

New species of water striders (Hemiptera: Heteroptera: Gerromorpha: Hydrometridae, Gerridae) from Eocene Baltic amber

By Herbert ZETTEL¹ and Ernst HEISS²

(With 22 figures)

Manuscript submitted on June 29th 2010,
the revised manuscript on October 7th 2010

Abstract

New species of two hitherto monotypic genera of water striders are described from Baltic amber inclusions: *Metrocephala schaeferi* nov. spec. is compared with *Metrocephala anderseni* POPOV, 1996 (Hydrometridae), and *Succineogerris nilsi* nov. spec. with *Succineogerris larssoni* ANDERSEN, 2000 (Gerridae). Additional descriptive notes and illustrations are presented for the type material of *S. larssoni*.

Keywords: amber, Baltic, Hydrometridae, Gerridae, *Metrocephala*, *Succineogerris*, new species, taxonomy

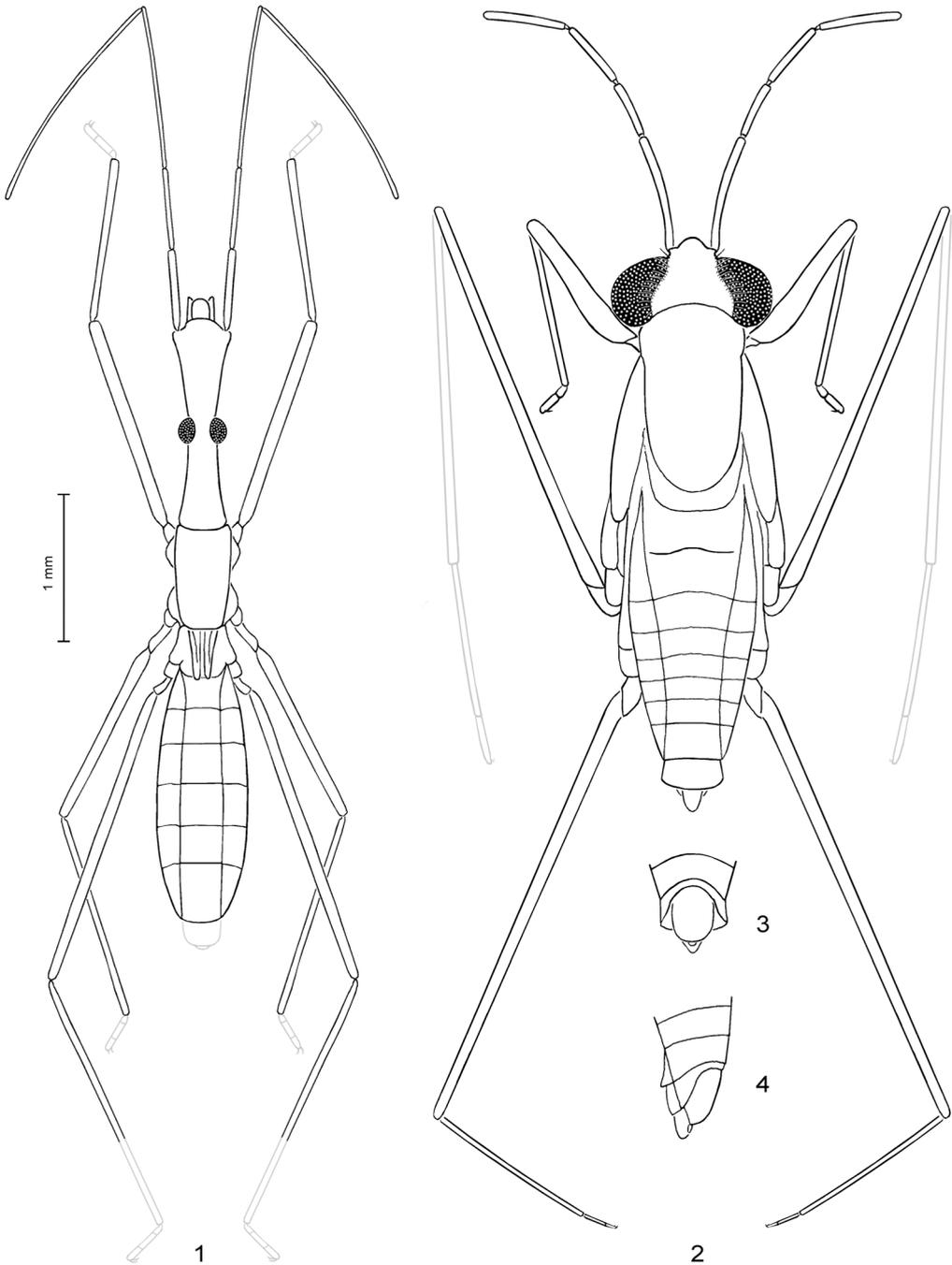
Zusammenfassung

Zwei neue Arten aus bisher monotypischen Gattungen der Wasserläuferartigen Wanzen werden aus Baltischem Bernstein beschrieben: *Metrocephala schaeferi* nov. spec. wird mit *Metrocephala anderseni* POPOV, 1996 (Hydrometridae) verglichen, und *Succineogerris nilsi* nov. spec. mit *Succineogerris larssoni* ANDERSEN, 2000. Eine zusätzliche Beschreibung samt Illustrationen des Typematerials von *S. larssoni* wird beigefügt.

Schlüsselwörter: Bernstein, Baltikum, Gerridae, *Metrocephala*, *Succineogerris*, neue Taxa, Taxonomie

¹ International Research Institute of Entomology, Natural History Museum, Burgring 7, 1010 Vienna, Austria; e-mail: herbert.zettel@nhm-wien.ac.at

² Entomological Research Associate, Tiroler Landesmuseum Ferdinandeum, Josef-Schraffl-Straße 2a, 6020 Innsbruck, Austria; e-mail: aradus@aon.at



Figs 1–4. **1:** *Metrocephala schaeferi* nov. spec., holotype, habitus reconstruction; hypothetical parts in grey; **2–4:** *Succineogerris nilsi* nov. spec.; **2:** habitus reconstruction; hypothetical parts in grey; **3:** terminal segments ventral aspect; **4:** ditto, lateral aspect.

Introduction

