

A new subfamily, genus and species of Tingidae (Hemiptera: Heteroptera) from Burmese amber

Ernst HEISS, Viktor B. GOLUB & Yuri A. POPOV

Abstract

Specimens of the lace bug family Tingidae from Cretaceous Burmese amber inclusions are recognized as a new taxon which is classified in a new genus, for which a new subfamily is erected. They are described and illustrated herein as *Tingiometrinae* subfam.n., *Tingiometra* gen.n. and *Tingiometra burmanica* sp.n.

Key words: Hemiptera, Heteroptera, Tingidae, new subfamily, new genus, new species, Burmese Amber, cretaceous, fossil, Myanmar.

Zusammenfassung

Inklusen von Exemplaren der Heteropterenfamilie Tingidae in kreidezeitlichem Burmesischen Bernstein werden als neue Art einer neuen Gattung zugeordnet, für die eine neue Unterfamilie errichtet wird. Sie werden nachstehend als *Tingiometrinae* subfam.n., *Tingiometra* gen.n. und *Tingiometra burmanica* sp.n. beschrieben und abgebildet.

Introduction

The rich commercially exploited cretaceous amber deposits in northern Myanmar (formerly Burma), known as “burmite”, contain a very diverse insect fauna (GRIMALDI et al. 2002, GRIMALDI & ENGEL 2005, ROSS et al. 2010). Numerous new taxa of Heteroptera have been described (e.g., HEISS & GRIMALDI 2001, 2002, HEISS 2012, HEISS & POINAR 2012, POPOV & HEISS 2014), however only two genera and species of the lace bugs, family Tingidae: *Spinitingis ellenbergeri* HEISS & GUILBERT, 2013 and *Burmacader multivenosus* HEISS & GUILBERT, 2013.

Examination of recently acquired burmite inclusions has proved that the well preserved insects belong to an undescribed taxon of lace bugs, which cannot be placed in any of the recognized extant genera. The unusual and hitherto never observed combination of characters diagnostic for Tingidae like the areolate structure of hemelytra and pronotum, with a hydrometrid-like elongate head without tubercles and very long labium and legs, justifies the description of a new genus and species for which a new subfamily is proposed (see discussion).

Material and methods

The female holotype preserved in Burmese amber, with stellate hairs as syninclusions, is embedded in a block of artificial resin 11 × 14 × 7 mm. It is deposited in the collection of

the first author (EH) at the Tiroler Landesmuseum, Innsbruck, Austria (CEHI). Another female in an oval piece of burmite with other insect syninclusions (Fig. 12), will later be embedded in a block of artificial resin for better future conservation. It is considered conspecific and therefore designated as paratype. It is deposited with the holotype in CEHI. Measurements were taken with a micrometre eyepiece and are given in millimetres.

Taxonomy

Systematic position

Hemiptera

Heteroptera

Cimicomorpha LESTON, PENDERGRAST & SOUTHWOOD, 1954

Tingoidea LAPORTE, 1832

Tingidae LAPORTE, 1832

Tingiometrinae subfam.n.

Type genus: *Tingiometra* gen.n. by monotypy.

Notes: Classification and nomenclature of Tingidae taxa of suprageneric rank follow those used in the Catalogue of the Heteroptera of the Palaearctic Region (PÉRICART & GOLUB 1996).

Diagnosis: Body elongate oval. Hemelytra and paranota finely areolate. Head very long and rather narrow, dorsally without tubercles, clypeus crest-like, anteocular portion narrower and longer than postocular portion. Eyes placed at a considerable distance from base of head. Antennae 4-segmented, long and slender; second antennal segment is longest. Labium 4-segmented, its apex reaching posterior margin of middle coxa.

