International Journal of Entomology Research
www.entomologyjournals.com
ISSN: 2455-4758
Received: 04-05-2026, Accepted: 04-06-2026, Published: 19-06-2026
Volume 11, Issue 2, 2026, Page No. 505-511

Diversity of micro-moths in Chatrapati Sambhajinagar, Maharashtra, India

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DOI: https://doi.org/10.66856/ijer.2026.11.2.11208

Abstract
A preliminary study of the micro moth diversity was conducted in Chatrapati Sambhaji Nagar, Maharashtra, India, during the period of 2024 - 2025, A total of 35 moth species, belonging to 32 genera and 11 families. Every effort was made to discover and preserve the hidden fauna of Chatrapati Sambhaji Nagar. To discover the diversity and existence of moths. obtained from a reservoir using simple light traps, effective from dusk to dawn. The families represented in the collection samples included Erebidae, Nolidae, Crambidae, Uraniidae, Megalopygidae, Attevidae, Cossidae, Noctuidae, Pyralidae, Geometridae, Saturniidae and Noctuoidae. According to the study, there may be opportunities for new records. The family Crambidae was the most dominant, followed by Erebidae, Noctuidae and Nolidae. The research also indicated potential new records of moth families and species in the Chatrapati Sambhaji Nagar region of Marathwada, Maharashtra.

Keywords: Diversity, *Lepidoptera*, micro moths, Chatrapati Sambhaji Nagar

Introduction

Lepidoptera is a group of insects that includes many large and showy species. Moths act as an indicator species of the effects of fragmentation (Kalawate 2018) [7]. Among these, butterflies have been studied most due to their diurnal activity and colourful wing patterns. Consequently, the conservation of butterflies is much better than any other group of insects (Wang & Fang, 2007), (Ravindra Fakirrao Pathre*1, Moth Fauna (*Lepidoptera*: Heterocera) from the Marathwada Region of Maharashtra. 2019) [12]. Generally, Moths are commonly nocturnal, holometabolous, and phytophagous insects. They occur in various habitats, including natural forests, grasslands, Agro-horticultural fields, and crop plantations (Yogesh Rameshwar Kayande 2023) [15]. The Marathwada region is renowned worldwide for its Ajanta and Ellora caves. It is the most diverse region of Maharashtra, connected with the Sahyadri mountain ranges. (Ravindra Fakirrao Pathre* 2020) [11]. Chatrapati Sambhaji Nagar district is situated in the north-central part of Maharashtra between North Latitude 19° 15' and 20° 40, and East Longitude 74° 37' and 75° 52'. It covers an area of 10,107 sq. km, falling in parts of the Survey of India. Agriculture is the main occupation of the rural people.

The tropical forests can be efficiently monitored using 'early warning' indicator groups of non-economic insects. (Brown 1997) [3]. *Lepidoptera* belong to holometabolous endopterygotes, scale-winged insects, including butterflies and moths. Recent estimates reveal the existence of over 1,27000 species of Moths worldwide (NEMA 2007) [9]. *Lepidoptera* is the second largest and the most diverse order of the class Insecta (Bharamal 2015) [2]. They are agricultural pests, night pollinators and nocturnal insects. Their population changes with slight changes in climate or pollution, and thus are known as potential bio-indicators (1Shajiya Tabassum 2012) [1]. Chhatrapati Sambhajinagar, situated in central Maharashtra, India, features a semi-arid tropical climate characterised by significant seasonal variations in temperature and rainfall. The area's combination of urban, agricultural, and semi-natural environments is likely to host a wide variety of micro-moth communities. Still, detailed information on the diversity of micro moths. Addressing this gap is crucial for a deeper understanding of *Lepidoptera* ecology and for guiding conservation efforts in the region.

Materials and Methods

During the present study, the moths were collected from different localities of Chatrapati Sambhaji Nagar. A moth specimen was collected using a light trap with a white screen (500 WT Hylogen) during the study period from January 2023 to December 2025. This is the most suitable trap for tropical and sub-tropical regions (Recommended by William, 1987). As widely documented by lepidopterists, many trap designs are not mostly suitable for use in tropical conditions (Nikam 2013) [10]. The samples were collected from 6 PM to 5 AM. Collected moths were etherised in the plastic bottle, placed in paper envelopes, and brought to the laboratory. The specimens were preserved by the dry preservation method. A field observation of moths attracted to light sources was conducted between 20:00 and 02:30 every night. Later, they were pinned on an insect stretching board using entomological pins and were kept in the insect box for later identification. All specimens were well labelled and preserved in an airtight insect box, having naphthalene balls as a fumigant for later identification. The identification of the material was made with the help of available literature, Such as (Moore,1880-1882; Hampson, 1891-1896; Holloway, 1985-2008; Bell and Scott: 1937, Gurule *et al*, 2010-2013 [10].