The presence of water insects in amber seems on principal to be contradictive, as their living habitats are aquatic or semiaquatic environments and amber originates from resin of extinct trees. However, the already known fauna of aquatic insects from Baltic amber is very rich and hundreds of species assigned to nine different orders and 74 families are recorded to date. An excellent overview is given by WICHARD et al. (2009).

Gerromorpha are mostly aquatic organisms living on the surface of freshwater and, in general, are sparsely documented in the fossil record. In a recent reinterpretation of fossil records DAMGAARD (2008) lists 34 taxa (*Succineogerris larssoni* to be added), which doubtless belong to Gerromorpha and to at least four families (Hebriidae, Hydrometridae, Veliidae, Gerridae, and incertae sedis). In addition, the first doubtless representatives of Mesoveliidae were recently discovered in Dominican (GARROUSTE & NEL 2010) and Baltic amber (ZETTEL & HEISS, in prep.). According to GRIMALDI & ENGEL (2005), the oldest fossil gerromorphan bug is a mesoveliid from the Upper Jurassic (152 million Ma) of Kazakhstan, but the assignment of that fossil was not accepted by ANDERSEN (1998) and doubted by DAMGAARD (2008). According to DAMGAARD (2008: Tab. 1) the oldest doubtless Gerromorpha are Mesozoic Hydrometridae from the Lower Cretaceous (110 Ma) of Brazil and a gerrid from the Lower Cretaceous (100 Ma) of France. Hitherto, seventeen species have been described from inclusions in Baltic (40-35) and Dominican Amber (20-17 Ma) (DAMGAARD 2008, GARROUSTE & NEL 2010).

The present study describes two amber inclusions of the Baltic Sea (40-35 Ma) from the second author's collection. They represent new species of *Metrocephala* POPOV, 1996 (Hydrometridae) and *Succineogerris* ANDERSEN, 2000 (Gerridae).

Material and methods

Both type specimens are included in small pieces of Baltic amber which were embedded in blocks of clear polyester resin for better long term preservation. This method facilitates easier examination and prevents the precious inclusion from unintentional damage during handling.

