

# INVESTIGATION ON THE BUTTERFLY DIVERSITY IN THE RURAL ECOSYSTEMS OF KOLLAM DISTRICT, KERALA

*Dissertation submitted to the University of Kerala*

*in partial fulfillment of the requirements*

*for the award of the degree of*

**BACHELOR OF SCIENCE**

**IN**

**ZOOLOGY**

(2016-19 batch)

Sl. No.	Name of candidates	Candidate code
1	ALFIYA R	250 16 142003
2	ARSHA AJITH A K	250 16 142005
3	FOUSIYA S	250 16 142009
4	REMYA RAJAN P R	250 16 142011
5	SWATHY A	250 16 142016
6	ADEESH KRISHNA A L	250 16 142018
7	AMINA THAJUDEEN	250 16 142025
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12	SAIDALI N	250 16 142037
13	MOHAMMED ANAZ H	250 16 142043



**DEPARTMENT OF ZOOLOGY  
TKM COLLEGE OF ARTS AND SCIENCE  
KOLLAM-691005, KERALA**

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**KOLLAM-5**

**March 2019**

# CERTIFICATE

This is to certify that the dissertation entitled '**Investigation on the Butterfly Diversity in the Rural Ecosystems of Kollam District, Kerala**' is an authentic record of the work done by a group of thirteen students of B. Sc Zoology, 2016-19 batch under my supervision as partial fulfillment of the requirements for the award of the Degree of **Bachelor of Science in Zoology** and this report has not been submitted earlier for the award of any degree or diploma or any other similar titles anywhere.

Certified bona fide:

Dr. Jasin Rahman V.K

*(Supervisor)*

Dr. Jasin Rahman V.K

Asst. Professor

Asst. Professor & Head

Dept. of Zoology

Dept. of Zoology

## EXAMINERS:

1.

2.

# DECLARATION

We do hereby declare that this dissertation '**Investigation on the Butterfly Diversity in the Rural Ecosystems of Kollam District, Kerala**' is a bona fide report of the project work carried out by us, under the supervision and guidance of Dr. Jasin Rahman V.K, Asst. Professor, Department of Zoology, TKM College of Arts and Science, Kollam as a partial fulfillment of the requirements for the award of the Degree of **Bachelor of Science in Zoology**.

ALFIYA R .....  
ARSHA AJITH A K .....  
FOUSIYA S .....  
REMYA RAJAN P R .....  
SWATHY A .....  
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NISHIDA NAZAR .....  
SAIDALI N .....  
MOHAMMED ANAZ H .....

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ALFIYA R  
ARSHA AJITH A K  
FOUSIYA S  
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*DEDICATED TO OUR PARENTS AND  
TEACHERS....*

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## INTRODUCTION

Butterflies are the beautiful, flying insect with large scaly wings. They have a spiritual meaning that they are deep and powerful representation of life. Many cultures associate the butterflies with our souls. Around the world, people view the butterfly as representing endurance, change, hope and life.

Butterflies are providing the best rapid indicators of habit quality and they are the sensitive indicators of the climatic change. Since butterflies are the first indicators of any drastic change in the environment, including climate change, the study of butterfly diversity can spread light on the changes in landscape and ecological impact. These are insects belongs to *macro lepidopteran* clade Rhopalocera from the order Lepidoptera, which also includes moths. Butterflies are the most tantalizing and beautiful creatures, among the insect group, there are an often regarded as flagship species. These are perhaps the most studied and well known insect group. In terms of indicator organisms for biodiversity studies on butterflies are an excellent choice as they are common almost everywhere, attractive and easy to observe. The butterfly diversity high in tropics compared to temperate regions of the world. Adult butterflies have large, often brightly coloured wings, and conspicuous, fluttering flight. They are day fliers and play an important role in ecosystem acting as plant pollinators and fine composition are severely affected butterflies. Butterflies are the most attractive and



colourful insects. They play a crucial role in the food-chain of the birds, reptiles, amphibians. Butterflies and their caterpillars are dependent on specific host plants for food, thus the diversity of butterflies indirectly reflects overall plant diversity especially that of shrubs and herbs in the given area. Most of them are strictly seasonal and prefer only particular set of habitats.

