International Journal of Entomology Research
ISSN: 2455-4758; Impact Factor: RJIF 5.24
Received: 16-01-2021, Accepted: 17-02-2021, Published: 23-03-2021
www.entomologyjournals.com
Volume 6, Issue 2, 2021, Page No. 116-121

Occurrence and abundance of butterflies during monsoon season at Mysuru City, Karnataka

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Abstract
The field survey was conducted to study on Butterflies occurrence during Monsoon season at Mysuru, Karnataka. Butterfly species were documented from June to September, 2020 by following Standard Methods. A total of 56 butterfly species belonging to 05 different families were recorded. Further, Family Nymphalidae records highest number of Butterfly species (39.29 %), followed by Pieridae (23.21%), Lycaenidae (21.43%) and Papilionidae (10.71%) families. Least number of Butterfly species contributed by family Hesperiidae (5.36%). These Butterflies were further classified into Common (77%) and Rare (23%) based on Abundance status. Interestingly, Butterfly species *viz., Euploea core, Hypolimnas misippus, Cepora nerissa, Castalius rosimon and Pachliopta hector* which are listed in Schedule I, II and IV of Indian Wildlife Protection Act (IWPA), 1972 were documented from the study area. Thus, the present study instigates further research on various aspects on Butterfly species during different seasons at Mysuru, Karnataka which is important from the Conservation point of view.

Keywords: butterflies, nymphalidae, Mysuru City, Karnataka

Introduction
Butterflies are one of the amazing and magnificent elements of Biodiversity belonging to class Insecta and order Lepidoptera. They are popular because of their exquisitely colored and patterned wings (Ghazoul, 2002). Butterflies are essential component of an ecosystem and identified as bioindicators (Rajagopal *et al*., 2011). Being flagship species, they are capable of representing the overall health of the environment (Venketa Ramana, 2010). They accomplish pollination, a key stone ecological process in nature sustainability throughout the world (Kumar *et al.*, 2007). The term Lepidoptera was coined by Linnaeus in 1735 and is derived from Greek, *Lepidos* means "Scales" and *Petra* means "Wings". About 7% of all life forms on earth are members of the Lepidoptera. Lepidopterans are highly diverse group comprising over 250,000 species and make up around one quarter of all named species. Many Butterflies are iconic and popular. They are an extremely important group of 'Model' organisms used for centuries, to investigate many areas of biological research, including such diverse fields as Navigation, Pest control, Embryology, Mimicry, Evolution, Genetics, Population dynamics and Biodiversity Conservation (Raju Kasambe, 2018). The Butterfly fauna of Southern part of the Indian Peninsular is very rich and diverse compared to other parts of the Peninsular due to the availability of diverse habitat, a wide range of altitude gradients and associated microclimate regimes (Rajagopal *et al.,* 2011). There are approximately 17,200 Butterfly species are recorded from all over the world, amongst them 1,504 species of Butterflies are recorded in India (Arya *et al.*,2014). In Karnataka, about 318 species of Butterflies have been recorded (Shreekrupa and Raghunandan, 2020). Butterflies offer good opportunities for studies on Population and Community ecology (Pollard and Yates, 1993). Many species of butterflies are strictly seasonal and prefers only a particular set of habitats. Butterflies are given more attention throughout the world, because of their important service in environment quality assessment under terrestrial ecosystem (Ghazoul, 2002). Their short life cycle could result in rapid population size and their wide range of life style makes them sensitive to change in biotic and abiotic environment (Addai and Baidoo, 2013). Thus, Butterflies conservation needs are increasing with every year. In spite of this, Butterflies have been generally neglected and there are very few studies available on their community structures, population dynamics and the eco-climatic factors which affect Them (Jenber *et al*., 2020). Therefore, this study emphasized the occurrence and abundance of Butterflies during monsoon season at Mysuru City, Karnataka.

