Novitates Paleoentomologicae

No. 3, pp. 1–8 4 September 2013

A new genus and species of Baissidae in Late Cretaceous amber from New Jersey (Hymenoptera: Evanioidea)

Michael S. Engel[1]

Abstract. The extinct Mesozoic wasp family Baissidae is described from Late Cretaceous amber for the first time. ***Electrobaissa omega*** Engel, new genus and species, is described from an isolated male preserved in Turonian amber from New Jersey, and represents the latest occurrence of the family in the Mesozoic.

INTRODUCTION

While today the Evanioidea comprise only three families (Evaniidae and the closely related Aulacidae and Gasteruptiidae) and about 1200 species, during the Mesozoic a considerable diversity of evanioids were present including several extinct families (Grimaldi & Engel, 2005). One such family, the Baissidae, was first established by Rasnitsyn (1975) for an enigmatic species discovered at the famous Early Cretaceous (Berriasian) Lagerstätte of Baissa along the Vitim River in central Siberia. At the time, the affinities of the Baissidae were unclear and a subsequent genus that was more thoroughly known, *Manlaya* Rasnitsyn, was placed in the Aulacidae (Rasnitsyn, 1980). Rasnitsyn (1980) considered that the characters of *Manlaya* supported a unification of the families Aulacidae and Gasteruptiidae. Rasnitsyn (1986) eventually established a distinct subfamily for *Manlaya*, although shortly thereafter, he recognized the close affinity of *Baissa* Rasnitsyn and *Manlaya*, merging the two into a single subfamily within the then significantly expanded Gasteruptiidae. There seems little reason to unite aulacids, baissids, and kotujellitines into a single group, given the morphological and biological distinctiveness of the respective lineages and that gasteruptiids and Aulacidae are individually monophyletic and are in virtually universal usage in existing classifications and the literature. Demotion of aulacids within Gasteruptiidae only serves

[1] Division of Entomology, Natural History Museum, and Department of Ecology & Evolutionary Biology, 1501 Crestline Drive – Suite 140, University of Kansas, Lawrence, Kansas 66045, USA (msengel@ku.edu).

ISSN 2329-5880

to promote confusion over nomenclatural stability and Grimaldi & Engel (2005) and Engel (2006) accordingly retained them at the family rank, as well as Baissidae as basal to Euaulacides (= Aulacidae + Gasteruptiidae). Hitherto there have been described 30 valid species of baissids classified into five genera, all from the Early Cretaceous.

Herein is described a beautifully preserved male baissid from the Turonian amber of New Jersey (Figs. 1–2). The individual represents the first record of the family from North America as well as the latest occurrence of the lineage during the Mesozoic.

MATERIAL AND METHODS

The age and diversity of New Jersey amber has been reviewed by Grimaldi *et al*. (2000) and Grimaldi & Nascimbene (2010). The amber piece was trimmed and polished prior to embedding in a clear epoxy following the method outlined by Nascimbene & Silverstein (2000). Photomicrographs were taken with a Canon 7D digital camera attached to an Infinity K-2 long-distance microscope lens and illuminated with a Xenon flash. Measurements were taken from an ocular micrometer attached to an Olympus SZX-12 stereomicroscope. Wing vein nomenclature generally follows that illustrated by Rasnitsyn & Martínez-Delclòs (2000).

SYSTEMATIC PALEONTOLOGY

Family Baissidae Rasnitsyn

Baissidae Rasnitsyn, 1975: 90. Type genus: *Baissa* Rasnitsyn, 1975.
Manlayinae Rasnitsyn, 1986: 156. Type genus: *Manlaya* Rasnitsyn, 1980.

DIAGNOSIS: Evanioid family (metasomal articulation high on propodeum above metacoxal articulations) with compact overall body (plesiomorphically similar in this regard to Evaniidae, while Gasteruptiidae and Aulacidae are more slender). Antenna not elbowed (elbowed in Evaniidae); female antenna with 12 flagellomeres, male with 11 flagellomeres. Propleuron not extending forward to form pronounced 'neck' (present in Aulacidae and Gasteruptiidae); mesoscutum slightly humped anteriorly so that it is relatively high above pronotal posterior border (similar to but not as pronounced as in Aulacidae). Forewing venation more developed, similar to Aulacidae. Metatibia not clavate (as in Aulacidae, clavate in Gasteruptiidae). Metasoma articulating high on propodeum and separated from metanotum by extended dorsal propodeal surface (as in Aulacidae, propodeal dorsal surface reduced in Gasteruptiidae such that metanotum appears to touch metasomal articulation); metasoma not greatly compact or compressed (compact and compressed in Evaniidae), ovoid (elongate slender in Gasteruptiidae); first metasomal segment not elongate, petiolate, or tubular; first two terga not fused (terga I and II fused in Aulacidae and Gasteruptiidae); ovipositor sheaths prominent (very short in Evaniidae).

