



## PRELIMINARY REPORT ON THE ANURANS OF MT. PANTARON RANGE, BUKIDNON, CENTRAL MINDANAO, THE PHILIPPINES

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**ABSTRACT** – A field survey of anurans was conducted in the three barangays surrounding Mt. Pantaron Range in Bukidnon to determine the species richness, conservation status and microhabitat preferences. Field sampling was performed using a combination of belt transect, opportunistic and capture-mark release sampling techniques. Field investigations were done in the agro-ecosystem and montane forest with the elevation ranging from 1,100-1,550 masl. The study documented 18 anuran species belonging to seven families and 15 genera, and approximately 61 % (11 species) are Philippine endemics. Moreover, four (4) noteworthy Mindanao island endemic namely; *Ansonia muelleri*, *Leptobrachium lumadorum*, *Megophrys stejneri*, and *Pulchrana grandocula*. As to the conservation status, *Limnonectes magnus* was categorized as vulnerable. Majority of the anu-rans were observed near bodies of water such as ponds and streams while other species were collected in the ground microhabitat especially in the leaf litters and fallen and decaying logs. The result of the survey showed high species richness of anurans in Mt. Pantaron Range and more species are likely to be documented if the place is totally explored.

*Keywords: Mindanao Island, Pantaron Range, Amphibians, Endemism*

## INTRODUCTION

Anurans are biological indicator and more sensitive to the environment than other wildlife (Hopkins, 2007). The changes in biodiversity in the forest ecosystem developed a drastic change thus, affecting the anuran species inhabiting the forest. The richness of herpetological fauna of the Philippine Islands is high in terms of diversity and endemism (Diesmos et al., 2015; Brown et al. 2013; Diesmos et al. 2014). However, amphibians face threats such as habitat modification and loss, natural catastrophes, invasive species, hunting for food or the pet trade and the spread of chytrid fungus (Diesmos et al. 2012; Brown and Stuart 2012).

Many studies were conducted about the diversity of anurans in the country particularly in Luzon, Mindoro, Palawan and Central Philippines (Alcala and Brown, 1998; Brown et al., 2008, 2013; Diesmos and Brown, 2011; Causaren, 2009; Diesmos et al., 2003; Ferner et al., 2001; Oliveros et al., 2011). In Mindanao, studies on the species richness and distribution were conducted in different mountain ecosystems (Relox et al. 2010; Plaza and Sanguila, 2015; Beukema, 2011; Nuñez et al., 2012).

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According to Diesmos et al. (2002) the Philippine Archipelago is recognized as one of the most important centers of herpetofaunal diversity in Southeast Asia. To date, Philippine anurans diversity is represented by 108 species, at least 80% of which are endemic to the archipelago (Diesmos et al. 2015; Brown et al. 2013).

Mt. Pantaron Range covers three municipalities (San Fernando, Cabanglasan, Impasug-ong) and one city (Malaybalay City) of the province of Bukidnon. It is the most extensive mountain massif on Mindanao and the major part of the central cordillera of Mindanao. It runs south from the municipality of Claveria in the north of the island towards the south to the municipality of San Fernando and separates the provinces of Bukidnon in the west and Agusan del Sur in the east (Gronemeyer et al. 2014), fronting the southeastern part of Mt. Kitanglad Natural Park and Mt. Tago Range in northeastern part. This mountain range possesses a high biodiversity value due to a great number of diverse endemic flora and fauna. It is one of the remaining mountain ecosystems in Bukidnon which is poorly explored and due to extensive conversion of forest ecosystem into agricultural land, resulted to the removal of the lowland dipterocarp forest. This study was conducted to provide a preliminary assessment on anuran species richness, conservation status, and microhabitat preferences on Mt. Pantaron Range, Bukidnon, the Philippines.

