IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 3, March 2025

Seasonal Diversity of Butterfly Species in and around Mokhada Town, Maharashtra, India.

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Abstract: *This research paper investigates the seasonal diversity of butterfly species in and around Mokhada Town, located in the Palghar district of Maharashtra, India. This study aims to document the variety and abundance of butterfly species throughout different seasons. The field surveys on butterflies were carried out in the study area three times a week for the period of nine months from June to February 2025. The results revealed a total of 63 butterfly species from 5 families. In which Nymphalidae was the richest amongst families that comprised (377 and 41%) of the total species of butterfly recorded in all three seasons in three selected areas, which was followed by Lycaenidae (199 and 21%), Pieridae (188 and 20%),Papilioninae (98 and 11%), and the Hesperiidae family was the lowest (65 and 7%), respectively. The research identifies key trends, such as higher species diversity during the monsoon and post-monsoon months, attributed to the availability of nectar-rich plants and increased moisture levels. This study highlights the potential of Mokhada as a key region for butterfly conservation, offering insights into the broader ecological significance of butterflies as bioindicators. The findings contribute to the growing body of research on butterfly ecology in India and provide a baseline for future studies on climate change impacts and biodiversity conservation in the region.*

Keywords: Mokhada Town, Butterfly Species, Seasonal Diversity, Biodiversity, Conservation

I. INTRODUCTION

Butterflies support the ecosystem by performing various functions like pollinating, being prey, being biological pest controllers, causing genetic variation in plants, improving environmental attractiveness, and lowering carbon dioxide levels in the atmosphere (M. Ghazanfar et al., 2016). During the paddy crop's ripening stage, butterflies are crucial for improved pollination and an additional crop that increases crop yield (Dharmik R. Ganvir et al., 2018). Mokhada, located in the Palghar district of Maharashtra, India, offers a unique and rich environment for studying butterfly diversity due to its varied landscapes, including forests, grasslands, and agricultural areas. The town and its surrounding areas are situated in the Western Ghats, a biodiversity hotspot that supports numerous species of flora and fauna, some of which are endemic. Butterflies, belonging to the order Lepidoptera, are among the most vibrant and ecologically significant insects in the world. They play crucial roles in ecosystems as pollinators, serving as indicators of environmental health due to their sensitivity to habitat changes and climate variations (Wynter-Blyth, 1957).

The diversity of butterfly species within a specific geographic region can offer valuable insights into the health and stability of local ecosystems, making them important subjects for ecological research and conservation (Kunte, 2000). Mokhada Town, situated in the Palghar district of Maharashtra, India, represents a region of great ecological interest. This semi-rural area is characterized by a mix of tropical forests, agricultural land, and human settlements, providing a variety of habitats that support diverse wildlife, including butterflies (Sondhi, 2010). Despite the increasing awareness of the importance of butterfly species in India, the seasonal patterns of butterfly diversity and their environmental correlates in regions such as Mokhada remain largely understudied. The seasonal variation in butterfly populations is influenced by several factors, including temperature, humidity, rainfall, and the availability of food sources such as nectar plants (Kunte & Kunte, 2008). In regions like Mokhada, where the climate shifts between dry and wet seasons, these environmental changes can significantly impact butterfly distribution and abundance (Bhagat, 2015).

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Understanding these seasonal patterns is crucial for the effective management and conservation of butterfly species, as it can help predict trends in population dynamics and guide habitat preservation strategies (Bhat & Padhye, 2017).

This research aims to explore the seasonal diversity of butterfly species in and around Mokhada Town. By conducting systematic surveys over a nine-month period, this study seeks to identify the butterfly species present, examine their seasonal fluctuations, and determine the environmental factors that influence their distribution. The findings of this study will contribute to the broader understanding of butterfly ecology in the Indian subcontinent and provide a foundation for future conservation initiatives aimed at preserving butterfly species and their habitats in the region.

II. MATERIALS AND METHODS

Mokhada is a town located in the Palghar district of Maharashtra, India, nestled within the Western Ghats- a biodiversity hotspot and an ecologically rich region. It is 160 kilometers from Mumbai, the state capital, and 90 kilometers northeast of Palghar, the district headquarters. Rainfall in the region ranges from 650 to 950 mm per year on average. Mokhada's varied topography, which includes forested areas, agricultural land, grasslands, and water bodies, provides a unique and diverse environment for butterfly species. The area is characterized by a tropical climate with distinct seasons, including the monsoon (June to September), post-monsoon (October and November), and dry seasons (December to February), all of which influence the biodiversity and seasonal dynamics of the region.

