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Taxonomic studies on two species of genus *Calyptra* *ochsenheimer* (Lepidoptera: Noctuidae) from Kashmir

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Abstract

A comprehensive and a comparative taxonomic account of species of the genus *Calyptra* Ochseneimer is provided herewith. Two species are recognized in the genus: *Calyptra rectistria* Guenee and *Calyptra bicolor* Moore. Male and female external genitalic attributes are provided. Supplementary photographs and illustrations are also provided. Both species have been reported for the first time from Kashmir Himalayas.

Keywords: Comprehensive, Taxonomic, account, Genitalia, *Calyptra*

1. Introduction

Genus *Calyptra* was first established by Ochseneimer in 1816 on the type species *Phalaena thalictri* Borkhausen [1]. While synonymising the generic names *Calyptra* Ochseneimer, *Oraesia* Guenee, *cultasta* Moore, and *Hypocalpe* under genus *Calpe* Treitschke, has reported nine species from India under this genus [2]. Finally reported that *Calyptra* has priority over *Calpe* [3]. Reported three new species from India under the genus *Calyptra*. Out of an estimated of forty species, sub-species, forms and abbreviations, associated with *Calyptra* on global basis, only seventeen species now belong to the genus, as per recent analysis done by [4]. Described male genitalia of *Ophideroides* Guenee, *fasciata* Moore, *orthograptia* Butler and *minuticornis* Guenee [5]. Included *Calpe* Treitschke, *Culasta* Moore, *Hypocalpe* Butler and *Percalpe* Berio as junior synonyms of genus *Calyptra* [6].

Moths in the genus have wingspans ranging from 35 to 72 mm and are sometimes commonly known as vampire moths, due to the ability of pierce mammalian flesh and feed on blood. Modified proboscis with strongly sclerotized erectile barbed hooks of these moths is used for piercing both thick and hard-skinned fruits such as peaches, plums, and citrus fruits and sometimes mammalian skin [7]. These moths are found in southern Europe, eastern Africa, sub-Himalayan southern Asia, Manchuria, and broadly throughout Southeast Asia [8]. It is likely that blood feeding moths engage in this behavior facultatively, depending on regional availability of mammalian versus plant hosts [9]. Eight of the 17 to 19 described species have been reported to pierce mammalian skin under natural conditions: *Calyptra eustrigata* (Hampson), *Calyptra minuticornis* (Guenee), *Calyptra orthograptia*, (Butler), *Calyptra bicolor* (Moore), *Calyptra fasciata* (Moore), *Calyptra ophideroides* (Guenee), *Calyptra parva* Banziger and *Calyptra pseudobicolor* Banziger (5 of these 8 have been known to pierce human skin) and two additional species (*Calyptra fletcheri* and *Calyptra thalictri*) have shown this behavior in experiments or under semi-natural conditions [9] documented the first example of blood-feeding by *Calyptra* in a temperate region, by *Calyptra thalictri* in Far Eastern Russia. Individuals from one site exhibited blood-feeding behavior in experimental trials while individuals from a second site did not. Such variation has been observed for other *Calyptra* species as well [9]. In subtropical and tropical Asia, *Calyptra* moths are considered facultative or opportunistic blood-feeders, typically feeding on ungulates (hoofed mammals) such as tapirs, rhinos, and cattle, and occasionally on elephants and humans. Interestingly, female *Calyptra* adults have not been documented feeding on blood [10]. In the present studies, taxonomic studies of two species belonging to the genus *Calyptra* has been carried out from the study site for the first time.

2. Materials and Method

The study was conducted during 2012- 2013 from different agro forestry habitats in Kashmir Himalaya. The specimens were collected with the help of light trap. Different collection sites were selected for the purpose of collection with an altitudinal distribution ranging from 1500m

