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Short Communication: Butterfly Species in Disturbed Ecosystem of Mt. Matutum Protected Landscape, South Cotabato, Philippines

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Abstract

Butterflies are good indicators of the health status of certain ecosystems because of their sensitivity to environmental alterations. Despite this, few studies have been conducted on this important taxon, especially in disturbed habitats near Mt. Matutum Protected Landscape of South Cotabato province, Philippines. Thus, an inventory of species composition and status of butterflies was conducted in agroecosystem and forest patch in Acmonan, Tupi, South Cotabato. Result of the study revealed 34 butterfly species belonging to five families. Among these families, Nymphalidae dominates with 16 species, followed by Lycaenidae with seven species, Papillionidae with five species and Peiridae with four species. Family Hesperiidae is least represented with only two species identified. Of the 34 species identified, three are known to be Philippine endemic: Celarchus archagathos archagathos, Ragadia melindena melindena, Ypthima s. stellera, and 1 Mindanao endemic - Ypthima sensilis; three rare: Euripus nyctelius nysia, Symbrenthia hypatia matuti (site endemic) and Ypthima sensilis, and five uncommon species. This result implies that disturbed ecosystem like agricultural areas provides a unique habitat for butterflies; however, sustainable conservation strategies must also be employed to balance biodiversity and livelihood of the community.

Keywords*: agroecosystem, biodiversity, butterfly, conservation, inventory*

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1.0 Introduction

Butterflies are considered one of the most stunning insects that have gained a sensible amount of attraction all over the biosphere due to their fantastic coloration, distribution, and ecological functions (Dwari *et al*., 2017). Accordingly, this group of insects is not exempted from various threats such as urbanization, habitat destruction, expansion of agricultural lands and human settlement, and pesticide usage (Elanchezhyan *et al.,* 2017), which affects its abundance and diversity. Thus, diversity of this group can be used in crafting good conservation plans and policies for various ecosystem types, especially near disturbed areas like human settlements and agricultural lands (Vaghela *et al.,* 2013). In the Philippines, there is scarcity of information on butterflies though biodiversity studies have been conducted in different protected landscapes and buffer zones in the country. Various species of flora and fauna have been documented. Despite this, few studies have focused on butterflies, making references to butterflies limited or scarce. As mentioned, diversity studies were mostly done in protected areas and in disturbed and semi-disturbed habitats. Ramirez and Mohagan (2012) documented 104 species in agroecosystems and dipterocarp forest of Maitum Village, Tandag. 44 species in Mt Nebo (Sumagaysay & Sumagaysay, 2012), 142 species and 1 subspecies were recorded in Mt. Hamiguitan (Mohagan & Treadaway, 2012), Mangaoang *et al.* (2016) recorded 28 species in Davao Oriental, 13 species in Bega Watershed, Agusan del Sur (Nuneza *et al.*, 2016) and Salaga *et al.* (2018) documented 45 species in selected areas of Davao City. Moreover, Guadalquiver *et al.* (2019) reported 62 species of butterflies in Mimbilisan Protected Landscape. These studies only show that butterfly research in Mindanao is not that much compared with other species with ecological importance. However, there are still areas that remain unexplored and one of these is Mt. Matutum Protected Landscape (MMPL) and its vicinity.

Mt. Matutum is a declared protected area under Presidential Proclamation number 552, series of 1995. In the lowland part of Mt. Matutum, including Brgy. Acmonan in Tupi, conversion of land to cater agriculture is very evident. This anthropogenic activity might impact communities of flora and fauna in the area. One of its effects might be reduction of butterfly population and diversity due to removal of its habitat and food sources (Garcia Pérez, 2012). Ramirez and Mohagan (2012) revealed that low butterfly diversity is evident in the agroecosystem due to lesser tree density, disturbances (habitat destruction such as small-scale logging and sand and gravel extraction), and lesser plant diversity. According to Mangaoang *et al.* (2016), low species richness of butterflies is evident in human-impacted and disturbed sites such as gardens, plantations, and grasslands. More studies are showing that differences in habitat and presence of disturbances (anthropogenic activities, presence of avian predator, monoculture, exotic plant species) affect butterfly communities and diversity in various ways such as in their abundance pattern (Ramesh *et al.,* 2010), influence species composition and change butterflies' communities (Majumder *et al.,* 2012; Lee *et al.,* 2015; Vu *et al.,* 2015). However, these variations in species documented depend on the type of crop planted in an agroecosystem. A study by Mahata *et al.* (2018) on butterfly diversity in three different agroforestry plantations showed that coffee plantation is the best habitat for butterflies compared with *Anacardium oxcidentale* and *Psidium guajava* plantations. Moreover, richness and diversity of butterflies increase with the heterogeneity in lots of crops and decreases in those with few or no elements of associated vegetation (Garcia Pérez, 2012).

