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Butterfly diversity in and around Ramtek Gadmandir forest area, central India

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Abstract

Butterflies are most attractive insect in the world which have receive enormous amount of attention among all insects. They are part of life and an important component of its rich biodiversity. Watching and recording of butterfly species in and around Ramtek Gadmandir was done by using digital cameras during the month of August 2017 to August 2019. Total 30 species of butterflies was belonging to 20 genera and 5 families were recorded. The highest number of butterflies was recorded belonging to Family Nymphalidae (12 species), followed by Papilionidae (6 species), Pieridae (6 species), Lycaenidae (5 species) and minimum number of species were recorded from family Hesperidae (1 species). Out of 30 species, 24% were very common, 46% were common, 24% were rare and 6% were very rare species respectively. Maximum species reported from June to December and its number decline from January onward.

Keywords: Butterfly diversity, ramtek, gadmandir, host plants

1. Introduction

Insects show largest biodiversity on planet. Healthy biological communities depend on insects as herbivores, pollinators, seed dispersal, predators and prey and butterflies are one of them ^[1]. Lepidoptera is highly specialized insect order, included scaly winged insects i.e. butterfly and moths that passing through complete metamorphosis ^[2].

Butterflies are indicators of healthy ecosystems and a healthy environment. They show a broad variety of all species compared to the other invertebrates. As a prey to birds, bats and other insectivorous animals, they play an significant part in the food chain ^[3]. They were commonly used by ecologists to study the effect of habitat loss and climate change as model organisms, because the climate change and habitat quality indices are sensitive ^[4].

Ramtek is small town, and its geographical location is 21°24'0''N, 79°21'0''E located at 48 km distance at north side from zero miles of Nagpur, a central part of India. Ramtek Gadmandir is situated at the top of Ramgiri hill. Ramgiri hill divides into two sub hills. At the east side of Gadmandir Ambala Lake is situated, while on the south east side, Khindsi Lake a popular tourist place is located. The Ramgiri hill containing seasonal flowering plants as well as tropical deciduous forest area.

Due to huge construction activity on Gadmandir, green vegetation, many living organisms and butterflies were destroyed. Because of destruction of natural habitat, the butterfly population were in threat. Therefore the present study was carried out to prepare a list of butterfly species for further references to understood butterfly diversity in and around Ramtek Gadmandir area.

2. Materials and Methods

A field survey and investigation was carried out at Ramtek Gadmandir area of approximately 5x7 sq. Km from August 2017 to August 2019. The butterfly watching, data recording and butterfly photography has been carried out by digital camera during first day of every week and holidays at morning and evening time regularly. Temperature and humidity were recorded, accordingly (Table-1). Photographs of butterflies were taken from different angles and the species were identified with the help of available reference books, publications, and literature with keys and concerned with experts ^[2, 5]. Simultaneously the habitat and host plant availability were carried out during the study period.

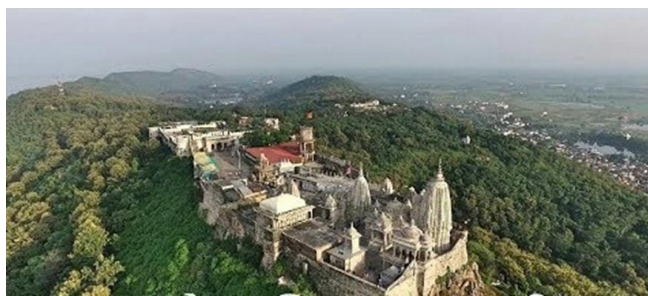


Fig 1: Location of Gadmandir, Ramtek

3. Results and Discussion

During present study the survey was conducted out from the month of August 2017 to August 2019 in and around Ramtek Gadmandir. Total 20 genera and its 30 species of butterfly were recorded belonging to 5 families, i.e. Papilionidae, Nymphalidae, Pieridae, Lycaenidae and Hesperidae. A maximum number of species belongs to family Nymphalidae (Species 12) followed by Papilionidae (species 6) and Pieridae (species 6), Lycaenidae (species 5) and only one genera and one species were recorded in family Hesperidae. (Table. 2), (Fig. 2). In present study it has been observed that out of 30 butterfly species 7 species (24%) were very common, 14 species (46%) were common, 7 species (24%) were rare and 2 species (6%) were very rare species (Table.4), (Fig.3). Family Nymphalidae represents 8 genera with 12 species which is dominant population over other family population. The dominance of Nymphalidae is being documented by many researches in central India [6, 7]. This is may be because of their polyphagous nature which helps them to inhabit. Their dominance is also because of their active flying nature and they can search a large area for resources (Table. 3).

