New Fossil Soldier Beetles (Coleoptera: Cantharidae) in Burmese, Baltic and Dominican Amber

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New fossil soldier beetles (*Coleoptera*: *Cantharidae*) in Burmese, Baltic and Dominican amber

George Poinar Jr. & Fabrizio Fanti

Abstract

New soldier beetles (Cantharidae) are described from amber deposits in Burma (Myanmar), the Baltic region and the Dominican Republic. They include the Lower Cretaceous Burmese amber *Ornatomalthinus elvirae* gen. et sp. n., the Upper Eocene Baltic amber *Rhagonycha* (s. str.) *sucinobaltica* sp. n. and the mid-Tertiary Dominican amber *Tytthonyx* (s. str.) *geiseri* sp. n. These are the first descriptions of soldier beetles from Burmese and Dominican amber. The new genus *Ornatomalthinus* in Burmese amber is noted for possessing features similar to lycid beetles (Coleoptera: Lycidae) and for emitting, presumable defensive, secretions from everted thoracic and abdominal vesicles.

K e y w o r d s : Soldier beetles, Cantharidae, amber, new genus, new species, palaeoentomology.

1. Introduction

While inclusions of fossil Cantharidae Imhoff, 1856 in amber are fairly common (Spahr 1981; Kazantsev 2013) with the first species described by Schaufuss (1892), only in the last decade of the 1900's and early 2000 has this family received more attention with descriptions of various taxa (Kuśka 1992, 1996; Kuśka & Kupryjanowicz 2005; Kazantsev 2010, 2013; Kuśka & Kania 2010; Alekseev & Kazantsev 2014; Kazantsev & Perkovsky 2014). Previously, fossil Cantharidae were described from Baltic amber (e.g., Yablokov-Khnzorian 1960; Alekseev 2013; Kazantsev 2013), Rovno amber (Kazantsev 2010; Kazantsev & Perkovsky 2014), Mexican Chiapas amber (Wittmer 1963) and from the Brunstatt brown coals of Alsace (Förster 1891). Specimens without specific attribution were reported from Baltic amber (e.g., Klebs 1910; Hieke & Pietrzeniuk 1984; Kubisz 2000, 2001), Lebanese amber (Kirejtshuk & Azar 2013), and Burmese amber (Rasnitsyn & Ross 2000; Poinar et al. 2007). The present study describes a new genus and species in Burmese amber that is characterized as a lycid mimic; a new species of *Tytthonyx* LeConte, 1851 in Dominican amber (first record of Silinae Tytthonyxini), and a new species of *Rhagonycha* Eschscholtz, 1830 from Baltic amber. These are the first descriptions of soldier beetles from Burmese and Dominican amber.

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2. Materials and methods

The Burmese specimen originated from the Noije Bum 2001 Summit Site in the Hukawng Valley, southwest of Maingkhwan in the state of Kachin, Myanmar (26°20'N, 96°36'E). Amber-bearing strata in this mine were assigned to the Upper Albian (97–110 Ma) of the Early Cretaceous on the basis of paleontological (ammonite) evidence (Cruickshank & Ko 2003). The Dominican fossil originated from an amber mine in the northern mountain range (Cordillera Septentrional) of the Dominican Republic between Puerto Plata and Santiago (DD latitude and longitude: 19.4–70.4).

Dating of Dominican amber is controversial, with the youngest proposed age of 20–15 mya based on foraminifera (Iturralde-Vinent & MacPhee 1996) and the oldest of 45–30 mya based on coccoliths (Cepek in Schlee 1990). The Baltic amber specimen originated from the Kaliningrad region in Russia. Baltic amber is considered to range between 48.6–40.4 MY and 37.2–33.9 MY.

All three amber specimens were re-polished in order to highlight the dorsal and ventral views and examined and photographed with a Nikon stereoscopic microscope SMA-10-R at 80x and a Nikon Optiphot microscope at 800x. Helicon Focus Pro X64 was used to stack photos for better clarity and depth of field. The specimens are deposited in the Poinar amber collection maintained at Oregon State University, Corvallis, OR 97331, USA.

3. Systematic descriptions

Family Cantharidae Imhoff, 1856 (1815)

Subfamily Cantharinae Imhoff, 1856 (1815)

Tribe Cantharini Imhoff, 1856 (1815)

Genus *Ornatomalthinus* Poinar & Fanti nov.

