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Descriptions of two new elateroid beetles (Coleoptera: Eucnemidae, Elateridae) from Burmese amber

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Abstract. Two new elateroid taxa are described from amber deposits excavated from the northern region of Myanmar. Two genera, *Cenomana* **gen. nov.** (Coleoptera: Eucnemidae), and *Cretopityobius* **gen. nov.** (Coleoptera: Elateridae) are described for the first time from Burmese amber. The following new species are described: *Cenomana clavata* **sp. nov.** and *Cretopityobius pankowskiorum* **sp. nov**. Each new species is diagnosed and illustrated.

Key words. False click beetle, click beetle, Myanmar, new genera, new species, paleoentomology.

Introduction

Burmese amber is often known as burmite and is the only cretaceous deposit to be commercially exploited for more than 2000 years. It is used for carvings in China and also the first to be scientifically studied (Shi et al. 2012). Amber comes from deposits and is excavated from multiple sites in northern Burma (present day Myanmar) from which pieces vary from being transparent yellow to deep red in color. These fossilized resins are relatively hard and also resist fracturing (Shi et al. 2012).

The age of these deposits places them in the Cretaceous Period (Rasnitsyn and Ross 2000). Grimaldi et al. (2002) noted Burmese amber contains a mix of paleofaunal elements of both Upper and Lower Cretaceous. They concluded the age of these pieces to be from the early Cenomanian Stage of the Cretaceous Period (~98 mya), based on the stratiographic distribution of some Cretaceous index taxa (i.e. *Hilarimorphites* Grimaldi and Cumming (Diptera: Apystomyiidae) and *Prioriphora* McAlpine and Martin (Diptera: Phoridae) as well as *Sphecomyrma* Wilson and Brown (Hymenoptera: Formicidae)) present in those samples. Of the seven Cretaceous amber sites in the world, Burmese amber is by far the most biologically diverse in paleobiota. Greatest diversity of inclusions found in these pieces is Arthropoda, especially Coleoptera. Approximately 228 families of organisms have been reported from Burmese amber compared with 68–125 families found in the other six Cretaceous amber sites (Shi et al. 2012).

Ancient sources of these fossilized resins have been explored. Grimaldi et al. (2002) believed the source of the amber may have been from resins of an extinct species of *Metasequoia* Miki (Cupressaceae), based on the presence of fragments of leafy shoots in the amber, Apparently, no chemical analysis of these pieces was performed during that time. Poinar et al. (2007) determined the plant source through both nuclear magnetic resonance and anatomical analysis of wood fibers present in the amber. They determined these resins were produced from extinct araucarioid trees in the Araucariaceae, especially *Agathis* Salisbury, commonly known as kauri pines, now restricted to the southern hemisphere. The group of plants was once widespread through much of the Mesozoic Era, especially in the Jurassic Period. Towards the end of the Cretaceous Period, the planet was much cooler, with ice sheets developing on the South Pole and average global temperature falling from 31°C down to 21°C (McNamara 2012). Much of the plant life that thrived during the hottest periods began to disappear as global climate began to cool. Poinar et al. (2007) concluded their findings were based on examining macro- and microfossils in both amber pieces and the surrounding sedimentary bedrocks containing the amber and spectroscopic analysis of these pieces.

Rasnitsyn and Ross (2000) inventoried all of the arthropods identified in pieces of Burmese amber placed in the Department of Paleontology at the Natural History Museum in London (BMNH). They listed 1198 specimens from the Museum's collection. Of those, two specimens were identified belonging to Eucnemidae and 19 specimens were identified as members of Elateridae. Grimaldi et al. (2002) noted

large amounts of amber were shipped to the American Museum of Natural History (AMNH) from a Canadian mining company (Leeward Capital Corp.) after purchasing these samples from a local source near Tanai in Myanmar. From those sorted samples, 1200 pieces containing 3100 inclusions have been catalogued in the museum. From their observations, only 12 specimens have been identified as Elateridae, whereas no eucnemid specimens were identified from those samples at the AMNH. To date, none of these specimens afforded formal naming and descriptions.

