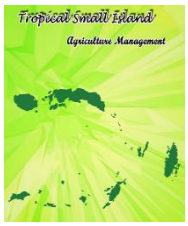

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Identification of Bird species in Wetlands around Siran Lake, Muara Kaman, Central Mahakam, East Kalimantan

Chandradewana Boer, Arie Prasetya, Rustam, Rita Diana*

Laboratory of Ecology and Biodiversity of Tropical Forest Conservation, Faculty of Forestry, Mulawarman University, Indonesia

Email Corresponding Author**: **ritadiana@fahutan.unmul.ac.id

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ABSTRACT

The avifauna of tropical peat swamp forests in East Kalimantan has not been well documented because of the smallest peat area compared to central Kalimantan. The surveys were conducted using various methods in the Muara Siran peat swamp forests and surrounding areas of Lake Siran (heath forest and riparian) in East Kalimantan, Indonesia. These findings were recorded on a list of 80 bird species as well as in numerous noteworthy records. Wetlands are an essential habitat for many threatened and near-threatened bird species. We also discovered Gallinula tenebrosa in Siran Lake, a species that has not been seen in over a century. However, it has a wide distribution globally, including in Australia and the United States. In the peat swamp forest, we recorded Cymbirrhinchus macrurus and Ichtyophaga humilis, rare and widely distributed. We also found Dicrurus hottentotus and Dicrurus remifer, some species of Ferruginous Babbler, Trichastoma bicolor, and the White-necked Babbler, Stachyris leucotis. The Hook-billed bulbul Setornis criniger and the Sooty capped Babbler Malacopteron affinae are found in riparian forests. There are six species of woodpecker. *Dryocopus javensis, Great Slaty Woodpecker, Mulleripicus pulverulentus, Meyglyptes tukki, Picus puniceus,* and *Sasia abnormis*. *Cuckoo-shrike Coracina striata* and *Pitta sordia* were also discovered. Wetlands (peat swamp forest, heath forest, and riparian areas) should be better protected due to their importance to many species, particularly from destruction and loss of habitat caused by forest fires.

Introduction

The discovery of bird species living in certain types of wetlands is exciting. This is because several species are water birds with large body sizes. They are easy to observe.

Wetlands such as peat may also have unique bird species (Posa, 2011; Anchundia, 2020). However, studying peat is tiresome due to its terrain being periodically inundated by water, rendering it challenging to navigate. Information on the inhabitants of these ecosystem types is currently insufficient, although some research on wetland areas has been conducted.

Materials and Methods

Research Location

This research was conducted in the first year of 2021 in Muara Siran Village, Kutai Kartanegara, East Kalimantan. The village is geographically situated at 0 ° 5'5.17 "South Latitude and 116 ° 35'5.2" East Longitude. Muara Siran Village is located in the Muara Kaman sub-district and has an area of ± 42,201 hectares. Generally, the topography is lowland, where most of the area is a peat swamp forest wet every year (Muara Siran Village, 2017). The Peat Forest Area of Muara Siran Village has a monthly rainfall of between 108.6 mm to 322.9 mm with an annual temperature of 24˚-30˚C. The average daily humidity ranges between 80 - 90% in the morning, dropping to 70% in the afternoon. The topography of Muara Siran Village consists mostly of swamps and the plains at an altitude of 0-100 m above sea level. The village is divided into two areas based on the spatial pattern, namely cultivation (18,444.57 ha) and protected areas (23,756.43 ha). The cultivation area consists of settlements, residential reserves, agriculture, energy gardens, timber utilization, livestock, and community forestry. Meanwhile, protected areas consist of Nature Reserves, Core Peat Protection Spaces, Peat Eco-Tourism Spaces, Peat Garden Spaces, Local Protection Spaces, and Water Bodies (Desa Siran, 2017). The following figure shows the bird survey location.

