Vol. 4 January 2013
CHED Accredited Research Journal, Category A
Print ISSN 2094-5019 • Electronic ISSN 2244-0461
doi: http://dx.doi.org/10.7828/ajob.v4i1.295

Asian Journal of Biodiversity
Art. #295 pp. 23-45
This Journal is in the Science Master Journal List of
Thomson Reuters (ISI) Zoological Record

Biodiversity Assessment of Mt. Banahaw de Dolores, Philippines

CECILIA N. GASCON
ORCID No. 0000-0001-7030-1472
chielo_22@yahoo.com

RONALD C. GARCIA
ORCID No. 0000-0003-4676-6821
forcuala_garcia@yahoo.com

FRANCISCO N. BELTRAN
ORCID No. 0000-0002-3565-5096
for_27fnb@yahoo.com

WILFREDO C. FALLER
ORCID No. 0000-0002-4395-7529
fallerwilfredo@yahoo.com

MARY ANN R. AGUDILLA
ORCID No. 0000-0002-1555-0027
maryannagudilla@yahoo.com
Professor, Department of Forestry and Environmental Science, College of Agriculture,
Southern Luzon State University

Abstract - A study was conducted to assess the diversity of biological communities at Mt. Banahaw de Dolores in Sitio Kinabuhayan, Sta Lucia, Dolores, Quezon; the area was characterized by identifying the forest trees present, species richness and diversity, and dominance. This was after a 5 year moratorium visitation in the national park. The forest inventory used the quadrat sampling method. Wildlife

inventory and insect collection were conducted within 700 masl to the peak of Mt. Banahaw de Dolores. Result revealed a total of 455 trees belonging to 92 species and representing 37 families. A total of 16 families of birds represented by 30 species, 5 species of bats, 3 species of amphibians and 2 reptiles were recorded. Similarly, a total of 285 insects representating more than 104 families and 17 orders were identified. Result also showed high values for Shannon-Weiner index (H) and species richness (d). Species were evenly distributed among areas sampled as reflected by high values of Eveness index. These values indicate high species variation and diversity.

Keywords - Mt. Banahaw de Dolores, biodiversity, Philippines, species richness, Shannon-Weiner index

INTRODUCTION

Mt. Banahaw-San Cristobal National Park has a total land area of 11 133.33 hectares. It covers a total of 9 municipalities including a city in provinces of Laguna and Quezon. The municipality of Dolores lies on south-western slope of Mt. Banahaw. Mt. Banahaw de Dolores (Fig. 1) is one of its three peaks towering to about 2 155 meters above sea level (masl).

As one of the remaining mountain ecosystem in the region, Mt Banahaw-San Cristobal National Park is an important ecosystem that serves as a resource-base both to human and ecological system. Ecologically, the mountain provides habitat for various flora and fauna. The national park also serves as a catchment basin for potable water supply for nearby communities. It also caters pilgrimage and religious activities of different groups. However, it was revealed that human disturbance in the areas had caused destruction and imbalance in the ecosystem and consequently faded the way to a five-year moratorium (2004-2008) on visitation.

The study is the first research conducted in the area after the moratorium. It focused on assessing biological diversity Mt Banahaw de Dolores covering areas within 700 masl up to the peak which hosted most of the *"Puestos"* of pilgrimage. Forest trees composition and wildlife including insects were also identified, listed and analyzed for species diversity.

Fig. 1. Mt. Banahaw de Dolores is one among the three peaks of Mt. Banahaw, Philippines

OBJECTIVES OF THE STUDY

The study aimed to assess the species composition and diversity of forest trees and fauna and provide additional knowledge and baseline information on the mountain's ecosystem. Furthermore, it aimed to characterize the forest structre and species diversity of Mt. Banahaw de Dolores.

MATERIALS AND METHODS

Brief Description of the Study Site

Geographic Location. Mt Banahaw-San Cristobal National Park lies between $13^0$55′ and $14^0$10′ latitude and $121^0$16′ and $121^0$35′ longitude bounded by Laguna Lake on the north, Tayabas Bay on the south, Bicol Peninsula on the southeast, and tail end of Sierra Madre Mountain on the east (Gascon, 2002). Sitio. Kinabuhayan, Dolores, Quezon which lies at south-western slope of Mt. Banahaw. The study site covered 700masl to the peak of Mt. Banahaw. The study site is shown in Fig. 2.