## MATERIALS AND METHODS

### *Study area*

The study sites are situated in the 3 barangays namely; Barangay Busdi and Barangay Kibalabag of Malaybalay and Barangay Bulonay, Impasug-ong, Bukidnon (Table 1). It is bounded in the northeastern part by Mt. Tago Range. Its topography ranges from rolling to moderately steep and steep terrain. The mountain has several peaks with highest peak with an elevation of 1,802 masl. Part of the mountain was logged over and some existing vegetation is considered to be an old growth forest by which it is characterized by having trees with a bigger Diameter at Breast Height (DBH) but some patches were open grassland and cogonal areas. The selection of the two sampling sites was based on vegetation types and it was limited to reachable areas or within the established trail.

**Table 1.** Localities visited between 2008- 2009, listed by site number.

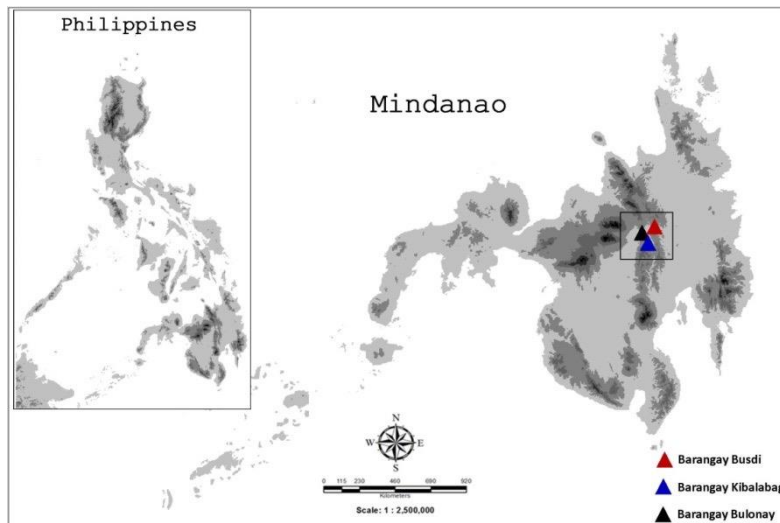
Study Site	Locality	Coordinates
1	Barangay Busdi, Malaybalay, Bukidnon	08°18'10" N, 125°15'37" E
2	Barangay Kibalabag, Malaybalay, Bukidnon	08°16'26" N, 125°10'85" E
3	Barangay Bulonay, Impasug-ong, Bukidnon	08°21'20" N 125°15'50" E

The three barangays are generally characterized by these two vegetation types as described briefly as follows:

A. **Agro-ecosystem:** Altitude ranging from 1,100-1,250 m asl; dominated by different agricultural crops, such as *Zea mays* L., *Allium sepa* L., *Lycopersicum esculentum* Mill., *Sechium edule* Sw.; some economic fruit trees include *Artocarpus heterophyllus* Lamk., *Psidium guajava* L., and

*Lansium domesticum* Corr. Serr. This area is dominated also by different invasive alien species such as, *Lantana camara* L., *Piper aduncum* L. and *Impatiens balsamina* Elm. Grasses- highly dominated followed by the *Pteridium aquilinum*. The original vegetation is said to be lowland dipterocarp forest but it has been logged and converted to agricultural land (E. Libuhan, pers comm.). The area is also located meters away from the village. The area has numerous fish ponds which is one of the main sources of food for the people in the area. The agroecosystem of Mt. Kitanglad and Mt. Malindang are also dominated by these agricultural crops and fruit trees (Amoroso et al., 2011).

**B. Montane Forest-** with altitude ranging from 1,250-1,550 m asl; characterized by taller trees with bigger dbh (diameter at breast height) ranging from 10-90 cm diameter, with height ranging 16-40 m; dominated by *Lithocarpus* spp., *Agathis philippinensis* Warb, *Phyllocladus hypophyllus* Hook. f. *Syzygium* spp., tree ferns such as *Sphaopteris* spp. and *Alsophila* spp. Trees were also covered with some mosses and ferns. Generally, the montane forests in the Philippines are characterized by the presence of the *Lithocarpus* spp., *Syzygium* spp., gymnosperms such as *Agathis philippinensis* Warb, *Phyllocladus hypophyllus* Hook. f. including tree ferns of family Cyatheaceae and Dicksoniaceae (Whitford, 1991; Gruezo, 1997; Buot and Okitsu, 1998; Fernando et al., 2004; Amoroso et al., 2011).