INCLUDED GENERA: Presently the family consists of six genera, almost all exclusively from the Early Cretaceous of Asia – *Baissa* Rasnitsyn (3 species: Rasnitsyn, 1975, 1991), *Humiryssus* Lin (6 species: Lin, 1980; Zhang & Rasnitsyn, 2004), *Manlaya* Rasnitsyn (18 species: Rasnitsyn, 1980, 1986, 1990; Rasnitsyn *et al*., 1998; Rasnitsyn & Ansorge, 2000; Rasnitsyn & Martínez-Delclòs, 2000); *Tillywhimia* Rasnitsyn & Jarzembowski (2 species: Rasnitsyn *et al*., 1998), *Mesepipolaea* Zhang & Rasnitsyn (1 species: Zhang &

Rasnitsyn, 2004), and *Electrobaissa*, new genus (1 species: herein). The various genera can be identified by the key presented below (*vide infra*).

Comments: Most of the similarities between Baissidae and Aulacidae are plesiomorphic and therefore not indicative of a direct relationship. Indeed, aulacids share with gasteruptiids the fusion of the first metasomal terga, a feature not present in baissids, as well as a distinct 'neck', formed of the elongate propleura. Baissids occupy a more basal position relative to Aulacidae and Gasteruptiidae (= Euaulacides *sensu* Engel, 2006), and within the Neoevanioides as recognized by Engel (2006). Praeaulacidae are apparently basal relative to the Neoevanioides + Evaniiformes (= Evaniidae).

Key to Genera of Baissidae

1. Forewing marginal cell large, distalmost abscissa of Rs reaching near to wing apex; distalmost abscissa of Rs relatively straight beyond point where distal rs-m should be present 2
—. Forewing marginal cell short, distalmost abscissa of Rs meeting anterior wing margin well before wing apex; distalmost abscissa of Rs gently arching anteriorly to wing margin beyond point where distal rs-m should be present, giving marginal border a convex appearance ..... *Humiryssus* Lin
2(1). Forewing 1Rs originating more strongly proximad of pterostigmal base, separated by length greater than pterostigmal basal width 3
—. Forewing 1Rs originating near to pterostigmal base, separated by length subequal to pterostigmal basal width ..... *Mesepipolaea* Zhang & Rasnitsyn
3(2). Forewing 1cu-a confluent with first abscissa of M, or only faintly postfurcal; Rs+M present 4
—. Forewing 1cu-a distinctly postfurcal, well beyond first abscissa of M; Rs+M absent ..... *Tillywhimia* Rasnitsyn & Jarzembowski
4(3). Forewing A complete, present proximad and apicad 1cu-a 5
—. Forewing A incomplete, missing proximad 1cu-a ..... *Baissa* Rasnitsyn
5(4). Second medial cell distinctly elbowed owing to strong basal arch in 2M after separation from 2Rs ..... *Electrobaissa* Engel, n. gen.
—. Second medial cell more straight, 2M not strongly arched posteriorly after separation from 2Rs ..... *Manlaya* Rasnitsyn

