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PRELIMINARY ASSESSMENT OF BATS AT PADER CAVE, VICTORIA, ZAMBOANGA CITY, WESTERN MINDANAO, PHILIPPINES

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ABSTRACT

The study was conducted to gather information on bats in Pader Cave, Victoria, Zamboanga City. Specifically, the study aimed to identify species of bats, species dominance, and occurrence of species per station and document the morphological characteristics of each species identified. Samples of bats captured using mist netting method. Species identification was based on Ingle and Heaney Key to the Bats of the Philippine Islands (1992). A total of 360 individuals belonging to sub-order Megachiroptera were identified in the different elevations of Pader Cave, Victoria, Zamboanga City. The two species are *Rausettus amplexicaudatus* and the *Cynopterus brachyotis*. The dominant species is *Cynopterus brachyotis (240). Rausettus amplexicaudatus (120)* was the least dominant. Site 3 has the most abundant number of bats with the elevation of 67 meter above sea level. Site 1 has the lowest number of bats with an elevation of 54 meter above sea level. The *Rausettus amplexicaudatus* has the highest total length (250mm) and *Cynopterus brachyotis* has the lowest length (220mm). *Cynopterus brachyotis* has the highest density (0.01) and *Rausettus amplexicaudatus* has the lowest density (0.005). Station 3 has the lowest temperature (24 degree celcius) and station 1 has the highest (27 degree celcius). Based on the data gathered, the results show higher elevation has greater number of bats, considering the pressure in higher elevation is low; there will be a little disturbance which is favourable for the bats to have their rest. The presence of these species indicates that there is still good natural cave in Zamboanga City.

KEYWORDS: *Rausettus amplexicaudatus, Cynopterus brachyotis,* relative density, diversity indices, nfrugivorous.

INTRODUCTION

The 7000 plus islands of Philippine archipelago hosts over 70 bat species belonging to 32 seven families (Ingle and Heaney, 1992; Heaney et al., 2010). Ingle and Heaney (1992) pioneered a comprehensive assessment of bats in the Philippines and developed the first 34 taxonomic key, which has become fundamental to most bat studies in the country.

Approximately 32% bat species in the Philippines are frugivorous or nectarivorous and the 36 remainder is predominantly insectivorous. Insectivorous species include 37 Vespertilionidae, Rhinolophidae, Hipposideridae, and 38 other insectivorous species Mollosidae, Megadermatidae, and 39 Emballonuridae, (Heaney et al 2010).

In terms of endemism, 35% (n=27) of species 40 are known to be endemic to the country, with the highest described endemism in the Old-world 41 fruit bats (Pteropodidae), with 60% endemic in the country, and often restricted to Islands or 42 single localities. In contrast to this, insectivorous families have relatively low described 43 endemism (12%), though this is likely due to under-description of species present and large 44 numbers of cryptic species i.e., the case of Hipposideros groups (Esselstyn et al 2012; Murray et al 2012).

Bats contribute to the generation of the forest, maximizing genetic variation of the flowering plants. But unfortunately, many species of bats are becoming endangered due to habitat destruction and many human attitudes toward bats. Habitat destruction results to an inadequate supply of food, unavailability of secure roosting sites and a declined in the survivorship rate of bats.

Increasing habitat destruction will cause extinction of more bats in the immediate future. This information has prompted the researcher to conduct a study on the identification of bats at Manicahan cave, Zamboanga City.

The Chiroptera Specialist Group of IUCN's (International Union for the Conservation of Nature) Species Survival Commission bats are overexploited for food. There is also a general lack of information about the distribution, status, biology has produced two Action Plans examining conservation issues several species of bats in the Philippines including 10 of the 25 species of fruit eating bats continue to decline and are threatened to the brink of extinction. Bats that live in caves and the large group of fruit-eating flying foxes are most vulnerable because they are disturbed by people and hunted for food. They are also vulnerable to extinction because like humans, bats generally give birth to only one pup at a time. (Mickleburgh et al 2002). The result of this study will serve as baseline information and it will also help in changing the human's point of view in enhancing their appreciation to bats. This can also initiate preserving measures as well information drive in preserving bats. This study will focus on the identification and classification of bats in Manicahan cave, Zamboanga City. Other bats beyond the area will not be considered. Morphological characteristics is only for documentation and historical characteristics are not considered in this study.