The Western Ghats are home to many endemic species of plants and animals, making this region of great interest for ecological studies. In particular, Mokhada's landscapes support a wide variety of flora, which in turn, provide essential resources for butterflies. These diverse habitats make it an ideal location to study seasonal butterfly diversity and the relationship between butterfly species and their host plants. The Mokhada region is located at an altitude of about 300-600 meters above sea level, which gives it a mix of tropical and subtropical climate conditions. The presence of water bodies like rivers and streams in the area also adds to the biodiversity of the region, making it a dynamic site for studying ecological interactions.

III. STUDY AREA AND SAMPLING SITE

For the study of seasonal diversity of butterfly species, three representative sampling sites have been selected in and around Mokhada. Each site was chosen for its distinct habitat characteristics that are known to support different butterfly species and plant types.

Site 1: Grassland & Garden Area (Arts, Science & Commerce College, Mokhada)

Site 2: Agricultural Land and Wetland (Site near ITI College)

Site 3: Forested Area (Site near Gandhi Pool /Jawhar Fata)

The three selected sites cover a wide range of habitats, including forests, open grasslands, and agricultural-wetland areas. This diversity allows the study to account for how different environments influence butterfly diversity and the availability of host plants across seasons.


Site 1


Site 2


Site 3

IV. SURVEY METHOD

The field surveys on butterflies were carried out in the study area three times a week for the period of nine months from June to February 2025. Butterflies will be observed in the study area from 8am to 11am in the morning by the Pollard Walk method. This method involves walking a fixed transect path while recording all butterfly species encountered,

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along with their behavior and interaction with host plants. The transects at each site will cover an area of about 500 m, ensuring coverage of a variety of habitats within the site. In the field, photographs of the butterflies were taken with the help of a mobile phone and a Sony camera.

V. SPECIES OF BUTTERFLY AND ITS IDENTIFICATION

Identification of butterfly species involves recognizing different species based on distinct morphological characteristics, behavior, habitat preferences, and sometimes even by their interaction with host plants. The process of identifying butterflies can be done using a combination of field observations and reference materials such as identification guides, photographs, or online databases and relevant available literature and photographs described by Sunil et al. (2016) and Kumar et al. (2016). Butterflies are also identified by using different websites (i, ii, iii) as mentioned in the reference section and Dr. Raju Kasambe, 2016

VI. RESULT AND DISCUSSION

Checklist of the species of butterfly in the study area

Tables 1, 2, and 3 present the checklist of butterfly species observed in all three seasons in the study area. The results indicated that a total of 63 species of butterflies belonging to 5 families were recorded in the study area. Nymphalidae was the richest family in the study area in all seasons (377 & 41%), followed by the Lycaenidae family (199 & 21%). Table 5 shows that in all three seasons, 927 individuals of butterflies are observed in three selected sites. In addition, the pie charts in figs. 1, 2, and 3 show the family-wise percentage composition of butterflies in the monsoon, post-monsoon, and dry seasons. The family Nymphalidae displays the greatest number of butterfly species seen during the study period.

Table 1: Checklist of the species of butterfly recorded in the study area (Monsoon Season)

Sr. No.	Family	Common Name	Scientific Name	Monsoon Season (June to September)			Total No.
				Site A	Site B	Site C	
1	Hesperiidae	Tricolored pied flat	*Coladeniaindrani*	2	1	0	3
2		Indian palm bob	*Suastusgremius*	3	2	0	5
3		Rice swift	*Borbocinnara*	1	2	1	4
4		Common banded awl	*Hasorachromus*	2	1	1	4
5		Indian Grizzled Skipper	*Spialiagalba*	1	1	0	2
6		Small banded swift	*Pelopidas mathias*	2	1	1	4
7		Common Dart	*Taractroceramaevius*	1	2	0	3
8	Papilionidae	Common jay	*Graphiumdoson*	3	0	1	4
9		Common rose	*Pachlioptaaristolochiae*	2	0	0	2
10		Spot swordtail	*Graphiumnomius*	2	0	1	3
11		Common Mormon	*Papilio polytes*	3	1	1	5
12		Tailed jay	*Graphiumagamemnon*	3	1	1	5
13		Lime butterfly	*Papilio demoleus*	2	0	2	4
14		Blue Mormon	*Papilio polymnestor*	2	1	1	4
15	Lycaenidae	Peacock royal	*Tajuria cippus*	1	0	0	1
16		Pea Blue	*Lampidesboeticus*	4	1	2	7
17		Common Pierrot	*Castaliusrosimon*	4	1	2	7
18		Monkey puzzle	*Rathinda amor*	1	1	0	2
19		Dark grass blue	*Zizeeriakarsandra*	2	2	4	8
20		Common silverline	*Cigaritisvulcanus*	2	2	0	4
21		Gram Blue	*Euchrysopscnejus*	3	3	2	8
22		Common hedge blue	*Acytolepispuspa*	2	1	1	4

