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continued on the back inside cover

Caption: Large Indian Civet *Viverra zibetha*, Tricoloured Munia *Lonchura malacca* and *Hoya wightii* (Medium—pencil crayon on watercolour paper) © Supriya Samanta.

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COMMUNICATION

Diversity of moths from the urban set-up of Valmiki Nagar, Chennai, India

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Abstract: A study was conducted at Valmiki Nagar, Chennai, Tamil Nadu, India to explore its moth diversity from December 2018 to May 2021. This manuscript presents a partial checklist of moths from Valmiki Nagar. Four locations around the colony were studied to record the moth fauna. The study sites were surveyed twice a month using a mercury vapour lamp along with a white sheet, along with over 100 visits at night. Diurnal surveys were conducted bimonthly to observe larval host plants and day flying moths. A total of 135 species were recorded from the study area, belonging to nine superfamilies. The most diverse family of moths recorded was family Erebidae, with 39% of moths recorded in the study belonging to this family, followed by Crambidae (30%), Geometridae (8%), and other families constituting the rest. The moth diversity in the month of July was seen to be the highest. Along with this study, future studies on similar lines will help in documenting the moth diversity of Chennai.

Keywords: Ecology, Endemic, Lepidoptera, nocturnal, pollinators, seasonality, species richness.

Editor: Anonymity requested.

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Author contributions: VMN—conceived and designed the study, conducted a survey, prepared the checklists and photographed the moths. RS—helped in literature and comparison of specimens, results and discussion of the paper, helped compile the picture collage and map. MN—contributed to results and discussion and literature review also helped preparing charts. All three authors approve the final version.

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INTRODUCTION

Moths are predominantly nocturnal and complement butterflies, their daytime counterparts, as important pollinators of flowers especially the night blooming ones (Anil & Parthasarathy 2017).

Moths play an important role in the food chain as prey for diverse organisms such as bats, birds, insects, and reptiles (Raju & Ramana 2020). Several species of moths are important ecological indicators of the ecosystem's health (Warren & Bourn 2011) due to their sensitivity to the changes in the environment and are model organisms for habitat quality and climate change. Moths are often considered as pests in agroecosystems due to the large-scale crop damage caused predominantly in their larval stages (Sinu et al. 2013) and by some species in their adult stages, like the fruit piercing moths (*Eudocima* spp.).

India has recorded over 12,000 species of moths across 40 families (Chandra & Nema 2007). Several studies have been conducted across various locations in southern India. A large section of the studies that were conducted in Tamil Nadu are from the ghat regions with none from urban residential set-ups. Several studies from Tamil Nadu recorded varying moth diversity, including 188 species of Noctuoidea from four families (Sivasankaran et al. 2017), five species of fruit piercing moths of the genus *Eudocima* (Ramkumar et al. 2010a) and 27 species of moths belonging to the family Sphingidae from Kanyakumari (Iyer & Kitching 2019). The most recently published moth diversity study at Chennai is from the Adyar Eco-Park, where 90 species of moths (Nagarajan et al. 2021) were recorded. Another study dealt with the coast of Chennai recorded 42 species (Nagarajan et al. 2022).

The current study aims at documenting the species diversity of Valmiki Nagar (Chennai), thereby giving an insight into the urban moth diversity of Chennai.

Study area

Chennai is the capital city of the state of Tamil Nadu, situated along the Coromandel coast. The mean temperature of Chennai is around 28.6 °C and it receives an annual mean rainfall of 140 cm. However, most of the rain Chennai receives is in bulk during the north-east monsoon. It also houses tropical dry evergreen forest, scrub forests, grasslands, mangroves, and sand dune habitats. This wide range of habitats is favourable for Chennai to host a variety of fauna. A total of 1,039 species of plants have been recorded in Chennai, 322 species of birds (eBird India 2020), and 18 species of mammals have also been reported from Chennai. So far, no study on the moths recorded in the whole of Chennai has been published, though several works are being pursued by the authors to shed light on the same.

Valmiki Nagar is a residential colony located in Thiruvanmiyur, Chennai, Tamil Nadu, India. Several private gardens and avenue trees growing in the neighbourhood encompass the natural vegetation of the study area. The most predominant trees (mostly non-native) in the locality are Copperpod Tree *Peltophorum pterocarpum*, Rain Tree *Albizia saman*, Neem Tree *Azadirachta indica*, Indian Ash Tree *Lannea coromandelica*, Portia Tree *Thespesia populnea*, Gulmohar *Delonix regia*, Pongame Tree *Millettia pinnata*, and Peepal Tree *Ficus religiosa*. It is a coastal colony, located along the Bay of Bengal. Thickets growing in the fringes of the beach account for species normally found in grasslands and open country. This vegetation consists of Calotropis, Devil's Grass *Cynodon dactylon*, and *Acalypha indica*. To the north lies Kalakshetra, a thickly vegetated campus that is known to house several forest fauna, including the Slender Loris (Kumara et al. 2017). Thiruvanmiyur is known to house 72 species of butterflies, with a majority of species recorded from Valmiki Nagar. Valmiki Nagar alone has 98 species of birds recorded (eBird India 2021). With such data publicly availed, the authors aim to shed light on the moth diversity of the locality.

METHODS

A preliminary survey was conducted to find suitable light trapping sites. Four sites where substantial moth diversity was observed were selected as survey sites. The locations have been marked in Figure 1. From December 2018, regular and periodic moth observations were made by setting up a moth sheet and surveying the walls of apartments in the locality.

The moth sheet has been described in the sentences that follow. A single white cloth (134 x 130 cm) was spread out between two vertical poles. Above this cloth, a 150 W power mercury vapour lamp was placed and connected to the nearest power supply. This screen was set up from 1930 h till 0030 h once every 15 days. This was done to record changes in diversity due to changes in the lunar phase, if any. Apart from the moth sheet, species visiting tube lights in common areas of the community that were easily accessible moths were also recorded. These were recorded in various staircases of apartment complexes in the community. These surveys were conducted at least twice a week to generate significant data to assess the

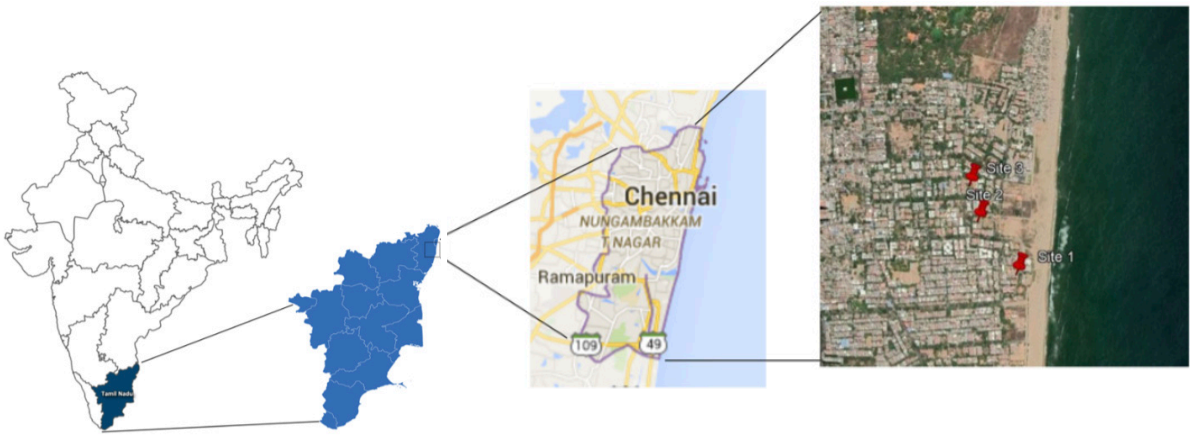

Figure 1. Map depicting the study area, with sampling sites marked in red.

seasonality of species and moth abundance throughout the year. To maintain uniformity in data collection, the survey was conducted individually along a transect and observations were made around the same time (2030–2200 h). There are a few studies in India on the moth diversity in urban spaces. Thus, this was conducted to show the cohabitation of moths in urban landscapes. Opportunistic nocturnal walks and day walks were also carried out. Day walks were conducted to record species that were active pollinators and to find moths that might have been otherwise missed.

