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Effect of Anthropogenic Activity on Butterfly Population at Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, UP

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Abstract

The aim of the study is to determine the influence of differentiated landscape management on the distribution on abundance of butterfly species. The objective of this study were to asses butterfly communities and to determine the influence of disturbance on butterfly individuals, species richness and composition with in four SGPGI Campus management Area (A1 Entry Area, A2 Road side Area, A3 Hospital Area).The survey is conducted between February 2024 to May, 2024 using Photographs and direct seen and observed. The pattern of butterfly abundance and species richness are studied in study areas at SGPGI Campus Lucknow. A total 18 butterfly species found which is belonging to Hesperiidae, Papilionidae, Pieridae, Lycaenidae and Nymphlidae families were recorded at the 4 areas(Biotopes).However the SGPGI Campus which surrounded by the Anthropogenic activities are due to this human activities butterfly diversity abundance are badly affected. Therefore it's important to protect habitat and dry season water for the conservation of butterflies.

Keywords: Butterflies, SGPGI Campus Sites, Diversity, Abundance, Environment, Habitat, Human activities.

Introduction

Butterflies are extremely important group of Colorful insects. All butterflies are included under group Macro Lepidoptera along With some larger moths. They prefer specific habitats and their diversity is restricted to different seasons (Kunte, 1997 and Padhaye et al., 2006). Butterflies have been studied systematically since the early 18th Century and 19,238 species have been documented worldwide (Heppner, 1998). Around the world, butterflies are regarded as one of the most well taxonomically and ecologically studied Group of insects belonging to the order Lepidoptera (Robbins and Opler,1997; Mihoci et al., 2011). Butterflies prefer a particular set of habitats and host plants for their survival. Being sensitive to the Temperature, humidity and light levels and also to disturbances and changes in the quality of habitat they are Regarded as potential indicator species of environmental quality and healthy ecosystems (Gunathilagaraj et Al., 1998, Balmer and Erhardlt, 2000; Hogsden and Hutchinson, 2004 and Thomas, 2005).Among the insects, butterflies occupy a vital position in ecosystems and their occurrence and Diversity are considered as good indicators of the health of any given terrestrial biotope (Kunte 2000; Aluri and Rao 2002; Thomas 2005).The human impact on the global environment has triggered a mass extinction event Of significance on a geological time scale as well as causing widespread changes in The global distribution of organisms (Chapin et al. 2000; Thomas et al.

2004).As herbivorous insects, the distribution of larval and nectar host plants has a distinct impact on the status of butterfly Diversity (Culin 1997; Solman Raju et al. 2004).

Quite few studies have advocated that butterflies are key taxa for Biodiversity monitoring because they reflect changes of climatic environments along with Seasonal and other ecological changes and they are good indicators of anthropogenic Disturbance and habitat quality Collection of baseline information on animal biodiversity is A reference point for ecological risk valuation and management but this remain far from being Realized. One of the most important aspects of any conservation strategy is the identification of high value sites on the basis of their biodiversity content In recent years, there has been an Escalating increase in human pressure on the biodiversity which causes conservation Challenges to biologists due to anthropogenic disturbances . Insects being a major taxonomic Group of animal species are mostly affected and represent a good example of these challenges however are remained undiscovered and less prioritized group for conservation assessments .Butterflies among other insects, are typically considered as a good example, that can be Sampled and identified within a short period of time and give indication of habitat Conservation priority . Species diversity and community structure of butterfly in urbon forest fragment at Lucknow studied by Kumar and Rana, 2018.

Human activities not only deter many native species from altered environments, but also lead to the permanent isolation of groups of many species, and thus time After time, increasing the risk of their extinction

In the Sanjay Gandhi Postgraduate Institute of Medical Science Campus there are found many anthropogenic activity like more movement of vehicles ,human crowd and deforestation for the purpose of buildings of college and Hospital Result in the loss of natural habitats butterflies thrive .As these area shrink Butterflies face the challenge in finding suitable breeding and foraging ground .The resources such as host plant and food sources for butterflies available sites for their survive and consequent for over survey .

