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FAUNISTIC ACCOUNT ON SPHINGID MOTHS (LEPIDOPTERA: SPHINGIDAE) OF MIZORAM, NORTHEAST INDIA: A PRELIMINARY CHECKLIST.

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Keywords: Sphingidae, first report, diversity, inventory, Mizoram.

INTRODUCTION:

The family Sphingidae Latreille, 1802 commonly called as Hawkmoths belong to the order Lepidoptera having a cosmopolitan distribution including Polar Regions; in some areas they often appear as seasonal visitors (Hodges, 1971). They are one of the most well inventoried and documented Lepidopteran families, known by 1602 species belonging to 205 genera worldwide (Kitching *et al.,* 2018) and about 200 species have been reported from India (Harshlata *et al.,* 2023). Derzhavets (1984) classified this family into two subfamilies; Macroglossinae Harris, 1839 and Sphinginae Latreille, [1802].

Adult Sphingid moths, like most Lepidoptera, play important role in agriculture entomology as pollinator (Kislev *et al.,* 1972, Nilsson *et al.,* 1987, Johnson *et al.,* 2016, Darrault & Schlindwein, 2002). They are easily identified by their conspicuous morphological features comprising a stout and large body, pointed triangular forewing and reduced hindwing. The larvae of these moths are phytophagous and are major defoliators of agricultural crops and ornamental plants (Bell & Scott, 1937).

MIZORAM

Mizoram, covering a geographical area of 21,087 km^2, is situated in the North-Eastern part of India. It represents an important part of the Indo-Myanmar biodiversity hotspot and is rich in flora and

fauna. The elevation ranges from 21m at Tlabung to 2,157m at Phawngpui. Despite its tropical location, it enjoys a moderate climate throughout the year (Pachuau, 2009). Sphingid moth fauna of Mizoram is still very poorly documented. Though several species have been reported (Shubhalaxmi *et al.,* 2011, Joshi *et al.,* 2021), a comprehensive study and proper documentation on members of this family is still lacking. The primary objective of this paper is to document Sphingid moths from Mizoram.

The present study provides a detailed morphological description of adult Sphingid moths along with their genital studies. The description of each specimen includes their original references, a brief diagnosis and their distribution range with short remarks for each species. A distribution map shows collection sites using light trapping method, which consists of fourteen localities (Figure 1).

MATERIALS AND METHOD:

Study site:

Sphingid moths were collected from different parts of Mizoram at elevations ranging from 143m – 1487m asml (Table 1). The study site consists of two national wetlands, namely Palak lake at Siaha district which is the largest lake in Mizoram and Tamdil Lake at Saitual district. The trapping site was usually set up in the buffer zone of forest where human activities are less or almost none at some sites. Sampling localities, altitudinal ranges and GPS coordinates are provided in Table 1.

Collection and preservation:

The reported specimens were collected using a light trap design based on principles of standard light trap. A white sheet of cloth was hung between two vertical poles and illuminated using 160-watt mercury vapour lamp using Honda™ EP1000 portable generator as a power source. Two light traps were placed separately at each sampling site. The larger specimens were hand sampled and collected in the field by injecting petroleum ether in their thorax region, while killing jar containing petroleum ether was frequently used for smaller specimens. The sampled moths were then pinned in Systematics and Toxicology Laboratory Mizoram University, Aizawl. Cannon EOS 550D digital camera was used to take images of moths. Genitalia were examined and dissected using Moticam 1080 following Lee & Brown (2006). The specimens were then kept with their wings folded vertically and placed in butter paper. Thymol crystals were used for preservation.

Identification:

Identification of sphingid moths was done based on relevant published literature (Bell & Scott, 1937, Holloway, 1987, Hampson, 1892, Smetacek, 1994 and Shubhalaxmi, 2018) along with pictorial samples deposited in Sphingidae Museum Database. Morphological attributes such as size, wing shape and color patterns were taken into consideration for identification. Males were more abundant than females and are usually smaller in size as compared to females in most species.

Sl. No	Study site	GPS coordinates		Altitude (m)
		Latitude	Longitude	
1	Mizoram University (Site 1)	23.73722222	92.66333333	804
2	Aizawl (Site 2)	23.73638889	92.71416667	1012
3	Rahum (Site 3)	24.26694444	92.83361111	143
4	Uibaikawn (Site 4)	24.26222222	92.81305556	615
5	North Hlimen (Site 5)	24.22888889	92.805	671
6	Tamdil (Site 6)	23.26222222	92.95138889	767
7	West Phaileng (Site 7)	23.67527778	92.48055556	776
8	Thenzawl 1 (Site 8)	23.2775	92.77083333	746
9	Thenzawl 2 (Site 9)	23.30638889	92.78583333	704
10	Thenzawl 3 (Site 10)	23.31388889	92.79611111	546
11	Serzawl (Site 11)	23.98833333	92.59944444	347
12	Hmuifang (Site 12)	23.45388889	92.75194444	1487
13	Palakdil (Site 13)	22.205	92.88666667	273
14	Palakdil view (Site 14)	22.1925	92.88444444	542

Table 1: Sampling sites with their respective co-ordinates and elevational ranges.

RESULT:

The current study reports a total of 15 species of 11 genera belonging to two subfamilies viz., Sphinginae and Macroglossinae. The genus *Theretra*, represented by 4 species, was found to be the most abundant followed by *Acherontia* (2 species) and the remaining *Neogurelca, Marumba, Psilogramma, Agrius, Daphnis, Macroglossum, Pergesa, Dolbina,* and *Cechetra,* each represented by a single species. Five species, *Cechetra lineosa*, *Dolbina inexacta, Neogurelca hyas, Psilogramma discistriga* and *Theretra oldenlandiae* collected during the study are reported here for the first time from Mizoram. The authors previously reported *Ampelophaga dolichoides* and *A. rubiginosa* belonging to the sub family Macroglossinae from a different altitude in Mizoram (Hmar *et al.*, 2023).

