***Short Research Article***

**A CHECKLIST OF BUTTERFLIES IN KARULAI, MALAPPURAM DISTRICT, KERALA, INDIA**

**Abstract**

The present study provides a checklist of butterflies from Karulai, Malappuram District, Kerala. The study was conducted over a period of one year, from August 2020 to July 2021. A total of 76 butterfly species belonging to five families and 13 subfamilies were recorded. The family Nymphalidae was the most dominant, followed by Lycaenidae, Papilionidae, Hesperiidae, and Pieridae. The butterfly diversity and abundance of host plants in the study area highlight its importance for protection and conservation. The quality and availability of host plants play a crucial role in affecting an organism's growth, development, and reproduction.

**Key words**

Butterflies, Karulai, Lepidoptera, Nymphalidae, Conservation

**Introduction**

Butterflies are insects belonging to the order Lepidoptera*.* Lepidoptera is the second largest and one of the most widely recognized and diverse insect orders, comprising butterflies and moths . Kerala hosts a rich and diverse butterfly fauna, primarily due to the availability of a wide range of habitats. Of the 1,501 butterfly species recorded in India, 327 species have been documented in the Kerala region (Palot *et al.,* 2003).

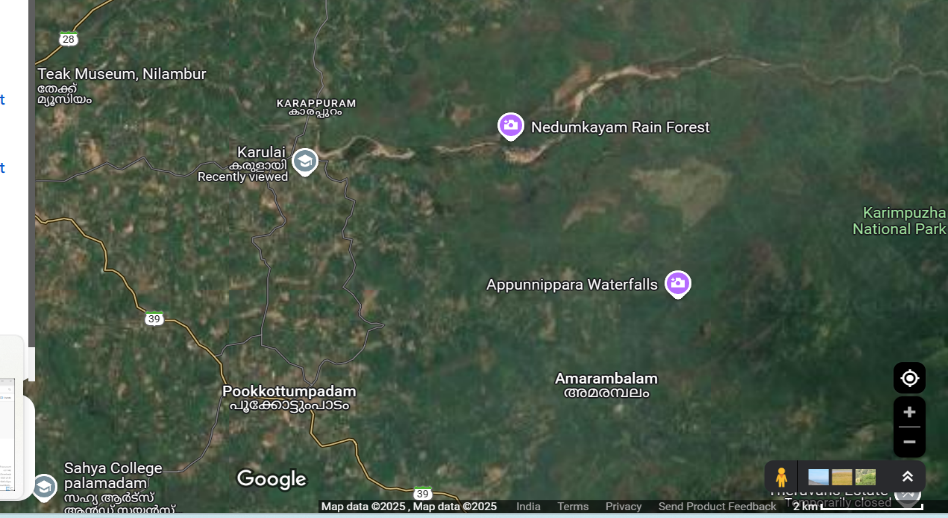
Butterflies play several vital roles in ecosystems. Primarily, they serve as pollinators by visiting flowers to feed on nectar (Vijayan & Anbalagan, 2023), which contains essential nutrients such as vitamins, lipids, sugars, and amino acids. During this process, they unintentionally collect pollen on their bodies and transfer it to other flowers during subsequent visits, thereby facilitating cross-pollination. This not only supports plant reproduction but also enhances genetic variation among plant species. Migratory butterfly species can transport pollen over long distances, further promoting genetic diversity and potentially increasing plant resilience to diseases. In addition to their role in pollination, butterflies are considered ecological indicators of ecosystem health. Their sensitivity to even slight environmental changes makes them valuable bioindicators, offering early warnings of habitat degradation and the decline of other wildlife populations.

