



EREBID MOTHS IN THE AGROECOSYSTEMS OF NORTHERN KERALA

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ABSTRACT

The occurrences of erebid moths were monitored in the agroecosystems of Northern Kerala. Five districts viz., Malappuram, Kozhikode, Wayanad, Kannur and Kasaragod were covered during March 2018 to 2020 with 98 nights of survey. The observations led to observations on 1085 specimens and 121 species under 83 genera in ten subfamilies viz., Aganainae, Arctiinae, Boletobiinae, Calpinae, Erebininae, Herminiinae, Hypeninae, Lymantriinae, Pangraptinae, Scoliapteryginae.

Key words: Kerala, agroecosystems, Lepidoptera, Heterocera, subfamilies, genera, species occurrence, pest status, distribution, banana, cashew, coffee, vegetables, paddy, spices, cocoa, rubber

Order Lepidoptera comprises moths and butterflies that has important roles in the agroecosystem as herbivores and as food for predatory and parasitic species (Sivasanakaran K. et al., 2014). An estimated 1, 27,000 species of moths have been reported worldwide (Alfred et al., 1998). From India over 12,000 moth species have been reported so far (Chandra and Nema, 2007). There are few studies that have examined regional moth diversity in southern India, and specific studies on the moth diversity of Kerala are summarized as follows. Mathew and Rahamathulla (1995) reported 318 species of moths from the Silent Valley National Park during five months of survey. Sudheendra kumar and Mathew (1999) reported 277 species of moths from Parambikulam Wildlife Sanctuary during three years of survey. Mathew et al. (2004a) reported 128 species of moths from Shendurney Wildlife Sanctuary during two weeks of survey. Mathew et al. (2004b) reported 87 species of moths from Peppara Wildlife Sanctuary during two months of survey. Mathew et al. (2005) reported 113 species of moths from Peechi-Vazhani Wildlife Sanctuary. Mathew et al. (2007) reported 90 species of moths from Neyyar Wildlife Sanctuary during two months of survey. Mathew et al. (2018) reported 112 species of moths from the Vagamon Hills, Idduki during a year of survey.

Family Erebidae is a well known and diverse group of moths in the superfamily Noctuoidea with almost worldwide distribution. Erebidae was reviewed following molecular analysis of Noctuidae in the 2000s, with more than half of noctuid species being transferred to Erebidae. The group is known by 10,945 species, out of which 1929 species are reported from

the Oriental region (Heppner, 1991) and 525 species from India (Singh et al., 2014). The family includes the underwings (*Catocala*); litter moths (Herminiinae); tiger, lichen, and wasp moths (Arctiinae); tussock moths (Lymantriinae), including the arctic woolly bear moth (*Gynaephora groenlandica*); piercing moths (Calpinae and others); micronoctuoid moths (Micronoctuini); snout moths (Hypeninae); and zales, though many of these common names can also refer to moths outside the Erebidae (for example, crambid snout moths). These vary in size from the largest of all moths (>5 in 127 mm wingspan in the black witch) to the smallest of the macromoths (0.25 in 6 mm in some of the Micronoctuini). The coloration spans the full range of dull, drab, and camouflaged (e.g., *Zale lunifera* and litter moths) to vivid, contrasting, and colorful (e.g., Aganainae and tiger moths). The taxonomic studies on Indian Erebidae were mainly initiated in 19th century. Review of literature revealed that 'Catalogue of moths of India' by Cotes and Swinhoe (1887) was the first published catalogue on this group of moths from then limits of India (including Sri Lanka and Myanmar) with 204 species under 82 genera from Indian main land. Besides this, Indian Erebidae has also received a good attention by eminent lepidopterists like Moore (1865, 1867, 1872), Hampson (1891, 1892, 1894, 1896, 1900, 1901, 1903, 1907, 1914, 1918, 1919, 1920), Zerny (1912), Seitz (1913), Draudt (1914), Rothschild (1914, 1936), Strand (1919, 1922), Fletcher (1925), Bryk (1937) and Sevastopulo (1944, 1948). Due to the high altitude and favorable conditions, northern Kerala has an abundant and diverse flora and fauna. The region has a wide variety of insects, a major component of which is the order Lepidoptera, but scientific documentation

of the moth fauna from Northern Kerala is very much lacking. In the present study, an effort was made to document erebid moths occurring in agroecosystems of northern Kerala.

MATERIALS AND METHODS

The moths were collected from the agroecosystems of northern Kerala, covering five districts viz., Malappuram, Kozhikode, Wayanad, Kannur and Kasaragod from March 2018 to 2020, using vertical light sheet during 1800 hrs to 0600 hrs the over 98 nights of surveys, as followed by Mathew and Rahamathulla (1995). The survey was conducted from four different zones in each district. Kasaragod (12.4996°N, 74.9869°E), Ranipuram (12.4280°N, 75.3616°E), Kanhangad (12.3311°N, 75.0915°E) and Nileshwaram (12.2596°N, 75.1281°E) were the zones from Kasaragod district. Thalipparamba (12.0351°N, 75.3611°E), Iritty (11.9819°N, 75.6703°E), Koothuparamba (11.8319°N, 75.5655°E) and Thalassery (11.7491°N, 75.4890°E) were the zones from Kannur district. Kuttiady (11.6543°N, 75.7535°E), Perambra (11.5640°N, 75.7564°E), Balussery (11.4413°N, 75.8202°E) and Mukkam (11.3212°N, 75.9963°E) were the zones from Kozhikode district. Pulpally (11.7923°N, 76.1663°E), Sulthan bathery (11.6629°N, 76.2570°E), Muthanga (11.6691°N, 76.3695°E) and Kalpetta (11.6103°N, 76.0828°E) were the zones from Wayanad district. Parappanangadi (11.0540°N, 75.8555°E), Tirur (10.9167°N, 75.9245°E), Malappuram (11.0510°N, 76.0711°E) and Nilambur (11.2855°N, 76.2386°E) were the zones from Malappuram district.