MATERIALS AND METHOD

Selection of the sampling site

This study was conducted at Pader cave, Victoria, Zamboanga City. Victoria is about 24 kilometres from the main city hall. It is right on the main east coast highway.

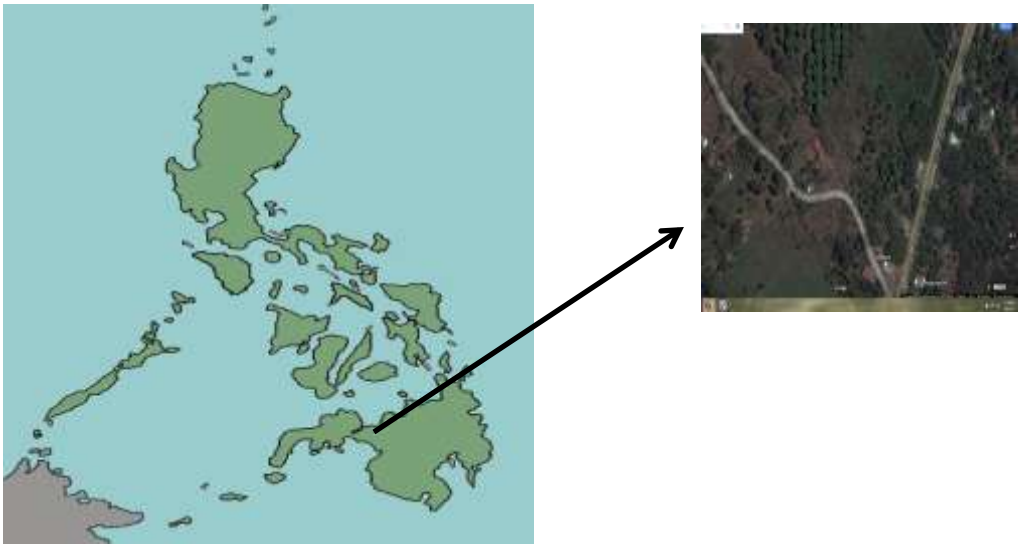

Figure 1: The Location of the Study site (Pader Victoria, Zamboanga City).

Sampling Design

Direct counting and group counts was categorized from the photographs done to characterize individuals bounded with in colony. The method comprises the total count of bats per resting since it is different to relate these counts to area of space occupied. Spotting scope and the direct observation and quick counts and the use of binocular were employed. Bats in the cave are difficult to count individually when they are not at rest. To obtain these estimates and actual counts, photographs was taken as the bats approaches the cave above surface.

Gathering data

Data was gathered by comparing the species density the frequency among areas in the cave. The following formulas came from the book of G. Texon and A. Manila (2005). These were used in determining its density and frequency.

Statistical Analysis

Average density was used to compare the density of sampled bats per site. Research Parameters includes**;** Elevation, define as an altimeter or an altitude meter was the instrument that was used to measure the altitude and elevation of the cave**;** and air temperature**,** temperature of a cave is directly related to the outside temperature. And thermometer was used to measure the air temperature of the cave.

Research Procedures

Preparation of Mist Net

With the use of bolo, two poles of bamboo were cut and trimmed. These poles were used to raise the mist net trap above the ground to effectively catch the flying bats and to prevent the net from getting entangled with the surrounding vegetation. This was done by typing up each side of the net to each pole. The cords situated at the sides of the net were tied up against the pole firmly enough to prevent sagging but also loose enough to provide adequate pockets to stop the bats from bouncing off the net.

