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Research Article

Studies on the diversity of butterflies in and around the Nizam College, Hyderabad, Telangana State, India

Madhavi.M[1]*, Krishna[2]

[1]*Department of Zoology, Nizam College, Osmania University, Hyderabad-500001, Telangana, India*
[2]*Department of Zoology, Osmania University, Hyderabad-500007, India*

*Corresponding author:
E-mail: prsmadhavi@gmail.com

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ABSTRACT

Butterflies are one of the most important assemblages of insects that act as biodiversity indicators as well as nature's gardeners. Owing to habitat destruction for developmental activities in urban environment and unscientific management of natural resources, much of our native butterflies are fast disappearing and at present, their survival is under threat. The objective of the present survey is focused on the assessment of the diversity and seasonal abundance of butterfly with vegetation composition of habitat and conservation priorities in the study area. A total of 4 species of butterflies were recorded during August-2017to March-2018.This study is aimed towards contributing to the plan of biodiversity restoration in our campus and development of management strategies so as to ensure sustenance of butterflies and ecosystem services derived from them.

1. Introduction

Insect comprises more than half of earth diversity of species. Butterflies are technically well studied group, which have received a reasonable amount of attention throughout world ,Yet even within genera containing very common and wide spread species, our understanding of true species diversity may prove to be startling below common expectation have worldwide by 1998. The figure is not constant because of continuous addition of new butterflies' species. Many butterflies' species are strictly seasonal indicators in term of anthropogenic disturbance and habitat quality. Lepidoptera community assembly and the factors which influence it have long been a topic of interest to ecologist and conservationists. Human dominated landscape form a substantial and ever increasing amount of the earth surface. These modified habitats often influence butterfly species and their dynamics.

Arthropods are good indicators of habitats biodiversity because they respond quickly to environmental changes and are highly diverse taxon. Lepidoptera (butterflies and moths) and second largest order of arthropods and are most easily identified, making them particularly for biodiversity survey. Butterflies occur in a wide range of situations but are particularly characteristics of humid tropical forests, in which the known species occur. Two important aspects of diversity are species richness and relative abundance of individuals. Species richness is the most considerable conservation planning and natural resource management.

2. Material and Methods

2.1 *Butterfly Sampling and Identification*

This study was carried out from August-2017 to March-2018 using the timed, directed, temporary distance transect method in Nizam College area. Caldas and Robbins (2003). Transects were 50 meters in length and were temporarily established. While walking along transect, butterflies seen across a 5 m distance from either side of the mid- line were recorded. Two 50 meters transects were sampled for each habitat and 30 minutes were spent in each transect. A pair of binoculars was used to identify butterflies seen along transects and a hand lens was used for closer identification if necessary. Field identification of butterflies was done using standard guides, such as those of D'Abrera (1998); Gamage (2007). Unidentified butterflies were collected using an aerial insect net and were released in to the same habitat after confirming their identity.

3. Results and Discussion

3.1 *Eurema brigitta*

***Eurema brigitta*,** the small grass yellow or broad-bordered grass yellow, is a small butterfly of the family Pieridae, that is, the yellows and whites. It is found in India, other parts of Asia, Australia and Africa. These butterflies are main indicator of pollution in the study area.

Figure-1. Survey sites of butterflies

A- Landscape garden of principal office

B-Plant nursery of Nizam College

C-Centenary block landscape garden

D-Herbal garden of Botany Department in Nizam College

Table 2. Sampling sights with their Global positioning system in the study area

Site name	Global positioning system
Principal land scape	Latitude:17.297469 ; longitude:78.475873
Nursery	Latitude:17.397709 ; longitude:78.475513
Butterfly house	Latitude:17.397636 ; longitude:78.475525
Herbal garden	Latitude:17.398327 ; longitude:78.475266
Centenary Block Landscape	Latitude:17.398362 ; longitude:78.475289

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Figure-2. ***Eurema brigitta.***

3.2 Papilio clytia

*T*he common name of *Papilio clytia* is 'swallow-tail butterfly', found in south and Southeast Asia. The butterfly belongs to the subgenus Chilasa, the black-bodied swallowtails. It serves as an excellent example of a Batesian mimic among the Indian butterflies.

Figure-3. ***Papilio clytia***

3.3 Danaus genutia

***Danaus genutia*,** the common tiger, is one of the common butterflies of India. It belongs to the "crows and tigers", that is, the Danainae group of the brush-footed butterflies family. The butterfly is also called striped

tiger in India to differentiate it from the equally common plain tiger, *Danaus chrysippus*. The species was first described by Pieter Cramer in 1779.