A light trap consisting of two 65w CFL bulb and 160w mercury vapour lamp was powered by a battery box, portable generator (Honda TM EP 1000) or electrical mains, if available, and placed in front of a 4x5 ft. white cotton screen (Shamsudeen et al., 2005). Quantitative measures of moth density permit assessment of the pest status of various species related to specific agricultural crops. In each case, an economic injury level (EIL) is determined as the pest density at which the loss caused by the pest equals in value the costs of available control measures or, in other words, the lowest population density that will cause economic damage. EIL of species were compared with the results published by NBAIR (2020), TNAU and a checklist is prepared. The collected moths were killed by using ethyl acetate and by instant freezing using freezing pads. They were later stretched using standard spreading boards, pinned, and preserved in airtight

insect box, having naphthalene balls as fumigant as discussed by Mikkola (1986) and Landry and Landry (1994). The standard techniques given by Zimmerman (1978) have been followed for spreading of wings. Each specimen was provided with a label indicating the scientific name, locality and date of collection. With regard to systematic arrangement of families, Heppner (1998) was followed. The identification was done with the help of relevant literature (Hampson, 1892, 1894, 1896; Kononenko and Pinratana, 2013, Kirti and Singh, 2015; Kirti and Singh, 2016, Singh et al., 2014). The classification followed in this manuscript is based on Nieukerken et al. (2011). The specimens were deposited in the 'National Zoological Collections' of the Zoological Survey of India, WGRC- Kozhikode (ZSIK). Specimens were photographed using canon Power shot sx430 Camera placing the specimen on graph paper for measurement purpose. Live Specimens collected were killed immediately by instant freezing and also by introducing in to killing jar and processed as per standard techniques in lepidopterology. The dry preservation is done in fumigated entomological boxes and stored in the insect cabinets in the Zoological Survey of India, WGRC- Kozhikode.

RESULTS AND DISCUSSION

Altogether 1085 specimens of 121 species of erebid moths belonging to 83 genera under ten subfamilies (Aganainae, Arctiinae, Boletobiinae, Calpinae, Erebiniae,

