**An updated checklist of butterflies of district Gaya, Bihar**

**Abstract**

Butterflies play an essential role in the ecosystem, serving as pollinators, food sources, and effective indicators of environmental shifts. This study primarily concentrates on recognizing butterfly species and their diversity in the Bhagalpur district of Bihar, India. A total of 48 species of butterflies were noted during the survey. Of these, 102 species were recorded for the first time from Gaya. A total of 36 species were documented from the Nymphalidae family. The species most frequently found in the target area included *Ariadne ariadne*, *Danaus chrysippus*, *Euploea core*, *Junoniaalmana*, *Junoniaiphita*, *Leptosianinanina*, *Melanitisleda*, *Papiliodemoleus*, and *Ypthimahuebneri*. Nonetheless, a small number of species like *Cigaritisvulcanus*, *Curetisacuta*, and *Spialiagalba* were infrequently encountered. The highest diversity was seen in winter, while the lowest diversity occurred in summer.

**Keywords:** Butterfly, Species, Gaya, Diversity.

**Introduction**

Butterflies (Lepidoptera: Rhopalocera) are strikingly coloured insects, and their hues result from pigments found in their scales. They serve a vital function in ecosystems, functioning as pollinators, food providers, and signals of the ecosystem's health. A large number of butterflies typically signifies a more thriving ecosystem. Butterflies aid in ecosystem restoration by providing pollination and serving as a food source. Higher butterfly populations might suggest greater plant variety and the presence of other pollinator species in restored regions (Dobson, 2012). Butterflies serve as effective indicators of climatic, seasonal, and ecological shifts and assist in creating conservation strategies. Butterflies are crucial to the ecosystem due to their coevolutionary relationship with plants, as their existence is interconnected (Ghazanfar et al., 2016).They are vulnerable to environmental influences like temperature, humidity, precipitation, solar radiation, air temperature, wind speed, and the presence of larval host plants (Ribeiro and Freitas, 2012).

Extensive research has focused on taxonomy, diversity, relative abundance, reproductive biology, and seasonal behaviours of butterflies across various states in India(Paul, 1981; Kunte, 1997; 2000; 2006; Sethy et al., 2014; Gajbe, 2016; Kumar et al., 2016; Dey et al., 2017; Kanagaraj and Kathirvely, 2018) and in Bihar(Sharma, 2017; Bharat, 2023; Masroor, 2022a; 2022b; 2022c 2022d; masroor, 2024a; 2024b). However, there are scanty reports on butterfly taxonomy and diversity in Bihar (Sharma and Kumar, 2017; Somala et al., 2020).

**Material and methods**

For almost two years, the butterflies were surveyed using random techniques. Every week, from early in the morning until late in the afternoon, their numbers were arbitrary and kept within 25 feet. The survey's path was predetermined and precise in terms of timing and movement. The study was often carried out under favourable weather conditions; wet, overcast, stormy, and hot weather conditions were disregarded. A digital camera was used to snap pictures of butterflies in their natural environments. The relevant literature (Wynter-Blyth, 1997; Kehimkar, 2008; Guptha et al., 2012; Smetacek, 2017) served as the basis for the species identification. The Sites selected for study were focused on enriched vegetation and less human activity area (Site1- Bodhgaya, Site 2- Islamganj, Site 3- Paimar village, Site 4-Naili)

**Result and Discussion**

The current research identified 102 butterfly species across 5 families and 71 genera throughout the study duration (Table:1, Graph:1).In Gaya Nymphalidae represents 35% of total recorded species followed by Lycaenidae 24%, Pieridae 18%, Hesperiidae 12% and Papilionidae 11%. While according to sites, in site 1 Nymphalidae recorded highest diversity of 35 species followed by Lycaenidae 25, Pieridae 18, Hesperiidae 12 and Papilionidae 11 species. In Site 2 Nymphalidae recorded highest diversity of 23 species followed by Lycaenidae 16, Pieridae 15, Hesperiidae 9 and Papilionidae 9 species. Site 3 Nymphalidae recorded highest diversity of 21 species followed by Lycaenidae 15, Pieridae 10, Hesperiidae 11 and Papilionidae 7 species. While site 4Nymphalidae recorded highest diversity of 31 species followed by Lycaenidae 24, Pieridae 16, Hesperiidae 10 and Papilionidae 9 species. Site 1 represents 101 species followed by site 4 recorded 90 species, site 2 recorded 72 and site 3 recorded 64 species. Observation records show a healthy diversity of butterfly species need more enriched flora and the sites having less plant diversity represents less species diversity in Gaya district.

