

Taxonomic history of *Pericoma albomaculata* Wahlgren, 1904 (Diptera, Psychodidae) with new synonymies and description of *Panimerus halophilus* sp. n.

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A lectotype is designated for *Pericoma albomaculata* Wahlgren, 1904 and the species is illustrated and diagnosed. The female specimen is found to be conspecific with the female of *Pericoma rivularis* Berdén, 1954, both as associated in the original description and as subsequently associated using DNA barcodes. *Pericoma rivularis* Berdén, 1954 is consequently placed as a synonym of *Pericoma albomaculata* **syn. n.** The species treated as *Panimerus albomaculatus* auctt. in the literature from 1922 onwards is found to belong to a distinct species of *Panimerus*, herein described as *Panimerus halophilus* Kvifte & Salmela **sp. n.** The ecology of the latter species is reviewed; most records are from brackish water wetlands but the species also sporadically occurs along fresh water ponds or headwater streams.

Key words: Moth flies, Diptera, Psychodidae, Psychodinae, taxonomy, revision, Europe.

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Introduction

In a revision of «Nematocera» described by J.W. Zetterstedt, Wahlgren (1904) described one species of moth flies (Diptera, Psychodidae) as *Pericoma albomaculata*. This description was based on three specimens, of which two were collected from Småland, Sweden, and one is without locality data (deposited in Naturhistoriska Riksmuseet, Stockholm). Wahlgren also claimed that one specimen of "Psychoda ocellaris var. b Zett. D.S. [=Diptera Scandinaviae] p. 3705"

in Zetterstedt's type collection (in Museum of Zoology, University of Lund) was identical with the other studied material. By current standards of taxonomic practice, Wahlgren's description of *P. albomaculata* was very superficial, as mostly wing venational characters were used (Figure 1a).

The first genital illustrations (Figure 1b) and a detailed redescription of *P. albomaculata* were published by Tonnoir (1922) based on material collected from the Netherlands and compared with one female syntype. In addition to redescrbing the species, he transferred it to

