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Diversity and Status of Butterflies in Maitum Village, Tandag, Surigao del Sur, Philippines

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Abstract - Diversity and assessment of butterflies of Maitum, Tandag, Surigaodel Sur were conducted to provide information on the species composition, diversity and status of butterflies in dipterocarp forest and agro ecosystems. A total of 104 species of butterflies belonging to 68 genera and 5 families were documented. Species richness of the butterflies was higher in the dipterocarp forest (89) than the agro ecosystem (51). The dipterocarp forest had greater mean individual (4.173) than the agro ecosystem (3.712). The diversity level was fair in dipterocarp forest (H'= 1.638) as compared to the agroecosystem area with low level of diversity (H'= 1.369). Dendrogram for similarity of species composition showed a fairly low species between the two study stations, this suggests the importance of the two habitats for the conservation of butterflies in Maitum Village, Tandag, Surigao del Sur. Assessment of status showed that 57 species (54.8 %), were common 16 (15. 3%) were rare, 12 (11.5%) were rare Philippine endemics, 6 (5.7%)

were common Philippine endemics, 2 (1.9%) common Mindanao endemics, 1 (.96%) rare Mindanao endemic, 1 (.96%) very rare eastern Mindanao endemic, and 9 (8.6%) were undetermined. These results suggest that Maitum, Tandag, Surigao del Sur is the home of 104 species of butterflies and the dipterocarp forest is the home of diverse and endemic species of butterflies for conservation.

Keywords - Diversity, Status, Conservation, Butterflies, Maitum Village.

INTRODUCTION

Tandag City is in the north-eastern coast of Mindanao. The city is the provincial capital of Surigao del Sur and one of the newly proclaimed cities in the country (United Tourist Promotions, 2008). It lies on the eastern part of Surigao del Sur which is part of Region XIII or Caraga Region. It has a total land area of 29, 173 hectares. Of these 5, 911 has. are alienable and disposable and 25, 709 are forestlands. Tandag falls under the Type II climate in the country, which is characterized by rainfall distributed throughout the year, with a negligible short dry season (MPDO Tandag Executive Summary 2004).

A study on mammal diversity by Wargues et al. (2007), taken from the WCSP 18th Annual Biodiversity Symposium "Biodiversity in the Philippine Uplands" Symposium Manual, reported a total of 28 species in Tandag, Surigao del Sur. No study on the diversity of butterflies has been reported on the area yet. This study focused on the diversity of butterflies in Maitum, Tandag, Surigao del Sur.

MATERIALS AND METHODS

Description of Study Site

This study was conducted in selected locations in Maitum, Tandag, Surigao del Sur (Figs. 1 & 2). The site is partially inhabited and is composed of two vegetation types: Agroecosystem and Dipterocarp Forests. The topography is generally plain, rolling and gently sloping. From Tandag City proper, the study site can be reached by motorcycles in approximately 30 minutes. The study was done from April to December 2010. Maitum Village has atotal land area of 1,327.37 hectares. Tandag falls under the Type II climate in the country, which is characterized by rainfall distributed throughout the year, with a negligible short dry season (MPDO Tandag Executive Summary 2004).

Establishment of Study Stations

Two study stations were established. The following were:

Station 1: Agroecosystem area (Fig.3)

Station 2: Dipterocarp forest area (Fig.4)

Sampling of butterflies was done in the above established stations of the study site.

Sampling Techniques

The following sampling techniques were employed:

1. ***Transect walk sampling***

This was done by walking three hours from 7:00AM to 10:00AM through the 2 km transects in each study station (Figs. 5 & 6), adapted from Mohagan, and Treadaway 2010. All butterflies seen along the 2 km transect were collected, counted and listed. Butterflies seen 5 m ahead were included in the collection (Pollard and Yates 1995).

A total of 6 weeks were devoted for sampling butterflies last summer 2010 at 3 weeks per station. Another 2 weeks was allotted for sampling in December 2010 at 1 week sampling time per station. Collections of voucher specimens were limited to 3 to 5 individuals only per species. Sample duplicates were released after each transect walk.

2. **Opportunistic Sampling**

To enhance species richness, Opportunistic Sampling was employed. This method was used to document butterflies outside the transect. Areas around the transect were scanned for butterfly species to enrich listings (Chiong 2007).A total of 6 weeks were devoted for sampling butterflies last summer at 3 weeks per station. Another 2 weeks was allotted for sampling in December at 1 week sampling time per station.

Collection of Specimens

Collection of butterflies was done using insect catching nets made of fine silk material to avoid wing damage. This was enhanced also by employing baits like fruit bait made of over ripe banana or any available fruit (Fig. 7). Brightly colored clothes were also used during sampling to attract butterflies to the researcher's location (Fig. 8). Butterflies collected were deposited in CMU Museum.

Classification and Identification

Classification of butterflies was done using references like books, journals photographs of previously identified specimens. Examples of these include: Butterflies of the World by Schroeder and Treadaway, Butterflies of the South East Asian Islands, The Zoological Society of London Journal, and Field Identification Guides by other authors.

Analysis of Data (Biodiversity Assessment)

Using BioPro software version 2.0, the following biodiversity indices was determined: Shannon-Weiner Diversity Index, Species Richness, Species Abundance and Bray-Curtis Similarity Index of Species Composition.

Assessment of Status

The national status and distribution of collected butterflies was determined using the Checklist of Butterflies in the Philippine Islands (Treadaway 1995).

RESULTS AND DISCUSSION

Table 1. Status of butterflies of Maitum Village, Tandag, Surigao del Sur.