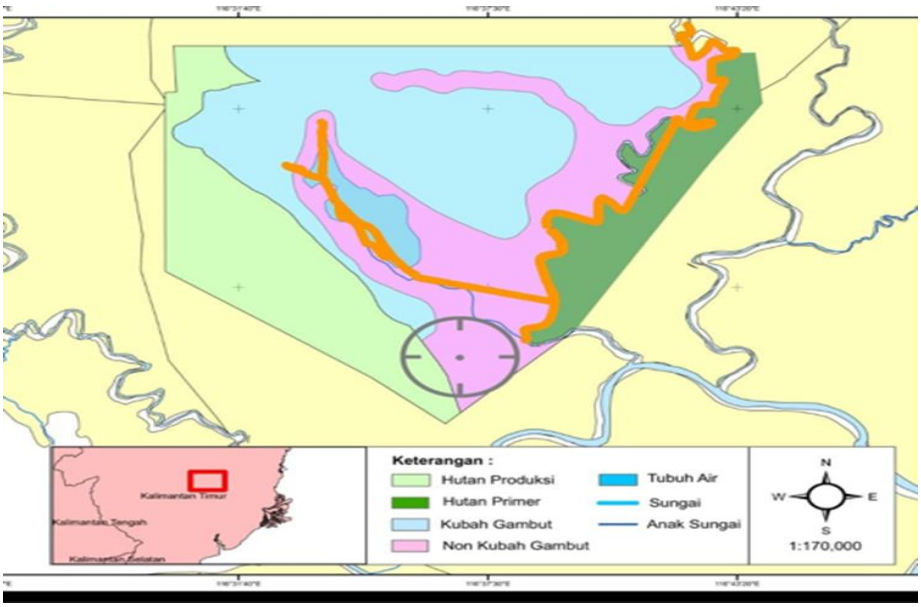

Figure 1. The bird survey location around Siran Lake

Three habitats were studied, namely peat, riparian, and heath. Around Siran Lake, Muara Kaman, there is a large area of peat swamp forest. However, this is relatively small compared to the area observed in Central Kalimantan or South Sumatra. The water birds welcomed the researchers when they entered the Lake from the downstream of the Siran and the Kedang Kepala Rivers. The watercolour is blackened downstream of Siran village, where the river functions as an outlet that meets the Kedang Kepala and empties into the large Mahakam river. Behind Siran Lake lies a peat forest that did not escape the 1982/83 forest fires and the subsequent forest fires in East Kalimantan. Furthermore, Muara Siran's peat forest is crowded with lots of lower vegetation, including vines and shrubs, rendering it highly difficult to enter. The following distinct location is a riparian area on the banks of the Kedang Kepala River, about 15 km from the river's estuary. This area is part of the Muara Kaman Nature Reserve, extending into a shape flanked by the Kedang Kepala river and the Kedang Rantau river. Meanwhile, the Kerangas forest is located behind a peat forest large enough to allow bird watching on foot.

Methodology

The three combination methods used in this study considered the vast forest area and the limited time available. Observations involved the use of binoculars at a magnification of 10 x 40, mist net capture, and voice recognition either directly or via recording (Arbimon application) was carried out in the field. Observations were made in the morning, afternoon, and evening and the installation of sound recordings. Furthermore, the existence of bird species was recorded exploitatively given the limited research time.

Results and Discussion

Number of Bird Types and Dietary Classes

The first work was to visit Siran Lake and subsequently the peat forest located across the Lake. Many water birds were observed along the Siran river and Lake, and getting to the middle, the birds began to decrease. They were almost absent from entering the peat forest, which is directly connected to Siran Lake water, which was flooded. The correlation of aquatic plants found mainly at the mouth of a lake with several waterbirds was quite significant. Many aquatic weeds act as attractors for these birds to forage, manoeuvre, perch, or fly over. Peat is like flooded forests when the water is high, as the Siran river is connected to the Kedang Kepala River, emptying into the Mahakam and continuing to the sea. This sea tide is massive, slows the boat's passage to Samarinda or vice versa, and pushes the water into Siran Lake, periodically inundating the peat for a long time (3-4 months). Apart from infiltration water and high tide, Siran Lake is known to have springs that never dry out, even during the dry season.

