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A checklist of diversity of butterflies in the campus of University of Science and Technology, Meghalaya (USTM), Ri- bhoi district, Meghalaya, India

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Abstract

Northeastern India is one of the unique biodiversity hotspots marked by its number of endangered and endemic species. This region has variable climatic conditions and vegetation patterns which harbors a number of odonates and lepidopteron species. A number of studies were carried out to ascertain the butterfly species present in Meghalaya, one of the states of northeastern India. However till date no study has been carried out in the campus of the university marked by its unique vegetation patterns. In the present study, a checklist has been prepared to ascertain the number of different species of butterflies present in the University campus. It has been found that 127 species of butterflies belonging to 5 families are present dominated by Nymphalidae (35%), followed by Lycaenidae (27%), Pieridae (14%), Hesperidae (13%) and Papilionidae (11%). Thus it can be suggested that campus of USTM provides and support good species richness of butterflies which is of great taxonomic significance.

Keywords: Butterfly diversity, species richness, USTM campus, Ri-bhoi district, Meghalaya

1. Introduction

Butterflies are most studied insects around the globe due to their vivid morphology and taxonomic complexities among the Lepidopteron insects. Importances of butterflies in nature are emphasized by the statement that together with large moths they are considered as flagship species to promote insect conservation and resource protection [1]. Studies on the diversity and natural history studies on butterflies are essential for the maintenance of biological diversity and conservation purposes.

Northeastern India is one of the biodiversity hotspot areas of our country marked by great number of endangered and endemic species and butterflies share an important part in its species composition. It is estimated that more than 50% of the butterfly species found in India occur in the northeast, so it is often also called the "Papilionidae-rich zone" in the 'Indo-Burma hotspot' as per IUCN [2]. The Indian subcontinent hosts about 1,504 species of butterflies [3] and a total of 962 species of butterflies have been reported from this northeastern India region, but recent reports indicate that the actual number could be above 1,000 species. Although Northeast represents only 7.7% of Indian landmass, it has 66.85% of butterfly diversity of Indian region (<http://www.arunachaltimes.in/iird-northeast-butterfly-meet-2016/>). Diversity of butterflies in Meghalaya is widely studied as most of the species are of either endangered or endemic. Besides good environmental condition of this hilly state favour a good species richness. Garo, Khasi and Jantia Hills of Meghalaya documented a great richness of lepidopteran diversity. Garo hills of Meghalaya harbors near about 156 genera and 298 species of butterflies [4] indicating a glimpse of butterfly species richness in the region. Much work has been carried out regarding the diversity and distribution of butterflies in Garo Hills as compared to Khasi hills of Meghalaya. USTM is situated in the east Khasi hills of Ri bhoi district of Meghalaya where till date no such taxonomic work were carried out to figure out the lepidopteron diversity. Thus, a survey was carried out to ascertain the diversity of butterfly species in the campus of one the nascent university of northeast India, USTM (University of Science and Technology, Meghalaya), Meghalaya, India.

2. Material and Methods

A) Description of Study Site: USTM campus (26° 06'10.64"N – 91° 50'43.76"E) is situated in the Ri -Bhoi district of Meghalaya and is very near to the Khanapara area of Guwahati, Assam. Ri bhoi district is situated in East Khasi hills. The nascent university is located in hilly terrain marked by densely covered trees, forest areas, scattered grassland and water bodies. It covers an area of approximately 400 acres (Figure 1).

B) Methodology: The present study was conducted between October 2015 to November 2016. The butterflies in and around university campus were documented by direct observations, random walks and opportunistic observations mostly during the morning (07:00–11:30 hr) and in the evening (3:00–17:30 hr). The butterfly survey was carried out by searching for a distance of 10 m on either side of transect. The transects representative of the area were selected considering topography, vegetation and habitat structure found in university campus. All individuals were identified in the field using standard guides [5-7]. For common names of butterflies [8, 9] were followed. A total of 10 transect counts were made for the study and the species which were difficult to identified in the open field where trapped following standard scientific methods, identified and kept in the Entomology laboratory of the University for documentation.

