Vol. 1 No. 1 December 2010
CHED Accredited Research Journal, Category A
Print ISSN 2094-1519 • Electronic ISSN 2244-0461
doi: http://dx.doi.org/10.7828/ajob.v1i1.99

Asian Journal of Biodiversity
Art. #99, pp. 1-24

Diversity and Status of Butterflies across Vegetation Types of Mt. Hamiguitan, Davao Oriental, Philippines

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Date Submitted: Oct. 7, 2009
Final Revision Complied: Dec. 1, 2009

Abstract - An inventory was conducted to determine the diversity and status of butterflies of Mt. Hamiguitan Wildlife Sanctuary, Davao Oriental, using quadrat method in five vegetation types, namely; agroecosystem (10-400 masl), dipterocarp (500-900 masl), montane (900-1400 masl), mossy (1400-1500 masl) and pygmy (1500-1675 masl). Two 20m x 20m plots were established per vegetation type. These inventory techniques revealed 142 species of butterflies plus one new subspecies described and illustrated. Diversity assessment using Shannon-Weiner index showed high level (4.1) in the Montane forest as compared to other vegetation types. Bray-Curtis similarity index showed low species similarity in pygmy, mossy and agro-montane forests (< 40 %). Furthermore, this study revealed 7 possible new species, 44 endemics: 2 eastern Mindanao endemic (very rare), 4 Mt. Hamiguitan endemic (very rare), 16 Mindanao endemic and 22 Philippine endemic. Seven species are new records in Mindanao. Mt. Hamiguitan

Wildlife Sanctuary is the home of diverse and endemic butterfly species.

Keywords - butterflies, species richness, pygmy vegetation types, Mt. Hamiguitan

INTRODUCTION

Butterflies are easily selected as organisms for study among arthropods because of their attractiveness, ecological and socio-cultural uses. Ecologically, butterflies play an important role in our ecosystems. They are considered as biological components which affect human life in various ways either directly or indirectly, and in tangible or intangible manner. Their larvae transform millions of tons of plant matter into animal and waste matter and are eaten by other animals or eventually recycled into plant matter. The larvae help in controlling weeds and also in cross pollination of many flowering plants (Treadaway 1995). The larvae are sources of genetic material for gene diversity (Weed 1976). They can be biological indicators for environmental quality and component of natural landscape. Butterfly habitats depict the quality of existence of their natural landscape and are indicators of biologically rich environment.

Despite their usefulness, studies leading to the conservation of the Philippine butterflies and the influence of vegetation types on their existence are scanty especially in Mindanao (Gapud 2005).

The work of Ballentes, Mohagan, Espallardo and Zarcilla (2005) on arthropod fauna in Mt. Malindang and its environs documented 764 species. Thus far, the need to conduct surveys is accentuated by rapid destruction of forest communities here in the Philippines, particularly in Mindanao where primary forest has been reduced for livelihood purposes yet basic ecology of most invertebrate fauna remains unknown. Treadaway (1995) reported 895 taxa of butterflies in the Philippines and noted the ecological status of each species. As can be expected, the larger islands have high number of species. Mindanao, the second largest island in the Philippine archipelago, is the home of 528 species, in which 41.5 % or 219 species are endemic.

Many of the species are still awaiting to be discovered and named in places which have not been biologically explored.

One of the biologically unexplored mountains in Mindanao for butterfly fauna is Mt. Hamiguitan Wildlife Sanctuary in Davao Oriental. The information on diversity and status of butterflies is useful as one basis for the protection, conservation and management of the sanctuary.

This study was conducted to assess the diversity and status of butterflies in Mt. Hamiguitan Wildlife Sanctuary, Davao Oriental to provide baseline information of the butterfly fauna across vegetation types. Specifically, this study provides trends on species richness, relative abundance, endemism and similarity of communities based on species composition of butterflies across vegetation types.