Bird observation is difficult in the peat swamps due to the high water and the dense peat trees. However, the presence of stagnant water enables the researchers to enter deeper into the peat. Meanwhile, the kerangas forest is hidden behind a unique peat area in terms of edaphic, limestone, and sand soils. There were about 80 bird species observed during the research on various types of habitats in the wetlands in the Middle Mahakam. As the research time is extended, it is expected that several other types will be discovered. However, the four types of ecosystems studied were concentrated in one area, and many of the same bird species were found in multiple locations.

As previously known, peat forests were formed due to permanent or periodic inundation of forests either from Siran Lake or peat behind riparian areas (riverbanks). This means that the formation of peat forests is highly influenced by the inundation of water based on the duration. This also affects bird species, as the forest area is not too wide. Therefore, many bird species can control some of the available habitats (Boer & Rustam, 2020). Also, with Kerangas forests, which were generally found in small and separated areas (due to edaphic factors), it was not easy to find specific bird species in the area. The following shows the bird species identified during the study in 4 wetland locations in Muara Kaman, Middle Mahakam.

Table. 1. Bird species identified during research in the wetlands, Muara Kaman

Family	Species Name	Siran Lake	Peat	Health	Riparian	IUCN
Accipitridae	*Haliastur indus*	√	-	-	-	LC
	Ichthyophaga humilis	-	√	-	-	NT
Alcedinidae	*Alcedo euryzona*	-	-	-	√	CR
	Alcedo meninting	√	-	-	√	LC
	Ceyx erithacus	-	-	-	√	-
	Ceyx rufidorsa	-	-	-	√	LC
	Pelargopsis capensis	√	-	-	√	LC
Anatidae	*Dendrocygna arcuata*	√	-	-	-	LC
Apodidae	*Collocalia fuciphaga*	-	√	√	√	-
Ardeidae	*Ardea sumatrana*	√	-	-	-	LC
	Ardeola bacchus	√	-	-	-	LC
	Egretta alba	√	-	-	-	LC
	Egretta garzetta	√	-	-	-	LC
	Egretta intermedia	√	-	-	√	-
	Egretta sacra	√	-	-	√	LC
Bucerotidae	*Anthracoceros albirostris*	-	-	-	√	LC
Campephagidae	*Pericrocotus flammeus*	-	-	-	√	LC
Camprimulgidae	*Caprimulgus macrurus*	-	√	-	-	LC
Capitonidae	*Megalaima australis*	-	√	√	√	-
	Megalaima mystacophanos	-	√	√	√	NT

Family	Species Name	Siran Lake	Peat	Health	Riparian	IUCN
Ciconiidae	*Leptoptilos javanicus*	-	√	-	-	VU
Columbidae	*Ducula aenae*	√	-	-	-	LC
	Geopelia striata	-	-	-	√	LC
	Streptopelia chinensis	√	-	-	-	-
	Treron vernans	-	-	-	√	LC
Coraciidae	*Eurystomus orientalis*	-	-	-	√	LC
Cuculidae	*Cuculus micropterus*	-	-	-	√	LC
	Cuculus saturatus	-	-	-	-	LC
	Phaenicophaeus chlorophaeus	-	√	-	-	LC
Dicruridae	*Dicrurus hottentottus*	-	√	-	-	-
	Dicrurus remifer	-	√	-	-	LC
Eurylamidae	*Corydon sumatranus*	-	-	-	√	LC
	Cymbirhy nchus Cymbirhynchus macrurus	-	√	-	-	-
Hirundinidae	*Hirundo rustica*	√	-	-	√	LC
	Hirundo tahtica	√	-	-	√	LC
Laniidae	*Lanius schach*	-	-	-	√	LC
Laridae	*Larus ridibundus*	-	-	-	√	LC
Meropidae	*Merops philippinus*	√	-	-	√	LC
Muscicapidae	*Ficedula narcissina*	√	-	-	-	LC
	Hypothymis azurae	-	-	-	√	LC
	Rhinomyas umbratilis	-	√	-	-	LC
	Rhipidura javanica	√	√	√	√	LC
Nectariniidae	*Aethopyga siparaja*	-	√	-	-	LC
	Anthreptes malacensis	-	√	-	-	LC
	Arachnothera longirostra	-	-	-	√	LC
	Arachnothera robusta	-	-	-	√	LC
Phalacrocoracidae	*Anhinga melanogaster*	√	-	-	-	NT
Picidae	*Dryocopus javensis*	-	-	-	√	LC
	Meiglyptes tukki	-	√	-	-	NT
	Mulleripicus pulverulentus	-	-	-	√	VU
	Picus puniceus	-	-	-	√	LC
	Sasia abnormis	-	-	√	√	LC
	Dicaeum rafflesi	-	√	-	-	-
Pittidae	*Pitta sordida*	-	-	-	√	LC
Ploceidae	*Lonchura fuscan*	-	-	-	√	LC
	Lonchura leucogastra	-	√	-	-	LC
	Lonchura malacca	-	√	-	√	LC
Pycnonotidae	*Criniger bress*	-	√	√	√	-
	Criniger phaeocephalus	-	√	√	√	-
	Pycnonotus atriceps	-	-	√	-	-
	Pycnonotus aurigaster	-	√	√	√	LC
	Pycnonotus brunneus	-	-	-	√	LC
	Pycnonotus flavescens	-	-	√	-	LC

