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# On Three Species of Genus *Eupterote* Hübner, [1820] from Chhattisgarh, with a Consolidated Species List of the Genus from India (Lepidoptera: Eupterotidae)

A. Raha, A. Majumder, A. K. Sanyal & K. Chandra

## Abstract

Morphology including genitalia of three species of genus *Eupterote* Hübner, [1820] viz. *E. bifasciata* Kishida, 1994, *E. mollifera* (Walker, 1865) and *E. undata* Blanchard, [1844] collected from Chhattisgarh, India are discussed here for first time with illustrated images. Among these three species, *E. bifasciata* and *E. mollifera* are newly recorded from the Central Indian Landscape. An updated list of 14 Indian species of genus *Eupterote* with their distribution is also provided. Six *E. undata* morphs with their images are illustrated here for first time. With the present record of *E. bifasciata*, we extend its distribution range significantly to the south in more or less plain habitat of the Deccan Peninsular biogeographic zone and confirm its occurrence in India.

KEY WORDS: Lepidoptera, Eupterotidae, *Eupterote*, genitalia study, range extension, taxonomy, India.

## Sobre tres especies del género *Eupterote* Hübner, [1820] de Chhattisgarh, con una lista consolidada de las especies del género de India (Lepidoptera: Eupterotidae)

## Resumen

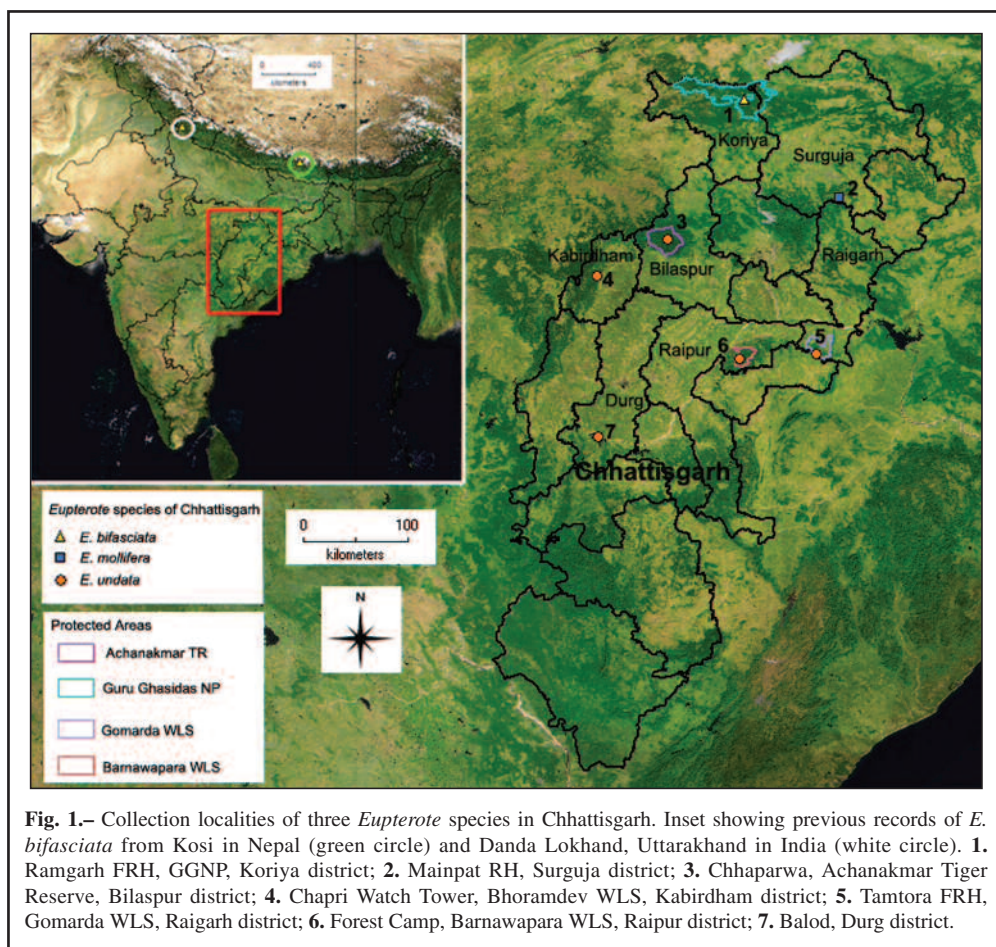
Se discute aquí por primera vez con ilustración de los imagos y su morfología, incluyendo la genitalia de tres especies del género *Eupterote* Hübner, [1820], a saber, *E. bifasciata* Kishida, 1994, *E. mollifera* (Walker, 1865) y *E. undata* Blanchard, [1844] colectadas de Chhattisgarh, India. Entre estas tres especies, *E. bifasciata* y *E. mollifera* son nuevas citas para el centro de la India. También se proporciona una lista puesta al día de 14 especies indias del género *Eupterote* con su distribución. Se ilustran seis formas de *E. undata* con sus adultos por primera vez. Con el presente registro de *E. bifasciata*, extendemos, significativamente, su rango de distribución hacia el sur en más o menos el hábitat de la zona biogeográfica de la meseta peninsular del Decán y confirmamos su presencia en la India.

PALABRAS CLAVE: Lepidoptera, Eupterotidae, *Eupterote*, estudio de la genitalia, rango de extensión, taxonomía, India.

