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First record of the genus *Thaumastoptera* Mik, 1866 (Diptera, Limoniidae) from Myanmar amber, mid-Cretaceous, with description of a new species

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Abstract. A new species of the genus *Thaumastoptera* Mik, 1866, *Thaumastoptera burmanica* sp. nov., from mid-Cretaceous Myanmar ambers is described and illustrated. The new species represents the first record of the genus *Thaumastoptera* from Myanmar amber. The new species is similar to another fossil species *Thaumastoptera electra* Alexander, 1931, by the wing venation, but differs from the latter by the shorter R2+3+4, longer R5, and the position of the r-m distal to R2. A key to all fossil species in this genus is provided.

Keywords. Crane fly, fossil species, Burmese amber, Tipuloidea, taxonomy.

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Introduction

Limoniidae Speiser, 1910 represents the largest family within Tipuloidea Latreille, 1802, with over 11 000 extant species worldwide (Oosterbroek 2026). This family also comprises over 450 extinct species, which span Mesozoic to Caenozoic deposits from Myanmar, Japan, Siberia, the Baltic Region, Lebanon, Western Europe and Central and North America (Alexander 1931; Zherichin & Sukacheva 1973; Fujiyama 1985; Evenhuis 1996; Men *et al.* 2023). Numerous biotic taxa are preserved in Myanmar amber (98.79 ± 0.62 Ma), with 495 families, 1540 genera and 2424 insect species recorded so far (Ross 2026). In the past ten years, continuous investigations by researchers have expanded the known Limoniidae fauna of Myanmar amber to 34 species within 20 genera (Ribeiro 2003; Krzemiński 2004;

Podenas & Poinar 2009; Kania *et al.* 2015a, 2015b; Gao *et al.* 2016; Men *et al.* 2019, 2023, 2026; Kania-Kłosok *et al.* 2021, 2022; Kopeć *et al.* 2021a, 2021b, 2023; Krzemiński *et al.* 2021, 2025; Men & Podenas 2021).

The genus *Thaumastoptera* Mik, 1866 is a small but widely distributed genus. It comprises 11 extant species, among which three species are recorded from the Oriental Region, and three from the Afrotropical Region, four from the Palaearctic Region, and one from the Nearctic Region (Oosterbroek 2026). The diagnostic characteristics of this genus are summarized as follows: body small; antenna short, flagellomeres oval; wing usually hyaline, anal lobe well developed, R3 absent, R2 generally long, M1+2 not forked and stalked with M3, discal cell absent, m-cu far proximal to the bifurcation of M; tergite 9 transverse, sometimes with epiproct; sternite 9 well developed, forming a complete ring together with tergite 9, bearing one or two pairs of gonostyli; ovipositor elongated, with slender and upward-curved cerci (Podenas 2000). This genus is divided into two subgenera, *Thaumastoptera* (*Taiwanita*) Alexander, 1929 and *Thaumastoptera* (*Thaumastoptera*) Mik, 1866, with the former containing only a single extant species. This genus also includes four fossil species, *Thaumastoptera electra* Alexander, 1931 and *Thaumastoptera ryszardi* Krzemiński, 1985 from Baltic amber, *Thaumastoptera shinaqi* Podenas, 2000 from Jordanian amber, and *Thaumastoptera undulata* (Cockerell & Haines, 1921) from the Eocene Insect Limestone of the United Kingdom (Cockerell 1921; Alexander 1931; Krzemiński 1985; Podenas 2000).

During the sorting and identification of insect inclusions in Myanmar amber, one new species of the genus *Thaumastoptera* was found. Herein, we describe and illustrate the new species, which represents the first record of this genus from Myanmar amber.

Material and methods

The type fossil specimen studied herein was found in mid-Cretaceous amber deposits (98.79 ± 0.62 Ma) in Tanai District, Kachin State (Hukawng Valley) of northern Myanmar (Fig. 1) (Shi *et al.* 2012; Li *et al.* 2015). The studied specimens in Myanmar amber were legally obtained before February 2021. The type fossil specimen is deposited in the Systematics and Evolution Laboratory, School of Life Sciences, Anqing Normal University, Anhui Province, P.R. China.

Photographs of the body were taken using an Olympus SZ61 stereo microscope (Olympus, Japan). All measurements were taken in millimeters (mm) using a digital caliper. The methods of description and illustration follow those of Podenas (2000). The terms of genital structures follow those of Cumming & Wood (2017) and Starý & Oboňa (2018), and the terms of wing venation are adopted from de Jong (2017).