Materials and Methods
The field survey was carried out randomly at few selected places to record occurrence of Butterflies at Mysuru City (12^0 18'26" N Latitude, and 76^0 38'59" E Longitude at 740msl) Karnataka. Observations were carried out during monsoon season from June to September, 2020 at 8.00 to 11.00hrs and 16.00 to 18.00hrs. The study area also known as *'Sandalwood city of India', 'Cultural capital of Karnataka'* and *'City of Palaces'* lies in the foothills of Chamundi hills endowed with several lakes and important river namely *Kaveri* and its tributary *Kabini.* The Mysuru city experiencing temperature ranging from 10.2°C to 38°C with an average Annual Rainfall around 798.6 mm (IMD, 2020). The area supports diverse flora, necessary for Butterflies existence. The Butterfly species were recorded by employing Pollard Walk Method (PWM) as per the Standard Methods of (Kunte, 1997 and Gupta *et al.,* 2012). The abundance of Butterflies was determined as per Shreekrupa and Raghunandan, 2020 and Sayeswara, 2018

and Classified them into Common and Rare categories. Identification of recorded Butterflies was based on field guides, captured photographs using digital camera (Canon EOS 1500D, 24.1MP with 55 – 250mm lens) and through scientific literatures (Kunte *et al.*, 2012).

