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Bat diversity and local conservation initiatives in the Montane forest of MT. Kalatungan in Pangantucan, Bukidnon, Philippines

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Abstract

Bat diversity assessment and gathering of data on local conservation initiatives was conducted in two sampling stations *viz*; the upper and lower montane forest of Mt. Kalatungan Range Natural Park in Portulin, Pangatucan, Bukidnon to provide information on bat species composition, diversity trend and local conservation initiatives in Portolin, Pangantukan,Bukidnonusing95 mist-net nights to capture bats. Bats captured were measured in terms of body length, for arm, ear, tail and femur. Bats were released after taking the morphometries. Five species were recorded in the upper montane forest and four species in lower montane forest with a total of 70 individuals. Three species: *Haplonycteris fischeri (*Lawrence), *Macroglossus minimus (*É. Geoffroy), *Ptenochirus jagori* (Peters) were caught in both stations. Two species: *Cynopterus brachyotis (*Müller*)* and *Harpyionycteris whiteheadi (*Thomas) are disconcordant in the upper montane, while one species *Rhinolophus arcuatus (*Peters) - an insect bat, was the only disconcordant species in the lower montane. All six species recorded in the upper and lower montane forest of Mt Kalatungan were categorized as Least Concern. In general, these values indicate a relatively low bat diversity. Species diversity was higher (0.57) in the upper montane and (0.47) in the lower montane forests. *Haplonycteris fischeri* (Lawrence) is dominant both in upper and lower montane forests, accounting to 33% and 44.3% relative abundance, respectively.Interview and FGD results show that presently, local residents are not practicing bat hunting due to implementation of legal and cultural laws of the community.

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Introduction

Bats have both ecological roles in the forest ecosystems, particularly for natural pollination, seed dispersal, forest regeneration, population regulation, and pest control. Bats are also considered important in scientific research and tourism. The exit of millions of bats from caves at dusk and the large colonies of fruit bats hanging at roost trees fascinates and attracts eco-tourists. Hence, it helps in the increase of income of the locality through ecotourism. However, bats are also facing threats due to habitat degradation and loss. As in many cases of biodiversity threats, habitats are lost or reduced due to land clearing for agriculture, plantations, timber extraction, and the overexploitation of flora and fauna. In addition, migration also accounts for habitat degradation. As the population of migrant communities surrounding forests increases, attempts to illegally cut timber and hunting of wildlife also doubles. Thus, diversity of species, including bats can decline which will have impact to the ecology of forests.

Mt Kalatungan is adeclared Protected Area that harbors diversity of flora and fauna. The forests of Mt Kalatungan is sacred to the Talaandig tribe as their traditional ritual area. The continued existence of the mountain ensures the community's perpetual existence and survival. However, the demand for more lumber has encouraged migrants to enter the sacred forest of Mt Kalatungan (De Vera and Guina, 2008).Regenerating forests that serve as wildlife corridors are also converted or utilized for agriculture. Consequently, Mt Kalatungan is prone to socio economic pressure.

Based on the assessment of Bird Life International (2011), Mt. Kalatungan has been considered as an Important Bird Area (IBA) in 2001 due to the presence of the threatened Philippine Eagle (*Pithecophaga jefferyi)* and Philippine Hawk-eagle (*Nisaetus philippensis)* included in the IUCN Red List. Mt Kalatungan also harbors five threatened mammals: two are Endangered, i.e. Flying Fox *Acerodon jubatus* and Mindanao Pygmy Fruit Bat *Alionycteris paucidentata* while three are Vulnerable, i.e. Philippine deer *Cervus mariannus,* Philippine warty pig *Sus philippinensis*, and white-collared or Mindanao fruit bat *Megaerops wetmorei.*

These data show that Mt Kalatungan is an ecologically important wildlife habitat. However, there is no list yet of bats found specifically in Barangay Portulin portion of Mt Kalatungan.

This study sought to determine the species of bats in Mt Kalatungan, specifically in Barangay Portulin, Pangantucan, Bukidnon. This is part of the INWARD (Integrated Watershed Research and Development) Phase 2 – Muleta watershed under the PCAARRD-DOST funding. Thus, this paper sought to infer the status of bats and their habitat in the forest of Portulin that plays a vital role in the conservation and protection of the bats of Mt Kalatungan as well as the culture of Lumad communities. Additionally, this paper intends to provide information on the species composition, diversity, threats and measures to protect the habitats of bats in this western slope of Mt. Kalatungan particularly at the upper and lower montane forest.

