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Diversity of butterfly species, host preference and seasonal distribution in cat campus

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Abstract
A random field survey was conducted to explore the diversity of butterfly species, their host preference and their seasonal distribution in CAT Campus from post monsoon months to summer months (December 2018 – April 2019).
Results revealed about the different butterfly fauna and their preferred hosts and their seasonal variation during different months from December to April. Studies of butterflies indicate that the resources availability abundantly a key role in their population ecology. Their presence in an area emphasize the availability of larval food plants in abundance.

Keywords: Butterfly, host, seasonal variation and diversity

Introduction
Butterflies (Lepidoptera: Rhopalocera) are one of the most plant dependent group of insects when compared to the other mega diverse insect groups. (Althuri J.B, *et al.*, 2002) [1]. Butterflies are beneficial as they serve as pollinators, some groups as weed killers some as indicators of environmental quality and are appreciated for their aesthetic value (Chakravarthy *et al*., 1997) [3]. The holometabolons life history of butterflies reveals that Lepidoptera are exposed to a wide range of environmental influences and are highly sensitive to the climatic changes in temperature, humidity and high levels (Andheria A.P 2001) [2]. Nearly 1500 butterflies are identified from the Indian Sub – continent, constituting 8.3% of the 18,000 known species of the world; most of the Indian butterflies are reported from the Himalayas and from the Western ghats.
The population status of butterflies in any area would help us to understand the status of ecosystem (Chakravarthy *et al*., 1997) [3]. Insects are important components of the World's biota. They interact biotic and abiotic fectors at different tropic level and in an ecosystem (Chakravarthy *et al*., 1997) [3].
Insect diversity contributes to the development of agriculture, medicine and scientific research. The lack of insect diversity may cripple the genetic base requested for the Integrated Pest Management Programme which in turn could affect the possibility of increasing the production of food and environmental management.
Of all the insects, butterflies and moths has been most admired and popular. They belong to the order Lepidoptera (2nd Largest order, colourful order) with more than 1,05,000 known species.
The butterflies are considered as beneficial insects and are important natural resources as they,

a. Help in pollination, a key process in a natural population.
b. Important ecological indicators since they are closely associated to plants, at all stages of its life cycle.
c. They have an important place in web of life.
d. They enhance the aesthetic value of the environment by their exquisite wing colours. Hence the reason increasing global interest in conserving and managing butterflies (New *et al*., 1995) [8].

The butterfly fauna in India is rich with 1,500 species which is closed to 90% of total butterfly in world (Baskaran S, Eswaran R, 1998) [4]. The butterflies are selected in their choice of flowers for feeding and for reproduction. Studies of butterflies indicate that the resources availability abundantly a key role in their population ecology.

Their presence in an area emphasize the availability of larval food plants in abundance (Joy Sharmila E, Joseph Thatheyus., 2013) [6].

The diversity of butterflies may also due to their migration of search of food and reproduction. Thousands of butterflies of related species fly in definite direction in search of new larval food plants for the next generation. (Meeta sharma, Noopur Sharma., 2013) [7].

CAT Campus consists of nearly 153 hectares situated at the base of foothills of Western ghats of Kullapuram village, at a distance of 25 km from Theni, Tamil Nadu, India. The geographical location lies at the coordinates of 10°00' N 77°37' E. The average summer temperature lies between 37° - 40.5° C (104.9° F) and the average winter temperature lies between 13° - 15° C (59° F). The district is known for its salubrious climate, hills and lakes. The important reservoir nearby CAT Campus is Vaigai dam. Within 5 km lies the reserve forest area.

Area suitable for rich floral diversity which act as host for different butterfly fauna. Some of the major host species are *Citrus* spp, *Murraya koenigii, Ficus religiosa, Calotropis* spp, *Lantana camera, Tridax procumbens, Mangifera indica, Chrysanthemum* spp, *Azadirachta indica, Tectona grandis, Cocus nucifera, Casuarina equisetifolia, Terminalia cattapa, Annona reticulate, Acacia nilotica, Ailanthus excels, Carica papaya, Psidium gujavum, Lycopersicon lycopersicum, Solanum tuberosum, Oryza sativa, Musa* spp, *Saccharum* spp, and major flowers, vegetables, fruits and tree crops.

The main objectives of the study are,

1. To find out the species of butterflies in the selected areas.
2. To find out the species of butterflies in different locations and environmental conditions.
3. To find out the species in the season of post monsoon month of December and in summer months of January, February, March and April.
4. To find out the host of butterfly species.
5. To observe the butterfly species in CAT Campus.

