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New species of *Elaphropoda* Lieftinck, 1966 and *Habropoda* Smith, 1854 (Hymenoptera, Apidae) from Arunachal Pradesh, India

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Abstract. *Elaphropoda* Lieftinck, 1966 and *Habropoda* Smith, 1854 are two rarely collected genera belonging to the family Apidae. *Elaphropoda* is found to be restricted to the Oriental region with 13 extant species. *Habropoda* is a rather extensively distributed genus with a total of 55 species worldwide. We describe two new species (*Elaphropoda triangulata* sp. nov. and *Habropoda adi* sp. nov.) belonging to these genera, based on two male specimens collected from Arunachal Pradesh, India. The importance of male holotypes in rarely collected Hymenoptera is highlighted. Also, the rarity of anthophorine bees in collections and the distribution pattern of *Elaphropoda* and *Habropoda* are discussed. Identification keys and distribution maps to the Indian species of *Elaphropoda* and *Habropoda* are provided.

Keywords. Anthophorinae, male description, Northeast India, solitary bees, taxonomy.

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Introduction

The subfamily Anthophorinae Dahlbom, 1835 (Hymenoptera: Apidae) comprises a diverse group of bees known for their robust bodies, dense pubescence and elongated tongue adapted for nectar collection from flowers with deep floral structures. This subfamily comprises more than 750 species belonging to eight genera, exhibiting a wide range of sizes and characteristics (Engel 2018; Saini *et al.* 2021). They are widely distributed across Africa, Asia, Australia, Europe, and the Americas (Michener 2007; Ascher & Pickering 2025). These bees typically inhabit areas with sandy or loose soil, which is suitable for their ground-nesting behavior. They are often found in open, sunny habitats like meadows and grasslands where they can forage on abundant floral resources (Michener 2007).

The Oriental region is a hotspot for Anthophorinae. Out of the eight known genera present within this group, six (*Habrophorula* Lieftinck, 1974, *Elaphropoda* Lieftinck, 1966, *Habropoda* Smith, 1854, *Amegilla* Friese, 1897, *Anthophora* Latreille, 1803 and *Varthemapistra* Engel, 2018) are found in this region. Notably, the northern part of South-East Asia, stretching from India to South-East China, stands out as a region of immense diversity at the generic level. This pattern suggests that this region could be the center of origin for this subfamily, from where they radiated and diversified (Dubitzky 2007).

The genus *Elaphropoda*, includes 13 species, of which five (*E. khasiana* (Schulz, 1906), *E. magretti* (Bingham, 1897), *E. arunachalensis* Saini *et al.* 2021, *E. guptai* Saini *et al*. 2021, and *E. nuda* (Radoszkowski, 1882)) are known from India (Saini *et al.* 2021; Asher & Pickering 2025). Species of this genus inhabit the lush rainforests of the lower mountain zone, specifically at elevations ranging from 1450 to 1700 meters (Lieftinck 1966). In the Oriental region, they are distributed across India, Nepal, China, Taiwan, Vietnam, Thailand, Malaysia, and Indonesia (Saini *et al.* 2021). Lieftinck (1966) and Wu (1979, 1984, 1985, 1991) revised the genus from the Old World and China, respectively. These bees, although remarkable in their characteristics, often go unnoticed and are scarce in collections (Natural History Museum 2014). Their restricted distributions makes it difficult to locate and collect them.

The genus *Habropoda* Smith, 1854 is distributed in subtropical to tropical regions (Dubitzky 2007). *Habropoda* includes 55 species of which seven (*H. sinensis* Alfken, 1937, *H. turneri* Cockerell, 1909, *H. rowlandi* (Meade-Waldo, 1914), *H. deiopea* Cameron, 1897, *H. krishna* Bingham, 1908, *H. radoszkowskii* (Dalla Torre, 1896), and *H. plantifera* Lieftinck, 1974) are reported from India (Lieftinck 1974; Wu 1984, 1979; Dubitzky 2007; Tran & Engel 2025). Unlike *Elaphropoda*, *Habropoda* is widespread in North America and parts of the Old World. In the Oriental region, species of this genus are known from India, Taiwan, Vietnam, China, and Thailand (Tran & Engel 2025). Most of the Asiatic species of this genus were revised by Lieftinck (1974) and a key to Chinese species is provided by Wu (1979).

Due to the rarity of these species, comprehensive descriptions of the males and females are not readily available for all the species (Nguyen *et al.* 2016). The description of several Asiatic species (*E. magrettii* (Bingham, 1897), *E. moelleri* (Bingham, 1897), *E. bembidion* Lieftinck, 1966, *E. percarinata* (Cockerell, 1930), *H. krishna* Bingham, 1908, *H. sutepennis* Cockerell, 1929, *H. zixangensis* Wu, 1979, *H. apostasia* Lieftinck, 1974, *H. pelmata* Lieftinck, 1974 and *H. plantifera* Lieftinck, 1974) is based on male specimens (Lieftinck 1974; Wu 1984, 1991). Male descriptions are important as they possess many unique morphological characters. For example, structures of male genitalia may provide diagnostic features for species identification, particularly in aculeate Hymenoptera Linnaeus, 1758 (Buck *et al.* 2008). Males exhibit distinct morphological characteristics that can significantly differ from females like unique coloration, modified appendages like antennal modification, or specialized structures related to mating behavior etc. some examples include larger and more complex antennae in male honeybees, bright metallic colouration in male orchid bees (tribe Euglossini Latreille, 1802), modified forelegs in male leaf cutter bees to hold and position female during mating etc. (Hurd & Michener 1955; Michener 2007). These features are highly specific and can significantly vary between closely related species, enabling accurate identification and classification (Michener 2007).

Although species descriptions based on multiple specimens and both sexes are preferable and describing a species from a single sex represents a compromise; in situations where only one male individual has been collected, it is still justifiable to erect a new species based on the male description alone if it possesses distinct morphological characters, including body coloration. For instance, *Dasypoda delectabilis* Ghisbain & Michez, 2023 (Hymenoptera: Melittidae) was described from a single male holotype collected in arid regions of south-eastern Iran, based on a unique combination of morphological characters that distinguished it from all other known species of *Dasypoda*, despite the female remaining

unknown. Collecting even a single individual of rare or elusive species can be challenging sometimes, resulting in few specimens available for study (Ghisbain *et al.* 2023). This is especially true in the case of rarely collected anthophorine genera such as *Habropoda* and *Elaphropoda*, and descriptions based solely on male specimens have historically been necessary to document species diversity (e.g., Lieftinck 1966, 1974; Wu 1979, 1991) highlighting the rarity of collecting conspecific males and females together. If the male or female individual exhibits unique and distinctive characteristics that help to distinguish it from other known species, it can be considered a valid basis for describing the species (Winston & Disney 2000).

