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Relationship of Avifauna and Mangroves in Laguindingan, Misamis Oriental, Philippines

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Abstract

Mangrove rehabilitation is one of the conservation strategies to protect bird species, reduce the impacts of climate change, increase marine productivity and improve eco-tourism management in Misamis Oriental. This study aimed to correlate the diversity of planted mangrove trees and avifauna species in Laguindingan, Misamis Oriental. The study used a descriptive-evaluative research with the use of point-centred quadrat method (PCQM), and line transect and mist netting technique in determining diversity of mangrove and birds species. Result showed that the planted mangroves provide habitat for eight (8) avifauna species namely; Eurasian Tree Sparrow, Pied Fantail, Brown Shrike, Grey Streaked Flycatcher, Spotted Imperial Pigeon, White-Collared Kingfisher, Little Egret and Golden Bellied Fly-eater which belong to four (4) Orders and eight (8) Families. Among the avifauna, Brown Shrike has the highest relative abundance with 19.45% while Golden Bellied Fly-Eater has the lowest relative abundance at 5.01%. The vegetation of the area is composed of two (2) different mangrove species, namely: *Rhizophora apiculata* and *Rhizophora mucronata* which has equal percentage in terms of its relative abundance (50%). Avifauna species has a strong diversity correlation with the mangrove species diversity. Moreover, the planted mangroves is habitable for avian species however is highly vulnerable to anthropogenic activities that can threaten the diversity of both avian and mangrove species.

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Introduction

Mindanao is one of the largest island in the Philippines, it is a tropical country and composed of varieties of species both flora and fauna. One of these forest types is a mangrove forest which surrounds the coastline of some marine areas, in which varieties of species are found. Mangroves grow luxuriantly in the places where freshwater mixes with seawater. Mangroves is a home by different varieties of species where they can also fetch the foods they need (Duke *et al.,* 2007). Mangrove forest is a habitat of different avifauna species, aside from shelter and food it is also the area where they can hatch their eggs. Birds are also an intricate component of ecosystem, which every living organisms need for own survival (Boris *et al.,* 2011). Mangroves are important because it also prevents flooding and it is the one who catches the waste generated by humans. It is the one that lessen the impact of tsunamis, hurricanes and cyclonic storms on human lives and properties (Danielsen *et al.,* 2005; Selvam, 2005).

A human intervention such as over exploitations and forest destruction has also threatened the diversity of birds (Roy *et al.,* 2011). Reducing a large area of contiguous habitat to several smaller parcels means that birds requiring large breeding territories will not be able to find them (Kessen *et al.*, 2002). Mangrove forest is highly threatened now due to some anthropogenic activities and even climate change that is caused by human activities. One of the vulnerable areas to climate change impacts in Mindanao is northern Mindanao. Hence, this preliminary study was conducted at Tubajon, Laguindingan, Misamis Oriental to provide baseline information to the community. The area has abundant mangroves planted by the community and growing tourism in the area as a result of their efforts. Barangay Tubajon is a diverse community since it is surrounded by marine water, aside from that it also supports number of species. Tubajon is well-known due to the abundance of mangrove trees that serves as habitat for avifaunal species. Indeed, this study aimed to assess and correlate the diversity of the avifaunal species and mangrove trees.

Materials and methods

Research Setting

This study was conducted at the Aquamarine Park of Barangay Tubajon, Laguindingan, Misamis Oriental in northern Mindanao having seventy-two (72) hectares of mangrove trees located at 8°37'22.71" N, 124.46°27'50.09" E. The red line of Fig. 2 indicates the location of the study at Aquamarine Park. The park was planted with mangrove species by the local government and local volunteers. It was claimed as protected area for mangroves and itchyofauna by the local government of Tubajon, Laguindingan, Misamis Oriental.