3. Results

A total of 127 butterfly species spread over five families were recorded during the present survey (Appendix 1). At family level, the family Nymphalidae was dominant with 44 species (35%) followed by Lycaenidae with 35 species (27%), Pieridae with 18 species (14%), Hesperidae with 16 species (13%) and Papilionidae with 14 species (11%) (Figure 1 and 2).

During the present study period, butterflies belonging to family Nymphalidae were dominated by presence of number of individuals of Common Indian Crow, Common Evening Brown, Common Bush Brown, Common Four-ring, Common Sailer, Chocolate Pansy, Grey Pansy, Peacock Pansy and Lemon Pansy. Lycaenidae family is represented in large number by Lime Blue, Pale Hedge Blue, Pale Grass Blue, Common Cerulean, Banded Lineblue, Common Pierrot, Long banded Silverline, Common Tit, Yamfly and Common Acacia Blue. Pieridae family is represented by more individuals of Psyche, Red Breast Jezebel, Common Grass Yellow, Indian Cabbage White and Red Base Jezebel. Hesperidae family is marked by the presence of number of Fulvous Pied Flat, Bush Hopper, Grass Bob, Straight Swift and Common Awl. Papilionidae family is dominated by the individuals of Common Jay, Common Blue Bottle, Red Helen and Common Mime. These species were said representatives of each family as they were found more than five in number in the 10 transects counted to prepare the checklist.

4. Discussion

Butterflies are said to be excellent pollinator of nature and they are said to be best indicator of environmental quality. Taxonomist are fascinated with butterflies since time

immortal as these wonderful creatures have vivid colours, patterns and markings making them unique from each other. Their presence lies from lowest to highest altitudes with great variations in their occurrence and makes them a suitable species to be of great taxonomic significance.

In the present study, a checklist has been prepared to ascertain the number of species of butterflies presents in the campus of USTM, which is one of the nascent university of Meghalaya. The campus of the university is marked with variable topography and vegetation patterns making it one of the suitable places for butterflies. In the present study, a total of 127 species were recorded in which the members of family Nymphalidae was dominant with 44 species followed by Lycaenidae with 35 species, Pieridae with 18 species, Hesperidae with 16 species and Papilionidae with 14 species. Although occurrences of different species varied throughout the study period and seasonality of occurrence of different species has not been included in the present study however most of the species were recorded during post monsoon season.

Among the 127 species observed, Danaid Eggfly, Common Hedge Blue, Common Mime and Common Pierrot are protected under schedule - I of Indian Wildlife Protection Act 1972 whereas Chocolate Albatross, Common Albatross, Black-vein Sergeant, Grey Count, Lesser Gull, Long banded Silverline and Metallic Cerulean are some few species that are protected under schedule - II of Indian Wildlife Protection Act 1972.

Good species richness in this study area may be contributed to variation in vegetation patterns and a suitable climatic condition that forms a good habitat area for the butterflies. Vegetation is composed of local weeds, shrubs and planted trees that provide suitable habitat to most of the butterfly species found in the study. A stiff elevation from the mainland may also contribute to the admixture of species from local Khanapara area of Guwahati and east Khasi hill areas. Besides this, a good rainfall in the surrounding forest cover may attribute to the diversity too. Predominance of the family Nymphalidae with respect to species diversity in the present study area is in good correlation with other studies conducted by researchers [10].

From the above finding it can be suggested that university campus which spreads across in more than 400 acres harbors a rich butterfly diversity. Species composition shows admixture of both low and high altitude species as the university is very near to both Amchang forest reserve and Khanapara reserve areas. As it is just a preliminary investigation to ascertain the diversity of butterfly species, a much more elaborate study is required to find out the richness of subfamilies and genera of butterflies as well as variation in the occurrences of species in different seasons. Conservation of butterflies is essential for sustainable development and for this a detailed study of diversity and richness of these wonderful creatures are needed for proper conservation and preservation. The present finding can be said to have significant taxonomic importance as it is the first study of its kind in the study area and has the potential to add few species to the fauna of Meghalaya.