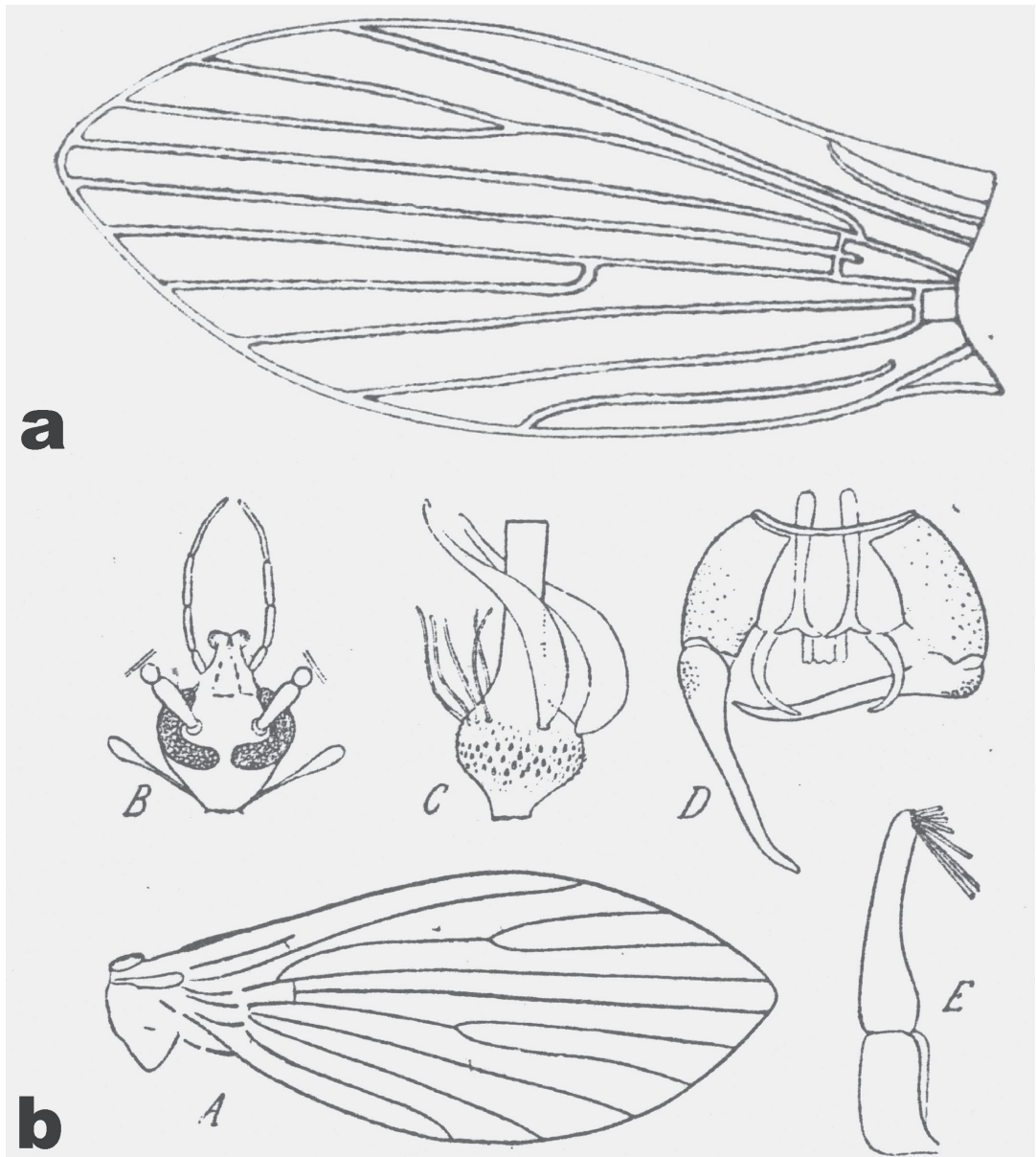


FIGURE 1. Historical illustrations on *Pericoma albomaculata* Wahlgren, 1904 and auct. **a.** Wing venation by Wahlgren (1904, Figure 8). **b.** Wing venation, head, flagellomere, surstyli and male genitalia by Tonnoir (1922, Figure 10).

Telmatoscopus Eaton, 1904. This redescription is also the most recent one, forming the basis of the redescriptions by Jung (1956) and Vaillant (1972). Following Vaillant (1972), the species was placed in *Panimerus* Eaton, 1913.

Upon reexamining the type series of Wahlgren (1904) we discovered that the specimens were

females in the genus *Pericoma*, strikingly similar to the female of *Pericoma rivularis* Berdén, 1954 as illustrated in the original description (Berdén 1954). This genus is placed in Pericomaini, which traditionally has been considered a separate tribe from where the species identified as *Pericoma albomaculata* by Tonnoir (1922) and subsequent

authors, has been placed (Duckhouse 1987, Vaillant 1990, Wagner 1990, 1997, 2004, Ježek & van Harten 2005, Kvifte *et al.* 2011, Kvifte & Andersen 2012, but see Kvifte 2018). The species known in the literature as *Panimerus albomaculatus* therefore is left with no name. In this paper we therefore describe *Panimerus albomaculatus* auctt. as new, under the name *Panimerus halophilus* Kvifte & Salmela, **sp.n.** We also provide data on habitat preferences and present a revised diagnosis for *Panimerus* due to the species' aberrant morphology.

Material and methods

All Finnish specimens are from Malaise trap samples. Ethylene glycol was used as a preservative in the traps and the collected material was later stored in 70% ethanol. Other material examined in this study was collected by hand or in Malaise traps with 70% ethanol as a preservative, and subsequently stored in 80–100% alcohol. Prior to examination, specimens were macerated in KOH, dissected and mounted on slides in Euparal or Canada balsam. Locality data is quoted as on the original data labels.

All measurements are given in μm , except for wing length which is given in mm. Measurements are given as means followed by ranges and number of specimens examined. Morphological terminology is in accordance with Kvifte & Wagner (2017), specific morphological terminology of the genitalia follow Kvifte (2014).

The following abbreviations are used: LMM – Regional Museum of Lapland, Rovaniemi, Finland; NCBN – Netherlands Centre for Biodiversity Naturalis, Leiden, the Netherlands; NRMS – Naturhistoriska Riksmuseet, Stockholm, Sweden; ZLUS – Zoologiska museet i Lund, Sweden; ZMFK – Zoologisches Forschungsmuseum Alexander-König, Bonn, Germany; ZMUB – Natural History collections, University Museum of Bergen, University of Bergen, Norway.