MATERIALS AND METHODS

Study Area

Mt. Hamiguitan (Fig. 1) is located at 124° 14′ N and 5°21′E. The Sanctuary is under the jurisdiction of three municipalities : Mati at the southern part, San Isidro at the northern side and Governor Generoso at the eastern side. A portion of Mt. Hamiguitan (San Isidro side) was declared in February 3, 1994 as protected landscape consisting of 21, 200 has. The mountain range is characterized by different vegetation types: the beach forest starting 0-35 masl, pygmy 36-180 masl, mixed dipterocarp forest at 280- 860 masl, montane at 870- 910 masl, mossy at 920 - 1250 and pygmy (bonsai) at 1260 - 1700 masl. The range is also characterized by three major drainages which carve out a rugged terrain, the Dumagook river (Fig. 2), Mansadok river (Fig. 3) and the Puting Bato (Fig. 4), and with two swamp areas (Figs. 5 & 6) locally called lakes.

The study was conducted within Mt. Hamiguitan, Davao Oriental. Two transect belts were done in San Isidro and Mati side of Mt. Hamiguitan using the natural trail called transect belt I and II. Transect belt I was established from Sitio Tumaliti to the peak of Mt. Mansadok for the Municipality of San Isidro side. Transect belt II was established from Sitio Magum to Lantawan 1 for Mati side. Five vegetation types were identified per transect belt . The five types include the following: agroecosystem dipterocarp forest 1, montane forest 1, mossy 1 and pygmy forest 1 in transect belt I for San Isidro side. The five vegetation types in transect belt 2 include: agroecosystem 2, dipterocarp 2, montane 2, mossy 2 and pygmy forest 2 for Mati side. Two 20 m x 20 m plots/quadrats were established in each sampling site to survey the species richness and diversity of butterflies. Butterflies were collected in these sites with the use of a catching net and bait traps.

Sampling Technique

Plot/Quadrat sampling technique was used to collect the data for diversity and richness of butterflies in Mt. Hamiguitan. Butterflies were observed, collected and counted within the two 20 m x 20 m quadrats/ vegetation. These data were recorded for the data on richness, altitude, type of vegetation, distribution, and abundance for the determination of diversity indices along elevation gradient or across vegetation types.

Abundance, species richness and Shannon-Weiner diversity index was determined using BIO PRO software version 2.0. Likewise, cluster analysis determined the similarity of communities based on butterfly composition across vegetation types using BIO PRO software.

Preservation

The three specimens of butterflies per species slightly pressed at the thorax were placed in the triangular wax with moth balls to kill and preserve them.

Classification, Identification and Description

Classification and initial identification of butterflies were done using books, journals, and photographs of identified specimens.

Assessment of Status

Status of butterflies was assessed using Treadaway's Checklist (1995). The scale of occurrences was used to evaluate the status of butterflies throughout Mt. Hamiguitan: very rare - (1-3 occurrences), rare – (4-10 occurrences), common- (11-20 occurrences), very common- (21-above occurrences).

RESULTS AND DISCUSSION

Species Richness

A total of 142 species (Table 1) (Figs. 11-14 pp. 22-24) of butterflies were sampled in Mt. Hamiguitan. These species belong to 97 genera and 6 families of butterflies. Of these, 28 species were family Hesperidae, 27, Lycaenidae; 55, Nymphalidae; 11, Papilionidae; 19, Pieridae; and Rionidae represented by a single species .

Species richness of butterflies showed an increasing trend in agroecosystems (10-400 masl), dipterocarp forests (400-900 masl) and montane forests (900-1400 masl) while it is decreasing from mossy forests (1400 masl-1500 masl) to pygmy forests (1500-1675 masl).

Butterfly abundance was highest in agroecosystem 2 with 26 individuals, followed by agroecosystem 1 with 25 individuals, montane 1 with 18, montane 2 with 17, dipterocarp 1 with 15, dipterocarp 2 with 11, mossy 1 with 6, pygmy 1 with 8 and pygmy 2 with 1 (Table 2 p. 12). Butterfly abundance decreased with increased elevation using rank dominance plot (Fig.1 p. 12). This suggests that butterfly species in higher elevations have the tendency to become rare or unique.

