



Toad bugs (Hemiptera: Gelastocoridae) in Myanmar amber



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ARTICLE INFO

Article history:

Received 6 January 2016

Received in revised form

24 February 2016

Accepted in revised form 25 February 2016

Available online 2 March 2016

Keywords:

Toad bug

Gelastocoridae

Myanmar amber

Nerthra bichelata sp. n.

Gelastocoris curiosus sp. n.

ABSTRACT

Two new species of toad bugs (*Nerthra bichelata* sp. n. and *Gelastocoris curiosus* sp. n.) (Hemiptera: Gelastocoridae) are described from Myanmar amber. Diagnostic characters of *N. bichelata* sp. n. are the large paired ocelli, subequal claws on protarsus that is fused with the protibia, slender profemur bearing two short, prominent ventral teeth, a large spherical terminal antennal segment and an elongate terminal segment of the rostrum. Diagnostic characters for *G. curiosus* sp. n. are paired, equal claws on the single-segmented, articulated protarsus, lateral margin of pronotum with a triangular protrusion and relatively narrow profemora with a series of broad transverse thickenings on the apical half of the ventral surface. These are the first descriptions of Gelastocoridae in amber and the first record of Gelastocorinae in Asia.

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1. Introduction

Toad bugs (Hemiptera: Gelastocoridae), that were originally treated in the family Nerthridae Kirkaldy (Blatchley, 1926), are a unique group of widespread predatory bugs commonly associated with riparian habitats (Todd, 1955; Schuh and Slater, 1995). They are small, squat bugs often with a subvertical head and prominent eyes directed outward and often upward as well. Most possess two ocelli and the 3–4 segmented antennae are short and usually concealed in a groove beneath the eyes. The 4-segmented beak is relatively short and the profemora are often swollen and grooved for the reception of the tarsi. There are 5 instars in their life cycle (Blatchley, 1926; Todd, 1955).

The common name is appropriate for these insects since their body form resembles that of a toad and they display a hopping behavior in motion. While possessing a relatively small rostrum and short raptorial forelegs, toad bugs are considered select predators that feed on other small invertebrates in the environment.

Their remarkable jumping abilities not only allow them to pounce on small insects such as grouse locusts, but to escape from predators (Blatchley, 1926). The family consists of two extant genera, *Gelastocoris* Kirkaldy with some 14 species and *Nerthra* Say with some 92 species (Todd, 1961a; Kment and Jondra, 2008). Some

workers recognize *Montandonius* Melin as a valid genus, however we follow Todd (1955) who considers it a synonym of *Gelastocoris*. Fossils of members of this family are quite rare, however a subfossil species was recently reported (Faúndez and Ashworth, 2015). The present study describes the first representatives of this family from amber.

2. Materials and methods

The specimens originated from the Noije Bum 2001 Summit Site mine excavated in the Hukawng Valley in 2001 and located southwest of Maingkhwan in Kachin State (26°20'N, 96°36'E) in Myanmar. The location of the Noije Bum amber mine, as well as a geological survey of Cretaceous deposits in northern Myanmar is presented in Cruickshank and Ko (2003). Based on paleontological evidence this site was dated to the late Albian of the Early Cretaceous (Cruickshank and Ko, 2003), placing the age at 97–110 Ma. A more recent study using U–Pb zircon dating determined the age to be 98.79 ± 0.62 Ma (Shi et al., 2012), earliest Cenomanian. Since samples in the latter study were taken from sedimentary matrix containing the amber, the amber is obviously older than this date. Nuclear magnetic resonance (NMR) spectra and the presence of araucaroid wood fibers in amber samples from the Noije Bum 2001 Summit Site indicate an araucarian tree source for the amber (Poinar et al., 2007).

Observations and photographs were made with a Nikon SMZ-10 R stereoscopic microscope and Nikon Optiphot compound

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microscope with magnifications up to 800 \times . Helicon Focus Pro X64 was used to stack photos for better depth of field.

3. Systematic paleontology

The following fossil species are easily assignable to the Gelastocoridae by their general habitus, 4-segmented rostrum, large eyes projecting dorso-laterally, two ocelli, 4-segmented antennae concealed beneath the eyes and large pronotum wider than the head (Todd, 1955). The hidden antennae of toad bugs distinguish them from the Ochteridae and Saldidae and the presence of ocelli (in most species) separates them from the Naucoridae (Todd, 1955).

The two subfamilies of the Gelastocoridae, each with a single genus, are clearly distinguished by the structure of their single-segmented fore tarsus. This structure is fused to the tibia and contains only one well-developed claw in the Nerthrinae Kirkaldy, but is separate, articulated with the tibia and contains a pair of well-developed claws in the Gelastocorinae Champion. A single representative of both subfamilies is described below from Myanmar amber.

Hemiptera
Ochteroidea
Gelastocoridae
Nerthrinae Kirkaldy
Nerthra Say

Nerthra bichelata sp. n. Poinar and Brown (Figs. 1–6)

The specimen is complete except for four missing legs. The left foreleg and left midleg are present and the foreleg is well preserved. Sand particles and two snails are also present in the amber piece.

