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PLEUROCERATOS BURMITICUS N. GEN., N. SP. (COLEOPTERA: SILVANIDAE) FROM EARLY CRETACEOUS BURMESE AMBER

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Abstract.—A **new genus** and **species** of cucujoid beetle, ***Pleuroceratos burmiticus* Poinar and Kirejtshuk** in the *Oryzaephilus* generic complex of Silvanidae, is described from Early Cretaceous Burmese amber. The new genus is characterized by the head, pronotum and elytra bearing a series of longitudinal costae, large, protruding round eyes, long tri-quadri-dentate mandibles, elongate trochanters, contiguous procoxae, 11- segmented antenna with 3-segmented symmetrical, abrupt, loose club bearing a sensory extension on apical segment, 5 subequal, freely movable, abdominal segments, and elytra covering most of the abdomen. This is the first description of a Mesozoic member of the family Silvanidae.

Key Words: *Pleuroceratos* n. gen., *Pleuroceratos burmiticus* n. sp., Silvanidae, Burmese amber, Cretaceous fossil

Burmese amber is an important fossil insect site from the Early Cretaceous. The amber contains a recently described new family (Kirejtshuk and Poinar 2006). We describe a cucujoid from these deposits. While unique, this specimen possesses many characters of the family Silvanidae and is placed therein. Previous silvanid fossils have been reported only from Tertiary Baltic and Bitterfeld ambers (Ponomarenko and Kirejtshuk 2004a, b).

Materials and Methods

The amber piece containing the fossil is roughly trapezoidal in outline, measuring 7 mm long by 5 mm wide and 2 mm deep. Observations, drawings, and photographs were made with a Nikon SMZ-10 R stereoscopic microscope and Nikon Optiphot compound microscope.

In 2001, a new amber mine was excavated in the Hukawng Valley, southwest of Maingkhwan in the state of Kachin (26°20′N, 96°36′E) in Burma (Myanmar). This new amber site, known as the Noije Bum 2001 Summit Site, was assigned to the Upper Albian of the Early Cretaceous on the basis of paleontological evidence (Cruickshank and Ko 2003), placing the age at 97 to 110 mya. 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 (possibly *Agathis*) tree source of the amber (Poinar et al. 2007). The fossil beetle is well-preserved and com-

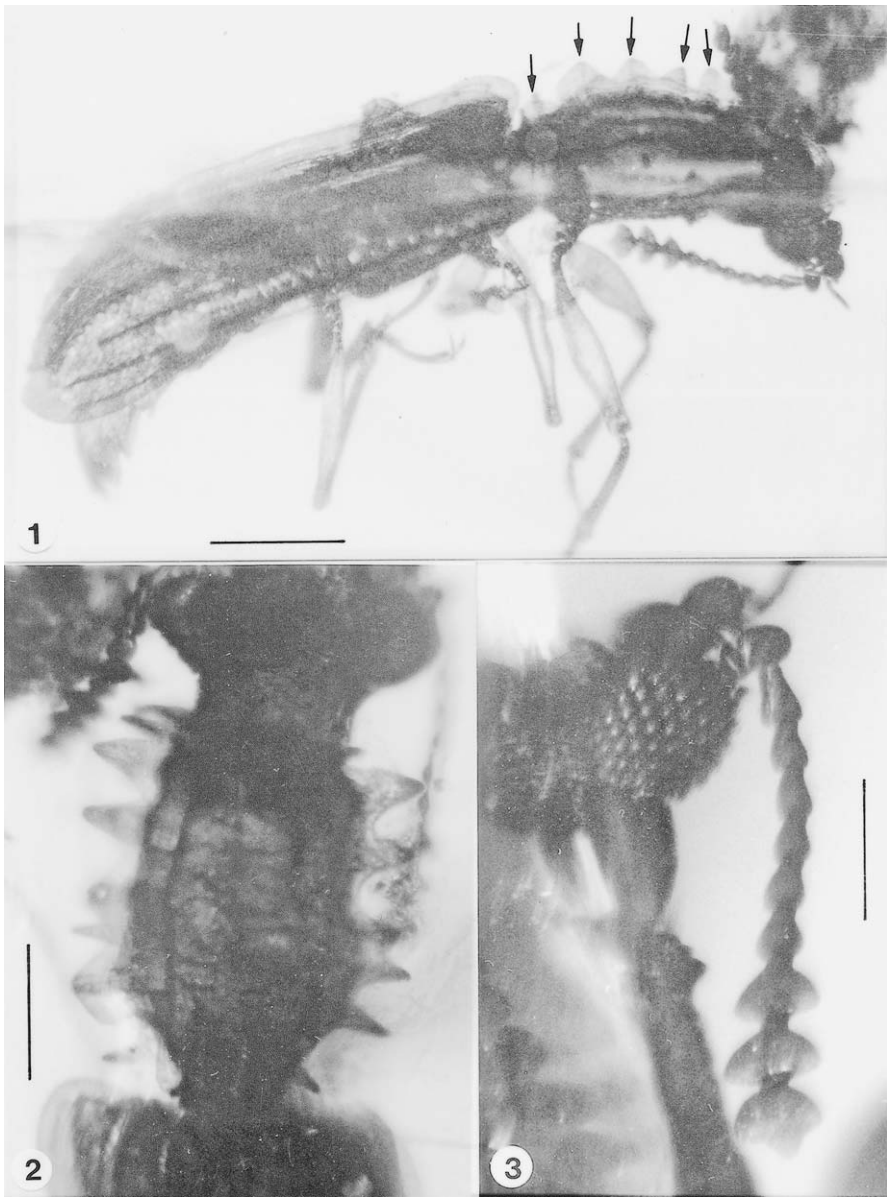
plete, with all appendages intact (Figs. 1, 6). Since it could not be placed in any extant or extinct genus, it is described below in a new genus.