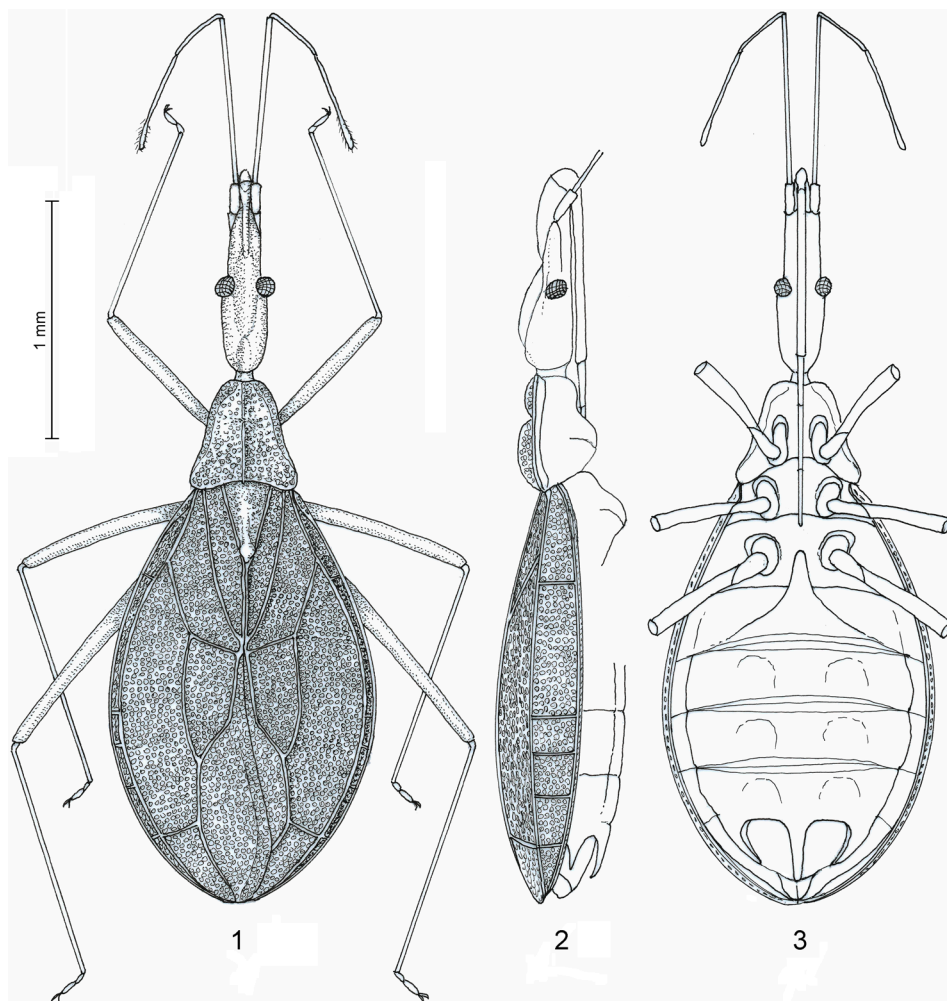
Pronotum bell-shaped in outline, its anterior and posterior margins sinuate. Anterior lobe without elevated areolate structure (vesicula), posterior lobe not produced and overlapping scutellum. Hemelytra with corium divided by longitudinal carinate veins into costal, subcostal, discoidal, and sutural areas. No distinct stenocostal lamina developed. Clavus separated from corium by a commissure. Discoidal area divided into anterior (basal), medial and posterior (radial) large cells by two carinate transverse veins. Vein R+M separating subcostal and sutural areas, distally bifurcated into R and M. Sutural area narrow, membrane not developed. Legs very long.

Tingiometra gen.n.

Type species: *Tingiometra burmanica* sp.n. by monotypy.

Diagnosis: Head strongly elongate, anteocular part distinctly longer than postocular part. Eyes moderately protruding laterally. Ratio length of antennal segments $I < II > III < IV$; second antennal segment $4.6\times$ as long as first one. Pronotum with a longitudinal bilobate median carina and narrow paranota bearing one row of small areolae. Structure of hemelytra as given in subfamily diagnosis. Tibiae $1.13\text{--}1.34\times$ as long as femora.

Etymology: Refers to the tingid-like body and the hydrometrid-like elongate head.



Figs. 1–3: *Tingiometra burmanica* sp.n. (reconstruction of holotype): (1) dorsal view; (2) lateral view; (3) ventral view.

***Tingiometra burmanica* sp.n. (Figs. 1–12)**

Material examined: Holotype female (Figs. 1–9) preserved in Cretaceous Burmese amber from northern Myanmar (without locality), this embedded in a block of transparent artificial resin. It is designated as holotype, labelled accordingly and deposited in the CEHI collection. Paratype female (Figs. 10–12) of same origin with spread hemelytra is designated as paratype and labelled accordingly, deposited in CEHI.

Description: Holotype. Submacropterous female; body egg-shaped elongate. Whole surface of hemelytra with rows of small areolae separated by carinate veins. Areolae of pronotum indistinct and vanishing on anterior lobe.

