# Two formerly unrecognized species of Sciaridae (Diptera) revealed by DNA barcoding

KAI HELLER, ARNE KÖHLER, FRANK MENZEL, KJELL MAGNE OLSEN & ØIVIND GAMMELMO

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During a study of Norwegian Sciaridae using DNA barcoding and morphological examination, cases of cryptic diversity were detected. *Cratyna uliginosoides* **sp. n.** is distinguished from *Cratyna uliginosa* (Lengersdorf, 1929) and *Trichosia lengersdorfi* **sp. n.** is separated from *Trichosia edwardsi* (Lengersdorf, 1930) **restit**., which still constitutes a species complex. Barcoding proved to be an essential tool for the taxonomic resolution of cryptic species complexes. The lectotype of *Rhagio morio* Fabricius, 1794 **syn. n.** was identified as belonging to *Sciara hemerobioides* Scopoli, 1763, therefore *Rhagio morio* becomes a junior synonym of the latter and the name *Trichosia morio* is replaced by *Trichosia caudata* (Walker, 1848) **restit**.

Key words: COI barcoding, *Cratyna*, cryptic species, new species, *Trichosia*

*Kai Heller, c/o Senckenberg Deutsches Entomologisches Institut, Erwin-Salomon-Straße 25, D-25451 Quickborn, Germany. E-mail: kaiheller@gmx.de*

*Arne Köhler, Senckenberg Deutsches Entomologisches Institut, Eberswalder Straße 90, D-15374 Müncheberg, Germany. E-mail: arne.koehler@senckenberg.de*

*Frank Menzel, Senckenberg Deutsches Entomologisches Institut, Eberswalder Straße 90, D-15374 Müncheberg, Germany. E-mail: frank.menzel@senckenberg.de*

*Kjell Magne Olsen, BioFokus, Gaustadalléen 21, NO-0349 Oslo, Norway.*
*E-mail: kjell-magne@biofokus.no*

*Øivind Gammelmo, BioFokus, Gaustadalléen 21, NO-0349 Oslo, Norway.*
*E-mail: oivind@biofokus.no*

## Introduction

Sciaridae is a family of small, generally uniform, insects of the order Diptera. It is a species rich, but still poorly studied family. Despite their abundance and diversity, they have been neglected for a long time – primarily due to the difficulty of identifying the species. In principle, the male genitalia are now considered to provide good means for species identification. However, at present, keys are only available for certain regions or genera, and as new species are continuously discovered, they soon become outdated. A thorough knowledge of the fauna of sciarids is essential as a basis for good identification keys. The most modern approach involves DNA barcoding of previously identified or even randomly collected individuals. This method reveals that in some cases individuals of even well established species fall into very distinct genetic clusters with no intermediate forms. Subsequent

morphological analysis shows, in most cases, that the genetic differences are accompanied by previously unnoticed morphological characters. Therefore, we are here not really treating cryptic species, which would not be separable by morphology, but only overlooked ones. In many of these species complexes, several synonym names exist and type material needs to be revised in order to find the right names for each newly discovered species. This process is often very time consuming and complicated, especially when the type material is not easily accessible or in poor condition. For the sake of nomenclatural stability, designation of neotypes might be inevitable, when the original material cannot be unambiguously assigned to either one of the variants. We have already identified a multitude of such unresolved species complexes. As a start to clarifying these problems, we here present two complexes that are not affected by very problematic nomenclature.

## Material and methods

The specimens used for this study were primarily collected within the framework of the Norwegian Taxonomy initiative for Sciaridae (project: "The Sciaridae (Diptera) of southern Norway [excl. the high mountains]"). Collecting methods were mainly Malaise traps, sweep netting and coloured dishes. Additionally, slide-mounted material was also incorporated. DNA extracts and partial COI gene sequences were generated using standard primers and bi-directional Sanger sequencing with BigDye 3.1 termination at the Canadian Centre for DNA Barcoding in Guelph through collaboration with the Norwegian Barcode of Life Network (NorBOL) for the Norwegian material. DNA barcoding of the COI gene was also accomplished via GBOL for other European countries (Heller & Rulik 2016). Sequences of all specimens are present in BOLDSYSTEMS (dx.doi.org/10.5883/DS-SCICRY01). All sequences were also deposited in GenBank under accession numbers KX038973–KX039039. We consider the comparison of DNA sequences to be the most reliable method of species identification. Microscopic analysis is however nearly equally reliable. As the species involved are all very common, in some cases specimens were identified only under the stereomicroscope and kept in alcohol. The material is or will be deposited in the insect collections of the Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany (SDEI); the Natural History Museum, University of Oslo, Oslo, Norway (NHMO); the Museum of Natural History Trondheim (NTNU); the Swedish Museum of Natural History, Stockholm, Sweden (NHRS); the private collection of Kai Heller, Quickborn, Germany (PKHH); the Zoologische Staatssammlung München, Munich, Germany (ZSMC); the Finnish Museum of Natural History, Helsinki, Finland (UZMH); the private collection of Werner Mohrig, Poseritz, Germany (PWMP); the Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany (ZFMK) and Zhejiang Argricultural and Forestry University, Lin'an, Hangzhou, China (ZAFU). The terminology of morphological structures follows Menzel & Mohrig (1997a) except wing veins bM (= x) and r-m (= y).

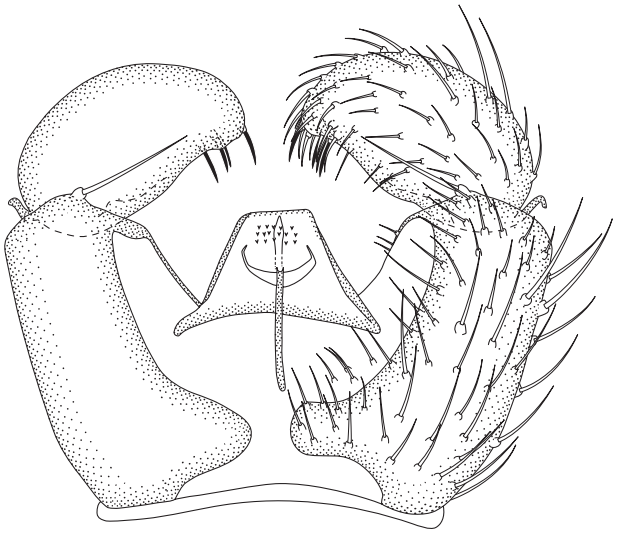
## The *Cratyna uliginosa* complex

Lengersdorf (1929) described a new species, from the Zehlau peat bog in Königsberg (now Kaliningrad region, Russia), which he called *Sciara uliginosa*. He presented a figure of the gonostylus and mentioned some further material from Estonia. Tuomikoski (1960) placed the species in the genus *Plastosciara* (synonym of *Cratyna*), gave a redescription of the species and another figure of the male genitalia. Many of his specimens from Finland were collected on the litter of spruce forests. Tuomikoski states that he studied the original type, but at present all the type material is considered lost (Menzel & Mohrig 2000). *Cratyna uliginosa* is regarded as one of the most widespread and common species of Sciaridae in Europe, recorded from 16 European countries (Heller & Menzel 2013). DNA barcoding of several individuals revealed, that they were assigned to two clearly different BINs (Barcode Index Numbers, Ratnasingham & Hebert 2013), with a genetic distance of more

than 10 % calculated by the BOLD algorithm. The genetic difference was also supported by differences in morphological characters.