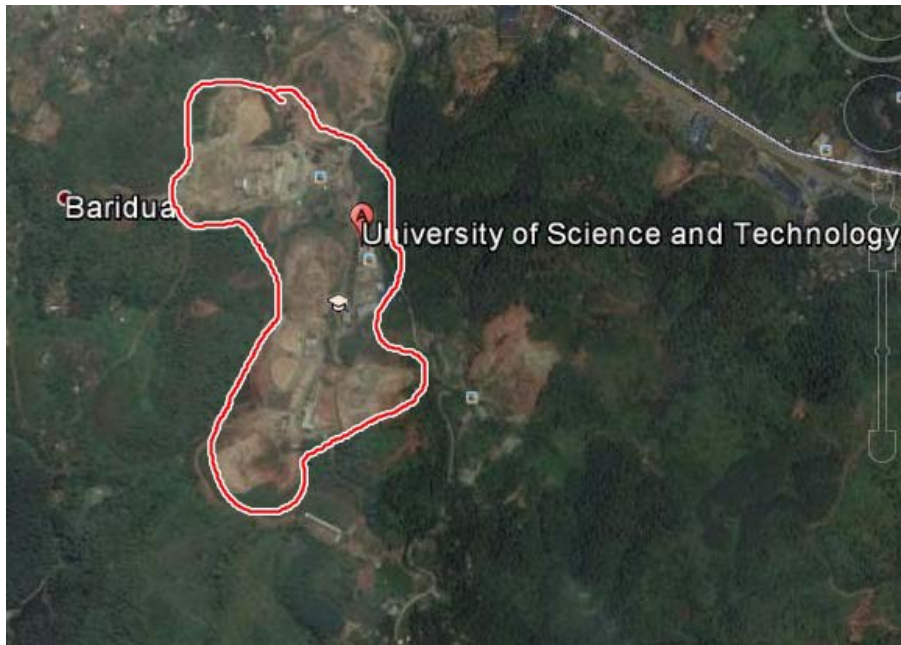


Fig 1: Showing the map of USTM campus, Meghalaya where study was carried out.

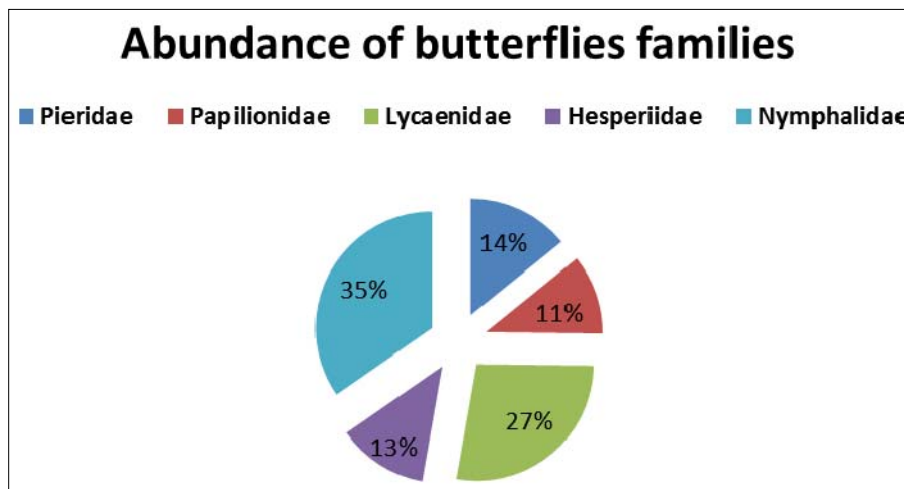


Fig 2: Percentage of occurrence of families of butterflies observed in USTM campus.

