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### A Study on Moth Fauna in and Around Heravanadu Village, Madikeri Taluk, Kodagu District, Karnataka, India

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**Abstract:** Moths are a group of insects that includes all members of order Lepidoptera that are not butterflies. The present study attempts to record the diversity of moths at Heravanadu village, Madikeri Taluk, Kodagu District, situated at central Western Ghats. Field study was carried out during February to August, 2021 randomly from 19:00 to 21:00 h by following Light Trapping Method (LTM), as most of the moth species are nocturnal. A total of 33 moth species were recorded belonging to 5 super families and 8 families. Highest number of moth species were recorded from the family Erebiidae (18 species) and least from Eupterotidae, Uraniidae and Zygaenidae families (1 species each). Further, the Shannon diversity index value ( $H = 3.394$ ) indicates that the study area is a preferred habitat by moth fauna. Thus, it can be concluded that to maintain the ecological balance, conservation of moth species habitat is necessary and there is a need to record the current status of moth population.

**Keywords:** Moths, Lepidoptera, Light trapping method, Shannon diversity, Erebiidae, Eupterotidae, Uraniidae, Zygaenidae

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### Introduction

Lepidoptera is the second largest and the most diverse order of the class Insecta (Benton, 1995) and a key component of the herbivore assemblage. Most of the insect larvae occupy an important trophic level as they are primary consumers and good pollinators as adults. Most of the biological

researchers have used Lepidoptera as a 'model' organism to assess the impact of human and pollution disturbance and management practices of the forest ecosystems (Elanchezhian *et al.*, 2014). As compared to butterflies, moths are at least ten times more abundant (Kehimkar,

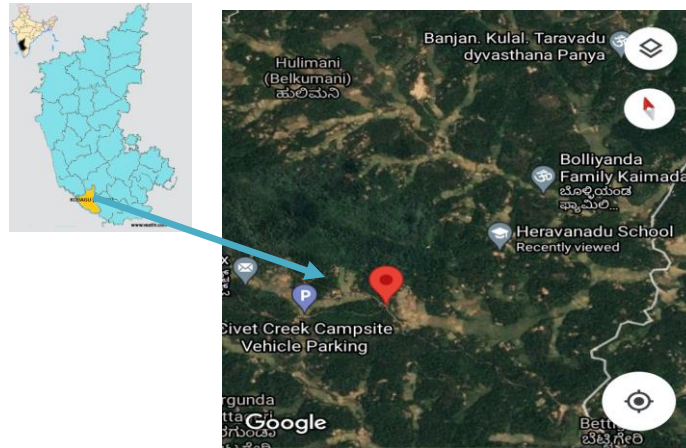


Fig. 1: Map showing the study area. (Source: Google map)

1997). In recent studies, scientists estimated that order Lepidoptera comprise of 1,74,250 species, in 126 families and 46 super families worldwide (Kristensen, 1999). In India, approximately 12,000 species of moths belonging to 41 families were recorded (Chandra, 2007). The Western Ghats, recognized as a Natural World Heritage Site by the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2012), is a mountain chain approximately 1,600 km in length running along the western side of peninsular India. Ramkumar *et al.* (2010) and Sivasankaran and Ignacimuthu (2014) have reported on the family Erebididae. Sivasankaran *et al.* (2011) recorded 154 species of Noctuid moths from the Western Ghats. Most species of moths are primarily nocturnal creatures that occupy a wide variety of habitats and constitute an important component of terrestrial ecosystems (Lintott *et al.*, 2014). Moths are sensitive to environmental pressures, moth assemblages of a region can act as indicators of environmental quality (Kitching *et al.*, 2000). Investigation of local Lepidopteran diversity in different habitat of fragmented lands due to anthropogenic disturbances constitute an important aspect of global biodiversity monitoring and provides valuable information necessary for the conservation of invertebrate biodiversity in Southeast Asia, which is experiencing a massive habitat loss during the past few decades (Nayak

and Sasmal, 2020). Despite the understanding on significance of moths, the scientific reports from this area are scanty. Hence, the present investigation aims at recording moth diversity in Heravanadu village of Kodagu district amidst central Western Ghats.

## Materials and Methods

### Study Area

Kodagu district occupies an area of 4,102 sq. km amidst the Western Ghats of south western Karnataka, India (Fig. 1). Heravanadu village (12.38.00° N and 75.68.25° E) is located in Madikeri taluk of Kodagu District. The region records approximately 19°-29°C temperature, with annual average rainfall of about 2,656 mm (IMD, 2021). The total geographical area is about 544 hectares with coffee and rubber plantations predominantly.