Table 1. List of butterflies from Mt. Hamiguitan and their status

Family	Ecological Status	Taxonomic status	Local Status
Hesperiidae			
1. *Aeriomachus musca* Mabille 1876	common		very rare
2. *Ancestroides nigrita fumatus* Mabille 1876	common		very rare
3. *Badamia exclamationis* Fabricius 1775	common		rare
4. *Baoris oceia* Hewitson 1868	common		very rare
5. *Choaspes plateni adhara* Fruhstorfer 1911	rare	endemic in Mindanao	rare
6. *Coladenia ochracea* Fruhstorfer 1911	very rare	Phil. endemic	Very rare
7. C. *semperi* Edwards & Edwards 1897	very rare	Phil. endemic	very rare
8. *Gangara thrysis philippensis* Fruhstorfer 1910	rare		rare
9. *Gerosis corona corona* Semper 1892	rare	endemic	very rare
10. *Halpe luteisquama* Mabille 1896	common	endemic	very rare
11. *Hasora chromus chromus* Cramer 1782	rare	new record in Mindanao	very rare
12. *H. khoda minsona* Swinhoe 1907	rare		very rare
13. *Isma feralia ferestrata* Elwes & Edwards 1897	rare	endemic	very rare
14. *Mooreana princeps* Semper 1892	rare	endemic	very rare
15. *Notocrypta feisthamalii alinkara* Fruhstorfer 1911	common		rare
16. *N. paralysos volux* Mabille 1993	common		Very rare
17. *Odontoptilum angulatum helisa* Semper 1892	rare	endemic	very rare
18. *O. leptogramma* Hewitson 1868	rare	endemic	very rare
19. *Oriens californica* Scudder 1872	common	endemic	very rare
20. *Pothantus mingo mingo* Edwards 1866	rare		rare
21. *Psolos fuligo fuligo* Mabille 1876	common		very rare
22. *Suada albina* Semper 1892	rare	endemic	very rare
23. *Tagiades gana elegans* Mabille 1877	common		rare
24. *Tagiades sp*	common		very rare

Table 1 continue

25. *T. trebellius martinus* Plotz 1884	common		common
26. *Taractrocera luzonensis luzonensis* Staudinger 1889	common		very rare
27. *Telicota ohara jania* Evans 1949	rare		very rare
Lycaenidae			
28. *Allotinus corbeti* Eliot 1956	rare	undetermined	very rare
29. *A. nivalis* Semper 1889	common	undetermined	very rare
30. *A. panctatus* Semper 1889	common	endemic m Mindanao	very rare
31. *A. aedius oenotria* Hewitson 1869	rare		very rare
32. *A. alitaenius panta* Evans 1957	rare	New record in the Philippines	very rare
33. *A. arsenius everetti* Evans 1957	rare	new in Mindanao	very rare
34. *A. corinda corinda* Hewitson 1869	common	Phil. endemic	very rare
35 *A. eridanus davalma sspn*	rare	New to Science	
36. *A. matsutaroi* Hayashi 1979	rare	endemic in Mindanao	very rare
37. *Bindahara phocides origenes* Fruhstorfer 1912	common		very rare
38. *Caleta angola angola* Hewitson 1876	rare		very rare
39. *Curetis tagalica tagalica* Felder 1862	common		very rare
40. *Euchrysops cnejos* Fabricius 1798	common		very rare
41. *Horaga lefebvrei osma* Fruhstofer 1912	rare		very rare
42. *Jamides alecto manilana* Toxopeus 1930	rare		very rare
43. *J. bochus pulchrior* Grose-Smith 1895	rare	New record in Mindanao	very rare
44. *J. celeno lydanus* FRuhstorfer 1910	rare	New record in Mindanao	very rare
45. *J. cleodus cleodus* Felder-felder 1865	common		very rare
46. *J. philatus osias* Roeber 1886	rare		rare
47. *Monodontides apona* Fruhstorfer 1910	rare	endemic	very rare
48. *M. hondai* Eliot & Kawazoe 1983	common	endemic	very rare
49 *Paruparo cebuensis* sspn.	rare	Phil. endemic	very rare
50. *P. cebuensis cebuensis*	rare	Phil. endemic	very rare
51. *Pithecops corvus corax* Fruhstorfer 1919	common		very rare