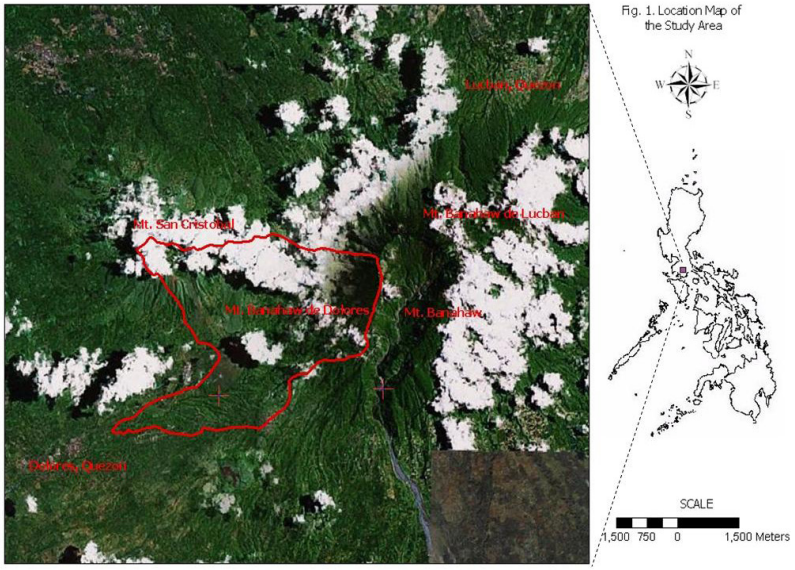

Fig. 2. Mt. Banahaw de Dolores lies at the south-westen slope of Mt. Banahaw.

Topography. The entire National Park has a rough terrain with slopes ranging from moderate to steep. Mt. Banahaw de Dolores is the highest among the three highest peaks of Mt. Banahaw with an elevation of two 155 masl. Other peaks, Mt. Banahaw de Lucban and Mt. Banahaw de Tayabas, have 1875 masl and 2140 masl elevations respectively.

Climate. The rainfall characteristics in the national park vary with sites. For instance, the average annual rainfall in Nagcarlan side (north-western slope) is 2350-2400 mm while Lucban side (north-eastern slope) has 4470 mm with rainfall distributed evenly throughout the year and 262 average rainy days. Northeast monsoon (Habagat) reaches Quezon province from December to January and North Pacific Tradewinds in February to March. In April easterly wind approaches the area. Southwest Monsoon approaches from June to October.

Soil. The lower reaches portions of Mt. Banahaw have sandy

loam soil and rich in organic matter. These make the soil suitable for growing seasonal crops. However, some portion of the national park exhibited high soil acidity.

Hydrology. The National park is drained by seven rivers systems namely; Balayong, Maimpis, Liliw, Dilitiwan, Malinao, Nagcarlan and San Diego. Mt. Banahaw de Dolores is drained by Kinabuhayan River towards Lagnas River. It drains water to different falls in Dolores, Quezon such as Sta. Lucia, Suplina and Kristalino including Taytay Falls in Majayjay, Laguna and Talong Ambon in the crater.

Forest Inventory

Transect method was used in the study. A total of twenty-five (25) 20m x 20m sample quadrants/ plots systematically distributed at different altitudes from 700 masl to the peak of Mt. Banahaw following Sitio Kinabuhayan – Durungawan site trail. Elevations were determined using a Pocket altimeter. GPS was used to determine location of plots.

All trees in plots with 10cm and above diameter at breast height (DBH) were identified and measured of its total height (TH), merchantable height (MH) and crown dimensions. Forest community was described in terms of species composition, density, frequency and its structure.

Inect Collection

A 2.5 km transect measuring 5m-wide traversing the different puestos in Brgy. Kinabuhayan namely; Puesto 1 (Kristalino), Puesto 2 (Suplina), Puesto 3 (Salaming Bubog), Puesto 4 (Kuweba ng Dios Ama) and Puesto 5 (Durungawan) was established. Species observed along the transect line were recorded and counted. For aquatic habitat, sampling sites with 4m x 200m were established.

Active and passive methods were used to sample insects at different puestos**.** Active collection techniques include Berlese funnel extraction, D- net, Surber sampler and net sweeping adopted from Yara (2009) while passive collection techniques utilized include pit fall traps and light traps adopted from Jaca (2004).

Wildlife Inventory

Collection was conducted in three sites around Barangay Kinabuhayan Mt. Banahaw de Dolores. These areas covered 700-1,400 masl at Barangay proper to Cristalina Falls, DENR office to kaingin area upslope to the mountain, and from Sitio Bangkong kahoy upslope to the mountain at 1,200 masl. Mist nest ½ in. mess size with a total of 60m² collection area was established for bats and birds collection. Rats were captured using live traps while frogs and snakes were collected by hand. A transect line of 2 km for each station was established and birds were counted along this transect line.

Data Analysis

The species richness, evenness, dominance and diversity indices were determined using Shannon-Weaver (H) formula for species Diversity, Dominance Index (C), and Evenness Index. For forest trees, composition, Importance value and Dominance index were also determined and forest structure was characterized.

RESULTS AND DISCUSSION

Forest Tree Composition and Diversity

A total of 455 trees belonging to 92 species and representing 37 families was identified (Table 1). The families *Moraceae,* and *Euphorbiaceae* had the highest species representation with 8 species followed by families *Theaceae* and *Meliaceae* with 7 and 6 species representation respectively. Family *Theaceae* also had the highest number of species sampled with 53 individuals. *Meliaceae* and *Moraceae* have 51 and 50 individuals respectively.