In this study, the first species of eucnemid and the third species of elaterid from Burmese amber are described. Cockerell (1917) described one species, *Acmaeodera burmitina* as a member of the family Buprestidae. It was previously identified as an elaterid, but through his description he dismissed his initial determination and ascertained the examined specimen exhibits traits agreeing with the cosmopolitan group, *Acmaeodera* Eschscholtz. He also described another, *Elater burmitinus* as a member of the family Elateridae. Bellamy (1995) briefly reviewed the buprestid fossils from amber deposits. He examined the holotype image of *A. burmitina* and determined the specimen does not bear any resemblance to any members of Buprestidae and transferred the species back to Elateridae.

Materials and Methods

Two pieces of Burmese amber containing the elaterid were provided by Mark Pankowski and his family of Baltimore, Maryland. A third piece containing the eucnemid was purchased on the internet through eBay®. Each piece was authenticated by ultraviolet and acetone tests and specific gravity using salt water developed by Poinar (1982). All amber pieces were observed to fluoresce when illuminated under ultraviolet light. Small amounts of acetone were placed on a Q-Tip® and applied to the pieces. None of the amber specimens were tacky when the treated area was touched. A specific gravity test consists of dissolving 2.5 level tablespoons of salt in one cup of water, achieving a specific gravity of 1.1. All polished pieces floated in the salt water solution. All images were taken with a JVC KY-F75U digital camera attached to a Leica® Z16 APO dissecting microscope with apochromatic zoom objective and motor focus drive, using a Synchroscopy Auto-Montage® Pro System and software version 5.01.0005.

The specimens examined for this study are currently found in the following collections:

GERP Global Eucnemid Research Project, Department of Entomology, University of Wisconsin-Madison.
USNM Smithsonian Institute, Washington, District of Columbia.
WIRC Insect Research Collection, UW-Madison, Department of Entomology, Madison, Wisconsin.

Systematics

Family Eucnemidae

Subfamily Macraulacinae Fleutiaux, 1922

Tribe Jenibuntorini Muona, 1993

Cenomana Otto, gen. nov.

Type species. *Cenomana clavata* **sp. nov.**, designated here.

Description. Body approximately five times longer than wide, dorsally convex. **Head:** Hypognathous with inconspicuous setae. Frons convex, without median ridge or groove. Vertex with short, median ridge. Frontoclypeal region apically rounded, about 2.0 times wider than base. **Antennae:** With 11 antennomeres; scape 4.0 times longer than pedicel; pedicel elongate, somewhat globular, shorter than

antennomere III; antennomere III more than 2.0 times longer than antennomere IV; antennomeres IV–VIII sub-equal in length, longer than wide and rounded in cross sectional view; antennomeres IX–XI asymmetrical. Compound eyes large, round. **Pronotum:** Parallel-sided, convex. Setae inconspicuous. Slightly longer than wide, with well-developed hind angles. Lateral pronotal ridge entire. Notosternal suture as long as the hypomeral base. Hypomeron simple, without lateral antennal grooves. **Elytron:** Elongate, convex. Setae inconspicuous. Disc with very strong striae. Interstices convex, elevated. **Legs:** Prothoracic legs shortest; metathoracic legs longest, slightly longer than prothoracic legs. Metatarsi, including claws as long as tibia. Metatarsomere I shorter than II–V combined. Metatarsomeres I–III simple. Metatarsomere IV simple, as wide as III. Metatarsomere V elongate. Claws simple. **Venter:** Setae inconspicuous. Elytral epipleura enlarged, not grooved. The metepisterna are largely obscured by elytral epipleura. Metacoxal plates medially 3.0–6.0 times wider than laterally. Tarsal grooves absent on meso- and metaventrite Abdomen with five visible ventrites, medially convex. Last visible ventrite evenly rounded caudally.