**Conclusion**

This study represents a dedicated attempt to record and propose effective methods for enhancing butterfly diversity in Gaya district. The current situation shows that the post-monsoon and winter periods were the most beneficial for butterfly activities in the region. Further studies on this community and their relationship with favoured plants can provide us with enhanced insights into their conservation and management around these irrigation reservoirs.

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Serial no.** | **Common name** | **Scientific name** | **Site 1** | **Site 2** | **Site 3** | **Site 4** |
|  | **Family: Hesperiidae** |  |  |  |  |  |
| **1** | Indian Palm Bob | *Saustusgrenius* (Fabricius,1798) | \* | \* | \* | \* |
| **2** | Small Branded Swift | *Pelopidas mathias* (Fabricius, 1798) | \* | \_ | \_ | \* |
| **3** | Common Red Eye | *Matapa aria* (Moore, 1866) | \* | \* | \* | \* |
| **4** | Paint Brush Swift | *Baorisfarri*(Moore, 1878) | \* | \* | \* | \_ |
| **5** | Grass Demon | *Udaspesfolus*(Cramer, 1775) | \* | \* | \* | \* |
| **6** | Contiguous Swift | *Polytremislubricans*(Herrich-Schaffer,1869) | \* | \_ | \* | \_ |
| **7** | Rice Swift | *Barbocinnara*(Wallace,1866) | \* | \* | \* | \* |
| **8** | Dark Palm Dart | *Telicotabambusae* (Moore, 1878) | \* | \* | \* | \* |
| **9** | Asian Grizzled Skipper | *Spialiagalba*(Fabricius, 1793) | \* | \* | \* | \* |
| **10** | Common Palm Dart | *Telicota colon* (Fabricius, 1775) | \* | \* | \* | \* |
| **11** | Common Banded Awl | *Hasorachromus* (Cramer, [1780]) | \* | \* | \* | \* |
| **12** | Brown Awl | *Badamiaexclamationis* (Fabricius, 1775) | \* | \_ | \* | \* |
|  | **Family: Papilionidae** |  |  |  |  |  |
| **13** | Common Mormon | *Papiliopolytes*(Linnaeus, 1758) | \* | \* | \* | \* |
| **14** | Indian Common Mormon | *Papiliopolytesromulus*Cramer, [1775] | \* | \* | \_ | \_ |
| **15** | Lime Butterfly | *Papiliodemolus*(Linnaeus, 1758) | \* | \* | \* | \* |
| **16** | Common Jay | *Graphiumdoson*(C. & R. Fedler, 1864) | \* | \* | \* | \* |
| **17** | Tailed Jay | *Graphiumagramemnon*(Linnaeus, 1758) | \* | \* | \* | \* |
| **18** | Common Rose | *Pachlioptaaristolochiae*(Fabricius,1775) | \* | \* | \_ | \* |
| **19** | Common Mime | *Papilioclytia*Linnaeus, 1758 | \* | \_ | \* | \* |
| **20** | Blue Mormon | *Papiliopolymnestor*(Cramer, 1775) | \* | \_ | \* | \* |
| **21** | Crimson Rose | *Pachliopta hector* (Linnaeus, 1758) | \* | \* | \_ | \* |
| **22** | Common Bluebottle | *Graphiumsarpedon* (Linnaeus, 1758) | \* | \* | \* | \_ |
| **23** | Chain Swordtail | *Graphiumaristeus* (Stoll, [1780]) | \* | \* | \_ | \* |
|  | **Family: Nymphalidae** |  |  |  |  |  |
| **24** | Gray Pansy | *Junoniaatlites*(Linnaeus, 1763) | \* | \* | \* | \* |
| **25** | Peacock Pansy | *Junoniaalmana*(Linnaeus, 1758) | \* | \* | \* | \* |
| **26** | Chocolate Pansy | *Junoniaiphita*(Cramer, 1779) | \* | \* | \* | \* |
| **27** | Lemon Pansy | *Junonialemonias*(Linnaeus, 1758) | \* | \* | \* | \* |
| **28** | Yellow Pansy | *Junoniahierta*(Fabricius, 1798) | \* | \_ | \_ | \* |
| **29** | Blue Pansy | *Junoniaorithya*(Linnaeus,1758) | \* | \* | \_ | \* |
