

**“THE PRELIMINARY STUDY ON DIVERSITY OF MOTHS IN  
BHARATA MATA COLLEGE THRIKKAKARA, KALAMASSERY  
MUNICIPALITY”**

Dissertation Submitted to Mahatma Gandhi University

In partial fulfillment of the requirements for the award of the degree of

**BACHELOR OF SCIENCE IN ZOOLOGY**



**DEPARTMENT OF ZOOLOGY**

**BHARATA MATHA COLLEGE**

**THRIKKAKARA**

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**/05/2020**

**CERTIFICATE**

This is to certify that the project entitled “**THE PRELIMINARY STUDY ON DIVERSITY OF MOTHS IN BHARATA MATA COLLEGE THRIKKAKARA KALAMASSERY MUNICIPALITY**” is a bonafide work done by **FATHIMA SHAJI** with register no **170021037716** during 2019-20 in partial fulfillment of the requirement for the award of the Bachelor Degree of Science in Zoology of MG university, Kottayam.

**Head of the department**

**Dr. Priyalakshmi G**

## **DECLARATION**

I do hereby declare that the work embodied in this dissertation entitled “**Preliminary study on the diversity of moth in Kalamassery municipality**” submitted to the Mahatma Gandhi university, Kottayam, in partial fulfillment for the award of Bachelor of Science in Zoology is record of bonafide dissertation done by me under the supervision of Aswini Venugopal, guest lecturer of Bharat Mata college Thrikkakara and that no part of this work has been submitted for the award of any other degree / diploma / associate ship / fellowship or any other similar title to any candidate of any university.

**PLACE: THRIKKAKARA**

**DATE:**

**FATHIMA SHAJI**

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## **ABSTRACT**

Arthropods are considered as the most successful animal group which consists of more than two-third of all animal species on earth. Class Insecta comprise about 90% of tropical forest biomass (Fatimah & Catherine 2002). Order Lepidoptera is the most diverse and second largest in class Insecta (Benton, 1995). Moths constitute the sub-order Heterocera of order Lepidoptera that has important roles in the forest ecosystem as herbivores and as food for predatory and parasitic species (Sivasanakaran K. *et al.* 2011). The present study was conducted at K M to evaluate the biodiversity of moths. During the present study, a total of 17 moth specimens were collected from the study area which represented a total of 5 Families distributed among 11 Genera and 13 Species. The highest species richness was shown by the family Erebidae and the least by the family Geometridae. The results of this preliminary study are promising; it sheds light on the unknown biodiversity of KM which needs to be strengthened through comprehensive future survey. This work help in future to conduct a moth diversity study easily and also help to find out the extinct, extant and threatened species in that particular area

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## **INTRODUCTION**

The moth include in the order Lepidoptera they are soft bodied insects and very greatly in size from minute to very large insects. They are characterised by the body, wings and appendages being generally covered densely with pigmented scales which provide the colour. Lepidoptera is one of the largest of the insect orders with more than 105,000 know species. They are economically important. Larvae of most species are phytophagous feeding grain, cultivated crops. Adult moths of a few species known to suck the fruit juice and cause damage to them. (David B V *et al*, 2004)

Approximately there is 11,000 species of moth.

Lepidoptera shows a great diversity of size, structure and other characteristics.

### **CHARACTERISTICS**

- Moths highly adapted
- Have 3 distinct body segments, the head, thorax and abdomen
- Thorax has 3 segments prothorax, mesothorax and metathorax
- Wings, body, legs are covered with scales
- Moths are duller coloring
- Have thick antennae and feathery

### **MORPHOLOGY**

#### **Adult:-**

**Head:** Head of the adult is hypognathous and relatively small .The clypeus occupies the greater portion of the head. The compound eyes are large and set well apart. The ocelli are two in number in most of the moths are on each side to the margin of the compound eye. The ocelli may be replaced by a pair of sensory organ known as Chaetosema in some families. The antenna vary greatly in their structure and length and secondary sexual characters may be well exhibited in the pectinate and bipectinate antennae of certain male Lepidoptera.

