

## A new species of *Hypolycaena* (Lepidoptera: Lycaenidae) from Arunachal Pradesh, north-eastern India

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**Abstract.** A new species, *Hypolycaena narada*, **sp. nov.**, is described from a series of male specimens from Arunachal Pradesh, north-eastern India. The new species is considerably distinct from other members of the tribe Hypolycaenini, and is easily distinguished from its relatives based on the following combination of characters: (a) slightly shining purple-blue upperside forewing with a dark, diffused androconial patch, (b) underside forewing apex and margin concolorous with the wing, (c) underside wings with narrow discal bands, ending in black costal spots, and (d) coastal black spot near the base.

**Keywords:** Indo-Burma biodiversity hotspot, species discovery, biodiversity surveys, butterfly taxonomy, Hypolycaenini.

### INTRODUCTION

The Oriental genus *Hypolycaena* C. & R. Felder, 1862 (Lepidoptera: Lycaenidae: Hypolycaenini) is placed under the subtribe Hypolycaeniti or Hypolycaenina, which is a complex of three allied genera: (1) *Hypolycaena* C. & R. Felder, 1862 (*Wien. Ent. Monatsschr.*, 6: 293). Type-species by selection by Scudder (1875, *Proc. Amer. Acad. Arts Sci., Boston*, 10: 195): *Myrina sipylus* Felder (C.), 1860; type locality: Amboina, Sulawesi, Indonesia (Hemming 1967). (2) *Chliaria* Moore, 1884 (*J. Asiat. Soc. Bengal (II)*, 53(1): 32). Type-species by original designation: *Hypolycaena othona* Hewitson, [1865]; type locality: Northern India (Moore, 1884; Hemming, 1967). (3) *Zeltus* de Nicéville, 1890 (*Butts. India Burmah Ceylon*, 3: 19, 399). Type-species by original designation: *Papilio etolus* Fabricius, 1787; type locality: “Indiis”, i.e., India (de Nicéville, 1890; Hemming, 1967). These three genera are weakly separated. Hence, some authors are of the opinion

that *Chliaria* and *Zeltus* are synonyms of *Hypolycaena*, and have treated all the species of this group under *Hypolycaena* (d’Abrera, 1986; Ek-Amnuay, 2012). Other authors have treated a combination of the three genera as valid, but treated different, incongruent sets of species under *Hypolycaena* and *Chliaria* (Evans, 1932; Inayoshi, 2015; Io, 2000; Larsen, 2004; Pinratana, 1981; Smith, 1989; 2006; Varshney, 2010). “Hypolycaeniti” was discussed in detail by Corbet *et al.* (1992), who treated the three genera as separate and distinguished between them as given in the generic key below.

Corbet *et al.* (1992) further noted of *Hypolycaena*: “The characters are those of the tribe. The genus, as generally employed to-day, contains a very heterogeneous lot of species. The larva of at least one typical Oriental species feeds on the flowers of orchids, as in the very closely allied *Chliaria*, but the larvae of atypical species have been found on a variety of dicotyledons. Distributed throughout the Ethiopian and Oriental Regions and reaching Australia.”, and of *Chliaria*: “Very close to, and doubtfully separable from, *Hypolycaena*, the only structural difference being the more abrupt antennal club, which is somewhat flattened beneath. The male genitalia [...] are of the same pattern as those of the typical species of *Hypolycaena*; they differ only slightly from one species to another and those of the component taxa of the *othona* complex are similar. [...] The genus is distributed from north India to Taiwan and Sundaland.” There are 11 species in the *Hypolycaena-Chliaria* complex in the Indo-Malayan Region (Table 1).

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Generic key to “*Hypolycaeniti*” (verbatim from Corbet *et al.* 1992).