Thus, this study was conducted to document species of butterflies in disturbed habitats, particularly in Brgy. Acmonan situated near the border of Mt. Matutum Protected Landscape. This is a preliminary account of butterfly species in disturbed ecosystems near protected landscapes and will be useful in formulating policies for the conservation and preservation of these significant organisms.

2.0 Methodology

2.1 Sampling site

The study was conducted in Brgy Acmonan, Tupi, South Cotabato situated at 6.3239 N, 125.0121 E, a hilly area near the Mt. Matutum Protected Landscape. There are agricultural lands in the area where varieties of crops were cultivated squash, corn, and coconut. Clearing activities were evident in some areas for planting agricultural crops and possible expansion of these agricultural lands. Despite this, forest patches can still be observed, specifically in areas located near and within the waterfalls. This body of water is noted to be the water source in the area. This forest patch was also selected as part of the sampling site (Fig 1).

2.2 Sampling Procedure

Rapid assessment of butterflies was done by traversing the agroecosystem and forest patch using existing human trail of Brgy. Acmonan, Tupi South Cotabato. During sampling, it was observed that most of the plants along the natural trail bear flowers. Butterflies species were evaluated using a combination of transect

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walk, visual encounter and photo-documentation. Opportunistic sampling was done between 8am - 12nn during January of 2017 from Matutum View Academy traversing the agroecosystem areas and forest patch back to the previously mentioned area. Butterflies were collected using swift net. In the preservation process, butterflies were soaked in ethyl acetate and were placed in the triangular wax paper with moth balls. Initial identification of the species was done in the field using field guides such as Checklist of Treadaway and Schroeder (2012); digitized image available in http://philippinelepidoptera.wix.com/butterflies. Pre-identified samples were confirmed by a local expert from Central Mindanao University. The ecological status of butterflies was assessed using Treadaway and Schroeder's (2012) revised checklist. Digital camera was used for documentation of each species. Specimens collected were deposited in the Zoology section of the Central Mindanao University Museum.

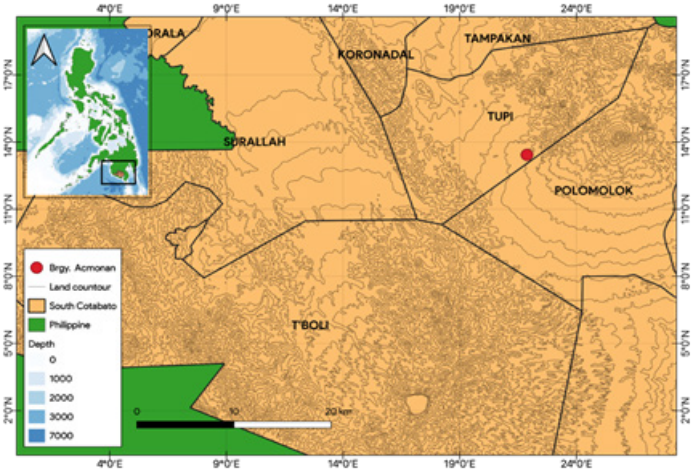

Fig. 1. Map of the Study Site

3.0 Results and Discussion

A total of 34 butterfly species belonging to 25 genera were identified in Brgy Acmonan, Tupi, South Cotabato. These species belong to 5 families, namely: Hesperiidae, Lycaenidae, Pieridae, Nymphalidae, and Papillionidae. Most of the species identified from the area belong to the family of Nymphalidae, with 16 belonging to 12 genera (*Athyma, Cyrestis, Danaus, Euripus, Faunis, Hypolimnas, Junonia, Lasippa, Neptis, Ragadia, Symbrenthia, and Ypthima*) followed by Lycaenidae with 7 species under 5 genera – *Catochrysops, Celarchus, Deudorix, Jamides,* and *Prosotas.* The result of the study also revealed that 18 out of 25 genera were represented by only 1 species and the remaining genera were composed of 2 or more species, as presented in Table 1. Similar result was reported by previous studies in which species under Nymphalidae dominates (Widhiono, 2015; Mangaoang *et al*., 2016; Nuñeza *et al.*, 2016; Ghosh & Mukherjee 2016; Ismail *et al.,* 2018). Aside from the fact that Nymphalidae is the largest family of butterflies in the world, its dominance in tropical region can also be associated with the wide feeding guild of this group, making them exist in a variety of habitats (Anbalagan *et al*., 2015), and they are also adapted to minimal disturbance. Moreover, Nymphalidae is not totally dependent on the available nectar because they also feed on rotten fruits and urine of other animals (Lamatoa *et al.*, 2013).