The information generated from the study can be the basis to promote natural forest regeneration to secure the habitat of the rich diversity of species in Mt. Kalatungan.

Materials and methods

Study Site

Thestudy on bat diversity conducted in Mt Kalatungan Range Natural Park, specifically at the portion of Baranggay Portulin in Pangantucan, Province of Bukidnon in Mindanao, Philippines (Fig.1), that lies between the coordinates 8°00' and 8°60' latitude and between 124°35' and 124°60' longitude.

It is bounded on the north by the municipality of Talakag, on the west by the municipality of Lantapan and the city of Valencia, and on the south by the municipality of Pangantucan. Its eastern side is bordered by both Talakag and Pangantucan.

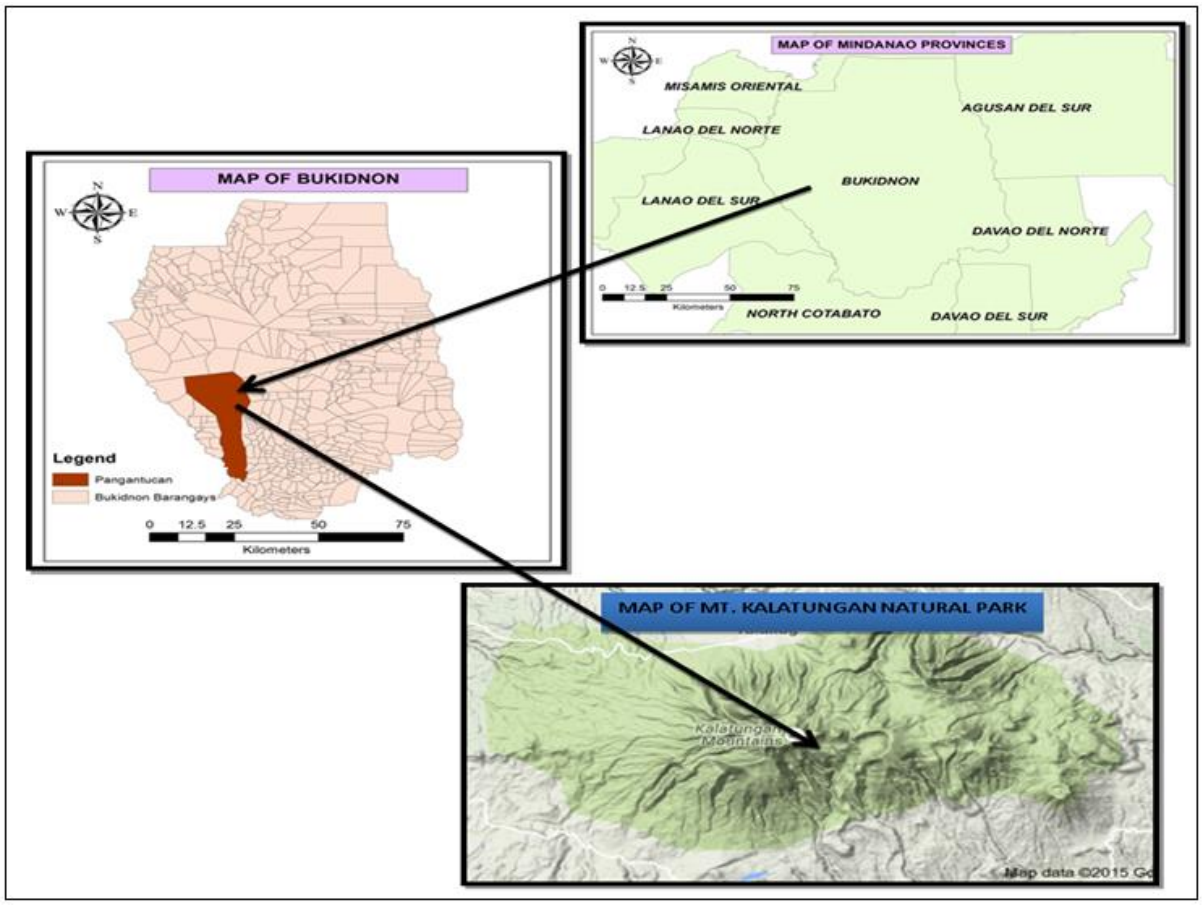

Fig. 1. Map of the study site.

