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Diversity of Butterflies - Strategies adopted for its conservation at Yogi Vemana University campus, Kadapa, A.P., India

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ABSTRACT

We documented the butterfly fauna and the host plants available in the Yogi Vemana University Campus during January 2013 to December 2013. Total 85 species of butterflies belonging to 5 families were recorded. This forms 46% of the butterflies documented from the Eastern Ghats. Fifty species of plants were found to be used as larval food plants in the campus. Among the butterflies recorded, 36 % belonged to Nymphalidae family, whereas family Hesperiidae showed lowest number of species (11%). *Catopsilia pomona, Tirumala limniace, Danaus chrysippus, Eurema hecabe, Castalius rosimon, Junonia hierta, Junonia lemonias* and *Euploea core* were the common species found in the campus. Present study reveals the butterfly diversity and habitat richness of Yogi Vemana University Campus. However, alteration of the landscape as part of the construction works and other developmental activities are harmfully affecting the habitat quality and the associated butterfly diversity of this campus. Subsequent to our study, we established Butterflies Park and also declared about 19 acres of the unaffected natural area under Botanical garden with both Larval and Nectar

host plants of the campus as a conservation area. This field laboratory, glass house (Butterfly Museum) with attached butterfly laboratory to carry forward the captive breeding methods to conserve the threatened and endangered species and also enables to restock the species in the wild. Conserved species of butterflies is now being used for various in-campus biodiversity studies as well as conservation awareness programmes focusing school children and people from various backgrounds through seminars and telecasting through Television news channels enlightening the importance of conservation of the locally available species.

Keywords: Yogi Vemana University, butterfly, conservation, Captive breeding

1. INTRODUCTION

Butterflies are highly sensitive to environmental change and are delicate creatures that act as good bio-indicators of the health of an ecosystem. They also are good pollinators (Rosenberg et al., 1986). The areas with undisturbed vegetation and high floral diversity support large butterfly communities. Butterflies and their caterpillars are dependent on specific host plants for foliage, and nectar as their food. Thus butterfly diversity reflects overall plant diversity, especially that of herbs and shrubs in the given area. The butterflies are essential part of any natural ecosystem plays a dual role as pollinators and energy transferors. It was encouraging that butterflies are now being included in the biodiversity studies and biodiversity conservation prioritization programme (Murugesan et al., 2011). Earlier various workers like Pandaripande (1990) in his studies listed 61 butterfly species in Nagpur city and 52 species from Amaravati University campus. Subba Reddi et al., (2002) provided a checklist of butterflies of Andhra University and documented 54 butterfly species. Hiren soni et al., (2005) provided a preliminary investigations of Butterfly Diversity of Sardar Patel University Campus, Vallabh Vidyanagar, Gujarat. Tiple et al., (2007), studied factors influencing nectar plant resource visits by butterflies and implications for conservation on Amravati University campus. The distributions of butterflies are exclusively dependent upon the availability of their food plants (Feltwell, 1986).

The present study was carried out from Yogi Vemana University campus, Kadapa, Andhra Pradesh, India during January 2013 to December 2013. A total of 85 butterfly species belonging to the families Nymphalidae, Pieridae and Papilionidae, Lycaenidae and Hesperiidae were recorded. Family Nymphalidae dominated in the study area, followed by Pieridae, Lycaenidae and Papilionidae. Species abundance reached the peak in February and March (spring) a decline was observed from the months of October and November (Early winter). During the present study species diversity values (H-) were found high in summer, spring and early winter. In the past few decades, butterfly populations in India have declined (Grewal, 1996), and it is often suggested that captive rearing / breeding and releasing of butterflies in the wild will help restock at-risk populations and serve as a means of conservation (Nicholls & Pullin, 2000; Mathew, 2001; Crone et al., 2007; Schultz et al., 2008). The basic protocol of captive propagation is to collect eggs from wild-mated female, rear larvae to adult butterflies in captive propagation facilities, and release adults/pupae back into wild populations (Crone et al., 2007). Present study reveals the butterfly diversity and habitat richness of the Campus.

2. STUDY AREA

The Yogi Vemana University (YVU) main campus is located at Vemanapuram, Kadapa District, Andhra Pradesh (Figure 1). The area lies between 14.47°N 78.82°E. and is located very close to the Lankamali Wildlife Sanctuary (14°45' - 14°72' N and 79°07' - 78°80' E), Eastern Ghats, the aerial distance of which is not more than 18 km. The campus has a total area of 391.44ha, and the major habitats include garden lands, botanical garden, plantations of sunflower, coconut, plantain, and orchards of mango, sapota and guava. YVU campus enjoys a moderate climate. The ten-year mean minimum temperature is 28.30C and ten-year mean maximum of 38.80C. The area receives south-west and north-east monsoons. The greater portion of the rainfall however is received from the south-west monsoon between June and September. The mean annual rainfall is 2763mm. The mean number of rainy days per year is 100 days (Yogi Vemana University campus weather station, 2013).

3. MATERIAL AND METHODS

Data on butterfly fauna its abundance and seasonality was based on observation from 0700 to 1100 h and 1400 to 1600 h photographic documentation was done. The butterflies were initially identified in the field condition and unidentified butterflies were collected using nylon nets and were identified using the keys of Wynter– Blyth (1957), Kehimkar (2008) and Venkata Ramana (2011). The larvae of certain rare and very rare butterflies were collected along with host plant leaves in the petri plates and their life cycle was studied in the captive breeding conditions in the laboratory and a few in the Butterfly Park.

The butterfly fauna of the campus was surveyed from January 2013 to December 2013. The whole campus was divided into two broad habitats such as plantations (Sunflower, mango, banana) with an area of 89.65ha and natural habitats having an area of 301.79ha. These two habitats were surveyed on foot at least once a week. The butterfly species were also photo-documented during

the study period. Species identity was confirmed with the help of the field guides by Kunte (2000) and Kehimkar (2008), taxonomy and nomenclature have been updated after Kunte et al. (2011). Butterflies observed were categorized into five groups based on their abundance during the period of study. Accordingly, those species observed 80–100 % of the survey days were categorized as very common (VC), 60–80 % as common (C), 40–60 % as occasional (O), 20–40% as rare (R) and below 20% as very rare (VR). Very little documentation has been done on butterfly fauna in Andhra Pradesh. Some of the earlier documentation on butterfly fauna from Eastern Ghats adjacent areas includes S.P.Venkata Ramana (2011) who had reported 83 species of butterflies from Silent Valley Eastern Ghats of southern Andhra Pradesh. In the present study, an attempt has been made to document the richness of butterflies in Kadapa Yogi Vemana University campus and the findings are presented in this paper.

