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LONGIOCULUS BURMENSIS, N. GEN., N. SP. (ORTHOPTERA: ELCANIDAE) IN BURMESE AMBER

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Abstract.—An adult orthopteran in Early Cretaceous Burmese amber is described as a **new genus and species, *Longioculus burmensis* Poinar, Gorochov, and Buckley**. On the basis of its tegminal venation, three-segmented tarsi, and large spines on the hind tibia, it is placed in the extinct family Elcanidae. This fossil differs from previously described members of the family by its relatively small and slender body, protruding eyes, enlarged scapes and antennal cavities, short pronotum, and unique venational and leg armament characters.

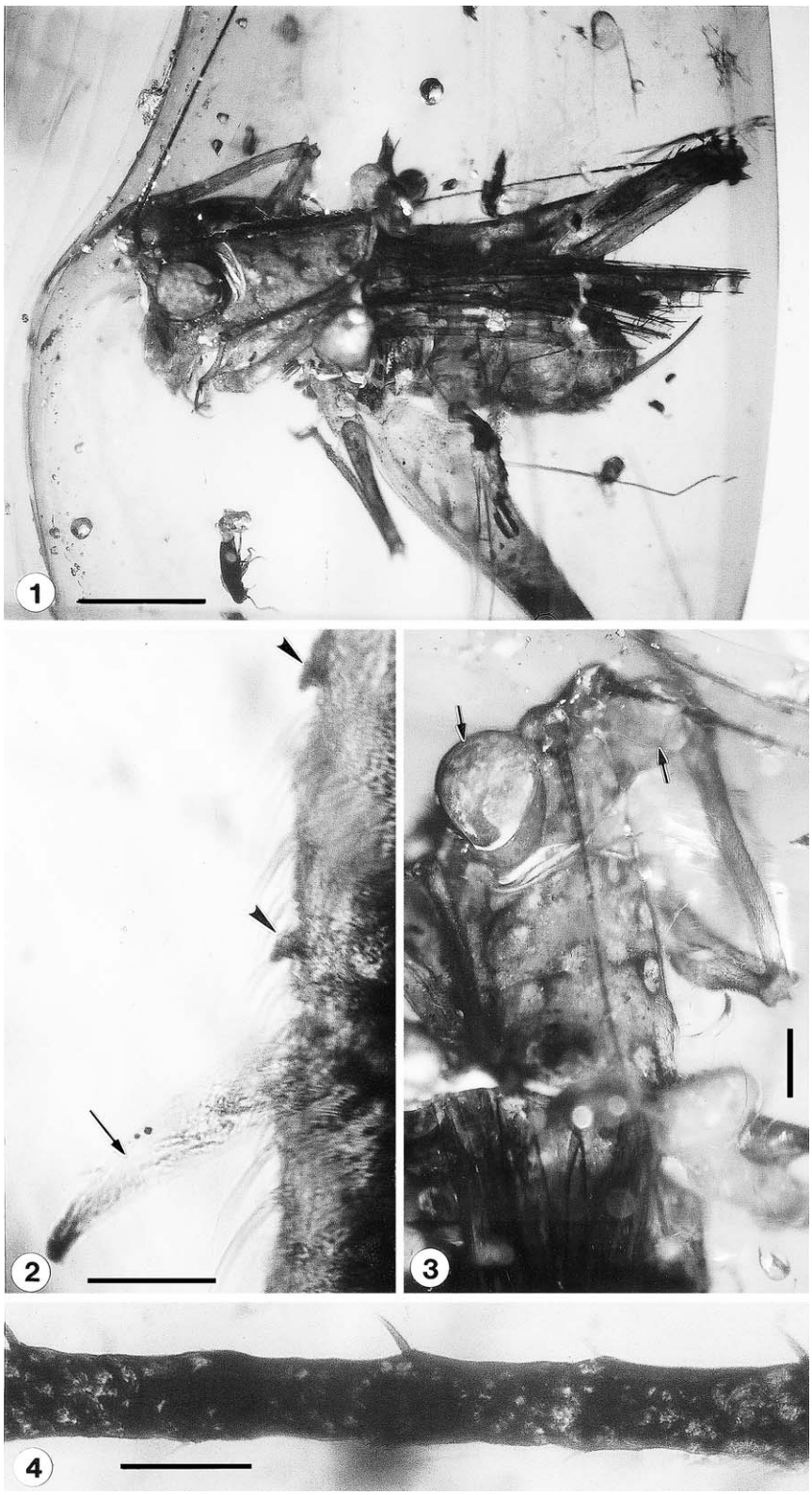
Key Words: Orthoptera, Elcanidae, *Longioculus*, *Longioculus burmensis*, Burmese amber, Early Cretaceous