1(2)	Underside hindwing without a black spot at the base of space 7 (but an orange bar may be present).....	<i>Hypolycaena</i>
2	Underside hindwing with a black spot at the base of space 7.....	
3(4)	Hindwing tail at vein 1b twice as long as the tail at vein 2.....	<i>Zeltus</i>
4	Hindwing tail at vein 1b much less than twice the length of the tail at vein 2.....	<i>Chliaria</i>

During recent surveys of butterfly diversity in NE India, a *Hypolycaena* species was recorded from the Namdapha National Park in eastern Arunachal Pradesh by several colleagues. This species did not match descriptions and illustrations of any known species of Hypolycaenina, as compared with the references mentioned above. A comprehensive examination of Hypolycaenina in the British Museum of Natural History (now the Natural History Museum, London), and in the Museum of Comparative Zoology at Harvard University, revealed that this species was distinct and new to science, which is described below. The wing venation nomenclature used below is the numerical system that is widely used in the Asian butterfly literature (Evans, 1932; Cantlie, 1962; Miller, 1970; Corbet *et al.*, 1992; Yata *et al.*, 2010). The terminology used below for wing patterns, morphology and genitalia also follows these standard taxonomic works on Asian butterflies.

*Hypolycaena narada* sp. nov. (Figs. 1-3, Tables 1-2)

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**Holotype:** Voucher code NCBS-PY976. Fig. 1, Table 2. ♂. The type locality is near the village of Bodhisatta, Changlang District, Arunachal Pradesh, NE India (N 27°33', E 96°23'). Collected by Krushnamegh Kunte, 14 March 2015. Preserved dry, pinned, deposited in the Research Collections Facility at the National Centre for Biological Sciences, Bengaluru (=Bangalore), India.

**Paratypes:** (1) NCBS-PY977. Fig. 1, Table 2. ♂. Collection data same as the holotype, except collected on 8 March 2015. (2) NCBS-PY978. Fig. 1, Table 2. ♂. Collection data same as the holotype, except collected on 8 March 2015. (3) NCBS-PY979. Table 2. ♂. Collection data same as the holotype. (4) NCBS-PY980. Table 2. ♂. Collection data same as the holotype, except collected on 11 March 2015. (5) NCBS-PY981. Table 2. ♂. Collection data same as the holotype, except collected on 11 March 2015. (6) NCBS-PY982. Table 2. ♂. Collection data same as the holotype, except collected on 11 March 2015 and preserved in ethanol for molecular work. (7) NCBS-PY983. Fig. 2 ♂ genitalia, Table 2. ♂. Collection data same as the holotype, except collected on 14 March 2015 and preserved in ethanol for molecular work.

**Description: Holotype:** Forewing length 15mm. **Upper side:** Both wings dark and slightly shining purple-blue. **Forewing** border sooty-grey, narrow, just a thread at tornus, gradually dilating to 2mm at apex and continuing along the costa almost up to the base. This border sometimes appears pale grey-brown in a side light (Fig. 3B). A dark, diffused androconial discal patch, spanning from the base of v2 to v7 and from cell-end outward for approx. 4mm. **Hindwing** black tails, ending in white tips, at v1 (approx. 6mm long) and v2 (approx. 4mm long), wing margin wavy at v3 and v4. The abdominal fold and costal margin in space 8 dark grey-brown.

Dispersed but prominent white scalation in the submarginal terminal area, which is condensed into submarginal white bars in spaces 1b, 1c and 2. A tornal, large, white-crowned black spot adjacent to the white bar in 1b. A black marginal line running the length of the termen, and cilia FW and HW pale grey. HW basal half and space 1c covered in ochreous, hair-like long scales, which are especially visible in a side light.