The occurrence of genera was higher in June to December than the February and March and very meagre in April to June. The butterfly population decreased onwards April to June in study area may be due to increase of temperature and humidity as well as less availability of host plant population. Similar kind of observation on butterfly diversity on seasonal distribution were carried out earlier by Tiple and Khurad, 2009 [1] around the Nagpur city and recorded total 145 species of butterflies in the eight study sites of Nagpur city [1]. Interestingly, According to Tiple and Khurad, 2009 [8] some butterflies (*Graphium antiphates*, *Papilio crino*, *Ypthima avanta*, *Everes argiades* and *Hasora chabrona*) which were

recorded earlier by D'Abreu, 1931 [9] from central part of India (Nagpur city), but has not been observed in 2009 [1]. Later on 61 species of butterflies were recorded in Nagpur city [10]. While 92 species of 59 genera of butterflies were noticed from Gorewada International Bio Park, Nagpur, Central India [11].

Highest number of butterflies were recorded in Western Ghats belonging to the Family Nymphalidae (51 species) followed by Lycaenidae (46 species), Hesperidae (22 species), Pieridae (22 species), and Papilionidae (9 species) [12]. Nymphalidae was most dominating family with a highest number of species and most butterfly species were observed from the monsoon to early winter but there after declined in early summer [12]. 98 species of butterflies belonging to family Papilionidae (06 species), Pieridae (14 species), Nymphalidae (39 species), Lycaenidae (24 species) and Hesperidae (15 species) were noticed regularly in reserve forest area, seminary hill, Nagpur city [8]. During the present study we recorded 20 genera and 30 species of butterflies in and around Ramtek Gadmandir population wise Nymphalidae has the highest number of butterflies followed by Pieridae, Papilionidae, Lycaenidae and Hesperidae. During present observation it has been noticed that the family Nymphalidae shows dominance over other families. Family Pieridae, Papilionidae and Lycaenidae having an average population while Hesperidae has minimum population, may be due to preferential food plantations available in and around Ramtek Gadmandir area.

The study area is dominated by various plant species belonging to families Apocynaceae, Fabaceae, Annonaceae, Malvaceae, Acanthaceae, Rubiaceae, etc. (Table. 5), which provide diverse habitat, food and breeding sites for butterflies. Earlier, Tiple and Khurad in (2007), mentioned that the destruction of habitat, affect reduction of species richness and general abundance of butterflies [13, 14]. The Gadmandir area are surrounded by rice agricultural field. The farmers are widely using various pesticides in the field during cropping. Similarly due to various new construction on the Gadmandir area, host plantation has also been cutted out. As Ramtek Gadmandir is holy place, large number of devotees are visiting the mandir and increased the human activities causing disturbances. This may have a deleterious impact on butterfly population on the Gadmandir habitat.

Perhaps this is the first report on the butterfly diversity in Ramtek Gadmandir area and need more detailed observation.

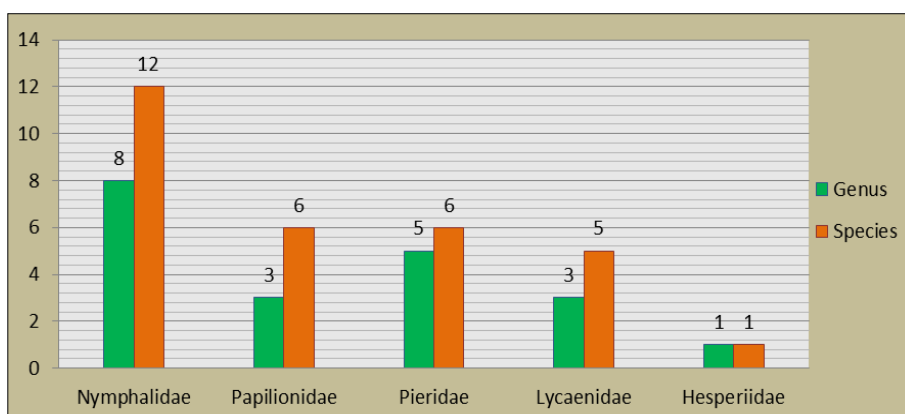
Table 1: List of butterflies observed on scheduled dates with temperature and humidity recorded on same date.

