems (Kier et al., 2009). Despite their limited spaces, still every small island have a distinct island ecosystem to sustain rich biodiversity (Taylor & Kumar, 2006). In fact, a small island ecosystem can function as a habitat to a wide range of resident and migratory avifauna species (Turner *et al.*, 2002; and David *et al.*, 2016). In return, local avifauna community help maintaining the food chain and loss-gain in forest stands of the small island in a constant state of equilibrium (Peh *et al.*, 2005; and Basnet *et al.*, 2016). However, certain avifauna species are particularly sensitive, especially towards biophysical and environmental changes in habitat condition (Yap *et al.*, 2007). Intensity and severity of disturbance defined diversity richness, where heavily-disturbed habitat could only provide limited food and subsequently sustain limited lives of avifauna individuals and species at a time, and vice versa (Miller *et al.*, 2003; Jones & Neelson, 2005; Yahya *et al.*, 2016). Then, forest stratification and succession can occur along with the progression of time, which could increase local vegetation diversity and food availability, and subsequently enrich avifauna diversity at the given habitat as well (Styring *et al.*, 2011). In a nutshell, habitat condition plays a vital role in shaping the diversity and composition of avifauna presented on a small island habitat.

At the South East region of Sabah lies a small island that is known as Sebatik Island (Universiti Malaysia Sabah, 2020). The northern part of this island is located within Malaysia border, while the remaining half is under the governance of Indonesia. To date, avifauna diversity of Sebatik Island was yet to be investigated by past researchers, where avifauna species that could be sighted on this small island remained uncertain at this moment. Likewise, a large area of forest on Northern Sebatik Island were either converted into human settlements or oil palm plantation, unlike Southern part of Sebatik Island with remaining large area of intact forest. Therefore, present study was commenced as a preliminary assessment on avifauna diversity presented at Sebatik Island in Tawau, Sabah.

In 2018, a scientific expedition was organized by the Small Island Research Centre (SIRC) to visit several locations on the Northern region of Sebatik Island, from 6 until 8 August. Within three days, Sungai Melayu Village, Mentadak Baru Village, Sungai Haji Kuning Village, Bergosong Village, and Sungai Haji Kuning were chosen as sampling areas and visited by the experts from SIRC. Mentadak Baru Village is located at Northwest Coast, while Bergosong Village is situated about 2.0 km away from the jetty at Northern Bay by terrestrial vehicles. Both Sungai Melayu and Sungai Haji Kuning Villages are reachable through water transportations along Sungai Melayu (approximately 2.6 km in length) and Sungai Haji Kuning (approximately 3.5 km in length) respectively. Figure 1 illustrates the locations of sampling areas in Sebatik Island of Tawau, Sabah.



**Figure 1.** Locality map of sampling areas in Sebatik Island of Tawau, Sabah.

Opportunistic sampling was applied in present study, in which field observation was conducted during daytime (8.00 a.m. to 5.00 p.m.) within the given three days. Avifauna individuals or groups that were sighted at the four visited villages and along Sungai Haji Kuning were recorded, and then photographs were captured for every viewing success of avifauna individual or group at respective sites. Species were identified based on the field guide written by Francis (2007), and then the number of sighted individual and habitat type were determined and recorded directly at field or based on the captured photographs. Moreover, IUCN Red List Status, feeding guild and migratory behaviour were determined based on the information that were provided by the online databases of IUCN (2020) for the species-in-question. Shannon ( $H'$ ) and Simpson (1-D) Diversity Indices were estimated to represent diversity richness and distribution evenness of avifauna on Sebatik Island respectively (Magurran, 2004). Then, differences in diversity richness and distribution evenness of avian between riverine mangrove and human settlement habitats were ascertained using Diversity T-Test. The Chi-squared Test was applied to examine the relationship between habitat type and species composition of avifauna, in terms of IUCN Red List Status, feeding guild and migratory behaviour. The statistical analyses were commenced using the statistical software PAST ver. 3.25 (Hammer *et al.*, 2001), with confidence interval level at 95.0 % ( $p < 0.05$ ).