One of the barangays bordering Mt Kalatungan is Barangay Portulin which is one of the nineteen barangays of the municipality of Pangantucan. Portulin is situated in the northern part of the municipality with an elevation of approximately 1,200 meters above sea level, The barangay has a total land area of 4,267.50 hectares. The Talaandig community in Portulin has a population of 465 individuals distributed in 93 households. The community is located high up in the Kalatungan mountain range whose livelihood depends on farming. Ten percent of thetotal land area of the barangay is agriculture planted with. sugar cane, corn, rice, coffee, and vegetables as main crops. Forty-four hectares of the land area is set aside for protection (Barangay Portulin LGU, 2014).

The study area is a tropical rainforest which lies in between two streams i.e. Bagik-ikan and Lumaguok. The topography is steep and the temperature is at an average of 22˚C.

The sampling site falls within the biodiversity plot of the INWARD-Project Phase 2- Muleta Watershed. The area is dominated by the following flora: *Lithocarpus sp, Syzygium sp, Adinandra apoensis, Cinnamomum mercadoi, Clethra canescens, Dacryocarpus imbricatus, Elaeocampus calomala, Lithocarpus sulitii, Macaranga dipterocarp ifolia, Neolitsea vidalii,* and *Symplocos sp*.

The site was subdivided into two, i.e. upper montane with elevation of 1500m masl to 1700 masl, and lower montane with elevation ranging from 1400m masl to 1450m masl(Fig. 2).

The upper montane has approximate distance 1 kilometer from the lower montane. The lower montane forest has a steep slope. It has adjacent small scale farm planted with short term crops such as corn, potatoes, carrots, pechay, bell pepper, tomatoes, spring onions and coffee. However, some part of the upper montane forest at the elevation 1700

masl is an open area about 0.25 hectare dominated with cogon, bamboo and banana. At the elevation 1600 masl, the dense forest is associated with ferns and rattan.

Entry to the site was made possible thru the entry protocol INWARD - Muleta Watershed Project. Courtesy calls were made at the Municipal LGU, through the Municipal Council and the office of the Mayor of Pangantucan, the CENRO-DENR in Pangantucan, Mt Kalatungan PAMB and the Portulin Tribal Association in Barangay Portulin with Datu Johnny Guina.A ritual was done prior to the conduct of the study.

Data collection

Purposive sampling was done to set up nets and capture bats. A total of 45 mist nets were established for 3 nights.

This accounts to a total of 95 mist net-nights. Potential travel corridors such as following the trails, streams and fruiting plants typically are the most effective places to set up nets. In order to catch and identify the bat samples, mist nets were deployed across and along trails, forest edge, forest interior and along the cliff (Fig.3). Sampling started from6 PM to 9 PM and checked every 30-minute interval to retrieve captured bats. A total of 95 net nights were done from December 27-30, 2015.

Table 1 shows the number of established mist nets in the entire sampling period. On the last day of sampling, mist nets were added in the lower montane forest along the hillside of the mountain and on the trails lateral to the cliff. This brings to a total of 95 net nights established in the entire duration of the sampling.

Bats captured were identified through the external features using the Ingle and Heaney (1992) taxonomic guide. External features of each species were observed and noted: presence of two claws, detailed structure of the ear and teeth, nose leaf, muzzle and tail. Morphometric were also done by using digital vernier caliper in millimeter: length of forearm, body length, total length, length of ear, and length of tail. Captured bats were marked by tying a thread on the tarsus of the bats.

No recapture was recorded in the entire sampling duration. Retrieved bats were given a drop of honey to relieve their stress from being trapped. To support the information being scripted in the study, data and information gathered were recorded and samples were documented using DSLR camera. The IUCN 4 version 3.1 (2015) was used to categorize the updated conservation status of captures bats.

The data gathered were analysed using biodiversity Professional Sofware Ver.2.0. Descriptive analysis was used to determine their level of awareness on the protection of bat species in the forest. Margalef's index and Shannon diversity index were used to compute the diversity and richness respectively, of bats in the study area.