The digital colour photographs were taken with a Leica DFC490 camera attached to a Leica MZ16 binocular microscope with the help of Image Manager IM50 and processed with Auto-Montage Pro and Adobe Photoshop 7.0 software. Measurements were taken with a micrometer eyepiece and are given in millimetres.

Order Hemiptera LINNÉ, 1758

Infraorder Gerromorpha POPOV, 1971

Family Hydrometridae BILLBERG, 1820

***Metrocephala schaeferi* nov. spec.**

(Figs 1, 5-9)

Etymology: Named after our friend Carl W. Schaefer (Storrs, USA) recognising his continuous efforts to improve the linguistic style of our English manuscripts.

Holotype (micropterous specimen, male?), enclosed in a piece of amber (11.8 × 7.9 mm) from the Baltic coast (exact locality and stratum unknown), labelled “Holotype ♂(?) / *Metrocephala schaeferi* n.sp. / des. H. Zettel & E. Heiss 2010”, stored in a box with the labels “He-Aq-1” and “BB-Hydrometr.”, in coll. Ernst HEISS, Innsbruck.

Description: Size: Body length 4.1 mm, maximum body width (at abdominal segment 5) 0.60 mm.

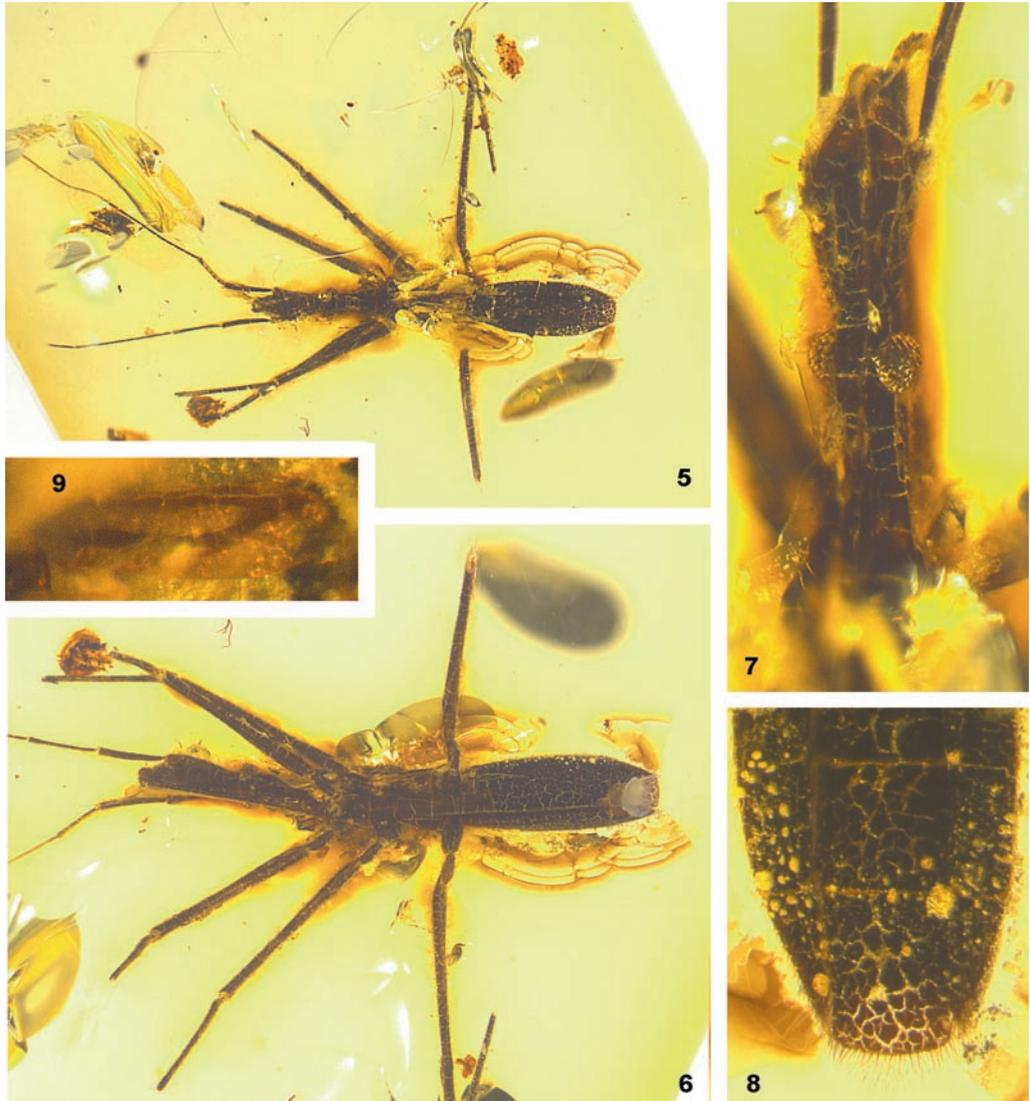
Colour: Body, antennae, and legs completely black, wing rudiments whitish with brown veins.