Butterflies do not have any chewing mouth parts. Instead they eat by sipping liquids, most often nectar, through their proboscis. A butterfly's proboscis can be found curled neatly on the lower side of the head when the butterfly is not eating. Average adult butterfly lives for only 2 weeks and butterflies are cold blooded which really means that they do not generate enough heat from their own metabolism to provide them with the heat and energy they need to fly. They can raise their internal temperature higher than the temperature around them in a way. Some butterflies live in habitats such as rain forest understories, where there is not a constant supply of flowers with nectar for the butterflies to eat. Like all insects, they have six jointed legs, three body parts, a pair of antennae, compound eyes, and an exoskeleton. The three parts are head, thorax, abdomen. The butterfly's body is covered with sensory hairs. A butterfly's wings are covered by thousands of tiny scales and these scales reflect light in different colours. But underneath all of those scales, a butterfly wing is actually formed by layers of chitin, the same protein that makes up an insect exoskeleton. These layers are so thin you can see right through them. As a butterfly ages, scales fall off the wings, leaving spots of transparent where the chitin layer is exposed. In

their lifecycle they exhibit complete metamorphosis to grow into an adult they go through 4 stages, viz., Egg, larva, pupa and adult.

Caterpillars need to eat a lot, and adults need to reproduce. Depending on the type of butterflies the life cycle of a butterfly may take anywhere from month to a whole year. Butterflies reproduce the way other animals do sperm from a male fertilizes eggs from a female. Butterflies also recognize each other through pheromones, or scents. During mating, males use clasping organs on their abdomens to grasp females. Many male butterflies deliver more than just sperm to their mates. In February and march, the final generation of hibernating butterflies comes out of hibernation to find a mate. They then migrate in order to find a place to lay their eggs. This starts stage one and generation one of the newer for the butterflies. Females lay eggs 5 to 7 days after emerging from the chrysalis. The eggs hatch after 3 days. Caterpillars emerge from the eggs and eat for 10 to 12 days before forming chrysalides. Adult butterflies emerge from the chrysalides in 7 to 10 days.

Butterflies are cold blooded and cannot withstand winter conditions in an active state. Butterflies may survive cold weather by hibernating in protected locations. They may use the peeling bark of trees, perennial plants, logs, or old fences as their overwintering sights. They may hibernate at any stage but generally each species dormants in only one stage.

Butterflies and caterpillars are preyed upon by birds, spider, lizards and various other animals. Largely defenseless against many of these hungry

predators, Lepidoptera have developed a number of passive ways to protect themselves. One way is by making themselves inconspicuous through the use of camouflage. Caterpillars may be protectively coloured or have structures that allow them to seemingly disappear into the background. A special character that shown by the butterflies are that they taste with their feet they have taste receptor's on their feet to help them find their host plant And locate food. A female butterfly lands on different Plants, drumming the leaves with her feet until the Plant releases its juices. Spines on the back of her legs have chemoreceptor that detects the right match of plant chemical. When she identified the right plant, she lays her eggs. A butterfly will also step on its food, using organ that sense dissolved sugars to taste food source like fermenting fruits. Adult butterfly's only feed liquids, usually nectar. Their mouth parts are modified for enable them to drink, but they can't chew solids. The proboscis, which functions as a drinking straw, stays curled under the butterfly's chin until it find source of nectar or other liquid nutrition. It then unfurls the long, tubular structure and sips up a meal. A few butterflies feed on sap, and some even resort to sipping from decaying carrion. Whatever the meal they suck it up a straw.

And another factor that need an ideal body temperature at about 85F to fly, since they are cold blooded animal, the cant regulate their body temperature. The surrounding air temperature has a big impact on their ability to function. If the temperature false below 55 degree, the butterflies are rendered immobile, unable to flee from predators or feed. When air temperature ranges between 82 degree to 100 degree F, butterfly can fly with

ease. In cooler days butterflies warm up the flight muscles, either by shivering or basking in the sun.

Many hundreds of Lepidoptera injures plants useful to humans, including most important sources of food, fabrics, fodder and timber. The great majority of the injurious species are moths, and the detrimental life stage is always the larva. However, unlike the members of other insect order, lepidopterans do not act as carriers of plant diseases, nor are any of them parasites of or injurious to humans. However, some species feed on open wounds or bodily secretions of wild or domestic animals.

The list of valuable plants subject to damage by lepidopterans is a long one, including may drains, sugar beets and sugar canes, cotton, tobacco, some root crops and leaf crops, many fruits, and timber and shade trees. The damage may involve the leaves stems roots or fruits. Woollens, furs, silk, and even feathers are eaten by fungus moths of several genera. The greater wax moth (*Galleria mellonella*) causes considerable damage in bee hives.

