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# Study of Butterfly (Lepidoptera) Diversity around a Protected Reservoir (Kerwa) at Bhopal, India

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**ABSTRACT: Generally observed, butterflies play an important role in maintaining the balance of nature and health of the living world. The number of Indian butterflies amount to one fifth of the world of butterfly species. There are about 28,000 known butterfly species in the world. Bhopal a capital city of Madhya Pradesh is also Known as "City of Lakes" endowed with some nature's gift as green belt, Forest environment and beautiful natural and manmade lakes. Kerwa Reservoir is situated 17 km from Bhopal City. The Kerwa Reservoir is surrounded by agricultural fields with rural habitation. Not enough research work on Butterfly has been reported from this neglected biodiversity spot of Kerwa area, may be, this is the pioneer work done on the subject matter.**

***Key Words:*** Aerial Sweep Nets, Host Plant, Pollination. Butter flies.

## INTRODUCTION

Butterflies are found mostly everywhere in the world in a climatically where neither too hot nor too cold temperature. It may be noted that Antarctica is the only continent on which no Lepidoptera (butterflies) have been found. The total number of species of butterflies recorded from the Indian region is about 1501 species (Gaonkar, 1996). Butterflies are the most beautiful and colorful creatures on the earth and have a great aesthetic value. About 1500 species of butterflies are found in India ( Haribal 1992). Some butterflies are migratory. They fly thousands of miles in the winter to places having a warmer climate, and return back in the spring. Butterflies serve as important plant pollinators in the local environment, and help to pollinate more than 50 economically important plant crops (Borges et al., 2003). Butterflies are also good indicators of environmental changes as they are sensitive to habitat degradation and climate changes ( Kunte 2000).

Bhopal is known as city of lakes, having more then fifteen lakes and reservoir in and around the city. Kerwa Reservoir is one of the important manmade beautiful reservoirs surrounded by agricultural fields with rural habitation & hilly lush green forest. It is located at the outskirts of the city which is easily approachable. The water of this reservoir is mainly used for irrigation and city water supply.

The water reservoir and the vegetation planted around the farm house land & forest have created an ideal habitat and source of attraction for many faunal species like insects, reptiles, birds, fish and mammals. The area is surrounded with a very large variety of trees, mini forest, vast grassland & small hills, these are the elements for architecting a preferred habitat for such species.

Butterflies are the most beautiful and colorful creatures on earth and have a great aesthetic value, about 1500 species at butterflies are found in India (Haribal 1992) Although in the recent past, several researchers have studied butterflies from some districts and conserved areas of Madhya Pradesh and Chhattisgarh (Singh 1977; Gupta 1987; Choudhury 1995; Singh and Chandra 2002; Siddiqui and Singh 2004; Chandra 2006). (Ashish D. Tiple, 2012) but possibly no work is done particularly in Kerwa region also not enough literature/publications concerning butterflies at Kerwa region could be traced.

Although some work has been done but mainly focused on water quality (Gupta, Ranjeeta Choudhary and Monika Vishwakarma, 2009). Bhattacharya has done survey and reported a case study. During my research work on "Kerwa Reservoir for its conservation management and Eco-tourism", when a large numbers of so beautiful, attractive and very colorful butterflies were noticed. It was truly so amazing and wonderful, to inspired anyone for further exploration in the subject matter.

**Study Area:** The preliminary checklist of fauna (Butterfly) in and *around Kerwa Reservoir* is prepared with annotations on abundance and habitat preferences. Bhopal district is situated on the central part of India, at an altitude of 262 meter from mean sea level. The highest temperature in summer at 45°C and lowest temperature 04°C in winter ever recorded.

**Location of Kerwa Reservoir**: Longitude 77d- 22'- 25" , Latitude 23d- 9'55" Catchment area 4.5sq km (24.85sq M). Total 18 species were found by the authors in this study area. During the study following species were recorded- Pailionidae (2), Pieridae (3), Lycaenidae (2), Nymphalidae (7), Satyridae (2) and Hesperidae (2).

These species are not noticeable throughout the year. Time period and frequency of appearance provides scope of further studies in the subject matter.