DNA barcoding was carried out as described in Kvifte & Andersen (2012) in cooperation with the projects Norwegian Barcode of Life (NorBOL

www.norbol.org), the Finnish Barcode of Life (FinBOL, www.finbol.org) and German Barcode of Life (GBOL, www.bolgermany.de).

Taxonomy

Pericoma Walker, 1856

Pericoma Walker, 1856: 256. (Type species: *Trichoptera trifasciata* Meigen, 1818, by original designation.)

= *Leptopericoma* Vaillant, 1976: 214. (Type species: *Trichoptera trifasciata* Meigen, 1818, by original designation.)

Pericoma albomaculata Wahlgren, 1904

Pericoma albomaculata Wahlgren, 1904: 16

= *Pericoma rivularis* Berdén, 1954: 36 **syn.n.**

= *Pericoma bavarica* Wagner, 1981: 50 **syn.n.** (synonymised with *Pericoma rivularis* by Wagner 1994)

= *Pneumia rivularis* (Berdén, 1954) – Omelková & Ježek, 2012 (new genus combination)

Material examined: Lectotype female (designated by G.M. Kvifte, 2012). «Mus. Dalm., NHRS-BYWS 000000038» Dissected, mounted in Canada balsam (NRMS). Other material examined: **NORWAY:** Rogaland, Leiranger, Varaleite. 59.326°N, 5.73°E, 31.VIII.2013, P. Djursvoll leg. (Malaise trap, ZMUB). 1♂. Hedmark, Os, Røst Nord. 62.531°N, 11.1515°E, 30.VII.2016, G. Kvifte leg. (hand collected, ZMUB) 1♂1♀. **FINLAND:** Lkor: Pelkosenniemi, Sadinvaara. 67.094°N, 27.858°E, 3.VI.–8.VII.2015, J. Salmela leg. (Malaise trap). 1♂ JS-COI-2016-0158, 1♂ JS-COI-2016-0159. Obb: Rovaniemi, Savioja. 66.2262°N, 25.3778°E, 24.V.–28.VI.2013, J. Salmela leg. (Malaise trap) 1♀ JS-COI-2016-0233. As previous, 1♀ JS-COI-2016-0234, 1♀ JS-COI-2016-0235, 1♂ JS-COI-2016-0236 (all barcoded, in LMM).

Other barcoded Norwegian material is listed in Kvifte & Andersen (2012) and Kvifte & Boumans (2014).

Diagnosis: Adult female. Scape 1.5 times as long as wide, same length as elongate spheroid pedicel (Figure 2a). Wing (Figure 2c) 2.5 times as long as wide, with Sc curved dorsad and reaching level of origin of R2+3, origin of R2+3 basad to apex of 2nd basal cell, wing apex between R4 and R5, radial and medial forks in line with CuA2. Jugum ovoid V-shaped with lateral margin curved,