**Underside:** Both wings pale grey, shining silvery-grey in bright light. **Forewing** cell-end bar defined on both sides by inner black and outer white lines. Discal band narrow, uneven but contiguous, ochreous in the middle, black- and then white-edged on both the sides, pointed and vanishing near v1, ending in a black spot at v10. A faint grey-brown, wavy, post-discal line from v1 to v6. **Hindwing** cell-end bars similar to the FW, but less well-marked. Two prominent, oblong, white-ringed black spots along the costal margin, of which the basal spot is before the cell-end bar, and the outer spot is beyond the discal band. The discal band narrow, ochreous in the middle, black- and then white-edged on both the sides, and highly broken. It is composed of an oblique line in 1b, a pair of disconnected oblique lines in 1c converging towards each other in the middle, and then a series of largely conjoined spots in spaces 2 to 6, which is dislocated at v4. A tornal, large, white-crowned black spot in 1b, lined towards v1 by sparse, iridescent blue scales. Another large, orange-crowned black spot in space 2. This is followed by grey-centred white rings in spaces 3 to 6, which are inwardly defined by dark grey. A black marginal line running the length of the termen of both wings, with cilia bright pale grey.

Head, thorax and abdomen overall similar to other *Hypolycaena*. Frons white. Labial palps white at the base, black near the tip. Eyes black. Antennae black, narrowly ringed white; club black, tipped reddish similar to *Hypolycaena othona* Hewitson, [1865]. Proboscis ochreous. Thorax white below, purple or purple-brown above. Legs broadly ringed black and white. Abdomen dark brown to almost black above, white below.

**Paratypes, and intraspecific variation:** All the paratypes are largely similar to the holotype, including in the overall colour pattern and forewing length (Fig. 1, Table 2). Variation is seen primarily in the nature of the discal bands on the underside, and the extent of white scalation near the terminal margin on the upper side of hindwing. In the holotype, the discal band on the forewing underside is straight and almost touches v1. This discal band is similarly straight and almost touching v1 in all the paratypes except in NCBS-PY977, in which the discal band is bent inwards at v3, and ends in the middle of space 1c. On the hindwing underside, the discal spot in 3 is not elongated in the holotype and all the paratypes, except in NCBS-PY977, in which it is elongated and points towards the wing base. In the holotype, there are dispersed but prominent white scales in the submarginal terminal area of the hindwing, which are condensed into submarginal white bars in spaces 1b, 1c and 2. Similar white scales and submarginal white bars are present in paratypes NCBS-PY980 and NCBS-PY981. In paratypes NCBS-PY977, NCBS-PY978 and NCBS-PY979, the dispersed white scales are nearly absent, and the submarginal bars in 1a, 1b and 2 are very narrow and therefore somewhat indistinct (this is especially the case in NCBS-PY978).

**Male genitalia:** The male genitalia of the paratype (NCBS-PY983; Fig. 2) are of similar form but quite distinct from the male genitalia of *H. kina celastroides* Corbet, 1938 and *H. tora semanga*

