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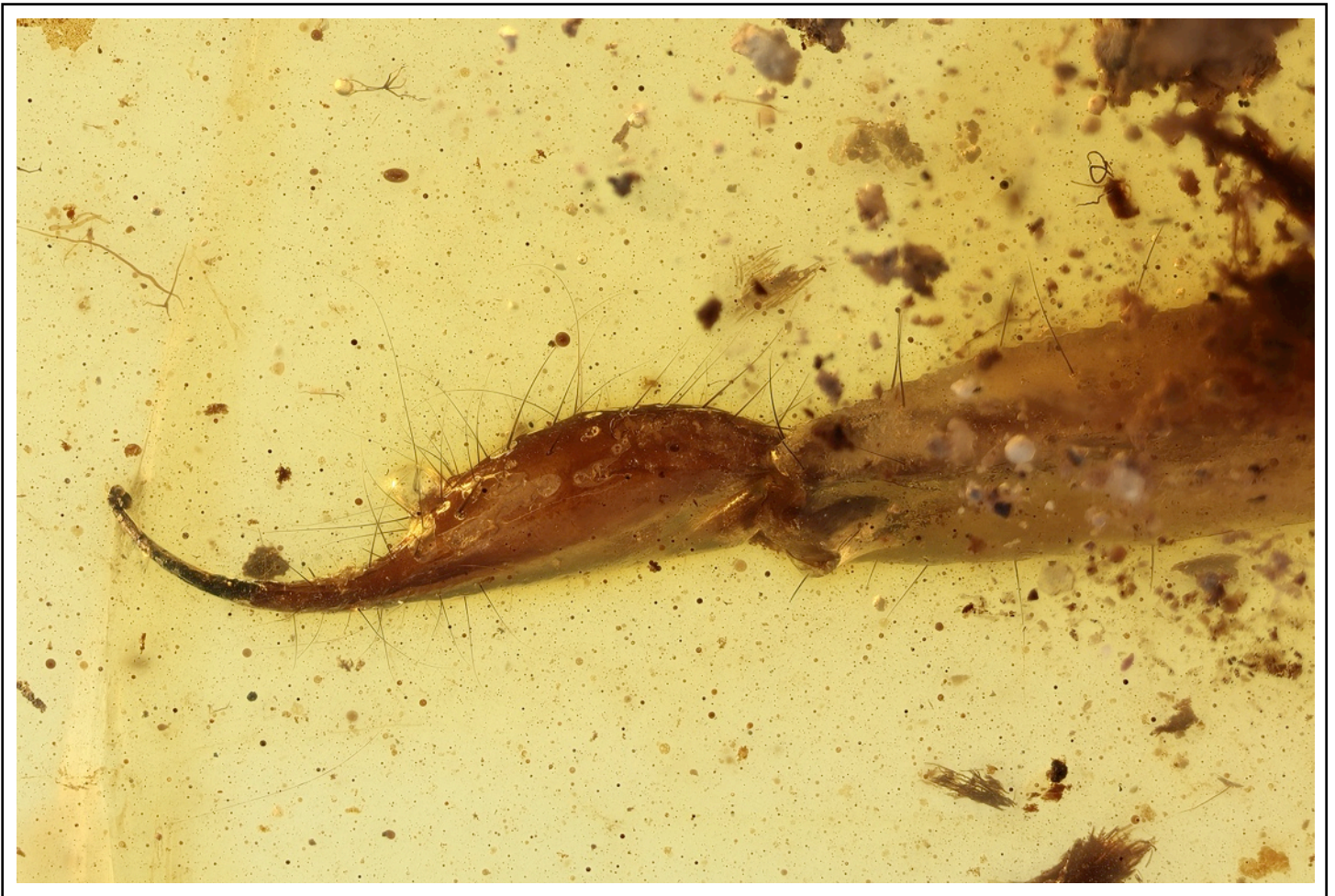
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New considerations on the taxonomic status of the family Palaeotrilineatidae Lourenço, 2012 and description of a new genus and new species (Scorpiones: Buthoidea)

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Keywords:

Scorpiones;
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Paratrilineatus;
new genus;
new species;
taxonomy;
description;
variability;
fossil;
Burmite.

Abstract. – A new genus and a new species are described for the enigmatic family Palaeotrilineatidae Lourenço, 2012. The descriptions of these new taxonomic elements bring further evidence to confirm the validity of this family. The present study equally contributes to better clarify the taxonomic position of the family Palaeotrilineatidae and further suggests a stronger association to the superfamily Buthoidea.