Family	Species Name	Siran Lake	Peat	Health	Riparian	IUCN
	Pycnonotus goiavier	-	√	√	√	LC
	Setornis criniger	-	-	√	-	VU
Rallidae	*Gallinula tenebrosa*	√	-	-	-	LC
Silviidae	*Orthotomus artrogularis*	-	√	√	√	LC
	Orthotomus ruficeps	-	√	-	-	LC
Sternidae	*Chlidonias hybridus*	√	-	-	√	LC
Strigiformes	*Ketupa ketupu*	-	-	-	√	LC
Sturnidae	*Aplonis panayensis*	√	-	-	√	LC
Timaliidae	*Macronous gularis*	-	√	√	-	LC
	Malacopteron affinae	-	-	-	√	-
	Stachyris erythropthera	-	√	-	-	-
	Stachyris leucotis	-	√	-	-	NT
	Trichastoma bicolor	-	√	-	√	LC
Turdidae	*Copsychus malabaricus*	-	-	-	√	-
	Copsychus saularis	-	-	√	√	LC
Total Species		20	28	15	45	

More species were found in riparian areas due to the ease of access. Therefore, the registration and chance of encounters with bird species were higher, including along the Kedang Kepala river. From the knowledge side of the dietary class, several classes were obtained, as shown in the following figure.

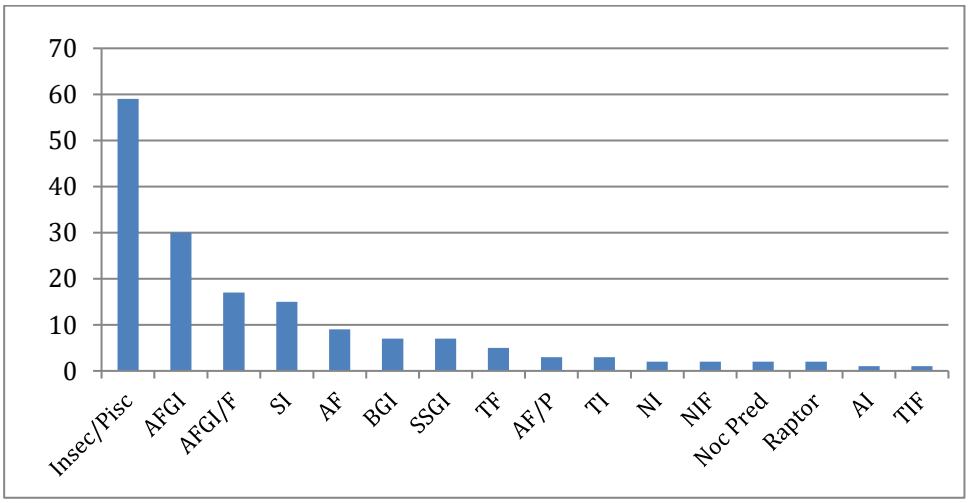

Figure 2. Comparison of bird dietary classes from total individuals and bird species found

