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## ON THE FEMALE MORPHS, ECOLOGY AND MALE GENITALIA OF *CALLEREBIA DIBANGENSIS* ROY (LEPIDOPTERA: NYMPHALIDAE: SATYRINAE) RECORDED NEAR MAYODIA PASS IN LOWER DIBANG VALLEY, ARUNACHAL PRADESH, INDIA

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### OPEN ACCESS

**Abstract:** *Callerebia dibangensis* was recently described from a single specimen collected in 1987 from Upper Dibang Valley, Arunachal Pradesh along with comparison of wing morphology of this single male individual with the congeners. However, there is no other information on the species. The current study recorded a large number of live individuals of such a species around Mayodia pass and was thus able to note the variations in wing morphology, the wing morphology of the female, distinguishing features between the sexes, observations on biology and ecology of *C. dibangensis* from Mayodia pass (1,900–2,265 m) in lower Dibang Valley, Arunachal Pradesh, India along with comparison of male genitalia of *C. dibangensis* with its closest ally *C. scanda opima* from the same locality.

**Keywords:** Arunachal Pradesh, *Callerebia scanda opima*, female morphs, male genitalia, Mayodia pass, sub-tropical broad leaved hill forest.

The author during the course of his surveys in Arunachal Pradesh covering 17 districts (Fig. 1) from east to west (Tirap, Namsai, Changlang, Lohit, Anjaw, Upper and Lower Dibang Valleys, Upper, West and East Siang, Upper and Lower Subansari, Kurung Kumey, Popumpare, East and West Kameng and Tawang) from November 2011 to December 2014 found six individuals of this *Callerebia* on 9 August 2012 from Mayodia pass and then again found the same species at the same place in very large numbers on 29–31 August 2013. While the author was himself thinking of describing this *Callerebia*, as a new species, he came across the publication in



DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED	EXTINCT IN THE WILD	EXTINCT
DD	LC	NT	VU	EN	CR	EW	EX

*Callerebia dibangensis*



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**Competing Interest:** The author declares no competing interests.

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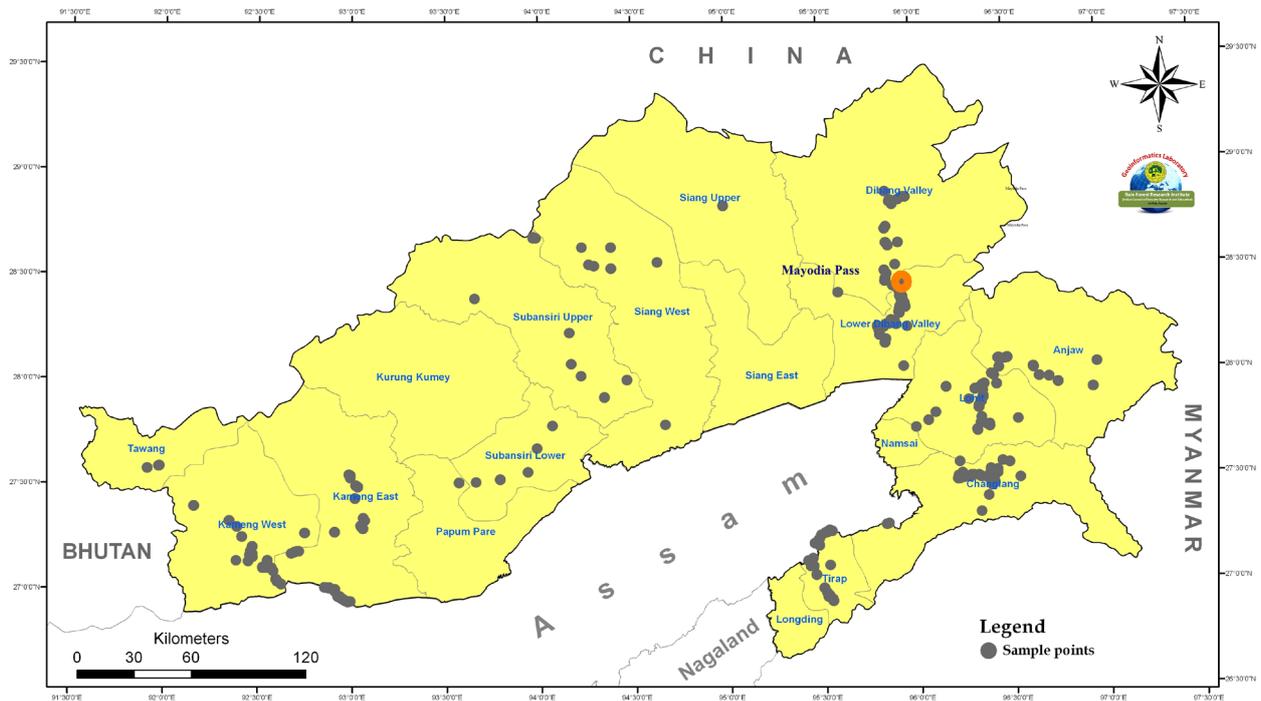