In the SGPGI area the human pressure is rapidly increasing which may lead to management problem , which often a long run may affect diversity ,abundance and distribution of butterfly species in the area .However ,information on the diversity and distribution many species including butterflies is often incomplete and data are lacking. The main objective of this study was to asses butterfly species and to understand whether the existing anthropogenic activities may have influenced diversity and distribution of influenced diversity and distribution of butterfly

Study Area and Methodology

Study Area

The city Lucknow is the capital of state Uttar Pradesh located in Northern India . The climate of Lucknow is sub-tropical, with a rainy season that runs roughly from mid –June to early October , due to monsoon and a dry season from mid-October to early June .The survey of Effect of Anthopogenic Activity on Butterfly Population was carried out at SGPGI Lucknow .(Figure 1) , from February 2024 to May 2024,Observation were made in the morning from 9:00 am to 11 am and in evening 3:30 pm to 5:00 pm when butterflies were most active and human activity is also going on.SGPGI 277 acres of land which has various habitats including Entry area/Site 1 (Fig 2),Road sides /Site 2(Fig 3),Garden area/Site 3 (Fig 4), Hospital area/Site 4 (Fig 5).There are some specific areas like garden and road sides where butterflies more active .There is found some plant like Common sunflowers which is helpful for the butterfly habitats . In the Road side area at the muddy and sandy area (often tainted with animal urine or excreta),the butterfly sips water rich in mineral salt and other essential nutrients that have reached from the surrounding soil .The dissolved salt and minerals may be used to make pheromones (that the male uses to attract females)