Furthermore, there were 9 species categorized under threatened status based on DENR guidelines (DENR Admin. 01, 2007) which established the National List of Threatened Philippine Plants and Their Categories, and the List of Other Wildlife Species. These include Igem-pugot (*Podocarpus lophatus* de Laub.), Kasau-kasau *(Gongospermum philippinense* Radlk.) and Makaasim *(Syzigium nitidum* Benth.)

Species Density, Frequency and Dominance

Taguhangin *(Syzygium caudatifolium* (Merr.) was the most abundant species with 27 individuals and species density of 1.080 (or about 27 individuals per hectare area). Tabsik *(Eurya ovobata* (Blume) Khs.*)* and Tabsik kapalan *(Eurya pachyphylla* Merr.*)* were also found to have high species density with 0.920 and 0.800 respectively. The mean density for all species was 0.196 or about 2 individuals of each species per hectare.

S. caudatifolium was also the most frequently occurring species at 0.360 (or 9 out of 25 plots). Tabsik *(E. ovobata)* and Tabsik kapalan *(E. pachyphylla)* followed closely with frequency values of 0.280 and 0.320 respectively. While these species were the most frequent, they mostly appear in higher elevations, apparently above 1300 masl.

Ulaian *(Lithocarpus llanosii* (A. DC) Rehd.*)* had the highest dominance values with 16.173 IV and 0.054 DI. Lakot (*Helicia paucinervia* Merr.*)* followed with 14.624 IV and 0.049 DI. Taguhangin *(S. caudatifolium)* has 14.378 and 0.048 for the indices. However, these low values of IV and DI indicate that no species has considerable dominance over the area.

Tree Composition and Species Dominance at Different Elevations

No single species dominated the area on a per elevation basis. Celebes oak *(Lithocarpus celebicus* (Miq.) Rehd.*)* with only 0.38 DI values was the highest. Low dominance indicates high diversity at different elevations and no particular tree species has considerable dominance on the site. In addition, there were different species with highest IV and DI values for various elevation ranges. Although Taguhangin *(Syzygium caudatifolium* (Merr.) Merr.*)* and Celebes oak *(Lithocarpus celebicus* (Miq.) Rehd.*)* occupied and constituted the dominant species from 1300 masl to 1900 masl, low computed IV and DI indicates distribution of dominance over several species therein. Almazol (2006) also had similar findings at elevations as low as 400 masl.

Forest Structure

Trees in lower altitudes has bigger diameter and taller than trees in higher altitudes. Mean diameter and height of all trees sampled were 32.38 cm and 11.05 m respectively. In most altitudes, trees were under

small diameter classes (10-20 cm and 21-30 cm) indicating stunted growth in these areas. Most trees sampled were also small and did not exceed 30 m height indicating that forest canopy had fewer storey/ layers. Aragones (1992) explained that diameter change was attributed to the soil characteristics as affected by steep topography and harsh environment in higher altitudes.

Table 1. List of Tree Species (by Family) Identified from Mt. Banahaw, Sitio Kinabuhayan, Dolores, Quezon.

Family Name	Scientific Name	Common Name
Aceraceae	*Acer laurinum* Hassk.apud Hoeven & de Vriese	Baliag
Boraginaceae	*Ehretia polyantha* (DC.) Johnst.	Tamaua
Burseraceae	*Dacryodes incurvata (Engl.) H.J. Lam*	Kamiling
	Canarium euryphyllum Perk. *var. euryphyllum* Leenh.	Mayakiat
	Canarium euryphyllum Perk. var. ramossii (Merr.) Leenh.	Ramos maeakiat
Buxaceae	*Buxux rolfei* Vidal	Malagaapi
Caprifoliaceae	*Viburnum odoratissimum* Kern	Idog
	Viburnum propinquum Hemsl.	Idog-idog
Clethraceae	*Clethra canescens var. luzonica* (Merr.) Sleum.	Apiit
	Clethra canescens Reinw. Ex Blume	Clethra
	Clethra canescens var. novoguineensis (Kaneh. & Hatus.) Sleum.	Malaklak
Dilleniaceae	*Saurauia latibractea* Choisy	kulalabang
Dipterocarpaceae	*Shorea contorta* Vidal	White Lauan
Ebenaceae	*Ebenaceae spp*	Ebenaceae
	Diospyros diepenhorstii Merr.	Talang gubat
Elaeocarpaceae	*Elaeocarpus candollei* Elmer	Nangkaon
Eupherbiaceae	*Acalypha caturus* Blume	Migtanung puso
	Neotrewia cumingii (Muell.-Arg) Pax&K. Hoffm.	Apanang
	Omalanthus populneus (Geisel.) Pax	Balanti
	Macaranga tanarius (L.) Muell. Arg.	Binunga
	Homolanthus fastousus (Linden) F.-Vill.	Botinag
	Homolanthus alpinus Elmer	Buta
	Glochidion xerocarpum (O. Schwarz.) Airy Shaw	Kangil
	Bischofia javanica Blume	Tuai

