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Assessment of Winged Jewels in selected areas of Visakhapatnam, India

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ABSTRACT

Butterflies are called as "winged jewels" due to their sparkling and vibrating appearance. They were considered to be biodiversity indicators due to their major role at the base level of the food chain. Due to increase in population and expansion of urban sectors there could be severe threat to richness to these winged jewels. The aim of the present study was to carry out diversity and abundance of the butterfly population in the City of Visakhapatnam. Two green patches of the study area (Indira Gandhi Zoological Park, Kailasagiri Park) were selected to identify butterfly species. A total of 62 species of 5 families were recorded. Family Nymphalidae recorded highest of 22 species were found followed by Lycaenidae (15), Pieridae (15), Papilionidae (7) and Hesperiidae with three species. A seasonal variation among the butterfly population was observed. Post monsoon was found to be good season for the abundance and richness of butterfly's population compared to pre monsoon season.

Key words : *Winged jewels, Green patches, Seasons, Richness and Abundance*

Introduction

Richness and abundance of the species depends on thick biodiversity. Many studies in the past showed link between biodiversity and ecosystem stating that the species diversity enhances productivity and ecosystem stability (Naeem *et al*., 1994; Tilman *et al*., 1996; Majumder *et al*., 2012). Richness of vegetation could be the home of many insects and butterflies (Kunte 1997; Alfred *et al*., 2002; Agarwala *et al*., 2010). Butterflies are very popular and known insects due to their fascinating and sparkling colours which attracts researches to do their study. In India an extensive work on butterflies were carried out by Sree Kumar *et al*., 2001; Singh *et al*., 2001, Sharma, 2009; Raut *et al*., 2010; Kunte, 2012; Nair, 2014; Basavarajappa *et al*., 2018. The presence of butterflies in an area is the good indication of proper vegetation. Butterflies existence in the ecosystem is very helpful in pollination of different plant species (Padhya *et al*., 2006; Dennis *et al*., 2017). Moreover butterflies are very sensitive towards change in climatic factors such as sunlight, temperature, humidity, rainfall (Tsai Ch *et al*., 2020). Many anthropogenic activities are involved in the change in the environmental factors, increase in population and urban development leads to pollution which shifts the pattern of butterflies and their habitats.

From the past few years the city is growing very fast in terms of human population, expansion of urban sectors and increase in pollution. Keeping this scenario the present study was taken up to identify population of butterfly in Visakhapatnam city green patches.

Methodology

Indira Gandhi Zoological Park: It is India's third largest zoological park covers about 625 acres consist of 17.7692 ºN 83.3501 ºE coordinates. It consists of Monkey Pod tree, Morning glory, West Indian *Jasmine, Senna spectabilis, Crepe Jasmine, Ficus benghalensis* as host plants for butterfly population.

Kailasagiri Park: This park is situated at hilltop of Visakhapatnam city, covers with an area of 380 acres. The park is situated at 173 meters from sea level having coordinates of 17.748997ºN 83.342235 ºE. It consists of many host plants such as Oleander, Jimsonweed, West Indian Lantana, Yellow elder, Morning glory, West Indian Jasmine, Senna spectabilis, Crepe Jasmine.

Description of Camera: To appreciate the beauty of winged jewels capturing though camera would be a fascinating thing. Most of them are fluttering and sitting on flowers for sucking nectar. To capture these butterflies in camera 35 mm single lens reflex (SLR) and Canon DSLR with macro lens is most suitable which is quite compact and versatile with macro modes gives good results. In addition to that Samsung Galaxy Note 8 mobile camera was also been used to capture.

Butterflies identification was made through by field visit and following field guides Kehimkar, 2016 and Smetacek, 2017. All scientific names and the identification of winged jewels were studied through the guide

To study the species of butterflies first sun rays falls on leaves and flowers would be a suitable time for capturing them with camera. Mostly mornings from 7.30 am to 11.30 am as they get charged by the heat of sun and their wings can be easily fluttered with dryness of heat. Cool mornings bring butterflies to bask in the sun and these will not readily fly until their bodies are warm enough, thus providing a marvelous opportunity to get photographs at close quarters.