Table 1 shows the list of avifauna species that are observed on Sebatik Island of Tawau, Sabah, whereas Table 2 displays the species traits of small island avifauna that are observed at various habitats on Sebatik Island. Within three days, 28 avifauna individuals belonged to 13 species, 10 families and 6 orders were encountered on Sebatik Island. Eight out of the recorded 13 species and 28 individuals belonged to 8 different families, and then avifauna fauna family with the highest number of sighted species (23.1 % or 3 species) was Ardeidae (waterbirds), followed by Alcedinidae (kingfishers) with two sighted species (15.4 %). Among the 13 recorded avian species, Barn Swallow (*Hirundo rustica*) was determined as the most abundant species on Sebatik Island and at the human settlement habitat (n = 9), followed by Brahminy Kite (*Haliastur indus*) as the second-most abundant species on this small island, at the same time the most abundant species at riverine mangrove habitat of Sungai Haji Kuning (n = 4). Moreover, Asian Glossy Starling (*Aplonis panayensis*) (n = 3), followed by both the Oriental Dwarf-kingfisher (*Ceyx erithaca*) and Chestnut Munia (*Lonchura atricapilla*) (n = 2 respectively), were determined to be more abundant than the remaining 8 species in present study. According to IUCN (2020), the five highly-abundant avifauna species were in fact "Least Concern" species, because their current local and global population sizes remained large and stable. Perhaps, this could be a possible explanation behind their high abundance on this small island.

**Table 1.** List of avifauna species that are observed on Sebatik Island of Tawau, Sabah.

Order	Family	Scientific Name	Common Name	n
Pelecaniformes	Ardeidae	<i>Ardea alba</i>	Great Egret	1
		<i>Egretta eulophotes</i>	Chinese Egret	1
		<i>Ardea sumatrana</i>	Dusky-grey Heron	1
Accipitriformes	Accipitridae	<i>Haliastur indus</i>	Brahminy Kite	4
Suliformes	Anhingidae	<i>Anhinga melanogaster</i>	Oriental Darter	1
Coraciiformes	Alcedinidae	<i>Ceyx erithaca</i>	Black-backed Kingfisher	1
		<i>Halcyon pileata</i>	Black-capped Kingfisher	2
Passeriformes	Sturnidae	<i>Aplonis panayensis</i>	Asian Glossy Starling	3
	Passeridae	<i>Passer montanus</i>	Eurasian Tree Sparrow	1
	Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow	9
	Estrildidae	<i>Lonchura atricapilla</i>	Chestnut Munia	2
	Nectariniidae	<i>Cinnyris jugularis</i>	Olive-backed Sunbird	1
Columbiformes	Columbidae	<i>Ducula aenea</i>	Green Imperial Pigeon	1

\*Note: n = Number of sighted individual.

Next, results of Chi-squared Test indicated that the migratory behaviour and habitat type were related to feeding guild ( $p < 0.05$ ) of avifauna. In present study, only three migratory avifauna species were recorded, and then all recorded migratory species were carnivores, in which Oriental Dwarf-kingfisher and Barn Swallow were encountered at human settlements, while the vulnerable Chinese Egret (*Egretta eulophotes*) was observed along Sungai Haji Kuning. Carnivorous species have limited food sources when compared to omnivorous and herbivorous species, thus migration may serve as their adaptive responses towards food shortage in a habitat, and then small island habitat becomes one of their transit locations (Gilbert *et al.*, 2018). Besides that, 7 out of the 13 recorded species were in fact carnivores (53.8 %), and then all five species observed at the riverine mangrove habitat were carnivorous species as well. On the contrary, avifauna community at human settlement habitat was comprised of two carnivorous species, two herbivorous species, and four omnivorous species. This finding reveal that avifauna species composition, in term of feeding guild, can be different between different habitat types, therefore support the results of Chi-squared Test of present study.



**Table 2.** Species traits of small island avifauna observed at various habitats on Sebatik Island.

Common Name	IUCN (2020)	Feeding Guild	Migratory Behaviour	Habitat Type
Great Egret	LC	Carnivore	No	Mangrove
Chinese Egret	VU	Carnivore	Yes	Mangrove
Dusky-grey Heron	LC	Carnivore	No	Mangrove
Brahminy Kite	LC	Carnivore	No	Mangrove
Oriental Darter	NT	Carnivore	No	Mangrove
Oriental Dwarf- kingfisher	LC	Carnivore	Yes	Village
Black-capped Kingfisher	LC	Carnivore	No	Village
Asian Glossy Starling	LC	Omnivore	No	Village
Eurasian Tree Sparrow	LC	Omnivore	No	Village
Barn Swallow	LC	Omnivore	Yes	Village
Chestnut Munia	LC	Herbivore	No	Village
Olive-backed Sunbird	LC	Omnivore	No	Village
Green Imperial Pigeon	LC	Herbivore	No	Village

\*Note: IUCN = International Union for Conservation of Nature and Natural Resources; LC = Least concern; NT = Near-threatened, and; VU = Vulnerable.

