

Supplementary Information for

***Kekveus brevisulcatus* sp. nov., a new featherwing beetle from mid-Cretaceous amber of northern Myanmar (Coleoptera: Ptiliidae)**

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**List of all Supplementary Information:**

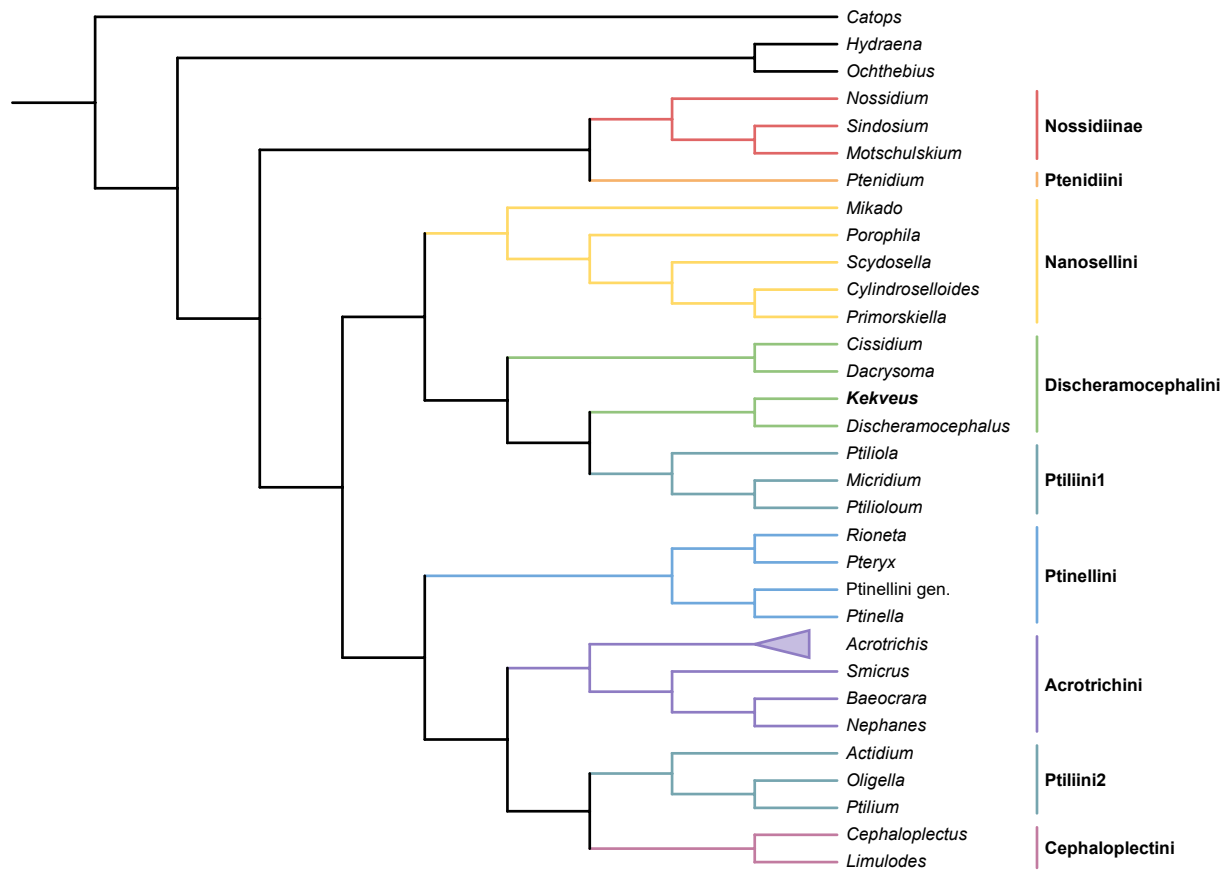
**Figure S1.** Placement of *Kekveus* within Ptiliidae, analyzed based on the matrix by Polilov et al. (2019a). Tree resulting from the constrained parsimony analysis under implied weights.

**Figure S2.** Relationship between *Kekveus brevisulcatus* and other Discheramocephalini, analyzed based on the matrix by Grebennikov (2009). Tree resulting from the constrained Bayesian analysis.