Results and Discussion

In the present study 60 species of 45 genera and five different families was identified in Kailasagiri Park and Indira Gandhi Zoological Park. The five families include Hesperiidae, Lycaenidae, Nymphalidae, Papilionidae, and Pieridae. From Hesperiidae three species were identified, from Lycaenidae 15 species, Nymphalidae 22 species, from Papilionidae 7 species and from Pieridae 15 species were isolated which was tabulated in Table 1. The species identified were Common Banded Awl, Giant Red Eye, Indian Palm Bob, Ape Fly, Common Cerulean, Common Lineblue, Common Pierrot, Common Silverline, Forget–Me-Not, Gram Blue, Lesser Grass Blue, Lime Blue, Monkey Puzzle, Pale Grass Blue, Pea Blue, Plains Cupid, Tiny Grass Blue, Zebra Blue, Angled Castor, Blue Pansy, Blue Tiger, Chocolate Pansy, Commander, Common Baron, Common Castor, Common Evening Brown, Common Indian Crow, Common Leopard, Common Nawab, Common Palmfly, Common Sailor, Common Tiger, Common Tree Brown, Danaid Eggfly, Glassy Tiger, Great Eggfly, Lemon Pansy, Plain Tiger, Tawny Coster, Yellow Pansy, Common Jay, Common Mormon, Common Rose, Crimson Rose, Lime Butterfly, Spot Swordtail, Tailed Jay, Common Albatross, Common Emigrant, Common Grass Yellow, Common Gull, Common Jezabel, Common Wanderer, Crimson Tip, Mottled Emigrant, One Spotted Grass Yellow, Pioneer, Plain Orange Tip, Psyche, Small Grass Yellow, Three Spotted Grass Yellow, Yellow Orange Tip.

Indira Gandhi Zoological Park

The three species of Hesperiidae family were found in IGZP compared to KP as the availability of host plants are more for theses species to exist. Ten species of Lycaenidae, 17 species of Nymphalidae, six from Papilionidae, eleven from Pieridae was found in this region tabulated in Table 1 and 2.

Kailasagiri Park

Twelve species from Lycaenidae, Thirteen species from Nymphalidae, seven species from Papilionidae, Twelve species from Pieridae were identified in Kailasagiri Park.

Season wise variation among the population of the butterflies was observed in our study. The species which were very common in post monsoon become rare in pre monsoon may be due to change in the climatic conditions as well as with the presence of host plants (Pohi *et al*., 2011; Kocikova *et al*., 2015).

The presence of Nymphalidae family species were more in late monsoon and early monsoon compared to other family species in our study. Similar study was carried out by Boruah *et al.,* 2018 demonstrated that this family was dominated in the study region of Odisha. As these were largest com-