A few Lepidoptera are directly beneficial to humans nearly all silk is obtained by the domesticated silk worm (*Bombyx mori*) which is originally from china. Other silks such as shantung and tussah are the products of various Asiatic giant silkworm moths (Family Saturniidae). The larvae and sometimes the adults of a few species are used for food. The larvae of one skipper are collected in large quantities in the Congo, and the 10 cm (4 inch) caterpillars of giant skippers, known in Mexico as *Gusanos de maguey*, are both consumed domestically and canned and exported for consumption as

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hors d'oeuvre. The south American cactus moth has been highly beneficial in weed control, clearing more than 150 million in Australia of alien prickly pear cactus. Doubtless, humans also benefit from much unrecognized weed eating by caterpillars and flower pollination by adults.

India has around 1501 species of butterflies, out of this 316 species are reported at Kerala (Palot et al. 2012). Mathew and Rahmathullah (1993) had reported 100 species of butterflies from Silent Valley National Park. At Thenmala and Rosemala, Nymphalidae had the highest dominant index and this was followed by Papilionidae (Shamsudeen and Mathew, 2010). This study deserves importance in the context of the need of extensive surveys yet to be conducted in Kollam district.

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## OBJECTIVES

- To observe and scientifically identify the butterfly fauna in the rural ecosystems of Kollam district
- To list out the butterflies in the study areas
- To create an awareness on conserving these important pollinators

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## REVIEW OF LITERATURE

Many surveys have been conducted in Kerala and all over the India for exploring the diversity of Butterflies. Butterflies are insects from the order Lepidoptera. Adult butterflies have large, often different coloured wings and are very attractive. Butterflies fossils date to the Paleocene, which was about 56 million years ago.

Very little documentation has been done on butterfly fauna in Kerala. Some of the earlier documentation on butterfly fauna from Kerala and adjacent areas include Mathew and Rahamathulla (1993), ( 100 species of butterflies from Silent Valley National Park), Sudheendrakumar et al. (2000), (124 species of butterflies from Parambikulam Wildlife Sanctuary), Arun (2003) (75 species from Siruvani Reserved Forests), Ambrose and Raj (2005) (24 species from Kalakkad-Mundanthurai Tiger reserve), Eswaran and Pramod (2005) (75 species from Anaikatty near Coimbatore), Prasad et al. (2010) (52 species from Kerala University campus, Thiruvananthapuram) and Toms et al. (2010) (109 species from Mahatma Gandhi University campus, Kottayam). A total of 139 species of butterflies belonging to six families were identified from the KAU campus, including four species that are endemic to the Western Ghats and nine species protected under various schedules of the Indian Wildlife (Protection) Act, 1972 (Aneesh et al. 2013). A butterfly survey conducted at the Periyar Tiger Reserve in Kerala's Idukki district, has recorded 246 butterfly species and the survey revealed that the reserve has

around 30-32 butterfly species that are seen only in the Western Ghats (Anonymous). The butterflies recorded from Shenduruny Wild life sanctuary (73 species), formed nearly one third of butterflies recorded from whole of Kerala (314 species) and of the Western Ghats (330 species) (Shamsudeen and Mathew, 2010). The annual butterfly survey in the Aralam Wildlife Sanctuary recorded 178 species of butterflies, including 9 species that are endemic to the Western Ghats (Anonymous). The organizers said the survey had added two new species to the sanctuary- Nilgiri Grass Yellow and Silver Streak Acacia Blue. Both are extremely rare and unknown only from very few specimens from the Western Ghats. With these two additions, the total number of butterflies in the Aralam WLS is 257, the highest in any of the protected areas of the state. The family Nymphalidae (Brush-footed butterflies) is more diverse with 67 species followed by Lycaenidae-blue (50 species), Hesperidae-skippers (25 species), Pieridae-whites and yellow (20 species), Papilionidae-swallowtails (16 species) and a single species from the family Riodinidae Judies and Punches (Anonymous). The first ever comprehensive butterfly survey held in Munnar Wildlife division has spotted as many as 206 new species (Anonymous). In a three day survey conducted by the Kerala Forest Department in association with the Travancore National History Society (TNHS) and the Kottayam Nature Society (KNS), the survey team has systematically reviewed the Chinnar Wildlife Sanctuary as well as the four national park of Mathikettan Shola, Pampadum Shola, Anamudy Shola and the Kurinjimala Wildlife Sancturay and the highest number was recorded at Mathikettan Shola with 148 species,



