Zootaxa 5739 (1): 008–012
https://www.mapress.com/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.5739.1.4
http://zoobank.org/urn:lsid:zoobank.org:pub:CE506020-5CAC-4698-BB04-EDC97D7F6C53

Description of the female of *Aradus superstes* Germar & Berendt, 1856 from the Eocene Baltic amber (Hemiptera: Aradidae)

DANY AZAR[1,2]
[1]*State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing 210008, China*
[2]*Lebanese University, Faculty of Science II, Natural Sciences Department, Fanar - El-Matn, PO Box 26110217, Lebanon*
danyazar@ul.edu.lb; https://orcid.org/0000-0002-4485-197X

Abstract

Aradus superstes Germar & Berendt, 1856 from Eocene Baltic amber is known from a sole male specimen. Herein the female of this fossil species is described and illustrated.

Key words: Aradinae, sexual dimorphism, flat bug

Introduction

Baltic amber is the most abundant and scientifically important Eocene fossil resin in the Northern Hemisphere, originating primarily from forests dominated by conifers. Its geological age is generally constrained to the middle–late Eocene (*ca.* 47–34 Ma), with most deposits dated near 44 Ma (Weitschat & Wichard, 2010). This amber represents the product of extensive resin flows transported into marine basins, where they polymerized and accumulated in large secondary deposits around the southeastern Baltic region. Owing to its exceptional clarity and preservation quality, Baltic amber contains one of the richest fossil arthropod assemblages known, with more than 15,000 described species (Penney & Jepson, 2014). Consequently, it provides a unique window into Eocene terrestrial ecosystems and remains indispensable for studies of insect evolution, paleoecology, and biogeography.

The true bug family Aradidae Brullé, 1836 (flat bugs) is a diverse and globally distributed lineage of Hemiptera, with approximately 2,200 extant described species in over 250 genera, adapted to life under bark, often feeding on fungal hyphae (Marchal *et al.*, 2011). They lack ocelli and the labia have four segments. Their tarsi are two-segmented. The fossil record of Aradidae is comparatively rich, comprising more than 60 described species, with the earliest representative (*Aradus nicholasi* Popov, 1989) dating back to the Lower Cretaceous of Bon-Tsagan in Mongolia (Marchal *et al.*, 2011; Popov, 1989). Most fossil Aradidae are preserved in amber, notably from the early Cenomanian Burmese amber—which yields the oldest record—and from the Eocene Baltic amber, which contains the most diverse assemblage of fossil *Aradus* Fabricius, 1803 species.

Within Aradidae, the subfamily Aradinae Amyot and Serville, 1843 is characterized by dorsoventrally flattened bodies and elongate antennae, traits that are well-suited to their cryptic habit.

The genus *Aradus* Fabricius, 1803, within Aradinae, is particularly prominent in the fossil record of the Baltic (Eocene) amber. To date 21 species were described from this amber: *A. assimilis*, *A. consimilis* and *A. superstes* Germar & Berendt, 1856; *A. frater* Popov, 1978; *A. frateroides* and *A. popovi* Heiss, 1998; *A. goellnerae* and *A. lativentris* Heiss, 2002a; *A. weitschati*, *A. kotashevichi*, *A. velteni*, *A. voigti*, *A. damzeni* and *A. balticus* Heiss, 2002b; *A. garabenhorsti* Heiss, 2013; *A. macrosomus* Heiss, 2014a., *A. leptosomus*, *A. rotundiventris* Heiss, 2014b, *A. penteneuros* Heiss, 2014c; *A. hoffmanni* and *A. stebnerae* Heiss, 2016. These numerous fossil *Aradus* illustrate that the genus was already highly speciose by the Eocene and offer important insights into the early evolutionary history and biogeography of flat bugs.