The mouthparts are of sucking type forming a proboscis and in a few cases they may be vestigial, in which case the adult do not feed. The labrum is represented as a narrow transverse band across the lower part of the face at the base of the proboscis often lateral lobes called palpifers are present. The mandibles are wanting. The sucktorial proboscis is formed of two greatly elongated galeae which are held together by hooks and interlocking spines and is kept coiled in a spiral. The maxillary palpi are 5 or 6 segmented. The labium is found on the ventral aspect of the mouth and is reduced to a small plate. The labial palpi are 3 segmented, and are hypopharynx is present.

**Thorax:** The thoracic segments are fused and the mesothorax is the largest and the most predominant. The wings are well developed and proportionately large. They are covered by overlapping scales and on the wing membrane of most cases microtrichia or aculei are present. In some a tympanal organ may be found the metathorax at the base of the wings. Androconia (plumules) are specialized scales found in the group on the upper surface of the wings of certain lepidopterous males and may serves as outlets for odoriferous glands. Most primitive type of venation is found in the members belonging to the family Micropterygidea whose wings are closely alike. The wings are may be held in various positions at rest.

**Legs:** The legs are well developed with larged fixed coxae. The tarsi are five-segmented ended in pair claws.

**Abdomen:** The abdomen is ten-segmented and frequently partly fused .In many lepidoptera tympanum is situated one on either side at the base of the abdomen.

**Genetalia:** The male genetalia consist of a tegumen representing the ninth segment in the form of a narrow ring encircling the apex of the body and an invaginated sternal region called vinculum which in turn form a median succus extending into the preceding segment. Hinged to the vinculum are a pair of claspers the most prominent organ of the external genetalia. On the inner aspect of the claspers are spine-like herpes. Towards the hindmargin of the ninth tergum is a median hook-like or bifid process known as uncus. Gnathos is present in many Lepidoptera. The uncus and gnathos are usually supposed to represent the tergum and sternum of the tenth segment. Below the gnathos is present the aedeagus which is supported by a sclerotised juxta. The anus opens just beneath the uncus.



In the female the attenuated and telescoped terminal abdominal segments form a retractile ovipositor in many forms. The insects are oviparous and holometabolous. (David B V *et al*, 2004)

### **SCIENTIFIC CLASSIFICATION**

Kingdom: Animalia

Phylum: Arthropoda

Class: Insects

Order: Lepidoptera

Moth has cryptic appearance I assume that the adaptation to match the background upon which the species rests and thereby to avoid detection by visually hunting predators (Ricklefs Robert. E *et al*; 1947)

Further I assumed that the species compete for background and morphological adaptations that match them as an “escape space” (Ricklefs Robert. E *et al*, 1974)

Mostly moths are active at night. During day they hide and rest ie, they are mostly nocturnal but some are active in day time.

This analysis mainly to find the diversity of moth and their families, and their morphological features.

Differences in species diversity between areas are reflected in differences in the Variety of appearances used by moths and presumably in the Variety of their resting backgrounds (O Rourke Kevin *et al*, 1975)

Diversity shows negative correlation with the average temperature and nocturnal moth shows a very similar correlation with the climatic variables. Moth diversity is shown also to be influenced by habitat diversity (Turner J R *et al*, 1987)

Moth play an important role in the natural ecosystem as pollinators, food in the food chain and also with the saproxylic nature of larvae of many species (Srinivasan *et al*, 2014)

There have been number of studies examining moth diversity in different states. Some of them are summarized follows. Matthew and Rahmatullah (1995) reported 318 species of moths from the

silent valley national park during 5 months of survey. Sudheendra Kumar and Matthew (1999) reported 277 species of moth from parambikulam wildlife sanctuary during 3 years of survey. Mathew *et al*, (2004a) are reported 128 species of moths from Shendurney wildlife sanctuary during 2 weeks of survey. Mathew *et al*, (2004b) reported 87 species of moths from peppara wildlife sanctuary during 2 months of survey. Mathew *et al*, (2005) reported 113 species of moths from Peechi-vazhani wildlife sanctuary. Mathew *et al*, (2007) reported 90 species of moths from Neyyar wildlife sanctuary during 2 months of survey. Mathew *et al*, (2018) reported 112 species of moths from Vagamon hills. Idukki during a year of survey. Mathew and Menon (1984) are reported 155 species of Pyralid moths from Kerala. (Sondhi yash *et al*, 2018)

## OBJECTIVES

The present study attempts to explore the diversity of moths in Kalamassery municipality with the following main objectives.