## MATERIAL METHOD

Butterflies are generally regarded as one of the best taxonomically studied groups of insects (Robbins and Opler 1997). Since last few decades, Lepidoptera (Rhopalocera) is the most studied class of insects. Butterflies play an immense role in pollination, which helps to increase heterozygosis in flora or bring variations through kinds of pollen dispersion from one place to another place. Studies on the butterflies of central India dates back to Forsayeth (1886), Betham (1890, 1891) and Witt (1909). Butterflies were observed in most of the representative areas like city gardens, grasslands forests and scrub forests during monsoon, winter and summer months.

Butterflies are an important aspect of ecosystems for they interact with plants as pollinators and herbivores (Tiple *et al* 2006).

Data on butterfly is available in abundance and it must be noted that these data are season based. It varies greatly with the change of season. Best time to collect specimen of butterfly is between 7.00 to 11.00 hrs, because this is the peak time of butterfly activity. For the study purpose the specimens were collected separately during monsoon, winter and summer months of the years between January 2012 and December 2013. Many of the species were photographed and some had to be observed with the help of binocular. When the identification was not possible through photographs only then we followed "All-out search" holding physically collection of butterflies using handheld aerial sweep nets. These species were used for identification and observation and thereafter released to atmosphere. In some cases these were placed in suitable plastic bottles and taken to laboratory for further identification with the help of field guide (Winter-Blyth 1957; Haribal 2002, Kunte 2000; Gupta and Mondal 2005, available literature (Sathyamurthy, 1994; Kunte, 2000; Antram) and expert's opinion of guides.

## OBSERVATION AND DISCUSSION

This survey of butterflies was too primarily to identify the different butterflies at different habitats and different representative fields. Butterflies were categorized into four groups based on their occurrence during the study period on the basis of frequency of sightings.

These selected fields are: Eco-Tourism Centre (bank of river), Main Reservoir areas (water surroundings) Forest Range Hills(grasslands) and Near Sarodipura village (Agriculture Land). All these sites are situated within 10 to 20 km of Bhopal City. Total of four different site were selected for the present study purpose. These sites are as under:

**ETC :** Eco-Tourism Centre (Near Kerwa River, Garden & medicinal plants)

**FRH:** Forest Range Hills (Near Ganesh Ghati)

**MDA:** Main Reservoir areas (mostly public visiting eg. Bhola baba ka mandir)

**AGL:** Agriculture Land (Near Sarodipura village)

**ETC:** This place is situated 2-3 k.m. from main Kerwa reservoir. Eco-Tourism Centre (Near Kerwa river Garden & medicinal plants) eco tourism centre has plantation area, shrubs and herbs vegetation, medicinal and garden area. Kerwa River is flowing along with boundary wall of ETC centre; it is surrounded by huge trees. These area occupied by various types of vegetation viz*; Eucalyptus* spp., *Cassia siamea, Pongamia pinnata*, and Acacia spp., The area has got well-protected greenery in the following Medical Plant viz Awala (*Emblica officianalis*) and *Gloriosa superb* (Kalihari). Great Eggfly and Dandid Eggfly are available in plenty. When we look minutely by the literature great eggfly (*Hypolimnas bolina*), it appears somewhat like Dandid egg fly, having white & Black Spots. Its specialty additional blue color spots towards its centre.

**FRH:** This way passes through Eco Centre, after some distance we enter to forest Range Hills. This area covers the entire Maya kot, Rechhan kot, (Near Ganesh Ghati). A large variety of trees like *Holoptelia integrifolia* (Bandar Papdi), *Tactona Grandis* (Sagaun) and Bamboo plantation, *Calotropis gigantia* (Aak), *Delonix regia* (Gulmohar) and monosperma (Palash).

Common tiger is found near red or pink flowers. Blue Tiger- It Butterfly Found in India That Belongs to Crow and Tigers, Upper Side Black with Bluish-White Semi Hyaline Spots and Streaks is very active in the afternoon; Plain tiger *Danaus chrysippus* (Linnaeus), the male plain tiger is smaller than the female, but more brightly colored.

The Plain Tiger is believed to be the first Butterflies to be used for Art work. Around 3500 Year Old, Egyptian Fresco in Luxor Features, one of the Oldest Illustration of this species is available in archives. The male plain tiger is smaller than the female, but more brightly colored.

**MDA:** Kerwa reservoir - Main Reservoir areas (public visiting area) is largest water body of Bhopal which surrounded by mostly scrub vegetation area including Bamboo plantation.

