

## *Palaeocryptorhynchus burmanus*, a new genus and species of Early Cretaceous weevils (Coleoptera: Curculionidae) in Burmese amber

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### ABSTRACT

*Palaeocryptorhynchus burmanus* gen. et sp. nov. (Coleoptera: Curculionidae: Cryptorhynchinae) is described from Cretaceous Burmese amber. The fossil is notable for its unique femora interlocking mechanism consisting of a flange on the basal third of the profemur that inserts into a groove along the basal portion of the mesofemur and the elongate, spatulate rostrum.

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### 1. Introduction

Weevils of the family Curculionidae (often considered “modern” weevils) are rare in Mesozoic deposits (Arnoldi, 1977; Gratshev and Zherikhin, 2003; Ponomarenko, 1995). Up to the present, only two fossils have been reported, both from the Cretaceous. One is *Dorotheus guidensis* Kuschel (1959), a member of the Brachycerinae from Late Cretaceous Maestrichtian deposits in Chile. The second is a specimen in Early Cretaceous Burmese amber that was collected from the same deposits as the present fossil (Poinar and Brown, in press). This study describes a Burmese amber weevil in the subfamily Cryptorhynchinae, providing the first record of this subfamily from the Mesozoic.

### 2. Materials and methods

The amber piece containing the weevil is roughly trapezoidal in outline, with the top measuring 10 mm, the bottom 5 mm and the sides each 4 mm. Observations, drawings, and photographs were made with a Nikon SMZ-10 R stereoscopic microscope and Nikon Optiphot compound microscope with magnifications up to 700×. The amber was obtained from a mine first excavated in 2001 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 for the amber (Poinar et al., 2007a). The Burmese amber weevil is well preserved and complete, with all its appendages still attached (Fig. 1). The right side is partially obscured by a fracture and hyphae of a saprophytic fungus.

### 3. Systematic palaeontology

Order Coleoptera Linnaeus, 1758  
Family Curculionidae Latreille, 1802  
Subfamily Cryptorhynchinae Schönherr, 1825

Genus *Palaeocryptorhynchus* gen. nov.

*Type species. Palaeocryptorhynchus burmanus* gen. nov., sp. nov.

*Diagnosis.* Cryptorhynchine Curculionidae with scales, elongate spatulate rostrum retracted into a median channel (ventral or pectoral groove) terminating sharply in a mesosternal receptacle, pronotum extended over head, femora toothed, tibia with terminal, simple uncus, elytra lacking prominent humeri, and a covered pygidium. Distinguished from extant members of the subfamily by

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having a femoral interlocking mechanism consisting of a flange on the basal third of the profemur that inserts into a groove extending along the basal portion of the mesofemur.

**Description.** Medium sized (6.7 mm) weevils densely covered with oval-orbiculate scales and punctures; head partially covered by pronotal extension; post-ocular lobes short, with eyes partly covered when rostrum apex is retracted; eyes coarsely faceted, separated by width of rostrum; rostrum long, slender, curved and expanded toward apex, retracted in mesosternal receptacle at end of ventral furrow; receptacle positioned between procoxae; pronotum as long as wide, base weakly bisinuate; femora thickened, with robust, ventral tooth positioned near middle; tibial apices with well-developed, nearly straight uncus; tarsomere 3 distinctly bilobed, tarsomere 5 elongate, bearing paired, divaricate, simple claws; tarsomeres 2 and 3 with ventral hair pads; scutellum squamose; elytra oval, lacking prominent humeri, with declivity at terminus; elytral striae with large punctures; striae alternating with ridges; pygidium covered.

**Composition.** Monobasic.

**Etymology.** - *Palaeo* is from the Greek “paleous” for old and “cryptorhynchus” is for an extant genus in the subfamily whose characters closely resemble those of the fossil.

**Notes.** The overall structure of the fossil and the insertion of the rostrum into a ventral furrow is characteristic of members of the subfamily Cryptorhynchinae. While this condition also occurs in some Ceutorhynchinae and Desmidophorinae of the Bracyceridae (Thompson, 1992), members of the latter subfamily lack or have imperfect tibial unci (Thompson, 1992). The distinct unci of the fossil show its relationship with Cryptorhynchinae, rather than Brachycerinae. Another character used to separate the two subfamilies is the presence of sclerolepidia, minute, delicate structures positioned along the metasternal border. While the desmidophorines lack these structures, the cryptorhynchines often possess them (Lyal et al., 2006; Kuschel, 1995). While a row of specks along the metasternal border of the fossil could be interpreted as sclerolepidia, it is not possible to identify them with certainty, thus this character cannot be used. A third cryptorhynchine character, which is possessed by the fossil, is that the rostrum is retracted in a ventral furrow that ends in a sharply delineated mesosternal receptacle or cup (Oberprieler et al., 2007; R. T. Thompson, personal communication, June 2, 2008). Desmidophorines tend to be plump with a more robust rostrum than occurs in the fossil and usually have tufts on setae on the elytra (Morimoto and Kojima, 2006). The fossil can be separated from members of the Ceutorhynchinae because of its large size and mesothoracic epimera between the base of the pronotum and elytra being masked from above. These characters, especially the well-formed tibial uncus and sharply delineated mesosternal receptacle or raised cup at the end of the ventral furrow, support the placement of the fossil in the subfamily Cryptorhynchinae.

