



DIVERSITY OF BUTTERFLIES (LEPIDOPTERA) IN MAHATMA PHULE A. S. C. COLLEGE CAMPUS AND ADJACENT AREAS OF PANVEL, RAIGAD, MAHARASHTRA

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. Authors LNM, SPS, RBP and PRP designed the study, carried out all the work, wrote the protocol and managed the literature searches. Author LNM wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Panvel region of Raigad district harbors a great range of vegetation, estuary and mountainous hills and thus offers habitation for living organisms including butterflies. Several anthropogenic activities including the ongoing construction of Navi Mumbai International Airport (NMIA) has destroyed habitat in and around Panvel region. Loss of habitat results in the decline of biodiversity of both vertebrates and invertebrates. There is not even a preliminary list of Lepidopteran species of this region. Therefore, the present study was conducted to prepare a checklist of butterflies in the region. Butterflies were observed for one year (from June 2019 to May 2020) in different localities of Mahatma Phule College of Arts, Science and Commerce (MPASC) campus and the adjacent areas in Panvel. A total of 42 species of Lepidopteran belonging to 32 genera and 6 families were recorded. Among the 6 families, Nymphalidae dominated the list with 14 genera and 21 species, Pieridae with 7 genera and 9 species, Lycaenidae with 7 genera and 7 species, Papilionidae with 2 genera and 3 species, Hesperidae and Riodinidae with 1 genus and 1 species each. This study would provide information on the biodiversity of butterflies of the region that can be used as a baseline preliminary data for further butterfly studies.

Keywords: Lepidoptera; panvel; butterflies; habitat loss; biodiversity.

1. INTRODUCTION

Biological diversity refers to the variety and variability among living organisms and the ecological complexes in which they live [1]. Biodiversity forms the root of all living systems, the foundation for sustainable development, constitutes the basis for environmental health and is

a source of economic and ecological security for the future generation. The Indian subcontinent is the seventh-largest country in the world, is quite rich in biodiversity with a sizable percentage of endemic flora and fauna. India is one among the twelve mega biodiversity countries of the world and that 80% of the insects are endemic in India [2].

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The total number of known species of Lepidoptera makes up about 10% of total animal kingdom and is roughly equivalent to the number of known flowering plants species [3]. Lepidoptera is the second largest order of class Insecta and most fascinating group. Approximately 1500 butterflies are identified from the Indian subcontinent, constituting 8.33% of the 18,000 known species of the world [4-7]. Most of the Indian butterflies are reported from the Himalayas and the Western Ghats [8].

Butterflies (Lepidoptera: Rhopalocera) are one of the most important pollinators and herbivores in nature [9,10]. Butterflies have coevolved with plants as they live on nectar and in larval condition leaves of the host plant [11,12]. Butterflies are considered useful bio-indicator species for monitoring and detecting changes in the environment because of their diversity, wide distribution, specific to vegetation type, rapid response to perturbation, taxonomic tractability, statistically significant abundance, ease of sapling and sensitivity to environmental variations [13-20]. Erosion of natural habitats, urbanization, and pollution due to anthropogenic activities manifold the intensity of environmental variations. Habitat loss occurs when habitat is converted into other uses and species are no longer able to survive [21-26].

Several anthropogenic activities including the ongoing construction of Navi Mumbai International Airport (NMIA) have caused the destruction of habitat in and around Panvel region that may have led to dwindling of butterfly species. There is no record of study on butterfly biodiversity of the Panvel region till date. Hence, the present study was undertaken to establish a pattern of butterflies' biodiversity in Mahatma Phule College of Arts, Science and Commerce (MPASC) College campus and adjacent areas of Panvel, Raigad district, Maharashtra. The study will pave way for further studies on the biodiversity of butterflies and its conservation in and around Panvel area by setting up an inventory of insects and various human activities encountered in the area.

2. MATERIALS AND METHODS

2.1 Study Area

Mahatma Phule College of Arts, Science and Commerce (MPASC) college campus located in Panvel, Raigad district of Maharashtra, India was the area of observation for butterfly biodiversity (Fig. 1). It is spread in 13 acres. The Panvel is one of the most populous cities of Raigad district located in the Mumbai Metropolitan Region. Panvel is situated on the banks of the Gadhi river which flows and opens into the Panvel Creek of the Arabian sea. Panvel city is surrounded by hills on two sides. The college campus and its surroundings have natural vegetation, a botanical garden having several types of medicinal and other plants. Presence of food plants for butterflies in the campus provides ideal conditions for the flourishing of butterflies.

