



Relative Abundance and Status of Butterfly Species in Magway Environs, Myanmar

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Abstract

Relative abundance and occurrence frequency of butterfly species in Magway environs was investigated during June 2014 to May 2015. A total of 63 species confined to 45 genera, among 5 families and accounted to a total of 4217 individuals were recorded. The highest percentage of common (C) species 30.16%, abundance (A) 9.52%, frequent (F) 14.29%, occasional (O) 26.98%, sporadic (S) 11.11%, rare 9.52% were recorded. *Catopsilia pomona* showed the highest relative abundance (0.0930), followed by *Eurema hecabe* (0.0870), *Catopsilia pyranthe* (0.0839), *Ixias pyrene* (0.0654) and *Appias libythea* (0.0467) during the study period. According to the whole study area, 4 species were very common, 25 species were common and 34 species were uncommon. Relative abundance and occurrence frequency of each butterfly species may be related to availability of food source, habitat condition and environmental condition. Thus, this study was partially informed the habitat health and biological diversity of Magway environs.

Keywords: relative abundance, occurrence frequency, butterfly, Magway

1. Introduction

Among the insects, butterflies occupy a vital position in ecosystem and their occurrence and diversity are considered as good indicators of the health of any given terrestrial biotope [1, 2]. In the world, they are approximately 170,000 known species of Lepidoptera: about one tenth of these are butterflies, and the rest are moths. Butterflies and moths are amazing in their variety of size, shape and color. Their immense diversity, and ability to adapt to climate, has made them one of the most successful creatures on earth [3].

Butterflies being sun loving insects are abundant from July to October and have been well noted by entomologist that the brightest colour. Knowledge of the stability or decline of local butterfly population can be an important tool in environmental protection. To assess changes in the distribution and abundance of a butterfly fauna, reliable information on spatial and temporal occurrence is essential [2]. Butterflies species are abundant on moist ground, mud puddles, and spots of sand or pebbles with water, near streams where sulphur are dissolved. In orchid gardens, shrub-lands, waterfall and forest only males mud puddle because they need salts to facilitate sperm production. Some are attracted to rotten fruit, carrion, urine and animal dung [4].

Butterfly distribution and habitat associations depend on their ecological adaptability. The abundance of butterflies in an area indicates the healthy conditions of the environment since interdependent relationship exists between the plant and the butterflies. The adult butterflies serve as external agents for cross-pollinated plants while visiting one flowering plant after another gathering nectar and pollen as their sources of food. Favorable habitats of butterfly species will be in places where flowering and host plants flourish. However, butterfly species could hardly exist in areas with depleted flora due to habitat loss. A butterfly's close

association with certain plants or habitat may make it highly vulnerable to changing conditions of the environment. Deforestation or undertaking other activities by man, and natural hazards are main causes that lead to habitat loss of butterfly species apart from other predators that prey upon the developmental stages as well as the adults [5].

The species of butterflies in any habitat are not equally abundant, even under the conditions of uniformity which prevail in the equatorial regions, and it is the usual experience that a majority are comparatively rare while only a few are common. In most areas, usually well over 90 percent of the individuals collected belong to about 10 percent of the species [6].

In Myanmar, few studies have been undertaken on the diversity of butterfly species in particular area. However, relative abundance and occurrence frequency of the butterfly species has not been conducted in the area of Magway. Thus, this study was selected to investigate the butterfly species and to record the status of butterfly species in Magway environs.

2. Materials and methods

2.1 Study area and study sites

Magway Township is situated in Magway Region within the Dry Zone of Central Myanmar, which has dry and hot climate. It has an area of 1098.37 km². Magway Township is located on the eastern bank of the Ayeyawady River. It lies between 20°06' 41.13"N to 20°10' 11.33" N and 94°55' 03.32"E to 94°57' 02.96" E.

Five study sites were chosen on the basis of topography and ecological habitats.

Site (I) Myinkin Village: It is situated at the Southwest part of Magway and lies at Latitude 20° 07' 0.09" to 20° 07' 11.76" N and Longitude 94° 56' 11.8" to 94° 56' 29.42" E. This study site includes grassy land, tall and medium trees,

shrubs, paddy fields and other cultivated fields.