*Palaeocryptorhynchus burmanus* sp. nov. (Figs. 1–7)

**Material.** Holotype female in Burmese amber from the Hukawng Valley, deposited in the Poinar amber collection (accession # B-C-42) maintained at Oregon State University. No additional specimens are known.

**Diagnosis.** As for genus.

**Description.** Length = 6.7 mm. Shape oblong, robust, densely covered with dull black and whitish scales and variously sized punctures; head deflexed, brown, partly covered by pronotal extension, length exposed portion of head = 600  $\mu$ m, width head = 850  $\mu$ m; rostrum long, slender, bi-carinate, as long as head and pronotum combined, slightly curved and flattened toward apex, narrow with spatulate tip in dorsal view, length = 2.5 mm; eyes prominent, narrowly separated by base of rostrum, only partly covered by ocular lobes when rostrum is retracted; thorax

constricted at apex, forming collar that extends 470  $\mu$ m over head; width of collar = 1.1 mm; pronotum densely punctate, base bisinuate, notum with single, longitudinal, black scale line on either side of median ridge, length pronotum = 2.1 mm; width pronotum = 2.1 mm; femora long, each with sharp medial tooth ranging from 380–390  $\mu$ m at base and 232–250  $\mu$ m in height; basal third portion of forefemur bearing posterior flange that inserts into groove extending along basal portion of mesofemur; tibiae slightly shorter than femora, each tibia with a terminal, simple, uncus ranging from 180 to 205  $\mu$ m in length; corbels not seen; tarsal claws divaricate, simple; elytra brown with black scale patterns, length elytra = 4.3 mm, height elytra = 1.3 mm, humeral angles obtusely rounded, sides parallel to about middle; elytron with 10 striae, each with a single row of large punctures and scales; striae separated by prominent and constant costae; abdominal ventrites black; tip of abdomen covered by elytra.