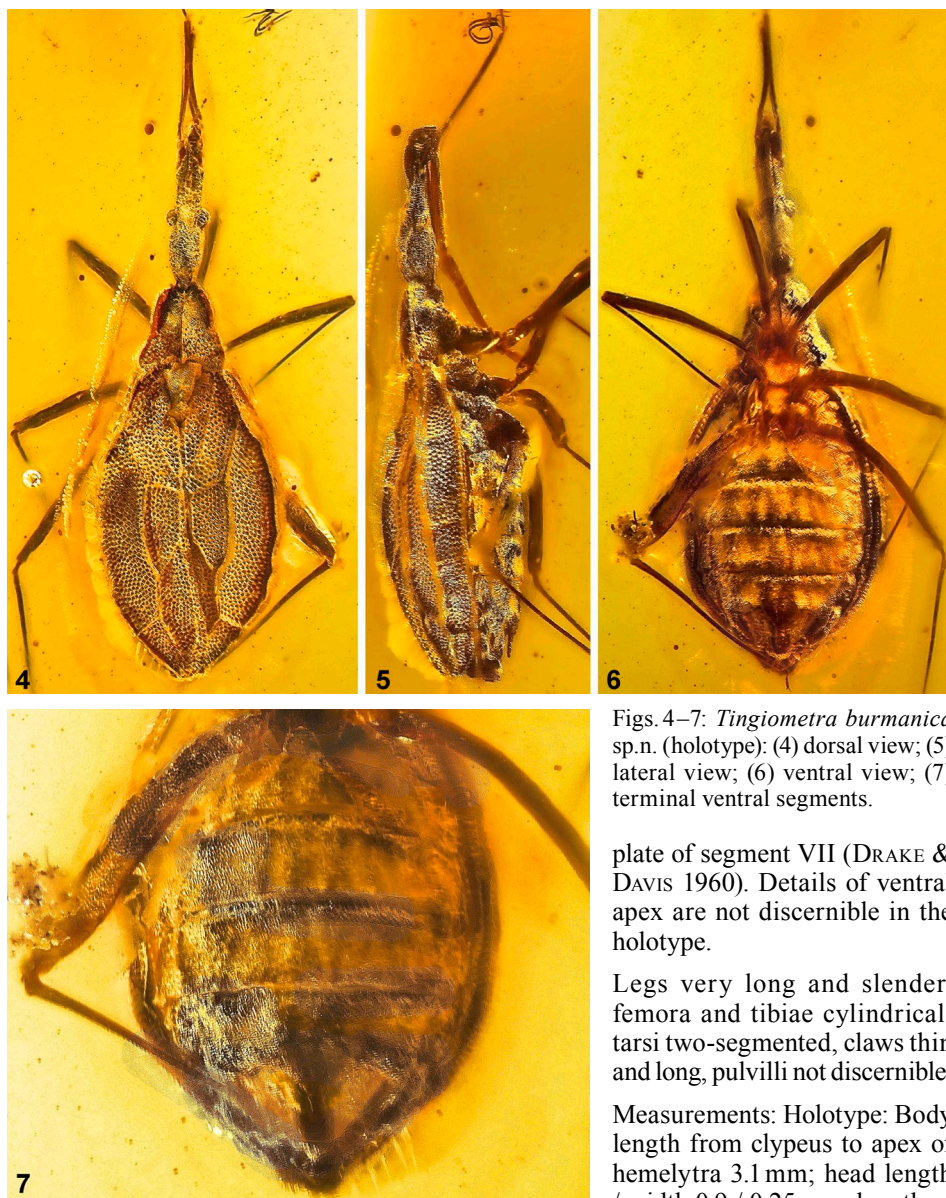
Head elongate and very narrow, about $3.6\times$ as long as width of head across eyes, antocular portion narrower and $1.28\times$ as long as the wider postocular portion; surface of vertex longitudinally elevated, delimited posteriorly by an oval depression, anteriorly connected to the crest-like clypeus which is rounded and bent downward at apex. Antenniferous lobes small, adhering. Antennae long and slender, about $5.9\times$ as long as width of head; segment I shortest and thickest, II longest, III and IV shorter and thinner than II. Eyes subglobose, with large ommatidia inserted in head. Ocelli absent. Postocular lobes subparallel and straight, raised and rounded, posteriorly converging to constricted collar. Labium 4-segmented reaching metasternum; first segment thickest and shortest, II–IV thin, II longest.

