

Systematic Studies on Subfamily *Gelechiinae* (Lepidoptera: Gelechiidae) with New Record to Western Ghats

R.S.M. Shamsudeen

Department of Zoology, Sir Syed College, Taliparamba-670142, Kannur University, Kerala, India

Abstract: Four species namely, *Anarsia patulella* Meyrick, *Anarsia isogama* Meyrick, *Hyatima haligramma* (Meyrick) and *Sitotroga cerealella* (Olivier) were reported with new records to Western Ghats and Kerala. Diagnosis, nomenclature aspects and distribution are presented in this paper. A modified collection methodology were followed which is useful in taxonomic studies.

Key words: Microlepidoptera • Gelechiidae • Gelechiinae • Western Ghats • Kerala

INTRODUCTION

Gelechiidae is one of the largest family of microlepidoptera and includes more than 4,600 described species belonging to about 500 genera in the world [1] Hodges. A large number of species are present in the Oriental, Neotropical, Ethiopian and Australian Regions [2] Becker.

Gelechiidae is similar to other gelechioid families in that its members have a scaled proboscis and strongly recurved labial palpus. Gelechiidae differ from other gelechioid families by having a combination of the following characters: 1) hindwing subrectangular to trapezoidal with sinuous or concave termen and prominent apex, 2) forewing lanceolate to elongate-ovate with CuP absent, 3) the retinaculum of the wing-coupling mechanism on the radial vein of the female forewing, 4) labial palpus long, second segment often with ventral brush, third segment long, acute, rarely with short dorsal brush of rough scales, 5) male gnathos forming a pair of lateral, articulated, symmetrical sclerites with an articulated, mesial hook described by Hodges [3]. Most Microlepidoptera have certain specialized characteristics by which we can readily segregate them as a preliminary step during field surveys. Most Gelechioidea have a smooth scaled head with broad, flat scales; slender, recurved labial palpi having a long, pointed apical segment and elongated antennae clothed with scales on its basal half. Members of Gelechiidae usually lack an antennal pecten; many Gelechiidae, have oval forewings,

the antennae are shorter than the forewings [4-6] described by Shamsudeen, Shamsudeen, R.S.M. and George Mathew. The main aim of this study is to pertain basic information and update the taxonomy of Gelechiidae based of general external Morphology.

Methodology: The Gelechiidae specimens were collected during the night time with the help of portable light traps. Besides this, some specimens were collected at night to an illuminated vertical white sheet. The light source we used was an 18-watt CFL (Compact Fluorescent Lamp) powered by a 12-watt car battery by Shamsudeen *et al.* [7]. The methodology discussed by workers such as Mikkola [8] as well as by Landry and Landry [9] was followed for the pinning, stretching and preservation of specimens. The standard techniques given by Robinson *et al.* [10] and Zimmerman [11] have been followed for wings and genitalia respectively. With regard to systematic arrangement of families classification for Lepidoptera by Heppner [12] were followed.

Diagnosis

Super Family Gelechioidea: Vertex and frons decorated with smooth scales; labial palpi 3-segmented, upturned, 3rd segment long, acute; forewing with veins $R_4 + R_5$ stalked; hind tibia with dorsal surface furnished with long slender scales.

Family Gelechiidae: Gelechiidae Stainton, 1854, *Insecta Br. Lepid.* Tineina

Type Genus: *Gelechia* Hubner, (1825) 1816, *vertz. Bekannter Schmett.*, 415.

Vertex and frons covered with smooth scales; antennae smaller than $\frac{3}{4}$ th length of forewing; labial palpi upturned, second segment long, acute; hindwing with vein R₁ and Sc united from base of wing or R₁ running into Sc beyond base of wing, discocellular perpendicular by axis of wing or directed at 45° angle toward base of wing from M₂ termen excavated. The family Gelechiidae is classified into three subfamilies (Gelechiinae, Pexicopinae, Dichomeridinae) out of which two subfamilies have been dealt herewith.

Key to Subfamily Gelechiinae: Juxta absent; hindwing normally scaled. Abdominal sternum 2 with a pair of venulae and a pair of apodemes or a pair of apodemes if a pair of venulae only, then forewing with CuA1 and CuA2 separate.

Key for Separation of Species: Subfamily Gelechiinae.

1. Corpus bursae large, sub ovate in shape; signum crescent-shaped-----

Anarsia patulella

-Corpus bursa elongated and bean-shaped; signum rough, hemispherical body bearing short spines---
----*Hypatima haligramma*

2. Uncus small and short-----3
Uncus large and long-----4

3. Uncus short and small arising from the anterior margin; tegumen, long and broad-----
--*Anarsia isogona*

-Uncus short, small and apically pointed; tegumen short and broad; gnathos long and tubular-----
----*Sitotroga cerealella*

4. Uncus large and long about $\frac{1}{3}$ rd length of valvae; tegumen broad, ventral and most of the dorsal surface with long scales; gnathos long, slender and evenly curved----*Hypatima haligramma*

Family: Gelechiidae

Subfamily: Gelechiinae

Anarsia patulella **Meyrick:** *Gelechia patulella* Walker, 1864, *List Specimens lepid., Insects Colln. Br. Mus.*, 29, p. 635.