No live moths were collected during the study attributing to the ethical beliefs of the authors. Moths were recorded using visual observation and photographs. A Canon 5D Mark IV camera along with a 100 mm macro lens was used to photograph the moths. No external flash was used. However, in some cases, a flashlight was used to provide illumination. Identification of the various species of moths was done by comparing the external morphology of the observed moths to the descriptions provided by Hampson (1892). Consultation with experts wherever possible, references from citizen science initiatives like www.mothsofindia.org and www.inaturalist.org, and the field guide by Shubhalaxmi (2018) were made uses for identifying moths. Difficult to confirm species were left at genus level.

RESULTS AND DISCUSSION

During the defined period of observation, a total of 135 species of moths were recorded from the locality. These include 11 species belonging to the superfamily Bombycoidea, one species of Gelechioidea, 11 species of Geometroidea, one species of Hyblaeoidea, 66 species of Noctuoidea, 42 species of Pyraloidea, one species of Thyridoidea, one species of Yponomeutoidea, and one species of Tortricidae. A complete annotated checklist of moths recorded in the study can be found in Table 1. Out of these listed species, 97 of them were photographed and have been represented in Image 1–98.

Out of the 135 species of moths, 100 species were seen in Site 1, 84 species were seen in Site 2, and 36 species were seen in Site 3. Twenty-three species of moths were seen opportunistically and not during the moth screen sessions.

Moth studies on the moth diversity from Tamil Nadu are family- or subfamily-specific. The current study attempts to understand the moth diversity from various families found in the study area.

A study on Sphingid moths from Kanyakumari (Iyer & Kitching 2019), the first of its kind from the state, records 27 species of moths, of which six were recorded in the current study. *Cephonodes picus* was not recorded in the study at Kanyakumari, while being observed regularly at Valmiki Nagar. Both *Cephonodes* spp. were observed in the day. During this time, they were observed on flowers such as Alexandrian Laurel (*Calophyllum inophyllum*). *Neolamarckia kadamba* was the observed host plant for *Cephonodes* sp. They were seen visiting walls in hot afternoons. They were only seen in June and July in the study. In the current study, an interesting striped *Hippotion* moth was observed. Iyer & Kitching (2019) described *Hippotion boerhavia* as a difficult species to confirm based on morphology and is said to only be confirmable with genitalia examination of a male specimen; but they do mention that *H. boerhavia* has a more striped appearance and elongated forewing, as seen in the specimen that was recorded in our current study, eliminating it from *H. rosetta*, which

was also seen during the study. Another similar species, *H. rafflesii* is known to occur in southern India, but this species is known to have a rich brown ground colour and poses a pink shaded hind wing upper side tornus (pale in the specimen dealt with in our study). This leaves us with the only other option, *H. echeclus*, a species known to occur in drier parts of southern India. However, this was also eliminated due to the absence of a black upper margined under wing in the specimen seen in our study. However, without a proper examination of the genitilia, it was decided to leave the specimen encountered as a *Hippotion* sp. *Hippotion* were seen nectaring and resting in the mornings on *Sensieveria zylanica*. Caterpillars of *Hippotion* sp. were seen feeding on the Pongame Tree, which also served as the host plant for *Psilogramma vates*. They were best seen from June till October, most commonly in the months of July and August. Caterpillars of *Daphnis nerii* were observed feeding on *Nerium oleander*.

Superfamily Noctuoidea was the most diverse superfamily in the study area, with moths belonging to the family Erebidae being the most common and diverse in the study area. Subfamily Erebinae was the most diverse in this family. The most common species from the subfamily include *Parallelia stuposa, Gramodes geometrica, Achaea janata*, *Pandesma* sp., *Trigonodes hyppasia, Mocis undata, Pericyma glaucinans*, and *Lacera noctilo*. Subfamily Artcinae were infrequently observed in the study area, except *Amata passalis,* which was seen commonly throughout the year, especially after heavy rains. *Amata passalis* caterpillars were observed eating dead wood on several occasions, as well as on *Millettia pinnata*. *Amyna axis*, *Helicoverpa armigera, Spodoptera litura, Pseudozarba opella*, and *Chrysodeixis* sp. were the most commonly seen members of the family Noctuidae. *Spodoptera litura* catterpillars were seen on a wide variety of garden plants and weeds. The moth is known to have a wide variety of host plants according to (Jian-Xiang et al. 2011).

A detailed diversity and seasonality study on fruit piercing moths (genus *Eudocima*) from the state describes the presence of five species, which are usually seen from September to January (Ramkumar et al. 2010b). The current study was able to find three out of these five, with the seasonality of the species matching the trends observed by Ramkumar. In our study, *E. materna* had a longer on wing period among the fruit piercing moths, for almost eight months of the year, followed by *E. phalonia*, as was the case in Ramkumar's study. It is also noteworthy that the present study and Ramkumar's record the same relative abundance

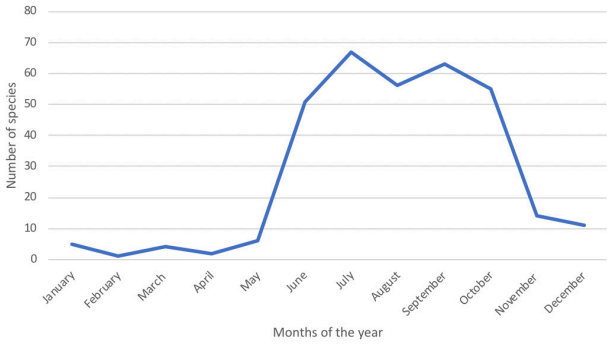

Figure 2. Seasonality of moths observed during the study.

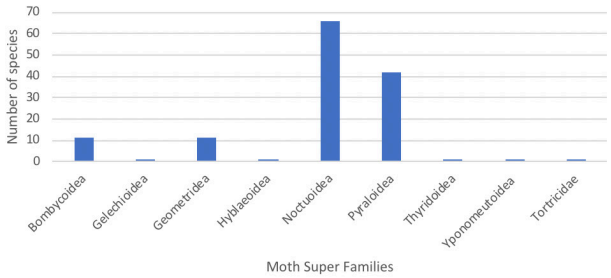

Figure 3. Moth family diversity from Valmiki Nagar.

between the species, *E. materna* > *E. phalonia* > *E. homaena.* These moths were found mainly in the second and third floors of apartments, at a height of 20 and 30 feet from the ground, respectively. *E. phalonia* was often seen hovering near pomegranate plants, while *E. materna* was seen laying its eggs on a *Citrus* sp., both known host plants for the respective species (Shubhalaxmi 2018).

A study by Rathikannu in 2018 recorded 188 species of moths from this family from various locations in Tamil Nadu (Rathikannu et al. 2018), which lists most of the species seen in the current study. The most diverse subfamily recorded in the study was subfamily Spilomelinae. The most common species observed were *Euclasta* sp., *Paliga* sp., *Antigastra catalaunalis*, *Cnaphalocrocis medinalis*, *Sameodes cancellalis*, *Spoladea recurvalis*, and *Pygospila tyres.* During the observations made in this study, crambid moths were most common in the second floor of apartments, at an height of 6.1m (20 ft) from the ground. The most preferred season for moths from this family was from June till October. *Cnaphalocrocis medinalis* in particular was seen in swarms of up to 200 individuals during the month of October. *Cydalima laticostalis* was the only observed exception, only seen in the study area from November to March. Among the rare species,

Table 1. Checklist of moths observed at Valmiki Nagar during the study.