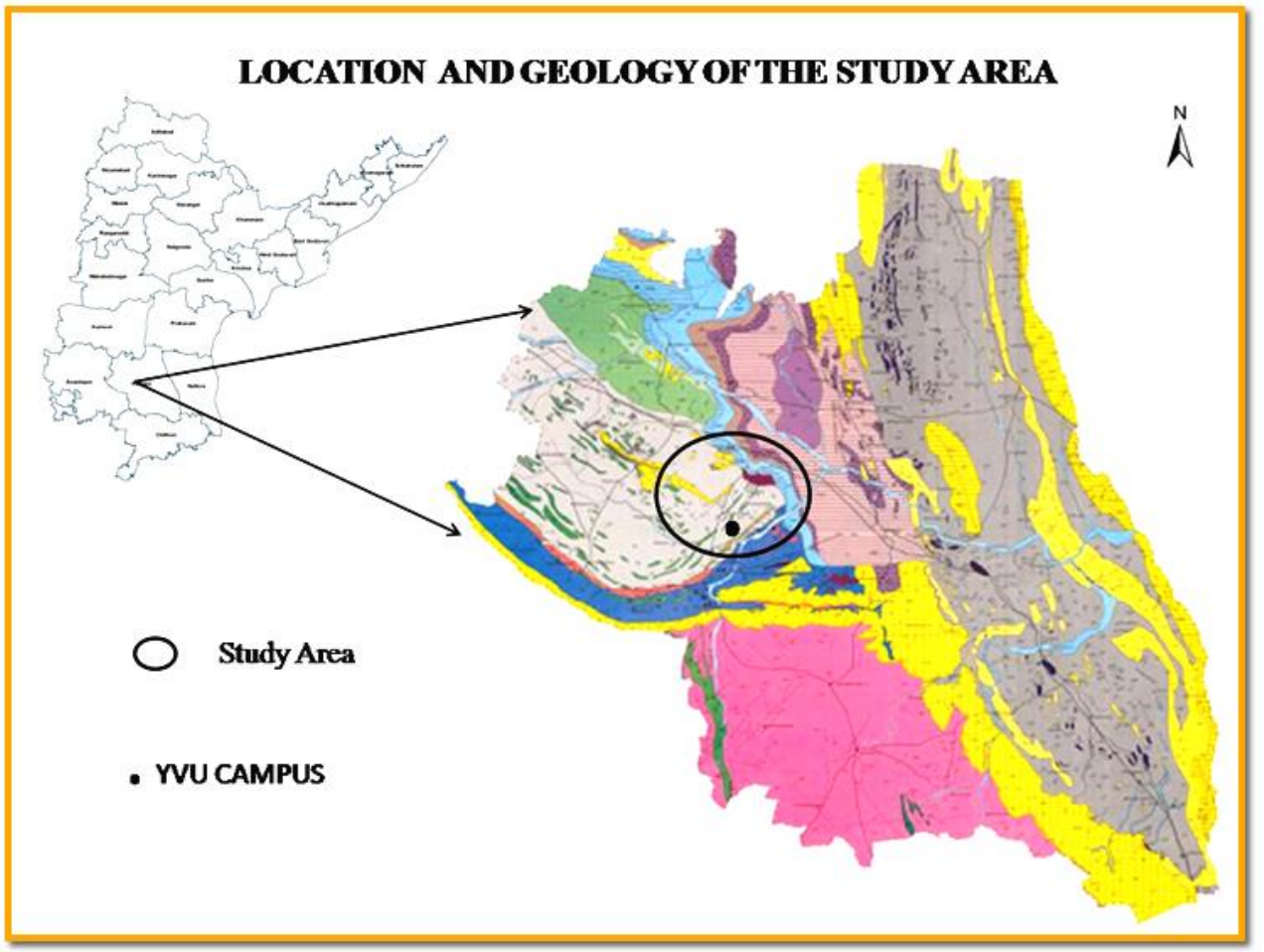


Figure – 1 Study site(Yogi Vemana University campus - Kadapa)

Table 1
Butterfly fauna of Yogi Vemana University

Scientific Name	Common Name	Season by months	Relative Abundance
Family: Nymphalidae			
1. *Danaus chrysippus chrysippus*	Plain tiger	1-12	* * * * *
2. *D. limniace leopardus*	Blue tiger	10-4	* * * *
3. *D. plexippus*	Common tiger	3-10	*
4. *Eyuploea core core*	Common crow	1-12	* * * *
5. *Elymnias hypermnestra*	Common palm fly	9-3	*
6. *Erites falcipennis*	Common Cyclops	9-3	*
7. *Melanitis leda ismene*	Common evening	9-5	* * * *
8. *Mycalesis visala subdita*	Tamil brush brown	1-3	*

9. *Ariadne merione merione*	Common castor	1-12	* * * *
10. *Euthalia garuda*	The baron	5-8	*
11. *E. nais*	The baronet	6-10	* * * *
12. *Hypolimnas bolina*	Great egg fly	6-10	* * * *
13. *H. misippus*	Danaid egg fly	7-3	* * * *
14. *Junonia almanac*	Peacock pansy	7-12	* * * *
15. *J. hierta*	Yellow pansy	6-12	* * *
16. *J. lemonias*	Lemon pansy	1-12	* * * * *
17. *J. orithyia*	Blue pansy	7-12	* * *
18. *J. iphita*	Chocolate pansy	6-12	* * *
19. *Neptis hylas*	Common sailer	10-4	* * *
20. *Phalanta phalantha*	Common leopard	1-12	* * * *
21. *Byblia ilithyia*	The Joker	3-7	* *
22. *Vanessa indica*	The Paller	4-5	*
23. *Cynthia erota*	The Devil	9-11	*
24. *Atella alcippe*	The Camel	2-4	*
25. *Acraea terpsicore*	Tawny coster	1-12	* * * * *
26. *Charaxes solon*	Black Rajah	10-4	***
27. Melanitis phedima	Dark evening brown	9-11	**
Family: Lycaenidae			
28 *Apharitis vulcanus*	Common silverline	8-10	*
29. *Castalius rosimon rosimon*	Common pierrot	1-12	* * * *
30. *Castalius caleta*	Common Comb	4-9	**
31. *Tarucus nara*	The Hill Rock	2-5	*
32. *Euchrysops cnejus*	Gram blue	1-12	* * * *
33. *Everes lacturnus syntala*	Indian cupid	6-10	* * * *
34. *Jamides celeno aelianus*	Common cerulean	1-12	* * * *
35. *Rapala airbus sorya*	Indian red flash	5-7	* *
36. *Spindasis vulcanus vulcanus*	The silverline	6-10	* * * *
37. *Talicada nyseus*	Red pierrot	4-6	* *
38. *Lycaenesthes emolus*	The wind mill	3-5	*
39. *Rapala jarbus*	Indian Red glass	4-7	* *
40. *Curetis thetis*	Oak blue	7-9	*
41. *Pratapa deva*	Common cool	12-3	*
42. *Rathinda omor*	Monkey puzzle	1-12	* * * *
43. *Deudorix perse*	Large guava blue	4-7	*
44. *Spindasis ictis*	Common short silver line	1-12	* * * *
45. *Spindasis nipalicus*	Silver gray silver line	8-10	* * * *
Family:Papilionidae			
46. *Graphium agamemnon*	Tailed jay	1-12	* * * *
47. *G. doson*	Common jay	5-10	*
48. *Pathysa nomius nomius*	Spot sword tail	6-7	* *
49. *Pachliopta aristolochiae*	Common rose	1-12	* * * *
50. *P. hector*	Cromson rose	1-12	* * * *
51. *Papilio polymnestor*	Blue Mormon	10-3	* *
52. *P. polytes polytes*	Common mormon	5-8	*
53. *P. memnon*	Common merun	3-5	*
54. *P. liomedon*	The black tail	1-3	*
55. *P. crino*	Common banded peacock	5-8	*
56. *Princeps demoleus*	Lime butterfly	3-11	* * * *
57. *Papilio helenus*	Red helen	5-8	* *
58. *Atrophaneura pandiyana*	Malabar rose	3-5	*
59. *Graphium sarpedon*	Commen blue bottle	5-8	* *
Family: Pieridae			
60. *Anaphaeis aurota*	The pioneer	1-12	* * * *

