

**ANCHINEUS DOLICHOBOTHRIS, A NEW GENUS AND SPECIES OF
EARLY CRETACEOUS WEEVILS (CURCULIONOIDEA: COLEOPTERA) IN
BURMESE AMBER**

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Abstract.—A new genus and species of weevils (Coleoptera: Curculionidae: *Anchineus dolichobothris* Poinar and Brown) are described from Cretaceous Burmese amber. The new family is characterized by: a long, narrow rostrum in the upper position, geniculate antennae with a loosely compact club, antennal scrobes extending the length of the rostrum, a lobed fifth tarsal segment, small trochanters, a well developed unguitactor plate, divaricate, toothed, tarsal claws and unequal ventrites.

Key Words: *Anchineus* n. gen., *Anchineus dolichobothris* n. sp., Burmese amber, Early Cretaceous, Curculionidae

Mesozoic weevils have been little studied and with the exception of two species assigned to the subfamily Mesophyletinae (*Mesophyletis calhouni* Poinar 2006 and *Cretonanophyes longirostris* Zherikhin 1977) in the extinct family Eccoptarthridae (Poinar 2006), all possess straight antennae and fall into the primitive weevil Division Orthoceri (Arnoldi 1977; Alonso-Zarazaga and Lyal 1999; Gratshev and Zherikhin 2003; Ponomarenko 1995; Zimmerman 1993, 1994a). The present study describes a new family of weevils in Early Cretaceous Burmese amber that possesses unusual morphological characters.

MATERIALS AND METHODS

The amber piece containing the fossil is roughly rectangular in outline, measuring 7 mm long by 4 mm wide and 2 mm in depth. 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 derived 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 Noiye 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 Noiye Bum 2001 Summit site indicate an araucarian (possibly *Agathis*) tree source for the amber (Poinar et al. 2007).

The Burmese amber weevil is well preserved and complete, with all its

appendages still attached (Fig. 1). Only the pronotum is partially collapsed, resulting in some distortion. The specimen is tentatively placed in the family Curculionidae but could not be accommodated in an extant or extinct genus based on its morphological characters (Thompson 1992; Kuschel 1995; Zimmerman 1993, 1994a, b; Blatchley and Leng 1916), thus it is described below in a new genus.