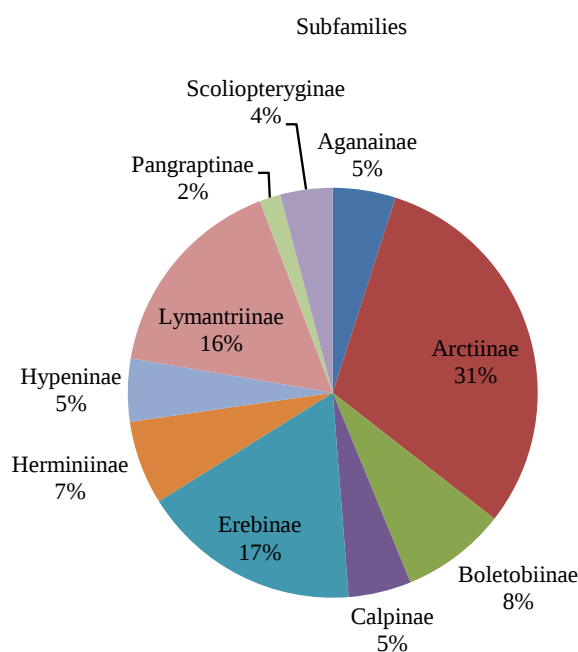


Fig. 1. Relative species abundance among the different subfamilies

Table 1. Checklist of Erebiidae from agroecosystems of northern Kerala

Subfamily	Scientific name	Location	Activity duration	No. of samples	Agroecosystem	Pest status
1. Aganainae	<i>Asota canaracia</i> Moore, 1878	KPTA, KSGD, NLSM, PLPY, SBRV	June 2019, August 2019	8	Banana, cashew, coffee	Minor pest of coffee
	<i>Asota caricae</i> Fabricius, 1775	MLPM, KPTA, KSGD, NMBR, PGDI, PLPY, SBRV	March 2019, March 2020, June 2019, July 2019, March-2020	39	Banana, cashew, coffee, mixed vegetables, paddy	Minor pest of coffee and ficus
	<i>Asota ficus</i> Fabricius, 1775	KTDY	March-2020	2	Mixed vegetables	Minor pest of Ficus
	<i>Asota plana</i> (Walker, 1854)	KPTA, KSGD, SBRV, PLPY, KNGD	March 2019, April 2019, June 2019, August 2019	10	Banana, cashew, coffee, paddy	Minor pest of ficus
	<i>Asota producta</i> (Butler, 1875)	KNGD	June 2019	2	Coffee	Minor pest of ficus
	<i>Neochera inops</i> (Walker, 1854)	KPTA, NMBR	March 2019, January 2019	5	Coffee	Data deficient
	<i>Adites hilaris</i> Walker, 1854	MTGA, KPTA, NMBR, TSRY, NLSM	January 2019, April 2019, December 2019	8	Banana, coffee, spices, mixed vegetables	Data deficient
	<i>Aloa lactinea</i> Cramer, 1777	SBRV	June 2019	1	Coffee	Polyphagous and feeds on almost all green vegetation
	<i>Amata cyssea</i> (Cramer, 1782)	KNGD, KPTA, TPMB, SBRV, NLSM, KPMB, BSRY, TIRR, KTDY	January 2019, March 2019, March-2020, August 2019, July 2019	25	Banana, coffee, mixed vegetables, paddy	Minor pest of sandalwood
	<i>Amerila astreus</i> Drury, 1773	KSGD	August 2019	1	Cashew	Minor pest of <i>Dioscorea</i> sp, <i>Ixora</i> sp.
	<i>Argina astrea</i> Drury, 1773	TPMB	March-2020	1	Mixed vegetables-	Minor pest of <i>Crotalaria</i> sp. <i>Ficus</i> sp., <i>Eugenia cordata</i> .
	<i>Barsine cuneatoratus</i> Singh & Kirti, 2016	KPTA, SBRV, MLPM, KSGD, PGDI	August 2019, June 2019, February 2019	10	Cashew, coffee, mixed vegetables	Data deficient
	<i>Brunia antica</i> Walker, 1854	TPMB, KPTA, PLPY, IRTY, TSRY, PRBA	January 2019, January 2019, June 2019, August 2019, November 2019, March 2020	15	Mixed vegetables, cocoa, rubber, cashew,spices	Major pest of citrus
	<i>Capissa vagesa</i> (Moore, 1859)	BSRY, NLSM, KPTA	August 2019, March 2020	5	Banana, mixed vegetables	Data deficient
2. Arctiinae	<i>Coleta coleta</i> (Stoll, 1781)	KPTA, RAPM	June 2019, August 2019	4	Banana, cashew, coffee	Data deficient
	<i>Creatonotos gangis</i> (Linnaeus, 1763)	NMBR, BSRY, SBRV, PLPY, KPTA, MLPM, PGDI, MTGA	January 2020, March 2019, June 2019	20	Cashew, coffee, mixed vegetables, paddy	Polyphagous and feeds on several host plants including coffee, sweetpotato.
	<i>Creatonotos transiens</i> (Walker, 1855)	MTGA, MUKM, PGDI, KNGD, KPTA, SBRV, KSGD, IRTY	January 2019, June 2019, February 2019, February 2020, March 2020, August 2019	25	Banana, cashew, coffee, paddy, rubber, spices	Minor pest of <i>Musa</i> sp.
	<i>Cyana catorrhoda</i> Hampson, 1897	KPTA, MLPM, PGDI	February 2020, August 2019	5	Banana, coffee, mixed vegetables	Data deficient
	<i>Cyana guttifera</i> (Walker, 1856)	BSRY, NMBR	December 2019	5	Mixed vegetables	Minor pest of <i>Mangifera indica</i> , <i>Tectona grandis</i> , <i>Camellia sinensis</i> .
	<i>Cyana peronata</i> (Walker, 1854)	KPTA, NLSM, SBRV, MTGA	June 2019, August 2019, February-2020	8	Coffee, banana, mixed vegetables	Minor pest of <i>Mangifera indica</i> , <i>Tectona grandis</i> , <i>Camellia sinensis</i> .
	<i>Eilema sororcula</i> (Hufnagel, 1766)	KTDY, IRTY, KPTA, PLPY	January-2020, August 2019, April 2019	8	Coffee, banana, paddy	Data deficient
	<i>Eressa confinis</i> Walker, 1854	RAPM, SBRV, PLPY, TIRR, NLSM, KPMB, BSRY, KPTA, IRTY	January 2019, March 2019, June 2019, September 2019	20	Coffee, spices, mixed vegetables, paddy	Minor pest of <i>Cosmos</i> sp., <i>Dhalia</i> sp., Sandal wood, Sweet potato

(contd. Table 1)

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<i>Eugoa basipuncta</i> (Hampson, 1891)	KSGD, NMBR, PGDI	January 2019, June 2019, October 2019	5	Cashew, mixed vegetables	Data deficient
<i>Gampola sinica</i> Dubatolov, Kishida & Wang, 2012	BSRY, PGDI, TSRY, MLPM, MUKM	June 2019, July 2019, August 2019, September 2019, December 2019	15	Spices, mixed vegetables	Data deficient
<i>Lyclene goensis</i> Kriti and Gill, 2009	KPTA, RAPM, PGDI, TPMB, KPMB, SBRY, TSRY, KTDY	February 2020, March 2020, June 2020, July 2019, November 2019	20	Spices, mixed vegetables, paddy	Data deficient
<i>Lyclene obsoleta</i> Moore, 1878	MTGA, RAPM, KSGD, PGDI, KNKD, PRBA	April 2019, January 2020, June 2019, September 2019	20	Coffee, spices, paddy, mixed vegetables, cocoa	Data deficient
<i>Lyclene terminospota</i> Singh, Kriti and Joshi, 2015	PLPY, MUKM, MLPM, NMBR	January 2019, June 2019, November 2019	10	Cashew, spices, rubber, mixed vegetables	Minor pest of paddy
<i>Lyclene uncalis</i> Kriti and Gill, 2009	KSGD, NLSM, SBRY, TSRY	June 2019, July 2019	8	Cashew, paddy	Data deficient
<i>Macotasa nubecula</i> (Moore, 1879)	TSRY, MTGA, KPTA, RAPM, KSGD, MUKM, PGDI	January 2019, February 2020, August 2019, October 2019, June 2019	15	Cashew, coffee, paddy, spices, mixed vegetables, banana	Data deficient
<i>Macotasa tortricoides</i> (Walker, 1862)	KNKD, KPTA, PLPY, PRBA, RAPM	January 2020, December 2019	10	Cocoa, spices, mixed vegetables	Data deficient
<i>Neptia conferta</i> (Walker, 1854)	NLSM, BSRY, TIRR, MUKM, KTDY, IRTY	June 2019, July 2019	25	Spices, mixed vegetables	Minor pest of <i>Eleusine coracana</i> , <i>Solanum melongena</i>
<i>Nishada pseudochilomorpha</i> Joshi and Singh, 2016	MTGA, NMBR	January 2019	4	Cashew	Data deficient
<i>Nyctemera lactinicia</i> (Cramer, 1779)	KPTA, PRBA	August 2019, December 2019	5	Cocoa, coffee, spices	Minor pest of sandal, <i>Erogeron</i> sp.
<i>Olepa clavatus</i> (Swinhoe, 1885)	PLPY, KNKD	January 2019, June 2019	2	Coffee, banana	Major pest of banana, brinjal. Minor pest of <i>Camellia sinensis</i> , Cucurbits.
<i>Olepa ricini</i> Fabricius, 1775	KPTA, PGDI, KSGD, MUKM, SBRY, MLPM	March 2019, June 2019, March 2020, August 2019	20	Banana, coffee	Minor pest of brinjal, sweet potato, banana, <i>Cucurbita</i> etc.
<i>Oeonitis entella</i> (Cramer, [1779])	KPTA, NMBR	August 2019	5	Coffee	Data deficient
<i>Padenia transversa</i> (Walker, 1854)	TPMB, KPTA, PLPY, KPMB	January 2019, July 2020	8	Coffee, rubber, spices, mixed vegetables	Data deficient
<i>Pareuchaetes pseudoinsulata</i> Rego Barros 1956	KTDY, BSRY, IRTY, SBRY	January 2019, March 2020, April 2019, August 2019	98	Banana, cashew, coffee, mixed vegetables	Minor pest of <i>Chromolaena odorata</i> , <i>Eupatorium</i> sp.
<i>Pseudoblabeis oophora</i> Zeller, 1853	IRTY, NMBR	January 2019	2	Spices	Larvae feeds on lichen and moss on tree trunks.
<i>Rajendra perrottetii</i> Guerin-Meneville 1844	SBRY, NMBR	April 2019	4	Banana	Data deficient
<i>Spilosoma obliqua</i> (Walker, 1855)	PRBA, RAPM	June 2019	10	Cocoa, cashew	Major pest of cucurbits and cashew
<i>Syntomoides imaon</i> Cramer, 1780	KNKD, BSRY, KPTA, SBRY, TPMB, PGDI, NLSM, NMBR, TIRR, PRBA	January 2020, February 2020, March 2019, June 2019, July 2019, August 2019	75	mixed vegetables, paddy, spices, rubber, cocoa	Minor pest of sweet potato, sandalwood etc.
<i>Utheisa lotrix</i> Cramer, 1777	TSRY, BSRY, NLSM, PGDI	February 2020, March 2020, August 2019	5	Mixed vegetables, spices	Minor pest of <i>Crotalaria</i> sp., <i>Dahlia</i> sp. <i>Heliotropium indicum</i>