Sr. No.	Scientific Name	Date of collection	Temperature	Humidity
Nymphalidae (12)				
1.	<i>Euploea core</i>	06-Aug-17	27°C	89%
2.	<i>Junonia lemonias</i>	20-Aug-17	29°C	89%
3.	<i>Junonia orithya</i>	28-Aug-18	27°C	54%
4.	<i>Junonia atlites</i>	29-Dec-18	15°C	45%
5.	<i>Junonia almanac</i>	29-Dec-18	15°C	45%
6.	<i>Byblia ilithyia</i>	17-Sept-17	29°C	82%
7.	<i>Hypolimnas bolina</i>	4-Nov-18	27°C	70%
8.	<i>Ypthima asterope</i>	23-sept-18	27°C	89%
9.	<i>Danaus chrysippus</i>	22-sept-17	29°C	70%
10.	<i>Acraea terpsicore</i>	16-sept-18	29°C	70%
11.	<i>Melanitis leda</i>	19-Nov-17	25°C	64%
12.	<i>Melanitis phedima</i>	21-oct-18	29°C	66%
Papilionidae (6)				
13.	<i>Papilio polytes</i>	14-Jan-2018	30°C	80%
14.	<i>Papilio demoleus</i>	17-June-18	38 °C	89%

15.	<i>Papilio glaucus</i>	14-Oct-18	27°C	66%
16.	<i>Graphium agamemnon</i>	2-sept-18	26°C	89%
17.	<i>Pachliopta aristolochiae</i>	11-Feb-18	27°C	79%
18.	<i>Pachliopta hector</i>	7-oct-18	29°C	70%
Pieridae (6)				
19.	<i>Eurema laeta</i>	28-Jan-18	30°C	67%
20.	<i>Eurema brigitta</i>	6-Jan-19	25°C	80%
21.	<i>Ixias Marianne</i>	2-Sept-18	26°C	89%
22.	<i>Pieris oleracea</i>	16-June-19	37°C	89%
23.	<i>Catopsilia pomona</i>	18-Nov- 18	24°C	61%
24.	<i>Kricogonia lyside</i>	30-Sept-18	31°C	66%
Lycaenidae (5)				
25.	<i>Zizula hylax</i>	7-oct-18	29°C	70%
26.	<i>Leptotes pirithous</i>	15-July-18	32° C	83%
27.	<i>Leptotes plinius</i>	9-Dec-18	20°C	83%
28.	<i>Zizina otis</i>	12-Dec-18	21°C	80%
29.	<i>Leptotes cassius</i>	17 –March-18	35°C	82%
Hesperiidae (1)				
30.	<i>Borbo cinnara</i>	16-Dec-18	18°C	60%

Table 2: Distribution of Genera and Species of Butterflies in respective families

Sr. No.	Family	No. of Genera	No. of Species
1.	Papilionidae	03	06
2.	Nymphalidae	08	12
3.	Pieridae	05	06
4.	Lycaenidae	03	05
5.	Hesperiidae	01	01
Total	05	20	30

**Fig 2:** Distribution of genera and species of butterflies in respective families. (On X- axis: Name of Butterfly Family, on Y-axis: Number of Butterflies)**Table 3:** List of Butterflies with common name and status.

Sr. No.	Common Name	Scientific Name	Status
Nymphalidae (12)			
1.	Common crow	<i>Euploea core</i>	VC
2.	Lemon pansy	<i>Junonia lemonias</i>	VC
3.	Blue pansy	<i>Junonia orithya</i>	R
4.	Grey pansy	<i>Junonia atlites</i>	C
5.	Peacock pansy	<i>Junonia almana</i>	C
6.	Joker butterfly	<i>Byblia ilithyia</i>	VR
7.	Blue moon butterfly	<i>Hypolimnas bolina</i>	R
8.	Common 3-ring butterfly	<i>Ypthima asterope</i>	R
9.	Plain tiger butterfly	<i>Danaus chrysippus</i>	VC
10.	Tawny castor	<i>Acraea terpsicore</i>	VC
11.	Common evening brown butterfly	<i>Melanitis leda</i>	C
12.	Dark evening brown butterfly	<i>Melanitis phedima</i>	R
Papilionidae (6)			
13.	Common mormon	<i>Papilio polytes</i>	R
14.	Lime butterfly	<i>Papilio demoleus</i>	VC
15.	Eastern tiger butterfly	<i>Papilio glaucus</i>	R
16.	Tailed Jay	<i>Graphium agamemnon</i>	VR