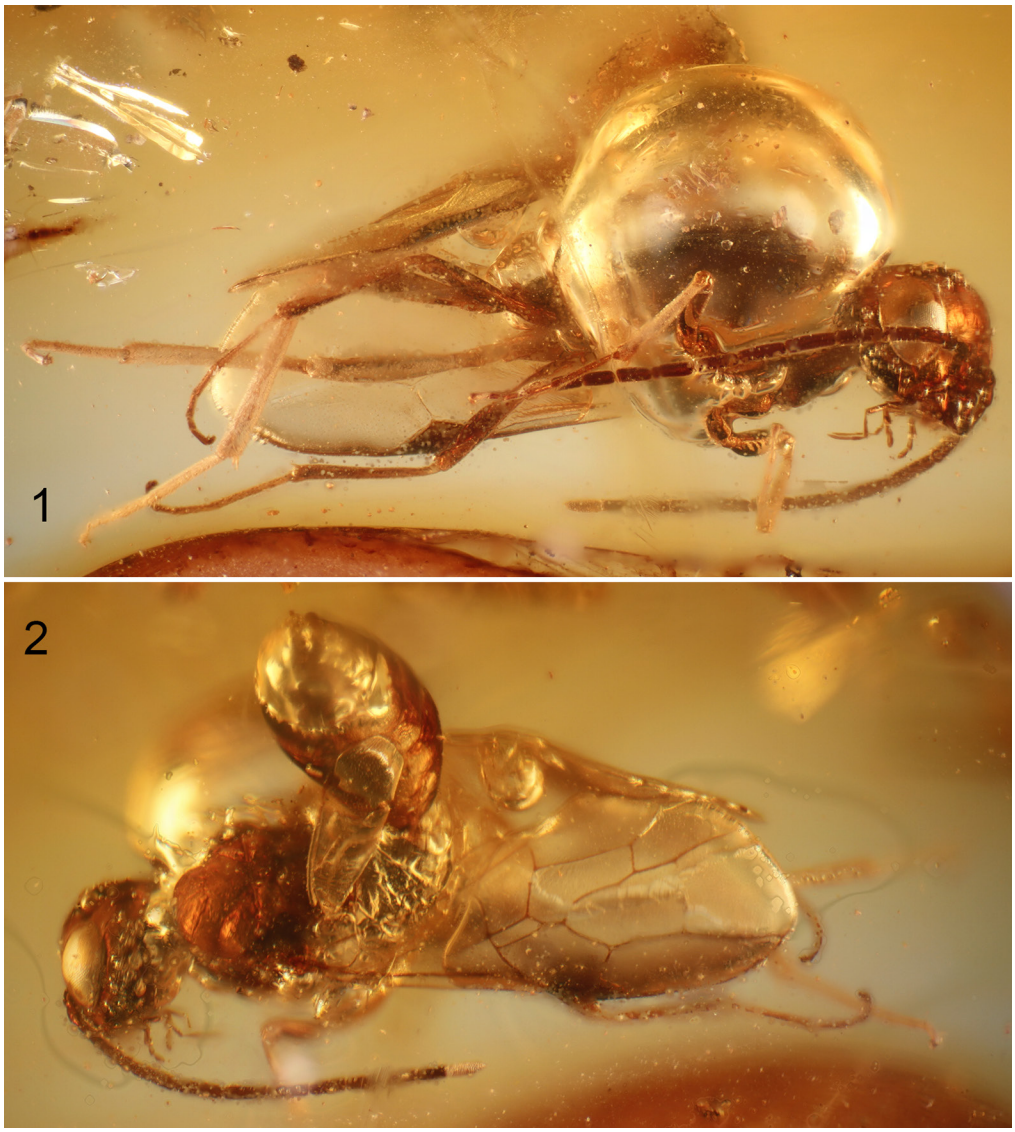
Electrobaissa Engel, new genus

ZooBank: urn:lsid:zoobank.org:act:087D095A-7C83-48E2-8DD3-B9077ED92528

Type species: *Electrobaissa omega* Engel, new species.

Diagnosis: Body size small, forewing length less than 3 mm; compound eyes prominent, with anterior orbital margins parallel; forewing marginal cell large, distalmost abscissa of Rs relatively straight beyond 2rs-m and extending near to wing apex; Rs originating proximad of pterostigmal base; 1cu-a confluent with first abscissa of M; basal vein with M about one-half length of Rs; 1Rs+M present; first medial cell strongly transverse, parallel-sided; 2Rs+M present, about as long as 1m-cu; second medial cell distinctly elbowed owing to strong basal arch in M after separation from Rs; vein A complete, present proximad and distad 1cu-a.

Etymology: The new genus-group name is a combination of the Greek word *elektron* (meaning, "amber") and *Baissa*, type genus of the family. The name is considered feminine.