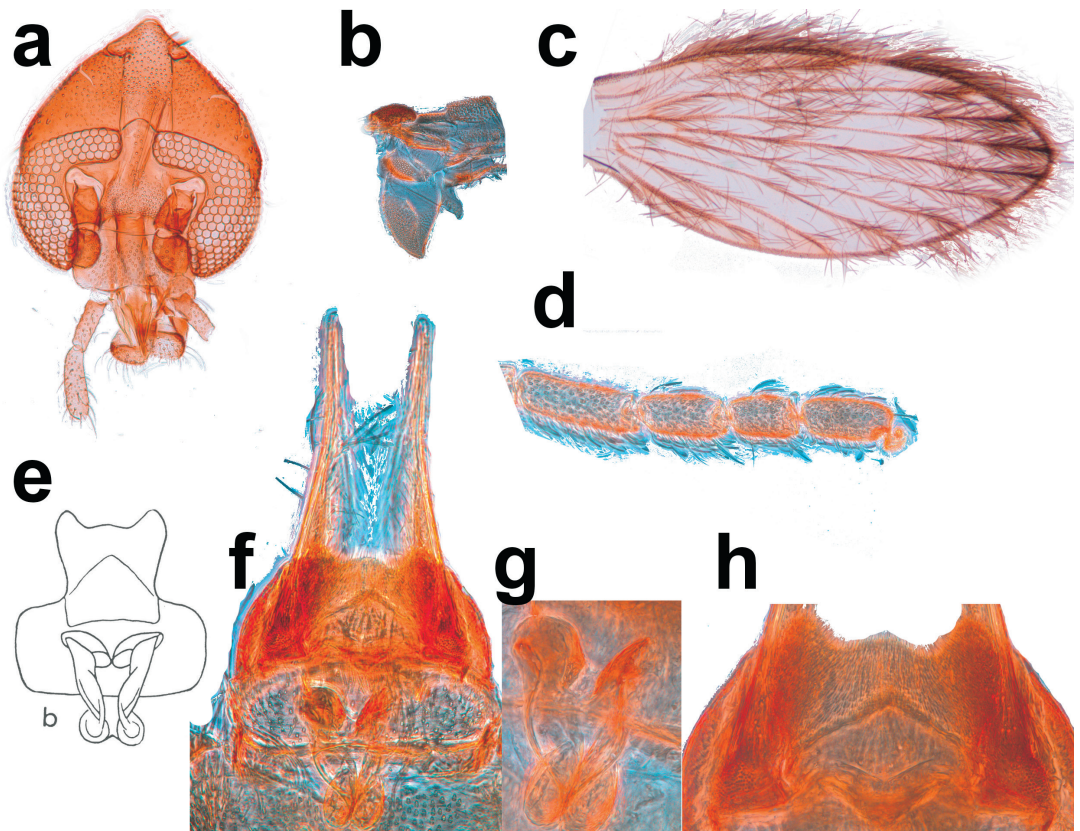


FIGURE 2. *Pericoma albomaculata* Wahlgren, 1904 lectotype female (a–d, f–h), with illustration from the original description of *Pericoma rivularis* Berdén, 1954 for comparison. **a.** Head, dorsal view. **b.** Jugum, dorsal view. **c.** Wing, dorsal view. **d.** Tarsus 2–5 of fore leg, lateral view. **e.** Female terminalia (from Berdén 1954, Figure 4b), ventral view. **f.** Female terminalia, ventral view. **g.** Genital chamber, detail, ventral view. **h.** Subgenital plate, ventral view.

mesal margin straight (Figure 2b). Terminalia with subgenital plate with hind margin produced in two lateral and one weaker medial point, internal V-shaped sclerite present (Figures 2e–h).

Remarks: The female lectotype of *Pericoma albomaculata* has the wing, genitalia and parts of the head in good condition, and was chosen from the syntypic series as the most similar specimen to the original description. Both antennae are broken, the best preserved one with only scape, pedicel and one flagellomere. The shapes of the antennal segments, as well as the eyebridge, vertex and wing, suggest that the species belongs to Pericomaini.

The only Fennoscandian Pericomaini species known to have the characteristic medial triangular

projection of the female subgenital plate is *Pericoma rivularis* Berdén, 1954 (Figure 2E, reproduced from Figure 4b in Berdén 1954), which we therefore place here in synonymy with *Pericoma albomaculata*, **syn.nov.** This synonymy is further supported by the shape of the genital chamber and the wing including the characteristic ovoid V-shaped jugum, and is not contradicted by any character evidence known to us.

The placement of *Pericoma albomaculata* in *Pericoma* rather than in *Pneumia* Enderlein, 1935 is provisional as discussed by Kvifte & Andersen (2012).