Pronotum bell-shaped, about $1.33\times$ as long as wide; anterior and posterior margin concave; lateral margins sinuate, humeri and anterolateral angles rounded; disk flat with a longitudinal median areolate carina, consisting of a longer and higher posterior part with two rows of areolae and a shorter and less high anterior part with one row of areolae, separated by a shallow transverse impression; paranota narrow and slightly reflexed with one row of indistinct areolae. Anterior part of pronotum without a vesicula or hood, posterior lobe not produced posteriorly, thus not overlapping scutellum which is entirely visible in dorsal view.

Scutellum large, triangular and completely exposed, about $1.5\times$ as long as wide at base; disk medially carinate on posterior half, raised at apex, surface finely punctate, with short dense adhering pilosity.

Hemelytra submacropterous, covering apex of abdomen. Left wing overlapping sutural area of right wing, their surface completely areolate. Corium divided into costal, subcostal, discoidal and sutural areas (terms for hemelytral areas and other parts of body after DRAKE & DAVIS 1960). No distinct stenocostal lamina developed. Subcostal, discoidal, and sutural areas separated by carinate veins; subcostal area with about 10, discoidal area with 7–8 rows of areolae at their widest part, their surface nearly flat; lateral declivous costal area hardly visible from above, with 6–7 areolae divided by 5 transverse carinae, lateral margin reflexed with one row of rudimentary areolae (better seen from below). Discoidal area divided by two carinate veins into three large cells: anterior, medial and posterior (basal, medial and radial according to POPOV 1989); these veins obliquely directed towards the longitudinal axis of the body. Vein R+M separating subcostal and sutural areas almost straight, near its apex bifurcated into R and M, diverging posteriorly almost at a right angle. R dividing subcostal area into two large cells, the anterior one much larger than the posterior one. M separating the medial (posterior) large cells of discoidal and subcostal area. Sutural area very narrow, its base with one row of areolae, posteriorly with two rows and several areolae of a third row at apex. Apical half of sutural area represents the reduced hemelytral membrane. Clavus distinct, with four rows of areolae at its widest part, commissura longer than scutellum.

Venter. Labium long, its apex surpassing anterior margin of metasternum. Pro-, meso- and metasternum separated by transverse sutures. Lateral margins of abdomen delimited by a hypocostal lamina with an indistinct row of small areolae; a finger-like median projection of mediosternite III reaches middle of metacoxae. Sternites II and III completely fused, which is characteristic for Cantacaderinae (DRAKE & DAVIS 1960); sternites IV–VI separated by transverse furrows, the latter fused to sternite VII which shows a median and 2 (1+1) lateral posteriorly directed projections. These are detached from the lower lying surface of terminal segments in lateral view, which represents the elongate subgenital



Figs. 4–7: *Tingiometra burmanica* sp.n. (holotype): (4) dorsal view; (5) lateral view; (6) ventral view; (7) terminal ventral segments.

plate of segment VII (DRAKE & DAVIS 1960). Details of ventral apex are not discernible in the holotype.

Legs very long and slender, femora and tibiae cylindrical; tarsi two-segmented, claws thin and long, pulvilli not discernible.

Measurements: Holotype: Body length from clypeus to apex of hemelytra 3.1 mm; head length / width 0.9 / 0.25 mm; length of postocular portion 0.35 mm, eye

0.1 mm, anteocular portion 0.45 mm; width of postocular lobe 0.2 mm, of anteocular part of head 0.15 mm; length of antennae 1.475 mm, length of antennal segments I / II / III / IV = 0.15 / 0.7 / 0.22 / 0.4 mm; pronotum length / width 0.375 / 0.50 mm; scutellum length / width 0.30 / 0.20 mm; length commissura 0.35 mm; hemelytra length / width 1.72 / 1.12 mm; length of femora / tibiae of fore legs 0.93 / 1.05; middle legs 0.94 / 1.12; hind legs 0.95 / 1.30 mm. Paratype: Body length 3.25 mm; head length / width 0.40 / 0.25 mm; pronotum length / width 0.42 / 0.62; scutellum length / width 0.35 / 0.25 mm.



Figs. 8–9: *Tingiometra burmanica* sp.n. (holotype): (8) head, pronotum and scutellum; (9) hemelytral structure, dorsal view.

Etymology: The epithet refers to the country of origin of the amber inclusions.