Fabaceae	*Ormosia paniculata* Merr.	Sagang Kahoy
Fagaceae	*Lithocarpus celebicus* (Miq.) Rehd.	Celebes oak
	Lithocarpus caudatifolius (Merr.) Rehd.	Katabang
	Lithocarpus jordanae (Laguna) Rehd.	Katiluk
	Lithocarpus llanosii (A. DC) Rehd.	Ulaian
Flacourtiaceae	*Hydnocarous subfalcata* Merr.	Damol
	Casearia philippinensis Merr.	Gangiat
	Flacourtia indica (Burm. f.) Merr.	India bitongol
	Ahernia glandulosa Merr.	Sanglai
Guttiferae	*Garcinia rubra* Merr.	Kamandis
	Calophyllum soulattri Burm. f.	Pamintaugon
Juglandaceae	*Engelhardia spicata* Lechen. Ex Blume *var spicata* Jacobs	Lupisan
Lauraceae	*Machilus curranii* Merr.	Curan kuliisiau
	Machilus philippinensis Merr.	Kulilisiau
	Helicia paucinervia Merr.	Lakot
Melastomataceae	*Astronia lagunensis* Merr. *var. pauciflora* (Merr.) Maxw. & Veldk.	Dungau dalang
	Astrocalyx calycina (Vidal) Merr.	Tanghau
Meliaceae	*Chisocheton pentandrus* (Blanco) Merr. *ssp. paucijugus* (Miq.) Mabb.	Batuakan
	Aglai llanosiana C. DC.	Bayanti
	Aglai squamulosa King	Bugalbal/Bugalbal pula
	Chisocheton pentandrus (Blanco) Merr. sub*sp. pentandrus*	Katong matsing
	Agalai luzoniensis (Vidal) Merr. & Rolfe	Kuling manok

Family Name	Scientific Name	Common Name
Meliaceae	*Aglaia odoratissima* Blume	Kuling papan
Moraceae	*Ficus nota* (Blanco) Merr.	Tibig
	Ficus irisina Elmer *var. irisina*	Aplas
	Ficus botryocarpa Miq. *var. subaldidoramea* (Elmer) Corner	Basikong puti
	Ficus variegate Blume *var. sycomoroides* (Miq.) Corner	Dulalog
	Ficus minahassae (Teijsm. & de Vr.) Miq.	Hagimit
	Ficus cumingii Miq. *ar cumingii Corner*	Is-is ibon
	Ficus irisana Elmer *var. validicaudata* (Merr.) Corner	Obdas

	Ficus ampelas var ampelas Burm. F.	Upling gubat
Myristicaceae	*Endocomia macrocoma* de Wilde s*sp. prainii* (King) de Wilde	Parugan
	Knema glomerarta (Blanco) Merr.	Tambalau
Myrsinaceae	*Ardisia angustifolia* A. DC.	Tagpong Kitig
Myrtaceae	*Syzigium nitidum* Benth.	Makaasim
	Syzygium urophyllum Merr.	Malaruhat buntutan
	Syzygium simile (Merr.) Merr.	Panglomboen
	Syzygium caudatifolium (Merr.) Merr.	Taguhangin
Oleaceae	*Linociera ramiflora* Wall.	Karaksan
Podocarpaceae	*Dacrycarpus cumingii (Parl.) de Laub.*	Banahaw Igem
	Podocarpus lophatus de Laub.	Igem pugot
Proteaceae	*Helicia loranthoides* Presl	Tarang
Rubiaceae	*Neonauclea pseudocalycina* Ridsd.	Malakalamansanai
	Canthium monstrosum (A. Rich.) Merr.	Tadiang anuang
	Neonauclea media (Havil.) Merr.	Wisak
Rutaceae	*Clausena mollis* Merr.	Kamangyanis
	Evodia confusa Merr.	Bugauak
Sapindaceae	*Euphoria nepheloides* Radlk.	Iboli
	Gongospermum philippinense Radlk.	Kasau-kasau
	Pometia pinnata Forst. & Forst.	Malugai
	Sapindaceae spp.	Sapindaceae *spp*
Sapotaceae	*Palaquium merillii* Dub.	Dulitan
	Palaquium philippinense (Perr.) C.B. Rob.	Malakmalak
Sterculiaceae	*Pterospermum longipes* Merr.	Bayukbyukan
	Pterospermum obliquum Blanco	Kulatingan
	Pterocymbium tinctorium (Blanco) Merr.	Taluto
Symplocaceae	*Symplocos odoratissima* (Blume) Choisy ex Zoll. *var. odoratissima* Noot.	Agosip
Taxaceae	*Taxus sumatrana* (Miq.) de Laub.	Amugauen
Theaceae	*Eurya buxifolia* Merr.	Basbasit
	Eurya coriacea Merr.	Bakig
	Eurya japonica Thunb. *Var nitida* (Korth.) Dyer	Batik
	Eurya acuminate DC.	*Batik-tilos*
	Adinandra luzonica Merr.	Kamingi
	Eurya obovata (Blume) Khs.	Tabsik
	Eurya pachyphylla Merr.	Tabsik kapalan