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followed by the Chinnar Wildlife Sanctuary with 141 species, the Anamudi Shola with 94 species and Pamapdum Shola with 88 species (Kuttoor, 2015). Survey organized by forest and wildlife department and Wayanad based Ferns naturalist society found 221 species and 11 new species of butterflies at Parambikulam tiger reserve (Anonymous). In a survey conducted by Shamsudeen and Mathew (2010) noticed altogether, 73 species from Shendurny Wild Life Sanctuary in which Rosemala area contained 69 species and Thenmala had 63 species.

India is one of the 17 mega biodiversity countries of the world. It is host to a spectacular number of butterflies, many of which are endemic to the Indian Region, which makes this an especially important region for butterfly diversity and conservation. The migration of butterflies from Palani plains to Chinnar area of Western Ghats is a common phenomenon after the south-west monsoon (Anonymous).

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## MATERIALS AND METHODS

### STUDY AREA

The study areas include various domestic and commercial agricultural landscapes especially horticultural ecosystems in Kollam District (Plate 1). This district is located on the southwest part of Kerala State and extends from Lakshadweep Sea to the Western Ghats. It is bordered by Trivandrum district on the South, Alapuzha and Pathanamthitta districts in the North, Thirunelveli district of Tamilnadu State in the East and Lakshadweep sea in the west. It lies between North latitudes  $8^{\circ} 45'$  and  $9^{\circ} 07'$  and East longitudes  $76^{\circ} 29'$  and  $77^{\circ} 17'$ . It has a geographical area of 2491 sq. km which is about 6.48% of the total geographical area of the State. This district has been gifted with sea, lakes, plains, mountains, rivers, streams, backwaters, forest, vast green fields and tropical crop of every variety, both food and cash crop, hence called God's own Capital. The district is drained by three west flowing rivers, Achenkovil, Kallada and Ithikara, originating in the eastern hilly region. These rivers together with their tributaries exhibit dendritic pattern of drainage. The whole district of the study area has a tropical humid climate, with an oppressive summer, plentiful seasonal rainfall and cool winters. Temperature is almost steady throughout the year. The average temperature is around  $25^{\circ} \text{C}$  to  $32^{\circ} \text{C}$ . Summers usually begin from March and extend till May. The rest of the year is generally dry. The monsoons begin by June and end by September. The district receives an

average rainfall of about 2555 mm annually. The major source of rainfall is South West monsoon from June to September which contributes nearly 55% of the total rainfall of the year. The North East monsoon season from October to December contributes about 24% and the balance 21% is received during the month of January to May as pre-monsoon showers. Winter is from November to February during which temperature is moderately cool hovering from 18° C to 25° C. The Relative humidity is higher during the monsoon period and it is higher all through the year during the morning hours. Ecologically Kollam district belongs to Agasthyamalai Biosphere Reserve. The vegetation consists of typical southern subtropical flora. Though the rural areas are gifted with many undisturbed habitats, most areas are on the threat of unscientific construction activities and destruction of wetlands and rain groves.

### **Methodology**

Regular visits were made in various ecosystems in the rural areas of the study area from the first week of August 2018 to the first week of March 2019. Areas including Gardens, Agroecosystems, Shrubs and herbs, Grasslands and Ponds were visited. Typical and unique features of the wings, abdomen and pattern of coloration of all body parts were noted down. The pattern of color patches and print distribution were marked. Butterflies were photographed from different angles as often as possible to obtain sufficient photographs to enable positive identification of species. Descriptions and photographs were compared with literature and the

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species were identified based on the collected data and available reference, both printed and electronic. Species identity was confirmed with the help of the field guides by Kunte (2000) and Kehimkar (2008) and the book of Kasambe (2018). Taxonomy and nomenclature have been updated. Vegetation of each site and sub site were keenly observed and relevant data were recorded.