61. *Appias pandione*	Spot puffin	7-2	* *
62. *A. albina darada*	Common albatross	12-4	* *
63. *Catopsilia crocale crocale*	Common emigrant	1-12	* * *
64. *C. c. Pomona*	Lemon emigrant	6-10	* * * *
65. *C. pyranthe*	Molted emigrant	1-12	* * * * *
66. *Colotis danae danae*	Crimson tip	1-12	* * * * *
67. *C. eucharis eucharis*	Plain orange tip	1-12	* * * * *
68. *C. fausta*	Large salmon arab	6-11	* * * * *
69. *C. amata*	The Rose tip	8-12	**
70. *Cepora nerissa nerissa*	Common gull	1-12	* * * *
71. *Delias eucharis*	Common jezebel	9-12	* *
72. *Eurema hecabe simulate*	Common grass yellow	1-12	* * * *
73. *Leptosia nina nina*	The psyche	9-4	* *
74. *Valeria valeria anais*	Common wanderer	1-4	* * *
75. *Eurema blanda*	Three spot grass yellow	9-4	* * *
76. *Eurema brigitta*	Small grass yellow	1-12	* * * *
Family: Hesperiidae			
77. *Borbo cinnara*	Rice swift	1-12	* * * *
78. *Pelopidas mathias mathias*	Small branded swift	1-12	* * * *
79. *Hasora alexis*	Common banded Awl	2-8	* *
80. *H. nexis*	The Red dot	4-5	*
81. *spialia galba*	Indian skipper	1-12	* * * *
82. *Sarangesa dasahara*	Commen small flat	8-10	* * *
83. *Caprona agama*	Spotted angle	9-4	* * *
84. *Tara ctrocera maevius*	Commen grass dart	9-4	* * *
85. *Gegenes Nostradamus*	Dingy Swift	6-11	* * *

***very rare **rare ***less common ****common *****very common**

Table 2

Butterfly Ovipositing Host Plants

Butterfly Species	**Larval host plant**
1. Danaus chrysippus	:*Calotropis gigantea, C. procera*
2. Euploea core	: *Ficus indica, F. religiosa, Neeriumodorum*
3. Tirumala limniace	:*Vottacaca*
4. Danaus plexippus	: *Raphistemma pulchellum*
5. *Euploea crassa*	:*Ficus hispida*
6. *Melanitis zietenius*	: Bamboos
7. *Melanitis leda*	:Grasses
8. *Elymnias sps.*	: Palms
9. *Mycalesis*	:Grasses
10. Euthalia nais	: *Shorea robusta*
11. E. garuda	: *Mangifera indica, Anacardium oxidentale*
12. Neptis hylas	: *Dalbergia*
13. Precis hierta	: *Asteracantha longifolia*
14. P. orithya	: *Justicia procumbens*
15. P. lemonias	: *Asestacea gangetica, Asteracanthalongifolia*
16. P. almanac	: *Sarlaria, Asteracantha longifolia*
17. P. atlites	: *Sarlaria, Asteracantha longifolia*
18. P. iphita	: *Sarlaria, Asteracantha longifolia*
19. Bablia ilithyia	: *Eupherbiaceae sps.*

20.	*Ergolis merione*	: *Ricinus comunis*
21.	*Acraea terpsicore*	: *Hybanthes ennespermus*
22.	*Talicada nysus*	: *Bryophyllum calycinum*
23.	*Castalius rosiumon*	: *Zizyphus jujuba*
24.	*Euchrysops enesus*	: Legurmineceus sps.
25.	*Jamedes celeno*	: *Pongamia glabra*
26.	*Lampides boretious*	: *Crotalaria capensis*
27.	*Rathinda amor*	: *Ixora croton sps.*
28.	*Spindasis vulcanus*	: *Zizyphus jujuba*
29.	*Wretis thetis*	:*Pongamia glabra*
30.	*Pachliopta aristolochiae*	: *Aristolochiae indica*
31.	*Pachliopta hector*	: „
32.	*Papilio polymnestor*	: *Citrus sps.*
33.	*P. polytes*	: „
34.	*Princeps demoleus*	: *Murraya Korenigii*
35.	*Graphium Agamemnon*	: *Polyalthia longifolia*
36.	*G. doson*	: „
37.	*Leptosia nina*	:*Capparis spinosa*
38.	*Cepora nerissa*	: *Cafllaros spoaroa*
39.	*Colotis sps.*	:*Cadaba indica*
40.	*Catopsilia sdps.*	: *Casia siamea, Casia occidentalis*
41.	*Eurema hecabe*	: *Casia tora, mimosa pudica*
42.	*Taroctrocera maeviers*	: Grasses
43.	*Barbo cinnara*	: Grasses
44.	*Striuntus galba*	: Grasses
45.	*Amathusia phidippus*	: Palms
46.	*Euthalia patala*	: *Werus incana*
47.	*Neptis columella*	: *Dalbergia*
48.	*Vanessa indica*	: *Urtica sps.*
49.	*Cynthia erota*	: *Modecca palmate*
50.	*Cethosia cyane*	: *Passiflora*
51.	*Dodona eugenes*	: Bamboo & grass.
52.	*Castalius caleta*	: *Zizyphus rogosa*
53.	*Tarucus Theophrastus*	: *Zizyphus jujube*
54.	*Everes argiades*	: *Lotus corniculatus*
55.	*Everes dipora*	: *Flemingia fruticulosa*
56.	*Euchrsops enejus*	: *Ougenia dalbergioides*
57.	*Jamides bochus*	: flower of *Butea frondosa*
58.	*Curetisnthetis*	: *Pongamia glabra*
59.	*Horsefieldia aniata*	: *Olax scandens*
60.	*Spindasis lohita*	: *Terminalia paniculata*
61.	*Tajuria lippus*	: *Loranthus lonigflorus*
62.	*Rapala nissa*	: *Indigo atropurpurea*
63.	*Rapala dieneces*	: *Schmicdelia racemosa*
64.	*Triodes* minos	: Aristolochia *indica*
65.	*Chilsa clytia*	: *Cinnamomum Zylanium*
66.	*Papilio polymnester*	: *Citrus decumana*
67.	*P.mennon*	: *Citrus sps.*
68.	*P.manchan*	: *Umbelliferae*

