

The first pseudogarypid in Rovno amber (Ukraine) (Pseudoscorpiones: Pseudogarypidae)

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Abstract. The first *Pseudogarypus* pseudoscorpion is recorded from Rovno amber (Ukraine). The fossil is partially obscured and pyretised, but it could be reconstructed virtually with high resolution X-ray computed tomography (micro-CT). It was also compared with the *Pseudogarypus* species from late Eocene Baltic amber, and the conspecificity with *Pseudogarypus minor* Beier, 1947 is argued.

Samenvatting. De eerste *Pseudogarypus* (Pseudoscorpiones: Pseudogarypidae) uit Rovno amber (Oekraïne) De eerste *Pseudogarypus* pseudoschorpioen werd gemeld uit Rovno amber (Oekraïne). Het fossiel is gedeeltelijk zichtbaar en gepyritiseerd, maar kon virtueel gereconstrueerd worden door middel high resolution X-ray computed tomography (micro-CT). Het werd onder meer vergeleken met de *Pseudogarypus*-soorten van Baltische amber uit het laat-Eoceen en de determinatie als *Pseudogarypus minor* Beier, 1947 wordt geargumenteed.

Résumé. Première mention d'un *Pseudogarypus* (Pseudoscorpiones: Pseudogarypidae) de l'ambre de Rovno (Ukraine) Le premier pseudoscorpion du genre *Pseudogarypus* est mentionné de l'ambre de Rovno (Ukraine). Le fossile n'est que partiellement visible et pyritisé, mais en utilisant la tomographie aux rayons X de haute résolution (micro-CT), il pourrait même être reconstitué. L'exemplaire fut comparé avec des espèces de *Pseudogarypus* de l'ambre baltique de l'éocène tardif, et la conspécificité avec *Pseudogarypus minor* Beier, 1947 est argumentée.

Key words: Pseudoscorpiones – Pseudogarypidae – micro-CT scan – Rovno amber fossil.

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Introduction

Rovno amber, represented by the deposits from the north of the Rovno region (Perkovsky *et al.* 2007, 2010) contains a rich invertebrate fauna. It is geographically independent from Baltic amber. More than 170 new taxa have been described from Rovno amber in the period 2002–2012, but both late Eocene ambers also join numerous invertebrate species (Perkovsky *et al.* 2010; Perkovsky 2011).

In 2012 a geogarypid pseudoscorpion was reported in Rovno amber, that appeared to be conspecific with *Geogarypus gorskii* Henderickx, 2006, a species originally described from Baltic amber (Henderickx & Perkovsky 2012).

Here we analyse another interesting pseudoscorpion specimen from Rovno amber. This specimen is moderately preserved, but the observation could be completed with high resolution X-ray computed tomography (micro-CT) and again it was possible to attribute the specimen to an existing species.

Materials and methods

Amber fossil

The examined pseudoscorpion K-27423 was found in Klesov (Rovno region) and is deposited in the collection of the Schmalhausen Institute of Zoology.

The specimen is fossilised in a 32 × 9 × 6 mm piece of amber, engraved K-27423. It appears complete, but larger parts are covered with white opaque amber. The visible dorsal side is somewhat discoloured with whitish

amber and shows two cracks (Fig. 1). The lateral sides and the underside are obscured with opaque amber (Fig. 2a). Under the specimen is an internal flowline with cracks, which makes it impossible to make observations via the ventral plane. Lateral facets were grinded and polished to look at the chelal hands and to observe the chaetotaxy. Dorsal and ventral planparallel planes have been grinded and polished to allow illumination and better observation. The specimen was tilted in different positions in low viscosity fluid to adjust the observation edge for measurements (Fig. 3 a, b, c, d).

Optically visible details were observed and measured using reflected and translucent illumination with a Leitz microscope and a Canon MP-E objective in combination with Zerene stacker image processing software.

X-ray scanning and reconstruction

The fossil was scanned at the Ghent University Center for Tomography (UGCT) using the dual-head system (Masschaele *et al.* 2007). Given the sample size, the transmission tube head was used. A total of 1801 projection images of 1450×1820 pixels were recorded using the Varian PaxScan 2520V at an exposure time of 2000ms per projection. A geometrical magnification of approximately 60 was used, yielding a reconstructed voxel size of $2.11^3 \mu\text{m}^3$. The 3D volume was reconstructed using the in-house developed software package Octopus (www.octopusreconstruction.com) and renderings were made using Volume Graphics VGStudioMax (www.volumegraphics.com).

Due to the high amount of highly-attenuating material present in the fossil (Fig. 4a, b), most probably

pyrite, phase contrast edge enhancement was minimal, despite the object-to-detector distance of approximately 850 mm. Unlike previous visualized fossil pseudoscorpions in amber (Henderickx *et al.* 2006, 2012) some fine details could thus not clearly be visualized. Nevertheless, the 3D renderings provide useful morphological information.



Figure 1. *Pseudogarypus minor* in Rovno amber, dorsal view.



Figure 2. *Pseudogarypus minor* in Rovno amber, right lateral view, 2a: visible light, 2b micro-CT reconstruction, same scale.

