



## Moth diversity in and around Baramati area

Sharvari V. Shah, Kishor U More

Department of Zoology, Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati, Pune, Maharashtra, India

### Abstract

The present study aims to explore the diversity of moths in and around Baramati area. The survey was conducted from August 2019 to February 2020. A total 16 species of moths belonging to 7 families and 5 superfamilies were recorded from different areas of Baramati. The family Erebidae was found to be the most dominant taxon with 5 species followed by 3 species of each Sphingidae, Geometridae, and one species each from Crambidae, Eupterotidae, Hesperidae, and Notodontidae.

**Keywords:** Study, explore, recorded, dominant, taxon

### Introduction

Insects are the most diverse and largest group of organisms on Earth, comprising approximately 30 orders and nearly one million described species. They account for about 75% of all described species, inhabiting land, water, and air across nearly all habitats and continents, including Antarctica. Arthropods, the most diverse animal group, make up over two-thirds of all animal species on Earth. The order Lepidoptera, described by Linnaeus in 1758, includes butterflies and moths. The word "Lepidoptera" derives from Greek words "lepis" (scale) and "ptera" (wings). With about 180,000 species, they are distributed among 126 families (Capinera. et. al., 2008) [8] and 46 superfamilies (Mallet. et. al., 2007) [12], representing ten percent of all described living organisms. Lepidoptera is one of the most widespread and widely recognized insect orders globally (Powell. et. al., 2009) [29].

Lepidoptera exhibit many variations in body structure that have evolved to provide benefits in life and distribution. Moths, the cousins of butterflies, belong to this order. Documenting moth diversity can offer evolutionary insights and aid in developing conservation goals for lepidopteran insects. This study aims to explore the diversity of moths in and around Baramati, Maharashtra, which remains largely uninvestigated. Lepidoptera species richness increases with habitat heterogeneity, supporting the paradigm that resource and structural diversity promote greater biotic diversity.

The most diverse and second-largest order within the class Hexapoda is Lepidoptera (Benton, 1995) [6]. They provide crucial ecosystem services like pollination, decomposition, and nutrient cycling. Lepidoptera, including butterflies and moths, are common in forest ecosystems and agricultural fields and are often termed biological indicators of ecosystems. Moth fauna in India is poorly known, with limited surveys before the 20th century during the British administration, especially in Maharashtra. The first volume of Lepidoptera Indica was published in 1890, and these publications remain among the finest and most comprehensive works on Lepidoptera. In recent years, Lepidoptera have been used as model organisms by the researchers to explore the impact of manmade activities and pollution, on ecosystems. They perform essential ecosystem services and show promise as indicators of forest health (Kitching et al., 2000) [23] and surrogates for the diversity of other insect groups such as Hymenoptera.

Moths are primarily night active, phytophagous hexapods, seen in various habitats, such as forests, grasslands, agricultural fields, and crop lands. They are often used as indicators of biodiversity and habitat quality, contributing significantly to ecosystems as pollinating agents, food sources in the food webs, and through the saproxylic habit of many larvae (Schmidt et al., 2006) [30]. Moths typically display shades of brown, orange, yellow, or green, occasionally with silver or pale coloured markings. Adults are nocturnal and lack the functional mouthparts.

Moths are familiar to humans due to their appearance, colour patterns, size, and plant relationships. The heavy covering of colour scales on their ptera forms the basis for their attractive color patterns (Kristensen et al., 2015). Many moths are major pests of agricultural crops and forest plants, and they are cosmopolitan, occurring in diverse habitats from the plains to deserts, forests, and mountainous regions. Moth population levels peak in September and October. Biodiversity is notable in the river banks of the Marathwada region and vegetation sites like Gautala Sanctuary, Mahurgad, and Naygaon Mayur Wildlife Sanctuary. This study is the first of its kind in the Marathwada region. Moths with larger wingspans are stronger fliers and return from greater distances than smaller moths. Temperature affects moth catches, with higher temperatures positively influencing recapture rates.

Studies have examined moth family distribution and diversity patterns concerning vegetation, climate, and topography, primarily in tropical regions. In temperate regions, studies on nocturnal macromoth community structure and diversity have focused on relatively flat topography and homogenous vegetation types. Substantial collections were conducted at these locations in July, August, and September due to frequent moth activity. Insect collections involve sweep nets, handpicking, and light traps. The present study recorded species belonging to a total of 16 genera of moths, with the families Erebidae, Sphingidae, and Geometridae being the most dominant.