Study Area

The present study was conducted in Chatrapati Sambhaji Nagar district, situated in the Marathwada region of Maharashtra, India. Geographically, the district lies between approximately 19°52′–20°40′ N latitude and 74°40′–75°40′ E longitude. The region experiences a semi-arid to tropical climate, characterised by hot summers, moderate monsoon rainfall, and mild winters (Gore 2019) [4]. Field sampling was carried out in the locality of a stream reservoir and its surrounding habitats, which provide favourable ecological conditions for moth diversity. Aquatic-adjacent vegetation, artificial illumination, and reduced nocturnal disturbances enhance moth attraction and activity, particularly for nocturnal taxa (Holloway 1986) [6]. Chatrapati Sambhaji Nagar represents an ecologically transitional zone within the Deccan Plateau, combining natural and anthropogenic landscapes. Moths represent a significant threat to commercial and fruit crops within this region. This study provides the first comprehensive checklist of 112 moth species recorded in Marathwada, Maharashtra (Ravindra Fakirrao Pathre*1, Moth Fauna (*Lepidoptera*: Heterocera) from the Marathwada Region of Maharashtra. 2019) [12]. Given that many moth species are polyphagous during their larval (caterpillar) stage, they possess diverse feeding habits that impact various flora. These findings establish a baseline for future research aimed at habitat restoration and biodiversity conservation. Consequently, the study area holds strong potential for the discovery of new distributional records and previously undocumented moth species and families within the Marathwada region.

Sampling Protocol

Micro-moths were collected monthly for a year (Jan 2023 [15]–Dec 2025). Sampling was conducted using portable light traps with Hylogen bulbs operated from dusk to midnight (18:30–6:00). Specimens attracted to the lights were collected and preserved for identification. Light trapping was employed as the primary sampling technique due to its efficiency in attracting nocturnal *Lepidoptera*. Trapping was conducted on nights with favourable weather conditions, avoiding heavy rainfall, strong winds, and full moon phases, as these factors are known to influence moth attraction and flight activity (Robinson 1997) [14]. Traps were positioned near vegetation and water bodies to maximise capture efficiency, as such environments support higher moth abundance and diversity. The light source was placed at a height of approximately 1.5–2.0 m above ground level, allowing optimal visibility and attraction radius (Kitching 2017) [8]. Sampling was repeated at regular intervals to minimise temporal bias and ensure representative coverage of the local moth fauna.

Identification and Analysis

Collected moth specimens were identified to the family and species level using standard taxonomic keys, monographs, and regional faunal literature. Identification was primarily based on external morphological characters, including wing shape and pattern, venation, antennae type, body colouration, and scaling patterns. Where necessary, diagnostic characters described in recent taxonomic revisions were consulted to confirm species-level identification.

The identification was done with the help of relevant literature was supported by comparison with authenticated reference images and published descriptions. Taxonomic nomenclature and higher classification followed current *Lepidopteran* classification systems, and family-level placement was verified using updated global and regional checklists (van Nieukerken *et al.*). Species names were cross-checked to ensure consistency with accepted scientific nomenclature.