**Etymology.** - *burmanus* is for the type locality.

**Type locality.** Hukawng Valley, southwest of Maingkhwan in the state of Kachin (26°20'N, 96°36'E) in Burma (Myanmar).

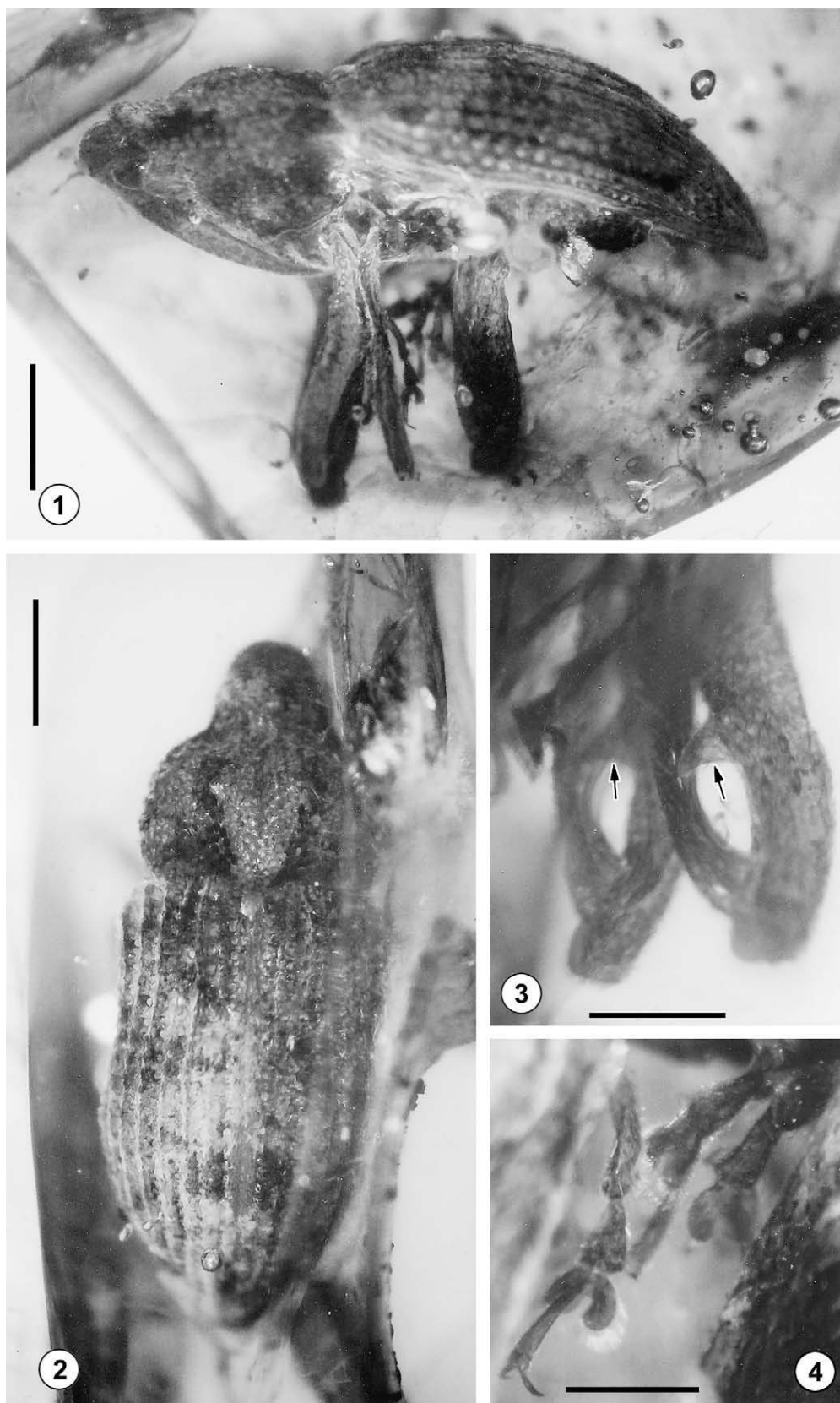
#### 4. Discussion

One of the most interesting characters of the fossil is its apparent ability to interlock the equally thickened pro and mesofemora. A similar condition could not be found in the literature or noted on any images or specimens of Cryptorhynchinae. The basal third of the profemur is expanded into a flange that inserts into a groove along the basal portion of the mesofemur (Fig. 7). The mechanism is unique and the function of such an interlocking device is undoubtedly associated with the weevil's biology. The presence of a notch on the right side of the tip of the rostrum (Fig. 6) could have resulted from a congenital malformation or a predator.