Local practices and management of bats

Key informant interviews using prepared survey questionnaire were conducted to acquire information in terms of the utilization practices, threats and management of the residents with regards to bats in the montane forest of Mt Kalatungan. Ten respondents were purposively sampled with the following criteria: knowledgeable in bats who reside in the area for at least 5 years. The results of interviews were tabulated and analyzed using descriptive statistics such as frequency and percentage.

Results and discussion

Bat Species Composition

Six species of bats accounting to a total of 70 individuals belonging to two families (Pteropodidae and Rhinolophidae) and six genera were documented in the montane forest of Mt Kalatungan in Barangay Portulin, Pangantucan, Bukidnon (Table 1). A total of 68 individuals of fruit bats and 2 individuals of insect bats were captured. The results is lower compared to the study of Joven (2007) which recorded 12 species

in the montane forest of Mt Hilong-Hilong, yet higher compared to the study of Esmalde (2014) which documented only two species in Sacramento Cave in San Fernando, Bukidnon. But similar to the results conducted at higher elevations in the mountains of Mindanao, such as Mt. Apo, Mt. Kitanglad and Mt. Hamiguitan (Mohagan *et al.*, 2015; Salmoy *et al.,* 2017).

Table 1. Type and number of mist net established.

Sampling site	Types of mist net	No. of nets
Upper Montane Forest	High Net	3
	Sub-canopy Net	9
	Ground Net	7
	Sub-total	19
Lower Montane Forest	High Net	1
	Sub-canopy Net	18
	Ground Net	7
	Sub-total	26
Total		45

A total of 32 individuals representing five species were caught in the upper montane forest and 38 individuals representing four species in the lower montane forest. On the other hand, there were only four species caught in the lower montane forest.

The bat species captured in both sites is reflected in Table 2. Of the total six species captured, *C. brachyotis* and *H. whiteheadi* are bats found only in upper montane while the insect bat *R. arcuatus* was found only in lower montae forest.

Table 2. Species compositionand abundance of bats on Mt. Kalatungan, Bukidnon.

Species	Family	Frequency	Relative abundance (%)
Upper Montane			
1. *Haplonycteris. fischeri* (Lawrence)	Pteropodidae	23	32.9
2. *Cynopterus brachyotis* (Müller)	Pteropodidae	5	7.1
3. *Macroglossus minimus* (É. Geoffroy)	Pteropodidae	2	2.9
4. *Harpyionycteris whiteheadi* (Thomas)	Pteropodidae	1	1.4
5. *Ptenochirus jagori*(Peters)	Pteropodidae	1	1.4
6. *Rhinolophus arcuatus (*Peters)	Rhinolophidae	0	0
Lower Montane			
Haplonycteris. fischeri (Lawrence)	Pteropodidae	31	44.3
7. *Ptenochirus jagori*(Peters)	Pteropodidae	4	5.7
8. *Rhinolophus arcuatus (*Peters)	Rhinolophidae	2	2.9
9. *Macroglossus minimus* (É. Geoffroy)	Pteropodidae	1	1.4
Cynopterus brachyotis(Müller)	Pteropodidae	0	0
Harpyionycteris whiteheadi(Thomas)	Pteropodidae	0	0
Total	2	70	100

The pygmy fruit bat, *H. fischeri,* is dominant in the two sampling sites accounting to a total of 77% relative abundance. Similarly, Turner *et al.* (2006) revealed that *H. fischeri* is most abundant in Lower Montane of North Negros Forest Reserve.

According to Heany *et al.* (2002), *H. fischeri* is a common resident of primary forest habitats at middle elevations (150-2500m) and becoming most abundant between 1200-1500m. This species is Philippine endemic and is most abundant in a relatively undisturbed site.

In fact, the study of Turner *et al.* (2006) also revealed that *H. fischeri* was also present at all sites accounting to 29% of the total number of individuals captured. As stated by Rickart *et al. (*2007), native species have variable tolerance for disturbance; many can persist in moderately disturbed habitat and can re-colonize areas that have been severely disturbed.

This may also be the reason why *H. fischeri*is widespread despite the disturbed state of lower montane forest in Barangay Portulin.

Table 3. Computed diversity indices.