Systematic Account:

Superfamily BOMBYCOIDEA Latreille, 1082

Family SPHINGIDAE Latreille, 1082

I. Genus *Theretra* Hübner, [1819]

Theretra Hübner, [1819]; *Verz. bek. Schmett*. (9): 135

1.***Theretra nessus*** (Drury, 1773)

Sphinx nessus Drury, 1773; *Illust. Nat. Hist. Exot. Insects* 2: 46

Wingspan: Male: 108 - 122mm; Female: 123 - 130mm.

Material examined: Site 1 (23˚44'14" N 92˚39'48"E), 804m, 13.iii.2021 – 2♂; Site 7 (23˚40'13"N 92˚28'50"), 776m,

03.viii.2021 – 1♂; Site 13 (22˚12'18" N 92˚53'12" E), 273m, 08.ix.2021 – 7♂ 1♀; Site 14 (22˚11'33" N 92˚53'04" E), 542m, 31.iii.2022 – 1♂; Site 3 (24°16'00" N 92°50'01" E), 143m, 19.viii.2021 – 1♂, 10.xi.2021 – 4♂; Site 4 (24˚15'55" N 92˚ 48'18" E) 615m, 21.vii.2022 – 1♂, 21.vii.2022 – 1♂; Site 9 (23˚18'23" N 92˚47'46" E) 702m, 24.viii.2022 – 1♂; Site 10 (23˚18'50" N 92˚47'46" E) 546m, 25.vii.2022 – 1♂. Coll. Lalruatthara Hmar, Isaac Zosangliana, Lalhmangaiha Khiangte.

Diagnosis: Head and thorax olive-green, thorax suffused with ferruginous; a grey lateral stripe from palpus to end of thorax, lateral with deep golden markings on both sides of the abdomen with a dark patch on each segment; a prominent olive-green band at medial area. Antenna serrated. This species can be easily distinguished by their wing fascies. Forewing with costal margin suffused with green colour which usually fades in stored specimens, apex of the forewing falcate.

Male genitalia: Uncus well sclerotised, short, broad at the base and narrow towards tip, upper half of the uncus well setosed, semi membranous; membranous gnathos, same size with vinculum; sacculus well developed, short and well sclerotized, bifid with nearly equal arm, well sclerotized; long valva extending beyond uncus, semi sclerotized, well setosed; saccus sclerotized, short and rounded; short aedeagus, well sclerotized, having small denticles at the tip.

Female genitalia: Large and long corpus bursae; well-defined signum extending almost the entire length of corpus bursae; ductus bursae long; apophysis long, anterior apophysis is longer than posterior apophysis; ostium bursae semi membranous.

Distribution:

India: Andaman and Nicobar Islands, Arunachal Pradesh, Uttarakhand, Assam, Andhra Pradesh, Gujarat, Goa, Jammu and Kashmir, Madhya Pradesh, Maharashtra, Manipur, Nagaland, Uttar Pradesh, Jharkhand, Kerala, Karnataka, Meghalaya, Himachal Pradesh, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, West Bengal and Manipur (Irungbam & Fric, 2021).

Elsewhere: Bhutan, Nepal, Myanmar, southern China, South Korea, Japan, Singapore, Indonesia, Malaysia, Sundaland, Hong Kong, Thailand, Vietnam, Taiwan and Philippines. (Irungbam & Fric, 2021).

Remarks: Shubhalaxmi *et al.,* (2011) have mentioned the presence of this species in Mizoram. The present records confirm its presence in Mizoram. Holloway (1987) reported this species from various altitudinal ranges from low lands to 2600m asml. The current study reported this species from five different sites all of which falls under 1000m asml.

2. ***Theretra clotho*** (Drury, 1773)

Sphinx clotho Drury, 1773; *Illust. Nat. Hist. Exot. Insects* 2: 48

Wingspan: Male: 58 – 98 mm; Female: 100 - 104mm

Material examined: Site 6 (23˚44'15" N 92˚57'05" E), 767m, 14.x.2020 – 5♂ Site 1 (23˚44'14" N 92˚39'48" E), 804 m, iii.2021 – 1♂; Site 7 (23˚40'13" N 92˚28'50"E), 776m, 03.viii.2021 – 1♂; Site 13 (22˚12'18" N 92˚53'12" E), 273m, 08.ix.2021 – 3♂; Site 3 (24°16'00" N 92°50'01" E), 143m, 14.iii.2021 – 10♂ 2♀; 18.viii.2021 – 1♂ ; 10.xi.2021 – 4♂; Site 4 (24˚15'55" N 92˚48'18" E) 615m, 21.vii.2022 – 1♂ 3♀; Site 9 (23˚18'23" N 92˚47'46" E) 702m, 24.viii.2022 – 1♀. Coll. Lalruatthara Hmar, Isaac Zosangliana, Lalhmangaiha Khiangte.

Diagnosis: Head and thorax greenish brown, white lateral stripe from palpus extending till the near end of thorax. Antenna serrated, hook tip with underside whitish grey. Abdomen greenish brown, black lateral patch on the first segment near the thorax. Forewing olive green to greyish green with a dark patch at the upper side of discal cell, weak post median lines, except for the fourth, which is extended to the apex of the wing. Hind wing short, dark colour faded toward end.

Male genitalia: Uncus massive, broad at the base, narrow towards tips, well sclerotized, few setae near the tip; sclerotized tegumen, broad at the base of uncus; valva semi membranous, well setosed, extended beyond uncus; well sclerotized sacculus, short and well defined; long saccus and sclerotized; long aedeagus, well sclerotized and well defined.

Female genitalia: Long corpus bursae, membranous; signum long and well defined almost extending through the length of corpus bursae; long ductus bursae, semi membranous; antrum long, cylindrical and sclerotized; apopthysis long and narrow, anterior apophysis slightly longer than posterior apophysis.