**Figure 1.** Location Map of the three study sites within the Mt. Pantaron Range, Bukidnon, Mindanao Philippines.

### Field Sampling Techniques

Fieldwork was conducted during the summer months (April-May) of 2008 and 2009. A 200-meter belt transect with five meters distance on each side was established in each sampling sites. Opportunistic and capture-mark-release sampling techniques were also conducted to gather more data on the distribution of the species. The group composed of 3-4 persons was made to collect mainly on the

anurans species. Day and night samplings were conducted between 0300-0600 H and 1600-2200 H, respectively. Specimens were captured by hand or with the use of nets. Data documented includes date, locality, coordinates, and general description of the habitat and the microhabitat. Voucher specimens were preserved in 80% alcohol and deposited at the University Museum in Central Mindanao University. Digital photographs were taken to document the natural coloration of specimens and microhabitats. The morphometrics of each specimen were taken to aid in the identification of the species. The specimens were identified using various published references (Alcala, 1986; Alcala and Brown, 1998; Diesmos et al., 2003; Brown et al., 2009; Diesmos et al., 2015).

## RESULTS AND DISCUSSION

### *Species richness and distribution*

A total of 18 species representing seven anuran families in 15 genera were recorded in Mt. Pantaron (Table 2). The family Dicroglossidae had the most number of species while Bufonidae, Ceratobatrachidae, Microhylidae and Ranidae were represented by three species each, Megophryidae with 2 species and Rhacophoridae with one species.

**Table 2.** Checklist and Conservation Status of Anurans in Mt. Pantaron, Bukidnon, Philippines.

Family	Species	English Name	Local Name	Endemism	Conservation Status
Bufonidae	<i>Ansonia muelleri</i>	Mueller's Toad	Kaluya	Endemic	
	<i>Rhinella marina</i>	Marine Toad	Cam frog		
	<i>Pelophryne lighti</i>				
Ceratobatrachidae	<i>Platymantis corrugatus</i>	Rough-backed Forest Frog		Endemic	
	<i>Platymantis guenthi</i>	Guenther's Frog		Endemic	
Dicroglossidae	<i>Limnonectes leytensis</i>	Giant Philippine Frog	Bakbak	Endemic	
	<i>Limnonectes magnus</i>	Mindanao Fanged Frog	Bakbak	Endemic	Vulnerable
	<i>Limnonectes parvus</i>	Philippine Small-disked Frog		Endemic	
	<i>Occidozyga laevis</i>	Puddle Frog	Kayunok		
Megophryidae	<i>Leptobrachium lumadorum</i>		Kayumpapa	Endemic	
	<i>Megophrys stejneri</i>	Mindanao Horned Frog	Pongpong	Endemic	

**Table 2 (Continued).** Checklist and Conservation Status of Anurans in Mt. Pantaron, Bukidnon, Philippines.

Family	Species	English Name	Local Name	Endemism	Conservation Status
Microhylidae	<i>Chaperina fusca</i>	Yellow Spotted-mouthed Frog			
	<i>Kalophrynus sinensis</i>	Black-spotted Narrow-mouthed Frog	Koka		
	<i>Oreophryne anulata</i>			Endemic	
Ranidae	<i>Pulchrana grandocula</i>	Big-eyed Frog	Kalugi	Endemic	
	<i>Sanguirana everetti</i>	Common Tree Frog	Kalugi		
	<i>Staurois natator</i>	Rock Frog	Antig	Endemic	
Rhacophoridae	<i>Polypedates leucomystax</i>	Four-lined Tree Frog	Mangalangit		

