International Journal of Entomology Research
www.entomologyjournals.com
ISSN: 2455-4758
Received: 04-06-2023, Accepted: 19-06-2023, Published: 06-07-2023
Volume 8, Issue 7, 2023, Page No. 33-39

Butterfly species diversity and richness in the selected study area of Thamarassery Village, Kozhikode District, Kerala, India

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Abstract

Butterflies are a member of the order Lepidoptera, which is a huge collection of insects that make up the phylum Arthropod. They exist all across the earth, with the exception of the poles. In the current study, a survey was carried out in Thamarassery village, Kozhikode District, Kerala, to create a preliminary checklist of butterflies. Thamarassery village is a heart land of Kerala state. Thamarassery village has tropically wet and dry climate. Between June and the beginning of October, rain is most common. Samples of butterflies were taken between August 2021 and January 2022. In this brief investigation, 29 butterfly species from five families were identified. With 13 species, Nymphalidae led the list. There are seven species in Papilionoidea and five species in Pieridae. Lycaenidae had only three species and Hesperidae had only one species. It was found that 21 species of butterflies were common, 5 species were occasional and 3 species of butterflies were rare in occurrence in Thamarassery village. The ecology of a specific region may be studied using butterflies as a key model organism. This study will set the stage for future butterfly research by shedding light on the variety of butterflies.

Keywords: Butterflies, species diversity, Thamarassery village, biodiversity, seasonal abundance, conservation

Introduction

Butterflies are a taxonomically well-studied group of insects that act as indicator taxa for both habitat quality and human disturbance (Ghazoul, 2002; Kocher and Williams, 2000) [10] [17]. Almost 18,000 different species of butterflies have been identified (Heppner, 1998; Martinez *et al*., 2003) [12, 24], including 1501 species from India (Kehimkar, 2008) [16]. Butterflies are delicate biota, and changes in the environment and in the structure of the forest have a significant impact on them (Pollard, 1991) [27]. The most exquisite and colourful animals on earth, butterflies also have a high aesthetic value. They are an important component of the food chain that also includes predatory insects, spiders, amphibians, reptiles, and birds (Aneesh *et al*., 2013) [2].

Butterflies are morphologically and colourfully noteworthy, which has different consequences on the culture for some groups of people, making them also sociologically relevant (Alma *et al*., 2015) [1]. Butterflies contribute to the ecology in particular by recycling nutrients needed by crops (Schmidt and Roland, 2006) [32]. Since butterflies and their caterpillars depend on particular host plants for sustenance, the diversity of butterflies indirectly reflects the diversity of all plants in the area, particularly that of shrubs and herbs (Padhye *et al.*, 2006) [26]. The majority of them only occur at specific seasons and favour a specific range of habitats (Kunte, 1997) [21].

As pollinators, the adult butterflies contribute to the pollination of numerous native plants. In tropical regions where these insects are abundant and diverse in species, butterflies play a significant role in the growth, maintenance, and expansion of the flora. In the larval and adult stages, these butterflies serve as prey for numerous predators, including birds. Due to their sensitivity to environmental changes, diversity, advanced taxonomy, and lower economic and temporal costs of collection, diurnal butterflies are preferred indicators of habitat disturbance (Bonebrake *et al*., 2010; Daily and Erlich, 1991; Leon-Cortes *et al*., 2003; Bonebrake and Sorto, 2009) [23, 8, 6, 5].

One kind of insect whose diversity makes it interesting to study is the butterfly. Butterflies are insects that can be easily recognized in nature due to their appealing shapes and colors. According to Widhiono (2009) [35], butterflies serve as pollinators and bioindicators of environmental damage. The microclimate changes as a result of shifts in the dry and wet seasons, which have an impact on the populations of several species of butterflies. Rainfall and average temperatures differ depending on the season. The purpose of measuring habitat characteristics is to ascertain how they affect butterfly diversity (Handini, 2017) [11].

Materials and methods

Study area

The current study on butterfly variety was conducted in the village of Thamarassery Village, Kozhikode (Dist), Kerala. Thamarassery village is a beautiful place in its natural beauty as it is near to Wayanad district of Kerala. This area has a beautiful waterfall called Thusharagiri falls which is a part of Western Ghats. The study area's coordinates are 11° 24′ 50″N and 75° 55′ 22″E. Large trees, dense shrubs, and long grasses may be present in this study area, providing the butterflies with shelter.