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Introduction

The first description of a scorpion found in Early Cretaceous amber from Myanmar (or Burmite) took place less than a quarter of a century ago (Lourenço, 2002), and was based on a rather incomplete element which was subsequently allocated to the family Palaeoburmesebuthidae Lourenço, 2015. Further studies took place and, new discoveries started to know a remarkable pace, especially from 2015 (Lourenço, 2015a,b; Lourenço & Beigel, 2015). A first synopsis was proposed by Lourenço (2023) but shows already some limitations in account of the growing number of new taxa described since then.

The findings accomplished since 2002, revealed several new families and subfamilies and a noticeable number of new genera and species. If some of these familial groups proved to be rather common and quite speciose, such as those of the families Palaeoburmesebuthidae Lourenço, 2015 and Chaerilobuthidae Lourenço & Beigel, 2011 (Lourenço, 2023; Lourenço & Beigel, 2011; Lourenço & Velten, 2024a,b). Others remain markedly more confidential and even enigmatic, such as the elements of the family Palaeotrilineatidae Lourenço, 2012 with the single genus and species *Palaeotrilineatus ellenbergeri* Lourenço, 2012 (Lourenço, 2012), or those of the family Sucinlourencoidae Rossi, 2015 equally with a single genus and species *Sucinlourencoides adrianae* Rossi, 2015 (Rossi, 2015). The rarity of, at least, some of these elements may be explained by their global large size, as for example, the species of the family Palaeotrilineatidae which can reach 30 mm in total length; rendering therefore more aleatory

their capture by the resin. Another example which goes in this sense is the one of *Cretaceousopisthacanthus smeelei* Lourenço, 2021 (family Protoischnuridae); single species known for this genus and described on the basis of one juvenile measuring 23 mm in total length (Lourenço & Velten, 2021).

In the present contribution, a new genus and species belonging to the family Palaeotrilineatidae Lourenço, 2012 are described. The new descriptions bring further elements to support the validity of this family. A reanalysis of several characters equally attempts to bring some possible clarifications on the taxonomic position of the family Palaeotrilineatidae and further suggests a stronger association to the superfamily Buthoidea.

Material and methods

The specimen investigated is preserved in a moderately clear block of yellow to reddish-yellow amber that measures 37 x 16 x 4-5 mm. Therefore, the piece is rather thick, which renders observation somewhat difficult. Also included in the piece are quite many blackish vegetal debris and bubbles, that prevents a full observation of several characters such as the carapace and tergites. The scorpion is almost complete; only a major portion of the right pedipalp was fragmented. Many characters, in both dorsal and ventral view are, however, clearly visible and allow detailed investigation. The schematic drawings provided here are an interpretation of what was observable. Illustrations and measurements were produced with the aid of a Wild M5 stereomicroscope equipped with a drawing tube (camera lucida)

Reviewer: Eric Ythier (*BYG Taxa, France*) - ZooBank: <http://zoobank.org/06FD0852-A88E-49E5-B8E6-E1494B86C4E1>



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and an ocular micrometre. Measurements follow Stahnke (1970) and are given in mm. Trichobothrial notations follow Vachon (1974), while cheliceral nomenclature follows Vachon (1963); other morphological terminology mostly follows Hjelle (1990). Trichobothria were definitely recorded only when their bothria (areoles) could be observed. Other trichobothria may be suggested by the presence of transverse hairs. The body and appendages of the scorpion may also present an important chetotaxy, consequently some misinterpretations are always possible. Considering the morphologies of pedipalps, telson and especially the pectines, the scorpion is most certainly an adult male.

Taxonomic treatment

Superfamily **Buthoidea** C. L. Koch, 1837

Family **Palaeotrilineatidae** Lourenço, 2012

Genus **Paratrilineatus** Lourenço **gen. n.**

ZooBank: <https://zoobank.org/FC4F34E6-812A-4B56-AEBA-071F43615382>

Type species. – *Paratrilineatus schmidti* Lourenço **sp. n.** (Fig. 1-16)