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23		Common Cerulean	*Jamides celeno*	2	2	1	5
24		Red Pierrot	*Talicadanyseus*	1	1	1	3
25		Rounded Pierrot	*Tarucusextricatus*	2	2	1	5
26		Indian Sunbeam	*Curetis thetis*	1	0	1	2
27		Angled Pierrot	*Caleta decidia*	2	1	1	4
28	Pieridae	Psyche	*Leptosianina*	1	2	1	4
29		Common gull	*Ceporanerissa*	2	1	0	3
30		Three-spot grass yellow	*Euremablanda*	1	2	1	4
31		Spotless grass yellow	*Euremalaeta*	3	1	2	6
32		Common grass yellow	*Euremahecabe*	4	5	4	13
33		Common emigrant	*Catopsiliapomona*	6	2	3	11
34		Common jezebel	*Delias eucharis*	2	1	2	5
35		Mottled Emigrant	*Catopsiliapyranthe*	5	2	4	11
36		Common Wanderer	*Pareronia valeria*	4	1	0	5
37	Nymphalidae	Baronet	*Euthalia nais*	2	0	0	2
38		Yellow pansy	*Junoniahierta*	1	1	1	3
39		Bamboo Treebrown	*Lethe europa*	2	0	2	4
40		Common palmfly	*Elymniashypermnestra*	1	0	0	1
41		Common Bushbrown	*Mycalesisperseus*	1	1	1	3
42		Sahyadri blue oakleaf	*Kallima horsfieldii*	1	0	0	1
43		Blue pansy	*Junoniaorithiya*	2	1	2	5
44		Common Sailer	*Neptishylas*	2	1	1	4
45		Painted lady	*Vanessa cardui*	1	1	1	3
46		Common Baron	*Euthalia aconthea*	2	0	0	2
47		Common five ring	*Ypthimabaldus*	1	0	2	3
48		Common Castor	*Ariadne merione*	3	2	1	6
49		Common Evening Brown	*Melanitisleda*	2	1	2	5
50		Great eggfly	*Hypolimnasbolina*	2	2	1	5
51		Oriental Commander	*Moduzaprocris*	2	0	0	2
52		Grey pansy	*Junoniaatlites*	1	2	1	4
53		Chocolate pansy	*Junoniaiphita*	2	2	1	5
54		Peacock pansy	*Junoniaalmana*	1	1	0	2
55		Lemon pansy	*Junonialemonias*	1	2	1	4
56		Plain tiger	*Danaus chrysippus*	5	3	2	10
57		Danaid eggfly	*Hypolimnasmisippus*	4	2	1	7
58		Black rajah	*Charaxes solon*	1	0	0	1
59		Blue tiger	*Tirumala limniace*	5	3	2	10
60		Glassy tiger	*Paranticaaglea*	4	2	1	7
61		Stripped tiger	*Danaus genutia*	4	1	1	6
62		Common crow	*Euploea core*	3	2	3	8
63		Common leopard	*Phalantaphalantha*	2	2	0	4
Total				**142**	**79**	**70**	**291**

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Table. 2. Checklist of the species of butterfly recorded in the study area (Post Monsoon Season)