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## RESULTS AND DISCUSSION

A total of 18 butterflies species belonging to 5 different families were observed (Table 1). Family Nymphalidae showed the maximum species, comprising of 6 species including *Danaus genutia*, *Euploea core*, *Euthalia aconthea*, *Hypolimnas bolina*, *Hypolimnas misippus* and *Tirumala septentrionis dravidarum* followed by Lycanidae consisting of *Jamides celeno blairana*, *Jamides celeno celeno*, *Leptosia nina*, *Neopithecops zalmora* and *Pseudozizeeria maha*, Papilionidae viz., *Papilio polymnestor*, *Papilio polytes*, *Graphium agamemnon* and *Pachliopta hector*, Pieridae viz., *Catopsilia Pomona* and *Delias eucharis* and Hesperidae with lowest number, only one, viz., *Udaspes folus*. The present study recorded butterflies mostly from garden and agrifields and least from ponds and grass lands.

Arun and Azeez (2003) and Nandakumar (2015) has noted that Family Nymphalidae represent the maximum species of butterflies in the forests of Kerala. The findings of the present study underline the highest diversity of Nymphalidae followed by Lycanidae, Papilionidae, Pieridae and Hesperidae. The present study recorded maximum butterfly species in garden habitat followed by agrifield. Agricultural sites had significantly more butterflies than non-agricultural sites (Grossmueller and Lederhouse, 1987). Habitat selection in butterflies is directly related to the availability of preferred food plants for larvae and adults (Thomas, 1995 and Erica, 1999).

Although more than 300 butterflies are reported to be present in the Southern Western Ghats, many recent studies from other areas in Kerala such as Parambikulam Wildlife Sanctuary (Sudheendrakumar et al. 2000) and Silent valley National Park (Poyry et al. 2009) report much less diversity with maximum species richness in the evergreen habitats. The fauna at study sites contained distinct elements so as to suit with the vegetation characteristics of the area. The present study reveals that the study areas provide favorable ecological conditions and habitat for butterflies. It might be due to the presence of sufficient host plants and favorable climatic conditions for the development and growth of butterflies.

<b>Table 1. List of the butterflies recorded from the study area</b>		
<b>Sl. No.</b>	<b>Common name</b>	<b>Scientific name</b>
<b>Papilionidae</b>		
1	Blue Mormon	<i>Papilio polymnestor</i> Cramer, 1775
2	Common Mormon	<i>Papilio polytes</i> Linnaeus, 1758
3	Tailed Jay	<i>Graphium agamemnon</i> Linnaeus, 1758
4	Crimson Rose	<i>Pachliopta hector</i> Linnaeus, 1758
<b>Nymphalidae</b>		
5	Common Baron	<i>Euthalia aconthea</i> Cramer, 1777
6	Common Crow	<i>Euploea core</i> Cramer, 1780
7	Danaid Eggfly	<i>Hypolimnas misippus</i> Linnaeus, 1764
8	Common Tiger	<i>Danaus genutia</i> Cramer, 1779
9	Great Eggfly	<i>Hypolimnas bolina</i> Linnaeus, 1758
10	Dark Blue Tiger	<i>Tirumala septentrionis dravidarum</i> Butler, 1874
<b>Pieridae</b>		
11	Common/Lemon Emigrant	<i>Catopsilia Pomona</i> Fabricius, 1775
12	Common Jezebel	<i>Delias eucharis</i> Drury, 1773
<b>Lycaenidae</b>		
13	Andaman Common Cerulean	<i>Jamides celeno blairana</i> Cramer, 1775
14	Oriental Common Cerulean	<i>Jamides celeno celeno</i> Cramer, 1775
15	Pale Grass Blue	<i>Pseudozizeeria maha</i> Kollar, 1844
16	Psyche	<i>Leptosia nina</i> Fabricius, 1793
17	Quaker	<i>Neopithecops zalmora</i> Butler, 1870
<b>Hesperiidae</b>		
18	Grass demon	<i>Udaspes folus</i> Cramer, 1775