DNA barcoding: *Pericoma albomaculata* was first barcoded (as *P. rivularis*) by Kvifte & Andersen (2012) and remains a well-supported

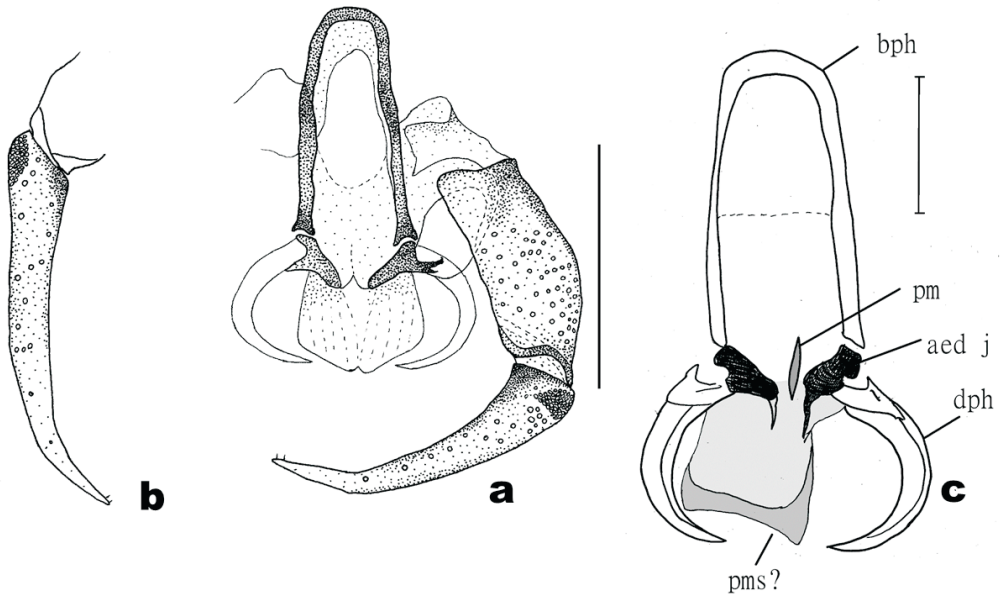


FIGURE 3. *Panimerus halophilus* Kvifte & Salmela, sp.n., male. **a.** Gonocoxite, gonostylus and aedeagus, dorsal view. **b.** Gonostylus, lateral view (scale bar 200 μ m). **c.** Homology of parts of aedeagus (see Kvifte 2014 for details). Abbreviations: aed j – aedeagal joint, bph – basiphallus, dph – distiphallus, pm – paramere, pms – parameral sheath.

species molecularly. As per January 2020, 37 specimens of both sexes are associated with its BIN BOLD:ABA0881 in the BOLD database, showing a maximum distance of 2.67% within the cluster and being separated by 8.89% from their nearest neighbour BOLD:ACA5306.

***Panimerus* Eaton, 1913**

Panimerus Eaton, 1913: 425. (Type species: *Pericoma notabilis* Eaton, 1893, by designation of Kvifte 2013: 62)
 = *Lepiseoda* Enderlein, 1935: 247. (Type species: *Pericoma notabilis* Eaton, 1893, by original designation)
 = *Mogisetia* Enderlein, 1937: 91. (Type species: *Pericoma albifacies* Tonnoir, 1919, by original designation)

Diagnosis: Antennae with 14 flagellomeres, each flagellomere carrying a pair of single or bifurcate digitiform or foliform ascoids; scapus 2–3 times length of pedicel; cornicula present; wings with membrane in most species with darkened patches around the distal ends of at least the radial and medial veins; Sc parallel to C, reaching distad of basal cells; aedeagus symmetrical, basiphallus dorsoventrally compressed, broad in dorsal view, distally U-shaped at junction with distiphallus; distiphallus symmetrical, with two branches; each

branch bilobed consisting of a mesal sclerited joint and a lateral crescent-shaped appendage (e.g., Figures 3A, 3C).

Remarks: For a discussion of the nomenclatural history of *Panimerus*, see Kvifte (2013).

The diagnosis here presented is in accordance with those of Jung (1956) and Duckhouse (1966). A broader concept of the genus was proposed by Vaillant (1972), who included in it also the species placed by Kvifte (2014) in *Seoda* Enderlein, 1935. Indeed, *Seoda* differs from *Panimerus* mainly in plesiomorphic characters and could therefore prove to be paraphyletic.

Ježek (1984, 1990), on the other hand, proposed a narrower diagnosis excluding *Panimerus integellus* (Jung, 1956) and *Panimerus sarai* Salamanna, 1975; for which he described the genera *Psycmera* Ježek, 1984 and *Karakouvimerus* Ježek, 1990, respectively. Our inclusion of these taxa into *Panimerus* (Kvifte 2012, 2019, Salmela *et al.* 2014) is in accordance with the phylogenetic hypothesis of Ježek (1990), where the three putative genera are placed together in a single clade.