17.	Common rose	<i>Pachliopta aristolochiae</i>	C
18.	Crimson Rose	<i>Pachliopta hector</i>	C
Pieridae (6)			
19.	Spotless grass yellow butterfly	<i>Eurema laeta</i>	VC
20.	Common grass yellow butterfly	<i>Eurema brigitta</i>	VC
21.	White-orange tip butterfly	<i>Ixias marianne</i>	C
22.	Mustard white butterfly	<i>Pieris oleracea</i>	R
23.	Common emigrant butterfly	<i>Catopsilia pomona</i>	C
24.	Lyside sulphur butterfly	<i>Kricogonia lyside</i>	NR
Lycaenidae (5)			
25.	Tiny grass blue	<i>Zizula hylax</i>	C
26.	Common zebra blue butterfly	<i>Leptotes pirthous</i>	C
27.	Plumbago blue butterfly	<i>Leptotes plinius</i>	C
28.	Lesser grass blue butterfly	<i>Zizina otis</i>	NR
29.	Cassius blue butterfly	<i>Leptotes cassius</i>	NR
Hesperiidae (1)			
30.	Rice swift	<i>Borbo cinnara</i>	NR

Abbre: VC-Very Common; C – Common; NR- Not Rare; R- Rare; VR- Very Rare.

Table 4: Occurance of butterflies.

Sr. No.	Status	No. of species	% of species
1.	Very common	7	24%
2.	Common	14	46%
3.	Rare	7	24%
4.	Very rare	2	6%

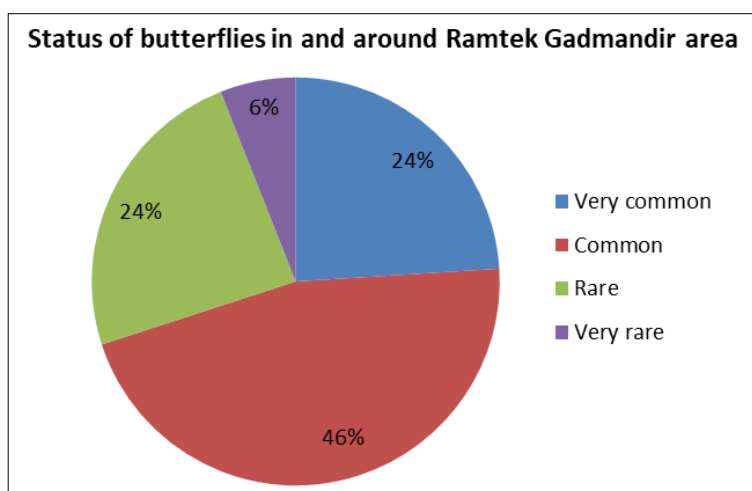


Fig 3: Occurance of Butterflies

Table 5: Host plants in and around Ramtek Gad Mandir.

Sr. No	Family	Common name of plant	Botanical name of plant
1.	Verbenaceae	Tick –berry	<i>Lantana camara</i>
2.	Apocynaceae	devil tree	<i>Alstonia scholaris</i>
3.	Rubiaceae	West Indian Jasmine	<i>Ixora sp.</i>
4.	Asteraceae	Lessingianthus elegans	<i>Vernonia elegans</i>
5.	Ranunculaceae	Traveller's joy	<i>Clematis triloba</i>
6.	Oxalidaceae	sleeping beauty	<i>Oxalis corniculata</i>
7.	Verbenaceae	White sky flower	<i>Duranta repens</i>
8.	Passifloraceae	Yellow alder	<i>Turnera ulmifolia</i>
9.	Caryophyllaceae	Annual pink	<i>Dianthus caryophyllus</i>
10.	Proassicaea	Indian mustard,	<i>Brassica juncea</i>
11.	Apognaceae	rose periwinkle	<i>Catharanthus roseus</i>
12.	Asteraceae	Blanket flower	<i>Gaillardia sp</i>
13.	Roseceae	Damask rose	<i>Rosa domascena</i>
14.	Apocynaceae	Oleander	<i>Nerium oleander</i>
15.	Asteraceae	Indian blanket flower	<i>Gaillardia pulchella</i>
16.	Mallows	Rosemallows	<i>Hibiscus</i>
17.	Rutaceae	Curry tree	<i>Murraya koenigii</i>