Species No.	Family/Species Name	Local	National	IUCN
A.	**Family HESPERIIDAE**			
1	*Aeromachus musca*	Very rare	Rare Philippine Endemic	Rare Endemic
2	*Ancistroides nigrita fumatus*	Very rare	Common	Common
3	*Borbo cinnara*	Very rare	Common	
4	*Halpe luteisquama*	Very rare	Common Philippine Endemic	
5	*H.* sp.1	Very rare	Undetermined	
6	*Isma feralia ferestrata*	Very rare	Rare Philippine Endemic	
7	*Notocrypta paralysos volux*	Rare	Common	Common Endemic
8	*Odontoptilum angulatumhelisa*	Very rare	Rare	
9	*Oriens californica*	Very rare	Rare Philippine Endemic	Common Endemic
10	*Parnara bada borneana*	Very rare	Rare	
11	*P. kawazoei*	Common	Common	
12	*Potanthus mingo mingo*	Very rare	Rare	Rare
13	*Pyroneura liburnia minda*	Very rare	Rare Philippine Endemic	
14	*Tagiadesgana elegans*	Very rare	Common	Common
15	*T. japetustitus*	Rare	Common	Common
16	*T. trebellius martinus*	Very rare	Common	Common Philippine Endemic
17	*Taractrocera luzonensis*	Common	Common	
18	*Telicota* sp.1	Very rare	Undetermined	
B.	**Family LYCAENIDAE**			
19	*Acytolepis puspa bazilana*	Rare	Common	
20	*Allotinus fallaxa phacus*	Very rare	Common	
21	*Caleta angola angola*	Very rare	Rare	
22	*Catochrysops strabo luzonensis*	Very Common	Common	Philippine Endemic
23	*Celarchus archagathos archagathos*	Very rare	Rare Philippine Endemic	
24	*Cheritra orpheus orphnine*	Very rare	Common	
25	*Euchrysops cnejus cnejus*	Rare	Common	Common
26	*Everes lacturnus lacturnus*	Very Common	Common	
27	*Hypolycaena shirozui*	Very rare	Rare Philippine Endemic	

28	*H. sipylus tharrytas*	Rare	Common	
29	*Jamides celeno lydanus*	Very Common	Common	Rare
30	*J. cleodus cleodus*	Very rare	Common	
31	*J. philatu sosias*	Very rare	Rare	
32	*Lampides boeticus*	Very rare	Common	Common
33	*Nacaduba bereniceleei*	Rare	Rare	
34	*N.* sp. 1	Very rare	Undetermined	
35	*N.* sp. 2	Very rare	Undetermined	
36	*N.* sp. 3	Very rare	Undetermined	
37	*Pithecops corvus corax*	Very rare	Common	
38	*Prosotas dubiosa subardates*	Very rare	Rare, New record in Mindanao	
39	*P.* sp. 1	Very rare	Undetermined	
40	*Zizina otis oriens*	Very rare	Rare	
C.	**Family NYMPHALIDAE**			
41	*Acrophtalmia albofasciata*	Very rare	Rare Mindanao Endemic	
42	*Amathusia phidippus pollicaris*	Rare	Common	Common
43	*A.* sp.1	Very rare	Undetermined	
44	*Anosia melanippus edmondii*	Very rare	Common	Common
45	*Athyma maenus semperi*	Very rare	Rare	
46	*Discophora philipina*		Rare Philippine Endemic	
47	*Dophla evelina proditrix*	Rare	Common	
48	*Elymnias beza beza*	Very rare	Common Mindanao Endemic	
49	*Euploe amulciber mindanensis*	Rare	Common	
50	*Euthalia alpheda cusama*	Very rare	Rare	
51	*Faunisphaon leucis*	Very rare	Common	
52	*Hypolimnas anomala anomala*	Rare	Common	Common
53	*H. bolina philippensis*	Very rare	Common	Common
54	*Junonia almana almana*	Very Common	Common	Common
55	*J. atlithes atlithes*	Rare	Common	
56	*J. hedonia ida*	Very Common	Common	Common
57	*Lasippae busa laetitia*	Very rare	Common	
58	*Lethe europa cevanna*	Very rare	Common	
59	*Lexias panopus miscus*	Very rare	Common	
60	*Melanitis atrax lucillus*	Very Common	Common	
61	*M. boisduvalia boisduvalia*	Very rare	Rare Philippine Endemic	
62	*M. leda leda*	Very Common	Common	Common
63	*Moduza thespias*	Very rare	Rare Philippine Endemic	
64	*Mycalesis felderi felderi*	Rare	Rare Philippine Endemic	
65	*M. janardana micromede*	Rare	Common	
66	*M. micromede micromede*	Rare	Rare	
67	*M. mineus phlippina*	Common	Common	Rare
68	*M.* sp.1	Rare	Undetermined	
69	*M. tagala semirasa*	Common	Rare	
70	*Neptis cymela nitetus*	Very rare	Common	
71	*N. mindorana pseudosoma*	Rare	Common	
72	*N. pampanga boholica*	Very rare	Rare	Common
73	*Orsotriaena medus medus*	Rare	Common	
74	*Pantoporia dama commixta*	Very rare	Common	Common
75	*Rhinopalpa polynice validice*	Very rare	Common	
76	*Symbrenthia lilaea semperi*	Very rare	Common	Common

77	*Tanaecia leucotaeniaa quamarina*	Very rare	Common	
78	*Ypthima sempera chaboras*	Very Common	Common Philippine Endemic	Common Philippine Endemic
79	*Y. sempera sempera*	Rare	Common Philippine Endemic	
80	*Y. sensilis*	Very rare	Rare Philippine Endemic	
81	*Y. stellerastellera*	Very Common	Common Philippine Endemic	
82	*Zeuxidia amethystus amethystina*	Very rare	Rare	
D.	**Family PAPILIONIDAE**			
83	*Arisbe decolor tigris*	Very rare	Very rare, Eastern Mindanao Endemic	
84	*A. eurypylus gordion*	Rare	Common	
85	*Atrophaneura semperi aphthonia*	Very rare	Rare	Rare Threatened, Philippine Endemic
86	*Grapium agamemnon agamemnon*	Very rare	Common	
87	*Lamproptera meges decius*	Very rare	Common	
88	*Menelaides deiphobus rumanzovia*	Very rare	Common	
89	*M. helenus hystaspes*	Very rare	Common Philippine Endemic	Common Philippine Endemic
90	*M. polytes ledebouria*	Very rare	Common	Common
91	*Pachliopta kotzebuea philippus*	Rare	Common	
92	*P. mariae mariae*	Very common	Common	
93	*Troides rhadamantus*	Very rare	Common Philippine Endemic	Common
E.	**Family PIERIDAE**			
94	*Appia snepheleelis*	Rare	Rare	
95	*Catopsilia pyranthe pyranthe*	Common	Common	Common
96	*Cepora aspasia orantia*	Very rare	Common	
97	*Delias hyparete luzonensis*	Rare	Common	
98	*D. hyparete mindanensis*	Very rare	Common	
99	*Eurema alitha alitha*	Very common	Common Mindanao Endemic	Common Mindanao Endemic
100	*E. blanda valli volans*	Rare	Common	Common
101	*E. hecabeta miathis*	Very common	Common	
102	*E. sarilalas arilata*	Very rare	Rare Philippine Endemic	Rare Philippine Endemic
103	*E.* sp.1	Very rare	Undetermined	
104	*Pareronia boebera trinobantes*	Very rare	Common	