## Introduction

The genus *Eupterote* Hübner, [1820] belonging to subfamily Eupterotinae is represented by some 30 to 80 species worldwide (NÄSSIG, 2000). The genus being still unrevised, the exact number of species is unknown. HAMPSON (1892) reported 14 species from India and no other comprehensive studies on the genus or family from the country is available hitherto. Among these 14 species, three species viz. *E. geminata* Walker, 1855, *E. primularis* Moore, 1884 and *E. unicolor* Hampson, 1891 were synonymised under *E. hibisci* (Fabricius, 1775), *E. diffusa* Walker, 1865 and *E. undata* Blanchard, [1844], respectively. GRÜNBERG (1914) described *Sarmalia decolorata* from the Khasi Hills of Assam, India, later transferred to genus *Eupterote* by NÄSSIG (1995). Recently, *Eupterote bifasciata* Kishida, 1994, has been reported in

an inventory study on moths of Devalsari, Uttarakhand by SONDHI & SONDHI (2016), resulting in a consolidated 14 *Eupterote* species from India. Most of the species of *Eupterote* show remarkable variations in size and wing pattern between individuals of the same species from different as well as same localities suggesting the need for thorough genital and molecular investigations. Superficially, species of the genus *Eupterote* are usually more or less yellowish to rufous or often brownish to greyish in colour with fore wing expanse ranging from 45-130 mm. Taxonomically, they bear very short and porrect palpi, antennae with moderately long branches and somewhat hairy legs. Fore wings are generally broad with outer margin rounded, discocellulars angled below vein  $M_2$  and vein  $M_1$  is stalked with  $R_3$ ,  $R_4$ , and  $R_5$ , or from the cell. Hind wing has discocellulars angled below  $M_2$  and veins  $M_1$  and  $R_5$  are either stalked or originating from the angle of cell (Fig. 2A). FORBES (1955) provided first description of male genitalia of the genus in his revision which was later discussed by HOLLOWAY (1982, 1987). The structure typically consists of bifid uncus fused to the tegumen and both of them well developed and sclerotized. Valvae are basally fused together to about one third of their length and fixed with the vinculum and tegumen, giving it a ring like appearance. Juxta is usually fused to the aedeagus and inner area of valvae, thus restricting free movement of aedeagus and its removal is possible only when the juxta is dislocated (Fig. 2B). SOOD *et al.* (2006) discussed on the genital characteristics of some Eupterotids from Shivaliks, India. Other than this, taxonomic study on this highly capricious group of moths in India is literally absent.



During the course of a faunal inventorization of Chhattisgarh, India, we have collected several specimens of *Eupterote* from different parts of the state. The present study discusses for the first time on detailed morphology and genitalia of three species viz. *E. bifasciata* Kishida, 1994, *E. mollifera* (Walker, 1865) and *E. undata* Blanchard, [1844] identified from Chhattisgarh collections. Among these three species *E. bifasciata* and *E. mollifera* are reported for the first time from the Central Indian landscape. A consolidated list of *Eupterote* species occurring in India with their detailed distribution patterns is also provided in this communication (Table 1).

**Table 1.**— Species of *Eupterote* found in India.

S. No.	Species	Distribution in India	Distribution elsewhere	Remark
1.	<i>Eupterote undata</i> Blanchard, 1844	Throughout India	Java, Myanmar, Pakistan, Philippines, Sri Lanka, Sumatra.	Most widely distributed
2.	<i>Eupterote fabia</i> Cramer, 1780	Maharashtra, Sikkim, West Bengal, Throughout S. India	Bhutan, Sri Lanka	
3.	<i>Eupterote mollifera</i> Walker, 1865	Chhattisgarh, Maharashtra, S. India	Myanmar, Sri Lanka	New Record to Chhattisgarh and Central India
4.	<i>Eupterote flavicollis</i> Guérin-Meneville, 1843	S. India		
5.	<i>Eupterote diffusa</i> Walker, 1865	S. India	Sri Lanka	
6.	<i>Eupterote hibisci</i> (Fabricius, 1775)	Karnataka, N. India	Sri Lanka	
7.	<i>Eupterote lineosa</i> (Walker, 1855)	Maharashtra, Nagaland, S. India, Sikkim	Bangladesh, Bhutan, Myanmar, Nepal, Sri Lanka	
8.	<i>Eupterote undans</i> Walker, 1855	Assam, Indian Himalayas, Karnataka, Maharashtra, S. India	Nepal, Bhutan	
9.	<i>Eupterote testacea</i> Walker, 1855	Assam, Meghalaya	Bangladesh, Myanmar	
10.	<i>Eupterote translata</i> Swinhoe, 1885	Maharashtra, S. India		
11.	<i>Eupterote flavida</i> Moore, 1884	Karnataka, Maharashtra, S. India		
12.	<i>Eupterote citrina</i> Walker, 1855	Central India, Maharashtra, Sikkim		
13.	<i>Eupterote decolorata</i> (Grünberg, 1914)	Assam		
14.	<i>Eupterote bifasciata</i> Kishida, 1994	Chhattisgarh, Uttarakhand	Nepal	New Record to Chhattisgarh and Central India. Range extension to southern part of India

## Materials and Methods

Chhattisgarh state covers an area of about 135, 194 km<sup>2</sup> and extends between 17° 46'–24° 8'N latitude and 80° 15'–84° 24' E longitude in the Central Indian landscape. The state falls on three biogeographic provinces viz. 6D-Chota Nagpur Plateau, 6C-Eastern Highland, and 6E-Central Highland (RODGERS *et al.*, 2002) of the Deccan Peninsular biogeographic zone of India.

Approximately, 44% of the state is covered with vegetation having two major forest types, i.e. tropical moist and dry deciduous forests (CHAMPION & SETH, 1968).

The moth specimens were collected by setting light traps at different locations in Chhattisgarh. For light traps, mercury bulb (160 W) was fixed in front of a white cloth measuring 1.5 m X 2 m. The cloth was fixed vertically between two poles or trees and the bulb was hanged in such a way that it reached nearly half the length of the cloth with a gap of at least 1 ft. between the bulb and the cloth. A Honda Siel portable generator was used to supply power for lighting the bulb. The geographical coordinates of the collection sites were recorded using Garmin Oregon 550 GPS which were further used for preparing maps in the programme DIVA-GIS version 7.5 (Fig. 1). Collected specimens were studied under Leica S8AP0 HD binocular microscope. Photographs of the habitus were taken with Nikon D300s camera and 105 mm Nikon lens. For studying genitalia, abdomens from male and female specimens were removed from 5<sup>th</sup> segment and kept in 10% NaOH overnight. Soaked abdominal segments were dissected in 20% ethyl alcohol and studied and photographed under Leica stereo zoom microscope M205A. After examination, the genitalia are stored in 70% alcohol and specimens are deposited in the National Zoological Collection (NZC) of the Zoological Survey of India (ZSI), Kolkata.