Riverine mangrove habitat is rich in aquatic wildlife that can function as the food sources for the carnivorous Brahminy Kite, Chinese Egret, Dusky-grey Heron (*Ardea sumatrana*), Great Egret (*Ardea alba*), and Oriental Darter (*Anhinga melanogaster*). Therefore, riverine mangrove habitat can be vital to the survival of given species on Sebatik Island (Mojiol *et al.*, 2008; and Lim *et al.*, 2019). On the other hand, local human settlements are surrounded by vegetation in high diversity and density, and also situated close to rivers, thus an abundant of aquatic wildlife, insects, seeds and fruits are available in and around these villages (Miller *et al.*, 2003). In fact, high food availability and variation may be a leading factor that results in the presences of eifth avifauna species with different feeding guilds at given villages (Mojiol *et al.*, 2008; and Lerman *et al.*, 2014). In other words, both natural and human-disturbed habitats are vital to the survival of local small island avifauna diversity, thus conservation effort must be provided to prevent these two habitats from being degraded and become unsuitable for sustaining lives of the avifauna community of Sebatik Island in future.

In term of avifauna diversity, northern region of Sebatik Island was determined to have rich, yet unevenly distributed, avifauna diversity ( $H' = 2.133$ ;  $1-D = 0.1660$ ), with referred to Magurran (2004). Then, both riverine mangrove and human settlement habitats shared no common species, in which only 5 species and 8 individuals were sighted along the riverine mangrove of Sungai Haji Kuning, whereas the remaining 8 species and 20 individuals were encountered at the four visited villages. Although riverine mangrove habitat was determined with lower diversity richness and distribution evenness of avifauna ( $H' = 1.386$ ;  $1-D = 0.6875$ ) than those of human settlement habitat ( $H' = 1.704$ ;  $1-D = 0.7450$ ), still differences in both aspects between these two habitats were statistically insignificant ( $p < 0.05$ ). In other words, both riverine mangrove and human settlement habitats are critical for the survival of the local small island avifauna community (Boonratana & Sharma, 1997; Gilbert *et al.*, 2018; Lim & Mojiol, 2019).

By comparing present findings with past findings, diversity and composition of the small island avifauna on Sebatik Island are highly dissimilar with those of Gaya Island. Based on the findings of Gilbert *et al.* (2018), avifauna species of Gaya Island was different and more diverse than those of Sebatik Island obtained in present study. On the contrary, 9 out of the 13 avifauna species recorded

in present study could be observed along Lower Kinabatangan River and at Kota Kinabalu Wetland Centre from the mainland of Borneo (Boonratana & Sharma, 1997; and Mojiol *et al.*, 2008). Similarity in habitat condition can be a possible explanation behind the similarity in recorded avifauna species between Sebatik Island and the mainland riverine habitats, but not with Gaya Island (Lim & Mojiol, 2019). Additionally, application of different sampling techniques and sampling time constraint can also affect data accuracy and precision, which may result in obtaining different avifauna diversity and composition between Gaya Island and Sebatik Island. Riverine and mangrove habitats were often reported to be inhabited by a wide range of avifauna species (Boonratana & Sharma, 1997; and Mojiol *et al.*, 2008). But then, lower avifauna diversity was obtained for riverine mangrove habitat than for human settlement habitat in this study, which could be caused by time constraint as well (Ancrenaz, 2013). Furthermore, avifauna individuals from undisturbed habitats will avoid visiting to highly-disturbed areas (Lim & Mojiol, 2019). Since that this study only conduct avifauna sampling along the highly-human-used Sungai Haji Kuning and not the surrounding undisturbed mangrove forests, which may lead to the low viewing success of local riverine avifauna species in this study. In other words, further research is required to examine and obtain the absolute avifauna diversity and composition that are presented, not only at human settlement and riverine mangrove habitats, but also at the remaining land cover of Northern region of Sebatik Island, using a standardized sampling technique and longer sampling duration.

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