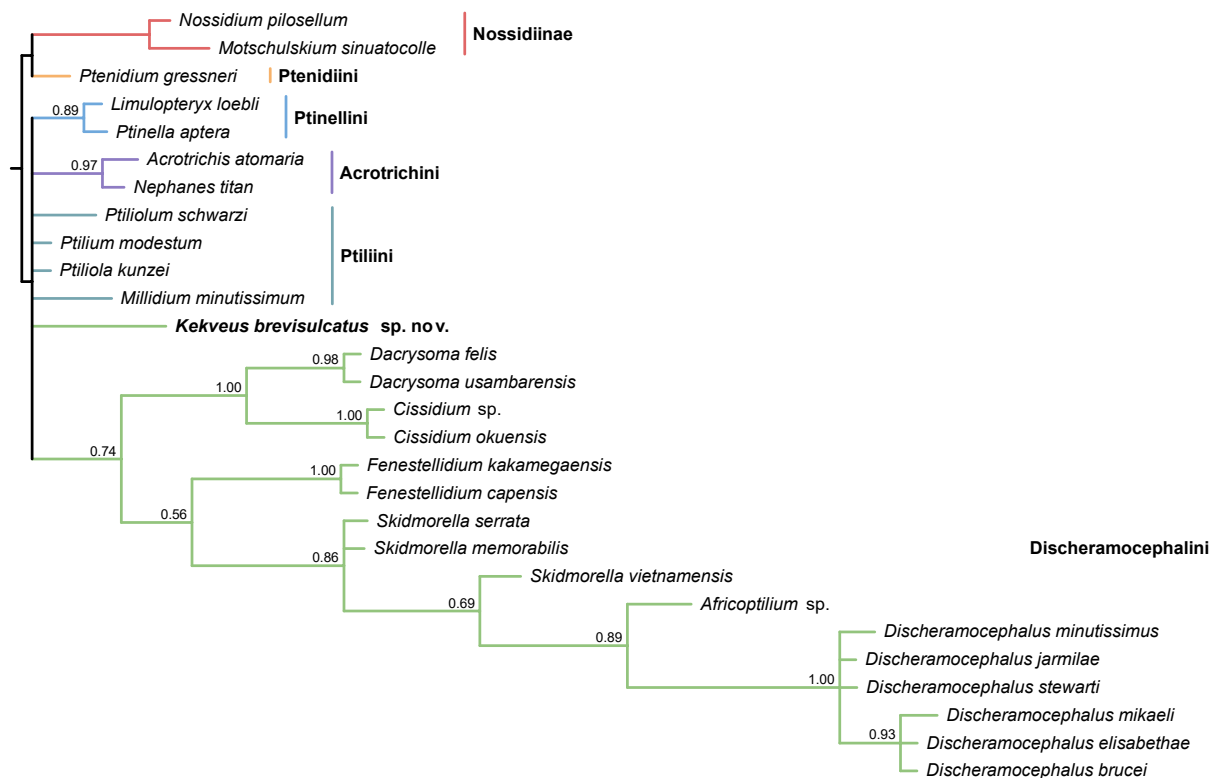
**Data S1.** List of characters used in the phylogenetic analyses based on Polilov et al. (2019a).

**Data S2.** List of characters used in the phylogenetic analyses based on Grebennikov (2009).

**Data S3.** Morphological datasets used for the analyses.



**Figure S1.** Placement of *Kekveus* within Ptiliidae, analyzed based on the matrix by Polilov et al. (2019a). Tree resulting from the constrained parsimony analysis under implied weights.



**Figure S2.** Relationship between *Kekveus brevisulcatus* and other Discheramocephalini, analyzed based on the matrix by Grebennikov (2009). Tree resulting from the constrained Bayesian analysis.