***Cratyna* (*Cratyna*) *uliginosa* (Lengersdorf, 1929)** (Figures 1 & 3)

**Material studied**: **Austria,** ***Vorarlberg***, Baad, Walmendinger Horn, montane meadow, 47.316° N, 10.120° E, sweep netting, 18.VIII.2001, leg. K. Heller (no. 3551, PKHH), 1 male; ***Styria***, Gesäuse Nationalpark, fountain at Saugasse near Forststraßenkehre, 14.631° N, 47.622° E, sweep netting, 12.VI.2010, leg. R. Gerecke (no. 7768, PKHH), 1 male; ***Tyrol***, Bad Kleinkirchheim, spruce forest zone, 46.813° N, 13.793° E, sweep netting, 20.VII.2010, leg. K. Heller (no. 7676, PKHH) 1 male; Sellrain, Potsdamer Hütte - Roter Kogel, alpine heather, 47.141° N, 11.177° E, sweep netting, 24.VII.2013, leg. K. Heller (ZFMK-TIS-14915, ZFMK; no. 8243, PKHH) 2 males; **Denmark**, ***Midtjylland***, Norddjurs Kommune, Anholt, *Pinus* scrub, 56.867° N, 11.5869° E, malaise trap, 20.XI.2006, leg. Kjeldgaard (no. 8376, PKHH) 1 male; ***Syddanmark***, Varde, Ho, pine, oak forest, 55.546° N, 8.224° E, sweep netting, 29.IV.1998, leg. K. Heller (no. 2627, PKHH) 1 male; **Finland**, ***Ab (Regio aboënsis)***, Vihti, Vihtijärvi, 60.524° N, 24.918° E, 26.VII.1962, leg. R. Tuomikoski (no. 1478, UZMH) 1 male; 16.VIII.1969, leg. R. Tuomikoski (no. 1479, UZMH) 1 male; 03. VI.1962, leg. R. Tuomikoski (no. 1477, UZMH) 1 male; ***Kn (Kainuu)***, Kuhmo, Elimyssalo Nat. Res., spruce/birch/aspen forest, 64.167° N, 30.317° E, sweep netting, 07.VIII.2004, leg. M. Jaschhof (no. 6215, PKHH) 1 male; Kieverrysjärvet, spruce/pine/birch forest, 63.767° N, 29.883° E, sweep netting, 17.VII.2004, leg. C. & M. Jaschhof (no. 6504, 6505, PKHH) 2 males; ***Ks (Regio kuusamoensis)***, Kuusamo, Kalliovaara, spruce/birch/pine forest, 65.717° N, 29.083° E, sweep netting, 30.VII.2004, leg. M. Jaschhof (no. 6466, PKHH) 1 male; ***Lapland***, Kemijärvi, Karhunotko, alpine brook, stony, 67.000° N, 27.133° E, malaise trap, 11.VII.2014, leg. J. Salmela (ZFMK-TIS-2547868, ZFMK) 1 male; Muonio, Saivokero, headwater stream, spruce and birch, 68.117° N, 24.083° E, malaise trap, 11. VII.2014, leg. J. Salmela (ZFMK-TIS-2544998, ZFMK-TIS-2544999, ZFMK) 2 males; 18. VIII.2014, leg. J. Salmela (ZFMK-TIS-2541784, ZFMK) 1 male; Savukoski, Tyyroja, spruce forest, 68.133° N, 28.567° E, malaise trap, 05.VIII.2014, leg. J. Salmela (ZFMK-TIS-2544985, ZFMK) 1 male; ***LkE (Lapponia kemensis pars orientalis)***, Kaetkaeaapa-Serrijoki, Kaetkaeaapa N2, lähdeletto, hieman ruosteinen, 67.166° N, 27.879° E, malaise trap, 30.VIII.2015, leg. J. Salmela (JS-COI-2016-0039, Research Collection of Jukka Salmela) 1 male; ***Li (Lapponia inarensis)***, Utsjoki, tundra, 27.017° N, 69.750° E, malaise trap, 10.VII.2000, leg. Fatouros (no. 3300, PKHH) 1 male; 14.VIII.2000, leg. Fatouros (no. 3359, PKHH) 1 male; ***LK (Laatokan Karjala)***, Parikkala, Lake Siikalahti, birch/alder swamp forest, 61.567° N, 29.567° E, sweep netting, 19. VIII.2004, leg. M. Jaschhof (no. 6361, PKHH) 1 male; ***N (Nylandia)***, Hindsby, Sipoo, N, Ryteikko, 60.340° N, 25.244° E, malaise trap, 07.IX.2005, leg. P. Vilkamaa (no. 6416, PKHH) 1 male; **Germany,** ***Baden-Württemberg***, Bad Buchau, Federsee near Bannwald, 48.063° N, 9.596° E, malaise trap, 14.VII.2003, leg. D. Doczkal (no. 4507, PKHH) 1 male; 24.v.2003, leg. D. Doczkal, (no. 4951, PKHH) 1 male; Bad Rotenfels, Bannwald Birkenkopf, 48.808° N, 8.315° E, malaise trap, 30.X.2003, leg. D. Doczkal (no. 4565, PKHH) 1 male; Gaggenau, Kirschberg, *Quercus petraea* forest, 48.817° N, 8.370° E, malaise trap, 23.VI.2011, leg. D. Doczkal (no. 8203, PKHH) 1 male; ***Saxony***, Dresden, Klotzsche, northern part of Dresdner Heide, Sauerbruchweg, mixed forest with ponds, 51.136° N, 13.819° E, malaise trap, 01.VII.2014, leg. A. Reimann (ZFMK-TIS-2552086, ZFMK) 1 male; ***Schleswig-Holstein***, Dosenmoor, bog with birches, 54.134° N, 10.025° E, photoeclector, 15.IX.1988, leg. T. Tiburtius (no 497, PKHH) 1 male; 15.IX.1986, leg. T. Tiburtius (no. 480, 481, 482, PKHH) 3 males; Göttin, dry pine forest, 53.533° N, 10.699° E, sweep netting, 21.V.1999, leg. K. Heller (no. 2776, PKHH) 1 male; Gudow-Kehrsen, bog, 53.588° N, 10.789° E, sweep netting, 20.V.1995, leg. K. Heller (no. 1036, PKHH) 1 male; Langenhorner Heide, heather, 54.667° N, 8.917° E, sweep netting, 17.VI.2000,



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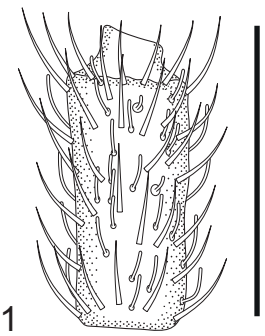

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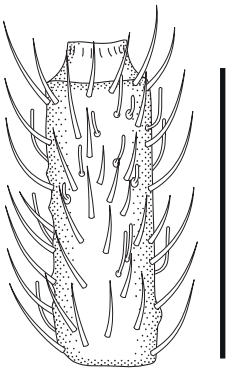

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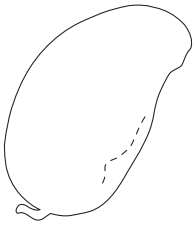
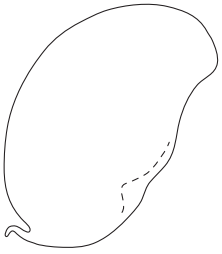


*Cratyna uliginosa*



*Cratyna uliginosoides*

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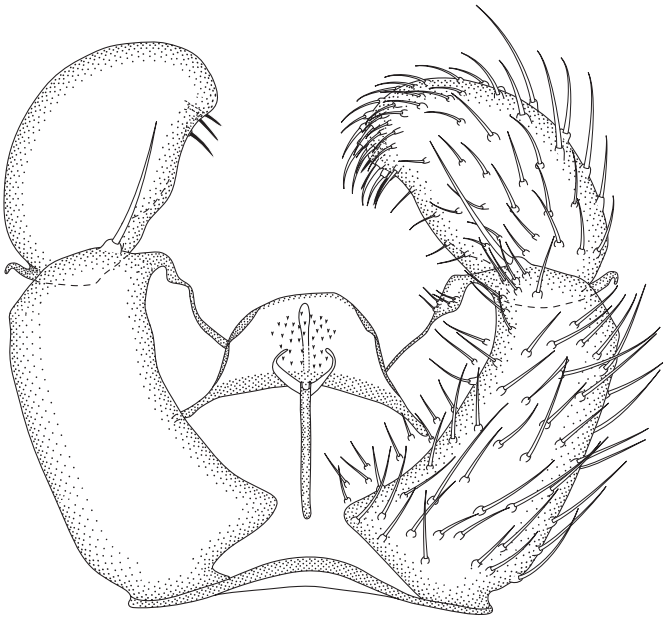

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**FIGURES 1–5**. *Cratyna uliginosoides* sp. n. and *Cratyna uliginosa* (Lengersdorf, 1929). **1**. *Cratyna uliginosa* 4th flagellomere. **2**. *Cratyna uliginosoides* 4th flagellomere. **3**. *Cratyna uliginosa* hypopygium. **4**. *Cratyna uliginosoides* hypopygium. **5**. Shapes of gonostyli of *Cr. uliginosoides* and *Cr. uliginosa*. Scale bars 0.1 mm.