Superfamily Curculionoidea Latreille,
1802

Family Curculionidae Latreille, 1802

***Anchineus* Poinar and Brown, new genus**

Type species: *Anchineus dolichobothris*
Poinar and Brown

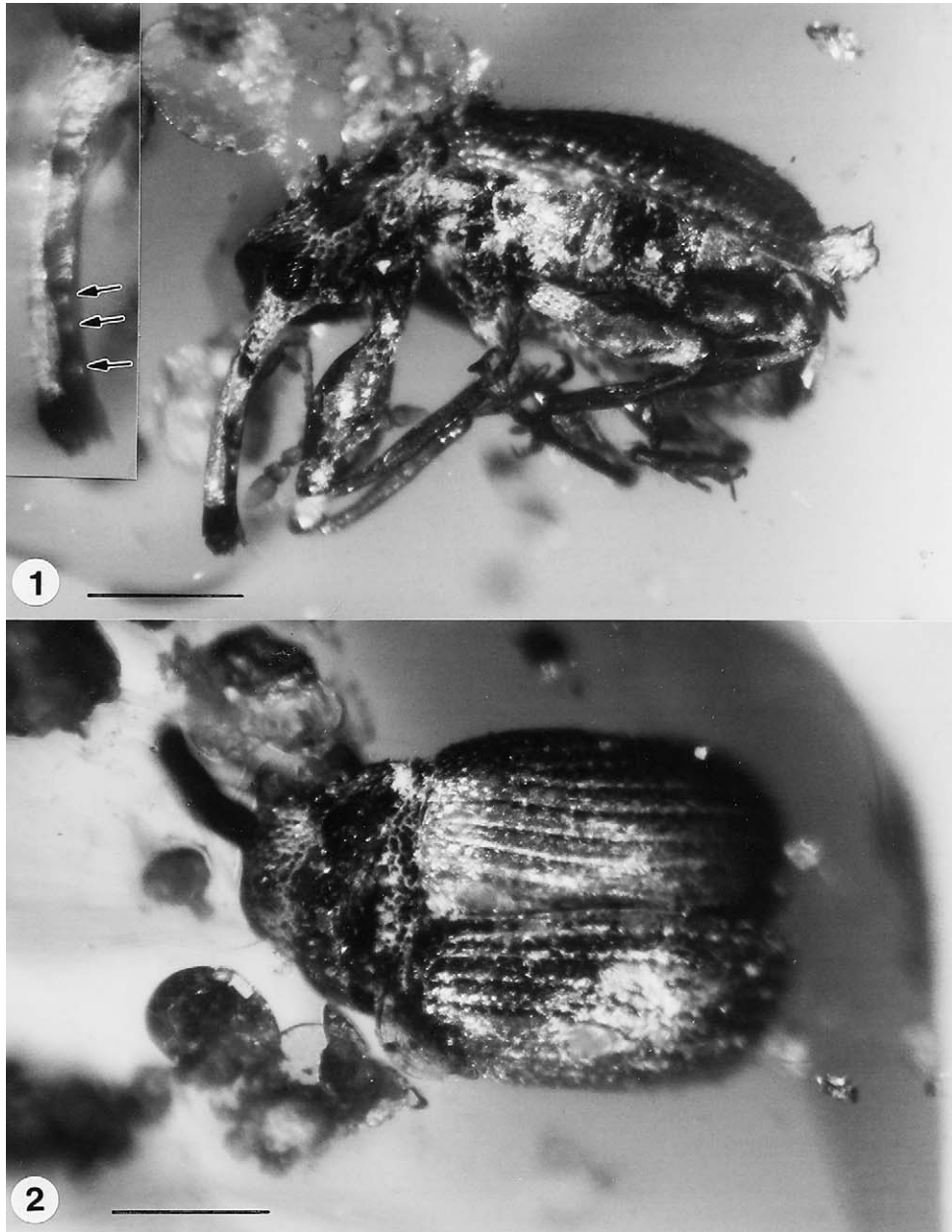
Description.—Very small weevils; rostrum long, slender, slightly curved; antennae elbowed (geniculate), funicle with 7 segments; scape longer than first three funicular segments, attached toward apex; scape not reaching anterior border of eye; scape/funicle ratio, 0.69; antennal insertions on side of rostrum; antennal scrobes elongate, extending nearly entire length of the rostrum to accommodate all portions of antenna; club 3-segmented, loose; eyes round, small, positioned on dorsal-lateral side of head; pronotum transverse; legs long; trochanters short, triangular to subquadrate; femur attached to side of small trochanter; all femora thickened, unarmed; tibia straight, apices with short spines and fringe of clothing setae; tarsomere 2 emarginate, tarsomere 3 distinctly bilobed, tarsomere 4 reduced, positioned between lobes of tarsomere 3, tarsomere 5 extended and bilobed at apex; large unguitactor plate positioned between lobes of fifth tarsal segment; claws paired, divaricate, with broad tooth at base; elytra broad, concave, striate, surface covered with rows of coarse granules interspersed with tubercles; scutellum present, triangular; wings present;

ventrites unequal in length, first two long, 3rd and 4th short and 5th long, all with straight sutures; pygidium probably slightly exposed.

Diagnosis.—The geniculate antennae, elongate scape, vertical mandibles and antennal scrobes separate *Anchineus* from all Mesozoic weevils except *Cretonanophyes longirostris* Zherikhin (in Arnoldi 1977) and *Mesophyletis calhouni* Poinar (2006). *Anchineus* differs from *Cretonanophyes* by its shorter rostrum, subequal ventrites, more elongate body and dentate claws. From *Mesophyletis*, *Anchineus* differs in lacking elongated trochanters with the femur attached to their apices and pedunculated lobes of the third tarsal segments but in possessing prolonged antennal scrobes extending the length of the rostrum.

In his treatise on Australian weevils, Zimmerman (1993, 1994a, b) divided the Superfamily Curculionoidea into three Divisions. The Orthoceri included the primitive weevils with straight antennae, the Gonatoceri contained the advanced weevils with geniculate antennae and the Heteromorphi consisted of those species that did not clearly belong to either of the above, but showed some features of each. Based on the antennal characters, the fossil would fall in the Gonatoceri. The loose antennal club and unusual tarsal and scrobal characters makes it difficult to place the fossil in a particular subfamily or tribe. Employing phylogenetic analysis to determine its placement (Marvaldi et al. 2002) is not feasible since most of the unique characters of the fossil are not included in these analyses and many of the characters that are used, such as genital structures, are not visible on the fossil.

