DIVERSITY OF MICROCHIROPTERANS IN THE THREE HABITATS OF ARGAO WATERSHED FOREST RESERVE, CEBU, PHILIPPINES

LS Obiso¹, SMT Alcazar¹, EA Agbay¹, HM Alburo¹GB Hoyohoy², ^{EP} Lillo¹, AB Malaki¹, RLV Rica³, RDC Manalastas³ and RP Opiniano¹

¹ Cebu State College of Science and Technology – Argao Campus
² Cebu State College of Science and Technology – Barili Campus
³ Cebu State College of Science and Technology – Main Campus

ABSTRACT

This study was undertaken to gather information about microchiropteran species composition and diversity in three habitat type (riverine ecosystem, mixed/plantation forest and natural forest) at Argao Watershed Forest Reserve which will serve as a baseline data for conservation program. Mist-netting (1.22 x 6m mist net) were conducted from April 9 – December 27, 2008.

A total of two-hundred microchiropteras representing four families in six generas, were captured, process and identified using Key to the Bats of the Philippines (Ingle and Heaney, 1992).

Results showed that mixed/plantation forest has the highest diversity among the three habitat types followed by the natural forest and the riverine ecosystem respectively. The top five abundant species are *Chaerephon plicata* (Wrinkled lipped bat) followed by *Rhinolophus inops, Rhinolophus virgo, Rhinolophus arcuatus* and *Hipposideros diadema*.

The capture of *Chaerephon plicata* (Wrinkled lipped bat) must be considered in conservation effort because this specie once form the largest colonies of bats in the Philippines but presently most of its colony are reduced in size or entirely destroyed (Ingle and Heany, 1992).

INTRODUCTION

Microchiropterans are small bats with quite large ears that eat insects. These kinds of bats catch 3000 insects a night using echolocation. Bats echolocate at such high frequency we can't hear them as they fly around and by this they can see insects flying in front of them. Their presence in the ecosystem is very important because they are considered as the major predator of night-flying insects, making them beneficial to man in several ways. They consume many agricultural pests such as cutworm and corn borer moths, potato beetles and grasshoppers. Mosquitoes and similar people pest are eliminated much more efficiently by microhiropterans that by the avifaunal community.

Bats including microchiropterans are hunted for food in this side of the islands which leads to its declining population. Another factor is habitat loss due to shifting cultivation or kaingin. This is a main threat to microchiropteran biodiversity in our country particularly Cebu (<u>www.batcon.org/batsmag/</u>). Cebu contains approximately 15 km², or 0.3 percent of its original dipterocarp forest cover.

Argao Waterhed Forest Reserve located at the southern part Cebu islands is one of the important areas for biodiversity (Mallari, 2002). Little has been known to its biodiversity. Thus, this study will serve as a baseline data that can be used by LGU's, academe and the national government in introducing wildlife conservation program.

MATERIAL AND METHODS

Description of Study Sites

The study was conducted in the three habitat sites; namely, riverine ecosystem, mixed/plantation forest and natural forest found within Argao Watershed and Forest Reserve in Argao, Cebu. The watershed area has a

type III climate (Corona type) which means that there is no pronounced dry and wet seasons. However, it is observed that the dry season occurs from February to April while the rainy season occurs from May to December. The watershed area is located approximately between latitude 9 ° 48'58" and 9 ° 56' 3" North, longitude 123° 27' 00" and 127° 34' 27" East. It lies in an approximate distance of 81 kilometers away from Cebu City and 15 kilometers from Argao town proper and is accessible by any type of land transportation. The remote areas can be accessed by foot through established foot trails.

Riverine habitat (lotic ecosystem), is the main river of the Argao Watershed Forest Reserve. The waters are flowing (lotic) and exhibit a longitudinal gradation in temperatures, concentration of dissolved material, turbidity, and atmospheric gases, from the source to the mouth. To be considered as riverine ecosystem, twenty meters on both sides of the riverbank is delineated to be included in the study.

Mixed/plantation forest is the area within the watershed in which exotic species are introduce or planted while natural forest is the area within the watershed where natural patches of forest and endemic species are gr



Figure 1. The Study Site Argao Watershed and Forest Reserve

Mist Netting Procedure

To capture microchiropterans, mist nets measuring 1.22 m x 6m were set in flyways of the area in mixed/plantation forest and in natural forest. Ropes and slingshots were used to set the mist nets on trees and flyways which is 3 to 4 meters above the ground. In the riverine ecosystem, mist nets were set across and along the riverline using bamboo slats and ropes. Mist nets are set 10 meters apart within the riverline.