Tiliaceae	*Grewia multiflora* Juss.	Danglin
Ulmaceae	*Celtis luzonica* Warb.	Malaikmo
Urticaceae	*Dendrocnide luzonensis (Wedd.)* Chew *var luzonensis* Chew	Lipa

Forest Profile

In lower altitudes, forest structure was composed of at least 2 distinct canopy layers. Tree composition and height characteristics changed with elevations with lower elevation relatively taller compared with trees at higher altitudes. At 2000 masl elevation, a single-layer canopy resembled and less shaded. Gascon et al. (2005) had the same observation on forest structure. They also found out that tree height and composition decreases as elevation increases. These observation were similar in other forest communities of Mt. Banahaw such as in areas facing Majayjay, Laguna (Faller, 1998)

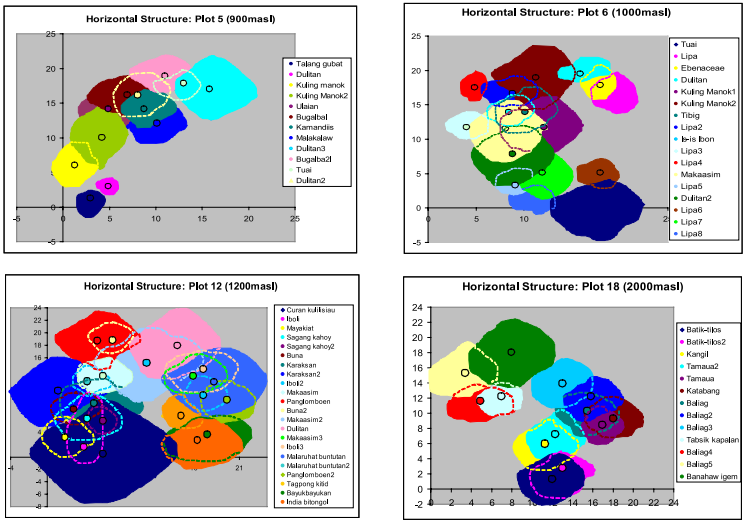

Fig. 3. Horizontal Structures at 900 masl,1000 masl, 1200 masl and 2000 masl.

Diversity of Forest Trees

Mt. Banahaw de Dolores has high tree species diversity with Shannon-Weiner index (**H**) value of 4.058 and species richness (**d**) of 15.195. Species were evenly distributed among tree species sampled within the area with eveness index (**e**) of 0.893 (dominance is 0.024). These computed values indicate that there was wide species variation and no particular species dominates the area. Species diversity, richness and eveness were also high at different elevation (Table 2).

Table 2. Tree species diversity indices at different altitudinal range

Elevation Range	Diversity Indices			
	Shannon-Wiener (H)	Richness (d)	Eveness (e)	Dominance (c)
700-800	2.486	4.116	0.918	0.094
800-900	3.039	6.193	0.956	0.055
900-1000	2.865	5.525	0.973	0.062
1000-1100	2.598	4.782	0.899	0.102
1100-1200	2.280	3.299	0.889	0.127
1200-1300	2.476	3.559	0.971	0.095
1300-1500	1.490	1.477	0.926	0.244
1500-1600	1.732	2.216	0.890	0.209
1600-1700	1.978	2.551	0.900	0.168
1700-1800	1.864	2.216	0.958	0.164
1800-1900	2.283	3.526	0.843	0.132
1900-2000	2.529	3.616	0.934	0.090
2000-2100	2.531	4.502	0.913	0.094

Wildlife

A total of 16 families of birds represented by 30 species were identified. Family Columbidae had the most number of species (7) followed by Nectariniidae and Pycnonotidae both represented by 3 species. Mammals (bats), amphibian and reptiles were also found with 5, 3, and 2 species respectively. One species of frog and one species of snake were still under identification.

Birds

Transect 2 (700-1,400 masl of its mid-mountain) has the highest species diversity index **(H)** and evenness index followed by Transect 3 and Transect 1. Surprisingly however, Transect 1 had the lowest Dominance index owing to the nature of birds of being mobile and transitory. Dominance Index indicates bird's territorial preferences.