The fossil shares many characteristics with members of the Caridae, such as a 7-segmented funicle with a loose antennal club, antennae inserted on the sides of the rostrum, tarsi with divaricate claws and leveled and subequal abdom-



Figs. 1–2. *Anchineus dolichobothris* in Burmese amber. 1, Lateral view (left side) of holotype female. Bar = 400 μ m. Insert shows scrobe extending length of rostrum. Arrows show depressions in scrobe for possible reception of club segments. 2, Dorsal view of holotype female. Bar = 368 μ m.

inal ventrites. However carids do not have geniculate antennae.

Although *Anchineus* superficially resembles members of the Apionidae and has some features of this family, such as a 7-jointed funicle and bifid claws, apionids

typically have straight antennae with fused antennal clubs. Characters *Anchineus* shares with the Nanophyidae are geniculate antennae with a loosely 3 segmented antennal club, however nanophyids have antennal funicles with only 4–

6 segments, the mesocoxal cavities are well separated, the tarsal claws are not toothed and the ventrites are curved at the sides.

Anchineus also has features found in members of the Late Jurassic family Eobelidae as defined by Arnoldi (1977). The eobelids have 11-segmented antennae with a loose club, well-developed eyes and a pronotum with a lateral carina, but they have straight antennae. Another basic character of the eobelids is that the head steeply descends to the base of the rostrum so that the lower angle of the rostrum is in the same plane as the lower margin of the head. Such a "lower placement of the rostrum" is considered a relictual character and exists today in only a few weevils (Arnoldi 1977). Modern weevils have a middle or upper position of the rostrum, which is the condition in *Anchineus*.

Since *Anchineus* has geniculate antennae, well-developed scrobes, an upper position of the rostrum and small trochanters, its tentative placement in the family Curculionidae seems reasonable, even though the great majority of taxa in this family have compact antennal clubs (Thompson 1992). The age of the fossil and the unusual nature of the tarsi and antennal scrobes (anterior as well as posterior to the antennal insertion) suggests that *Anchineus* might belong to a completely separate weevil lineage. This could explain the possible nonhomology of the above characters with that of extant "higher" weevils.

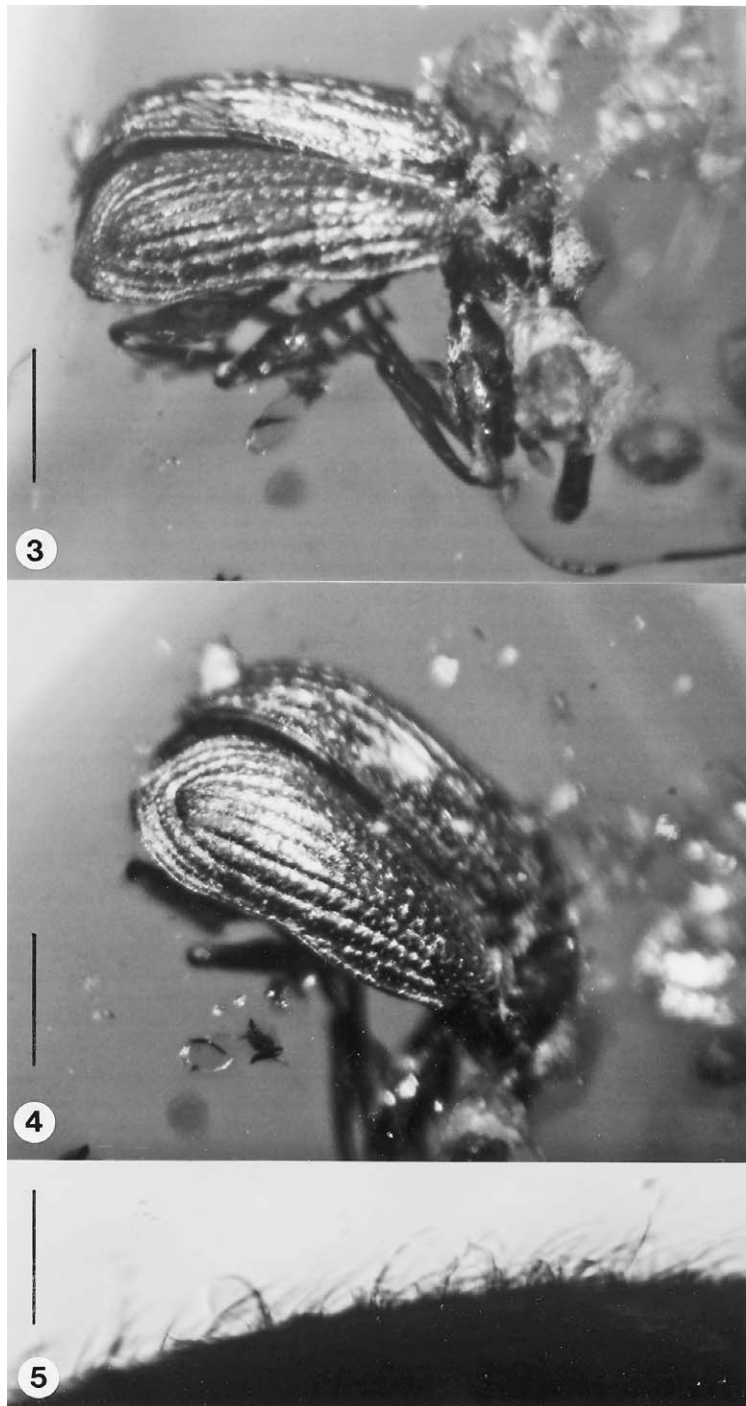
Etymology.—*Anchineus* is from the Greek "anchi" for near and the Greek "neos" for new or recent in reference to certain characters (geniculate antennae, trochanters) that resemble those of extant weevils. The gender is masculine.