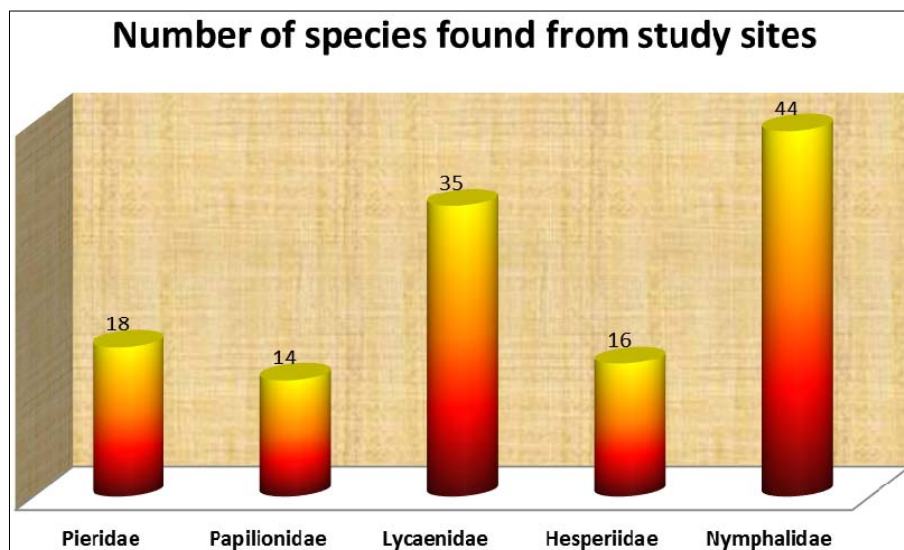


Fig 3: Chart showing family wise distribution of number of butterflies at USTM campus.

Appendix 1: Showing the number of butterfly species along with their families observed in USTM campus.

