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Assessment of the Diversity of Animals in the Forest Ecosystems of Pantabangan–Carranglan Watershed Forest Reserve, Nueva Ecija, Philippines

Annie Melinda Paz-Alberto, Shirley C. Serrano,
and Daryl A. Juganas

*Institute for Climate Change and Environmental
Management, Central Luzon State University, Science
City of Muñoz, Nueva Ecija*

The diversity of animals in the forested area of Pantabangan–Carranglan Watershed Forest Reserve was assessed. The four major groups of animals such as birds, mammals, reptiles, and amphibians were observed, described, identified, and classified. Birds and volant mammals were observed through standard mist netting and either sight or sounds. On the other hand, nonvolant mammals were observed or caught by traps and searching along their possible habitat. Amphibians were caught by hand, and the reptiles were observed through sightings.

A total of 53 animal species were observed in the area under 30 families, where Families Columbidae, Pteropodidae, Muridae, Colubridae, Ceratobatrachidae, and Dicroglossidae were the most represented families. Of the observed animals, 40 species were identified up to species level, and 13 species were identified through sightings and sounds.

A bird species “Sawsaw-it” (*Cinnyris jugularis*) got the highest importance value index of 19.32% and biodiversity indicator value of 17.5%. It was also the most common and the most dominant animal species surveyed in the forest ecosystem. Pantabangan–Carranglan Watershed Forest Reserve exhibited low-to-very low diversity.

Six species were listed as vulnerable and 3 species as near threatened. There were 40 native species recorded. Furthermore, there were no introduced species recorded in Pantabangan–Carranglan Watershed Forest Reserve.

Human activities such as timber poaching, forest fires, soil erosion, kaingin farming, mining, and wildlife hunting posed small-to-moderate impacts on the area.

Keywords: Fauna, Biodiversity, Forest Ecosystem, Pantabangan–

Carranglan Watershed Forest Reserve, IUCN Red List of Threatened
Species

INTRODUCTION

Biodiversity as defined in the United Nations Convention on Biological Diversity (UNCBD) is “the variability among living organisms from all sources including, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part.” Biodiversity consists of a variety of species, their genetic make-up, and the communities or population to which they belong (MEA, 2011).

The Philippines’ terrestrial and marine habitats contain some of the richest flora and fauna, and its waters are considered a part of the Biodiversity-Coral Triangle. Further, many of these organisms are endemic to the Philippines. Of the 580 recorded birds, more than 35% can only be found in the Philippines. More than 60% of the 167 different species of mammals and 65% of more than 10,000 species of plants are endemic (Lee, 2010).

Animals are excellent indicators of the change in the biosphere. They are sensitive to the quality of atmosphere and habitat in which they live, and they play important roles in traditional culture, folklore, study and research, pharmaceuticals, pest control agents, and important food source for some cultures (The Global Amphibian Campaign, 1999).

This project aimed to determine the exploitation and conservation status of forest biodiversity in Central Luzon. Specifically, the project aimed to conduct assessment of the diversity of animals in the selected forest ecosystems of Central Luzon; identify indicators of biological diversity in the forest ecosystems of Central Luzon; determine sources of all levels of impacts of environmental problems/degradation of forest ecosystems in Central Luzon; identify alien/introduced species in the forest ecosystems and their impact on biodiversity; and determine the ecological/economic role/functions of animals in the forest ecosystems of Central Luzon.

METHODOLOGY

Study Area

The Pantabangan–Carranglan Watershed Forest Reserve (PCWFR) covers an area of 97,318 ha. where 4023 ha. comprise the water reservoir. The

watershed was divided into 10 stations. Of these, two stations were selected in the northern part of the PCWFR, two stations in the southern part, two stations in the eastern part, two stations in the western part, and two stations in the center of the watershed. In each station, 10 quadrats were chosen and designated as study areas and were delineated and digitally mapped. The delineated study area was divided into grid with a scale dimension of 10 m × 12 m. The numbers of grids were determined, and a simple lottery method was used to represent the random sampling technique.