leg. K. Heller (no. 3121, PKHH) 1 male; Sarnekow, alder forest, 53.548° N, 10.740° E, sweep netting, 19.V.1991, leg. K. Heller (no. 48, PKHH) 1 male; Segeberger Forst, oak forest, 54.022° N, 10.202° E, photoeclector, 15.V.1987, leg. T. Tischler (no. 50, 51, 305, PKHH) 3 males; Siggen, beech and oak forest, 54.291° N, 11.056° E, photoeclector, 26.V.1985, leg. T. Tischler (no. 491, PKHH) 1 male; Sorgwohld, heather, 54.356° N, 9.573° E, photoeclector, 01.X.1991, leg. N. Voigt (no. 513, PKHH) 1 male; Sterley, Pipersee, pine, oak forest, 53.641° N, 10.849° E, sweep netting, 25.V.1997, leg. K. Heller (no. 2353, PKHH) 1 male; Wankendorf, alder forest, 54.113° N, 10.202° E, photoeclector, 15.IX.1988, leg. R. Hingst (no. 49, PKHH) 1 male; ***Thuringia***, Friedrichroda, beech forest, 50.858° N, 10.564° E, sweep netting, 21.VI.1996, leg. K. Heller (no. 1528, PKHH) 1 male; **Italy**, ***South Tyrol***, St. Magdelena im Gsiesertal, spruce forest, ascend to Spielbühl, 46.834° N, 12.232° E, sweep netting, 31.VII.2002, leg. K. Heller (no. 3873, PKHH) 1 male; **Netherlands**, ***North Brabant***, Tilburg, Kaaistoep, 51.565° N, 5.076° E, malaise trap, 30.V.1998, leg. J.W.A. v. Zuijlen (no. 3752, PKHH) 1 male; 19.IX.1998, leg. J.W.A. v. Zuijlen (no. 3781, PKHH) 1 male; **Norway**, ***Akershus***, Asker, Sem, Tangen, 59.859° N, 10.434° E, malaise trap, 31.V.2010, leg. M. Steinert (BAB389990, NHMO) 1 male; ***Aust-Agder***, Birkenes, Birkeland, Nordåsen, 58.336° N, 8.240° E, malaise trap, leg. S. Svendsen, (BAB 390089, NHMO) 1 male; Lillesand, Lillesand, Furulia – S-faced slope, 58.242° N, 8.358° E, malaise trap, leg. G. Wiig (BAB415833, SDEI) 1 male; ***Finnmark***, Sør-Varanger, Neiden, 69.700° N, 29.383° E, 11.VIII.1985, leg. J. Tuiskunen (no. 1476, UZMH) 1 male; ***Hedmark***, Elverum, Starrmoen NR, 60.850° N, 11.692° E, malaise trap, 29.VII.2004, leg. L.O. Hansen & E. Rindal (BAB415184, NHMO) 1 male; Stor-Elvdal, N Krokmyra – Ved hytta, E Fåfengtjørna, 61.606° N, 10.840° E, malaise trap, 21.IX.2012, leg. K.M. Olsen (BAB374737, BAB415020, NHMO) 2 males; ***Hordaland***, Bergen, Fløyfjellet, swampy old spruce forest, 60.3956° N, 5.3462° E, sweep netting, 07.VI.2014, leg. A. Köhler (BAB376919, SDEI) 1 male; Stord, Hageberg SV – SE of Vistvik, NE coast of Stord, 59.942° N, 5.429° E, sweep netting, 18.VIII.2015, leg. K. Heller (BAB420789, NHMO) 1 male; ***Møre og Romsdal***, Ørskog, Nysætra – NE of Sjøholt, near Nysætervatnet, Hillside and damp meadow (downy birch, dwarf birch, some scots pines, blueberry, rushes, sedges, mosses), 62.521° N, 6.916° E, sweep netting, 22.VIII.2015, leg. K. Heller (BAB420930, BAB436493, NHMO, BAB436494, SDEI, 3 males; ***Sogn og Fjordane***, Jølster, Hamarsvika – NE of Vassenden, Jølstravatnet, Mountain slope with meadow and deadwood rich mixed forest (grey alder, downy birch, rowan, Norway spruce), damp ground vegetation (blueberry, ferns, grasses, mosses) with small springs., 61.499° N, 6.164° E, sweep netting, 20.VIII.2015, leg. K.M. Olsen & Ø. Gammelmo (BAB431422, BAB431023, NHMO) 2 males; ***Vestfold***, Larvik, Farmenrøysa Ø, 59.229° N, 10.025° E, malaise trap, 05.VIII.2014, leg. S. Olberg (BAB393492, NHMO) 1 male; 27.V.2014, leg. S. Olberg (BAB378103, NHMO) 1 male; Mølen – På sandstranden nord på odden, 58.976° N, 9.820° E, malaise trap, 01.VI.2009, leg. Ø. Gammelmo, S. Olberg, K.M. Olsen (BAB404318, NHMO) 1 male; Småås, 59.211° N, 10.010° E, malaise trap, 27.V.2014, leg. S. Olberg (BAB383912, NHMO) 1 male; 10.VII.2014, leg. S. Olberg (BAB411256, NHMO) 1 male; 02. ix.2014, leg. S. Olberg (BAB410574, BAB436486, BAB436488, NHMO, BAB436485, BAB436487, BAB436489, SDEI) 6 males; Re, Revetal, Våle, 59.367° N, 10.276° E, malaise trap, 20.VIII.2002, leg. E. Rindal (BAB390018, SDEI, BAB390019, NHMO) 2 males; 12.IX.2002, leg. E. Rindal (BAB415152, SDEI) 1 male; **Poland**, ***Podlaskie Voivodeship***, Laskowiec, Biebrza valley, alder forest, 53.233° N, 22.565° E, yellow pan trap, V.1994, leg. Lippert (no. 5416, PKHH) 1 male; **Russia**, **Altai**, Artybasch, dense coniferous forest, 51.803° N, 87.265° E, sweep netting, 02.VII.2005, leg. K. Heller (no. 4446, PKHH) 1 male; ***Kaliningrad***, Zehlau bog, bog, 54.446° N, 21.015° E, pitfall trap, 06.IX.1994, leg. D. Mossakowski (no. 3475, PKHH) 1 male; **Slovakia**, ***Detva District***, Krivan, spruce forest, 49.166° N, 20.017° E, sweep netting, 28.VII.2007, leg. K. Heller (no. 5650, 5653, PKHH), 2 males; **Sweden**, ***Darlana***,

Orsa, Orsa-Grönklitt, forest and bog, 61.216° N, 14.544° E, sweep netting, 07.VIII.2006, leg. K. Heller (no. 4985, PKHH) 1 male; Österaberget Nat. Res., mixed forest (spruce, birch, willow), 61.433° N, 14.800° E, malaise trap, 17.VIII.2005, leg. C. & M. Jaschhof (no. 5983, PKHH) 1 male; ***Härjedalen***, Nyvallen, Nyvallens fäbod, alpine birch and spruce wood, 62.317° N, 13.569° E, malaise trap, 04.VIII.2004, leg. Swedish Malaise Trap Project (no. 3258, NHRS) 1 male; Nyvallens fäbod: alpine birch and spruce wood, alpine birch and spruce wood, 62.317° N, 13.569° E, malaise trap, 04.VIII.2004, leg. Swedish Malaise Trap Project (no. 3259, 3421, 4330, 4331, 4332, NHRS) 5 males; ***Lule lappmark***, Kåbdalis, Suorke Reserve, swamp forest (spruce, birch aspen), 66.017° N, 19.983° E, malaise trap, 23.X.1993, leg. B. Viklund (no. 5245, NHRS) 1 male; ***Skåne***, Mölle, Kullabergs naturreservat, Oak forest in southern slope, 56.283° N, 12.494° E, malaise trap, 20.IX.2005, leg. Swedish Malaise Trap Project (no. 2237, NHRS) 1 male; Kullabergs naturreservat, Oak forest in southern slope, Oak forest in southern slope, 56.283° N, 12.494° E, malaise trap, 20.IX.2005, leg. Swedish Malaise Trap Project (no. 2277, 2800, 2801, 3298, NHRS) 4 males; ***Småland***, Gränna, Lönnemålen, next to old cellar, Norway spruce forest with big harvested ashes, 58.049° N, 14.573° E, malaise trap, 24. IX.2003, leg. Swedish Malaise Trap Project (no. 3186, NHRS) 1 male; ***Södermanland***, Nämdö, Krokudden, Krokvik, spruce and pine forest, 59.208° N, 18.696° E, malaise trap, 29.VII.2009, leg. Williams & Malm (no. 5113, NHRS) 1 male; ***Uppland***, Älvkarleby, Batfors, pine forest with blueberry, 60.461° N, 17.318° E, malaise trap, 29.VII.2003, leg. Swedish Malaise Trap Project (no. 7522, PKHH) 1 male; ***Värmland***, Ransäter, Ransberg Herrgard, Old mixed deciduous forest in stream ravine, 66.607° N, 14.097° E, malaise trap, 12.IX.2005, leg. Swedish Malaise Trap Project (no. 3335, NHRS) 1 male; Ransberg Herrgard, Old mixed deciduous forest in stream ravine, Old mixed deciduous forest in stream ravine, 66.607° N, 14.097° E, malaise trap, 12.IX.2005, leg. Swedish Malaise Trap Project (no. 5014, 5015, NHRS) 2 males.