	Super-Family	Family	Sub-Family	Species
1.	Bombycoidea	Eupterotidae	Eupterotinae	*Eupterote* sp. Hübner, 1820
2.	Bombycoidea	Saturniidae	Saturniinae	*Actias selene* (Hübner, [1807])
3.	Bombycoidea	Sphingidae	Sphinginae	*Cephonodes hylas* (Linnaeus, 1771)
4.	Bombycoidea	Sphingidae	Sphinginae	*Cephonodes picus* (Cramer, [1777])
5.	Bombycoidea	Sphingidae	Sphinginae	*Daphnis nerii* (Linnaeus, 1758)
6.	Bombycoidea	Sphingidae	Sphinginae	*Hippotion* sp. Hübner, 1819
7.	Bombycoidea	Sphingidae	Sphinginae	*Hippotion celerio* (Linnaeus, 1758)
8.	Bombycoidea	Sphingidae	Sphinginae	*Hippotion rosetta* (Swinhoe, 1892)
9.	Bombycoidea	Sphingidae	Sphinginae	*Macroglossum gyrans* Walker, 1856
10.	Bombycoidea	Sphingidae	Sphinginae	*Psilogramma vates* (Butler, 1875)
11.	Bombycoidea	Sphingidae	Sphinginae	*Theretra nessus* (Drury, 1773)
12.	Gelechioidea	Gelechiidae	Dichomeridinae	*Dichomeris* sp. Hübner, 1818
13.	Geometroidea	Geometridae	Ennominae	*Achrosis* sp. *Guenée, 1857*
14.	Geometroidea	Geometridae	Ennominae	*Chiasmia eleonora* (Cramer, [1780])
15.	Geometroidea	Geometridae	Ennominae	*Chiasmia emersariaa* (Walker, 1861)
16.	Geometroidea	Geometridae	Ennominae	*Chiasmia* sp. Hübner, 1823
17.	Geometroidea	Geometridae	Ennominae	*Cleora sp.* Curtis, 1825
18.	Geometroidea	Geometridae	Ennominae	*Hyperythra lutea* (Stoll, [1781])
19.	Geometroidea	Geometridae	Sterrhinae	*Chrysocraspeda faganaria* Guenée, [1858]
20.	Geometroidea	Geometridae	Sterrhinae	*Idaea* sp. Treitschke, 1825
21.	Geometroidea	Geometridae	Sterrhinae	*Scopula caesaria* (Walker, 1861)
22.	Geometroidea	Geometridae	Sterrhinae	*Scopula* sp. Schrank, 1802
23.	Geometroidea	Geometridae	Sterrhinae	*Traminda mundissima* (Walker, 1861)
24.	Hyblaeoidea	Hyblaeidae		*Hyblaea puera* (Cramer, 1777)
25.	Noctuoidea	Erebidae	Aganainae	*Asota caricae* (Fabricius, 1775)
26.	Noctuoidea	Erebidae	Aganainae	*Asota producta* (Butler, 1875)
27.	Noctuoidea	Erebidae	Aganainae	*Diagama hearseyana* Moore, 1859
28.	Noctuoidea	Erebidae	Anobinae	*Plecoptera sp* Gueén, 1852
29.	Noctuoidea	Erebidae	Anobinae	*Tephriopis* sp. Walker, 1865
30.	Noctuoidea	Erebidae	Arctinae	*Amata passalis* (Fabricius, 1781)
31.	Noctuoidea	Erebidae	Arctinae	*Ceryx sp* Wallengren, 1863
32.	Noctuoidea	Erebidae	Arctinae	*Cyana bhatejai* Singh & Kirti 2015
33.	Noctuoidea	Erebidae	Arctinae	*Creatonotos gangis (complex)*
34.	Noctuoidea	Erebidae	Arctinae	*Mangina syringa* (Cramer, [1775])
35.	Noctuoidea	Erebidae	Boletobiinae	*Ataboruza divisa* (Walker, 1862)
36.	Noctuoidea	Erebidae	Calpinae	*Eudocima homaena* (Hübner, [1823])
37.	Noctuoidea	Erebidae	Calpinae	*Eudocima materna* (Linnaeus, 1767)
38.	Noctuoidea	Erebidae	Calpinae	*Eudocima phalonia* (Linnaeus, 1763)
39.	Noctuoidea	Erebidae	Eulepidotinae	*Anticarsia irrorata* (Fabricius, 1781)
40.	Noctuoidea	Erebidae	Erebinae	*Acantholipes* sp. (Lederer, 1857)
41.	Noctuoidea	Erebidae	Erebinae	*Achaea janata* (Linnaeus, 1758)
42.	Noctuoidea	Erebidae	Erebinae	*Achaea serva* (Fabricius, 1775)
43.	Noctuoidea	Erebidae	Erebinae	*Artena dotata* (Fabricius, 1794)
44.	Noctuoidea	Erebidae	Erebinae	*Bastilla crameri* (Moore, [1885])
45.	Noctuoidea	Erebidae	Erebinae	*Bastilla simillima* (Guenée, 1852)

