# A New Genus of the Subfamily Apioninae (Coleoptera: Brentidae) from the Lower Eocene Oise Amber

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**Abstract**—A new genus and species, *Palaeotanaos oisensis*, is the first described representative of Apioninae from the Lower Eocene Oise amber. The new genus belongs to the tribe Tanaini and is similar to the genus *Tanaos* Schoenherr, 1826 and differs from it in the convex, not flattened, and slightly elongate body, the antennae inserted in basal one-third of rostrum, comparatively long flagellum, and elongate club, large and strongly convex eves, narrow and long tibiae without mucro, short precoxal part of prothorax, and narrower

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# **INTRODUCTION**

and long tarsi.

The superfamily Curculionoidea is one of the largest and most diverse groups of the order Coleoptera known since the Middle-Late Jurassic of Karatau (Arnoldi, 1977; Legalov, 2012b; Gratshev and Legalov, 2014). Brentidae Billberg, 1820 is the second most diverse family of Curculionoidea (Kuschel, 1995). Several groups included here in the Brentidae as subfamilies were often regarded as separate families, e.g., Eurhynchinae Lacordaire, 1863, Apioninae Schoenherr, 1823, Antliarhininae Schoenherr, 1823, and Nanophyinae Gistel, 1856 (Zimmerman, 1994; Wanat, 2001). The so-called family Apionidae, with four subfamilies (Eurhynchinae Lacordaire, 1863, Apioninae, Nanophyinae, and Ithycerinae Schoenherr, 1823) was accepted by Crowson (1955), Thompson (1992), and Kuschel (1995). The subfamily Microcerinae Lacordaire, 1863 was assigned to the Brentidae by Oberprieler (2000). We follow the viewpoint uniting these groups within one family, although Ithyceridae is treated here as a separate family (after Legalov, 2009). A "phylogenetic" analysis for Brentidae was made by Wanat (2001). The composition of the subfamily Apioninae was accepted according to Alonso-Zarazaga and Lyal (1999). The family Brentidae has been recorded no earlier than the Lower Cretaceous (Zherikhin and Gratshev, 2004) and almost all fossil records of this group are now considered as Apioninae. Most data on fossil apionines are based on

Schoenherr, 1839) before this study was described from the Turonian of Kzyl-Dzhar (Kazakhstan) (Legalov, 2014). In this study, a new representative of this subfamily is described from the Lower Eocene Oise amber, the first described specimen of those recently mentioned by Kirejtshuk and Nel (2013). This new species belongs to the tribe Tanaini, which has not been recorded in the Eocene. However, the oldest Paleogene apionines were found in Menat (France, Middle Paleocene), and shall be described by us in a further publication. MATERIAL AND METHODS The holotype of the species under consideration is

materials from Baltic amber, Florissant shales, and Dominican amber (Scudder, 1893; Legalov, 2012a;

Kirejtshuk and Ponomarenko, 2015; Poinar and Leg-

alov, 2015), but the oldest Apioninae (tribe Tanaini

The holotype of the species under consideration is housed in the Muséum national d'histoire naturelle (Paris). The specimen was studied using an Olympus SCX9 stereomicroscope in Muséum national d'histoire naturelle, and also a Leica MZ 16.0 stereomicroscope in the Zoological Institute (St. Petersburg). Because the consistence of the amber in the piece examined for this study does not allow the authors to observe clearly outlines of some sclerites of the specimen, the high-resolution CT scan, v/tome/x L240-180 from GE Sensing and Inspection Technologies phoenix/x-ray, which includes two interchangeable tubes (tube 240kV/320W with microfocus X-ray detectability tube up to 1  $\mu$ m and RX 180 nanofocus kV/15W detectability with up to 500 nm), 400 × 400 large movable detector mm with a matrix of 20242 pixels (pixel size:  $200 \times 200 \mu$ m), as a collective equipment (USM MNHN-CNRS 2700, platform AST-RX), was used to obtain clearer images of the specimen (Garrouste et al., 2013).