| **30** | Plain Tiger | *Danuschrysippus*(Linnaeus, 1758) | \* | \* | \* | \* |
| **31** | Striped Tiger | *Danusgenutia*(Cramer, 1779) | \* | \* |  | \* |
| **32** | Blue Tiger | *Trimulalimniace*(Cramer,1775) | \* | \_ | \* | \* |
| **33** | Common Baron | *Euthaliaaconthea*(Cramer, 1777) | \* | \* | \* | \* |
| **34** | Gaudy Baron | *Euthalialubentina* (Cramer, 1777) | \* | \_ | \_ | \* |
| **35** | Common Leopard | *Phalantaphalanta*(Drury, 1773) | \* | \* | \* | \* |
| **36** | Common Crow | *Euuploea core* (Cramer, 1780) | \* | \* | \* | \* |
| **37** | Common Evening Brown | *Melantisleda*(Linnaeus, 1758) | \* | \* | \* | \* |
| **38** | Dark Evening Brown | *Melantisphedima*(Cramer, [1780]) | \* | \* | \_ | \* |
| **39** | Common Three-ring | *Ypthimaasterope*(Klug, 1832) | \* | \_ | \* | \* |
| **40** | Common Four-ring | *Ypthimahuebneri*Kirby, 1871 | \* | \* | \_ | \* |
| **41** | Common Bush Brown | *Mycalesisperseus*(Fabricius,1775) | \* | \* | \* | \* |
| **42** | Dark-branded Bushbrown | *Mycalesismineus*(Linnaeus, 1758) | \* | \_ | \_ | \* |
| **43** | Commander | *Moduzaprocris*(Cramer, 1777) | \* | \* | \* | \* |
| **44** | Great Eggfly | *Hypolimnasbolina*(Linnaeus, 1758) | \* | \* | \* | \* |
| **45** | Danaid Eggfly | *Hypolimnasmisippus*(Linnaeus, 1764) | \* | \* | \* | \* |
| **46** | Common Castor | *Ariadne merione*(Cramer, 1777) | \* | \* | \* | \* |
| **47** | Tawny Castor | *Acraea terpsicore*(Fabricius,1793) | \* | \* | \* | \* |
| **48** | Angled Castor | *Ariadne ariadne*(Linnaeus, 1763) | \* | \_ | \* | \_ |
| **49** | Himalayan Yellow Coster | *Acraea issoriaissoria*(Hubner, [1819]) | \* | \_ | \_ | \_ |
| **50** | Common Sailor | *Neptishylas*(Linnaeus, 1758) | \* | \* | \* | \* |
| **51** | Short-banded Sailer | *Phaedyma columella* (Cramer, [1780]) | \* | \* | \_ | \* |
| **52** | Common Palmfly | *Elymnias hypermnestra* (Linnaeus,1763) | \* | \* | \* | \* |
| **53** | Baronet | *Symphaedranais*Forster, 1771 | \* | \_ | \_ | \* |
| **54** | Bamboo Tree Brown | *Lethe europa* (Fabricius, 1787) | \* | \_ | \_ | \* |
| **55** | Glassy Tiger | *Paranticaaglea*(Stoll, [1782]) | \* | \* | \_ | \* |
| **56** | Bengal Spotted Palmfly | *Elymniasmalelasmalelas*(Hewitson, 1863) | \* | \_ | \_ | \_ |
| **57** | White-line Bushbrown | *Telingamalsara*(Moore, 1857) | \* | \_ | \* | \_ |
| **58** | Great Evening Brown | *Melantiszitenius*(Herbst, 1796) | \* | \* | \_ | \* |
| **59** | Indian Nawab | *Charaxesbharata*C. & R. Fedler, [1867] | \* | \_ | \_ | \* |
|  | **Family: Pieridae** |  |  |  |  |  |
| **60** | Mottled Emigrant | *Catopsiliapyranthe*(Linnaeus,1758) | \* | \* | \_ | \* |
| **61** | Common Emigrant | *Catopsiliapomana*(Fabricius, 1775) | \* | \* | \* | \* |
| **62** | Oriental Mottled Emigrant | *Catopsiliapyranthepyranthe*(Linnaeus, 1758) | \* | \_ | \* | \_ |
| **63** | Yellow Orange Tip | *Ixias pyrene* Linnaeus, 1764 | \* | \* | \* | \* |
| **64** | White Orange Tip | *Ixias marianne*(Cramer,1779) | \* | \* | \_ | \* |
| **65** | Common Jezebel | *Delias eucharis* (Drury,1773) | \* | \* | \* | \* |
| **66** | Common Wanderer | *Pareroniahippia*(Cramer,1776) | \* | \* | \_ | \* |
| **67** | Common Grass Yellow | *Euremahesabe*(Linnaeus,1758) | \* | \* | \* | \* |
