Study of Diversity of Moths in Urban Areas of Khamgaon City, Buldhana (M.S.)

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Abstract
Moths belong to the order Lepidoptera and this type of fauna are easily affected by a slightest change in environment hense keeping in view moths could be used to check the minute change of environment can be called as bioindicators of environment. Taking a chance to investigate environmental health all possible efforts were carried out in this work to list and unfold this hidden fauna of urban areas of Khamgaon city and some surrounding areas. Collection of moths was carried out from June 2022 to August 2022. A total number of 13 moths specimens were collected by using simple light trapping method operated from dusk to down and by using photographed method. The moths were identified to family level. Families Sphingidae, Geomtridae, Erebidae, Noctuidae, and Geometridae were recorded. Family Erebidae dominated among all 5 families in diversity and abundance.

Keywords: Lepidoptera, bioindicators, simple light trapping, erebidae, urban areas

Introduction
Biodiversity and natural resources form the root of all living system. Insects comprise more than half of the world's known animal species (Wilson, 1992) of which the second largest and more diverse order is Lepidoptera of class Insects (Benton, 1995). Insecsts, especially moths played an important role in earth ecosystems and has effect on the environment. Recent recorded report is over 1,27,000 species of moths found all over the world (Alfred et al. 1998) and over 12,000 species found in India. (Chandra and Nema 2007). *Lepidoptera* is probably one of the most suitable groups for most quantitative comparisons between insect faunas to be valid, for the many reasons elaborated by Hollway (1980,1984 and 1985), especially their abundance, species richness, response to vegetation and climate, their ease of sampling using light traps and relatively advanced taxonomy. Moths are the cousins of butterflies. Moths also play a vital role in telling us about the health of our environment, like canary in the coalmine. Documenting the diversity of moth fauna can help to lead a new evolutionary insights and a first step in developing conservation goals for the lepidopteran insects. Hence, in the present study an attempt has been made to study the diversity of moths in and around Khamgaon city, Maharashtra which is still not investigated. The main obejective was to study the moth fauna, collect them, identify the moth diversity, and their occurrence. The study was carried out from June 2022 to August 2022.

Study Area: The present study was carried out in an attempt to understand and measure the status of moth diversity in and around the Khamgaon city. Khamgaon, the urban as well as largest industrial area and taluka place, is situated in Buldhana district of Maharashtra state and lies in biogeographic zone

Deccan Peninsula: The state of Maharashtra is located in the Deccan region of India. This area coordinates between Longitude 200 34'07''N and Latitude 760 23'21''E. Khamgaon is situated 50 km from Buldhana. Moths were collected from in and around Khamgaon city. Survey was conducted by vising the area of Residental area Rekha Plot, Khamgaon and Januna lake, College campus, Botanical garden. The latitude of Rekha Plot is 20.711622 and longitude is 76.566132 and DMS latitude 20°42'41.8392" N DMS longitude. 76°33'58.0752" E. Januna lake latitude 20.4785° N and longitude 77.0399° E study is conducted during January 2020-March 2020 in a 2 around Khamgaon.

Fig 1: Geographical Location of Study area

Material and Methods
Collection of Moths
Most of the moths were attracted through the light traps technique, by using actinic tubes and mercury bulb of about 20 to 125 watt. Baiting techniques such as sugaring as well as use of fruit pulp is also successful. But the most suitable method used is sheet method. The white cloth sheet was used for attracting the moth along with a bright light source. Light trap was also set during the 6-9 pm time period using a 160w mercury vapour bulb over a 3×3m (square) white cloth sheet which was hung between two vertical poles

The moths collected were killed by ethyl acetate and later pinned in insect stretching board. All specimens were preserved in airtight insect box, having naphthalene balls as fuming moth. Each specimen was provided with a label indicating the locality and date of collection.

Moths were photographed and colour images were created by using Canon digital camera (Power Shot, SX160IS, 16x, 42x optical zoom and by using a Nikon™ D300 with a 105 mm macro lens or a Nikon™ D60 and 18-55mm lens.