69.	*Belenois mesentina*	: *Capparis sps.*
70.	*Pieris sp*	: *Cruciferae*
71.	*Hasorer vita*	: *Milletia racemosa*
72.	*Suastus gremius*	: Palms
73.	*Matapa* aria	: Bambus
74.	*Potanthus*	: *Bambus*
75.	*Jambrix salsata*	: *Grasses*

Table 3
Butterfly Nectar Host Plants

Name of the Nectar host plant	Flowering season	Flower color
1. *Cadaba fruiticosa* (L.) Druce	Throughout year	Green
2. *Capparis spinosa* L.	Dec. to Feb	Green
3. *Cleome viscose*	Jun to Feb	Yellow
4. *Hibiscus rosasynensis* L.	Throughout year	Red
5. *Sida acuta* ;Burm.	Aug to Dec	Yellow
6. *S. cardifolia* L.	Aug to Dec	Yellow
7. *Waltheria indica* L.	Jul to Oct	Yellow
8. *Muntingia calabura* L.	Throughout year	White
9. *Tribulus terrestris* L.	Jun to Oct	Yellow
10. *Murraya koenigii* Spreng.	Apr to May	White
11. *Azadiorachta indica* A. Juss	Feb to Apr	White
12. *Scyutia myrtina* Kurz	Feb to Apr	Green
13. *Zizyphus mauritiana* Lamk.	Aug to Oct.	Green
14. Z. oenoplia Mill	Aug to Oct	Green
15. Z. xylopyrus Wild	Jun to Aug	Green
16. *Sapindus emarginatus* Vahl	Oct to Feb	Yellow
17. *Anacardium occidentale*, L.	Dec. to Mar	Yellow
18. *Moringa oleifera*, Lamk.	Throughout year	White
19. *Pongamia glabra* Vent.	Apr to Jun	White
20. *Caesalpinia coriaria* Wild	Jul to Sep	Yellow
21. *C. pulcherrima* Swartz.	Thoughout year	Red
22. *Peltophorum pterocarpus* DC.	May to Sep	Yellow
23. *Albizzia lebbeck* Benth.	Mar t o May	White
24. *Enterolobium saman*, Prain.	Mar to May	Pink
25. *Syzygium jambolanum*, DC.	May to Jul	White
26. *Alangium lamarckii*, Thw.	Mar to Apr	White
27. *Borreria hispida*, K.Sch.	Jul to Oct	Pink
28. *Hamelia patens*, Jacq.	Throughout year	Red
29. *Ixora arborea*, Roxb.	Throughout year	White
30. *Randia brandisii* Gamble n. comb.	Jun to Aug	Yellow
31. *Cosmos sulphureus*, Cav.	Throughout year Sep to Dec (P)	Orange Red
32. *Eupatorium majus*, Vahl	Pink	Pink
33. *E. triplinerve*, Vahl	Sep to Jan	Pink
34. *Gaillardia picta*, Sweet.	Nov to Dec.	Red
35. *Helianthus debilis*, Lam.	Sept to Dec	Yellow
36. *Lagasca mollis*. Cav.	July to Oct	White
37. *Tridax procumbens* L.	Throughout year	Yellow
38. *Tithonia rotundifolia*. Blake.	Throughout year	Orange-Red
39. *Jasminum angustifolium*. Wild.	Jun to Aug	White
40. *Carissa carandus* L.	Throughout year	White

41. *Carissa spinarum*, L.	Apr to Jul	White
42. *Catharanthus roseus* (L.) Don.	Throughout year	Pink
43. *Nerium odorum* L.	Throughout year	Pink
44. *Rauwolfia serpentine*, Benth.	Sep to March	White
45. *Wrightia tinctoria*, R.B.R.	Apr to Jun	White
46. *Merremia tridentate* Hallierf.	Aug to Oct	Yellow
47. *Pedalium murex* L.	May to Aug	Yellow
48. *Adhatoda vasica* Nees.	Jan to Mar	White
49. *Asystasia gangetica* (L.) T.And.	Jun to Nov	,,
50. Justicia procumbens L.	Jun to Oct	*Pink*
51. *Citheroxylon subserratum*, SW.	Apr to Jul & Sep	White
52. *Clerodendron phlomidis*, L.	May to Aug	,,
53. *C. infortunatum*, L.	Mar to Apr	,,
54. *Duranta repens* L.	Jun to Dec	Violet
55. *Lantana camara* L.	Throughout year	Orange-red
56. *Premna latifolia* Roxb.	May to Aug	White
57. *Stachytorpheta indica* Vahl.	Jun to Sep	Violet
58. *Tectona grandis* L.	Throughout year	Violet
60. *Hyptis suaveolens* Poit	Sep to Nov	Violet
61. *Ocimum basilicum* L.	Jul to Sep	White
62. *Leucas aspera*	Jun to Oct	,,
63. *Bougainvillea spectabilis* Willd.	Throughout year	White
64. *Santaalum album* L.	Jun to Oct	Purple-red
65. *Antigonon leptopus* Hook & Arm.	Throughout year	Pink
66. *Jatropha gossypifolia* L.	Jun to Aug	Red
67. *J. podagrica*, Hook.	Throughout year	Red
68. *Euphorbia splendens*, Hook.	Throughout year	Red
69. *Strychnos nux-vomica*	Feb to May	Pale White
70. *S. potatorum*	Apr to Jun	Pale white
71. *Ravenala madagascrensis*	May to Aug	Yellow
72. *Caryota urens*	Apr to Jun	Red
73. *Conocarpus erectus*	July to Sep	White
74. *Sanseviera roxburghiana*	Sep to Nov	White
75. *Aloe veera*	June to Dec	White
76. *Agave picta*	Apr to July	White
77. *Agave striata*	Apr to Jun	White
78. *Phoenix sylvestris*	Sep to Nov	Pink-Cream
79. *Balnites aegyptica*	Sep to Nov	Yellow
80. *Agave attenuate*	Apr to July	White
81. *Adenium abesum*	Oct to Nov	Pink
82. *Gloriosa superba*	Sep to Dec	Red
83. *Rosa indica*	Throughout the year	Various colours
84. *Pulmaria rubra*	Sep to Nov	White