	Super-Family	Family	Sub-Family	Species
46.	Noctuoidea	Erebidae	Erebinae	*Chalciope mygdon* (Cramer, [1777])
47.	Noctuoidea	Erebidae	Erebinae	*Parallelia stuposa* (Fabricius, 1794)
48.	Noctuoidea	Erebidae	Erebinae	*Dysgonia cf torrida* (Guenee, 1852)
49.	Noctuoidea	Erebidae	Erebinae	*Ericeia pertendens* (Walker, 1858)
50.	Noctuoidea	Erebidae	Erebinae	*Ericeia inangulata* (Guenée, 1852)
51.	Noctuoidea	Erebidae	Erebinae	*Erebus hieroglyphica* (Drury, 1773)
52.	Noctuoidea	Erebidae	Erebinae	*Erebus macrops* (Linnaeus, 1768)
53.	Noctuoidea	Erebidae	Erebinae	*Fodina cuneigera* (Butler, 1889)
54.	Noctuoidea	Erebidae	Erebinae	*Grammodes geometrica* (Fabricius, 1775)
55.	Noctuoidea	Erebidae	Erebinae	*Grammodes stolida* (Fabricius, 1775)
56.	Noctuoidea	Erebidae	Erebinae	Hypocala subsatura Guenée, 1852
57.	Noctuoidea	Erebidae	Erebinae	*Hypocala cf deflorta* (Fabricius, 1794)
58.	Noctuoidea	Erebidae	Erebinae	*Ischyja* sp. Hübner, [1823]
59.	Noctuoidea	Erebidae	Erebinae	*Lacera noctilio* (Fabricius, 1794)
60.	Noctuoidea	Erebidae	Erebinae	*Macaldenia palumba* (Guenée,1852)
61.	Noctuoidea	Erebidae	Erebinae	*Mocis frugalis* (Fabricius, 1775)
62.	Noctuoidea	Erebidae	Erebinae	*Mocis undata* (Fabricius, 1775)
63.	Noctuoidea	Erebidae	Erebinae	*Ophiusa cf triphaenoides* (Walker, 1858)
64.	Noctuoidea	Erebidae	Erebinae	*Pandesma sp* Guenée, 1852
65.	Noctuoidea	Erebidae	Erebinae	*Pericyma glaucinans* (Guenée, 1852)
66.	Noctuoidea	Erebidae	Erebinae	*Polydesma boarmoide* Guenée, 1852
67.	Noctuoidea	Erebidae	Erebinae	*Rhesala sp.* Walker, 1858
68.	Noctuoidea	Erebidae	Erebinae	*Serrodes campana* (Guenée, 1852)
69.	Noctuoidea	Erebidae	Erebinae	*Serrodes partita* (Fabricius, 1775)
70.	Noctuoidea	Erebidae	Erebinae	*Sphingomorpha chlorea* (Cramer, 1777)
71.	Noctuoidea	Erebidae	Erebinae	*Spirama* sp. Guenée, 1852
72.	Noctuoidea	Erebidae	Erebinae	*Trigonodes hyppasia* Cramer, [1779]
73.	Noctuoidea	Erebidae	Herminiinae	*Hydrillodes* sp. Guenée, 1854
74.	Noctuoidea	Erebidae	Herminiinae	Herminiinae sp. Leach, 1815
75.	Noctuoidea	Erebidae	Hypeninae	*Dichromia sagitta* (Fabricius, 1775)
76.	Noctuoidea	Erebidae	Hypeninae	*Hypena laceratalis* Walker, [1859]
77.	Noctuoidea	Erebidae	Hypeninae	*Hypena cf obacerralis* Walker, 1859
78.	Noctuoidea	Erebidae	Lymantriinae	*Olene mendosa* Hübner, 182
79.	Noctuoidea	Erebidae	Lymantriinae	*Somena scintillans* Walker, 1856
80.	Noctuoidea	Erebidae	Scoliopteryginae	*Anomis flava* (Fabricius, 1775)
81.	Noctuoidea	Noctuidae	Acontiinae	*Acontia* sp. Ochsenheimer, 1816
82.	Noctuoidea	Noctuidae	Eustrotiinae	*Amyna axis* Guenée, 1852
83.	Noctuoidea	Noctuidae	Eustrotiinae	*Maliattha signifera* (Walker, [1858])
84.	Noctuoidea	Noctuidae	Eustrotiinae	Pseudozarba opella (Swinehoe, 1855)
85.	Noctuoidea	Noctuidae	Heliothinae	*Helicoverpa armigera* Hübner, [1809]
86.	Noctuoidea	Noctuidae	Noctuinae	*Spodoptera exigua* (Hübner, 1808)
87.	Noctuoidea	Noctuidae	Noctuinae	*Spodoptera litura* (Fabricius, 1775)
88.	Noctuoidea	Noctuidae	Noctuinae	*Leucania* sp. Ochsenheimer, 1816
89.	Noctuoidea	Noctuidae	Plusiinae	*Chrysodeixis spp* Hübner, 1821
90.	Noctuoidea	Nolidae	Risobinae	*Risoba obstructa* Moore, 1881
91.	Pyraloidea	Crambidae	Acentropinae	*Parapoynx affinialis* Guenée, 1854

	Super-Family	Family	Sub-Family	Species
92.	Pyraloidea	Crambidae	Acentropinae	*Parapoynx diminutalis* Snellen, 1880
93.	Pyraloidea	Crambidae	Acentropinae	*Parapoynx stagnalis* (Zeller, 1852)
94.	Pyraloidea	Crambidae	Acentropinae	*Nymphicula blandialis* (Walker, 1859)
95.	Pyraloidea	Crambidae	Glaphyriinae	*Crocidolomia sp* Zeller, 1852
96.	Pyraloidea	Crambidae	Glaphyriinae	*Hellula undalis* (Fabricius, 1781)
97.	Pyraloidea	Crambidae	Glaphyriinae	*Noorda blitealis* Walker, 1859
98.	Pyraloidea	Crambidae	Pyraustinae	*Euclasta* sp. Lederer, 1855
99.	Pyraloidea	Crambidae	Pyraustinae	*Paliga* sp. Moore, 1886
100.	Pyraloidea	Crambidae	Pyraustinae	*Pyrausta phoenicealis* (Hübner, 1818)
101.	Pyraloidea	Crambidae	Pyraustinae	*Isocentris filalis* (Guenée, 1854)
102.	Pyraloidea	Crambidae	Schoenobiinae	*Scirpophaga* sp. Treitschke, 1832
103.	Pyraloidea	Crambidae	Schoenobiinae	*Scirpophaga incertulas* (Walker, 1863)
104.	Pyraloidea	Crambidae	Spilomelinae	*Agrotera basinotata* Hampson, 1891
105.	Pyraloidea	Crambidae	Spilomelinae	*Antigastra catalaunalis* (Duponchel, 1833)
106.	Pyraloidea	Crambidae	Spilomelinae	*Chabula acamasalis* (Walker, 1859)
107.	Pyraloidea	Crambidae	Spilomelinae	*Cnaphalocrocis medinalis* (Guenée, 1854)
108.	Pyraloidea	Crambidae	Spilomelinae	*Cnaphalocrocis patnalis* (Bradley, 1981)
109.	Pyraloidea	Crambidae	Spilomelinae	*Cnaphalocrocis rutilalis* (Walker, [1859])
110.	Pyraloidea	Crambidae	Spilomelinae	*Cydalima laticostalis* (Guenée, 1854)
111.	Pyraloidea	Crambidae	Spilomelinae	*Diaphania indica* (Saunders, 1851)
112.	Pyraloidea	Crambidae	Spilomelinae	*Herpetogramma licarsisalis* (Walker, 1859)
113.	Pyraloidea	Crambidae	Spilomelinae	*Haritalodes derogate* (Fabricius, 1775)
114.	Pyraloidea	Crambidae	Spilomelinae	*Hodebertia testalis* (Fabricius, 1794)
115.	Pyraloidea	Crambidae	Spilomelinae	*Hydriris ornatalis* (Duponchel, 1832)
116.	Pyraloidea	Crambidae	Spilomelinae	*Maruca vitrata* Fabricius, 1787
117.	Pyraloidea	Crambidae	Spilomelinae	*Nausinoe geometralis* (Guenée, 1854)
118.	Pyraloidea	Crambidae	Spilomelinae	*Nausinoe pueritia* (Cramer, [1780])
119.	Pyraloidea	Crambidae	Spilomelinae	*Notarcha aurolinealis* (Walker, 1859)
120.	Pyraloidea	Crambidae	Spilomelinae	*Omiodes* sp. Guenée, 1854
121.	Pyraloidea	Crambidae	Spilomelinae	*Pagyda salvalis* Walker, 1859
122.	Pyraloidea	Crambidae	Spilomelinae	*Palpita annulifer (complex)* Inoue, 1996
123.	Pyraloidea	Crambidae	Spilomelinae	*Parotis* sp. Hübner, 1831
124.	Pyraloidea	Crambidae	Spilomelinae	*Poliobotys ablactalis* (Walker, 1859)
125.	Pyraloidea	Crambidae	Spilomelinae	*Pycnarmon cribata* (Fabricius, 1794)
126.	Pyraloidea	Crambidae	Spilomelinae	*Pygospila costiflexalis* Guenée, 1854
127.	Pyraloidea	Crambidae	Spilomelinae	*Pygospila tyres* (Cramer, [1780])
128.	Pyraloidea	Crambidae	Spilomelinae	*Sameodes cancellalis* (Zeller, 1852)
129.	Pyraloidea	Crambidae	Spilomelinae	*Spoladea recurvalis* (Fabricius, 1775)
130.	Pyraloidea	Crambidae	Spilomelinae	*Syngamia latimarginalis* (Walker, 1859)
131.	Pyraloidea	Pyralidae	Galleriinae	*Lamoria* sp. Walker, 1863
132.	Pyraloidea	Pyralidae	Pyralinae	*Endotricha cf repandalis* Fabricius, 1794
133.	Thyridoidea	Thyrididae	Strigliniinae	*Banisia* sp. Walker, 1863
134.	Yponomeutoidea	Plutellidae	Pyralinae	*Plutella xylostella* (Linnaeus, [1758])
135.	Tortricoidea	Tortricidae	Olethreutinae	*Loboschiza koenigiana* (Fabricius, 1775)