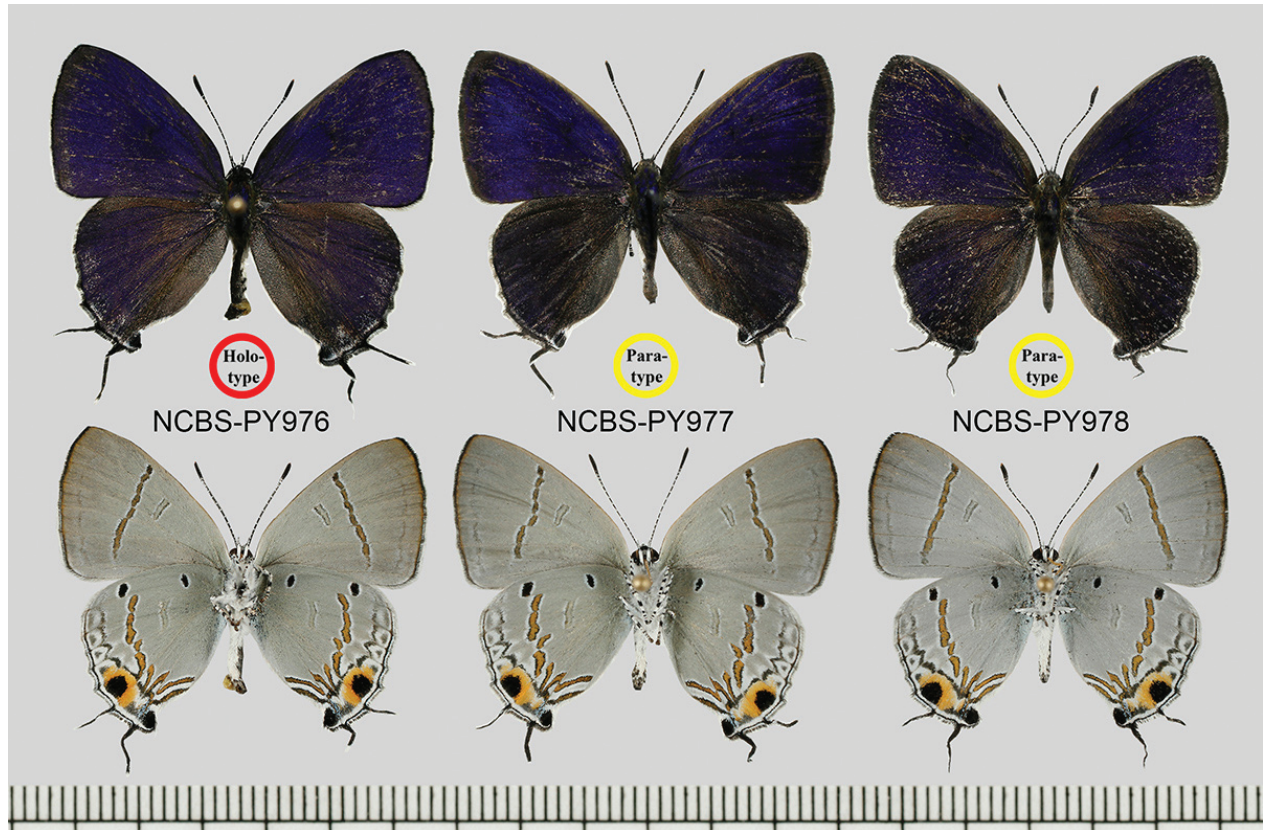
**Table 1:** Overview of the Indo-Malayan *Hypolycaena* (inclusive of *Chliaria*).

Species	Type locality	Distribution	Polytypism	References
<i>Hypolycaena amabilis</i> (de Nicéville, 1895)	“N.-E. Sumatra; Java”	Southern Thailand to Borneo and Java	Polytypic	1, 11-13
<i>Hypolycaena balua</i> Moulton, 1911	Kuching (Sarawak, Borneo, Malaysia)	Peninsular Malaya to Borneo	Polytypic	2, 11-13
<i>Hypolycaena erylus</i> (Godart, [1824]) – Common Tit	Java	Himalaya to Sulawesi, the Philippines, and New Guinea	Polytypic	3, 11-13
<i>Hypolycaena kina</i> (Hewitson, [1869]) – Blue Tit	“Darjeeling” (West Bengal, India)	Himalaya to Indo-China and Malaysia	Polytypic	4, 11-13
<i>Hypolycaena merguia</i> (Doherty, 1889)		Myanmar to Sumatra, Java and Borneo	Polytypic	5, 11-13
<i>Hypolycaena narada</i> Kunte, sp. nov. – Banded Tit	Bodhisatta (Arunachal Pradesh, India)	NE India, possibly N. Myanmar	Monotypic	–
<i>Hypolycaena nilgirica</i> (Moore, [1884]) – Nilgiri Tit	“Coonoor, Nilgiris” (Tamil Nadu, India)	Western Ghats and Sri Lanka	Monotypic	6, 11-13
<i>Hypolycaena othona</i> (Hewitson, [1865]) – Orchid Tit	“Northern India”	SW India to Indo-China, Malaysia and Indonesia	Polytypic	7, 11-13
<i>Hypolycaena pahanga</i> Corbet, 1938	“Malaya”	Peninsular Malaya	Monotypic	8, 11-13
<i>Hypolycaena thecloides</i> (C. & R. Felder, 1860)	Malay Peninsula	Myanmar to the Philippines, Nicobar Islands, Sumatra, Java, Borneo	Polytypic	9, 11-13
<i>Hypolycaena tora</i> (Kheil, 1884)	Nias (Sumatra, Indonesia)	Sumatra, Indonesia, Peninsular Malaya	Polytypic	10-13

