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In-situ Conservation of Some Butterfly Species Population of Koti Women's College Campus, Hyderabad (Telangana) India

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Abstract:
In-situ conservation of some species of Butterfly population (order: Lepidoptera) in the University campus of Koti Women's college and its vicinity in Hyderabad (Telangana) India was undertaken, owing to their importance in the terrestrial ecosystem. Conserving butterfly species will result in the improved environment enriched with survival benefits for the other organisms also. One of the main aims of the present work is to stop the declines and conserve the most threatened butterfly species by in-situ conservation method encouraging the growth of the plants that attract the butterflies and also to introduce them in other places as well, where there is decline in their distribution. The significance of the study is to introduce them in the places where there is abundance of the flowering plants but without any butterfly species and also to connect to the other areas outside the campus to achieve a widespread distribution and conservation of them, a method of typical land scaping approach and to bring awareness among the people about the importance of their conservation. There is a dire need to ascertain the causes for the absence of the butterflies and to encourage them to increase in numbers in such natural habitats by corrective measures thereby conserving the species. Therefore, a study was initiated to record the number of different species of butterflies available in the college campus by selecting different locations. A total of 26 species of butterflies belonging to three different families i.e., Nymphalidae, Pieridae and Papilionidae, were recorded during the study period from June 2014 to Dec 2019. During the course of the study it was observed that the family Nymphalidae was dominant followed by Pieridae and Papilionidae in terms of both species composition and the total number. Nymphalidae accounted for about 57.3%, Pieridae 25.7% and Papilionidae at 16.9%.
It was also observed that the numbers gradually increased in the campus today when compared to the initial study due to the efforts made. The campus is the source for the butterfly species to be distributed in different areas.

Keywords: Lepidoptera, pollution, indicators, environment health

INTRODUCTION

Butterflies are the valuable indicators of environmental health. The indicator species can be considered as signalling organisms of their own presence as well as of other species' abundance and diversity in an environment. (Kremen, 1994; Launer, and Murphy, 1994; Sharma and Sharma, 2017). They are the first evolved species (150 million years ago) and a diverse group of nearly two lakh plus species world over. They are a part of the food chain and are prey for many insectivorous animals, aves, and mammals (Tharindu Ranasinghe, 2016). They are the natural heritage of our planet and are used in many areas of research studies because of their simple life cycle, varied colours and wing patterns and also exhibit mimicry (Butterfly conservation.org) The butterflies are the agents of pollination and a natural pest control(Nancy Ostiguy, 2011).

The degradation of the environment in the recent past for the development, habitat destruction, pollution etc resulted in the loss of butterfly diversity. Butterflies indicate environmental degradation and react to any change in their habitat. Their struggle to survive in such environments is a warning sign to protect them and their environment (Dirk Maes and Hans Van Dyck, 2001).

The life cycle of the butterfly is divided into four stages i.e., egg, larva (caterpillar), pupa (chrysalis), and adult (imago). The larvae and adults of most butterflies feed on specific parts and specific types of plants (Nitin et al., 2018). There is a need to encourage the growth of the plant varieties thereby conserve them for the future generations and to protect them by identifying the areas where there is a threat to them by anthropogenic activities, introduce them into the areas free of threats and provide habitats to encourage them to increase their population. There is a dire need to bring awareness about their conservation in the present context of the ongoing campaign all over the globe about biodiversity conservation (National Insect Week, 2020). Biodiversity is the key for more variety for a better society. There are different methods to conserve the butterflies such as the land scape approach i.e., by connecting a range of habitats across large areas, connecting land for wild life through coordinated conservation of various sites for a wide range of species.

The college campus has well maintained gardens and lawns including a botanical garden which harbours a vast majority of the plant species that attract a variety of butterflies. As the area harbours butterflies of different species distributed throughout the campus, it can be presumed to have a good diversity of them, which may be attributed to the lustrous greenery and well nurtured gardens that provide a suitable dwelling place serving as a breeding habitat for the butterflies. However, even in some areas of the campus where the main thoroughfare is confluent with the compound wall along an entire stretch with high traffic, the butterfly population was declining gradually; therefore it was mandatory to restore the natural flora and fauna of the ecosystem in the campus by relocating them in the interior of the campus. Therefore, the present study was undertaken to conserve them as they serve as umbrella species (the organisms that protect the co-existing species).