- Collection of moths
- Find out the diversity of moths in Kalamassery municipality

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## REVIEW OF LITERATURE

A study was conducted at Vagamon hill station to evaluate the biodiversity of moths. During that study, a total of 675 moth specimens were collected from the study area which represented 112 species from 16 families. Though much of the species has been reported earlier from other parts of India, 15 species were first records for the state of Kerala. The highest species richness was shown by the family EREBIDAE and the least by the families LASIOCAMPIDAE, URANIIDAE, NOTODONTIDAE, PYRALIDAE, YPONOMEUTIDAE, ZYGAENIDAE, and HEPIALIDAE with one species each. The result of this study was; it sheds light on the unknown biodiversity of Vagamon hills. (Mathew *et al.*, 2018)

Insect species diversity with reference to moths was done in silent valley national park. Maximum number of moths collected belongs to the family by PYRALIDAE, NOCTUIDAE, GEOMETRIDAE, ARCTIIDAE. Some families like LASIOCAMPIDAE, BOMBYCIDAE, and GELECHIDAE was only poorly represented. In general, flora bears close resemblance that of Sri Lanka although it is characterized by the presence of several endemic species having affinities with the Malayan elements. Altogether 318 species of moths belonging to 19 families was recorded in this study (Mathew George *et al.*, 1995)

282 species of moths was recorded during surveys conducted over 31 surveys night during a three year period in Shendurney wildlife sanctuary (WLS) and Ponmudi, Kerala, India. Shendurney is a biodiversity hotspot within the Western Ghats. It has a high degree of endemism and several new species. The diversity in Sandurney was poorly studied and only 128 moth species have been previously reported. 15 range extensions were recorded, of which 14 were new records for Kerala, one a new record for India, and one a new species (Sondhi yash *et al.*, 2018)

The most common Lepidopteron families include NOCTUIDAE, ARCTIIDAE and SPHINGIDAE. Sphingid moths are rare when compared to Arctiid and Noctuid moths because of scarcity of host plant. A survey was done to analyse the diversity of sphingid species in the parli panchayat. (Krishna *et al.*, 2016)

This paper presents an inventory of 418 species of moths (303 identified to species, 116 identified to genus) from 28 families belonging to 15 superfamilies, which were collected by light trapping at eight sites in Northern Western ghats, India. Of species recorded, 11 species from 5 families appears to be new records for India, range extensions were noted for 130 species from 16 families, and 25 species from 6 families are endemic to India. The dominant families were EREBIDAE, GEOMETRIDAE, SPHINGIDAE, and CRAMBIDAE. Highest number of moth were recorded from Malshej Ghat, Sanjay Gandhi national park and bhimashankar wildlife sanctuary. The highest species diversity was recorded from Sanjay Gandhi national park. Amboli, koyna wildlife sanctuary and Malshej Ghat showed a number of new records and endemic moth fauna. This paper was concluded, that the moth diversity of Northern Western Ghats is similar to that of north East India (V Subalakshmi *et al.*, 2011)

The study on insect fauna of Peechi-vazhani wildlife sanctuary, 374 species of Insects mostly belonging to Lepidoptera, Coleoptera, and Hemiptera were recorded. The fauna was rich and diverse and contained several rare and protected species. The moth fauna is rich in arboreal feeding forms. Certain species associated with herbaceous ground vegetation are of economically important. Beetles are also abundant, being dominated by phytophagous and scavenger forms, the former feeding mostly on herbaceous ground flora and the latter associated with animal excreta. The bags recorded in this study included mostly phytophagous forms. They hymenopterans contained several species of solitary bees and wasps. An Inventory of 382 species of insects recorded from the sanctuary is given (Mathew George *et al.*, 2005)