### Methodology

The study was carried out during February to August, 2021 by following Light Trapping Method (LTM) (Alex *et al.*, 2021) during 19:00 to 21:00 h. The collected moths were photographed using a digital camera (Nikon; D5600) and identified based on taxonomic literature (Kehimkar, 1997) & iNaturalist (<https://www.inaturalist.org>). Further, the observed moths were classified as per Van Nieukerken *et al.* (2011) and the diversity index

Table 1: Moth fauna recorded in and around Heravanadu Village, Kodagu district, Karnataka (2021)

| Moth fauna |              |              |                |        |                              |
|------------|--------------|--------------|----------------|--------|------------------------------|
| S. No.     | Super family | Family       | Sub - family   | S. No. | Species                      |
| 1.         | Bombycoidea  | Eupterotidae | Eupterotinae   | 01     | <i>Eupterote lineosa</i>     |
|            |              | Sphingidae   | Macroglossinae | 02     | <i>Cephanodes hylas</i>      |
|            |              |              | Macroglossinae | 03     | <i>Macroglossum passalus</i> |
| 2.         | Geometroidea | Geometridae  | Geometrinae    | 04     | <i>Hemistola sp.</i>         |
|            |              |              | Sterrhinae     | 05     | <i>Idaea deversaria</i>      |
|            |              |              | Oenochrominae  | 06     | <i>Scopula immutata</i>      |
|            |              |              |                | 07     | <i>Eumelea ludovicata</i>    |
|            |              | Uraniidae    | Microniinae    | 08     | <i>Micronia aculeata</i>     |
| 3.         | Noctuoidea   | Erebidae     | Arctiinae      | 09     | <i>Barsine cuneonotatus</i>  |
|            |              |              |                | 10     | <i>Barsine sp.</i>           |
|            |              |              |                | 11     | <i>Nepita conferta</i>       |
|            |              |              |                | 12     | <i>Amata passalis</i>        |
|            |              |              |                | 13     | <i>Amata bicincta</i>        |
|            |              |              |                | 14     | <i>Cyana hamata</i>          |
|            |              |              |                | 15     | <i>Olepa clavatus</i>        |
|            |              |              |                | 16     | <i>Nyctemera coleta</i>      |
|            |              |              |                | 17     | <i>Pelosia sp.</i>           |
|            |              |              |                | 18     | <i>Ceryx sp.</i>             |
|            |              |              |                | 19     | <i>Cretonotos gangis</i>     |
|            |              | Erebinae     | Hermiinae      | 20     | <i>Pandesma quenavadi</i>    |
|            |              |              |                | 21     | <i>Phalaenostola sp.</i>     |
|            |              |              |                | 22     | <i>Hypopyra vespertilio</i>  |
|            |              |              |                | 23     | <i>Euproctis sp.</i>         |
|            |              |              |                | 24     | <i>Euproctis sp.</i>         |
|            |              |              |                | 25     | <i>Lymantria obfuscata</i>   |
|            |              | Noctuidae    | -              | 26     | <i>Egnasia ephyrodalis</i>   |
|            |              |              |                | 27     | <i>Spodoptera litura</i>     |
|            |              |              |                | 28     | <i>Amphipyra pyramidea</i>   |
|            |              |              |                | 29     | <i>Agrotis sp.</i>           |

|                                                  |             |            |             |            |                              |
|--------------------------------------------------|-------------|------------|-------------|------------|------------------------------|
|                                                  |             |            | Catocalinae | 30         | <i>Antiblemma</i> sp.        |
| 4.                                               | Pyraloidea  | Crambidae  | -           | 31         | <i>Diaphania indica</i>      |
|                                                  |             |            | -           | 32         | <i>Spoladea recurvalis</i>   |
| 5.                                               | Zygaenoidea | Zygaenidae | -           | 33         | <i>Cyclosia papilionaris</i> |
| 05 Super family                                  |             | 08 Family  | -           | 33 species |                              |
| Shannon Diversity (H) = 3.394 & Eveness = 0.971. |             |            |             |            |                              |