| **68** | Spotless Grass Yellow | *Euremalaeta*(Boisduval,1836) | \* | \_ | \_ | \* |
| **69** | Leser Gull | *Ceporanadia*(Lucas, 1852) | \* | \* | \_ | \_ |
| **70** | Common Gull | *Ceporanerissa*(Fabricius,1775) | \* | \* | \* | \* |
| **71** | Indian cabbage white | *Pieris canidia*(Sparrman, 1768) | \* | \* | \_ | \* |
| **72** | Small Grass Yellow | *Euremabrigitta*(Stoll,[1780]) | \* | \* | \* | \* |
| **73** | Psyche | *Leptosianina*(Fabricius,1793) | \* | \* | \* | \* |
| **74** | Cabbage Butterfly | *Pieris rapae*(Linnaeus, 1758) | \* | \* | \_ | \* |
| **75** | Three-spot Grass Yellow | *Euremablanda*(Boisduval, 1836) | \* | \* | \_ | \* |
| **76** | Pioneer | *Belenoisaurota*(Fabricius, 1793) | \* | \* | \* | \* |
| **77** | Pale Clouded Yellow | *Coliaserate*(Esper, 1805) | \* | \_ | \_ | \* |
|  | **Family: Lycaenidae** |  |  |  |  |  |
| **78** | Common Pierrot | *Castaliusrosimon*(Fabricius,1775) | \* | \* | \* | \* |
| **79** | Common Silverline | *Cigaritisvulcanus*(Fabricius,1775) | \* | \_ | \_ | \* |
| **80** | Plains Cupid | *Chiladespandava*(Horsefield,1829) | \* | \* | \* | \* |
| **81** | Slate Flash | *Rapalamanea*(Hewitson,1863) | \* | \* | \* | \* |
| **82** | Dark Grass Blue | *Zizeeriakarsamdara*(Moore,1865) | \* | \* | \* | \* |
| **83** | Lesser Grass Blue | *Zizinaotis*(Fabricius,1787) | \* | \* | \* | \* |
| **84** | Rounded Pierrot | *Tarucusnara*(Kollar,1884) | \* | \* | \* | \* |
| **85** | Common Guava Blue | *Viracholaisocrates*(Fabricius,1793) | \* | \* | \_ | \* |
| **86** | Lime Blue | *Chiladeslajus*(Stoll,[1780]) | \* | \* | \* | \* |
| **87** | Gram Blue | *Euchysopscnejus*(Fabricius,1798) | \* | \* | \* | \* |
| **88** | African Babul Blue | *Azanusjesous*(Guerin-Meneville,1849) | \* | \_ | \* | \* |
| **89** | Pea Blue | *Lampidusboeticus*(Linnaeus,1767) | \* | \* | \* | \* |
| **90** | Apefly | *Spalgisepeus*(Westwood, 1851) | \* | \_ | \_ | \* |
| **91** | India sunbeam | *Curetisthetis*(Drury,[1773]) | \* | \* | \_ | \* |
| **92** | Saronis Sunbeam | *Curetissaronis*Moore,1877 | \* | \_ | \* | \* |
| **93** | Spotted Pierrot | *Taucuscallinara*Butler,1886 | \* | \* | \* | \* |
| **94** | Margined Hedge Blue | *Celatoxiamarginata*(de Niceville, [1884]) | \* | \_ | \_ | \* |
| **95** | Zebra Blue | *Leptosiaplinius* (Fabricius,1793) | \* | \* | \* | \* |
| **96** | Lankan Oak Blue | *Arhopalaamantes* (Hewitson, 1862) | \* | \_ | \_ | \* |
| **97** | Forget Me Not | *Ctochrysopsstrabo*Fbricius, 1793 | \* | \* | \* | \* |
| **98** | Pale Grass Blue | *Pseudozizeeriamaha* (Kollar, [1844]) | \* | \_ | \_ | \* |
| **99** | Common Red Flash | *Rapalaiarbus*(Fabricius, 1787) | \* | \* | \_ | \* |
| **100** | Peacock Royal | *Tjuriajehana* Moore, [1884] | \* | \_ | \* | \_ |
| **101** | Silverstreak Blue | *Iraota timoleon* Stoll, 1790 | \* | \* | \_ | \* |
| **102** | Monkey Puzzle | *Rathinda amor* (Fabricius, 1775) | \* | \_ | \_ | \* |

**Table: 1. Tablerepresenting the butterfly species belongs to five families documented during study in four selected sites located in Gaya district.**

**Graph: 1. Histogram showing the percentage and number of species in five families of butterfly in four selected sites of Gaya district.**