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Diagnosis for the new genus. – General morphology shows similarities with those of the genus *Palaeotrilineatus*, however, a combination of features can be used to diagnose the new genus. A large global size as the one already observed for the single known species of the family Palaeotrilineatidae with a total length of 29.85 mm for a possible adult male. Anterior margin of carapace with a moderate median concavity. Pectines very long, with 20-21 very elongated teeth; distal tooth only partially rounded; fulcra present but not conspicuous; sternum sub-pentagonal with a strongly marked distal concavity; spiracles small and slightly oval to semi slit-like in shape; chelicerae with moderately long distal teeth; more basal teeth not well observable. Vesicle with an elongated pear-like shape and a very long aculeus. Trichobothrial pattern similar to that of genus *Palaeotrilineatus* and apparently combining elements observed for buthids, chaerilids and pseudochactids types, respectively A, B and D (Vachon, 1974; Sologlad & Fet, 2001, 2003); consequently placed again in the type G, as defined for the family Palaeotrilineatidae (Lourenço, 2012): are approximately observable 2-3 internal, 3-4 dorsal and 3 external trichobothria on the femur; 1 internal, 4-5 dorsal, 1-2 ventral (one may be a displaced trichobothrium) and 8-9 external trichobothria on the patella; 4-5 dorso-external, 3 ventral on chela hand and 6 on fixed finger.

Derivatio nominis. – Generic name associates *Para* (next to) with *trilineatus*, and indicates its close association with genus *Palaeotrilineatus*.

Diagnosis for the new species. – The same as for the new genus.

Holotype. – Most certainly an adult male.

Type locality and horizon. – Myanmar (Burma), Kachin; precise locality unknown; Lower Cretaceous.

Patronym. – The specific name honours Mr André Schmidt (Zofingen, Switzerland) who supported the present study.

Depository. – The type specimen is deposited in the collections of Mr André Schmidt (Zofingen, Switzerland).

Description

Coloration. – The scorpion is reddish to reddish-yellow; carapace, tergites and sternites reddish-yellow; metasomal segments and telson, pedipalps and legs yellow to reddish-yellow. The ventral aspect, prosoma and mesosoma, is dark reddish to reddish-yellow.

Morphology. – Carapace weakly granulated to smooth; anterior margin with a moderate median concavity, as observed in some extant buthoids. Carinae and furrows weak to absent. Median ocular tubercle clearly anterior to centre of carapace; median eyes moderate to large in size. Three lateral eyes clearly visible. Sternum sub-pentagonal. Mesosomal tergites weakly observable, but appear to have a weak granulation and one median carina; tergite VII apparently with five visible carinae. Pectines very long with 20-21 teeth; distal tooth not rounded; fulcra present but inconspicuous; zone with peg sensilla can be perceived on some teeth. Sternites smooth and acarinate; VII with four carinae; spiracles semi-oval to slightly slit-like in shape. Metasomal segment I with ten carinae; segments II to IV with eight carinae; segment V with five carinae; dorsal carinae of segments I-IV with minute spinoid granules, better marked on IV; dorsal aspect of segments I-V weakly depressed; setation on segments I to V moderately marked. Telson with a very long pear-shaped vesicle not flattened laterally; weakly granular to smooth, but with an intense setation; aculeus very long and weakly curved; subaculear tooth reduced. Cheliceral dentition only partially visible; distal teeth moderately long and overlapping for about one fourth of their length (see Vachon, 1963 as reference). Pedipalp femur pentacarinat; with very strong spinoid granules on internal face; patella with dorso-internal, ventro-internal, dorso-external, external and ventral carinae; internal face with very strong spinoid granules. Chela with moderately marked carinae; all faces weakly granular. Fixed and movable fingers each with one series of small rounded granules, divided in 9-10 subseries by slightly larger granules; extremity of fingers with stronger spinoid granules; setation of pedipalps moderately to strongly marked. Trichobothriotaxy still defined as type G (Lourenço, 2012). See diagnosis for details.

Morphometric values (mm). Comparative morphological measurements for the male holotypes of *Palaeotrilineatus ellenbergeri* and *Paratrilineatus schmidti* Lourenço **sp. n.**

– **Total length** (including telson) 31.05/29.85.

– **Carapace**

length 3.73/3.67;
anterior width 2.00/1.87;
posterior width 3.27/3.47.

– **Mesosoma** length 6.94/7.41.

– **Metasomal segments**

I: length 2.40/2.34, width 1.60/1.67;
II: length 2.47/2.41, width 1.34/1.61;
III: length 2.53/2.54, depth 1.33/1.54;
IV: length 3.13/3.14, depth 1.27/1.54;
V: length 5.10/4.47, depth 1.26/1.39.

– **Telson** length 4.75/3.87.

– **Vesicle** width 0.63/-, depth 0.60/0.94.

– **Right pedipalp**

femur length 2.80/2.81, width 1.13/0.87;
patella length 4.47/-, width 0.93/1.24;
chela length 5.13/-, width 1.13/-, depth -/-;
movable finger length 4.33/-.