85. *Synadenium grandis*	Sep to Nov	Red
86. *Yucca gloriosa*	May to July	White
87. *Tabebuia argentea*	Apr to July	White
88. *Neolamarckia cadamba*	May to Aug	Red
89. *Hymenodictyon orxence*	Apr to July	Yellow
90. *Ceiba pentandra*	Apr to July	White
91. *Ficus religiosa* (serves as a larval host)	May to Aug	Cream
92. *Ficusbenghalensis* (serves as a larval host)	May to Aug	Cream
93. *Ficus racemosa* (serves as a larval host)	May to Aug	Cream
94. *Heliconia rostrata*	Throughout the year	Red
95. *Drimia nagarjuna*	Sep to Dec	Yellow
96. *Dalbergia sisso*	Apr to Jun	White
97. *Mitragyna parviflora*	May to Aug	Red
98. *Citrus lemon* (serves as a larval host)	Apr to July	White
99. *Mangifera indica* (serves as a larval host)	Mar to Jun	White
100. *Annona squamosa* (serves as a larval host)	Sep to Nov	White-yellow
101. *Opuntia dellini*	Sep to Dec	Pink
102. *Datura metal*	Aug to Nov	Brown-white
103. *Calistomen citrates*	Sep to Nov	Red
104. *Bouchirosia umbrellata*	Jun to Dec	Think Red
105. *Cereus pterogonus*	Sep to Nov	White-cream
106. *Erythrina variegate*	Aug to Nov	Red
107. *Calotropis procera* (serves as a larval host)	Throughout the year	Lavender-White
108. *Calotropis gigantia* (serves as a larval host)	Throughout the year	White
109. *Mrytus cummunis*	Jun to Nov	Pink white
110. *Liliacea Sp*	July to Dec	Various colours
111. *Tinospora cordifolia*	Jun to Nov	Red
112. *Syzygium cumini*	Sep to Dec	White
113. *Striga gesnerioides*	Jul to Oct	Red
114.*Habenasia roxburghii*	Sep to Dec	Yellow
115. *Echinops echinatus*	Jun to Sep	White
116. *Cleome gynandra*	Jul to Oct	Pink
117. *Cleome argentea*	Oct to Dec	Pink
118. *Cassia alata*	Jul to Dec	Yellow
119. *Cassia siamea*	Jul to Dec	Yellow
120. *Cassia fistula*	Jul to Dec	Yellow
121. *Cassia occidentalis*	Jul to Dec	Yellow
122. *Sopubia dulfinifoloa*	Aug to Nov	White
123. *Ocimum Mexicana*	Throughout the year	Red
124. *Lucas aspera*	Sep to Nov	White
125. *Ipomoea cornia*	Sep to Dec	Pale pink

126. *I.obscura*	Sep to Nov	White
127. *Nymphaea pubescens*	Throughout the year	White
128. *Nelumbo nucifera*	Sep to Nov	Pink
129. *Nymphaea nouchali*	Aug to Nov	Rose
130. *N.rubra*	Jul to Nov	Pink
131. *Mandifera indica*	Apr to Dec	Yellow
132. *Crotalaria ramossissima*	Jul to Dec	Yellow
133. *Canavalia gladiate*	Mar to Sep	Pink
134. *Aristolachia indica*	Set to Dec	Yellow
135. *Bauhinia purpuria*	Aug to Nov	Pink
136. *Gloriosa superba*	July to sep	Red-yellow
137. *Dicrostaclis cineraria*	Sep to Nov	White
139. *Eulophia gramina*	Jul to Oct	White
140. *Datura stramonium*	July to Dec	White
141. *Crytostegia grandifolia*	Jun to Oct	Pink-white
142. *Argimone Mexicana*	Jun to Nov	Yellow
143. *Acasia nilotica*	Aug to Nov	Yelloe-red
144. *Anisomeles malabarica*	Sep to Nov	Lavender
145. *Adhathoda zeylanica*	Jul to Oct	White
146. *Myrtus sp.*	May to Jun	White
147. *Morinda pubiscense*	Sep to Nov	White
148. *Trichuriella monsonia*	Oct to Dec	Pink
149. *Spathodea campnulata*	Sep to Nov	Orange
150. *Pavonia zeylanica*	Aug to Sep	Lavender-white
151. *Plumaria sp.*	Sep to Nov	Pink-white
152. *Lepidogathis cristata*	Aug to Dec	White

Table 4
Wing-position of different Butterflies while foraging at flowers

Name of the butterfly	Wing fluttering	Wing spreading	Wings upright and half opened	Wings upright and adpressed
Danaus chrysippus	-	+	-	+
Tirumala limniace	-	-	-	+
Euploea core	-	-	-	+
Melaniotis leda ismene	-	+	-	-
Euthalia garuda	-	+	-	-
Hypolimnas bolina	-	+	-	+
H. misippus	-	+	-	+
Precis almanac	-	-	+	-
P. hierta	-	+	+	-
P. lemonias	-	+	+	-
P. orithyia	-	+	-	-
Phalanta phalantha	-	+	-	+
Acraea violae	-	+	-	+
Apharitis vulcanus	-	-	-	+
Castalius rosimon	-	-	-	+
Euchrysops cnejus	-	-	-	+

Jamides celeno	-	-	-	+
Rapala jarbus sorya	-	-	-	+
Pachliopta aristolochiaae	+	-	-	-
P. hector	+	-	-	-
Graphium Agamemnon	+	-	-	-
G. doson	+	-	-	-
G. nomius	+	-	-	-
Papilio demoleus	+	-	-	-
P. polymnestor	+	-	-	-
P. polytes romulus	+	-	-	-
Anapheuis aurota	-	-	+	+
Appias albino darada	-	-	+	+
Catopsilia crocale	-	-	-	+
C. crocale pomona	-	-	-	+
Cepora nerissa	-	-	-	+
Colotis danae	-	-	+	-
C. eucharis	-	-	+	-
C. fausta	-	-	+	-
Delias eucharis	-	-	-	+
Eurema hecabe	-	+	-	+
Valeria valeria anais	-	+	-	+
Borbo cinnara	-	-	-	+
Pelopidas mathias	-	-	-	+