Distribution:

India: Andaman Islands, Arunachal Pradesh, Assam, Gujarat, Himachal Pradesh, Maharashtra, Manipur, Nagaland, Sikkim, Tamil Nadu, Uttar Pradesh, Ladakh, Jharkhand, Karnataka, Kerala, Meghalaya, Odisha, Punjab, Uttarakhand, West Bengal (Irungbam & Fric, 2021).

Elsewhere: Northern Pakistan, Nepal, Bhutan, Laos, Hong Kong, Taiwan, Sri Lanka, Myanmar, China, Japan, Indonesia, Sundaland and Philippines (Irungbam & Fric, 2021).

Remarks: This species have been reported to frequent lowland areas (Holloway, 1987) and is in concordance with the current findings as this particular species was found to inhabit an elevational range below 800m asml. Shubhalaxmi *et al.*, (2011) mentioned the presence of this species in Mizoram.

3. ***Theretra alecto*** (Linnaeus, 1758)

Sphinx alecto Linnaeus, 1758; *Syst. Nat. (Edn* 10) 1: 492˚.

Wingspan: Male: 84 – 86mm.

Material examined: Site 14 (22˚11'33" N 92˚53'04" E), 542m, 31.iii.2022 – 2♂. Coll. Lalruatthara Hmar, Isaac Zosangliana, Lalhmangaiha khiangte.

Diagnosis: Head and thorax ferruginous, Antenna serrated, underside hoary, body

ferruginous, white lateral stripe from palpus extending till the end of thorax, as in *Theretra clotho.* Black lateral patch on either side of the first segment of the abdomen near the thorax. Forewing beige at the base, darker towards apex, dark patch at the upper side of discal cell, numerous lines from discal to apex. Hind wing upperside red, basal area black, extending along the inner margin towards tornus.

Male genitalia: Uncus setose at the base, tip well sclerotized with no setae, gradually narrow towards tip; tegument sclerotized, sickle shape; teguments curved and sclerotized, broad at base, narrow toward uncus; vinculum sclerotized, narrow; valve long, well setosed, extended beyond uncus, semi membranous; sacculus well defined, sclerotized and pointed; saccus rounded, sclerotized. Short aedeagus, semi membranous and small denticles at the tip.

Distribution: India: Andaman Islands, Arunachal Pradesh, Assam, Himachal Pradesh, Manipur, Maharashtra, Nagaland, Tamil Nadu, Uttar Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Meghalaya, Punjab, Sikkim, Uttarakhand and West Bengal (Irungbam & Fric, 2021).

Elsewhere: Pakistan, Nepal, Bhutan, Hong Kong, Philippines, Sri Lanka, China, Japan, Indonesia, Greece, Bulgaria, Turkey, Iran, Turkmenistan, Uzbekistan, Kyrgyzstan, Afghanistan, Iraq, Lebanon, Israel and Egypt. (Irungbam & Fric, 2021).

Remarks: Shubhalaxmi *et al.,* (2011) have mentioned the presence of the species in Mizoram. The present record confirms its presence in Mizoram.

4.***Theretra oldenlandiae*** (Fabricius, 1775)

Sphinx oldenlandiae Fabricius, 1775; *Syst. Ent*.: 542

Wingspan: 58 – 72mm. (Male: 58 – 69mm; Female: 70 – 72mm)

Material examined: Site 12 (23˚27'14" N 92˚45'07" E), 1487m, 16.vii.2020 – 1♂ 3♀; Site 13 (22˚12'18" N 92˚53'12" E), 273m, 07.ix.2021 – 2♂.

Head along with thorax earth brown in colour, greyish white dorsal lateral stripe from palpus extending to the end of thorax, white double dorsal line from thorax extending till the end of the abdomen. Antenna hoary, serrated with hook at the tip. Forewing greyish white, with an orbicular spot, numerous oblique lines running from post basal towards tips, with the middle one whitish brown. Hindwing blackish brown with a pale grey line to the outer part reaching the apex.

Male genitalia: Uncus well sclerotized, setosed at the base, narrow towards tips; gnathos membranous, tegumen U-shape, sclerotized; valve elongated, extended beyond the uncus, well setosed at the inner side with setae; sacculus sclerotized extended, forming a finger like projection narrow towards tips; saccus U-shape, moderate in size and sclerotized. Short aedeagus, sclerotized and cylindrical having sinuate denticle at the tip.

Female genitalia: Corpus bursae well developed, moderate in size; signum

visible and extended to the half-length of corpus bursae, membranous; ductus bursae moderate in length, membranous; small antrum, anterior apophysis is slightly shorter than posterior apophysis; papillae anales sclerotized and setosed with few setae.

Distribution: India: Andaman Islands, Arunachal Pradesh, Assam, Chhattisgarh, Gujarat, Jammu and Kashmir, Maharashtra, Manipur, Nagaland, Tamil Nadu, Uttar Pradesh, Delhi, Himachal Pradesh, Punjab, Jharkhand, Karnataka, Madhya Pradesh, Meghalaya, Sikkim, Tripura, Uttarakhand and West Bengal (Irungbam & Fric, 2021).

Elsewhere: Pakistan, Nepal, Bhutan, Sri Lanka, northern Afghanistan, Myanmar, China, South Korea, Japan, the Solomon Islands, New Guinea, eastern Russia, Laos, Hong Kong and Philippines (Irungbam & Fric, 2021).

Remarks: Holloway (1987) reported this species to inhabit open low land areas while the current study reported this species both from lower elevation (273m asml) as well as higher elevation (1487m asml). Shubhalaxmi *et al.,* (2011) have mentioned the presence of this species in Mizoram.

II. Genus *Acherontia* Laspeyres, 1809

Acherontia Laspeyres, 1809; *Jenaischeallg. Literatur-Zeit*. 4(240): 100

5. ***Acherontia lachesis*** Fabricius, 1798

Sphinx Lachesis Fabricius, 1798; Ent. Syst. (Suppl.): 434

Wingspan: Male: 102 – 119mm; Female: 120 – 130mm.