Pleuroceratos Poinar and Kirejtshuk, new genus

Description.—Small, elongate, moderately convex dorsally; body and appendages castaneous to piceo-castaneous; head, thorax and elytra with coarsely sculptured dorsal integument bearing longitudinal ridges of varying length, width and shape; dorsal and ventral surface glabrous, covered with small punctures; head with lateral angles prolonged into flattened costae that extend most of length; single small costa located along midline of head; antenna 11-segmented, exposed, insertion in front of eyes; first and second segments petiolate; second segment inserted at ~90° angle on lateral surface of first segment; 3-segmented club abrupt, symmetrical, loose, terminal segment pointed; dorsal surface with two lateral and one median costa; eyes round, protruding, coarsely faceted; mandibles prominent, left with 4 teeth and right with 3 teeth; labrum free, wider than long, maxillary palp apparently 3-segmented, terminal segment subcylindrical and longer than basal two combined; labial palp not observed; pronotum with 6 longitudinal widely crenulate costae; scutellum partially concealed; tarsal formula 5-5-5; first 4 segments subequal, fifth longer than all preceding segments combined; tarsal claws simple, paired, widely divergent; procoxae adjacent along midline of prosternum; apices of tibiae bearing a pair of short spurs and corbels; mesocoxal cavities circular, adjacent; metacoxal cavities widely separated; all trochanters elongate; elytra covering most of abdomen; tip of abdomen bent downward; each elytron with 3 longitudinal carinae interspersed with transverse rows of comparatively large suboval punctures; elytral apices rounded; abdomen with 5 exposed, subequal, abdominal ventrites with straight sutures, apparently all freely movable; anal sclerite partly extruded and widely rounded at apex.

Etymology.—*Pleuroceratos* is derived from the Latin ''pleuron'' for ''side'' and ''ceras'' for ''horned,'' in regard to the multiple ridges on the pronotum and elytra. The gender is masculine.