***Panimerus halophilus* Kvifte & Salmela, sp. n.**

= *Telmatoscopus albomaculatus* (Wahlgren 1904) – Tonnoir 1922: 175; Barendrecht 1934; Enderlein 1937; Jung 1956; Nielsen 1961.

= *Panimerus albomaculatus* (Wahlgren, 1904) – Vaillant 1972: 71; Ježek 1984; Wagner 1990, 1997, 2004; Autio and Salmela 2010; Salmela et al. 2014.

Type material: Holotype ♂. **THE NETHERLANDS:** «Abcoude, 12 VII 20 de Meijere leg (NCBN).» Paratypes: 3♂♂3♀♀ with holotype, «Abcoude, 8. VII '21 de Meijere» 4♂♂ (NCBN, pinned specimens). **FINLAND:** Ab: Turku, Pomponrahka, 1.VIII.2012, Malaise-trap, J. Salmela & E. Nummela leg. (ZFMK); Oba: Hailuoto, Kaaranselkä 7217566:3397254, 4.VII.–12.VIII.2005 T. Nieminen leg 2♂; same locality but 11.VIII.–8.X.2005 1♂; N: Espoo, Nuuksio National Park 66943:33722, 12.VIII.–12.IX.2003, J. Ilmonen leg 1♂; Al: Hammarland, Holmviken 670797:309759 16.VI.–28.VII.2007 O. Autio & J. Salmela leg 9♂♂4♀♀; same locality but 28.VII.–26.IX.2007 1♂1♀; Al: Jomala, Björnsby 669627:311108, 17.VI.–28.VII.2007 O. Autio & J. Salmela leg 3♂♂4♀♀; Al: Hammarland, Ängesjön 670703:309837, 17.VI.–28.VII.2007 O. Autio & J. Salmela leg 1♀; Al: Gotbyviken 66886:31014, 27.VII.–25.IX.2007 O. Autio & J. Salmela leg 1♂1♀; Al: Österviken 66933:31135, 29.VII.–27.IX.2007 O. Autio & J. Salmela leg 117♂♂149♀♀; Al: Finström, Holmsjön 670235:310277, 16.VI.–26.VII.2007 O. Autio & J. Salmela leg 2♂♂ (LMM). **NORWAY:** Hedmark, Løten, Tjernlitjern. 9.VIII.2003. 4♂♂ As previous, except 13.VIII.2004, 3♂♂, as previous except 20.VII.2006, 2♂♂. All Ø. Håland leg., coll. ZMUB. **SWEDEN:** Skåne, Limhamn, 19.VII–4.VIII.2011, 1♂, B.W. Svensson leg., coll. ZMUB.

Diagnosis: *Panimerus halophilus* can be separated from all other *Panimerus* species on the pedicel symmetrical without bristles, ascoids with single foliform branches, and surstyli with 12–15 tenacula. *Panimerus sarai* Salamanna, 1975 differs in having ascoids with bifurcate filiform ascoids and several male genitalic characters.

Description: Adult male. Head: Eyes separated, smallest distance between eyes 45 (range 36–56, n = 11). Antennae with scape,

pedicel and 14 flagellomeres. Scape cylindrical, length 236 (192–276, n = 10). Pedicel globular, as long as wide, length 75 (range 62–88, n = 10). Flagellomeres pitcher-shaped, asymmetrical. First and second flagellar segments with relatively short neck (length ratio bulbous part: neck F1 = 2, F2 = 1.7), necks of other flagellomeres longer (length ratio of bulbous part: neck F3 = 1, F4 = 1, F5 = 0.8–0.9). Each flagellomere with a pair of ascoids, about equal in length to flagellar segments, curved, maximum width in their base, tapering toward tip. Head with a pair of long-stalked cornicula, with distal bulbs. Length of palpomeres 108 : 146 : 161 : 184 (range 91–132 : 127–172 : 151–205 : 179–189, n = 11:9:7:2 due to palps broken in some measured specimens)