Figure-4. *Danaus genutia*

3.4. *Danaus chrysippus*

Danauschrysippus, also known as the plain tiger or African queen, is a medium-sized butterfly widespread in Asia, Australia and Africa. It belongs to the Danainae subfamily of the brush-footed butterfly family Nymphalidae. Danainae primarily consume plants in the genus Asclepias, more commonly called milkweed. Milkweed contains toxic compounds, cardenolides, which are often consumed and stored by many butterflies. Because of their emetic properties, the plain tiger is unpalatable to most predators. As a result, the species' coloration is widely mimicked by other species of butterflies. The plain tiger inhabits a wide variety of habitats, although it is less likely to thrive in jungle-like conditions and is most often found in drier, wide-open areas.

Figure-5 Danaus chrysippus

3.5 Graphium doson

Graphium dosonis the common jay, is a tropical papilionid (swallowtail) butterfly with pale blue semi-transparent central wing bands that are formed by large spots. There is a marginal series of smaller spots. The underside of wings is brown with markings similar to upper side but whitish in colour. The sexes look alike. The species was first described by father and son entomologists Cajetan and Rudolf Felder. They are used to monitor the environmental conditions and change in habitat conditions.

3.6 Tirumala septentrionis

Tirumala septentrionis, the dark blue tiger, is a danaid butterfly found in the Indian subcontinent and Southeast Asia. The caterpillars feed on *Wattakaka volubilis*.

Figure-6. *Graphium doson*

Figure-7 *Tirumala septentrionis*

As per the data collected from senior employees of Nizam College, there are hundreds of butterflies in and around the premises of Nizam College that make the college a mini BRINDAVAN. But now the situation has become worse that butterflies are only found in the multiply of tens.

The reasons mentioned below could be the most probable reasons for the butterflies to become endangered species.

- Parasitoids,
- Predators,
- Pathogens

Butterflies are threatened in their early stages by parasitoids and in all stages by predators, diseases and environmental factors. Braconid and other parasitic wasps lay their eggs in lepidopteran eggs or larvae and the wasps' parasitoid larvae devour their hosts, usually pupating inside or outside the desiccated husk. Most wasps are very specific about their host species and some have been used as biological controls of pest butterflies like the large white butterfly. When the small cabbage white butterflies was accidentally introduced to New Zealand, it had no natural enemies. In order to control it, some pupae that had been parasitised by a chalcid wasp were imported, and natural control was thus regained.[] Some flies lay their eggs on the outside of caterpillars and the newly hatched fly larvae bore their way through the skin and feed in a similar way to the parasitoid wasp larvae. Predators of butterflies include ants, spiders, wasps, and birds.

Caterpillars are also affected by a range of bacterial, viral and fungal diseases, and only a small percentage of the butterfly eggs laid ever reach adulthood. The bacterium Bacillus thuringiensis has been used in sprays to reduce damage to crops by the caterpillars of the large white butterfly, and the

Figure-8. Pie chart depicting the diversity of butterflies

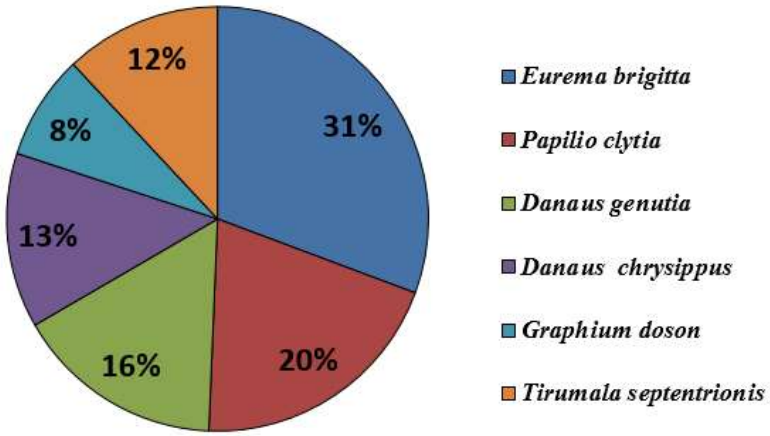

Table-2. List of documented butterflies in Nizam College

Sl.no.	Family	Scientific name	Common name	Occurrence
1	Pieridie	Euremabrigitta	Small Yellow grass	Common
2	Paplionoidea	Papilioclytia	Common mime	Rare
3	Paplionoidea	Graphiumdoson	Common jay	Common
4	Nymphalidae	Danausgenutia	Common Tiger	Common
5	Nymphalidae	Danauschrysippus	Plain Tiger	Very Common
6	Nymphalidae	Tirumalaseptentrionis	Dark Blue tiger	Rare

entomo-phathogenic fungus, *Beauveria bassiana* has proved effective for the same purpose.