Systematics

Fossil Pseudogarypidae

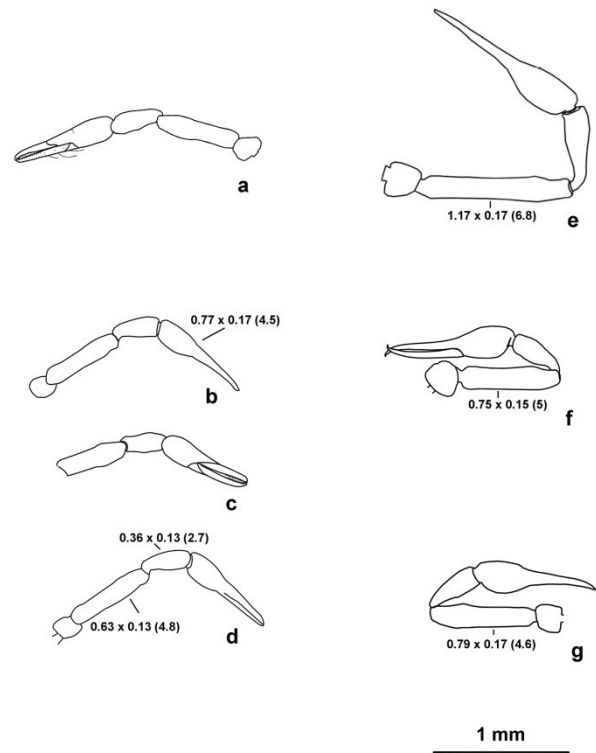
Five fossil species of Pseudogarypidae Chamberlin, 1923 (Fealloidea) have been described from Baltic amber. An overview is given in Henderickx *et al.* 2012.

The Rovno specimen: diagnosis

(measurements in mm, if not indicated)

This pseudoscorpion from Rovno amber is a typical *Pseudogarypus*, it has 4 well visible eyes on protuberances, a carapace with posterolateral protuberances anterior to carapacial alae and pleural membranes raised into folds (Fig. 2b). It is a small specimen (body length 2mm (Fig. 4), with a relative short femur (0.63×0.13 , L/W index 4.8) This excludes the species with a relative long pedipalpal femur (*Pseudogarypus synchrotron* Henderickx, 2012 (Fig. 3e), *P. hemprichii* Beier, 1937 and *P. extensus* Beier, 1937). The carapace is as long as wide ($0.56 \text{ mm} \times 0.56 \text{ mm}$), as *Pseudogarypus minor* Beier, 1947 figured in the original description (Beier 1947: 194), different from the

carapace of the holotype of *P. pangaea* Henderickx, 2006 which is wider than long (Henderickx *et al.* 2006). The teeth of the pedipalpal finger could be observed with translucent light, (Fig. 5a, Fig. 3c) and appear spaced, as in *P. minor*, different from *P. pangaea* (Fig. 3g) which has a contiguous row of teeth on both pedipalpal fingers (Henderickx *et al.* 2006: 48).



3

Figure 3a: *Pseudogarypus minor* in Rovno amber, right chela, paraxial view with translucent indication of the three axial trichobothria of the pedipalpal finger. Fig.3b, c,d: *Pseudogarypus minor* in Rovno amber, left chela, tilted in different positions to allow measurements (indicated) and observation of the teeth (3c). Figure 3e: *Pseudogarypus synchrotron*, holotype, left chela of holotype, mirror view; Fig. 3f: *Pseudogarypus minor*, right chela (according to Beier, 1947); Fig. 3g: *Pseudogarypus pangaea*, holotype, left chela.

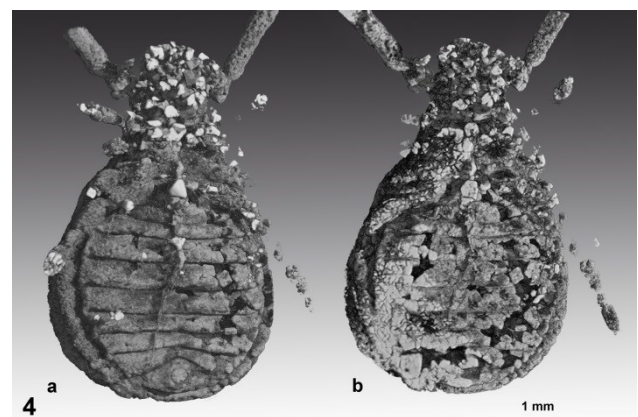


Figure 4a,b: *Pseudogarypus minor* in Rovno amber, micro-CT scan, settings of the reconstruction on 3b are different to show the internal pyrite crystallisation.

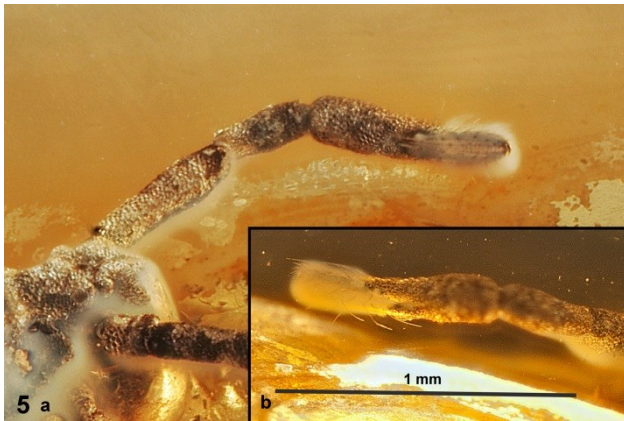


Figure 5:

The Rovno specimen appears therefore more similar with *P. minor*, but is significant smaller than the latter: the femur length is only 0.63 mm (0.79 in *P. minor*, Fig. 3f). However, a ventral illumination revealed only tree trichobothria on the axial side of the chelal fingers, a

characteristic of a *Pseudogarypus* tritonymph. The small size could therefore be explained by the subadult state of the specimen. The ventral side, visible with micro-CT scan (Fig. 4a, b) does not show a well developed genital plate, only a minor curve indicating that the specimen is probably a subadult male.

Conclusion

We can conclude that the Rovno specimen is a tritonymph, conspecific with *Pseudogarypus minor*, a species described from Eocene Baltic amber.

Acknowledgements

The Micro-CT scans, beamtime and reconstructions were fully supported by the Ghent University, Department of Subatomic and Radiation Physics.

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