MATERIAL AND METHODS

Surveys were carried out at different locations on the campus from June 2014 to Dec 2019. For assessing the butterfly distribution repeated surveys of the absence and or presence of the species was done in a particular season. Field notes, photographs and observations of butterflies were taken during the day light from morning 10am to afternoon 3pm following transect method of sampling at different locations in the campus (J.A. Brown and M.S. Boyce, 1998). A transect is usually a fixed route (walk) at a site where the butterflies are recorded on a weekly basis over a period of few years. A majority of the transects were chosen to cover the entire campus ensuring proper monitoring of the total species present. The species were noted along with the date, location of capture, the number of organisms and the plant associations. The host specific plants were recorded in each location. The latest nomenclature and common names are used according to D' Abrera (1982-1986), Evans (1932), and Kehimkar (2008), Varshney (1990). The species were identified with the help of the key given by Haribal, 1992. Statistical analysis of the data was done using one way ANOVA (Arun Bhadra Khanal, 2015).

RESULTS

A total of 26 species of butterflies belonging to three different families were recorded. The average number of each butterfly species per year and the total number in each family i.e., Nymphalidae, Pieridae and Papilionidae, are presented in Table 1. The numerical data of the species in each family is represented as percentages in the given table 1. The data shows the species belonging to the family Nymphalidae are more compared to the Pieridae and the Papilionidae families (i.e., 57.3%, 25.7%, and 16.9% respectively). The images of the butterfly species taken from different sites in the campus are given below as Figures 1, 2 & 3 belonging to the three family's nymphalidae, pieridae and papilionidae respectively.

Table 1: The composition and the average number, total number and the percentage of Butterfly species in each family recorded from the study sites.

Family	Common name	Scientific Name	Average Number/year	Total	Percentage
Nymphalide	1.Common leopard	*Atella phalanta*	26	281	57.3%
	2. Egg fly	*Hypolimnas bolina*	20		
	3. Blue tiger	*Tirumala limniace*	10		
	4. Danaid eggfly	*Hypolimnas missipus*	10		
	5. Blue pansy	*Precis orithya*	08		
	6. Yellow pansy	*Precis hierta*	20		
	7. Common crow	*Euploea core*	35		
	8. Striped tiger	*Danaus genutia*	05		
	9. Common castor	*Ariadne merione*	05		
	10. Plain tiger	*Danaus chrysippus*	05		
	11. Common evening brown	*Melanitis leda*	15		
	12. Lemon pansy	*Junonia lemonias*	40		
	13. Plain earl	*Tanaecia jahnu*	30		
	14. Lemon pansy	*Precis lemonias*	17		
	15. Common Indian crow	*Euploea layardi*	25		
	16.Yellow pancy	*Junonia hierta*	10		
Pieridae	1. Jezebel	*Delias species*	30	126	25.7%
	2. White orange tip	*Ixias marianne*	06		
	3. Small grass yellow	*Eurema brigitta*	20		
	4. Small white	*Pieris rapae*	25		
	5. Common emigrant	*Catopslia crocale*	12		
	6. Mottled emigrant	*Catopsilia pyranthe*	03		
	7. Common grass yellow	*Eurema hecabe*	30		
Papilionidae	1. Common rose	*Atrophaneura aristolochiae*	15	83	16.9%
	2. Yellow helen	*Papilio nephleus*	10		
	3. Common blue bottle	*Graphium sarpedon*	18		
	4. Lime butterfly	*Papilio demoleus*	18		
	5. Tailed jay	*Graphium agamemnon.*	12		
	6. Tailed jay	*Polyalthia*	10		

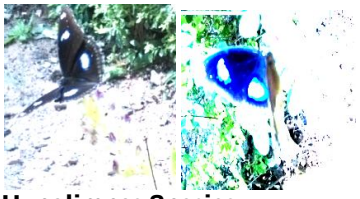
The species identified commonly in the family Nymphalidaewere Junonia, Hypolimnas, Euploea, and Danus etc while Delias, common yellow grass were among the pieridae family and tailed jays in the family papilionidae. The plants were identified as milk weed (asclepias) and asters for the caterpillars of monarchs, plants of verbenacea (lantana), about a dozen species of it that attracted monarchs, grasses (skippers) etc to name a few. The number of the butterflies increased today because

of the efforts made in maintaining the gardens. The data was analysed statistically using one way ANOVA as given in the table 2 and found to be significant. Based on the F-value it can be interpreted that there is a significant difference between the means of the butterfly population.

Table 2: Statistical analysis of the data by one-way ANOVA

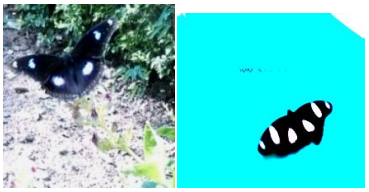
S. No.	Groups	N	Mean	Standard deviation	Standard error
1.	Group1(Nymphalidae)	16	17.56	11.0873	2.7718
2.	Group2 (Pieridae)	7	18	11.1505	4.2145
3.	Group3 (Papilionidae)	6	13.83	3.7103	1.5147