### Abbreviation used

Alt.- Altitude  
colls.- Collected by  
FRH- Forest Rest House  
GGNP- Guru Ghasidas National Park  
NZC- National Zoological Collections  
WLS- Wildlife Sanctuary  
ZSI- Zoological Survey of India.

### Results

Three species of genus *Eupterote* viz. *E. bifasciata*, *E. mollifera* and *E. undata* were identified from Chhattisgarh collections following HAMPSON (1892), HOLLOWAY (1982, 1987) and KISHIDA (1994) and comparing museum specimens of NZC, ZSI. Among them, *E. undata* was most abundant including several morphs. Male genitalia of each morph was dissected and compared. Detailed descriptions of the outer morphology, variations and genitalia of the three species are discussed below. Comparison of different parts of male genitalia of the three species is provided in Table 2.

*Eupterote bifasciata* Kishida, 1994 (Fig. 3A)

*Eupterote bifasciata* Kishida, 1994: 65. (TL: Kosi, Nepal)

Specimen studied: INDIA, Chhattisgarh, Koriya District, GGNP, Ramgarh FRH, 23.6822° N, 82.4407° E, Alt. 601 m, 1-VIII-2011, 2 ♂♂, (colls. A. Raha and Party).

Diagnostic characters: Wing expanse: ♂ 50 mm. Palpi dark brown; frons bright yellow; antennae with branches moderate. Head thorax and abdomen pale yellow. Both wings pale yellow having diffused ante and prominent post medial purplish rufous lines, former running nearly straight from costa at basal third to inner margin; postmedial line starting from costa at apical third on fore wing, slightly excurved to M<sub>3</sub>, then vertical to inner margin, and it is nearly straight on hind wing.

Genitalia ♂ (Fig. 3B-F): Shows morphology of the typical *Eupterote* genitalia. Uncus bifid, fused to the tegumen with a pair of more or less developed subdorsal processes, tegumen more or less uniformly arched at the dorsal surface; saccus extended, narrow, long, and slightly expanded basally; valvae fused with the tegumen-complex and placed close to the tegumen, valvae fused together basally by more than one third of their length, ventral surface bulged uniformly which can be best understood in the lateral view of genitalia, valvae become narrow apically, well developed and curved almost reaching the tip of uncus, a prominent broad ridge on inner free side of both valvae separating the

apical half, inner and ventral surface of valvae setose and slightly rough, valvae bulged laterally forming prominent groove at the base before vinculum; juxta small, tightly fused to valvae and aedeagus and never reaches beyond vinculum; aedeagus cannot be removed, until the juxta is disrupted, aedeagus becomes narrow apically, slightly arcuate and without any spine, vesical without any scobinations.

Distribution: India: Chhattisgarh (Koriya), Uttarakhand. Elsewhere: Nepal.

Note: The species is recorded for the first time from Central India. Not much is known about its distribution in India, except one record from Uttarakhand (SONDHI & SONDHI, 2016). It is smallest among the congeners found in India. The present record is its range extension to the Deccan Peninsular biogeographic zone as well as Southern India.

*Eupterote mollifera* (Walker, 1865) (Fig. 3G)

*Dreata mollifera* Walker, 1865, *List Lep. Ins. Brit. Mus.*, **32**: 376. (TL: Sri Lanka)

*Tagora anthereata* Walker, 1865, *List Lep. Ins. Brit. Mus.*, **32**: 512.

*Bomochroa ornata* Felder, 1874, *Reise. Novara. Lep.*: Pl. 94, f. 3.

*Eupterote canaraica* Moore, 1879, *Proc. Zool. Soc. Lond.*: 410.

*Eupterote nilgirica* Moore, 1879, *Lep. Atk.*: 77.

*Apha flava* Moore, 1884, *Trans. Ent. Soc. Lond.*: 359.

*Tagora discrepans* Moore, 1884, *Trans. Ent. Soc. Lond.*: 360.

*Eupterote contaminata* Moore, 1884, *Trans. Ent. Soc. Lond.*: 363.

*Eupterote todara* Moore, 1884, *Trans. Ent. Soc. Lond.*: 364.

*Eupterote mollis* Moore, 1884, *Trans. Ent. Soc. Lond.*: 367.

*Eupterote lativittata* Moore, 1884, *Trans. Ent. Soc. Lond.*: 367.

*Eupterote flavia* Hampson, 1891, *Ill. Lep. Het. Brit. Mus.*, **8**: 64.

*Eupterote rufodisca* Hampson, 1891, *Ill. Lep. Het. Brit. Mus.*, **8**: 64.

*Eupterote rectifascia* Hampson, 1891, *Ill. Lep. Het. Brit. Mus.*, **8**: 65.

*Eupterote olivescens* Rothschild, 1920, *J. Fed. Malaya States Mus.*, **8**: 137.

*Eupterote multiarcuata* Holloway, 1976, *Moths of Borneo Mt. Kinabalu*: 54.

Specimen studied: INDIA, Chhattisgarh, Surguja District, Mainpat FRH, 22.8177° N; 83.2851° E, Alt. 1137 m, 10-IX-2012, 1 ♂ (colls. A. Raha and Party).