Type species: *Ornatomalthinus elvirae* Poinar & Fanti sp. n., monotypic.

Etymology: The generic name was derived from Latin "*ornatus*" = adorned (for sculpture elytra) and "*malthinus*" = soft/flabby. Gender: masculine.

Diagnosis: Other extant or fossil families that have elytra with costae and reticulated punctation are: Omalisidae Lacordaire, 1857, Berendtimiridae Winkler, 1987 and Lycidae Laporte de Castelnau, 1838. However, Omalisidae has six visible ventrites and the pronotum is different, Berendtimiridae has six visible ventrites, the third antennomere is similar in size and vestiture to the second, and the cranium resembles a raised flat shield-like structure (Winkler 1987). *Ornatomalthinus* gen. n. has a greater number of visible ventrites and the structure of the head, antennae and pronotum are different from those of the other families. We can also distinguish the new genus from Lycidae by its normal and short trochanters (long in Lycidae) and cylindrical tibiae (nearly always flattened in Lycidae). Moreover, the shape of the head and prothorax and the general habitus is different from these features in the Lycidae.

The unequal maxillary palpomeres with the last segment securiform, pronotum without modified lateral margins, and short elytra with complete hind wings suggest that the new taxon belongs in the Cantharinae. *Ornatomalthinus* gen. n. is characterized by its elytral sculpture (adorned with striations provided of relief points), which is reminiscent of representatives of the family Lycidae (lycids mimics). This feature is not present on any fossil genera (only *Mimoplatycis* Kazantsev, 2013, has a conspicuous carinate pronotum but the elytra are normal). Net-winged elytra with "window" punctures is an extinct character representing a case of mimicry. It is the earliest fossil record of cantharids mimicking lycids. Diagnostic characters include the combination of small size, very short 11-segmented female antennae, long meso- and metathoracic legs, complete hind wings and short elytra narrowing at apex with evident striation equipped with relief points.

Ornatomalthinus elvirae Poinar & Fanti sp. n.
Figs. 1–3

Type: Holotype: female, in Burmese amber, accession No. B-C-28.

Type locality: Myanmar: Kachin State, Southwest of Maingkhwan, Hukawng Valley, mine near Noije Bum, designated as "Noije Bum 2001 Summit Site" (26°20'N, 96°36'E).

Type horizon: Upper Albian (97–110 Ma) of the Early Cretaceous.

Etymology: The species is named in honor of Dr. Elvira Castiglione, who proposed the genus name.

Description: Female, based on the very short antennae and distended abdomen. Alate, body dark-brown, length 3.5 mm. Head wrinkled, larger than the prothorax, with small elliptical eyes, and relatively long mandibles with a sharp tooth positioned at two thirds of their length. Maxillary palpomeres: first short, second long and thin, third long but shorter than the second, and the last segment securiform and triangular-shaped. Antennae 11-segmented, robust, filiform (the left preserved until the 4th article), short, reaching the humeral-elytral area with antennomeres subequal: scape long, segments 2–3 and 8–10 shorter than segments 4–7, the last filiform and moderately cylindrical. Pronotum rugose, slightly transverse, moderately narrowed forward with rounded corners. Scutellum triangu-