References: 1: de Nicéville 1895; 2: Moulton 1911; 3: Godart 1824; 4: Hewitson 1869; 5: Doherty 1889; 6: Moore 1884; 7: Hewitson 1865; 8: Corbet 1938; 9: C. & R. Felder, 1860; 10: Kheil 1884; 11: d’Abbrera 1986; 12: Corbet *et al.* 1992; 13: Species index cards in the British Museum of Natural History (Natural History Museum, London).

**Table 2:** Type material of *Hypolycaena narada*, sp. nov. All specimens were collected by the author near Bodhisatta, Changlang District, Arunachal Pradesh, India (N 27°33’, E 96°23’), and are now deposited in the NCBS Research Collections Facility, Bengaluru, India.

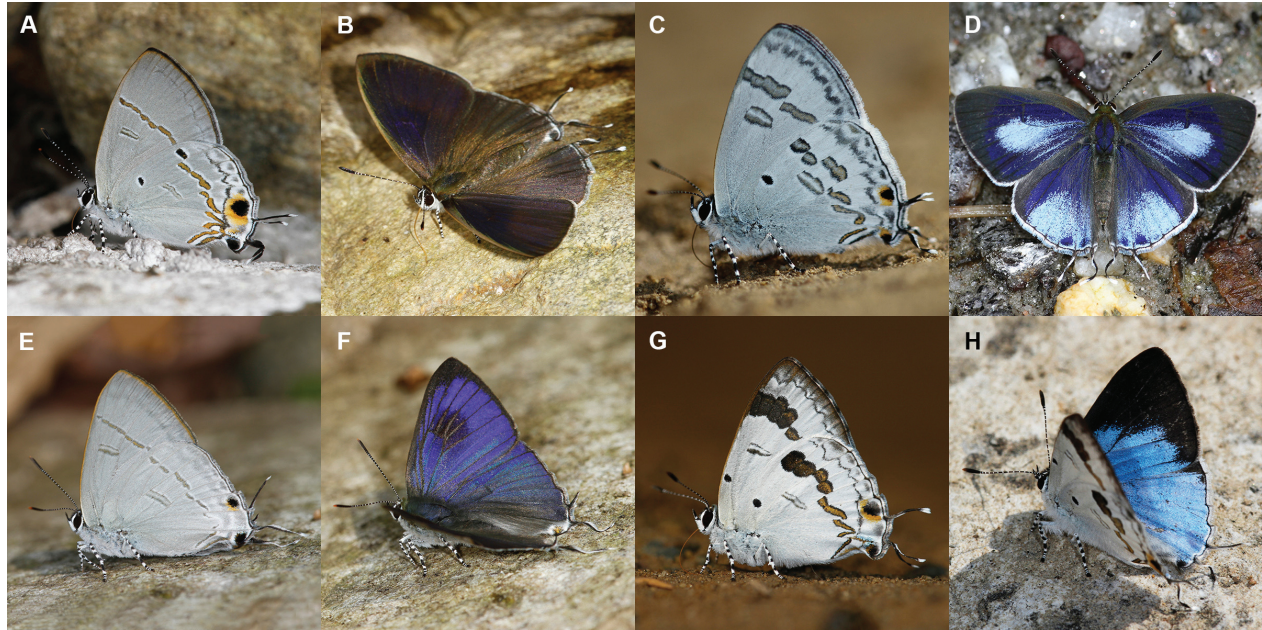
Type	Voucher code	Sex	Forewing length	Collection date	Preservation method
Holotype	NCBS-PY976	Male	15 mm	2015/03/14	Dry, pinned
Paratype	NCBS-PY977	Male	15 mm	2015/03/08	Dry, pinned
Paratype	NCBS-PY978	Male	15 mm	2015/03/08	Dry, pinned
Paratype	NCBS-PY979	Male	15 mm	2015/03/14	Dry, pinned
Paratype	NCBS-PY980	Male	15 mm	2015/03/11	Dry, pinned
Paratype	NCBS-PY981	Male	16 mm	2015/03/11	Dry, pinned
Paratype	NCBS-PY982	Male	15 mm	2015/03/11	In ethanol
Paratype	NCBS-PY983	Male	14 mm	2015/03/14	In ethanol