Diagnostic characters: Wing expanse: ♂ 65 mm. Ground colour varies from bright yellow to drab and in both sexes, often with rufous suffusion, the degree and extent of rufousness varies considerably depending on locality. Head pale rufous, sometimes purplish red, thorax sometimes with pale rufous band; fore legs partly and tarsi dull purplish red. Fore wing with costa and whole medial area having pale rufous suffusion, apical area darkest, leaving the outer area with ground colour, underside with darker suffusion; double rufous postmedial lines, with one line often obsolete, in present specimen the postmedial line very pale on upperside but prominent on underside, postmedial line underside sending short striae along veins; upperside with 5 pale rufous waved lines before postmedial line, a gap at the discal area; a highly waved submarginal line beyond postmedial lines; an elliptical rufous patch between postmedial and submarginal line, just below costa, two more grey spots below the elliptical spot, grey spots larger and forming a more complete series in female, a rufous spot near inner margin between postmedial and outer wavy lines, the spots and outer wavy line variable. Hind wing with three indistinct wavy lines before the double postmedial lines one of which is prominent, underside having prominent pattern than the upperside, postmedial line underside sending short striae along veins; a highly wavy outer line beyond the postmedial lines, like fore wing; a dark spot between the postmedial and outer wavy lines near the anal angle, like fore wing, the outer wavy line and spots within highly variable.

Genitalia ♂ (Fig. 3H-L): Uncus bifid, fused to the tegumen complex, somewhat shorter, more robust and sclerotized than *E. bafasciata*, a small projection between the two processes of uncus; tegumen much arched at the dorsal surface; Saccus extended, rod like, but shorter than that of *E. bifasciata* and *undata*, not expanded basally; valvae ankylosed to the tegumen-complex and placed



much close to the tegumen, valvae fused together basally by less than one third of their length, leaving the maximum inner surface free and forming a perfect 'U', ventral surface of valva bulged irregularly which can be best understood in the lateral view of genitalia, the apical half of the valva reduced, flattened and slightly curved, ending much before the tip of uncus, a prominent ridge not as broad as in *E. bifasciata* on inner free side of both valvae separating the apical half, inner surface of the basal half of valvae setose, sclerotized and corrugated, lateral surface of the valvae bulged and forming groove before vinculum basally as in *E. bifasciata*; juxta small, tightly fused to valvae and aedeagus and ends before vinculum; aedeagus cannot be removed, until the juxta is disrupted; aedeagus arcuate more than *E. bifasciata* and without any spine, vesica without any scobination or cornutus, inner surface of the apical part of aedeagus with dense chitinous stripes.

Distribution: India: Chhattisgarh (Surguja), Maharashtra, S. India. Elsewhere: Myanmar, Sri Lanka.

Note: The species is recorded for the first time from Central India. It shows noticeable variations in size and morphology. As a result, several Authors described them as separate species which were synonymized later by HAMPSON (1892) and treated them as different forms of *mollifera*. The above specimen under study resembles *mollifera* = *flava* = *anthereata* = *ornata* which was earlier reported from South India and Sri Lanka. The males sometimes are similar to *E. fabia*, but are much smaller and with ground colour always yellow. Wing expanse of males varies from 64-84 mm and that of females 80-90 mm. From India, the larvae are reported to be feeding on *Amomum subulatum* and *Elettaria cardamomum* of Zingiberaceae, *Citrus* (Rutaceae), *Coffea* (Rubiaceae), *Moringa pterygosperma* (Moringaceae) (ROBINSON *et al.*, 2001).

*Eupterote undata* Blanchard, 1844

*Eupterote undata* Blanchard, 1844, *In Jacquemont, Voy. Ind. Ins.*, 4: 23. (TL: India)

*Dreata undifera* Walker, 1855, *List Lep. Het. Brit. Mus.*, 4: 904.

*Eupterote imbecilis* Walker, 1855, *List Lep. Het. Brit. Mus.*, 4: 905.

*Eupterote taoensis* Moore, 1878, *Proc. Zool. Soc. Lond.*: 848.

*Eupterote vialis* Moore, 1879, *Proc. Zool. Soc. Lond.*: 409.

*Eupterote subdita* Moore, 1884, *Trans. Ent. Soc. Lond.*: 361.

*Eupterote vinosa* Moore, 1884, *Trans. Ent. Soc. Lond.*: 361.

*Eupterote cupreipennis* Moore, 1884, *Trans. Ent. Soc. Lond.*: 361.

*Eupterote suffusa* Moore, 1884, *Trans. Ent. Soc. Lond.*: 362.

*Eupterote variegata* Moore, 1884, *Trans. Ent. Soc. Lond.*: 362.

*Eupterote griseipennis* Moore, 1884, *Trans. Ent. Soc. Lond.*: 362.

*Eupterote assimilis* Moore, 1884, *Trans. Ent. Soc. Lond.*: 363.

*Eupterote sinuata* Moore, 1884, *Trans. Ent. Soc. Lond.*: 363.

*Eupterote consimilis* Moore, 1884, *Trans. Ent. Soc. Lond.*: 364.

*Eupterote castanoptera* Moore, 1884, *Trans. Ent. Soc. Lond.*: 365.

*Eupterote nigricans* Moore, 1884, *Trans. Ent. Soc. Lond.*: 365.

*Eupterote caliginosa* Moore, 1884, *Trans. Ent. Soc. Lond.*: 367.

*Eupterote persimilis* Moore, 1884, *Trans. Ent. Soc. Lond.*: 368.

*Eupterote dissimilis* Moore, 1884, *Trans. Ent. Soc. Lond.*: 368.

*Eupterote cinnamomea* Moore, 1884, *Trans. Ent. Soc. Lond.*: 368.

*Eupterote similis* Moore, 1884, *Trans. Ent. Soc. Lond.*: 369.

*Eupterote decorata* Moore, 1884, *Trans. Ent. Soc. Lond.*: 369.

*Eupterote affinis* Moore, 1884, *Trans. Ent. Soc. Lond.*: 369.

*Murlida fraterna* Moore, 1884, *Trans. Ent. Soc. Lond.*: 371.

*Eupterote diabolica* Swinhoe, 1885, *Proc. Zool. Soc. Lond.*: 303.