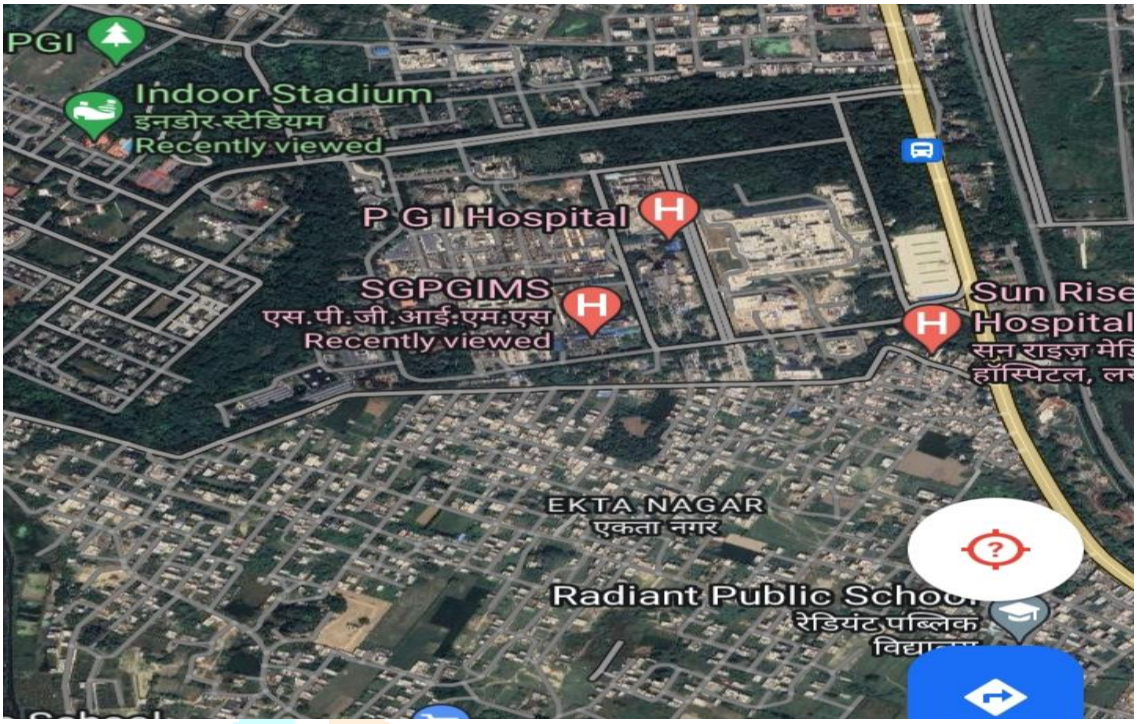

Fig.1 : Map of the study area

Fig.2: Area 1

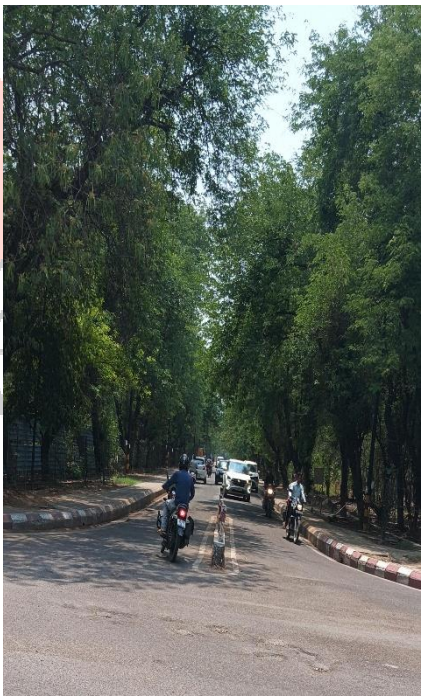

Fig.3: Area 2

Fig.3: Area 3

Fig 4: Area 4

Methodology

Data on daily basis from February 2024 to May 2024 has been recorded in survey data sheet in morning and evening shift .The number of butterflies were recorded by direct watching and through the photographic confirmations The collection of specimen was strictly avoided .The butterfly that could be identified in the field were not captured while those that could be identified were captured by the sweep net method and identified using suitable keys (Gay et al,1992 ;Haribal,1992; Kehimkar,2008) and released back in same habitat with least disturbance .The individuals observed were classified into different families as per the classification .

Photographs were taken from different angles with (AI CAM 50MP) Camera . On the basis of constant sighting of the butterfly species has been divided into four categories namely **Very common ,Common, Rare** and **Very Rare** describe in Table **1** All the scientific name and identification of Butetrfly followed in the present study is reffered from (Varshney,1983; Wynter- Blyth, 1957).

Observation

This document illustrated total No. Of butterfly species representing genera across the distinct families. Hesperiidae(4), Papilionidae(3), Pieridae(3), Lycaenidae(4), Nymphalidae(4).

Graph -1 Butterfly species in different areas of SGPGI Campus.