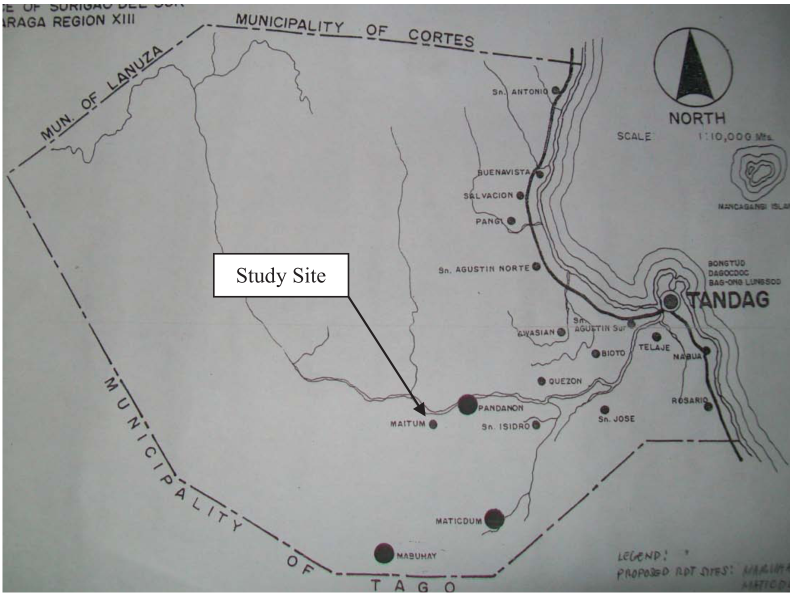


Fig. 1. Map of Tandag City, Surigao del Sur (from: Municipal Development and Planning Office).

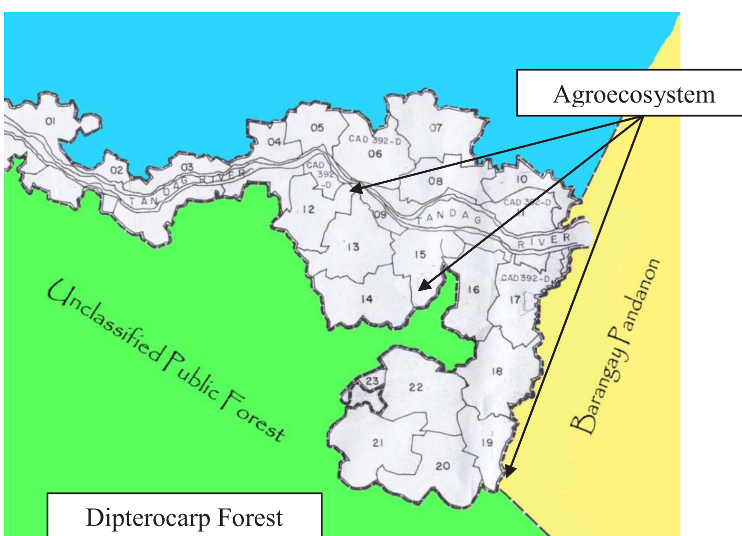


Fig. 2. Map of Maitum, Tandag, Surigao del Sur (Trinidad, 2004)

Fig. 3. Portion of agro-ecosystem, Maitum, Tandag, Surigao del Sur.

Fig. 4. Portion of dipterocarp forest, Maitum, Tandag, Surigao del Sur.

Fig. 6. Delineated 2 kilometer transect line in the agroecosystem of Maitum, Tandag, Surigao del Sur.

Fig. 6. Delineated 2 kilometer transect line in the dipterocarp forest of Maitum, Tandag, Surigao del Sur.

Fig. 7. Butterfly catching trap baited with overripe banana.

Fig. 8. Trap sampling using brightly colored clothes to attract butterflies to enhance species richness (adapted from Mohagan & Treadaway, 2010).

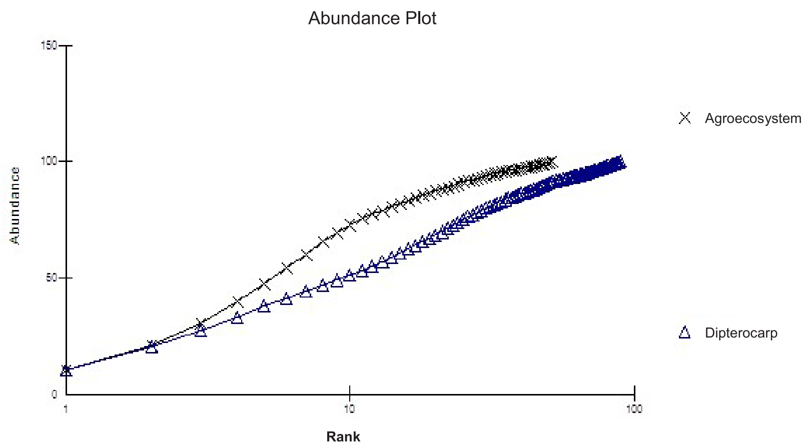


Fig. 9. Plot of abundance of butterflies of Maitum across two study stations.