Diversity Indices	Sampling Site	
	Upper Montane	Lower Montane
Shannon-Weiner Diversity Index (H')	0.92	0.65
Shannon Index (J') of Evenness	0.57	0.47
Margalef's Richness Index (D_{Mg})	1.15	0.82

Bat Diversity Indices

Margalef's index is higher in upper montane. Diversity index was higher in the upper montane as compared to lower montane. The recorded high diversity in the upper montane was due to the presence of banana which served as food for fruit bats. These bananas were planted in the abandoned farm. Bananas are preferred food of bats. Elangovan *et al.*, (2000) described that the bracts covering the inflorescences of banana begin to open about 30 minutes after sunset and a number of creamy white flowers emerge that last just one night, then the bat will startto open the bract of the banana (Edirisinghe and Kusuminda, 2014).

Table 4. Bats composition and conservation status.

Species	Local Name	ConserVation Status (IUCN, 2015-4 version 3.1)
Family Pteropodidae		
Haplonycteris fischeri (Lawrence)	Kalapanit	Least Concern
Cynopterus brachyotis (Müller)	Paniki	Least Concern
Macroglossus minimus (É. Geoffroy)	Kalapanit	Least Concern
Ptenochirus jagori (Peters)	Kabog	Least Concern
Harpyionycteris whiteheadi (Thomas)	Sabul	Least Concern
Family Rhinolophidae		
*Rhinolophus arcuatus (*Peters)	Kalapanit	Least Concern

Temperature also influences the distribution of bats, being a warm blooded mammal. As elevation increases, mean temperature decreases. When temperatures increase, species from lower elevation move up (Maselli *et al,* 2010). The temperature of the site which recorded 22°C influenced the bat species from the lower montane to migrate in the upper montane to inhabit in a cooler place. These accounts for the higher diversity in the upper montane. Lower montane, however, was less diverse than upper montane due to disturbances by human activities and forest fragmentation.

This is supported by Asher (2009) who stated that habitat loss, disturbance and fragmentation are the major threats to many species. On the other hand, Nuñeza *et al.* (2015) reported that undisturbed site has relatively high diversity index.

The lower montane of Barangay Portulin has adjacent small scale farming of short term crops such as corn, potatoes, carrots, pechay, bell pepper, tomatoes, spring onions and coffee. The forest has estimated distance 1.5 km from the farm. Thus, diversity is low due to forest fragmentation.

Distribution of Captured Bats in the Study Site

Haplonycteris fischeri (Lawrence) (Fig.4) This species is a strictly forest-dwelling Philippine endemic bat and is widespread through most of the country thus being assessed as Least Concern.

It is also common at higher elevation which is consistent to the study of Joven (2007) in the montane forest and mossy forest (Salmoy, 2007) of Mt Hilong-hilong.

In the study of Bandiez (2009), this species is uncommon in mossy forest. Tinong, (2006) reported that *Haplonycteris fischeri* is also abundant in Mt Hamiguitan, Davao Oriental.

This species was previously assessed as Vulnerable in the previous published Red List Assessment (Ong *et al.,* 2008) yet currently assessed as Least Concern.

Table 5. Community management of forest (n=10).

Parameters	Measures	Frequency*
Importance of Forest	Source of medicine	10
	Ritual area	10
	Source of food	9
	Provides pure and clean water	9
	Part of the culture as Indigenous people	8
	Habitat for wildlife	7
	Source of lumber	5
Conservation Measures to Protect the Forest	Prohibition of the practice of Kaingin	8
	No cutting of trees	7
	No throwing of garbage	6
	Others (Reforestation)	3
LGU Implemented Programs for Forest Protection	Information drive: Conduct seminars about forest	14
	Others (Bantay Lasang program, Reforestation, no kaingin activities)	6

*with multiple responses.

Harpyionycteris whitheadi (Thomas) (Fig.5)

The species was caught in the upper montane forest at the elevation 1700 masl. The area was previously cultivated by the local resident but is currently a grassland dominated with cogon and bamboo tree with patches of banana in the upper portion of the area. *H. whiteheadi*is relatively widespread and common in suitable habitat. In general, their main habitat is montane forest (Heaney *et al.,* 1998). In a 2003 mist net survey on Mt Apo, *H. whiteheadi* was uncommon in lower elevation mossy-montane forest that had been subjected to habitat alteration (Godfrey *et al.*undated, as cited by IUCN, 2015).

Cynopterus brachyotis (Müller) (Fig.6)

This species occurs throughout the Philippines having a relatively wide distribution and is tolerant of a broad range of habitat and has a presumed large population. In this study, *C. brachyotis*was captured only from upper montane forest with 5 individuals at the elevation of 1600 masl. It is absent in the lower montane forest for it is locally threatened by the deforestation as a result from conversion of land to agricultural uses (Molur *et al.*, 2002).