The species richness closely resembles that of the Aurora Memorial National Park, Balbalasang-Balbalan National Park on Luzon Island, Panay Island and Mt. Arakan and Mt. Apo in North Cotabato on Mindanao. It is higher than that of Batanes Province, Mts. Palay-Palay Mataas-na-Gulod Protected Landscape, Zambales Mountains in Luzon Island, Romblon Island Group, Cebu, Mt. Hamiguitan, Davao Oriental, Mt. Kitanglad, Bukidnon in Mindanao Island. However, it is relatively lower than that of Mt. Malindang, Misamis Occidental and Mt. Hilong-hilong, Agusan del Norte. (Table 2). High species richness is probably correlated with the availability of different microhabitat types, relatively constant environmental condition, high humidity and rapid decomposition (Causaren, 2009) (Table 3).

The family Bufonidae was represented by three species viz., one introduced *Rhinella marina*, a Mindanao faunal endemic *Ansonia muelleri* and *Pelophryne lighti*. *Ansonia muelleri* was commonly referred to as “kaluya” by the locals which means that could harm or stress out. According to them this toad produces toxins that could harm their enemy. Ceratobatrachidae was represented by two species: *Platymantis corrugatus*, *P. guentheri*. These two species are both Philippine endemics. All *Platymantis* are endemic to the Philippines and the genus exhibited most number of described species in the country (Diesmos et al. 2015).

Family Dicroglossidae is represented by three Philippine endemic species, viz., *Limnonectes leytenis*, *L. magnus*, *L. parvus* and a widely distributed puddle frog, *Occidozyga laevis*. Of all the species of the anurans collected, “Bakbak” or *L. magnus* is the most palatable and it has been assessed as Near Threatened and Vulnerable because the species is hunted for its meat (Sanguila et al. 2016, DAO

2004-15). Megophryidae include the two Mindanao faunal endemics; *Megophrys stejneri* and *Leptobrachium lumadorum*. These species were both found along road sides near Barangay Kibalag and Bulonay.

**Table 3.** Total number of anurans in different locations in the Philippines.

Location	Total Number of Species	References
Batanes Province	1	Lacaste et al. 2015
Mts. Palay-Palay Mataas-na-Gulod, Protected Landscape, Luzon Island	14	Causaren 2009
Romblon Island Group	13	Siler et al. 2012
Balbalasang-Balbalan National Park, Luzon Island	23	Diesmos et al. 2004
Aurora Memorial National Park	19	Brown et al. 2000
Zambales Mountains, Luzon	13	Brown et al. 1996
Cebu	13	Supsup et al. 2016
Panay Island	20	Ferner et al. 2000
Mt. Hamiguitan, Davao Oriental	14	Ates and Delima 2008
Mt. Malindang, Misamis Occidental	25	Nuñez et al. 2006
Mt. Kitanglad, Bukidnon	10	Beukema 2011
Mt. Hilong-Hilong, Agusan del Norte	27	Plaza and Sanguila 2015
Mt. Arakan, North Cotabato	19	Ates and Delima 2008
Mt. Apo, North Cotabato	17	DENR Report 1998

Ranidae was represented by three species namely, *Chaperina fusca*, *Kalophrynus sinensis*, *Oreophryne anulata*. It has been reported that most of the taxonomic distribution of anurans in other locations in the Mindanao followed the typical pattern which showed a proportionately large number of species belonging to family Ranidae. (Ates and Nuneza, 2000, Ates and Delima, 2008; Beukema, 2011; Relox et. al, 2011). Lastly, Rhacophoridae is represented by one species, *Polypedates leucomystax*.

Some species of anurans observed in the study was also recorded in the adjacent mountains viz. *A. muelleri*, *L. lumadorum*, *M. stejneri*, *Limnonectes leytensis*, *L. magnus*, *P. leucomystax* in Mt. Kitanglad (Beukema, 2011); *A. muelleri*, *S. everetti*, *L. magnus* in Mt. Kimangkil (Ates and Nuneza, 2000).

