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The first fossil Paussine (Coleoptera: Carabidae) from Mexican amber

MÓNICA M. SOLÓRZANO KRAEMER, Bonn

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Abstract: *Eohomopterus simojovelensis* n. sp., the first fossil record of the subfamily Paussinae (Coleoptera: Carabidae) from the Miocene amber of the Simojovel area, Chiapas, Mexico, is described. The morphology of the new species is compared with *Eohomopterus poinari* NAGEL, 1997 from Dominican amber as well as with extant representatives of *Eohomopterus*, and the biogeographical implications are discussed.

Keywords: Mexican amber • Chiapas • Paussinae • *Eohomopterus* • Miocene • biogeography • taxonomy • new taxon

Kurzfassung: Der erste Vertreter der Paussinae (Coleoptera: Carabidae) *Eohomopterus simojovelensis* n. sp., wird aus dem mexikanischen Bernstein (Simojovel Gebiet, Chiapas, Mexiko; Miozän) beschrieben. Die Morphologie dieser neuen Art wird mit *Eohomopterus poinari* NAGEL, 1997 aus dem Dominikanischen Bernstein sowie mit rezenten Angehörigen von *Eohomopterus* verglichen, und die biogeographischen Beziehungen werden diskutiert.

Schlüsselwörter: Mexikanischer Bernstein • Chiapas • Paussinae • *Eohomopterus* • Miozän • Biographie • Taxonomie • neues Taxon

Introduction

According to the classification of NAGEL (1987a), the Paussinae constitute a subfamily of the Carabidae. The number of extant species of the subfamily has been estimated to range from 460 to 600 (NAGEL 1997). All Paussinae are myrmecophiles, i.e. obligate guests of ants, and have evolved remarkable morphological adaptations to coexist with these social insects. Specimens of extant species of the Paussinae have been collected at light, under stones and logs, in pitfall and flight intercept traps, from ant nests, when walking on the ground and on grass, and on and beneath bark (NAGEL 1987a). Little is currently known about their biology. The genus *Eohomopterus* WASMANN, 1919 is especially poorly investigated, but it can be assumed that the larvae live together with ants (pers. comm. NAGEL, 2004).

Paussinae are rare insects, mostly strongly restricted to the tropics. From Mexico only six specimens have been recorded to date, assigned to the following three species: *Homopterus hondurensis* DARLINGTON, 1964

from northern Yucatan and from Tuxtla Gutiérrez, Chiapas, also known from Panama and Honduras; *Homopterus steinbachi* KOLBE, 1920 from Coatzacoalcos, Veracruz, also known from Bolivia, Colombia, French Guiana and Brazil; *Homopterus (Arthropteropsis) praemonens* KOLBE, 1920 from Tuxtla Gutiérrez, Chiapas and from Xalapa, Veracruz, also recorded from Bolivia, Brazil and San Salvador. It can therefore be assumed that these species have spread northwards comparatively recently, because their flight capability is low, and the land bridge of the Central American Isthmus was incomplete before Late Pliocene (DARLINGTON 1964).

Extant species of the genus *Eohomopterus* are known from Ecuador (*Eohomopterus aequatoriensis* WASMANN, 1899), from Brazil (*E. centenaries* LUNA DE CARVALHO, 1960), and from Guadalupe, Lesser Antilles, West Indies (a new species of *Eohomopterus*, see DAVIDSON 1991 cited in NAGEL 1997) (Fig. 1). Fossil ant nest beetles are reported from lacustrine Eocene sediments of Eckfeld, Germany (WAPPLER 2003), from



Fig. 1. Distribution of extant (●) and fossil (■) species of *Eohomopterus* WASMANN, 1919.

Baltic amber (WASMANN 1929; DARLINGTON 1950; NAGEL 1987b), and from Dominican amber (NAGEL 1987b, 1997). From the latter, the four species, *Eohomopterus paulmuelleri* NAGEL, 1987, *E. poinari* NAGEL, 1997, *Homopterus hispaniolensis* NAGEL, 1987, and *Protopaussus pristinus* NAGEL, 1997 have been reported. The herein described specimen is the first record of Paussinae from Mexican amber (Fig. 1).

Systematic palaeontology

Family Carabidae LATREILLE, 1802
Subfamily Paussinae LATREILLE, 1807

Genus *Eohomopterus* WASMANN, 1919

Type species: *Homopterus aequatoriensis* WASMANN, 1899.

Diagnosis: According to NAGEL (1997), the genus is characterized by the shortened dovetailed part of the elytral suture, dilated apical labial palpomere, presence of a protibial emargination and small tarsomere 4, which is largely concealed at base of slightly lobed tarsomere 3.

Remarks: As the specimen is not well preserved, many morphological features of the posterior portion as well as the dorsal and ventral portions are incompletely revealed. A more detailed description of these regions thus remains tentative. However, as the diagnostic characters such as the tarsomeres, antennae and portions of the mouthparts are clearly visible, the assignment of the specimen to *Eohomopterus* is unambiguous.

Eohomopterus simojovelensis n. sp.