Thorax brownish, without distinctive features. Wing membrane hyaline with Sc, apices of all veins, radial and medial forks and basal part of R₅ with darker pigmentation. Wing length 2.4 mm (range 2.2–2.7 mm, n = 9)

Hypopygium: Hypandrium slightly wider medially, connected laterally to proximal parts of epandrium. Gonocoxite (Figure 3a) cylindrical, length 182 (range 163–204, n = 11). Gonostylus (Figure 3a) elongate, slender, length 347 (range 299–384, n = 11), slightly bent in distal end. Length of aedeagus 234 (range 208–260, n = 11). Distiphallus with lateral elements (Figures 3a, 3c) strongly curved, hyaline, tips pointed; medial elements inconspicuous, weakly sclerotised; aedeagal joints with basiphallal connection as big as parameral connection, distiphallal connection reduced. Basiphallus U-shaped, with darkly sclerotised edges and contrasting membranous inner part. Epandrium about as long as wide. Surstyli elongate, straight, length 305 (range 260–344, n = 10). Surstyli bearing 12–15 unfringed tenacula of varying length, longest tenaculum about a third of surstylus length. Proctiger conical with weakly concave sides.

Adult female: In general, similar to male. 9th tergite, cerci, genital chamber and subgenital plate, see Figure 4.

Distribution: Recorded from the Netherlands (Tonnoir 1922), Denmark (Nielsen 1961), Finland (Autio & Salmela 2010, Salmela et al. 2014), the Åland archipelago (Autio & Salmela 2010) and