F-Statistic value=0.35165; P-value-0.70682



Hypolimnas Species

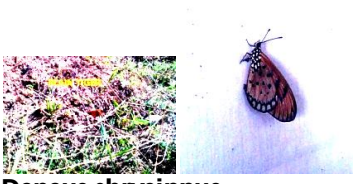
Danaid egg fly



Hypolimnas bolina

Junonia lemonias

Tanaecia jahnu



Danaus chrysippus

Junonia hierta

Figure 1: Nymphalidae

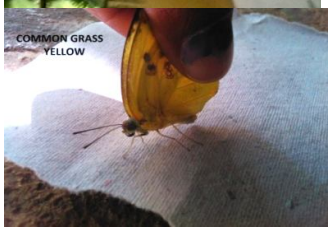




Delias Species

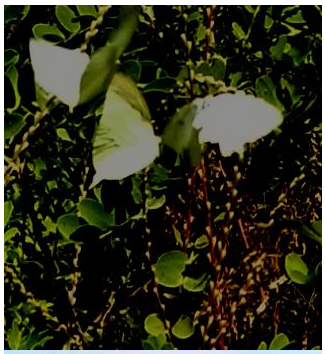
Euploea core layardi





Eurema

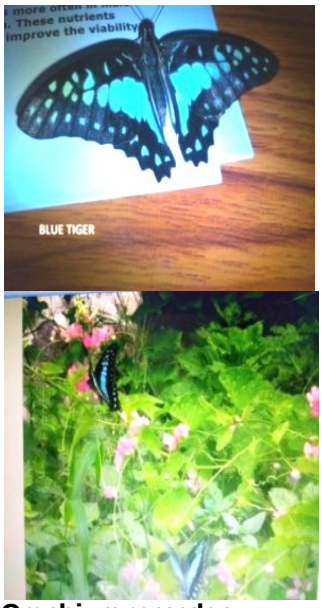
Euploea core




Eurema hecabe


Delias Species

Figure 2: Pieridae



Graphium sarpedon

Papilio nephleus

Polyalthia

Graphium agamemnon

Figure 3: Papilionidae

DISCUSSION

The present study gives a clear indication of the climatic conditions , vegetation etc that are congenial to the butterfly diversity in the campus. However, some areas showed declining population of butterflies due to poor plant growth dominated by unwanted plants and also due to the noise and dust pollution, as it is very near to the main thoroughfare. In such areas the butterflies were collected with nets and were released in the gardens. A clean environment with a rich and vast varieties of plants are an essential prerequisite for the rich diversity of butterflies as seen in most parts of the campus. The tropical forest species reside in similarity of the coexisting species instead of the number of niches available (Klopfer and Mc Arthur (1961), as can be observed from the current study by the great diversity of the butterfly species.The diversity pattern of the species of different families as well as different habitats depends on the consistency of the vegetation and the availability of food resources (Robin et al., 2015). From the data of the present study it is a clear indication that the campus has vegetation that is more suitable to the members of the family of Nymphalidae as they are more in number and the composition when compared to the species of the two other families studied.

It is easier for the natural species to be conserved in-situ by a little effort and can serve as sources to be released everywhere in order to enhance their population.The efforts are being made to introduce the species available in the campus in and around the areas of Hyderabad city so that they increase in large numbers. Also making use of the latest biotechnological tools (c-cruz et al., 2013)one can,to a large extent improve the biodiversity of the butterflies by the hybridization and culture methods of the plants that provide food, shelter, breeding habitats for them.Similar studies have been done on the in-situ conservation of butterflies by establishing the gardens (George and Mary, 2007) and also the seasonal fluctuations of the butterfly population in Peechi, Kerala, India (George, 2014). The present study is partly related to the studies done at Peechi, Kerala and is limited to the gardens of the campus and it is intended to disseminate the different species to the other parts of the city as has been done by the butterfly conservation society by establishing the gardens in the city at various

public places like parks, colleges etc and to spread awareness among people for the conservation of the butterflies.

CONCLUSION

The campus harbours a good number of the butterfly species with the gardens well maintained.The efforts made to protect and conserve the existing species in the campus also contributes to biodiversity conservation. The strategies to improve the conditions of the local environment with habitats free of any kind of disturbances can make the butterfly species thrive well and it inturn will check all other aspects of balancing the environment like unwanted growth of plants,weeds,some insects (aphids), pollination etc. Therefore, it is concluded that there is no need of special care for conserving any species but to simply maintain the already existing habitats congenial for the breeding of butterflies as observed during the present study. The objective of the study i.e., to introduce them in the places where there is abundance of the flowering plants but without any butterfly species is achieved to some extent thereby restoring the species that were reducing .The awareness among the people about the importance of the butterflies and their conservation is already underway with the help of the Butterfly conservation society (BCS). Lastly, the other strategy is being able to connect to the other areas outside the campus to spread them, is yet to be achieved with the help of the above strategies.

Conflict of interest:
The author declares that There is no conflict of interest.

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