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– 4000 m amsl. After killing, pinned and properly stretched specimens were preserved in insect wooden cabinets. Forewing and hindwing of each species were detached from the body of an adult by simply giving upward jerk followed by dipping into 70% alcohol for 1-2 minutes, then placing in sodium hypochlorite for 10-20 minutes depending upon the size of the insect for descaling, then transferring the wings into glacial acetic acid for 10 minutes, later on into carbo-xytol for 15 minutes and mounted finally on a glass slides in DPX mountant. Male and female genitalia were dissected out. The genitalia were dipped overnight or boiled for 20-30 minutes with 10% KOH solution to get the musculature sufficiently relaxed. Later on KOH was removed by washing in distilled water for 2 or 3 times. The dissection was performed within a cavity block, with the help of fine forceps and needles under an Olympus SZX7 binocular stereoscope microscope. The dissected parts were transferred to acetic acid glacial in another cavity block for 10-15 minutes and finally transferred to carbo-xytol for 15 minutes. After clearing they were mounted finally on a slide in DPX mountant and covered with cover slip. The drawing of wings was done on camera lucida attached to binocular microscope. The photographs of genitalia and other parts were taken by the help of Olympus digital camera (CAMEDIA C-7070). The collected materials have

been deposited in Department of Zoology and Environmental Sciences, Punjabi University Patiala for future reference.

3. Observations

Diagnostic characters of subfamily Calpinae: Proboscis fully developed; second segment of labial palpi thickened; tibiae hairy; tibial spines absent on mesothoracic leg; hindwing vein M2 well developed and approximated to M3 at the base, arising close to the lower angle of the cell; frenulum single in the male and multiple in female.

Genus *Calyptra* Ochseneimer

Ochseneimer, 1816, *Eur. Schmetz.*, 4: 78.

Type species: *Phalaena thalictri* Borkhausen.

Diagnosis: Labial palpus correct, elongated forwardly as beak like; forewing with a quite protuberant, broadly rounded lobe at the based half of the inner margin; a corresponding broad excision at distal half of inner margin; tornus mostly marked by a broadly rounded extension, often ending in a sharp 'hook', extremely fine, vertically arranged, whitish to brownish sinuating lines.

Key to the studied species of genus *Calyptra* Guenee

1	Male genitalia with uncus without hairs, vinculum u-shaped; valva long and narrow; with a sclerotized scar at saccular margin; harpe absent; carina fringed with hairs, aedeagus tubular straight with apical spine	<i>rectistria</i> Guenee
2	Male genitalia with uncus fringed with hairs, vinculum v-shaped; valva short and broad; inner saccular margin saw toothed; harpe present; saccular process curved apically covering cucullar margin, aedeagus broad and curved without apical spine	<i>bicolor</i> Moore

Calyptra rectistria (Guenee)

Guenee, 1852, *Hist. Nat. Insectes (Lepid.)*, 6: 363. (Plate - 1)

Head orange; thorax red brown; abdomen and underside much paler; collar fiery orange; palpi upturned; forewing longer and more produced at apex; red brown suffused with purplish; numerous indistinct slightly waved oblique lines; a dark streak on median nervure; from apex to inner margin an oblique double line beyond middle, pale filled near apex; area beyond it suffused with gold; hindwing ochreous white, suffused with fuscous towards outer margin.

Male Genitalia: Uncus long and curved, pointed apically; tegumen very long, membranous and thin tube like; vinculum u-shaped; scaphium prominent as long as uncus, membranous; valvae long and narrow, with a sclerotized scar at saccular margin; harpe absent; carina fringed with hairs; transtilla with two spines, broad basally and pointing apically, highly sclerotized; juxta well developed triangular; aedeagus short and broad; tubular straight with sharp apical spine: proximal part highly sclerotized, distal part membranous; vesica sac like, with a patch of spicules; cornuti concentrated centrally; ductus ejaculatorious entering at base.

Female Genitalia: Not Studied.

Material examined: Anantnag: Daksum, 2600 m, 3♂♂, 16.vi.2009; Kokernag, 1841 m, 2♂♂, 15.vi.2009; Lidderwatt, 3300m, 2♂♂, 14.vii.2010, 29.vi.2012.

Distribution: Dharamsala, Sikkim, Sylhet.

Remarks: This species has been reported for the first time from Kashmir Himalaya.

Calyptra bicolor Moore

Fabricius, 1794, *Proc. Zoo. Soc.*, 883. (Plate - 2)

Head and thorax red brown; abdomen orange yellow; forewing being more produced at apex; brownish ochreous tinged with purplish; intervals between browner oblique fasciae greyish; with numerous fine pale striae; outer oblique line red; pale transverse strigulae distinct; on veins towards termen are some black and white dots; hindwing orange yellow, or wholly clear yellow; underside with outer area of forewing orange yellow.