**Figure 1.** Type specimens of *Hypolycaena narada* sp. nov., showing minor phenotypic variation. Specimen details are given in Table 2 and in the text. A millimetre-scale is at the bottom.



**Figure 2.** Male genitalia of *Hypolycaena narada* sp. nov. (paratype, NCBS-PY983). **A:** lateral view, with the aedeagus removed. **B:** right valva, lateral view from outside. **C:** ventral view of the fused valvae. **D:** aedeagus, lateral view. All separated parts of the male genitalia (B-D) are proportional to A. The scale bar is approximate. Dissection and images by Dipendra Nath Basu.



**Figure 3.** Indian *Hypolycaena* co-occurring with *H. narada* at its type locality. **A-B:** *H. narada* male. **C-D:** *H. kina kina* male. **E-F:** *H. erylus himavantus* male. **G-H:** *H. othona othona* male. **A-B:** Lunkai Nullah, Namdapha National Park, Changlang District, Arunachal Pradesh, India. 8 March 2015. **C:** 19th Mile, Namdapha NP. 10 March 2015. **D:** Passingthang, Upper Dzongu, North Sikkim District, Sikkim, India. 4 August 2014. **E-F:** Lunkai Nullah, Namdapha NP. 8 March 2015. **G:** 19th Mile, Namdapha NP. 10 March 2015. **H:** Lunkai Nullah, Namdapha NP. 8 March 2015. These specimens were not collected. (All images by Krushnamegh Kunte, except D by Rohan Lovalekar).

Corbet, 1940 that are illustrated by Corbet *et al.* (1992). The uncus is large and round, similar to that of *H. kina celastroides*. Right and left valvae are fused but deeply cleft, similar to other *Hypolycaena*. The shape of the valva (Fig. 2B-C) is distinct from other species of *Hypolycaena*, with the base rounded and the tip elongated, angled and pointed.

**Female:** Female of this species is unknown.

**Diagnosis:** *Hypolycaena narada* is distinguished from other members of *Hypolycaena* and related *Hypolycaenina* based on the following combination of traits: (1) slightly shining, dark purple-blue UPFW (senna-brown, shiny blue or pale purple and blue in related *Hypolycaena*), (2) UPFW with a diffused, dark purple androconial patch in male (as a prominent brand in *H. erylus*, and largely absent in related *Hypolycaena*), (3) UNFW apex and terminal margin concolorous with the wing (ochreous in *balua*, *tora*, *merguia* and many similar *Hypolycaena*), (4) UN narrow, more or less contiguous, ochreous discal band, ending in black costal spots (either not narrow, absent or highly broken in other *Hypolycaena*, black costal spots absent in many Oriental *Hypolycaena*). These characters are summarized, and an identification key for Indo-Malayan *Hypolycaena* is provided, below. All the previously known Indo-Malayan *Hypolycaena* are illustrated by d'Abreu (1986), Corbet *et al.* (1932) and Ek-Amnuay (2012) where they may be compared.

**Etymology:** The specific name is based on Narada, a learned Vedic sage from Indian mythology, who was known for his mischief. The name is applied here to the species as a remark on a mischievous—and at the same time wise—prank by a friend, who shall remain unnamed, that led to this species description.