Site (II) Magway University Campus: It is located at nearly Southern part of Magway and lies at Latitude 20° 07' 56.57" to 20° 08' 21.17" N and Longitude 94° 55' 50.42" to 94° 56' 21.39" E. This site has various flowering plants, cultivated fields, shrubs, grassy land, large trees and medium-sized plants.

Site (III) Lut Lat Yae Park: This study site is situated at the Southwest part of Magway and lies at Latitude 20° 8' 31.85" to 20° 8' 41.46" N and Longitude 94° 55' 24.70" to 94° 55' 29.37"E. It is composed of various flowing plants, shrubs, herbs, grassy lands, medium and tall trees and it is also abundant with moist shady places.

Site (IV) Myathalon Area: This study site is situated at the Northwest part of Magway and it is along the Ayeyawady River bank where the Myathalon Pagoda is built. It lies at Latitude 20 ° 19' 00" to 20°10' 18.19" N and Longitude 94° 55' 0.29" to 94 ° 55' 9.06" E. There are bushes, grassy land, wild flowering plants, and cultivated lands, tall and medium trees in this area.

Site (V) Nagu Village: This study site is situated at the Southeast part of Magway and lies between Latitude 20° 8' 12.50" to 20° 8' 26.52" N and Longitude 94° 57' 34.5" to 94° 57' 53.16" E. It is represented with orchard, cultivated land, shrubs, grassy land and trees.

2.2 Field methods

This study was carried out from June 2014 to May 2015 in Magway environs. The method is walk/count method [7] which involves walking and counting individuals. Observations were made between 8:30 am to 02:00 pm. Pace was slow but constant, covering the transect line in about an hour. Collection was made twice per month at the first and third week of every month. Butterflies resting on plants and those in flight were counted and identified. If it was hard to identify, the insect net was used to capture them and make exact identification. Only those species that could not be identified in the field were killed and later identified in the laboratory using the available literature. Care was taken to avoid counting the same individual more than one observation and tracking of individual butterflies was practiced.

2.3 Identification of butterfly

The species were identified according to Bingham [8, 9], Talbot [10, 11], Cobert and Plendlebury [12] and Kinyon [13].

2.4 Analysis of data

The collected data were analyzed as follow after Bisht *et al.* [14]

Relative abundance =

$$\frac{\text{total number of individual in each species}}{\text{total number of individual in all observed species}}$$

The status of butterflies are categorized as-

Uncommon (uC) = having relative abundance less than 0.0100

Common (C) = having relative abundance of 0.01000 and above but less than 0.0500

very common (vC) = having relative abundance of 0.0500 and above.

The frequency of occurrence of each species was calculated based on the number of occasions the species was collected during the samplings. The status of these butterflies was determined with the help of standard frequency chart as presented by Tamang *et al.* [14]

The status of butterfly species are categorized as

Frequency (%)	Category
91-100	Common
81-90	Abundant
61-80	Frequent
31-59	Occasional
15-30	Sporadic
05-14	Rare
< 5	Extremely Rare

3. Results

The status of butterfly species was conducted from Magway environs during June 2014 to May 2015. A total of 4217 individuals represented to 63 species belonging to 5 families, namely family Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Hesperidae were recorded during the study period. The higher percentage of butterfly family Nymphalidae 27 species (42.86%) followed by Pieridae 15 species (23.81%), Lycaenidae 8 species (12.70%), Papilionidae 7 species (11.11%) and Hesperidae 6 species (9.52%) were recorded. (Table 1, Figure 1).

During the study period, the composition of species was revealed to be the highest in Site II (57 species, 90.48%), followed by Site IV (47 species, 74.60%), Site I and III (43 species, 68.25%) the lowest number in Site V (38 species, 60.32%) (Table 2, Figure 2).