Data Gathering and Documentation

The 4 major groups of animals namely, birds, reptiles, amphibians, and mammals were surveyed, monitored, and recorded in each quadrat. The animals were recorded by monitoring the number of sightings. The following information was gathered: common name, habitat, locality, altitude, province, morphological description of the animal, and ethnobiological information (benefits/uses, values, associated beliefs and practices, etc.). Ethnobiological/ethnopharmaceutical/ethnomedicinal information of the recorded and observed animals was gathered through focus group discussion by means of interview with the local people who are living in the protected area and are knowledgeable about local wildlife and resource use.

Collection and observation of the representative animals that were not known or not identified were conducted through the use of mist nets and binoculars for flying mammals and birds, improvised traps for reptiles and birds, cast nest of small mesh size for small animals, and handpicking for other animals. All animals were photographed and released thereafter.

Pertinent information regarding their habitat, sex, behavior, and economic and ecological importance was also noted. All observed animals were identified and classified based on available Taxonomic Keys, and authentication was done by an expert in Taxonomy of Animals at the National Museum, Manila.

Quantitative descriptions of animals were gathered to compute for the various ecological parameters such as the following: frequency, relative frequency, density, relative density and dominance, relative dominance, and importance value index among others. Species diversity was computed and determined using the Shannon's Diversity Index (Smith & Wilson, 1998). Furthermore, biodiversity indicator was also determined using the formula

($\text{IndVal}_{ij} = A_{ij} \times B_{ij} \times 100$) adapted from Dufrene and Legendre (1997).

Rare, endangered, depleted, endemic, and economically important species of animals were identified. Indicators of biological diversity as well as introduced species were also identified, and their impact on biodiversity was also determined.

RESULTS AND DISCUSSION

Assessment of the Diversity of Animals

A total of 53 animals were observed in the Pantabangan–Carranglan Watershed Forest Reserve, Carranglan side. Of these, 33 are birds, seven are mammals, seven are reptiles, and six are amphibians (Table 1).

A total of 41 species of animals were all identified up to species level. Twenty-two species of birds, seven species of mammals, seven species of reptiles, and five species of amphibians were identified. Eleven species of birds and only one species of amphibians were only identified through their local names.

Birds

Birds were the most numerous group of vertebrates in the area. Based on the identified species of birds, Order Passeriformes was well represented with seven species. Birds of the Order Columbiformes were represented with three species. Birds of the Orders Strigiformes, Coraciiformes, and Piciformes were represented with two species each. Birds of the Orders Cuculiformes, Falciformes, Graniiformes, and Galliformes were represented with one species each.

Mammals

The captured mammals are grouped under Orders Carnivora, Artiodactyla, Primata, Chiroptera, and Rodentia. The seven species of mammals belonging to five Families include two (2) volant mammals from the Family Pteropodidae, two rodents (Muridae), one macaque (Cercopithecidae), one warty pig (Suidae), and one civet cat (Viverridae).

(Herpetofauna) Reptiles and Amphibians

Herpetofaunal assessment was also conducted in Pantabangan–Carranglan Watershed Forest Reserve. A total of 13 species of reptiles and amphibians were recorded and identified. Seven species of reptiles belonging to five Families were identified; three Colubridae and one species each from Gekkonidae, Pythonidae, Varanidae, and Viperidae. A total of six species of amphibians were also recorded. Five species were identified up to genus and species level belonging to three families, two species each for Families Dicroglossidae and Ceratobatrachidae and one species from Family Bombinatoridae.

**IMPORTANCE VALUE INDEX (IVI) OF ANIMALS SURVEYED
(TABLE 2)**

Results revealed that *Cynniris jugularis* obtained the highest importance value index of 19.32%. The *C. jugularis* is a passerine bird which feeds largely on nectar, although they also take insects, especially when feeding the young. Most species could take nectar by hovering but usually perch to feed most of the time (Birdlife International, 2016). This was followed by an amphibian *Occidozyga laevis*, Gunther, with 17.40% IVI. *O. laevis* is distributed widely in Southeast Asia at elevations up to 1200 masl. This frog is found in a range of habitats, from polluted puddles and marshes to clear mountain streams. This species inhabits forested areas but not disturbed areas. In the Philippines, it can tolerate some disturbed habitat. It also inhabits some pristine lower montane and lowland forests (Zainuddin, 1999).