Table 3. Birds biodiversity indices

Transect	Species Diversity Index	Dominance Index	Evenness Index
	(H)	(C)	(e)
1	1.0836	0.0918	0.8806
2	1.7626	0.0761	1.3331
3	1.0854	0.0898	0.94702

Bats

Seven (7) individual species of bats were identified belonging to the Order Chiroptera and Sub-order Megachiroptera know as Megabats**.** Biodiversity indices in the three sampling sites for bats show Evenness Index with higher value while its species diversity and dominance index are low. This means that majority of bats in the locality could also be found in the three sampling site. *Ptenochirus jagori, Cynopterus brachyotis, Eonycteris robusta* and *Otopteropus cartilagonodus* were evenly distributed and observed in two different sites unlike *Eonycteris spelea glandifera* and *Macroglossus minimus* that were confine in one site.

Table 4. Bats Species Identified from Mt. Banahaw de Dolores

Common Name	Scientific Name	Super Family
1. Cynopterus brachyotis	Malaysian Fruit Bat	Noctilionoidea
2. Eonycteris robusta	Robust Bat	Rhinolophoidea
3. Eonycteris spelea glandifera	Gland-bearing Dawn Bat	Vespertilionoidea
4. Macroglossus minimus	Long-tongue Fruit Bat	Noctilionoidea

5. Otopteropus cartilag-onodus	Cartilage-ear Fruit Bat	Rhinopomatoidea
6. Ptenochirus jagori	Jagor's Fruit Bat	Rhinolophoidea
7. Rhinolophus arcuatus	Arcuate Horse-shoe Bat	Nataloidea

Rats/Snake and Frogs

Only Oriental Rice field rat *(Ratus tanezumi)* with 3 individuals were collected in Cristalina Falls (700-1,000 masl) and at Sitio Bangkong kahoy 1,200 masl. For reptiles, Philippne Pit Viper *(Trimesurus flavomaculatus)* and a new undescribed blind snake were found. There were four (4) individual frogs collected, one of which was new undescribed species of very small in size while the two species were Forest Ground frog *(Platymantis dorsalis)* and Luzon ground frog *(Platymantis luzonensis)* based on description of Diesmos (1998).

Table 5. Summary of Bird Identification within the transect along the Trail (700 masl) from Barangay proper to Cristalina Falls and DENR trail upslope to 1,100 to the summit within main Mt. Banahaw at Barangay Kinabuhayan Dolores, Quezon

Family name	Scientific Name	Common Name	Local Name
Alcidinidae	*Halcyon smyrnesis*	White-throated Kingfisher	Salaksak
Apodidae	*Collocalia esculenta*	White-bellied Swiftlet	Layang-layang
Accipitridae	*Spilornis holospilus*	Philippine Serpent Eagle	Lawin
Campephagidae	*Lalage nigra*	Pied Triller	
Columbidae	*Phapitreron leucotis*	White-eared Brown-dove	Bato-bato
	Streptopelia chinensis	Spotted dove	Kolo-kolo
	Chlcophaps indica	Emerald dove	Limbas
	Geopelia striata	Peaceful dove	
	Chrysococcyx xanthorhynchus	Violet cuckoo	
	Eudynamys scolapacea	Common Asian Koel	
	Ducula badia	Mountain Imperial Pigeon	Balod
Hirundinidae	*Hirundo tahitica*	Pacific swallow	Layang[2]
	Hirundo rustica	Barn swallow	
Laniidae	*Lanius cristatus*	Brown shrike	Kalaga[2]

	Lanius validirostris	Mountain Shrike	
Motaciludae	*Anthus novaeseelandiae*	Richards Pipit	Ton-toryut
Nectariniidae	*Nectarinia jugularis*	Olive-backed Sunbird	Pirit [2]
	Nectarinia sperata	Purple-throated Sunbird	
	Nectarinia asiatica	Purple Sunbird	
Oriole	*Oriolus chinensis*	Blacked-naped Oriole	
Phasianidae	*Gallus gallus* (male)	Red jungle fowl*	Labuyo
	G. gallus (female)		
Pycnonotidae	*Hypsipetes philippinus*	Mountain Bulbul	Kalaga
	Hypsipetes charlottae	Buff-vented Bulbul	Tarat
	Pycnonotus goiavier	Yellow-vented Bulbul	
Psittacidae	*Loriculus galgulus*	Blue-crowned Hanging Parrot*	Kulasisi
	Prioniturus discurus	Blue-crowned Racquet Tail*	Kulasisi
Strigidae	*Ninox scutulata*	Brown Hawk-owl	Kuwago
Trogonidae	*Harpactes ardens*	Philippine Trogon	
Zosteropidae	*Zosterops montanus*	Mountain White-eye	Pirit
	Zosterops palpebrosus	Oriental white-eye	
[2]- look a like feature of a bird for easy identification, * observed birds in captivity			

Identified Insects in Kinabuhayan Forest

Table 6 shows the list of insect's species collected in the different puestos of Kinabuhayan forest in Dolores Quezon; Puesto 1 (Kristalino), Puesto 2 (Suplina), Puesto 3 (Salaming Bubog), Puesto 4 (Kuweba ng Dios Ama) and Puesto 5 (Durungawan). A total of 285 species representating more than 104 families and 17 orders were identified.