The Oise amber deposit is located near the town of Creil at the place known as 'Le Quesnoy' (Paris Basin, Creil, Oise, France). The age of this site was estimated as Lower Eocene (about 53 Ma). These Sparnacian beds are made up of a succession of lenticular bodies showing two main facies: clayey sands rich in frequently pyritized lignite, together with amber; and grav clavev sands with less lignite (1-12%) of sediment). These facies reflect a hypoxic environment. The dominance of amber-producing tree species and the presence of freshwater suggest a semi-deciduous forest (Nel et al. 2004; Brasero et al. 2009; Kirejtshuk and Nel, 2013). The climate of that time was hot, with wet and dry seasons, which corresponds to a paratropical paleoenvironment (De Franceschi and De Ploëg 2003). The amber-producing tree is Aulacoxylon sparnacense (Combretaceae or Caesalpiniaceae), which could be related to extant Terminalia L. (Combretaceae) or Leguminosae-Caesalpiniaceae (De Franceschi and De Ploëg, 2003). Brasero et al. (2009) gave the most complete entomofaunal composition of the Oise amber; Kirejtshuk and Nel (2013) published a review of beetles found in this burial.

# SYSTEMATIC PALEONTOLOGY Family Brentidae Billberg, 1820 Subfamily Apionidae Schoenherr, 1823 Tr i b e Tanaini Schoenherr, 1839

### Genus Palaeotanaos Kirejtshuk, Legalov et Nel, gen. nov.

E t y m o l o g y. From the Greek  $\pi\alpha\lambda\alpha\iota\delta\varsigma$  (palaios, ancient, very old) and the generic name *Tanaos;* masculine gender.

Type species. *Palaeotanaos oisensis* Kirejtshuk, Legalov et Nel, sp. nov.

Diagnosis. Body elongate oval; with long semierect setae. Elytral apices and head inclined. Rostrum moderately long, comparatively thick. Forehead considerably narrower than eye diameter and somewhat narrower than rostrum base. Eyes large, convex and prominent, rounded. Scrobes foveiform. Antennae inserted in basal one-third of rostrum, reaching middle of pronotum. Flagellum moderately long and club elongate. Pronotum bell-shaped, with basal flange, widest along posterior third and narrowing anteriorly and widened again at anterior edge (looking from above like slightly emarginate on sides at apex). Scutellum subsemicircular and narrowing at base. Elytra almost straight on sides, widest behind middle. Humeri weakly raised. Sutural postscutellar sulcus without tubercles or setae; 9th striae complete. Preand postcoxal parts of prothorax short; procoxal cavities contiguous. Mesocoxal cavities almost rounded, narrowly separated. Legs long. Procoxae subconical. Mesocoxae subhemispherical. Metacoxae subtriangular, weakly convex. Abdominal ventrites 1 and 2 subequal in length and each longer than each of ventrites 3 and 4. Femora without teeth; tibiae narrow and long, without mucro. Protibiae almost straight and narrow. Meso- and metatibiae weakly curved, widened at apex. Tarsi only slightly shorter than meso- and metatibiae.

Comparison. The new genus is similar to *Tanaos* Schoenherr, 1826 and differs from it in the convex, not flattened and slightly elongated body, the antennae inserted in basal one-third of the rostrum, comparatively long flagellum and elongate club, large and strongly convex eyes, narrow and long tibiae without mucro, short precoxal part of the prothorax, and the narrower and long tarsi.

R e m a r k s. The new genus is assigned to the family Brentidae because of its long abdominal ventrites 1 and 2, shortened abdominal ventrites 3 and 4, nongeniculate antennae, somewhat elongate trochanters separating the femora from the coxae, and elvtra without scutellar striole (Thompson, 1992; Gratshev and Legalov, 2014). The slightly elongate trochanters separating the femora from coxae, nongeniculate antennae, visible scutellum, seven-segmented flagellum, subconical procoxae suggest placement of this genus within the subfamily Apioninae (Thompson, 1992; Kuschel, 1995). The slightly elongate trochanters, antennae with quite compact club and toothed large tarsal claws show that the new genus should be assigned to the tribe Tanaini. The sexual dimorphism in this group is mostly expressed in the presence or absence of mucro and structure of the abdomen. It is difficult to determine the sex of the specimen examined, because abdominal ventrites 1 and 2 are depressed (as can be in males), but this depression may result from fossilization, because the elytra of this specimen are also distorted. The angles of plane of abdominal ventrites 3 and 4 to that of ventrites 1 and 2, flattened ventrite 5, tibiae without mucro, and also the absence of a trace of aedeagus in the scanning of abdomen (Fig. 2c) give evidence for the proposed sexual attribution of the specimen examined.