***Anchineus dolichobothris* Poinar and Brown, new species**
(Figs. 1–10)

Description.—Female; characters as listed under the generic diagnosis. Body length 1.6 mm.

Head: Head deflexed; epistome slightly protruding; mandibles vertical, two notched, with three rounded teeth, with lower two extending forward beyond level of uppermost one; maxillary palps 3-segmented, projecting antero-laterad; lacinia prominent, with row of short setae; only tips of labial palps exposed; eyes round, prominent, coarsely granulate, located at base of rostrum on lateral side of head, eye diameter = 175 μm ; rostrum long, slender, curved, widened slightly at apex, antennal scape 238 μm long, insertion point at 45% of rostral length from tip; scape slender, widest at tip, longer than combined first three funicular segments; antennal funicle with 7 segments, length funicular segments; 1: 84 μm , 2: 70 μm , 3: 49 μm , 4: 35 μm , 5: 35 μm , 6: 35 μm , 7: 35 μm ; ratio of scape/funicle, 0.69; first and second funicular segments sub-equal in length; funicular segments with sparse hair bands; club composed of three loosely joined segments, length of club segments; 1: 56 μm , 2: 56 μm , 3: 112 μm ; club segments with sparse hairs; scrobes sulciform and foveiform.

Thorax: Black, pronotum transverse, lacking ocular lobes, with basal transverse ridge reaching right angles; width at apex, 480 μm , width at base, 644 μm , length 500 μm , flat, sparsely pubescent, procoxae prominent, separated by narrow prosternal process; mesocoxae closely approximate; metacoxae well separated; femora clavate, proximal portions somewhat truncated, unarmed; tibia elongate, bearing 3 apical spurs and long, clothing setae; tarsi 5-segmented, first tarsal segment truncate; second segment emarginate; third segment bifid with elongate lobes; fourth segment reduced; fifth segment elongated with apex separated by large unguitactor plate, resulting in bilobed condition; tarsal claws divaricate, dentate; elytra metallic black, with prominent shoulders, tapering posteriorly, vestiture



Figs. 3–5. *Anchineus dolichobothris* in Burmese amber. 3, Lateral dorsal view (right side) of holotype female. Bar = 353 μm . 4, Dorsal posterior view (right side) of holotype female. Bar = 353 μm . 5, Vestiture on surface of elytra. Bar = 65 μm .



Figs. 6-9. *Anchineus dolichobothris* in Burmese amber. 6, Lateral view of rostrum with left antenna. Note flexure between the first and second funicular segments. Arrows show funicular segments. Bar = 107 μm . 7, Detail of lateral view of tip of rostrum with protruding three-toothed mandibles and 3-segmented maxillary palps projecting antero-laterad. Arrow shows labial palp. Arrowhead shows galea. Bar = 60 μm . 8, Detail of claw. Arrow shows tooth. Bar = 48 μm . 9, Terminal mesotarsomeres. Arrowhead shows terminal lobe of fifth tarsomere. Arrow shows unguitactor plate with attached claws. Bar = 55 μm .