Material examined: Site 12 (23˚.27'14" N 92˚.45'07" E), 1487m, 16.vii.2020 – 1♂ 1♀; Site 7 (23˚40'13" N 92˚28'50" E), 776m, 03.viii.2021 – 1♀; Site 3 (24°16'00" N 92°50'01" E), 143m, 14.iii.2021 – 1♂; Site 14 (22˚11'33" N 92˚53'04" E), 542m, 31.iii.2022 – 1♂ 1♀; 07.vii.2021 – 1♀ ; 30.iii.2022 – 1♂ 1♀; Site 4 (24˚15'55" N 92˚48'18" E) 615m, 21.vii.2022 – 2♂ 1♀. Coll. Lalruatthara Hmar, Isaac Zosangliana, Lalhmangaiha Khiangte.

Diagnosis: Head ferruginous. Antenna serrated, dark, creamy white at the tip. Abdomen dark with yellow patch receding on either side of the abdomen from the first to fouth segment. The area under black on the abdomen and hind wing is greater as compare to *Acherontia styx*. Forewing ferruginous, white wavy line intersects post discal cell vertically followed by dark yellow towards tip with an orbicular white spot on discocellular. Upper side of thorax with metanotum and end of mesonotum marked with red hairs. Hind wing upper side having large black patch on the basal half.

Male genitalia: Uncus well defined, narrow towards tips, sclerotized, with no setae; membranous gnathos; short valva, curved, massive and well setosed, nearly membranous; sacculus sclerotized, bifid with one short arm and one long arm; rounded succus, short and well sclerotized. Long aedeagus, cylindrical, sclerotized having denticle at the tip.

Female genitalia: Corpus rounded and well developed, small in size, extending just

beyond apophysis. short and membranous ductus bursae. Anterior and posterior apophysis are almost equal in length. Small antrum. Palpillae anales sclerotized with a numerous projection of setae.

Distribution:

India: Arunachal Pradesh, Assam, Andaman and Nicobar Islands, Jammu and Kashmir, Karnataka, Madhya Pradesh, Andhra Pradesh, Goa, Gujarat, Maharashtra, Manipur, Nagaland, Meghalaya, Odisha, Punjab, Sikkim, Tamil Nadu, Uttarakhand and West Bengal (Irungbam & Fric, 2021).

Elsewhere: Eastern Pakistan, Nepal, Bhutan, Thailand, Laos, Vietnam, Hong Kong, Myanmar, China, Taiwan, Malaysia, Indonesia, southern Japan, Papua New Guinea, the Hawaiian Islands, Moluccas and Philippines (Irungbam & Fric, 2021).

Remarks: This species closely resembles *Acherontia styx* in having skull like marking on the thorax but differ in the presence of diagnostic basal patch in *A. lachesis*. This species is found to inhabit both lower and higher elevation. Shubhalaxmi *et al.,* (2011) mentioned the presence of this species in Mizoram.

6. ***Acherontia styx*** (Westwood, 1848)

Sphinx (Acherontia) styx Westwood, 1847; *Cabinet Orient. Ent.:* 88

Wingspan: Male: 92mm.

Material examined: Site 12 (23˚27'14" N 92˚45'07" E), 1487m, 16.vii.2020 – 1♂. Coll. Lalruatthara Hmar, Isaac Zosangliana, Lalhmangaiha khiangte.

Diagnosis: Head and thorax dark brown. Antenna serrated, dark and white portion at the tip. Lateral lines at the side which meet behind the thorax, with a skull mark at the centre. Golden yellow markings on the either side of the abdomen in each segment. Forewing stripped with various shade of dark brown and white patches, having two medial bands on the underside. Hindwing golden yellow with postmedial dark patch not reaching costa, with a similar dark patch between tornus and apex not touching either side.

Male genitalia: It is almost same as *Acherontia lachesis*, short and massive. Uncus broad to the base and narrow towards tips with no setae, curved inward; gnathos membranous; semi membranous tegumen; valva well setosed to lower side from base to tip, extending beyond uncus; sacculus well defined and bifid with well sclerotized long and short arm; short saccus, rounded and sclerotized. Long and slender aedeagus, well sclerotized, narrow from base to tip having small denticle.

Distribution: India: Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Delhi, Himachal Pradesh, Meghalaya, Jammu and Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Manipur; Odisha, Rajasthan, Sikkim, Tamil Nadu, Uttarakhand and West Bengal (Irungbam & Fric, 2021).

Elsewhere: Pakistan, Nepal, Bhutan, Bangladesh, Northern Thailand, Laos, Myanmar, China, Russian, Taiwan and Moluccas. (Irungbam & Fric, 2021).

Remarks: *Acherontia styx* has been reported to be much rarer than its congeners. Holloway (1987) reported this species only at an elevation above 1200m asml. This is consistent with the current study as only a single specimen was recorded during the surveyed period at an elevation of 1487m asml. Shubhalaxmi *et al.,* (2011) have mentioned the presence of this species in Mizoram.

III. Genus *Neogurelca* Hogenes & Treadaway, 1993

7. ***Neogurelca hyas*** (Walker, 1856)

Lophura hyas Walker, 1856, *List Specimens lepid. Insects Colln. Br. Mus*. 8: 107.

Material examined: Site 1 (23˚44'14" N 92˚39'48" E), 804 m, 14.iii.2021 – 1♀. Coll. Lalruatthara Hmar.

Wingspan: Female: 42mm.

Diagnosis: Head and thorax greyish brown; antenna serrated; numerous pairs of lateral segments of the abdomen. Forewing grey-brown, dark patch on the upper side of discal cell, numerous horizontal wavy lines from post basal line extending till the post-discal cell. Hindwing yellow at the base till median line, annular spot on the discocellulars, black marginal band of even width along outer margin.

Female genitalia: Large corpus bursae, membranous; signum not well visible; ductus bursae moderate in size, semi sclerotized, antrum cylindrical and semi sclerotized; anterior apophysis almost same in length as that of the posterior ones, long and narrow; papillae anales setosed with large and small setae.