Sr. No.	Family	Common Name	Scientific Name	Post-Monsoon Season (October & November)			Total No.
				Site A	Site B	Site C	
1	Hesperiidae	Tricolored pied flat	*Coladeniaindrani*	3	2	0	5
2		Indian palm bob	*Suastusgremius*	2	1	1	4
3		Rice swift	*Borbocinnara*	2	3	2	7
4		Common banded awl	*Hasorachromus*	1	2	0	3
5		Indian Grizzled Skipper	*Spialiagalba*	1	2	0	3
6		Small banded swift	*Pelopidas mathias*	2	1	2	5
7		Common Dart	*Taractroceramaevius*	1	2	1	4
8	Papilionidae	Common jay	*Graphiumdoson*	4	2	1	7
9		Common rose	*Pachlioptaaristolochiae*	3	1	0	4
10		Spot swordtail	*Graphiumnomius*	3	1	0	4
11		Common Mormon	*Papilio polytes*	4	0	2	6
12		Tailed jay	*Graphiumagamemnon*	5	2	0	7
13		Lime butterfly	*Papilio demoleus*	3	1	3	7
14		Blue Mormon	*Papilio polymnestor*	3	2	2	7
15	Lycaenidae	Peacock royal	*Tajuria cippus*	1	1	1	3
16		Pea Blue	*Lampidesboeticus*	5	6	4	15
17		Common Pierrot	*Castaliusrosimon*	5	0	3	8
18		Monkey puzzle	*Rathinda amor*	2	0	0	2
19		Dark grass blue	*Zizeeriakarsandra*	5	7	4	16
20		Common silverline	*Cigaritisvulcanus*	2	0	1	3
21		Gram Blue	*Euchrysopscnejus*	5	8	2	15
22		Common hedge blue	*Acytolepispuspa*	3	3	3	9
23		Common Cerulean	*Jamides celeno*	3	3	2	8
24		Red Pierrot	*Talicadanyseus*	3	0	0	3
25		Rounded Pierrot	*Tarucusextricatus*	2	2	1	5
26		Indian Sunbeam	*Curetis thetis*	1	1	0	2
27		Angled Pierrot	*Caleta decidia*	1	4	1	6
28	Pieridae	Psyche	*Leptosianina*	1	1	0	2
29		Common gull	*Ceporanerissa*	3	3	1	7
30		Three-spot grass yellow	*Euremablanda*	2	3	2	7
31		Spotless grass yellow	*Euremalaeta*	4	4	3	11
32		Common grass yellow	*Euremahecabe*	6	8	7	21
33		Common emigrant	*Catopsiliapomona*	8	3	5	16
34		Common jezebel	*Delias eucharis*	3	0	1	4
35		Mottled Emigrant	*Catopsiliapyranthe*	7	4	6	17
36		Common Wanderer	*Pareroniavaleria*	2	0	1	3
37		Baronet	*Euthalia nais*	2	0	1	3
38		Yellow pansy	*Junoniahierta*	1	2	0	3
39		Bamboo Treebrown	*Lethe europa*	1	1	4	6
40		Common palmfly	*Elymniashypermnestra*	3	0	0	3
41		Common Bushbrown	*Mycalesisperseus*	1	2	2	5
42		Sahyadri blue oakleaf	*Kallima horsfieldii*	1	0	0	1

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43	Nymphalidae	Blue pansy	*Junoniaorithiya*	3	2	1	6
44		Common Sailer	*Neptishylas*	2	0	1	3
45		Painted lady	*Vanessa cardui*	1	0	2	3
46		Common Baron	*Euthalia aconthea*	3	1	1	5
47		Common five ring	*Ypthimabaldus*	2	1	0	3
48		Common Castor	*Ariadne merione*	1	3	1	5
49		Common Evening Brown	*Melanitisleda*	2	2	3	7
50		Great eggfly	*Hypolimnasbolina*	3	2	2	7
51		Oriental Commander	*Moduzaprocris*	1	0	0	1
52		Grey pansy	*Junoniaatlites*	5	2	3	10
53		Chocolate pansy	*Junoniaiphita*	3	3	1	7
54		Peacock pansy	*Junoniaalmana*	1	4	2	7
55		Lemon pansy	*Junonialemonias*	1	3	2	6
56		Plain tiger	*Danaus chrysippus*	8	4	6	18
57		Danaid eggfly	*Hypolimnasmisippus*	4	1	2	7
58		Black rajah	*Charaxes solon*	1	0	0	1
59		Blue tiger	*Tirumala limniace*	6	3	4	13
60		Glassy tiger	*Paranticaaglea*	6	1	2	9
61		Stripped tiger	*Danaus genutia*	3	2	2	7
62		Common crow	*Euploea core*	3	4	3	10
		Common leopard	*Phalantaphalantha*	2	1	1	4
Total				**181**	**127**	**108**	**416**

Table. 3. Checklist of the species of butterfly recorded in the study area (Dry Season)

Sr. No.	Family	Common Name	Scientific Name	Dry Season (December to February)			Total No.
				Site A	Site B	Site C	
1	Hesperiidae	Tricolored pied flat	*Coladeniaindrani*	0	0	0	0
2		Indian palm bob	*Suastusgremius*	0	0	0	0
3		Rice swift	*Borbocinnara*	0	1	1	2
4		Common banded awl	*Hasorachromus*	1	1	0	2
5		Indian Grizzled Skipper	*Spialiagalba*	1	0	1	2
6		Small banded swift	*Pelopidas mathias*	0	1	1	2
7		Common Dart	*Taractroceramaevius*	1	0	0	1
8	Papilionidae	Common jay	*Graphiumdoson*	1	1	1	3
9		Common rose	*Pachlioptaaristolochiae*	2	1	1	4
10		Spot swordtail	*Graphiumnomius*	3	1	1	5
11		Common Mormon	*Papilio polytes*	1	1	2	4
12		Tailed jay	*Graphiumagamemnon*	3	0	2	5
13		Lime butterfly	*Papilio demoleus*	2	1	2	5
14		Blue Mormon	*Papilio polymnestor*	2	0	1	3
15		Peacock royal	*Tajuria cippus*	0	0	0	0
16		Pea Blue	*Lampidesboeticus*	3	2	3	8
17		Common Pierrot	*Castaliusrosimon*	2	2	1	5
18		Monkey puzzle	*Rathinda amor*	1	0	0	1