 Accepted by D.-Y. Huang: 19 Dec. 2025; published: 31 Dec. 2025

Aradus superstes was initially described by Germar & Berendt (1856), based on a single specimen without however providing neither the sex of the examined specimen nor its measurements. Heiss (1998) redescribed in detail the holotype (male, deposited in the Museum für Naturkunde, Berlin, Germany, Inventory Nr. MBJ 1883).

Herein the female of *Aradus superstes* is describe and illustrated. The description of this new female specimen from Baltic amber contributes to ameliorate our understanding of the diversity and distribution of the family during the Eocene.

Material and methods

The study is based on a single flat bug (Hemiptera: Aradidae) specimen preserved in a piece of Baltic amber. To improve visibility, cracks in the amber were consolidated by applying a low-viscosity epoxy resin (ESCIL Geofix, parts A and B). The resin wicking into the cracks eliminated internal reflections and significantly increased transparency. Subsequently, the amber piece was trimmed with an electric saw and polished through a series of emery paper grits, concluding with a final polish using diatomite powder.

The specimen is deposited in the collections of the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences (NIGPAS), Nanjing, China, under the accession number NIGP209778.

Observations and imaging were performed using a Zeiss Axio ZoomV16 stereomicroscope equipped with a Zeiss Axiocam 512 colour camera. All photographs are digitally stacked composites of multiple focal planes, processed using Helicon Focus 8 software. Figures were assembled with Adobe Photoshop CC2019. A line drawing was prepared using a camera lucida attachment on an Olympus BX53 compound microscope. Measurements are given in microns.

Terminology for wing venations follow Heiss (2002a).

Systematic palaeontology

Order Hemiptera Linnaeus, 1758

Family Aradidae Brullé, 1836

Subfamily Aradinae Amyot and Serville, 1843

Genus *Aradus* Fabricius, 1803

Aradus superstes Germar & Berendt, 1856

(Figs 1, 2)

Material. Specimen number NIGP209778. Macropterous female from Baltic amber, deposited in the collections of the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences (NIGPAS), Nanjing, China.

Diagnosis. As given by Heiss, 1998.

Description. Macropterous female (Fig. 1A–C), 6540 μm long and 3377 μm large. Body and legs with fine granulation; antennae densely covered with tubercles bearing setae. Color gray-brown with irregular lighter areas and a paler membrane.

Head

1099 μm long and 1304 μm (Fig. 2A). Antenna four-segmented, 2037 μm long, with antennal segment II longest; antennal segments' lengths: I: 242, II: 801, III: 547, IV: 447. Antennal tubercles distally pointed. Eyes large, spherical, projecting laterally (Fig. 2A). Vertex with U-shaped transverse depression. Rostrum four-segmented, slightly surpassing prosternum.