Agrotera basinotata, *Cnaphalocrocis patnalis*, and *Pygospila costiflexalis* were only seen once during the study. *Ipomea pes-caprae* and *Canavalia rosea* grow in abundance along the beaches of Valmiki Nagar, which attracted moths like *Maruca vitrata, Hellula undalis, Spoladea recurvalis*, and *Cnaphalocrocis medinalis*. The plants also served as diurnal roosting spots for these moths, along with *Plutella xylostella, Scopula* sp., *Spodoptera* spp., and *Achyra* sp. *Spoladea recurvalis* was also observed nectaring on *Ixora* sp., *Wedelia tribobata* and Madagascar Periwinkle *Catharanthus roseus* in apartment complexes during the day. From Chennai, it would be important to survey moths from forested set-ups such as the Indian Institute of Technology, Guindy National Park, Madras Christian College, and Theosophical Society to ascertain the diversity of crambid moths in the area. Crambid moths have been used in the field of environmental monitoring of genetically modified crops (Lang et al. 2011).

Two species of micromoths were commonly recorded in the study, namely, *Plutella xylostella* and *Loboschiza koenigiana*. Both species were seen throughout the year, though more often in June and July. The known host plant for *Loboschiza koenigiana*, *Hibiscus rosa sinensis* (Shubhalaxmi 2018), is abundant in the study area, accounting for its common presence.

Moth diversity was not constant through the various months of the year. The data collected by the authors suggests that moth diversity peaked from June till October, with the month of July recording the greatest number of species of moths. The rise and fall in the diversity of months were very drastic as seen in Figure 2. The sudden peak in May to June may be due to occasional showers and possible local movement of moths due to the south-west monsoon. The second peak was seen during the month of October that dropped post November. A similar trend was observed during the survey carried out at Adyar Eco-Park, Chennai in 2019 (Nagarajan et al. 2021). A conjecture that may be derived based on the observations from the current study, is that the north-east monsoon, which is known to arrive in Tamil Nadu during that time, may facilitate moth emergence in that period. These are conjectures that need a continuous study to confirm. However, moth diversity was seen to drop post November at the study site. Further study on the effect of temperature on moth diversity must be conducted.

The most diverse family of moths recorded was the family Erebidae, with 39% of moths recorded in the study belonging to this family, followed by Crambidae (30%), Geometridae (8%) and other families. This order in species diversity among the various moth families was similar to the diversity of moths from a study recently conducted from Banaras Hindu University, Varanasi, India (Nayak & Ghosh 2020). The study highlights that the polyphagous nature of moths belonging to the superfamily Noctuoidea might account for their higher species richness in the urban localities like Banaras. The results of the current study were compared to the findings of other moth diversity studies (Singh et al. 2021) recorded 19 species of moths from the urban landscape of Jodhpur. However, this lower species diversity can be attributed to the difference the in the natural vegetation between Jodhpur and Chennai. Since there is a deficit in published urban moth studies from India, the authors of the current study have chosen to highlight our results with any published report from an urban environment. Figure 3 shows the species distribution among the various families of moths recorded.

CONCLUSION

Moths are as abundant as butterflies in urban spaces. A total of 135 species of moths were recorded from Valmiki Nagar over a span of two years. Of these, 97 species were photographed and have been presented in the current work. The most diverse family in the study area was the family Erebidae. Nectaring plants that were often used by moths in the study area were observed and reported in the current work. The current work would hopefully serve to bring more urbanites to watch moths, thereby contributing to a greater understanding of the role of moths in urban ecosystems.

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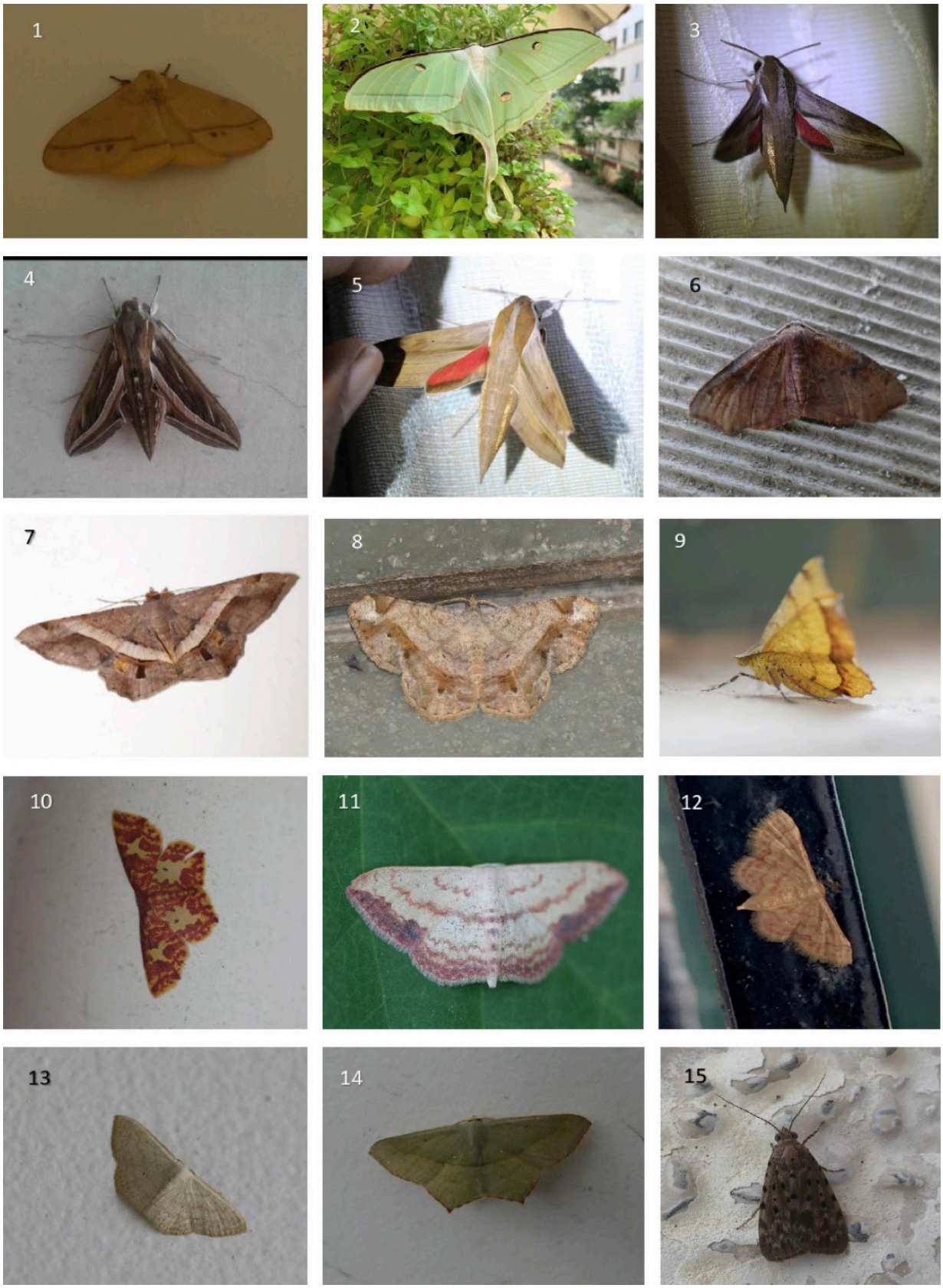

Image 1–15. 1—*Eupterote* sp. | 2—*Actias selene* | 3—*Hippotion* sp. | 4—*Hippotion celerio* | 5—*Hippotion rosetta* | 6—*Achrosis* sp. | 7—*Chiasmia eleonora* | 8—*Chiasmia* sp. | 9—*Hyperythra lutea* | 10—*Chrysocraspeda faganaria* | 11—*Scopula caesaria* | 12—*Idaea* sp. | 13—*Scopula* sp. | 14—*Traminda mundissima* | 15—*Diagama hearseyana*.