Derivatio nominis: Based on the amber locality Simojovel in the southeastern part of Mexico, province Chiapas.

Type material: Holotype, sex indet., No. Mx 121-D, Staatliches Museum für Naturkunde, Stuttgart, Germany.

Amber matrix: The investigated piece of amber is approximately 10 x 5 mm in size and contains only one specimen. The amber shows cracks inside (Fig. 2). The cracks run dorsally and ventrally around the specimen. The beetle is lacking the end of its abdomen, so that the genitalia are not preserved. The end of the right antenna is also missing, but the left antenna is complete.



Fig. 2. General view of *Eohomopterus simojovelensis* n. sp. – Scale: 3 mm.

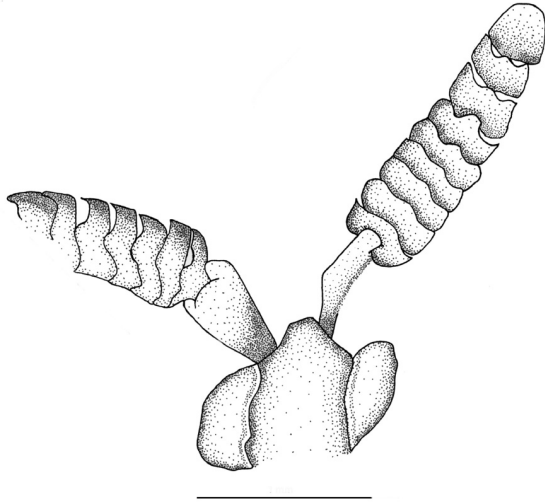


Fig. 3. *Eohomopterus simojovelensis* n. sp., drawing of head and antennae in dorsal view. – Scale: 1 mm.

The piece comes from Simojovel de Allende, Chiapas, Mexico. Simojovel de Allende is a mining district located in the northern part of the state of Chiapas, at 17°08'19''N and 92°42'00''W, at 600 m height; approximately 50 km from the city of Tuxtla. The fossiliferous amber-bearing deposits of this area are middle Miocene in age (RUST & SOLORZANO KRAEMER, in prep.).

Diagnosis: The pronotum is almost rectangular with the anterior angles broadly rounded and the posterior angles somewhat angled. The main difference between the fossil Mexican species *Eohomopterus simojovelensis* n. sp. and the only extant representatives, *E. aequatoriensis* and *E. centenarius* from South America and *E. paulmuelleri* from Dominican amber, is the length and width of tarsomeres 2 and 3. In *E. somojovelensis* n. sp. tarsomeres 2 and 3 are broader than in the other two species.

Description: Similar to *E. paulmuelleri*, *E. simojovelensis* n. sp. appears shrunken, thus some edges appear sharper than in the living species.

Size: Length of bent body 6.5 mm.

Head: With large eyes approximately as wide as pronotum, but slightly smaller, head between eyes slightly depressed, with two small flat median pits; frons, vertex, neck and also elytra finely punctate.

Antenna: Longer than combined length of head and pronotum, approximately 2.5 mm long, reaching tip of scutellum, if bent backward; scape compressed, slightly longer than wide; pedicel not visible; flagellum of 9 articles; antennomere 3 (basal article of flagellum) transversally rhombic; antennomeres 2 to 8 transversally rectangular, of equal size, somewhat more than twice as broad as long; apical antennomere semicircularly rounded at apex and as long as broad (Fig. 3).

Mouth parts: Maxillary palpus with four palpimeres, last palpimere hardly tapered to apex and longer than other three palpimeres combined (Fig. 4B); labial palpus with last palpimere markedly enlarged and plate-like; ligula incompletely visible; mandible thin (Figs. 4A, B).

Pronotum: Flat, slightly wider than long, somewhat tapered towards base; lateral margins slightly convex on distal half but not completely visible, approximately 1 mm long and 1.2 mm wide anteriorly and 1 mm wide posteriorly, not markedly narrowed towards base. Anterior and posterior angles broadly rounded; lateral margins sharply marked and slightly raised with adjacent, shallow furrow on disc; this furrow slightly widened and deepened towards base; pronotal disc finely punctate.