2.2 Study Location

The selected sites were surveyed for a period of one year from June 2019 to May 2020 to assess the biodiversity of butterflies. Field observations were conducted following Pollard Walk Method [27]. Field surveying was made weekly between 9.00 to 15.00 hours during the sunshine period for photographing the butterflies while walking along surveyed paths along with the areas. Surveying path was limited to a stretch of about 3 m width and 50 m long on an average. Butterflies were photographed using Cannon 1100 D Zoom camera. Species were identified with the help of standard identification manuals and published literatures [9,28,29,30].

3. RESULTS AND DISCUSSION

A total of 42 species of lepidopteran belonging to 32 genera and 6 families were recorded (Tables 1 & 2). Among the 6 families, Nymphalidae dominated the list with 14 genera and 21 species, Pieridae with 7

Table 1. List of families with number of genera & species of butterflies recorded in MPASC College campus and adjacent areas of Panvel, Raigad district

S. No.	Family	Genera	Species	Family wise species Percentage (%)
1	Hesperiidae	01	01	2.38
2	Lycaenidae	07	07	16.67
3	Nymphalidae	14	21	50.00
4	Papilionidae	02	03	7.14
5	Pieridae	07	09	21.43
6	Riodinidae	01	01	2.38
Total	06	32	42	

genera and 9 species, Lycaenidae with 7 genera and 7 species, Papilionidae with 2 genera and 3 species, Hesperidae and Riodinidae with 1 genus and 1 species each. (Tables 1 and 2, Figs. 2-4) Butterflies from family Nymphalidae showed maximum species diversity dominance with 21 species (50%) followed by family Pieridae consisting 9 species (21.43%),

Lyciniidae represented by 7 species (16.67%), family Papilionidae consisting 3 species (7.14%) and family Hesperidae and Riodinidae recorded the least number of species diversity with one species each (2.38%) (Figs. 2-4; Tables 1 and 2). Genus *Euploea*, *Mycalesis*, and *Eurema* showed maximum species diversity among genus with 3 species each.

Table 2. Checklist of Butterflies (Insecta, Lepidoptera) recorded in MPASC College campus and adjacent areas of Panvel, Raigad district