In the state of Kerala, documentation of butterfly species has been carried out by several authors (Prasad *et al.,* 2010; Lakshmi Priya *et al.,* 2017; Nandana & Roopavathy, 2019; Jobiraj *et al.,* (2024)., Sukumaran *et al.,* 2022; Rekha and Shafas, 2022; Binu *et al.,* 2022., Siny & Nandini, 2023; ), including a few diversity studies conducted specifically in the Palakkad region (Swapna & Sushama, 2011; Narmadha & Varunprasath, 2018; Anjali & Dhivya, 2021; Jayasree *et al.,* 2023; Sruthi & Lakshmi, 2024). The study by Revathy and Mathew (2013) recorded a total of 50 butterfly species from the Butterfly Garden at Nilambur, Kerala. It revealed that the most abundant butterfly family was Nymphalidae. The authors also identified several suitable candidate species for inclusion in butterfly garden management programs. A total of 206 species of butterflies were recorded by Sujitha *et al.,* (2019) during their study of the butterflies of the Myristica swamp forests in the Shendurney Wildlife Sanctuary, located in the southern Western Ghats, Kerala, India. These recorded species belong to six families. Among them, 19 species are endemic to the Western Ghats. Jobiraj *et al.,* (2020) recorded 59 species belonging to six families from Thusharagiri, Kerala, India. Among these, four species are endemic to the Western Ghats, and six species are protected under various schedules of the Indian Wildlife (Protection) Act, 1972. A total of 83 butterfly species from five families were recorded at Navsari Agricultural University (NAU), Navsari, Gujarat by Malek *et al.*, (2024). These included 6 species from Hesperiidae, 6 from Papilionidae, 20 from Pieridae, 23 from Lycaenidae, and 28 from Nymphalidae.

Butterflies are key bioindicators, reflecting the health of ecosystems through their diversity and sensitivity to environmental changes. Documenting butterfly species in an area through a checklist helps establish a baseline for monitoring biodiversity over time. This aids in detecting ecological changes, guiding conservation efforts, and raising awareness about local biodiversity. Though several studies have been conducted on butterfly diversity in Kerala, little work has been done on the diversity and host plants of butterflies in Karulai. In view of this lack of documentation, the present study was carried out in Karulai, Malappuram District.

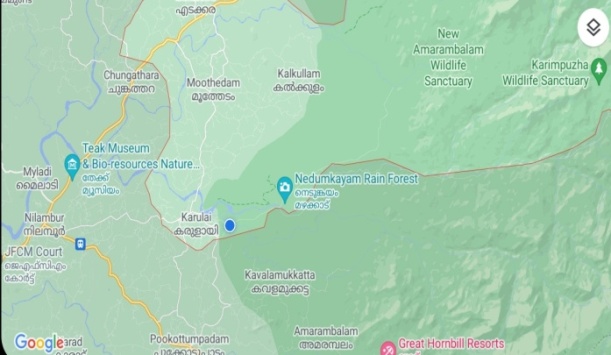
**Materials and Methods**

The present study was conducted from August 2020 to July 2021. The study area, Karulai located in Nilambur Taluk (Figure 1(A-b)). It is situated near the Nedunkayam rainforest and the Nilambur Butterfly Garden. Several streams flow through the region, which also includes paddy fields, rubber plantations, and coconut and areca nut plantations. The area is rich in faunal diversity due to its proximity to the rainforest.



**11°17'10.6"N 76°18'10.2"E**

**Figure-1a (Study area)**



**Figure-1b (Study area)**

Butterfly monitoring was conducted during daytime hours, from 10:00 AM to 4:00 PM, and photographs were taken during the same period using a Samsung A10 and a Redmi 9 Pro camera. Species identification was carried out using standard references, including A Naturalist’s Guide to the Butterflies of India by Peter Smetacek and the e-book Butterflies of the Western Ghats by Dr. Raju Kasambe, along with assistance from experts in the field. The larval host plants of the butterflies were also documented. As this was a primary study aimed at biodiversity conservation, no specimens were collected during the monitoring process.

**Results and Discussion**

**A total of 76 butterfly species belonging to five families were recorded. These included Nymphalidae (33 species), Lycaenidae (15 species), Hesperiidae (9 species), Papilionidae (10 species), and Pieridae (9 species)**. The family Nymphalidae was the most dominant, with 33 species. The second most dominant family was Lycaenidae, comprising 15 species, followed by Papilionidae, with 10 species. under one subfamily. The families Hesperiidae and Pieridae each included nine species (Figure-2). The dominance of the family Nymphalidae has also been reported in the studies by Xavier (2006), Revathy and Mathew (2013), Antony and Prasad (2016), Nandana and Roopavathy (2019), Dalie *et al*., (2023), Siny and Nandini (2023), and Jayasree *et al.,* (2023).