Figure 1. Location of Mayodia pass in Lower Dibang Valley (orange filled circle; 28°17'21.0"N & 95°55'16.9"E; 2239m), and other butterfly sampling points in Arunachal Pradesh, India, taken up for study (November 2011–December 2014) by the author (Source: Geo-Informatics Laboratory, Ecology & Biodiversity Conservation Division, Rain Forest Research Institute, Jorhat, Assam).

September 2013 (Roy 2013), in which a specimen of a male having similar wing morphology as that of the ones found in Mayodia pass was described as *C. dibangensis*. No genitalic information was given by Roy. The present findings thus give conclusive evidence to the existence of such a species from the Lower Dibang Valley.

**MORPHOLOGY**

**Description**

Female 1 (RFRI-39) (Image 1) : (Female not described earlier). Forewing length 35mm, 28°17'21.0N & 95°55'16.9E, elevation 2239m, Near Mayodia Pass towards Hunli, Lower Dibang Valley, Arunachal Pradesh, India, 29 August 2013. coll. Arun P. Singh, Ecology & Biodiversity Division, Rain Forest Research Institute, Jorhat, Assam.

Upperside: Ground colour dark chocolate brown, slightly blackish, paler towards margins. Very large round orange-ringed apical ocellus (11mm), black inner with two white pupils. Edges of ring distinct and regular. Hindwing single tornal ocellus in space 2. Narrow reddish ring, black inner and white pupil.

Underside: Ground colour dark chocolate. Forewing apical ocellus large as on upperside, but with an additional thin reddish outer ring. Forewing termen margin covered with a thin scattering of white scales

tapering towards tornus. Hindwing white scales forming prominent small striae with slight violet tones covering the whole wing apart from a narrow area around the tornal ocelli. Striae darker towards the costa and apex. In the basal half they are more separate and alternate with the dark brown ground colour producing a distinctive snow-drift like appearance. They are densest towards the discal region in spaces 1, 2 and 3 where they merge with one another. Hindwing has one tornal ocelli with white pupil, in space 2, much larger than 1c and also has a red in the dark space surrounding it. Both the ocelli are orange ringed. Ocellus in space 1 absent in this specimen but may be present as a minute dot in females.

Male 1 (RFRI-38) (Image 3) : Forewing length 33mm. (Fresh or newly emerged), 28°17'21.0N & 95°55'16.9E, elevation 2239m, Near Mayodia Pass towards Hunli (site II), Lower Dibang Valley, Arunachal Pradesh, India, 29 August 2013, coll. Arun P. Singh, Ecology & Biodiversity Division, Rain Forest Research Institute, Jorhat, Assam.

Upperside: Ground colour dark chocolate brown, slightly blackish, paler towards margins. The round orange-ringed apical ocellus (09mm) is not as wide as in the female and is more sharply defined, black inner with two white pupils. Edges of ring distinct and regular without orangish tinge bordering it. Hindwing single



**Image 1. Female 1 (RFRI-39) *Callerebia dibangensis*, left dorsal view and right ventral view. 31 August 2013, near Mayodia Pass towards Hunli (site II; 28°17'21.0N & 95°55'16.9E; 2239m), Lower Dibang Valley District, Arunachal Pradesh, India.**



**Image 2. Female 2 - *C. dibangensis*, left dorsal view and right ventral view. 28°17'21.0N & 95°55'16.9E; 2239m on 31 August 2013, near Mayodia Pass towards Hunli (site II), lower Dibang Valley District, Arunachal Pradesh, India**

tornal ocellus in space 2. Narrow reddish ring, black inner and white pupil, but not so prominent and merging with the base wing colour.