Table 1. Identification of Butterflies in the Study Area

S. No.	Name of the Butterfly	Species Name	Igzp	Kp	WPA-Wildlife Protection Act (1972) Status
HESPERIIDAE FAMILY					
1	COMMON BANDED AWL	*Hasora chromus*	√		
2	GIANT RED EYE	*Gangara thyrisis*	√		
3	INDIAN PALM BOB	*Suastus gremius*	√		
LYCAENIDAE FAMILY					
4	APE FLY	*Spalgis epius*		√	
5	COMMON CERULEAN	*Jamides celeno*	√	√	
6	COMMON LINEBLUE	*Prosotas nora*	√		
7	COMMON PIERROT	*Castalius rosimon*	√	√	Schedule-I
8	COMMON SILVERLINE	*Spindasis vulcanus*	√	√	
9	FORGET–ME-NOT	*Catochrysops Strabo*	√	√	
10	GRAM BLUE	*Euchrysops cnejus*		√	
11	LESSER GRASS BLUE	*Zizina otis*	√	√	
12	LIME BLUE	*Chilades lajus*	√	√	
13	MONKEY PUZZLE	*Rathinda amor*	√		
14	PALE GRASS BLUE	*Pseudozizeeria maha*	√		
15	PEA BLUE	*Lampides boeticus*	√	√	
16	PLAINS CUPID	*Chilades pandava*	√	√	
17	TINY GRASS BLUE	*Zizula hylax*	√	√	
18	ZEBRA BLUE	*Leptotes plinius*	√		
NYMPHALIDAE FAMILY					
19	ANGLED CASTOR	*Ariadne ariadne*			
20	BLUE PANSY	*Junonia orithya*	√		
21	BLUE TIGER	*Tirumala limniace*	√		
22	CHOCOLATE PANSY	*Junonia iphita*	√	√	
23	COMMANDER	*Moduza procris*		√	
24	COMMON BARON	*Euthalia aconthea*	√		
25	COMMON CASTOR	*Ariadne merione*	√	√	
26	COMMON EVENING BROWN	*Melanitis leda*	√	√	
27	COMMON INDIAN CROW	*Euploea core*	√	√	Schedule-IV
28	COMMON LEOPARD	*Phalanta phalantha*	√	√	
29	COMMON NAWAB	*Polyura athamas*	√		
30	COMMON PALMFLY	*Elymnias hypermnestra*	√	√	
31	Common sailor	*Neptis hylas*	√	√	
32	Common tiger	*Danaus genutia*	√		
33	COMMON TREE BROWN	*Lethe rohria*	√	√	
34	DANAID EGGFLY	*Hypolimnas missipus*		√	Schedule I& II
35	GLASSY TIGER	*Parantica aglea*	√		
36	GREAT EGGFLY	*Hypolimnas bolina*	√		
37	LEMON PANSY	*Junonia lemonias*	√	√	
38	PLAIN TIGER	*Danaus chryssipus*	√	√	
39	TAWNY COSTER	*Acraea terpiscore*	√	√	
40	YELLOW PANSY	*Junonia hierta*	√		
PAPILLIONIDAE FAMILY					
41	COMMON JAY	*Graphium doson*	√	√	
42	COMMON MORMON	*Papilio polytes*	√	√	
43	COMMON ROSE	*Pachilopta aristilochiae*	√	√	
44	CRIMSON ROSE	*Pachilopta hector*	√	√	Schedule-I
45	LIME BUTTERFLY	*Papilio demoleus*	√	√	
46	SPOT SWORDTAIL	*Graphium nomius*		√	
47	TAILED JAY	*Graphium agamemnon*	√	√	

Table 1. *Continued ...*

S. No.	Name of the Butterfly	Species Name	Igzp	Kp	Wpa (1972) Status
PIERIDAE FAMILY					
48	COMMON ALBATROSS	*Appias albina*	√		
49	COMMON EMIGRANT	*Catopsila pomona*	√	√	
50	COMMON GRASS YELLOW	*Eurema hecabe*	√	√	
51	COMMON GULL	*Cepora nerissa*	√	√	Schedule-II
52	COMMON JEZABEL	*Delias eucharis*	√	√	
53	COMMON WANDERER	*Pareronia valeria*	√	√	
54	CRIMSON TIP	*Colotis danae*			
55	MOTTLED EMIGRANT	*Catopsila pyranthe*	√		
56	ONE SPOTTED GRASS YELLOW	*Eurema andersoni*	√	√	
57	PIONEER	*Belenois aurota*	√		
58	PLAIN ORANGE TIP	*Colotis aurora*	√		
59	PSYCHE	*Leptosia nina*	√	√	
60	SMALL GRASS YELLOW	*Eurema brigitta*	√	√	
61	THREE SPOTTED GRASS YELLOW	*Eurema blanda*	√	√	
62	YELLOW ORANGE TIP	*Ixias pyrene*	√		