Catopsilia pomona showed the highest relative abundance (0.0930), followed by *Eurema hecabe* (0.0870), *Catopsilia pyranthe* (0.0839), *Ixias pyrene* (0.0654) and *Appias libythea* (0.0467) during the study period. According to the whole study area, four species were very common, 25 species were common and 34 species were uncommon in the study period (Table 3)

Regard with the whole study area during the study period, the occurrence frequency was found to be the highest in *Papilio demoleus*, *Leptosia nina*, *Appias libythea*, *Ixias pyrene*, *Catopsilia pyranthe*, *Catopsilia pomona*, *Eurema hecabe*, *Danaus chrysippus*, *D.genutia*, *Melanitis leda*, *Mycalesie perseus*, *M. mineus*, *Ypthima baldus*, *Junonia lemonia*, *Hypolimnas misippus* and *H. bolina* (100%) (Table 3). According to the whole study area, 19 species were common (C), five species were abundance (A), nine species were frequency (F), 17 species were occasional (O), seven species were sporadic (S) and six species were rare in the study period (Figure 4, Figure 3).

With regarded to the status of relative abundance, the percentage of uncommon butterfly species 53.97%, common 39.68% and very common 6.35% were recorded in the study area (Table 4).

The percentages of status categories during study period revealed that there existed not much differences in the values evaluated. The highest percentage of common (C) species 30.16%, abundance (A) 9.52%, frequent (F) 14.29%, occasional (O) 26.98%, sporadic (S)11.11%, rare 9.52% were recorded in the study area (Table 5, Figure 4). With respect to two status category, *Papilio demoleus*, *Leptosia nina*, *Appias libythea*, *Danaus chrysippus*, *D.*

genutia, *Tirumala limniace*, *Melanitis leda*, *M. mineus*, *Ypthima baldus*, *J. almanac*, *J. lemonia*, *Hypolimnas misippus*, *H. bolina*, *Zizina otis* were common in study area.

4. Discussion

The butterflies are good indicators of climatic conditions as seasonal and ecological changes and they can serve conservation. Biological diversity is good environmental indicator of habitat health [15]. Butterflies are often used as indicators of ecosystem health and at large scales, to assess biotic response to global change. Long-term monitoring studies in many countries show changes in abundance, diversity and or phenology [16]. There were 568 known species worldwide and 96 species were present in Myanmar [17]. Relative abundance and occurrence frequency of butterfly species in Magway environs were investigated during June 2014 to May 2015. Magway is situated in central dry zone of Myanmar. A total of 63 species of butterfly belonging to 5 families were recorded in the Magway environs.

Family Papilionidae are the most spectacular group of butterflies [12]. In Myanmar, there are highest butterfly species was found in family Nymphalidae. Nan Cherry Win [18] reported 90 butterfly species under three families, the most species was found in Family Nymphalidae (51) species, 28 species in Pieridae and 11 species of Papilionidae were recorded in Taunggyi and Hopone environs. Aye Thandar Win [19] also reported that the highest number of species was found in family Nymphalidae 27 species and the lowest was found in family Riodinidae, in Loikaw environs. It is agreed in this study, the highest number of butterfly species were observed in the family Nymphalidae (27 species) while the lowest in family Hesperidae (6 species). It is may be due to different habitat condition in Myanmar. Papilionids were more evidence on the hills than a lower elevation. Naw Cillia Lin Bert [20] described 12 species of Papilionidae in Winewaw Township, Kachin State. It is suggested that Papilionids are more common on the habitats of high elevation environments than the lower level.

According to the study sites, the composition of species was revealed to be the highest in Site II (57 species, 90.48%) and the lowest number in Site V (38 species, 60.32%). The number of butterfly (43 species, 68.25%) were recorded in the both site I and III. With respect to the relative abundance, *Catopsilia pomona* showed the highest relative abundance (0.0930) the lowest *Elymnias hypermnestra*, *Phalanta phalantha*, *Pantoporia sandaka*, *Lampides boeticus*, *Jamides alecto*, *Suastus gremius*, *Telicota ohara* (0.0002) were recorded in the study period. It was assumed that the more occurrences of butterfly species and individuals depended upon preference of their habitats. Matter *et al.* [21] suggested that the abundance of individuals is assumed to increase proportionately with habitat area [22, 23]. Connor *et al.* [24] stated that if organisms arrive at sites randomly, larger area represents larger targets and should receive more immigrants than smaller area. Moreover, Paivinen *et al.* [25] stated that if a species tends to inhabit more habitats when local abundant species will tend to