**Data S1.** List of characters used in the phylogenetic analyses based on Polilov et al. (2019a).

- 1 Orientation of head: (0) not distinctly deflexed; (1) strongly deflexed, frons and postclypeus in ventral position.
- 2 Epistomal ridge: (0) present; (1) absent.
- 3 Gular sutures: (0) present; (1) absent.
- 4 Transverse ventral genal bulge: (0) absent; (1) present.
- 5 Compound eyes: (0) present in all specimens; (1) dimorphic; (2) absent in all specimens.
- 6 Antennal grooves: (0) absent; (1) present, shallow; (2) present, distinct.
- 7 Number of antennomeres: (0) 11; (1) 10; (2) 9; (3) 8.
- 8 Insertion of flagellomere 1: (0) flagellomere 1 not retracted into pedicel; (1) flagellomere 1 distinctly retracted into pedicel and proximal flagellum distinctly narrower than the pedicel; (2) flagellomere 1 distinctly retracted into pedicel, flagellomere 1 and pedicel forming a continuous cylindrical structure.
- 9 Antennal club: (0) absent, antennae filiform or gradually widening distally; (1) 5-segmented; (2) 3-segmented (3) entire flagellum club-shaped, with short cylindrical flagellomeres.
- 10 Labral-mandibular locking mechanism: (0) absent; (1) present.
- 11 Shape of mandible: (0) apical part of mandibles distinct and prominent; (1) distal part shortened, not prominent; (2) distal part reduced.
- 12 Number of segments of galea: (1) two-segmented, with distinct suture; (2) one-segmented.
- 13 Shape of apical maxillary palpomere: (0) not aciculate; (1) aciculate.
- 14 Base of mentum: (0) separated from submentum by suture; (1) fused with submentum.
- 15 Shape of mentum: (0) wider than long, greatest width at base; (1) approximately as long as wide, or slightly longer than wide, with sides subparallel; (2) approximately as long as wide, dilated medially; (3) longer than wide, dilated in middle region.
- 16 Lateral premental lobes: (0) distinctly developed; (1) vestigial.
- 17 Palpiger: (0) separated from prementum; (1) fused.
- 18 Number of labial palpomeres: (0) 3; (1) 2; (2) 1.
- 19 Laminatentorium: (0) present; (1) absent.
- 20 Dorsal arms of tentorium: (0) present; (1) absent.
- 21 Cervical sclerites: (0) present; (1) absent.
- 22 Location of greatest width of pronotum: (0) in posterior half; (1) in middle region; (2) in anterior half.
- 23 Posterior pronotal angles: (0) not or only moderately produced posteriorly, not closely clinging to elytral humeri; (1) strongly prolonged and closely clinging to elytral humeri.
- 24 Microsculpture of dorsal surface of pronotum and elytra: (0) smooth or punctate; (1) distinctly reticulate or scaly.
- 25 Microsculpture of ventral surface of thoracic segments: (0) smooth or punctate; (1) distinctly reticulate or scaly; (2) dense vestiture of short hairs forming plastron.
- 26 Sculpture of pronotum: (0) smooth or finely sculptured; (1) with large rounded impressions; (2) with deep longitudinal impressions; (3) with large and deep impressions of irregular shape.
- 27 Pubescence of pronotum and elytra: (0) homogeneous; (1) with two types of hairs.
- 28 Hypomer al antennal pocket: (0) absent; (1) present.
- 29 Prothoracic ectodermal glands along lateral margins of prothorax: (0) absent; (1) present.
- 30 Prosternal process between procoxae: (0) present, moderately wide, at least partly separating procoxae; (1) present but narrow; (2) extremely short or absent, procoxae contiguous; (3) elongate and broad, extending beyond mesoventrite.