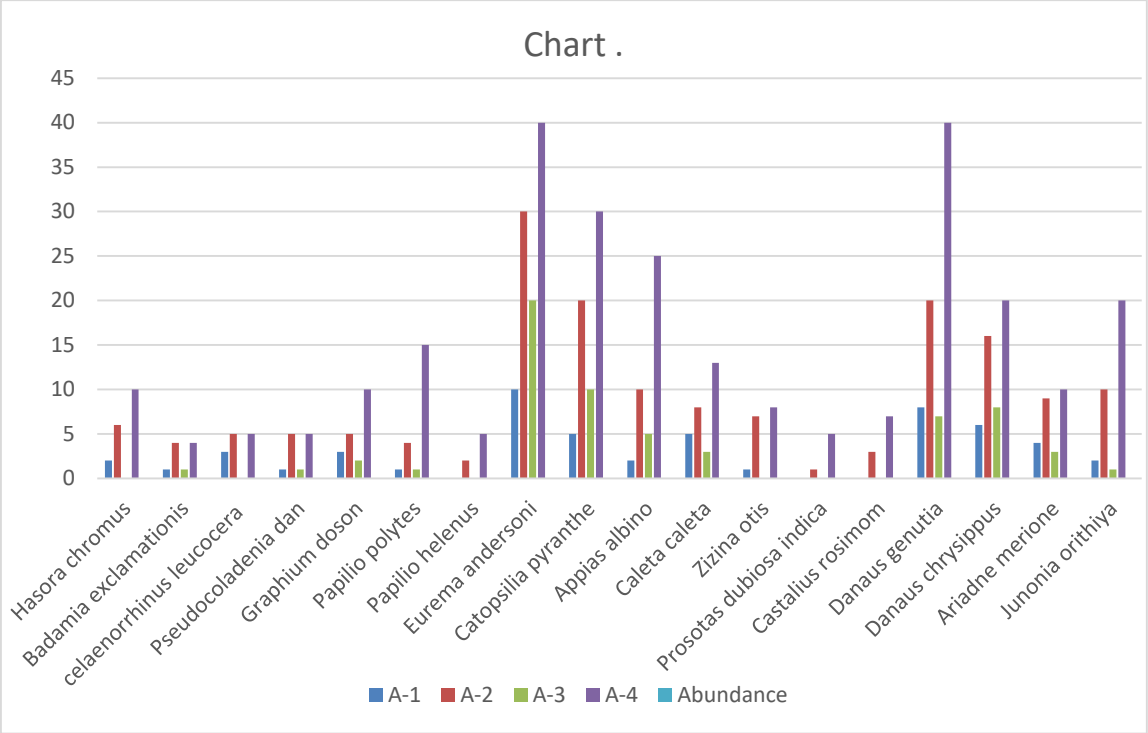

Table -1 Status of butterfly species in different study areas.

Familiy	S. N.	Scientific Name	Common Name	A-1	A-2	A-3	A-4	Status
Hesperiidae	**1**	*Hasorachromus*	Common Banded Awl	2	6	_	10	**C**
	2	*Badamiaexclamationis*	Brown Awl	1	4	1	4	**R**
	3	*celaenorrhinusleucocera*	Common Spotted Flat	3	5	_	5	**R**
	4	*Pseudocoladeniadan*	Fulvous Pied Flat	1	5	1	5	**R**
Papilionidae	**5**	*Graphiumdoson*	Common Jay	3	5	2	10	**C**
	6	*Papilio polytes*	Common Mormon	1	4	1	15	**C**
	7	*Papilio helenus*	Red Helen	_	2	_	5	**VR**
Pieridae	**8**	*Euremaandersoni*	One Spot Grass Yellow	10	30	20	40	**VC**
	9	*Catopsiliapyranthe*	Mottled Emigrant	5	20	10	30	**VC**
	10	*Appias albino*	Common Albatross	2	10	5	25	**VC**
Lycaenidae	**11**	*Caleta caleta*	Angled Pierrot	5	8	3	13	**C**
	12	*Zizinaotis*	Lasser Grass Blue	1	7	_	8	**R**
	13	*Prosotasdubiosa indica*	Tailless Lineblue	_	1	_	5	**VR**

	14	*Castaliusrosimom*	Common Pierrot	_	3	_	7	**VR**
Nymphlidae	**15**	*Danaus genutia*	Striped Tiger	8	20	7	40	**VC**
	16	*Danaus chrysippus*	Plain Tiger	6	16	8	20	**VC**
	17	*Ariadne merione*	Common Caster	4	9	3	10	**C**
	18	*Junoniaorithiya*	Blue Pansy	2	10	1	20	**C**