On the other hand, *Ahaetulla nasuta* got 4.95% IVI while “Baboy Damo”, *Sus philippensis*, obtained 2.78% IVI. *A. nasuta* is a diurnal snake which is commonly found in trees and bushes in the forest and agricultural lands. They feed on frogs, lizards, and birds (Thy et al., 2015). Furthermore, *S. philippensis* is endemic to the Philippines and occurs through most of the country, except in the Palawan Faunal Region. It was formerly abundant from sea level up to at least 2800 m, but now, it is common only in remote forests, montane, and mossy forests (Oliver & Heaney, 2008).

SPECIES DIVERSITY

Table 3 shows the various diversity indices of vertebrates in Pantabangan–Carranglan Watershed. Shannon’s Diversity Index shows that the 10 stations observed in Pantabangan–Carranglan Watershed Forest Reserve had low avian diversity, with a value of 2.43. Shannon’s Index of Diversity also shows that mammals, reptiles, and amphibians had very low diversity, with values of 1.89, 1.83, and 1.09, respectively. Still, these values imply low diversity with regard to the three groups of vertebrates. This is because of the low number in species observed and the low number of individuals recorded, and many of the vertebrates observed had only 1 to 2 numbers of individuals in all the 10 stations observed in Pantabangan–Carranglan Watershed, Carranglan, Nueva Ecija.

The low diversity of the animals in the forest ecosystem of Pantabangan–Carranglan Watershed Forest Reserve may be the result of human activities such as fires, wildlife hunting, and habitat destruction caused by timber poaching.

BIODIVERSITY INDICATORS

“Sawsaw-it” (*Cinnyris jugularis*) obtained the highest biodiversity indicator value of 17.5% followed by “Piruka” (*Pycnonotus goiavier*) with 8.82% and “Sante” (sound/sightings only) with 7.31% biodiversity indicator values (Table 3). The findings could be due to the high number of individuals of the species observed and their wide spread distribution. The other groups of animals (mammals, reptiles, and amphibians) had very few numbers of individuals and are less distributed (Table 4).

In Pantabangan–Carranglan Watershed Forest Reserve, it is interesting to note that all of these animals with high biodiversity indicator value are birds.

Biodiversity indicators are quantitative data to measure aspects of biodiversity, ecosystem condition, ecosystem services, and drivers of change and to help understand how biodiversity is changed over time and space (UNEP, 2013). These are species whose presence or absence affects the biodiversity of a particular area. They can serve as important sources of food for the other species, and they can serve as indicators of habitat/ecosystem conditions. Species with more than 80% biodiversity indicator values are

considered as biodiversity indicator species.

The presence of these species is important in determining the habitat/ecosystem condition and the disturbances experienced in the area. The absence of these species may mean that the area is disturbed or is not in good condition anymore. Hence, biodiversity indicator may form as an essential part of monitoring and assessment to give the status of biodiversity in the area.

ECOLOGICAL STATUS OF ANIMAL SPECIES IN THE FOREST ECOSYSTEM OF PANTABANGAN-CARRANGLAN WATERSHED FOREST RESERVE (TABLE 5)

Based on the latest IUCN Red List (2014.2), two species of bird, one reptile, one amphibian, and two species of mammals were evaluated as vulnerable species. These species also had decreasing population trend; thus, they were highly threatened by habitat loss and other ecological disturbances. There were also two near threatened species. One species had not yet been evaluated, and another species is unknown. There were also one bird species, four mammalian species, four reptiles, and two amphibians observed in Pantabangan–Carranglan Watershed Forest Reserve which were listed as least concern. Some of these species had stable or increasing population. However, 13 species were evaluated with decreasing population. In the future, these animals may therefore become threatened because of the threats in their habitat. Furthermore, based on the DAO 2004-15 lists of threatened species, *Haliastur indus*, a bird, was evaluated as endangered species. *Ducula carola*, *Ceyx melanurus*, *Sus philippensis*, and *Varanus salvator* were also listed as vulnerable. Moreover, *Macaca fascicularis philippinensis*, *Python reticulatus*, and *Barbourula busuangensis* were also listed as other threatened species.