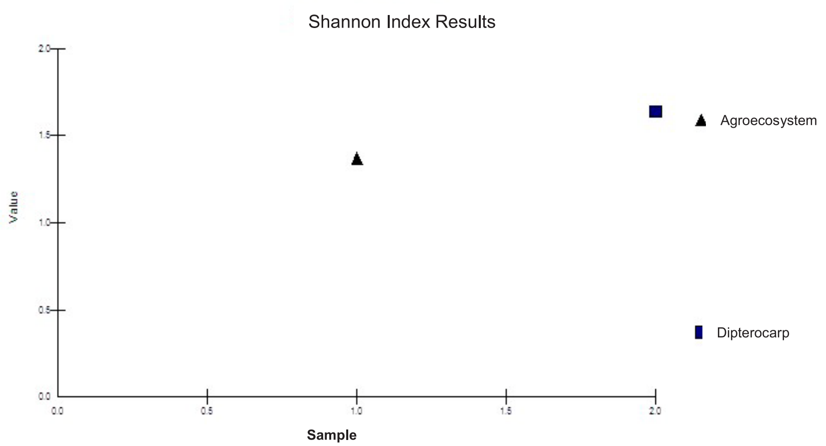


Fig. 10. Shannon-Weiner plot of diversity for agroecosystem and dipterocarp forest sampling site

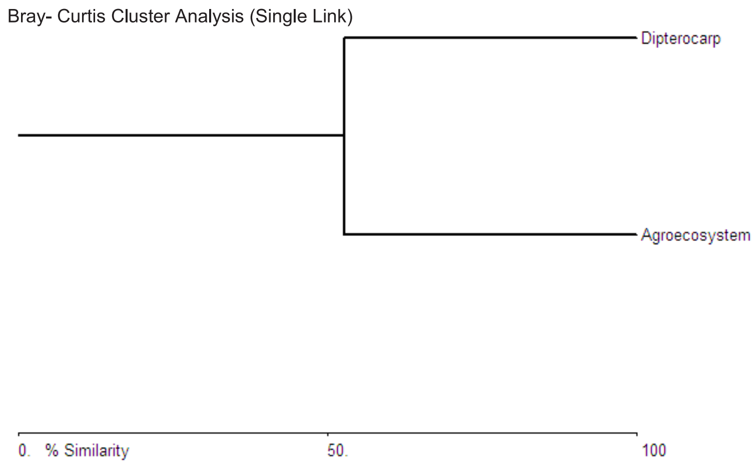


Fig. 11. Dendogram on the cluster analysis of butterfly distribution in Maitum Village, Tandag, Surigao del Sur across the two sampling stations.

1a. *Aeromachus musca* | 1a. *Aeromachus musca* | 2a. *Ancistroides nigrita fumatus* | 2b. *Ancistroides nigrita fumatus*

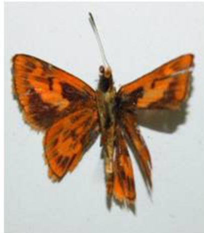
3a. *Borbo cinnara* | 3b. *Borbo cinnara* | 4a. *Halpe luteisquama* | 4b. *Halpe luteisquama*

5a. *Halpe sp. 1* | 5b. *Halpe sp. 1* | 6a. *Isma feralia ferestrata* | 6b. *Isma feralia ferestrata*

7a. *Notocrypta paralysos volux* | 7b. *Notocrypta paralysos volux* | 8a. *Odontoptilum angulatum helisa* | 8b. *Odontoptilum angulatum helisa*

Fig. 12. 1a-8b. Species of Family Hesperiidae


9a. *Oriens californica*


9b. *Oriens californica*

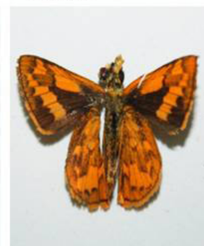

10a. *Parnara bada borreana*


10b. *Parnara bada borreana*


11a. *P. kawazoei*


11b. *P. kawazoei*


12a. *Potanthus m. mingo*


12b. *Potanthus m. mingo*


13a. *Pyroneura libornia minda*


13b. *Pyroneura libornia minda*


14a. *Tagiades gana elegans*


14b. *Tagiades gana elegans*


15a. *T. japetus titus*


15b. *T. japetus titus*


16a. *T. trebellius martinus*


16b. *T. trebellius martinus*

Fig. 13. 9a-16b. Species of Family Hesperiidae

17a. *Taractocera l. luzonensis* | 17b. *Taractocera l. luzonensis* | 18a. *Telicota sp.1* | 18b. *Telicota sp.1*

19a. *Acytolepsis puspa bazilana* | 19b. *Acytolepsis puspa bazilana* | 20a. *Allotinus fallax aphacus* | 20b. *Allotinus fallax aphacus*

21a. *Caleta a. angola* | 21b. *Caleta a. angola* | 22a. *Catochrysops strabo luzonensis* | 22b. *Catochrysops strabo luzonensis*

23a. *Celarchus a. archagathus* | 23b. *Celarchus a. archagathus* | 24a. *Cheritra orpheus orphnine* | 24b. *Cheritra orpheus orphnine*

Fig. 14. 17a-18b. Species of Family Hesperiidae;
19a-24b. Species of Family Lycaenidae.

25a. *Euchrysops c. cnejus* 25b. *Euchrysops c. cnejus* 26a. *Everes l. lacturnus* 26b. *Everes l. lacturnus*

27a. *Hypolycaena shirozui* 27b. *Hypolycaena shirozui* 28a. *H. sipylus tarrytas* 28b. *H. sipylus tarrytas*

29a. *Jamides celeno lydanus* 29b. *Jamides celeno lydanus* 30a. *J. c. cleodus* 30b. *J. c. cleodus*

31a. *J. philatus osias* 31b. *J. philatus osias* 32a. *Lampides boeticus* 32b. *Lampides boeticus*

Fig. 15. 25a-32b. Species of Family Lycaenidae.

Fig. 16. 33a-40b. Species of Family Lycaenidae.

41a. *Acrophtalmia albofasciata*

41b. *Acrophtalmia albofasciata*

42a. *Amathusia phidippus pollicaris*

42b. *Amathusia phidippus pollicaris*

43a. *Amathusia sp.1*

43b. *Amathusia sp.1*

44a. *Anosia mellanipus edmondii*

44b. *Anosia mellanipus edmondii*

45a. *Athyma maenus semperi*

45b. *Athyma maenus semperi*

46a. *Discophora philipina*

46b. *Discophora philipina*

47a. *Dophla evelina proditrix*

47b. *Dophla evelina proditrix*

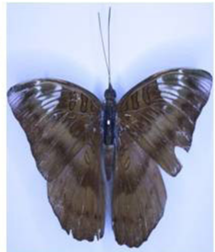
48a. *Elymnias b. beza*

48b. *Elymnias b. beza*

Fig. 17. 41a-48b. Species of Family Nymphalidae.