S. No.	Family	Scientific Name	Common Name
1	Hesperidae	<i>Aeromachus dubius</i> (Elwes& Edwards, 1897)	Dingy Scrub Hopper
2	Lycaenidae	<i>Azonus ubaldus</i> (Stoll, 1782)	Bright Babul Blue
3		<i>Chilades pandava</i> (Horsfield, 1829)	Plains Cupid
4		<i>Jamides alecto</i> (Swinhoe, 1915)	Metallic Cerulean
5		<i>Leptotes plinius</i> (Fabricius, 1793)	Zebra Blue
6		<i>Rathinda amor</i> (Fabricius, 1775)	Monkey Puzzle
7		<i>Talicauda nyseus</i> (Guérin-Meneville, 1843)	Red Pierrot
8		<i>Tarucus indica</i> (Evans, 1932)	Indian Pointed Pierrot
9	Nymphalidae	<i>Acraea violae</i> (Fabricius, 1793)	Tawny Coster
10		<i>Ariadne ariadne</i> (Linnaeus, 1763)	Angled Castor
11		<i>Cirrochroa thais</i> (Fabricius, 1787)	Tamil Yeoman
12		<i>Danaus chrysippus</i> (Linnaeus, 1758)	Plain Tiger, African queen
13		<i>Euploea core</i> (Cramer, 1780)	Common Crow
14		<i>Euploea klugii</i> (Moore, 1858)	King Crow, Brown King Crow
15		<i>Euploea sylvester</i> (Fabricius, 1793)	Double-branded Crow
16		<i>Hypolimnas bolina</i> (Linnaeus, 1758)	Great Eggfly
17		<i>Hypolimnas misippus</i> (Linnaeus, 1764)	Danaid Eggfly
18		<i>Junonia almana</i> (Linnaeus, 1758)	Peacock Pansy
19		<i>Junonia atlites</i> (Linnaeus, 1763)	Gray Pansy
20		<i>Kallima horsfieldi</i> (Kollar, 1844)	Southern Blue Oakleaf
21		<i>Melanitis leda</i> (Linnaeus, 1758)	Common Evening Brown
22		<i>Mycalesis mineus</i> (Linnaeus, 1758)	Dark-brand Bushbrown
23		<i>Mycalesis perseus</i> (Fabricius, 1775)	Common Bushbrown
24		<i>Mycalesis visala</i> (Moore, 1858)	Long-brand Bushbrown
25		<i>Neptis jumbah</i> (Moore, 1858)	Chestnut-streaked Sailer
26		<i>Parantica aglea</i> (Stoll, 1782)	Glassy Tiger
27		<i>Phalanta alcippe</i> (Stoll, 1782)	Small Leopard
28		<i>Tirumala limniace</i> (Cramer, 1775)	Blue Tiger
29		<i>Tirumala septentrionis</i> (Butler, 1874)	Dark Blue Tiger
30	Papilionidae	<i>Graphium doson</i> (C. & R. Felder, 1864)	Common Jay
31		<i>Papilio demoleus</i> (Linnaeus, 1758)	Lime Butterfly
32		<i>Papilio polytes</i> (Linnaeus, 1758)	Common Mormon
33	Pieridae	<i>Catopsilia pyranthe</i> (Linnaeus, 1758)	Mottled Emigrant
34		<i>Colotis amata</i> (Cramer, 1775)	Small Salmon Arab
35		<i>Delias eucharis</i> (Drury, 1773)	Common Jezebel
36		<i>Eurema brigitta</i> (Stoll, 1780)	Small Grass Yellow
37		<i>Eurema hecabe</i> (Linnaeus, 1758)	Common Grass Yellow
38		<i>Eurema nilgiriensis</i> (Yata, 1990)	Nilgiri Grass Yellow
39		<i>Leptosia nina</i> (Fabricius, 1793)	Psyche
40		<i>Pareronia hippie</i> (Cramer, 1776)	Common Wanderer
41		<i>Prioneris sita</i> (C. & R. Felder, 1865)	Painted Sawtooth
42	Riodinidae	<i>Abisara bifasciata</i> (Moore, 1877)	Two-spot Plum Judy