### Methodology

**Study area:** The study area includes various sites from Baramati, a historic city and a municipal council in the Pune district. The town is located in the eastern part of the Pune district and western Maharashtra, with the city center positioned at 18.15°N latitude and 74.58°E longitude. It stands at an average elevation of 538 meters (1765 feet).

**Collection and identification:** Photographs and dead specimens were collected from the premises of Vidya Pratishthan’s School, the surrounding of Vidya Pratishthan’s School of Architecture, Vidyanagari campus, Baramati, and Malegaon Sugar Factory campus from August 2019 to February 2020. The collected dead specimens were pinned on an insect spreading board to allow wing stretching and preserved in an insect collection box. Identification was carried out with the help of an expert at the Zoological Survey of India, Akurdi, Pune; Maharashtra.

**Observations and results**

The study documented 16 genera of moths belonging to 5 superfamilies and 7 families across various sites in Baramati area. The family Erebidae (5 genera) was the most dominant taxon, followed by Sphingidae (3 genera), Geometridae (3 genera), and 1 genus each from Eupterotidae, Notodontidae, Crambidae, and Hesperidae.

**Table 1:** Summary of super families

Superfamily	Family	Number of species	Total no. of species
Noctuoidea	Erebidae	6	7
	Notodontidae	1	
Bombycoidea	Eupterotidae	1	4
	Sphingidae	3	
Geometroidea	Geometridae	3	3
Pyraloidea	Crambidae	1	1
Papilionoidea	Hesperidae	1	1

**Table 2:** Checklist of the identified moths

Sr. No.	Superfamily	Family	Name of Species
1	Noctuoidea	Erebidae	<i>Perina nuda</i> (Fabricius, 1787)
2			<i>Lymantria incerta</i> (Walker, 1855)
3			<i>Achaea serva</i> (Fabricius, 1775)
4			<i>Ophiusa tirhaca</i> (Cramer, 1777)
5			<i>Chrysopera combinans</i> (Walker, 1858)
6		<i>Mocis</i> sp.	
7		Notodontidae	<i>Antheua servula</i> (Drury, 1773)
8	Bombycoidea	Eupterotidae	<i>Eupterote</i> sp.
9		Sphingidae	<i>Hippotion celerio</i> (Linnaeus, 1758)
10			<i>Acheronita Styx Styx</i> (Westwood, 1848)
11	Geometroidea	Geometridae	<i>Daphnis nerii</i> (Linnaeus, 1758)
12			<i>Biston suppressaria</i> (Guenee, 1857)
13			<i>Hyposidra talaca</i> (Walker, 1860)
14			<i>Cleora</i> sp.
15	Pyraloidea	Crambidae	<i>Maruca vitrata</i> (Fabricius, 1787)
16	Papilionoidea	Hesperidae	<i>Parnara</i> sp.



*Perina nuda* (Fabricius, 1787)



*Lymantria incerta* (Walker, 1855)



*Achaea serva* (Fabricius, 1775)



*Ophiusa tirhaca* (Cramer, 1777)



*Chrysopera combinans* (Walker, 1858)



*Mocis* sp.



*Anthea servula* (Drury, 1773)



*Eupterote* sp.



*Hippotion celerio* (Linnaeus, 1758)



*Acheronita Styx Styx* (Westwood, 1848)



*Daphnis nerii* (Linnaeus, 1758)



*Biston suppressaria* (Guenee, 1857)



*Hyposidra talaca* (Walker, 1860)



*Cleora* sp.



*Maruca vitrata* (Fabricius, 1787)



*Parnara* sp.

**Discussion**

The diversity of moths in Baramati area was explored, revealing a variety of moth genera across different families. The findings align with previous studies indicating that Erebidae, Sphingidae, and Geometridae are among the most dominant moth families in various regions. The observed diversity highlights the ecological richness of the study area and provides a baseline for further ecological and conservation studies.

**Conclusion**

The study successfully recorded sixteen species of moths from Baramati tehsil, with Erebidae being the most dominant family. This research contributes to the understanding of moth diversity in the region and underscores the importance of continued biodiversity monitoring and conservation efforts.

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