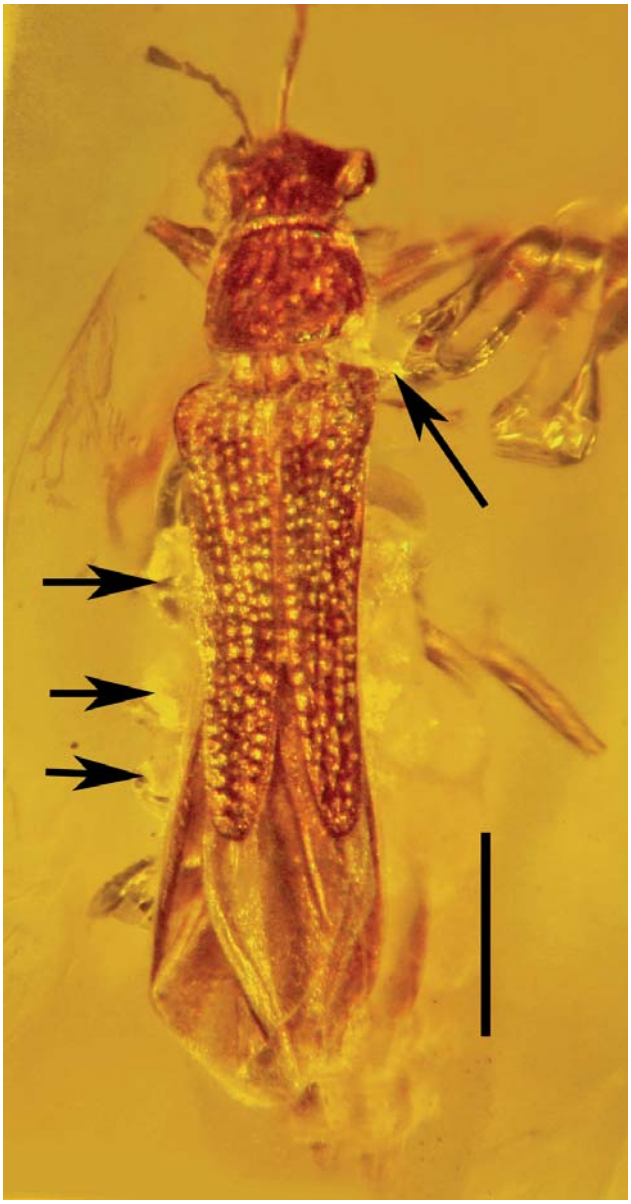

Fig. 1. *Ornatomalthinus elvirae* gen. et sp. n. in Burmese amber. Holotype, dorsal view. Right arrow shows a cuticular vesicle extruded from the thorax. Left arrows show secretions emitted from cuticular vesicles of the abdomen. Bar = 0.8 mm.

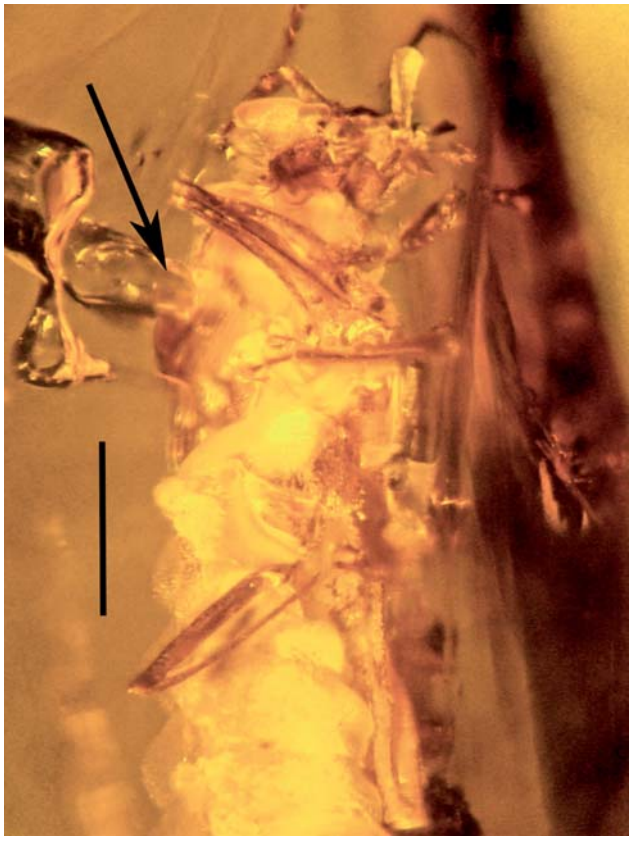

Fig. 2. *Ornatomalthinus elvirae* gen. et sp. n. in Burmese amber. Holotype, subventral view. Arrow shows cuticular vesicle extruded from the thorax. Bar = 0.5 mm.