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19	Lycaenidae	Dark grass blue	*Zizeeriakarsandra*	2	3	2	7
20		Common silverline	*Cigaritisvulcanus*	1	0	1	2
21		Gram Blue	*Euchrysopscnejus*	3	3	3	9
22		Common hedge blue	*Acytolepispuspa*	1	1	0	2
23		Common Cerulean	*Jamides celeno*	1	1	1	3
24		Red Pierrot	*Talicadanyseus*	1	0	0	1
25		Rounded Pierrot	*Tarucusextricatus*	1	0	2	3
26		Indian Sunbeam	*Curetis thetis*	1	1	1	3
27		Angled Pierrot	*Caleta decidia*	0	0	0	0
28	Pieridae	Psyche	*Leptosianina*	0	0	1	1
29		Common gull	*Ceporanerissa*	1	1	1	3
30		Three-spot grass yellow	*Euremablanda*	1	0	1	2
31		Spotless grass yellow	*Euremalaeta*	1	2	2	5
32		Common grass yellow	*Euremahecabe*	2	1	3	6
33		Common emigrant	*Catopsiliapomona*	3	1	2	6
34		Common jezebel	*Delias eucharis*	2	0	2	4
35		Mottled Emigrant	*Catopsiliapyranthe*	4	2	3	9
36		Common Wanderer	*Pareroniavaleria*	1	1	0	2
37	Nymphalidae	Baronet	*Euthalia nais*	1	0	1	2
38		Yellow pansy	*Junoniahierta*	1	1	1	3
39		Bamboo Treebrown	*Lethe europa*	2	1	2	5
40		Common palmfly	*Elymniashypermnestra*	1	0	1	2
41		Common Bushbrown	*Mycalesisperseus*	2	3	3	8
42		Sahyadri blue oakleaf	*Kallima horsfieldii*	1	0	1	2
43		Blue pansy	*Junoniaorithiya*	1	1	0	2
44		Common Sailer	*Neptishylas*	1	1	0	2
45		Painted lady	*Vanessa cardui*	2	1	3	6
46		Common Baron	*Euthalia aconthea*	1	0	0	1
47		Common five ring	*Ypthimabaldus*	3	2	0	5
48		Common Castor	*Ariadne merione*	1	0	1	2
49		Common Evening Brown	*Melanitisleda*	4	3	1	8
50		Great eggfly	*Hypolimnasbolina*	3	1	2	6
51		Oriental Commander	*Moduzaprocris*	1	1	0	2
52		Grey pansy	*Junoniaatlites*	2	1	1	4
53		Chocolate pansy	*Junoniaiphita*	1	1	0	2
54		Peacock pansy	*Junoniaalmana*	2	0	2	4
55		Lemon pansy	*Junonialemonias*	2	2	1	5
56		Plain tiger	*Danaus chrysippus*	3	1	2	6
57		Danaid eggfly	*Hypolimnasmisippus*	2	1	1	4
58		Black rajah	*Charaxes solon*	0	0	0	0
59		Blue tiger	*Tirumala limniace*	1	1	1	3
60		Glassy tiger	*Paranticaaglea*	1	2	1	4
61		Stripped tiger	*Danaus genutia*	1	1	1	3
62		Common crow	*Euploea core*	2	3	2	7
63		Common leopard	*Phalantaphalantha*	1	0	1	2
Total				**92**	**57**	**71**	**220**

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Table: 4. List of some host or nectar food plants recorded in study area