Some butterflies of study areas

Striped Tiger

Blue Pansy

Plain Tiger

One Spot Grass yellow

Mottled Emigrant

Comman joy

Pieris Canidia

Common castor

Angled Pierrot

Common Banded

Lemon Pansy

Common Mormon

ANTHROPOGENIC ACTIVITIES TAKING PLACE ON SGPGI CAMPUS

Habitat loss and deforestation

Habitat fragmentation and habitat loss are major threatened factor responsible for biodiversity decline on earth (Harrison et al., 2012; Foley et al., 2005) Butterflies is a popular group of insect . Recent reports reveal that about 100 out of 1500 butterfly species occurring in India are on the verge of extinction (Solman Raju & Rao 2002). A number of colonies of butterfly have been exterminated by human activities, resulting in changes of habitats beyond the tolerance limit of species .The contrasts in diversity might relate to the occurrence of nectar plants and larval host plantused by majority of butterfly species. The Hospital and entry area have complex vegetation structures and substantial resources of host plant and nectar, whereas the plantation and grassland sites score lower for resource and vegetation complexity; the garden site is intermediate between these groups. Similarly, the plantation and Grassland experience the most serious disturbance (building, human activity, grass mowing); nevertheless, the Hospital and entry area experience different kinds of disturbance, mostly removal of material for fires and human crowd, which carry consequence for butterfly populations.

Entry Area: The entry area of SGPGI campus which is heavily frequented by people .which has a very negative effect on butterfly population .There is always a crowd of people in the entry area along with this there is also heavy movement of vehicles affect butterfly population greatly .Pollution which is released of vehicles carbon dioxide (Co2) emission ,significant quantities of carbon monoxide (CO) Hydrocarbon (HC) ,Nitrogen oxide (Nox) Suspended particles matter (spm) and other air toxins are emitted from these motor vehicles in the atmosphere ,causing serious environmental and health impacts on butterflies population .By this reason at the entry area there is very rarely seen species of butterfly. By the reason of high human activities at the entry area there is seen very rare of butterfly . The morning time when there is less traffic then you can see butterflies here. But as people start coming and going Butterflies decreases .

Road Side area: In the SGPGI Campus there is many roads and many plants have been planted on its sides which is Neem ,Ashok ,Sagon etc plant mostly planted . Plants growing on road sides which is also flowering plants . Because of the flower on them butterflies sit more on these plants and sucking of nector/juice get its food from flower .But as morning turns to afternoon peoples traffic starts increasing on the road sides due to which the butterflies get disturbed and butterflies is not able to get its nutrition properly. which greatly affects their adult stage and their other activities .At the road sides green grass butterfly is more seen .I think green grass butterfly is no more affected by the human activities and in the comparison to this other butterfly is more affected .Due to this reason butterflies rarely seen in the road sides of SGPGI campus.

Hospital area: Construction of hospital by cutting the plant affects butterfly diversity greatly .As the name suggests where there is a hospital that will be people. And the hospital for the treatment of various types of technology are used which emit various types of radiations , pollution and toxic gasses due to this technologies butterfly population badly affected .But flowering plants and other plants have been planted all around the hospital which along with providing oxygen to humans also provides nutrition to butterfly but as the movement of people start increasing near hospital area .Butterflies getting disturbed and able to carry out its activities properly like do not take nutrition properly and mating process .Ambulance noise also has a very bad effect on butterfly population.

Garden area: There are many garden in the SGPGI Campus made for people to sit .In which many flowering plant have been planted which is very useful for butterfly population habitats and also very useful for the life cycle of butterflies and it is a big reason of butterfly diversity. But some anthropogenic activities disturb the butterfly activities in the garden like flowering plants attract butterflies attract human in the same way.

Butterflies larvae, pupa and caterpillars live on flowers and leaves. So when pluck flowers by the people and also touch the leaves by the people. Larvae, pupae and caterpillar of butterfly are get badly affected or destroyed. Many plants are cut and pruned to make them beautiful. In which butterfly's pupa, larvae and caterpillars cut off with plant parts .All this process in the garden greatly affects the butterfly population.