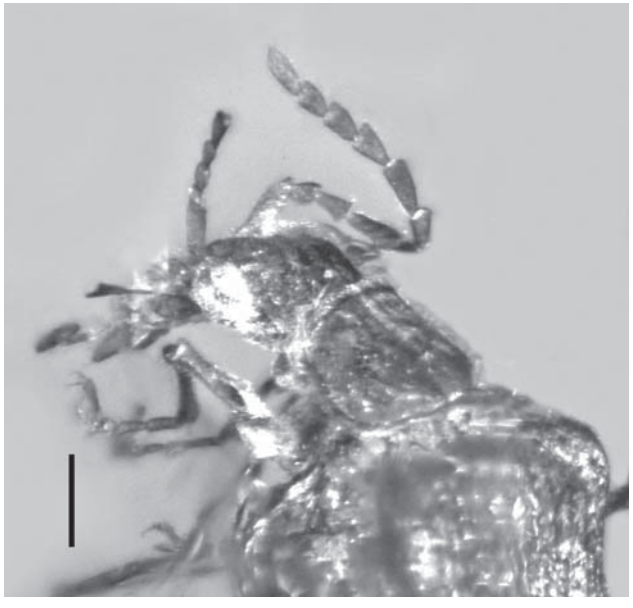

Fig. 3. *Ornatomalthinus elvirae* gen. et sp. n. in Burmese amber. Holotype, detail of head and prothorax. Bar = 0.5 mm.

lar-shaped. Elytra short, not parallel, reaching to approximately the fifth tergite, rounded and narrowing at apex, adorned with striae containing relief points. Hind wings present, folded and extended beyond the elytra in dorsal position. Legs bent and slightly intertwined, anterior pair quite short, especially the tibiae, with femora quite robust; mesothoracic legs with thin and long femora and tibiae; metathoracic legs with long femora slightly thickened; tibiae and tarsi thin and long. Five tarsomeres with the first approximately the same length as the second, the third narrow and slightly shorter than the second, the fourth with large plantar pads, and the fifth long and narrow. Anterior tarsal claws simple with pointed, triangular denticle at the base. Abdomen large and expanded.

Syninclusions: None.

Diagnosis: The new species has a unique elytral sculpture that does not occur on any extant or extinct member of the family. The combination of short elytra, small size, indistinct net-winged elytral pattern and appearance occurs in three subfamilies: Cantharinae, Chauliognathinae and Malthininae. In Cantharinae, reduced elytra and complete hind wings are very rare and only known in two species: *Lycocerus michiakii* Okushima & Brancucci, 2008 and *Lycocerus strictipennis* Y. Yang & X. Yang, 2011 (M. Geiser, personal communication, 2015), both of which are much larger than the present fossil (8–10 mm). Furthermore high-mountain species frequently have reduced elytra, but these species are apterous or have greatly reduced hind wings. In Chauliognathinae there is the Neotropical genus *Malthesis* Motschulsky, 1853, that looks slightly similar to the fossil but larger (extant species range from 7 to 13 mm) and the species generally have the prothorax with strongly bordered sides. In Malthininae there are the genera: *Maltypus* Motschulsky, 1860, *Inmalthodes* Pic, 1938, and *Prosthaptus* Gorham, 1900, with "reticulate" elytra, but these genera have quite a different habitus. Moreover some South American Silinae are fairly similar in appearence.

Genus *Rhagonycha* (s. str.) Eschscholtz, 1830

Rhagonycha (*s. str.*) *sucinobaltica* Poinar & Fanti sp. n.
Figs. 4–6

Type: Holotype: male, in Baltic amber, accession No. C-202.

Type locality: Russia: Kaliningrad region. Baltic Sea coast.

Type horizon: Middle Eocene (Lutetian) (48.6–40.4 MY) to Late Eocene (Priabonian) (37.2–33.9 MY).

Etymology: The specific name is derived from Latin "*sucinum*" = amber and "*baltica*" (named in reference to the locality).

Description: Male, based on antennal length and extended body, which is blackish to dark brown with pronotum slightly darker than elytra. Body length 3.5 mm. Head small, narrower then the prothorax, with prominent rounded eyes. Antennae elongate, reaching and overtaking the metathoracic legs, 11-segmented, filiform with antennomeres roughly the same length except for the longer scape. Pronotum apically constricted with posterior corners very evident but rounded. Scutellum triangular. Elytra elongate, reaching the abdominal apex with surface rough and with fine and thin long hairs; only

the right hind wing that is strongly folded is visible. Legs fairly robust, anterior and mesothoracic femurs and tibiae dark brown; all femora are slighlty thickened while the tibiae are elongate with lightly enlarge apices; metathoracic legs dark brown. All tarsi five-segmented and equipped with long hairs, with third segment not bilobed at sides and shorter than the second; first and second tarsomeres about the same length, the fourth with large elongated lobes and the fifth elongated. Claws bifid at apex with rounded denticle at base. Female unknown.

