

A new species of *Euthalia* Hübner, 1819 subgenus *Limbusa* Moore, [1897] (Lepidoptera, Nymphalidae, Limenitidinae, Adoliadini) from Arunachal Pradesh, Northeast India

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ABSTRACT: A new species of *Euthalia* Hübner, 1819 (subgenus *Limbusa* Moore, [1897]) (Lepidoptera, Nymphalidae, Limenitidinae, Adoliadini) is described from Arunachal Pradesh, northeastern India. This species, *Euthalia (Limbusa) zubeengargi*, Sadasivan & Upadhaya **sp. nov.**, is assigned to the *Patala* group of *Limbusa* based on its wing pattern, venation, and male genital morphology. A detailed description of the male and its genitalia is presented, along with a revised key to the males of Subtype A2 of the *Patala* group sensu Yokochi (2011). © 2026 Association for Advancement of Entomology

KEY WORDS: New taxon, butterfly, duke, *Patala* group, morphology, Basar, Eastern Himalayas, taxonomic key

INTRODUCTION

Butterflies of the subgenus *Limbusa* Moore, [1897] of *Euthalia* Hübner, 1819 inhabit broad-leaved forests of the Oriental Region, particularly in northeastern India, southern China and Indochina, and extend northwards into the temperate Sino-Himalayan zone (Yokochi, 2010; Huang *et al.*, 2016). They are characterised by a brown ground colour variably suffused with bluish-green iridescence and a well-defined series of creamy-yellow to white discal spots on the wings (Yokochi, 2010). The group was comprehensively revised by Yokochi (2010, 2011, 2012) and currently

comprises more than 80 recognised species (Yokochi, 2010, 2011, 2012; Lang, 2012, 2025; Saito and Inayoshi, 2014; Yoshino, 2023).

Species of the subgenus *Limbusa* are classified into three principal groups—the *Patala*, *Franciae*, and *Nara* groups—based on external facies and male genital morphology (Yokochi, 2011). The *Patala* group, which contains most *Limbusa* species, is defined by a uniformly pale-brown underside lacking the glittery silver typical of the *Nara* group, males that are generally larger with forewing lengths commonly exceeding 40mm and a less acute hindwing angle, and a yellowish

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upperside suffusion that does not extend into space 7. Diagnostic wing markings include a continuous pale discal band (or its remnant) on the hindwing running from costa to dorsum, a distinct median white spot in space 6, and conspicuous submarginal spots in spaces 8 and 6 on the forewing. The male genitalia bear an elongated valva with apical serrations, showing species-level variations, whereas the females are typically larger and exhibit species-dependent sexual dimorphism with correlated pattern elements across sexes (Yokochi, 2010, 2011, 2012). Within the *Patala* group, male hindwing spotting permits recognition of Type A, characterised by a discal band (or trace) in hindwing extending from the costa to the dorsum without paralleling the termen, and Subtype A2, in which a line connecting the forewing postdiscal white spot in space 6 and the postdiscal spot in space 3, when extrapolated, reaches the termen (Yokochi, 2011).

Fieldwork in the Basar region of Arunachal Pradesh, India, yielded several individuals of an undescribed *Euthalia* species with a distinct and stable external phenotype. Morphological assessment of the captured male, supplemented by high-quality field photographs of an additional male, unequivocally indicated that this taxon is distinct from all currently recognised species. Although an extensive targeted collection was attempted for several months, no further material could be secured. Therefore, proceeded with the formal description of this species based on a single adult male, corroborated by multiple photographic records from the type locality. Although the description is presently based on a single male specimen, a formal taxonomic treatment is justified by the documented stability and diagnosability of external wing characters in *Limbusa* (Yokochi, 2010, 2011, 2012), together with the clear, non-overlapping distinctiveness of male genital morphology as a primary species-level diagnostic trait in the *Patala* group (Yokochi, 2010, 2012).

MATERIALS AND METHODS

The taxonomy of *Euthalia* Hübner, 1819, follows the treatments of Yokochi (2010, 2011, 2012), and species-level identification was performed using the diagnostic keys provided therein. Specimen imaging

was performed using a Canon EOS 70D DSLR camera fitted with a 180mm macro lens and an MP-E 65 mm f/2.8 1–5× macro lens. The male genitalia were treated overnight with KOH, dissected under a stereo-zoom microscope (HEADZ Model HD81), and preserved in glycerol. Line drawings were prepared by the senior author with the aid of a stereo-zoom microscope. The forewing length (FW) was measured as the maximum straight-line distance from the wing base to the apex, following Van Hook *et al.* (2012). The terminology for wing-pattern elements follows Evans (1932), and that for male genitalia follows Corbet and Pendlebury (1992). The holotype will be deposited in the insect collection facility of the Zoological Survey of India (ZSI) at the Western Ghat Regional Centre (WGRC), Kozhikode, Kerala.