The climate of the study area was wet and humid sometimes with brighter clouds. Temperature remains moderate and may be fluctuating throughout the year. During the study that is from August 2021 to January 2022 it was a wet climate by which starting was having rainfall and at the end was a cool climate. Average rainfall during this area was 3107 mm and the temperature was 29°C from November to 32°C in January.

Sampling

The butterfly fauna was surveyed in the field between August 2021 and January 2022. Either from 3:00 to 5:00 pm or from 8:00 to 11:00 am, the study was conducted. Random observations and opportunistic sampling were conducted while traversing the roadways, village paths, agricultural lands, residential vegetation, and other areas in and around this area. At the location of capture, butterflies were seen, caught, photographed, identified, and promptly released.

Identification

in the field, butterflies were recognised and captured on camera. The photos were taken using a digital camera and as well as in the mobile device IPhone 11. When collecting a specimen in a challenging situation, an aerial sweep net was used. The specimen was then moved to a plastic container and transported home for thorough identification (Sabir *et al*., 2000; Munir *et al*., 2008) [29, 25]. The proper steps were followed to guarantee that the butterfly's wing scales were hurt as little as possible. The species was verified using the field guides by Kunte (2000) [20] and Kehimkar (2008) [16]. Identification was greatly aided by Kunte *et al*.'s (2016) [19] improved taxonomy and nomenclature. Identification of butterflies in the current study was with the help of the field guide of Raju Kasambe, (2018) [28] i.e., Butterflies of the Western Ghats.

With the assistance of an entomologist and pertinent literature, the colour patterns, sizes, and shapes of the butterflies as well as their designs were taken into consideration in order to identify the species of butterfly along with the photographs described by Sunil *et al*., (2016) [34] and Kumar *et al*., (2016) [18].

Data analysis

The butterflies that were seen during each survey were tabulated and classified down to the species level. The occurrence status was evaluated using the number of sightings of each species at the study sites. The classification of sightings in the study area was decided as follows: rare (R) - 1 to 2 sightings, occasional (O) - 5 to 10 sightings, and frequent (C) - 11 to 16 sightings.

Results and discussion

The order of butterflies known as Lepidoptera is incredibly vibrant and has outstanding aesthetic value. They are widely distributed throughout the planet, with the exception of regions near to the poles, and are considered as useful biological indicators due to their large diversity, short generation time, strong mobility, host choice, and sensitivity to environmental changes (Lee *et al*., 2015) [22]. Butterflies depend on certain host plants and have a complicated life cycle, making them vulnerable to human activities that damage their environment. Farmers were able to achieve high productivity by land irrigation and fertilizer applications, but all of these methods have put many butterflies and their biotopes in danger.

Study of butterfly diversity in the selected study site

The current butterfly diversity research was conducted at Thamarassery Village, Kozhikode (Dist), Kerala. Table 1 contains a thorough list of butterfly species families, species names, common names, and occurrences. The photographs of butterfly species reported in the present study are displayed in Figure 1 to 2. Graph showing the butterfly family diversity is shown in Figure 3. During the present field investigation, 29 species of butterflies from the families Hesperiidae, Lycaenidae, Nymphalidae, Papilionidae, and Pieridae have been discovered. Nymphalidae (44.8%) was determined to be the most prominent family with 13 species, followed by Papilionidae (24.1%) with 7 species, Pieridae (17.2%) with 5 species, Lycaenidae (10.3%) with 3 species, and Hesperidae (3.6%) with 1 species.

August, September, October, and November saw the highest levels of butterfly activity. 29 species in all, spanning five families, were counted. The summer season had the greatest diversity of butterflies, while the winter, or the months of December and January, saw little butterfly activity. The whole butterfly activity was recorded every day between August 2021 and January 2022, from 8:00 am to 11:00 am or 3:00 pm to 5:00 pm. Weather, month, season, host plants, temperature, and species type all affect diversity.

According to the findings of this study, the most often sighted groups throughout this investigation were Nymphalidae and Papilionidae. The status of every species is classified based on direct sightings during the study, which revealed that 21 species (*Pachliopta aristolochiae, Pachliopta hector, Graphium agamemnon, Ypthima huebneri, Mycalesis perseus, Ypthima baldus, Pantoporia hordonia, Neptis hylas, Junonia lemonias, Junonia iphita, Moduza procris, Acraea terpiscore, Parantica aglea, Euploea core, Eurema hecabe, Catopsilia pomona, Leptosia nina, Delias eucharis, Appias lyncida, Castalius rosimon, Zizula hylax*) out of 29 species were commonly sighted.