The number of species identified in this study is lower compared with the study of Salaga *et al.* (2018) considering that both studies were conducted in similar vegetation types. However, species richness in this study is higher compared with the study of Nuñeza *et al.* (2016), Mangaoang *et al.* (2016) and Manalo *et al.* (2017) which were also conducted in disturbed areas. This only implies that anthropogenic activities impacted butterfly richness in varying degrees which also differ from one region to another and one vegetation type to another. Human-made disturbances such as alterations in land use, urban and agricultural expansions resulted in low butterfly species (Chowdhury & Soren, 2011; Nuñeza *et al.,* 2016).

Table 1. Species of butterflies identified in Acmonan, Tupi, South Cotabato with ecological status.

SPECIES	ECOLOGICAL STATUS
I - HESPERIIDAE	
Halpe sp	
Taractrocera luzonensis luzonensis Staudinger 1889	Common
II - LYCAENIDAE	
Catochrysops panormus exiguus Distant 1886	Common
Catochrysops strabo luzonensis Tite 1959	Common
Celarchus archagathos archagathos Fruhstorfer 1910	Uncommon (Philippine endemic)
Deudorix epijarbas Moore 1857	Common
Jamides bochus pulchrior Grose-Smith 1895	Common
Jamides sp	
Prosotas dubiosa subardates Piepers & Snellen 1918	Uncommon
III - PIERIDAE	
Catopsilia pomona pomona Fabricius 1775	Common
Catopsilia scylla asema Staudinger 1885	Common
Eurema blanda vallivolans Butler 1883	Common
Eurema hecabe tamiathis Fruhstorfer 1910	Common
IV- NYMPHALIDAE	
Athyma maenas semperi Moore 1896	Uncommon
Cyrestis cassander orchomenus Fruhstorfer 1912	Common
Danaus melanippus edmondii Lesson 1837	Common
Euripus nyctelius nysia Semper 1887	Rare
Faunis phaon leucis Felder & Felder	Common
Hypolimnas anomala anomala Wallace 1869	Common
Hypolimnas bolina philippensis Butler 1874	Common
Hypolimnas misippus Linnaeus 1764	Common
Junonia hedonia ida Cramer 1775	Common
Lasippa pata semperi Moore 1899	Uncommon
Neptis pampanga boholica Moore 1899	Uncommon
Ragadia melindena melindena Felder & Felder 1863	Uncommon (Philippine endemic)
Symbrenthia hypatia matuti Schroeder & Treadaway 1998	Rare (site endemic)
Ypthima stellera stellera Eschscholtz 1821	Common (Philippine endemic)
Ypthima sempera chaboras Fruhstorfer 1911	Uncommon
Ypthima sensilis Kashiwai 1982	Rare (Mindanao endemic)
V- PAPILLIONIDAE	
Arisbe eurypylus gordion Felder & Felder 1864	Common
Graphium agmemnon Agamemnon Linnaeus 1758	Common
Menelaides deiphobus rumanzovia Eschscholtz 1821	Common
Menelaides polytes ledebouria Eschscholtz 1821	Common
Troides rhadamantus rhadamantus Lucas 1835	Common

Result of a study conducted by Widhiono (2015) on four different forest types revealed that agroforest has the lowest diversity, abundance, and endemism. This result corroborates with the study of Vu (2008) in which agricultural lands have the lowest species richness and abundance among the five habitat types considered. Mohagan and Treadaway (2010) stated that butterfly existence in a particular habitat could be explained by the host plants and appropriate nectarine plants. This provides relevant food sources for both larval and adult stages of butterflies in the area. During fieldwork, it was observed that various species of grasses and plants bear flowers.

Butterflies are cold-blooded insects therefore, they might be flying in the open area to expose themselves for wing drying. Furthermore, the field sampling was rapid and short to identify all the species thriving in the area. This study on butterflies is the first on the agroecosystem near Mt. Matutum Protected Landscape, thus it provides baseline data that is good for strategizing any conservation intervention that would balance between preservation of biodiversity, specifically on butterfly community and people's livelihood, given that it is an agricultural area.