Family	Nymphalidae	
Sl no.	Common Name	Scientific Names
1	Striped Tiger	<i>Danaus genutia genutia</i> Cramer
2	Plain Tiger	<i>Danaus chrysippus chrysippus</i> Linnaeus
3	Glassy Tiger	<i>Parantica aglea melanoides</i> Moore
4	Chestnut Tiger	<i>Parantica sitasita</i> Kollar
5	Common Indian Crow	<i>Euploea core core</i> Cramer
6	Common Nawab	<i>Polyura athamas athamas</i> Drury
7	Tawny Rajah	<i>Charaxes bernardus hierax</i> Felder & Felder
8	Variiegated Rajah	<i>Charaxes kahruba kahruba</i> Moore
9	Common Duffer	<i>Discophora sondaica zal</i> Westwood
10	Longbrand Bushbrown	<i>Mycalesis visala visala</i> Moore
11	Common Evening Brown	<i>Melanitis ledaleda</i> Linnaeus
12	Dark Evening Brown	<i>Melanitis phedimabela</i> Moore
13	Banded Treebrown	<i>Lethe confuse confuse</i> Aurivillius
14	Common Palmfly	<i>Elymnias hypermnestra undularis</i> Drury
15	Common Bush Brown	<i>Mycalesis perseusblasius</i> Fabricius
16	Dark-brand Bush brown	<i>Mycalesis mineusmineus</i> Linnaeus
17	Common Fiver-ring	<i>Ypthima baldusbaldus</i> Fabricius
18	Large Three-ring	<i>Ypthima nareda nareda</i> Kollar
19	Common Four-ring	<i>Ypthima huebneri</i> Kirby
20	Red Lacewing	<i>Cethosia biblis tisamena</i> Fruhstorfer
21	Leopard Lacewing	<i>Cethosia cyane cyane</i> Drury
22	Cruiser	<i>Vindula erota erota</i> Fabricius
23	Commander	<i>Moduza procris procris</i> Cramer
24	Common Sergeant	<i>Athyma perius perius</i> Linnaeus
25	Black-vein Sergeant	<i>Athyma ranga ranga</i> Moore
26	Knight	<i>Lebade martha</i> Fabricius
27	Common Sailer	<i>Neptis hylas kamarupa</i> Moore
28	Plain Sailer	<i>Neptis cartica</i> Moore
29	Broad-banded Sailer	<i>Neptis sankara amba</i> Moore
30	Baron	<i>Euthalia aconthea garuda</i> Moore
31	Grey Count	<i>Tanaecia lepidea lepidea</i> Butler
32	Common Castor	<i>Ariadne merione tapestrina</i> Moore
33	Common Jester	<i>Symbrenthia lilaea khasiana</i> Moore
34	Blue admiral	<i>Kaniska canace canace</i> Linnaeus
35	Indian Red Admiral	<i>Vanessa indica indica</i> Herbst
36	Chocolate Pansy	<i>Junonia iphita iphita</i> Cramer
37	Grey Pansy	<i>Junonia atlites atlites</i> Linnaeus
38	Peacock Pansy	<i>Junonia almana almanac</i> Linnaeus
39	Blue pansy	<i>Junonia orithya</i> Linnaeus
40	yellow pansy	<i>Junonia hierta hierta</i> Fabricius
41	Nigger	<i>Orsotriaena medus mandata</i> Moore
42	Great Eggfly	<i>Hypolimnas bolinajacantha</i> Drury
43	Lemon Pansy	<i>Junonia lemonias lemonias</i> Linnaeus
44	Danaid Eggfly	<i>Hypolimnas misippus</i> Linnaeus
45	Centaur Oak blue	<i>Arhopala centaurus pirithous</i> Moore
46	Aberrent Oakblue	<i>Arhopala abseus indicus</i> Riley
47	Spotless Oakblue	<i>Arhopala fulla ignara</i> Riley
48	Common Acacia Blue	<i>Surendra quercetorum quercetorum</i> Moore
49	Yamfly	<i>Loxura atymnus continentalis</i> Fruhstorfer
50	Blue Imperial	<i>Ticherra acteacte</i> Moore
51	Common Imperial	<i>Cheritra freja evansi</i> Cowan
52	Banded Royal	<i>Rachana jalindra indra</i> Moore
53	Common Tit	<i>Hypolycaena erylushimavantus</i> Fruhstorfer
54	Fluffy Tit	<i>Zetus amasa amasa</i> Hewitson
55	Indian Red Flash	<i>Rapala iarbusiarbus</i> Fabricius
56	Long banded Silverline	<i>Spindasis lohita himalayanus</i> Moore
57	Golden Sapphire	<i>Heliophorus brahmamajor</i> Moore
58	Purple Sapphire	<i>Heliophorus epicles latilimbata</i> Fruhstorfer
59	Common Ciliate Blue	<i>Anthene emolusemolus</i> Godart
60	Elbowed Pierrot	<i>Caleta elnanoliteia</i> Fruhstorfer
61	Common Pierrot	<i>Castalius rosimon rosimon</i> Fabricius
62	Banded Lineblue	<i>Prosotas aluta coelestis</i> Wood-Mason & de-Niceville
63	Pale 4-Lineblue	<i>Nacaduba hermusnabo</i> Fruhstorfer
64	Opaque 6-Lineblue	<i>Nacaduba beroegythion</i> Fruhstorfer
65	Common Lineblue	<i>Prosotas noraardates</i> Moore