Materials and Methods

Experimental material

The study was carried out in College of Agricultural Technology, Kullapuram, Theni area during the month of December 2018 – April 2019 covering post monsoon and early summer seasons. In CAT the average temperature in summer varies between 37° - 40.5°C (104.9°F) while the average winter temperature varies between 13° - 15°C (59° F). The average annual precipitation is 730mm. The vegetation mainly includes *Citrus* spp, *Murraya koenigii*, *Ficus religiosa*, *Calotropis* spp, *Lantana camera, Tridax procumbens, Mangifera indica, Chrysanthemum* spp, *Azadirachta indica, Tectona grandis, Cocus nucifera, Casuarina equisetifolia, Terminalia cattapa, Annona reticulate, Acacia nilotica, Ailanthus excels, Carica papaya, Psidium gujavum, Lycopersicon lycopersicum, Solanum tuberosum, Oryza sativa, Musa* spp, *Saccharum* spp, and major flowers, vegetables, fruits and tree crops.

CAT Campus consists of nearly 153 hectares situated at the base of foothills of Western Ghats of kullapuram village, at a distance of 25 km from Theni, Tamil Nadu, India. The geographical location lies at the coordinates of 10°00' N 77°37' E. The district is known for its salubrious climate, hills and lakes. The important reservoir nearby CAT Campus is Vaigai dam. Within 5 km lies the reserve forest area.

The findings presented here are based on a site survey and investigations carried out by on a weekly one day basis from December 2018 to April 2019 at eight sites in and around area of CAT Campus. Site I was Lotus garden, Site II was wood lot, Site III was Crop cafeteria, Site IV was Mini orchard, Site V was Floriculture unit, Site VI was Medicinal crops unit, Site VII was Lawn and Site VIII was Kullapuram CAT wetland.

Data Collection

Pollard wark method was followed for observing butterflies. This methodology is a predominant type in monitoring butterflies, in brief this is a fixed - route walk (transect) which is established at a site on which butterflies are recorded along the route on a regular (weekly) basis under reasonable weather condition for a number of months. Care is taken in choosing a transect route as it must remain fixed to enable butterfly sightings. Butterflies are recorded in a fixed width band (typically 5m wide) along the transect each week from the beginning of December until end of April, ideally 15 counts were taken between 10.45 am and 3.45 pm only when weather condition were suitable for butterfly activity and this condition provide considerable effect on number of butterflies seen.

Results and Discussion

The study has focused on collecting fundamental information on change in diversity of butterfly and their resources such as larval food plants within the surrounding areas of CAT. The diversity and abundance of species is highly correlated with the availability of food plants in the surroundings.

During the survey 33 species were recorded. Their family wise distribution is represented. The community of butterfly was composed of 33 species of butterfly, 12 butterflies belong to the family Nymphalidae, 6 species belong to the family Papilionidae,7 species belong to the family Pieridae, 6 species belong to the family Lycaenidae and 2 species belongs to the family Satyridae. (Eswaran R, Pramod, P 2004) [5].

Nymphalidae (Brush (or) four footed butterfly)

It includes butterflies which are larger and brilliantly coloured and are generally seen in drier parts of peninsular India. Predominance of Nymphalidae had been reported by earlier workers also The Nymphalidae are a large group of robust bodied butterflies that come in every shape and colour. Highest number of butterfly species (12) belongs to this family. Few species are distributed throughout the year.

Ergolis merione

Forelegs are short, functionless, hairy and folded on thorax. Fore tibia is short and covered with long hairs.

Precis lemonias

Upper side is dark brown or grayish brown. Forewings with black lines, yellowish brown spots and two red ocelli. The lower one is larger and predominant. Underside is yellowish brown in male, pinkish brown in female. These are most common in India. It flies quickly and strongly but with less flutting of wings. Generally rests on the ground but not so frequently as the other pansies. The Butterflies feed on sida, alarthorn, etc.

Precis orithya

Upper side of the female forewing is two-thirds black and apex. Hindwings predominantly bright blue. Underside

greyish brown with white markings and wavylines. The butterflies are very active during the hottest part of the day. Visits the flowers Lantana, Marigold, Heliotrope etc. these butterflies are very common in our campus.