Abbreviations

ASL	Above sea level
FW	Forewing
HW	Hindwing
TNHS	Travancore Nature History Society
UpF	Upperside of forewing
UnF	Underside of forewing
UpH	Upperside of hindwing
UnH	Underside of hindwing
ZSI	Zoological Survey of India, Kozhikode, Kerala

RESULTS AND DISCUSSION

Systematics

Family Nymphalidae Rafinesque, 1815

Subfamily Limenitidinae Behr, 1864

Tribe Adoliadini Doubleday, 1845

Genus *Euthalia* Hübner, 1819

Subgenus *Limbusa* Moore, [1897]

Euthalia (Limbusa) zubeengargi, Sadasivan & Upadhaya **sp. nov.** (Figs. 2, 3A, 5A–C)

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Fig. 1 Map of north-east India showing the type locality of *Euthalia (Limbusa) zubeengargi* sp. nov. based on Google Earth

Holotype (Figs. 2A–B, 3A): 1 male. 15.vi. 2025, private homestead bordering semi-evergreen forests, Basar, Leparada District, Arunachal Pradesh, 600m ASL. Col. R. Upadhaya.

Other materials (observed but not collected): 1 male. 13.vii. 2025, Laiho community forest, Basar, Arunachal Pradesh, 750m ASL. Obs. R. Upadhaya.

Description of the Holotype (♂ TLRG 1014).

Head (Fig. 2A–B). Eyes without hairs, colored greyish-green with black eyespots in life. Labial palpi apex pointed, olive-greenish to brown on dorsum and white on ventrum. Antennae typical of the genus: club gradually swollen, upperside blackish-brown with tip orange-brown, underside ochreous-brown, turning paler towards tip, antennae 24mm, approximately two-thirds forewing length, reaching level of distal margin of forewing spot 6. Proboscis pale greenish outside, white on ventrum.

Thorax (Figs. 2A–B, 3A–C). Robust, covered with short brownish hairs on dorsum, paler brown on ventrum, covered with moderately long bluish hairs around mid, hind leg insertions, and wing bases. Legs pale greenish-brown on outer and pale bluish-white on inner aspect, claws brownish-black.

FW (Figs. 2A–B, 3A–C). 44mm. Costa evenly curved; apex weakly produced; termen slightly

undulate shallowly concave; dorsum straight. *UpF*: Ground colour deep olive-brown; basal half with irregular blackish circular markings on greenish-brown background. Discal–postdiscal band of elongate white spots in spaces 6–4 aligned as a stack; spot in 3 slightly shifted outward; spot in 2 elongate, triangular (canine-tooth shaped), extending along vein 2 toward termen, indenting submarginal greyish-white band and ending just short of termen; space 1 with heart-shaped white spot at mid-level and an additional suffused white tornal spot; two small, suffused but conspicuous white subapical spots in spaces 6, 8; discal band connected to mid-costa by elongate creamy-white spot near costa (above subcostal vein 12), parallel to and slightly longer than that in space 6. *UnF*: Ground colour greenish-brown with black dusting, basal area strongly suffused with turquoise-green; basal half with irregular blackish circular markings typical of the subgenus; discal–postdiscal band of white spots as above; inner margins broadly bordered with black (especially at suffused tornal spot in space 1), outer margins narrowly edged in black in spaces 2–6; subapical suffused white spots in spaces 6, 8; submarginal band greyish-white, ill-defined, extending from apex to tornus, inner border defined by a wavy fascia of contiguous black suffused chevron marks extending from outer border of subapical spot in 6 to distal edge of spot in 2; marginal border suffused brown.