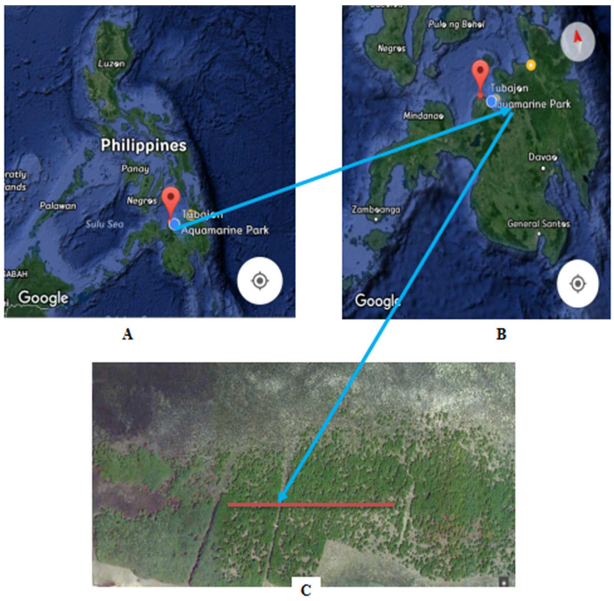

Fig. 2. Map showing the (a) Philippines (b) Mindanao and (c) the sampling area.

Data Gathering and Analysis

Line transect and mist netting method were used to identify avifauna species on October to November 2017. There were ten (10) pieces of mist nets having a measurement of ten (10) meters (m) long and were established along the line transect. Species that were not captured in the mist nets were still identified using the line transect considering its one kilometer distance. Sampling was done during food hunting, rest time, foraging, and roosting time of the avian species around 6-7am in the morning and 3-4pm in the afternoon. Species was identified based on its morphometric data and with the use of such references like Guide to the Birds of the Philippines by Kennedy *et al.* (2000) and also with the help of local residents of Brgy. Tubajon, Laguindingan, Misamis Oriental.

The effort curve illustrates the new species that are found during the sampling period. As it reaches its plateau, it means that there is no new species that are found and the sampling period can be done. The x-axis indicates the number of days in doing the sampling while the y-axis is the cumulative number of species found. The number of species found in the area has a total number of eight (8) for eight (8) days of sampling. The data gathered was based on the one hour one kilometer transect walk and the birds trapped into the mist nets installed by the researcher. This indicates that eight (8) different kinds of avifauna species were found in the area.

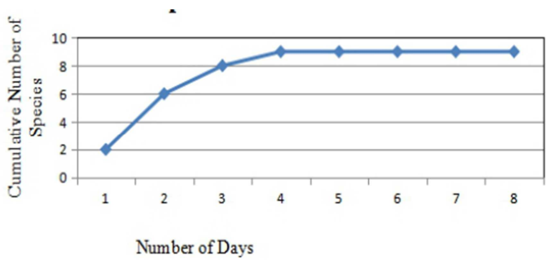

Fig. 3. Species effort curve of avifauna in Brgy. Tubajon, Laguindingan, Misamis Oriental.

Mangrove species were identified using a point-centered quadrat method (PCQM). In every set of points there is a representative species. The area was divided into four 90° quadrants having 250 meters per quadrant, and the mangrove species closest to the point in each quadrant was also identified (Satyanarayanam *et al.*, 2011). Data were analyzed by computation of the relative abundance, species richness and diversity of mangrove trees and bird species. Shannon-Weiner Index was used to acquire both the abundance and evenness of species.

In the Shannon Diversity Index, p is the proportion (n/N) of individuals of one particular species found (n) divided by the total number of individuals found (N), ln is the natural log, Σ is the sum of the calculations, and s is the number of species. Avifaunal diversity was correlated with the mangrove diversity.

Results and discussions

Species Composition, Relative Abundance and Diversity of Avifauna

There are eight (8) avifauna species present in Aquamarine Park at Brgy. Tubajon, Laguindingan, Misamis Orienal. It is composed of four (4) Orders such as Passeriformes, Columbiformes, Coraciiformes, and Pelecaniformes. Table 1 shows the species composition, taxonomic classification and its status of conservation for every avifauna species that had been observed in the area during data gathering.

The relative abundance of bird species present in the Aquamarine Park, Tubajon, Laguindingan, Misamis Oriental is shown in Table 2. A total number of 1,517 individuals were found, wherein Brown Shrike (*L. cristatus Linnaeus*) is the most abundant bird species with a total of 19.45% relative abundance.

