EXTENDED ABSTRACT

A PRELIMINARY STUDY ON THE MOTH DIVERSITY (LEPIDOPTERA) OF UNIVERSITY OF VAVUNIYA, PAMPAIMADU, SRILANKA

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Abstract

Moths are conspicuous insects that belong to the order Lepidoptera with 1,911 recorded species from Sri Lanka. The present study is the very first documentation on the moth species diversity in the University of Vavuniya premises, Pampaimadu, Vavuniya, Sri Lanka. This study was carried out from December 2020 to April 2021. University exhibits an enormous diversity of habitats including garden, lake, bushes and grassland having a large number of trees, shrubs, herbs and climbers. University gardens and streets are filled with a wide variety of vascular and medicinal plants like *Mangifera indica*, *Tamarindus indica*, *Tectona grandis*, *Artocarpus heterophyllus*, *Ziziphus oenopolia, Areca catechu*, *Cocos nucifera* and *Rosa indica*; which are common host plants to 40% - 50% of moth species. Moths were recorded by the examination of illuminated walls throughout the university and hostel premises during the late evenings and the early mornings. Among the 71 species of recorded moths 79% of the species fall under the families: Erebidae, Geometridae, and Crambidae. Identified moth species were showed colour polymorphisms ranging from brown, yellow, white, green, grey, black and violet. The largest moth recorded in this study was *Marumba dyras* with 125mm wingspan, whereas the smallest moth was *Nola lucidalis* with 11mm wingspan. This study will improve the better understanding of moth diversity in the University of Vavuniya and can be used in environment –friendly development programs.

Keywords: Moth species, lepidoptera, host plants, University of Vavuniya

1. Introduction

Moths are a group of insects belonging to the order Lepidoptera along with butterflies, which are very similar. Moths can be distinguished from butterfly by some morphological characteristics and behaviors. The shape of the antennae is the best way to distinguish moths from butterflies. Moths have simple thread-like or 'feathery" antenna without a club; Butterflies have a thickened club or hook on the tip of the antenna, never feathery. As well as Moths have a frenulum, which is a wing-coupling device; Butterflies do not have frenulum. Frenulum joins the forewing to the hind wing, so the wings can work in unison during flight. Butterflies are primarily diurnal, flying in the daytime. Moths are mostly nocturnal, flying at night. However, there are moths such as the buck moth that are diurnal, and there are butterflies that are crepuscules. In general, moths have superposition eyes; On the other hand, butterflies have apposition eyes. One of the most obvious differences between butterflies and moths is their resting wing position. Moths rest with their

wings open, whereas butterflies tend to rest with their wings upwards and closed. However, many butterflies "sun bake" with their wings open. The larval moths make a cocoon in wrapped silk covering whereas the butterfly larva makes a chrysalis, hard, smooth and has no silk covering.

Moths are being a Prominent element of terrestrial ecosystems, they function as pollinators of flowers, herbivores of crops and wild plants, and prey for numerous species of rodents, birds, and bats (Regier et al., 2009; Bates et al., 2014) and *Loris*. The diurnal moth species are herbivores and are almost entirely associated with angiosperms plants that largely depend on animal-assisted pollination (Wahlberg et al., 2013). These insects occupy a wide range of habitats all over the globe and are sensitive to environmental pressures such as temperature variations, air quality and climate changes. Therefore, monitoring the changes in the moth distribution patterns and abundance in an area can be used as an ecological indicator for the conservation of biodiversity (Dennis et al., 2019).

Recent reports suggest that moth diversity and abundance all over the globe have declined significantly in the past few decades (Hallmann et al., 2020). Several factors can be attributed to the worldwide decline in moth population including habitat loss, degradation and fragmentation, agricultural intensification, urbanization, environmental pollution, artificial light at night, and climate change (Dennis et al., 2019).

Global estimates show that there are 1, 27,000 species of moths distributed all over the world of which 1,911 moth species were recorded in Sri Lanka (Gunathunga et al., 2019). Several studies have explored the moth diversity from different areas of South Asia such as the country like India, Nepal, Malaysia, and Bhutan. To date, no comparable studies on moth diversity have been conducted in Sri Lanka.

This study investigated the moth diversity in the University of Vavuniya. This is a preliminary checklist that have been generated from the results of the survey for five months (December 2020 to April 2021).

2. Methodology

2.1 Study area:

The study was conducted in University of Vavuniya in Pampaimadu, Vavuniya, Sri Lanka. The University is covering an area of approximately 160 acres, and located between 8^0 45'16" N, 80^0 24'43" E to 8^0 45'22"N, 80^0 23'57"E at an elevation of 106 meters above mean sea level in the dry zone. Here the average temperature is 27.4 ^0C with an annual rainfall of 1434mm. University of Vavuniya exhibits an enormous diversity of habitats including garden, lake, bushes and grassland having a large number of trees, shrubs, herbs and climbers. As well as Pampaimadu is an agro-based village that is composed of rice fields, home gardens with mixed cultivations, and the adjoining areas are covered by forest vegetation.