#### Palaeotanaos oisensis Kirejtshuk, Legalov et Nel, gen. nov.

E t y m o l o g y. From the type locality of the holotype.

H o l o t y p e. MNHN, no. A52061 ("PA-15854"), female; Oise amber, near the town of Creil at the place known as 'Le Quesnoy,' Paris Basin, Oise, France; Lower Eocene (about 53 Ma). The complete specimen is in a small elongate cylindrical piece of amber, 10 mm long and 4 mm in diameter, corresponding to "stalagtite" resin.

Description (Figs. 1, 2). The body is subunicolored dark brown, with somewhat lighter append1438



**Fig. 1.** *Palaeotanaos oisensis* sp. nov., holotype MNHN, no. A52061, body; Oise amber, Lower Eocene, 3D reconstruction after X-ray scanning in high-resolution CT scan, v/tome/x L240-180: (a) dorsal, (b) ventral, and (c) lateral views. Length of specimen, 1.95 mm.



**Fig. 2.** *Palaeotanaos oisensis* sp. nov., holotype MNHN, no. A52061, Oise amber, Lower Eocene: (a) body, lateral view (photograph, Olympus SCX9 stereomicroscope, with Olympus camera); (b, c, d) 3D reconstruction after X-ray scanning in high-resolution CT scan, v/tome/x L240-180: (b) rostrum, ventral view; (c) sagittal section, inner view; (d) abdominal apex, ventral view. Length of specimen, 1.95 mm.

ages. The dorsum has short, fine, sparse, diffuse and slightly conspicuous hairs and thicker reddish hairs diffuse on the head and prothorax but arranged in rows partly corresponding to striae on the elytra and also forming a fringe along the elytral sides. The underside has somewhat shorter and less conspicuous hairs. The head is 0.9 times as long as the rostrum and 0.7 times as long as the pronotum; the rostrum has dense and coarse but not deep punctation; it is weakly curved, 3.6 times as long as wide at the apex, 2.5 times as long as wide in the middle, 2.2 times as long as wide at the base, and 0.8 times as long as the pronotum. The forehead is densely punctate; the eyes are large, convex, rounded; the vertex is weakly flattened, finely punctured; the temples are short, 0.3 times as long as the eye, punctate; the scape is 3.25 times as long as wide at the apex; antennomere 2 (pedicel) is about 1.5 times as long as wide at the apex and somewhat longer than scape; antennomere 3 is nearly 3 times as long as wide at apex, subequal in length to antennomere 2; antennomere 4 is about 2.5 times as long as wide at apex and 0.8 times as long as antennomere 3; antennomere 5 is about twice as long as wide at the apex and 0.8 times as long as antennomere 4; antennomere 6 is about 1.5 times as long as wide at the apex and 0.75 times as long as antennomere 5; antennomere 7 is about 1.6 times as long as wide at the apex and 1.3 times as long as antennomere 6; antennomere 8 is about as long as wide and 0.75 times as long as antennomere 7; club comprises about 0.3 of the entire antennal length with antennomere 9 about 0.7 times as long as wide at the apex and 2.3 times as wide as antennomere 8; antennomere 10 is about 0.6 times as long as wide at the apex and 1.1 times as wide as antennomere 9; antennomere 11 is about 1.4 times as long as wide at the base and twice as long as antennomere 10; the tip is distinctly acuminate. The pronotum is slightly convex on the disk, with a weak pronotal groove before the apex, densely and coarsely punctured, without striae and naked lines; the interspaces between punctures are 1.5-3.0 times as great as the puncture diameter and finely transversely rugose; the weakly convex prescutellar sulcus is present. The scutellum is somewhat wider than long. The elytra are weakly convex, about twice as long as wide combined at the base, 3.3 times as long as the pronotum; with nine regular striae and with a row of deep distinct and sparse punctures; stria 10 looking like short and with a trace of punctures along bottom; scutellar striole is absent; interspaces between punctures in striae are 2.0-3.5 times as great as puncture diameter; interstria intervals are wide and flat, finely transversely rugose, with one row of shallow and comparatively small punctures.