Identification of Moth
The available literature was used to identify the moths, including Moore (1880-1840), Hampson (1891-1896), Bell and Scott (1937), Holloway (1983-2011), Kendrik (2002), and Kirti and Singh (2015-2016). The classification system used by van Nieukerken et.al. (2011) was followed.

Result and Observation
A comprehensive survey carried out in various habitats of region to study the diversity and distribution of moths. This survey carried out from June 2020 to August 2022 in and around study area while studying the biodiversity of moth fauna from Khamgaon city and its surrounding area. A total of 13 species belonging to 5 families like Crambidae, Sphingidae, Erbidae, Noctuidae and Geometridae were recorded in the present work. Among the members of the family Erebidae were predominant in the collection and high species richness. All the identified species listed in Table1. Diversity indices were calculated using Past3 software, which showed Fisher's alpha, Shannon index, eveness and species richness of family. Month wise distribution of species given in Table 2 and percentage of species distribution in different family given in Table 3.
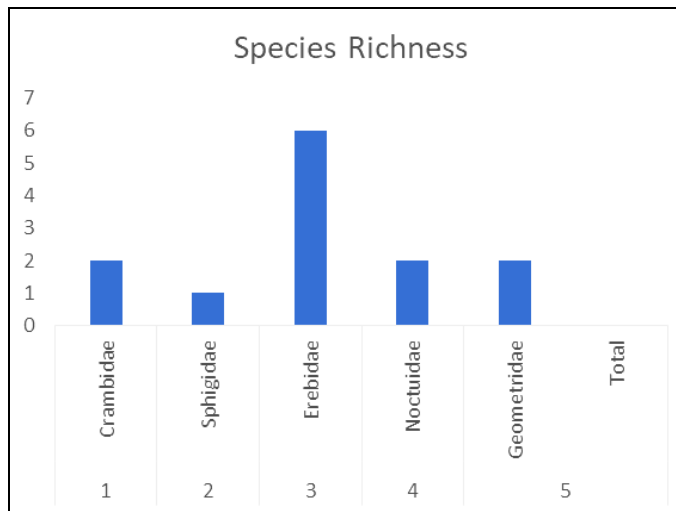
Graphs plotted with the help of MS-Ecxel in which Grap 1 show that Monthwise distribution of species, Graph 2 show that species richness in family and Graph 3 show that species percentage in family. Photographs of all identified 13 moth species are also provided along with scientific name by using Smartphone Camera.

Table 1: Family wise distribution and list of Moth General and identified species recorded from study area.

Sr. No.	Name of species	Family	Subfamily	Genus
1	Hymenia perspectails	Crambide	Spliomelinae	Hymenia
2	Diaphania indica	Crambide	Spliomelinae	Daphania
3	Daphnis nerri	Sphingidae	Macro glossinae	Daphnis
4	Lascoria ambigualis	Erebidae	Herminiiae	Lascoria
5	Sphingomorpha cholorea	Erebidae	Erbinae	Sphingomorpha
6	Achaea janata	Erbidae	Arctiinae	Achaea
7	Olepa ricini	Erbidae	Arctiinae	Olepa
8	Orvasca subnotata	Erbidae	Arctiinae	Orvasca
9	Hyphantria caunea	Erbidae	Noctuoidea	Hyphantria
10	Mythimna unipuncta	Noctuoidea	Noctuoidea	Mythimna
11	Leucpnycta diphteroids	Noctuoidea	Condicinae	Leucpnycta
12	Iridopsis	Geometridae	Ennominae	Iridopsis
13	Pleuroprucha insularia	Geometridae	Sterrhinae	Pleuroprucha

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**Table 2:** Showing month wise species distribution

Sr. No.	Species	Location	Month
1	Hymenia perspectalis	College campus	June
2	Diaphnia Indica	Residential area	June
3	Lascoria ambigualis	College campus	June
4	Sphingomorpha chlorea	Januna Lake	June
5	Orvasca subnotata	College campus	July
6	Pleuroprucha insularia	College campus	July
7	Daphnis nerii	Residential area	July
8	Achea Janata	Januna Lake	July
9	Olepa ricini	Residential area	July
10	Leuconycta Diphteroids	Residential area	August
11	Iridopsis species	College campus	August
12	Hyphantria Caunea	Residential area	August
13	Mythimna unipuncta	Residential area	August

Table 3: Percentage of species distribution in different family.