Measurements (in mm): Head width at eyes 0.37, median length 1.49, interocular width 0.11, eye length 0.18; anteocular region, width (= maximum width of head) 0.40, length 0.78; postocular region, width 0.28, length 0.48. Lengths of antennal segments 1–4: 0.54, 0.54, 1.09, 1.49. Pronotum width ca. 0.55, median length 0.67. Lengths of leg segments (femur, tibia, tarsus): fore leg: 1.44, 1.15 (probably not broken), tarsus broken off; middle leg: 1.51, 1.37 (probably not broken), tarsus broken off; hind leg: 2.18, tibia broken. Wing rudiments, length 0.36, width 0.09.

Structural characteristics: Head moderately long, with strongly enlarged anteocular region (in dorsal and lateral aspect), maximum width at antennal tubercles. Rostrum long, reaching mesocoxae. Pronotum relatively stout, with broad, somewhat tumescent collar. Metathorax short. Wings rudimentary, as short strips reaching posterior end of tergite 1, one narrow cell developed. Abdomen slender (as compared with the type species), laterotergites being approximately 1.5 times as wide as tergites. Hind margin of tergite 7 with row of fine, posteriad directed hairs. In ventral aspect, distance of procoxae slightly smaller than those of meso- and metacoxae. Sternite 7 with deep, roundish, ventral emargination. Antennae and legs set with short, erect pubescence.

Comparative notes: The holotype is a micropterous specimen with small, narrow wing rudiments as frequently seen also in recent Hydrometridae. Genitalia are lacking, but from the deep emargination of sternite 7, it is concluded that it is a male. Moreover, abdominal segments 7 and 8 are flexibly connected by a thin membrane in males of Hydrometridae (which easily can be destroyed even in fresh material), but are tightly connected in females. The specimen fits well in the genus *Metrocephala* based on all

characteristics mentioned by POPOV (1996): e.g., by small size, head shape, ratios of antennomere lengths, short metathorax, and wide laterotergites. *Metrocephala schaeferi* nov. spec. strongly resembles the type species, *M. anderseni* POPOV, 1996 from Baltic amber, in many details: but comparison with the verbal description and illustrations (especially plate 2) provided by POPOV (1996) yields enough differences for an argumentation that



Figs 5–9. *Metrocephala schaeferi* nov. spec., holotype; 5: Complete specimen, dorsal aspect; 6: Complete specimen, ventral aspect; 7: Head, approximately dorsal aspect; 8: Abdominal segments 6 and 7, dorsal, aspect; 9: Right forewing rudiment.

these are two species: The most obvious difference is the shape of the abdomen which, in its relations, is much more slender in *M. schaeferi* and leads to an overall narrower appearance when compared with *M. anderseni*. The boundaries between laterotergites and mediotergites are not clear in the holotype of *M. anderseni* (POPOV 1996: Plate 2), but in the “Bitterfeld amber” female paratype (see POPOV 1996: Fig. 3) laterotergites 5 are almost twice as wide as the corresponding mediotergites (vs. 1.5 times in *M. schaeferi*). The legs (femora, tibiae) of *M. anderseni* are described as “ferrous” (Plate 2 in POPOV 1996 shows that they are reddish orange), whereas the legs of *M. schaeferi* are completely black; however, this difference may be due to diagenetic changes.