Here, we describe and illustrate two new species, *E. triangulata* sp. nov. and *H. adi* sp. nov. from Arunachal Pradesh, Northeast India and discuss the importance of male descriptions in anthophorine taxonomy. Additionally, we have included distribution patterns of Indian *Elaphropoda* and *Habropoda*. Locating conspecific females of these species would likely require extensive, long-term, and seasonally targeted fieldwork probably across multiple years. Considering the rapid landscape transformation occurring in the type localities of these species due to infrastructure development, road expansion, and land-use change, the present species are described without delay based on the available male specimens. In biodiversity-rich yet underexplored regions undergoing such changes, timely taxonomic documentation is essential, as postponing formal description in anticipation of future collections risks the loss of critical taxonomic information if populations decline or habitats are altered before additional specimens can be obtained.

Material and methods

The specimens included in the present study were collected from Pasighat and Yingku, Arunachal Pradesh. Located in the eastern Himalaya of Northeast India, the region forms part of the globally recognized Eastern Himalaya biodiversity hotspot (Myers *et al.* 2000), characterized by diverse forest types and high levels of species diversity.

Townes style Malaise traps were used to collect the specimens (Supp. file 1). The collected specimens were further dried with hexamethyldisilazane (HMDS) to preserve the fine structural details and reduce collapse of pubescence and later pinned. Morphological and color characters of the pinned and dried specimens were observed under a Zeiss Stemi 305 stereozoom microscope (LED illumination, 45×). Images were taken with the Keyence VHX-6000 digital microscope. Body length of the specimens were measured as the distance from the apical tip of the clypeus at the front of the head to the apical tip of the metasoma using inbuilt measure tool in Keyence VHX-6000 digital microscope. Intertegular distance (ITD) was measured as the shortest linear distance between the inner margins of the tegulae. Malar space was measured in lateral view as the shortest linear distance between the lower margin of the compound eye and the base of the mandible. Distribution maps of the Indian *Elaphropoda* and *Habropoda* were prepared using QGIS software (ver. 3.36), using coordinates obtained from previous literature, NHM London collections and primary data (Supp. file 2).

The holotype will be transferred to the collections of the national repository at ICAR-National Bureau of Agricultural Insect Resources (ICAR-NBAIR) Bangalore, after the acceptance of the manuscript. Morphological terminology is adapted from Michener (2007).

Abbreviations

F1–F11 = flagellar segments 1–11
ITD = inter-tegular distance
OOL = shortest distance from inner orbit and outer margin of lateral ocellus
POL = minimum distance between the two posterior ocelli
T1–T7 = tergites 1–7

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Hymenoptera Linnaeus, 1758
Family Apidae Latreille, 1802
Subfamily Anthophorinae Latreille, 1802

Genus ***Elaphropoda*** Lieftinck, 1966

Elaphropoda Lieftinck, 1966: 148. Type species: *Habropoda impatiens* Lieftinck, 1944, by original designation.

Diagnosis

Detailed diagnosis for the genus *Elaphropoda* were given by Lieftinck (1966) and Nguyen *et al.* (2016) as follows: medium-sized with elongate body and sparsely pubescent metasoma. Integument dark brown or black, face, legs and parts of metasoma often predominantly light colored. Pubescence throughout short and scanty, except on thorax, where it is long and dense (Fig. 1B); plumose hairs behind orbits, on thorax, and partly also on legs and gastral sterna. Disk of labrum and clypeus sparsely covered with long, erect, bristle-like hairs. Clypeus with mid longitudinal carina except in *E. magretti*. Metasoma comparatively long and narrow, that of male even more slender with pointed apex, the intermediate and terminal segments cylindrical in cross-section. Integument well exposed under the short tomentum, terga not distinctly banded but posterior margins usually with narrow fringe of dense appressed pubescence; hair fringes of sterna longer, erect and plumose.

Distribution

Oriental and Palearctic regions.

Key to the species (based on males) of Indian *Elaphropoda* Lieftinck, 1966

The key is adapted and modified from Saini *et al.* (2021).

1. Clypeus without medial longitudinal carina ..... ***E. magrettii*** (Bingham, 1897)
– Clypeus with medial longitudinal carina (Fig. 1C) 2

2. Yellow paraocular and supra clypeal mark present 3
– Yellow paraocular mark and supra clypeal mark absent ..... ***E. guptai*** Saini *et al.* 2021

3. Entire metasoma with honey yellow integument, metasoma without black pubescence .... ***E. nuda*** (Radoszkowski, 1882)
– Metasomal integument differently colored, never fully honey yellow, metasoma with black pubescence 4

4. Integument of T1 honey yellow, T1–T7 without pale fulvous fringes at basal parts .... ***E. arunachalensis*** Saini *et al*. 2021
– Integument of T1 coloration variable; T1–T7 with pale fulvous fringes at basal parts..... 5

5. Integument of T1–T3 with blackish brown, medial triangular markings, mandibles with two apical teeth in addition to third pre-apical tooth (Fig. 2A) ..... ***E. triangulata*** sp. nov.
– Integument of T1–T3 honey yellow without blackish brown, medial triangular markings, mandibles with single apical tooth in addition to pre-apical tooth ..... ***E. khasiana*** (Schulz, 1906)

Elaphropoda triangulata sp. nov.
urn:lsid:zoobank.org:act:D4B0B9D8-B06A-48BD-BFD9-D9A274924811
Figs 1–3, 7