Collection Data: Peechi; Sep., 2004 (2 ex.).

Distribution: India, Sri Lanka, Taiwan.

Host: Unknown.

Alar expanse: 10-11 mm.

Female Genitalia (PLATE-I, Fig.1): Ovipositor small, cylindrical with short hairs; posterior apophyses double the length of anterior apophyses; ostium funnel-shaped; ductus bursae small, thin and slightly banded in the middle; ductus seminalis arising from the junction of the corpus bursae; corpus bursae large, sub ovate in shape with a crescent-shaped signum.

Remarks: New record for Kerala.

Anarsia isogama Meyrick, 1913, *Journ. Bombay. Nat. Hist. Soc.* 22: Meyrick, 1925: 153; Caradja and Meyrick, 1935: 69; Gaede, 1937: 402; Clarke, 1969: (6) 245, f. 4. Collection data: Peechi; April 2003 (2 ex.).

Distribution: India, Sri Lanka, Taiwan, Japan.

Host: Unknown.

Alar expanse: 12-13 mm.

Male Genitalia (PLATE-I, Fig.2): Uncus short; tegumen as long as valva, broad at the base, left Valva broad with a slender, tapered process at the base, right valva is narrower than the left; aedeagus slender and tapering.

Remarks: New record for Kerala.

Hypatima haligramma (Meyrick) *Chelaria haligramma* 1926, *Exotic Microlepidoptera*, 3: 282.

Collection data: Peechi; Sep., 2003 (2 ex.).

Distribution: Northern India.

Host: *Mangifera indica*. *Anacardium occidentale*.

Alar expanse: 10-11 mm.

Male Genitalia (PLATE-I, Fig.3): Uncus about one third length of valvae, apically wider than at the base, medially narrowest; distal half of ventral and most of the dorsal surface with long scales; tegumen broad; gnathos long, slender and evenly curved; valvae nearly as long as tegumen; sacculus very short; aedeagus with inflated base, strongly bent medially, apex rounded; ductus ejaculatorius with a long band-like lamina.

Female Genitalia (PLATE-I, Fig.4): Ovipositor lobes elongate and lobate bearing short hairs; apophyses short; anterior apophyses about $\frac{1}{3}$ rd length of posterior apophyses; ductus long, slender and tubular; bursa elongated and bean-shaped; signum composed of a roughly hemispherical body bearing short spines.

Remarks: New record for Western Ghats.

Sitotroga cerealella (Olivier), Clerck, 1969, Catalogue of type specimens of Microlepidoptera in *Br. Nat. Hist. Mus.* 5: 375.

Collection data: Neyyar; March 2002 (1 ex.).

Distribution: Pantropical and subtropical.

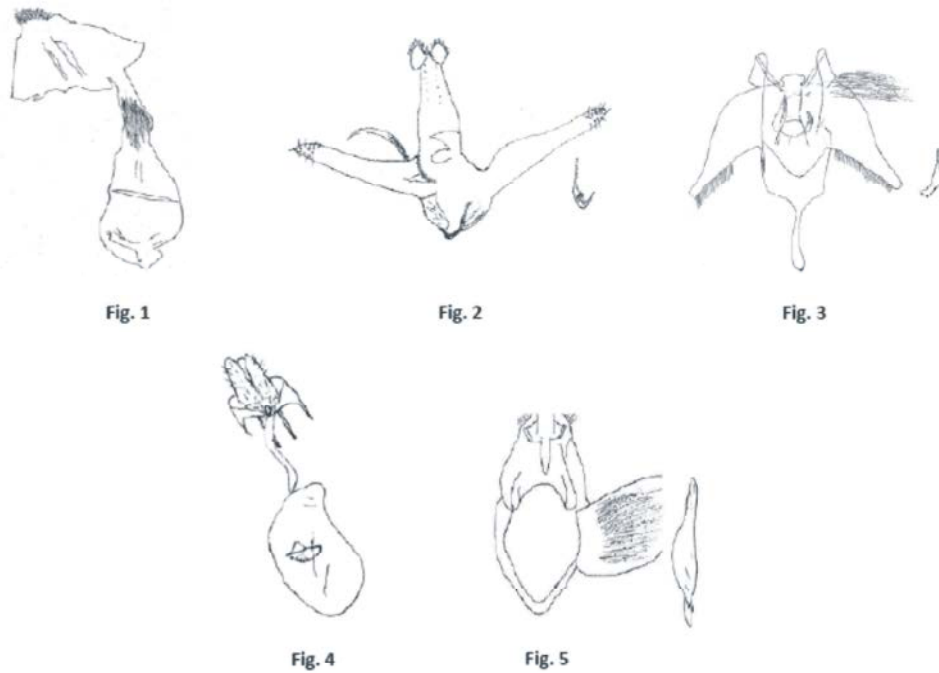


Fig. 1: Female Genital Morphology of *Anarsia patulella* Meyrick
 Fig. 2: Male Genital Morphology of *Anarsia isogama* Meyrick
 Fig. 3: Male Genital Morphology of *Hypotima haligramma* Meyrick
 Fig. 4: Female Genital Morphology of *Hypotima haligramma* Meyrick
 Fig. 5: Male Genital Morphology of *Sitotroga cerealella* (Oliver)

Host: Larvae of *Sitotroga cerealella* feed on stored grain (rice, maize, etc). It is a sporadically major pest.
 Alar expanse: 14 mm.