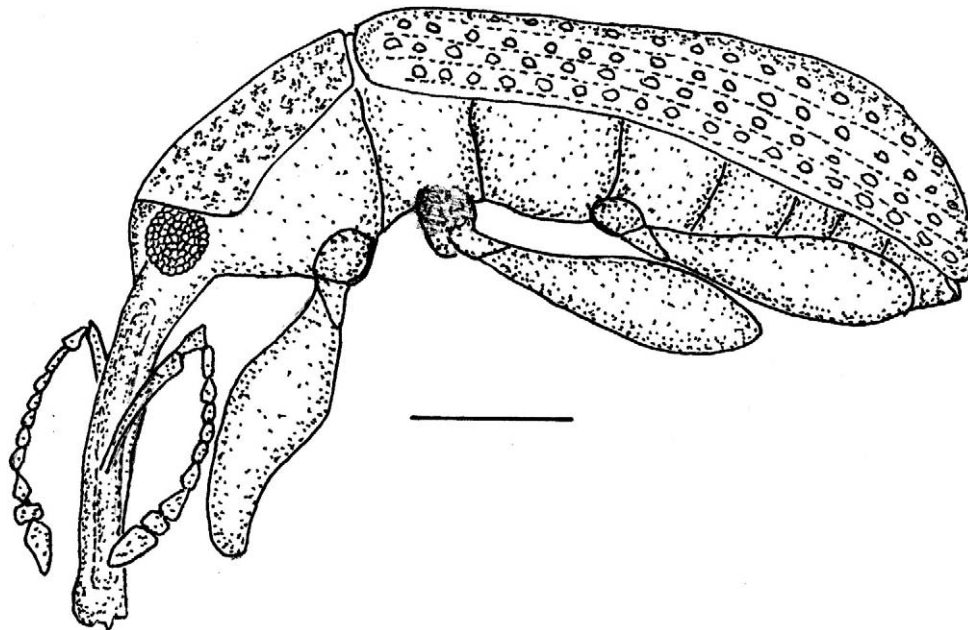


Fig. 10. Lateral view of *Anchineus dolichobothris* showing rostrum, antenna, trochanters and ventrites. Bar = 290 μ m.

sparse; elytron with 10 striae; elytral apices bluntly rounded; elytral surface covered with minute protuberances; scutellum triangular, scutellar striole absent.

Abdomen: Length, 1.05 mm; with five free, straight, metallic, black ventrites; 2nd and 3rd ventrites shorter than remainder; tip of abdomen rounded; pygidium probably slightly exposed (difficult to determine since elytra are partly open).

Male.—Unknown

Material examined.—Holotype female in Burmese amber from the Hukawng Valley, deposited in the Poinar amber collection (accession # B-C-41) maintained at Oregon State University.

Etymology.—*dolichobothris* is from the Greek “*dolichos*” for long and the Greek “*bothros*” for trench or trough, in reference to the extended scrobes. The gender is masculine.

DISCUSSION

The elongate, foveiform scrobes with depressions for the reception of the club

segments is an interesting adaptation and suggests that in repose, the funicle and club were partially inserted into the rostrum. On the left antenna, the flexation of the funicle (the elbow) is between the first and second funicular joints (doubly geniculate?), however this could be an artifact since the first funicular segment appears to be pulled away from the pedicel, even though the two are still touching. On the right antenna, the flexation is between the scape and first funicular segment, which is the normal orientation in weevils with geniculate antennae.

Also of interest is the well-developed unguitractor plate on the pretarsus of the fossil and its insertion into the tip of the fifth tarsal segment. The plate is invaginated so far into the fifth tarsal segment that it bisects the apex, resulting in a lobed fifth segment, which is an unusual condition for weevils.

Another curious condition of the fossil is the orientation of the mandibles. While most adult weevils have dorsally-ventral-

ly flattened mandibles that move horizontally, the mandibles in the fossil are laterally flattened and would have moved vertically. Vertical mandibles seem to have arisen independently in several taxonomically diverse groups, such as in *Curculio* L. in the Curculionidae, *Antliarhinus* Schönherr in the Antliarhinidae and *Allochorhynus* Sharp in the Allochorhynidae (Ting, 1936) and also appears on *Mesophyletis* (Poinar, 2006).

The bi-lobed tarsi and robust claws suggest that *Anchineus* was an arboreal species (Blatchley and Leng 1916). The long rostrum and rounded, vertical mandibles suggests that it could have fed and possibly oviposited in plant tissues, such as stems, developing flowers and soft fruits. Members of the genus *Curculio*, which also have long rostrums and blunt, vertical mandibles, bore into developing fruits (acorns, hazelnuts, etc) to feed and deposit their eggs (Blatchley and Leng 1916).

ACKNOWLEDGMENTS

Grateful appreciation is extended to Willy Kuschel for discussions on various characters of the specimen and its possible systematic placement. The authors also thank Stanislav Gorb for confirming the identity of the unguitactor plate and Roberta Poinar for comments on earlier drafts of this manuscript.

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