Morphological abbreviations

an lb = anal lobe
flag = flagellum
goncx = gonocoxite
i gonst = inner gonostylus
o gonst = outer gonostylus
ped = pedicel
ptg = proctiger
scp = scape
t 9 = tergite 9

Institutional abbreviation

AQNU = School of Life Sciences, Anqing Normal University, Anhui Province, P.R. China

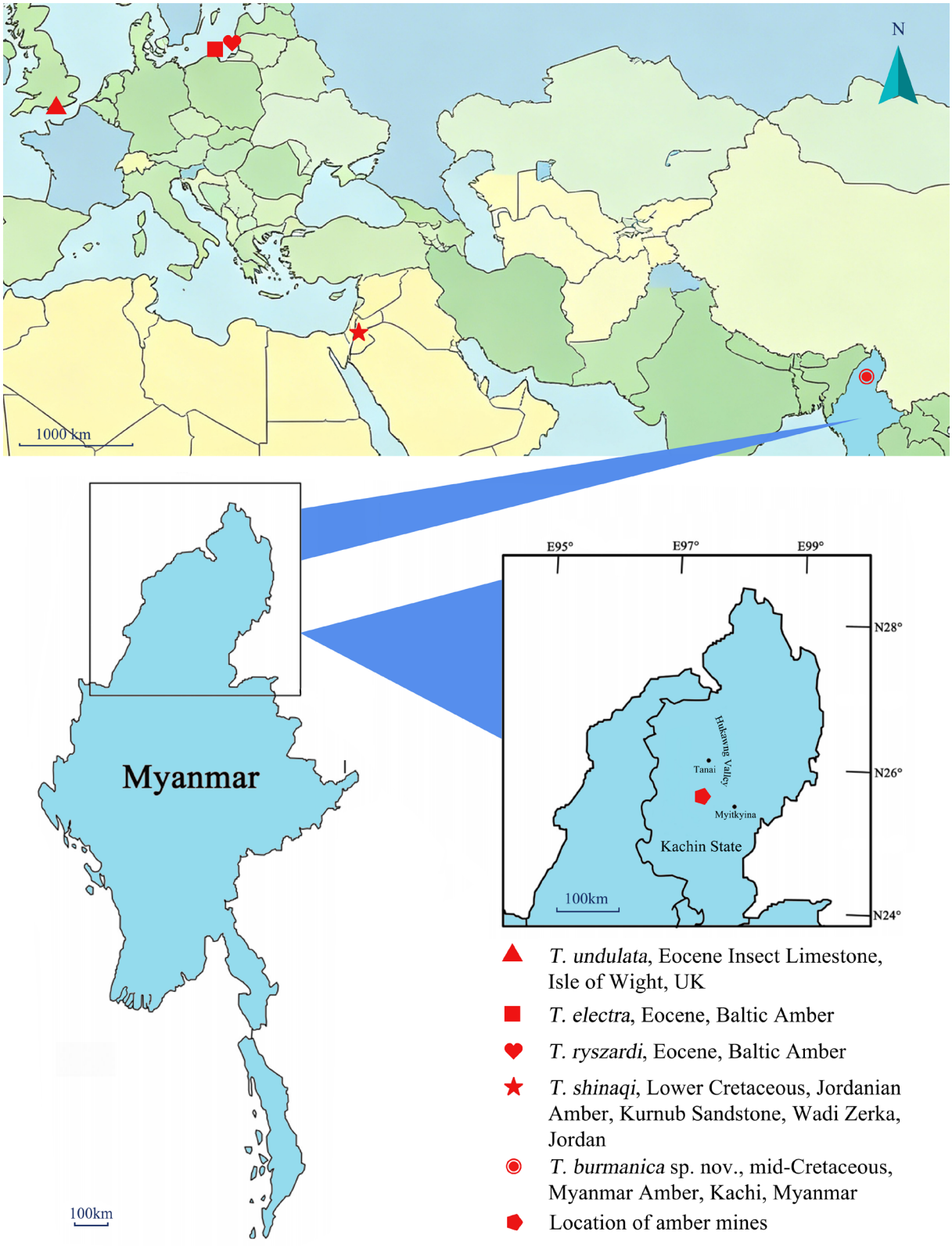


Fig. 1. Fossil species distribution of the genus *Thaumastoptera* Mik, 1866 and amber locality of the *Thaumastoptera* (*Thaumastoptera*) *burmanica* sp. nov., modified after Li *et al*. (2015).