Sr. No	Family	Species Richness	Percentage
1	Crambidae	2	15.38%
2	Sphigidae	1	7.69%
3	Erebidae	6	46.15%
4	Noctuidae	2	15.38%
5	Geometridae	2	15.38%
	Total		100

Graph 1: Monthwise Distribution of Species

Graph 2: Species Richness in Family
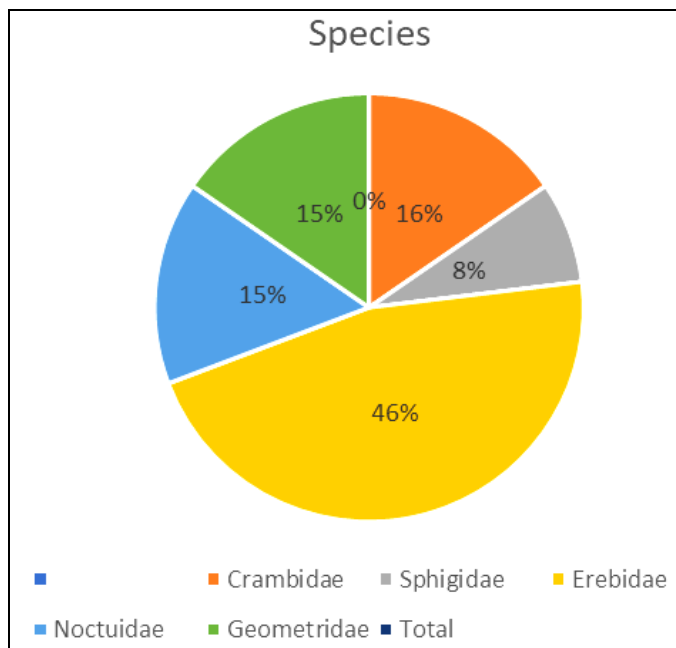
Graph 3: Species Percentage in Family
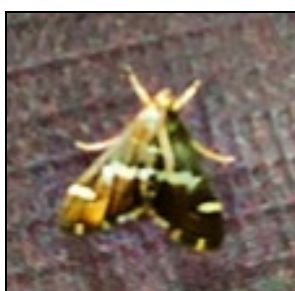
Hymenia perspectalis Perspectalis
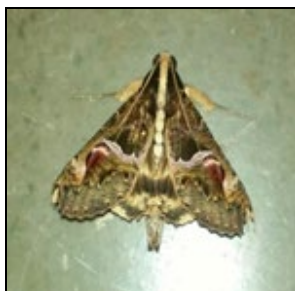
Sphingomorpha chlorea