Acraea violae
It is commonly called Towny coster. Very active and brightly coloured. Larvae feed on the *Tridax Procumbens, Lantana camara, Parthenium hysterophorus, Abutilon indicum* and *Tribulus terrestris*.

Danaus chrysippus
These group of butterflies are bright yellow with orange colour on forewings and hindwings. Very active in day time. They visit and suck the nectar on plants like *Azadirachta indica, Hamelia patens, Tribulus terrestris* and *Calotropis gigantia.*

Papilionidae (Swallow tails)
They are often large and brightly coloured butterflies. Prothoracic legs have tibial epiphysis. In many species hindwings has tail like prolongation. Amplexiform type of wing coupling is present. They are popularly known as swallow tail butterflies. The family papilionidae is represented by 6 species.

Papilio polymnestor
It is commonly called Blue Mormon. They feed on Rutaceae family crops. It is actively, brightly coloured *Aristolochiae* spp. It is otherwise called Common rose. Upper side is black with a predominant tail in hind wings. Five elongated white spots and red sub marginal spots are seen in the adult. They feed on *Aristolochiae* spp weed species.

Papilio polytes
It is otherwise known as Common Mormon. The adult male has black upperside and the forewings with the terminal series of white spots. These butterflies are generally seen in near human habitations especially gardens. They feed on citrus, especially lime, curry leaves etc.

Papilio demoleus
Upperside is black with yellow spots. Hindwings without a tail and with a brick red oval spot. Bluish spot present at near the coast 1 margin. Underside is almost black with 7 yellow streaks at the base and a few orange spots. They are commonly called citrus butterfly. This butterfly larva feed on citrus, lemon, orange, wood-apple, curry leaf etc.

Pieridae (White and Sulphurs)
They are white or yellow or orange coloured with black margin. They are white medium size butterflies with shades of yellow – orange. The family pieridae includes 7 butterfly species that are commonly seen. Most of them fly close to the ground.

Cepora nerissa
They are medium size brightly and attractively coloured. They are feed on variety of plant species.

Colitis danae
They are also called called crimson tip. These group of butterflies visit the small shrubs and flowering plants to suck the nectar and actively moving butterflies.

Pieris brassicae
Commonly called as whites or sulphurs. This groups are medium sized orange colour or white coloured butterflies with black markings. They are also feed on cruciferae family crops.

Lycaenidae (Blues, Coppers, Hair streaks)
The members of this family are minute too small, delicate and often brightly coloured butterflies. Their upperwings surface is either metallic blue or coppery and hind wings bear
delicate hair like prolongations and 2 or 3 spots along the margin. In this family 6 species were recorded.

Lampides boeticus
Adult is a violet metallic blue butterfly with predominant black in the hindwings. This groups of species feed on pulses, other Fabaceae family crops.

Virachola Isocrates
It is commonly called Pomegranate fruit borer. Adult it looks like a metallic blue or coppery colour with hair like prolongation found in hindwings. This groups of species feed on Guava, Pomegranate etc.

Satyridae (Browns, Meadow browns)
The family satyridae include butterflies are medium sized, largely shade loving dusky on the wings. They feed on grass, rice, bamboo's and plants. In this family 2 species were recorded.

Melanitis leda
They are dull brown or blackish in colour. Wings are with eye like spots both on the upper and lower surface. They also feed on grasses, rice, etc., Most butterflies have specific habitat and food requirements. Although adult butterflies are sensitive to their choice of flowers for feeding, most species never visit some flowers.
The family wise distribution of butterflies are represented as 12 species belong to the family Nymphalidae, 6 species belong to the family Papilionidae,7 species belong to the family Pieridae, 6 species belong to the family Lycaenidae and 2 species belongs to the family Satyridae which constitutes to a total of 33 species in selected eight sites. (Fig:1)
The host preference for the different butterfly species vary accordingly to their family distribution in the selected sites. The total number of butterfly species recorded more in the Nymphalidae family and their host preference are *Mangifera indica, Coccus nucifera, Phyllanthus emblica, Casuarina equisetifolia, Tridax procumbens, Calotropis gigantean, Phyllanthus niruri, Azadirachta indica, Butea monosperma, Tectona grandis, Plumeria rubra, Leucaena leucocephala* and *Tamarindus indica.* The least number of butterfly species recorded in the Satyridae family and their host preference are *Oryza sativa* and *Echinochloa colona.*
Among the selected 8 sites more number of host species are identified in the Wood lot that is located near the academic block. The identified host are as *Azadirachta indica, Butea monosperma, Tectona grandis, Pongamia pinnata, Plumeria rubra, Leucaena leucocephala* and *Tamarindus indica, Parthenium hysterophoresis, Ruellia tuberose, Sonchus oleraceus* and *Phyla nodiflora.* The site recorded with least number of host species is Kullapuram CAT wetland with hosts like *Echinochloa colona, Echinochloa crusgalli,*

Cynodon dactylon, Centella asiatica and *Marsilea quadrifolia*.