Preparation of Cage

Cage of size with 2 feet length on each side was utilized to harbour and secure the captured bat. At least 2 individuals of the same species were placed in a single cage. Proper care was taken to see to it that an individual of different species was not placed together.

Collection of Samples

There was 1 net that was used for each site. And since bats are nocturnal, it was prepared in the late afternoon and was checked morning. The captured bats were placed on cages and were taken for proper classification and identification. The gathering of samples specimens was done once. Three days for three trials.

Classification and identification of Samples

Collected samples were meticulously classified base only on their morphology with the help of reliable resources reference, such as The Key to the Bats of the Philippines Island by Ingle et al., the bats were classified starting from its suborder down to its species level.

RESULTS

Table 1 shows that station 3 has the highest number of individuals (193). Station 1 has the lowest number of species (47).

Table 1: Number of individuals per species in 3 stations.

Stations	Individuals Per Species	Number of species
1	47	2
2	120	2
3	193	2
Total	360	2

Table 2 shows that *Cynopterus brachyotis* has the highest number of individuals (100) in station 2 and 3. *Rausettus amplexicaudatus* has the lowest number of individuals (47) in station 1.

Table 2: The distribution of identified species of bats per station.

Stations	Individuals Per Species		Number of Species
	Cynopterus brachyotis	*Rausettus amplexicaudatus*	
1	40	7	2
2	100	20	2
3	100	93	2
Total	240	120	2

Table 3 shows that station 1 has the highest air temperature (26 ^{O}C). Station 3 has the lowest air temperature (24 ^{O}C). And station 3 has the highest elevation (67 metre). Station 1 has the lowest elevation (54 metre).

Table 3: Shows the air temperature and elevations of 3 stations.

Stations	Air temperature	Elevations (metre)
1	26 ^{O}C	54
2	25.5 ^{O}C	61
3	24 ^{O}C	67
Total	25 ^{O}C	61

Table 4 shows that *Cynopterus brachyotis* has the highest density (0.012) in station 2 and 3. *Rausettus amplexicaudatus* has the lowest density (0.0009). *Cynopterus brachyotis* has the highest relative density (83.3) in station 2 and 3. *Rausettus amplexicaudatus* has the lowest density (5.8)

Table 4: The density and relative density of each species in 3 stations.

Stations	Density		Relative density	
	Cynopterus brachyotis	*Rausettus amplexicaudatus*	*Cynopterus brachyotis*	*Rausettus amplexicaudatus*
1	0.005	0.0009	33.3	5.8
2	0.012	0.0025	83.3	16.7
3	0.012	0.0115	83.3	77.5
Mean	0.001	0.0049	67.0	33.0

Table 5 shows that *Cynopterus brachyotis* has the highest diversity indices. *Rausettus amplexicaudatus* has the lowest diversity indices.

Table 5: The Diversity indices of two species identified.

	Cynopterus brachyotis	*Rausettus amplexicaudatus*
Simpson_1-D	0.63	0.37
Shannon_H	1.03	0.66
Evenness_e^H/S	0.93	0.65
Margalef	0.37	0.42

Table 6 shows that *Rausettus amplexicaudatus* has the highest body length (250mm) and wing length (120mm). *Cynopterus brachyotis* has the lowest body length (220mm) and wing length (105mm).

Table 6: The body length and wing length of species.

	Cynopterus brachyotis	*Rausettus amplexicaudatus*
Body length	220 mm	250mm
Wing length	105mm	120mm

DISCUSSION

There are two species of bats that were identified and classified at different elevations of Pader Cave, Victoria, Zamboanga City. The identification and classification were done by using The Key to the Bats of the Philippines Island by Ingle et al., and by comparing their morphological measurement such as; total length, tail length, ear, forearm and hind foot to the standard measurement given in the Key to the Bats of the Philippines Island. All two identified species of bats in Pader Cave, Victoria, Zamboanga City belongs to the sub-order Megachiroptera or the fruit bats. And not even one species belong to Microchiroptera or insect bats were caught. This is due to the availability of food and survival capacity of bats. Megabats have well-developed visual cortex and show visual acuity, while microbats rely on their echolocation for navigation and finding prey.