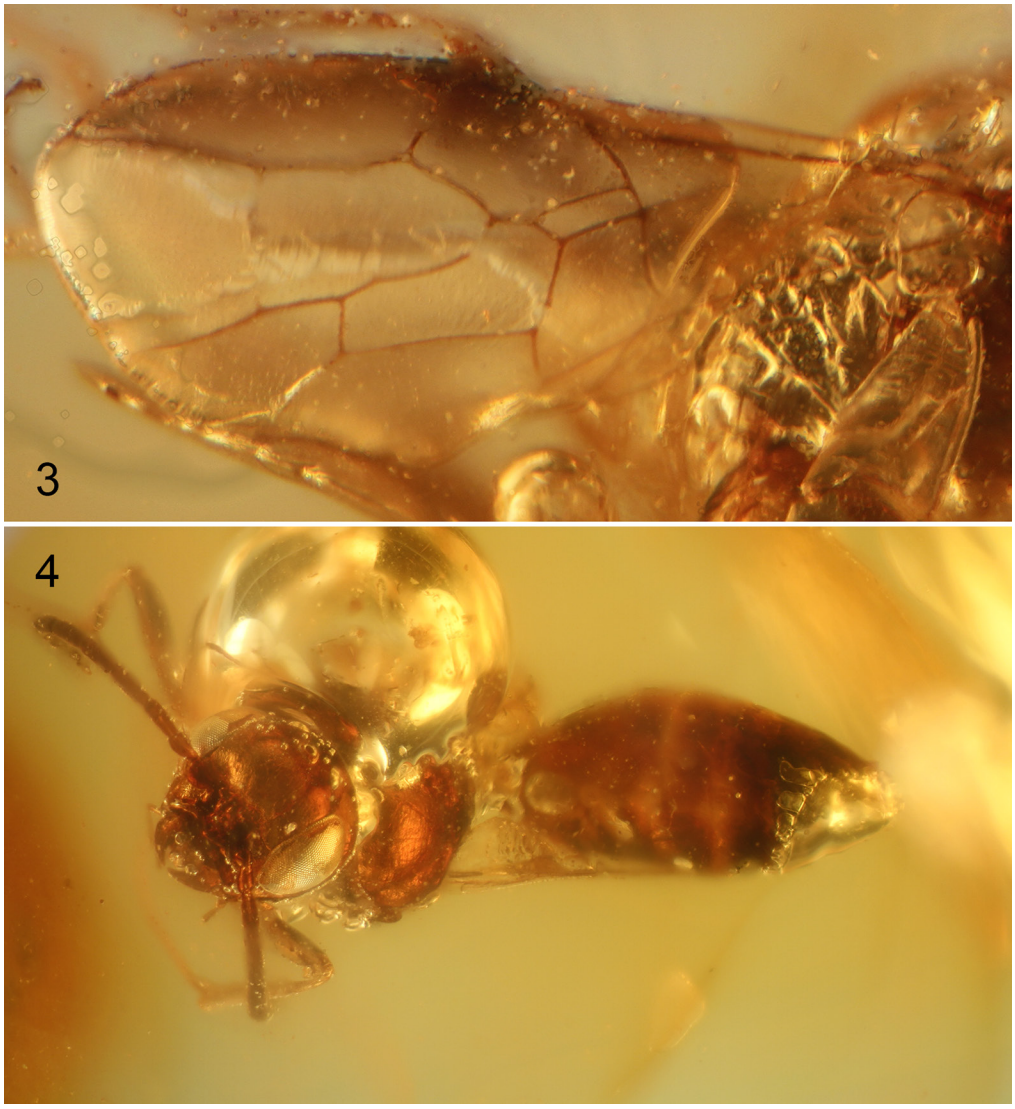


Figures 1–2. Photomicrographs of holotype male (AMNH NJ-Y001) of *Electrobaissa omega*, new genus and species. **1.** Right lateral view. **2.** Dorsal oblique view.

Electrobaissa omega Engel, new species
ZooBank: urn:lsid:zoobank.org:act:015EE615-93C1-4CE4-9D37-3813A9A495D8
(Figs. 1–4)

DIAGNOSIS: As for the genus (*vide supra*).