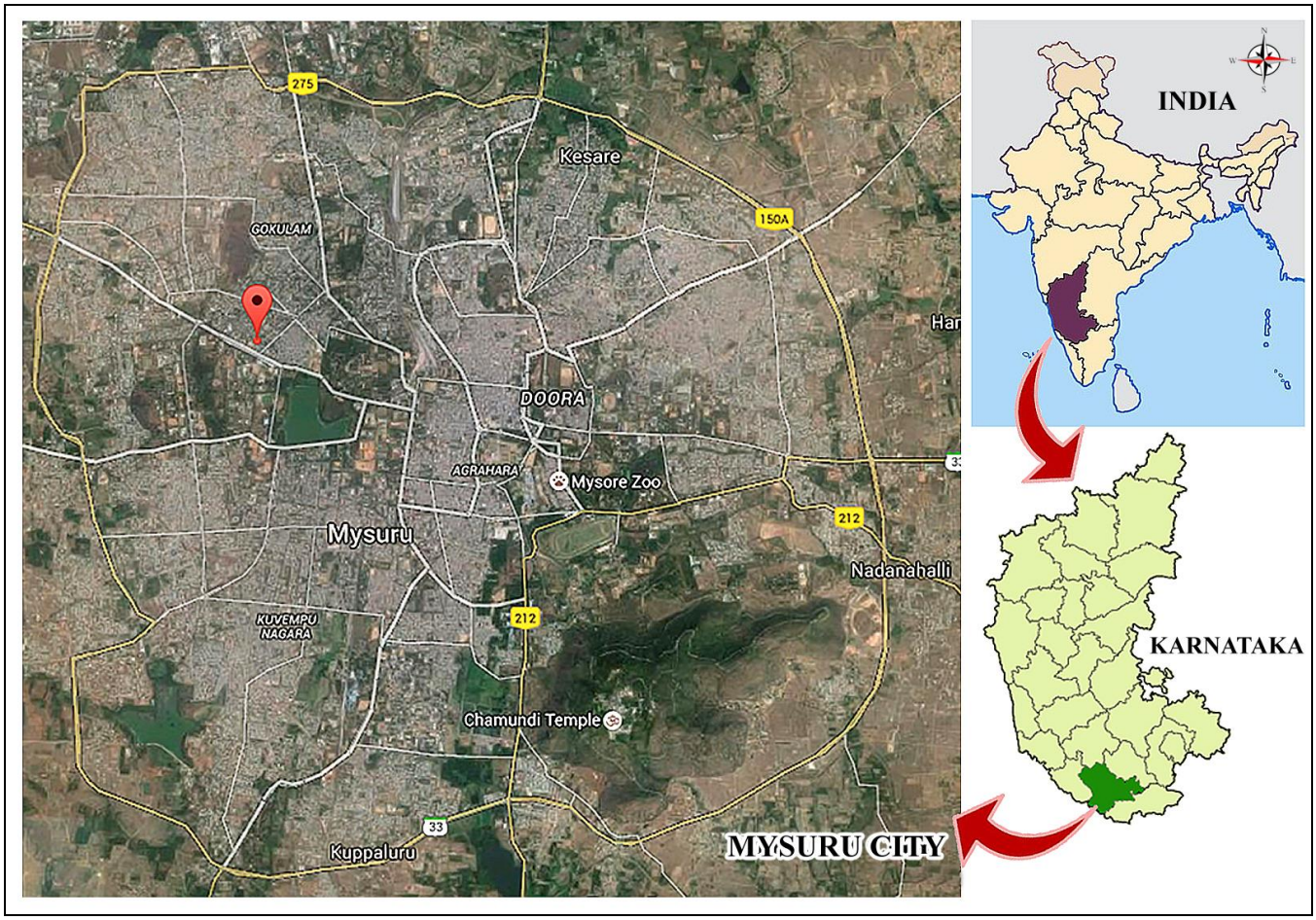

Fig 1: Map showing the study area

Results and Discussion

Occurrence and Abundance of Butterflies during Monsoon Season at Mysuru City, Karnataka is represented in Table 1. Totally 56 Butterfly species was recorded which belongs to 5 different families *viz.*, 22 species of Butterflies from Nymphalidae family, followed by 13 species from Pieridae, 12 species from Lycaenidae, 6 species from Papilionidae and 3 species of Hesperiidae were recorded. Based on the Relative abundance status the recorded Butterflies were classified into 'Common' and 'Rare' groups. Interestingly, Butterfly species *viz.*, *Euploea core*, *Hypolimnas misippus*, *Cepora nerissa*, *Castalius rosimon and Pachliopta hector* which are listed in Schedule I, II and IV of Indian Wildlife Protection Act (IWPA), 1972 were also recorded from the study area (Table 1). Percent contribution of Butterfly species recorded in the study area is depicted in Figure 2. Family Nymphalidae records highest number of Butterfly species (39.29%), followed by Pieridae (23.21%), Lycaenidae (21.43%), Papilionidae (10.71%). Whereas, least number of Butterfly species was contributed by family Hesperiidae (5.36%). Further, Butterfly species were classified into Common (77%) and Rare (23%) categories (Fig. 3). The abundance value was calculated using occurrence of Butterfly species. The *Eupolea core* was more abundant compared to other Butterfly species. This may be due to that the study area is enriched with the Butterfly species host plants accompanied with moderate climatic conditions that prevails from this area. Interestingly, the Butterfly species viz., *Blue pansy* and *Blue wanderer* was very less abundant compared to other butterfly species and the obtained results are in agree with the previous researchers (Kumar *et al*., 2007, Rajgopal *et al*., 2011, Sarjan *et al.*, 2000 and Shreekrupa and Raghunandan, 2020) and Venkata Ramana, 2010) who has carried out similar studies on Butterflies from different regions of Karnataka.

Conclusion

The present study reveals that the study area consists of 56 species of Butterflies. Wherein the existence of Butterflies are supported by the availability of floral host plants with moderate climatic regimes necessary for their diversity during Monsoon season at Mysuru City. This study depicts that the study area is home to many Lepidopterans in general and Butterfly species in Particular, wherein the family Nymphalidae members were more which reveals that the study area consists of many host plants available for Nymphalidae members, thereby increasing in their number. Also, the Butterfly species *Euploea core*, *Hypolimnas misippus*, *Cepora nerissa*, *Castalius rosimon and Pachliopta hector* which are protected under Wildlife protection act, 1972 are recorded from the study area. Thus, this study recommends that there is a dire need for the conservation of Butterfly species, which is a dynamic component of ecosystem through conservation of its native

host plant species in and around Mysuru city, Karnataka.

Acknowledgement
Second Author (RN) thankful to The Chief Executive Officer and The Principal, JSS College of Arts, Commerce and Science, Ooty road, Mysuru for permission to carry out this research work. Sincere thanks are also due to The Head, Postgraduate Department of Zoology, JSSCACS, Ooty road, Mysuru for encouragement.

Table 1: Occurrence of Butterflies recorded during Monsoon season at Mysuru, Karnataka