Underside: Ground colour dark chocolate. Forewing apical ocellus large as on upperside, with an additional thin reddish outer ring. Forewing termen margin covered with a thin scattering of white scales tapering towards tornus. Hindwing white scales forming prominent small striae with slight violet tings covering the whole wing, except the narrow area around the tornal ocelli. Striae become darker towards the costa and apex. In the basal half the striae appears more separate and alternate with the dark brown ground colour. The striae are very close with each other towards the discal region in spaces 1, 2 and 3 where they merge with one another. One prominent orange ringed tornal ocelli with black centre, ocellus in space 2 very much larger and orange ringed than 1c which is blind almost insignificant, a tiny dot. A

distinct dark space without white scales surrounds the ocellus in space 2.

Forewing length of 10 live individuals was measured besides these individuals in the field and it varied between 32–36mm (wingspan: 65–70 mm) while forewing length of two individuals of *C. scanda opima* from the same locality was 30–31 mm. The size of this species was larger than that of *C. scanda opima* (Images 5, 6). The specimens are at present at the Rain Forest Research Institute, Jorhat. After publication of the findings of the project, the *Callerebia dibangensis* specimens will be incorporated in the 'National Forest Insect Reference Collection' at Forest Research Institute (ICFRE), Dehradun, which is the main and largest repository of forest insects in the country.

**Male genitalia**

Male genitalia (Image 4) of this *Callerebia* compared



Image 3. Male 1 (RFRI-38) - *C. dibangensis*, left dorsal view and right ventral view. On 31 August 2013 near Mayodia Pass towards Hunli (site II; 28°17'21.0N & 95°55'16.9E; 2239m), Lower Dibang Valley, Arunachal Pradesh, India

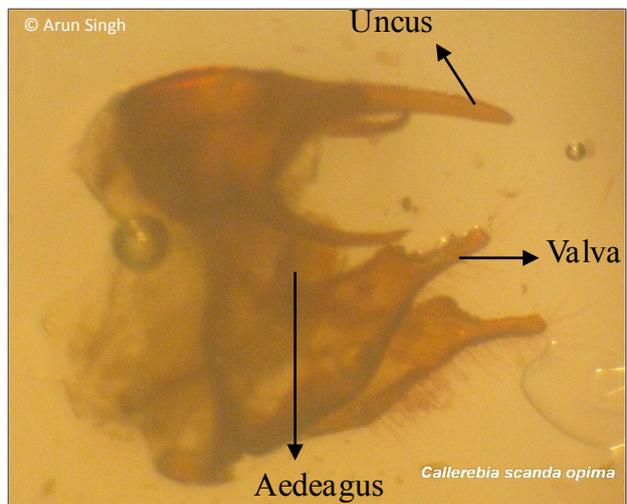
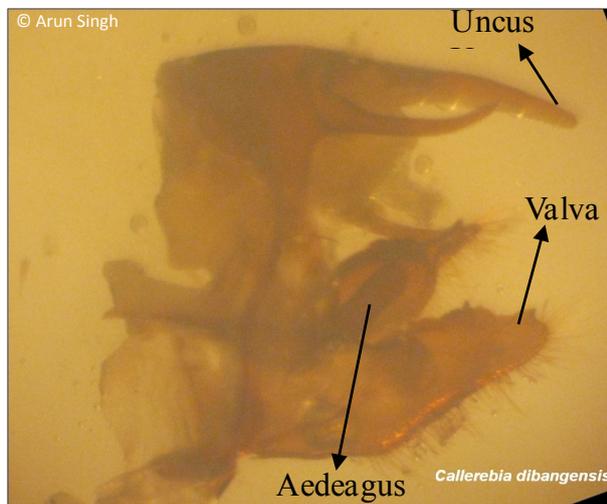