Etymology. The generic name is derived from the name, 'Cenomanian'; the age late in the Cretaceous period, from a time which the species had existed during that era. Gender: feminine.

***Cenomana clavata* Otto, sp. nov.**
Fig. 1–2

Holotype. Small, round, clear, polished yellow-colored amber piece with little debris intermixed with the specimen. Piece was excavated from northern Myanmar believed to be Cenomanian in age, approximately 96 million years old. Holotype is deposited in the collection of the Global Eucnemid Research Project (GERP) maintained at University of Wisconsin-Madison Department of Entomology, Madison, Wisconsin.

Description. Holotype: Length, 3.0 mm. Width, 0.75 mm. Body elongate, parallel-sided and tapering towards the elytral apex; head, pronotum, elytra and venter dark black (Fig. 1). **Head:** Subspherical; surfaces dullish, with small, rounded, evenly spaced granules; dark black. **Antennae:** Extending slightly beyond elytral humeri; antennomeres IX–X asymmetrical, widest apically, basally narrowed; antennomere XI basally bulbous, asymmetrical, dark black. **Pronotum:** Dull; surfaces with small, rounded, evenly spaced granules; base sinuous, with median groove extending near center of disc; dark black. **Scutellum:** Elongate, subtriangular and distally rounded**. Elytra:** Somewhat dullish with enlarged, elongate, evenly spaced granules; lateral sides constricted below humeri; interstices strongly elevated apically along elytral suture; dark black. **Venter** (Fig. 2)**:** Shiny; surfaces with crowded granules; dark black.

Etymology. Specific epithet is derived from the presence of loosely arranged clavate terminal antennal segments.

Remarks. The specimen has been keyed out as a member of the tribe Jenibuntorini within Macraulacinae through the higher classification key in Muona (1993) with one extant genus. *Jenibuntor* Muona is a monotypic genus presently distributed on the Australian continent. *Jenibuntor* is a relatively large sized species (14.0–16.0 mm long), similar to *Phlegon* Laporte and *Euryptychus* LeConte with produced frontoclypeal region. The tribe is distinguished by its gradually enlarged antennomeres IX–XI, with antennomere X being shorter than IX within the subfamily Macraulacinae. Although *Cenomana* do possess the gradually enlarged terminal antennal segments and antennomere X shorter than IX; it lacks the produced frontoclypeal region present in *Jenibuntor* and being quite small in size (3.0 mm long). Granulose exoskeletal surfaces in *Cenomana* is a unique feature within the tribe. Coarse, dense punctures are present in *Jenibuntor*.

Family Elateridae

Subfamily Pityobiinae Hyslop, 1917

***Cretopityobius* Otto, gen. nov.**

Type species. *Cretopityobius pankowskiorum* **sp. nov.**, designated here.

Description. Body approximately five times longer than wide, dorsally convex. **Head:** Hypognathous with elongate setae. Frons impressed, with transverse frontal carina above frontoclypeal region. **Antenna:** Bipectinate, elongate with 11 antennomeres; scape 4.0 times longer than pedicel; pedicel globular, subterminally attached to scape, as long as antennomere III; antennomere III shorter than antennomere IV; antennomeres IV shorter than V; antennomeres V–X sub-equal in length, longer than wide and rounded in cross sectional view; antennomeres IV–X each biramose with delicate, elongate, flattened rami arising from base of each segment; each rami slightly widened apically; antennomere XI simple, slightly longer than X. Compound eyes large, round. **Pronotum:** Arcuate, sinuous laterally, convex and setose. Longer than wide, with well-developed, truncate hind angles. Lateral pronotal ridge entire. Hypomeron simple, without antennal grooves. **Elytron:** Elongate, convex, setose. Disc with strong, distinct striae. Interstices convex, elevated. **Legs:** Prothoracic legs shortest, Metathoracic legs longest, slightly longer than prothoracic legs. Metatarsi, including claws as long as tibia. Metatarsomere I slightly shorter than 2–5 combined. Metatarsomeres I–III simple. Metatarsomere III with membranous ventral lobe. Metatarsomere IV excavate-emarginate, ventrally setose, wider than III. Metatarsomere V elongate. Claws simple. **Venter:** Setae inconspicuous. Elytral epipleura not grooved. Metacoxal plates medially 3.0–6.0 times wider than laterally. Tarsal grooves absent on meso- and metaventrite. Abdomen with five visible ventrites, medially convex. Last visible ventrite evenly rounded caudally.