2.2 Moth count and identification:

This study was carried out from December 2020 to April 2021. Moth's count was done through the frequent opportunistic visits to light sources of hostel and university building walls. Observations in the university premises were done in the morning hours from 7.00 a.m. – 9.00 a.m. and in the hostel premises from 7.00 p.m. to 6.00 a.m. Moths were photographed and identified with the help of the research papers and journals. Those were difficult to identify were kept for proper identification. Colour of the moth was detected through visual observation with naked eyes and conformed compare to the literature as well as the wingspan of the moths and species interaction with host plants also documented with the use of literature.

3. Results and Discussion

The present study has documented 71 moth species among this 57 were identified at species level, 13 at genus level, and 1 was up to subfamily level. Photographs of all moths in the checklist are

illustrated in images 1-71 (All the photographs were taken by the authors).

Approximately 80% of moth species were observed from January to March immediately after the rainy season. In addition, 70% of moths were documented from the hostel premises near to high-power LED lamps. These moths were belonged to 13 families. Of them 79% of the species were recorded from the Family Erebidae (23 species), Geometridae (19 species), and Crambidae (14 species) respectively and the rest were recorded in other Families(Figure 1).

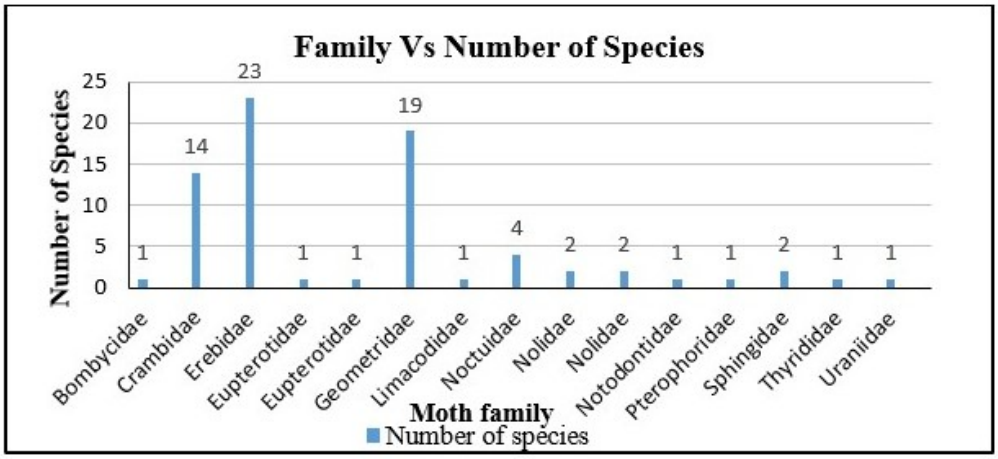

Figure 1. Moth families with number of moth species

The most notable species in both the University and the hostel premises were *Cyana puella*, *Olepa*, *Sommeria insulana*, *Sameodes cancellalis.* These species were observed almost every day regardless of weather conditions and location. As well as these species were more common which can be observed at any time of the day when other species were only available during the dawn and dusk.

Identified moths were appeared in different shades of colour. Background colour of the moth's wings is common in many species (Appendix II, Figure 2). The dominant shades of brown appeared in 39% (28 species) of the recorded moth species, then shades of Yellow 25% (18 species), White 14% (10 species) and shades of Green 11% (8 species) and 11% of the species was recorded in other colours (Appendix IV, Figure 2).