Sukumaran and Madhavan (2022) documented butterfly diversity across various habitats in Kannur, documenting 155 individuals representing 26 species from five families: Papilionidae, Pieridae, Nymphalidae, Lycaenidae, and Hesperiidae. A similar pattern was observed in the present study. Dalie and Swapana (2023) recorded 69 butterfly species in Ammadam, Thrissur, across five families. Nymphalidae was the most dominant with 30 species, followed by Lycaenidae and Papilionidae (11 each), Hesperiidae (10), and Pieridae (7). Sruthi and Lakshmi (2024) conducted a study to assess the diversity and abundance of butterfly fauna in and around the Choolanur Peafowl Sanctuary in Palakkad. A total of 25 butterfly species belonging to four families were recorded from the two selected sites. The family Nymphalidae was found to be the most dominant, followed by Lycaenidae and Pieridae, while Papilionidae was the least represented.

Binu *et al.,* (2022) studied butterfly-plant diversity in the Malappuram District of Kerala and documented approximately 33 plant species, belonging to 18 families and 29 genera that were pollinated by various butterfly species. They found that plant-insect interactions are essential for the pollination process and contribute to better yields in both wild and cultivated plants. The availability of larval host plants was high in the study area. A checklist of the observed butterflies, along with their host plants, is presented in Table- 1. Many butterfly species within the same family were observed to share common host plants*.* For example*, Parantica aglea and Tirumala limniace* (Nymphalidae)both utilize *Calotropis gigantea* as their host plant. Similarly, *Hypolimnas misippus, Junonia atlites, Junonia iphita, and Junonia lemonias* (Nymphalidae)share *Barleria cristata. Mycalesis mineus* and *Mycalesis visala* (Nymphalidae) use***Setaria barbata****.Orsotriaena medus* (Nymphalidae)and *Borbo cinnara* (Hesperiidae) share***Oryza sativa****.Ypthima huebneri, Ypthima baldus,* and *Ypthima singala* (Nymphalidae)utilize ***Eleusine indica****.Caleta decidia* and *Castalius rosimon* (Lycaenidae)feed on***Ziziphus oenoplia****.Notocrypta paralysos* and *Udaspes folus* (Hesperiidae)share***Curcuma aurantiaca****.Tagiades japetus* and *Tagiades litigiosa* (Hesperiidae)use***Dioscorea wallichii****.Papilio dravidarum, Papilio helenus,* and *Papilio polymnestor* (Papilionidae) share ***Glycosmis pentaphylla****.Pachliopta aristolochiae* and *Troides minos* (Papilionidae)utilize ***Aristolochia indica****. Spindasis vulcanus* (Lycaenidae), *Catopsilia pomona,* and *Catopsilia pyranthe (Pieridae)* share***Cassia fistula****. Eurema blanda* and *Eurema hecabe* (Pieridae)feed on***Delonix regia****.* These host plant associations show that many butterfly species, especially those in the same family, use the same plants.