Results

Systematic paleontology

Class Insecta Linnaeus, 1758
Order Diptera Linnaeus, 1758
Family Limoniidae Speiser, 1910
Subfamily Limoniinae Speiser, 1910
Genus *Thaumastoptera* Mik, 1866

Subgenus ***Thaumastoptera* (*Thaumastoptera*)** Mik, 1866

Type species

Thaumastoptera calceata Mik, 1866, by original designation.

Thaumastoptera* (*Thaumastoptera*) *burmanica sp. nov.
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Figs 1–3

Diagnosis

Scape subequal in length to combined pedicel and first flagellomere. Wing hyaline, unpatterned; base of R5 longer than R2+3+4, 6.1 times length of r-m; r-m distal to R2; tergite 9 broad and rounded posteriorly, with conical epiproct; gonocoxite short; outer gonostylus basally broad, gradually tapering apically, curved inward medially.

Etymology

The specific epithet '*burmanica*' is named after Myanmar, the type locality of this new species.

Type material

Holotype
MYANMAR • ♂; Kachin State, Myitkyina District, Hukawng Valley; mid- Cretaceous, late Albian to early Cenomanian; AQNU, AQNU-DIP-2026005.

Description

Measurements. Length (male): body 2.88 mm (not including antenna, n = 1); wing 3.30 mm (n = 1); antenna 0.78 mm (n = 1).

Head. Rostrum relatively long, distinctly shorter than the length from its base to occiput. Antenna 16-segmented, if bent backward reaching the base of wing, scape cylindrical, elongate, expanded apically, subequal in length to combined pedicel and first flagellomere, pedicel subspherical, flagellum with flagellomeres oval, subequal in length, gradually thinner, each flagellomere with numerous black verticils, in which the longest one almost same length as its corresponding flagellomere (Figs 2A–C, 3A). Palpus (Figs 2C, 3B) with each palpomere subequal in length.

Thorax. Half as long as abdomen. Pronotum significantly protruded cephalad in lateral view, mesonotum and mediotergite densely covered with setae (Fig. 2A). Venation: Sc terminating not beyond half of wing length, pointed to vein C apically in arch, nearly level with Rs furcation; R1 terminating slightly beyond half of wing length, its tip proximad of r-m; R2 present, slightly curved, more than four times as long as R1; R4 1.9 times as long as Rs, weakly curved posteriorly to the outer margin of wing; R2+3+4 1.8 times as long as R2; R5 1.8 times as long as Rs, basal section of R5 6.1 times as long as r-m; discal cell

and cell m1 absent; M1+2 present, longer than M3; m-cu distinctly shorter than basal section of R5, its upper point proximad of Sc tip, m-cu far before the fork of M; both CuA and CuP relatively straight; A1 arched at apex; anal lobe strongly developed (Figs 2A–B, 3C). Hind leg with femur 3.20 mm (other leg parts are broken).

Abdomen. Covered with sparse setae. Hypopygium with tergite 9 broad and rounded posteriorly, width distinctly greater than length, maximum width 0.42 mm, with conical proctiger (Figs 2D, 3D). Gonocoxite relatively short, broad basally, maximum width 0.14 mm, length 0.23 mm (Figs 2D, 3D–E). Outer gonostylus basally broad, gradually narrowing to apex, curved inward medially, acute apically (Figs 2D, 3D–E). Inner gonostylus half-length of outer gonostylus, flattened, slightly curved, basally slightly broad, apically narrow (Figs 2D, 3D–E).

Remarks

The new species can be assigned to the genus *Thaumastoptera* based on the following morphological characters: antenna with flagellomeres oval; M1+2 present and stalked with M3, discal cell and cell m1 absent, m-cu far before the fork of M. Among five fossil and 11 extant species of *Thausmatoptera* species, *T.* (*T.*) *burmanica* sp. nov. is most similar to *T. electra* Alexander, 1931 from Baltic amber in wing venation, but differs from it in the following features: R2+3+4 shorter than base of R5, basal section of R5 6.1 times as long as r-m, and r-m distal of R2. By contrast, in *T.* (*T.*) *electra*, R2+3+4 is distinctly