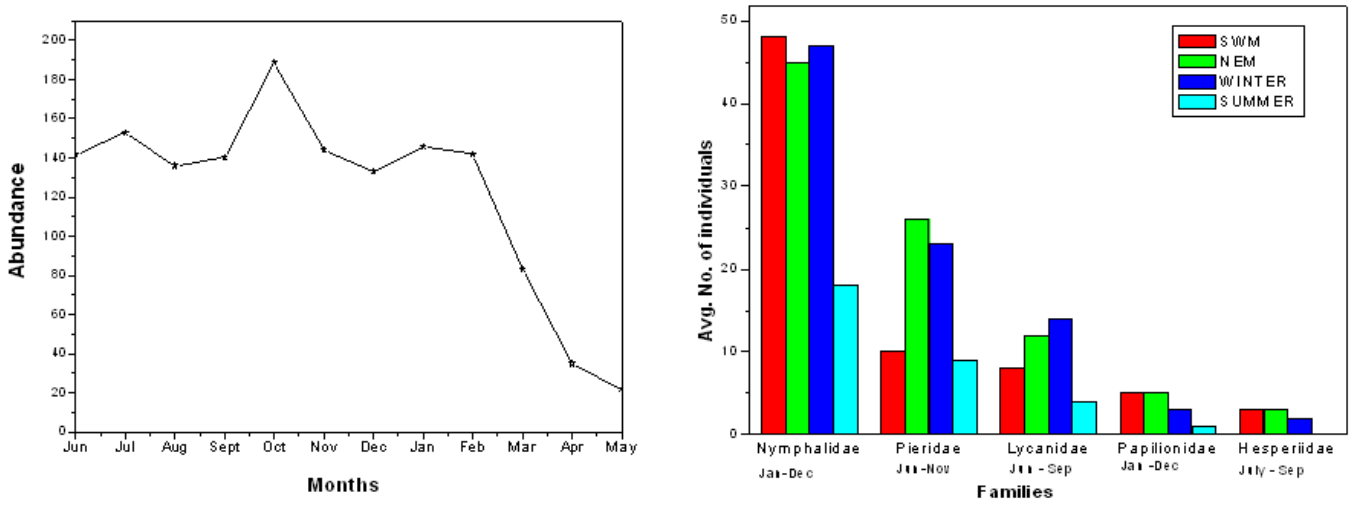


Figure 2

Abundance profile for butterflies observed in different months at Yogi Vemana University campus, Kadapa

4. RESULTS AND DISCUSSION

For the first time the study has been taken up during the period January 2013 to December 2013 in the university campus to study the seasonal abundance and diversity of butterfly population. The Yogi Vemana University Campus spread in an area of 700 acres with thousands of varieties of plants which serve as larval (Table 2 & plate 5) and nectar host plants (Table 3, Plate 3 & 4). In present investigation we have identified 70 species of butterflies (Table 1) from 5 families (Plate 1 & 2). The Nymphalidae butterflies were the dominant species in the campus and are present throughout the year with much abundance during June to August and decline gradually from October to December. Papilionidae butterflies were the spectacular species in the study area with their large wings. Hesperiidae species are commonly called as Skippers because of their rapid, bouncing flight. These species form the less dominant

group in the campus with only five species. The pieriids which are commonly called as whites and yellows are also present almost throughout the year. *Catopsilia pomona* this was the common migrant. *Danaus chrysippus, Tirumala limniace*, *Euploea core, Eurema hecabe, Papilio demoleus, & Castalius rosimon* are the most common species that are abundant in number and can be seen throughout the year. Anthropogenic effects due developmental activities in the campus uprooted some of the larval host plants. As these butterflies are host specific the unavailability of the host plants may lead to the extinction of the species. In present study we have investigated nine very rare and eight rare species and have applied the captive breeding method in order to restock the population into the wild. We have collected the egg, larvae and pupae of the rare and very rare species along with the leaves of larval host plants to the butterfly lab and reared them by captive methods and the adults were released in the environment. From 2010 onwards nearly 8000 butterflies were released in to the wild in order to restock their population as a conservation measure and also telecasted the importance of conserving the locally available species through various awareness programmes such as seminars, TV programmes, and debates.

A total of 70 species of butterflies belonging to five families were identified from the Yogi Vemana University campus including four species that are endemic to the Eastern Ghats and two species protected under various schedules of the Indian Wildlife (Protection) Act, 1972 (Table 1). The family-wise distribution of butterflies of the University campus was given in Figure 2. Family Nymphalidae (brush-footed butterflies) dominated the butterfly fauna of Yogi Vemana University campus with 25 species followed by Lycaenidae (blues) 15 species, Hesperiidae (skippers) 4 species, Pieridae (whites and yellows) 15 species, Papilionidae (swallow-tails) 11 species. Among the two broad habitat types at the University campus species richness was found to be more in natural areas with 60 species followed by plantations (98) (Figure 3) (Table 4). Habitat preferences of butterfly families (Figure 3) also show that the natural habitats have more number of species when compared to the man-modified habitats. This observation is quite significant and it emphasizes the importance of University campuses in the conservation of biological diversity of a region.