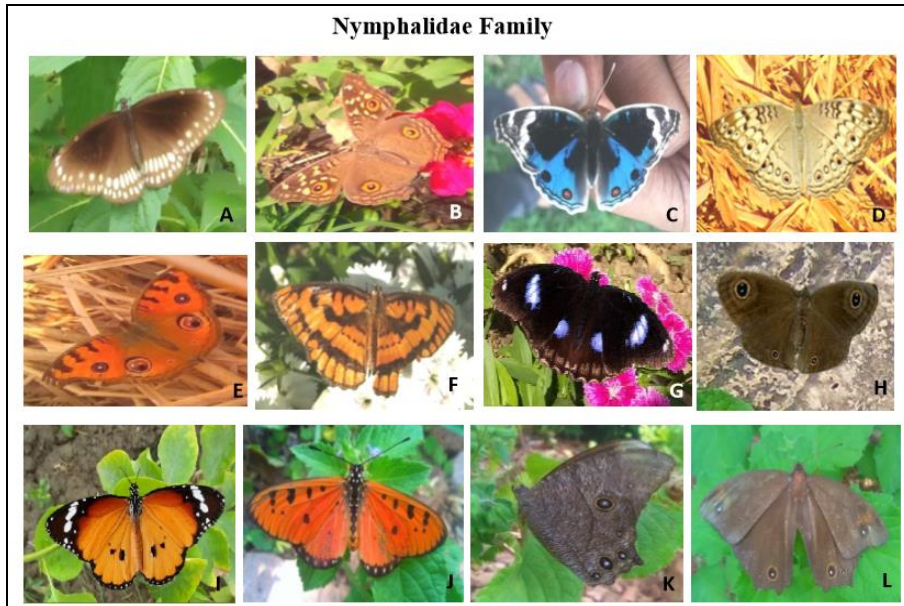


Plate 1: A. *Euploea core*, B. *Junonia lemonias*, C. *Junonia orithya*, D. *Junonia atlites*, E. *Junonia almana*, F. *Byblia ilithya*, G. *Hypolimnas bolina*, H. *Ypthima asterope*, I. *Danaus crysippus*, J. *Acraea terpsicore*, K. *Melanitis leda*, L. *Melanitis phedima*.

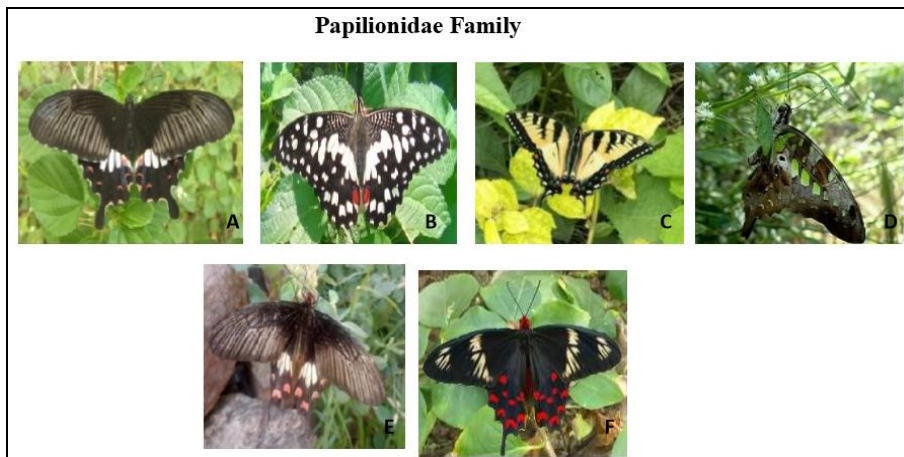


Plate 2: A. *Papilio polytes*, B. *Papilio demoleus*, C. *Papilio glaucus*, D. *Graphium agamemnon*, E. *Pachliopta aristolochiae*, F. *Pachliopta hector*.