In order to overcome these problems butterflies have adopted the following defence methods:

Butterflies protect themselves from predators by a variety of means. Chemical defences are widespread and are mostly based on chemicals of plant origin. In many cases the plants themselves evolved these toxic substances as protection against herbivores. Butterflies have evolved mechanisms to sequester these plant toxins and use them instead in their own defence. These defence mechanisms are effective only if they are well advertised; this has led to the evolution of bright colours in unpalatable butterflies (aposematism). This signal is commonly mimicked by other butterflies, usually only females. A Batesian mimic imitates another species to enjoy the protection of that species aposematism.

The common Mormon of India has female morphs which imitate the unpalatable red-bodied swallowtails, the common rose and the crimson rose. Mullerian mimicry occurs when aposematic species evolve to resemble each other, presumably to reduce predator sampling rates; Heliconius butterflies from the Americas are a good example.

Camouflage is found in many butterflies. Some like the oak leaf butterfly and autumn leaf are remarkable imitations of leaves. As caterpillars, many defend themselves by freezing and appearing like sticks or branches. Others have deimatic behaviours, such as rearing up and waving their front ends which are marked with eyespots as if they were snakes. Some papilionid caterpillars such as the giant swallowtail (*Papilio cresphontes*) resemble bird droppings so as to be passed over by predators. Some caterpillars have hairs and bristly structures that provide protection while others are gregarious and form dense aggregations. Some species are *myrmecophiles*, forming mutualistic associations with ants and gaining their protection. Behavioural defences include perching and angling the wings to reduce shadow and avoid being conspicuous. Some female Nymphalid butterflies guard their eggs from parasitoidal wasps.

3. Conclusion

Butterflies are important because of Aesthetic value:

- Butterflies are part of our natural heritage and have been studied for over 300 years.
- Butterflies are beautiful, with many being iconic and popular.
- People like butterflies.
- There are many references to butterflies in literature, from the Bible through Shakespeare to modern day literature, and from poetry to musical lyrics.
- Butterflies are used by advertisers and illustrators the world over as way of indicating that something is environmentally friendly.
- Butterflies are often portrayed as the essence of nature or as representing freedom, beauty or peace.

Ecosystem Value:

- Butterflies are indicators of a healthy environment and healthy ecosystems.
- They indicate a wide range of other invertebrates, which comprise over two-thirds of all species.
- Areas rich in butterflies and moths are rich in other invertebrates. These collectively provide a wide range of environmental benefits, including pollination and natural pest control.
- Moths and butterflies are an important element of the food chain and are prey for birds, bats and other insectivorous animals (for example, in Britain and Ireland, Blue Tits eat an estimated 50 billion moth caterpillars each year).
- Butterflies support a range of other predators and parasites, many of which are specific to individual species, or groups of species.
- Butterflies have been widely used by ecologists as model organisms to study the impact of habitat loss and fragmentation, and climate change

Educational Value:

- Butterflies and moths have fascinating life-cycles that are used in many countries to teach children about the natural world. The transformation from egg to caterpillar to chrysalis is one of the wonders of nature.
- Other educational aspects include the intricate wing patterns and iridescence, and as examples of insect migration.

Health Value:

- People enjoy seeing butterflies both around their homes and in the countryside.
- Over 120 sites are monitored across Ireland each week and collectively our recorders walk 2,700 km each year counting butterflies.
- Many people garden for wildlife in Ireland, many of them specifically for butterflies and other insects.

Economic value:

- Thousands of people travel abroad each year looking for butterflies and moths. Eco-tours bring income to many European countries and developing countries around the world (e.g. the valley of the butterflies in Rhodes and the Monarch roost in Mexico).
- Every butterfly and moth has developed its own suite of chemicals to deter predators and parasites, find a mate, and overcome the chemical defences of its host plant. Each of these chemicals has a potential value and could be exploited economically. For example, powerful antibiotics have been found in the Meadow Brown, one of our commonest and most widespread species

Intrinsic value:

- Butterflies have a right to exist, as much as any other species on the planet.
- Butterflies have been around for at least 50 million years and probably evolved some 150 million years ago.
- They are part of Life on Earth and an important component of its rich biodiversity.
- Butterflies and moths are a highly diverse group comprising over 250,000 species and make up around one quarter of all named species.
- Butterflies are flagship species for conservation in general and in particular for invertebrates.

Scientific value:

- Butterflies (and moths to a lesser extent) 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.
- The long history and popularity of butterfly study have provided a unique data resource on an insect group unmatched in geographical scale and time-scale anywhere in the world. This has proved extremely important for scientific research on climate change.

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Competing Interests

The authors have declared that no competing interests exist.

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