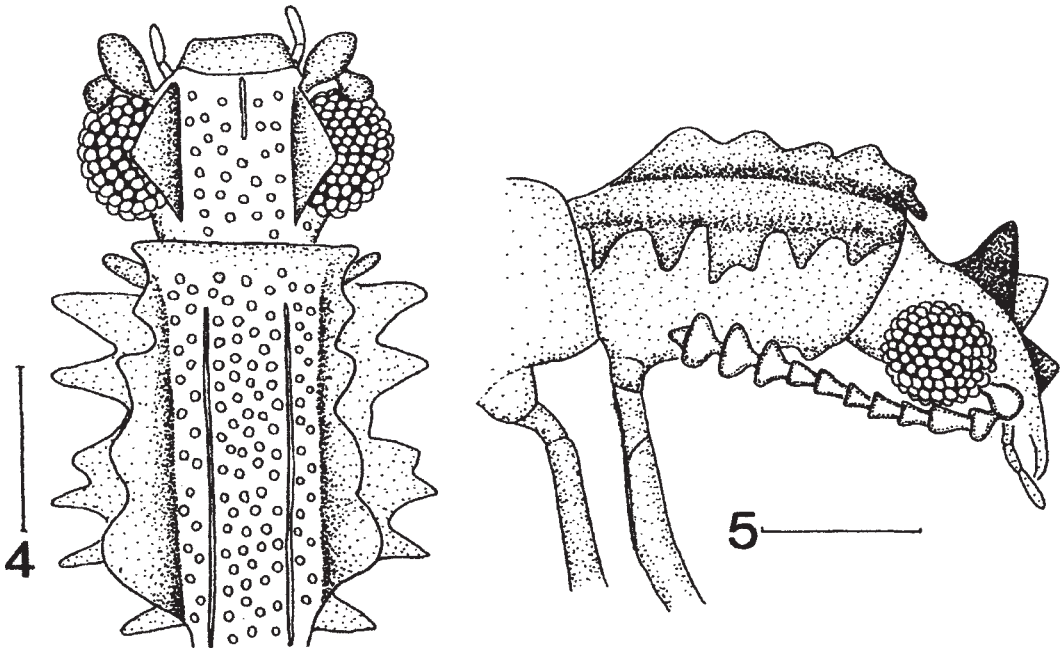
Diagnosis.—As well as unique characters, *Pleuroceratos* shares characters with both Silvaninae and Brontinae. Characters shared with the Silvaninae include: distinct loose antennal club, carina on pronotum and elytra, rather elongate trochanters, comparatively small oval pro- and mesocoxal cavities, lobed tarsomeres 1–3 and reduced tarsomere 4. Characters shared with Brontinae include: large eyes (e.g., *Cryptomorpha* Wollaston and *Psammaecus* Latreille), a distinct paramedian sulcus on head (e.g., *Cryptomorpha* and *Dendrophagus* Schonherr), distinct paramedian elongate elevations or costae combined with elongate grooves on head (e.g., *Platamus* Erichson, 1845) and elytra with large cell-like punctures (e.g., some *Cryptomorpha*). While most Brontinae (including Cryptomorphini, Psammoecini and Uleiocini) have long antennae lacking a club, some representatives of this subfamily have comparatively short antennae with well-developed clubs. In addition, the adjacent procoxae and long exposed maxillary palps can be found among some Brontinae (the latter characters particularly in *Ueiota* Latreille, 1796), but not among members of Silvaninae. However, very long trochanters and the narrowed femoral base are characteristic of Silvaninae but unknown among Brontinae. Some silvanins (particularly species of the genus *Silvamopsis* Grouvelle, 1892) have a large, wide tarsomere 3 with a small tarsomere 4, the latter apparently inside



Figs. 1–3. *Pleuroceratos burmiticus* in Burmese amber. 1, Lateral view. Note costae on prothorax (arrows). Bar = 0.48 mm. 2, Dorsal view of pronotum showing lateral costae. Bar = 0.30 mm. 3, Right antenna showing abrupt, symmetrical, loose, 3-segmented club with a glandular extension on the terminal segment. Bar = 0.21 mm.

the former. Almost all extant species of Silvanidae are more or less conspicuously pubescence on both dorsal and ventral sclerites, although this condition is reduced in *Corimus* Halstead, 1980. Another character unique for *Pleuroceratos* is its long mandibles, which do not occur in known representatives of either Brontinae or Silvaninae.

The new genus mostly closely resembles *Oryzaephilus* Ganglbauer, 1899, but is distinct from this genus by the



Figs. 4–5. *Pleuroceratos burmiticus* in Burmese amber. 4, Dorsal view of head and pronotum showing position of costae. Bar = 0.37 mm. 5, Lateral view of right side of head and pronotum showing costae on head and pronotum. Bar = 0.45 mm.

structure of the costae on the head and pronotum, the absence of pubescence on both dorsal and ventral sclerites, the lack of clear temples, a shorter frons, a distinct antennal club, 3 elongate costae on each elytron and much finer ventral punctures. Also, species of *Oryzaephilus* have only 2 lateral costae and 3 slightly elevated dorsal costae (or 5 subdepressed elongate rows interspaced by these costae).