This means that mangroves areas is habitable for Brown Shrike (*L. cristatus Linnaeus*). Insects, oerthoptera, coleopteran, other anthropods and spiders as prey items may be present in the area for the survival of Brown Shrike. Brown Shrike (*L. cristatus Linnaeus*) is not globally threatened and there is little information on their population and currently evaluated as least concern levels (del Hoyo *et al.,* 2007). Golden Bellied fly eater (*G. sulphurea*) is the least abundant species with a total of 5.01% relative abundance.

According to Birdlife International, Golden Bellied Fly-eater (*G. sulphurea*) is common in open country, second growth, mangroves and urban areas and feed on insects gleaning from leaves higher up in the trees (Clementes *et al.,* 2016).

Golden bellied flyeater (*G. sulphurea*) is not that highly disturbance tolerant as Brown Shrike (*L. cristatus Linnaeus*). According to Birdlife International of 2016, Golden bellied Flyeater (*G. sulphurea*) is evaluated as least concern.

Table 1. Avifauna species found in Brgy. Tubajon, Laguindingan, Misamis Oriental.

Order	Family	Scientific Name	Common Name	Conservation Status	Endemicity
Passeriformes	Passeridae	*Passer montanus*	Eurasian Tree Sparrow	Least Concern	Non-Endemic
Passeriformes	Rhipiduridae	*Rhipidura nigritorquis vigors*	Pied Fantail	Least Concern	Non-Endemic
Passeriformes	Laniidae	*Lanius cristatus Linnaeus*	Brown Shrike	Least Concern	Non-Endemic
Passeriformes	Muscicapidae	*Muscicapa griseisticta*	Grey Streaked Flycatcher	Least Concern	Non-Endemic
Columbiformes	Columbidae	*Ducula carola*	Spotted Imperial Pigeon	Vulnerable	Endemic
Coraciiformes	Alcedinidae	*Todiramphus chloris*	White-Collared Kingfisher	Least Concern	Non-Endemic
Pelecaniformes	Ardeidae	*Egretta garzetta*	Little Egret	Less Concern	Non-Endemic
Passeriformes	Acanthizidae	*Gerygone sulphurea*	Golden Belied Fly eater	Least Concern	Non-Endemic

Table 2. Relative abundance of avifauna species in Laguindingan, Misamis Oriental.

Species	Scientific Name	Ni	RA%
Eurasian Tree Sparrow	*Passer montanus*	278	18.33
Pied Fantail	*Rhipidura nigritorquis vigors*	256	16.88
Brown Shrike	*Lanius cristatus Linnaeus*	295	19.45
Grey streaked flycatcher	*Muscicapa griseisticta*	210	13.84
Spotted Imperial Pigeon	*Ducula carola*	117	7.71
White Collared Kingfisher	*Todiramphus chloris*	176	11.60
Little Egret	*Egretta garzetta*	109	7.19
Golden Bellied Fly-eater	*Gerygone sulphurea*	76	5.01
TOTAL:		1517	100

The species diversity index of bird species found in Aquamarine Park, Tubajon, Laguindingan, Misamis Oriental is shown in Table 3. The results obtained from this study show that the diversity and evenness (H=3.37, E= 0.46) in Aquamarine park is higher. According to Kerkhoff (2010), that the typical values are generally between 1.5 and 3.5 in most ecological studies, and the index is rarely greater than 4. The value between 0 and 1 with 1 being completed evenness of community increases (Kerkhoff, 2010). Moreover, any forms of anthropogenic activities (such as land conversion, hunting and cutting of trees, urbanization and pollution) that cause disturbance to habitats vary the species diversity of the area (Chase *et al.,* 2004). Furthermore species diversity may also vary depending on the taxonomic group and the structural parameter of the vegetation (Tews *et al.,* 2003).

Table 3. Diversity index of avifauna species Tubajon, Laguindingan, Misamis Oriental.