– **Left pedipalp**

femur length 3.20/2.94, width 0.80/0.93;
patella length 3.40/3.61, width 1.20/1.14;
chela length 6.27/5.53, width 0.53/0.98, depth -/-;
movable finger length 4.87/3.67.

Comments on the possible taxonomic position of the family Palaeotrilineatidae

The decision for erecting the new family Palaeotrilineatidae was mainly based on the observed trichobothrial pattern of *Palaeotrilineatus ellenbergeri* which suggested characteristics similar to those observed for three extant families or lineages: buthoids, chaeriloids and pseudochactids. In the moment when the family was created it was stated as follows: “According to some of

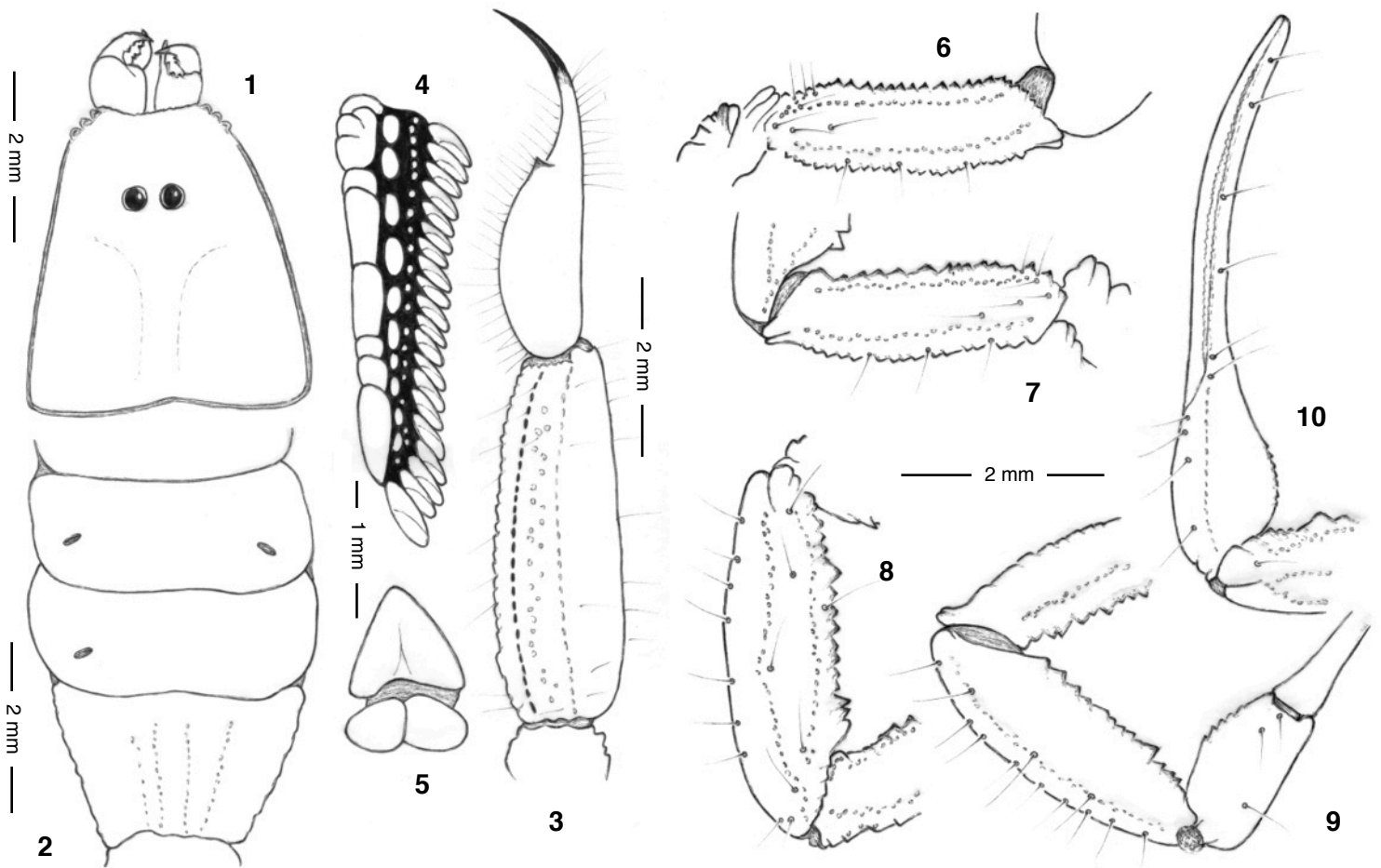


Fig. 1-10. *Paratrilineatus schmidti* Lourenço sp. n. Male holotype. (Scales. 2 mm: 1-3 & 6-10; 1 mm: 4-5)