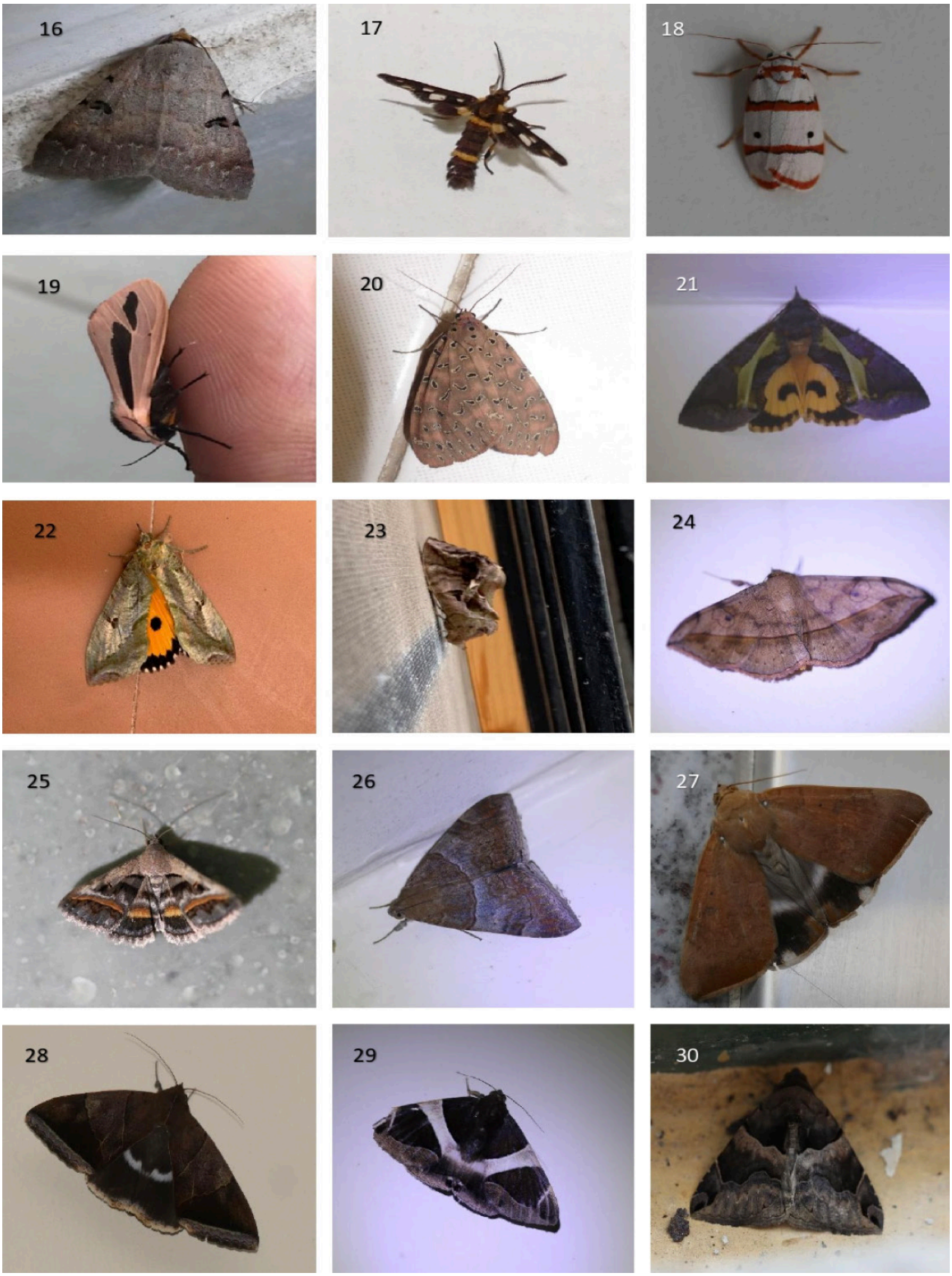

Image 16–30. 16—*Plecoptera* sp. | 17—*Ceryx* sp. | 18—*Cyana bhatejai* | 19—*Creatonotos gangis* (complex) | 20—*Mangina syringa* | 21—*Eudocima homaena* | 22—*Eudocima materna* | 23—*Eudocima phalonia* | 24—*Anticarsia irrorata* | 25—*Acantholipes* sp. | 26—*Achaea janata* | 27—*Achaea serva* | 28—*Artena dotata* | 29—*Bastilla crameri* | 30—*Bastilla simillima*.