Ecological Status:

22 (69%) out of 34 species of butterflies identified are common species, 7 (22%) are uncommon species and 3 (9%) individuals are rare (Fig 3). However, among these 22 common species is *Ypthima stellera stellera* (Nymphalidae), a Philippine endemic. 2 of the uncommon species have ecological status as Philippine endemic species- *Celarchus archagathos archagathos (*Lycaenidae*)* and *Ragadia melindena melindena* (Nymphalidae). Moreover, 2 out of 3 rare species are also endemic. 1 species is Mindanao endemic- *Ypthima sensilis* (Nymphalidae) and a site endemic- *Symbrenthia hypatia matuti* (Fig.4 A-E). No conservation status was included in this study because IUCN Red List is inclined towards more extensive and well-studied taxa; thus, application of IUCN system is challenging to use on butterfly studies (Ramirez & Mohagan, 2012).

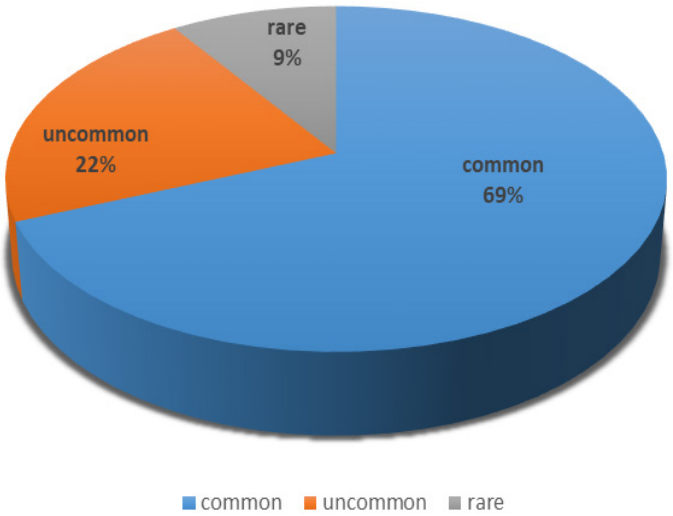

Figure 3. Ecological status of documented butterfly in Mt. Matutum Protected Landscape.

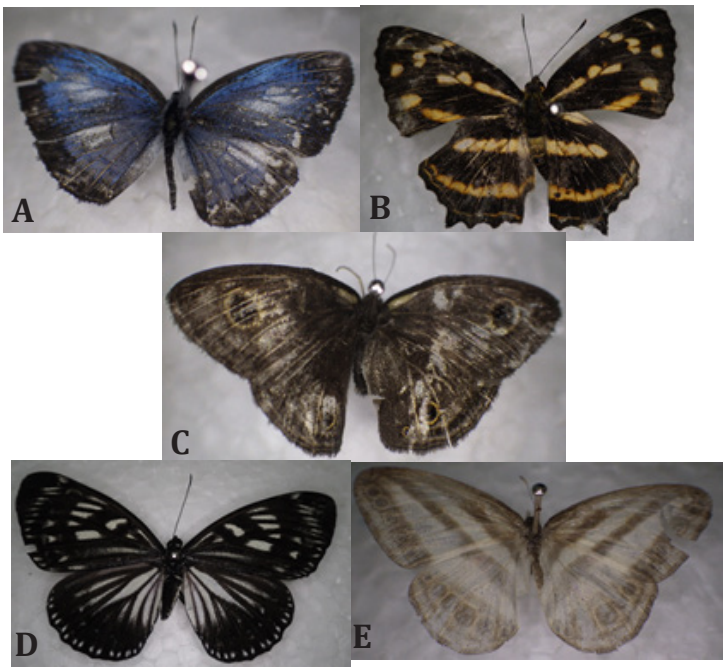

Figure 4. Endemic and rare species of butterflies in disturbed ecosystem of Mt. Matutum Protected landscape. A. *Celarchus archagathos archagathos.* B. *Symbrenthia hypatia matuti.* C. *Ypthima sensilis.* D. *Euripus nyctelius nysia.* E. *Ragadia melindena melindena*

4.0 Conclusion and Recommendation:

Our study provides baseline information for butterflies in disturbed ecosystems near the Mt. Matutum Protected Landscape (MMPL) which will be useful for an in-depth research on butterfly distribution diversity, this group of insects' abundance, and identifying other survival threats in MMPL and the vicinity. In addition, the result of the study implies that the agroecosystem houses a considerable number of butterfly species which might be attributed to the type and kind of vegetation of the sampling areas. The presence of endemic and rare species (14%) necessitates frequent monitoring aside from an appropriate conservation strategy to preserve these species in the area. Moreover, it is recommended to conduct further assessment in a wider sampling area, establish more sampling plots and prolong fieldwork to fully document the range of butterfly distribution and document more species in Mt. Matutum Protected Landscape (MMPL).

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