**Diagnostic characters**: The gonostylus is basally thick and apically narrowed. Apico-dorsally there is a prominence covering the more conspicuous slender, hyaline megasetase in ventral view. It is usually smaller than *Cr. uliginosoides* **sp. n.** and has shorter antennae (length-width index = 2.2–2.4). It is not in every case possible to distinguish *Cr. uliginosa* from *Cr. uliginosoides*, primarily because the gonostyli easily become deformed in slide mounted specimens.

**Redescription**

**Male**: *Head*. Eye bridge 3 rows of facets. Antennae unicoloured. Length-width index of 4th flagellomere = 2.0–2.4; length of neck of 4th flagellomere 0.35–0.45 of segment width; transition from basal part to neck pronounced (Figure 1). Colour of neck unicoloured. Antennal setae shorter than segment width; of normal strength; dense. Sensillae present. Antennal setae adjacent. Palpi bright, or darkened; normal; palpomeres 3. First segment of normal shape; with 1–2 bristles; with only sparse sensillae. Second segment shortly oval. Third segment shorter than first. *Thorax*. Notum unicoloured. Thoracic setae normal. Posterior pronotum with 2–3 fine setae. Mesothoracic sclerites bare. *Legs*. Colour yellow-brown. Hairs on fore coxae bright. Front tibia apically with a patch of setae. Front tibial organ bright. Front tibial organ not bordered. Hind coxae of same colour as femora. Tibial setae on hind legs normal, shorter than tibial width. Tibial spurs of equal length. Claws untoothed. *Wings*. Wings slightly darkened; of normal shape. Wing membrane without macrotrichia. Wing venation weak, with faint stem of M. M-fork of normal shape. $R_1$ inserting clearly before base of m-fork; posterior veins bare; bM bare; r-m bare, or with a few setae; bM/r-M = 0.6–0.8; stem CuA/bM = 0.30–0.55; $R_1$/R = 0.9–1.1; c/w = 0.68–0.88. Halteres darkened; of normal length. *Abdomen*. Abdominal setae strong, but sparse. Both tergal and sternal setae brown. Hypopygium (Figure 3) same colour as abdomen. Inner membrane of hypopygium scarcely setose; base of gonocoxites with normal, weak hairs; gonocoxites length/width = 0.56–0.66, broadly separated; inner margin of gonocoxites normally U-shaped; elongated setae on gonocoxites absent. Gonostylus = 0.11–0.13 mm, 1.65–1.75 times as long as wide; inner margin

concave; apex tapered. Awl-like setae absent. Subapical megasetae present, thin, curved, in one group; number of megasetae 3–4; position of basalmost megaseta 8–15 % from top. Whiplash-hair absent. Tegmen length/width = 0.6–0.7; shape of tegmen equally rounded, sometimes difficult to see due to preparation artefacts (compare Figure 3); central process finger-like. Length of ejaculatory apodeme/hypopygium = 39–49 %; aeadeagal apical structure present. Field with aedeagal teeth present. *Measurements*. Body size = 1.8–2.5 mm. Hind tibia = 0.8–1.0 mm. Wing length = 1.5–2.0 mm.

**Distribution and ecology**: *Cratyna uliginosa* is currently represented on BOLD by only four specimens of the BIN ACJ3298 from Germany, Finland and Norway. Our studied material also indicates a distribution from Central to Northern Europe. However the single specimen from Altai hints at a far more Eastern range. In contrast, the BIN is not recorded from the Nearctic Region. *Cratyna uliginosa* is a very common species, occurring in a variety of conditions and not only in bogs, as the specific epithet "*uliginosa*" may imply. But interestingly, there are no records from strongly anthropogenic habitats.

**Remarks**: Tuomikoski (1960) placed the two species *Plastosciara uliginosa* and *Plastosciara latiforceps* in the subgenus *Decembrina* Frey (type species *Decembrina prima*) based on the apically rounded gonostyles and the not thickened palpi. Menzel & Mohrig (2000) synonymized *Plastosciara* s. str. and *Decembrina* with *Cratyna* s. str. (type species *Cratyna atra*), and *Plastosciara latiforceps* with *Cratyna ambigua*. The synonymy of *Decembrina* with *Cratyna* appears to be correct, because *Cratyna ambigua* is indeed a *Cratyna* s. str. However, the *Corynoptera*-like species around *Cratyna uliginosa*, namely *Cr. betulae*, *Cr. contracta* and *Cr. sicata*, share some characteristics, especially the tiny, hyaline and unpaired spines at the dorsal side of the gonostylus, which might lead to the placement in a subgenus of their own. *Cratyna uliginosa* can be distinguished from the other species by the weaker and more apically placed spines.

The whole syntype material of *Sciara uliginosa* is deemed to be lost (Menzel & Mohrig 2000), and therefore it is not certain, whether it belonged to *Cratyna uliginosa*, in our sense, or to *Cr. uliginosoides*. Hence it might have been appropriate to designate a neotype in order to keep the nomenclature stable, when two so morphologically similar species are involved. However, for the following reasons, we do not. Firstly, there is one specimen from one of the type localities, "Jöpre-Moor" in Estonia, collected by A. Dampf (1884–1948). The only difference from the published data is the collecting date, 4th instead on 2nd of September, 1922. A typing error in the publication cannot be excluded. There was also another collecting event at the 5th of September by the same collector at that locality. Thus it is more likely that Dampf collected on two subsequent days at the same place instead of four days. Therefore that specimen from Jöpre might be available as a lectotype. Unfortunately, its gonostylus is not clearly visible, as it is placed just under the edge of the coverslip. The measurements of wings and antenna are, however, in the range of *Cr. uliginosa* rather than *Cr. uliginosoides*. Additionally, we identified a specimen from the Zehlau bog as, in our sense, clearly belonging to *Cr. uliginosa*. The list of specimens of both species indicates furthermore, that only *Cratyna uliginosa* is common in bogs. Finally, the drawing presented by Lengersdorf in the original publication fits better with *Cr. uliginosa* than with *Cr. uliginosoides*.

We were able to see specimens from Finland, collected by Tuomikoski. They all clearly belong to *Cr. uliginosa*, so most probably the drawing presented by Tuomikoski (1960) also shows this species.

***Cratyna* (*Cratyna*) *uliginosoides* Heller, Köhler & Menzel sp. n.** (Figures 2 & 4)

**Type material**

**Holotype**: **Norway**, ***Aust-Agder***, Evje og Hornnes, Klepsland, S-vendt, blåbær-smyle-eik-bjørk-einerskog, 58.615° N, 7.949° E, malaise trap, 01.VIII.2008, leg. J.T. Klepsland (BAB393375, NHMO) 1 male.