66	Common Cerulean	<i>Jamides celeno celeno</i> Cramer
67	Metallic Cerulean	<i>Jamides alecto eurysaces</i> Fruhstorfer
68	Dark Cerulean	<i>Jamides bochus bochus</i> Stoll
69	Pale Grass Blue	<i>Pseudozizeeria mahamaha</i> Kollar
70	Forget-me-not	<i>Catochrysops strabo strabo</i> Fabricius
71	Dark Grass Blue	<i>Zizeera karsandra</i> Moore
72	Common Hedge Blue	<i>Acytolepis puspagisca</i> Fruhstorfer
73	Pale Hedge Blue	<i>Udara dilecta dilecta</i> Moore
74	Lime Blue	<i>Chilades lajuslajus</i> Stoll
75	Common Brownie	<i>Miletus chinensis assamensis</i> Doherty
76	Pointed Pierrot	<i>Tarucus theophrastus indica</i> Evans
77	White Cerulean	<i>Jamides cleodus pura</i> Moore
78	Royal Cerulean	<i>Jamides caerulea</i> Druce
79	Hill Hedge Blue	<i>Celastrina agriolus iyntea</i> de Nicéville
80	One-spot Grass Yellow	<i>Eurema andersoni jordani</i> Corbet & Pendlebury
81	Three-spot Grass Yellow	<i>Eurema blanda silhetana</i> Wallace
82	Common Grass Yellow	<i>Eurema hecabe hecabe</i> Linnaeus
83	Common Emigrant	<i>Catopsilia pomona pomana</i> Fabricius
84	Great Orange Tip	<i>Hebomoia glaucippe glaucippe</i> Linnaeus
85	Chocolate Albatross	<i>Appias lyncida</i> Cramer
86	Common Albatross	<i>Appias albino darada</i> Felder & Felder
87	Eastern Striped Albatross	<i>Appias olferna olferna</i> Swinhoe
88	Indian Cabbage White	<i>Pieris canidia indica</i> Evans
89	Lesser Gull	<i>Cepora nadina nadina</i> Lucas
90	Common Gull	<i>Cepora nerissa phryne</i> Fabricius
91	Red Base Jezebel	<i>Delias pasithoe pasithoe</i> Linnaeus
92	Red Spot Jezebel	<i>Delias descombesi descombesi</i> Boisduval
93	Red Breast Jezebel	<i>Delias thysbe pyramus</i> Wallace
94	Yellow Jezebel	<i>Delias agostina agostina</i> Hewitson
95	Psyche	<i>Leptosia nina nina</i> Fabricius
96	Pioneer	<i>Belenois aurota aurota</i> Fabricius
97	Common Wanderer	<i>Pareronia hippia</i> Fabricius
98	Indian Awlking	<i>Chaospes benjaminii japonica</i> Murray
99	Common Awl	<i>Hasora badra</i> Moore
100	Common Spotted Flat	<i>Celaenorrhinus leucocera leucocera</i> Kollar
101	Fulvous Pied Flat	<i>Pseudocoladenia danfabia</i> Evans
102	Common Dartlet	<i>Oriens goloides</i> Moore
103	Common Dart	<i>Potanthus pseudomaesa</i> Moore
104	Straight Swift	<i>Parnara bada bada</i> Moore
105	Small branded Swift	<i>Pelopidas mathias</i> Fabricius
106	Large Branded Swift	<i>Pelopidas sinensis sinensis</i> Mabille
107	Brown Forest Bob	<i>Scobura woolletti</i> Riley
108	Chestnut Bob	<i>Iambrix salsala salsala</i> Moore
109	Grass Bob	<i>Suada swerga swergade</i> Niceville
110	Common Red eye	<i>Matapa aria</i> Moore
111	Common Banded Demon	<i>Notocrypta paralysos asawa</i> Fruhstorfer
112	Tiger Hopper	<i>Ochus subvittatus subradiatus</i> Moore
113	Bush Hopper	<i>Ampittia dioscorides</i> Fabricius
114	Common Blue Bottle	<i>Graphium sarpedon sarpedon</i> Linnaeus
115	Common Jay	<i>Graphium dostonaxion</i> Felder
116	Tailed Jay	<i>Graphium agamemnon agamemnon</i> Linnaeus
117	Yellow Helen	<i>Papilio nephelus</i> Boisduval
118	Common Mormon	<i>Papilio polytes romulus</i> Cramer
119	Common Raven	<i>Papilio castor castor</i> Westwood
120	Red Helen	<i>Papilio helenus helenus</i> Linnaeus
121	Great Mormon	<i>Papilio memnon agenor</i> Linnaeus
122	Redbreast	<i>Papilio alcmenor alcmenor</i> C.&R.Felder
123	Common Batwing	<i>Atrophaneura varunaastorion</i> Westwood
124	Common Rose	<i>Atrophaneura aristolochiae</i> Fabricius
125	Common Birdwing	<i>Troides helenacerberus</i> Felder & Felder
126	Common Mime	<i>Papilio clytia clytia</i> Linnaeus
127	Lime Butterfly	<i>Papilio demoleus demoleus</i> Linnaeus