1. Carapace and chelicerae, dorsal aspect. 2. Sternites V-VII, showing carinae and spiracles. 3. Metasomal segment V and telson, ventro-lateral aspect. 4. Pecten. 5. Sternum and genital operculum. 6-10. Trichobothrial pattern. 6-7. Right and left femur, dorsal aspect. 8. Left patella, dorsal aspect. 9. Left patella and chela, ventral aspect. 10. Left chela, dorso-external aspect.

the visible characters originally observed - particularly the trichobothrial pattern - the new scorpion seems to be allied to buthoids, chaeriloids and pseudochaeriloids. These three lineages are today represented in Southeast Asia. Even so, the assignment of the new family to one of the superfamilies, Buthoidea or Chaeriloidea (Lourenço, 2000), remains difficult. This is due to the incompleteness of the data currently available about these Burmese amber scorpions⁷.

In fact, *Palaeotrilineatus ellenbergeri* shows several characteristics which can lead to associate it rather to the buthoids. Nevertheless, the trichobothrial patterns observed, which can be defined as a majorante neobothriotaxy, tends to reject this immediate association. According to what was defined by Vachon (1974), buthids present a trichobothrial pattern of type A, which appears as the simplest and/or the most stable among those defined for the different families. In account of their regularity in numbers, type A is majorly defined as orthobothriotaxic (Vachon, 1974; Soleglad & Fet, 2001), which means that the majority of the generic-groups and species show a stable number composed mainly by what is defined as fundamental trichobothria, with very few exceptions of genera presenting species with majorants or minorants neobothriotaxies. Naturally, most of the definitions proposed by Vachon (1974) should rather be considered as a conventional approach, not truly reflecting any type of evolutionary pathway (Soleglad & Fet, 2001). In other terms, if we limit the analysis to the buthids, the most frequent observed model is, *a priori*, the standard model. One question however, can be addressed in relation to the fossil lineages which evolved in past geological times and especially those going back to the Cretaceous

period. If we limit the analysis to lineages associated to the buthoids, as for example *Archaeoananteroides* Lourenço, 2016 and *Cretaceousbuthus* Lourenço, 2022, which can clearly be accommodated in the families Ananteridae Pocock, 1900 and Buthidae C. L. Koch, 1837, or those belonging to the family Palaeoburmesebuthidae (Lourenço, 2023), genera *Palaeoburmesebuthus* Lourenço, 2002, *Betaburmesebuthus* Lourenço, 2015 and *Spinoburmesebuthus* Lourenço, 2017, then it becomes possible to confirm that the trichobothrial patterns observed are very similar or even identical to type A as defined by Vachon (1974). This only attests that this model was already present during the Mesozoic period. However, other divergent models most certainly were already present with marked differences to the typical model A. These divergences can still be observed for some extant groups such as the genera *Buthiscus* Birula, 1905, *Liobuthus* Birula, 1898 or *Vachoniolus* Levy, Amitai & Shulov, 1973 which present a majorante neobothriotaxy and/or *Orthochirus* Karsch, 1891 with a minorant neobothriotaxy (Vachon, 1958, 1974; Levy et al., 1973; Lourenço & Leguin, 2011; Ythier & Lourenço, 2023). It may also be important to notice that another family described from Cretaceous amber, *Archaeobuthidae* Lourenço, 2001, also presents a typical neobothriotaxy, but was clearly associated to the buthoids (Lourenço, 2001).

In account of all these remarks, and in particular the confirmation of some old characters associated with the illustration of some new characters provided with the description of the second genus and species for the family Palaeotrilineatidae, it seems more reasonable to include this family within the superfamily Buthoidea C. L. Koch, 1837.