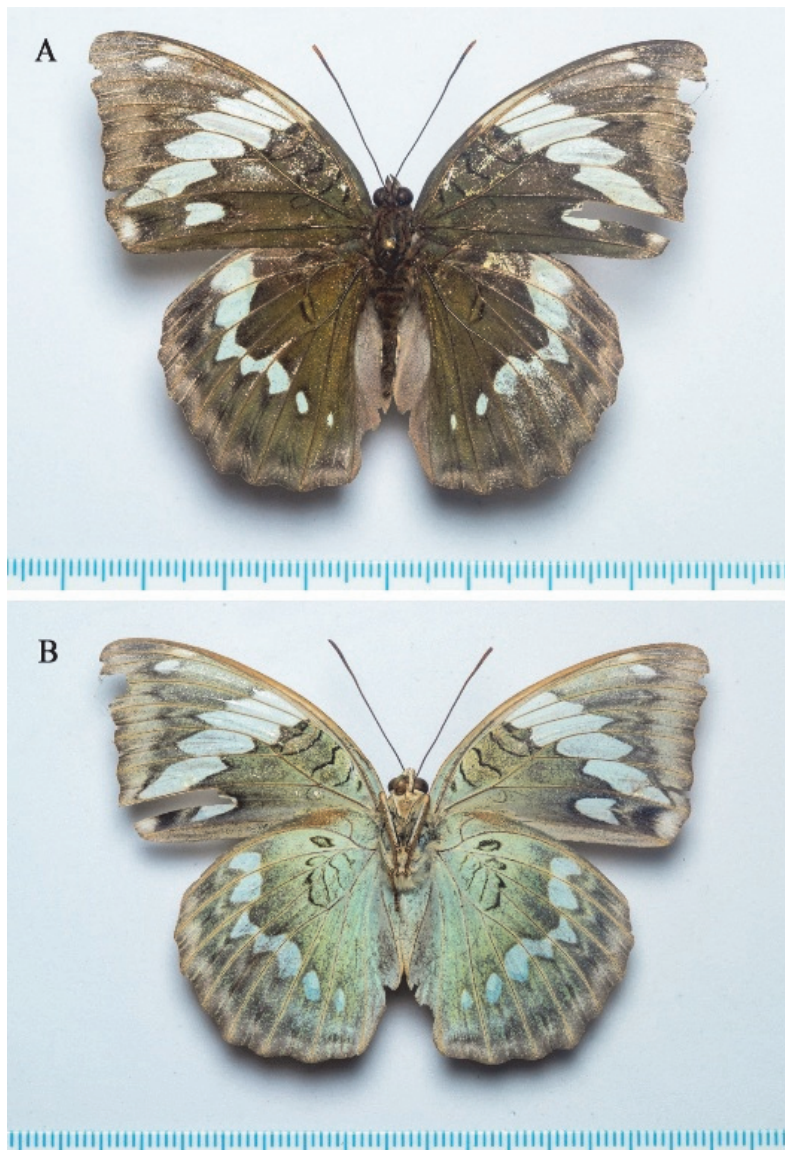


Fig. 2 *Euthalia (Limbusa) zubeengargi* sp. nov. Holotype male (TLRG 1014). A: Dorsal view; B: Ventral view. © Kalesh Sadasivan

HW (Figs. 2A–B, 3A–C). Costa moderately convex; termen convex, more at v4, margin undulate, scalloped between each vein; tornus weakly angular. *UpH*: Discal band pale bluish-white, extending from spaces 3 to 7; band broader towards costa, tapering towards 3, outer margin of band undulate in spaces 3–7; a narrow greyish-brown submarginal band with its outer edge lying very close to termen. *UnH*: Ground colour pale turquoise-

green, suffused with blackish scales; discal band pale bluish-white, as in *UpH*, with spots margined in suffused black; postdiscal pale fascia, followed by another dark fascia of same size, both ill-defined and borders suffused; a submarginal narrow greyish-brown submarginal band as on the *UpH*. Wing bases clothed in long, pale brownish hairs. Cilia in scalloped edges white, near vein ends, olive greenish-brown.

Abdomen (Figs. 2A–B, 3A–C). Brown, covered in short brownish hairs on dorsum, having greenish shade in posterior segments, ventrally covered with moderately long bluish hairs.

Male genitalia (Fig. 5A–C). Valva stout, approximately three times longer than broad; dorsal margin sinuate, convex medially; apex blunt, directed posteriorly, armed apically with 4–5 large laterally curved teeth; ventral portion of valva with a prominent basal bulge merging into harpe; sacculus gently convex, ventral margin nearly straight; phallus thin, approximately half as long as male armature; tegumen with rounded dorsal margin, distal margin straight toward fenestrula; uncus stout basally, proximal half straight, distal half deflected ventrally at $\sim 40^\circ$; saccus about as long as width of vinculum.

Female. Unknown

Variation (Fig. 3) No significant variation was observed between the type male and the field-photographed specimen, except for the presence of an additional minute white dot in space 1a on the forewing upperside (UpF) of the specimen that was not collected (Fig. 3B–C).