49a. *Euploea mulciber mindanensis*


49b. *Euploea mulciber mindanensis*


50a. *Euthalia alpheda cusama*


50b. *Euthalia alpheda cusama*


51a. *Faunis phaon leucis*


51b. *Faunis phaon leucis*


52a. *Hypolimnas a. anomala*


52b. *Hypolimnas a. anomala*


53a. *Hypolimnas bolina philippensis*


53b. *Hypolimnas bolina philippensis*


54a. *Junonia a. almana*


54b. *Junonia a. almana*


55a. *Junonia a. atlites*


55b. *Junonia a. atlites*


56a. *Junonia hedonia ida*


56b. *Junonia hedonia ida*

Fig. 18. 49a-56b. Species of Family Nymphalidae.

57a. *Lassipa ebusa laetitia* | 57b. *Lassipa ebusa laetitia* | 58a. *Lethe europa cevanna* | 58b. *Lethe europa cevanna*

59a. *Lexias panopus miscus* | 59b. *Lexias panopus miscus* | 60a. *Melanitis atrax lucillus* | 60b. *Melanitis atrax lucillus*

61a. *M. b. boisduvalia* | 61b. *M. b. boisduvalia* | 62a. *M. l. leda* | 62b. *M. l. leda*

63a. *Moduza thespias* | 63b. *Moduza thespias* | 64a. *Mycalesis f. felderi* | 64b. *Mycalesis f. felderi*

Fig. 19. 57a-64b. Species of Family Nymphalidae.


65a. *M. janardana micromede*


65b. *M. janardana micromede*


66a. *M. m. micromede*


66b. *M. m. micromede*


67a. *M. mineus. philippina*


67b. *M. mineus philippina*


68a. *Mycalesis sp.1*


68b. *Mycalesis sp.1*


69a. *M. tagala semirasa*


69b. *M. tagala semirasa*


70a. *Neptis cymela nitetus*


70b. *Neptis cymela nitetus*


71a. *N. mindorona pseudosoma*


71b. *N. mindorona pseudosoma*


72a. *N. pampanga boholica*


72b. *N. pampanga boholica*

Fig. 20. 65a-72b. Species of Family Nymphalidae.


73a. *Orsotriaena m. medus*

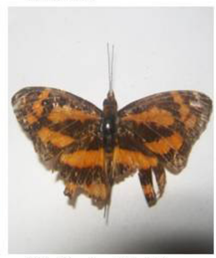

73b. *Orsotriaena m. medus*

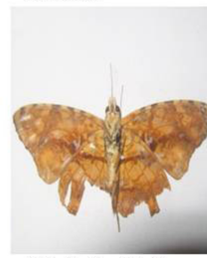

74a. *Pantoporia dama commixta*


74b. *Pantoporia dama commixta*


75a. *Rhinopalpa polynice validice*


75b. *Rhinopalpa polynice validice*


76a. *Symbrenthia lilaea semperi*


76b. *Symbrenthia lilaea semperi*


77a. *Tanaecia leucotaenia aquamarina*


77b. *Tanaecia leucotaenia aquamarina*


78a. *Ypthima sempera chaboras*


78b. *Ypthima sempera chaboras*


79a. *Y. s. sempera*


79b. *Y. s. sempera*


80a . *Y. sensilis*

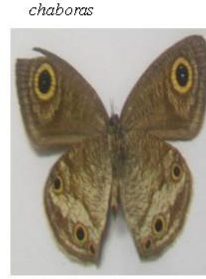

80b. *Y. sensilis*

Fig. 21. 73a-80b. Species of FamilyNymphalidae.


81a. *Y. s. stellera*


81b. *Y. s. stellera*


82a. *Zeuxidia amethystus amethystina*


82b. *Zeuxidia amethystus amethystina*


83a. *Arisbe decolor tigris*

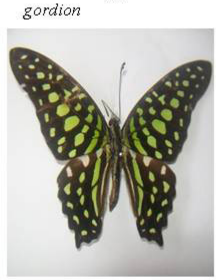

83b. *Arisbe decolor tigris*

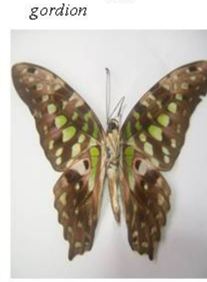

84a. *A. eurypylus gordion*


84b. *A. eurypylus gordion*


85a. *Atrophaneura semperi aphthonia*

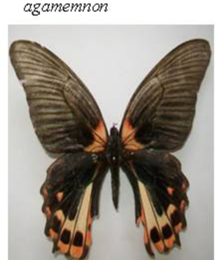

85b. *Atrophaneura semperi aphthonia*


86a. *Grapium a. agamemnon*


86b. *Grapium a. agamemnon*


87a. *Lamproptera meges decius*


87b. *Lamproptera meges decius*


88a. *Menelaides deiphobus rumanzovia*

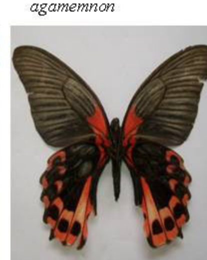

88b. *Menelaides deiphobus rumanzovia*

Fig. 22. 81a-82b. Species of Family Nymphalidae
83a-88b Species of Family Papilionidae