Distribution:

India: Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Madhya Pradesh, Nagaland, Manipur, Mizoram, Uttar Pradesh, Tamil Nadu, Chhattisgarh, Rajasthan, Maharashtra, Andaman and Nicobar Islands, Goa, Gujarat, Andhra Pradesh and Karnataka (Shubhalaxmi *et al.,* 2011).

Elsewhere: Nepal, Bhutan, Myanmar, Bangladesh, Taiwan, Southern Japan, Thailand, Laos, Vietnam, Malaysia, Indonesia and Philippines (Shubhalaxmi *et al.,* 2011).

Remarks: The species is reported here for the first time from Mizoram.

IV. Genus *Marumba* Moore, 1882

Marumba (Smerinthinae) Moore, 1882; *Lepid. Ceylon* 2 (1): 8

8.***Marumba dyras*** (Walker, 1856)

Smerinthus dyras Walker, 1856: *List Spec. Lepid. Insects Colln. Br. Mus.* **8**: 25

Wingspan: Male: 97 – 103mm; Female:104 – 106mm.

Material examined: Site 6 (23˚44'15" N 92˚57'05" E), 767m, 14.x.2020 – 1♂ 1♀; Site 2 (23˚43'57" N 92˚42'32" E) 911m, 15.vii.2020 – 1♂; Site 7 (23˚40'13" N 92˚28'50" E), 776m, 03.viii.2021 – 1♂ 1♀.

Coll. Lalruatthara Hmar, Isaac Zosangliana, Lalhmangaiha Khiangte.

Diagnosis: Head and thorax pale brown. Antenna pale brown, pectinated and hook like tip. Mid line arising from head extended till the last segment of the abdomen. Forewing apex, pale brown with numerous wavy horizontal lines emerging from base extended till the sub marginal region, with a dark patch on the lower side of post discal cell. Hind wing slightly darker than forewing with two spots on the tornus which is quite larger in male.

Male genitalia: Uncus short, well sclerotized, divided into two rounded lobes; gnathos pointed and sclerotized; valva thick and well sclerotized, setosed inner side and the upper side with small and large setae; harpe strongly hook-shaped and sclerotized with few setae at the base; saccus short or almost absent, well sclerotized. Aedeagus long, cylindrical, and slightly curved, granulose, having denticles at the tip.

Female genitalia: Small and short corpus bursae, semi membranous, short ductus seminalis, semi membranous; weakly sclerotized ductus bursae; anterior apophysis slightly shorter than posterior apophysis which is extended beyond corpus bursae; semi membranous papillae anales, well setosed.

Distribution:

India: Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Karnataka, Gujarat, Maharashtra and Andaman and Nicobar Islands. (Shubhalaxmi *et al.,* 2021)

Elsewhere: Sri Lanka, Nepal, Bhutan, Bangladesh, Myanmar, Thailand, S China, Philippines, Indonesia, Malaysia and Taiwan. (Shubhalaxmi *et al.,* 2021)

Remarks: Shubhalaxmi *et al.,* (2011) have mentioned the presence of this species in Mizoram. The present study confirms its presence in Mizoram.

V. Genus *Psilogramma* Rothschild & Jordan, 1903

Psilogramma Rothschild & Jordan, 1903; *Novit. Zool.* 9 *(Suppl.)*: 29, 42

9. ***Psilogramma discistriga*** (Walker, 1856)

Wingspan: Male: 102 – 140mm.

Material examined: Site 6 (23˚44'15" N 92˚57'05" E), 767m, 14.x.2020 – 2 (132, 120); Site 7 (23˚40'13" N 92˚28'50" E), 776m, 03.viii.2021 – 3 (118, 124, 140); Site 3 (24°16'00" N 92°50'01" E), 143m, 14.iii.2021 – 7♂; Site 11 (23˚59'17" N 92˚35'57" E), 345m, 05.v.2021 – 2 (114, 126). Coll. Lalruatthara Hmar, Isaac Zosangliana, Lalhmangaiha Khiangte.

Diagnosis: Species belonging to the genus *Psilogramma* shows strong similarity with its congeners based on their appearance, wing pattern and coloration. Head, thorax, forewing and abdomen are grey with a numerous dark patch. Antennae serrated, hook tipped. Dark dorsal lateral stripe from palpus till the end of thorax. Abdomen with three straight dark stripes on the dorsal side from the first to last

segment. Forewing with dark streak from costa, discal cell with numerous dark patches fades at the interspace, dark streak at the margin. Hindwing whitish grey at base and darker towards outer margin.

Male genitalia: Uncus well developed, divided into two curved lobes equally sclerotized, few setae at the base; gnathos membranous; long valva, sclerotized, extending beyond the uncus, inner part well setosed with setae all over; saccus broad at base, extended and narrow toward tip, well sclerotized. Aedeagus sclerotized, distal end having backward directed sclerotized plate.

Distribution:

Andaman Islands, Arunachal Pradesh, Assam, Delhi, Punjab, Jharkhand, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Sikkim, Himachal Pradesh, Karnataka, Tamil Nadu, Uttarakhand and West Bengal (Irungbam & Fric, 2021).

Elsewhere: Bhutan, Bangladesh, Myanmar, China, Indonesia, Hong Kong, Vietnam, Laos, Thailand, Malaysia and Philippines (Irungbam & Fric, 2021).

Remarks: The species is recorded here for the first time from Mizoram.

VI. Genus *Agrius* Hübner, [1819]

Agrius Hübner, [1819]; *Verz. bek. Schmett*. (9): 140

10. ***Agrius convolvuli*** (Linnaeus, 1758)

Sphinx convolvuli Linnaeus, 1758; Syst. Nat. (Edn. 10) 1: 435;

Wingspan: 84 – 108mm. Male: 84 – 105mm; Female: 106 - 108mm)

Material examined: Site 12 (23˚27'14" N 92˚45'07" E), 1487m, 16.vii.2020 – 3♂ 2♀; Site 4 (24˚15'55" N 92˚48'18" E) 615m, 21.vii.2022 – 1♂. Coll. Lalruatthara Hmar, Isaac Zosangliana, Lalhmangaiha Khiangte.