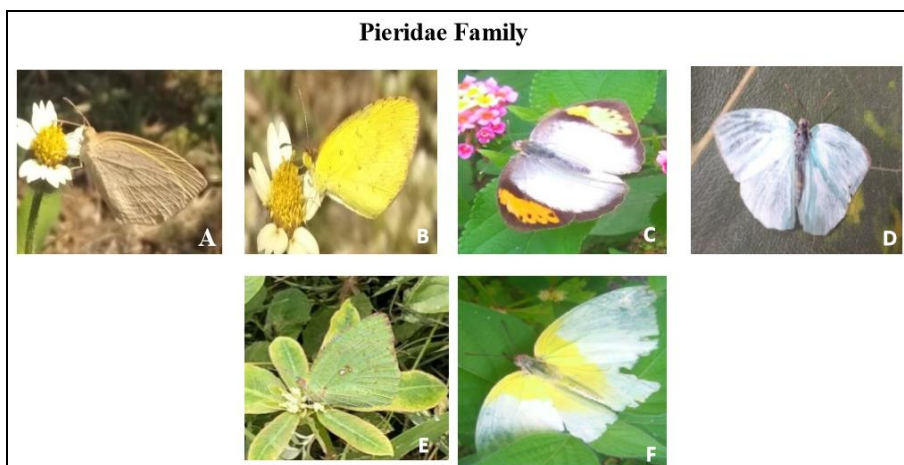


Plate 3: A. *Eurema laeta*, B. *Eurema brigitta*, C. *Ixias marianne*, D. *Pieris oleracea*, E. *Catopsilia pomona*, F. *Kricogonia lyside*.

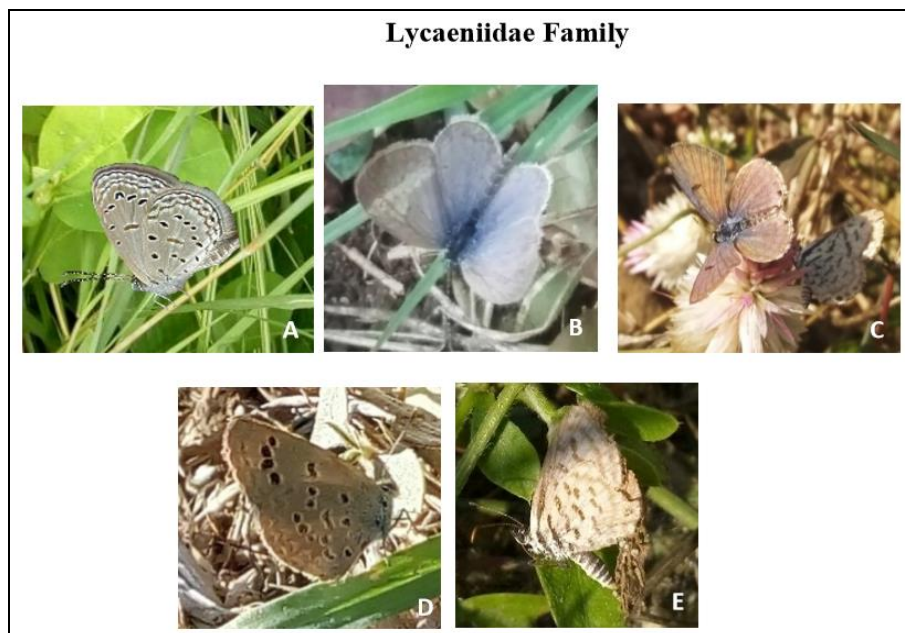


Plate 4: A. *Zizula hylax*, B. *Leptotes pirithous*, C. *Leptotes plinius*, D. *Zizina otis*, E. *Leptotes cassius*



Plate 5: *Borbo cinnara*

4. Conclusion

The present study provide the preliminary data about diversity of butterflies in Ramtek Gadmandir area. The highest population of butterfly species were Nymphalidae family while Hesperidae shows minimum diversity. The highest diversity of family Nymphalidae species is due to presence of maximum host plants of species specific. This study will help for further details work on butterfly fauna, seasonal distribution and diversity and will also help to identify the potential threats to butterfly species. From the present study it is concluded that Ramtek is rich of butterflies species due to presence of preferable number of host plants. Perhaps this is the first report in exploring the butterfly wealth in Ramtek.

5. Acknowledgement

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