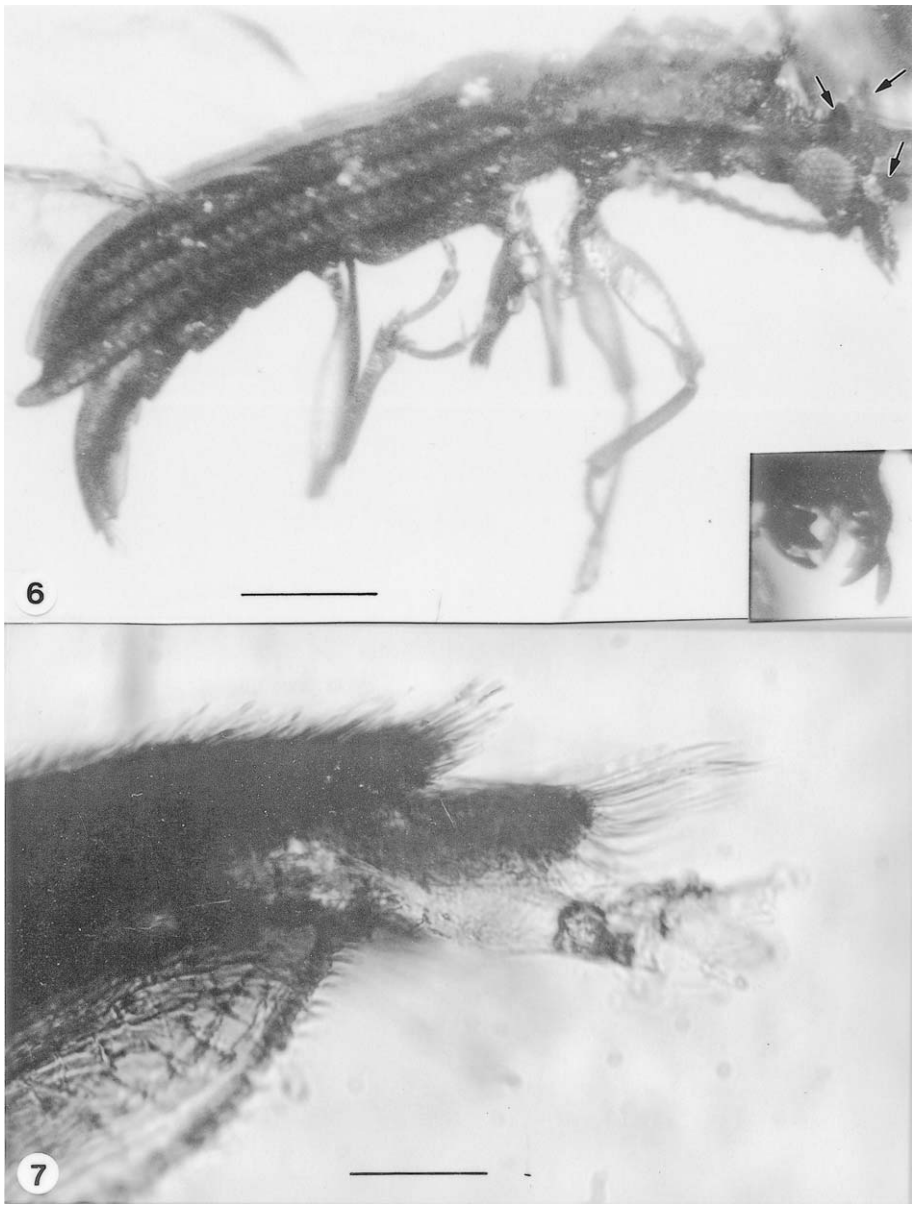
Type species.—*Pleuroceratos burmiticus*, n. sp.

Pleuroceratos burmiticus Poinar and Kirejtshuk, new species

(Figs. 1–7)

Description.—Characters as listed under generic description. Male; length body, 3.05 mm; body color mostly castaneous; head and portions of legs piceocastaneous. Head, thorax and abdominal sternites bearing irregular positioned small punctures; elytra with rows of large punctures as described in generic description;.

Head: Length, 0.6 mm; dorsum with small punctures arranged in irregular rows; dorsal surface bearing one short median and 2 long lateral costae; lateral costae partially overlap eyes in dorsal view; eyes large, protruding, facets coarse; mandibles well developed and prominent; right mandible 3-toothed, left mandible 4-toothed; all teeth with acute apices except proximal tooth on left mandible, which is blunt; presence of dorsal mycangium could not be determined; antenna reaching only slightly beyond middle of pronotum; antennal insertion directly anterior to eye; first and second antennal segments pedunculate; second antennal segment inserted on lateral surface of first segment; antennae with abrupt, symmetrical, loose, 3-segmented club; glandular extension on terminal portion of 11th segment; antennal grooves absent.



Figs. 6–7. *Pleuroceratos burmiticus* in Burmese amber. 6, Lateral view from a different angle than in Fig. 1. Note costae on head (arrows) and rows of punctures on elytra. Bar = 0.45 mm. Insert shows asymmetrical mandibles. 7, Apex of abdomen showing exposed anal sclerite and inner sac of penis. Bar = 0.24 mm.