Scrub vegetation and plantation comprises of different types of plants species viz, Acacia spp. *Terminalia eliptica*, *Cassia fistula* (Ramdanda), *Ziziphus mauritiana* (Ber), *Tamarindus indica*, C*alotropis gigantia* (Aak), Bamboo species and Grasses. Mostly visitors, tourist and local often go to temple *e.g.*, Bhola baba ka mandir and Sidhrawari mandir through this passage and this as some impact on the habitation of butterflies nearby.

*Indian Skipper* (*Syrichtus galba*) seems to be the rarest of butterflies as it was seen only once in Eco Tourism centre garden during the study period. Common mime *Papilio Clytia* (Linnaeus) feeds mainly from flowers of shrubs and small trees. Its larva host plant is *Litsea chinesis* and *Cinnamonum camphora*.

**AGL➔** Agriculture Land (near Sarodipura village) Due to rapid urbanization and usage of pesticide in large quantity has adversely effected the population of butterflies near human habituated area. At village Sarodipura and mendori village mostly these crops are grown this area *e.g.*, Arhar dal (*Cajanus cajan*), Family- Fabaceae, Pea (*Pisum sativum*), Family- Fabaceae, *Mustard (condiment)* Family- Brassicaceae.

Common Jezebel (*Delias Eucharis)*, It has very colorful spots and it looks differently. It was found to be very active in the afternoon. Common Perrot (*Castalius Rosimon*) is very different because it is in white color. It look unique and different, it flies close to the ground and settle down often.

Butterflies Were Categorized into Five Groups on the basis of their occurrence during the study period on the basis of Frequency of visibility.

These groupings are : [1] Abundant [2] Common [3] Un-common [4] Rare [5] Very Rare.

**Table 1: Butterflies Description and their population.**

| S.No. | Common Name | Scientific Name | Family | Occurrence (Month) | Status | Situation / Location |
|---|---|---|---|---|---|---|
| 1 | Plain Tiger | *Danaus chrysippus* (Linnaeus) | Danaidae | Jan - Dec | common | FRH |
| 2 | Great Eggfly | *Hypolimnas bolina* (Linnaeus) | Nymphalidae | June - Jan | Un Common | ETC |
| 3 | Danaid Eggfly | *Hypolimnas misippus* (Linnaeus) | Nymphalidae | Jan - Dec | Un Common | ETC |
| 4 | Lemon Pansy | Junonia lemonias (Linnaeus) | Nymphalidae | Jan - Dec | common | ETC |
| 5 | Blue Tiger | *Tirumala limniace* (Cramer) | Nymphalidae | Jan - Dec | Un Common | FRH |
| 6 | Common Sailer | Neptis hylas(Linnaeus) | Nymphalidae | July - Dec | Not Rare | AGL |
| 7 | Dark Evening Brown | Melanitis phedima (Cramer) | Satyridae | Jan - Oct | Not Rare | MDA |
| 8 | Common Evening Brown | *Melanitis leda* | Satyridae | Sep – Dec | Un Common | FRH |
| 9 | Common Mime | Papilio Clytia (Linnaeus) | Nymphalidae | Jan - Dec | Rare | FRH |
| 10 | Common Tiger | Danaus genutia | Nymphalidae | Sep - Dec | common | MDA |
| 11 | Crimson Rose | Pachliopta hector *(Linnaeus)* | Papilionidae | Aug - Jun | Very Rare | FRH |
| 12 | Lime Butterfly | Papilio demoleus (Linnaeus) | Papilionidae | Jan - Dec | common | ETC |
| 13 | Lemon Emigrant | Catopsilia pomona (Fabricius) | Pieridae | Jan - Dec | Un Common | AGL |
| 14 | Common Jezebel | *Delias eucharis* (Linnaeus) | Pieridae | Sep - March | Abundant | AGL |
| 15 | Common Grass Yellow | *Eurema hecabe* (Linnaeus) | Pieridae | March - Sep | Abundant | MDA |
| 16 | Common Pierrot | *Castalius rosimon* (Fabricius) | Lycaenidae | June - July | Rare | AGL |
| 17 | Forget-me-not | Catochrysops Strabo(Fabricius) | Lycaenidae | Oct – Dec | Very Rare | FRH |
| 18 | Indian Skipper | Syrichtus galba(Fabricius) | Hesperidae | Aug - Oct | Very Rare | MDA |

Species of butterflies noticed during the study are reported above but those which could be found during the study by the authors are Pailionidae: Pieridae: Lycaenidae: Nymphalidae: Papilionidae: and Hesperidae:

There are some more species in the region and these were not traceable during the study, this needs to be investigated further.