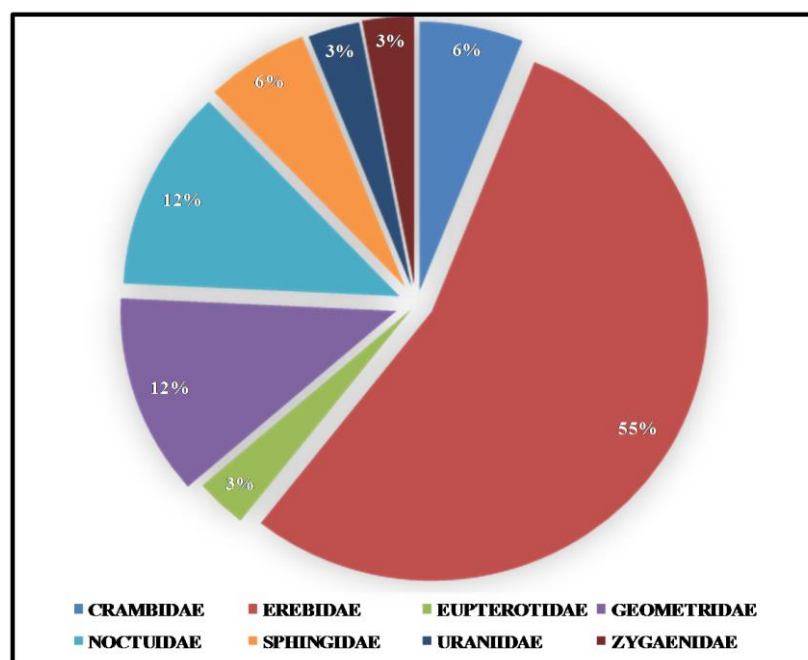


Fig. 2: Percent occurrence of moth families recorded in and around Heravanadu village, Kodagu district, Karnataka (2021).

was calculated using the formulae:

$$\text{Shannon Diversity (H)} = -\sum P_i [\ln P_i]$$

Where, H = Shannon diversity index;  $P_i = n/N$  = fraction of the entire population made up of species. n = Total number of organisms of a particular species, N = Total number of organisms of all species and ln = Natural log.

The obtained data was analyzed using MS Excel programme. None of the moth species was captured or killed during the study period.

## Results and Discussion

During the present investigation, a total of 33 species of moths were recorded belonging to 5 super families namely Bombycoidea, Geome-

troidea, Noctuoidea, Pyraloidea and Zygaenoidea and 8 families namely Crambidae, Erebidae, Geometridae, Uraniidae, Sphingidae, Eupterotidae, Noctuidae, and Zygaenidae. Among these moths 24 species were identified to species level, another 9 species to generic level with Shannon Diversity (H) = 3.394 and Eveness = 0.971 values representing that the study area is an ideal habitat for moth fauna (Table 1). Of the 33 species of moths, the Erebidae family was dominant with 55% of the species followed by 12% each from the Geometridae and Noctuidae families, 6% each from the Sphingidae and Crambidae families, and 3% each from the Eupterotidae, Uraniidae, and Zygaenidae families (Fig. 2). Few moth species recorded in this study are depicted in Figure 3.