Mist nets were set from 6 PM to 6 AM (considered as one net night) the following day and inspected every 6 PM, 9 PM, 12 AM, 3 AM and 6 AM the following day. As soon as microchiropterans are capture nets are lowered down and they are removed to prevent stress and injury. Captured microchirpterans were placed in bags and were identified following the "Key to the Bats of the Philippine Islands" by Ingle and Heaney (1992). Biometric measurements (forearm, hindfoot, tail,body length,tail length), sex, maturity, and weight were recorded and each animal was marked at the wings using white ink prior to release.

For each habitat, a total of seventy five net nights were taken. Sample took place from April 9 to December 27, 2007.

Microchiropterans Mist Netted



Fig. 2. Number of Microchiropterans Mist Netted at Three Habitats from April 9 to December 27, 2007

Figure 2 shows the number of microchiropterans mist netted across three habitat type at different time interval. It is noted that the number of mist netted microchiropterans decline from dusk to dawn. Undergoing the data by ANOVA (RCBD) it shows a non significance difference among habitat types but blocking shows a significant difference (at 5%).

Using the Key to the Bats of the Philippines (Ingle and Heaney, 1992), overall misted netted microchiropteras represents four families in six generas (*Mollosidae: Chaerephon; Rhinolophidae: Hipposideros and Rhinolophus; Megadermatidae: Megaderma* and *Vespertilionidae: Murina* and *Myotis*).

Table 1. Diversity and Abundance of Microchiropterans at Argao Watershed Forest Reserve.				
		Habitat		
Species	Riverine	Mixed/Plantation	Natural Forest	
		Forest		
	64	1	2	
Chaerephon plicata	(95.52)	(3.12)	0	
	[0.02]	[0.05]		
		1		
Hipposideros bicolor	0	(3.12)	0	
		[0.05]		
		2		
Hipposideros coronatus	0	(6.25)	0	
		[0.08]		
Hipposideros diadema		4	3	
	0	(12.5)	(2.97)	
		[0.11]	[0.05]	
		1	1	
Megaderma spasma	0	(3.12)	(0.99)	
		[0.05]	[0.02]	
Murina cyclotis	2	3	1	
	(2.99)	(9.38)	(0.99)	
	[0.05]	[0.01]	[0.02	
	. ,		1	
Mvotis muricola	0	0	(0.99)	
			[0.02]	
		5	2	
Rhinolophus arcuatus	0	(15.36)	(1.98)	
nimolophus arcuatus	-	[0 13]	[0 03]	
Rhinolophus inops	1	[0.10] 2	91	
	(1 49)	- (6 25)	(90,10)	
	[0 03]	[0.23]	[0 04]	
	[0.05]	[0.00] A	[0.04]	
Rhinolophus philippinensis	0		٥	
	U	(12.J) [0 11]	U	
		10.111		

Diversity and Abundance

Tropical Technology Journal Volume 11, No. 1-2, January-June 2008

		9	2
Rhinolophus virgo	0	(28.13)	(1.98)
		[0.16]	[0.03]
Total Importance Value	0.10	0.92	0.21
Total Number of Microchiropterans Mist	67	22	101
Netted	07	52	101
Number of Net Nights	75	75	75
Number of Bats per Night	0.89	0.43	1.35
Numbers in parenthesis = relative abundance			
Numbers in brackets = importance value			

Table 1 presents the diversity and abundance of microchiropterans mist netted at Argao Watershed and Forest Reserve. Mixed/plantation forest has the highest total Importance Value followed by natural forest and riverine ecosystem respectively. The top five abundant species are *Chaerephon plicata* (Wrinkled lipped bat) followed by *Rhinolophus inops, Rhinolophus virgo, Rhinolophus arcuatus* and *Hipposideros diadema*.

Table 2 Regional geographic distribution, habitat preference and current status of microchiropterans mist
netted at Argao Watershed Forest Reserve (Ingle and Heaney, 1992).