Diagnosis: Sexually dimorphic. Female are usually larger than male. Head, thorax and antenna Light grey with no hook at the tip. Thorax with two lines marking on top. Slightly red marking at the 1st segment of the abdomen, light pink marking on the abdominal ribs from 2nd to 6th segment. Forewing ground colour with numerous dark patches and markings which is usually less in female. Hindwing light grey, wavy dark line arises from base extending towards the outer margin.

Male genitalia: Uncus broad at base, narrow towards tip, sclerotized, tip curved; gnathos membranous; weakly sclerotized valve, having setosed at the inner side; sclerotized sacculus having small extension; harpe well defined, sclerotized and pointy; weakly sclerotized saccus, short and small. Aedeagus small, well sclerotized wall, cylindrical, having denticle at the tip.

Female genitalia: Small but long corpus bursae, semi membranous; relatively long ductus bursae; short antrum; posterior apophysis is slightly longer than anterior apophysis; papillae anales weakly sclerotized, having small setae.

Distribution:

India: Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Delhi, Himachal Pradesh, Punjab, Jammu and Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal (Irungbam & Fric, 2021).

Elsewhere: Throughout the tropical and subtropical Old World, Mongolia, Siberia and Japan (Holloway, 1987).

Remarks: The species is reported for the first time from Mizoram. This species is reported to frequent the lowland areas but its presence has been reported at an elevation above 1000m asml.

VII. Genus *Daphnis* Hübner, [1819]

Daphnis Hübner, [1819]; *Verz.bek. Schmett*. (9): 134

11. ***Daphnis nerii*** (Linnaeus, 1758)

Sphinx nerii Linnaeus, 1758; *Syst. Nat*. (*Edn* 10) 1: 490

Wingspan: Female: 102 – 104mm.

Material examined: Site 2 (23˚44'11" N 92˚42'51" E) 1012m asl. 15.iii.2020 – 1♀; (23˚44'01" N 92˚42'37" E) 953m asl. 30.x.2022 – 1♀. Coll. Lalruatthara Hmar.

Diagnosis: Head greenish with reddish brown in front, vertex with a grey band. Antennae uni-pectinated, greyish white. Thorax green with collar outlined in grey. Pale greenish abdomen, oblique line at side of each segment. Forewing dark green, numerous white patches, slight pink curved marking arising from basal line and end on upper side of the discal cell with a dark spot at the base. Hindwing brownish grey with a pale curved sub marginal line, beyond in which the area is olive green, with white speck at the end.

Female genitalia: Corpus bursa broad and long, semi membranous. Cornuti clearly visible. Ductus bursa short and massive almost equal in size with corpus bursa, membranous. Anterior and posterior apophysis short.

Distribution:

India: Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Maharashtra and Gujarat. (Shubhalaxmi *et al.,* 2011).

Elsewhere: Sri Lanka, Pakistan, Bhutan, Myanmar, Thailand, China, Taiwan, Japan, Malaysia, Europe, Yemen, Africa, Mauritius, Saudi Arabia and Afghanistan (Shubhalaxmi *et al*., 2011).

Remarks: Shubhalaxmi *et al.,* (2011) have mentioned the presence of this species in Mizoram. The present record confirms its presence in Mizoram.

VIII. Genus *Macroglossum* Scopoli, 1777

Macroglossum Scopoli, 1777; *Introd. Hist. nat*.: 414

12. ***Macroglossum gyrans*** Walker, 1856

Macroglossum gyrans Walker, 1856; *List Spec. Lepid. Insects Colln Br. Mus*. 8: 91

Wingspan: Male 46mm; Female: 50mm.

Material examined: Site 2 (23˚43'57" N 92˚42'32" E) 911m, vii.2020 – 1♂ 1♀. Coll. Lalruatthara Hmar.

Diagnosis: The upper side of the head, thorax, and basal half of the abdomen are the same dark grey colour as the forewing upper side. Antenna serrated and club shape. The underside of the palpus, thorax, and legs are almost pure white. The sides of the thorax and legs are shaded or speckled with light yellow scales. The forewing with numerous curved markings from discal cell to apical. Hindwing with a more conspicuous fascia as compared to forewing with a black patch beyond the yellow medial line.

Male genitalia: Uncus weakly sclerotized, curved, broad at base and narrow towards tips, with few setae at the base; valve weakly sclerotized and well setosed with setae from base to the end, long, extending beyond uncus, sacculus sclerotized, extended forming sinuate end; saccus moderate in size forming V-shape, sclerotized. Short aedeagus, sclerotized, narrow towards tip, forming a finger like projection, having denticle.

Female genitalia: Large corpus bursae, membranous, signum well defined and visible dark line extended from signum connected to ostium; anterior apophysis is longer than posterior apophysis, short antrum; sclerotized papillae anala setose with few setae.

Distribution:

India: Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Madhya Pradesh, Karnataka, Tamil Nadu, Gujarat and Maharashtra. (Shubhalaxmi *et al.*, 2021).

Elsewhere: Bhutan, Myanmar, Thailand and Sri Lanka (Shubhalaxmi *et al.*, 2021).

Remarks: Shubhalaxmi *et al.*, (2011) have mentioned the presence of this species in Mizoram. The present record confirms its presence in Mizoram.

IX. Genus *Pergesa* Walker, 1856

Pergesa Walker, 1856; *List Spec. Lepid. Insects Colln Br. Mus*. 8: 149

13. ***Pergesa acteus*** (Cramer, 1779)

Sphinx acteus Cramer, [1779]; *Uitl.Kapellen* 3 (17-21): 93

Wingspan: Male: 66 – 76mm.