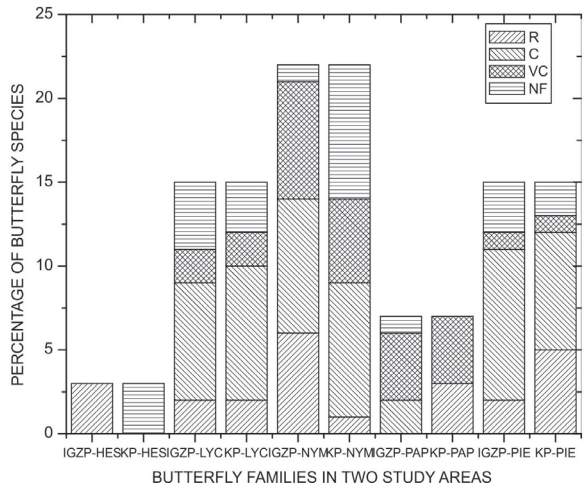

Fig. 1. Compartive study of butterflies in two different areas of post monsoon

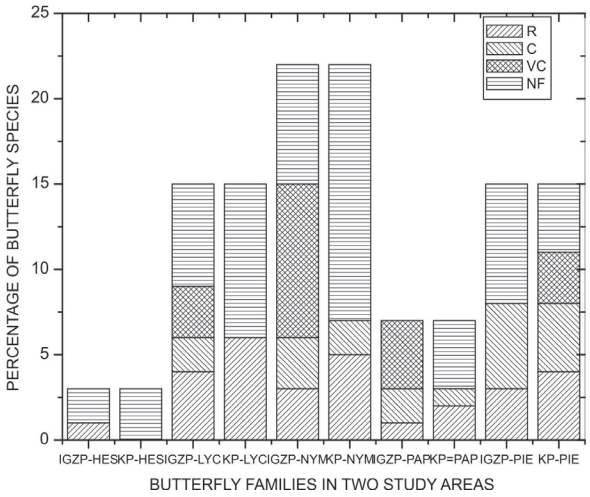

Fig. 1. Compartive study of butterflies in two different areas of premonsoon

munity in the world, in our observations 22 species were identified shown in Fig 1. The description of figure also demonstrates that some of them are rare (R), common (C), very common (VC) and some were not found (NF).

Figure 2 gives information about the butterfly species percentage in terms of common, very common, rare and not found. If we compare the two graphs it is clearly noted that pre monsoon species are less this might be due to high humidity and high temperature in the study area and post monsoon found to be suitable for enhancing the population of butterflies.

Rajagopal *et al*., 2011 revealed the community structure and diversity of species from Arignar Anna Zoological Park, Chennai and Daniel *et al*., 2018 studied butterfly diversity in Tamil Nadu agricultural university campus. In our study the species found maximum in Kailasagiri Park followed by Indira Gandhi Zoological Park.

In our study we have found smallest butterfly Tiny Grass Blue of wingspan 13 mm to largest butterfly of Blue Tiger of wingspan of 115 mm. According to Vu *et al.* 2011 the presence of grass and shrub

Table 2. Identification of Butterflies in Late Monsoon and Early Monsoon Season in the Study Area

S. No.	Name of The Butterfly	Species Name	IGZP		KP	
			Post Monsoon	Pre Monsoon	Post Monsoon	Pre Monsoon
	HESPERIIDAE FAMILY					
1	COMMON BANDED AWL	*Hasora chromus*	R	NF	NF	NF
2	GIANT RED EYE	*Gangara thyrisis*	R	NF	NF	NF
3	INDIAN PALM BOB	*Suastus gremius*	R	R	NF	NF
	LYCAENIDAE FAMILY					
4	APE FLY	*Spalgis epius*	NF	NF	R	NF
5	COMMON CERULEAN	*Jamides celeno*	C	R	C	NF
6	COMMON LINEBLUE	*Prosotas nora*	NF	R	NF	NF
7	COMMON PIERROT	*Castalius rosimon*	C	C	C	R
8	COMMON SILVERLINE	*Spindasis vulcanus*	C	R	C	NF
9	FORGET–ME-NOT	*Catochrysops Strabo*	C	NF	C	NF
10	GRAM BLUE	*Euchrysops cnejus*	NF	NF	R	NF
11	LESSER GRASS BLUE	*Zizina otis*	VC	VC	VC	R
12	LIME BLUE	*Chilades lajus*	VC	R	VC	R
13	MONKEY PUZZLE	*Rathinda amor*	R	VC	NF	R
14	PALE GRASS BLUE	*Pseudozizeeria maha*	NF	NF	C	R
15	PEA BLUE	*Lampides boeticus*	C	VC	C	R
16	PLAINS CUPID	*Chilades pandava*	C	C	C	NF
17	TINY GRASS BLUE	*Zizula hylax*	C	NF	C	NF
18	ZEBRA BLUE	*Leptotes plinius*	R	NF	NF	NF
	NYMPHALIDAE FAMILY					
19	ANGLED CASTOR	*Ariadne ariadne*	R	NF	NF	R
20	BLUE PANSY	*Junonia orithya*	R	NF	NF	R
21	BLUE TIGER	*Tirumala limniace*	R	R	NF	NF
22	CHOCOLATE PANSY	*Junonia iphita*	VC	VC	VC	C
23	COMMANDER	*Moduza procris*	C	VC	C	R
24	COMMON BARON	*Euthalia aconthea*	R	C	NF	NF
25	COMMON CASTOR	*Ariadne merione*	C	VC	C	NF
26	COMMON EVENING BROWN	*Melanitis leda*	C	C	C	NF
27	COMMON INDIAN CROW	*Euploea core*	VC	VC	VC	R
28	COMMON LEOPARD	*Phalanta phalantha*	C	NF	C	NF
29	COMMON NAWAB	*Polyura athamas*	VC	R	NF	NF
30	COMMON PALMFLY	*Elymnias hypermnestra*	VC	VC	VC	C
31	COMMON SAILOR	*Neptis hylas*	C	C	C	NF
32	COMMON TIGER	*Danaus genutia*	VC	NF	R	NF
33	COMMON TREE BROWN	*Lethe rohria*	C	NF	C	NF
34	DANAID EGGFLY	*Hypolimnas missipus*	NF	NF	C	NF
35	GLASSY TIGER	*Parantica aglea*	R	R	NF	NF
36	GREAT EGGFLY	*Hypolimnas bolina*	C	VC	NF	NF
37	LEMON PANSY	*Junonia lemonias*	C	VC	C	R
38	PLAIN TIGER	*Danaus chryssipus*	VC	VC	VC	NF
39	TAWNY COSTER	*Acraea terpiscore*	VC	VC	VC	NF
40	YELLOW PANSY	*Junonia hierta*	R	NF	NF	NF
	PAPILLIONIDAE FAMILY					
41	COMMON JAY	*Graphium doson*	C	R	R	NF
42	COMMON MORMON	*Papilio polytes*	VC	VC	VC	NF
43	COMMON ROSE	*Pachilopta aristilochiae*	VC	VC	VC	C
44	CRIMSON ROSE	*Pachilopta hector*	VC	VC	VC	R
45	Lime Butterfly	*Papilio demoleus*	C	C	R	NF
46	Spot Swordtail	*Graphium nomius*	NF	C	R	NF
47	Tailed Jay	*Graphium agamemnon*	VC	VC	VC	R