**Distribution:** This species has so far been recorded only from the Changlang District of Arunachal Pradesh in north-

eastern India. Within Changlang, it has been recorded from at least four localities: (a) near the village of Bodhisatta, the type locality, (b) Lunkai Nullah (stream), near Bodhisatta and Deban tourist complex (N 27°30.4', E 96°24.0'), (c) Deban, near the tourist complex (N 27°29.8', E 96°23.4'), and (d) 19<sup>th</sup> Mile, on road to Vijaynagar (N 27°28.7', E 96°24.1'). All four localities fall between 300m and 450m asl. Spot records from the first two localities are my personal observations, spot records from the last three localities are by Rohan Lovalekar, Hemant Ogale, Milind Bhakare, Amol Patwardhan and Rudraprasad Das ([www.ifoundbutterflies.org/sp/2946/Hypolycaena-narada](http://www.ifoundbutterflies.org/sp/2946/Hypolycaena-narada)). The species quite likely occurs in Assam and other neighboring states in north-eastern India, where suitable habitat is present. The type locality is also very close to northern Myanmar and south-eastern Tibet. However, it remains to be seen whether the tall mountains (over 4,000 m asl) on the eastern and northern sides of the type locality towards Myanmar and Tibet, which may act as dispersal barriers, have restricted the species to India.

**Status, habitat, and habits:** The species appears to be locally common along cool streams flowing through mixed evergreen forests. Males are frequently seen puddling on wet soil and on bird droppings from early morning to late afternoon. They have not been seen taking nectar from flowers yet. They are bold while mud-puddling, which makes it easy to approach and photograph them. Even when they are disturbed, they fly to nearby vegetation, and soon return to mud-puddle. Their flight is fluttering but not very fast, similar to other members of *Hypolycaena*.

**Flight period:** The species appears to be very narrowly univoltine. In the past 20 years, various teams have surveyed butterflies in the Namdapha area practically throughout the

An updated key to the species of *Hypolycaena* (inclusive of *Chliaria*) from the Indo-Malayan Region, expanded from Corbet *et al.* (1992):

- 1 (8) UNHW<sup>1</sup> without a black spot at the base of space 7  
 2 (7) UP ♂ purple or blue, ♀ brown  
 3 (6) UPFW shining deep blue  
 4 UPFW ♂ with a prominent brand beyond the cell. Large. ....*erylus*  
 5 UPFW ♂ without a prominent brand. Small. ....*amabilis*  
 6 (3) UPFW dark purple, no brand. UNFW terminal margin broadly tinged pale ochreous.....*merguia*  
 7 (2) UP brown, UPHW large tornal orange patch.....*thecloides*  
 8 (1) UNHW with a black spot at the base of space 7  
 9 (16) UNFW without a small black costal spot above the cell  
 10 (13) UP blue or purple in ♂, white in ♀, with black borders  
 11 ♂ UPFW dark purple, with narrow borders, disc not pale (female unknown).....*narada*  
 12 ♂ UPFW with very broad borders, disc pale blue, extending narrowly to the base.....*kina*  
 13 (10) ♂ UP deep senna-brown. ♀ UP reddish brown, with a white tornal area HW  
 14 UNFW terminal margin largely concolorous with the wing, discal line dark grey, upper spots near the costa much larger.....*nulgirica*  
 15 UNFW terminal margin broadly tinged pale ochreous, discal line dark ochreous and of nearly uniform width throughout.....*balua*  
 16 (9) UNFW with a small black costal spot above the cell  
 17 (18) UNFW apex broadly ochreous, discal band brighter ochreous, usually not or very little broader towards costa.....*tora*  
 18 (17) UNFW apex concolorous with the wing, but may be darkened. Discal band dark, the upper spots towards costa prominently broader and disjointed from the lower narrow discal line  
 19 ♂ UPFW apical half black, basal half shining pale blue. UNFW discal band dark grey, black or dark ochreous, the upper spots 3 to 4 times broader than the lower discal line. ♀ UP brown with a bluish white area HW .....*othona*<sup>2</sup>  
 20 ♂ UPFW apical black border more restricted, the remaining wing duller, deeper blue, filling most of space 2 and basal half of 3.  
 ♀ UPFW greyish blue with black borders.....*pahanga*

<sup>1</sup> UP=upper side, UN=underside, FW=forewing, HW=hindwing.