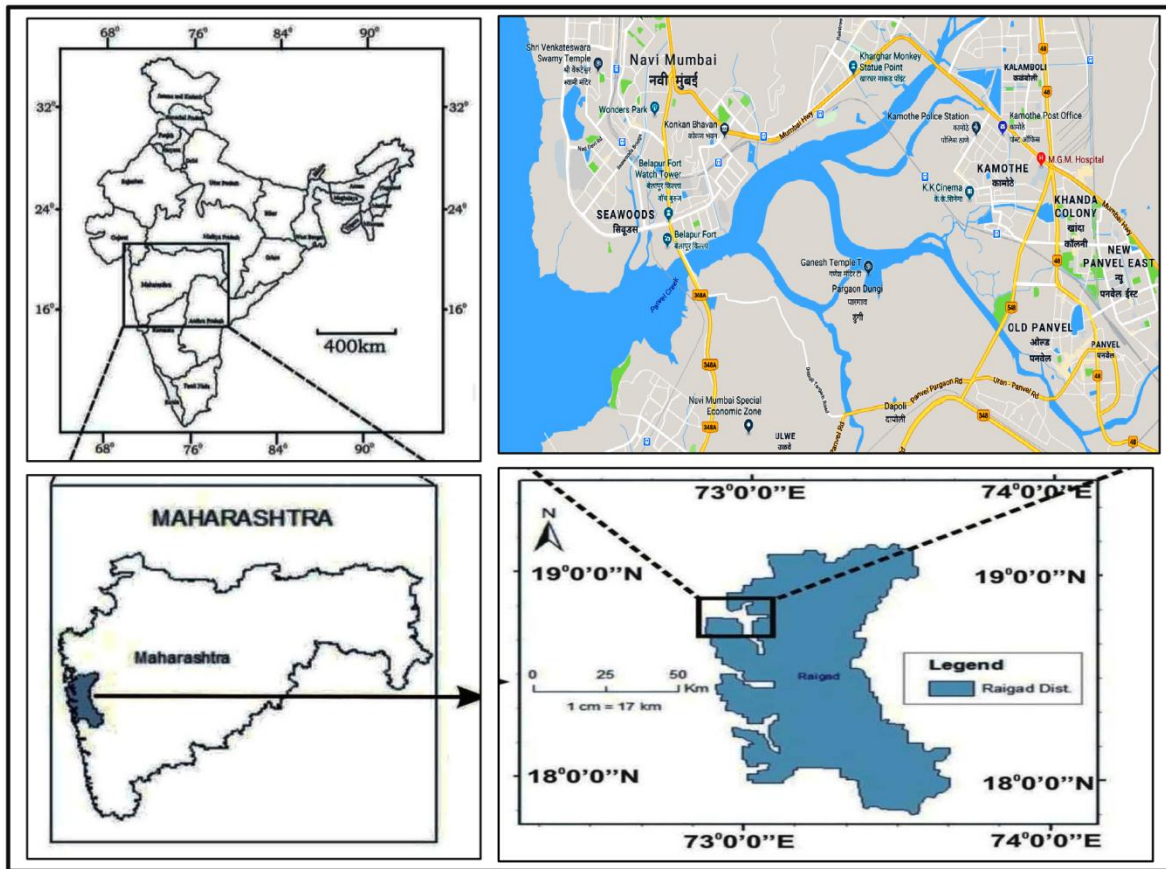


Fig. 1. Location map of the study area



Fig. 2. Butterflies recorded in MPASC College campus and adjacent areas of Panvel, Raigad district