Species	Distribution	Habitat Preference	Current Status
Chaerephon plicata	throughout the Philippines	caves, buildings and other sites in the forest	uncommon with threat
Hipposideros bicolor	throughout the Philippines	caves, hollow trees, hollow fallen logs and other sites in the forest	common with threat
Hipposideros coronatus	throughout the Philippines	caves, hollow trees, hollow fallen logs and other sites in the forest	common with threat
Hipposideros diadema	throughout the Philippines	caves, hollow trees, hollow fallen logs and other sites in the forest	common with threat
Megaderma spasma	throughout the Philippines	caves and hollow trees	common with threat
Murina cyclotis	throughout the Philippines	caves, buildings, foliage, hollow trees, unfurled banana leaves and bamboo internodes	common with threat
Myotis muricola	throughout the Philippines	caves, buildings, foliage, hollow trees, unfurled banana leaves and bamboo internodes	common with threat
Rhinolophus arcuatus	throughout the Philippines	caves, hollow trees, hollow fallen logs and other sites in the forest	common with threat
Rhinolophus inops	throughout the Philippines	caves, hollow trees, hollow fallen logs and other sites in the forest	common with threat
Rhinolophus philippinensis	throughout the Philippines (endemic)	caves, hollow trees, hollow fallen logs and other sites in the forest	common with threat
Rhinolophus virgo	throughout the Philippines	caves, hollow trees, hollow fallen logs and other sites in the forest	common with threat

Based on the Key to the Bats of the Philippines (Ingle and Heaney, 1992), almost all the mist netted chiropterans are distributed throughout the Philippines with *Rhinolophus philippinensis* as endemic. Habitat preference of these species are caves, hollow trees and hollow fallen logs within the forest. It is also noted that *Chaerephon plicata* (Wrinkled lipped bat) is now uncommon due to threats. It was once formed the largest colonies of bats in the Philippines (Ingle and Heaney, 1992).

CONCLUSION AND RECOMMENDATIONS

Sampling of microchiropteras by mist netting was done at the three habitat type of Argao Watershed and Forest Reserve Cebu Philippines from April 9 – December 27, 2007. A total of two-hundred microchiropteras representing four families and six generas, were mist netted (*Mollosidae: Chaerephon; Rhinolophidae: Hipposideros and Rhinolophus; Megadermatidae: Megaderma* and *Vespertilionidae: Murina* and *Myotis*).

Diversity and abundance of microchiropterans is high at mixed/plantation forest followed by natural forest and riverine ecosystem respectively. The top five abundant species are *Chaerephon plicata* (Wrinkled lipped bat) followed by *Rhinolophus inops, Rhinolophus virgo, Rhinolophus arcuatus* and *Hipposideros diadema*.

Most of the species are distributed throughout the Philippines with *Rhinolophus philippinensis* as endemic specie. Habitat preference of these species are caves, hollow trees and hollow fallen logs within the forest. It is also noted that *Chaerephon plicata* (Wrinkled lipped bat) is now uncommon due to threats. It was once formed the largest colonies of bats in the Philippines (Ingle and Heaney, 1992).

Program on the conservation of *Chaerephon plicata* (Wrinkled lipped bat) within the undisturbed habitat will be given attention and a further study on cave dwelling bats be conducted.

REFERENCES

Books

Mallari, N.A.D, B.R. Tabaranza, Jr., and M.J. Crosby. 2001. **Key Conservation Sites** in the Philippines. Harribon Foundation and Birdlife International. Bookmark, Inc., Makati City, Philippines. 485 p

Odum, E.P., 1971. Fundamentals of Ecology 3rd edition. Saunders Book CompanyJournals

Ingle, N.R. , and Heaney, L.R. 1992. **A Key to the Bats of the Philipiine Islands**. Fieldiana: Zoology, new species, 69 : 1-44 p

Internet

Bats and Humanity. http://www. Earthlife.net/mammals/bat-man.html visite May 11, 2008.

Bat Conservation International. http://www.batcon.org/home/index.asp?id visited May 12, 2008

Heaney, L.R. and Heidemen, P.D., 1987. Philippine Fruit Bats: Endangered and extinct.

http://www.batcon.org/batsmag/v5n1-3.html

ACKNOWLEDGMENT

Special thanks to the CSCST System Research and Development Office for the support, likewise to the Commission on Higher Education RO 7 (CHED) for the endorsing the project. Appreciation and deep gratitude to the Cebu Biodiversity Conservation Foundation, Inc. for the training and continuing support they provided to the Macroflora and Fauna Research Team of the CSCST System. Special mention to Lisa Marie, Philip Godfrey and Orlyn. To DENR-CENRO, Argao, LGU Argao thru the Barangay chairman of Usmad, Catang, Tabayag, Conalum and Cansuje for their support. We also extend our thanks to the school administration for the all out support during the conduct of the study.