Table 1 continue

52. *Poritia philuta phare* Druce 1895	common		very rare
53. *Prosotas nora semperi* Fruhstorfer 1916	common		very rare
54. *Rapala varuna nada* FRuhstorfer 1912	rare		very rare
55. *Remilana westermanni* Felder & Fekder 1865	common		very rare
56. *Tajuria jalajala jalajala* Felder & Felder 1862	common	endemic in Mindanao	rare
57. *Zizina otis oriens* Butler 1883	common	new record	common
Nymphalidae			
58. *Acrophtalmia leto ochine* Semper 1887	rare	endemic in Mindanao	common
59. *A. albofasciata* Uemura & Yamaguchi 1982	common		common
60. *Amathusia phidippus pollicaris* Butler 1870	common		rare
61. *Athyma maenas semperi* Moore 1898	rare		rare
62. *Cethosia luzonica magindanica* Semper 1888	common		very common
63. *Charaxes antonius antonius* Semper 1878	rare	endemic in Mindanao	rare
64. *Cirrochroa tyche tyche* C. & R. Felder 1861	common		rare
65. *Cupha arias dapatana* Grose-Smith 1887	common		very common
66. *Cyrestis maenalis rizali* Tsukada & Nishiyama 1985	common		very common
67. *Danaus melanippus edmondii* Lesson 1837	common		very common
68. *Dischopora philippina* Moore 1895	rare	Phil. endemic	very rare
69. *Dophla evelina proditrix* Fruhstorfer 1913	common		very common
70. *Elymnias beza beza* Hewitson 1877	common	endemic in Mindanao	very common
71. *Euploea eunice eunice* Godart 1819	common		very common
72. *E. tulliolus pollita* Erichson 1834	common		very rare
73. *E. mulciber mindanensis* Staudinger 1885	common		rare
74. *Euthalia lubentina philippensis* Fruhstorfer 1899	rare		very rare
75. *Faunis phaon leucis* C. & R. Felder 1861	common		very common
76. *Hypolimnas anomala anomala* Wallace 1869	common		very common
77. *H. bolina* Butler 1874	common		very common
78. *H. misippus* Linnaeus 1769	common		rare

Table 1 continue

79. *Idea leuconoe obscura* Staudinger 1889	common		common
80. *Ideopsis gaura glaphyra* Moore 183	rare	endemic in Mindanao	Very rare
81. *I. juventa manillana* Moore 1883	common		very common
82.*Junonia hedonia ida* Cramer 1775	common		very common
83. *J. orithya leucasia* Fruhstorfer 1912	common		common
84. *Lassipa pata semperi* Moore1899	rare		very common
85. *Lethe chandica byzaccus* Fruhstorfer 1911	common		common
86. *Lexias panopus miscus* Fruhstorfer 1913	common		very common
87. *L. satrapes trapesa* Semper 1888	rare		very common
88. *Libythea geoffroy philippina* Staudinger `889	common		very common
89. *Melanitis atrax lucillus* Fruhstorfer 1908	common		common
90. *M. leda leda* Linnaeus 1758	common		common
91. *Moduza thespias* Semper 1889	rare	Phil. endemic	rare
92. *Mycalesis felderi felderi* Butler 1868	rare	Phil. endemic	very rare
93. *M. tagala semirasa* Fruhstorfer 1908	rare		very rare
94. *M. treadawayi cotabatana* Schroder & Treadawayi	common	endemic in Mindanao	very rare
95. *Neptis pampanga boholica* Moore 1899	common		rare
96. *Pantoporia cyrilla athenais* C. & R. Felder 1863	common		very common
97. *Parthenos Sylvia philippensis* Fruhstorfer 1898	common		common
98. *Prothoe semperi semperi* Honrath1884	rare	Phil. endemic	very rare
99. *Ptychrandra loquinii plateni* Semper 1891	rare		very rare
100. *Ragadia melindena melindena* C. & R. Felder 1863	rare	Phil. endemic	common
101. *Symbrethia lilaea semperi* Moore 1899	common		rare
102. *Tacola magindana magindana* Semper 1878	rare	Phil. endemic	rare
103. *Tanaecia leucotaenia* aquamarina Fruhstorfer 1912	common		common
104. *Terrinos clarissa lucilla* Butler 1870	rare	Phil. endemic	very rare
105 *Tirumala hamata orientalis* Sempper 1879	common		rare
106. *T. ishmoides strymon* Fruhstorfer 1911	rare		rare