**Paratypes**: **Germany**, ***Brandenburg***, Luisenfelde, Langer Berg, Grumsiner Forst, forest,

52.982° N, 13.914° E, malaise trap, 15.V.2013, leg. SDEI (ZFMK-TIS-2520487, ZFMK) 1 male; Wald 4c, 52.982° N, 13.914° E, malaise trap, 15.V.2013, leg. SDEI (ZFMK-TIS-2507147, ZFMK) 1 male; Templin, Alt Placht, beech forest, 53.167° N, 13.400° E, sweep netting, 13.VII.2014, leg. K. Heller (ZFMK-TIS-2531954, ZFMK) 1 male; pine forest, 53.165° N, 13.406° E, sweep netting, 24.V.2015, leg. J. Westhoff (ZFMK-TIS-2551978, ZFMK) 1 male; Waldsieversdorf, NSG Tiergarten, mixed pine forest, 52.542° N, 14.038° E, sweep netting, 24.IV.2014, leg. K. Heller (ZFMK-TIS-2520464, ZFMK) 1 male, ***Mecklenburg-Vorpommern***, Röbel-Müritz, Rechlin, Nationalpark Müritz, Boek, Areal between Müritz and Binnenmüritz, mixed forest, 53.425° N, 12.780° E, sweep netting, 13.VI.2015, leg. K. Heller (ZFMK-TIS-2555559, ZFMK-TIS-2555560, ZFMK) 2 males; Rostock, Lütten Enn, garden, 54.133° N, 12.086° E, malaise trap, 16.V.2013, leg. J. Hagemeister (ZFMK-TIS-2513172, ZFMK) 1 male; Waren (Müritz), Nationalpark Müritz, Babke-Zartwitz-Speck-Schwarzenhof, pine forest, 53.412° N, 12.846° E, car netting, 13.VI.2014, leg. A. Kleeberg (ZFMK-TIS-2556366, ZFMK) 1 male; windfall, pine forest, 53.405° N, 12.866° E, sweep netting, 14.VI.2014, leg. K. Heller (ZFMK-TIS-2531458, ZFMK-TIS-2531459, ZFMK-TIS-2531460, ZF MK-TIS-2531461, ZFMK-TIS-2531468, ZFMK) 5 males; ***Saxony***, Dresden, Klotzsche, norther part of Dresdner Heide, Sauerbruchweg, mixed forest with wet places and ponds, 51.1362° N, 13.8186° E, malaise trap, 08.VII.2014, leg. A. Reimann (ZFMK-TIS-2552086, ZFMK) 1 male; ***Schleswig-Holstein***, Hasloh, Pfingstwald, beech forest, 53.697° N, 9.899° E, sweep netting, 21.IV.2014, leg. K. Heller (ZFMK-TIS-2520437, ZFMK) 1 male; Henstedt-Ulzburg, Kadener Chaussee, joung birch forest with mosses, 53.779° N, 9.955° E, sweep netting, 05.V.2013, leg. K. Heller (ZFMK-TIS-14880, ZFMK-TIS-2513612, ZFMK) 2 males; **Norway**, ***Akershus***, Ullensaker, Sessvollmoen – N Moen, Lite, for lengst nedlagt sandtak. Noe aktivitet med motosykler og andre kjøretøyer. Noe henlegging av avfall., 60.244° N, 11.157° E, malaise trap, 06.VIII.2014, leg. K.M. Olsen (BAB410563, SDEI) 1 male; ***Hedmark***, Stor-Elvdal, N Krokmyra – Ved hytta, E Fåfengtjørna, 61.606° N, 10.840° E, malaise trap, 21.IX.2012, leg. K.M. Olsen (BAB415020, SDEI) 1 male; ***Hordaland***, Stord, Hageberg SV – SE of Vistvik, NE coast of Stord, 59.942° N, 5.429° E, sweep netting, 18.VIII.2015, leg. K. Heller (BAB420789, NHMO) 1 male; Sveio, Langemyr – SE of Sveio, Mixed forest (scots pine, Norway spruce, downy birch, common hazel, juniper) with ferns and mosses., 59.505° N, 5.283° E, malaise trap, 17.VIII.2015, leg. K.M. Olsen (BAB431506, NHMO) 1 male; ***Møre og Romsdal***, Volda, Øyraelva – Along the stream, Deadwood rich deciduous forest along the path (common hazel, grey alder, sycamore maple, rowan, birch, ferns, mosses), 62.144° N, 6.077° E, sweep netting, 21.VIII.2015, leg. K. Heller (BAB421374, SDEI) 1 male; ***Sør-Trøndelag***, Trondheim, M. Sommerlystvegen – In the garden of no. 22, Garden with lawn and some larger trees, at the top of a woody hillside, 63.405° N, 10.383° E, malaise trap, 22.VI.2014, leg. E. Stur & T. Ekrem, (BIOUG15761-E07, NTNU) 1 male; ***Vestfold***, Larvik, Småås, 59.211° N, 10.010° E, malaise trap, 27.V.2014, leg. S. Olberg (BAB383912, NHMO) 1 male; 10.VII.2014, leg. S. Olberg (BAB411256, NHMO) 1 male; **Poland**, ***Powia Slawienski***, Darlowo, Wicie, 54.512° N, 16.474° E, sweep netting, 22.VIII.2013, leg. B. Rulik (ZFMK-TIS-2527944, ZFMK) 1 male.

**Additional material studied**: **Germany**, ***Baden-Württemberg***, Belchen, 47.826° N, 7.833° E, malaise trap, 03.VII.2003, leg. D. Doczkal (no. 4847, PKHH) 1 male; ***Brandenburg***, Waldsieversdorf, NSG Tiergarten, forest, 52.544° N, 14.069° E, sweep netting, 27.VI.2014, leg. K. Heller (no. 544, ZFMK) 1 male; ***Lower Saxony***, Torfhaus, spruce forest, 51.817° N, 10.532° E, sweep netting, 25.V.2006, leg. K. Heller (no. 4735, PKHH) 1 male; ***North-Rhine-Westphalia***, Köln-Poll, garden, 50.914° N, 6.999° E, malaise trap, 28.VI.1994, leg. J. Franzen (no. 3021, PKHH) 1 male; ***Schleswig-Holstein***, Dagebüll, salt marsh, 54.730° N, 8.715° E, colour pan trap, 15.V.1975 (no. 570, PKHH) 1 male; Elsdorf-Westermühlen, beech forest, 54.259° N, 9.528° E, sweep netting, 13.V.1996, leg. K. Heller (no. 2336, PKHH) 1 male; Kiel-University, garden, 54.346° N, 10.108°

E, malaise trap, 12.V.1995, leg. K. Heller (no. 933, PKHH) 1 male; Lübeck, Falkenhusen, spruce forest, 53.934° N, 10.424° E, sweep netting, 01.V.2001, leg. K. Heller (no. 3409, PKHH) 1 male; Rantum, Sylt, pine forest, 54.850° N, 8.298° E, sweep netting, 03.V.2005, leg. K. Heller (no. 4348, PKHH) 1 male; Tinnum, Sylt, Tinnumburg, lawn and reed, 54.898° N, 8.319° E, sweep netting, 30.IV.2005, leg. K. Heller (no. 4344, PKHH) 2 males; **Netherlands**, ***Friesland***, Terschelling, 'groenplak', primary dune succession, 53.400° N, 5.367° E, photoeclector, 06.V.2002, leg. J. Vogels (no. 4092, PKHH) 1 male; **Norway**, ***Buskerud***, Sigdal, Furukrone Nr. 1, pine forest, 60.050° N, 9.417° E, gasing, 05.VI.1998, leg. J. Skartveit & K. Thunes (no. 3071, PKHH) 1 male; ***Hedmark***, Stor-Elvdal, N Krokmyra – Ved hytta, E Fåfengtjørna, 61.606° N, 10.840° E, malaise trap, 21.IX.2012, leg. K.M. Olsen (BAB374738, SDEI) 1 male; ***Møre og Romsdal***, Molde, Julaksla N – W of Mek, Mixed forest on steep mountain slope with crevices and cavities (scots pine, Norway spruce, downy birch, grey alder, rowan, juniper, heather, blueberry, cottongrass, marsh orchids, rushes, mosses), 62.735° N, 6.989° E, sweep netting, 22.VIII.2015, leg. K. Heller (BAB421491, NHMO) 2 males; Vestnes, Småøyane – SE of Kristisetra (SE of Vestnes), bog and deadwood rich carr between road and river (downy birch, grey alder, rowan, juniper, rushes, sedges, mosses, lichens), 62.560° N, 6.994° E, sweep netting, 22.VIII.2015, leg. K. Heller (BAB421474, NHMO) 1 male; ***Sogn og Fjordane***, Høyanger, N Furehaugen, Lite gråorskogholt langs bekk i ellers myrete terreng. Fjellbjørkeskog på sidene, 61.052° N, 5.832° E, malaise trap, 19.VIII.2015, leg. K.M. Olsen (BAB440645, NHMO) 1 male; ***Telemark***, Bamble, Langøya – Bukt på østsiden (Langøya I), 59.007° N, 9.756° E, malaise trap, 01.VI.2009, leg. Ø. Gammelmo, S. Olberg & K.M. Olsen (BAB404253, BAB436497, SDEI) 2 males; Tinn, Hovin, Spjeldset, 59.941° N, 9.038° E, malaise trap, 11.VII.2004, leg. O. Lønnve (BAB390682, NHMO) 1 male; Vestfold, Horten, Borre, Adaltjern, Bakkenteigen, 59.370° N, 10.436° E, malaise trap, 24.X.2003, leg. E. Rindal (BAB389667, SDEI) 1 male; Larvik, Småås, 59.211° N, 10.010° E, malaise trap, 18.VI.2014, leg. S. Olberg (BAB436490, SDEI, BAB436491, NHMO) 2 males; 02.IX.2014, leg. S. Olberg (BAB433910, NHMO, BAB436492, SDEI) 2 males; **Sweden**, ***Härjedalen***, Nyvallen, Nyvallens fäbod, alpine birch and spruce wood, 62.317° N, 13.569° E, malaise trap, 04.VIII.2004, leg. Swedish Malaise Trap Project (no. 4824, NHRS) 1 male; ***Småland***, Bäckebo, Grytsjöns naturreservat, old aspen forest in boulder terrain, 63.177° N, 15.301° E, malaise trap, 18.V.2006, leg. Swedish Malaise Trap Project (no. 7453, PKHH) 1 male.