Each species collected has its own diagnostic characteristics. These characteristics include the morphometry of the Snout to Vent Length (SVL), shape and projection of the snout, color pattern, skin texture and webbing of fingers and toes. The SVL range of the specimens collected were consistent with the morphometry and other characteristics noted by Alcala and Brown (1998); Diesmos et al., 2015 and Sanguila et al. (2016).

**Table 4.** Occurrence of Anurans in the two vegetation types.

Family	Species	Agro-ecosystem	Lower Montane Forest
Bufonidae	<i>Ansonia muelleri</i>		x
	<i>Rhinella marina</i>	x	
	<i>Pelophryne lighti</i>		x
Ceratobatrachidae	<i>Platymantis corrugatus</i>		x
	<i>Platymantis guentheri</i>		x
Dicroglossidae	<i>Limnonectes leytensis</i>	x	x
	<i>Limnonectes magnus</i>	x	x
	<i>Limnonectes parvus</i>		x
	<i>Occidozyga laevis</i>	x	x
Megophryidae	<i>Leptobrachium lumadorum</i>	x	x
	<i>Megophrys stejneri</i>	x	x
Microhylidae	<i>Chaperina fusca</i>		x
	<i>Kalophrynus sinensis</i>	x	x
	<i>Oreophryne annulata</i>		x
Ranidae	<i>Pulchrana grandocula</i>	x	
	<i>Sanguirana everetti</i>	x	
	<i>Staurois natator</i>	x	x
Rhacophoridae	<i>Polypedates leucomystax</i>	x	
<b>TOTAL</b>		11	14

Our data showed that most of the species are found in the lower montane forest (14 spp.) (Table 4). However, there are some species that can be found in both vegetation such as *Limnonectes leytensis*, *L. magnus*, *Occidozyga laevis*, *Leptobrachium lumadorum*, *Megophrys stejneri*, *Kalophrynus sinensis* and *Sanguirana everetti*. These results were consistent with the study of Diesmos et al., (2003),

Delima et al. (2006) and Causaren (2009) who also recorded some of these species in human-altered habitats such as Agro-ecosystems. Conversely, *Ansonia muelleri*, *Platymantis corrugatus*, *Platymantis guentheri*, *Platymantis sp.*, *Limnonectes parvus*, *Chaperina fusca* and *Oreophryne annulata* were confined in undisturbed areas within the lower montane forest. Alcalá and Custodio (1995) and Delima et al. (2006) also recorded some of these species in undisturbed habitats that occupied in free or nearly free from logging and other human impacts. Moreover, some of these species were also encountered in secondary forest and along riparian habitats in lowland forest (Sanguila et al. 2016).

#### ***Endemism and Conservation Status***

The anuran assemblage in the study exhibited remarkably high degree of endemism (61%), with at least 11 species are endemic to the country viz., *Ansonia muelleri*, *Platymantis corrugatus*, *P. guentheri*, *Limnonectes leytensis*, *L. magnus*, *L. parvus*, *Leptobrachium lumadorum*, *Megophrys stejnegeri*, *Oreophryne anulata*, *Staurois natator*, *Pulchrana grandocula*. Only one threatened species was recorded in the area based on the assessment from DAO 2004-15 (Table 1).

#### ***Microhabitats***

A total of six microhabitat types were identified viz., artificial bodies of water (fish pond), rocks along streams/streams, shrubs growing near the stream while forest litter fall, shrubs growing in the forest and falling logs. Majority of the species (about 12 species) can be both aquatic and terrestrial that are found within or near the bodies of water such as in fish ponds and streams (Table 5). These species have generalized reproductive mode wherein they deposit eggs directly in the water and have an aquatic developmental stage (Causaren, 2009). But, some species like *Platymantis* have specialized mode of reproduction in which eggs are laid terrestrially and undergo direct development by skipping tadpole stage (Crump, 1982 and Alcalá and Brown.1998).