Species	Ni	Index Variable	*Sum*
Passer montanus	278	=n1	0.72
Rhipidura nigritorquis vigors	256	=n2	0.64
Lanius cristatus Linnaeus	295	=n3	0.79
Muscicapa griseisticta	210	=n4	0.47
Ducula carola	117	=n5	0.20
Todiramphus chloris	176	=n6	0.35
Egretta garzetta	109	=n7	0.15
Gerygone sulphurea	76	=n8	0.07
Diversity Index	1517	=N	3.37

Species Composition, Abundance and Diversity of Mangrove Species

There are two (2) species of mangrove trees found in Aquamarine Park, Brgy. Tubajon, Laguindingan, belonging to one (1) Family *Rhizophoraceae*. These are mainly planted mangroves by the local community (Table 4). Due to environmental factors and life range, species becomes lesser in richness but the planting of new mangrove was established in order to replace the putrefied mangroves. The influence of human and climatic factors also affects the density vegetation, habitat, abundance of food types, and assemblage of avian species (Aceved-Whitehouse and Duffus, 2009). Furthermore, the environment and climate has been altered due to the anthropogenic activities (Hansen *et al.,* 2001). The human activities like cutting of mangrove trees have been observed during the collection of data.

Table 4. Species composition of mangrove species in Tubajon, Laguindingan, Misamis Oriental.

Family	Scientific Name	Common Name	Local Name	Conservation Status
Rhizophoraceae	*Rhizophora apiculata*	Tall- stilt Mangrove	Bakhaw Lalaki	Least Concern
Rhizophoraceae	*Rhizophora mucronata*	Loop- root Mangrove	Bakhaw Babae	Least Concern

Table 5 shows the relative abundance of the two (2) mangrove species found in Brgy. Tubajon, Laguindingan, Misamis Oriental. In terms of abundance, the two species found namely: Tall- Stilt Mangrove (*Rhizophora apiculata*) has 50% abundance similar to Loop- Root Mangrove (*Rhizophora mucronata*).

It was equally abundant because both species belongs to low to mid-tide level (Hussain *et al.,* 2010). Furthermore, the availability of the nutrients to mangrove plant production is being controlled and dependent to some biotic factors (Reef, 2010). Moreover, planted mangroves is a method of restoring ecological function but it cannot be justified as not diverse, since it is often replanted with mono-genus stands. It might have few species but the abundance of the mangrove forest provides essential needs for birds such as for the shelter, food and protection. It is also very important to birds since it is the one that protect them in the ground in dwelling predators (Georgia-Pacific Corporation, 1999).

Table 5. Relative abundance of mangrove species in Tubajon, Laguindingan, Misamis Oriental.

Species	Ni	RA%
Rhizophora apiculata	20	50
Rhizophora mucronata	20	50
Total	40	100

Table 6 shows the mangrove species diversity in the sampling area. Mangrove diversity is H=3.22 which means that species are diverse in the area. This stipulates that mangrove and canopy provides important habitat for a wide range of avifauna species (Blasco *et al.,* 2008). Furthermore, mangrove species found were strongly indicative of a specific species in the sampling site, emphasizing the importance of the number of zones to bird's diversity (Mohd-Azlan *et al.,* 2012).

Table 6. Species diversity of mangrove species in Tubajon, Laguindingan, Misamis Oriental.

Mangrove Species	Ni	Index Variable Name	*Sum*
Rhizophora apiculata	20	=n1	1.61
Rhizophora mucronata	20	=n2	1.61
Diversity Index	40	=N	3.22

The correlation between mangrove species diversity and avian species diversity varies linearly. The Pearson correlation coefficient indicates that its value of *0.932* have positive association, that is as one variable increases the other value of variable increases as well.

Moreover, the positive correlation concludes that the avian diversity is dependent to mangrove species. The existence of vegetation such as mangrove trees and other crops are essential to the avifauna species, in which forest are important habitat and it also provides food, nest site and protection for birds (Simeone *et al.,* 2002).

Conclusion

Avifauna species is diverse, rich and abundant, while the mangrove species is not as highly as diverse compared to the other natural mangrove forest for it is a man-made. Furthermore, the avifauna species has a strong relationship with the mangrove species, in which, the avian species is highly dependent on the mangrove composition. Moreover, the man-made eco-tourism forest is habitable for avian species where they can hatch their eggs, source of foods and it is also act as their shelter. In addition, Aquamarine Park of Barangay Tubajon, Laguindingan, Misamis Oriental is highly vulnerable to anthropogenic activities that can threaten the composition and diversity of both avian and mangrove species.

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