Thorax: Length, 0.7 mm; pronotum longer than wide, anterior margin truncate; surface with irregular rows of small punctures; dorsum bearing 6 longitudinal costae, three on each side of median line; inner (first) pair with entire edges, not extending to anterior margin of pronotum; middle (second) and outer (third) pair extending length of pronotum; middle pair with irregular edge bearing 5 projections, most with rounded apices; outer pair of longitudinal costae

wider than inner and middle ones, with 6 prominent projections, third projection (from anterior end) partly fused with 4th projection; simple toothlike process protruding between middle and outer longitudinal costa near anterior margin of pronotum; procoxae adjacent, possibly partially fused; prolonged trochanters arise from sides of procoxae; mesocoxal cavities rounded, widely separated by ridge; metacoxal cavities elliptical, positioned at end of longitudinal, raised, mesosternal extension; first three tarsal segments of anterior leg with numerous long hairs beneath, fourth segment with only few long hairs; fifth segment with rows of short, sparse hairs; proximal segments of meso- and metatarsi with protruding hairs; metafemoral tooth not evident.

Elytra: Length, 1.75 mm; 3 longitudinal carinae on each elytron; first elytral interval (between suture line and first longitudinal carina) with 2 longitudinal series of coarse punctures; second interval (between first and second longitudinal carina) with 3–4 longitudinal series of coarse punctures (fourth row incomplete); third interval (between 2nd and 3rd longitudinal carina) with 2 longitudinal series of coarse punctures; 2 longitudinal rows of coarse punctures on outer explanate portion of each elytron; elytral apices rounded.

Abdomen: With 5 subequal, apparently flexible, abdominal ventrites with straight sutures; surface of abdominal ventrites covered with small punctures; lateral edges of all tergites explanate; abdominal apex with exposed anal sclerite and inner sac of penis.

Female.—Unknown

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 41042 (accession # ab 378). The specimen is available for study by contacting R. Buckley.

Etymology.—The specific epithet ''burmiticus'' is derived from the country of origin (noun in apposition).

Discussion

Since early studies on Mesozoic beetles (Arnol'di et al. 1977), additional descriptions of fossil Coleoptera from this period have appeared (Ponomarenko and Kirejtshuk 2004a, b). However *Pleuroceratos* is the first Mesozoic record of a Cucujoidea family. While the subfamily Silvaninae was revised by Grouvelle (1912) , Halstead (1973, 1980) revised the genus *Silvanus* and the *Oryzaephilus* genera complex, Thomas (1984) discussed the phylogenetic relationships of the Silvanidae, and Pal et al. (1985) revised the genus *Uleiota* from India and Sri Lanka and discussed its systematic position. The entire family needs further study. The Silvanidae are members of a basal group of Cucujoidea, as defined by Wilson (1930), which also may include Phloeostichidae, Propalticidae, Cucujidae, Laemophlaeidae, and Passandridae. These families have a similar body shape, integumental sculpture, wing venation, and aedeagus; suggesting a close relationship (Crowson 1955, 1973; Kirejtshuk 2000; Leschen et al. 2005).

Pleuroceratos is placed in the subfamily Silvaninae although differing from other members of the subfamily by its rather long 3–4 dentate mandibles, costate dorsal surface (although the head of *Airaphilus* I. Redtenbacher, 1858, also has lateral costae above its eyes), rather large eyes, 6 longitudinal costae on the pronotum, and strongly lobed tarsomeres 1–3. All recent silvanins have a narrow to moderately wide prosternal process, however the procoxae of the new genus appear to be adjacent.

The fossil differs from the following described silvanin genera by several characters: from *Acorimus* Halstead,