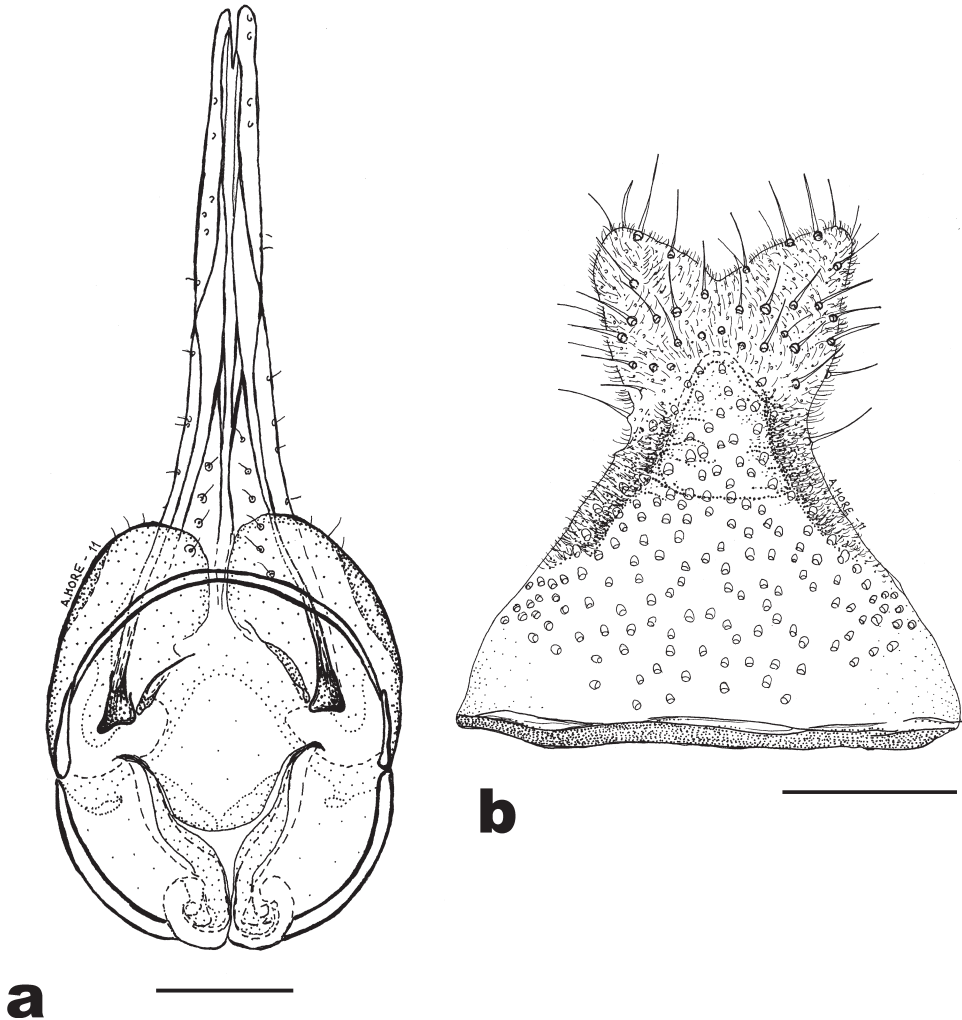


FIGURE 4. *Panimerus halophilus* Kvifte & Salmela, sp.n., female. **a.** 9th tergite, cerci and genital chamber, dorsal view. **b.** Subgenital plate, ventral view (scale bar 100 μ m).

Norway (Kvifte *et al.* 2011). The Swedish record in the present paper is the first to unambiguously confirm the presence of *Panimerus halophilus* (*Panimerus albomaculatus* auctt.) from Sweden, despite the type locality of *Pericoma albomaculata* in Småland. The occurrence in Germany listed by Wagner (2004) is not associated with published localities in the primary literature nor with specimens in publicly available collections, however we deem it likely that the species occurs on the German coast.

Etymology: From the greek prefix ἅλς (*halo*),

salt, and φίλος (*philos*), friend, referring to the species' apparent association with brackish or other saline habitats (see below). The epithet is to be treated as an adjective, following the grammatical gender of the genus.

Biology: A majority of the Finnish specimens are collected from habitats influenced by brackish water. Most of the records come from SW Finland and the Åland archipelago, where it proved especially abundant in a grazed coastal meadow. However, in Åland one of the finding localities was a rich fen. The species is also recorded from

the northern Baltic, Gulf of Bothnia (Hailuoto Island).

Although most of the known specimens of *P. halophilus* are from coastal localities, it is also recorded from three inland localities: A Finnish record from Espoo, some 20 km from the Baltic coast, a Swedish record from the limestone quarry of Limhamn and a Norwegian record from the shaded pond Tjernlitjern. The Swedish and Norwegian records are from small water bodies in mixed mature forests; however, whereas the Espoo record is from the margins of a small intermittent stream, the Tjernlitjern and Limhamn records are associated with ponds.

Remarks: One other species of *Panimerus* is associated with coastal and saline habitats, namely the Mediterranean-Arabic *Panimerus* (*Karakovounimerus*) *sarai* Salamanna, 1975 (Salamanna 1975, Wagner 1984, Ježek 1990, Ježek & van Harten 2002). This species shares several morphological characters with *P. halophilus*, including cornicula with very long stems, pedicel globular without any stiff bristles and internode of 13th flagellomere developed. If further evidence for a genealogical relationship between these two species are found, *Panimerus halophilus* may warrant inclusion in the subgenus *Karakovounimerus* Ježek, 1990.

DNA barcodes: DNA barcodes were successfully obtained from one Finnish *P. halophilus* specimen and compared with unpublished sequences from several other *Panimerus* species collected in Germany and Norway (G.M. Kvifte, unpubl.). The DNA barcode clustered in the BIN BOLD:ACT2863 as its only current member, with a distance of 10.18% in pairwise distances to its nearest neighbour BOLD:ADG6505 (currently unidentified). Compared with other Northern European species, *P. halophilus* differs from *P. albifacies* by 11.2% and *P. maynei* by 12.4–12.5%.

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Bo W. Svensson, Lund for sharing specimens of *P. halophilus* with us and to Björn Rulik, Bonn, for assistance in obtaining DNA barcodes. Gladys Ramirez, Bergen, mounted some of the slides. Finally we are grateful to Rüdiger Wagner and an anonymous reviewer for comments on an earlier version of the manuscript. DNA barcoding was financed by the German Federal Ministry for Education and Research [German Barcode of Life GBOL1: BMBF #01LI1101A] and by the Norwegian Barcode Of Life project (NorBOL) financed by the Norwegian Research Council grant 226134/F50. Fieldwork in Norway was largely financed by the Norwegian taxonomy initiative (Artsdatabanken), particularly the project «insects on rich fens in Hedmark, east Norway».

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