Table 1 continue

107. *Vagras sinha sinha* Kollan 1844	common		rare
108. *Vindula dejone dejone* Erichson1834	common		rare
109. *Ypthima semperi chaboras* Fruhstorfer 1911	common	Phil.endemic	rare
110. *Y. stellera stellera* Eschscholtz 1821	common	Phil. endemic	rare
111. *Zethera musa* C. & R. Felder 1861	common	Phil. endemic	rare
112. *Zeuxidia sibulana sibulana* Honrath 1884	rare	endemic in Mindanao	very rare
Papilionidae			
113. *Achillides palinurus daedalus* Felder & Felder 1861	common		very common
114. *Arisbe euphratoides* sspn.	Very rare	Endemic in Mindanao	rare
115. *A. eurypilus gordion* Felder & Felder 1864	common		common
116. *Graphium Agamemnon Agamemnon* Linnaeus 1758	common		common
117. *G. sarpedon sarpedon* Linnaeus 1858	common		common
118. *Lamprotera meges decius* Felder & Felder 1862	common		very common
119. *Menelaides deiphobus rumanzovia* ESchscholtz 1821	common		very common
120. *M. helinus hystaspes* Felder & felder 1862	common	endemic	very common
121. *M. polytes ledebouria* Eschscholtz 1821	common		very common
122. *Papilio demolius libanus* Fruhstorfer 1908	common		very common
123. *Troides rhadamantus rhadamantus* Lucas 1835	common		very rare
Pieridae			
124. *Appias nero zamboanga* Felder & Felder 1862	common		very common
125. *A. olferna peducea* Fruhstorfer 1910	common		rare
126. *Catopsilia pomona pomona* Fabricius 1775	common		very common
127. *C. pyranthe pyranthe* Linnaeus 1758	common		very comon
128. *C. scylla asema* Staudinger 1885	common		rare
129. *Cepora aspasia orantia* FRuhstorfer 1910	common		common
130. *C. boisduvaliana semperi* Staudinger 1890	common		rare
131. *Delias baracasa baracasa Semper 1890*	rare	Endemic in Mindanao	very rare

Table 1 continue

132. *D. hyparete mindanensis* MITIS 1893	common	Endemic in Mindanao	very common
133. *Delias magsadana* Yananoto & Takei 1995	Very rare	Endemic in Mindanao	very rare
134. *Eurema alitha alitha* C. & R. Felder 1862	common	Endemic in Mindanao	very rare
135. *E. blanda vallivolans* Butler 1883	common		very common
136. *E. brigitta roberto* Schroeder,Treadaway & Nuyda 1990	rare	endemic	very rare
137. *E. hecabe tamiathis* Fruhstorfer 1910	common		common
138. *E. sarilata sarilata* Semper 1891	rare	Phil. endemic	common
139. *Gandaca harina mindanensis* Fruhstorfer 1910	common		common
140. *Leptosia nina terentia* FRuhstorfer 1920	common		very common
141. *Pareronia boebera trinobantes* Fruhstorfer 1911	common		common
Riodinidae			
142. *Abisara mindanensis mindanensis* Semper 1892	common	undetermined	very rare

Table 2. Descriptive statistics on the diversity of butterfly occurrences across vegetation types in Mt. Hamiguitan

Sample	Mean Individuals	Variance	Standard Deviation	Standard Error	Total Individuals	Total Species	Shannon H (index)	Index of evenness
Agro1	2.209	29.253	5.409	0.459	307	35	3.367	0.88
Agro2	1.46	13.584	3.686	0.313	203	41	3.497	0.87
Dipt1	1.165	7.081	2.661	0.226	162	37	3.526	0.92
Dipt2	0.626	3.598	1.897	0.161	87	24	3.134	0.89
Montane 1	3.072	18.444	4.295	0.364	427	105	4.554	0.89
Montane 2	1.576	11.217	3.349	0.284	219	46	3.784	0.90
Mossy 1	0.23	0.918	0.958	0.081	32	10	2.303	0.93
Mossy 2	0.086	0.224	0.474	0.04	12	5	1.609	0.96
Pygmy 1	0.18	0.38	0.617	0.052	25	18	2.773	1
Pygmy 2	0.007	0.007	0.085	0.007	1	1	2.773	1