The dominant species among three stations is the *Cynopterus brachyotis* with total number of 240 species counted. And the least dominant species among the three stations is *Rausettus amplexicaudatus* with a total number of 120 species counted. A factor affecting the dominant and least dominant species is the competition among species of the bats. Competition occurs when resources are limited such as food supply and safe hibernating area. Since there are only two species of bats found in the area, competition did really exist, this type of competitions are what you called the contest competitions. It is when some individuals claim enough resources while denying others a share, so the unsuccessful individual suffers.

Another factor is that, it is less disturbed by human activities compare to the other caves in Zamboanga City. The abundant species is the *Cynopterus brachyotis* based on the result of diversity indices. Bats distribution and abundance varies from one elevation to the other considering that bats are agile, mobbing frequently from one place to another. Factors such as food supply, migration, temperature, human hunting activities, mortality could be the triggering factors for its distribution and abundance.

The measurement ranges gathered from the representatives that were caught conforms to the standard ranges that provided in the The Key to the Bats of the Philippines Island by Ingle et al., The *Rausettus amplexicaudatus* is the largest species in terms of the size of the body, with a body length that range from 250mm to 260mm, on the other hand, the *Cynopterus brachyotis* is the smallest species with a body length range from 220mm to 230 mm. The measurement in bats is one of the morphological basis for the separation of its representatives species.

The number of species per station. Based on the data gathered the highest number of species observed through direct counting was the station number 3 with mean of 193. 33 with two species and station 1 has only 47.33 with 1 species which is the lowest and 120.67 with two species observed.

The air temperature data gathered in three different stations are in table number 3, result shows that station 3 has the lowest temperature with 24 Degree Celsius and the highest is station 1 with 26 Degree Celsius, this indicates that station 3 has the coldest station and hottest for station 1.

Table 4 is showing the resulted elevation of the study, result shows that station 1 has the lowest elevation with 54 meter and the highest is station 3 with 67 meter, this indicates that station 3 has the highest elevation and station 1 has the lowest elevation.

Density and Relative Density based on tables 5 and 6 show that *Cynopterus brachyotisn* has greater number than *Rausettus amplexicaudatus.* This indicates that *Cynopterus brachyotis* is diverse than *Rausettus amplexicaudatus.*

Table 7 shows that *Cynopterus brachyotis* has the highest number of diversity indices with Shannon, Simpson and Eveness and Markalef resulted with greater number than *Rausettus amplexicaudatus*, this indicates that species of *Cynopterus brachyotisn* in terms of richness is greater than *Rausettus amplexicaudatus.*

CONCLUSION

A total of 360 individuals representing two species were identified in the three sites in Pader Cave, Victoria, Zamboanga City. All the two species belongs to the sub-order Megachiroptera, under the family Pteropodidae. The two species are *Cynopterus brachyotis* and *Rausettus amplexicaudatus.* The dominant species in Pader Cave, Victoria is *Cynopterus brachyotis*, while the least dominant species is *Rausettus amplexicaudatus.* Among the three sites, site 3 has the most number of bats based on direct counting done.

The *Rausettus amplexicaudatus* is the largest species caught in terms of body size, while the *Cynopterus brachyotis* is the smallest. Based on the data gathered, the results show higher elevation has greater number of bats, considering the pressure in higher elevation is low, there will be a little disturbance which is favourable for the bats to have their rest.

RECOMMENDATION

Based on the gathered data, the researcher recommends that further study should be conducted on the same sites, which may include all the area of the cave. He also suggests to increase the sampling area or sites, days of observation in each site, and to increase the number and type of nets that will be used.

The researcher also suggest to study the endo-parasites and ecto-parasites that these bats are carrying as the researcher encounter a lot of bats dead bodies with worms inside and outside.

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Appendices

Picture 1: Shows the identified bats species (Rausettus amplexicaudatus) using its morphological appearance.