Family Gerridae LEACH, 1815

***Succineogerris nilsi* nov. spec.**

(Figs 2-4, 10-15)

Etymology: Named for the memory of the heteropterologist Prof. Dr. Nils Møller Andersen (Copenhagen) for his eminent contribution to the knowledge of fossil Gerromorpha.

Holotype (apterous male): enclosed in a piece of amber (11.8 × 9.8 mm) from the Baltic coast (exact locality and stratum unknown), labelled “Holotype ♂ / *Succineogerris nilsi* n.sp. / des. H.Zettel & E.Heiss 2010”, stored in a box with the labels “He-Aq-4” and “BB-Gerridae”, in coll. Ernst HEISS, Innsbruck.

Description: Size: Body length 3.9 mm, maximum body width (at mesacetabula) 1.28 mm.

Colour: Dorsum dark, blackish. Head without markings except pair of very small orange dots at insertions of posterior trichobothria. Pronotal lobe with very narrow yellow margin posterolaterally and posteriorly. Venter light brown to dark brown. Antennae blackish, legs blackish except forefemora partly light brown.

Measurements (in mm): Head width 1.06, median length 0.56, interocular width 0.38, eye length 0.46. Lengths of antennal segments 1–4: 0.80, 0.41, 0.50, 0.60. Pronotum width 0.73, median length 1.31. Lengths of leg segments (femur, tibia, tarsus): fore leg: 1.21, 1.19, 0.31; middle leg: 3.06, tibia and tarsus broken off; hind leg: 3.34, 1.32, 0.23.

Structural characteristics: Head short, anteriorly pointed in dorsal aspect, along dorsal eye margin with dense row of lash-like black setae. Rostrum turned ventrad, in resting position tip would reach forecoxa. Pronotum narrow, shield-shaped, incompletely covering mesonotum; sides of lobe slightly converging posteriad, posterior margin narrowly rounded. Suture between metanotum and abdominal tergite 1 not visible. Mesofemur on ventral surface distally with rows of short peg-like setae. Metafemur all over ventral surface with such setae, but more numerous in proximal half. Hind leg without visible claws. Tergite 7 with row of posterodorsal directed, black setae along hind margin.

Genitalia of male: Segment 8 as characteristic for *Succineogerris* (see also Comparative notes): in dorsal aspect (Fig. 15) very broad (slightly broader than tergite 7) and short, with straight sides and slightly sinuate hind margin; in lateral aspect (Fig. 4) dorsal face slightly convex and separated from sides by sharp bend, hind margin strongly sinuate as ventral part much shorter than dorsal face and largely covered by sternite 7; in ventral aspect (Figs 3, 14) hind margin deeply concave. Pygophore (Fig. 3) ovate, much narrower than segment 8, hind margin evenly convex. Proctiger narrow, subtriangular.



Figs 10–15. *Succineogerris nilsi* nov. spec., holotype (male): (10) Complete piece of amber with specimen in dorsal aspect. (11) Body (appendages partly omitted), lateral aspect. (12) Head and thorax, approximately dorsal aspect (note large eyes, shape of pronotum and absence of erect setae on pleura). (13) Setae along dorsal eye margin. (14) Apex of abdomen, ventral aspect. (15) Apex of abdomen, dorsal aspect (note shape of hind margin of tergite 8).