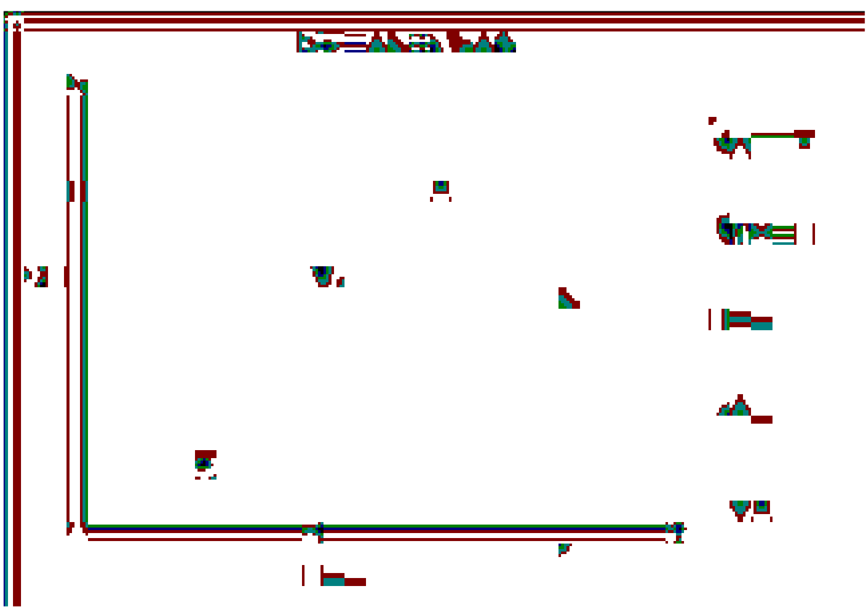

Fig. 1. Rank dominance of Butterflies in Mt. Hamiguitan

Shannon-Weiner index (Fig.2) showed that highest species diversity occurred in montane 1 (4.1), followed by mountain 2 (3.4) the lowest was in mossy 2 (1.5). Species diversity of butterflies in the montane forests is not merely influenced by elevation but also by the vegetation type and other factors. Kruger (2005), in his study on insect diversity in apple and garden orchard, reported that Shannon –Weiner index values of 1.5 to 3 are fair levels, 4 to 6 are high levels of insect diversity. Montane forest in Mt. Hamiguitan had Shannon –Weiner index value of 4.1, indicating high level of butterfly diversity.

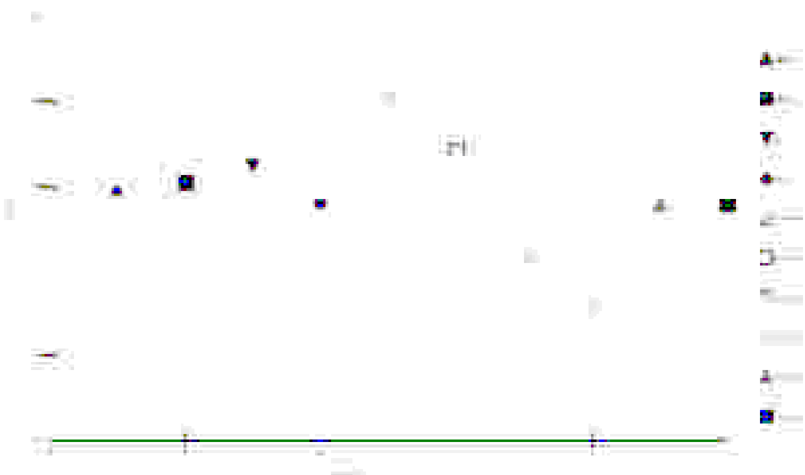

Fig. 2. Shannon-Weiner plot of diversity index of butterfly species across vegetation types of Mt. Hamiguitan

This result is consistent to Cameron (1999) where alpha diversity of insect was higher in woods of Texas prairies. Ballentes, Mohagan, Espallardo and Zarcilla (2005) in their studies conducted in Mt. Musuan, Mt. Kalatungan and Mt. Malindang on butterflies and other arthropods found that diversity was high in the second layer and vegetations were varied. Temperature ranges were similar.