MAJOR SOURCES OF ENVIRONMENTAL DEGRADATION

Fire, kaingin, timber poaching, mining, and soil erosion/silt run-off had moderate impacts on the degradation of the Pantabangan–Carranglan Watershed. Quarrying and wildlife hunting posed small impacts on the

Pantabangan–Carranglan Watershed which were being done by the local people (Table 6).

These threats and problem present in the forest ecosystem had great impacts on the biodiversity of the forest ecosystems especially on those species which had been listed in the IUCN Red List and DAO 2004-15. If the area loses valuable floral diversity, the fauna will also be threatened. The loss of biodiversity thus threatens the balance of the ecosystem and the available resources for all the living things associated with the forest ecosystem. Furthermore, a disruption of this biodiversity will also disrupt the normal cycle of nutrients, organic substances, and water and energy flow in the forest ecosystem.

CONCLUSION

There were only a few species of animals recorded in Pantabangan–Carranglan Watershed. The status of the diversity of fauna in the forest ecosystem of Pantabangan–Carranglan Watershed ranged from low to very low. This could be due to the environmental threats which posted moderate and small impacts on the forest ecosystems and the disturbances made by the people living near and inside the forest ecosystems. These threats included illegal logging/timber poaching, fires, soil erosion, kaingin farming, mining, wildlife hunting, and quarrying. These major sources of environmental degradation present in the forest ecosystem had great impacts on the biodiversity of the forest ecosystems.

RECOMMENDATIONS

Based on the results of the study, the following are being recommended.

1. Biodiversity assessment studies should be undertaken in other forest ecosystems in Central Luzon which have not been studied yet in order to complete the Biodiversity Information System (BIS) in Central Luzon.
2. Local ordinances pertaining to “Biodiversity Conservation” should be done by the local community to preserve and conserve wildlife and those plants that are now critically endangered, endangered, threatened, and vulnerable.

3. Biodiversity monitoring should be regularly conducted specifically to monitor the status of biodiversity and the status of the identified biodiversity indicators in this study.

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Table 1. Computed ecological parameters of the surveyed animals in Pantabangan–Carranglan Watershed Forest Reserve, Nueva Ecija.

Local Name/Scientific Name	No. of Individuals	F	RF (%)	D	RD (%)	Do	RDo (%)	IVI (%)
BIRDS								
Cinnyris jugularis	40	0.7	6.5420560	0.0033333	12.3456790	0.0567	0.43105139	19.3187864
Pipit	30	0.7	6.5420560	0.0025	9.25925925	0.0756	0.57473519	16.3760505
Pycnonotus goiavier	25	0.5	4.6728971	0.0020833	7.71604938	0.0648	0.49263017	12.8815767
Ceyx melanurus	23	0.5	4.6728971	0.0019166	7.09876543	0.07043478	0.53546757	12.3071302
Sante	22	0.5	4.6728971	0.0018333	6.79012345	0.07363636	0.55980701	12.0228276
Lonchura punctulata	8	0.5	4.6728971	0.0006666	2.46913580	0.2025	1.53946928	8.68150228
Sarcops calvus	12	0.4	3.7383177	0.001	3.70370370	0.108	0.8210502	8.26307174
Ptnopilius occipitalis Gray	9	0.4	3.7383177	0.00075	2.77777777	0.144	1.09473371	7.61082924
Penelopides manillae	5	0.4	3.7383177	0.0004166	1.54320987	0.2592	1.97052068	7.25204831
Haliastur indus	3	0.3	2.8037383	0.00025	0.92592592	0.324	2.46315084	6.19281509
Mulleripicus funebris	4	0.3	2.8037383	0.0003333	1.23456790	0.243	1.84736313	5.88566935
Phapitreron leucotis Temminck	2	0.2	1.8691588	0.0001666	0.61728395	0.324	2.46315084	4.94959367
Phaenicophaeus cumingi	2	0.2	1.8691588	0.0001666	0.61728395	0.324	2.46315084	4.94959367
Turnix ocellatus	2	0.2	1.8691588	0.0001666	0.61728395	0.324	2.46315084	4.94959367
Gallus gallus philippensis	2	0.2	1.8691588	0.0001666	0.61728395	0.324	2.46315084	4.94959367
Zosterops nigrorum	6	0.2	1.8691588	0.0005	1.85185185	0.108	0.82105028	4.54206101
Lonchura leucogastra	5	0.2	1.8691588	0.0004166	1.54320987	0.1296	0.98526034	4.39762909
Bullisi	4	0.2	1.8691588	0.0003333	1.23456790	0.162	1.23157542	4.33530220
Ducula carola	10	0.1	0.9345794	0.0008333	3.08641975	0.0324	0.24631508	4.26731427