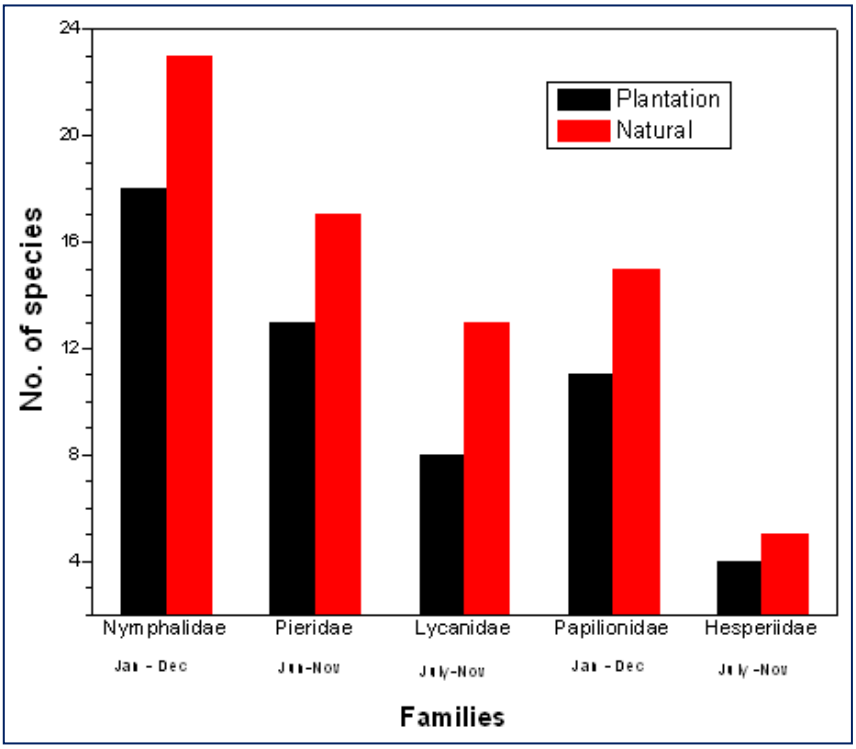
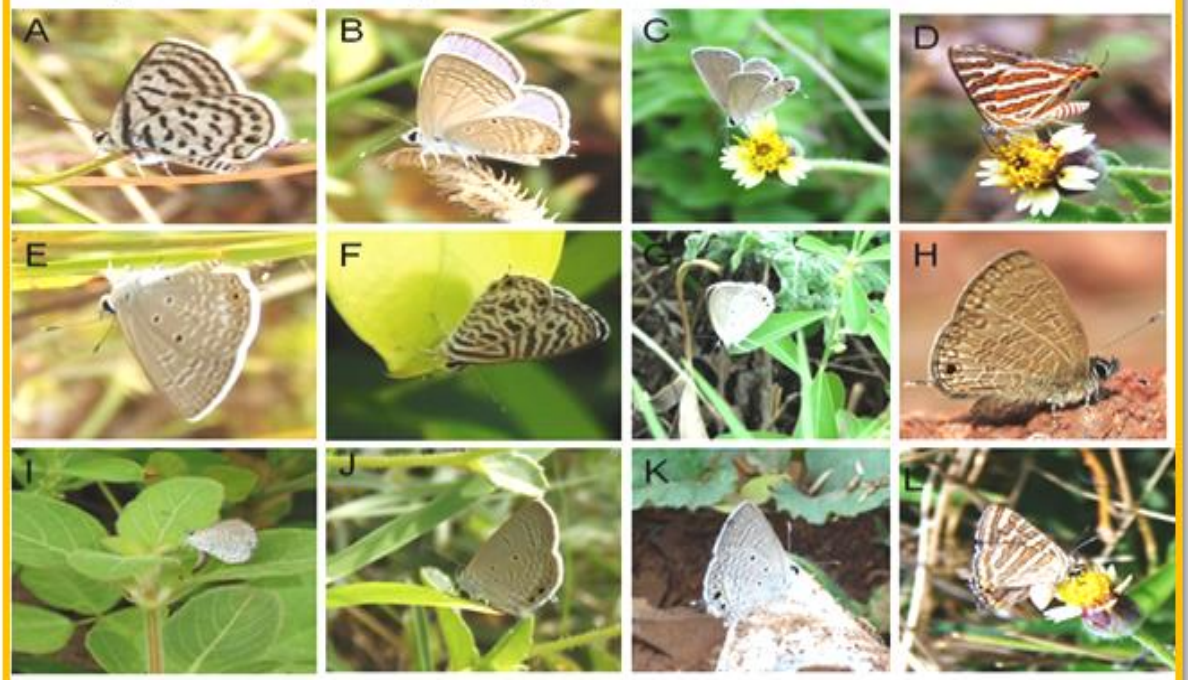


Figure 3
Habitat preference of the butterfly families at Yogi Vemana University Campus, Kadapa

5. CONSERVATION AND CURATION

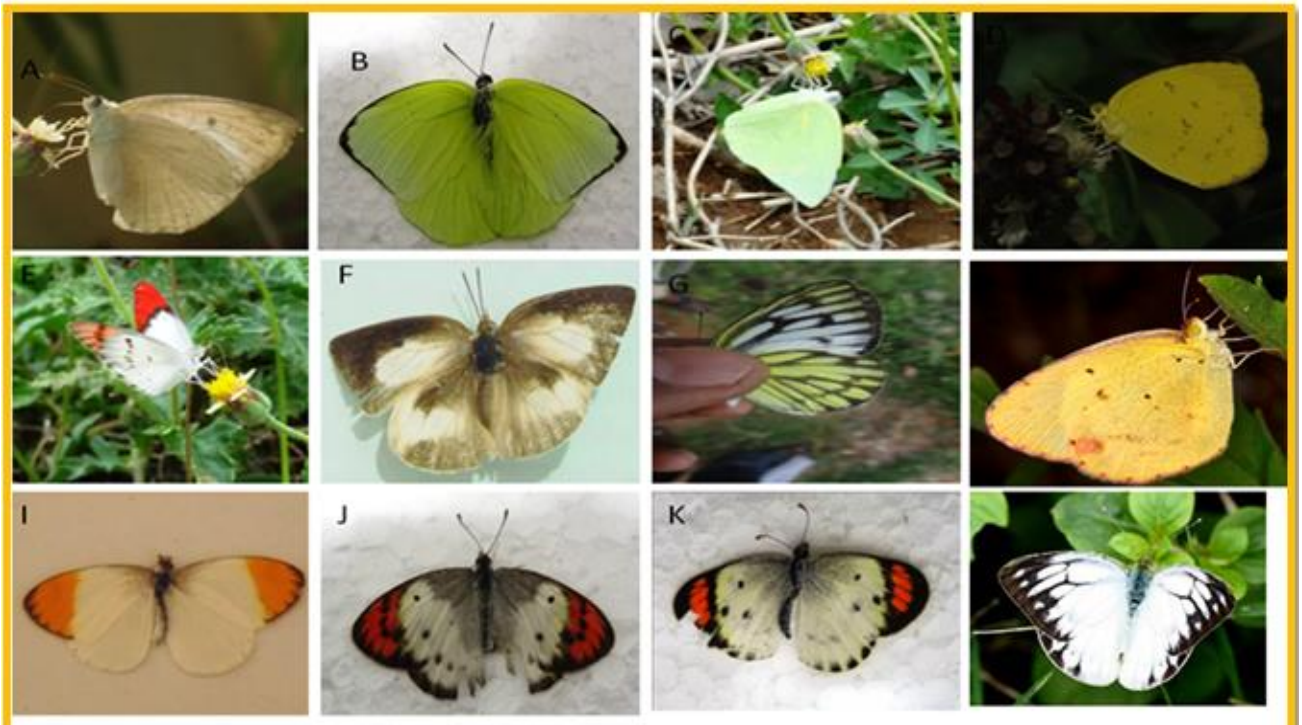
In Papua New Guinea (PNG), butterfly farms make as much as 16 times that varieties per capita income. Similar operations boast similar success in Coasta rica, Colombia, Malaysia and Thailand. The Kipepeo project won the Dubai international prize in 1998 for its successful efforts in utilizing peoples' support for the conservation of Arabuko-Sokoke forest, by involving forest-edge communities in butterfly farming of the overall effects of the project on the forest and rural communities have been positive. Ecotourism is getting popular with tourists visiting wild resources. Revenue from such tourism should be ploughed back for the benefit of the locals. Today all over the world butterfly business turnover between US $ 20 to 30 million per year. Several thousands of dead butterflies are supplied to museums and private collections and to the producers of fancy items for the general market. Collected insects were pinned or mounted and stored dry, although the adults of some orders and all soft bodied immature insects are preserved in vials of 70 – 80% ethanol or mounted onto microscope slides. Pupal cases, cocoons, waxy coverings and exuviate were kept dry and either pinned mounted on cards or points or delicate stored in gelatin capsules or in preserving fluid.