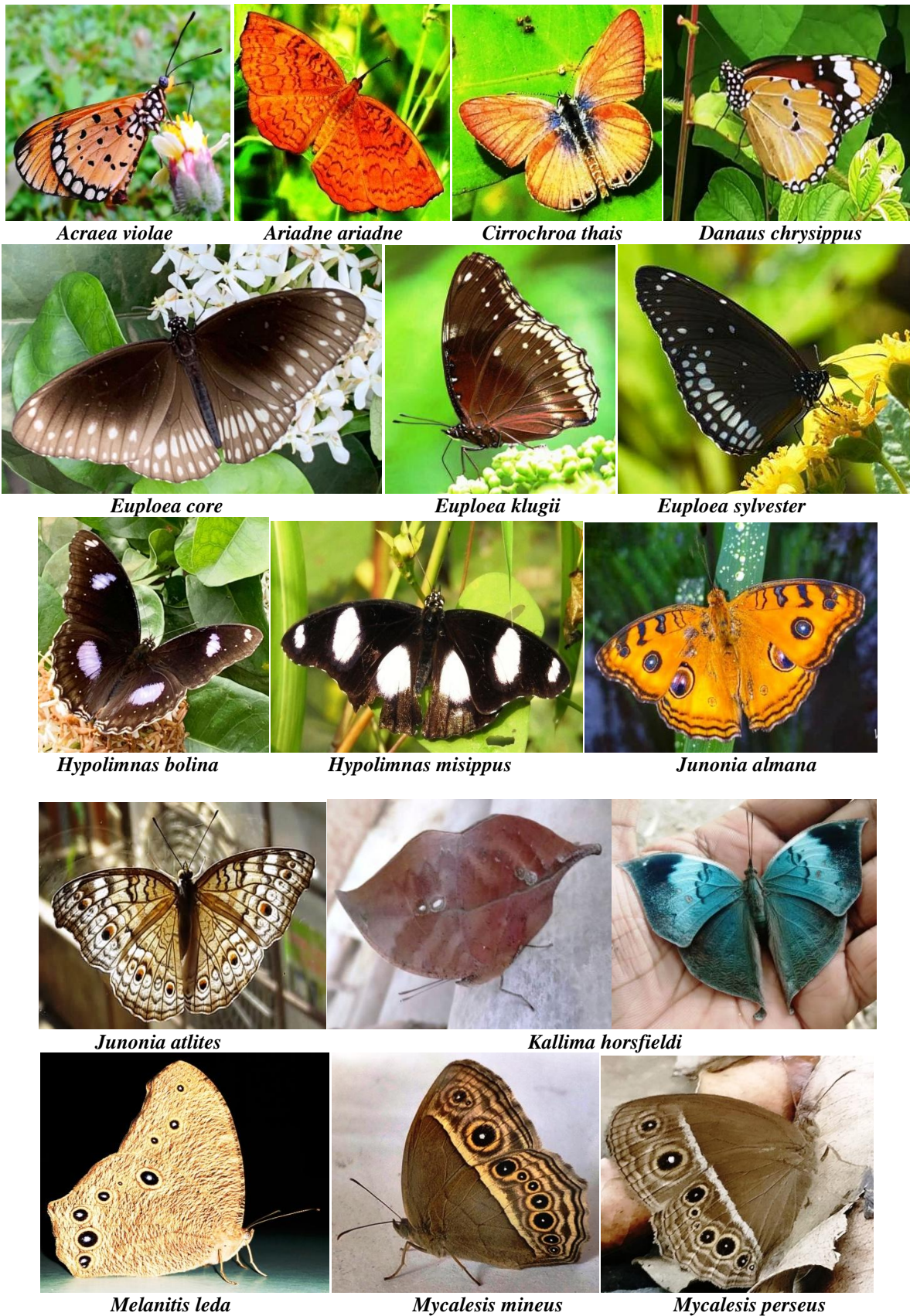


Fig. 3. Butterflies recorded in MPASC college campus and adjacent areas of Panvel, Raigad district



Mycalesis visala



Neptis jumbah



Parantica aglea



Phalanta alcippe



Tirumala limniace



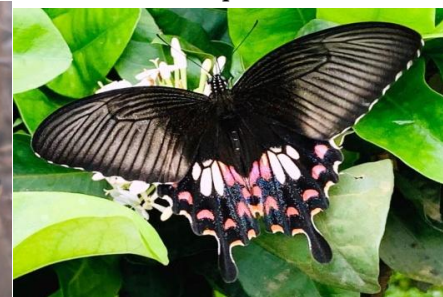
Tirumala septentrionis



Graphium doson



Papilio demoleus



Papilio polytes



Catopsilia pyranthe



Colotis amata



Delia seucharis



Eurema brigitta



Eurema hecabe



Eurema nilgiriensis



Fig. 4. Butterflies recorded in MPASC College campus and adjacent areas of Panvel, Raigad district

Butterflies (Lepidoptera: Rhopalocera) are beneficial as they help in pollination and are considered as ecological indicators and are appreciated for their aesthetic value [31-35]. Availability of food (host plant and nectar plant) and microclimate are the main factors affecting butterfly diversity largely [36-40]. The college campus is rich in vegetation serving as foods for butterflies, therefore, we recorded better diversity of butterflies in the campus. Sources of food for all stages of butterflies form the reason for the richness of butterflies. Butterfly habitat protection should get attention in any conservation programme.

Family Nymphalidae is the largest family representing nearly one-third of the known butterflies of the world. The high biodiversity of nymphalids and lycaenids in our data is consistent with other studies on butterfly diversity [41-44]. They are dominant because most of the species are polyphagous in nature, of their ecological adaptation [45] and speciation and high dispersal ability [46]. Additionally, many species of this family are strong, active fliers that might help them in searching for habitats and foods in large areas [47-50].

Butterflies are good indicators in terms of anthropogenic disturbance and habitat quality [51]. Since this study is the first preliminary study of butterfly biodiversity of this area, therefore, cannot be confirmed about the loss of butterfly species. The checklist of butterflies generated in this study will serve as baseline data for further studies. Further, Intensive studies on butterfly diversity are required to improve the list of butterfly species and to ascertain the impact of anthropogenic alteration of the habitats in and around Panvel region.

4. CONCLUSION

Butterflies (Lepidoptera: Rhopalocera) are beneficial as they help in pollination, are considered as ecological indicators and are appreciated for their aesthetic value. Availability of food (host plant and nectar plant), habitat and microclimate are the main factors affecting butterfly diversity. Anthropogenic activities are responsible for the destruction of habitat, loss of food plants and change in microclimate especially due to the ongoing construction of Navi

Mumbai International Airport (NMIA). In the present study, a total of 42 species of butterflies belonging to 32 genera and 6 families were recorded. Since there is no earlier record of butterflies species list of this area and therefore any change in butterflies diversity cannot be confirmed. These preliminary observations on butterfly diversity of MPASC college campus will serve as the basis for future studies on the ecology, biology and conservation of butterflies in Panvel in general and at MPASC college campus in particular. Further detailed studies are required to improve the checklist of butterflies diversity and to assess the impact of anthropogenic alteration on butterflies diversity.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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