Male Genitalia (PLATE-I, Fig.5): Uncus small, apically pointed and triangular in shape; socii cylindrical, fringed with short hairs; gnathos long and tubular; tegumen short and broad; vinculum long and slender, of the same length of tegumen; saccus distinct and V-shaped; valvae broad, fringed with tufts of hairs which appears as a birds' beak at the distal end; aedeagus long and slender, narrow at the proximal end and bears a small cornuti.

Remarks: Adults collected from light trap. *Sitotroga* contains three more species, from the old world tropics and subtropics.

DISCUSSION

Morphological details of the external genitalia offer reliable clues for species segregation in Lepidoptera. The morphological details of the external genitalial structure of various species are discussed herein in order to evaluate their usefulness in taxonomic segregation of the group.

Comparative Morphology of Male Genitalia

Uncus: In Gelechiidae, Uncus is hook-shaped and basally enlarges as in *Anarsia patulella*; short arising from the anterior margin as in *Anarsia isogona*; small, apically pointed and triangular in shape as in *Sitotroga cerealella* or about one-third length of valva as in *Hypatima haligramma*.

Tegumen: In Gelechiidae, it is long in *Anarsia patulella*; it is short, broad in *Sitotroga cerealella* and broad as in *Hypatima haligramma*. It is longer in *Symmoca indagata*. Tegumen small and somewhat arched in *Plutella xylostella*.

Valvae: In Gelechiidae, valvae are asymmetrical in *Anarsia patulella*. Valvae fringed with tufts of hairs, which looks like a birds' beak as in *Sitotroga cerealella*. Valvae are nearly as long as tegumen in *Hypatima haligramma*.

Saccus: In Gelechiidae, saccal region well developed in *Anarsia patulella*; distinct and V-shaped in *Sitotroga cerealella*; very short in *Hypatima haligramma*;

Gnathos: absent as in *Anarsia patulella*; long and tube-like as in *Sitotroga cerealella*; long, slender and evenly curved as in *Hypatima haligramma*;

Sacculus: very short in *Hypatima haligramma*;

Aedeagus: Well developed in all sub families. Long and slender in *Sitotroga cerealella*; with inflated base in *Hypatima haligramma*

Comparative Morphology of Female Genitalia

Ovipositor: In Gelechiidae, ovipositor is extremely short in *Hypatima haligramma*; cylindrical with short hairs as in *Anarsia patulella*;

Apophyses: In *Anarsia patulella*, posterior apophyses double the length of anterior apophyses; anterior apophyses about 1/3rd length of posterior apophyses in *Hypatima haligramma*; posterior apophyses of the same length of anterior apophyses in *Symmoca signetella*

Ostium Bursae: it is large and placed in the middle in *Hypatima haligramma*;

Ductus Bursae: ductus bursae small, thin and slightly banded in the middle as in *Anarsia patulella*; Ductus bursae narrow and slightly dilated in *Hypatima haligramma*;

Corpus Bursae: Corpus bursae is sub ovate in shape as in *Anarsia patulella*; membranous and oval in *Hypatima haligramma*;

Signum: Signum is a crescent-shaped in *Anarsia patulella*; signum large, hat-shaped, covered with strong spines showing serration in *Hypatima haligramma*

Similarity and Dissimilarity of Subfamily Gelechiinae:

In *Anarsia isogona*, uncus short arising from the anterior margin, which is about one third length of valva, apically wider than at base, medially narrowest in *Hypatima haligramma* and uncus is small, apically pointed and triangular in *Sitotroga cerealella*. Saccus is small and narrow in *Anarsia isogona* and *Hypatima haligramma* and in *Sitotroga cerealella* it is distinct and V-shaped. Valvae are broad in *Anarsia isogona*. Valvae are nearly as long as tegumen in *Hypatima haligramma* and in *Sitotroga cerealella* valvae are broad fringed with tufts of hairs, which look like a bird's beak at the distal end. In the female genitalia, ovipositor is small, cylindrical with short hairs in *Anarsia patulella* and in *Hypatima haligramma*, it is elongate and lobate bearing short hairs.

Signum also shows wide variations. In *Anarsia patulella*, signum is crescent-shaped and in *Hypatima haligramma* it is composed of a roughly hemispherical body bearing short spines.

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