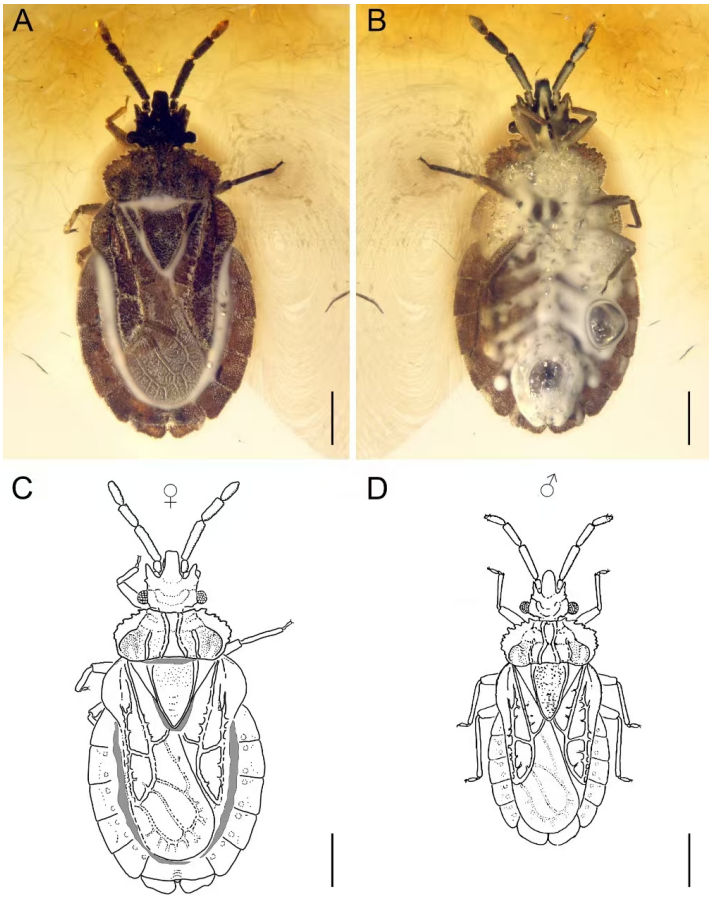

FIGURE 1. *Aradus superstes* Germar & Berendt, 1856. **A**, Dorsal view of female specimen NIGP209778. **B**, Dorsal view of female specimen NIGP209778. **C**, Line drawing of dorsal view of female specimen NIGP209778. **D**, Line drawing of dorsal view of male holotype redrawn and adapted from Heiss (1998). Scale bars = 1 mm.

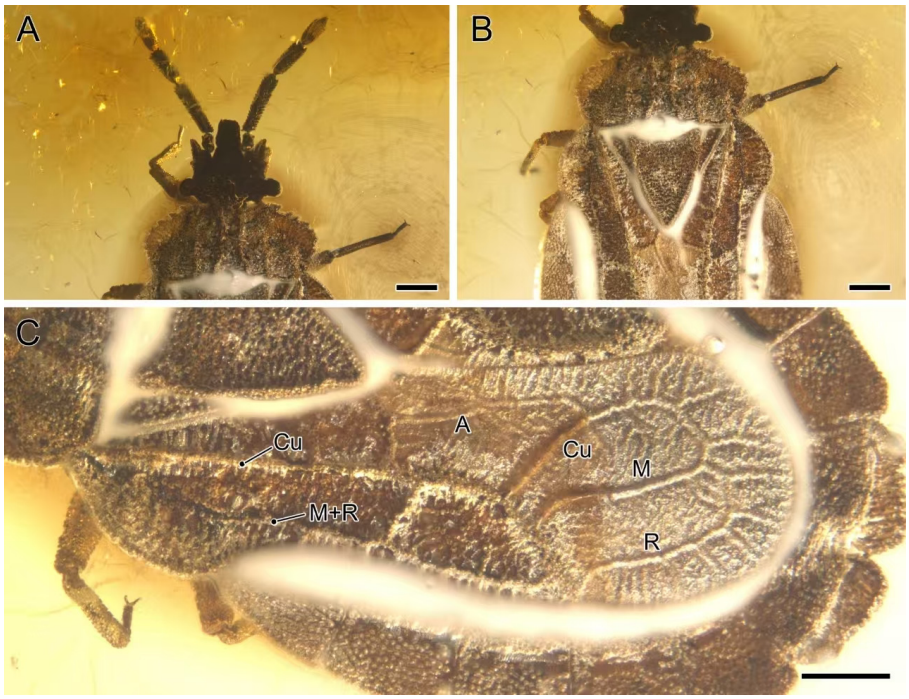

FIGURE 2. *Aradus superstes* Germar & Berendt, 1856, female specimen NIGP209778. **A**, Dorsal view of head. **B**, Dorsal view of pronotum and scutellum. **C**, Hemelytra; A= Anal vein, Cu = Cubitus, M = Media, R = Radius. Scale bars = 500 µm.