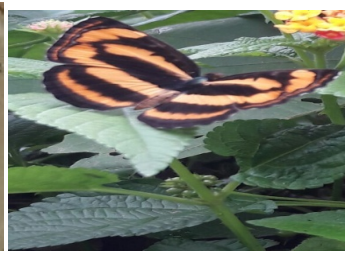
Photo-plates of few butterfly species collected from USTM campus



Junonia orithya Linnaeus



Graphium dosonaxion Felder



Symbrenthia lilaea khasiana Moore



Papilio clytia clytia Linnaeus



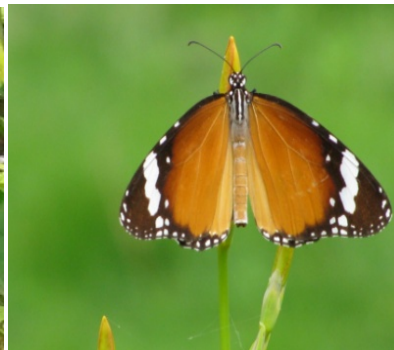
Atrophaneura aristolochiae Fabricius



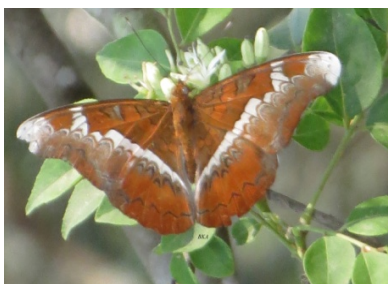
Papilio nephelus Boisduvel



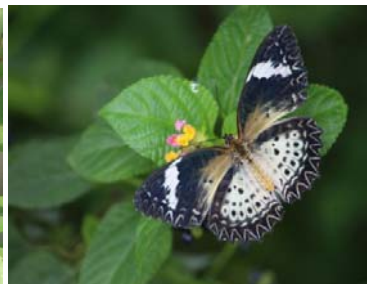
Polyura athamas athamas Drury



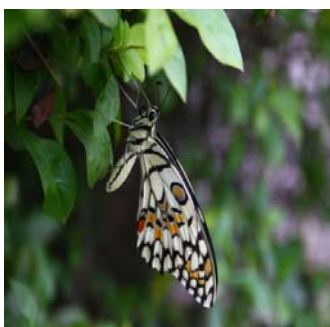
Hypolimnas misippus Linnaeus



Lebade martha Fabricius



Cethosia cyane cyane Drury



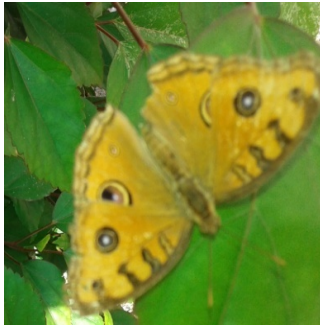
Papilio demoleus demoleus Linnaeus



Junonia lemonias lemonias Linnaeus



Euploea core core Cramer



Junonia almanac Linnaeus



Spindasis lohita himalayanus Moore



Junonia atlites Linnaeus



Tanaecia lepidea lepidea Butler



Eurema hecabe hecabe Linnaeus



Melanitis ledaleda Linnaeus



Papilio polytesromulus Cramer



Elymnias hypermnestra



Hypolycaena erylus himavantus Fruhstorfer

5. Conclusion

A preliminary invigilation on the diversity of butterflies in USTM campus showed great richness and it depicts a great taxonomic work. In the present study altogether 127 species of butterflies were reported from the 10 transect study sites of the university campus, among which some of the species

belongs to schedule – I and schedule -II of Indian Wildlife Protection Act 1972. In the light of this finding it can be concluded that ideal location, topography and surrounding climatic conditions make the USTM campus a good habitat place for butterflies and further elaborate studies can be carried out regarding richness in terms of subfamily and

genera, species richness and distribution, seasonal variations and altitudinal occurrences of different species of present so that a taxonomic addition may come out which will aid in valuable taxonomic studies In future.

6. Acknowledgement

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7. References

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