*Eupterote hirsuta* Swinhoe, 1891, *Trans. Ent. Soc. Lond.*: 139.

*Eupterote unicolor* Hampson, 1891, *Ill. Lep. Het. Brit. Mus.*, 8: 65.

Specimen studied: INDIA, Raipur District, Barnawapara WLS, Barnawapara Camp, 21.4000° N;

82.4052° E, Alt. 321 m, 1-VII-2011, 1 ♂; 2-VII-2011, 1 ♂; 3-VII-2011, 1 ♂, 1 ♀ (colls. Dr. K. Chandra and Party), 4-VII-2011, 2 ♂♂; 5-VII-2011, 2 ♂♂; 6-VII-2011, 2 ♂♂; 8-VII-2011, 1 ♂ 25-VII-2011, 1 ♂, 28-VII-2011, 1 ♂, 2-VIII-2011, 1 ♂, 5-VIII-2011, 1 ♂, 25-VII-2012, 1 ♂ (colls. S. K. Gupta and Party); Bilaspur District, Achanakmar Tiger Reserve, Chhaparwa FRH, 22.4458° N; 81.7702° E, Alt. 402 m, 10-VI-2012, 4 ♂♂; Durg District, Balod, Compartment No. 98, 20.7110° N; 81.1621° E, Alt. 387 m, 25-IX-2012, 1 ♂; Kabirdham District, Boramdev WLS, Chapri Watch Tower, 22.1291° N; 81.1534° E, Alt. 560 m, 29-IX-2013, 1 ♂ (colls. A. Raha and Party); Raigarh District, Gomarda WLS, Tamtara FRH, 21.4442° N; 83.0826° E, Alt. 254 m, 28-VI-2015, 3 ♂♂ (colls. A. Majumder and Party).

Diagnostic characters: Wing expanse: 72-110 mm. Colour varies from yellow with brownish suffusion to completely brown, yellow and brown colours may show considerable variations in their intensity from individual to individual. Bandings on fore and hind wings show incredible variations, but the basic pattern is more or less similar. Fore wing with two prominent postmedial lines which are present in every individual, a highly wavy submarginal line beyond them which may be light in some individuals, usually the inner postmedial line is thicker and darker than the outer one; eight indistinct wavy lines, any or all of them may become obsolete, this occurs in similarly coloured specimens from the same locality; some morphs have three dark spots below costa just before the apex between postmedial and submarginal wavy lines and two towards inner margin, some morphs have two costal spots out of three and one out of two spots near inner margin prominent, while some have the costal spots smudged to a dark brown patch. Hind wing without lines on basal area; two parallel postmedial lines with the inner one thicker and a waved submarginal line beyond, like the fore wing; five waved lines before the postmedial lines; some spots between the postmedial and submarginal lines near anal angle, sometimes those may be obsolete or become a complete series.

Genitalia ♂ (Fig. 3N-R): Uncus bifid, long, robust, sclerotized and fused to the tegumen-complex, tegumen more or less straight at the dorsal surface; saccus extended, narrow, long, and expanded basally; valvae fused with the tegumen-complex and the gap between tegumen and costal end of valve is larger than the other two species, a small, setose and less sclerotized lump behind each valve at the costal end, valvae fused together basally by nearly one third of their length, more than *E. mollifera* and less than *E. bifasciata*, ventral surface more or less straight, a prominent groove at the origin of valve basally separating it from vinculum, valvae distally blunt, coiled, narrower at apex and never reaching the tip of uncus, a less distinct ridge at the inner surface of each valve separating the apical half, inner and ventral surface of valvae setose, rough and slightly corrugate; juxta elongated, tightly fused to valvae and aedeagus and reaching beyond vinculum; aedeagus cannot be removed, until the juxta is disrupted, aedeagus the most arcuate among the three species under study and without any spine, ventral edge pronounced distally; vesical tube like, swollen and minutely scobinate at the middle area.

Genitalia ♀ (Fig. 2C): Corpus bursae spherical, membranous, weakly sclerotized and without signum; ductus bursae long, narrow, wider towards corpus bursae, sclerotized and slightly expanded towards ostium bursae; ductus seminalis originating from sub basal area of ductus bursae; apophyses robust, well sclerotized, anterior apophyses larger than posterior apophyses.

Distribution: India: Chhattisgarh (Bilaspur, Durg, Kabirdham, Raigarh, Raipur), Himachal Pradesh, Madhya Pradesh, Maharashtra, Punjab, Sikkim, Tamil Nadu, Uttarakhand, West Bengal. Elsewhere: Java, Myanmar, Pakistan, Philippines, Sri Lanka, Sumatra.

Note: The species shows remarkable variations in morphology starting from size to wing colouration and banding patterns. Earlier authors described them as separate species, but later they were synonymized by HAMPSON (1892) who treated them as different forms of *E. undata*. In the present study, we have come across six different morphs. Two male specimens of morph *nigricans* (wing expanse: ♂, 90 mm) (Fig. 4B) are dark umber-brown having all the lines and spots inside the submarginal line prominent. A single female of morph *undata* (wing expanse: ♀, 102 mm) (Fig. 4C) is dusky brown with the ground colour pale yellowish. Three males of *subdata* (wing expanse: ♂, 72-86 mm) (Fig. 4E-F) are dark reddish brown with distinct yellowish collar. Two males of *hirsuta* (wing expanse: ♂, 94 mm) (Fig. 4A) morph have yellow ground colour strongly suffused with



reddish umber making the waved lines obscure and having yellow hairs on collar. Five male specimens of morph *variegata* (wing expanse: ♂, 84 mm) (Fig. 4D) are reddish brown with indistinct spots. Twelve male specimens of *decorata* (wing expanse: ♂, 76-88 mm) (Fig. 3M) have the ground colour yellow with broad and prominent red-brown markings and red-brown suffusion on apex, sometimes outer margin, of fore wing. The male genitalia of six morphs in the present collection looked similar and no distinguishing character was found between them. Extensive molecular studies for such variations are necessary. Larvae are extremely polyphagous, feeding on *Bombax ceiba* (Bombacaceae), *Campsis grandiflora* (Bignoniaceae), *Cedrela toona* (Meliaceae), *Dalbergia monetaria* and *Erythrina orientalis* of Leguminosae, *Gmelina arborea*, *Lantana camara*, *Tectona grandis* and *Vitex negundo* of Verbenaceae family, *Planchonia careya* (Lecythidaceae), *Quisqualis indica* (Combretaceae), *Ricinus communis* (Euphorbiaceae), *Shorea robusta* (Dipterocarpaceae), *Terminalia* (Combretaceae) (ROBINSON *et al.*, 2001).