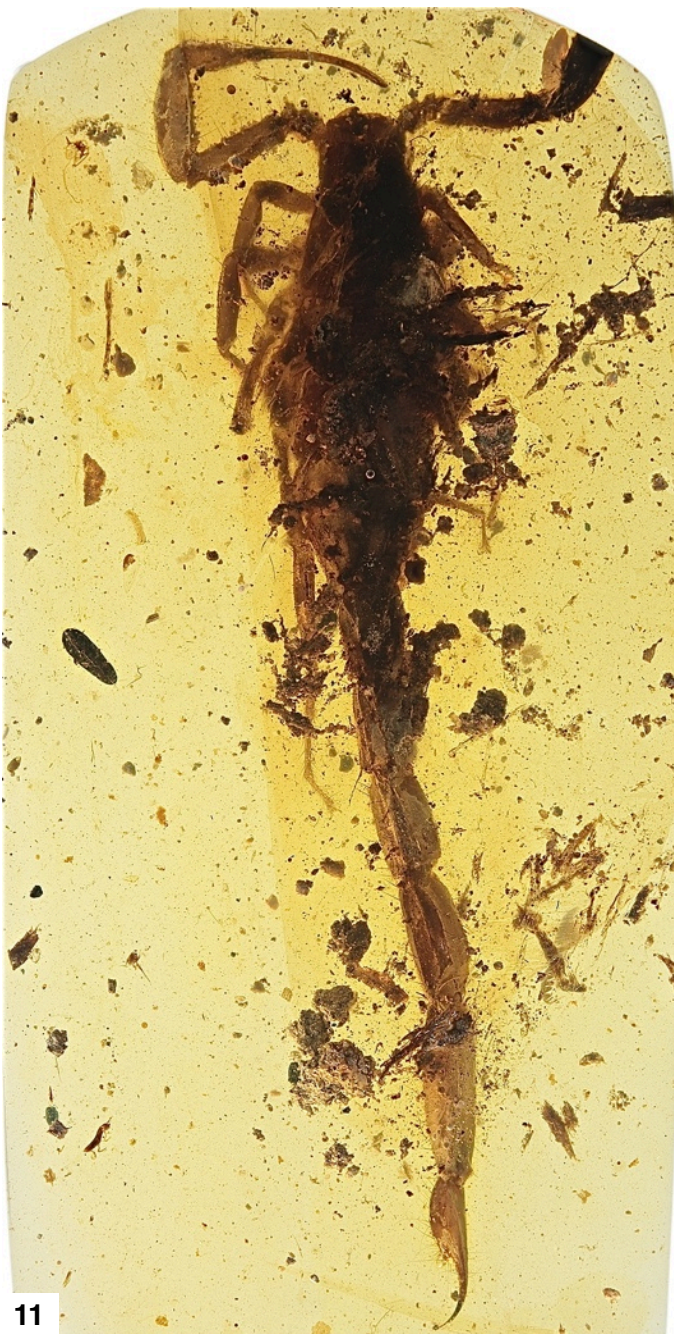
During the present study, a second scorpion specimen was equally examined. A very small juvenile with a total length of 4.11 mm. Precise sex could not be determined. This scorpion belongs to the family Chaerilobuthidae Lourenço & Beigel, 2011 and to the genus *Chaerilobuthus* Lourenço & Beigel, 2011. It shows clear affinities with *Chaerilobuthus staxi* Lourenço, 2024. The specimen is now deposited in the collections of Jürgen Velten (Kirchheimbolanden, Germany).

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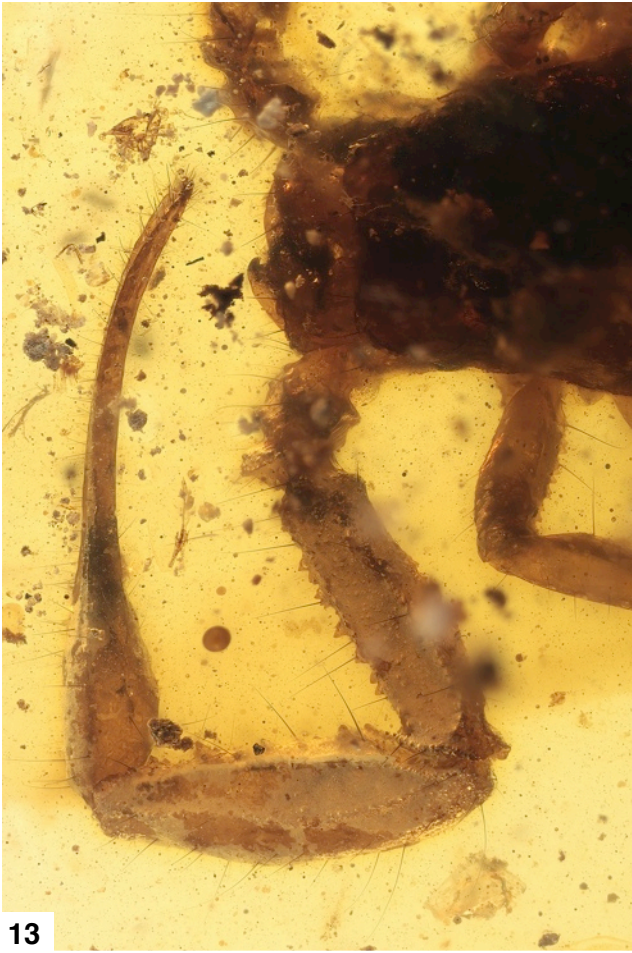