The result could be attributed to the influence of temperature, which decreases with elevation. This is true to butterflies since only few butterflies resist cold especially that their wing structures are dressed with scales which become heavy when wet (14-21°C). This is one reason why highest species richness was observed in montane (21-32 °C) forests. This observation was consistent with Cameron (1999) where alpha diversity of insects was found highest in the woods sites of Texas prairies and on wildlife distribution. Schmidt (2003) as cited by Gapud (2005) had documented the change of species composition of trees from higher to lower elevation due to slope position and drainage. Consequently, butterfly fauna composition is also affected due to dependence on food plants' availability.

Heaney, Neidema, Rickart, Utzurum and Klompen (1989) studied the factors influencing the distribution of mammals of Mt. Makiling. They found out that variability in patterns of species diversity, endemism and distribution are influenced by two major factors: temporal (date and time) and spatial (country, region, faunal region, ecosystem, habitat and microhabitat). Date, time, microhabitat presence and habitat influenced the patterns of species richness and endemism in the sites of Mt. Hamiguitan (Haribon Foundation 2000).

Dendrogram of cluster analysis (Fig. 3 p. 15) on the similarity of butterfly composition in Mt. Hamiguitan across vegetation had shown that the two agroecosystems are ecologically similar. Montane forests and dipterocarp forests are two related habitats and these were further clustered as agro-montane forest on the bases of butterfly species composition with >55% similarity index. Mossy 1, mossy 2, pygmy 1 and pygmy 2 are clustered as unique habitats with very low similarity index of <40%. The Dendrogram produced in the clustering of habitats in this study did not follow the authors' original classification of habitats. Temperature ranges (21-32°C) have clustered agroecosystem, dipterocarp and montane into agro-montane forest. Mossy 1(1400-1500 masl) and mossy 2 (1200-1300 masl) differ in elevation, sunlight penetration, moss cover, tree heights, and temperature. The two mossy forests in Mt. Hamiguitan are two different habitats unique from each other. Pygmy 1(1500-1675 masl) and pygmy 2 (36-280 masl) differ in elevation, temperature, moss cover and disturbance so it follows that the two pygmy forests in Mt. Hamiguitan had different butterfly composition. Although there are species that can exist in a wide range of habitat, there are species, too, (concordant species) that are specific in terms of habitat preferences (disconcordant species). This further suggests that conservation of habitat must not focus only on primary forest or higher elevation forest but also the logged-over areas or agroecosystems for the conservation of anthropogenic butterfly species.

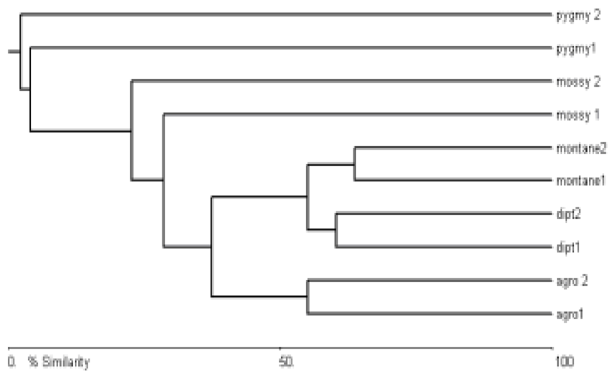

Fig.3. Dendrogram on cluster analysis of butterfly species composition

The list of butterfly status in Table 1 (p. 6) shows that 42 out of 140 are common (51.4%), 18 are rare (12.9%), seven common endemic (5%), 15 are rare endemic (10.7%), two are very rare endemic (1.4%), two are site endemic (1.4%), and two are Eastern Mindanao endemic (1.4%). One is common and new record in Mindanao (0.71%), five are rare and new record in Mindanao (3.6%) and one very rare, new record in Mindanao. One has no established status yet.

A total of 44 species of endemic butterflies from Mt. Hamiguitan was listed at about 31% of the total sample plus seven are new records in Mindanao based on the Treadaway, 1997 checklist. Local assessment of status of butterflies had shown that 42.8% are very rare, 20.7% are rare, 13.7% are common and 22.8% are very common.

The trend on endemism across vegetation follows the general distribution of butterflies in Mt. Hamiguitan where elevation influenced the vegetation types and butterfly species composition (Fig. 4). There was no similarity of endemic butterfly species across vegetation. Abundance of endemics and number of unique endemic species decrease with increased elevation.