Table 1: Butterfly Diversity in the Selected Study Site

Sl. No	Scientific Name	Common Name	Family	Occurrence (R, C, O)
1	*Pachliopta aristolochiae*	Common rose	Papilionidae	C
2	*Pachliopta hector*	Crimson rose	Papilionidae	C
3	*Graphium agamemnon*	Tailed jay	Papilionidae	C
4	*Graphium sarpedon*	Blue bottle	Papilionidae	O
5	*Papilo polytes*	Common mormon	Papilionidae	O
6	*Triodes minos*	Southern birdwing	Papilionidae	R
7	*Papilio polymnestor*	Blue mormon	Papilionidae	R
8	*Ypthima huebneri*	Common four ring	Nymphalidae	C
9	*Mycalesis perseus*	Common bush brown	Nymphalidae	C
10	*Ypthima baldus*	Commom five ring	Nymphalidiae	C
11	*Pantoporia hordonia*	Common lascar	Nymphalidiae	C
12	*Neptis hylas*	Common sailor	Nymphalidiae	C
13	*Hypolimnas bolina*	Great egg fly	Nymphalidiae	O
14	*Junonia lemonias*	Lemon pansy	Nymphalidiae	C

15	*Junonia iphita*	Chocolate pansy	Nymphalidiae	C
16	*Moduza procris*	commander	Nymphalidiae	C
17	*Tirumala limniace*	Blue tiger	Nymphalidiae	O
18	*Acraea terpsicore*	Tawny coster	Nymphalidiae	C
19	*Parantica aglea*	Glassy blue tiger	Nymphalidae	C
20	*Euploea core*	Common crow	Nymphalidae	C
21	*Eurema hecabe*	Common grass yellow	Pieridae	C
22	*Catopsilia pomona*	Lemon emigrant	Pieridae	C
23	*Leptosia nina*	Psyche	Pieridae	C
24	*Delias eucharis*	Common jezebel	Pieridae	C
25	*Appias lyncida*	Chocolate albatross	Pieridae	C
26	*Castalius rosimon*	Common pierrot	Lycaenidae	C
27	*Talicada nyseus*	Red pierrot	Lycaenidae	R
28	*Zizula hylax*	Tiny grass blue	Lycaenidae	C
29	*Udaspes folus*	Grass demon	Hesperidae	O

(R – Rare, C – Common, O – Occasional)

A) *Pachliopta aristolochiae* **B) *Pachliopta hector*** **C) *Graphium agamemnon***