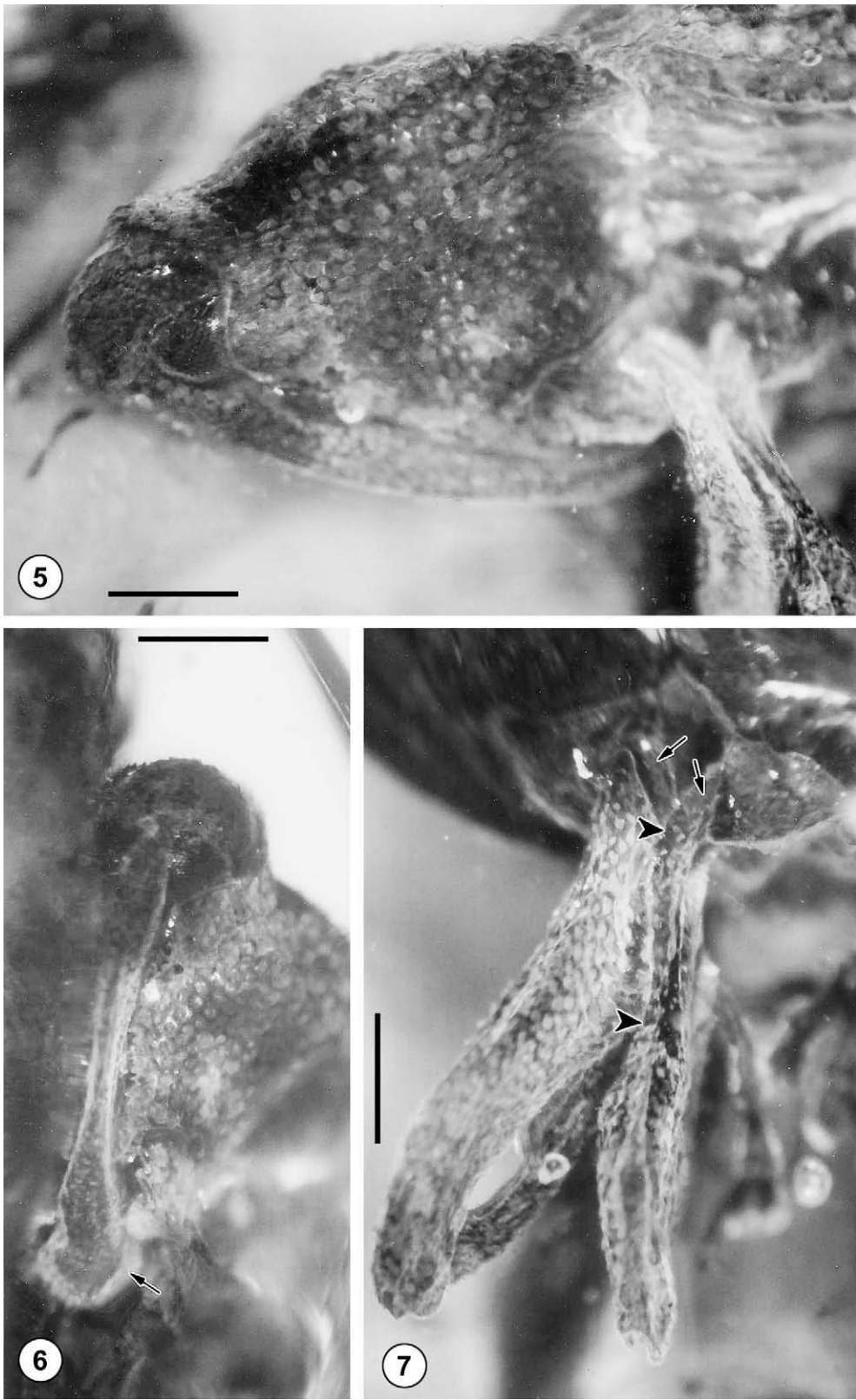
All previously known fossil Cryptorhynchinae are from the Tertiary and most are sedimentary fossils (*Cryptorhynchus annosus* Scudder 1876, *C. gypsi* Oustalet 1874, *C. renudus* Heyden 1862 and *C. sp.* Foerster, 1889) (Scudder, 1890, 1891, 1893). All of these species are much smaller (all under 4 mm in length) than *P. burmanus* and none has prominent postocular lobes. The only previously described amber cryptorhynchines are *Cryptorhynchus hurdi* Zimmerman and *C. species 1* Zimmerman and *C. species 2* Zimmerman from Tertiary Mexican amber (Zimmerman, 1971). *Cryptorhynchus species 2* is only fragmentary, *Cryptorhynchus species 1* is only 2.5 mm in length and while *C. hurdi* is 4.8 mm in length, its eyes are completely concealed by large postocular lobes.

The present fossil is the oldest representative of the Cryptorhynchinae and the first record of this subfamily from the Mesozoic. It provides clear evidence that the Curculionidae were diversifying in the Early Cretaceous. The food habits of present day members of the Cryptorhynchinae are diverse. Apparently most, if not all, tropical forms, to which *Palaeocryptorhynchus* would belong, develop as borers in decaying or healthy bark, stems, roots, tubers and fruits of angiosperms (Kalshoven, 1981). Likewise, the temperate species of *Conotrachelus* Dejean 1835 in the North Central United States are all limited to angiosperms (Schoof, 1942). Several angiosperms have been described from the same fossil deposits (Poinar, 2004; Poinar and Chambers, 2005; Poinar et al., 2007b) showing that in Southeast Asia during the Early Cretaceous, cryptorhynchines were co-evolving with flowering plants.

However, some members of the subfamily also develop on gymnosperms. *Conotrachelus neomexicana* Fall feeds on seeds of *Pinus ponderosa* in northern Arizona (Blake et al., 1989) and some cryptorhynchines in New Zealand develop in dead wood of the araucarian, *Agathis australis* (D. Don) Lindl. (Ecroyd, 1982). Thus it is possible that *Palaeocryptorhynchus* developed in the tree that formed the amber in Myanmar.



**Figs. 1–4.** . Holotype of *Palaeocryptorhynchus burmanus* Poinar, gen. nov., sp. nov. 1, Lateral view. Scale 1.2 mm. 2, Dorsal view. Scale 1.2 mm. 3, Tooth on pro and mesofemurs (arrows). Scale 500  $\mu$ m. 4, Tarsi. Scale 500  $\mu$ m.



**Figs. 5–7.** Holotype of *Palaeocryptorhynchus burmanus* Poinar, gen. nov., sp. nov. 5, Head and prothorax. Note scales. Scale 400  $\mu\text{m}$ . 6, Ventral view of head and rostrum. Arrow shows sharply delineated mesosternal receptacle that receives the tip of the rostrum. Scale 630  $\mu\text{m}$ . 7, Pro and mesofemurs. Arrows show adjacent trochanters. Interlocked portions of adjacent femurs are indicated by distance between arrowheads. Scale 500  $\mu\text{m}$ .

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