Fig. 4. Abundance plot for endemic species across vegetation types in Mt. Hamiguitan

Preferred habitat

The pygmy forests of Mt. Hamiguitan supported the existence of the most rare site endemic butterfly *Delias magsadana*, which cannot be found anywhere else in the world except in Mt. Hamiguitan (Treadaway, 1995). The Pygmy forest in Mt. Hamiguitan is the sanctuary of *Delias magsadana*. This butterfly is locally abundant during the months of August and September. This result is a rediscovery of *Delias magsadana* since 1994 with only one collected species in August.

Papilionids were abundant in the lower elevation, in the Agroecosystems of Mt. Hamiguitan because their food plants, which are the Rutaceae and the Anonaceae are widely cultivated. Most of them are confined in the lower elevation together with the most abundant species of Pieridae like *Catopsilia pomona*, *C. pyranthe* and *C. asema*; their food plants grow in the lower elevation.

Achillides euphratoides of the Papilionidae were only found in the Montane forests. They were unique in the area, together with the other beautiful species like *Terinos lucella*, and the rest of the Hesperids. These natural forest dwelling species are rare and endemic.

Few species were very common like *Junonia hedonia ida, Lexias satrapes trapesa, Lexias panopus, Hypolimnas bolina, Hypolimnas anomala,* *Melanitis leda*, *Cupha areas dapatana* are among the wide range habitat butterflies in Mt. Hamiguitan. It can be found from dipterocarp forest to pygmy during sunny weather.

In general, Mt. Hamiguitan is the home of many butterfly species due to the different habitat types. The pygmy forest supports the very rare, site endemic species *Delias magsadana*.

CONCLUSIONS AND RECOMMENDATIONS

Mt. Hamiguitan is home to 142 species of butterflies. Butterfly diversity increased from agroecosystems (10-400 masl) to montane forest (900-1400 masl). Butterfly species are highly diverse with some concordant species in the montane forest, fair levels of diversity in some unique habitats like dipterocarp, mossy, and pygmy forest of Mt. Hamiguitan had disconcordant species. There is high level of endemism of butterflies in Mt. Hamiguitan (4.7). Rarity increases from lower to higher elevation with *Delias magsadana* as the rarest species as revealed by the dendrogram of similarity index pointing that Pygmy is a unique habitat. A two-year monitoring on butterflies is recommended to sample more endemic and new species which remain to be discovered in the area. The high level of species diversity and presence of 3 site endemic species in Mt. Hamiguitan are significant for conservation. The mountain must be strictly protected to promote the restoration of butterfly habitats. Butterflies may increase in population where food plants are abundant even those that are in the anthropogenic area where food plants are domesticated by humans. The pygmy forests should be strictly protected. The collection of the site endemic *Delias magsadana* must be regulated.

ACKNOWLEDGMENTS

The senior author would like to extend her sincerest gratitude to the late Dr. Mardonio M. Lao, President of Central Mindanao University for his whole hearted support to the research endeavors of the faculty and for granting the authors travel to the field site on official time; Colin G. Treadaway of Senckenberg Museum for the financial support and for helping the author in identifying the specimens; Mr. Jayson

C. Ibañez of the Philippine Eagle Foundation for the accommodation on field and entry protocol; and, Dr. Victor B. Amoroso for his professional advice, concern and guidance.

This research is a portion of a dissertation of the primary author with funding support from Senckenberg Museum in partnership with the Philippine Eagle Foundation Inc., CENRO Lupon, Department of Environment and Natural Resources (DENR), Critical Ecosystem Partnership Fund (CEPF) and Bukidnon Resource Management Foundation, Inc. (BRMFI).

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Fig. 5. Panoramic view of Mt. Hamiguitan

Fig. 6. Dumagook river

Fig. 7. Mansadok river

Fig. 8. Puting Bato

Fig. 9. Hidden garden

Fig. 10. Tikog garden

Fig. 11. *Delias magsadana*

Fig. 12. *Taraka hamada dustinkeani*

Fig. 13. *Paruparu cebuensis*

Fig. 14 *Arhopala eridanus davalma*