Sr. No.	Common Name	Scientific Name	Scientific name of host or nectar food plants
1	Rice swift	*Borbocinnara*	*Celosia argentea, Tephrosia purpurea, Tridax procumbens*
2	Common Mormon	*Papilio polytes*	*Cussiasiemia, Lantana camara,*
3	Tailed jay	*Graphiumagamemnon*	*Lantana camara*
4	Lime butterfly	*Papilio demoleus*	*Lantana camara, Moringa oleifera, Tephrosia purpurea, Trichodesma indicum*
5	Pea Blue	*Lampidesboeticus*	*Celosia argentea*
6	Common Cerulean	*Jamides celeno*	*Celosia argentea, Tephrosia purpurea, Tridax procumbens, Zizyphusmauritiana*
7	Red Pierrot	*Talicadanyseus*	*Tridax procumbens*
8	Rounded Pierrot	*Tarucusextricatus*	*Lantana camara, Tridax procumbens, Zizyphusmauritiana*
9	Psyche	*Leptosianina*	*Tridax procumbens*
10	Common gull	*Ceporanerissa*	*Asclepias curassavica, Lantana camara, Tagetiserecta, Tridax procumbens*
11	Common grass yellow	*Euremahecabe*	*Celosia argenta, Lantana camara, Tephrosia purpurea,*
12	Common emigrant	*Catopsiliapomona*	*Cassia auriculata, Lantana camara, Tephrosia purpurea, Tridax procumbens*
13	Common jezebel	*Delias eucharis*	*Celosia argenta, Lantana camara*
14	Mottled Emigrant	*Catopsiliapyranthe*	*Catharanthus roseus, Cussiasiemia, Lantana camara, Sida acuta*
15	Common Wanderer	*Pareroniavaleria*	*Bauhinia purpurea, Tagetiserecta*
16	Yellow pansy	*Junoniahierta*	*Celosia argentea, Lantana camara, Tephrosia purpurea, Tridax procumbens*
17	Blue pansy	*Junoniaorithiya*	*Celosia argentea, Lantana camara, Trichodesma indicum, Tridax procumbens*
18	Common Castor	*Ariadne merione*	*Lantana camara, Tagetiserecta, Tridax procumbens*
19	Grey pansy	*Junoniaatlites*	*Celosia argentea, Tridax procumbens*
20	Lemon pansy	*Junonialemonias*	*Asclepias curassavica, Celosia argentea, Tephrosia purpurea, Tridax procumbens*
21	Plain tiger	*Danaus chrysippus*	*Catharanthus roseus, Celosia argentea, Crotalaria juncea, Lantana camara, Trichodesma indicum, Tridax procumbens,*
22	Danaid eggfly	*Hypolimnasmisippus*	*Asclepias curassavica, Celosia argentea, Lantana camara*
23	Common crow	*Euploea core*	*Celosia argentea, Lantana camara, Tridax procumbens*
24	Common leopard	*Phalantaphalantha*	*Celosia argentea, Lantana camara, Tridax procumbens*

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ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 3, March 2025

Table: 5. Photo plate of the species of butterfly observed in the study

 *Danaus chrysippus*	 *Tirumala limniace*	 *Euploea core*
 *Danaus genutia*	 *Junoniaalmana*	 *Hypolimnasbolina*
 *Graphiumnomius*	 *Euthalia nais*	 *Neptishylas*
 *Cigaritisvulcanus*	 *Curetis thetis*	 *Melanitisleda*

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 *Junoniahierta*	 *Junoniaorithiya*	 *Junoniaatlites*
 *Phalantaphalantha*	 *Tarucusextricatus*	 *Caleta decidia*
 *Pelopidas mathias*	 *Vanessa cardui*	 *Spialiagalba*
 *Coladeniaindrani*	 *Castaliusrosimon*	 *Euthalia aconthea*

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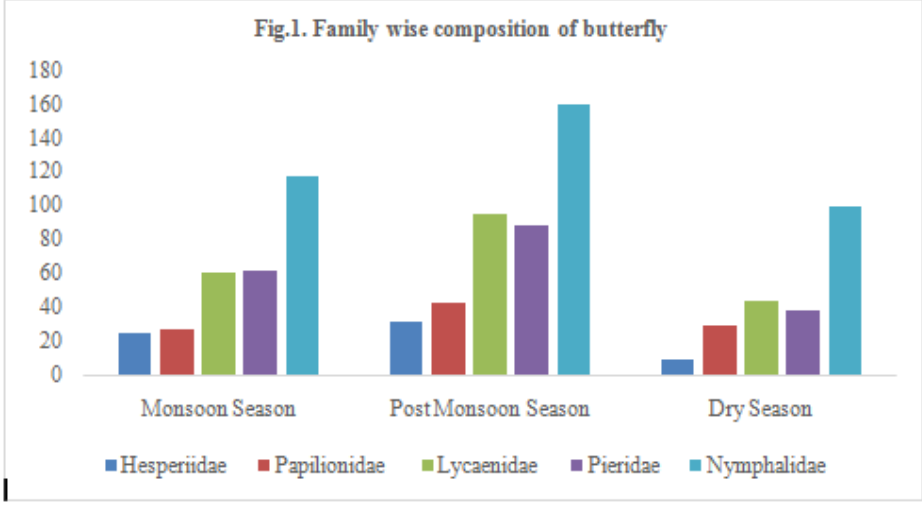