DESCRIPTION: ♂: Total body length 4.40 mm; forewing length 2.95 mm, hind wing length 1.25 mm. Integument chestnut brown, imbricate and impunctate throughout; wing membranes hyaline, clear, veins brown except pterostigma dark brown; setae widely scattered, minute and simple. Head slightly wider than long, width 0.88 mm, length 0.82 mm. Compound eyes prominent, occupying much of lateral surface of



Figures 3–4. Photomicrographs of holotype male (AMNH NJ-Y001) of *Electrobaissa omega*, new genus and species. **3.** Detail of forewing venation (*vide* Rasnitsyn & Martínez-Delclòs, 2000, for vein nomenclature). **4.** Frontal view.

head, length 0.49 mm, width 0.35 mm; medial orbital margins straight and parallel; upper interorbital distance 0.55 mm; lower interorbital distance 0.55 mm; ocelli arranged in equilateral triangle on dorsal surface of vertex, median ocellus at dorsal tangent of compound eyes, median ocellus separated from lateral ocellus by one ocellar diameter, lateral ocellus separated from ocular border by slightly more than one ocellar diameter. Frons gently convex, without frontal line (not carinate and not impressed). Antennae situated just ventral to compound eye mid-height; antenna filiform, 13 antennomeres; scape short, only slightly longer than wide, length 0.16 mm, apical width 0.13 mm; pedicel length 0.13 mm, width 0.09 mm; flagellomeres each longer than wide; first flagellomere length 0.20 mm, width 0.08 mm; second flagello-

mere length 0.22 mm, width 0.08 mm. Gena narrower than compound eye in profile, width 0.14 mm. Occipital carina apparently absent. Malar space well developed, as long as scape, length 0.16 mm. Mandible short, stout, length 0.31 mm, base broad and thick for about half of mandible length, tapering and curved quickly to prominently acute apex, simple with no subapical dentition, inner border of apical half gently concave. Labrum transverse, medial length 0.14 mm, width 0.31 mm. Maxillary palpus with five palpomeres; labial palpus with four palpomeres. Clypeus transverse, much wider than long, slightly depressed relatively to remainder of face. Mesosoma length 1.75 mm; pronotum short, without distinct posterior dorsal surface; mesoscutum high above pronotal posterior border, anterior margin broadly rounded; notauli distinct, deeply impressed, not areolate, gently arched, extending posteriorly to transverse mesoscutal sulcus independently, not meeting prior to sulcus, trisecting transverse sulcus into equal thirds; median line not present; mesoscutellum large; metanotum greatly reduced; propodeum coarsely areolate throughout, with areolae laterally smaller than those dorsally, dorsal surface long, slightly shorter than mesoscutellum, articulation with metasoma high above metacoxal articulations, articulation at posterior end of dorsal surface near abrupt slope to posterior surface. Forewing with costal cell wide, nearly as wide as pterostigma; Rs originating more proximad of pterostigmal base, separated by length about as wide as pterostigmal base; 1cu-a straight, slightly oblique, confluent with basal vein (= 1M); basal vein straight, short, shorter than first abscissa of Rs; Rs+M present, divided into longer abscissa (1Rs+M) and shorter abscissa (2Rs+M) by 1m-cu; 2Rs+M about as long as 1m-cu; first medial cell transverse, anterior and posterior borders parallel-sided (Fig. 3); second medial cell elongate, elbowed as 2M arches posteriorly after separation from 2Rs (Fig. 3); second cubital cell large; 2m-cu present; pterostigma longer than wide, with apex tapering, border inside marginal cell relatively straight; r-rs slightly distad pterostigma midlength, relatively long and straight, longer than pterostigmal width; marginal cell large, distalmost abscissa of Rs reaching near to wing apex and relatively straight beyond point where 2rs-m should be present; 1rs-m and 2rs-m spectral, most apparent by their minute stubs at junctures with Rs and M (Fig. 3); vein A complete, present proximad and distad 1cu-a. Hind wing with venation greatly reduced; Sc+R present and running to about three-quarters of wing length; A present and running to about wing midlength; M+Cu nebulous, running in midwing, bifurcating apically with Cu arching posteriorly to meet A near its apex, M terminating and not extending beyond, nebulous rs-m extending from apex of M+Cu to meet R on anterior wing margin somewhat proximad its apex. Legs slender, tibia not clavate; protibia length 0.63 mm; probasitarsus length 0.39 mm; tibial spur formula 1-2-2; metatrochantellus present, short; tibiae and tarsi with minute setae more dense than on other podites; metabasitarsus about as long as combined lengths of remaining tarsomeres; pretarsal claws short, stout, simple; arolium large. Metasoma ovoid, length 1.81 mm, first metasomal segment unmodified, not petiolate or conical; only slightly longer than second segment; segments wider than long; genitalia not exposed.