Among insect orders identified five orders namely: Diptera, Coleoptera, Hymenoptera, Lepidoptera and Hemiptera account for 86.32% of the total insect fauna. According to Gapud (2005), these five orders were the most dominant insect orders known to occur in the Philippines. Though other insect orders account for only 13.68%, they are evenly distributed in different puestos. Furthermore, Orders Plecoptera (stonefly nymphs), Trichoptera (caddisfly larvae) and Ephemeroptera (may flies nymphs) were present in the aquatic habitat of these puestos. These are indicator species (Carisen, et al., 2004), their presence or absence gives information about the health and quality

of the stream as these species require high dissolved oxygen levels in order to survive. The presence of these insects indicates that the streams in the different puestos still have healthier aquatic environment.

Insects' Diversity Indices

Diversity index shows that Puesto 2 (Suplina) > Puesto 4 (Salaming Bubog) > Puesto 5 (Durungawan) > Puesto 1 (Kristalino) > Puesto 3 (Kuweba ng Diyos) the same trend with species richness (Table 7). All the puestos got high diversity and evenness indices and low dominance values, indicative that though five orders dominate species of insects are equally represented in each the puestos and that all the puestos can support diverse species of insects. According to Odum (1971), higher diversity means longer food chains and more cases of symbiosis (mutualism, parasitism, commensalisms, and so forth). The richness of the Kinabuhayan forest implies good habitat for forest life including insects.

Table 6. Insects collected in Kinabuhayan Forest Classified to its CorrespondingOrder, Family

Order	Family Name	Order	Family Name	Order	Family Name
Blattodea	Blaberidae		Nycteribiidae	Lepidoptera	Noctuidae
	Blatillidae		Otitidae		Papilionidae
	Blattidae		Phoridae		Pieridae
Coleoptera	Bostrichidae		Psychodidae		Pyralidae
	Carabidae		Sarcophagidae		20sp unidentified
	Cerambycidae		Sciaridae	Odonata	Coenagrionidae
	Chrysomelidae		Simuliidae		Platycnemididae
	Cicindelidae		Stratiomyidae		6 *sp.* unidentified
	Coccinellidae		Tephritidae	Orthoptera	Acrididae
	Curculionidae		Tipulidae		Gryllidae
	Dytiscidae	Ephemeroptera			Tetrigidae
	Elateridae	Hemiptera	Alydidae		Tettigoniidae
	Gyrinidae		Aphrophoridae		2 *sp.* unidentified
	Hydrophilidae		Cercopidae	Phasmatodea	Diapheromeridae

	Lampyridae		Cicadellidae		Heteropterygidae
	Lucanidae		Cixiidae	Plecoptera	Nemouridae
	Nitidulidae		Corixidae		2 *sp.* unidentified
	Passalidae		Gerridae	Psocoptera	Epipsocidae
	Platypodidae		Machaerotidae		Myopsicidae
	Pselaphidae		Membracidae	Thysanoptera	Phlaeothripidae
	Scarabaeidae		Mesoveliidae	Trichoptera	Leptoceridae
	Staphylinidae		Miridae		1 *sp.* unidentified
	Tenebrionidae		Pentatomidae		
	Throcidae		Pyrrhocoridae		
	5sp unidentified		Reduviidae		
Collembola	Entomobryidae		Scutelleridae		
	Hypogastruridae		2sp nidentified		
Dermaptera	Forficulidae	Hymenoptera	Apidae		
Diptera	Acroceridae		Braconidae		
	Anthomyiidae		Chalcididae		
	Asilidae		Drosophilidae		
	Blephariceridae		Eumenidae		
	Calliphoridae		Eurytomidae		
	Conopidae		Formicidae		
	Culicidae		Proctotrupidae		
	Diopsidae		Sphecidae		
	Dolichopodidae		Vespidae		
	Drosophilidae		Formicidae		
	Empididae		1sp unidentified		
	Heleomyzidae	Isoptera	Termitidae		
	Micropezidae	Lepidoptera	Arctiidae		
	Milichiidae		Danaidae		
	Muscidae		Eupterotidae		
	Mycetophilidae		Geometridae		
	Neriidae		Gracilariidae		

Table 7. Diversity Indices of Insects in the Different Puestos of Kinabuhayan Forest

Puestos	Species Diversity (H)	Species Richness (d)	Evenness Index (e)	Dominance Index (c)
Puesto 1 (Kristalino)	3.493	9.698	0.929	0.041
Puesto 2 (Suplina)	4.489	29.824	0.866	0.002
Puesto 3 (Salaming Bubog)	3.162	8.531	0.863	0.056
Puesto 4 (Kweba ng Diyos Ama)	3.851	13.983	0.906	0.025
Puesto 5 (Durungawan)	3.537	10.771	0.946	0.058

CONCLUSIONS

The study was conducted to assess the species composition and diversity of forest trees of Mt. Banahaw in Sitio Kinabuhyan, Sta. Lucia, Dolores, Quezon. Based on results of the study the following conclusions were formulated:

1. The study area was composed of various species of trees, wildlife and insects under different families;
2. No particular species of wildlife, trees or insects dominates such that individuals were evenly distributed among the species sampled;
3. Forest community structures in higher altitudes differ from that of lower elevations with the former exhibiting stunted growth and less stratified canopy; and
4. High values of species richness, diversity index and eveness as well as low dominance values show that Mt Banahaw de Dolores is a highly diversity ecosystem.