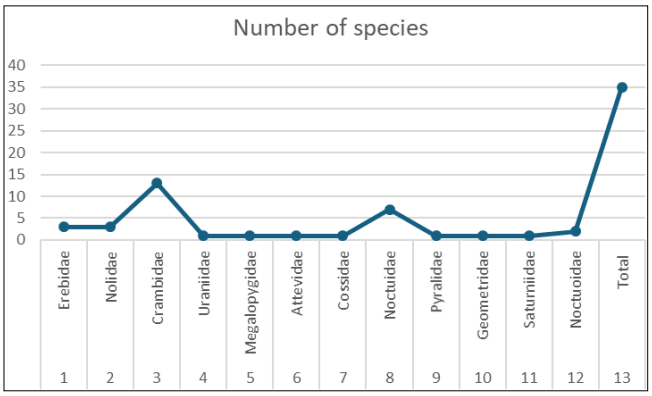


Fig 1: Family wise Distribution of Moth Species

Results and Discussion

The recorded families include Erebidae, Nolidae, Crambidae, Noctuidae, Uraniidae, Megalopygidae, Saturniidae, Attevidae, Pyralidae, Cossidae, Geometridae and Noctuoidae. Crambidae family was the most dominant, contributing the maximum number of species, followed by Noctuidae and Erebidae, while the outstanding families were represented by less species. The genus Xanthodes was represented by more than one species, where most of the other genera were represented by a single species. The occurrence of diverse moth taxa indicates a significant level of *Lepidopteran* diversity in the study area and reproduces the ecological suitability of the region for moth fauna. The

detailed list of species along with their genera, families, and author is presented in Table 1.

The present study documents 35 moth species belonging to 32 genera and 11 families from the study area, indicating a moderate level of moth diversity. Moths are considered important ecological indicators since their diversity and abundance frequently reflect the health and stability of local ecosystems. The diversity recorded in this study suggests that the study region provides suitable environmental conditions such as vegetation diversity, availability of host plants, and favourable climatic conditions for moth existence and reproduction.

Amongst the recorded families, Crambidae was the most dominant family with the highest number of species. This dominance may be attributed to the wide host range and adaptability of crambid moths to various habitats, particularly agricultural and semi-natural ecosystems. Similar observations have been reported in several faunal studies where Crambidae commonly represents a major portion of the moth community. The family Noctuidae was also well represented, which is expected since noctuid moths are one of the largest and most widely distributed family of *Lepidoptera*.

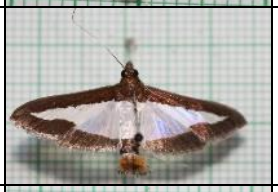
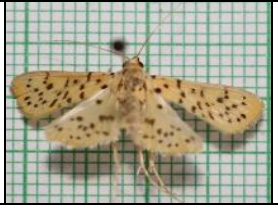
Several economically important species such as Helicoverpa zea, Spodoptera mauritia, and Maruca vitrata were observed during the survey. These species are known agricultural pests affecting crops like maize, pulses, and other cultivated plants. Their presence in the study area may be associated with the surrounding agricultural landscape and availability of host plants. In contrast, species like Creatonotos gangis and Micronia aculeata represent typical moth fauna found in tropical and subtropical ecosystems.

The occurrence of species belonging to families such as Geometridae, Uraniidae, Megalopygidae, and Cossidae indicates habitat heterogeneity and the presence of diverse ecological roles. These families are generally associated with forest vegetation and natural habitats, suggesting that the study area supports both agricultural and semi-natural ecosystems.

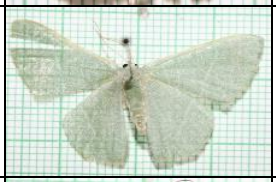
Overall, the present study provides baseline information on moth diversity in the region. Such documentation is important for understanding local biodiversity, monitoring ecological changes, and supporting future conservation and taxonomic studies. Further long-term surveys using additional sampling methods and seasonal monitoring may reveal a greater diversity of moth species in the area.

Table 1: Systematic List of Moth Fauna with Genus, Family, and Author Citation

Sr. No.	Moth Species	Genus	Family	Photo	Species Id	Described by
1	*Creatonotos gangis*	Creatonotos	Erebidae		M1	(Linnaeus, 1763)
2	*Xanthodes Albago*	Xanthode	Nolidae		M2	(Guenne,1852)
3	*Neoleucinodes Elegantalis*	Neoleucinodes	Crambidae		M3	Capps,1948
4	*Helivocoverpa Zea*	Helivocovrpa	Noctuidae		M4	(Boddie,1850)
5	*Xanthodes Transversa*	Xanthodes	Nolidae		M6	(Guenee, 1852)
6	*Anomis*	Anomis	Erebidae		M7	(Hubner,1821)
7	*Cirrhochrista brizolis*	Cirrhochrista	Crambidae		M9	(Walker,1859)