Comparative notes: ANDERSEN (2000) described *Succineogerris larssoni* from one male and one female (both apterous) in Baltic amber. The genus was compared with the recent genus *Neogerris* of the Gerrinae which it strongly resembles, but differs in lost claws and larger size (ANDERSEN 2000). *Succineogerris nilsi* nov. spec. is larger than *S. larssoni* and as the middle legs of *S. nilsi* are broken, the presence of claws cannot be confirmed for the new species. There are two other, more important generic characteristics of *Succineogerris* which were not highlighted by ANDERSEN (2000): In males of both *Succineogerris* species, abdominal segment 8 is strongly widened, with a female-like appearance in its dorsal aspect. In the holotype of *S. nilsi* it can be well recognized that only the tergal part is affected by this dilatation, but the lateral parts are strongly constricted, and the sternal part is compressed and – because it is short – almost completely enclosed by sternite 7. This is a unique configuration in Gerridae. The ventral aspect of the abdomen of *S. larssoni* is not clearly visible, but from the visible parts it can be concluded that the structures are similar to those of *S. nilsi*. The second apomorphic characteristic of *Succineogerris* is the row of long setae along dorsal eye margin, which is visible in all three specimens (but poorly so in the female of *S. larssoni*). There are several species-specific differences between *S. larssoni* and *S. nilsi*. Firstly, there is a difference in eye size, eyes of *S. nilsi* being relatively larger than in *S. larssoni*; minimum distance of eyes being 0.36 times head width in *S. nilsi*, and 0.40 in both specimens of *S. larssoni*. There is also a considerable difference in antennal length of the two males: In *S. larssoni* the antenna is 0.63 times as long as body, but in *S. nilsi* only 0.56 times. In the holotype, lateral parts of the thorax (especially meso- and meta-acetabula) and the abdominal sternites bear erect black setae, which are absent in *S. nilsi*. However, this character is not visible in the female paratype of *S. larssoni* and might support the consideration that this female is not conspecific with the male. The male of *S. larssoni* has an unusually long and slender forefemur which is also slightly longer than the foretibia. In contrast the forefemur of *S. nilsi* is stout and short, distinctly shorter than the foretibia, and resembles the forefemora of *Neogerris* species. The dorsal hind margin of segment 8 of the male is distinctly sinuate in *S. larssoni*, but almost evenly convex in *S. nilsi*. There are additional differences in body size and shape of the pronotal lobes between the two *Succineogerris* species, but these characters should not be used for species distinction as they are of high intraspecific variability in the closely related extant genus *Neogerris*.

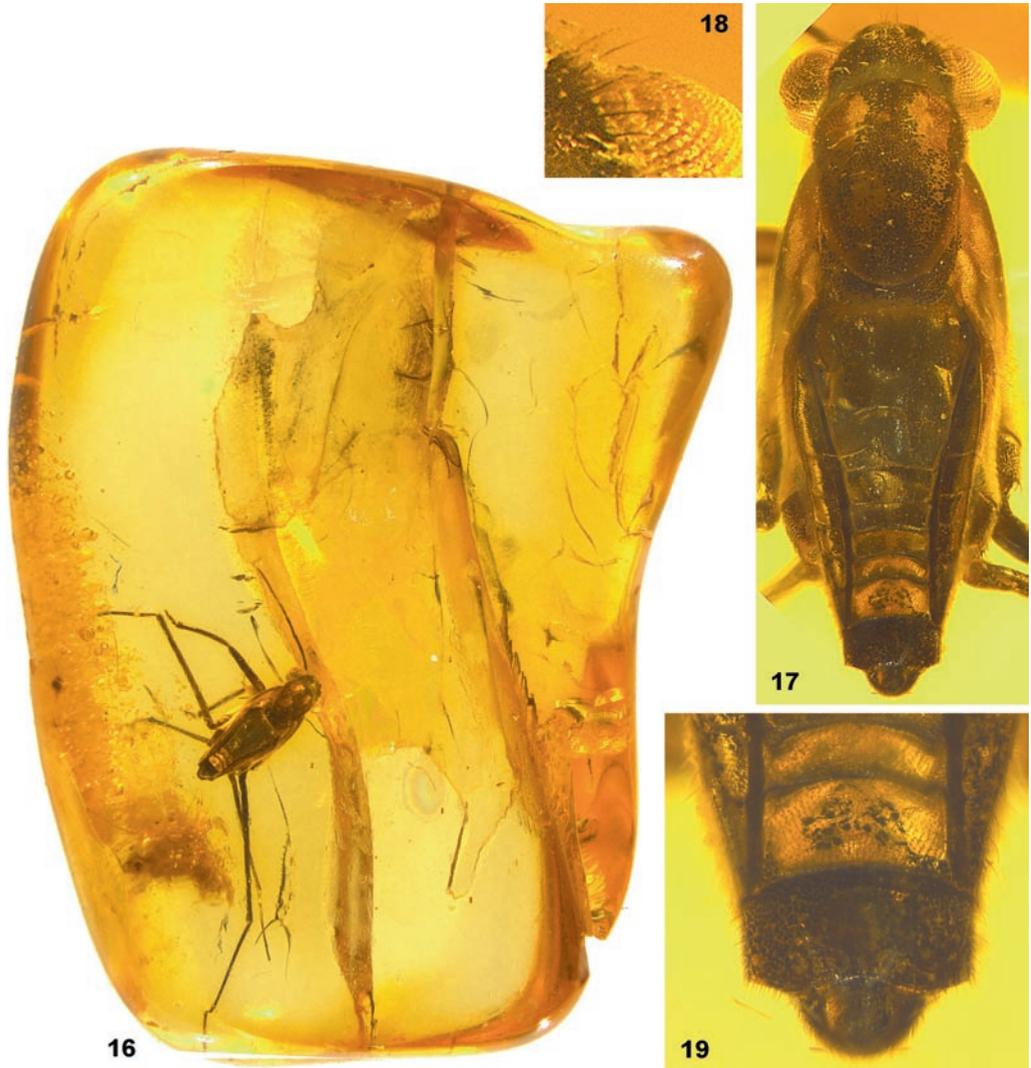
***Succineogerris larssoni* ANDERSEN, 2000**