Syninclusions: None.

Diagnosis: In this specimen the maxillar palpomeres are not clearly visible, but it has tarsi with third segment not bilobed at the sides and the claws bifid at apex, which characters are typical of the genus *Rhagonycha* and not present in other genera. This new species is distantly related to the "*Rhagonycha atra* group" consisting of *Rh. atra* (Linnaeus, 1767), *Rh. elongata* (Fallén, 1807) and *Rh. gallica* Pic, 1923, that are widely distributed in Europe, Turkey and some parts of Russia. It can be distinguished by the smaller size (3.5 mm versus 4.5–7 mm for extant species), the blackish-brown coloration, very narrow pronotum, and slender appearance. It is also distinguished from *Rhagonycha kryshtofovichi* (Yablokov-Khnzorian, 1960) by the claws, pronotum and dark coloration instead of reddish-brown.

Fig. 4. *Rhagonycha* (s. str.) *sucinobaltica* sp. n. in Baltic amber. Holotype, dorsal view. Bar = 1.0 mm.

Fig. 5. *Rhagonycha* (s. str.) *sucinobaltica* sp. n. in Baltic amber. Holotype, ventral view. Bar = 0.7 mm.

Fig. 6. *Rhagonycha* (s. str.) *sucinobaltica* sp. n. in Baltic amber. Holotype, detail of tarsus and claws. Bar = 60 µm.

Subfamily Silinae MULSANT, 1862

Tribe Tytthonyxini ARNETT, 1962

Genus *Tytthonyx* (s. str.) LECONTE, 1851

Tytthonyx (s. str.) *geiseri* POINAR & FANTI sp. n.
Figs. 7–8

T y p e : Holotype: male, in Dominican amber, accession No. C-7-70.

T y p e l o c a l i t y : Dominican Republic: Cordillera Septentrional, mine between Puerto Plata and Santiago.

T y p e h o r i z o n : Uncertain. Upper Eocene to Lower Miocene (45–30 MY to 20–15 MY).

E t y m o l o g y : The species name is in honor of MICHAEL F. GEISER (expert of worldwide Cantharidae).

D e s c r i p t i o n : Male, alate, light testaceous-brown. Small size but stout, body length 2.4 mm, with terminal abdominal segments folded up (estimated body length: 2.8–3.2 mm). Head large and very triangular behind the eyes, which are very prominent and rounded. Mandibles relatively long and thin with a small rounded tooth near the base. Antennae dark-testaceous, serrate, longer than the metathoracic legs, 11-segmented with first three antennomeres filiform and cylindrical at apex, segments 4-9 strongly serrate, especially the 5th, 6th, 7th and 8th, while the 4th and 9th have normal serrations and the penultimate (10th) is only slightly serrate, with the terminal segment 11 filiform; scape longest and others subequal in length. Pronotum quite transverse with rounded angles, scutellum triangular. Elytra large but abbreviated with short hairs along the sides, rounded apex and barely reaching the first tergites; hind wings very long and fully developed and only bent slightly at apex. Legs extremely long and slender (particularly the tibiae) with femora more robust. All tarsi five-segmented, the first long and thin, the second shorter, the third small, the fourth divided into two long lobes and the 5th slender. Claws simple and minute. Abdomen folded upwards.

Fig. 7. *Tytthonyx* (s. str.) *geiseri* sp. n. in Dominican amber. Holotype, dorsal view. Bar = 0.9 mm.