occupy more habitats and have wider distributions. In this work, status of butterfly in Site II was higher than other sites because the area of Site II is the largest among the five study sites. Moreover, the sites II were abundance of the nectar food plants of adult butterfly are mostly wild and natural plants. The wild plants are more abundant in Site II so the butterfly species were also abundant in this site. In this study, most species more abundant with increasing habitat area including the three most abundant species *Catapsilia pomona*, *C. pyrenthes* and *Eurema hecabe*. However, some species are including the five rare species *Elymnias hypermnestra*, *Lampides boeticus*, *Jamides alecto*, *Surendra vivarna* and *Telicota colon* rare with increasing habitat area.

Regarding with occurrence frequency, the status of *Papilio polytes*, *Melanitis zitenius* *Acraea terpsicore*, *Ariadne Ariadne* and *Tarucus callinara* were abundant. *Triodes aeacus*, *Graphium doson*, *Appias albino*, *Euthalia aconthea*, *Jamides alecto*, *Badamia exclamationis*, *Potanthus confusus* were recorded in the status of sporadic and *Pachliopta aristolochiae*, *Cepora nerissa*, *Hebomoia glaucippe*, *Pareronia anais*, *Catapsilia. Scylla*, *Cethosia cyane*, *Phaedyma collumella*, *Pantoporia sandaka*, *Castalius rosimon* were found in the status of frequent in the study area. According to the butterfly status category, based on relative abundance, 34 species were common while based on occurrence frequency, 19 species were common during the study period. The changes of status in some butterflies species occurred may be related to habitat suitability, availability of food resources and climate change.

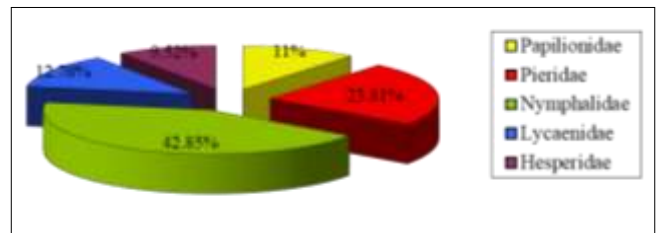


Fig 1: Percentage composition of butterfly species in different families during the study period

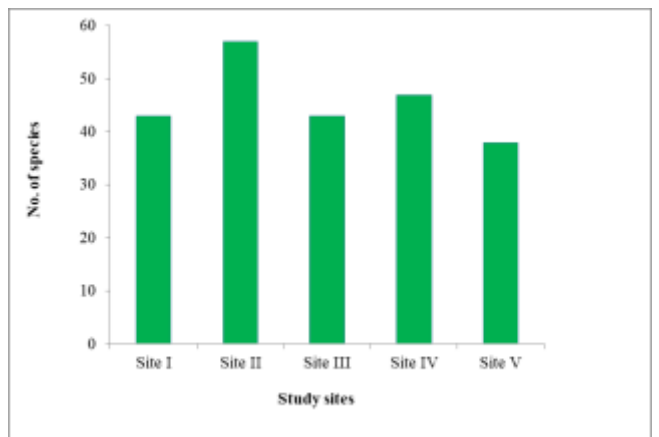


Fig 2: Composition of butterfly species in different sampling sites during the study period

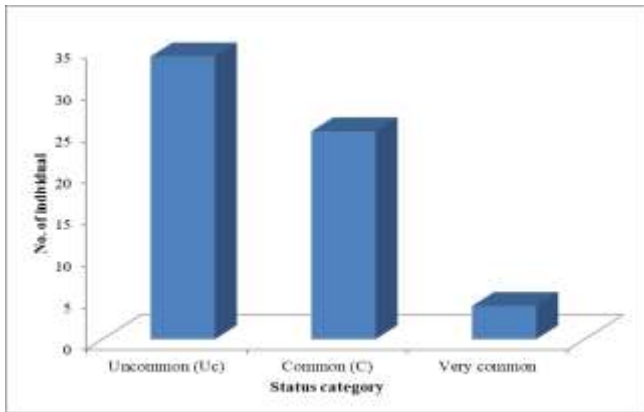


Fig 3: Status of butterfly species base on relative abundance during the study period