- 31 Extension of elytra: (0) covering entire dorsum of abdomen; (1) apical 2–3 abdominal tergites remaining uncovered.
- 32 Cuticular folds on inner elytral surface: (0) absent; (1) present.
- 33 Horizontally oriented deep fossa on each side of mesoventral keel: (0) absent; (1) present.
- 34 Mesopleuron: (0) separated from ventrite; (1) partly fused with ventrite; (2) completely fused.
- 35 Shape of meso- and metaventral processes between metacoxae: (0) mesoventral process ending near middle region of mesocoxae with distinct suture; (1) mesoventral process ending at posterior margin of mesocoxae with distinct suture; (2) mesoventral process projecting beyond posterior mesocoxal margin; (3) boundary between mesoventral process and metaventrite indiscernible, mesocoxae separated by narrow process; (4) boundary between mesoventral process and metaventrite discernible, with mesocoxae separated by wide process; (5) metaventral process wider than metacoxae, anteriorly directed, fused with mesoventral process.
- 36 Length of metaventrite: (0) longer than diameter of mesocoxae; (1) similar to diameter of mesocoxae.
- 37 Longitudinal impression along anterior margin of metaventrite: (0) absent; (1) present.
- 38 Metaventral lines: (0) absent; (1) present, reaching anterolateral angle of metaventrite; (2) present, reaching lateral margins of mesocoxae anteriorly.
- 39 Shape of metendosternite: (0) common stem short, arms long; (1) common stem widened and flattened, arms long; (2) common stem represented by thin wide transverse element, arms widely separated, long; (3) common stem short, arms long but thin and weakly sclerotized; (4) metendosternite compact, anterior arms short.
- 40 Apical muscular disc of arm of metendosternite: (0) present; (1) absent.
- 41 Length of alacrista: (0) not reaching beyond hind margin of metapostnotum; (1) distinctly reaching beyond hind margin of metapostnotum; (2) reaching beyond abdominal tergite III.
- 42 Single spur on each side of anterior region of metascutellum: (0) absent; (1) present.
- 43 Shape of metacoxae: (0) wider than long, contiguous or very narrowly separated; (1) small, distinctly separated; (2) enlarged, widening towards medial margin, contiguous, with wide metacoxal plates covering metafemora; (3) flattened, extending towards lateral margin, with cavity for retracted legs below them.
- 44 Shape of mesotrochanter: (0) unmodified; (1) narrowed, elongated.
- 45 Shape of femora: (0) not broadened and flattened; (1) distinctly broadened and flattened.
- 46 Number of tarsomeres: (0) five; (1) three.
- 47 Insertion of basal tarsomere: (0) not retracted into tibial apex; (1) retracted into tibial apex.
- 48 Shape of apical tarsomeres: (0) cylindrical; (1) dilated and flattened.
- 49 Size of pretarsal claws: (0) equal in size; (1) subequal.
- 50 Wings: (0) present; (1) dimorphic, present in some individual and absent in others; (2) absent.
- 51 Wing base: (0) membranous wing blade with veins; (1) petiole without membranous wing blade (Fig. 4).
- 52 Arrangement of folded wings below elytra: (0) overlapping; (1) parallel arrangement without overlap below elytra.
- 53 Ratio of width of wing blade and length of setae along its margin: (0) wing blade much wider than length of setae; (1) wing blade width similar to length of setae; (2) wing blade less than half as wide as length of setae.
- 54 Vein cubitus anterior (CuA): (0) present; (1) absent. According to Polilov et al. (2019a), here the nossidiine genera are coded as CuA present.
- 55 Number of veins in petiole or wing base: (0) three or more; (1) two; (2) one.
- 56 Number of veins in wing blade: (0) four or more; (1) three; (2) two.

- 57** Number of setae along margin of wing: (0) > 200; (1) 60–200; (1) < 60.
- 58** Wing folding patches (WFPs) on abdominal tergites: (0) absent; (1) present on tergites II–VII; (2) present on tergites II–VI; (3) present on tergites II–V.
- 59** WFPs: (0) absent; (1) represented by denticles; (2) represented by cuticular folds.
- 60** Shape of pterothorax and abdomen: (0) subparallel and posteriorly rounded; (1) distinctly triangular, tapering towards abdominal apex.
- 61** Position of abdominal segments VIII and IX: (0) retracted; (1) everted.
- 62** Shape of seventh visible sternite: (0) undivided; (1) divided into two lobes.
- 63** Hind margin of tergite X (pygidium): (0) without teeth or with few small teeth; (1) with 1–3 distinct apical teeth; (2) with specific flattened central tooth (sometimes bifurcated); (3) with two widely separated teeth and third tooth between them apically (the latter can be absent).
- 64** Spermathecal sperm pump: (0) absent; (1) present.
- 65** Shape of spermatheca: (0) strongly curved; (1) spherical; (2) funnel-shaped; (3) horseshoe-shaped, often asymmetrical; (4) ring-shaped; (5) poorly sclerotized, irregularly shaped; (6) simple helical; (7) complex helical.
- 66** Position of aedeagus: (0) shifted towards lateral body region; (1) placed along midline.
- 67** Parameres of aedeagus: (0) present; (1) strongly reduced; (2) absent.
- 68** Shape of aedeagus: (0) elongated and round in cross-section; (1) shortened and oval in cross-section; (2) shortened and flattened.