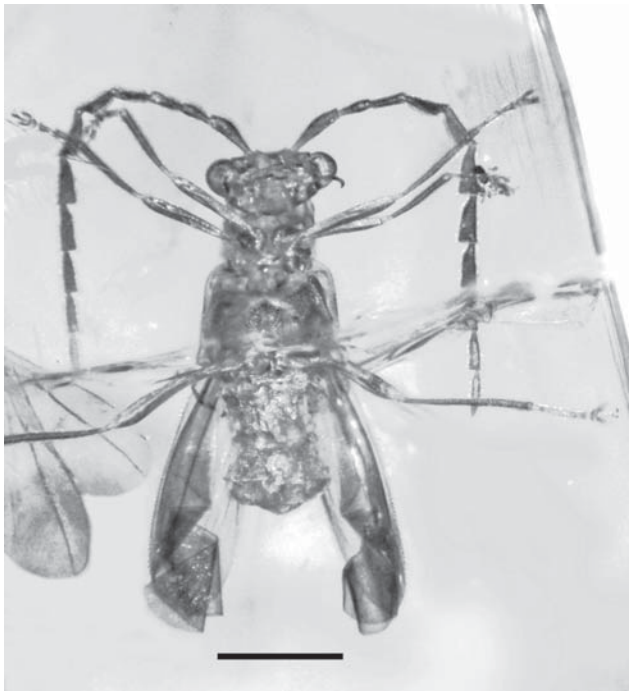

Fig. 8. *Tytthonyx* (s. str.) *geiseri* sp. n. in Dominican amber. Holotype, ventral view. Bar = 0.9 mm.

S y n i n c l u s i o n s : One Diptera.

D i a g n o s i s : No fossils of this tribe and genus are currently known. Species identifications are based on copulatory structures (WITTMER 1991, 1992) and since these features are not visible in fossils, the new species is recognized by its small size (less than 3 mm), which is found in very few extant species, and the above indicated characters. Based on the account by WITTMER (1991, 1992), we place this fossil in the subgenus *Tytthonyx* due to the serrate antennae of the male. The antennae are pectinate in males of the subgenus *Thinalmus* GORHAM, 1881.

R e m a r k s : The piece of amber with the *Tytthonyx* inclusion is very clear and transparent and allows an accurate examination of dorsal and ventral views of the specimen. It is in very good condition except for the terminal abdominal segments that are folded back on themselves.

4. Discussion

A second undescribed Burmese amber cantharid with similar characters to *Ornatomalthinus elvirae* sp. n., but currently unavailable for study, is illustrated in POINAR et al. (2007). This specimen also has very long tibiae,

11-segmented filiform antennae and a similar net-winged elytral pattern, however, it is longer, approximately 4.5 mm in length. It is difficult to say without further study whether it falls within the new fossil genus as a conspecific or new species. This undescribed specimen has cuticular vesicles extruded from both abdominal and thoracic segments. These vesicles are similar to the cuticular vesicles extruded from the thorax and abdomen of *Ornatomalthinus elvirae* sp. n. (Figs. 1–2, arrows). Secretions emitted from these vesicles are considered to represent a chemical defense response. Such defense responses are known to occur in a number of adult beetles, especially members of the Cantharidae (Poinar et al. 2007).

The genus *Rhagonycha* is poorly known in the fossil record. Specimens without specific attribution were reported from Baltic amber (Klebs 1910; Hieke & Pietrzeniuk 1984) and *Rhagonycha micans* was described by Piton (1939) from the Pliocene of Chambon Lake (Puy-de-Dôme, France), which is similar to the extant *Rhagonycha testacea* (Linnaeus, 1758). One previous species in Baltic amber (*Rhagonycha kryshtofovichi*) was originally described by Yablokov-Khnzorian (1960) as *Malchinus kryshtofovichi*. This latter specimen has simple tarsal claws, in contrast to true *Rhagonycha*, that has claws bifid at the apex. Characters established for *Rhagonycha* by Kazantsev (2013) are "anteriorly narrowed pronotum, distally widened terminal palpomeres and unmodified terminal abdominal segments". Therefore our specimen may be the only species of this genus known in amber.

The tribe Tytthonyxini is placed "*incertae sedis*" in the subfamily Silinae, between Malthininae and Silinae, due to the strange structure of the abdominal sternites and genitalia (Brancucci 1980). No fossils were known until now. *Tytthonyx* has about 70 extant species (e.g., Delkeskamp 1977; Wittmer 1991, 1992), 14 of which occur in the Dominican Republic. The female of *Tytthonyx geiseri* n. sp. is unknown, but probably has filiform antennae (sexual dimorphic character in extant species).

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