Adult orthopterans in amber are rare, since these insects are usually strong enough to free themselves from the resin. A well-preserved Burmese amber orthopteroid previously depicted in Poinar et al. (2005) is the topic of this paper. The specimen has three-segmented tarsi, a short pronotum, enlarged hind femora, and venational characters that align it with members of the family Elcanidae (Sharov 1968; Carpenter 1992; Gorochov 1995; Gorochov and Rasnitsyn 2002).

Materials and Methods

Amber from Burma occurs in lignitic seams in sandstone-limestone deposits in the Hukawng Valley, southwest of Maingkhwan in the state of Kachin (26°20′N, 96°36′E). Nuclear magnetic resonance (NMR) spectra of amber samples taken from the same locality as the fossils indicated an araucarian (possibly *Agathis*) source of the amber (Lambert and Wu, unpublished research 2002). Palynomorphs from the amber beds where the fossil originated have been assigned to the Upper Albian of the Lower Cretaceous (~100 mya) (Cruickshank and Ko 2003); however, since the amber is secondarily deposited, the age could be older.

The piece of amber containing the specimen is rectangular in shape, measuring 13 mm in length, 10 mm in width and 6 mm in depth. The fossil is well preserved and complete except for the tips of the antennae and wings, one side of the apex of the abdomen (including one cercus and the genital apparatus), the left metatibia and metatarsus and the apical portion of the right metatibia. Other fossils in the same amber piece are three small adult beetles, one mite, one adult nematoceran and several branched plant hairs. Observations and photographs were made with a Nikon SMZ-10 stereoscopic microscope and Nikon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Optiphot optical microscope (with magnifications up to 650×).

Family Elcanidae Handlirsch, 1906

Longioculis Poinar, Gorochov, and Buckley, new genus

Description.—Body relatively small and slender; scapes and antennal cavities greatly enlarged, occupying entire area between compound eyes; compound eyes large, protruding from head; ocelli lacking; pronotum short, hind tibia with dorsal row of denticles and row of much larger spines in middle part (and possibly in distal part); ventral surface of hind basitarsus with row of rather long spines; tegmina with both branches of false costa (''C'') meeting within short distance of each other on anterior wing margin; tegminal area between ''C'' and Sc narrow; tegminal crossveins in visible area between R+ RA reduced (most proximal crossvein in the area, possibly basal part of RS, situated between bases of third and fourth branches of RA).

Etymology.—''*Longioculis*'' is from the Latin ''oculus'' for eye and ''longus'' for long, in reference to the protruding eyes. The gender is masculine.

Diagnosis.—On the basis of the narrow, large spines on the hind tibiae, the new genus may belong to the Late Jurassic-Early Cretaceous subfamily Elcaninae (= Baisselcaninae). *Longioculis* is similar in size to the Early Cretaceous genus *Minelcana* Gorochov, Jarzembowsky, and Coram (Gorochov et al. 2006) and the smallest species of the Early Cretaceous genus *Panorpidium* Westwood (Westwood 1854), but can be distinguished from both these genera as well as from other genera of Elcanidae, except the Early Cretaceous *Cratoelcana* Martins- Neto (Martins-Neto 1991), by the apices of the branches of tegminal ''C'' positioned within a short distance of each other and the most proximal crossvein in the area between R+ RS (possibly the basal part of RS) situated near the bases of the third and fourth branches of RA. From *Cratoelcana*, with species over 20 mm in length, the new genus differs in being much smaller (under 8 mm in length).

Type species.—*Longioculis burmensis*, n. sp.

Longioculis burmensis Poinar, Gorochov, and Buckley, new species

(Figs. 1–12)

Description.—Characters as listed under generic description. Alate male; body brown with transparent wing; length body, 7.14 mm; length pronotum, 2.4 mm; length hind femur, 6.4 mm.