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3. Boletohiinae	<i>Ataboruza divisa</i> Walker, 1862	TSRY	June 2019	1	Rubber	Data deficient
	<i>Ataboruza lauta</i> Butler, 1878	KSGD	January 2019	1	Cashew	Data deficient
	<i>Autoba</i> sp. Walker, 1863	NMBR, MLPM	March 2020, March 2019	2	Banana, paddy	Data deficient
	<i>Caduca albopunctata</i> Walker, 1857	PLPY	June 2019	2	Cashew	Larvae feed on fungus
	<i>Corgatha tornalis</i> Wileman, 1915	NLSM	August 2019	5	Paddy	Data deficient
	<i>Corgatha zonalis</i> Walker, 1859	PGDI, NMBR	June 2019	5	Banana	Data deficient
	<i>Diomea</i> sp. Walker, 1858	KSGD	December 2019	4	Cashew	Data deficient
	<i>Homodes bracteigutta</i> Walker, 1862	PGDI, NMBR	June 2019	2	Banana	Minor pest of <i>Mangifera</i> sp., <i>Hevea</i> , <i>Cinnamomum</i> , <i>Coffea</i> , <i>Nephelium</i>
	<i>Lemyra coorgensis</i> Singh and Kirti, (2016)	KPTA, SBRY	August 2019	5	Cashew, coffee	Occasionally serious pest of Fabaceae spp.
	<i>Zurobata vacillans</i> Walker, 1864	SBRY, KSGD	January 2019, August 2019	4	Coffee, spices	The larva feeds on fungus on dead leaves, several lichens and Coccoidea (scale insects).
4. Calpinae	<i>Dierna patibulum</i> Fabricius, 1794	KSGD, NLSM	August 2019, December 2019	5	Cashew	Data deficient
	<i>Eudocima homaena</i> (Hubner, [1823] 1816)	NLSM, NMBR	July 2019	10	Mixed vegetables	Major pest of citrus and many vegetables.
	<i>Eudocima hypermenestra</i> Cramer, 1780	TSRY, NMBR	August 2019	5	Mixed vegetables	Major pest of guava, mango
	<i>Eudocima materna</i> (Linnaeus, 1767)	PGDI, MUKM	March 2020, September 2019	8	Banana, mixed vegetables	Major pest of <i>Citrus</i> sp., aonla -gooseberry (<i>Phyllanthus emblica</i>)
	<i>Eudocima phalonia</i> Clerck, 1764	BSRY, KPTA, KSGD, NLSM, KTDY, TIRR, MUKM, KPMB, TPMB	January 2019, June 2019, July 2019, August 2019, September 2019	15	Banana, cashew, coffee, mixed vegetables	Major pests of citrus
	<i>Oraisia provocans</i> Walker, 1858	TIRR, KPMB	March-2020	4	Mixed vegetables	Minor pest of <i>Cissampelos</i> sp.,
	<i>Achaea janata</i> Linnaeus (1758)	PGDI, NLSM, NMBR, TIRR	January 2019, March 2020, December 2019, June 2019	5	Mixed vegetables, Rubber	Major pest of mango, ficus and citrus.
	<i>Artene dotata</i> Fabricius, 1794	MTGA, PLPY	March 2019, July 2019	2	Paddy, mixed vegetables	Minor pest of <i>Getonia</i> , <i>Terminalia</i> sp.
	<i>Avatha bubo</i> Geyer, 1832	KSGD, BSRY	April 2019, August 2019	2	Cashew	Major pest of <i>Nephelium</i> sp.
	<i>Bastilla arcuata</i> (Moore, 1887)	TIRR, MTGA	February-2020, June 2019, July 2019, August 2019	4	Mixed vegetables	Minor pest of <i>Phyllanthus</i> sp.
5. Erebiinae	<i>Bastilla crameri</i> Moore 1885	PGDI, NMBR	August 2019	2	Mixed vegetables	Minor pest of <i>Phyllanthus</i> sp.
	<i>Erebus ephesperis</i> Hubner, [1823] 1816	TPMB, PGDI, TIRR	September 2019	5	Mixed vegetables	Major pest of <i>Smilax</i> sp.
	<i>Erebus hieroglyphica</i> Drury, 1773	MUKM, PGDI	September 2019	4	Mixed vegetables	Attracted to fallen overripe fruits
	<i>Ercheia cyllaria</i> (Cramer, 1779)	BSRY, KTDY, TIRR, TPMB, NLSM	September 2019, November 2019, December 2019	8	Spices, mixed vegetables	Minor pest of <i>Dalbergia</i> sp.
	<i>Ericia inangulata</i> Guenée, 1852	NLSM, KPTA, KSGD, KNGD	January 2019, April 2019, June 2019, August 2019	8	Cashew, coffee, paddy, rubber	Minor pest of <i>Cassia fistula</i> , <i>Albizia</i> , <i>Mimosa</i> , <i>Adiantum</i> , <i>Citrus</i> species.