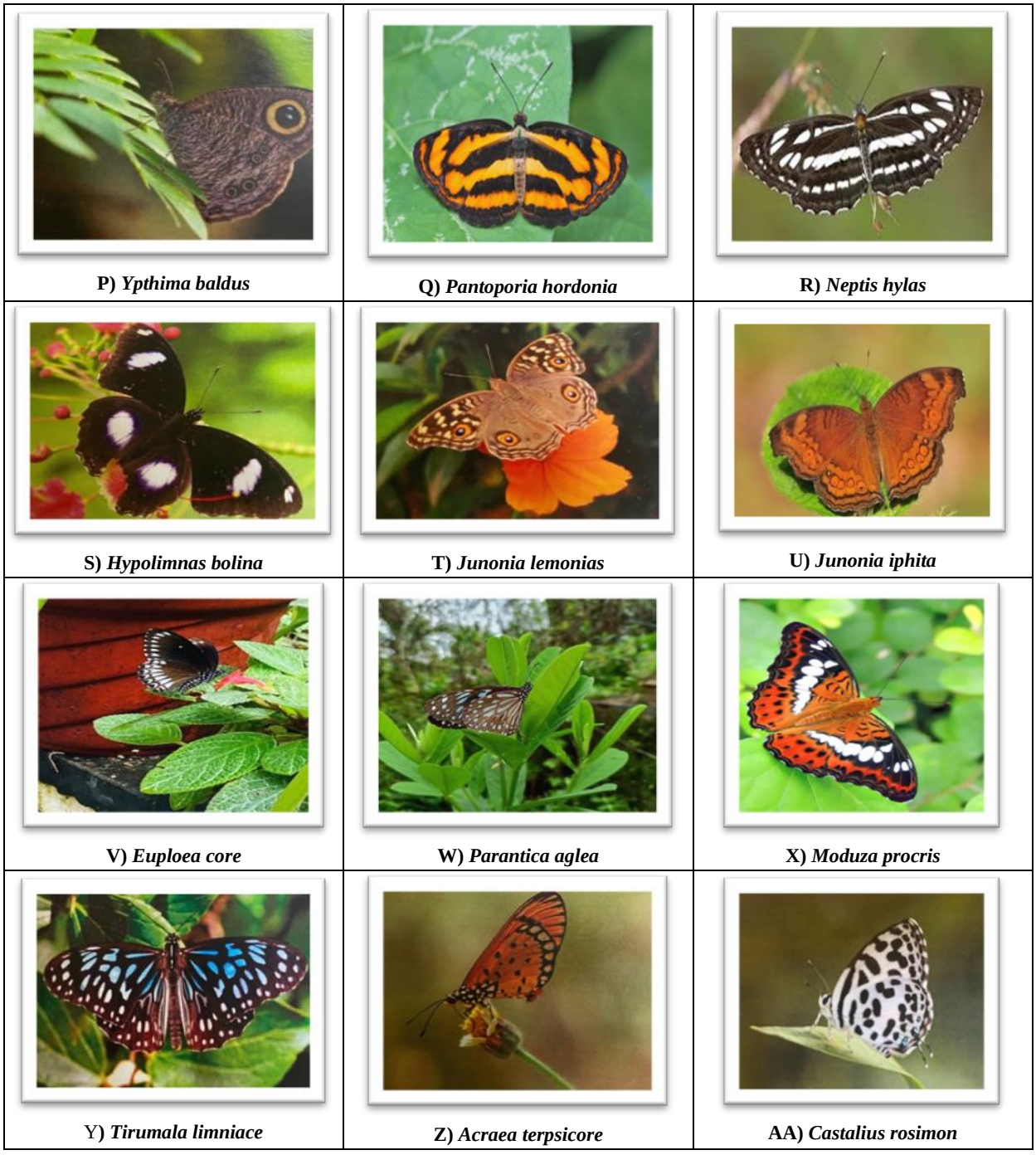
D) *Graphium sarpedon* **E) *Papilo polytes*** **F) *Troides minos***

G) *Papilio polymnestor* **H) *Eurema hecabe*** **I) *Catopsilia pomona***

J) *Leptosia nina* **K) *Delias eucharis*** **L) *Zizula hylax***

M) ***Appias lyncida*** | N) ***Ypthima huebneri*** | O) ***Mycalesis perseus***

Fig 1: Butterfly Species Identified in the Selected Study Site



P) ***Ypthima baldus*** | Q) ***Pantoporia hordonia*** | R) ***Neptis hylas***

S) ***Hypolimnas bolina*** | T) ***Junonia lemonias*** | U) ***Junonia iphita***

V) ***Euploea core*** | W) ***Parantica aglea*** | X) ***Moduza procris***

Y) ***Tirumala limniace*** | Z) ***Acraea terpsicore*** | AA) ***Castalius rosimon***