Head: Narrow; without rostral tubercles between antennal cavities; ocelli not observed; antennal cavities in contact with each other, with edges prominent; antennal scapes enlarged; antennal flagellum longer than body (both antennae cut off at edge of amber piece); filiform; antennomeres short, equal or subequal in size; each antennomere bears one to several spines; genae narrow; clypeus and mouthparts more or less normal for Ensifera (only lower edge of labrum exposed).

Thorax: Pronotum saddle-shaped, with anterior margin convex; pronotal dorsum with seven circular light blotches with dark borders located in depressions symmetrically positioned on each side; hind part of pronotum convex, not prolonged over abdomen; legs covered with short hairs; fore- and midfemora with pair of

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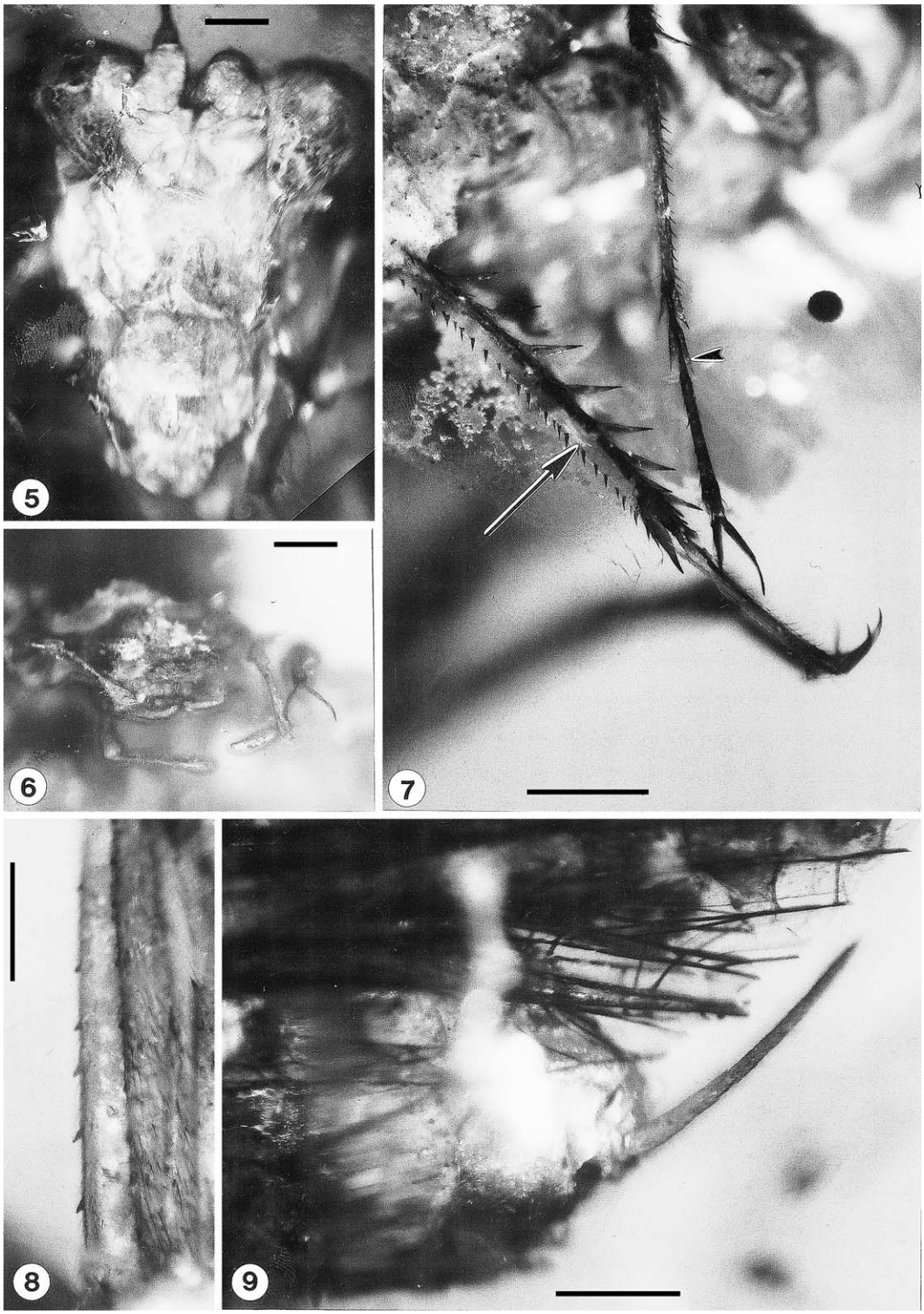
Figs. 1–4. *Longioculis burmensis* in Burmese amber. 1, Lateral view of entire specimen. Bar = 1.6 mm. 2, Metatarsus showing long spine (arrow) and two denticles (arrowheads). Bar = 88 μm. 3, Dorsal view of anterior portion showing protruding eyes (arrows) and round colored areas on pronotum. Bar = 542 μm. 4, Portion of antenna showing scattered setae. Bar = 63 μm.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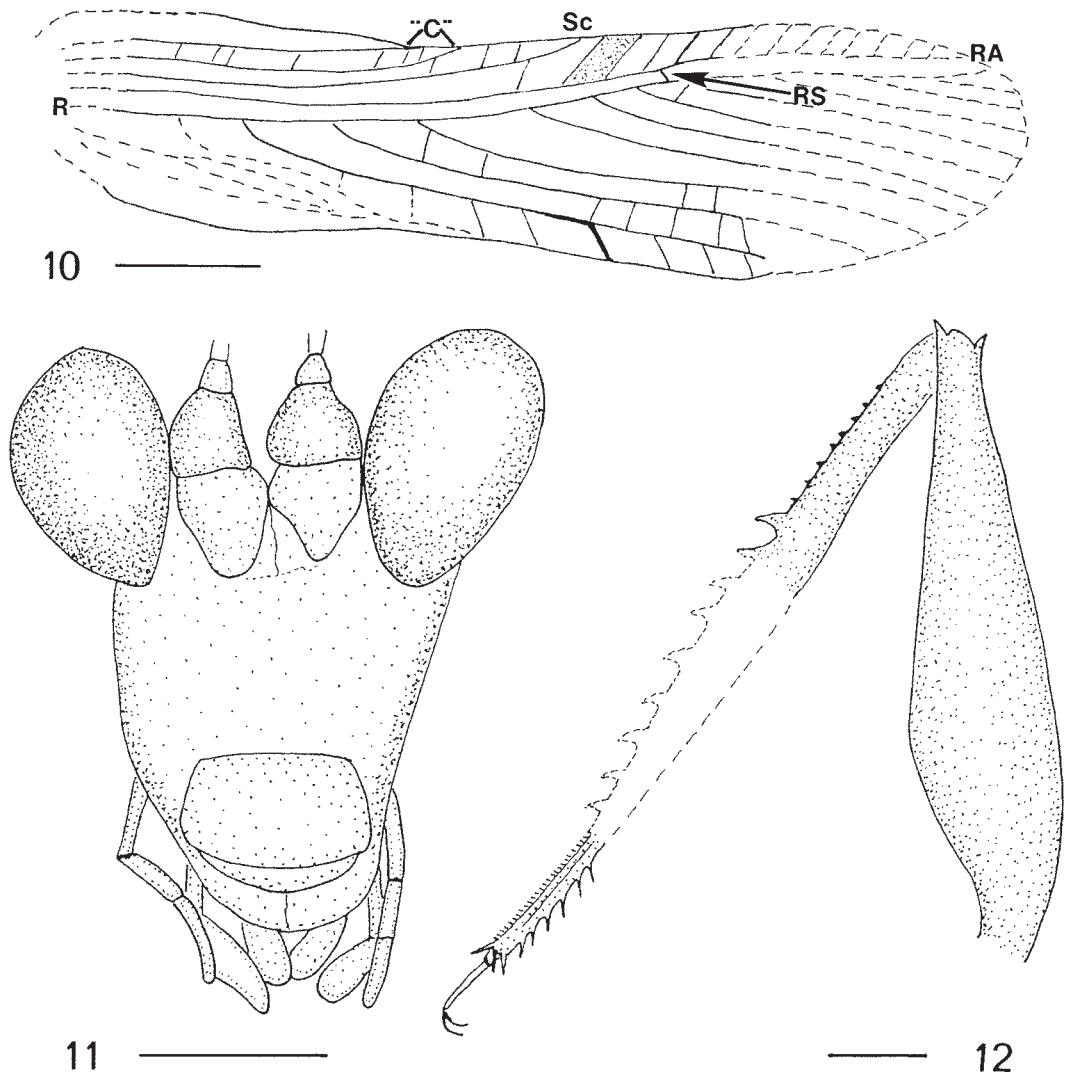