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<i>Hamodes propitia</i> Guerin-Meneville, 1831	NMBR, TIRR	June 2019, July 2019, September 2019	5	Spices, mixed vegetables, rubber	Minor pest of <i>Dalbergia sissoo</i> .
<i>Hypopyra vespertilio</i> Fabricius, 1787	KPTA, NMBR	August 2019	5	Banana	Minor pest of <i>Albizia</i> sp., <i>Camellia sinensis</i>
<i>Laspeyria ruficeps</i> Walker, 1864	KSGD, RAPM	February 2020, December 2019	4	Paddy, spices	Data deficient
<i>Lygniodes hypoleuca</i> Guenee, 1852	KTDY, IRTY, PGDI, PRBA	June 2019, July 2019, September 2019	7	Cocoa, coffee, cashew, rubber, mixed vegetables	Attracted to fallen overripe fruits
<i>Mocis frugalis</i> Fabricius, 1775	TSRY, PRBA, IRTY, TPMB, PGDI	January 2019, February 2019, February 2020, July 2019, June 2019	8	Cashew, mixed vegetables, paddy, cocoa	Major pest of rice, <i>Cyperus rotundus</i> , <i>Panicum maximum</i> ,
<i>Mocis undata</i> Fabricius, 1775	KTDY, NMBR	June 2019, December 2019	8	Mixed vegetables	Minor pest of <i>Hevea</i> , <i>Indigofera</i> , <i>Vigna</i>
<i>Ophiusa onelia</i> Guenee, 1852	KPTA	July 2019	4	Mixed vegetables	Data deficient
<i>Oxyodes scrobiculata</i> Fabricius, 1775	KSGD, NMBR	August 2019	4	Cashew	Minor pest of <i>Aglaia</i> , <i>Nephelium lappaceum</i>
<i>Pandesma anysa</i> Guenee, 1852	BSRY, NMBR	December 2019	4	Mixed vegetables	Data deficient
<i>Sphingomorpha</i> sp. Guenee, 1852	KSGD, KNGD	June 2019	4	Cashew, rubber	Data deficient
<i>Spirama retorta</i> Clerck, 1764	NLSM, NMBR	September 2019	4	Mixed vegetables	Data deficient
<i>Thyas coronata</i> (Fabricius, 1775)	KSGD, PGDI, TIRR, TPMB	June 2019, July 2019, August 2019	10	Cashew, mixed vegetables	Minor pest of <i>Terminalia</i> , <i>Nephelium</i>
<i>Hadennia jutalis</i> (Walker, [1859])	PRBA, PLPY, TIRR, PGDI	June 2019, November 2019, August 2019, September 2019	8	Paddy, rubber, mixed vegetables	Data deficient
<i>Hadennia mysalis</i> (Walker, 1859)	BSRY, NMBR	February 2020	2	Mixed vegetables	Data deficient
<i>Hydrillodes gravatalis</i> (Walker, [1859])	BSRY, NMBR	March 2019	5	Mixed vegetables	Minor pest of detritus and pericarp of <i>Shorea</i>
<i>Hydrillodes hemusalis</i> (Walker, [1859])	BSRY, SBRY, KTDY, PLPY, PRBA, MUKM	August 2019, November 2019, December 2020	10	Cashew, mixed vegetables, coffee, rubber	Data deficient
<i>Nodaria</i> sp. Guenee, 1854	MTGA, RAPM, PRBA, PGDI	June 2019, February 2020, March 2020, December 2019	5	Banana, paddy, mixed vegetables, rubber, cocoa	Minor pest of Grasses, <i>Dalbergia sissoo</i> , <i>Onyza sativa</i> .
<i>Simplicia bimarginata</i> (Walker, 1864)	KNGD, KTDY, KPTA, RAPM	December 2019, August 2019	5	Spices, coffee	Data deficient
<i>Simplicia butesalis</i> Walker, 1859	MUKM, NMBR	January 2019	5	Mixed vegetables	Data deficient
<i>Simplicia caenualis</i> Walker, [1859]	RAPM, TPMB, NMBR	July 2019, December 2019	10	Cashew, paddy	Data deficient

6. Herminiinae

(contd.)