Differential diagnosis

Elaphropoda triangulata sp. nov. differs from other known species of *Elaphropoda* in that the length of the body is larger (16.7 mm) and abdominal segments T1–T3 have a distinct, triangular, broad marking medially (Fig. 1A–B). The new species is closely similar to *E. khasiana* in having clypeus with mid longitudinal carina, yellow paraocular and supraclypeal mark (Fig. 1C), black pubescence on metasoma (Fig. 1B), hind wing vein cu-v strongly oblique (Fig. 3B) and metasoma with rather sparse and much shorter hairs than on the thorax (Fig. 1B). The new species differs from *E. khasiana* in having a completely yellow clypeus (clypeus with inverted T-shaped yellow mark in *E. khasiana*), supraclypeal area with wider yellowish patch (Fig. 1C) (with small yellowish triangular patch in *E. khasiana*), mandibles with three preapical teeth (two in *E. khasiana*) (Fig. 2A), wings with brown veins and pterostigma yellowish brown (black in *E. khasiana*) (Fig. 3A), scape yellow ventrally (reddish brown in *E. khasiana*), hind basitarsus blackish brown (yellowish brown in *E. khasiana*) (Fig. 2E), first and second flagellar segments yellowish (dark brown in *E. khasiana*) (Fig. 1D–E), integument of tegula yellowish brown (pale yellow in *E. khasiana*) (Fig. 1B, E), and legs honey yellow (vs yellow in *E. khasiana*) (Fig. 1A).

Etymology

The specific epithet is named '*triangulata*', referring to the distinct triangular, broad median marking present on the first three metasomal terga (T1–T3), which is a diagnostic character of this species.

Type material

Holotype

INDIA• ♂; Arunachal Pradesh, Pasighat, Abor Country River Camp; 28.11416667° N, 95.28722222° E; 227 m a.s.l.; 15–22 May 2023; R. Sahanashree leg.; Malaise trap; ICAR-NBAIR, AIMB/Hy/Ap30001.

Description

Male (holotype, Figs 1–3)

Measurements. Total body length 16.7 mm, fore wing 9.7 mm.

Head. Integument black with upper part of flagellum brown (Fig. 1D). Paraocular area, supraclypeal area, clypeus, labrum and basal ⅔ of mandible yellow (Figs 1C, 2A). Apical ⅓ of mandible brown (Fig. 2A). Clypeus with mid longitudinal carina (Fig. 1C). Ocelli unevenly yellowish brown (Fig. 1D). Head as long as wide (width: 8.111 mm; length: 8.178 mm). Compound eye not emarginate (Fig. 1D–E). Face and clypeus finely and sparsely punctate, punctures scattered and widely dispersed with interspaces (0.15 mm) 3 × as long as width of surrounding punctures (0.05 mm), vertex densely punctate with closely packed punctures with interspaces (0.07 mm) 2.3 × as long as width of surrounding punctures (0.03 mm) (Fig. 1C–D). Clypeus protuberant, protuberance of apical margin of clypeus (2.27 mm) in lateral view 1.3 × as long as width of eye (1.75 mm), mid longitudinal carina running from base to near apex, absent apically, wider than long (width: 2.26 mm, length: 1.65 mm), pubescent (Fig. 1C). Malar space short (0.1 mm) (Fig. 2A). Tongue long, 1.5 × as long as height of head (Fig. 1A). Mandible tridentate with inner tooth much smaller and less prominent than middle tooth (Fig. 2A). Head, clypeus and vertex with long golden yellow hair (Fig. 1C–D). Frons black with midlongitudinal groove and black hairs. POL: diameter of posterior ocellus: OOL= 1.3 : 1.0 : 2.9. Antenna with scape yellow ventrally, 2.7 × as long as maximum width, pedicel yellowish brown, 0.6 × as long as wide, first and second flagellar segments yellowish and the rest of the flagellar segments yellowish brown to dark brownish (Fig. 1B, D–E). First

flagellar segment 1.4 × as long as second flagellar segment, as long as wide. F2 transverse, 0.7 × as long as wide. F3–F11 longer than wide. Pale yellowish and long sparse hairs on antennal scape, clypeus, on broad triangular mark above clypeus and on labrum and mandibles; paraocular area from apex to near antennal socket with paler and shorter hairs.

Fig. 1. *Elaphropoda triangulata* sp. nov., holotype, ♂ (ICAR-NBAIR, AIMB/Hy/Ap30001). **A**. Habitus, lateral view. **B**. Habitus, dorsal view. **C**. Head, anterior view. **D**. Head, dorsal view. **E**. Head, lateral view.

Thorax. 1.1 × as long as high (length from pronotum to propodeum in habitus view and height is the widest part of thorax); length: 3.935 mm, height: 4.343 mm), aereolate- rugose (Figs 1A–B, E, 2B). Integument of tegula yellowish brown (Figs 1B, E, 2B). Thorax with yellowish hairs at dorsal part and pale-yellow hairs at ventral part. ITD: 2.9 mm.

Fig. 2. *Elaphropoda triangulata* sp. nov., holotype, ♂ (ICAR-NBAIR, AIMB/Hy/Ap30001). **A**. Head, antero-lateral view. **B**. Mesosoma, lateral view. **C**. Metasoma, lateral view. **D**. Apex of metasoma, dorso-lateral view. **E**. Hind leg, lateral view. **F**. Hind tibia, dorsal view.

Wings. Hyaline with brown veins and pterostigma yellow brown. Marginal cell 4.7× as long as wide (Fig. 3A). Pterostigma as long as prestigma. First and third submarginal cells each longer than second submarginal cell. Third submarginal cell 1.2× as long as second (measured medially), slightly wider than second (diagonally). First recurrent vein joining second submarginal cell at apex. Hindwing with 20 hamuli (Fig. 3B). Vein cu-v strongly oblique.