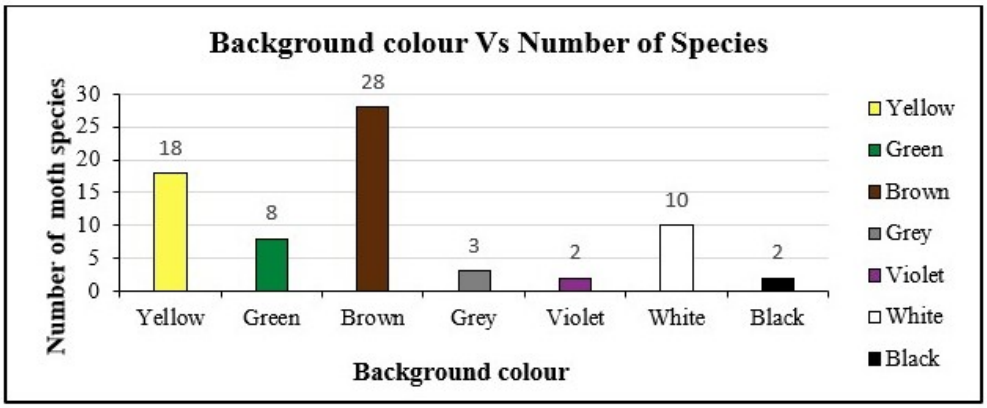

Figure 2. Background colour of the moths in different moth species

The 19% of moth species were observed in 26 – 30 mm wingspan (14 species), 9 species were in the 21 – 25 mm range. Although 7 species were recorded in 36 – 40 mm and 41 – 45 mm wingspan (Appendix V). The largest moth recorded in this study is *Marumba dyras* with a 125 mm wingspan as well as the smallest moth is *Nola lucidalis* with an 11mm wingspan (Appendix II, Figure 3).

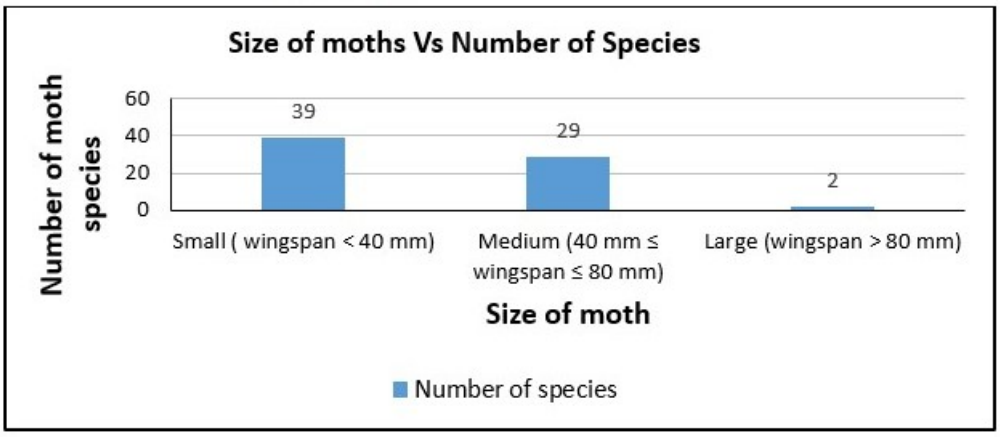

Figure 3. Size of moths according to the wingspan

Recorded moths were depended on different host plants in their larval stage to complete their life cycle. Some of them identified as pests for particular plants. (Appendix VI) (Figure 4)

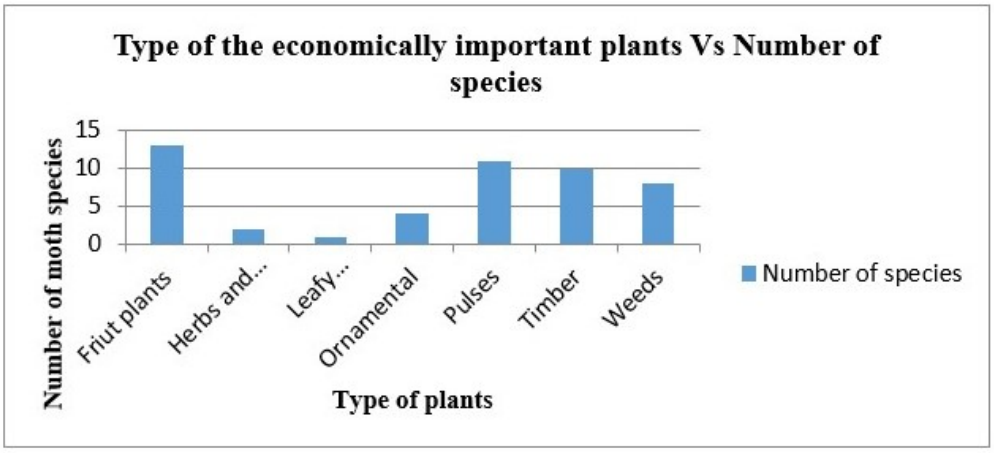

Figure 4. Type of economically important host plants and number of moth species considered as pests

Of these identified in the study area, 21% of moths are considered as pests for fruit plants, 15% attack cereal crops especially rice such as *Scriphophaga*, *Paraponyx, Glyphodes* belongs to family Crambidae which recorded at the hostel as hostels are situated near to the paddy land. (Appendix VI). In Sri Lanka *Scirpophaga incertulas* commonly known as yellow stem borer considered a major pest in rice cultivation. (Kudagamage and Nugliyadde., 1995). Those species were high in the period with rice cultivation in adjacent paddy fields. Among these *Amata passalis*, *Artaxa guttata, Parasa lepida* are considered as pests for many plant families (Appendix VI). Species such as *Isocentris filalis* and *Parapoynx diminutalis* can consider as natural enemies of weed species such as *Sphaeranthus indicus* which are abundant in rice fields in Vavuniya.