(Figs 16-22)

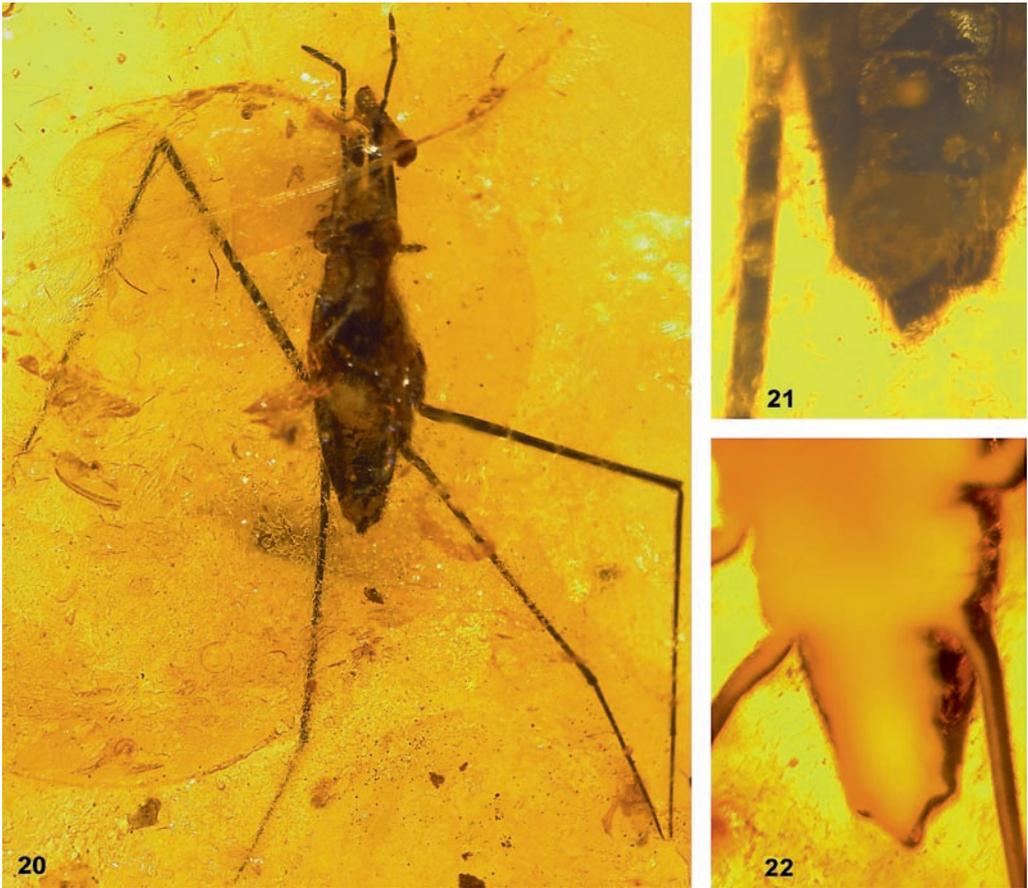
Material examined: Holotype, apterous male (Figs 16-19), and paratype, apterous female (Figs 20-22), from the Achim HERRLING Collection, Bramsche, Germany (ex Jonas DAMZEN Collection, Vilnius, Lithuania).