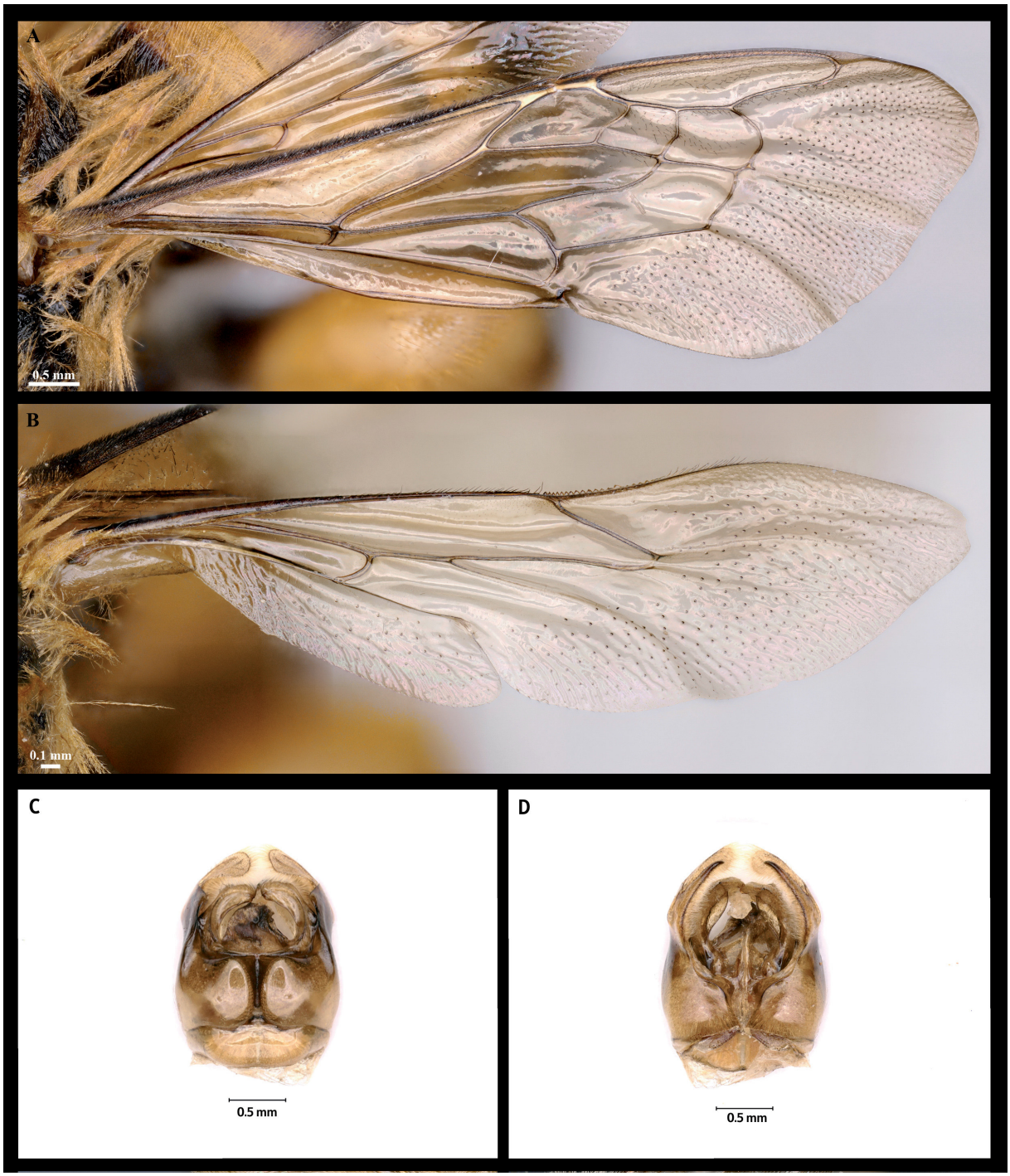

Fig. 3. *Elaphropoda triangulata* sp. nov., holotype, ♂ (ICAR-NBAIR, AIMB/Hy/Ap30001). **A**. Fore wing. **B**. Hind wing. **C**. Genitalia, dorsal view. **D**. Genitalia, ventral view.

Legs. Honey yellow except coxa, trochanter brownish black, basitarsus and tip of tarsal claws black (Figs 1A, 2D–F). Fore and mid femora and tibia unmodified without swelling. Hind femur swollen, 2.1 × as long as wide (Fig. 2C). Hind tibia longer than wide, 1.8 × as long as apical width, narrow at base, broader apically, basitibial plate distinct, brown (Fig. 2D–E). Legs with pale honey yellow hairs. Inner femora smooth and shiny, outer face of basitarsus with dense long hairs, mediotarsus and distitarsus with sparser and bristle hairs. Claws deeply clefted (Fig. 2D).

Abdomen. Metasoma with brown pubescence intermixed with pale yellow. T1–T3 yellow with distinct, triangular, broad marking medially, T4–T7 black (Figs 1B, 2C). T4–T5 with posterior incomplete transverse yellow band. Graduli distinct, dark brown (Fig. 2C). Metasoma with rather sparse and much shorter hairs than on thorax, first to fourth abdominal segments with pale yellow hairs fringed at basal parts. Metasoma finely punctate overall, punctures shallow and sparse, with smooth and shiny interspaces. Pygidial plate distinct, yellowish brown (Fig. 2D). Gonostylus distinctly divided into dorsal and ventral gonostylus, dorsal gonostylus strongly spatulate with pale honey yellow integument and hairs, ventral gonostylus slender and pointed with dark honey yellow integument except apex dark brown (Fig. 3C–D). Apex of gonostylus distinctly protruding beyond penis valve. Lateral sclerites of penis valve curved inwards, joining each other only apically. Gonocoxites nearly joining each other basally, ventral lobe of gonocoxite absent (Fig. 3D). Gonobase large with honey yellow integument, distinctly protruding beyond basal margin of gonocoxites. (Refer to Supp. file 3 for labelled genitalia).

Female

Unknown

Distribution

India (Arunachal Pradesh); only known from the holotype.

Genus ***Habropoda*** Smith, 1854

Habropoda Smith, 1854: 320, replacement for *Habrophora* Smith, 1854: 318. Type species: *Habropoda ezonata* (Smith, 1854).

Diagnosis

Habropoda is most clearly distinguishable from other members of the Anthophorinae by the absence of a flabellum on glossa and the broad, lamellate and apically expanded shape of the gonostyli of male genitalia. Vein cu-a of hind wing usually conspicuously oblique, at angle of 45° or less to first abscissa of M+Cu, third submarginal cell with anterior margin much shorter than posterior margin and terga II–V commonly without lateral longitudinal parts of graduli.

Distribution

Oriental, Nearctic and Palearctic region.

Key to the species (based on males) of Indian *Habropoda* Smith, 1854

The key is adapted and modified from Lieftinck (1974).