89a. *M. helenus hystaspes*

89b. *M. helenus hystaspes*

90a. *M. polytes ledebouria*

90b. *M. polytes ledebouria*

91a. *Pachliopta kotzebuea philippus*

91b. *Pachliopta kotzebuea philippus*

92a. *P. m. mariae*

92b. *P. m. mariae*

93a. *Troides rhadamantus*

93b. *Troides rhadamantus*

94a. *Appias nephele elis*

94b. *Appias nephele elis*

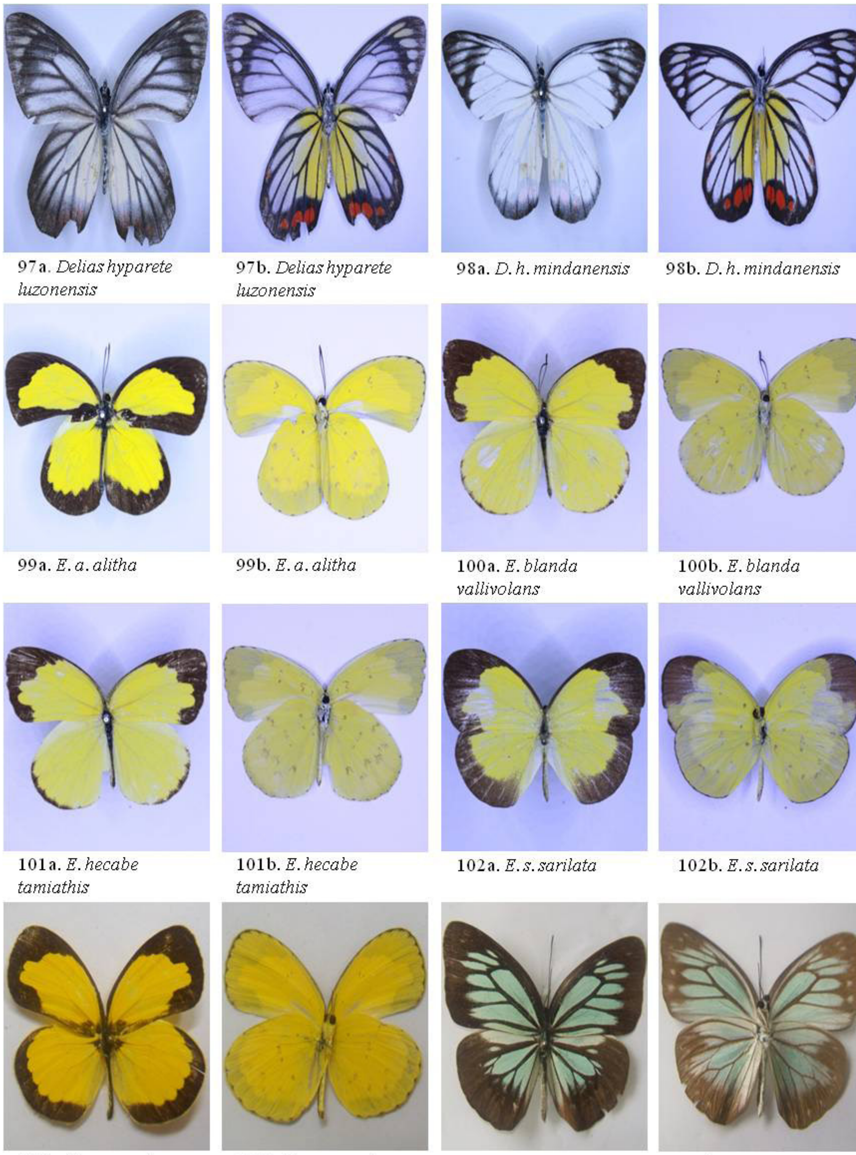
95a. *Catopsilia p. pyranthe*

95b. *Catopsilia p. pyranthe*

96a. *Cepora aspasia orantia*

96b. *Cepora aspasia orantia*

Fig. 23. 89a-93b. Species of Family Papilionidae
94-a-96-b. Species of Family Pieridae



97a. *Delias hyparete luzonensis*
97b. *Delias hyparete luzonensis*
98a. *D. h. mindanensis*
98b. *D. h. mindanensis*
99a. *E. a. alitha*
99b. *E. a. alitha*
100a. *E. blanda vallivolans*
100b. *E. blanda vallivolans*
101a. *E. hecabe tamiathis*
101b. *E. hecabe tamiathis*
102a. *E. s. sarilata*
102b. *E. s. sarilata*
103a. *Eurema sp1.*
103b. *Eurema sp1.*
104a. *Pareronia boebera trinobantes*
104b. *Pareronia boebera trinobantes*

Fig. 24. 97a-104b. Species of Family Pieridae

Species Composition

A total of 104 species of butterflies were collected in Maitum Village, Tandag, Suriagao del Sur. These species belong to 68 genera and 5 families of butterflies. Of these, eighteen (18) were from the family Hesperiidae, twenty two (22) were from the family Lycaenidae, forty (42) were from the family Nymphalidae, eleven (11) were from the family Papilionidae and eleven (11) were from the family Pieridae (Table 1). The result was lower as compared to the study of Mohagan and Treadaway (2010) in Mt. Hamiguitan, Davao Oriental with 142 species.

This may be due to the differences of the sampling techniques employed. The study of Mohagan and Treadaway (2010) employed an additional of two more methods of sampling, the Quadrat and Belt transect sampling method which were not employed in this study. There were species of butterflies common to both studies. This implies that butterflies have a certain degree of habitat preference. Butterflies select their habitat in relation to their food and host plants (Borkar & Komarpant 2004). Aside from, sampling techniques employed, the study site of Mohagan and Treadaway (2010) in Mt. Hamiguitan, Davao Oriental had a larger study site with greater number of habitats sampled and sampling duration was longer. Observation of Mohagan and Treadaway (2010) was also true to Cayabyab (2000) in Mt. Makiling, Laguna with 145 species. The study of Cayabyab (2000) used a modified version of Pollard's (1977) transect method that is similar to the method used in the current study.

The current study used 2 kilometer transects; although Cayabyab (2000) used 1 kilometer transects only, Cayabyab (2000) had a greater number of transects (7), than the current study (2). Another major difference between the current study, Cayabyab (2000) did not employ butterfly catching traps. The current study had a smaller sampling area than that of Cayabyab (2000). With reference to duration of study, Cayabyab (2000) had an exceedingly longer sampling duration. The greater sampling duration and the larger area in Mt. Makiling, Laguna could be a reason why the current study has a lesser number of species compared to Cayabyab (2000).

Although rapid surveys and extrapolation methods help provide a general framework for assessing biodiversity, understanding the dynamics of species diversity in communities requires long term data sets that partition diversity into its natural components of space and time (De Vries & Walla 2001). It appears that methods, size of study site, and length of sampling period has a direct implication on the results of a study.

Compared to the results of Salmoy (2010) in Camiguin Island, the present study had a greater number of species than the former (81 species). In terms of methods, Salmoy (2010) had more sampling methods than the current study. In fact, methods used by Salmoy (2010) are identical to those of Mohagan and Treadaway (2010). With reference to sampling duration, the current study had a shorter duration, 2 months compared to the study of Salmoy (2010) with 6 months. With reference to study site, Salmoy (2010) in Camiguin Island had a larger area for sampling than the current study, although the sampling area of Salmoy (2010) is still considered a volcanic area. According to Weibull and Ostman (2003) landscape features largely affect species composition especially for the most mobile group of butterflies. A possible reason for the higher species composition of the current study would be the higher disturbance due to the volcanic activity in the area of Salmoy (2010) in Camiguin Island.