AB) ***Talicada nyseus*** **AC)** ***Udaspes folus***

Fig 2: Butterfly Species Identified in the Selected Study Site

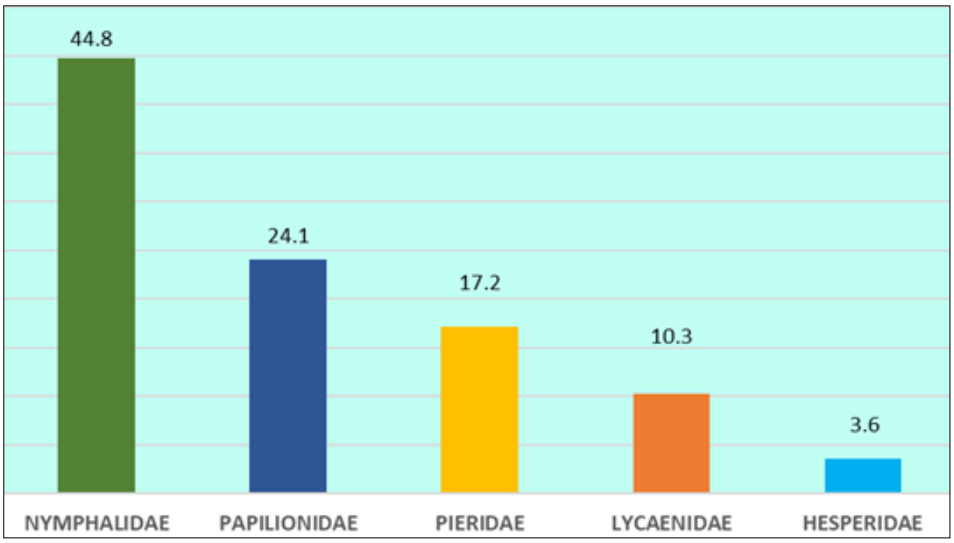


Fig 3: Graph Showing the Butterfly Family Diversity

Five species (*Graphium sarpedon, Papilio polytes, Hypolimnas bolina, Tirumala limniace, Udaspes folus*) were occasional and *Troides minos, Papilio polymnestor* and *Talicada nyseus* were rare. *Leptosia nina, Catopsilia pomona, Euploe core, Parantica aglea*, *Ypthima baldus*, and *Tirumala limniace* are the most highly observed butterflies. A minimum count of *Moduza procris*, *Junonia iphita*, *Udaspes folus,* and *Zizula* hylax was detected. This difference in numbers could be attributed to climatic circumstances, the availability of host plants, and the adaptability of the butterflies.

Discussion

According to several studies (Spitzer *et al*., 1993; Hill *et al*., 2001; Wood and Gillman, 1998) [33], disturbed habitat or forest gaps had higher butterfly diversity than thick forest or closed canopies. It is believed that the growth of secondary vegetation, such as *Lantana camera*, *Eupatorium odoratum*, and other species, which are excellent food supplies for many butterfly species, is the reason why disturbance and the existence of butterflies are associated. (1998; Wood and Gillman).

Butterflies only appear during certain seasons. They only appear often for a few months of the year and are absent or infrequent in the other seasons (Kunte, 2000) [20]. The diversity of insect and animal species has been shown to be connected to the structural complexity of the environment and the variety of vegetation forms (Gardner *et al*., 1995) [9]. Host plants will be used only when there are enough nectar available. Even at small scales, butterfly dispersal is predicted to follow the spread of their host plants, and the type of vegetation may suggest differences in the makeup of butterfly communities among environments at the general and family level (Beccaloni, 1997) [4].

The family Nymphalidae was the dominant family in the current study, containing 13 species and accounting for 44.8% of total butterfly species. In terms of species composition, the Nymphalidae were the most prevalent butterfly family (total of 13 species, 44.8%), followed by the Papilionidae, Pieridae, Lycaenidae, and Hesperidae. Furthermore, the current study's findings are validated by Bubesh *et al*., (2012) [7], who discovered 50 butterfly species belonging to five families. The families Nymphalidae and Lycaenidae had the most butterfly species in the study area. The findings of this study supported the findings of Sayeswara (2018) [31], who recorded a higher percentage of butterfly species from the Nymphalidae family with 44.4%, followed by Papilionidae with 22.2%, Lycaenidae with 8.33%, and Hesperidae with the lowest percentage of species in the study area. According to Saurav *et al*., (2017) [30], the Lycaenidae family has the most butterfly species, with 34.9%, followed by the Nymphalidae with 28.3%, the Hesperidae with 19.81%, and the Pieridae with 9.43%.

Post-monsoon, when there were a lot of butterflies, was the best time to see them. Population growth began during the monsoon and reached a rapid peak in the days after the rainy

season, followed by a second high in the spring. During this time, a great number of plants and trees bloom and blossom with flowers. This attracts a number of butterflies. The majority of species, however, hide out in areas of dense vegetation where there are some flowering species throughout the summer when the vegetation dries out.

Conclusion

Butterflies are indicators of a thriving environment and habitat. The current study is a preliminary study, so more research and collections are required to obtain a detailed record of the butterfly diversity and to develop standard monitoring procedures for assessing the environmental stability in this area. The research will also aid future efforts to comprehend the complicated nature of mutualistic interactions between butterflies and blooming plants, which is critical for the maintenance of ecosystem services. The butterfly species currently listed on this list are not exhaustive or definitive, and further study will be conducted to update this list.

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