1. Integument of tergites T1–T7 black; deeply and evenly punctate; basal ¾ of T1 with long, orange-yellow hairs followed by a thin line of long black hairs and a posterior, thick band of bright short yellow hairs; basal ¾ of T2–T5 sparsely covered with short black hairs and an apical thick band of short yellow hairs; apical yellow band absent in T6–T7, uniformly covered with short black hairs . ..... ***H. sinensis*** Alfken, 1937
– Integument of tergites yellowish brown to black, never completely black; pubescence not as above 2

2. Pubescence of mid and hind tibiae and basitarsi almost entirely black; pubescence of T1 entirely and basal portion of T2 bright yellow; T2 distally and T3 almost entirely black; distal portion of T3 and T4–T7 entirely reddish orange; tarsal arolia minute ..... ***H. turneri*** Cockerell, 1909
– Pubescence of mid and hind tibiae and basitarsi at least partly light coloured; dorsal pubescence not as above, never tricoloured; tarsal arolia well developed 3

3. Antennal article 3 longer than 4+5 4
– Antennal article 3 shorter than 4+5 6

4. Paraclypeal area black; clypeus yellow and paraclypeal area black with pale yellow hairs, black stripe along epistomal suture; antennal scape with yellow markings dorsally ..... ***H. adi*** sp. nov.
– Paraclypeal area yellow; antennal scape variable 5

5. Clypeus with a median narrow constriction; vestiture of T1–T7 uniform, with light yellow hairs intermixed slightly with black, posterior band of yellow dense short hairs present; head small and face narrower; second submarginal cell almost square, recurrent vein entering cell a little before its apex ..... ***H. krishna*** Bingham, 1908
– Clypeus without median narrow constriction; vestiture of T1–T7 not uniform, T1 and T2 without thick band of yellow dense short hairs, T3–T6 with thick yellow band of yellow dense short hairs, T7 black without yellow hairs; head large and face relatively broader; second submarginal cell longer than high, receiving recurrent vein well before its apex ..... ***H. deiopea*** Cameron, 1897

6. Clypeus predominantly black with a narrow I-shaped yellow median spot and transverse anterior bar tapering at either end; labrum dark brown with a distinct anterior emargination; legs dark brown; dorsal pubescence of thorax and metasoma light orange to deep chrome with dark hairs sparsely intermixed on thorax ..... ***H. radoszkowskii*** (Dalla Torre, 1896)
– Clypeus predominantly yellow with markings of varying size; labrum not emarginated apically but slightly crenulate apicomedially; rest of the characters not as above 7

7. Clypeus with conspicuous yellow medial spot, strongly constricted anteroposteriorly and brownish lateral marks; labrum light brown; legs orange-buff; dorsal pubescence of thorax and metasoma longer, more condensed and brightly orange; thick band of black hairs in the middle of T2 absent . ..... ***H. plantifera*** Lieftinck, 1974
– Clypeus without medial anteroposteriorly constricted spot and brownish lateral marks; labrum dark brown; dorsal pubescence almost entirely buff yellow, except some long hairs tipped with brown in head and thorax; thick band of black hairs in the middle of T2 present ..... ***H. rowlandi*** (Meade-Waldo, 1914)

Habropoda adi sp. nov.
urn:lsid:zoobank.org:act:15464B13-977A-4C75-8D7F-D74307049B62
Figs 4–6, 8

Differential diagnosis

Habropoda adi sp. nov. differs from other known species of *Habropoda* in having a clypeus with a black stripe along epistomal suture, separating the yellow areas on each side of it; paraclypeal and supraclypeal areas black with pale yellow pubescence (Fig. 4C); two yellowish brown spots on antero-lateral margin of labrum (Fig. 4E), labrum deeply punctate, malar space shorter than pedicel of antenna, basal part of mandible yellowish brown, gonostyli spatulate and hairy only at the tip (Figs 5F, 6C), body pubescence not uniform (Fig. 4B); white silky pubescence on gena and lateral sides of the body (Fig. 4A). The new species is similar to *Habropoda bucconis* (Friese, 1911) in having antennal segment 3 slightly longer than 4+5 (Fig. 5A) and length of body close to 12 mm. The new species differs from *H. bucconis* in having outer face of hind basitarsus covered densely with long decumbent hairs (sparsely in *H. bucconis*), T- or mushroom-shaped median spot absent on clypeus (present in *H. bucconis*), paraclypeal area black (yellow in *H. bucconis*), mandibular base brownish black (bright yellow in *H. bucconis*), labrum brownish black (dark reddish brown in *H. bucconis*) and body pubescence not uniform (orange buff in *H. bucconis*). The new species also shows resemblances to *H. rowlandi* (Meade-Waldo, 1914) in having long raised hairs in the thorax and head intermixed with brown hairs, labrum dark brown, 1.27 × as wide as long, marginal cell of forewing distinctly longer than distance from apex to wing tip. It differs from *H. rowlandi* in not having blackish brown band of hairs in the middle of tergite 2 (Fig. 5D) and body pubescence not uniformly buff yellow.

Etymology

The species is named '*adi*' after the Adi community, an indigenous group inhabiting the region of Arunachal Pradesh where the species was collected and is used as a noun in apposition.

Type material

Holotype

INDIA • ♂; Arunachal Pradesh, Yingku; 28.44573° N, 94.88308° E; 706 m a.s.l.; 5–7 May 2022; A.P. Ranjith leg.; Malaise trap; ICAR-NBAIR, AIMB/Hy/Ap30005.

Description

Measurements. Body length 12.3 mm, fore wing 7.6 mm.