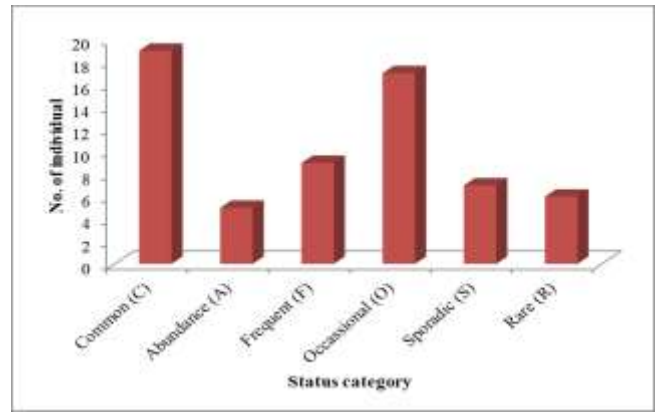


Fig 4: Status of butterfly species base on occurrence frequency during the study period

Table 1: Percentage composition of butterfly species in different families during the study period

No.	Family	Genus	Species	Percent Composition
1	Papilionidae	4	7	11.11
2	Pieridae	9	15	23.81
3	Nymphalidae	18	27	42.86
4	Lycaenidae	8	8	12.70
5	Hesperiidae	6	6	9.52
	Total	45	63	

Table 2: Percentage composition of butterfly species in different sampling sites during the study period

Sr No	No. of species	Percentage composition
Site I	43	68.25
Site II	57	90.47
Site III	43	68.25
Site IV	47	74.60
Site V	38	60.32
Total	63	

Table 3: Relative abundance, occurrence frequency status of each butterfly species in Magway Environs recorded during the study period.

Sr No	Scientific Name	No. of individuals	Relative Abundance	Status	Occurrence frequency (%)	Status
1	<i>Triodes aeacus</i>	6	0.0014	uC	25	S
2	<i>Pachliopta aristolochiae</i>	52	0.0123	C	66.67	F
3	<i>Papilio demoleus</i>	181	0.0429	C	100	C
4	<i>P. polytes</i>	52	0.0123	C	83.33	A
5	<i>P. memnon</i>	15	0.0036	uC	50	O
6	<i>Graphium doson</i>	6	0.0014	uC	25	S
7	<i>G. agamemnon</i>	47	0.0111	C	58.33	O
8	<i>Delias descombesi</i>	11	0.0026	uC	33.33	O
9	<i>D. hyparete</i>	19	0.0045	uC	41.67	O
10	<i>Leptosia nina</i>	161	0.0382	C	100	C
11	<i>Cepora nerissa</i>	71	0.0168	C	75	F
12	<i>Appias libythea</i>	197	0.0467	C	100	C
13	<i>A. albina</i>	3	0.0007	uC	16.67	S
14	<i>Ixias pyrene</i>	276	0.0654	vC	100	C
15	<i>Hebomoia glaucippe</i>	28	0.0066	uC	66.67	F
16	<i>Pareronia anais</i>	69	0.0164	C	75	F
17	<i>Catopsilia pyranthe</i>	354	0.0839	vC	100	C
18	<i>C. pomona</i>	392	0.0930	vC	100	C
19	<i>C. scylla</i>	13	0.0031	uC	66.67	F
20	<i>Eurema hecabe</i>	367	0.0870	vC	100	C
21	<i>E. andersonii</i>	16	0.0038	C	58.33	O
22	<i>E. ada</i>	11	0.0026	uC	50	O
23	<i>Danaus chrysippus</i>	208	0.0493	C	100	C
24	<i>D. genutia</i>	125	0.0296	C	100	C
25	<i>Tirumala limniace</i>	89	0.0211	C	91.67	C
26	<i>Parantic aglea</i>	19	0.0045	uC	50	O
27	<i>Euploe core</i>	40	0.0095	uC	58.33	O
28	<i>Elymnias hypermnestra</i>	1	0.0002	uC	8.33	R