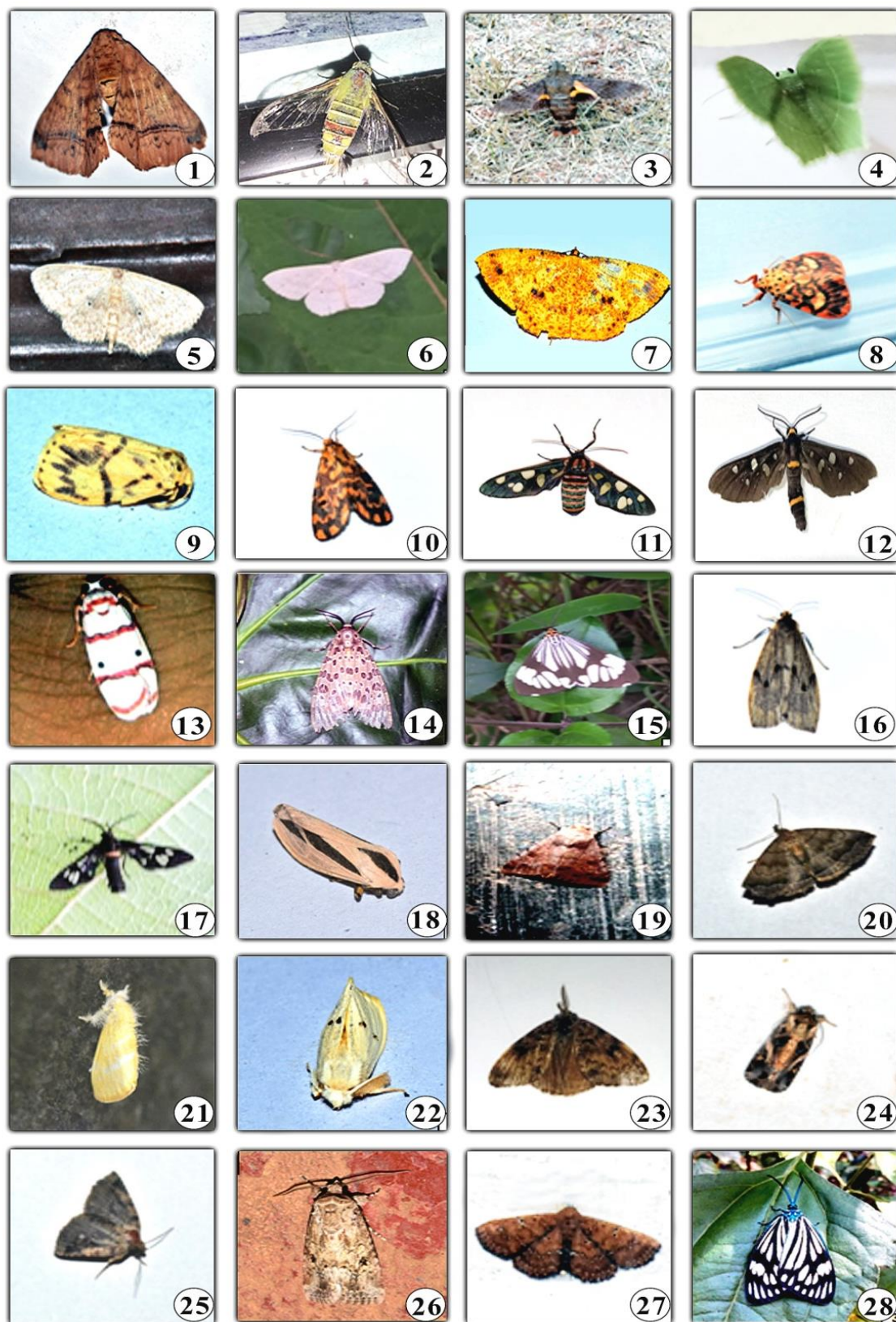


Fig. 3: Few Moth species recorded in and around Heravanadu village, Kodagu district, (1) *Eupterote lineosa*; (2) *Cephonodes hylas*; (3) *Macroglossum passalus*; (4) *Hemistola ornata*; (5) *Idaea deversaria*; (6) *Scopula immutata*; (7) *Eumelia ludovicata*; (8) *Barsine cuneonotatus*; (9) *Barsine* sp.; (10) *Nepita conferta*; (11) *Amata passalis*; (12) *Amata bicincta*; (13) *Cyana hamata*; (14) *Olepa clavatus*; (15) *Nyctemera coleta*; (16) *Pelosia* sp.; (17) *Ceryx* sp.; (18) *Creatonotos gangis*; (19) *Pandesma quenavadi*; (20) *Phalaenostola* sp.; (21) *Euproctis* sp.; (22) *Euproctis* sp.; (23) *Lymantria obfuscata*; (24) *Spodoptera litura*; (25) *Amphipyra pyramidea*; (26) *Agrotis* sp.; (27) *Antiblemma* sp.; (28) *Cyclosia papilionaris*.

Moth diversity in Kodagu district was studied by Mishra *et al.* (2016) and identified 102 genera under 17 families. Moth species of Erebidae (32.48%) dominated among all the other families identified, further their analysis revealed that 70% of moth species belonged to Erebidae, Geometridae and Crambidae. In the present investigation the same trend was observed except for the absence of Saturniidae family members. Further, moth diversity has been studied in different parts of India with reports revealing a wide variation in the distribution. According to Ghosh (2003) an increase in latitude may affect the distribution of moth species with a similar observation in tropics by Holloway (1994, 1997). According to reports of Kailash and Sambath (2013), Tawang district in Arunachal Pradesh had a dominance of Geometridae (48%) followed by Erebidae (26%), Drepanidae (8%) and Crambidae (7%). In the present study, even though the fact that Erebidae (55%) was the dominant family similar to earlier reports by Mishra *et al.* (2016) however, they have not reported moth species belonging to Noctuidae, Eupterotidae and Zygaenidae. The presence of moth species of these three families as reported in the present study suggests that moths are adapting to newer environments which may be due to decline in habitats they previously preferred.

## Conclusion

The present study attempts to record the diversity of moths at Heravanadu village, Madikeri Taluk, Kodagu District, situated at central Western Ghats. A total of 33 moth species were recorded belonging to 5 super families and 8 families. Highest number of moth species were recorded from the family Erebidae (18 species) and least from Eupterotidae, Uraniidae and Zygaenidae families (1 species each). Further, the Shannon diversity index value ( $H = 3.394$ ) indicates that the study area is a preferred habitat by moth fauna. It can be concluded that the moth diversity in a given geographic area may vary in time and space as they quickly respond to changing ecological factors. To maintain the ecological balance,

conservation of their habitat is necessary and there is a need to record the current status of moth population in the available habitats.

## Ethical Statement

No moth has been captured or sacrificed for this study, hence Ethical Approval not required.

## Author Contributions

Each author has contributed equally to the study's planning, analysis, writing, and editing. All authors have read and agreed to the published version of the manuscript.

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## Conflict of Interest

The authors declare no conflicts of interest.

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