7. Hypeninae	<i>Dichromia pullata</i> Moore, 1885	KSGD, NMBR	August 2019	5	Cashew	Minor pest of <i>Tylophora</i> sp., <i>Dregea</i> sp.
	<i>Dichromia sagitta</i> (Fabricius, 1775)	KNGD, NMBR	December 2019	4	Mixed vegetables	Minor pest of <i>Asclepiadaceae</i> sp.
	<i>Hypena labatalis</i> Walker, 1859	NMBR, NLSM, RAPM, MLPM, TPMB, TIRR, PLPY	February 2020, January 2019, July 2019, December 2019	10	Cashew, spices, mixed vegetables, rubber, spices	Data deficient
	<i>Hypena obacerralis</i> Walker, 1859	NLSM, KNGD, PLPY, NMBR	June 2019	7	Banana, cashew, paddy, rubber	Data deficient
	<i>Hypena thermesialis</i> Walker, [1866]	BSRY, TPMB, NMBR	December 2019	8	Mixed vegetables	Data deficient
	<i>Nolasena ferriferens</i> Walker, 1858	KPTA, NMBR	August 2019	4	Coffee	Data deficient
	<i>Arctornis comma</i> Hutton, 1865	KPTA, TPMB, PLPY, NMBR	January 2020, August 2019, March 2020	8	Coffee, mixed vegetables -	Minor pest of <i>Camellia sinensis</i> , <i>Diospyros</i> sp.
	<i>Arctornis marginata</i> Moore, 1883	KSGD, NMBR	January 2019, August 2019, December 2019	4	Cashew, spices	Minor pest of <i>Camellia sinensis</i> , <i>Diospyros candolleana</i>
	<i>Arctornis submarginata</i> (Walker, 1855)	KSGD, PRBA, NLSM, TIRR, NMBR	January 2019, February 2020, August 2019	10	Cashew, rubber, mixed vegetables, cocoa	Minor pest of tea.
	<i>Artaxa cf. digamma</i> Boisdual, 1844	TSRY, PGDI, KSGD, RAPM, NMBR	January 2019, June 2019, November 2019	10	Cashew, mixed vegetables, spices	Data deficient
	<i>Calliteara grotei</i> Moore, 1859	PRBA, RAPM, PLPY, KPTA	January 2019, June 2019, August 2019	10	Banana, cashew, coffee, Cocoa	Minor pest of <i>Tectona grandis</i> , <i>Acacia</i> , <i>Psidium guajava</i> , <i>Syzygium aqueum</i>
	<i>Carriola ecnomoda</i> Swinhoe, 1907	PRBA	January 2019	4	Cocoa, cashew	Data deficient
	<i>Euproctis lutea</i> (Fabricius, 1775)	MTGA, TSRY, MLPM	February 2019, August 2019	5	Paddy, rubber	Minor pest of <i>Lycopersicum esculentum</i> , <i>Begonia</i> , <i>Rosa odorata</i>
	<i>Euproctis</i> sp.1 Hübner, 1819	KNGD, BSRY, KPTA, NLSM, BSRY, TPMB	February-2020, March 2019, June 2019	8	Coffee, paddy	Major pest of mango
	<i>Euproctis</i> sp.2 Hübner, 1819	PRBA, MTGA	November 2019, December 2019	5	mixed vegetables, spices, cocoa	Major pest of citrus, coffee, tea, cocoa
	<i>Lymantria incerta</i> Walker, 1855	PGDI, PRBA	February-2020, March-2020	5	Mixed vegetables, rubber, cocoa	Minor pest of mango, <i>Terminalia</i> sp.
	<i>Lymantria marginata</i> Walker, 1855	NLSM	December 2019	4	Mixed vegetables	Minor pest of mango
	<i>Lymantria serva</i> (Fabricius, 1793)	KTDY, PGDI, TPMB, KPMB	February 2020, March 2020	8	Banana, spices, mixed vegetables	Minor pest of <i>Terminalia</i> sp., <i>Ficus</i>
	<i>Lymantria todara</i> Moore, 1879	PRBA, BSRY	February 2020, March 2020	5	Rubber, mixed vegetables, cocoa	Minor pest of mango, <i>Terminalia</i> sp.
8. Lymantriinae	<i>Lymantria</i> sp.1 Hübner, 1819	PGDI	March 2020	2	Mixed vegetables	Minor pest of <i>Terminalia</i> sp.
	<i>Nygmia icilia</i> Stoll [1790]	BSRY, KPTA, PGDI	February 2020	8	Banana, mixed vegetables	Minor pest of <i>Loranthus</i>
	<i>Nygmia semifumosa</i> (Holloway, 1976)	PLPY, PRBA, TPMB, PGDI	March 2019, June 2019, December 2019	8	Cashew, paddy, mixed vegetables, rubber, cocoa	Data deficient
	<i>Olene mendosa</i> Hübner, 1823	KNGD, KPTA, SBRY, PRBA	January 2019, February 2020, February 2019, June 2019	25	Coffee, paddy, rubber, cocoa	Minor pest of mango, sapota, brinjaj, bhendli, sweet potato, tea, coffee
	<i>Orgyia postica</i> Walker, 1855	SBRY	July 2019	5	Coffee	Minor pest of redgram, tea, teak, <i>Santalum album</i> , <i>Cinnamomum</i> sp.

(contd.)