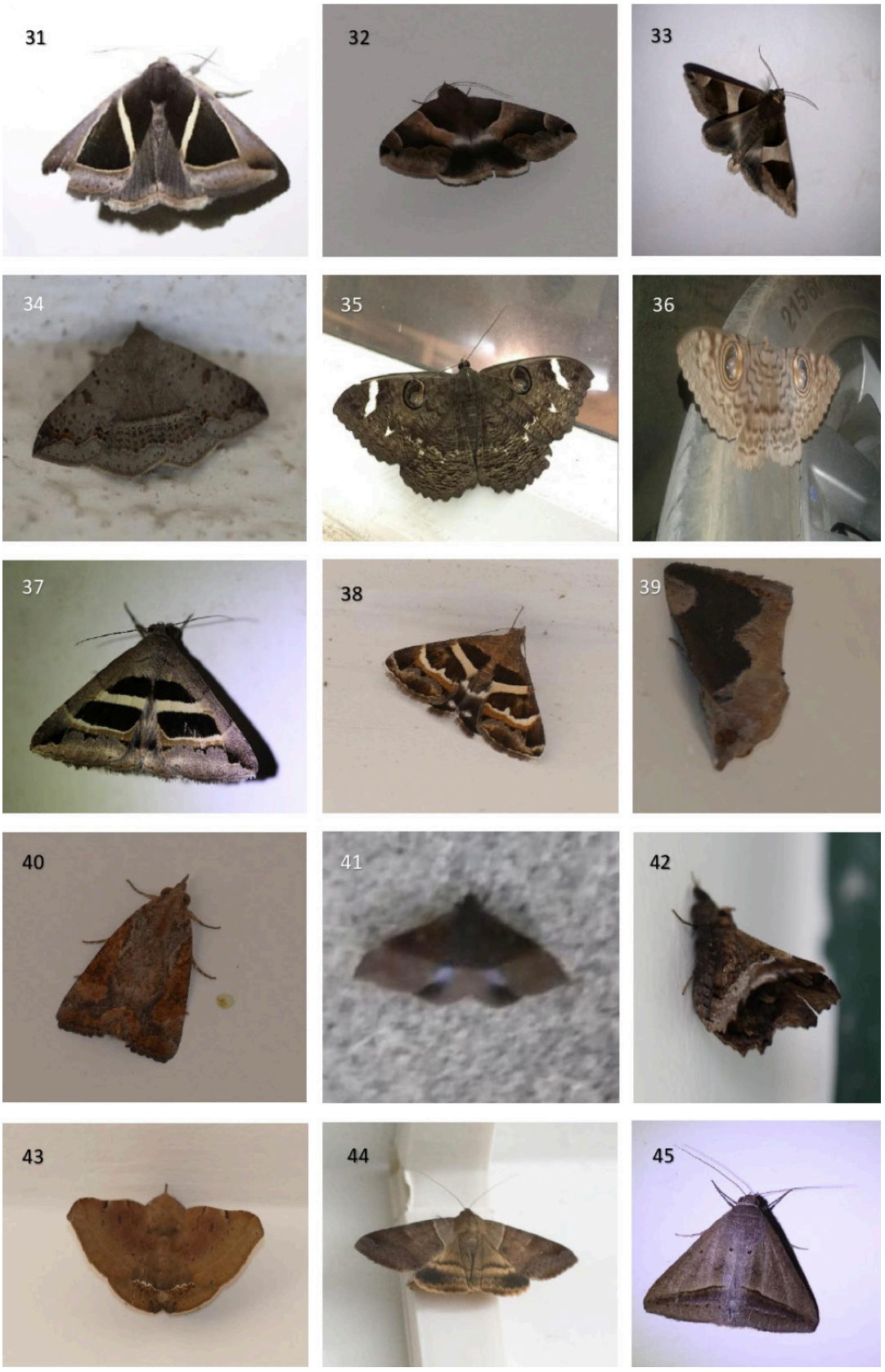

Image 31–45. 31—*Chalciope mygdon* | 32—*Parallelia cf stuposa* | 33—*Dysgonia cf torrida* | 34—*Ericeia pertendens* | 35—*Erebus hieroglyphica* | 36—*Erebus macrops* | 37—*Grammodes geometrica* | 38—*Grammodes stolida* | 39—*Hypocala subsatura* | 40—*Hypocala* cf. *deflorta* | 41—*Ischyja* sp. | 42—*Lacera noctilio* | 43—*Macaldenia palumba* | 44—*Mocis undata* | 45—*Mocis frugalis.*

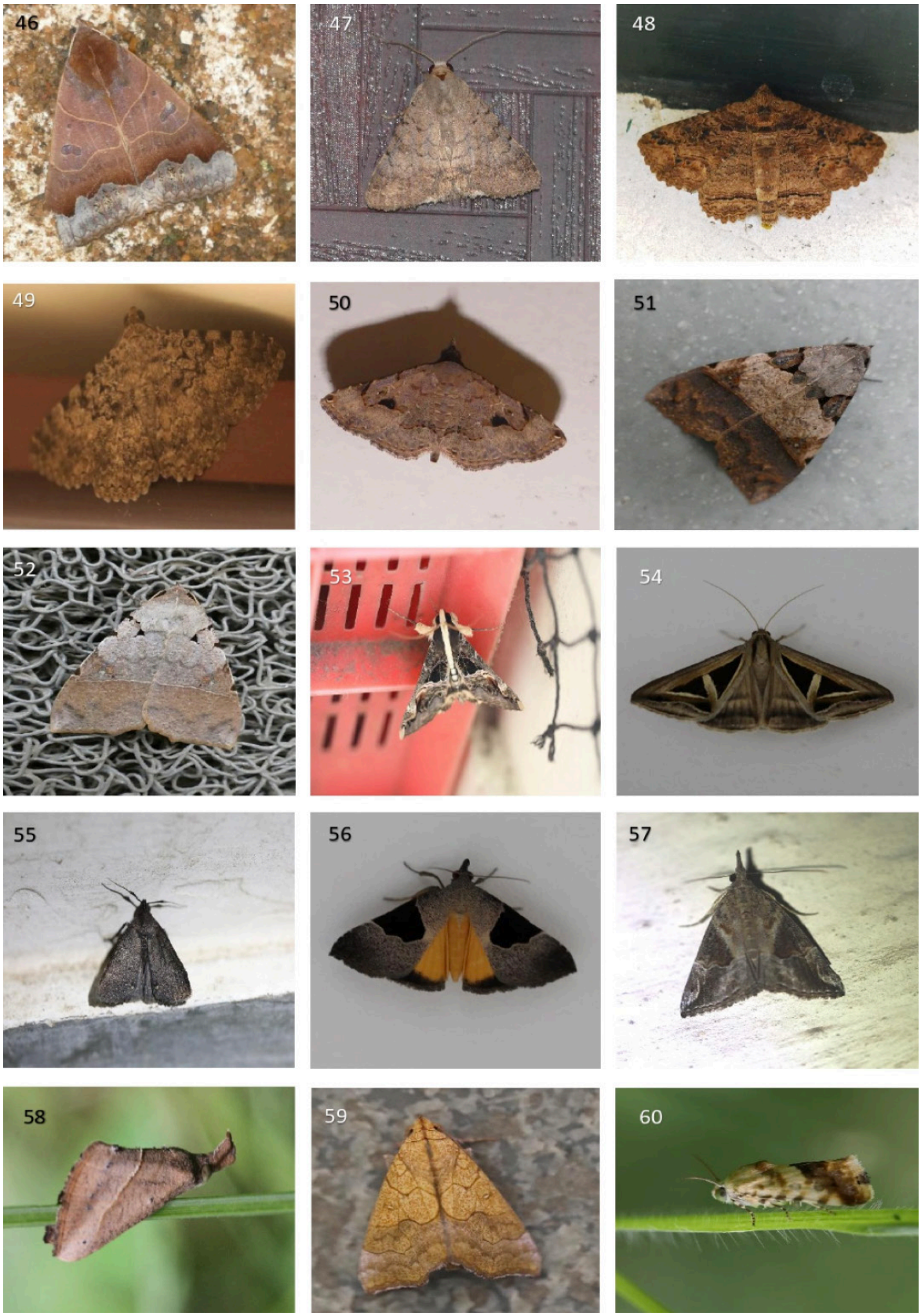

Image 46–60. 46—*Ophiusa cf triphaenoides* (Female) | 47—*Pandesma* sp. | 48—*Pericyma glaucinans* | 49—*Polydesma boarmoide* | 50—*Rhesala* sp. | 51—*Serrodes campana* | 52—*Serrodes partita* | 53—*Sphingomorpha chlorea* | 54—*Trigonodes hyppasia* | 55—Herminiinae sp. | 56—*Dichromia sagitta* | 57—*Hypena laceratalis* | 58—*Hypena* cf. *obacerralis* | 59—*Anomis flava* | 60—*Acontia* sp.