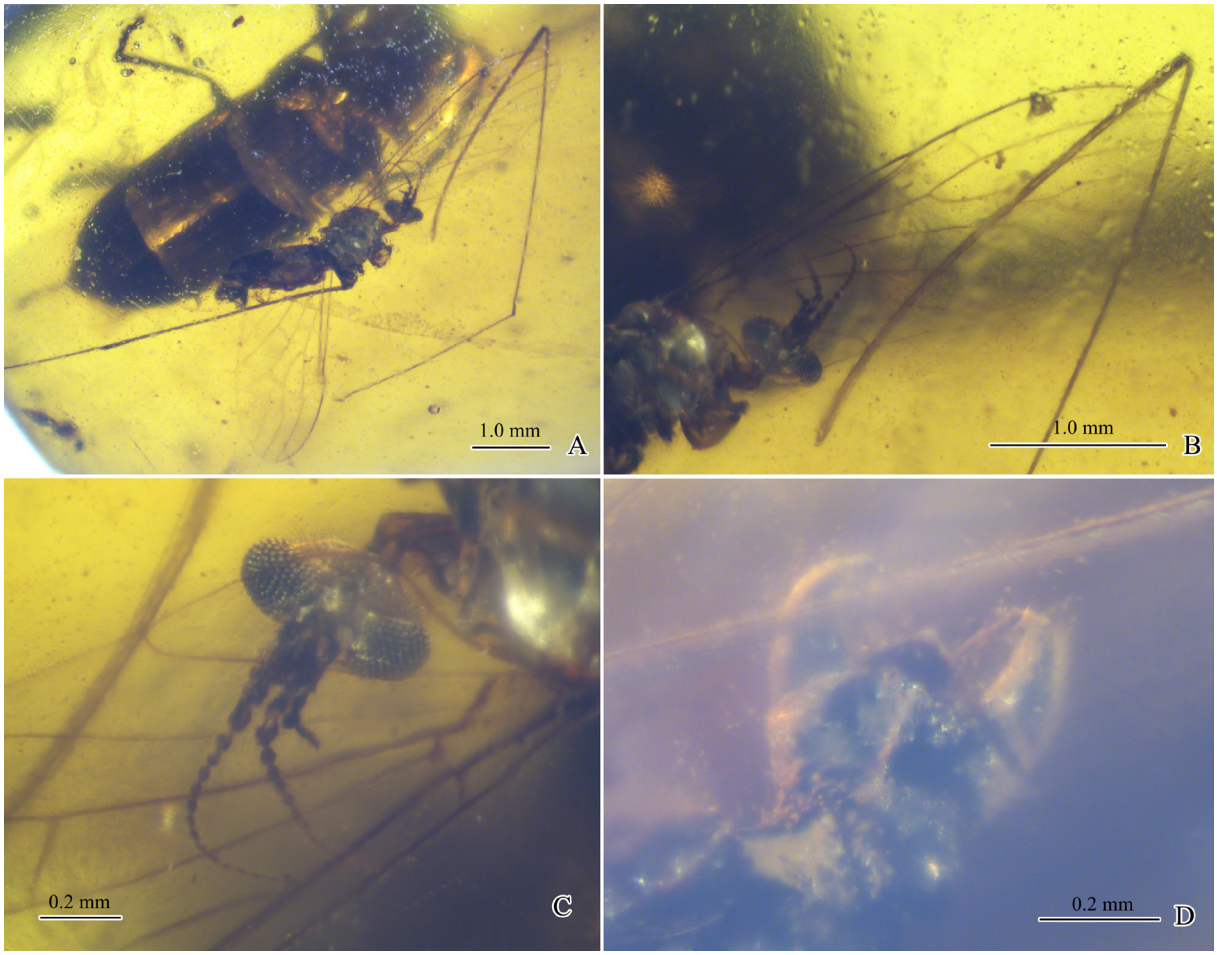


Fig. 2. *Thaumastoptera* (*Thaumastoptera*) *burmanica* sp. nov., holotype, ♂ (No. AQNU-DIP-2026005). **A**. Body, lateral view. **B**. Wing. **C**. Head, dorsal view. **D**. Hypopygium, dorsal view.

longer than basal section of R5, basal section of R5 is only 2.2 times the length of r-m, and r-m lies proximad to R2 (Kania 2015). In the holotype of *T.* (*T.*) *electra*, the basal section of R5 is 2.5 times the length of r-m (Alexander 1931).