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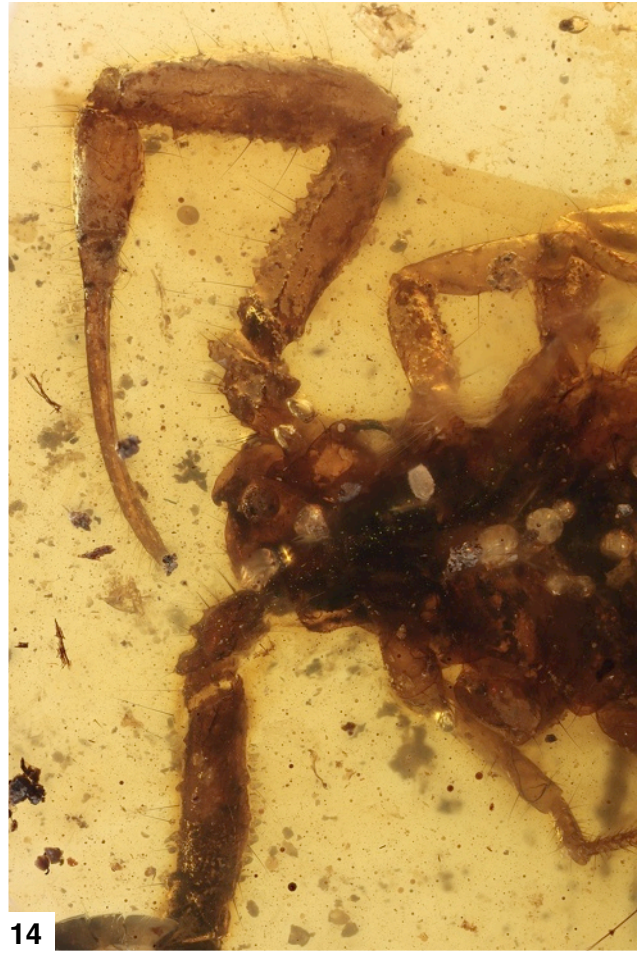


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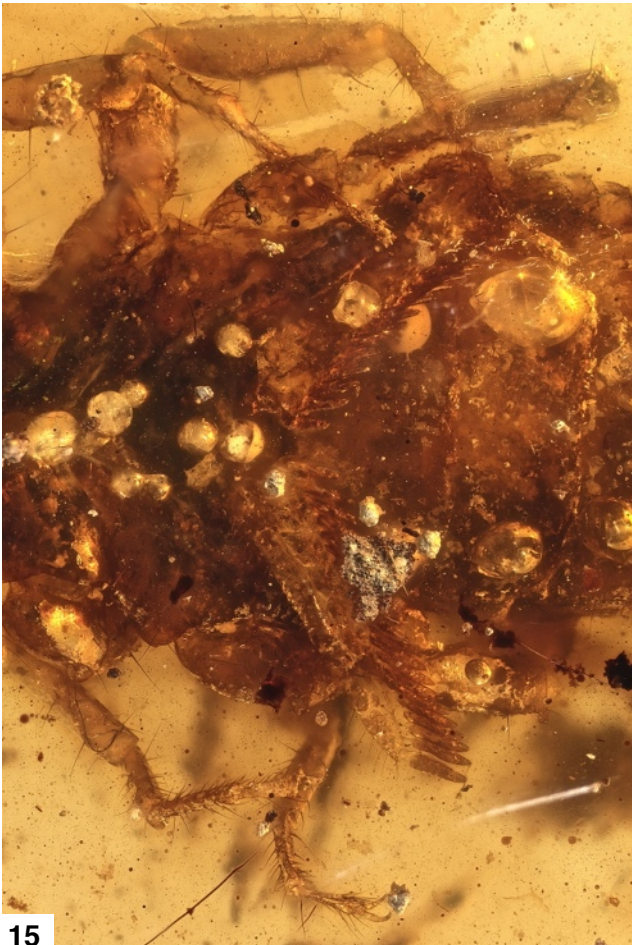
Fig. 11-12. *Paratrilineatus schmidti* Lourenço sp. n. Male holotype. Habitus, dorsal and ventral aspects.