**Table 2.**— Comparison of male genital parts of three *Eupterote* species.

♂ genital part	<i>E. bifasciata</i>	<i>E. mollifera</i>	<i>E. undata</i>
Uncus	Bifid, moderately long and less sclerotized	Bifid, short, robust with pointed end, strongly sclerotized; a small projection between two processes	Bifid, long, robust and strongly sclerotized
Tegumen	Fused, dorsal surface uniformly arched	Fused, strongly sclerotized and dorsal surface more arched than <i>E. bifasciata</i>	Fused, strongly sclerotized and dorsal surface more or less straight
Saccus	Long, narrow, rod-like with basally expanded	Extended, but least among the three, slightly wide and basally not expanded	Long, narrow, rod-like with basally expanded
Valva	Valvae placed close to the tegumen, ventral and lateral surface uniformly bulged, valvae fused together by more than one third of their length, inner surface setose not corrugated, apical half longest, tapering and curved almost reaching the tip of uncus	Valvae placed closest to the tegumen, ventral and lateral surface irregularly bulged, valvae fused together by less than one third of their length, inner margin 'U' shaped, inner surface setose and strongly corrugated, apical slightly curved	Gap between tegumen and valvae most, ventral surface more or less straight, lateral surface slightly bulged, valvae fused together by one third of their length lesser than <i>E. bifasciata</i> , inner surface half short, flattened and setose and slightly corrugated, apical half short, blunt, tapering and coiled
Vinculum	Separated from valvae by a groove, prominent	Separated from valvae by a groove, less prominent	Most prominent among the three
Juxta	Short, tightly fused to aedeagus, not reaching vinculum basally	Short, tightly fused to aedeagus, not reaching vinculum basally	Long, tightly fused to aedeagus, reaching beyond vinculum basally
Aedeagus	Slightly tapering apically, less arcuate	More arcuate than <i>E. bifasciata</i> , not tapering apically, inner surface of the apical part with dense chitinous stripes	Most arcuate, ventral surface extended apically
Vesica	Without scobinations	Without scobinations	Tube like, swollen and with minute scobinations at the middle area

## Discussion

Lepidoptera is the largest herbivorous and third largest insect order and moth comprises nearly

90% of its diversity. India has nearly 15000 known Lepidoptera species, but the exact number has not been worked out yet (CHANDRA, 2011). Status of many taxa of family Eupterotidae, in India, is not very clear. This may be due to lack of experts on this morphologically complex group. Moreover, the state of the art knowledge on moth diversity across India is uneven. Chhattisgarh is covered with extensive stretches of lush green vegetation and thus is expected to harbour many species of moths. The present study reports two species from Chhattisgarh viz. *Eupterote bifasciata* and *E. mollifera*, which are new to the Central Indian landscape. *E. bifasciata* quite recently described by KISHIDA (1994) from Tama Kosi, Nepal. The site is a bridge on River Kosi in Nepal Himalaya at an elevation of 860 m. Recently SONDHI & SONDHI (2016) spotted the species at Danda Lokhand, Uttarakhand, India in an inventory study. Uttarakhand being situated in North West Himalaya and adjacent to Nepal, the occurrence of *E. bifasciata* in Uttarakhand was rather apparent. With the present record, we extend the species' distribution range significantly to the south in more or less plain habitat of the Deccan Peninsular biogeographic zone and confirm its occurrence in India. The *E. undata* morphs with their images are illustrated here for first time. While analysing the occurrences of several morphs of *E. undata*, it is observed that morphs *decorata* and *variegata* were collected from low altitude areas below 350 m elevation and in monsoon season. Morphs *hirsuta* and *nigricans* were captured from altitudes of more than 400 m and during the summer season. Morph *subdata* was found between 200-400 m altitudes and during both summer and monsoon season. The above information on morph occurrences is based on mere observations only and to come to a conclusion, extensive surveys in different seasons and altitudes are necessary. Nevertheless, *decorata* and *variegata* may be considered as wet season and *hirsuta* and *nigricans* as dry season morphs of *E. undata*. Moreover, detailed descriptions and images of male genitalia of three species are also provided for first time. The genitalia of different morphs of *E. undata* did not show any significant variation, unlike their outer morphology. Hence, molecular characterisation is crucial for resolving morph complexities. Thorough revision of Indian Eupterotidae is necessary as the majority of species belonging to this family have not been studied at all since their discovery.