Material examined: Site 11 (23˚59'17" N 92˚35'57" E), 345m, 05.v.2021 – 2♂; Site 7 (23˚40'13" N 92˚28'50" E), 776m, 03.viii.2021 – 2♂; Site 13 (22˚12'18" N 92˚53'12" E), 273m, 07.ix.2021 – 4♂; Site 3 (24°16'00" N 92°50'01" E), 143m, 14.iii.2021 – 1♂, 19.viii.2021 – 1♂, 10.xi.2021 – 1♂; Site 4 (24˚15'55" N 92˚48'18" E) 615m, 21.vii.2022 – 1♂. Coll. Lalruatthara Hmar, Isaac Zosangliana, Lalhmangaiha Khiangte.

Diagnosis: Close resemblance with *Theretra nessus*, but smaller in size. Head, thorax and abdomen olive green. Greyish white lateral marking arising from palpus extending till the end of thorax. Antennae serrated. Single line marking from 1st segment till last segment on the abdomen. Forewing apex, falcate and ferruginous at

the tornal region. Hindwing ferruginous, dark at the base, white lining on outer marginal area.

Male genitalia: Uncus sclerotized, slightly shorter than valve, setosed at the broad base narrow towards tips; weakly sclerotized valva with well setosed in the inner side; sacculus sclerotized and extended forming a pointy projection; short saccus, broad and rounded. Aedeagus broad at the base and narrow towards tips, well sclerotized, having denticle at the tip.

Distribution:

India: Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, West Bengal, Maharashtra, Karnataka and Andaman Island (Shubhalaxmi *et al.,* 2011).

Elsewhere: Sri Lanka, Nepal, China, Myanmar, Thailand, China, Taiwan, Japan, Malaysia, Singapore, Indonesia and Philippines (Shubhalaxmi *et al.*, 2011).

Remarks: Shubhalaxmi *et al.,* (2011) have mentioned the presence of this species in Mizoram. The present record confirms its presence in Mizoram.

X. Genus *Dolbina* Staudinger, 1877

Dolbina Staudinger, 1887, *in Romanoff, Mem. Lepid*. 3: 155.

14. ***Dolbina inexacta*** (Walker, 1856)

Dolbina inexacta (Walker, 1856); *List Spec. Lepid. Insects Colln Br. Mus*. 8: 208

Wingspan: Male: 80 – 88mm.

Material examined: Site 6 (23˚44'15" N 92˚57'05" E), 767m, 14.x.2020 – 3♂; Site 12 (23˚27'14" N 92˚45'07" E), 1487m, 16.vii.2020 – 3♂; Site 7 (23˚40'13" N 92˚28'50" E), 776m, 03.viii.2021 – 1♂.

Diagnosis: Head, thorax and abdomen suffused with black irrorated with light brown colour. Antenna serrated, hooked tip. Forewing with apex not produced, dark brown crenulated with numerous irregular white patches, a prominent white rounded spot on discocellulars. Hindwing suffused with brown, less intricate as compared to forewing. Marginal line crenulate with irregular white patches.

Male genitalia: The male genital is short and massive; short uncus, flat, curved, well sclerotized, slightly longer than valva; tegumen membranous; valva well sclerotized, setosed with few setae, bifid tip forming U-shape curved; saccus well developed, extended forming V-shape. Long aedeagus, cylindrical and well sclerotized forming a large single denticle pointing backward direction.

Distribution: Arunachal Pradesh, Assam, Himachal Pradesh, Punjab, Jammu and Kashmir, Jharkhand, Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, Manipur, Meghalaya and Uttarakhand (Irungbam & Fric, 2021).

Elsewhere: Northern Pakistan, Nepal, Bhutan, China, Myanmar, Thailand, Laos, Vietnam, Peninsular Malaysia and Japan (Irungbam & Fric, 2021).

Remarks: The species is recorded here for the first time from Mizoram.

XI. Genus *Cechetra* Rothschild & Jordan, 1903

15. ***Cechetra lineosa*** (Walker, 1856)

Chaerocampa lineosa Walker, 1856; *List Spec. Lepid. Insects Colln Br. Mus*. 8: 144

Wingspan: 90 – 108mm. ♂

Material examined: Site 1 (23˚44'14" N 92˚39'48" E), 804m, iii.2021 – 3♂; Site 3 (24°16'00" N 92°50'01" E), 143m, 10.xi.2021 – 5♂; Site 13 (22˚12'18" N 92˚53'12" E), 273m, 29.iii.2022 – 1♂; Site 4 (24˚15'55" N 92˚ 48'18" E) 615m, 21.vii.2022 – 3♂; Site 10 (23˚18'50" N 92˚47'46" E) 546m, 25.vii.2022 – 2♂.

Diagnosis: Head, thorax and abdomen olive green. Antenna greyish white, serrated. Forewing having ground colour of the upper side and tornal region, numerous dark lines from post basal towards the apex, a green patch near the costal margin extending from basal to post discal with a dark spot at the discal cell. Hindwing dark colour from base to the apex, grey arises from the base at the mid part with a whitish grey colour lined the outer margin.

Male genitalia: weakly sclerotized uncus, board at base with few setae; tegument membranous; valva elongated beyond uncus, well setose in the inner side, weakly sclerotized; sacculus weakly sclerotized, cylindrical extension narrowing towards tip; short saccus, weakly sclerotized. Short aedeagus narrow towards tips, weakly sclerotized having denticle at the tip.

Distribution:

India: Arunachal Pradesh, Ladakh, Sikkim, Assam, Himachal Pradesh, West Bengal, Manipur, Meghalaya and Uttarakhand (Irungbam & Fric, 2021).

Elsewhere: Nepal, Bhutan, Thailand, Taiwan, Myanmar, Southern China, Indonesia, Malaysia and Vietnam (Irungbam & Fric, 2021).

Remarks: The species is recorded here for the first time from Mizoram.