Figure description :
AFGI (Arboreal foliage gleaning insectivore) : A type of insectivore that feeds on leaves
AFGI / F (Arboreal foliage gleaning insectivore/frugivore) : A type of insectivore that feeds on leaves and also eats fruit
TI (Terrestrial insectivore) : A type of insectivore that lives on the forest floor

TI/F (Terrestrial insectivore/frugivore) : A type of insectivore and the fruit eater which lives on the forest floor
TF (Terrestrial frugivore) : A type of fruit eater that lives on the forest floor
AI (Aerial insectivore) : A type of insectivore that forages in the air
AF (Arboreal frugivore) : A type of fruit eater that lives on tree canopy
AF P (Arboreal frugivore/predator) : A type of fruit eater that lives in the tree canopy and often becomes a predator of small animals
NI (Necativore/frugivore) : A type of honey and insect eater
NIF (Nectarivore / insectivore / frugivore) : A type of honey, insect and fruit eater.
Insec / Pisci (insectivore / Piscivore) : A type of fish and insect eater.
SI (Sallying insectivore): A type of insectivore that catches insects in the air after waiting for a while.
SSGI (Sallying substrate gleaning insectivore) : A type of insectivore that catches its prey when they alight on leaves, after waiting for it for a while.
BGI (Bark gleaning insectivore) : A type of insectivore that forages behind the bark.
Raptors: A type of birds of prey, such as from the Accipitridae family that hunt small animals.
Noc Predator (Nocturnal Predator): This type of predator is active at night.

Dietary classes are an effort to group bird species based on distinguishing characteristics such as food type, location of food and how it is ingested (Boer, 1998; Lopes, et al., 2016). More birds were found to be more generalist eaters than insect consumers, fruits and others. Furthermore, insects and fish eaters or other aquatic invertebrates were dominant in species compared to others.

Rare bird species which were successfully photographed

Some of the protected bird species and their pictures are shown in the following figure.

Figure 3. *Ichtyophaga humilis* (The Lesser Fish Eagle) and *Gallinula tenebrosa* (The dusky moorhen)

Figure 4. *Pelargopsis capensis(*The stork-billed kingfisher) and *Coracina striata* (Sumatra bar-bellied cuckooshrike)


Figure 5. *Dendrocygna arcuata* (The wandering whistling duck) and *Ceyx erythacus* (Oriental dwarf kingfisher)


Figure 6. *Alcedo euryzona* and *Haluartur Indus*

Gallinula tenebrosa is an endemic species of Kalimantan that has not been seen in over a century (Mac Kinnon 2010). However, it is widely distributed throughout the world, including Australia and the United States. *Ichtyophaga humilis* is also a species that is rarely found in many bird surveys throughout East Kalimantan. This is most likely due to its special diet, which is commonly found in wetlands. The Sumatra bar-bellied cuckoo shrike is also uncommon in many surveys because it prefers to perch on tall trees.

Furthermore, *Pelargopsis capensis* is a common waterbird found in wetlands, similar to *Ceyx erithacus*, often referred to as the smallest species. *Dendrocygna arcuata* is also noted as a visitor that lives in Kalimantan (MacKinnon & Philips, 2010) due to its widespread distribution. Anhinga melanogaster has been observed visiting Siran Lake in small numbers. It is well-known on many Southeast Asian islands and visits former mining lakes (Boer et al, 2003; Boer, 2018; Boer et al, 2020). *Lonchura fuscan,* which is also endemic to Kalimantan, has a sizable population.

Conclusion

Wetland bird communities have many unique and endemic species and a variety of visitors who stay for an extended period. As a result, sufficient research time is required to

identify all bird species and their community structures. This is required to calculate the diversity index and determine the dominance level.

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