The Nymphalidae family consists of highest number of butterfly species in 6 out of 8 recorded sites followed by Pieridae and Papilionidae family which are identified in 4 out of 8 recorded sites.

Among the vegetations selected tree crops act as host for many butterfly species followed by agricultural and horticultural crops which consists of medicinal crops and flower crops.

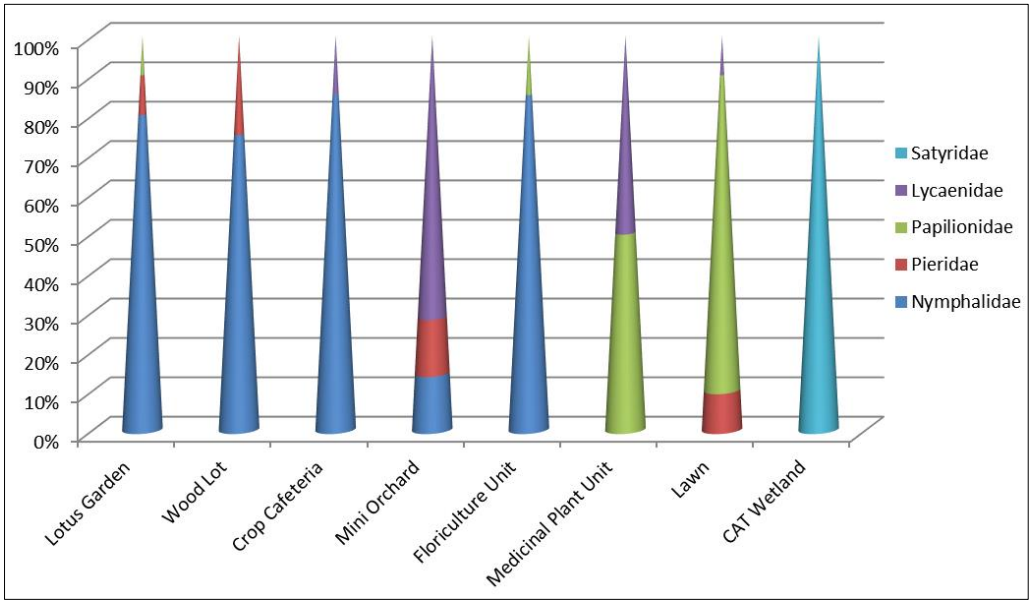

Fig 1: Percentage of Species abundance in the selected 8 sites:

Conclusion

Insect diversity play an important role in Pest Management Programme. Nearly 1500 species of butterflies are identified from Indian subcontinent, constituting 8.33% of the 18000 known species of the world. The present study deals with butterfly abundance in 8 different selected sites within the CAT Campus for 5 consecutive months.

The butterflies are collected using butterfly nets in the selected area during the morning hours by visiting the site once in a week for 5 months and recorded their species diversity with standard procedure.

During this study, we have recorded about 33 species of butterflies which have different host specific character from different study sites selected in and around CAT Campus. Among that study nearly 5 families of butterflies were identified and they are Nymphalidae, Pieridae, Papilionidae, Lycaenidae and Satyridae. The total number of species that are recorded in each family accounts to 12 species, 7 species, 6 species, 6 species, 2 species respectively. However the maximum number of species of butterflies were found in the study site 1 Lotus Garden belongs to the family Nymphalidae followed by Pieridae and Papilionidae.

There were nearly 39 species of host were identified which act as habitat for 33 species of butterflies. Among the survey conducted it was seen that maximum species of host belonging to tree species followed by agricultural and horticultural crops.

In this present study diversity of butterflies and their resources such as host plants within the CAT Campus were identified and recorded. Butterflies being highly sensitive to change in environment are easily affected by minor changes in the habitat and the abundance of species was recorded during December and January months and there was a drastic reduction in the species during March and April months due to rise in temperature and non-availability of suitable host species for the butterflies.

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