**TABLE 1: CHECK LIST OF BUTTERFLIES OBSERVED FROM STUDY AREA ALONG WITH HOST PLANTS.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SL.NO** | **FAMILY** | **SUBFAMILY** | **SPECIES** | **HOST PLANT** |
| 1. | Nymphalidae | Biblidinae | *Ariadne ariadne* | *Tragia involucrata* |
| 2. | Nymphalidae | Danainae | *Danaus genutia* | *Holostemma annulare* |
| 3. | Nymphalidae | Danainae | *Euploea core* | *Holarrhena antidysenterica* |
| 4. | Nymphalidae | Danainae | *Parantica aglea* | *Calotropis gigantea* |
| 5. | Nymphalidae | Danainae | *Tirumala limniace* | *Calotropis gigantea* |
| 6. | Nymphalidae | Danainae | *Tirumala septentrionis* | *Wattakaka volubilis* |
| 7. | Nymphalidae | Heliconiinae | *Acraea terpsicore* | *Passiflora edulis* |
| 8. | Nymphalidae | Heliconiinae | *Cirrochroa thais* | *Hydnocarpus pentandra* |
| 9. | Nymphalidae | Heliconiinae | *Phalanta phalantha* | *Flacourtia indica* |
| 10. | Nymphalidae | Limenitidinae | *Euthalia aconthea* | *Mangifera indica* |
| 11. | Nymphalidae | Limenitidinae | *Tanaecia lepidea* | *Melastoma malabatharicum* |
| 12. | Nymphalidae | Limenitidinae | *Moduza Procris* | *Mussaenda frondosa* |
| 13. | Nymphalidae | Limenitidinae | *Lasippa viraja* | *Dalbergia racemosa* |
| 14. | Nymphalidae | Limenitidinae | *Neptis hylas* | *Urena lobata* |
| 15. | Nymphalidae | Limenitidinae | *Phaedyma columella* | *Hibiscus mutabilis* |
| 16. | Nymphalidae | Limenitidinae | *Parthenos sylvia* | *Tinospora cordifolia* |
| 17. | Nymphalidae | Nymphalinae | *Hypolimnas bolina* | *Leportia interrupta* |
| 18. | Nymphalidae | Nymphalinae | *Hypolimnas misippus* | *Barleria cristata* |
| 19. | Nymphalidae | Nymphalinae | *Junonia atlites* | *Barleria cristata* |
| 20. | Nymphalidae | Nymphalinae | *Junonia hierta* | *Mimosa pudica* |
| 21. | Nymphalidae | Nymphalinae | *Junonia iphita* | *Barleria cristata* |
| 22. | Nymphalidae | Nymphalinae | *Junonia lemonias* | *Barleria cristata* |
| 23. | Nymphalidae | Satyrinae | *Elymnias caudata* | *Cocos nucifera* |
| 24. | Nymphalidae | Satyrinae | *Melanitis leda* | *Bambusa arundinacea* |
| 25. | Nymphalidae | Satyrinae | *Melanitis phedima* | *Oplismenus compositus* |
| 26. | Nymphalidae | Satyrinae | *Lethe europa* | *Bambusa bambos* |
| 27. | Nymphalidae | Satyrinae | *Mycalesis junonia* | *Oplismenus compositus* |
| 28. | Nymphalidae | Satyrinae | *Mycalesis mineus* | *Setaria barbata* |
| 29. | Nymphalidae | Satyrinae | *Mycalesis visala* | *Setaria barbata* |
| 30. | Nymphalidae | Satyrinae | *Orsotriaena medus* | *Oryza sativa* |
| 31. | Nymphalidae | Satyrinae | *Ypthima baldus* | *Eleusine indica* |
| 32. | Nymphalidae | Satyrinae | *Ypthima huebneri* | *Eleusine indica* |
| 33. | Nymphalidae | Satyrinae | *Ypthima singala* | *Eleusine indica* |
| 34. | Lycaenidae | Polyommatinae | *Acytolepis puspa* | *Senna alata* |
| 35. | Lycaenidae | Polyommatinae | *Caleta decidia* | *Ziziphus oenoplia* |
| 36. | Lycaenidae | Polyommatinae | *Castalius rosimon* | *Ziziphus oenoplia* |
| 37. | Lycaenidae | Polyommatinae | *Chilades pandava* | *Bauhinia variegata* |
| 38. | Lycaenidae | Polyommatinae | *Discolampa ethion* | *Ziziphus oenoplia* |
| 39. | Lycaenidae | Polyommatinae | *Euchrysops cnejus* | *Lablab purpureus* |
| 40. | Lycaenidae | Polyommatinae | *Freyeria putli* | *Heliotropium indicum* |
| 41. | Lycaenidae | Polyommatinae | *Freyeria trochylus* | *Pisum sativum* |
| 42. | Lycaenidae | Polyommatinae | *Jamides celeno* | *Abrus precatorius* |
| 43. | Lycaenidae | Polyommatinae | *Pseudozizeeria maha* | *Tephrosia purpurea* |