Head. Integument black with upper part of flagellum. Paraocular area and supraclypeal area black. Clypeus yellow with black stripe along epistomal suture (Fig. 4C). Labrum dark brown and deeply punctate with two yellowish brown spots on antero-lateral margin (Fig. 4E). Mandibles bidentate, basal half and apical ⅓ brownish yellow (Fig. 4E). Ocelli brownish black, placed in isosceles triangle (Fig. 4D). Head 1.2 × as wide as long (length: 7.406 mm, width: 8.801 mm). Upper part of the inner margin of compound eye slightly emarginate behind antennal torulus. Face and clypeus finely punctate with punctures scattered and widely dispersed with interspaces (0.09 mm) of 1.8 × as long as width of surrounding punctures (0.05 mm), vertex irregularly punctate with interspaces (0.08 mm) of 2.6 × as long as their width (0.03 mm). Clypeus protuberant slightly wider than long (length: 1.64 mm, width: 1.7 mm), protuberance of the apical margin of clypeus (2.99 mm) in lateral view 1.3 × as long as width of eye (2.3 mm), pubescent. Malar space short (0.096 mm), 0.5 × as long as antennal pedicel. Tongue long, 0.7 × as long as height of head. Mandible bidentate, blunt, outer tooth 2.1 × as long as inner tooth. Clypeus with pale yellow hair, head and vertex with pale yellow hair intermixed with brown. Frons black, finely punctate, with pale yellow hairs and a midlongitudinal groove. POL: diameter of posterior

ocellus: OOL= 1.1 : 1.0 : 2.1. Antenna with scape brownish black ventrally, yellow dorsally, yellow apico-ventrally, 2.5 × as long as maximum width, pedicel brown, 0.8 × as long as wide, first flagellar segment expanded apically, 2.1 × as long as wide, first flagellar segment yellow apico-ventrally, second flagellar segment yellow on basal half ventrally, flagellar segments 3 to 11 brown (Figs 4D, 5A). First flagellar segment 2.1 × as long as second flagellar segment. F2 1.1 × as long as wide. F3–F11 longer than wide.

Fig. 4. *Habropoda adi* sp. nov., holotype, ♂ (ICAR-NBAIR, AIMB/Hy/Ap30005). **A**. Habitus, lateral view. **B**. Habitus, dorsal view. **C**. Head, anterior view. **D**. Head, dorsal view. **E**. Labrum and mandibles, anterior view.

Thorax. As long as high (length: 3.884 mm, height: 3.956 mm), punctate with interspaces (0.07 mm) 2.4 × as long as width of surrounding punctures (0.03 mm). Integument of tegula brownish yellow, densely punctate with smooth interspaces (Fig. 4B). Thorax with pale yellowish tipped with brown at dorsal part and silky white hairs at ventral part (Figs 4B, 5A). ITD: 3 mm.

Fig. 5. *Habropoda adi* sp. nov., holotype, ♂ (ICAR-NBAIR, AIMB/Hy/Ap30005). **A**. Antennae. **B**. Hind leg, lateral view. **C**. Metasoma, lateral view. **D**. Metasoma, dorsal view. **E**. Apical abdominal segments (T4–T6), dorsal view. **F**. Genitalia.

Wings. Clear with dark brown veins and pterostigma brown (Fig. 6). Marginal cell 3.9 × as long as wide. Marginal cell of forewing 1.7 × as long as distance from its apex to wing tip. Pterostigma as long as prestigma (Fig. 6A). First submarginal cell 1.2 × as long as second submarginal cell. Third submarginal cell 1.2 × as long as second submarginal cell. Third submarginal cell 1.3 × as long as wide, 1.1 × as wide as second. First recurrent vein joining second submarginal cell towards apex of second submarginal cell. Hind wing with 13 hamuli (Fig. 6B). Vein cu-v strongly oblique.

Fig. 6. *Habropoda adi* sp. nov., holotype, ♂ (ICAR-NBAIR, AIMB/Hy/Ap30005). **A**. Fore wing. **B**. Hind wing. **C**. Genitalia, dorsal view. **D**. Genitalia, ventral view.

Legs. Brownish black, basitarsus and the tip of tarsal claws black (Fig. 5B–C). Fore and mid femora and tibia unmodified. Hind femur 3.9× as long as wide. Hind tibia longer than wide, 3.6× as long as wide, narrow at base, broader apically, basitibial plate distinct. Legs with pale yellow hairs dorsally. Hind femora with silky white branched hairs ventrally. Inner face of basitarsus with dense long spine like hairs, mediotarsus and distitarsus with shorter bristle-like hairs. Claws deeply clefted, tipped with brown.

Abdomen. Metasoma with pale yellow pubescence. T1–T7 narrow posterior transverse yellow band (Fig. 5C–E). Graduli indistinct. Metasoma with uniform sized hairs as on the thorax. Pygidial plate distinct, yellowish brown. Gonostylus distinctly divided into dorsal and ventral gonostylus, dorsal gonostylus slender with pale honey yellow integument, spatulate at apex with bristle like hairs, apex slightly protruding beyond penis valve, ventral gonostylus broad and ear-shaped with pale honey yellow integument (Figs 5F, 6C–D). Lateral sclerites of penis valve almost parallel sided, joining each other only apically. Gonocoxites clearly separated from each other basally with distinct interspace, ventral lobe of gonocoxite distinctly developed (Fig. 6D). Gonobase large with honey yellow integument, distinctly protruding beyond basal margin of gonocoxites.

Female

Unknown.

Distribution

India (Arunachal Pradesh); only known from the holotype.

Discussion

The role of male descriptions in insect taxonomy cannot be underestimated especially for rarely collected taxa. Often, male individuals also exhibit distinctive morphological traits (Michener 2007; Buck *et al.* 2008), including color patterns, specialized appendages, etc., which are pivotal for discerning closely related species. In many hymenopteran families, sexual dimorphism can extend to the highest point (Goulet & Huber 1993; Stubblefield *et al.* 1994). In some cases, a comprehensive male description alone can justify the establishment of a new species, thus emphasizing the significance of such descriptions in taxonomy. This is further underscored by Falk, as taxonomy of many apid genera requires examination of male genitalia characters using male specific taxonomic keys (Falk 2019).

The apid subfamily Anthophorinae is divided into *Anthophora* and *Elaphropoda* groups in which the former is more speciose than the latter (Engel 2018). Except *Amegilla*, *Anthophora* and *Habropoda*, all other genera are found to be less speciose (less than 25 species globally) (Engel 2018). Consequently, research efforts have predominantly focused on the genera *Amegilla* and *Anthophora* (Lieftinck 1944, 1956; Brooks 1988; Carion *et al.* 2025). In the subfamily Anthophorinae, many genera like *Habrophorula* and *Varthemapistra* have been described and validated based only on lone specimens, due to the rarity of these species in collections (Lieftinck 1974; Engel 2018). The taxonomy of anthophorine bees is further enhanced by the publication of male and female specific keys which points to the need for description of both sexes (LeBerge & Michener 1963; Lieftinck 1974; Wu 1991). Engel (2018) pointed out the difficulty in getting both male and female specimens and emphasized the need for taxonomic descriptions based on a single sex. For both *Elaphropoda* and *Habropoda*, the descriptions of extant species have been largely based on either male or female specimens and species having information from both sexes are found to be scarce (Lieftinck 1974). This is also true in the case of other anthophorine genus, *Deltoptila* LaBerge & Michener, 1963 where the taxonomy is more male based (LeBerge & Michener 1963).