9. Pangraptiinae	<i>Perina nuda</i> Fabricius, 1787	BSRY, KPMB, NMBR, IRTY, TIRR, PGDI	January 2019, May 2019, June 2019, August 2019, June 2019, July 2019,	10	Banana, cashew, mixed vegetables	Major pest of mango, <i>Artocarpus integer</i> , <i>Ficus</i>
	<i>Somena scintillans</i> Walker, 1856	KNGD, KPTA, TPMB, SBRY, NLSM, KPMB, BSRY, TIRR, KTDY		40	Coffee	Minor, sporadically serious pest of cucurbits, cowpea, <i>Lantana camara</i> , <i>Mangifera indica</i> , <i>Hibiscus rosa-sinensis</i>
	<i>Egnasia ephyrodalis</i> Walker, 1858	RAPM	December 2019	8	Spices	Minor pest of <i>Randia uliginosa</i>
	<i>Episparis tortuosalis</i> Moore, 1867	SBRY, NLSM	December 2019	7	Coffee, mixed vegetables	Minor pest of <i>Schleichera</i> sp., <i>Magnolia champaca</i>
10. Scoliopteryginiinae	<i>Anomis flava</i> Fabricius, 1775	TSRY, TIRR, MUKM, MTGA	June 2019, November 2019, March 2020	7	Banana, mixed vegetables	Minor pest of bhendi, hibiscus.
	<i>Anomis sabulifera</i> Guenée, 1852	KNGD	June 2019	2	Banana	Data deficient
	<i>Anticarsia gemmatilis</i> Hübner, 1818	NMBR, PGDI	February 2020, October 2019	2	Mixed vegetables	Data deficient
	<i>Anticarsia irrorata</i> (Fabricius, 1781)	MLPM	June 2019	2	Rubber	Data deficient
10. Scoliopteryginiinae	<i>Rusicada privata</i> (Walker, 1865)	NLSM	November 2019	7	Mixed vegetables	Minor pest of Hibiscus

*Abbreviations: KSGD = Kasaragod, RAPM = Ranipuram, KNGD = Kanhangad, NLSM = Nileschwaram, TPMB = Thalipparambu, IRTY = Irtty, KPMB = Kothuparambu, TSRY = Thalassery, KTDY = Kuttyadi, PRBA = Perambra, BSRY = Balussery, MUKM = Mulkam, PLPY = Pulpally, SBRY = Sulthan bathery, MTGA = Muthanga, KPTA = Kalpetta, PGDI = Parappanangadi, TIRR = Tirur, MLPM = Malappuram, NMBR = Nilambur

Herminiinae, Hypeninae, Lymantriinae, Pangraptinae, Scoliopteryginae) were observed from different agroecosystems of northern Kerala (Figs. 2-123). The detailed species checklist and pest status are provided in Table 1. Among the ten subfamilies, Arctiinae was the dominant one with 37 species followed by Erebininae (21), Lymantriinae (20), Boletobiinae (10), Herminiinae (8), Aganainae, Hypeninae and Calpinae (6 each), Scoliopteryginae (5) and Pangraptinae (2). District

wise distribution revealed that the subfamily Aganainae and Arctiinae were collected more from Wayanad district; Boletobiinae from Malappuram district; Calpinae from Kasaragod and Malappuram districts; Erebininae from Malappuram district; Herminiinae from Kozhikode and Malappuram districts; Hypeninae and Lymantriinae from Malappuram district; Pangraptinae from Kasaragod district; and Scoliopteryginae from Kasaragod and Malappuram district (Table 1). These

Figs. 2-123. Erebininae moths of agroecosystems of northern Kerala
Subfamily Aganainae



Fig. 2. *Asota canaracia*



Fig. 3. *Asota caricae*



Fig. 4. *Asota ficus*



Fig. 5. *Asota plana*



Fig. 6. *Asota producta*



Fig. 7. *Adites hilaris*



Fig. 8. *Neochera inops*

Subfamily Arctiinae



Fig. 9. *Aloa lactinea*



Fig. 10. *Amata cyssea*



Fig. 11. *Amerila astreus*



Fig. 12. *Argina astrea*

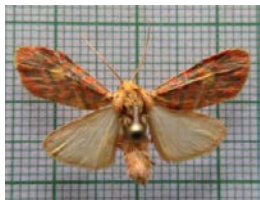


Fig. 13. *Barsine cuneorotatus*



Fig. 14. *Brunia antica*



Fig. 15. *Capissa vagesa*



Fig. 16. *Coleta coleta*

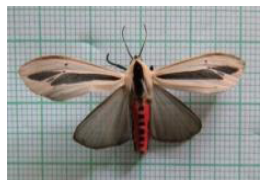


Fig. 17. *Creatonotos gangis*



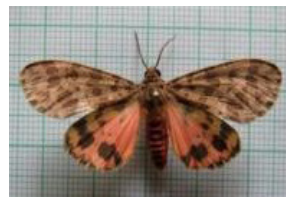
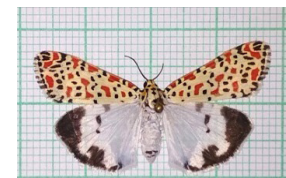
Fig. 18. *Creatonotos transiens*



Fig. 19. *Cyana catorhoda*



Fig. 20. *Cyana guttifera*

Fig. 21. *Cyana peronsata*Fig. 22. *Eilema sororcula*Fig. 23. *Eressa confinis*Fig. 24. *Eugoa basipuncta*Fig. 25. *Gampola sinica*Fig. 26. *Lyclene goaensis*Fig. 27. *Lyclene obsoleta*Fig. 28. *Lyclene terminospota*Fig. 29. *Lyclene uncalis*Fig. 30. *Macotasa nubecula*Fig. 31. *Macotasa tortricoides*Fig. 32. *Nepita conferta*Fig. 33. *Nishada pseudochilomorpha*Fig. 34. *Nyctemera lacticinia*Fig. 35. *Olepa clavatus*Fig. 36. *Olepa ricini*Fig. 37. *Oeonitis entella*Fig. 38. *Padenia transversa*Fig. 39. *Pareuchaetes pseudoinsulata*Fig. 40. *Pseudoblabeis oophora*Fig. 41. *Rajendra perrottetii*Fig. 42. *Spilosoma obliqua*Fig. 43. *Syntomoides imaon*Fig. 44. *Utetheisa lotrix*

Subfamily Boletobiinae



Fig. 45. *Ataboruza divisa*



Fig. 46. *Ataboruza lauta*



Fig. 47. *Autoba* sp.



Fig. 48. *Caduca albopunctata*



Fig. 49. *Corgatha tornalis*



Fig. 50. *Corgatha zonalis*



Fig. 51. *Diomea* sp.