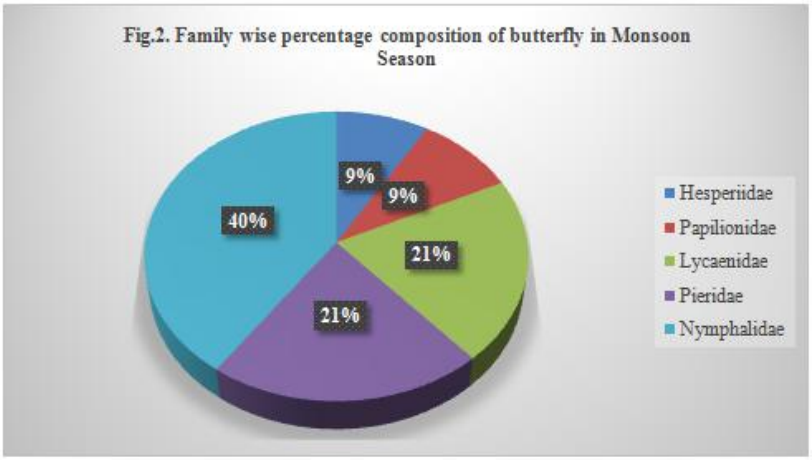

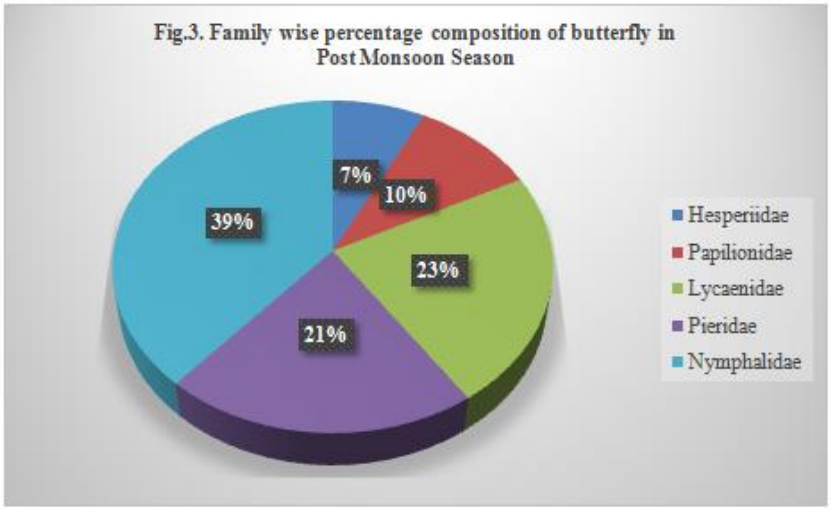

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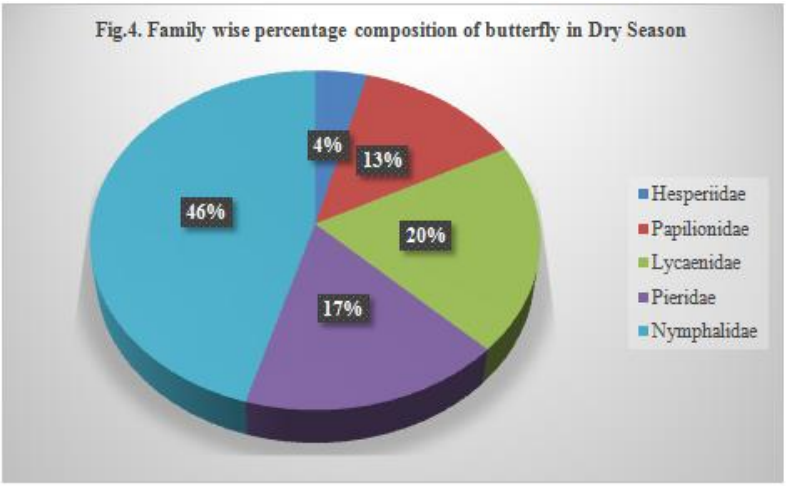
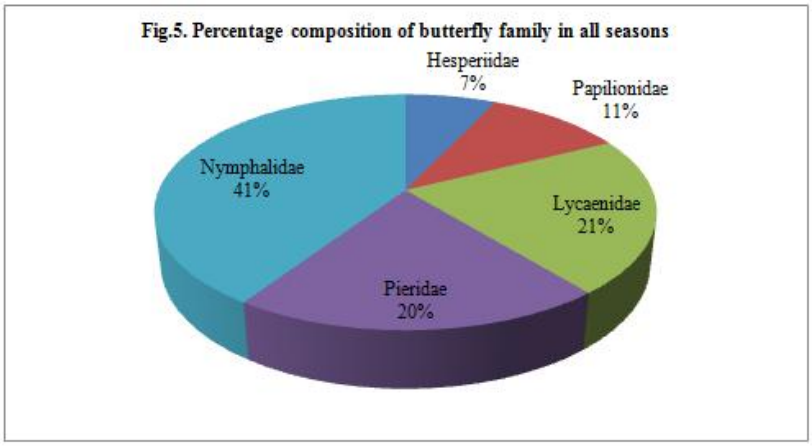