**Table 5.** Microhabitat preferences of anurans in Mt. Pantaron, Bukidnon, Philippines.

Family	Species	Total Number of Individuals						Total Sample
		Bodies of water (fish pond)	Rock near the bodies of water(stream)	Shrubs growing near the stream	Forest litter fall	Shrubs growing in the forest	Falling log	
Bufonidae	<i>Ansonia muelleri</i>		18					18
	<i>Rhinella marina</i>	5						5
	<i>Pelophryne lighti</i>			6				6
Ceratobatrachidae	<i>Platymantis corrugatus</i>					4	5	9
	<i>Platymantis guentheri</i>					4	2	6



**Table 5 (Continued).** Microhabitat preferences of anurans in Mt. Pantaron, Bukidnon, Philippines.

Family	Species	Total Number of Individuals						
		Bodies of water (fish pond)	Rock near the bodies of water(stream)	Shrubs growing near the stream	Forest litter fall	Shrubs growing in the forest	Falling log	Total Sample
Dicroglossidae	<i>Limnonectes leytensis</i>		27					27
	<i>Limnonectes magnus</i>	28	17	26				71
Megophryidae	<i>Leptobrachium lumadorum</i>		3	10				13
	<i>Megophrys stejneri</i>	10	9	15				34
Microhylidae	<i>Chaperina fusca</i>		6					6
	<i>Kalophrynus sinensis</i>				20		3	23
	<i>Oreophryne amulata</i>				2	2		4
Ranidae	<i>Pulchrana grandocula</i>	10	22					32
	<i>Sanguirana everetti</i>		8				6	14
	<i>Staurois natator</i>	4	15	3				22
Rhacophoridae	<i>Polypedates leucomystax</i>	4	8	10				22
<b>TOTAL</b>		77	139	64	27	10	19	<b>336</b>

Only one species strictly found in the ground microhabitat (in the forest floor and falling log) which is exhibited by *K. sinensis* while some species observed to have overlapping microhabitats. As cited by Causaren (2009) microhabitats are known to have important functions in the life history of amphibians these includes diurnal shelter, calling site, breeding site and oviposition site. This also suggest that species utilizes multiple microhabitats for foraging, refuge against predators or maybe for reproduction (Delima et al. 2006).



**Figure 2.** Anurans recorded from Mt. Pantaron Range, Bukidnon. (A) *Rhinella marina*, (B) *Ansonia muelleri*, (C) *Leptobrachium lomarudom*, (D) *Megophrys stejneri*, (E) *Limnonectes leytensis*, (F) *Limnonectes magnus*.



**Figure 3.** Anurans recorded from Mt. Pantaron Range, Bukidnon (continued) (A) *Sanguirana everetti*, (B) *Pulchrana grandocula*, (C) *Occidozyga laevis*, (D) *Platymantis guentheri* (E) *Staurois natator*, (F) *Kalophrynus sinensis* and Rhacophoridae include (G) *Polypedates leucomystax*.

## CONCLUSIONS

The study revealed a total of 18 species represented by seven families belonging to 15 genera. About 61% of anurans collected were endemic to the country and of these four are Mindanao faunal endemic. One species is vulnerable represented by *L. magnus*. Species were encountered mostly in aquatic microhabitats. However, overlaps in microhabitats were also observed maybe due to multiple uses of the available microhabitats. This study showed high richness of anurans in Mt. Pantaron. It is further recommended to do an extensive survey to fully document the diversity of anurans in the area and environmental factors that affect species diversity and distribution should be further investigated.

## STATEMENT OF AUTHORSHIP

This paper is part of the BS thesis and Special Problem of the primary author. The first and third authors conducted the field expedition at Mt. Pantaron Range, Bukidnon. The primary author conceptualized the framework of this paper and wrote the final content of the manuscript for publication with the guidance of the second and last authors.

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