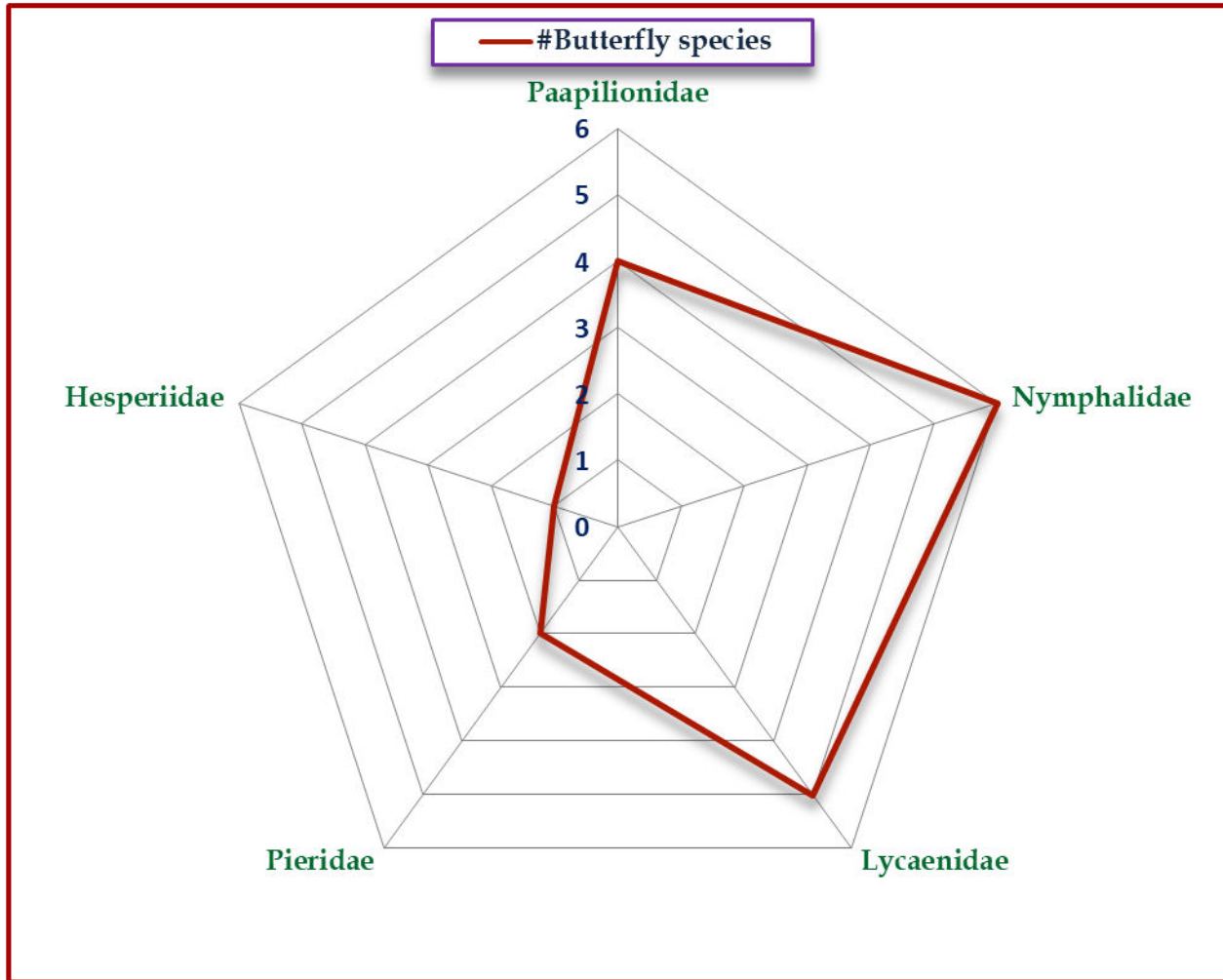


Fig. 1. Number of species observed in each family

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## SUMMARY AND CONCLUSION

The present study recorded 18 species of butterflies from 5 families. Family Nymphalidae showed maximum number of species (6), followed by Lycaenidae, Papilionidae, Pieridae and least in Hesperidae. From this survey, it showed that the number of species of butterflies observed in Garden habitat was consistently greater than Agrifield, pond, grassland and trees and shrubs. The study areas support a good number of butterfly species and much has still left to be explored. The present list of butterfly species is not conclusive and exhaustive and future exploration will be continued to update this checklist. In addition, further research will be needed for documentation of butterfly species which gives future conservation of butterflies in Kerala.