Sl. No	Family	Sl. No	Common Name	Scientific Name	Status	Occurrence	Abundance
1.	Nymphalidae (22 species)	1.	Angled Castor	*Ariadne ariadne* Linnaeus	C	8	0.14
		2.	Blue Pansy	*Junonia orithya* Linnaeus	R	1	0.01
		3.	Blue Tiger	*Tirumala limniace* Cramer	C	26	0.46
		4.	Chocolate pansy	*Junonia iphita* Cramer	R	4	0.07
		5.	Common Baron	*Euthalia aconthea* Cramer	R	4	0.07
		6.	Common Crow	*Euploea core* Cramer	C	31***	0.55
		7.	Common Evening Brown	*Melanitis leda* Linnaeus	C	16	0.28
		8.	Common Five Ring	*Ypthima baldus* Fabricius	C	22	0.39
		9.	Common Four-Ring	*Ypthima huebneri* Kirby	C	24	0.42
		10.	Common Tiger	*Danaus genutia* Cramer	C	8	0.14
		11.	Danaid Eggfly	*Hypolimnas misippus* Linnaeus	C	12**	0.21
		12.	Grey Pansy	*Junonia atlites* Linnaeus	R	4	0.07
		13.	Lemon Pansy	*Junonia lemonias* Linnaeus	C	19	0.33
		14.	Peacock Pansy	*Junonia almana* Linnaeus	C	17	0.30
		15.	Plain Tiger Butterfly	*Danus chrysippus* Linnaeus	C	29	0.51
		16.	Small Orange Acraea	*Acraea serena* Fabricius	C	11	0.19
		17.	Southern Sullied Sailer	*Neptis clinia* Moore	C	10	0.17
		18.	Tailed Palmfly	*Elymnias caudate* Butler	C	6	0.10
		19.	Tamil Bushbrown	*Mycalesis subdita* Moore	C	21	0.37
		20.	Tawny Coster	*Acraea terpsicore* Linnaeus	C	6	0.10
		21.	The Great Eggfly	*Hypolimnas bolina* Linnaeus	C	11	0.19
		22.	Yellow Pansy	*Junonia hierta* Fabricius	R	2	0.03
2.	Pieridae (13 species)	1.	Blue Wanderer	*Tirumala hamata* Macleay	R	1	0.01
		2.	Common Gull	*Cepora nerissa* Fabricius	C	12**	0.21
		3.	Common Jezebel	*Delias eucharis* Drury	C	16	0.28
		4.	Crimson Tip	*Colotis danae* Fabricius	R	3	0.05
		5.	Great Orange Tip	*Hebomoia glaucippe* Linnaeus	C	18	0.32
		6.	Common Emigrant	*Catopsilia pomona* Fabricius	C	22	0.39
		7.	Mottled Emigrant	*Catopsilia pyranthe* Linnaeus	C	11	0.19
		8.	Pioneer White	*Belenois aurota* Fabricius	C	18	0.32
		9.	Psyche	*Leptosia nina* Fabricius	R	4	0.07
		10.	Sara Orange Tip	*Anthocharis sara* Lucas	R	4	0.07
		11.	Three Spotted Grass yellow	*Eurema blanda* Boisduval	C	5	0.08
		12.	White Orange tip	*Ixias marianne* Cramer	C	17	0.30
		13.	Yellow orange Tip	*Ixias pyrene* Fabricius	C	5	0.08
3.	Lycaenidae (12 species)	1.	Apefly	*Spalgis epius* Westwood	C	7	0.12
		2.	Common Cerulean	*Jamides celeno* Cramer	C	8	0.14
		3.	Common Grass Blue	*Eurema hecabe* Linnaeus	C	23	0.41
		4.	Common Pierrot	*Castalius rosimon* Fabricius	C	5*	0.08
		5.	Common Silverline	*Cigaritis vulcanus* Fabricius	R	3	0.05
		6.	Dark Grass Blue	*Zizeeria karsandra* Moore	C	5	0.08
		7.	Forget-me-not	*Catochrysops strabo* Fabricius	C	17	0.30
		8.	Plains Cupid	*Luthrodes pandava* Horsfield	C	10	0.17
		9.	Red Pierrot	*Talicada nyseus* Khasiana Swinhoe	C	7	0.12
		10.	Slate flash	*Rapala manea* Hewitson	C	19	0.33
		11.	Banded Blue Pierrot	*Discolampa ethion* Westwood	C	8	0.14
		12.	White-tipped Line Blue	*Prosotas noreia* Felder	C	6	0.10
4.	Papilionidae (6 species)	1.	Blue Mormon	*Papilio polymnestor* Cramer	R	4	0.07
		2.	Blue Triangle Butterfly	*Graphium choredon* C.& R. Felder	C	5	0.08
		3.	Common Jay	*Graphium doson* Felder & Felder	C	7	0.12
		4.	Common Mormon	*Papilio polytes* Linnaeus	C	10	0.17
		5.	Crimson Rose	*Pachliopta hector* Linnaeus	C	8*	0.14
		6.	Lime Butterfly	*Papilio demoleus* Linnaeus	C	16	0.28
5.	Hesperiidae (3 species)	1.	African Marbled Skipper	*Gomalia elma* Moore	R	4	0.07
		2.	Common Straight Swift	*Parnara guttata* Bremer & Grey	C	13	0.23
		3.	Lesser Dart	*Potanthus omaha* Edwards	R	3	0.05
Total		56	-	-	-	616	-

Note: *Protected under Wildlife Act 1972 (*Under Schedule I and **Under Schedule II ***Under Schedule IV).