Etymology. The species is named in honour of the celebrated Indian singer and cultural icon Mr. Zubeen Garg, in recognition of his significant contributions to contemporary music in northeast India. The epithet is a compounded Latinised form of his first and family names, treated as a masculine genitive meaning “of Zubeen Garg.” The common name suggested is Basar Duke.

Ecology (Figs. 3–4) The species inhabits semi-evergreen forests of the Basar region of Arunachal Pradesh (Fig. 1), occurring between approximately 600–700m ASL in humid, shaded understory habitats (Fig. 4). Field photographs indicate that males utilise a range of microhabitats; one individual was observed mud-puddling on a moss-covered rock beside a forest stream (Fig. 3A), while others perched on broad-leaved saplings and shrubs 1–2m above ground in filtered light along narrow trails and riparian edges (Fig. 3B). The species also visits tree sap, as indicated by a male feeding at a bark

exudate patch, a behavior typical of several *Euthalia* (Fig. 3C). Individuals were active under diffused light from late morning to early afternoon, making short and slow flights between nearby foliage. All observations were made in dense, moist understories with persistent canopy shade, suggesting a preference for cool, humid microhabitats. The species appears to be genuinely rare and highly localized, known only from two males despite repeated surveys. Larval host plants and early stages remain unknown, though likely associated with broad-leaved canopy or subcanopy trees characteristic of Eastern Himalayan evergreen forests (Fig. 4).

Morphological evidence places the new species securely within the *Patala* group sensu Yokochi (2011). Its uniformly pale-brown underside, absence of the silvery sheen typical of the *Franciae* group, and male forewing length exceeding 40mm all agree with the diagnostic range of *Patala* group taxa. The hindwing outline is comparatively rounded, lacking the sharply produced angle of the *Nara* group, and the yellowish suffusion on the upperside remains restricted, not extending into space 7. Likewise, the continuous pale discal band on the hindwing upperside, together with the distinct white median spot in space 6 and the conspicuous submarginal marks in spaces 8 and 6 on the forewings, match the characteristic pattern suite of the group. These combined characteristics confirm the placement of this species within the *Patala* group.

Examination of the forewing pattern clearly indicates that the new species conforms to Subtype A2 of Type A within the *Patala* group. In this subtype, the diagnostic configuration involves the alignment of the line connecting the postdiscal white spot in UpF space 6 with space 3, when extrapolated, directed towards the termen. Both the holotype and photographed male exhibit this feature unambiguously, with the two spots lying in a straight, outward-slanting series that neither forms an acute angle (Subtype A1) nor inclines toward the dorsum (Subtype A3). This consistent orientation is a stable character across individuals and is fully congruent with Yokochi’s (2011) definition of Subtype A2. Together with other *Patala*-group traits, such as

forewing size, pale-brown underside, hindwing discal band reaching from the costa to the dorsum, and the pattern of submarginal white spots, the alignment of the forewing spots provides strong morphological support for assigning the new species to Subtype A2.

There are four known species in the Subtype A2—*E. (L.) pratti* Leech, 1891, distributed across central and southern China, including Hubei, Hunan, Guangxi, southern Gansu, Yunnan, Sichuan, Fujian, and Zhejiang; *E. (L.) occidentalis* Hall, 1930, recorded from Sichuan, Yunnan, and southern Gansu; and *E. (L.) cooperi* (Tytler, 1926), known from Mandalay, Myanmar, and *E. (L.) monastyrskiyi* Yokochi, 2011, was reported from northern Vietnam. Within Subtype A2 of the *Patala* group, *Euthalia (L.) zubeengargi* **sp. nov.** is most readily distinguished by the configuration of the forewing discal series and the associated hindwing pattern elements. Species of this assemblage can first be separated by position of the forewing spot in space 5: whether lies basad of or aligned with the spots in spaces 6 and 4. *Euthalia pratti* and *E. occidentalis* fall into the former category and differ from that of the new species. Among species with spot 5 aligned with spots 6 and 4, *Euthalia cooperi* is easily distinguished by its strongly displaced spot in space 2, which overlaps much less than half of spot 3 and is markedly shifted toward the termen. In contrast, *E. zubeengargi* **sp. nov.** shares with *E. monastyrskiyi* the condition in which spot 2 overlaps more than half the length of spot 3 and is only slightly shifted outward. However, *E. zubeengargi* **sp. nov.** and *E. monastyrskiyi* differ significantly in several key characteristics. In *E. monastyrskiyi*, spot 2 is small and oval, not extending along vein 2 towards the termen, and the forewing lacks a spot in space 1; the hindwing postdiscal band is weak, represented only by white markings in spaces 7 and the upper half of space 6, the remaining elements appearing as dark-edged brown spots, and spaces 1 and 2 lack white spots. In contrast, *E. zubeengargi* **sp. nov.** bears an elongate, triangular spot in space 2 that extends along vein 2 almost to the termen, along with a distinctive heart-shaped white spot in space 1 and