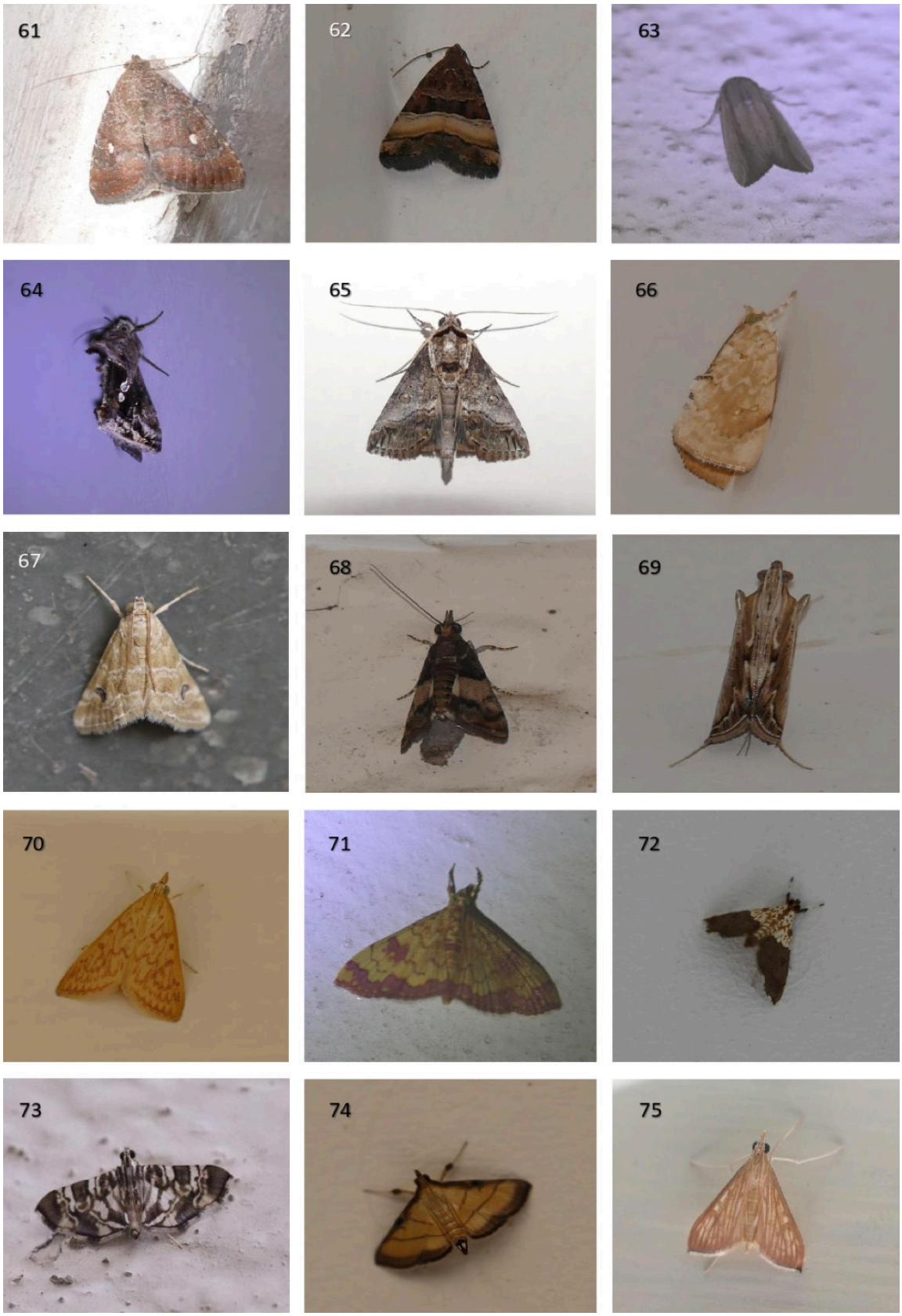

Image 61–75. 61—*Amyna axis* | 62—*Pseudozarba opella* | 63—*Leucania* sp. | 64—*Chrysodeixis* sp. | 65—*Risoba obstructa* | 66—*Crocidolomia* sp. | 67—*Hellula undalis* | 68—*Noorda blitealis* | 69—*Euclasta* sp. | 70—*Paliga* sp. | 71—*Isocentris filalis* | 72—*Agrotera basinotata* | 73—*Chabula acamasalis* | 74—*Cnaphalocrocis medinalis* | 75—*Antigastra catalaunalis.*

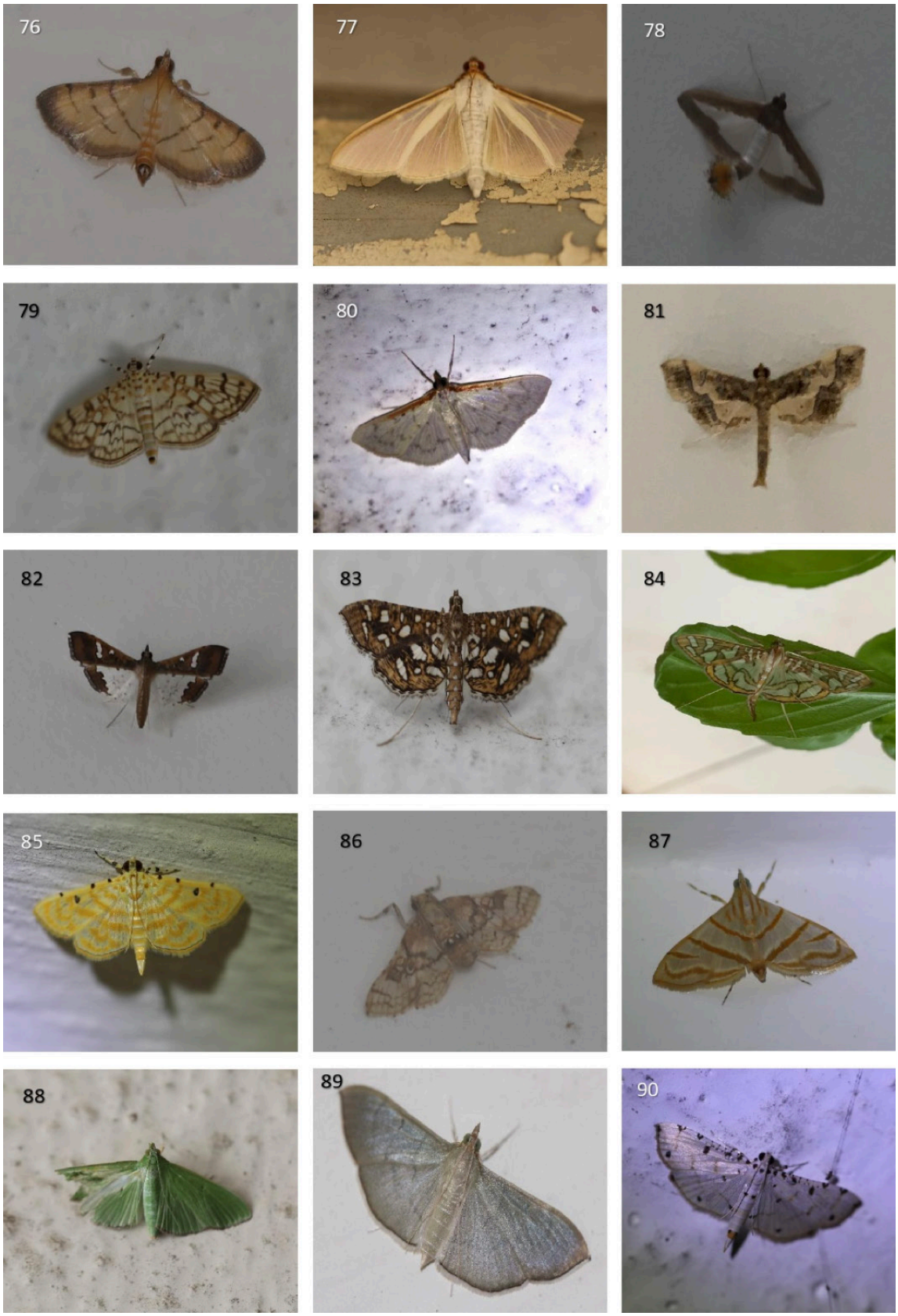

Image 76–90. 76—*Cnaphalocrocis patnalis* | 77—*Cydalima laticostalis* | 78—*Diaphania indica* | 79—*Haritalodes derogata* | 80—*Hodebertia testalis* | 81—*Hydriris ornatalis* | 82—*Maruca vitralis* | 83—*Nausinoe geometralis* | 84—*Nausinoe pueritia* | 85—*Notarcha aurolinealis* | 86—*Omphisa* sp. | 87—*Pagyda salvalis* | 88—*Parotis* sp. | 89—*Poliobotys ablactalis* | 90—*Pycnarmon cribata.*

Image 91–98. 91—*Pygospila costiflexalis* | 92—*Pygospila tyres* | 93—*Samoedes cansalis* | 94—*Spoladea recurvalis* | 95—*Syngamia latimarginalis* | 96—*Lamoria* sp. | 97—*Endotricha cf repandalis* | 98—*Banisia* sp.

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