**Diagnostic characters**: The new species is on average slightly larger than *Cr. uliginosa*, it has relatively longer antennae and the gonostylus, which is more elongate and parallel (Figure 5), has weaker and less conspicuous spines. The absolute length of the gonostylus proved to be a good distinguishing feature. In *Cr. uliginosiodes* it measures more than 0.13 mm, and in *Cr. uliginosa* less than 0.13 mm. Most characters can vary, and the gonostylus in slide mounted specimens is easily distorted or turned, so that it often cannot be observed in typical view, and not every male specimen can be identified with certainty to species level. For that reason only barcoded specimens were chosen as types.

**Description**

**Male**: *Head*. Eye bridge 3 rows of facets. Antennae unicolour. Length-width index of 4$^{th}$ flagellomere = 2.3–2.7; length of neck of 4$^{th}$ flagellomere 0.35–0.45 of segment width; transition of basal part to neck pronounced. Colour of neck unicolour. Antennal setae shorter than segment width; of normal strength; dense. Sensillae present. Antennal setae adjacent (Figure 2). Palpi bright, or darkened; normal; palpomeres 3. First palpomere of normal shape; with 1–2 bristles; with only sparse sensillae. Second palpomere shortly oval. Third palpomere shorter than first segment. *Thorax*. Colour brown, or bright brown. Notum unicolour. Thoracic setae normal; brown. Posterior pronotum with 2–3 fine setae. Mesothoracic sclerites bare. *Legs*. Colour yellow-brown. Hind coxae of same colour as femora. Hairs on fore coxae bright. Front tibia apically with a patch of setae. Front tibial organ bright. Front tibial organ not bordered. Tibial setae

on hind legs normal, shorter than tibial width. Tibial spurs of equal length. Claws untoothed. *Wings*. Wings slightly darkened; of normal shape. Wing membrane without macrotrichia. Wing venation weak, with faint stem of M. M-fork of normal shape. $R_1$ inserting clearly before base of m-fork; posterior veins bare; bM bare; r-m bare, or with a few setae; bM/r-M = 0.75–0.95; stem CuA/bM = 0.25–0.35; $R_1$/R = 0.85–1.05; c/w = 0.75–0.85. Halteres darkened; of normal length. *Abdomen*. Abdominal setae strong. Abdominal setae sparse. Tergal setae brown; sternal setae brown. Hypopygium (Figure 4) concolour with abdomen. Base of gonocoxites with normal, weak hairs; gonocoxites length/width = 0.52–0.62, broadly separated; inner margin of gonocoxites broadly extended; inner membrane of hypopygium scarcely setose; elongated setae on gonocoxites absent. Gonostylus = 0.13–0.15 mm, 1.65–1.75 as long as wide; Inner margin concave; apex equally rounded. Apical tooth absent. Awl-like setae absent. Subapical megasetae present; number of megasetae 2–5; megasetae thin; megasetae curved; megasetae in one group; Position of basalmost megaseta 8–15 % from top. Whiplash-hair absent. Tegmen length/width = 0.52–0.62; equally rounded; normal; Central process finger-like. Length of ejaculatory apodeme/hypopygium = 32–42 %; Aeadeagal apical structure present. Field with aedeagal teeth present. *Measurements*. Body size = 2.1–2.8 mm. Hind tibia = 0.9–1.1 mm. Wing length = 1.9–2.6 mm.

**Female**: Unknown.

**Etymology**: Because of the close similarity to *Cratyna uliginosa*, the species is given a name meaning "*uliginosa*-like".

**Distribution and ecology**: *Cratyna uliginosoides* is currently represented on BOLD by more than 300 specimens of the BIN AAN6446 – the huge majority from Canada, and a few from Germany and Norway. Our material extends that range to Poland, Sweden and The Netherlands. *Cratyna uliginosoides* is a very common species, occurring in a variety of conditions, but, in contrast to *Cr. uliginosa*, it seems to avoid very wet conditions and is present in urban habitats, such as gardens.

**The *Trichosia edwardsi* complex**

The taxonomic history of the nominate species *Lycoria edwardsi* has been quite changeable. In the appendix to his contribution to "Fliegen der palaearktischen Region", Lengersdorf (1930) introduced this name for *Sciara trochanterata sensu* Edwards (1925), because *Sciara trochanterata* (Zetterstedt, 1851) in his interpretation constituted a different species. Edwards had illustrated the gonostylus of what he thought was *trochanterata* for the first time, and distinguished it from *Sciara longiventris* Zetterstedt, 1851 [= *Trichosia morio* (Fabricius, 1794)] mainly on the absence of macrotrichia at the tip of the wing membrane. Tuomikoski (1960) followed Lengersdorf's and Edwards' concept, placing the species in the genus *Trichosia* (*Trichosia*), but retaining the name *Trichosia trochanterata* in accordance with Edwards. By the designation of lectotype specimens for *Sciara trochanterata* [= *Leptosciarella trochanterata*] and *Lycoria edwardsi* [= *Trichosia edwardsi*] (Menzel & Mohrig 1997b; Mohrig & Menzel 1997), it was put forward, that the two belonged to clearly different species and genera. However, Menzel & Mohrig (1997b) regarded *Lycoria edwardsi* Lengersdorf, 1930 as a synonym of the in their view highly variable species *Trichosia morio* (Fabricius, 1794). The female lectotype of *Rhagio morio* Fabricius, 1794 **syn. n.** belongs to *Sciara hemerobioides* Scopoli, 1763 (checked by Heller 2014) and therefore the name *Trichosia morio* needs to be replaced by the next available name, *Trichosia caudata* (Walker, 1848) **restit**. Menzel & Heller (2006) revalidated *Trichosia edwardsi*, based on the same diagnostic difference of the wing macrotrichia applied formerly by Edwards, Lengersdorf and Tuomikoski. In the Revision of Nearctic Sciaridae (Mohrig *et al.* 2013), *Trichosia edwardsi* was synonymized again, now with the North American *Trichosia habilis* (Johannsen, 1912). In the course of DNA barcoding, it became obvious that *Trichosia edwardsi sensu* Menzel & Heller (2006) is in fact a complex of by now 20 different BINs (ACE2217, ACF4471, ACF6248, ACF6942, ACF9360, ACF9391, ACG3537, ACG3657, ACG3843, ACG4607, ACJ0681,