an occasional small one in 1a; the hindwing postdiscal band is complete and clearly expressed from spaces 7 to 3, with well-developed white spots in spaces 1 and 2. This combination of forewing spot morphology and fully developed hindwing postdiscal series provides a unique suite of characters that unambiguously separates *E. zubeengargi* **sp. nov.** from all other known Subtype A2 species.

Euthalia (Limbusa) zubeengargi **sp. nov.** is distinct among Subtype A2 taxa. In *E. pratti*, *E. occidentalis*, and *E. cooperi*, the valva is long and slender and the apex is pointed with uneven serrations (Fig. D–F). In the new species the valva (Fig. 5A–C) is markedly stout, three times as long as broad; apex blunt, directed posteriorly; apical serrations set on rounded tip; ventral margin with strongly developed basal bulge meeting a broadened harpe at an acute angle (ventral expansion weak and angle more obtuse in other species). Apical serrations are regular in *E. zubeengargi* **sp. nov.** and *E. monastyrskiyi*; however, they differ in orientation, relative length, and number (Fig. 5B and 5G). The uncus is relatively long, and the distal half is sharply angulated ventrally at ~40° (only approached in *E. cooperi*; gently curved in the remaining species). The aedeagus is slender and shorter than that of the other species. This combination of characters—valval stoutness, ventral bulge development, apex form, harpe configuration, uncus angulation, and phallic structure—unambiguously diagnoses the new species.

Revised key to males of Subtype A2 of Type A of the *Patala* group in the subgenus *Limbusa* Moore, [1897] of *Euthalia* Hübner, 1819, based on Yokochi (2011)

1. UpF spot in space 5 shifted basad relative to spots in space 6 and 4 2
 - UpF spot in space 5 aligned on a straight line connecting spots in space 6 and 4..... 3
2. Upperside ground colour predominantly bluish-green.....*E. (L.) pratti* Leech, 1891



Fig. 3 *Euthalia (Limbusa) zubeengargi* sp. nov. live insect in field. A: holotype male (TLRG 1014) mudpuddling; B: Another male (not caught) sitting on low canopy; C: Sap sucking with *Kallima inachus* (Doyère, 1840). © Roshan Upadhaya



Fig. 4 *Euthalia (Limbusa) zubeengargi* sp. nov. Habitat images. A: semi-evergreen forests of the Basar region of Arunachal Pradesh; B: Vantage point in low canopy. © Roshan Upadhaya