A. *Libythea lepita* B. *Junonia orithiya* C. *Palantha Plantha* D. *Junonia almana* E.*Bybilia ilithyia* E. *Junonia hierta* G. *Mycalesis oculus* H. *Danius guntia* I. . *Euploea core* J. *Hypolimnas missipus* K. *Elymnias hypermnestra* L. *Vanessa cardui*



A. *Castalius rosimon* B. *Lampides boticus* C. *Chilades Pandava* D. *Spindasis Vulcanus* E. *Forget me not* F. *Leptotes plinius* G. *Chilades pandava (female)* H. *Nachanda karava* I. Zizula *hylax* J. *Euchrysops cnejus* K. *India cupid* L. *Spindasis Vulcanus*

Plate - 1. Butterflies of the Yogi Vemana University Campus



A.*Catopsilia pomona* B. *Catopsilia pomona* C.*Catopsilia pyranthe* D. *Eurema hecabe* E. *Colotis danae (male)* F. *Colotis vastalis* G. *Cepora nadina* H. . *Eurema brigitta* I. *Colotis eucharis* J. *Colotis Danae* K. *Colotis etrida* L. *Appias libythea*

A. *Atrophaneura aristolochiae* B. *Atrophanera hector* C.*Grapium nomius* D.*Papilio polymnester* E. *Papilio demolius* F.*Papilio polytes* G. *Grapium agamemnon* H.*Grapium dosan*

Plate - 2. Butterflies of the Yogi Vemana University Campus

A. *Argyreia pilosa* **B.** *Agrimone mexicana* **C.** *Anisomeles malabarica* **D.** *Acacia nilotica* **E.** *Almanda Sp* **F.** *Abutilon hirtum* **G.** *Agrimone mexicana* **H.** *Caralluma lasiantha* **I .** *Bauhinia purpurea* **J .** *Cassia alata* **K .** *Barleria prionotis* **L .** *Canavalia gladiata*

Plate: 3 Nectar host plants of the Yogi Vemana University Campus

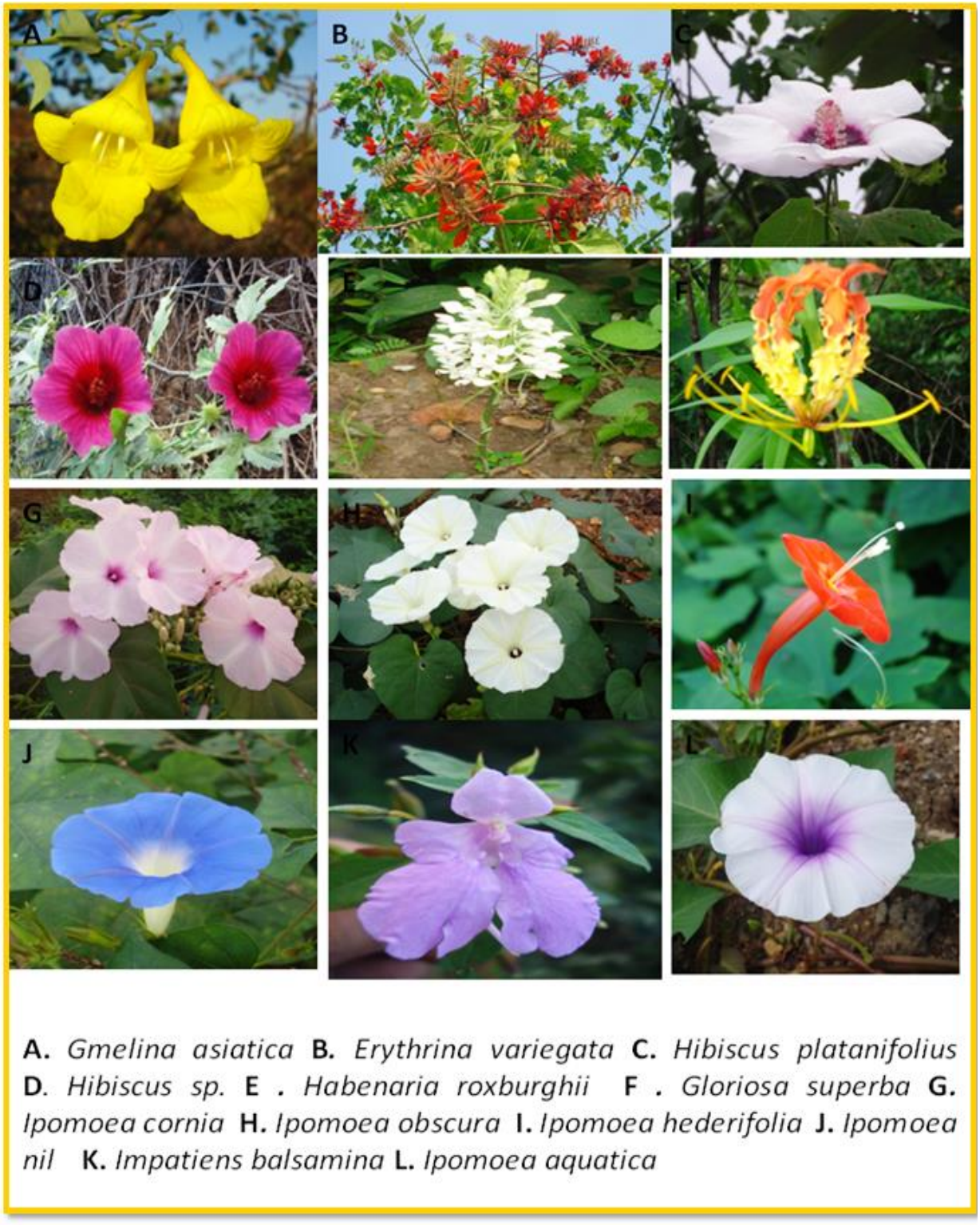


Plate: 4 Nectar host plants of the Yogi Vemana University Campus

A.Calotropis gigantea **B.** *Hybanthusennespermus* **C.** *Asteracantha longifolia* **D.** *Hibiscus cannabinus* **E.** *Asestacia. Gangetica* **F.** *Cassia tora* **G.** *Cassia fistula* **H.** *Cassia occidentalis* **I.** *Aristolachia indica* **J.** *Cycas circinalis* **K.** *Terminalia sp* **L.** Pomogranate

Plate: 5 Larval host plants of the Yogi Vemana University Campus

SUMMARY OF RESEARCH

This work within the limits of available resources provides necessary information about the identification of butterfly species including endemic & endangered species and also the Present study reveals the butterfly diversity and habitat richness of Yogi Vemana University Campus.

FUTURE ISSUES

Conserved species of butterflies is now being used for various in-campus biodiversity studies as well as conservation awareness programmes.

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