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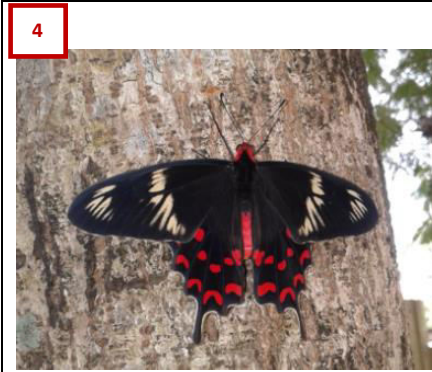
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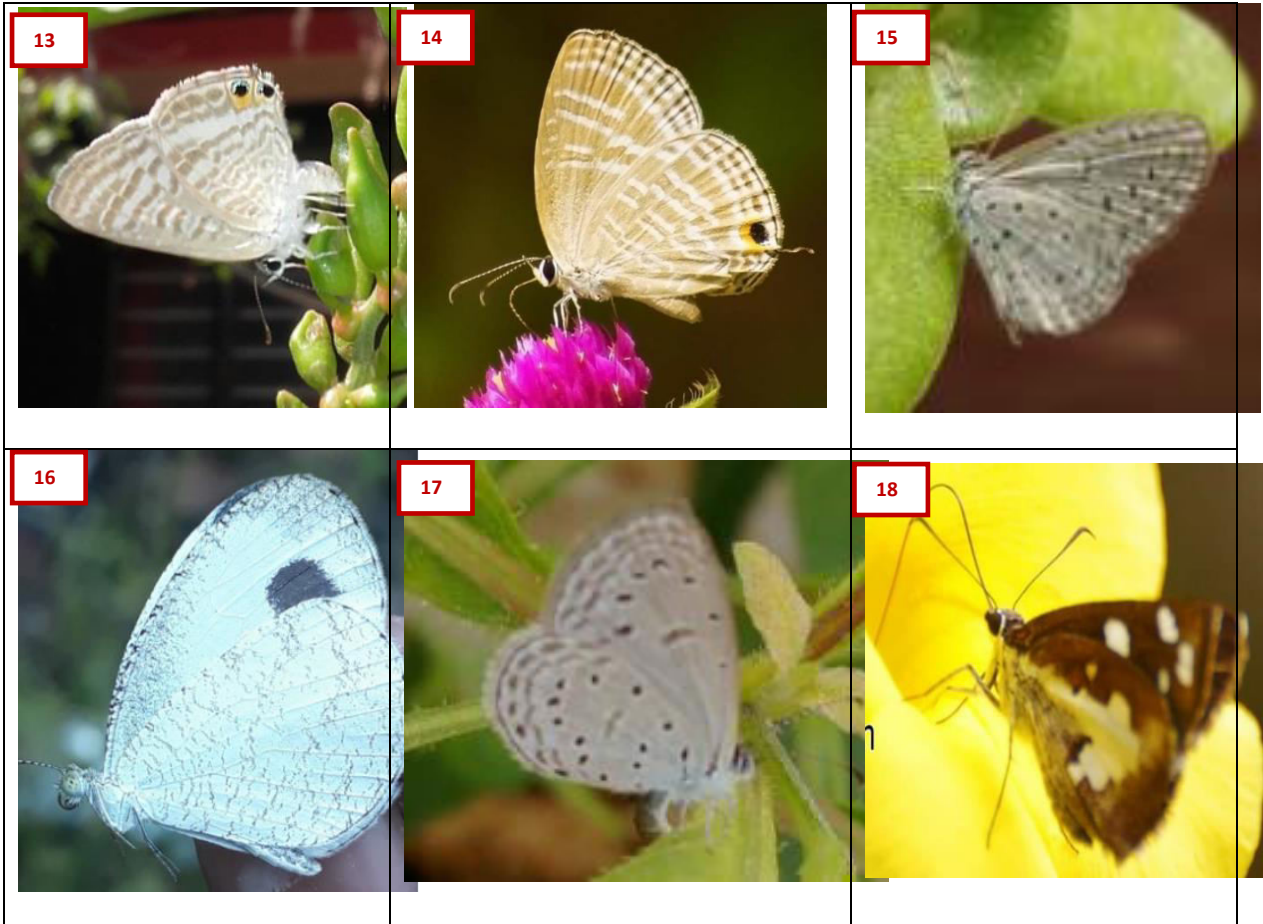
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Plates 1-18. The butterflies recorded from the study area. 1. Blue Mormon, 2. Common Mormon, 3. Tailed Jay, 4. Crimson Rose, 5. Common Baron, 6. Common Crow, 7. Danaid Eggfly, 8. Common Tiger, 9. Great Eggfly, 10. Dark Blue Tiger, 11. Common/Lemon Emigrant, 12. Common Jezebel, 13. Andaman Common Cerulean, 14. Oriental Common Cerulean, 15. Pale Grass Blue, 16. Psyche. 17. Quaker, 18. Grass demon