Table 2. *Continued ...*

S. No.	Name of The Butterfly	Species Name	IGZP		KP	
			Post Monsoon	Pre Monsoon	Post Monsoon	Pre Monsoon
	PIERIDAE FAMILY					
48	Common albatross	*Appias albina*	C	NF	NF	NF
49	Common emigrant	*Catopsila pomona*	VC	C	VC	R
50	Common grass yellow	*Eurema hecabe*	C	NF	C	NF
51	Common GULL	*Cepora nerissa*	C	C	C	R
52	Common JEZABEL	*Delias eucharis*	C	C	C	R
53	Common Wanderer	*Pareronia valeria*	C	NF	C	C
54	Crimson TIP	*Colotis danae*	C	R	C	NF
55	Mottled Emigrant	*Catopsila pyranthe*	C	R	NF	NF
56	One Spotted Grass Yellow	*Eurema andersoni*	R	NF	R	C
57	Pioneer	*Belenois aurota*	NF	NF	R	C
58	Plain Orange TIP	*Colotis aurora*	NF	NF	R	C
59	Psyche	*Leptosia nina*	C	C	C	VC
60	Small Grass Yellow	*Eurema brigitta*	C	C	C	VC
61	Three Spotted Grass Yellow	*Eurema blanda*	R	R	R	R
62	Yellow orange TIP	*Ixias pyrene*	NF	NF	R	VC

habitat is the common distribution place for high proportion dwelling of butterflies. In the present study similar finding were observed.

Some butterflies were listed endangered by Indian Wildlife Protection Act 1972 such as Common Pierrot (*Castalius rosimon*), Common Indian Crow (*Euploea core*), Danaid Eggfly(*Hypolimnas missipus*), Crimson Rose (*Pachilopta hector*), Common Gull (*Cepora nerissa*).These species were found in the study area in very abundant number in late monsoon and very rare in early monsoon.

Conclusion

The present study reflects information about the winged jewels in Visakhapatnam. There were no reports previously about late and early monsoon description of butterflies in the selected study area. It is very much essential to conserve these butterflies as they are primary consumers of food chain or food web which maintains ecological balance.

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