It is common in old growth lowland forest at 100 masl and in residual montane forest at 1450 (Heaney *et al.*, 2002).

Ptenochirus jagori (Peters) Fig.7.

This species was captured (Fig.7) from the lower montane forest with 4 individuals and only 1 in the upper montane forest. It is widespread and abundant with large populations which are generally stable (Heideman and Heaney, 1989) and is common in montane forest yet, absent in mossy forest (Heaney *et al.,* 2002). This is used to be categorized as Vulnerable in 2008 but currently assessed as Least Concern. Although this species has no doubt to be declining, overall it remains common and not significantly threatened.

Table 6. Community conservation of bats (n=10).

Parameters	Measures	Frequency *
Importance of Bats	Natural pollinators	7
	Helps in nature propagation	7
	Source of food	5
	Others (Source of fertilizer)	5
	Controls pests in the field	4
	Source of medicine	3
Implemented Rules and Regulations on Capturing Bats	"No hunting of bats" policy	6
	Impose Penalty	5
	Hunting is regulated	1
	Bats are for household uses only	1
Programs & Projects Initiated by the Government to Protect Bats	Information drive on the value of bats	7
	Conduct seminars on bat conservation	6
Measures to Enhance Environmental Protection of Bats	Community to regulate hunting of bats	9
	DENR program on forest conservation	5
	Impose penalties to those who violate the law	5
	DENR program on bat protection	5
	LGU formulate program on Bat Protection	3

*with multiple responses.

Macroglossus minimus (É. Geoffroy) (Fig. 8)

This species is abundant in disturbed areas but rare in old growth forest.it is known to be stable and geographically widespread as noted by Utzurrum (1992). This species is documented by Heaney *et al.* (2002) in montane forest at 925 masl and 1600 masl in Balbalasang, Kalinga Province. However, only 1 individual was caught from the lower montane forest and 2 individuals in the upper montane forest where there is a presence of banana. According from the study of Heideman and Utzurrum (2003)in Negros, *Macroglossus minimus* is strongly associated with species of *Musa* wherever they are abundant. Currently, it is assessed as Least Concern and "Not Threatened" in 2008.

*Rhinolophus arcuatusn (*Peters) (Fig.9)

This species is locally common in the Philippines (Heaney, 1998) and has a wide distribution and presumed large population. This species is still unlikely to be declining fast enough to qualify for listing in the threatened category.

The species was caught from the lower montane forest with 2 individuals at the elevation 1400- 1500 masl which appear to be consistent in the result of Heaney *et al.* (2002) in Balbalasang, Kalinga Province having recorded in montane and mossy forest ranging from 925- 1950 masl. This species is categorized as Least Concern.

Conservation Status of Bats

The conservation status of bats was determined using the IUCN (2015).

As shown in Table 3, all the captured species belong to the Least Concerned (LC) category. This means a taxon has been evaluated against the criteria and "does not qualify for critically endangered, endangered, vulnerable or near threatened" (IUCN, 2015). Widespread and abundant taxa are included in this category.

Fig. 2. Upper (A) and lower (B) montane forest.

The species *Haplonycteris fischeri* has been locally assessed as common that implies more abundant in the two sampling sites. Based on interviews, respondents consistently expressed that, at present, they no longer hunt bats because this is prohibited by LGU and DENR. Note that Mt Kalatungan is a protected area. In addition, the Portulin Talaandig Community takes responsibility in protecting the forest as local forest guards locally known as *Bantay Lasang (Forest Guards)*. As such, the bat species are still perceived as locally abundant.

Although at present bats in the study site are categorized as Least Concern, this may not necessarily mean that there is no threat. The other important concern is that bats that used to be found in this site may no longer be found in the future if their habitats are threatened(Table 3).

Threats affecting bat diversity

Rapid increase in the human population resulting to increase demand for land area and other natural resources contributes greatly to the declining populations of different species (Pimentel *et al.*, 2007).

This alteration of natural habitat of organisms including climate change has been linked to a global decline in vertebrate population (Forister *et al.,* 2010).

Fig. 3. Establishment of mist nets.

Threats to bats diversity was observed primarily in lower montage forest due to conversion of forest area into farmland.