| 44. | Lycaenidae | Polyommatinae | *Talicada nyseus* | *Bryophyllum delagoense* |
| 45. | Lycaenidae | Polyommatinae | *Zizeeria karsandra* | *Amaranthus spinosus* |
| 46. | Lycaenidae | Theclinae | *Spindasis vulcanus* | *Cassia fistula* |
| 47. | Lycaenidae | Theclinae | *Cheritra freja* | *Mangifera indica* |
| 48. | Lycaenidae | Theclinae | *Rathinda amor* | *Ixora coccinia* |
| 49. | Hesperiidae | Hesperiinae | *Lambrix salsala* | *Bambusa bambos* |
| 50. | Hesperiidae | Hesperiinae | *Notocrypta paralysos* | *Curcuma aurantiaca* |
| 51. | Hesperiidae | Hesperiinae | *Udaspes folus* | *Curcuma aurantiaca* |
| 52. | Hesperiidae | Hesperiinae | *Borbo cinnara* | *Oryza sativa* |
| 53. | Hesperiidae | Hesperiinae | *Potanthus omaha* | *Bambusa bambos* |
| 54. | Hesperiidae | Pyrginae | *Spialia galba* | *Sida acuta* |
| 55. | Hesperiidae | Pyrginae | *Sarangesa purendra* | *Blepharis asperrima* |
| 56. | Hesperiidae | Pyrginae | *Tagiades japetus* | *Dioscorea wallichii* |
| 57. | Hesperiidae | Pyrginae | *Tagiades litigiosa* | *Dioscorea wallichii* |
| 58. | Papilionidae | Papilioninae | *Graphium agumemnon* | *Annona reticulata* |
| 59. | Papilionidae | Papilioninae | *Graphium teredon* | *Cinnamomum verum* |
| 60. | Papilionidae | Papilioninae | *Papilio clytia* | *Cinnamomum tamala* |
| 61. | Papilionidae | Papilioninae | *Papilio demoleus* | *Citrus aurantium* |
| 62. | Papilionidae | Papilioninae | *Papilio dravidarum* | *Glycosmis pentaphylla* |
| 63. | Papilionidae | Papilioninae | *Papilio helenus* | *Glycosmis pentaphylla* |
| 64. | Papilionidae | Papilioninae | *Papilio polymnestor* | *Glycosmis pentaphylla* |
| 65. | Papilionidae | Papilioninae | *Papilio polytes* | *Murraya koengii* |
| 66. | Papilionidae | Papilioninae | *Pachliopta aristolochiae* | *Aristolochia indica* |
| 67. | Papilionidae | Papilioninae | *Troides minos* | *Aristolochia indica* |
| 68. | Pieridae | Coliadinae | *Catopsilia pomona* | *Cassia fistula* |
| 69. | Pieridae | Coliadinae | *Catopsilia pyranthe* | *Cassia fistula* |
| 70. | Pieridae | Coliadinae | *Eurema blanda* | *Delonix regia* |
| 71. | Pieridae | Coliadinae | *Eurema hecabe* | *Delonix regia* |
| 72. | Pieridae | Pierinae | *Hebomoia glaucippe* | *Crataeva magna* |
| 73. | Pieridae | Pierinae | *Leptosia nina* | *Cleome viscosa* |
| 74. | Pieridae | Pierinae | *Pareronia hippia* | *Capparis zeylanica* |
| 75. | Pieridae | Pierinae | *Appias lyncida* | *Crataeva magna* |
| 76. | Pieridae | Pierinae | *Delias eucharis* | *Azadirachta indica* |

**FIGURE 2: PIE DIAGRAM SHOWING NUMERICAL ABUNDANCE OF BUTTERFLY SPECIES OF FIVE FAMILIES.**

**Conclusion**

A total of 76 butterfly species belonging to 5 families were recorded. The family Nymphalidae was the most dominant, with 33 species. Host plant species were also documented during the study. Larval host plant availability was high in the study area with many butterfly species within the same family sharing host plants. A checklist of butterflies in each area provides a baseline for assessing ecosystem health and enables the tracking of changes over time. Butterflies are good indicators of a healthy environment and act as important pollinators. Therefore, the conservation of butterflies is essential. However, due to increasing anthropogenic activities, butterfly populations are declining. Habitat loss and deforestation are major threats, as they lead to the destruction of larval host plants and essential habitats.

**Disclaimer (Artificial intelligence)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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