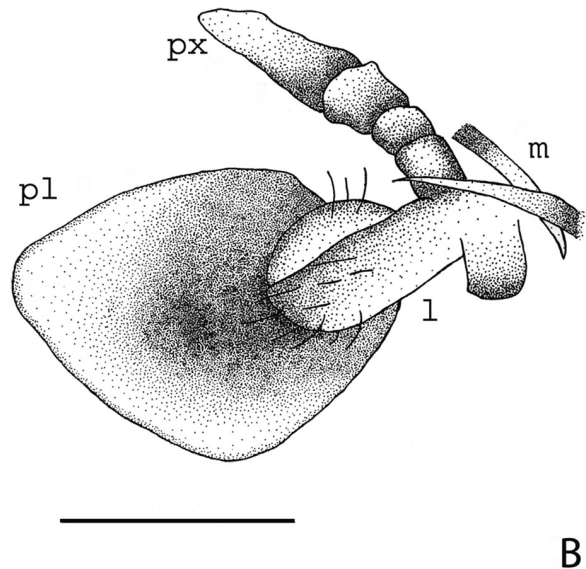
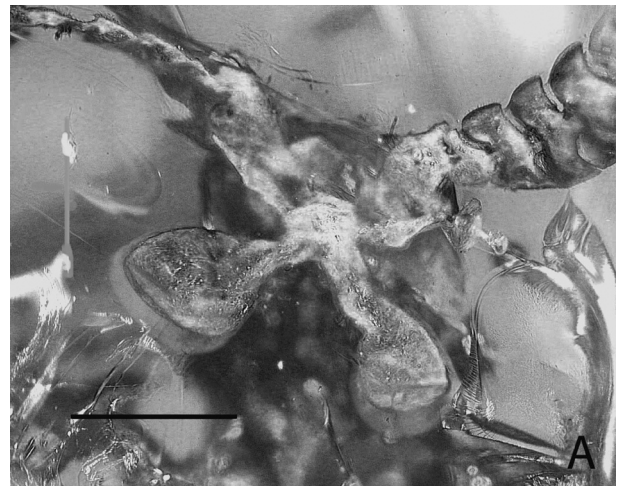


Fig. 4. *Eohomopterus simojovelensis* n. sp. – **A:** Mouthparts. **B:** Drawing of mouthparts. – m, mandibulae, px, palpus maxillaris, l, ligula, pl, palpus labialis. – Scale: 0.5 mm.

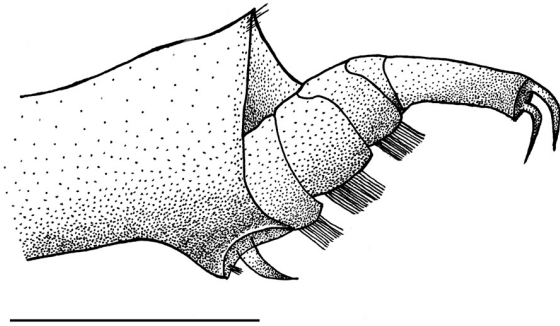


Fig. 5. *Eohomopterus simojovelensis* n. sp., protarsus. – Scale: 0.5 mm.

Elytra: Unmistakably glabrous, with fine and scattered punctation of series umbilicata as in *E. poinari* NAGEL, 1997. Elytra with lateral marginal edge very sharp in humeral area, from here extended possibly as blunt edge as far as middle posterior half without trace of marginal edge; scutellum equilaterally triangular; suture present in form of true elytral engagement only as far as just behind center; shoulders accentuated by depressions in area of elytral insertions.

Legs: Tibiae compressed with external apical angle distinctly lobed; 2 strong terminal spurs present; protibia slightly emarginate along apical half of internal edge; comb not visible or absent; tarsomeres 1–3 large and lobed; tarsomere 4 very small; protarsomeres 1–3 clothed beneath with tarsal pads; pubescence visible in protarsomeres 1–3 (Fig. 5), and on meso- and metatarsomeres 2–3. Procoxae separated by narrow prosternal process, meso- and metacoxae contiguous.

Pygidium: Not visible.

Affinities: The length of bent body of *Eohomopterus simojovelensis* n. sp. is 6.5 mm, *Eohomopterus paulmuelleri* NAGEL, 1987 has a body length of 5.6 mm, and *Eohomopterus poinari* NAGEL, 1997 is 8.0 mm long.

So far the genus *Eohomopterus* has been known only from the three type specimens belonging to the extant taxa, *E. aequatoriensis* from Ecuador, *E. centenarises* from Brasil and a new *Eohomopterus* species, which was discovered some years ago on Guadalupe, Lesser Antilles, West Indies (DAVIDSON 1991, cited by NAGEL 1997). In Dominican amber the genus is represented by two species, *E. paulmuelleri* and *E. poinari*. However, according to NAGEL (1997), the precise age of the two pieces of amber containing these specimens has not yet been determined. Although both species occurred in the Early- to Mid-Tertiary Dominican amber, their coexistence cannot be proposed with confidence, as they might have been separated for several millions of years.

Discussion

During the Eocene-Oligocene transition, the Greater Antilles and northern South America were briefly connected. At the same time Central and South America were already connected (ITURRALDE-VINENT & MACPHEE 1999). The present position of Hispaniola is the result of post-Oligocene left lateral displacement along the northern Caribbean plate boundary (ITURRALDE-VINENT 2001). Therefore, it is expected that many species, which are known from Mexican amber, can also be found in Dominican amber. Additionally, Mexican and Dominican ambers are approximately of the same age and are thought to have originated in similar settings. In both cases, the amber-producing tree belongs to the extant genus *Hymenaea* (Leguminosae) (GARCIA-VILLAFUERTE & PENNY 2003).

There are already examples in the literature, which indicate similarities between Dominican and Mexican amber (ANDRADE 1995; AMORIM 1998; ANDRADE & BARONI 1999).

Eohomopterus poinari and *E. simojovelensis* n. sp. from Mexican amber are apparently closely related. This may suggest that the environmental conditions at the place of origin of both amber sources could have been the same.

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