8	*Palpita quadristigmalis*	Palpita	Crambidae		M10	(Guenee,1854)
9	*Chasmina Candida*	Chasmina	Noctuidae		M11	(Walker,1854)
10	*Micronia aculeata*	Micronia	Uraniidae		M12	(Guenee,1857)
11	*Norape ovina*	Norape	Megalopygidae		M13	(Sepp,1848)
12	*Diaphania indica*	Diphania	Crambidae		M14	(Saunders, 1851)
13	*Glyphodes Bicolor*	Glyphodes	Crambidae		M16	(Swainson,1821)
14	*Eoophyla sejunctalis*	Eoophyla	Crambidae		M17	(Snellen 1876)
15	*Synclera jarbusalis*	Synclera	Saturniidae		M18	(Walder,1859)
16	*Maruca vitrata*	Maruca	Crambidae		M19	(Fabricius 1787)
17	*Atteva fabriciella*	Atteva	Attevidae		M20	(Swederus,1787)
18	*Conogethes punctiferalis*	Conogethes	Crambidae		M21	(Guenee, 1854)

19	*Heliocheilus julia*	Heliocheilus	Noctuidae		M22	(Gorte,1883)
20	*Orvasca subnotata*	Orvasca	Erebidae		M24	(Walker,1865)
21	*Omphisa anastomosalis*	Omphisa	Crambidae		M25	(Guenee,1854)
22	*Cactoblastis Cactorum*	Cactoblastis	Pyralidae		M27	(Ragonot 1901)
23	*Diatraea saccharalis*	Diatraea	Crambidiae		M28	(Fabricus,1794)
24	*Endoxyla neuroxantha*	Endoxyla	Cossidae		M29	(Lower,1900)
25	*Ponometia erastrioides*	Ponometia	Noctuidae		M31	(Guenee,1852)
26	*Samea ecclesialis*	Samea	Crambidae		M32	(Guenee,1854)
27	*Poliobotys ablactalis*	Poliobotys	Crambidae		M33	(Walker,1859)
28	*Proteuxoa Tetronycha*	Proteuxoa	Noctuidae		M37	(Hoare,2017)
29	*Acontia Lucida*	Acontiini	Noctuidae		M38	(Ochsenimer,1816)

30	*Spodoptera Mauritia*	Noctuoidae	Noctuoidae		M40	(Boisdural,1833)
31	*Xanthodes Albago*	Xanthodes	Nolidae		M41	(Gunenee,1852)
32	*Sesamia Inferns*	Sesamia	Noctuoidae		M43	(Walker,1856)
33	*Herpetogramma Luctuosalis*	Herpetogramma	Crambidae		M44	(Guenne,1854)
34	*Hemithea aestivaria*	Hemithea	Geometridae		M45	(Hubner,1799)
35	*Acontia crocata*	Acontia	Noctuidae		M46	(Guenne,1852)

Conclusion

The present study provides a systematic and preliminary assessment of micro-moth diversity in Chhatrapati Sambhaji Nagar, located in the Marathwada region of Maharashtra. The survey conducted during 2023–2025 documented a total of 35 moth species, of which 32 genera belonging to 11 families were confirmed from reservoir-associated habitats using light trapping methods. The recorded families include Erebidae, Nolidae, Crambidae, Uraniidae, Megalopygidae, Attevidae, Cossidae, Noctuidae, Pyralidae, Geometridae, Saturniidae, and Noctuoidae, with Crambidae emerging as the most dominant family, followed by Erebidae, Noctuidae, and Nolidae. The dominance of Crambidae and other nocturnal families indicates that reservoir ecosystems and adjacent vegetation provide favourable microhabitats and feeding resources for micro-moths, and the use of light traps proved to be an effective technique for documenting nocturnal *Lepidoptera* diversity under semi-arid tropical conditions. Seasonal and habitat-based sampling ensured representative documentation of the local fauna. This investigation contributes valuable baseline data for the *Lepidoptera*n fauna of the region, where detailed micro-moth studies have been limited, and highlights the ecological significance of freshwater-associated and semi-natural habitats in sustaining moth diversity within landscapes influenced by agriculture and urbanisation. Furthermore, the findings indicate strong potential for additional distributional records and possibly new species reports through more extensive, long-term, and seasonally intensive surveys, and recommend continued monitoring, integration of molecular tools, and expanded habitat coverage to enhance taxonomic resolution and ecological understanding.

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