Urbanization also is associated with habitat degradation including decreased plant species diversity, reduced water quality, and increased air and soil pollutions (Bastin, 1999; Hall *et al.*, 1999; McKinney, 2002; Singh *et al.*, 2009; Garg *et al.*, 2009). In terrestrial ecosystem, insect fauna represent more than 70% and also play an important role in food chain for the natural balance. Insects are extremely important components of the bioindicators of the world (Chakaravarthy *et al.*, 1997; Jana *et al.*, 2009).

Even though, the family Nymphalidae exhibited the maximum species compared to other families. The family Nymphalidae was most predominant in the Kerwa forest. The reason for this extraordinary abundance of Nymphalidae family compares then Pieridae and papilionidae butterflies in the study area can be ascribed to the dominance of their larval food plants in the region.

They further demonstrated that most of the species were noticeably absent in the disturbed and human impacted sites (gardens, plantation and grassland) and there was no occurrence of unique species in moderately disturbed areas comparable to those of less disturbed wild areas. The present study site is in constant disturbance due to the cutting of grasses, shrubs and trees for landscaping which may be the reason for the overall reduction of the number of species (Tiple, 2012).

During the intensive survey of Butterflies (Lepidoptra), from January 2012 to December 2013, in Bhopal district, a total number of 06 families were recorded. In terms of number of species result revealed that, out of total 06 families the Nymphalidae family (07 species) was the most dominant family, after which comes Pieridae family (03 species), followed by the Papilionidae (02 species), Lycaenidae (02 species), Hesperiidae (02 species) and Satyridae (02 species).

**Table 2. Butterflies observation.**

| S.No | Family | No of Species in the family | No of Individual observed |
|---|---|---|---|
| 1 | Nymphalidae | 7 | 41 |
| 2 | Papilionidae | 2 | 20 |
| 3 | Pieridae | 3 | 11 |
| 4 | Lycaenidae | 2 | 16 |
| 5 | Hesperidae | 2 | 6 |
| 6 | Satyridae | 2 | 7 |

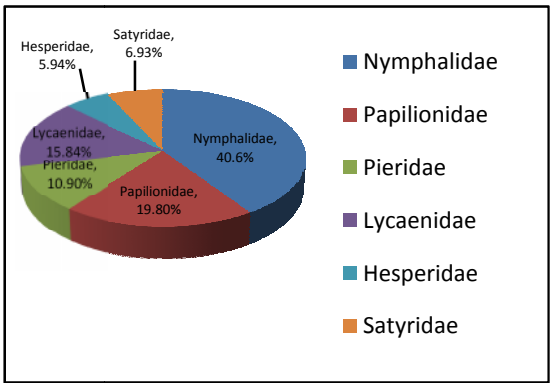


**Fig. 1.** Number of butterflies species and individuals Observed (percentage-wise).

## CONCLUSION

Urbanization also is associated with habitat degradation including decreased plant species diversity, reduced water quality, and increased air and soil pollutions (Bastin, 1999; Hall *et al.*, 1999; McKinney, 2002; Singh *et al.*, 2009; Garg *et al.*, 2009).

These recorded species come under the Indian Wildlife (Protection) Act 1972 List *e,g.*, Indian Skipper Syrichtus Galba (Fabricius) and Forget Me Not.

If we can grow more larva feed plant as landscaping and maintenance more colorful flowering plants at this area gardens and Kerwa's Reservoir area are carefully planned, the many species of butterflies may increase in the Eco tourism centre campus as well as Kerwa reservoir 's surrounding. Providing a rich source for butterfly conservation as well as for researcher may be a good scope in future. The reasons of why these species were not found during the study need to be investigated for researcher: Grow more food plant for larva eg. Common Tiger Butterflies needs small herbs twines and creepers from the family Asclepiadaceae (good maar) including Asclepias *curassavica*. Butterflies are an important aspect of ecosystems for they interact with plants as pollinators and herbivores (Tiple *et al* 2006). For our next generation we can save wonderful attractive creature on our surrounding garden & forest.

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