Etymology. The generic name is the combination of the stem, *Creto-* which is derived from the Latin word Crēt(a) meaning "chalk" or "clay" taken from the word Cretaceous, a period in the Mesozoic era from which the amber deposit were formed and the root, *Pityobius* LeConte for an elaterid genus, for which the group superficially resembles a Nearctic group in form. Gender: masculine.

***Cretopityobius pankowskiorum* Otto, sp. nov.**
Fig. 3–4

Holotype. Small, round, clear, polished yellow-colored amber piece with air bubbles, smaller insects, plant and soil debris intermixed with the specimen. Piece was excavated from northern Myanmar believed to be Cenomanian in age, approximately 96 million years old. **Paratype.** Small, round, clear, polished yellow-colored amber piece with debris, including disarticulated antennae intermixed with the specimen. Piece was excavated from northern Myanmar believed to be Cenomanian in age, approximately 96 million years old. Holotype is deposited in the Smithsonian Institute (USNM), Washington, District of Columbia. Paratype is deposited in the Insect Research Collection (WIRC), UW-Madison, Department of Entomology, Madison, Wisconsin.

Description. Holotype: Length, 5.5 mm. Width, 1.5 mm. Elongate and tapering towards the elytral apex; head, pronotum, elytra and venter dark brown; antennae and legs dark brown; head, pronotum and elytra clothed with long, erect setae (Fig. 3). **Head:** Dorso-ventrally flattened; surfaces shiny with closely spaced, shallow punctures; remaining areas of head obscured by air bubble; dark brown. **Antennae:** Long, extending almost 2/3 the length of its body; dark brown. **Pronotum:** Convex; surfaces glossy and transversely, shallowly rugose; base sinuous; about 1/2 of surface obscured by air bubble; dark brown. **Elytra:** Surfaces somewhat shiny and transversely rugose; dark brown. **Venter** (Fig. 4): Surfaces glossy with shallow indications of punctures; dark brown.

Variation. The paratype, although in its disarticulated condition in a piece of amber, is much larger and wider than the holotype at 7.0 mm long and 2.0 mm wide. There are no exoskeletal differences between the paratype and the holotype.

Etymology. The specific epithet is dedicated to the Pankowski family of Rockville, Maryland for providing these interesting specimens for study.

Remarks. These specimens are assigned to the subfamily Pityobiinae based on the smaller antennomere III in relation to II, bipectinate antennae, and general appearance similar to Nearctic species of *Pityobius*. In addition to these traits, both genera also have impressed frons above the frontoclypeal region. The new species differs from *Pityobius* based on its overall relative size, being smaller in *Cretopityobius* (5.5–7.0 mm long), larger in *Pityobius* (15.0–39.0 mm long) as well as the placement of rami in relation to each antennal segment. The rami arise from the base of each segment in *Cretopityobius*, while rami arise from the apices of each antennomere in *Pityobius*.