Table No. 5. Season wise composition of butterfly in each family

Family / Season	Hesperiidae	Papilionidae	Lycaenidae	Pieridae	Nymphalidae	Total
Monsoon season	25	27	60	62	117	**291**
Post Monsoon season	31	42	95	88	160	**416**
Dry	9	29	44	38	100	**220**
Total	**65**	**98**	**199**	**188**	**377**	**927**



VII. DISCUSSION

Checklist of the Butterfly Species

Based on the family-wise composition of the bar chart, the species of butterfly observed in all three seasons, the Nymphalidae family, was the highest number and percentage of the species of butterfly among the other families for three different seasons, which may be due to the availability of host plants, adaptation, and habitat preference of the species. The Nymphalidae family was indicated as dominant during the entire study period with the highest number of species of butterflies. The vegetation and habitat types in the study area might be the reason for the occurrences of the species of butterfly. Each and every site had various habitat patterns. In addition to that, the sites were found with residential areas, some forest areas, agricultural areas, and various aquatic habitats.

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The present study is very close to the findings of Dharmik R. Ganvir et al. (2018), who listed 69 species of butterflies belonging to 5 families from the Sakoli Taluka of Bhandara District, Maharashtra, India. The Nymphalidae family was indicated as dominant during the study period with the highest number of species of butterflies. With 25 species (36.24%), the Nymphalidae family was the largest, followed by the Lycaenidae with 19 species (27.53%), the Pieridae with 13 species (18.84%), the Hesperiidae with 8 species (11.59%), and the Papilionidae with only 4 species (5.80%). This study shows that in the monsoon and post-monsoon, the species richness is high.In addition, the result is supported by D. Ravi Varma et al. (2023), who observed 53 species of butterfly belonging to 5 families. The result showed that out of 53 species, the Nymphalidae family was found to have the greatest diversity (23 species), followed by Pieridae (12 species), Papilionidae (6 species), Lycaenidae (10 species), and Hesperiidae (2 species), which had the fewest species.

Diversity of Butterfly Species Across Three Selected Sites During the Monsoon, Post-Monsoon, and Dry Seasons

The present study investigates the diversity of butterfly species across three different sites, focusing on the variation in species richness and composition during three distinct seasonal periods: the monsoon, post-monsoon, and dry seasons. Butterfly diversity is highly influenced by climatic factors such as temperature, rainfall, and vegetation growth. The post-monsoon season is typically marked byrainfall, which plays a crucial role in enhancing plant growth and providing an abundant food source for herbivorous insects like butterflies. Our results indicate that during the post-monsoon season, butterfly diversity was significantly higher compared to the dry season across all three sites.In contrast, during the dry season, both butterfly species richness and abundance decreased, especially in sites with limited vegetation and reduced water sources. The lack of rainfall and the consequent scarcity of resources such as food and shelter likely explain this decline. Species that are adapted to arid conditions, such as those with specific drought-resistant features, were more prevalent during the dry season, yet the overall diversity was still reduced.

VIII. CONCLUSION

Based on the results obtained from the study on butterfly diversity in the study area, the Nymphalidae family was found to be maximum in number and percentage of the species of butterfly among all the families. The findings indicate that butterfly populations are influenced by various environmental factors such as temperature, humidity, and vegetation types, with distinct seasonal variations in species abundance and diversity. The study also highlights the crucial role of host plants in the lifecycle of butterflies, as these plants serve as food sources and breeding grounds for various species. Different species of butterflies were found to depend on specific host plants, which are seasonally abundant in the region. This seasonal dependence leads to fluctuations in the presence and diversity of butterfly species, with peak populations observed during the monsoon and post-monsoon seasons, when the abundance of host plants is higher. The findings contribute valuable insights for biodiversity conservation strategies in the region and advocate for sustainable management practices that protect both butterflies and their vital host plants.

ACKNOWLEDGEMENTS

The authorsare very grateful to the Department of Zoology and the LokneteRamsheth Thakur Arts,Science and Commerce College, Mokhada, Dist. Palghar, for approving this minor research project.

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