The current study had a greater number of species than Lit (2001) in Mount Banahao de Lucban, Quezon Province with 77 species. In terms of methods, the study of Lit (2001) and the current study were quite different due to the fact that the current study used more sampling methods. In terms of study site, the current study had smaller study site than Lit (2001). In terms of sampling duration, the study of Lit (2001) had a longer duration.

Aside from the difference in methods and duration of the study, butterfly composition differs from different study sites, which shows that geographical location influence butterfly composition. This observation is supported by Heaney (1991) and Mohagan and Treadaway (2010). As per observation, vegetation types also affect species composition. The dipterocarp forest had higher species composition at 50% disconcondantwihagroecosystem. This observation is consistent to Salmoy (2010) and Mohagan and Treadaway (2010) where food plants availability differ from one vegetation type to another, so that butterfly composition also differs with vegetation types.

Species Diversity

Species Abundance

Adequacy of sampling was not reached for both sampling stations. This is mostly due to the limited sampling period and limited resources, not to mention the security condition in the study site. New species may be listed additionally if sampling will be extended.

In the current study, butterfly abundance was higher in dipterocarp forest (434) than in the agroecosystem (386) due to greater presence and diversity of food plants in the dipterocarp forest. This result is consistent with Torreno et al. (2007) in Mt Hamiguitan, Davao Oriental with a higher abundance in dipterocarp forest (288) than agroecosystem (89).According to Schneider (2003), both habitat characteristics and landscape structure influenced species numbers and abundance of butterflies in grasslands.

In the study of Mohagan and Treadaway (2010)in Mt Hamiguitan, Davao Oriental, the agroecosystem 1 (25) and agroecosystem 2 (26) had higher abundance than the dipterocarp1 (15) and dipterocarp 2 (11). In Salmoy (2010), the argroecosystems of Mt. Timpoong (495) and Mt. Hibok-hibok (265) had higher abundance than the dipterocarp forests of both mountains (235). According to Mohagan and Treadaway (2010), abundance decreases with elevation.

It is interesting to note that in the studies of Mohagan and Treadaway (2010) and Salmoy (2010), there was a significant difference in the elevation of the agroecosystem and dipterocarp forest. In the current study, there was little difference in the elevation of the two study stations, therefore other factors like greater diversity of vegetation can be the reason for the greater abundance in the dipterocarp forest than agroecosytem and the type of habitat.

The agroecosystems studied by Mohagan and Treadaway (2010) and Salmoy (2010) were purely terrestrial but the agroecostem of this present study was a ricefield with coconut trees. There were fewer types of plants in the agroecosystem of the current study than in the studies of Mohagan and Treadaway (2010) and Salmoy (2010). Melendez (2001) demonstrated that the existence of butterflies in one's place is influenced by reproductive season and presence of food plants.

Species Richness

The dipterocarp forest of Maitum had greater number of species (89) compared to the agroecosystem (51). The result of Mohagan and Treadaway (2010) for species richness is parallel to this current study in which there was an increasing trend in the agro ecosystems, dipterocarp and montane forests. Butterfly fauna may be affected and endangered by many factors including land use, forest cultivation and plant protection (Özden 2003). The anthropogenic use of land can be a factor to the number of species observed in the study. In other words, agricultural lands have a lesser species richness than the forested areas.

The species richness result of the current study is contradictory to Salmoy (2010) in which the agroecosystems of Mt.Timpoong (50) and Mt. Hibok- hibok (30) had higher species richness than dipterocarp forests (22). According to Schneider (2003), the amount of adjacent forest, flower abundance, field size and estimated nutrient levels are factors influencing butterfly species richness. Due to the security situation in the site of the current study, the landscape and flora of the diperocarp forest were considerably kept intact. This may explain the greater species richness in the dipterocarp forest. Hansel et al. (2006) said that availability of host plants and food plants affects the presence of butterflies.

Shannon-Weiner Index for Diversity

In the current study, the average Shannon Weiner index of Maitum is low (H'=1.5); when viewed in terms of study stations, the dipterocarp forest had fair (H'= 1.638) than the agroecosytem with a low level (H'= 1.369). This result is consistent with Ballentes et al. (2006) in Mt. Malindang, in which diversity was higher in forest ecosystems than in agroecosystems. Vegetation structure and taxonomic composition are well known to have a major influence on community diversity (MacArthur, Recher & Cody, 1966; Southwood et al., 1979). Extraction of trees, even at low densities can result to considerable damage to residual stand and severe declines in biodiversity (Johns, 1992; Kellman & Tackaberry, 1999 cited from Lewis, 2001). The reduction of tree density can be a factor for the lesser butterfly diversity of the agroecosystem compared to the dipterocarp forest.

The presence of bushes and trees had probably favored butterfly diversity by creating shelter and offering other resources (Schneider, 2003). It is interesting to note that the agroecosystem area had almost no naturally growing trees left; this can be the reason for the fair level of butterfly diversity of the dipterocarp forest.

The result of the current study is consistent with the results of Mohagan and Treadaway (2010) in which the agroecosystem had a slightly higher diversity value. The current study is contradictory to that of Salmoy (2010) in which the agroecosystem had high level of diversity. When compared to the study of Chiong (2007) in Gumata Falls, Magsal, Guinuyoran, Valencia City, the current study had a significantly lower diversity. This could be due to the sampling effort exerted by Chiong (2007) as it may be due to the varied plants available and disturbances in the area. In Salmoy (2010) the agroecosystem of Mt. Timpoong (1.70) and Mt. Hibok-hibok (1.48) has greater diversity than the dipterocarp of both mountains (1.34) in Camiguin Island. Her results are different from the current study.

Similarity Index

The cluster analysis of the species composition has shown that the agroecosytem and dipterocarp forest have low similarity of species composition with only 52.683%. This suggests that only 50% of the species are concordant to both the rest, and the remaining 50% are disconcordant. This result is parallel to the result of Salmoy (2010) in which there was clustering of the agroecosystem and dipterocarp forest in Mt. Timpoong, Camiguin de Mindanao. The similarity of the species composition of the agroecosystem and dipterocarp forest of the current study is due to the close proximity of the study stations in Maitum, Tandag, Surigaodel Sur. According to De Veries et al. (1997), apparent similarity among habitats is likely an area effect due to close proximity of the dipterocarp forest and recent human disturbance that created a patchwork of successional habitats in the agroecosystem.