Holotype female. Body oval, compact, dark brown, length, 6.3 mm. *Head.* Subventral, length 0.7 mm; width, including eyes, 2.5 mm; width between eyes, 1.1 mm; front with pebbly surface, tooth-like tubercles absent; compound eyes large, protruding, bead-like, subpedunculate, with slight mesal emarginations on dorsal surface; two large ocelli present; rostrum short, directed downward, four-segmented, with basal segment positioned on line connecting bases of compound eyes, length 1.1 mm; antennae short, concealed beneath eyes, 4-segmented, lengths of articles: first, 105 μ m; second, 84 μ m; third curved, 140 μ m; fourth spherical, 245 μ m in diameter.

Thorax. Pronotum transverse with rugose, punctate surface, length, 1.5 mm; width, 3.8 mm, with uniformly smooth lateral margin, bisinuate anterior margin and single sinuate posterior margin; anterior 2/3rd of disc bearing paired curved tubercles; anterior angle obtuse at tip; antero-lateral margins almost straight, postero-lateral margin rounded, postero-lateral angles slightly rounded; scutellum separate, flat; apex of corium straight, with inner angle curved; hemelytra extending to end of abdomen, covering entire abdomen, longitudinal radial vein (embolar fold) extending full length of corium; membrane well-developed, even with tip of abdomen, claval vein straight, complete; radial vein not reaching wing margin; profemora relatively narrow, 2.0 mm in length, 2.6 times as long as wide, bearing two short, stout subterminal ventral teeth; protibia 1.4 mm long, with 2 rows of dense setae on anterior half of ventral surface; with a pair of short, transparent straight setae 50 μ m in length at apex; protarsus 1-segmented, fused to tibia, non-articulate; tarsomere 56 μ m in length, claws paired, curved, connate, unequal in length; small claw 140 μ m; large claw 175 μ m.

Abdomen. Width, 4.0, length, 4.4 mm, connexivum not visible; last sternite not emarginated; ovipositor lobes not projecting from tip of abdomen.

Type material. Holotype female deposited in the Poinar amber collection (accession # B-He-25) maintained at Oregon State University. ZooBank # = 213318B683F0

Type locality and horizon. Hukawng Valley southwest of Maignghwan in Kachin State (26°20'N, 96°36'E), Myanmar; lowermost Cenomanian, Upper Cretaceous.

Etymology. The specific name is derived from the Latin “bi” = two and the Latin “chela” = claw, in reference to the two subequal claws on the protarsus.

Diagnosis. Diagnostic characters of *Nerthra bichelata* sp. n. include large paired ocelli, width of pronotum less than greatest width of abdomen; paired subequal connate claws on protarsus that is fused to protibia, slender profemur bearing two short, prominent ventral teeth, a large spherical terminal antennal segment and elongate terminal segment of the rostrum. In the key of Todd (1955), *Nerthra bichelata* sp. n. comes closest to *N. spessa* (Distant) from India and *N. nudata* Todd from Australia. However, the former species is 8.5 mm long [it is a male but females are normally equal in length or larger than males (Todd, 1955)] and the posterior third of the pronotum is crossed by 2 moderate longitudinal carinations. The latter species is over 9.0 mm in length, the scutellum is elevated and the posterior portion of the pronotum has 3 broad, indistinct long carinations. No records of femoral teeth or subequal connate claws could be found in previous descriptions of *Nerthra* spp. (Todd, 1955, 1957, 1959, 1960a, 1961a, 1961b, 1977; Nieser, 1975, 1977; Nieser and Chen, 1992, 2005).

Hemiptera
Ochteroidea
Gelastocoridae
Gelastocorinae Champion
Gelastocoris Kirkaldy

Gelastocoris curiosus sp. n. Poinar and Brown (Figs. 7–11)

Holotype male. The specimen is complete and well preserved. Body oval, compact, light grey, flattened above and beneath, integument of pronotum granular, length, 5.3 mm.

Head. Subventral, length 0.8 mm; width (including eyes) 2.2 mm, width between eyes, 0.8 mm; front granular, tuberculate, tooth-like tubercles absent; compound eyes large, protruding, bead-like, subpedunculate, with slight mesal emarginations on dorsal surface; two ocelli present; antennae short, 0.8 mm long, with 4 subequal segments, concealed under compound eyes; rostrum short, length, 1.4 mm, directed downward and forward, four-segmented, with basal segment longest.

Thorax. Pronotum transverse, tuberculate, length, 1.1 mm, width, 3.0 mm, anterior and posterior margins sinuate; anterior angle prolonged; postero-lateral margin and lateral angles rounded; scutellum flat, fused to hemelytra; apex of corium straight, with inner angle straight; hemelytra extending to end of abdomen, entirely covering abdomen; longitudinal radial vein (embolar fold) extends full length of corium; membrane exposed, even with tip of abdomen; claval vein straight, complete; radial vein not reaching wing margin; profemora relatively narrow, 1.9 mm in length, with a series of broad transverse thickenings on the apical portion of the ventral surface; protibia 0.8 mm long; all tibiae and tarsi with numerous inclined spine-like setae; protarsus 1-segmented, articulate, 511 μ m in length; claws paired, straight, equal, divergent, length, 320 μ m; mesotarsus two-segmented, articulate, claws paired, straight, equal, divergent; metatarsus three-segmented, articulate, claws paired, straight, equal, divergent.

Abdomen. Smooth, width, 3.3 mm, length, 3.5 mm, connexivum exposed along edge on left side of body; last sternite not emarginated.

Type material. Holotype female deposited in the Poinar amber collection (accession # B-He-26) maintained at Oregon State University. ZooBank # = 213318B684F0

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