Fig. 52. *Homodes bracteigutta*



Fig. 53. *Lemyra coorgensis*



Fig. 54. *Zurobata vacillans*



Fig. 55. *Dierna patibulum*



Fig. 56. *Eudocima homaena*

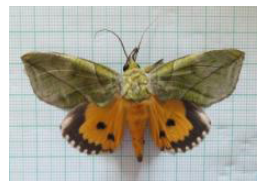


Fig. 57. *Eudocima hypermenestra*



Fig. 58. *Eudocima materna*



Fig. 59. *Eudocima phalonia*



Fig. 60. *Oraesia provocans*

Subfamily Erebinae

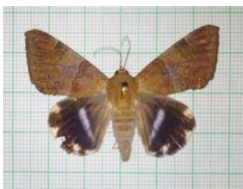


Fig. 61. *Achaea janata*



Fig. 62. *Artana dotata*



Fig. 63. *Avatha bubo*



Fig. 64. *Bastilla arcuata*

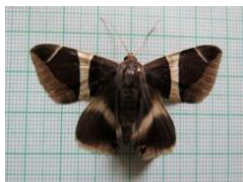


Fig. 65. *Bastilla crameri*

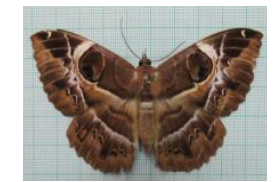


Fig. 66. *Erebus ephespheris*



Fig. 67. *Erebus hieroglyphica*

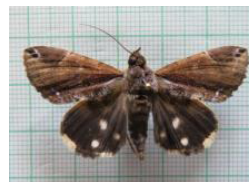
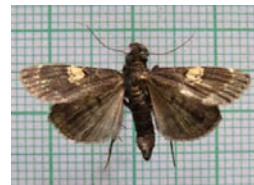


Fig. 68. *Ercheia cyllaria*

Fig. 69. *Ericeia inangulata*Fig. 70. *Hamodes propitia*Fig. 71. *Hypopyra vespertilio*Fig. 72. *Laspeyria ruficeps*Fig. 73. *Lygniodes hypoleuca*Fig. 74. *Mocis frugalis*Fig. 75. *Mocis undata*Fig. 76. *Ophiusa onelia*Fig. 77. *Oxyodes scrobiculata*Fig. 78. *Pandesma anysa*Fig. 79. *Spirama retorta*Fig. 80. *Sphingomorpha* sp.Fig. 81. *Thyas coronata*

Subfamily Herminiinae

Fig. 82. *Hadennia jutalis*Fig. 83. *Hadennia mysalis*Fig. 84. *Hydrillodes gravatalis*Fig. 85. *Hydrillodes hemusalis*Fig. 86. *Nodaria* sp.Fig. 87. *Simplicia bimarginata*Fig. 88. *Simplicia butesalis*Fig. 89. *Simplicia caenusalis*

Subfamily Hypeninae



Fig. 90. *Dichromia pullata*



Fig. 91. *Dichromia sagitta*



Fig. 92. *Hypena labatalis*



Fig. 93. *Hypena obacerralis*



Fig. 94. *Hypena thermesia*



Fig. 95. *Nolasena ferrifervens*

Subfamily Lymantriinae



Fig. 96. *Arctornis comma*



Fig. 97. *Arctornis marginata*



Fig. 98. *Arctornis submarginata*



Fig. 99. *Artaxa cf. digramma*



Fig. 100. *Calliteara grotei*



Fig. 101. *Carriola ecnomoda*



Fig. 102. *Euproctis lutea*



Fig. 103. *Euproctis* sp.1



Fig. 104. *Euproctis* sp.2



Fig. 105. *Lymantria incerta*



Fig. 106. *Lymantria marginata*



Fig. 107. *Lymantria serva*



Fig. 108. *Lymantria todara*



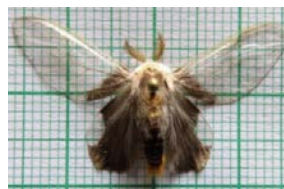
Fig. 109. *Lymantria* sp.1



Fig. 110. *Nygmia icilia*



Fig. 111. *Nygmia semifumosa*

Fig. 112. *Olene mendosa*Fig. 113. *Orgyia postica*Fig. 114. *Perina nuda*- MaleFig. 115. *Perina nuda*- FemaleFig. 116. *Somena scintillans*

Subfamily Pangraptinae

Fig. 117. *Egnasia ephyrodalis*Fig. 118. *Episparis tortuosalis*

Subfamily Scoliopteryginae

Fig. 119. *Anomis flava*Fig. 120. *Anomis sabulifera*Fig. 121. *Anticarsia gemmatilis*Fig. 122. *Anticarsia irrorata*Fig. 123. *Rusicada privata*

revealed four new records from Kerala- *Adites hilaris* (Fig. 7), *Ataboruza lauta* (Fig. 46), *Hypena thermesialis* (Fig. 94) and *Pseudoblabe oophora* (Fig. 40). Eight species were new from northern Kerala- *Autoba* sp. (Fig. 47), *Calliteara grotei* (Fig. 100), *Hydrillodes hemusalis* (Fig. 88), *Lymantria serva* (Fig. 107), *Nodaria* sp. (Fig. 86), *Ophiura onelia* (Fig. 76), *Orgyia postica* (Fig. 113) and *Simplicia butesalis* (Fig. 88).

ACKNOWLEDGEMENTS

The authors thank the Director, Zoological survey of India, Kolkata, for providing necessary facilities; also to NBAIR-Bangalore, TNAU-Coimbatore, Dr P

Girish Kumar, Zoological Survey of India Kozhikode, for constructive feedback on the manuscript.

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(Manuscript Received: November, 2020; Revised: January, 2021;

Accepted: January, 2021; Online Published: May, 2021)

Online published (Preview) in www.entosocindia.org Ref. No. e20286