Pronotum
More than twice as wide as long in the middle, 939 μm long and 2244 μm large (Fig 2B). Lateral margins broadly rounded and distally converging, strongly and irregularly dentate. With four longitudinal carinae, middle two developed throughout their entire length and approaching one another in an X-shape; lateral carinae expanded only from proximal margin to transverse furrow of pronotum. Shoulders bulged with a short longitudinal ridge. Proximal margin medially slightly indented, laterally rounded.

Scutellum
Triangular, 1432 μm long. Lateral margins raised like ridges, slightly indented medially, converging toward narrowly rounded apex (Fig. 2B). Surface in basal third slightly elevated and coarsely granulated, otherwise transversely wrinkled.

Hemelytra
4020 μm long and 1391 μm large (Fig. 2C). Corium in basal third broadly rounded with finely dentate lateral margin; distal angle reaching to one-third of dorsal laterotergite VI. Surface with pronounced longitudinal and transverse venation. Crossvein m–cu distal to the a–cu crossvein. Membrane with four longitudinal veins; two middle ones (cubitus and media) unite distally in a curved arch, forming a closed cell. Surface wrinkled.

Abdomen
3377 μm broad. Lateral margins of visible laterotergite III–VI evenly rounded, not protruding; VII slightly protruding and distally narrowly rounded. Ventrally with median longitudinal furrow. Female terminalia invisible under "cloudy" layer.

Legs
Slender; femora tapered proximally and distally; trochanter of pro- and mesofemora fused, but with a seam separating the metafemoral trochanter. Tibiae cylindrical, slender. Tarsi 2-segmented, with long, distally curved pretarsal claws.

Discussion

The female specimen described herein shares with the male holotype of *Aradus superstes* all diagnostic morphological characters across all body regions. The only differences observed, aside from the genitalia, are its larger overall size and its relatively broader abdomen. The general rule in insects is that females are typically larger than males. In Aradidae, sexual dimorphism is generally subtle; females tend to be equal to or larger than males, particularly in abdominal width, a pattern commonly associated with fecundity-driven selection across Heteroptera (Schuh & Slater, 1995).

The absence of any significant morphological differences between the male holotype of *A. superstes* and the female specimen described herein strongly supports their conspecificity. The combination of identical external characters, congruent proportions of major structures, and expected sexually dimorphic abdominal broadening in the female justifies the assignment of the present specimen to *Aradus superstes.*

Conclusion

The description of the female of *Aradus superstes* from Baltic amber enhances our understanding of this Eocene species and provides the first documentation of sexual dimorphism within the species. The recognition of both sexes allows a more complete characterization of the species, refines its diagnostic traits, and reduces the likelihood of misidentification of isolated specimens. Moreover, the confirmation of typical Aradidae sexual dimorphism in *A. superstes* contributes to broader discussions on morphological variability, systematics, and evolutionary patterns within fossil flat bugs. As Baltic amber continues to yield new material, the integration of both male and female characters will be crucial for reconstructing species boundaries, phylogenetic relationships, and paleobiological diversity within Aradinae.

Acknoledgments

I thank Profs André Nel and Ernst Heiss for their valuable comments. I thank Prof. Diying Huang for providing the studied material. This work was supported by the National Key Research and Development Program of China (2024YFF0807601).

References

Amyot, C.J.B. & Serville, J.G.A. (1843) *Histoire naturelle des insectes: Hémiptères*. Paris, xxvi + 681 pp., 12 plates.

Brullé, A. (1836*) Histoire naturelle des insectes, traitant de leur organisation et de leurs mœurs en* général*, et comprenant leur classification et la description des espèces*. Pillot, Paris, 415 pp.

Fabricius, J.C. (1803) *Systema Rhyngotorum secundum ordines, genera, species, adjectis synonymis, locis, observationibus, descriptionibus*. Brunswick, X + 314 pp.