The underside of the prothorax lacks postorbital lobes, densely punctured; the procoxal cavities are 4.5 times as long as the precoxal part; the mesocoxal cavities are more than five times as wide as the distance between them; the metepisterna are narrow and about six times as long as wide in the widest part, with shallow punctures; the metaventrite is weakly convex, 1.7 times as long as the mesocoxal cavity, weakly rugose, with shallow punctures; the metacoxal cavities are comparatively long. The abdomen is convex, but concave at the base along the middle, quite large and densely punctured; the interspaces between punctures are finely rugose; ventrite 5 is longer than ventrite 4. The trochanters are slightly elongate and separate the femora from the coxae. The femora are weakly clavate, finely rugose; the length-to-width ratio in the middle is 3.3-3.8 for the femora, 7.9 for the protibiae, and 4.7-5.2 for the meso- and metatibiae; the tarsi are long, with pulvilli on the underside; tarsomere 1 is elongate subconical; tarsomere 2 is wider than tarsomere 1 and conical; tarsomere 3 is bilobed; tarsomere 5 is thin, elongate, and somewhat thickened apically; the claws are comparatively large, free, with a large tooth at the base.

M e a s u r e m e n t s, mm. Body length, 1.95; body width, 9.8; length of rostrum, 0.41.

## DISCUSSION

Representatives of this tribe are recorded in the Cretaceous (Legalov, 2014). Some other brentids, i.e., Rhinorhynchidiini, Podapiini, Mecolenini, and Antliarhininae, have slightly elongate trochanters, as in species of Tanaini (Wanat, 2001). Species of the Mecolenini differ from the new species in the femora with teeth, pronotum with a prescutellar fovea, and multituberculate sutural postscutellar. The new genus differs from members of the tribes Rhinorhynchidiini and Podapiini in the somewhat separated mesocoxal cavities. Palaeotanaos gen. nov. differs from groups of the subfamily Antliarhininae in the spherical procoxae and much more flattened body. Recent representatives of the mentioned groups are distributed in South Africa, Australia, North America, and South Europe. These groups have not vet been found in amber (Legalov, 2012a; Poinar and Legalov, 2015). Representatives of Tanaini are associated with host plants of the family Proteaceae; those of Rhinorhynchidiini are associated with host plants of the family Cupressaceae; those of Podapiini are associated with host plants of the family Pinaceae; and those of Antliarhininae are associated with host plants from Zamiaceae (Kissinger, 1968; Zimmermann, 1994; Oberprieler, 1995a, 1995b; Alonso-Zarazaga, 1998). The oldest fossil record of Proteaceae was from the Cenomanian-Turonian of Australia (Ward and Doyle, 1994).

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# REFERENCES

Alonso-Zarazaga, M.A., The genus *Podapion* Riley, 1883, in *The Old World: A New Species and Biogeographical Implications (Coleoptera, Apionidae, Apioninae)*, Torino: Mus. Reg. Sci. Natur., 1998, pp. 133–143.

Alonso-Zarazaga, M.A. and Lyal, C.H.C., A World Catalogue of Families and Genera of Curculionoidea (Insecta: Coleoptera) Excluding (Scolytidae and Platypodidae), Entomopraxis, 1999.

Arnoldi, L.V., Rhynchophora, *Tr. Paleontol. Inst. Akad. Nauk SSSR*, 1977, vol. 161, pp. 142–176.

Brasero, N., Nel, A., and Michez, D., Insects from the Early Eocene amber of Oise (France): Diversity and palae-ontological significance, *Denisia*, 2009, vol. 26, pp. 41–52.

Crowson, R.A., *The Natural Classification of the Families of Coleoptera*, London: Nathaniel Lloyd and Co. Ltd., 1955.

De Franceschi, D. and De Ploëg, G., Origine de l'ambre des faciès sparnaciens (Eocène inférieur) du bassin de Paris: le bois de l'arbre producteur, *Geodiversitas*, 2003, vol. 25, pp. 663–647.

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Garrouste, R., Nel, A., Kirejtshuk, A.G., Perreau, M., Goussard, F., Garcia-Sanz, M., and Wils, P., New tools, new characters: The contribution of MNHN X-ray tomography CT Scan in the study of fossil hexapods, in *6th International Congress on Fossil Insects, Arthropods and Amber: Keynote Presentations Abstracts*, Byblos, 2013, pp. 38–39.

Gratshev, V.G. and Legalov, A.A., The Mesozoic stage of evolution of the family Nemonychidae (Coleoptera, Curculionoidea), *Paleontol. J.*, 2014, vol. 48, no. 8.

Kirejtshuk, A.G. and Nel, A., Current knowledge of Coleoptera (Insecta) from the lowermost Eocene Oise amber, *Insect Syst. Evol.*, 2013, vol. 44, pp. 175–201.