Precipitation was present in both the summer and rainy season sampling periods, although the rainy season sampling period had more rainy days than the summer sampling period. Air temperature ranges from 28 - 40 ˚C, with no observable temperature differences in the two habitat types and during the two sampling periods. The lack of difference of precipitation and air temperature could be a reason for the 50% concordant species observed in the study.

The difference in vegetation and in the two study stations can be a reason for the nearly 50% disconcordant butterfly species in the current study. This result is parallel to the results of Ballentes et al. (2006), in which little species similarities were observed between the vegetation typesof Mt. Malindang.

Degree of disturbance in the two study stations can also be a reason for the nearly 50% disconcordant species of butterflies in Maitum Village, Tandag, Surigao del Sur, there might be forest specialist species present in BrangayMaitum, Tandag, Surigao del Sur. The greater disturbance in the agroecosystem can be a factor for the disconcordant species. According to Koh (2007), butterfly species restricted to undisturbed forests often have narrower geographical ranges than species found in disturbed habitats. Forest butterflies are more likely to be impacted by forest modification than those that are known to occur in disturbed habitats (Koh 2007).

Status

Danielsen and Treadaway (2004) reviewed the status of 915 species and 910 subspecies of butterflies known in the Philippines, of these there were 133 globally threatened and conservation- dependent Philippine endemic taxa. The Philippines is biodiversity giant, but is sad to note that the Philippines is also a biodiversity hotspot.

Of the 104 species sampled in the current study, 57 were common (54.8 %), 16 were rare (15. 3%), and 22 (21.1%) were endemics; 12 were rare Philippine endemics (11.5%), 6 were common Philippine endemics (5.7%), 2 common Mindanao endemics (1.9%), 1 rare Mindanao endemic (.96%), 1 very rare eastern Mindanao endemic (.96%), and 9 (8.6%) were undetermined.

The endemism percentage of the current study is lower than that of Mohagan & Treadaway (2010) (31%) in Mt. Hamiguitan. The study of Hansel et al. (2006) in Mt. Malindang, Misamis Occidental (62.5%) had higher percentage of endemism than the current study. The study of Salmoy (2010) in Camiguin Island, had similar endemism (22%) to the current study. In the study of Ballentes et al. (2006) in Mt. Malindang, there were two endemic butterflies, which was lower than the current study.

The rare Philippine endemics were: *Aeromachus musca, Isma feralia ferestrata, Oriens californica, Pyroneura liburniaminda, Celarchusarchagatho sarchagathos,Hypolycaen ashirozui, Discophora philipina, Melanitis boisduvalia boisduvalia, Moduza thespias, Mycalesis felderi felderi, Ypthima sensilis,* and *Eurema sarilata sarilata.* Common Philippine endemics were: *Halpelutei squama, Ypthima sempera chaboras, Ypthima sempera sempera, Ypthima stellera stellera, Menelaides helenushystaspes,* and *Triodes rhadamantus.*

The common Mindanao endemics were: *Elymnas bezabeza* and *Eurema alithaalitha*. The rare Mindanao endemic species was *Acrophtalmia albofasciata* and the very rare Eastern Mindanao endemic species was *Arisbe decolortigris*. There were 22 endemic species in Maitum Village, Tandag, Surigao del Sur, with 19 endemic species in the dipterocarp forest and 9 endemic species in the agroecosystem.

Noteworthy to mention among the species sampled in the current study is *Prosotas dubios asubardates*, a rare species which is also a new record in Mindanao. Other noteworthy samples are *Arisbedecolortigris*, a very rare Eastern Mindanao endemic butterfly and *Acropthalmia albofasciata*, a rare Mindanao endemic butterfly. Danielsen and Treadaway (2004) mentioned Sulu and Mindanao hold disproportionate numbers of threatened butterflies.

There is a great need for further biodiversity studies in Mindanao and Surigao del Sur since, numerous species may become extinct before they are even documented. During the conduct of the study, trunks of lumber floated on the river near the study site. According to Koh (2007), many Southeast Asian butterflies are endemic to the region and face the grim prospect of global extinction if current levels of deforestation were to continue. Butterflies are highly sensitive to habitat disturbance, and have been used as an indicator taxon for ecological research (Koh 2007). In addition to the small scale logging, sand and gravel is a common business in the current study area, this can be detrimental to the butterfly species present in the area.

Only a few species of butterflies had an IUCN conservation status, a few of these species are: *Mycalesis mineus philippina* (rare), *Atrophaneura semperi aphthonia* (rare, threatened, Philippine endemic), *Eurema alithaalitha* (common Mindanao endemic), *Eurema sarilata sarilata* (rare Philippine endemic). Data on the conservation status of insects are scarce because the IUCN Red List is predisposed towards larger and better-studied taxa (Rodrigues et al. 2006). It is apparent that the IUCN system is difficult to use with regard to butterfly studies. A more comprehensive list for butterfly status is needed, although this requires an extensive compilation of numerous studies.

CONCLUSIONS AND RECOMMENDATIONS

Maitum, Tandag, Surigao del Sur is the home of one hundred four (104) species belonging to 5 families and 68 genera. Across the sampling stations, the dipterocarp forest showed a higher species abundance. The Shannon- Weiner index of diversity showed low level: Based on Kruger scale (2005), the dipterocarp forest of Maitum, Tandag, Surigao del Sur was at the fair level (1.638) of diversity than the agroecosystem area (1.369). The diversity level of Maitum is still low. Dendogram index of similarity between the agroecosystem area and dipterocarp infers that the species of the two stations are 52.683% similar. This suggests that the two habitats sampled are both important for the conservation of butterflies in Maitum, Tandag, Surigao del Sur. The dipterocarp forest of Maitum, Tandag, Surigao del Sur is the home of 19 endemic species and the agroecosystem area is home of 9 endemic species for conservation.

The study recommends the use of other sampling techniques like belt transect and plot sampling and canopy nets to enhance species composition by sampling high flying or canopy butterflies. Further sampling should be done to augment species richness and in order to satisfy the species accumulation curve requirement and that other types of baits be used in the butterfly traps so as to improve species richness and status by sampling on the other areas of Tandag, Surigao del Sur.

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