Sphingomorpha chlorea

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Diaphania indica

Orvasca subnotata

Achaea janata

Hyphantria caunea

Mythimna unipuncta

Leuconycta diphteroids

Pleuroprucha insularia

Iridopsis species
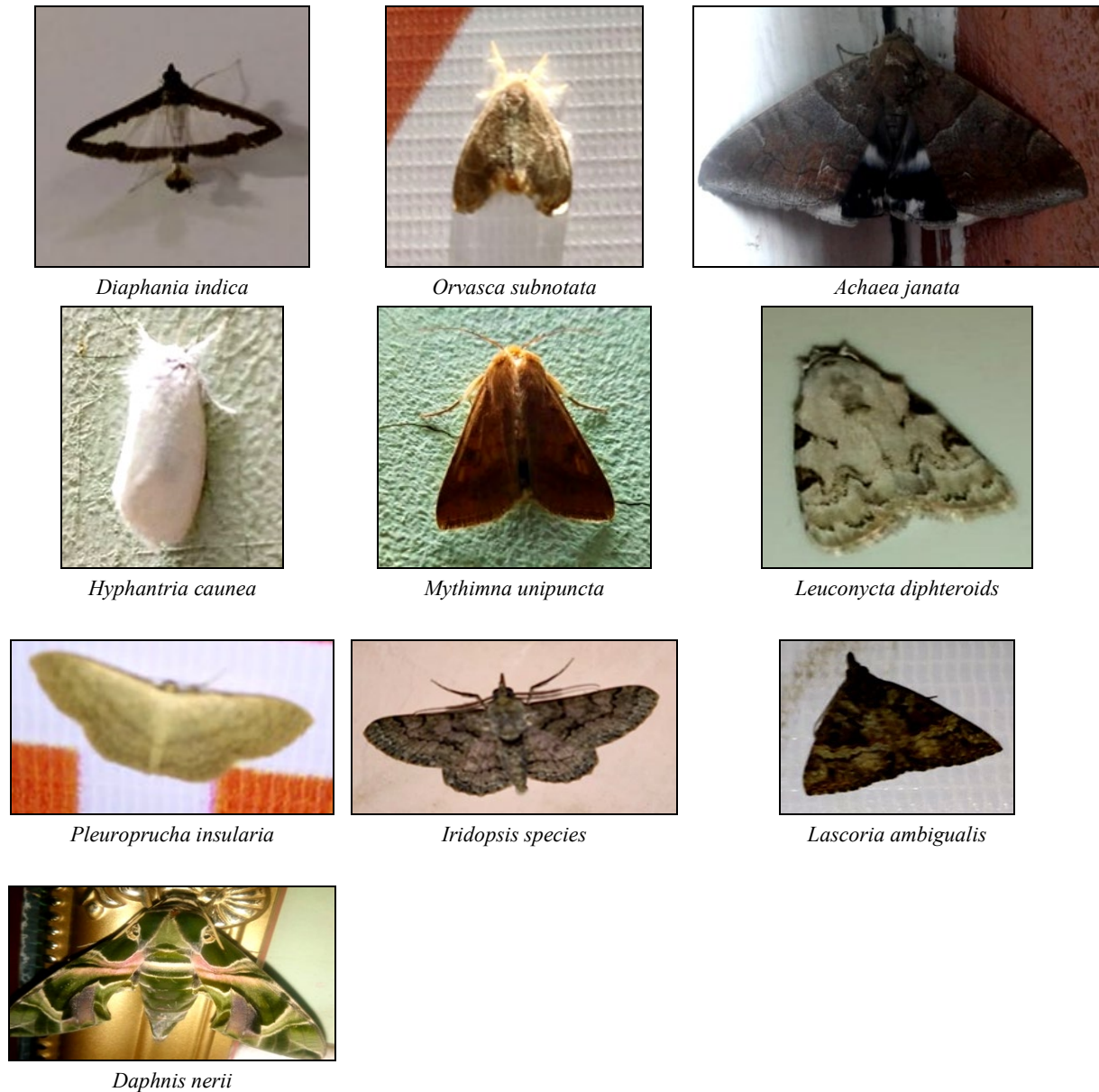
Lascoria ambigualis

Daphnis nerii

Fig 2: Photographs of 13 Identified Moth Species:-

Discussion

A comprehensive survey was made from January 2020 to March 2020 in and around Khamgaon study area regarding various habitats to study the diversity and distribution of moths. This topic tries to cover all of moth diversity and its composition in respective area for comparison of study sites. The diversity of living organism classified in the level of organization such as order, family, genus and species.

This study was mainly carried out to elucidate the biodiversity of moth fauna. It was observed that number of moth species is 13 belonging to 05 families and 10 subfamily have been listed in this order in (Table 1). Family *Erebidae* was found more than families viz., Crambidae, Sphingidae, Noctuidae, Geometridae. Family Erebidae was found to be dominant family which was represented by 06 species. This family was followed by Crambidae 02 species, followed by Sphingidae 01 species. Followed by Noctuidae and Geometridae 02 species each.

Conclusion

In this study, we have attempted to study the diversity of moths from khamgaon city, Buldana region. This work adds to the inventory of moths of this region which could be utilized for future studies.

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