Result & Disscusion

A total of 18 species of butterflies belonging to the Hesperiidae, Papilionidae, Pieridae, Lycaenidae and Nymphalidae families were found on the SGPGI Campus and their occurrence, stetus and biotopes are listed in Table -1. Species richness according to the sites and a simple division of biotopes is noted together with the number of unique butterfly species were recorded from the Entry area of the campus (Area 1), Three of which were unique and not recorded in other biotopes. Five species were found in Road side area (Area 2) and Four species found in the Hospital area (Area 3) and the 10 species found in the Garden area (Area 4) which is the most butterfly richer area in the all sites in SGPGI Campus. The area in and around the various buildings of the campus A few species of butterflies, viz. Striped tiger, Plain tiger, Common caster , Blue Pansy. Were unique to the garden while others, viz. One grass yellow, Angled pierrot, tailless lineblue were observed in all the biotopes. **Human activity impacts.** Recent reports reveal that about 100 of 1500 species found in India are one of the verge of extinction (Solman Raju & Rao (2002). A number of the colonies of butterflies have been exterminated by human activities, resulting in the changes of habitats beyond the tolerance limit of the species. The contrast in diversity might relate to the occurrence of nectar plants and larval host plants used by majority of butterfly species. The Hospital and Entry area have complex vegetation structures and substantial resources of host plants and nectar, whereas the plantation and grassland site score lower for resource and vegetation complexity; The Garden site is intermediate between these groups. The plantation and grassland (road sides) experience the most serious disturbance (building, human activity, grass moving); The Entry area and Hospital area experience different kinds of disturbance, mostly human crowd and moving of vehicles disturb the butterfly population.In the present study, the area under the greatest human impact were the plantation site around building of SGPGI campus Road side and Entry area. The removal/ distruction by human activity of naturally growing nectar and larval host plant harboring eggs, larvae, and pupae of butterfies has a great impact on richness, abundance and diversity of butterfly species. It is important to note that the diversity of butterflies was also adversely affected by grass cutting exposing butterflies to their natural predators and unauthorized grazing and cutting of plant for firewood at the SGPGI Campus. Destruction, degradation or fragmentation of biotopes are the most worrying cause of butterflies species extinction. Hence control of the exploitation of natural biotopes for butterflies, including shrub, herb and trees, dried and green grasses (eg. Grazing) would definitely help to maintain and increase the diversity of butterflies in the SGPGI Campus. **Education and Awareness:** Butterflies are charismatic and captivating organisms, making them excellent subjects for educational and outreach programs. Research on butterfly diversity and abundance can contribute to public awareness about the importance of biodiversity conservation. Engaging the public in butterfly monitoring programs and citizen science initiative allows individuals to actively participate in scientific research and gain a deeper understanding of the natural world. Such involvement can foster a sense of stewardship and promote conservation effort beyond butterfly population.

Conclusion

As we negative the human – impact gradient, the plight of butterflies serves as a poignant reminder of our interconnectedness with the natural world. Conservation efforts must be collective and comprehensive, addressing the multifaceted challenges posed by habitat loss, climate change and other anthropogenic factors. By understanding and mitigating the drivers the butterfly defaunation, we not only safeguard these delicate creatures but also contribute to the prevention of biodiversity and resilience of our planet's ecosystem.We found that understanding ecosystem support diversity of butterflies and disturbed ecosystem lead to migration, Elimination and less divers population and even no butterflies in area. They are very good pollinator and create the various plant species thrive without them plant species will eliminate so indirectly human race also. Educate people specially farmer for the need and importance of butterflies as a pollinator in different

cultivated and wild plant for enhancing genetic variation. Understand the impacts of human activities and seasonal variations on species diversity and the abundance of Butterflies in an ecosystem is important to inform the conservation of existing Game Reserves. Our finding suggest that there is a significant difference in butterfly diversity and abundance between SGPGI Campus and adjacent farmland with higher diversity in SGPGI where the land is free from anthropogenic disturbance. The large and significant variation in butterfly diversity and species community explained by anthropogenic and environmental factors suggests a need for conservation plans for the natural habitats of SGPGI which is under threat from anthropogenic disturbance from adjacent farmland. The butterfly species that were specific to certain locations may serve as ecological indicator because they appear to be favored by the environmental conditions of those locations. Future studies looking into how various individual butterfly species are influenced by the available quality of the habitat will be necessary in generation information that will be useful in identifying species- species need for improving the conversation of butterfly community in SGPGI Campus.

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