Based on the survey made at different localities in Tamilnadu, five species of primary fruit piercers belonging to two Genera Viz.; *Othreis materna* (L), *O.fullonia* (clerck), *O. homaena*, *O. salamina* (cram) and *Rhytia hypermnestra* (stoll) were found which feed on guava and citrus fruits. Among the five species *O.materna* was the predominant piercer followed by *O.fullonia* and *O.homaena*. The species Viz, *O.salamina* and *R.hypermnestra* where very less abundance in all the localities surveyved. Species richness of fruit piercing mouth was high at Periyakulam and low in Mettupalayam. Regarding seasonal abundance, the activity of *O.materna* is more from the second fortnight of July to till January and *O.fullonia* and *O.homaena* observed from the first week of September up to first fortnight of January. The larvae of *R.hypermnestra* were collected during

first week of October and both activity was recorded from the second fortnight of September. (Ramkumar J *et al.*, 2010)

Diversity of moths (insecta: Lepidoptera) in the Gupteswar reserve forest area of eastern Ghat hill, koraput district, Odisha, India was studied for the first time. Total 30 species of moths under 27 genera and 7 families were observed. Highest numbers of Species and Genera were observed under family CRAMBIDAE, followed by family GEOMETRIDAE day and family EREBIDAE (Jena Kumar Sudhir *et al.*, 2018)

The present study investigate the pattern of assembling of moths in 6 paddy fields in Palakkad district Kerala. This study also aimed to test the effect of seasonal variations on the diversity of moths. Light trap was used for specimen collection. A total of 189 moths belonging to 14 species were collected. Paddy field near Dhoni forest area has highest species diversity with nine Species which belonging to four Families. Mostly belonged to NOCTUIDAE, PYRALIDAE, SATURNIDAE, and SPHINGIDAE. The greatest number of specimens were collected during the summer and post monsoon period. This clearly reflected the influence of different seasons on most diversity and abundance (Praveen k., 2017)

Moths are nocturnal insects with dull colour, coming under class Insecta, order Lepidoptera. A survey was done to analyse the diversity of Sphingid species in the parli panchayat, Palakkad district, this was the main objective of this study. The survey started from March June 2011. The collection of moths were done by using a light trap and it was operated from 6: 30-9:30 p.m. all the days. A total of 72 moths were collected, from which only 18 moths belonging to the family SPHINGIDAE, which include 6 Species. *Hippotion boerhaviae* seen in more number in Pali panchayat, due to the presence of host plants like colocasia and yam followed by *Macroglossum aquila*. Genus **Theretra** was less in number in the study area when compared to other genus like **Hippotion, Macroglossum** etc. The number of Sphingid moths were high in the month of May. The diversity of an insect species in an area may change with the change in the host plants. So the plants should be conserved for a sustainable development of insects. In that current scenario, the cultivation of colocasia, yam, pea etc are in decreased level, if its production is increased, more number of Sphingid moths will attract and species diversity and abundance can be increased. This study give a preliminary data of Sphingid moths in Parli panchayat, and their host plants. (Krishnan Anila, 2016)

Giant moth worm found in North Eastern regional institute of science and technology campus, Papum pare, Arunachal Pradesh, India. Largest moth of this area was identified as Atlas moth, *Attacus atlas* it measured 23 cm and breadth from wing to wing. This species is brown with flask shaped transparent Windows on the fore and hind wings. Another moth was identified as Luna moth (Across Selene) SATURNIDAE. It measured 19cm in breadth from wing to wing. It is yellow with oval Windows on the wings. Posterior in of hind wing Wings in the species is greatly elongated and looks like a pair of tails. The causes of decline in Giant moth populations across different habitats are enumerated. (Mary PP *et al.*, 2016)

The paper gives a comprehensive account of moth (Lepidoptera, Heterocera) of Indian Sundarbans. Total 45 species have been reported from Indian part of sundarbans biosphere reserve. Among them, 16 species are reported for the first time from sundarban biosphere reserve of which 9 species are reported for the first time from the state of West Bengal, India. Moreover, 25 species are found as pests of different agriculturally important plants of India. (Biswas Olive., 2016)