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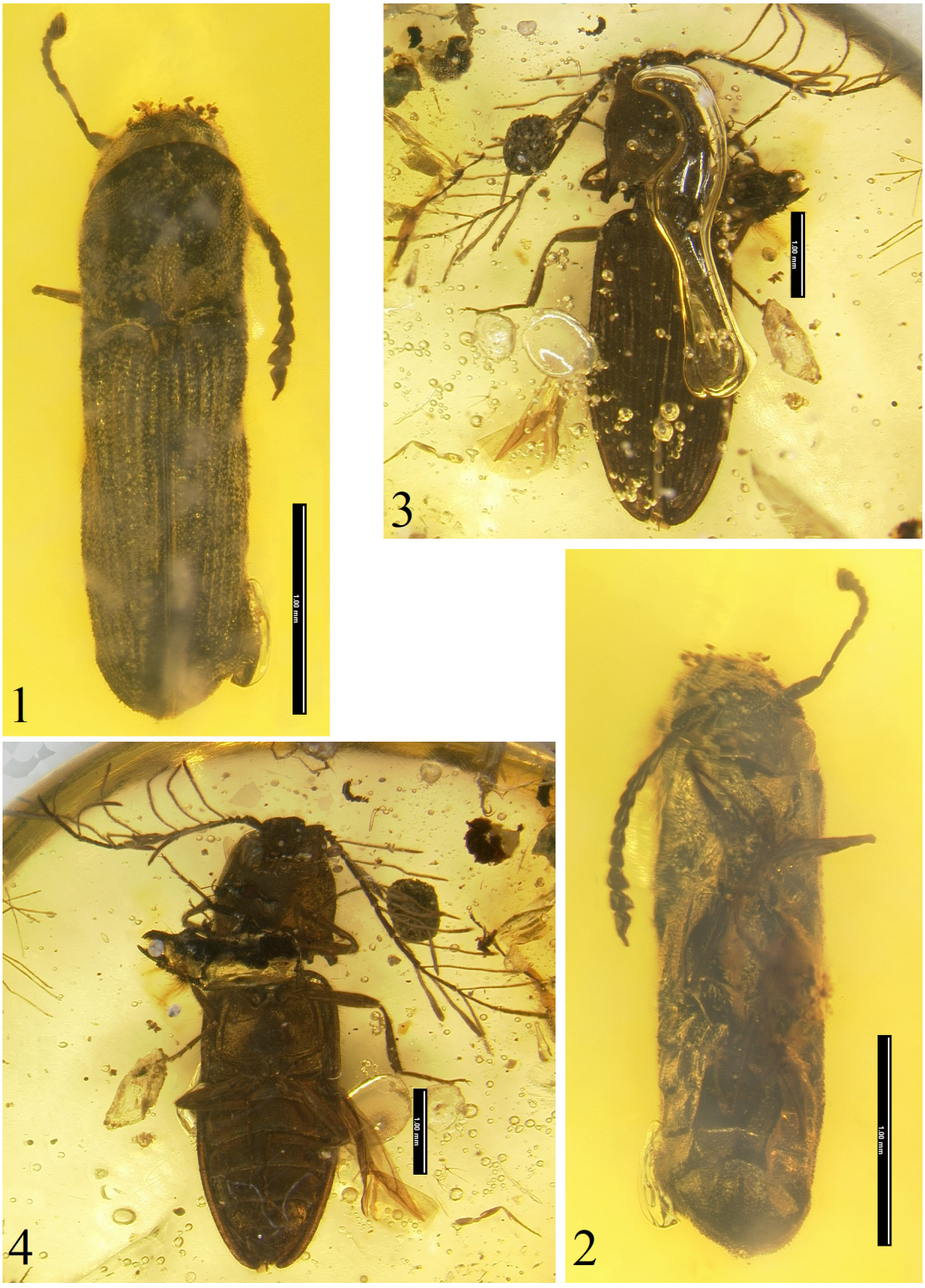

Figures 1–4. Fossil elateroids. **1)** *Cenomana clavata* holotype, dorsal habitus. **2)** *Cenomana clavata* holotype, ventral habitus. **3)** *Cretopityobius pankowskiorum* holotype, dorsal habitus. **4)** *Cretopityobius pankowskiorum* holotype, ventral habitus. (Scale: 1–4 = 1.0 mm)