Germar, E.F. & Berendt, G.C. (1856) Die im Bernstein befindlichen Hemipteren und Orthopteren der Vorwelt. *In*: Berendt, G.C. (Ed.), *Die im Bernstein befindlichen organischen Reste der Vorwelt*, 2, pp. 1–140. https://doi.org/10.5962/bhl.title.66910

Heiss, E. (1998) Revision der Familie Aradidae des Baltischen Bernsteins I. Bisher beschriebene Taxa der Gattung *Aradus* und zwei neue Arten (Insecta, Heteroptera). *Mitteilungen des Geologisch-Paläontologischen Instituts der Universität Hamburg*, 81, 251–268.

Heiss, E. (2002a) Revision of the family Aradidae in Baltic Amber IV. Two new *Aradus* from the collection of the Institut für Paläontologie, Museum für Naturkunde, Berlin (Heteroptera, Aradidae). *Mitteilungen des Museums für Naturkunde Berlin, Deutsche Entomologische Zeitschrift*, 49 (2), 221–225. https://doi.org/10.1002/mmnd.20020490207

Heiss, E. (2002b) Revision der Familie Aradidae des Baltischen Bernsteins VI. Neue Arten der Gattung *Aradus* Fabricius, 1803 (Heteroptera, Aradidae). *Linzer biologische Beiträge*, 34 (2), 1137–1150.

Heiss, E. (2013) Erstnachweis von Rindenwanzen (Aradidae) in Bitterfelder Bernstein (Insecta, Heteroptera). *Linzer biologische Beiträge*, 45 (1), 741–753.

Heiss, E. (2014a) Revision of the flat bug family Aradidae from Baltic Amber IX. *Aradus macrosomus* sp. n. (Hemiptera: Heteroptera). *Deutsche Entomologische Zeitschrift*, 61 (1), 27–29. https://doi.org/10.3897/dez.61.7155

Heiss, E. (2014b) Revision der Familie Aradidae des Baltischen Bernsteins X. Zwei neue *Aradus*-Arten (Hemiptera: Heteroptera). *Linzer biologische Beiträge*, 46 (1), 623–628.

Heiss, E. (2014c) Revision der Familie Aradidae des Baltischen Bernsteins XI. *Aradus penteneuros* nov. sp. mit ungewöhnlicher Flügeladerung (Hemiptera: Heteroptera). *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen*, 66, 25–29.

Heiss, E. (2016) Revision der Familie Aradidae (Rindenwanzen) des Baltischen Bernsteins XII. Zwei neue *Aradus*-Arten (Hemiptera: Heteroptera). *Abhandlungen aus dem Westfälischen Museum für Naturkunde*, 83, 27–34.

Linnaeus, C. (1758) *Systema naturae per regina tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. Editio decimo, reformata. L. Salvii, Holmiae [= Stockholm], v + 824 pp. https://doi.org/10.5962/bhl.title.542

Marchal, L., Guilbert, E., Brisac, P. & Nel, A. (2011) A new record and a new species of Aradidae fossils (Hemiptera: Heteroptera). *Zootaxa*, 2832 (1), 56–62. http://doi.org/10.11646/zootaxa.2832.1.4

Penney, D. & Jepson, J.E. (2014) *Fossil insects: An introduction to palaeoentomology.* Siri Scientific Press, Manchester, 224 pp.

Popov, Y.A. (1978) New species of Aradidae (Hemiptera) from the Baltic Amber. *Prace Muzeum Ziemi*, 29, 137–140.

Popov, Y.A. (1989) New fossil Hemiptera (Heteroptera + Coleorrhyncha) from the Mesozoic of Mongolia. *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte*, Stuttgart, 166–181.

Schuh, R.T. & Slater, J.A. (1995) *True Bugs of the World (Hemiptera: Heteroptera): Classification and Natural History*. Cornell University Press, Ithaca, New York, 336 pp.

Weitschat, W. & Wichard, W. (2010) Baltic amber. *In*: Penney, D. (Ed.), *Biodiversity of fossils in amber from the major world deposits.* Siri Scientific Press, Manchester, pp. 80–115.