The genus *Elaphropoda* is distributed mainly in the Oriental region from Northern India to the South Java (Michener 2007). There is no comprehensive treatment available for the genus and the available taxonomic data is more region specific (Lieftinck 1966; Wu 1979, 1991). Recently, Saini *et al.* (2021)

described two new species of *Elaphropoda* from Northeast India. Taxonomic information of most species of *Elaphropoda* is based on male specimens (Lieftinck 1966; Wu 1979, 1991) and information for both the sexes is available only for three species (Lieftinck 1966; Wu 1979), indicating that males and females are rarely collected together.

It is well accepted from fossil studies and molecular phylogenies that the diversification of bees and evolution of derived families and subfamilies took place in the Late Cretaceous (Rehan *et al.* 2013). This was also a period when the continental connection between the Americas and Eurasia existed (Murphy 2019). The temperate and subtropical to tropical distribution of the genus *Habropoda* can be explained with this. The distributions of most species of *Elaphropoda* are restricted to elevations between 1450–1700 m a.s.l. (Lieftinck 1974). The distributions of Indian *Elaphropoda* and *Habropoda* are also largely restricted to higher elevations, mainly in the Himalayan region between Nepal and India (Figs 7–8), except *E. khasiana* and *E. magrettii*, which are widely distributed. In contrast to this, *E. triangulata* is collected from a lower elevation (225 m a.s.l.). Members of the genus *Habropoda* also exhibit a similar distribution pattern as *Elaphropoda* in having an elevational gradient between 722–2300 m a.s.l. However, the occurrence of *H. adi* sp. nov. at the lower end of this gradient (722 m a.s.l.) (Fig. 8) may reflect limited sampling, and further surveys across elevations may clarify the full distributional range of the species of *Habropoda* in the Himalayan region. The period from July to November is considered as the active time of most species of *Habropoda*, including their reproductive period (August to September) (Lieftinck 1966). The newly described *H. adi* was, however, collected in May. It is worth mentioning that some exceptional collections have been documented in April and May, as observed for *H. radoszkowskii* (Lieftinck 1966) and this helps understand the unusual flight period and activity pattern exhibited by

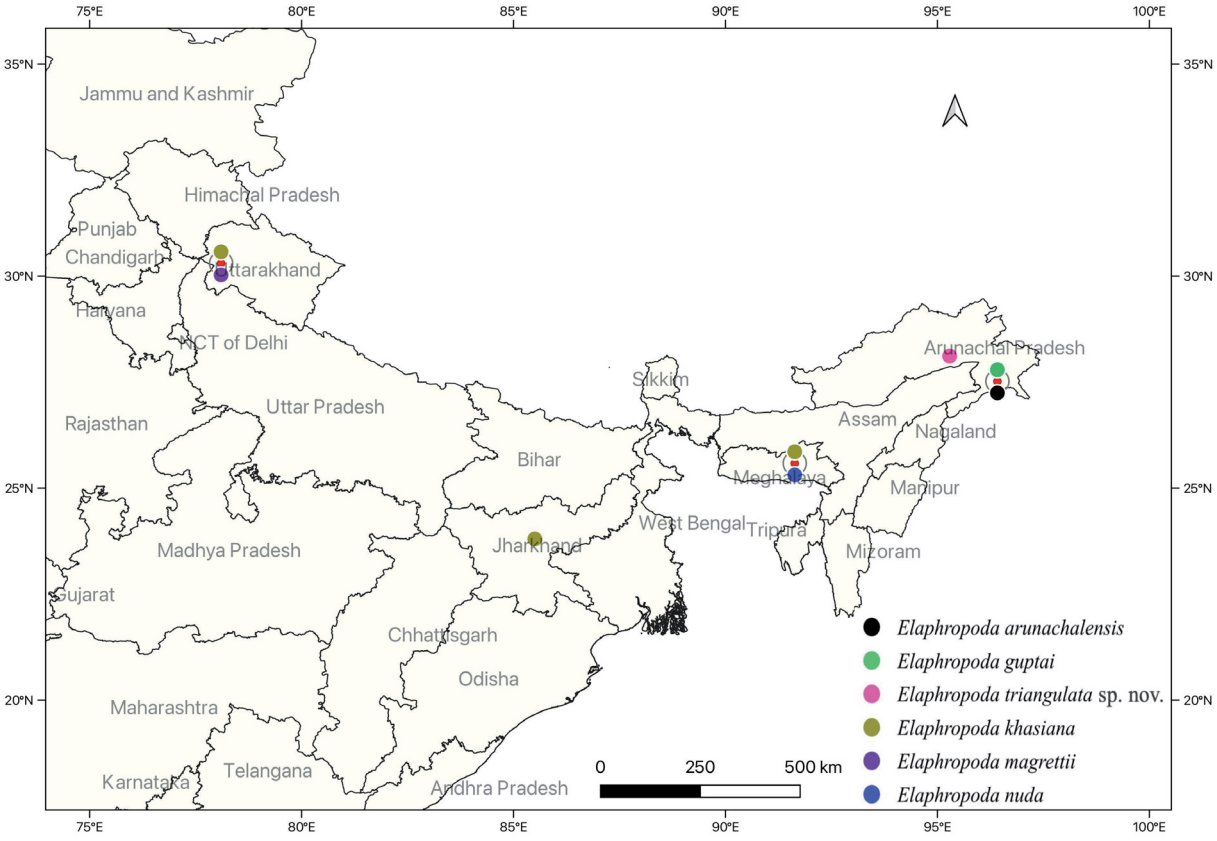

Fig. 7. Distribution of Indian species of *Elaphropoda* Lieftinck, 1966.

species of *Habropoda* including the new species *H. adi*. This is supported by the evidence from other species such as *H. sinensis* and *H. tainanicola* which are also active earlier in the year, viz., from March to May (Lieftinck 1966). Collectively, all these differences in the activity pattern of species of *Habropoda* point to season and habitat barely influencing the activity pattern.