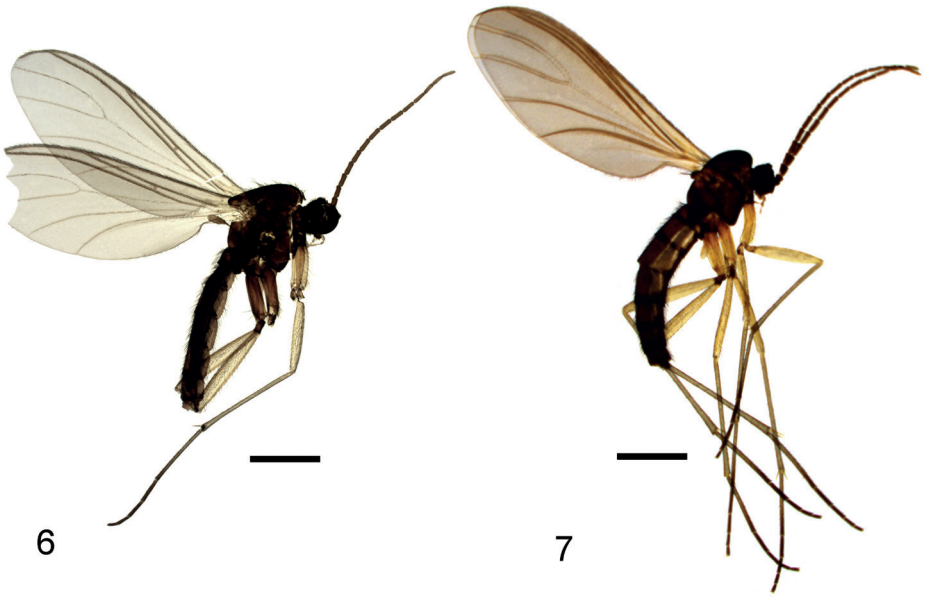
ACJ1249, ACP2072, ACE2215, ACD8591, ACV1950, ACV1951, ACV1952, ACV3128, ACV2020). The genetic distances to the nearest neighbour range from 2.73 % to 10.59 %. Many of these BINs are at present known by single, often only female, specimens, but interestingly, none of them is present in the well sampled Nearctic Region. Before final species limits within this complex can be established, a lot more genetic and morphological comparisons need to be undertaken. Still, we have already learnt, that the observed morphological variability is accompanied by genetic variability, and, to all appearances, more than one species must be present. Similarly, conspecificy of *Trichosia edwardsi* and *Trichosia habilis* can be excluded. For those reasons, we are again treating *Trichosia edwardsi* **restit.** as a valid species. Albeit we were able to clearly distinguish the most common BIN (ACD8591 described as a new species below) from all other BINs genetically, and morphologically, the remaining complex of species is still poorly understood. Some of them are affiliated to the smaller species *Trichosia confusa*. Further studies are needed to establish distinct species boundaries. In the meantime, we suggest treating the rest of the complex as *Trichosia edwardsi* s. l., particularly because the lectotype of *Sciara edwardsi* from Arran, New Forest (England) cannot at the moment be assigned to a particular BIN.

***Trichosia* (*Trichosia*) *lengersdorfi* Heller, Köhler & Menzel sp. n.** (Figures 7–9)

**Type material**

**Holotype**: **Norway**, ***Vestfold***, Larvik, Farmenrøysa Ø, 59.229° N, 10.025° E, 27.V.2014, leg. S. Olberg (BAB378101, NHMO) 1 male.

**Paratypes**: **Czech Republic**, ***Bohemia***, Bilina, Chloumek, top of a hill, steppe surrounded by oak forest, formerly NR 'Kajba', 50.546° N, 13.864° E, malaise trap, 28.V.1998, leg. M. Barták (no. 2207, SDEI) 1 male; 15.VI.1998, leg. M. Barták, (no. 2039, 2159, 2199, SDEI) 3 males; 24.VII.1998, leg. M. Barták (no. 2035, SDEI) 1 male; 24.VIII.1998, leg. M. Barták (2036, 2201, SDEI) 2 males; 25.VI.1998, leg. M. Barták (no. 2204, SDEI) 1 male; 28.V.1998, leg. M. Barták, (no. 2042, 2202; SDEI) 2 males; Hoblika, stony steppe, 50.522° N, 13.828° E, malaise trap, 14.V.1998, leg. M. Barták (no. 2209, SDEI) 1 male; Hoblika forest, 50.548° N, 13.760° E, photoeclector, 13.V.1998, leg. M. Barták (no. 2196, SDEI) 1 male; Stipanov, riverine vegetation of Lukovsy potok, alder carr, 50.533° N, 13.858° E, malaise trap, 24.VII.1998, leg. M. Barták (no. 2140, 2198, SDEI) 2 males; 28.V.1998, leg. M. Barták (no. 2177, 2200, SDEI) 2 males; Duchkov, underused garden, 50.600° N, 13.749° E, sweep netting, 09.V.1992, leg. M. Barták (no. 2040, SDEI) 1 male; drowned poplar forest along the old spoil bank Osecka, 50.611° N, 13.72° E, photoeclector, IV.1998, leg. M. Barták (no. 2213, SDEI) 1 male; Lom u Mostu, small pont, shallow banks with Typha-cover, 50.584° N, 13.673° E, malaise trap, 14.V.1998, leg. M. Barták (no. 2197, SDEI) 1 male; Sazava, 49.917° N, 14.917° E, car netting, 16.V.1992, leg. M. Barták (no. 2205, SDEI) 1 male; ***Moravia***, Buchlov, edge of deciduous forest, 49.108° N, 17.328° E, sweep netting, 29.X.1993, leg. M. Barták (no. 2212, SDEI) 1 male; **Denmark**, ***Midtjylland***, Kalø, Hestehaven, beech forest, 56.286° N, 10.467° E, photoeclector, 10.V.1993, leg. L.B. Nilesen (no. 8733, 8734, 8735, PKHH) 3 males; ***Syddanmark***, Marstrup, Hyttekaerevey, Pamhule Skov, beech forest with hazel-nut, 55.208° N, 9.440° E, sweep netting, 18.VI.2000, leg. F. Menzel (no. 2127, SDEI) 1 male; Varde, Ho, pine/oak forest, 55.546° N, 8.224° E, sweep netting, 29.IV.1998, leg. K. Heller (no. 2626, PKHH) 1 male; **Germany**, ***Baden-Württemberg***, Bad Buchau, Federsee nahe Bannwald, 48.063° N, 9.596° E, malaise trap, 14.VII.2003, leg. D. Doczkal (no. 4469, PKHH) 1 male; Belchen, 47.826° N, 7.833° E, malaise trap, 03.VII.2003, leg. D. Doczkal (no. 4819, 4850, PKHH) 2 males; Malsch, Heckelbachklamm, 48.883° N, 8.339° E, malaise trap, 02.VI.2003, leg. D. Doczkal (no. 7724, PKHH) 1 male; 17.V.2003, leg. D. Doczkal, (no. 4911, PKHH) 1 male; Todtnau, NSG Feldberg, top of mountain, 47.830° N, 7.943° E, malaise trap, 30.V.2003, leg. D. Doczkal (no. 5173, PKHH) 1 male; WilhM. Elmer Hütte, 47.830° N, 7.943° E, malaise trap, 30.V.2003, leg. D. Doczkal (no. 5133, 5134, PKHH) 2 males; ***Bavaria***, Sankt Oswald-




**FIGURES 6–7**. Habitus. **6**. Lectotype of *Trichosia edwardsi* (Lengersdorf, 1930). **7**. *Trichosia lengersdorfi* sp. n. Scale bars 1.0 mm

Riedlhütte, NP Bavarian Forest, forest, 48.951° N, 13.422° E, malaise trap, 18.V.2012, leg. Sellmayer (BIOUG05208-D01, ZSMC) 1 male; ***Berlin***, Berlin, Grunewald, 52.469° N, 13.229° E, photoeclector, V.1995, leg. I. Späth (no. 2144, SDEI) 1 male; V.1994, leg. I. Späth (no. 2174, SDEI) 1 male; IV.1995, leg. I. Späth (no. 2173, SDEI) 1 male; V.1900, leg. L. Oldenberg (no. 2130, SDEI) 1 male; 06.V.1906, leg. L. Oldenberg (no. 2132, SDEI) 1 male; 25.IX.1899, leg. L. Oldenberg (no. 2131, SDEI) 1 male; Berlin-Friedrichshagen, old pines, 52.455° N, 13.616° E, V.1994, leg. G. Möller (no. 2133, SDEI) 1 male; IV.1995, leg. G. Möller (no. 2138, 2142, 2143, 2162, SDEI) 4 males; VI.1994, leg. G. Möller (no. 2176, SDEI) 1 male; 09.VII.1993, leg. G. Möller (no. 2179, SDEI) 1 male; 14.V.1993, leg. G. Möller (no. 2166, SDEI) 1 male; Berlin-Treptow, forest district Müggelheim, 52.479° N, 13.477° E, photoeclector, V.1995, leg. G. Möller (no. 2141, 2178, SDEI) 2 males; pitfall trap, V.1995, leg. G. Möller (no. 2182, SDEI) 1 male; IV.1995, leg. G. Möller (no. 2170, 2180, SDEI) 2 males; 14.V.1993, leg. G. Möller (no. 2189, SDEI) 1 male; ***Brandenburg***, Bremsdorf, Schlaubetal Kr. Eisenhüttenstadt, spruce forest, 52.149° N, 14.496° E, 24.V.1989, leg. F. Menzel (no. 2108, SDEI) 1 male; Britz near Eberswalde, 52.889° N, 13.812° E, 06.V.1993, leg. M. Sommer (no. 2044, 2152, 2175, 2185, 2194, SDEI) 9 males; Chorin, bog, 52.916° N, 13.864° E, sweep netting, 19.v.1993, leg. M. Sommer (no. 2135, 2169, SDEI) 2 males; Finkenkrug, 52.561° N, 13.073° E, 12.V.1901, leg. L. Oldenberg (no. 2129, SDEI) 1 male; Golzow near Eberswalde, field edge / forest, 52.916° N, 13.798° E, yellow pan trap, 06.V.1993, leg. M. Sommer (no. 2184, SDEI) 1 male; 13.V.1993, leg. M. Sommer (no. 2109, SDEI) 1 male; Klein Ziethen near Eberswalde, Serwester See, dry grassland, 52.964° N, 13.940° E, 06.V.1993, leg. M. Sommer (no. 2043, SDEI) 1 male; Luisenfelde, Langer Berg, 52.909° N, 13.837° E, 06.V.1993, leg. M. Sommer (no. 2134, 2153, SDEI) 3 males; 29.IV.1993, leg. M. Sommer (no. 2154, SDEI) 1 male; Langer Berg, Grumsiner Forst, Wald 4, 52.982° N, 13.914° E, malaise trap, 07.V.2013, leg. SDEI (ZFMK-TIS-2507163, ZFMK-TIS-2520509, ZFMK) 2 male; Grumsiner Forst, Wald 4c, 52.982° N, 13.914° E, malaise trap, 15.V.2013, leg. SDEI (ZFMK-TIS-2507144,