Moths were collected from different parts of Peshawar during June to August in 2007 to determine the diversity, species richness and evenness. Total number of 774 moth specimens were collected by using symbol light traps operated from dusk to dawn daily for 60 Nights. The moths caught were identified up to family level. Families NOCTUIDEA, PYRALIDAE, ARCTIIDAE, GEOMETRIDAE, SPHINGIDAE, and LYMANTRIIDAE were represented in collection samples. The diversity index, species richness, and evenness of moth fauna in Peshawar were 3.14, 5.26, and 0.87, respectively. (Aslam Muhammad., 2009)

Field survey was conducted at different altitudes and land use areas 2 protected areas, Gangotri national park and Govind national park of Uttarkashi district, Uttarakhand India. A total of 475 specimens were collected using light trap method during the survey conducted between September 2008 and May 2010. Preliminary findings show a decreasing diversity with increasing altitude. Subalpine areas were least diverse and subtropical areas had the highest diversity of moths. The greatest number of specimens were collected during the summer and post monsoon period. The lunar phase had a significant effect on the caught success with New moon days resulting in the least number of species as well as individuals. Four species are new record from Western Himalaya within Indian Territory and also first time recorded from entire Himalayan landscape. As there was no previous study on the moth diversity of Gangotri landscape area, all the 32 species described



could be regarded as new to record from these to protected areas. (Sanyal Kumar Abesh *et al.*, 2003)

Preliminaries checklist of moth species collected in North Maharashtra is presented based on studies carried out in various localities from June 2009 to June 2010. From a total of 728 individuals, 245 morphospecies, placed in 177 Genera and 20 Families, were recognised. Almost a third of these species were collected as singletons and can be considered as rare. The moth fauna is very rich in arboreal feeding forms, indicating that the area is a fairly undisturbed forest patch. Of the 20 families encountered, EREBIDAE, NOCTUIDAE, CRAMBIDAE, GEOMETRIDAE and SPHINGIDAE are the most diverse. (Gurule Sachine A *et al.*, 2013)

## **MATERIALS AND METHODS**

### **STUDY AREA**

Study was conducted in KM. Kalamassery municipality is in Ernakulam District, a developing region having many buildings, chemicals and fertilizer manufacturing factories, hospitals, IT companies, have only less agricultural fields compare to other area. Kalamassery is a most developing area.

### **SAMPLING TECHNOLOGY**

#### **Pheromone trap**

Pheromone trap is a type of insect **trap** that uses **pheromones** to lure insects. Sex pheromones and aggregating pheromones are the most common types used. Pheromones are chemicals used by insects and other animals to communicate each other. Insects send these chemical signals to help attract mates, warn others of predators, or find food. Using specific pheromones, trap can be used to target pest in agricultural fields.

#### **Light trap**

Insects that fly into the **light** bulb fall down the funnel and are trapped in the **can**. The spout of the funnel should be large enough to let the insects drop through it easily, but no so large as to let the insects fly out again. The trap was placed on a stand above the ground level and operated during collecting time.

## Sweeping net

Common type of collecting method is sweeping, is done by moving a net back and through tall plants. This collects variety of small insects that may otherwise be overlooked.

There are two basic kinds of nets-aerial nets and sweep net

Aerial net- light nets for capture of insects in flights

Sweep net-Heavy canvas bag with heavy mounting ring for net. In use, it is moved quickly through foliage, shrubbery and other vegetation to dislodge insects feeding or resting on foliage