Kirejtshuk, A.G. and Ponomarenko, A.G., Catalogue of fossil Coleoptera, 2015, http:// www.zin.ru/Animalia/Coleoptera/eng/paleosys.htm and http://www.zin.ru/Animalia/Coleoptera/ rus/paleosys.htm

Kissinger, D.G., *Curculionidae subfamily Apioninae of North and Central America*, Mass: Taxon. Publ. South Lancaster, 1968.

Kuschel, G., A phylogenetic classification of curculionoidea to families and subfamilies, Mem. Entomol. Soc. Washington, 1995, vol. 14, pp. 5–33.

Legalov, A.A., A review of fossil and Recent species of the family Ithyceridae (Coleoptera) from the World Fauna, *Amur. Zool. Zh.*, 2009, vol. 1, no. 2, pp. 117–131.

Legalov, A.A., New and little known Apioninae (Coleoptera, Brentidae) in Eocene Baltic amber, *Euroas. Entomol. Zh.*, 2012a, vol. 11, no. 3, pp. 219–222.

Legalov, A.A., Fossil history of Mesozoic weevils (Coleoptera: Curculionoidea), *Ins. Sci.*, 2012b, vol. 19, no. 6, pp. 683–698.

Legalov, A.A., New Nemonychidae, Brentidae and Curculionidae (Coleoptera: Curculionoidea) from the Turonian of Kzyl-Dzhar (Kazakhstan), *Hist. Biol.*, 2014, vol. 26, no. 65, pp. 675–689.

Nel, A., de Ploeg, G., Millet, J., Menier, J.-J., and Waller, A., The French ambers: A general conspectus and the lowermost Eocene amber deposit of Le Quesnoy in the Paris Basin, *Geol. Acta*, 2004, vol. 2, pp. 3–8.

Oberprieler, R., The weevils (Coleoptera: Curculionoidea) associated with cycads: Classification, relationship, and

biology, in *Proceedings of the 3rd International Conference on Cycad Biology*, Vorster, P., Ed., Stellenbosch: Cycad Soc. S. Afr., 1995a, pp. 295–334.

Oberprieler, R., *The weevils (Coleoptera: Curculionoidea)* associated with cycads: 2. Host specity and implications for cycad taxonomy, in Proceedings of the 3rd International Conference on Cycad Biology, Vorster, P., Ed., Stellenbosch: Cycad Soc. S. Afr., 1995b, pp. 335–365.

Oberprieler, R., The larvae of the weevil tribe Eurhynchini and the phylogeny of the Brentidae (Coleoptera: Curculionoidea), *Invert. Taxon.*, 2000, vol. 14, pp. 755–770.

Poinar, G.O.Jr. and Legalov, A.A., New Apioninae (Coleoptera: Brentidae) in Dominican amber, *Hist Biol.*, 2015, vol. 27, no. 2, pp. 134–157.

Scudder, S.H., Tertiary rhynchophorous Coleoptera of the United States, *Monogr. US Geol. Surv. Tertiary*, 1893, vol. 21, pp. 1–206.

Thompson, R.T., Observations on the morphology and classification of weevils (Coleoptera, Curculionoidea) with a key to major groups, *J. Nat. Hist.*, 1992, vol. 26, pp. 835–891.

Wanat, M., Genera of Australo–Pacific Rhadinocybinae and Myrmacicelinae, with Biogeography of the Apionidae (Coleoptera: Curculionoidea) and Phylogeny of the Brentidae (s. lato), Mantis: Olsztyn, 2001.

Ward, J.V. and Doyle, J.A., Ultrastructure and relationships of mid-Cretaceous polyforate and triporate pollen from northern Gondwana, in *Ultrastructure of Fossil Spores and Pollen*, Kurmann, M.H. and Doyle, J.A., Eds., 1994, pp. 161–172.

Zherikhin, V.V. and Gratshev, V.G., Fossil curculionoid beetles (Coleoptera, Curculionoidea) from the Lower Cretaceous of northeastern Brazil, *Paleontol. J.*, 2004, vol. 38, no. 5, pp. 528–537.

Zimmerman, E.C., Brentidae, Eurhynchidae, Apionidae and a chapter on immature stages by Brenda May. Australian Weevils (Coleoptera: Curculionoidea), CSIRO, 1994.

Translated by P. Petrov