These newly described bee species from Arunachal Pradesh add to the growing body of evidence highlighting the underexplored diversity of insects in this region (Saini *et al.* 2018, 2021; Boyane *et al.* 2024; Sahanashree *et al.* 2024). In the past decade, several vertebrate and invertebrate taxa new to science have been described from Arunachal Pradesh, including the skink *Protoblepharus apatani* Mirza *et al*., 2022, the frog *Nidirana noadihing* Boruah *et al.,* 2023, the horned toad *Xenophrys apatani* Saikia *et al*., 2024, two species of *Elaphropoda* namely, *E. arunachealensis* Saini *et al*., 2021 and *E. guptai* Saini *et al*., 2021, the damselfly *Caliphaea sinuofurcata* Kunte, 2025 and a metallic-blue ant *Paraparatrechina neela* Sahanashree *et al.,* 2024 (Saini *et al*. 2021; Mirza *et al.* 2022; Boruah *et al.* 2023; Sahanashree *et al.* 2024; Saikia *et al.* 2024; Kunte 2025). Such findings emphasize the need for continued exploration and documentation to discover new species offering valuable insights into the biodiversity within these areas (Saini *et al.* 2018). The region is undergoing rapid infrastructural development, including expansion of road networks, bridges, and strategic tunnels, as well as proposals for large hydroelectric projects such as the 11 000 MW Upper Siang Multipurpose Project. Such development activities can alter forest habitats and river systems in this fragile Himalayan landscape, emphasizing the importance of documenting its biodiversity to support conservation and management efforts (Streinzer *et al.* 2019). More extensive sampling efforts and further research could reveal more species, elucidating their ecological relationships, and thus contribute to a broader understanding of the

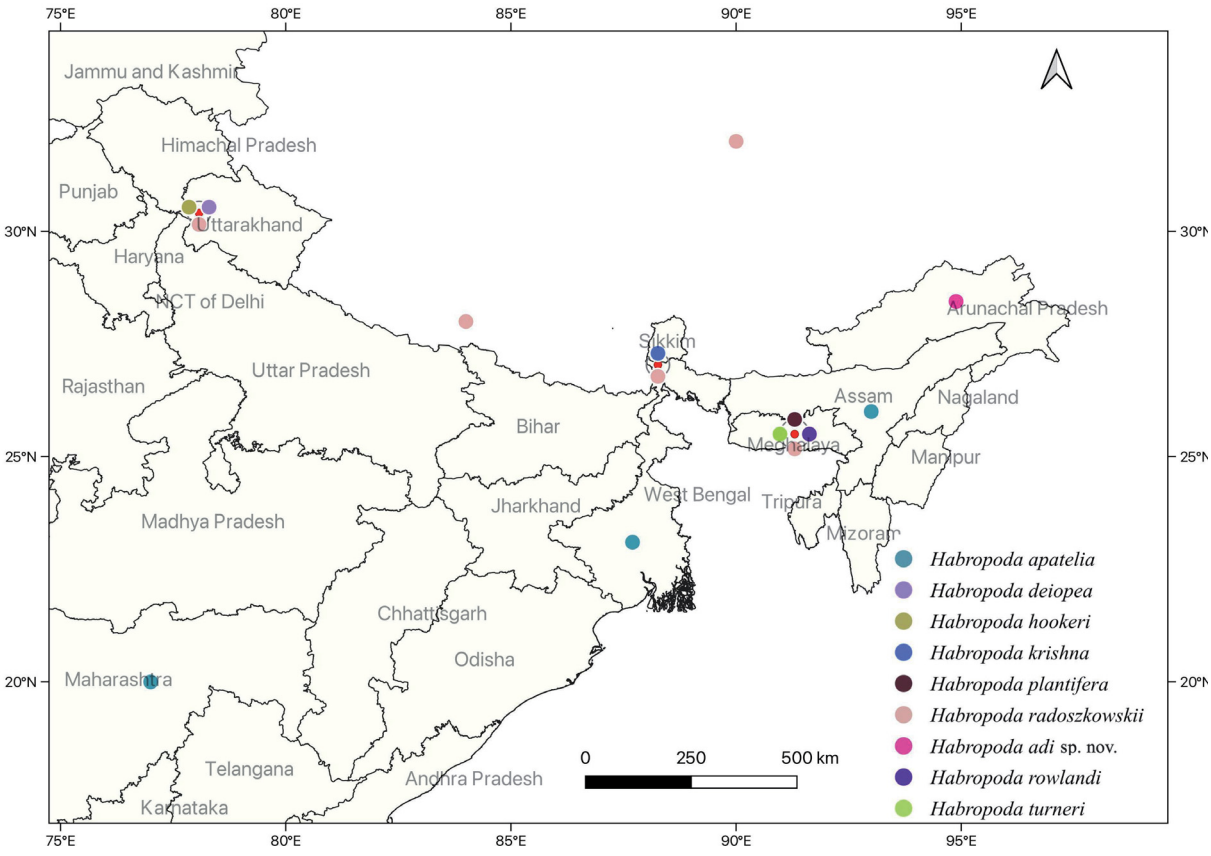

Fig. 8. Distribution of Indian species of *Habropoda* Smith, 1854.

biodiversity in the region (Saini *et al.* 2018; Streinzer *et al.* 2019). These efforts can contribute not only to taxonomic knowledge but also document conservation strategies that lead to management decisions for these ecologically significant regions.

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Supplementary files

Supp. file 1. Townes style Malaise traps used to collect the specimens.
https://doi.org/10.5852/ejt.2026.1073.3298.14528

Supp. file 2. Distribution (coordinates) of Indian *Elaphopoda* Lieftinck, 1966 and *Habropoda* Smith, 1854. https://doi.org/10.5852/ejt.2026.1073.3298.14529

Supp. file 3. Labelled genitalia (ventral view) of *Elaphropoda triangulata* sp. nov., holotype, ♂ (ICAR-NBAIR, AIMB/Hy/Ap30005). https://doi.org/10.5852/ejt.2026.1073.3298.14530