4. Conclusion

The baseline assessment conducted in the Vavuniya University has recorded the current moth diversity across the university premises by inventorying 71 moth species belongs to 13 families and colour, wingspan, host plant of the recoded moth species also documented in the appendixes. This checklist was performed for the first time based on an opportunity sampling method. A systematic study is needed to asset the species richness and abundance.

Finally, the University of Vavuniya is a place with great biodiversity and there is still significant scope for improvement of the university planning by establishing and maintaining landscape, gardens, and incorporating meaningful conservation measures for the protection of biodiversity of this environmental friendly academic institute. University environment provides opportunities for the research students as well as this study may help to nourish the upcoming researches.

Plate 1. 1- *Trilocha varians;* 2- *Parapoynx diminutalis;* 3- *Parapoynx fluctuosalis;* 4-*Isocentris filalis;* 5- *Ostrinia* sp.; 6- *Pyrausta phoenicealis;* 7- *Scirpophaga incertulas;* 8- *Agrotera coelatalis;* 9- *Bacotoma violata;* 10- *Cirrhochrista brizoalis;* 11- *Glyphodes bicolor;* 12- *Nagiella inferior;* 13- *Omphisa anastomosalis;* 14- *Protonoceras capitalis;* 15- *Sameodes cancellalis;* 16- *Sommeria insulana;* 17- *Amata passalis;* 18- *Amerila astreus;* 19- *Creatonotos gangis;* 20- *Cyana puella;* 21- *Eugoa bipunctata;* 22- *Olepa ocellifera;* 23- *Pareuchaetes pseudoinsulata;* 24- *Schistophleps bipuncta*

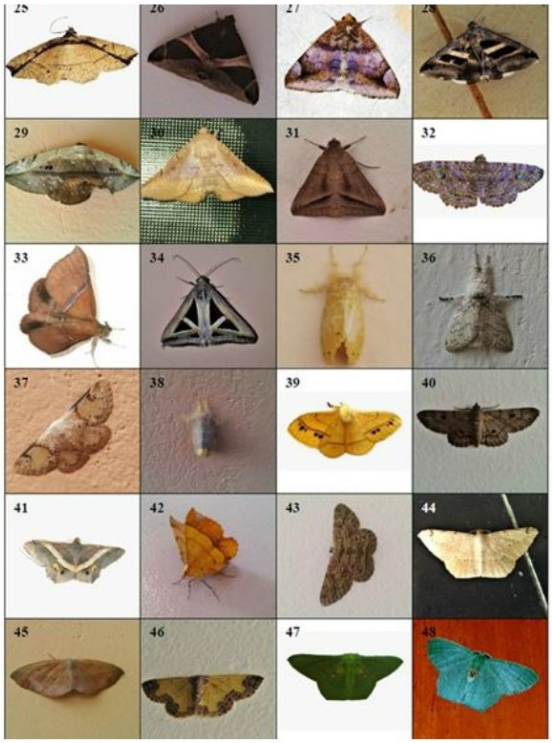

Plate 2. 25- *Tamba* sp.; 26- *Bastilla crameri;* 27- *Bastilla acuta;* 28-*Grammodes geometrica;* 29- *Hypopyra vespertilio;* 30- *Macaldenia palumba;* 31- *Mocis frugalis;* 32- *Speiredonia obscura;* 33- *Sympis rufibasis;* 34- *Trigonodes hyppasia;* 35- *Artaxa guttata;* 36- *Calliteara farenoides;* 37- *Carriola ecnomoda;* 38- *Orvasca* sp.; 39- *Eupterote hibisci;* 40- *Cleora* sp.; 41- *Chiasmia elnora;* 42- *Hyperythra lutea;* 43- *Hypomecis* sp.; 44- *Luxiaria* sp.; 45- *Omiza* sp.; 46- *Zamarada* sp.; 47- *Aporandria specularia;* 48- *Chlorissa aquamarina*

Plate 3. 49- *Comibaena leucospilata;* 50- *Pelagodes antiquadraria;* 51- *Polynesia sunandava;* 52- *Sauris* sp.; 53- *Anisephyra ocularia;* 54- *Scopula emissaria;* 55- *Scopula pulchellata;* 56- *Scopula minorata;* 57- *Somatina* sp.; 58- *Traminda mundissima;* 59- *Parasa lepida;* 60- *Aegocera venulia*; 61-Subfamily Condicinae; 62- *Callyna jugaria;* 63- *Cosmia* sp.; 64- *Earias* sp.; 65- *Nola lucidalis;* 66- *Netria viridescens;* 67- *Diacrotricha fasciola*; 68- *Nephele hespera;* 69- *Marumba dyras;* 70- *Striglina scitaria*; 71- *Phazaca* sp

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