♀: Unknown.

HOLOTYPE: ♂, AMNH NJ-Y001; New Jersey, Middlesex County, Sayreville; Late Cretaceous, Turonian. Deposited in the Division of Invertebrate Zoology, American Museum of Natural History, New York, New York.

ETYMOLOGY: The specific epithet is taken from the Greek letter omega, last letter of the alphabet and a general allusion to endings.

Comments: The new species in some respects resembles a small species of *Manlaya* (*i.e.*, species with forewing lengths under 4 mm) and can be distinguished from among them, aside from the generic features, by the following: costal cell nearly as broad as pterostigma; 1Rs originating proximad pterostigma by length equal to about pterostigmal basal width; r-rs slightly distad pterostigma midlength; basal vein with 1M much shorter than 1Rs; first medial cell transverse and parallel-sided; 2Rs+M present; 2M arching posteriorly after separation from 2Rs; 2m-cu present; and second medial cell elbowed.

DISCUSSION

Electrobaissa omega not only extends the family well into the latter part of the Cretaceous, it also expands the known distribution into North America (Laurentia at the time). The discovery of a definitive baissid in the Late Cretaceous of New Jersey makes the prospects for finding additional diversity tantalizing. In particular, the family may be sought in the slightly younger Campanian-aged deposits of Canada and perhaps even in the Cenomanian of Alaska. It also suggests the strong possibility of diverse species from the Early Cretaceous amber of Lebanon, Spain, and Myanmar. As further amber specimens are documented it should allow a more thorough characterization of the family and better assist the inclusion of such taxa into phylogenetic studies of basal Evanioidea and the early diversification of the superfamily.

ACKNOWLEDGEMENTS

I am grateful to David A. Grimaldi for bringing the present specimen to my attention, permitting its study, and being patient with the long gestation of the work. Ismael A. Hinojosa-Díaz assisted with photomicrography, supported by the Engel Illustration Fund of the University of Kansas College of Liberal Arts and Sciences. Partial support for the early phases of this work were provided by U.S. National Science Foundation grants EF-0341724 and DEB-0542909 (to M.S.E.). This is a contribution of the Division of Entomology, University of Kansas Natural History Museum.

REFERENCES

Engel, M.S. 2006. Two ensign wasps in Cretaceous amber from New Jersey and Myanmar (Hymenoptera: Evaniidae). *Polskie Pismo Entomologiczne* 75(3): 443–454.

Grimaldi, D., & M.S. Engel. 2005. *Evolution of the Insects*. Cambridge University Press; Cambridge, UK; xv+755 pp.

Grimaldi, D.A., & P.C. Nascimbene. 2010. Raritan (New Jersey) amber. In: Penney, D. (Ed.), *Biodiversity of Fossils in Amber from the Major World Deposits*: 167–191. Siri Scientific Press; Manchester, UK; 304 pp.

Grimaldi, D., A. Shedrinsky, & T.P. Wampler. 2000. A remarkable deposit of fossiliferous amber from the Upper Cretaceous (Turonian) of New Jersey. In: Grimaldi, D. (Ed.), *Studies on Fossils in Amber, with Particular Reference to the Cretaceous of New Jersey*: 1–76. Backhuys Publishers; Leiden, The Netherlands; viii+498 pp.

Lin, Q.-B. 1980. Mesozoic insects from Zhejian and Anhui Provinces. In: *Division and Correlation of the Mesozoic Volcano-Sedimentary Strata in Zhejiang and Anhui Provinces*: 211–234. Science Press; Beijing, China; i+234 pp. [In Chinese]

Nascimbene, P., & H. Silverstein. 2000. The preparation of fragile Cretaceous ambers for conservation and study of organismal inclusions. In: Grimaldi, D. (Ed.), *Studies on Fossils in Amber, with Particular Reference to the Cretaceous of New Jersey*: 93–102. Backhuys Publishers; Leiden, The Netherlands; viii+498 pp.