Image 4. Male genitalia (RFRI-38) of *Callerebia dibangensis* (left) compared with *Callerebia scanda opima* (RFRI-46) (right) (lateral views) showing the distinct valve. 31 August 2013, near Mayodia Pass (site II; 28°17'21.0N & 95°55'16.9E; 2239m), Lower Dibang Valley, Arunachal Pradesh, India

with *C. s. opima* from the same locality. The basic difference amongst them lies in the shape of the valva. In the former species the valva is much broader while it is a finger-like narrow projection in the latter. Male genitalia of this *Callerebia* also differs for male genitalia of *Callerebia suroia* Tytler and *Callerebia orixa* Moore as the 'uncus' is absent in these two species (Okano & Okano 1985) (<http://ir.iwate-u.ac.jp/dspace/bitstream/10140/2344/1/al-no36p157-160.pdf>)

**Variations in wing morphology**

Female 1 (Image 2) the forewings in this individual are very large and broad, but the smooth curve of the costa convex and forming all around the apex to the termen is broken by an angle. The edges of the ring are not distinct but diffused with orange, encircling the large

round apical ocellus. Hindwing has one tornal ocelli which is orange ringed but has red in the dark space surrounding it in the female while the male lacks the red in the dark space.

Individual no. 4 (Image 7) which is large in size. Hind wing has an additional third tornal ocelli which is represented in space 3, but being the smallest of the three tornal ocelli in line the others being in space 1 and 2. Ocellus in space 2 is much larger than 1c.

Individual no. 5 female (Image 8) has an additional smaller orange-ringed ocelli with a minute pupil in space 2 linked to the bigger round orange-ringed apical ocellus with white pupils in space 4 and 5.

The presence of an ocellus in space 2 on the under hindwing having a narrow reddish ring, black inner and white pupil and surrounded by dark space is the



Image 5. *Callerebia scanda opima*, dorsal and ventral views of a mating pair.



Image 6. *Callerebia scanda opima* - female

characteristic feature of this *Callerebia*. The presence of ocelli in spaces 1c and 3 has been found variable, absent especially in the females if even they are present, the ocellus in space 2 is always largest followed by ocelli in space 1c and space 3, respectively.

#### OBSERVATIONS

Images of live field specimens (Images 7–12). Dorsal and ventral views, 9–15 August 2012 and 29 & 31 August 2013 from Mayodia pass in Lower Dibang Valley.

#### Local abundance status

Recorded as 'locally abundant' on a ~30km road stretch 13km ahead from TiwariGaon (28°13'23.2N & 95°50'15.3E; 1452m) to '55 Mile' (28°16'47.1N & 95°54'45.52; 2257m) which lies 11km after Mayodia Pass and before Hunli township, on the way to Anini from Roing, in the Lower Dibang Valley District.

A total of six individuals were recorded in August 2012. Four individuals (1+1+2) were observed on 9 August 2012 from 13:30–16:10 hr on a hillside south-west facing, 70° slope, a few kilometers west of Mayodia. Two individuals (1+1), one male was recorded at 11:58hr near '55 Mile' and another individual at 13:15hr 13km before 'Tiwari Gaon' on 15 August 2012, while returning to Roing along the road side; both these sightings were close to human habitation.

This was the only species of *Callerebia* that I encountered in seven days (9–15 August 2012), the Dibang Valley up from Tiwari Gaon through Mayodia Pass-Hunli-Anini up to Mippi & from Anini to Dambuine towards Brunei. The altitude along the road varied from 1,900–2,300 m. No collections were made however.

However, during a second survey carried out from 28–31 August 2013, 93 individuals were counted at

seven locations on a stretch of ca. 20km, 15km on both the sides of Mayodia pass, towards Roing on the south and Hunli towards the north at altitudes between 2,203–2,265 m. The habitat was shared with *C. scanda opima* which was also encountered in good numbers, both species flying together near Mayodia pass. This species was recorded from 28°17'20.7N–95°55'16.0E to 28°18'15N–95°55'21.3E in exceptionally high numbers.