29	<i>Melanitis leda</i>	68	0.0161	C	100	C
30	<i>M. zitenius</i>	21	0.0050	uC	83.33	A
31	<i>Mycalesis perseus</i>	76	0.0180	C	100	C
32	<i>M. mineus</i>	82	0.0194	C	100	C
33	<i>Ypthima baldus</i>	22	0.0121	C	100	C
34	<i>Acraea terpsicore</i>	40	0.0069	uC	83.33	A
35	<i>Ariadne ariadne</i>	49	0.0111	C	83.33	A
36	<i>A. merione</i>	19	0.0055	uC	58.33	O
37	<i>Phalanta phalantha</i>	1	0.0038	uC	58.33	O
38	<i>Cethosia cyane</i>	22	0.0138	C	75	F
39	<i>Junonia atlites</i>	4	0.0021	uC	33.33	O
40	<i>J. almana</i>	67	0.0111	C	91.67	C
41	<i>J. lemonia</i>	127	0.0481	C	100	C
42	<i>J. orithya</i>	2	0.0038	uC	50	O
43	<i>J. hierta</i>	2	0.0024	uC	50	O
44	<i>Hypolimnas misippus</i>	52	0.0273	C	100	C
45	<i>H. bolina</i>	33	0.0107	C	100	C
46	<i>Phaedyma collumella</i>	28	0.0133	C	66.67	F
47	<i>Pantoporia sandaka</i>	1	0.0021	uC	58.33	F
48	<i>Euthalia aconthea</i>	4	0.0007	uC	16.67	S
49	<i>Charaxes solon</i>	0	0.0002	uC	8.33	R
50	<i>Castalius rosimon</i>	61	0.035	C	75	F
51	<i>Tarucus callinara</i>	74	0.0175	C	83.33	A
52	<i>Zizeeria karsandar</i>	30	0.0071	uC	75	O
53	<i>Zizina otis</i>	78	0.0185	C	91.67	C
54	<i>Catochrysops strabo</i>	10	0.0024	uC	41.67	O
55	<i>Lampides boeticus</i>	1	0.0002	uC	8.33	R
56	<i>Jamides alecto</i>	1	0.0002	uC	8.33	R
57	<i>Rapala iarbus</i>	2	0.0005	uC	16.67	S
58	<i>Badamia exclamationis</i>	25	0.0059	uC	25	S
59	<i>Suastus gremius</i>	1	0.0002	uC	8.33	R
60	<i>Potanthus confusius</i>	2	0.0005	uC	16.67	S
61	<i>Telicota ohara</i>	1	0.0002	uC	8.33	R
62	<i>Baoris farri</i>	12	0.0028	uC	58.33	O
63	<i>Caltoris brunnea</i>	20	0.0047	uC	58.33	O
Total no. of individuals		4217				

uC= uncommon, C= Common, vC= Very common, C = Common, O = Occasional A = Abundant, S = Sopradic, F = Frequent, R = Rare

Table 4: The percentage of the status of butterfly based on relative abundance during the study period

Status category	No. of species	Percentage
Uncommon (uC)	34	53.97
Common (C)	25	39.68
Very common (vC)	4	6.35
Total	63	

Table 5: The percentage of butterfly species based on occurrence frequency during the study period

Status category	No. of species	Percentage %
Common (C)	19	30.16
Abundance (A)	5	9.52
Frequent (F)	9	14.29
Occasional (O)	17	26.98
Sporadic (S)	7	11.11
Rare (R)	6	9.52
Total	63	

5. Conclusion

The abundance of butterfly was mainly affected by the area and nature of habitat which included the abundance of vegetation that provided nectar for the adults and also for the larvae which in turn is dependent on weather condition and other environmental factors. Therefore, relative abundance and occurrence frequency of each butterfly species may be related to availability of food source, habitat

condition and environmental condition. Thus, this study was partially informed the habitat health and biological diversity of Magway environs.

6. Acknowledgements

I am greatly indebted to Dr. Khin Maung Oo, Rector, University of Magway, for his permission to do this research work. I am greatly thankful to Pro-rectors Dr Win Soe and Dr. Than Than Oo, University of Magway for their interest and encouragement. I wish to express my gratitude to Professor Dr. Cho Cho Oo, Head of Zoology Department and Professor Dr Htay Htay, Zoology Department, University of Magway for their suggestion and help various ways throughout the research work.

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