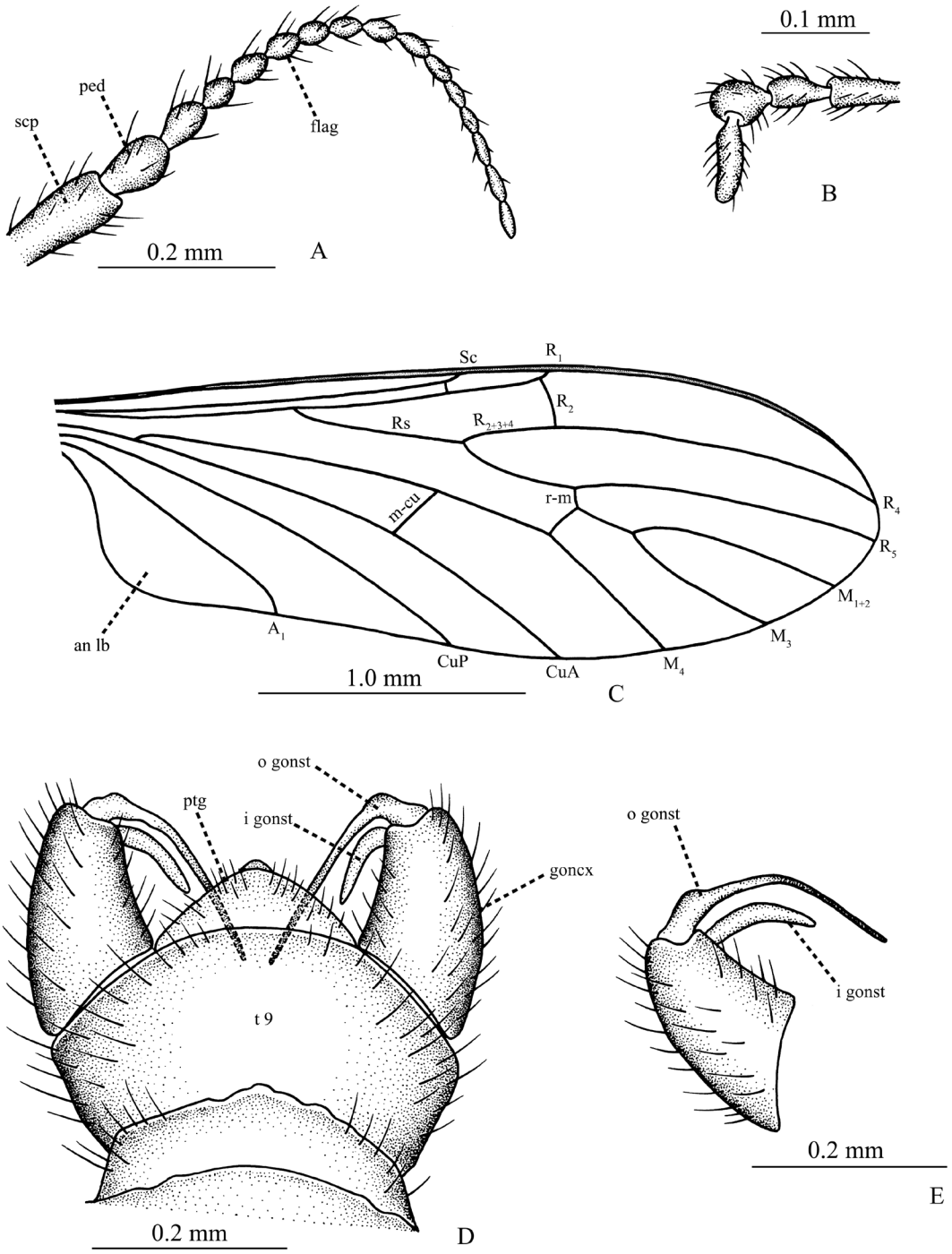


Fig. 3. *Thaumastoptera* (*Thaumastoptera*) *burmanica* sp. nov., holotype, ♂ (No. AQNU-DIP-2026005). **A**. Antenna, **B**. Palpus. **C**. Wing. **D**. Hypopygium, dorsal view. **E**. Gonocoxite with inner and outer gonostyli. Abbreviations: see Material and methods.