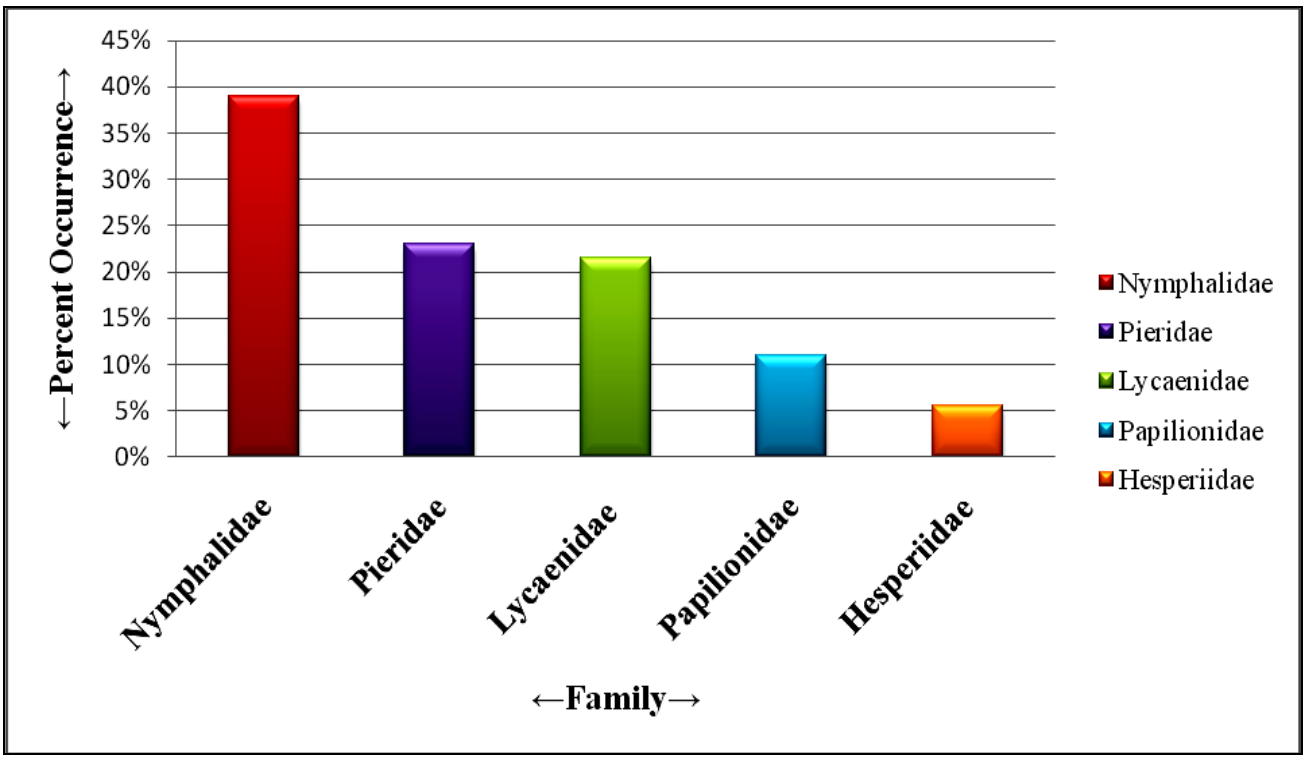

Fig 2: Percent Contribution of Butterfly families recorded at Mysuru City, Karnataka