Figs. 10–12. *Longioculis burmensis* in Burmese amber. 10, Venation of tegmina. Dotted portions represent reconstructed areas. Bar = 1 mm. 11, Frontal view showing protruding eyes, prominent antennal cavities and enlarged antennal scapes. Bar = 1 mm. 12, Hind leg showing denticles and spines on dorsal surface of metatibia and spines on ventral surface of basitarsus. Dotted portions represent reconstructed areas. Bar = 1 mm.

rounded apical lobules, lacking denticles; fore tibia with single apical outer spine; mid- and hind tibiae with pair of apical spines; basal portion of hind tibia on dorsal surface bearing single row of small denticles from 25–31 μm in height and 25–31 μm in width at base; distance between denticles 201–246 μm; denticles

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Figs. 5–9. *Longioculis burmensis* in Burmese amber. 5, Frontal view. Bar = 375 μm. 6, Mouthparts. Bar = 700 μm. 7, Metatarsus (arrow points to small spines on first tarsal segment of metatarsus) and mesotarsus (arrowhead). Note rows of large spines opposite small spines on ventral surface of basimetatarsus. Bar = 800 μm. 8, Denticles on proximal portion of metatibia. Bar = 575 μm. 9. Portion of abdomen showing remaining cercus. Bar = 800 μm.

replaced on middle part (and possibly on distal part) of dorsal surface of hind tibia by large spines (only one complete spine, 265 μm long and 63 μm wide, and one partial second spine visible); distance between first and second large tibial spines, 315 μm; all tarsi with first segment longer than 2nd and 3rd combined; apex of all basitarsi with 2 pairs of apical spines; midtarsus very short, less than ¼ as long as basitarsus; third tarsal segments with well- developed, simple, slightly curved claws; arolium absent; fore- and midbasitarsi with 2 rows of short spines on dorsal and ventral surfaces; hind basitarsus with two rows of spines, dorsal row composed of 27 short spines and ventral row with 7 large spines; midtarsus without spines; tegmina membranous (wings folded); venation as shown in Fig. 10; tegmina coloration light (transparent) with dark veins and clear area between first and second branches of RA.

Abdomen: Short, robust; cercus slender, pointed, approximately 1/3 length of abdomen; base of cercus with single, small, outer sensilla; anal plate, subgenital plate, and genital apparatus missing.

Material examined.—Holotype male in Burmese amber from the Hukawng Valley, southwest of Maingkhwan in the state of Kachin (26°20′N, 96°36′E), northern Myanmar (Burma), deposited in the amber collection of Ron Buckley, Florence, Kentucky (accession # ab 307). The specimen is available for study by contacting R. Buckley.

Etymology.—The specific name ''burmensis'' indicates the place of origin of the fossil.

Comments.—Unfortunately, the left hind tibia is missing and only the proximal half of the right hind tibia is present (the remainder is obliterated by a cavity in the amber) but the right midtarsus is present on the other side of the cavity. One complete and a second partial spine positioned at the distal end of the remaining portion of the hind tibia suggests that the entire distal portion contained a row of large spines, which is typical for elcanids. The depressed colored areas on the dorsum of the pronotum probably served as camouflage.

Discussion

Fossils of the superfamily Elcanoidea first appeared in the Early Permian and extended into the mid-Cretaceous. Members of the grasshopper-appearing family Elcanidae first appeared in the Early Jurassic and representatives of the subfamily Elcaninae, which ranged from Siberia to England and Brazil, were rather common in Lower Cretaceous localities (Martins-Neto 1991; Gorochov 1995; Gorochov and Rasnitsyn 2002). The small size of *Longioculis* may indicate how it became entrapped in amber.

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