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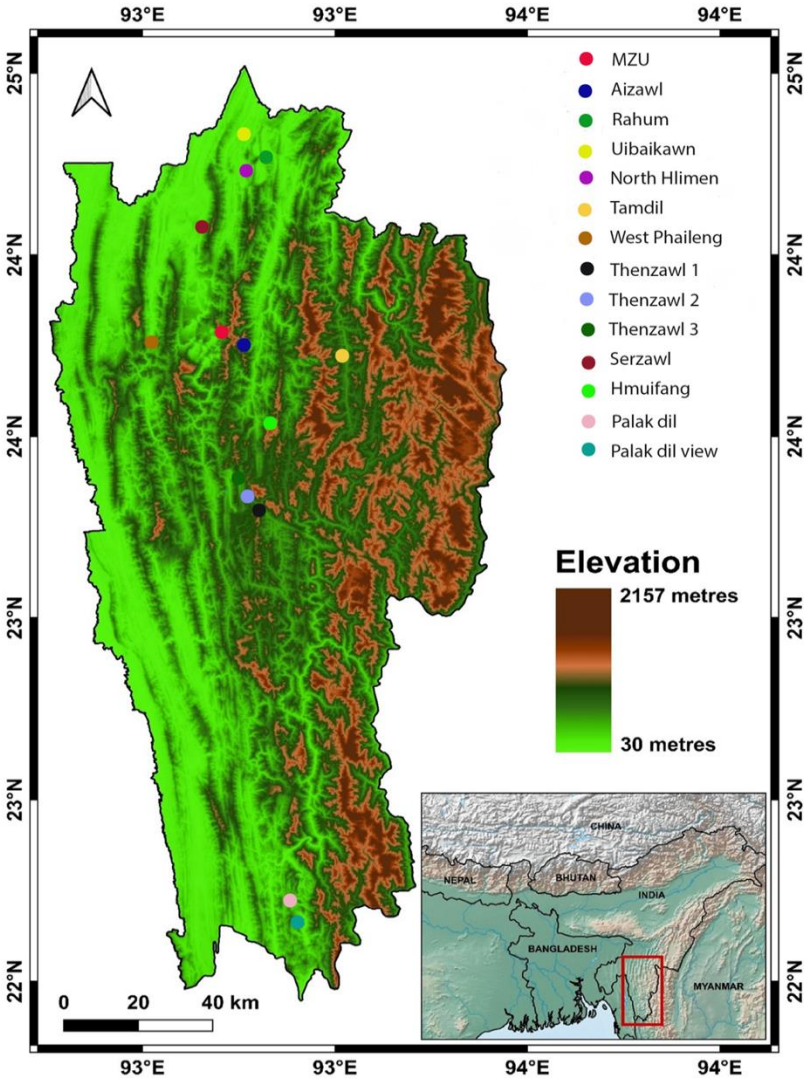

Figure 1: Map showing trapping localities during the study period

Figure 2: Sphingid moths collected during the study period. Each bar equals 10 mm.

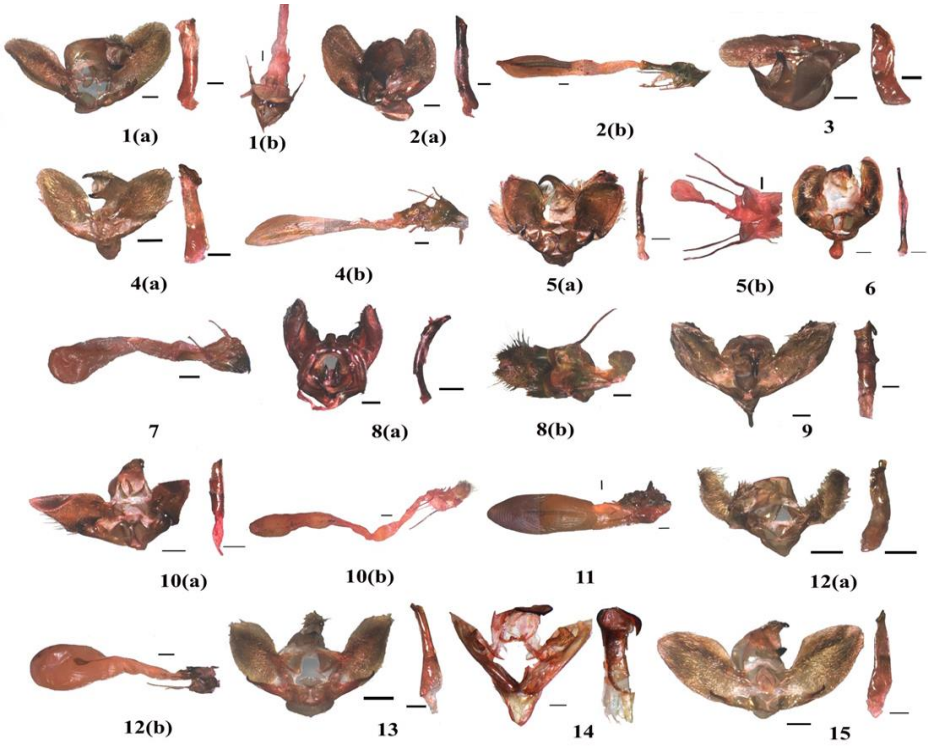

Figure 3: Genitalia of reported species. Scale bar = 0.1 mm.

1.*Theretra nessus* (a: male; b: female); 2. *Theretra clotho* (a: male; b: female); 3. *Theretra alecto* (male); 4. *Theretra oldenlandiae* (a: male; b: female); 5. *Acherontia lachesis* (a: male; b: female); 6. *Acherontia styx* (male); 7. *Neogurelca hyas* (female); 8. *Marumba dyras* (a: male; b: female); 9. *Psilogramma discistriga* (male); 10. *Agrius convolvuli* (a: male; b: female); 11. *Daphnis nerii* (female). 12. *Macroglossum gyrans* (a: male; b: female); 13. *Pergesa acteus* (male); 14. *Dolbina inexacta* (male); 15. *Cechetra lineosa* (male).