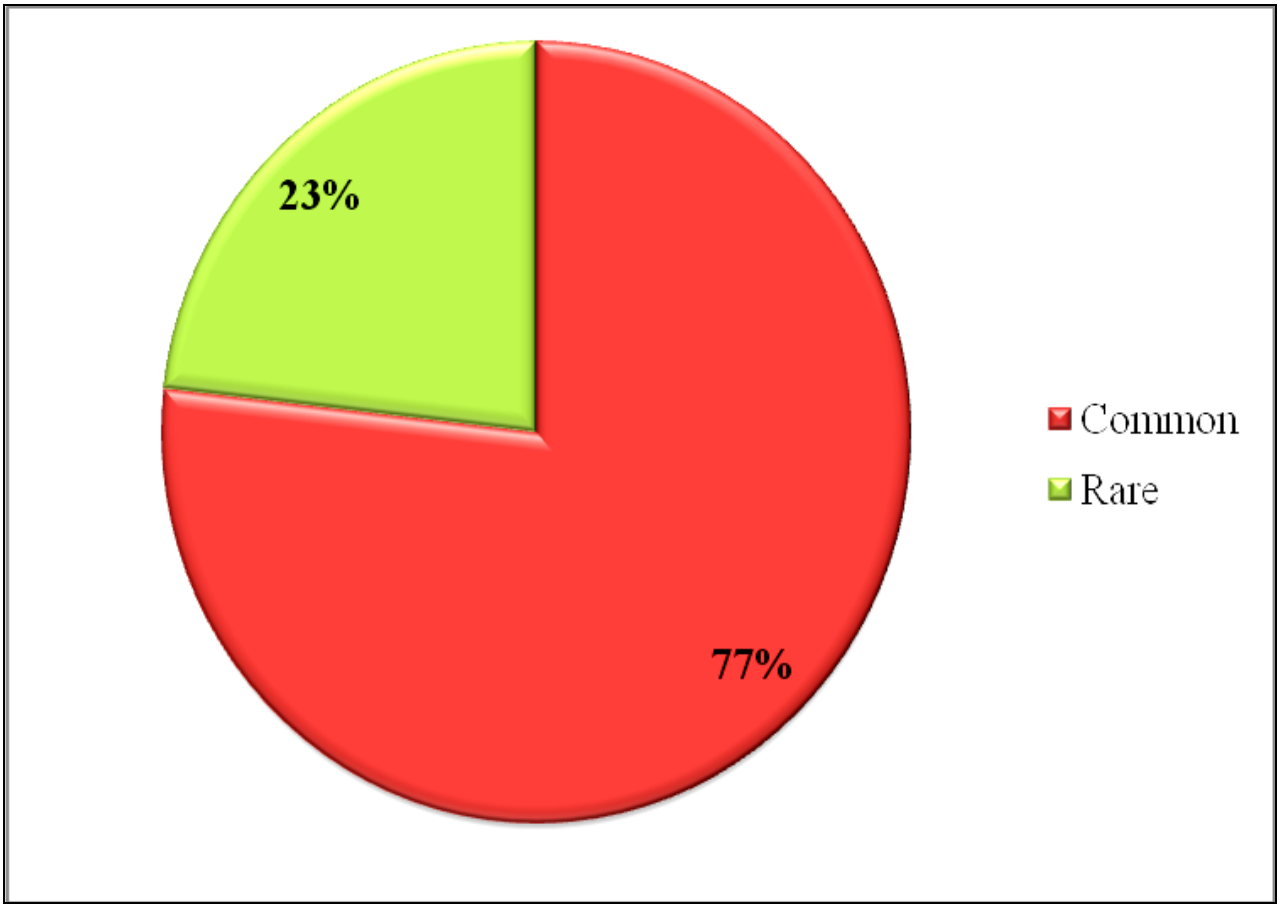

Fig 3: Percent Contribution of Relative Abundance of Butterfly species recorded at Mysuru City, Karnataka

1. Crimson Rose, 2. Blue Mormon, 3. Common Mormon, 4. Great Eggfly, 5. Lime Butterfly, 6. Common Jezebel, 7. Common Jay, 8. Crimson-Tip, 9. Common Five-ring, 10. Blue Tiger, 11. Tamil Bushbrown, 12. Common Evening Brown, 13. Peacock Pansy, 14. Lemon Pansy, 15. Peacock Pansy, 16. Grey Pansy, 17. Southern Palmfly, 18. Danaid Eggfly, 19. Yellow Pansy, 20. Blue Pansy, 21. Common Crow, 22. Angled Castor, 23. Plain Tiger, 24. Common Baron, 25. Tawny Coster, 26. Slate Flash, 27. White-tipped Lineblue, 28. Red Pierrot, 29. Common Cerulean, 30. Dark Grass Blue, 31. Common Silverline, 32. Banded Blue Pierrot, 33. African Marbled Skipper, 34. Plains Cupid, 35. Mottled Emigrant and 36. White Orange-tip.

Fig 4: Few Butterfly species recorded during Monsoon season at Mysuru City, Karnataka

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