Pakaw	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Otus longicornis	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Patat	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Hulak	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Ninox philippensis	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Megalaima haemacephala	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Muscicapa griseisticta	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Talaktak	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Buh-Buhiyap	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Bayik	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Sterna hirundo	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Kuwago	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Coracinastriata	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Bugkiyaw	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
MAMMALS								
Megaerops wetmorei	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Macaca fasc. Philipinensis	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Paradoxurus hermaphroditus	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Cynopterus brachyotis	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Phloeomys ballidus	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Sus philippensis	2	0.1	0.9345794	0.0001666	0.61728395	0.162	1.23157542	2.78343881
Bullimus luzonicus	2	0.1	0.9345794	0.0001666	0.61728395	0.162	1.23157542	2.78343881
REPTILES								
Ahaetulla nasuta	2	0.2	1.8691588	0.0001666	0.61728395	0.324	2.46315084	4.94959367
Dendrelaphis marenae	3	0.2	1.8691588	0.00025	0.92592592	0.216	1.64210056	4.43718537
Cyrtodactylus philippinicus	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Trimeresurus flavomaculatus	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Calamaria bitorques	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Varanus salvator	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Python reticulatus	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
AMPHIBIANS								
Occidozyga laevis	50	0.2	1.8691588	0.0041666	15.4320987	0.01296	0.09852603	17.3997836
Barboul busuangensis	4	0.4	3.7383177	0.0003333	1.23456790	0.324	2.46315084	7.43603650
Limnometes microcephalus	19	0.1	0.9345794	0.0015833	5.86419753	0.01705263	0.12963951	6.92841648
Platymantis dorsalis	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Palaka (Frog #5)	1	0.1	0.9345794	8.33333E-05	0.30864197	0.324	2.46315084	3.70637226
Platymantis dorsalis	2	0.1	0.9345794	0.0001666	0.61728395	0.162	1.23157542	2.78343881
TOTAL	324		100		100		100	300

Table 2. Animals with the highest number of importance value index (IVI) present in Pantabangan–Carranglan Watershed Forest Reserve.

Class	Species Name	Importance Value Index (IVI)
Birds	Cinnyris jugularis	19.32
Mammals	Sus philippensis	2.78
Reptiles	Ahaetulla nasuta	4.95
Amphibians	Occidozygal aevis Gunther	17.40

Table 3. Diversity indices of four groups of animals observed in Pantabangan–Carranglan Watershed Forest Reserve.

Group	No. of Species	No. of Individuals	Diversity Index	Interpretation
Birds	33	228	2.43	Low
Mammals	7	9	1.89	Very Low
Reptiles	7	10	1.83	Very Low
Amphibians	6	77	0.98	Very Low

Table 4. Animals in Pantabangan–Carranglan Watershed Forest Reserve with high biodiversity indicator values.

Species Name	Aij	Bij	Ind Val
Sawsaw-it (Cinnyris jugularis)	0.5	0.35	17.5
Piruka (Pycnonotus goiavier)	0.42	0.21	8.82
Sante (sound/sightings only)	0.43	0.17	7.31
Pipit (sound/sightings only)	0.32	0.22	7.04
Balog (sound/sightings only)	0.29	0.07	2.03

Table 5. Ecological status of animal species observed in Pantabangan–Carranglan Watershed Forest Reserve, Carranglan.