During the last two surveys in the same area (Roing-Mayodia-Hunli-Etalin-Anini-Mippi route) from 11–16 March 2014 and from 6–10 June 2014 by the author this species was absent. The reason was cold weather in March (day time temperature, 17–20 °C & low relative humidity, 44.8–72 %), but in June (day time temperature 20–25 °C) and relative humidity (90–94.8 %) was higher than March but this species was still not to be found.

#### Habits and habitat

Prefers forest openings and edges along the shrubberies, moist shady rocks with over hanging grasses on hillsides (Image 12). Has a slow hopping flight, preferring to remain close to the ground flying around the same patch in circles and coming back again to the same spot after some time. When disturbed, moves up the mountain slope, but slowly comes down again after some time. Settles on stones, moist rocks, leaves and flowers of herbaceous vegetation. Individuals were observed settling on leaves of *Rubus ellipticus* shrub (Images 8,9 and 10), feeding on nectar of small shrubs and herbs, settling on grasses and dwarf bamboos along the roadside. Flies in all types of weather-sunny, cloudy and drizzling of rain. Individuals recorded in flight between 09:33–14:00 hr. Hides in over hanging grass to escape from heavy rain. Courtship and mating was observed in cloudy weather for two pairs (image



Image 7. Individual 4 - *Callerebia dibangensis* near Mayodia pass 28°17'21.0N & 95°55'16.9E; 2239m, 31 August 2013.



Image 8. Individual 5 - *Callerebia dibangensis* near Mayodia pass, 9 August 2012.



Image 9. Individual 6 - *Callerebia dibangensis* Mayodia pass, 15 August 2012.



Image 10. Individual 7 - near *Callerebia dibangensis* Mayodia pass, Dibang Valley 29 August 2013

11) close to the ground on the road and was similar to any other *Callerebia*. However during 28–31 August 2013 the day time (1000–1500 hr) temperature varied between 19.9–20.8 °C and relative humidity between 89.3–94.2%, respectively, when this species was in flight and the weather at this time of the year was overcast and rainy, intermittent rain and drizzling along with some hours of sunshine.

#### Forest type in the area

'Sub-tropical broad leaved hill forest' (Champion & Seth 1968). Dominating tree species: *Populus gamblei*, *Rhus succediana*, *Phoebe lanceolata*, *Castanopsis indicia*, *Exbucklandia populnea*, *Acer* sp., *Morus levigata*, *Lyonia ovalifolia*, *Quercus* sp., *Machilus* sp., *Saruja punduna*, etc. Middle and lower storey: *Prunus* sp., *Rubus ellipticus*, *Spiraea* sp., *Rhododendron* sp.,

*Hedychium gardnerianum*, *H. densiflorum*, *H. coccineum*, *Vaccinium* sp., *Zanthoxylum armatum*, *Polygala arillata*, *Didymocarpus* sp., *Cephalostachyum* sp., *Sinarundinaria griffithiana* and grasses.

#### DISCUSSION

Borang et al. (2008) conducted a survey of the Dihang-Dibang biosphere during November 2006 and October 2007 but they did not record any *Callerebia* species. Recently, Gogoi (2012) had listed butterflies from the lower part of Dibang Valley District but he also did not record this species as the survey was from March–June 2011. Roy (2013) who found it in 1987 had described it in 2013 from near Anini existing between altitudes 1600–1800m in Upper Dibang Valley having no GPS at that time.



Image 11. Individuals 8 & 9 - *Callerebia dibangensis* in Mayodia pass, 29 August 2013 courtship display in *Callerebia dibangensis*

### CONCLUSION

The findings of the this study suggest that this *Callerebia* is a cryptic species, restricted and locally common in and around 'Mayodia Pass' in lower Dibang Valley in Arunachal Pradesh in the east Himalayan region of India where it prefers rocky-grass habitat between ~1900–2300 m. July–September appears to be the main flight period of this species, this period is characterized by intermittent rains, cloudy weather and high humidity. The wing pattern and shape shows slight variations in the female. A distinguishing feature between the sexes is that in the female the hindwing tornal ocelli, which is orange ringed, has 'red' in the dark space surrounding it while in the male this 'red' is lacking.



Image 12. Habitat of *Callerebia dibangensis* near Mayodia pass, lower Dibang Valley 29 August 2013.

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