## RESULT

### SPECIES RICHNESS IN KM

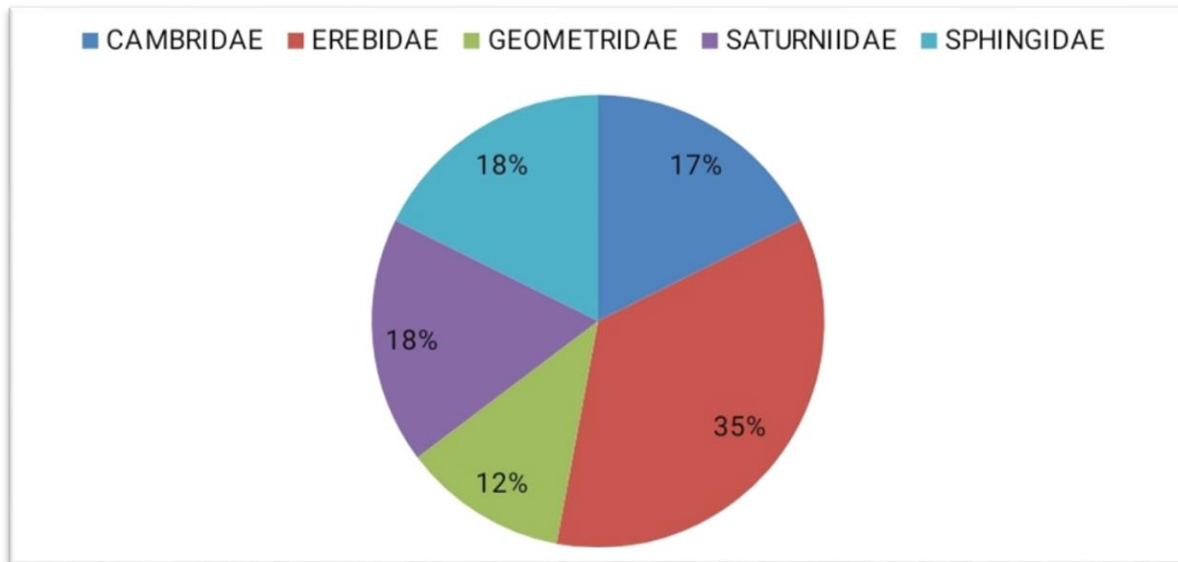
From the current field study, a total of 17 moth species coming under 11 genera belonging to 5 families were sighted in Kalamassery Municipality (Table 1). Among them 13 were identified up to species level and 11 up to genus level. They fall under 5 families such as Crambidae, Erebidae, Geometridae, Saturniidae, and Sphingidae.

**TABLE 1**

SL.NO.	FAMILY	GENUS SPECIES	COMMON NAME
1.	Erebidae	<i>Asota plana</i>	Owlet moth
2.	Erebidae	<i>Asota producta</i>	Snouted tiger moth
3.	Saturniidae	<i>Attacus atlas</i>	Atlas moth
4.	Saturniidae	<i>Attacus atlas</i>	Atlas moth
5.	Saturniidae	<i>Attacus taprobanis</i>	-----

6.	Geometridae	<i>Biston suppressaria</i>	Tea looper moth
7.	Crambidae	<i>Cnaphalocrocis sp</i>	Rice leafroller
8.	Sphingidae	<i>Daphnis nerii</i>	Oleander hawk moth
9.	Erebidae	<i>Erebus ephesperis</i>	Owl moth
10.	Erebidae	<i>Eudocima homaena</i>	-----
11.	Erebidae	<i>Eudocima materna</i>	Dot- underwing moth
12.	Erebidae	<i>Eudocima phalonia</i>	Fruit piercing moth
13.	Crambidae	<i>Herpatogramma sp</i>	Web worms
14.	Crambidae	<i>Sameodes cancellalis</i>	Banded pearl
15.	Geometridae	<i>Scopula sp</i>	-----
16.	Sphingidae	<i>Theretra laterilii</i>	Pale brown hawk moth
17.	Sphingidae	<i>Theretra silhetensis</i>	Brown-banded hunter hawk moth

**Relative species abundance of the 6 families is presented with the help of a pie diagram (fig1)**



**(Fig 1)**

**Description about 5 families of identified moths.**

**Family Erebidae**

The Erebidae are a family of moths in the super family Noctuidae. The family is among the largest families of moths by species count and contains a wide variety of well-known macromoth groups. The family includes the underwing ; litter moths ; tiger lichen and wasp moths ; tussock moths ; including the arctic woolly bear moths , piercing moth, micronoctuoid moths, snout moths, so

many of these common names can also refer to moths outside the Erebidae. Some of the Erebid moths are called owlet.