Key to fossil species of Thaumastoptera based on wing venation

1. R2+3+4 shorter than R2 2
– R2+3+4 longer than R2 3

2. Rs longer than R3+4 ..... ***T.* (*T.*) *shinaqi*** (Podenas 2000: fig. 3)
– Rs shorter than R3+4 ..... ***T.* (*T.*) *ryszardi*** (Krzemiński 1985: fig. 5)

3. Furcation of Rs beyond half the wing length ..... ***T.* (*T.*) *undulata*** (Krzemiński *et al*. 2019: fig. 30)
– Furcation of Rs not beyond half the wing length 4

4. Base of R5 2.2 or 2.5 times as long as r-m; m-cu perpendicular to CuA .....
..... ***T.* (*T.*) *electra*** (Alexander 1931: fig. 43; Kania 2015: fig. 24c)
– Base of R5 6.1 times as long as r-m; m-cu acute to CuA .....***T.* (*T.*) *burmanica*** sp. nov. (Fig. 3C)

Discussion

Among the 11 extant species of the genus *Thaumastoptera*, all possess an unbranched gonostylus except one species known only from a female holotype. Among the four previously described fossil species of this genus, excluding one female and one impression fossil, the remaining two species based on male specimens exhibit a branched gonostylus. The species described herein represents the fifth fossil species of this genus, and its gonostylus shows unambiguous branching. The gonostylus is likewise unbranched in species of *Tricyphona* Zetterstedt, 1837 (Pediciidae Osten-Sacken, 1859) and *Limonia* Meigen, 1803 (Limoniidae) (Ribeiro 2006). This unbranched morphology is most plausibly a secondary reduction, given that a branched gonostylus is inferred as the ancestral condition of Tipulomorpha Rohdendorf, 1961 (Starý 1992).

Thaumastoptera has R4, M1+2 connate with M3, and lacks both the discal cell and cell m1. These characters also occur in some other genera, such as *Eupilaria* Alexander, 1932, *Medleromyia* Alexander, 1974 and *Amphilimnobia* Alexander, 1920. They differ from *Thaumastoptera* in that the m-cu cross vein is close to the bifurcation of vein M, whereas it is far before the bifurcation of vein M in *Thaumastoptera*. The m-cu positioned posterior to the bifurcation of vein M is regarded as a plesiomorphic wing venation character throughout the family Limoniidae (Krzeminski & Zessin 1990; Krzeminski & Krzeminska 2003). This homoplastic trait can also be observed in *Antocha* Osten Sacken, 1860, *Idiocera* Dale, 1842, *Orimarga* Osten Sacken, 1869 and *Orimarguloides* Men & Podenas, 2021. Within the genus *Thaumastoptera*, all examined species consistently exhibit this m-cu arrangement. This consistent venational pattern distinguishes the genus, and our results improve our knowledge of wing venation evolution within Limoniidae.

Thaumastoptera shares highly similar wing venation with *Hovamyia* Alexander, 1951, *Idiocera* and *Teucholabis* Osten Sacken, 1860. Nevertheless, vein R3 is absent in *Thaumastoptera*, whereas it is present in the latter three genera. In Limoniidae, vein R3 is partially or completely fused with R4 in most species. Krzemiński (1996) regarded the reduction or loss of vein R3 as a significant apomorphy. In contrast, the complete separation of R3 and R4 represents an archaic trait, which can be observed in genera such as *Tricyphona* (Pediciidae) and *Mesotipula* Handlirsch, 1920–1921 (Limoniidae) (Krzemiński 1992).

To date, only 11 extant species and five fossil species of the genus *Thaumastoptera* have been documented, with its distribution spanning the Palaearctic, Oriental, Afrotropical and Nearctic regions. Fossil species of this genus are recorded from East Asia, West Asia, Western Europe and Northern Europe, ranging from the Eocene to the Lower Cretaceous (Fig. 1). It can therefore be inferred that this genus once possessed high species diversity and a much wider distribution range during its evolutionary history. More fossil materials attributable to *Thaumastoptera* are expected to be discovered in the future.

Author contributions

Conceptualization: QM, MS, PS. Formal analysis: QM, MS, PS. Funding acquisition; QM. Investigation: QM, MS, PS. Methodology, QM, MS, PS. Project administration: QM, MS. Resources: QM, MS. Validation: QM, PS. Visualization; QM. Writing – original draft: QM, MS, PS. Writing – review & editing, QM, PS.

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Data availability statement

All data supporting the findings of this study, including morphological data and images of the studied specimen, are presented within this article

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