Discussion of systematic position: Several important morphological characters of the new genus support its assignment to the family Tingidae: areolate hemelytra and paranota; subdivision of corium into costal, subcostal, discoidal, and sutural areas by elevated longitudinal veins; presence of longitudinal carina on pronotum; 4-segmented antennae and labium. Characters like the strongly elongated head, absence of stenocostal area of hemelytra, absence of posteriorly produced process of pronotum and therefore entirely visible scutellum in dorsal view, presence of transversal elevated veins in subcostal area, and fused abdominal segments II and III relate the new taxon to the subfamily Cantacaderinae and particularly similar to the tribe Phatnomini.

At the same time the new taxon shows significant differences to all extant taxa of generic and suprageneric ranks of Tingidae, including Cantacaderinae: unusually long “hydrometrid-like” head with eyes placed at considerable distance from the base of head (anteocular part 1.28× as long as postocular part), very long antennal segment II as the longest one,



Figs. 10–12: *Tingiometra burmanica* sp.n. (paratype): (10) dorsal view; (11) ventral view; (12) amber piece with paratype and syninclusions.

absence of tubercles or spines on head, elevated crest-like clypeus, concave posterior margin of pronotum (except *Eocader* DRAKE & HAMBLETON, 1934), large scutellum, the dichotomy of vein R+M in its distal part and the very long hind legs, their femora nearly reaching apex of abdomen. In extant Tingidae antennal segment III is the longest, head is usually beset with spines or tubercles, clypeus is not elevated above frons, and R+M is not bifurcated at apex. These complex features mentioned above indicate that this proposed new subfamily represents another fossil tingoid link (like the Cretaceous Ignotingidae ZHANG et al., 2005) within their phylogeny and is most probably the ancestral group of one of the basic extant cantacaderid groups of Tingioidea.

The new taxon shows some similarities to the single species of the Lower Cretaceous family Ignotingidae, i.e., *Ignotingis mirifica* ZHANG, GOLUB, POPOV & SHCHERBAKOV, 2005. The latter has very long and thin legs (especially long middle and hind femora) and antennae, its discoidal area of hemelytra is divided into several large cells as in *Tingiometra burmanica* sp.n. It differs however by the short head without spines and tubercles, areolate vesicula of pronotum and four large cells in discoidal area.

Tingiometra burmanica sp.n. seems to be related to the single species of the Lower Cretaceous family Hispanocaderidae GOLUB, POPOV & ARILLO, 2012 (*Hispanocader lisae* GOLUB, POPOV & ARILLO, 2012) sharing characters as a long head, antennal segment II longest (longer than segment I), posterior margin of pronotum concave, not posteriorly produced, scutellum rather large, and long slender legs. But *Hispanocader lisae* is characterized by the presence of simple ocelli, large lateral outgrowths behind eyes, and a “probing” type of rostrum thickened at the base; antennal segment III is longest, and veins R+M and CuA are not connected to each other, independently reaching the apex of hemelytra.

Two previously described Tingidae genera from Burmese amber, *Spinitingis ellenbergeri* HEISS & GUILBERT, 2013 and *Burmacader multivenosus* HEISS & GUILBERT, 2013 also show significant differences to *Tingiometra burmanica* sp.n. *Spinitingis ellenbergeri* has a short head armed with five long erect spines; antennal segment III is longest, segment IV is longer than I+II together, pronotal disk has three rows of long erect spines and a wide areolate collar. The head of *B. multivenosus* is short and without spines; antennal segment III is longest and R+M veins of hemelytra are not bifurcate apically.

A distinct distal dichotomy of hemelytron vein R+M occurs in two species of the fossil Tingidae genus *Sinaldocader* POPOV, 1989 (*S. drakei* POPOV, 1989 and *S. ponomarenkoi* GOLUB & POPOV, 2008) reported from the Lower Cretaceous of Mongolia and Russian Transbaikalia (POPOV 1989, GOLUB & POPOV 2008). This rare feature of venation is considered to be of great importance, as well as the division of discoidal area into three large cells. However, the head of both *Sinaldocader* species is short, the pronotum short and wide, and the scutellum rather small. Unfortunately no traces of antennae and legs are preserved in the prints of both *Sinaldocader* species.

Based on the above similarities of the new taxon with Tingoidea and characters differing from extant and extinct taxa of this superfamily, we consider and propose for the new taxon the rank of a distinct subfamily Tingiometrinae of the family Tingidae.

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