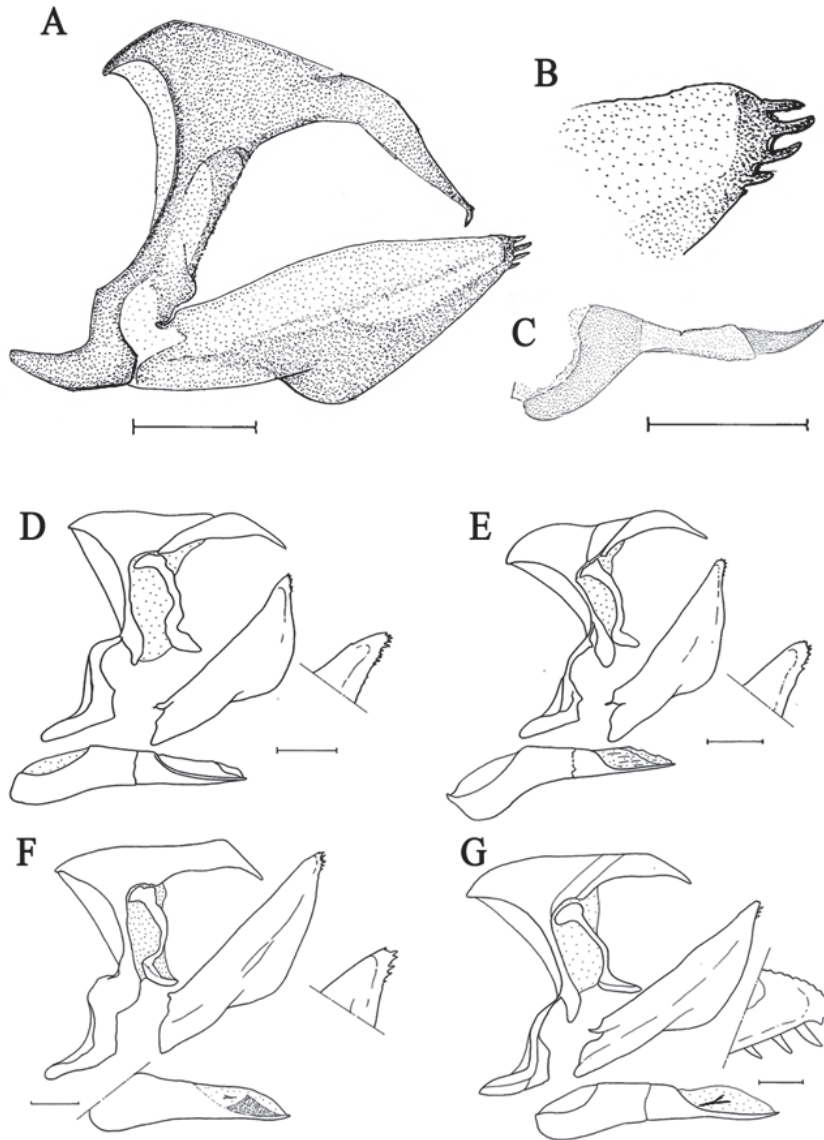


Fig. 5 Illustrations of male genitalia of Subtype A2 of Type A of the *Patala* group in the subgenus *Limbusa* Moore, [1897] of *Euthalia* Hübner, 1819. A: Right lateral view of genital armature of *Euthalia (Limbusa) zubeengargi* sp. nov.; B: Close-up of tip of valva showing the tooth; C: aedeagus; D: male genitalia of *E. (L.) pratti* Leech, 1891; E: male genitalia of *E. (L.) occidentalis* Hall, 1930; F: male genitalia of *E. (L.) cooperi* (Tytler, 1926); G: male genitalia of *E. (L.) monastyrskiyi* Yokochi, 2011. A–C male genitalia illustration based on holotype TLRG 1014; D–G illustration based on Yokochi (2011). © Kalesh Sadasivan

– Upperside ground colour predominantly brown
..... *E. (L.) occidentalis* Hall, 1930

3. UpF spot in space 2 overlapping, much less than half the length of spot in 3, spot in 2 markedly shifted towards the termen..... *E. (L.) cooperi* (Tytler, 1926)

– UpF spot in space 2 overlapping more than half the length of spot in 3, spot in 2 only slightly displaced outward towards the termen.....4

4. UpF spot in space 2 small, oval, not extending along vein 2 towards termen, no spot in space 1a

or 1b; UpH postdiscal band from 7–3 represented by white spots in spaces 7, and half of spot in 6, remaining band represented by dark-edged brown spots from 5–3; UpH dark-edged brown spots in space 2, no spot in space 1.....
.....*E. (L.) monastyrskiyi* Yokochi, 2011

–UpF spot in space 2 elongate, triangular, extending along vein 2 towards termen and ending just short of it, a heart-shaped spot in space 1b; UpH postdiscal band well-developed, composed of white spots from spaces 7 to 3, white spots in spaces 1 and 2.....
E. (L.) zubeengargi Sadasivan & Upadhaya, **sp. nov.**

The discovery of *Euthalia (Limbusa) zubeengargi* **sp. nov.** from Basar, Arunachal Pradesh, adds a fifth Subtype A2 member to the *Limbusa patala* group and represents a significant range extension within the eastern Himalayan butterfly assemblage. Even with a lineage exceeding 80 described species, the new taxon is diagnosable based on a unique suite of facies and male genital characters. The occurrence in low–mid elevation humid forests of the region highlights its exceptional yet incompletely known butterfly diversity—further reinforced by the recent record of *E. malaccana* (Fruhstorfer, 1889) from Basar (Roshan Upadhaya and Taslima Sheikh, pers. comm.). The extremely limited number of individuals observed despite extensive survey efforts implies genuine rarity or highly cryptic habits, underscoring the need for continued sampling, documentation of early stages and host plants, and long-term monitoring of butterfly diversity in Northeast India. This discovery emphasizes that the subtropical forests of Arunachal Pradesh continue to yield previously unrecognized butterfly taxa.

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