The edges of the forest is prone for subsistence cultivation which causes disturbance to the wildlife and loss of habitat resulting from habitat fragmentation.

However, according to interviews conducted, the presence of the cultivation in the upper montage is done by one of the tribal members in the past years.

This is now abandoned. Tribal community are practicing in cutting of trees for the purpose of construction of their houses, but in return five seedlings would be planted as part of their customary laws.

Fig. 4. *Haplonycteris fischeri* (Lawrence).

The continuous expansion of human settlements and agricultural areas within the protected area may drastically change its habitat characteristic (Ogutu *et al.*, 2012) as well as endangering the future life of wildlife species. Hunting is believed to threaten the survival of many important wildlife species, specifically bats (Gubbi and Linkie, 2012). Yet, local people near from the sites are currently participating in prohibiting the hunting of bats and other wildlife hence, bat species are locally abundant and are not at risk of being threatened. However, the locality of Barangay Portulin has initiated existing policies in prohibiting the destruction of natural vegetation as well as thriving wildlife within the protected area as part of their customary laws of the IPs. In addition, local government unit of Pangantucan, CENRO-DENR and non-government organization are actively participating for the protection and management of the protected area and also the wildlife in the forest.

Fig. 5. *Harpyionycteris whiteheadi* Thomas).

Community Forest Conservation Practices

Farming is the major means of livelihood in the community with an average monthly income of 1,000- 5,000 pesos.

The demand for land for farming may eventually be a threat to bat diversity. Based on interviews, local residents see the importance of forest as summarized in Table 4.

This has motivated community to conserve their forest. Barangay Portulin is dominated with the Talaandig Tribe, considered the forest very important as part of their culture as Indigenous Peoples (IP). In fact, the forest is their ritual area.

Fig. 6. *Cynopterus brachyotis* (Müller).

As a conservation measure of their forest, the community prohibited the practice of *kaingin* (slash and burn) in the protected area.

Accordingly, anybody caught doing *kaingin* will be sanctioned or will be penalized through payment of cash depending on the size of the area being burned. In addition, violators are obliged to replant the trees of the same species. On the other hand, cutting of trees without permission to the Tribal Council is not allowed, unless for traditional purposes e.g., construction of house within the community. Prior to cutting trees, they should be replaced first with five (5) trees to be planted for every cut tree. Importing of logs or lumber for commercial purposes is also not allowed as one of the conservation measures of their forest.

Fig. 7. *Ptenochirus jagori* (Peters).

In addition, throwing of garbage is strictly prohibited along or within the protected area or forest vicinity. Campers and visitors are required to bring their garbage at home (Table 4).

In addition to community conservation efforts, other programs are implemented as presented in Table 5. The local government of Pangantucan has initiated programs and projects in protecting the forest such on conducting of seminars and information drive on the value of the forest. Aside from LGU, Non-government organization (NGO) area also involved in protecting the forest, such advocating for no cutting of trees and practicing reforestation in the said area. Bantay-Lasang as an organization inside the community is also engaged, specifically in protecting, updating and monitoring of the area.

Fig. 8. *Macroglossus minimus* (É. Geoffroy).

Local residents see the importance of bats in sustaining the life of the forest by means of pollination and dispersion of seeds throughout the vicinity. They also presumed bats as helpful in protecting their fields in minimizing the nocturnal insects as pests on their crops by means of predation. Although they significantly considered bat as a source of food, they are not practicing the hunting of bats in the forest for it is strictly prohibited. A penalty is imposed to those caught hunting bats (Table 5).

Fig. 9. *Rhinolophus arcuatus (*Peters).

Somehow, the government has initiated an information drive on the value of bats and conducting a seminar on bat conservation to protect the bats in the forest.

Conclusions

Mt kalatungan is the home of five species of fruit bats. Diversity was higher in the upper montane to lower montane.

All species were classified as Least Concern (LC) as per IUCN (2015), which means that the taxon is not threatened. The local residents are not into hunting wildlife but the threat is more on habitat disturbance due to forest conversion to cultivation. The community has implemented local community conservation to protect bats and their forest as habitat for bats.

It is recommended that local awareness through IEC campaigns such as video showing and posters should be intensified especially to local schools and communities on the importance of forest and bats; and local community and PAMB should consider natural and assisted forest regeneration by protecting habitat and food sources of bats.

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