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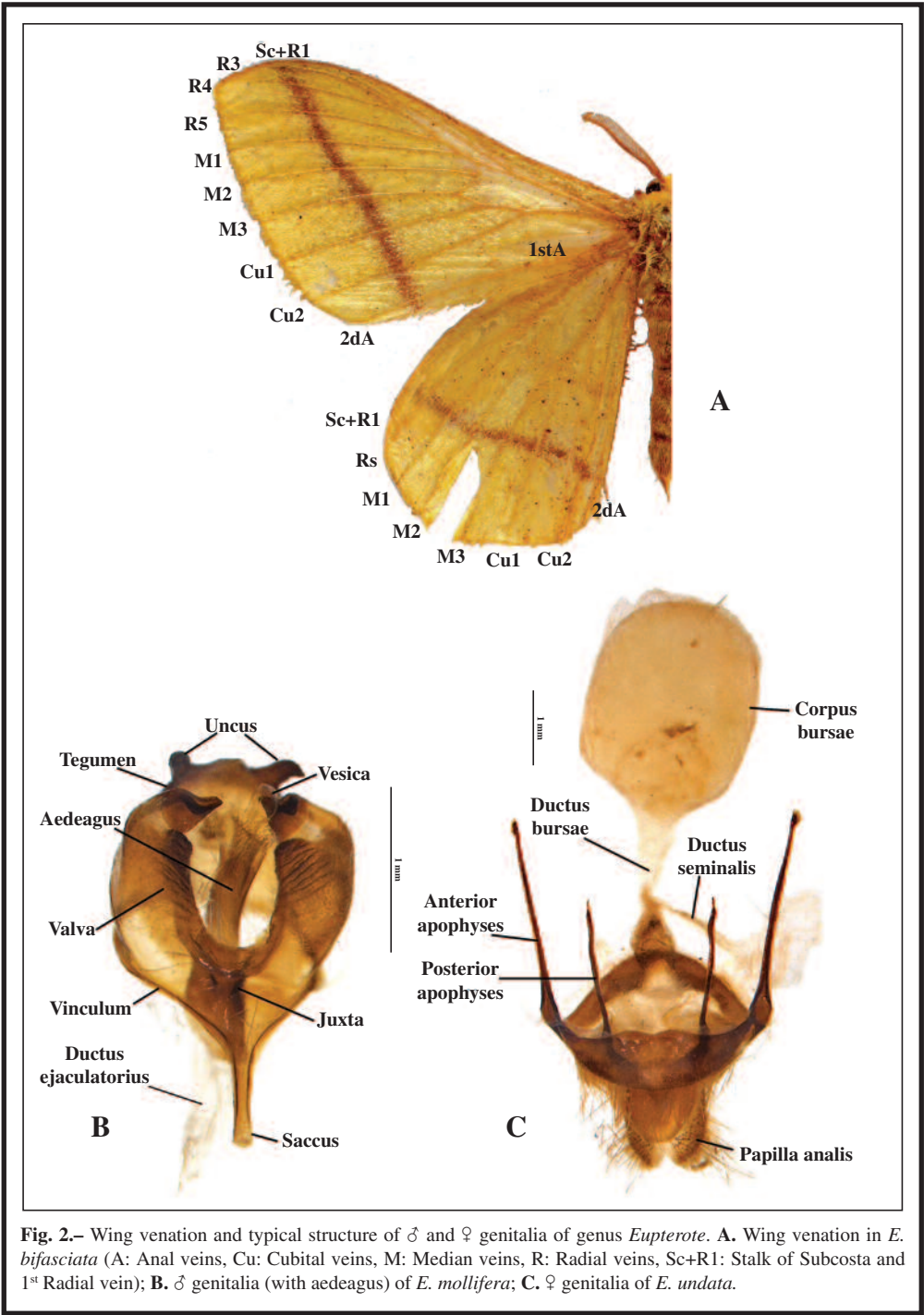
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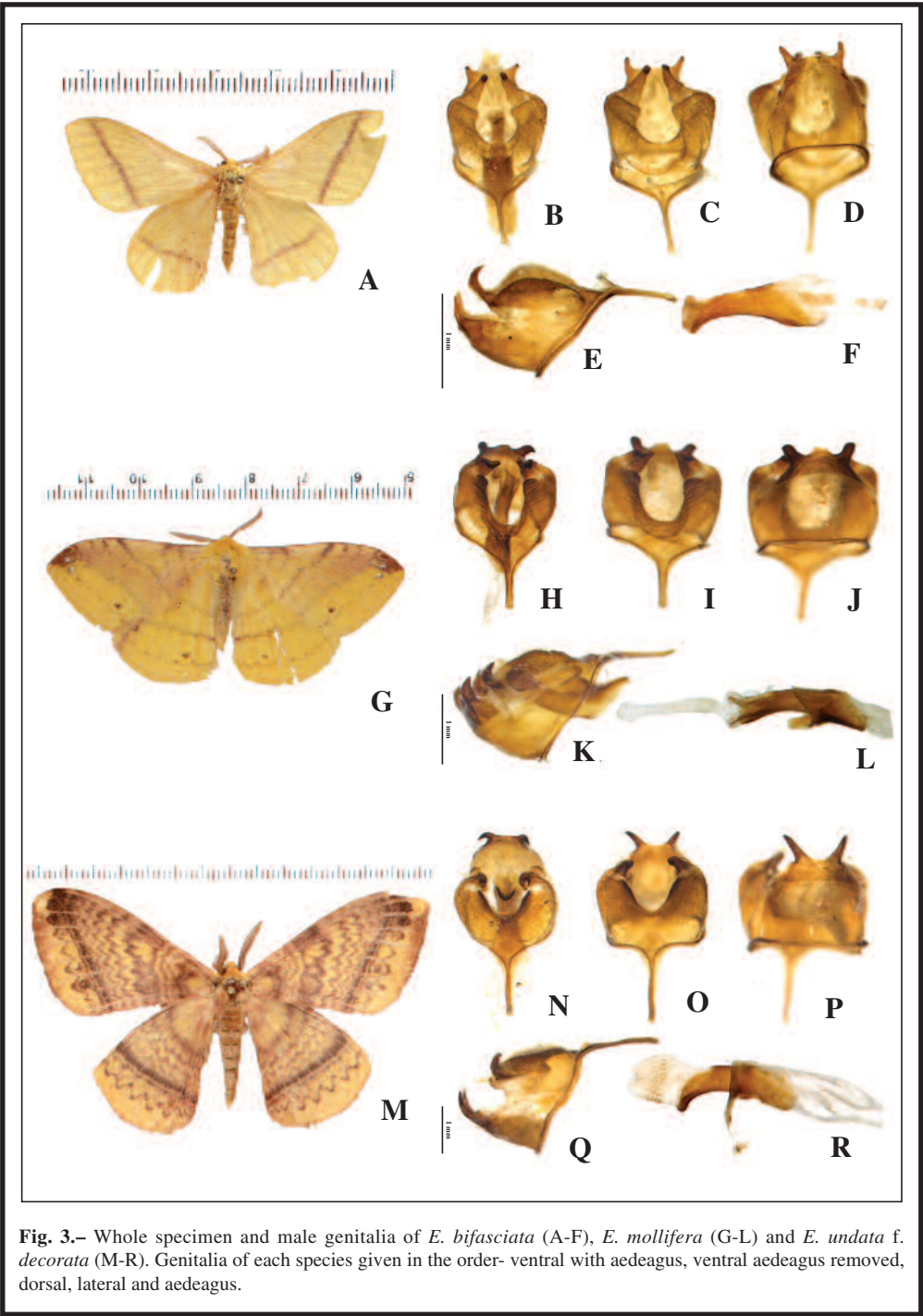
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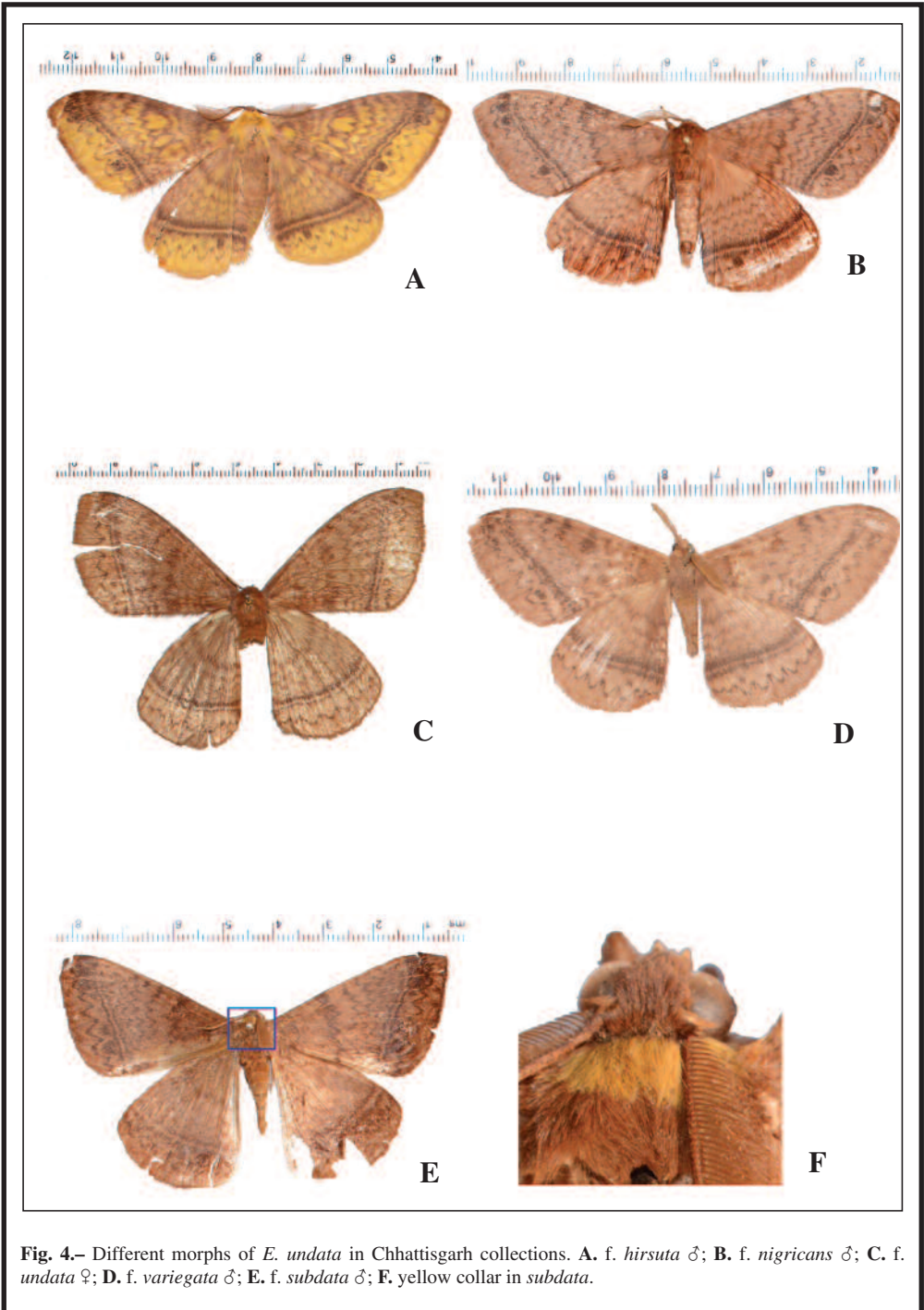


**Fig. 2.**– Wing venation and typical structure of ♂ and ♀ genitalia of genus *Eupterote*. **A.** Wing venation in *E. bifasciata* (A: Anal veins, Cu: Cubital veins, M: Median veins, R: Radial veins, Sc+R1: Stalk of Subcosta and 1<sup>st</sup> Radial vein); **B.** ♂ genitalia (with aedeagus) of *E. mollifera*; **C.** ♀ genitalia of *E. undata*.



**Fig. 3.**– Whole specimen and male genitalia of *E. bifasciata* (A-F), *E. mollifera* (G-L) and *E. undata f. decorata* (M-R). Genitalia of each species given in the order- ventral with aedeagus, ventral aedeagus removed, dorsal, lateral and aedeagus.





**Fig. 4.**– Different morphs of *E. undata* in Chhattisgarh collections. **A.** f. *hirsuta* ♂; **B.** f. *nigricans* ♂; **C.** f. *undata* ♀; **D.** f. *variegata* ♂; **E.** f. *subdata* ♂; **F.** yellow collar in *subdata*.



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