Notes: ANDERSEN (2000) provided a detailed description and drawings reconstructing the two types specimens. In order to allow a better comparison with *S. nilsi* nov. spec., we provide additional illustrations (photographs) and descriptive notes of the types:

Male: Head (Figs 17, 18) with dense row of long, curved setae along dorsal eye margin. Mesopleura, metapleura and dorsolateral areas of sternites with scattered long, erect setae. Forefemur unusually long, slightly longer than tibia, slender, with maximum width near base. Segment 8 slightly broader than tergite 7 and of subequal length in dorsal aspect (Fig. 19), with straight, sharply ridged sides and with distinctly bisinuate hind



Figs 16–19. *Succineogerris larssoni* ANDERSEN, 2000, holotype (male); **16**: Complete piece of amber with specimen in approximately dorsal aspect; **17**: Body (appendages partly omitted), approximately dorsal aspect (note small eyes, shape of pronotum and erect setae on meso- and metapleura; **18**: Setae along dorsal eye margin; **19**: Apex of abdomen, dorsal aspect (note shape of hind margin of tergite 8).



Figs 20–22. *Succineogerris larssoni* ANDERSEN, 2000, paratype (female); **20**: Complete specimen, dorsal aspect; **21**: Apex of abdomen, dorsal aspect; **22**: Apex of abdomen, ventral aspect.

margin; sternal part much shorter than dorsal part, almost completely covered by sternite 7. Pygophore ovate, much narrower than segment 8, hind margin evenly convex. Proctiger (Fig. 19) knob-like.

Female: Head with long setae along dorsal eye margin. Sides of thorax and abdominal sternites without erect setae. Tergite 8 (Fig. 21) approximately as wide as tergite 7 and of half length; its hind margin slightly convex and beset with dense row of short black setae directed posteriad. Sternite 7 (Fig. 22) with triangular middle lobe.

Acknowledgements

For the loan of the type specimens of *Succineogerris larssoni* we thank A. HERRLING (Bramsche) and W. WEITSCHAT (Hamburg), who kindly arranged this loan. The help by Harald BRUCKNER (Vienna) in producing the automontage photographs is cordially acknowledged as well as the linguistic review of the manuscript by Carl W. SCHAEFER (Storrs, USA). The critical reviews by Wilfried WICHARD (Köln) und Jakob DAMGAARD (Copenhagen), which helped to improve this paper, are gratefully acknowledged.

References

- ANDERSEN N.M. (1998): Water striders from the Paleogene of Denmark with a review of the fossil record and evolution of semiaquatic bugs (Hemiptera: Gerromorpha). – Det Kongelige Danske Videnskabernes Selskab, Biologiske Skrifter, **50**: 1–152.
- (2000): Fossil water striders in the Eocene Baltic amber (Hemiptera: Gerromorpha). – Insect Systematics & Evolution, **31**: 257–284.
- DAMGAARD, J. (2008): Evolution of the semi-aquatic bugs (Hemiptera: Heteroptera: Gerromorpha) with a re-interpretation of the fossil record. – Acta Entologica Musei Nationalis Pragae, **48/2**: 251–268.
- GARROUSTE, R. & NEL, A. (2010): First semi-aquatic bugs Mesoveliidae and Hebridae (Hemiptera: Heteroptera: Gerromorpha) in Miocene Dominican amber. – Insect Systematics & Evolution, **41/2**: 93–102.
- GRIMALDI, D. & ENGEL, M.S. (2005): Evolution of the insects. – Cambridge University Press, Cambridge, N.Y., XV + 755 pp.
- POPOV, Y.A. (1996): Water measurers from the Baltic amber (Heteroptera: Gerromorpha, Hydrometridae). – Mitteilungen des Geologischen Instituts der Universität Hamburg, **79**: 211–221.
- WICHARD, W., GRÖHN, C. & SEREDSZUS, F. (2009): Wasserinsekten im Baltischen Bernstein – Aquatic insects in Baltic Amber. – Verlag Kessel, Remagen – Oberwinter, 335 pp.