<sup>2</sup> Corbet *et al.* (1992) included *semanga* Corbet, 1940 as a subspecies under *othona*, and did not list *tora* as it was extralimital. However, inspection of the relevant taxa in this species-group revealed that *semanga* is much closer to nominotypical *tora* than it is to nominotypical *othona*, in spite of having female UP blue. Therefore, the key above includes *semanga* and similar taxa as subspecies under *tora* (incidentally, this was Corbet's initial placement) rather than under *othona*, and the distinguishing features are identified accordingly. It is likely that some of the putative subspecies under the currently polytypic *othona* and *tora* will ultimately prove to be distinct species when they are investigated closely.

year, but all the 15 or so sightings of this species have only been in the first three weeks of March. This cannot be because it was overlooked in other months: in the past seven years, the species was not seen in any other month even when we were specifically looking for it during six visits spread almost throughout the year. On the other hand, several individuals of the species were seen on each of the three visits in March (2009, 2014, 2015). From these observations, it appears that the species has a single brood per year, adults emerging in early March and persisting until late March.

**Larval host plants and early stages:** unknown. As noted by others (Corbet *et al.*, 1992; Fiedler, 1992; Robinson *et al.*, 2001; van der Poorten & van der Poorten, 2013), *Hypolycaena* feed as larvae on diverse plants but mostly on dicots, except "*Chliaria*", which feed on orchids.

**Sympatric *Hypolycaena*:** Three species of *Hypolycaena* are currently known to co-occur with this species: *erylus*, *othona* and *kina* (Fig. 3). Their habits and habitat use are similar.

## DISCUSSION

The subtribe Hypolycaeniti *sensu* Corbet *et al.* (1992), split into three genera, viz., *Hypolycaena*, *Chliaria* and *Zeltus*, or Hypolycaeniti/Hypolycaenina as currently organized by other authors in one to three genera, poses a taxonomic problem. As noted by Corbet *et al.* (1992), *Hypolycaena* alone is a large genus that has a very wide distribution from the Ethiopian Region through the Oriental

Region up to the Australian Region. If *Chliaria* and *Zeltus* are included under *Hypolycaena*, it comprises morphologically heterogeneous species that also use quite diverse larval host plants, suggesting sufficient divergence within this group to merit recognition of taxonomic subunits. Therefore, it may be appropriate and convenient to organize Hypolycaeniti/Hypolycaenina—comprising nearly 60 species, many of them polytypic—in several allied genera rather than a single large *Hypolycaena*. Whether *Hypolycaena* should be all-inclusive, or should *Chliaria* be distinct and valid if *Hypolycaena* is split into several genera as informed by molecular phylogenetic analyses, remains unresolved in absence of a comprehensive taxonomic treatment of Hypolycaenina. The taxonomic confusion surrounding *Chliaria* will prevail until such a molecular phylogenetic analysis is attempted. At present, I have followed recent trends (d'Abbrera, 1986; Inayoshi, 2015) in treating *Chliaria* as a synonym of *Hypolycaena*, and offer an updated key to distinguish between its Indo-Malayan species (see the key above).

As more information on this species accumulates, it will be made available on the *H. narada* species page of the *Butterflies of India* website (Kunte, 2015; www.ifoundbutterflies.org/sp/2946/Hypolycaena-narada).

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## EDITOR'S NOTE

The electronic edition of this article has been registered in ZooBank to comply with the requirements of the amended International Code of Zoological Nomenclature (ICZN). This registration makes this work available from its electronic edition. ZooBank is the official registry of Zoological Nomenclature according to the ICZN and works with Life Science Identifiers (LSIDs). The LSID for this article is: urn:lsid:zoobank.org:pub:4CA3D42A-CE93-4408-9457-463CEFBD4796 Registration date: June 7th, 2015. This record can be viewed using any standard web browser by clicking on the LSID above.

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