**Data S2.** List of characters used in the phylogenetic analyses based on Grebennikov (2009).

- 1 Body in cross-section, height/width ratio: (0) >0.85; (1) 0.65–0.85; (2) <0.55.
- 2 Body between pronotum and elytra in dorsal view: (0) not or only slightly constricted; (1) constricted.
- 3 Body behind pronotum: (0) not swollen laterally and vertically; (1) markedly swollen laterally and vertically.
- 4 Scale-like microsculpture on pronotum, elytra, and most of the body: (0) absent; (1) present.
- 5 Longitudinally oriented micro-ridges on ventral surface of prothorax: (0) absent; (1) present.
- 6 Elytral setae: (0) not forming clearly demarked longitudinal rows; (1) forming seven or eight longitudinal rows.
- 7 Transversely oriented deep depression behind eyes: (0) absent; (1) present, as two large fossae not connected by a groove; (2) present, as two large fossae connected by a groove; (3) present as deep groove extending laterad and ventrad.
- 8 Group of some 100–200 small punctures forming transverse band on head behind eyes: (0) absent; (1) present.
- 9 Apical antennomere: (0) not constricted at middle, not dumbbell-shaped; (1) constricted at middle, dumbbell-shaped.
- 10 Two longitudinal or anteriorly convergent grooves on mentum: (0) absent; (1) present.
- 11 Pronotosternal suture: (0) present; (1) absent.
- 12 Posterior edge of pronotum at middle: (0) straight or convex; (1) concave.
- 13 Depressions (not punctures bearing single setae) of pronotal disc: (0) absent; (1) rounded, present along posterior edge; (2) present as developed grooves of at least half pronotal length.
- 14 Longitudinal keel on scutellum: (0) absent; (1) present, either short (one-third of the length) or long and weak; (2) present, sharp, about as long as scutellum.
- 15 Transverse row of 12–13 round punctures on base of elytra and scutellum: (0) absent; (1) present.
- 16 Two deep exoskeletal fossae on scutellum: (0) absent; (1) present.
- 17 Meso-metaventral suture between mesocoxae: (0) clearly visible and forming a delimited border between sclerites; (1) obliterated, both sclerites fully amalgamated.
- 18 Meso-metaventral suture laterad of mesocoxae: (0) present and clearly visible externally as an externally projecting keel; (1) present only as internal thickening of cuticle, not visible externally.
- 19 Serration along meso-metaventral suture laterad of mesocoxae: (0) absent; (1) present.
- 20 Metaventral longitudinal lateral lines: (0) absent; (1) present.
- 21 Horizontally oriented perforation of mesoventral keel: (0) absent; (1) present.
- 22 Shape of horizontal perforation of mesoventral keel as visible in lateral view: (0) round; (1) vertically elongate, almost parallel-sided, about 2× longer than wide.
- 23 Grooves on mesoventrite originating from fossae of mesoventral keel and extending laterad: (0) absent; (1) present.
- 24 Fossae in anterior lateral corners of mesoventrite: (0) absent; (1) present.
- 25 Metacoxae: (0) separated by around one-fifteenth of metaventral width; (1) separated by around one-eighth of metaventral width; (2) separated by around one-sixth of metaventral width; (3) separated by around one-quarter of metaventral width.
- 26 Metacoxae: (0) not transverse, less than 2× as wide as long; (1) transverse, more than 2× as wide as long.
- 27 Posteriorly oriented projection of metaventral plate between metacoxae: (0) without two lateral teeth; (1) with two lateral teeth.
- 28 Alacrista of metathorax at middle: (0) without setae along margins; (1) with short setae along margins.
- 29 Metascutellar spur on alacrista: (0) absent; (1) present.

- 30** Hindwinge: (0) not or partly narrowed, individual seta of fringe not longer than width of wing blade; (1) narrowed, individual seta of fringe longer than width of wing blade.
- 31** Cavities on abdominal sternite VIII: (0) absent; (1) present.
- 32** Abdominal glands: (0) absent; (1) present.
- 33** Group of about 50–70 closely adjacent round micropores transversely oriented along posterior edge of tergite VIII: (0) absent; (1) present.
- 34** Transverse rows of teeth-like serration of abdominal sternites: (0) absent; (1) present.
- 35** Tergites XI and X: (0) free, separated from each other; (1) merged together into a single plate.
- 36** Single elongate internal sclerite parallel to aedeagus: (0) absent; (1) present.
- 37** Parameres: (0) present; (1) absent.