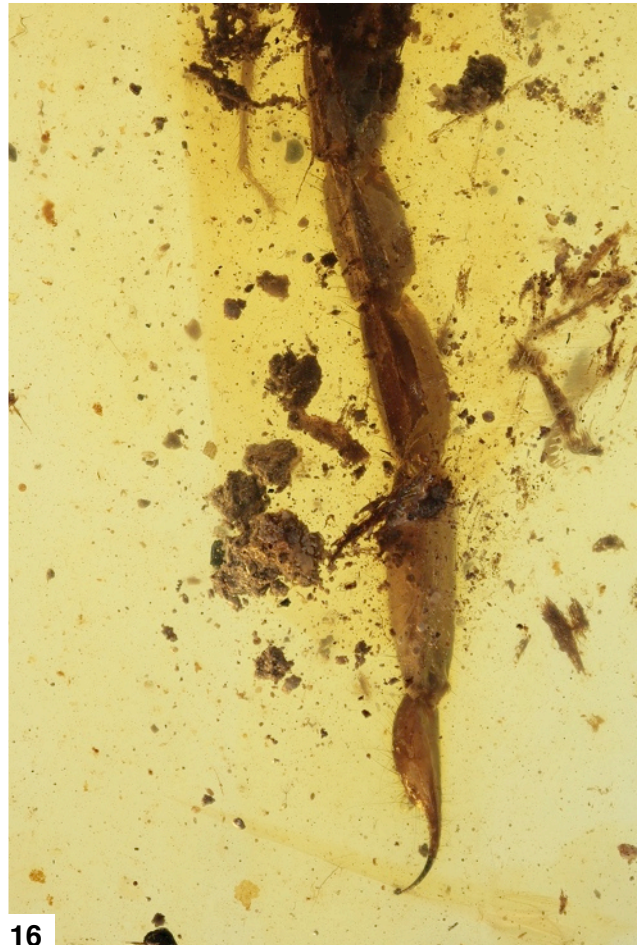
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Fig. 13-16. *Paratrilineatus schmidti* Lourenço **sp. n.** Male holotype.

13. Left pedipalp and carapace, dorsal aspect. 14. Left pedipalp and prosoma, ventral aspect. 15. Ventral aspect, showing sternum, genital operculum and pectines. 16. Metasoma, ventral aspect.

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Authors contribution ¹

Publisher Correspondence. – WL

Writing the article. – WL

Description. – WL

Article proofreading. – WL

Bibliographic work. – WL

Material study. – WL & JV

Author of the figures. – WL (Fig. 1-10) ; JV (Fig. 11-16) & couverture.

¹ WL = Wilson R. Lourenço – JV = Jürgen Velten

Résumé

Lourenço W. R. & Velten J., 2025. – Nouvelles considérations sur la position taxonomique de la famille des Palaeotrilineatidae Lourenço, 2012 et description d'un nouveau genre et d'une nouvelle espèce (Scorpiones : Buthoidea). *Faunitaxys*, 13(25): 1 – 6.

Un nouveau genre et une nouvelle espèce sont décrits pour la très énigmatique famille des Palaeotrilineatidae Lourenço, 2012. La description de ces nouveaux éléments taxonomiques apporte un soutien supplémentaire à la validité de cette famille. La présente étude contribue également à clarifier davantage la position taxonomique de la famille des Palaeotrilineatidae et suggère une association plus importante avec la superfamille des Buthoidea.

Mots-clés. – Scorpiones, Palaeotrilineatidae, *Paratrilineatus*, nouveau genre, nouvelle espèce, taxonomie, description, variabilité, fossile, Ambre Birman.

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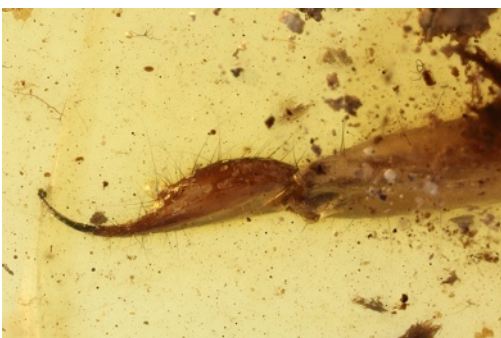


Illustration de la couverture :

Telson, lateral aspect in detail of *Paratrilineatus schmidti* Lourenço **sp. n.**

Crédits:

Wilson R. Lourenço : Fig. 1-10.

Alexander Beigel : Fig. 11-16 & couverture.