Rasnitsyn, A.P. 1975. Hymenoptera Apocrita of the Mesozoic. *Trudy Paleontologicheskogo Instituta Akademii Nauk SSSR* 147: 1–134. [In Russian]

Rasnitsyn, A.P. 1980. On the system of the family Aulacidae (Hymenoptera) in connection with a new finding in the Lower Cretaceous of Manlay. *Trudy Sovmestnoy Sovetsko-Mongol'skoy Paleontologicheskoy Ekspeditsii* 13: 65–67. [In Russian]

Rasnitsyn, A.P. 1986. Vespida (= Hymenoptera). *Trudy Sovmestnoy Sovetsko-Mongol'skoy Paleontologicheskoy Ekspeditsii* 28: 154–164. [In Russian]

Rasnitsyn, A.P. 1990. Vespida. Hymenoptera. *Trudy Paleontologicheskogo Instituta Akademii Nauk SSSR* 239: 177–205. [In Russian]

Rasnitsyn, A.P. 1991. New hymenopterans of the genus *Baissa* (Gasteruptiidae *s.l.*) from the Early Cretaceous in Buryatia and Mongolia. *Vestnik Zoologii* 1991(1): 78–79. [In Russian, with English summary]

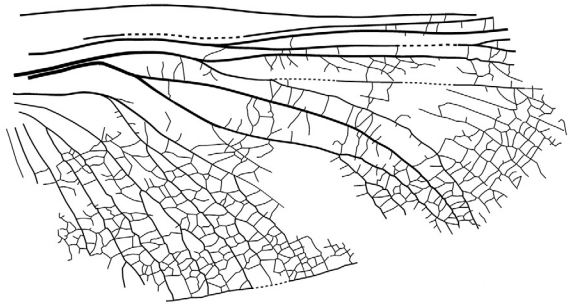
Rasnitsyn, A.P., & J. Ansorge. 2000. New Early Cretaceous hymenopterous insects (Insecta: Hymenoptera) from Sierra del Montsec (Spain). *Paläontologische Zeitschrift* 74(3): 335–341.

Rasnitsyn, A.P., & X. Martínez-Delclòs. 2000. Wasps (Insecta: Vespida = Hymenoptera) from the Early Cretaceous of Spain. *Acta Geológica Hispánica* 35(1–2): 65–95.

Rasnitsyn, A.P., E.A. Jarzembowski, & A.J. Ross. 1998. Wasps (Insecta: Vespida = Hymenoptera) from the Purbeck and Wealden (Lower Cretaceous) of southern England and their biostratigraphical and palaeoenvironmental significance. *Cretaceous Research* 19(3–4): 329–391.

Zhang, J.-F., & A.P. Rasnitsyn. 2004. Minute members of Baissinae (Insecta: Hymenoptera: Gasteruptiidae) from the Upper Mesozoic of China and limits of the genus *Manlaya* Rasnitsyn, 1980. *Cretaceous Research* 25(6): 797–805.

ZooBank: urn:lsid:zoobank.org:pub:43D3CBA8-9744-4F7F-B9FE-841713F1DE58



Pharciphyzelus lacefieldi Beckemeyer & Engel, 2011

NOVITATES PALEOENTOMOLOGICAE

Occasional Contributions to Paleoentomology

Novitates Paleoentomologicae is an international, open access journal that seeks to disseminate the results of research conducted on fossil arthropods, particularly fossil insects, at the University of Kansas. The journal covers all aspects of fossil arthropod research including, but not limited to, comparative morphology, paleobiology, paleoecology, phylogenetics, systematics, taphonomy, and taxonomy.

Novitates Paleoentomologicae was established at the University of Kansas through the efforts of Michael S. Engel, Jaime Ortega-Blanco, and Ryan C. McKellar in 2013 and each article is published as its own number, with issues appearing online as soon as they are ready. Papers are composed using Microsoft Word® and Adobe InDesign® in Lawrence, Kansas, USA.

Novitates Paleoentomologicae is registered in ZooBank (www.zoobank.org), archived at the University of Kansas and in Portico (www.portico.org), and printed on demand by Southwestern Oklahoma State University Press.

http://journals.ku.edu/paleoent
ISSN 2329-5880