### **Family Sphingidae**

The insects are widely distributed throughout the world and their moderate-sized to very large moths. They are mostly tropical. The forewings are elongated, the outer margin being very oblique. The antennae in the males are ciliated with partial whorls. Generally they are thicker towards and beyond the middle and pointed apically. The moths are mostly crepuscular or nocturnal. Few are diurnal. These insects are powerful fliers

### **Family Crambidae**

Smallest moths with four Wings been narrowed and elongated, labial Palpi porrect. Eggs are flat and laid in two or more rows overlapping each other, and are not covered with hairs. Larvae remain in silken webs or galleries and bore into stems, crowns or roots of graminaceous plants.

### **Family Saturniidae**

The insects are larger and found mainly in tropic countries, a few being present in temperate regions. Both sexes have pectinate antennae, the rami being longest in the males. Labial Palpi are very small and frenulum is wanting. Almost all moth have a transparent eye-spot near the center of each wing

### **Family Geometridae**

The members of this family have a slender body with relatively large wings. The moths are not strong fliers and often keep the wings horizontal at rest. Generally the moths have proboscis and frenulum and in few cases either the one or the other may be absent. Female of some genera process degenerate wings.



*Asota plana* (Erebidae).



*Asota producta* (Erebidae)



*Eudocima phalonia* (Erebidae).



*Eudocima homaena* (Erebidae)



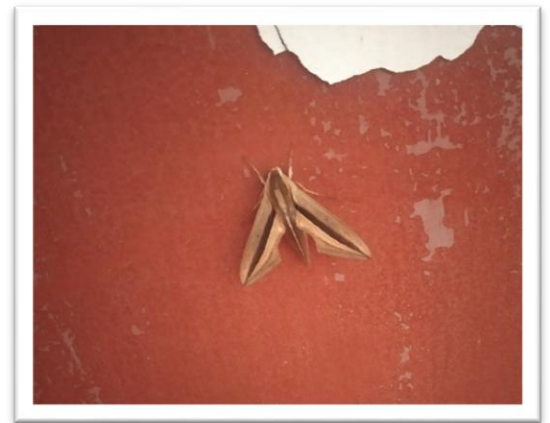
*Eudocima materna* (Erebidae).



*Erebus ephesperis* (Erebidae)



*Theretra laterilii* (Sphingidae).



*Theretra silhetensis* (Sphingidae)





*Cnaphalocrocis sp*(Crambidae).



*Sameodes cancellalis* ( Crambidae).



*Herpatogramma sp* (Cambridae).



*Attacus atlas* (Saturniidae)



*Attacus atlas* (Saturniidae).



*Attacus taprobanis* (Saturniidae)



*Biston suppressaria* (Geometridae).



*Scopula sp* (Geometridae)



*Daphnis nerii* (Sphingidae).

(Representative species of moths from Thrikkakara municipality the species and numbered 1 to 17 from the upper left, proceeding by rows)

## **DISCUSSION**

The study was done in KM in Ernakulam District. It was the first time a moth diversity study conducted at KM. It helps to shed light on the hidden diversity of moth fauna in KM. From the current field study, a total of 17 moths coming under 11 genera belonging to five families. Among them 13 were identified up to species level and 11 up to genus level. They all fall under five families such as CRAMBIDAE, EREBIDAE, GEOMETRIDAE, SATURNIIDAE, and SPHINGIDAE. The moths are mostly nocturnal (active at night). They vary in size, some are brightly coloured and nocturnal ones are always dull. The light trap is the most common method used to trap moths. In this study the most diverse family is EREBIDAE

## **CONCLUSION**

The abundance of moth diversity found during this preliminary study assures that the diversity of moths in this area is large. Insects being megadiverse group from a major component of biodiversity in any area and therefore surveying and documenting this fauna will indispensably contribute to many scientific studies and conservation programs. This helps in future to conduct a diversity study in easy way and also help to find out the extinct, extant, threatened species in that particular area which help to protect them.

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## **APPENDIX**

1. WLS – Wildlife sanctuary
2. K M – Kalamassery municipality