Fauna	Scientific Name	Conservation Status and Population Trend	
		IUCN 2013.1	DAO 2004-15
BIRDS			
Spotted Imperial Pigeon	Ducula carola	Vulnerable (D)	Vulnerable
Philippine Dwarf Kingfisher	Ceyx melanurus	Vulnerable (D)	Vulnerable
White Bellied Munia	Lonchura leucogastra	Least Concern (S)	
Olive Backed Sunbird	Cinnyris jugularis	Least Concern (S)	

Philippine Hawk-owl	<i>Ninox philippensis</i>	Least Concern (S)	
Sooty Woodpecker	<i>Mulleripicus funebris</i>	Least Concern (S)	
Grey-streak Flycatcher	<i>Muscicapa griseisticta</i>	Least Concern (S)	
White-eared Brown Dove	<i>Phapitreron leucotis</i>	Least Concern (S)	
Yellow-vented Bulbul	<i>Pycnonotus goiavier</i>	Least Concern (I)	
Coppersmith Barbet	<i>Megalaima haemacephala</i>	Least Concern (I)	
Luzon Tarictic Hornbill	<i>Penelopides manillae</i>	Least Concern (D)	
Scale-feathered Malhoka	<i>Phaenicophaeus cumingi</i>	Least Concern (D)	
Brahminny Kite	<i>Haliastur indus</i>	Least Concern (D)	Endangered
Bar-bellied Cuckoo-shrike	<i>Coracina striata</i>	Least Concern (D)	
Red Jungle Fowl	<i>Gallus gallus</i>	Least Concern (D)	
Yellowish White-eye	<i>Zosterops nigrorum</i>	Least Concern (U)	
Spotted Buttonquail	<i>Turnix ocellatus</i>	Least Concern (U)	
Coletto	<i>Sarcops calvus</i>	Least Concern (U)	
MAMMALS			
White-collared Fruit Bat	<i>Megaerops wetmorei</i>	Vulnerable (D)	
Philippine Warty Pig	<i>Sus philippensis</i>	Vulnerable (D)	Vulnerable
Philippine Long-Tailed Macaque	<i>Macaca fascicularis philippinensis</i>	Near Threatened (D)	Other Threatened Species
Common Palm Civet	<i>Paradoxurus hermaphroditus</i>	Least Concern (S)	
Northern Luzon Giant Cloud Rat	<i>Phloeomys ballidus</i>	Least Concern (S)	
Large Luzon Forest Rat	<i>Bullimus luzonicus</i>	Least Concern (U)	
Common Short-nosed Fruit Bat	<i>Cynopterus brachyotis</i>	Least Concern (U)	
REPTILES			
Common Water Monitor	<i>Vartanus salvator</i>	Vulnerable (D)	Vulnerable
Philippine Pit Viper	<i>Trimeresurus flavomaculatus</i>	Least Concern (S)	
Asian Vine Snake	<i>Ahaetulla nasuta</i>	Least Concern (S)	
Philippine Bent-toed Gecko	<i>Cyrtodactylus philippinicus</i>	Least Concern (S)	
Banded Worm Snake	<i>Calamaria bitorquis</i>	Least Concern (U)	
Reticulated Python	<i>Python reticulatus</i>	Not Evaluated (U)	Other Threatened Species
Painted Bronzeback	<i>Dendrelaphis marenae</i>	Unknown (U)	

AMPHIBIANS			
Philippine Flat-headed Frog	Barbourula busuangensis	Vulnerable (D)	Other Threatened Species
Luzon-fanged Frog	Limnonectes microcephalus	Near Threatened (D)	
Common Puddle Frog	Occidozyga laevis	Least Concern (S)	
Common Forest Frog	Platymantis dorsalis	Least Concern (D)	

Table 6. Sources of environmental degradation in the three forest ecosystem of Pantabangan–Carranglan Watershed Forest Reserve.

Sources of Environmental Degradation Scale and Impacts	
Fire	2.92 Moderate impact
Kaingin	2.76 Moderate impact
Illegal logging/Timber poaching	2.69 Moderate impact
Mining	2.67 Moderate impact
Soil erosion/Silt run-off	2.66 Moderate impact
Quarrying	2.18 Small impact
Wildlife hunting	2.13 Small impact

AUTHORS

Annie Melinda Paz-Alberto is Director and Project Leader, Shirley C. Serrano is Faculty and Project Staff, and Daryl A. Juganas is Science Research Assistant, all at the Institute for Climate Change and Environmental Management, Central Luzon State University, Science City of Muñoz, Nueva Ecija.

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