1980, *Afrocorimus* Halstead, 1980, and *Corimus*, *Pleuroceratos* differs with its much more slender body, longer head, absence of explanate pronotal and elytral borders, lack of pubescence, lack of dilatation over the antennal insertions, well raised costae and large punctures on the elytra. From *Afronausibius* Halstead, 1980, the fossil has a much more slender body with a longer head, non-explanate pronotal and elytral sides, absence of pubescence, distinct 3-segmented antennal club, lack of dilatation over the antennal insertions, only 3 raised costae, and large punctures on the elytra. From *Ahasverus* De Gozis, 1881, *Pleuroceratos* differs in having a more coarse dorsal sculpture, particularly elongate costae, and large punctures on the elytra. From *Airaphilus*, the fossil differs in lacking pubescence, having markedly shorter antennae with a more distinct antennal club, regular punctures, elongate costae on the elytra, and a subflattened underside. From *Austranausibius* Halstead, *Pleuroceratos* differs in the lack of pubescence, lack of dilatation over the antennal insertions, lack of temples, well raised costae, and large punctures on the elytra. From *Nausibius* Redtenbacher and *Pseudonausibius* Halstead, the fossil differs by its lack of pubescence, absence of dilatation over the antennal insertions, and large punctures on the elytra. From *Silvanopsis*, the fossil differs by its lack of pubescence, a 3-segmented antennal club, well raised costae, and large punctures on the elytra.

The large eyes and strongly lobed tarsi suggest that *Pleuroceratos* lived in a more or less exposed habitat. Many extant Silvanidae occur in subcortical spaces of dead or injured trees, especially substrates infested by fungi. The numerous costae of *Pleuroceratos* could have served a protective function, especially the lateral ones on the head, which would protect the eyes from debris. The large mandibles and protruding eyes suggest that it could have been, at least partly, carnivorous.

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Literature Cited

Arnol'di, L. V., V. V Zherikhin, L. M. Nikritin, and A. G. Ponomarenko. 1977. Mesozoic Coleoptera, Akademiya Nauk SSSR, Nauka Publishers, Moscow, 284 pp. (original in Russian, English translation by Smithsonian Institution Libraries and The National Science Foundation, Washington, D. C. in 1992).

Crowson, R. A. 1955. Natural Classification of the Families of Coleoptera. Nathaniel Lloyd, London, 187 pp.

———. 1973. Further observations on Phloeostichidae and Cavognathidae, with definitions of new genera from Australia and New Zealand. The Coleopterists Bulletin 27: 5462.

Cruickshank, R. D. and K. Ko. 2003. Geology of an amber locality in the Hukawng Valley, northern Myanmar. Journal of Asian Earth Sciences 21: 441–455.

Grouvelle, A. 1912. Notes sur les Silvanini (Col. Cucujidae). Synonymies et descriptions de genres nouveaux et de nouvelles espèces. Annales de la Société Entomologique de France 81: 313–386.

Halstead, D. G. H. 1973. A revision of the genus *Silvanus* Latreille (s.l.)(Coleoptera: Silvanidae). Bulletin of the British Museum of Natural History (Entomology) 29: 37–112.

———. 1980. A revision of the genus *Oryzaephilus* Ganglbauer, including descriptions of related genera (Coleoptera: Silvanidae). Zoological Journal of the Linnean Society 69: 271–374.

Kirejtshuk, A. G. 2000. On the origin and early evolution of the superfamily Cucujoidea (Coleoptera, Polyphaga). Comments on the family Helotidae. The Kharkov Entomological Society Gazette 8: 8–38.

Kirejtshuk, A. G. and G. PoinarJr. 2006. Haplochelidae, a new family of Cretaceous Beetles (Coleoptera: Myxophaga) from Burmese amber. Proceedings of the Entomological Society of Washington 108: 155–164.

Leschen, R. A. B., J. F. Lawrence, and S. A. Ślipiński. 2005. Classification of basal Cucujoidea (Coleoptera: Polyphaga): cladistic analysis, key and review of new families. Invertebrate Systematics 16: 17–73.

Pal, T. K., T. Sen Gupta, and R. A. Crowson. 1985. Revision of *Uleiota* (Coleoptera: Silvanidae) from India and Sri Lanka and its systematic position. Oriental Insects 18: 213–233.

Poinar, Jr., G., J. B. Lambert, and Y. Wu. 2007. Araucarian source of fossiliferous Burmeses amber: spectroscopic and anatomical evidence. Journal of the Botanical Research Institute of Texas 1: 449–455.

Ponomarenko, M. G. and A. G. Kirejtshuk. 2004a. WWW.zin.ru\Animalia\Coleoptera\rus\PALEOSYS.HTM (July 2004).

———. 2004b. WWW.zin.ru\Animalia\Coleoptera\rus\PALEOATL.HTM (July 2004).

Thomas, M. C. 1984. A new species of apterous *Telephanus* (Coleoptera: Silvanidae) with a discussion of phylogenetic relationships of the Silvanidae. Coleopterists Bulletin 38: 42–55.

Wilson, J. W. 1930. The genitalia and wing venation of Cucujoidea and related families. Annals of the Entomological Society of America 23: 305–358.