RECOMMENDATIONS

Based on the findings of the study the following are recommended:

1. Further study on other life forms such as vines, shrubs, herbs etc in the area for a more comprehensive floristic characterization.
2. Conduct of similar study on other portion of Mt. Banahaw de Dolores and other parts Mt. Banahaw-San Crisobal National Park to address variation in environmental factors among sites.
3. After 5-year closure, it was evident that the site is recovering from the effects of disturbance, hence strict regulation and monitoring of visitors and the conduct of religious activities in the site must be sustained.
4. Establishment of a permanent experimental plot for continuous monitoring of ecological changes in the site.

ACKNOWLEDGMENTS

This publication was made possible through the support of various groups and individuals to whom we express our gratitude:

Dr. Inocencio E. Buot, Project Mentor for Biodiversity Assessment in Kinabuhayan Forest, Sta. Lucia, Dolores, Quezon for providing technical assistance such as evaluation, recommendation to ensure successful implementation of the project which padded the way for the creation of this publication

Dr. Enrico P. Supangco, Director CHED-UPLB Zonal Research Center for Region IV and V, for providing the necessary funding and technical assistance in the project implementation and evaluation,

To the Vice-President for Research and Extension leaded by Dr. Milo O. Placino and Prof. Noime A. Villaverde for their support and assistance in the implementation of the project and formulation of this publication.

To Mr. Dennis Pulan for providing technical assistance and expertise in taxonomy and identification and characterization of leaf specimens,

To student researchers and volunteers for their support and assistance in the implementation of the project and conduct of field activities.

LITERATURE CITED

Almazol, A. E.
2006 Floristic Composition and Physiognomy of Kinabuhayan River Riparian Zones, Mt. Banahaw San Cristobal Protected Landscape. Siyasig Vol 2. No.1.

Aragones, E. G. Jr.
1990 Vegetation-Soil Pattern Along Altitudinal Gradient In the Western Slopes of Mt Banahaw, Luzon, Philippines. Ph.D. Dissertation.

Carisen, W.S., N.M.
2004 Trutmann, and the Environment Inquiry Team.. Watershed Dynamics (student Edition) p. 175.

DENR Admin. Order 01
2007 Establishing the National List of Threatened Philippine Plants and Their Categories, and the List of Other Wildlife Species.

Faller, W C.
1998 Vegetation Analysis of Forest Tree Communities at Different Altitudes of Mt Banahaw , Majayjay, Laguna. Ph.D. Dissertation.

Gapud, V. P.
2005 The Status of Insect Biodiversity in the Philippines. Samut-Sari. Vol. 4. No. 1 January - March 2005.

Gascon, C.N.
2002 Mt. Banahaw: Physical, Biological and Management Features: Foundation for the Philippine Environment, SYNERGOS, ASEAN Regional Centre for Biodiversity Conservation, and Southern Luzon Polytechnic College.

Gascon, C.N., N. Vidal, A.E. Almazol, and M A .R. Agudilla.
2005 Biodiversity Assessment of the Three Areas of Mt. Banahaw-San Cristobal Nastional Park. Siyasig Vol. 1. Number 1 .

Jaca, J.C.,
2004 Insect Diversity in 1,250 m^2 Lot of Sitio Ilalim at the Creater of Mt. Banahaw. Undergraduate Thesis. Southern Luzon State University.

Yara, K. R. A.
2009 Aquatic Insect Diversity at Taytay Falls in Barangay Taytay, Majayjay, Laguna. Undergraduate Thesis. Southern Luzon State University.

PHOTO DOCUMENTATION

Forest Inventory

Fig. 3. Sampled trees were identified, its diameter and height were also measured.

Fig. 4. Sampled trees were labeled to for photo-documentation

Wildlife Inventory

Fig. 5. Mist net was laid-out along bird and/or bat flight route for collecting samples.

Fig. 6. Rodents were captured using traps to determine wildlife species in the study area.

Fig. 7. The existence of wildlife in Mt. Banahaw can be evident from fecal matters found therein (elevation 1600 masl).

Insect Collection

Fig. 8. Students participated in the activity as part of their academics.

Fig. 9. Nocturnal insects were collected by light trapping.

Fig. 10. Surber sampler were used to collect aquatic insect (Kweba ng Dios Ama).