Male Genitalia: Uncus short and slightly curved, apically pointed, fringed with hairs, vinculum broad v-shaped; valva short and broad; inner saccular margin saw toothed; harpe present strong fingertip shaped, saccular process very long curved apically covering cucullar margin. Aedeagus short and broad, curved medially, without apical spine, vesica granulate, cornuti present at the lateral margin, ductus ejaculatorious entering basally.

Female Genitalia: Not Studied.

Material examined: Udhampur: Patnitop, 2100 m, 3♂♂, 14.viii.2009, 25.ix.2010.

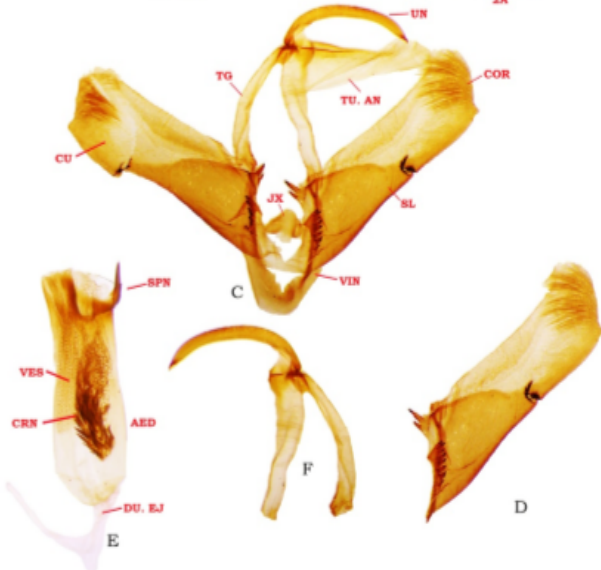
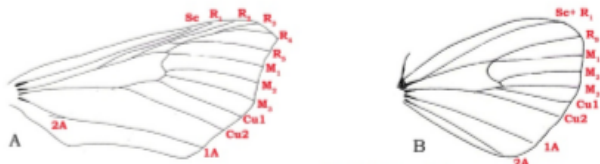
Distribution: India, N.W. Himalaya, Solan, Kangra.

Remarks: This species has been reported for the first time from Kashmir Himalaya.

PLATE - 1



Calyptra rectistria Guenee

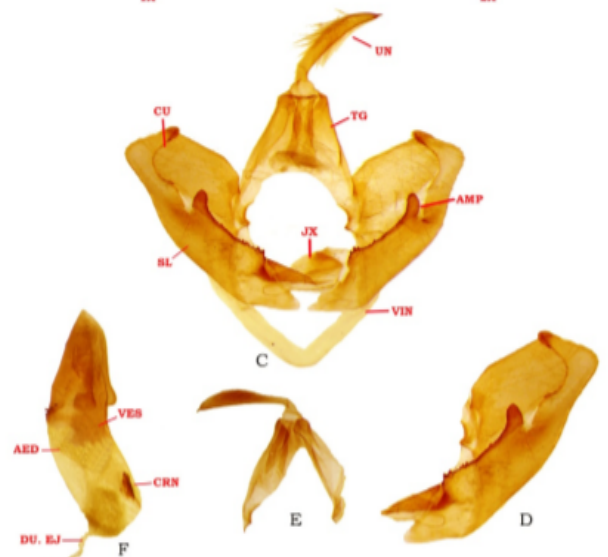
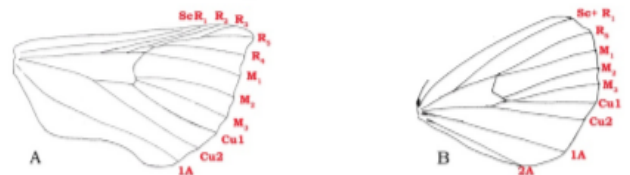


A. Forewing, B. Hindwing, C. Male genitalia, D. Valva (Left), E. Aedeagus, F. Uncus with Tegumen

PLATE - 2



Calyptra bicolor Moore



A. Forewing, B. Hindwing, C. Male genitalia, D. Valva (Left), E. Uncus with Tegumen (Enlarged), F. Aedeagus.

Abbreviations Used: UN-uncus; TG-Tegumen; TU, AN-Tuba analis; COR-Corona; CU-Cucullus; SL- Sacculus; JX-Juxta; VIN-Vinculum; SPN-Spine; VES-Vesica; CRN-Cornuti; DU, EJ-Ductus ejaculatorious; AMP-Ampulla; AED-Aedeagus.

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