ZFMK-TIS-2520485, ZFMK) 2 males; NSG Fettseemoor near Eberswalde, wet beech forest with birch and alder, 52.833° N, 13.817° E, 04.V.1989, leg. F. Menzel (no. 2161, 2183, SDEI) 2 males; Waldsieversdorf, NSG Tiergarten, 52.544° N, 14.069° E, window trap, VI.1994, leg. G. Möller (no. 2163, 2188, SDEI) 2 males; ***Hesse***, Rheingau-Taunus-Kreis, MF2, Lorch am Rhein, above castle Nollig, dry slope, 50.050° N, 7.800° E, malaise trap, 10.V.2013, leg. O. Niehuis (ZFMK-TIS-2527982, ZFMK-TIS-2528271, ZFMK-TIS-2528272, ZFMK) 3 males; Lower Saxony, Braunlage, spruce forest, 51.729° N, 10.609° E, sweep netting, 25.V.2006, leg. K. Heller (no. 4740, PKHH) 1 male; young maple forest, 51.729° N, 10.609° E, yellow pan trap, 28.V.2006, leg. K. Heller (no. 4729, PKHH) 1 male; ***Mecklenburg-Vorpommern***, Bandelin, Buchenwald, 53.968° N, 13.381° E, 06.v.1988, leg. F. Menzel (no. 2113, SDEI) 1 male; Bützow, 53.851° N, 11.981° E, 16.v.1901, leg. C.F. Ketel (no. 3416, SDEI) 1 male; Greifswald, deciduous forest, 54.096° N, 13.381° E, malaise trap, 26. VI.1995, leg. M. Jaschhof (no. 5263, PKHH) 1 male; Grubenhagen near Greifswald, high beech/ birch forest, 54.034° N, 13.367° E, 13.V.1988, leg. F. Menzel (no. 2114, SDEI) 1 male; Gützkow near Greifswald, Hasenberg, 53.941° N, 13.408° E, 01.V.1988, leg. F. Menzel (no. 2112, SDEI) 1 male; Nationalpark Müritz, MF4, Boek, Totholz, 50.320° N, 7.493° E, malaise trap, 12.VI.2015, leg. BioBlitz 2015 (ZFMK-TIS-2555499, ZFMK) 1 male; Rostock, Lütten Enn, Garten, 54.133° N, 12.086° E, malaise trap, 13.VII.2013, leg. J. Hagemeister (ZFMK-TIS-2513183, ZFMK) 1 male; 29.V.2013, leg. J. Hagemeister (ZFMK-TIS-2513153, ZFMK-TIS-2522100, ZFMK) 2 males; Vorbeck near Bützow, high beech forest with *Impatiens* understorey, 53.919° N, 12.064° E, 10.VI.1995, leg. F. Menzel (no. 2145, 2146, 2181, SDEI, 3 males; Waren (Müritz), Klink Garten, 53.480° N, 12.623° E, sweep netting, 23.IV.2014, leg. B. Rulik (ZFMK-TIS-2528258, ZFMK) 1 male; Woldegk, 53.465° N, 13.581° E, 30.V.1898, leg. C.F. Ketel (no. 2150, 2151, 2193, SDEI) 3 males; Zachow near Neubrandenburg, 53.450° N, 13.048° E, 16.V.1985, leg. K. Lembke (MO1017, MO1021, PWMP; 2105, 2106, 2107, SDEI) 6 males; Zirchow at Usedom, beech/oak forest, 53.894° N, 14.14° E, sweep netting, 07.V.1994, leg. M. Jaschhof (no. 5369, PKHH) 1 male; North-Rhine-Westphalia, Ubbedissen, beech forest, 51.983° N, 8.632° E, sweep netting, 12.VI.2004, leg. F. Menzel (no. 2045, SDEI) 1 male; ***Rhineland-Palatinate***, Ellscheid, NSG Mürmes, beech/oak forest, 50.150° N, 6.917° E, sweep netting, 12.VI.1999, leg. F. Menzel (no. 2104, 3417, SDEI) 2 males; Gönnersdorf, Mäuerchenberg, dry grassland, 50.333° N, 6.600° E, malaise trap, 22.VI.1991, leg. C. Cölln (no. 1853, PKHH) 1 male; Kirchheimbolanden, NSG Albertskreuz, 49.667° N, 8.016° E, malaise trap, 02.v.2002, leg. D. Doczkal (no. 5097, 5166, PKHH) 2 males; 19.VII.2001, leg. D. Doczkal (no. 4803, PKHH) 1 male; Niederzissen, MF7B, Bausenberg, meadow, 50.465° N, 7.226° E, malaise trap, 02.VI.2014, leg. B. Rulik *et al.* (ZFMK-TIS-2559676, ZFMK) 1 male; Winningen, MF4, Winningen, forest, 50.320° N, 7.493° E, malaise trap, 25.VII.2013, leg. B. Rulik et al. (ZFMK-TIS-2564720, ZFMK) 1 male; ***Saxony***, Dresden, Klotzsche, northern part of Dresdner Heide, Friedersdorfer Weg, former windthrow area, 51.134° N, 13.811° E, malaise trap, 18.VI.2014, leg. A. Reimann (ZFMK-TIS-2552137, ZFMK) 1 male; 25.VI.2014, leg. A. Reimann (ZFMK-TIS-2552123, ZFMK) 1 male; northern part of Dresdner Heide, near Friedersdorfer Weg, young forest on clearing area, 51.133° N, 13.811° E, malaise trap, 03.VI.2015, leg. A. Reimann (ZFMK-TIS-2559579, ZFMK) 1 female; Stadt Wehlen near Dresden, Bärenstein, forest, 50.957° N, 14.033° E, malaise trap, 21. VI.2008, leg. K. Heller (no. 6379, PKHH) 1 male; Zöblitz, forst district Zöblitz, beech forest, 50.659° N, 13.236° E, photoeclector, 06.VI.2001, leg. M. Elmer (no. 2148, SDEI) 1 male; ***Saxony-Anhalt***, Eisfelder Talmühle (Südharz), Großer Merkelsbach, spruce/hornbeam/sycamore forest, 51.617° N, 10.815° E, 30.V.1989, leg. F. Menzel (no. 2110, SDEI) 1 male; Radeweghaus near Hasselfelde, spruce/oak forest, 51.693° N, 10.855° E, 01.VI.1989, leg. F. Menzel (no. 2187, SDEI) 1 male; ***Schleswig-Holstein***, Blumenthal, Blumenthaler Berg, beech forest, 54.221° N, 10.023° E, sweep netting, 20.IV.2014, leg. K. Heller (ZFMK-

TIS-2520432, ZFMK) 1 male; Darry, Strezerberg, beech and pine forest, 54.313° N, 10.548° E, sweep netting, 29.IV.2012, leg. K. Heller (no. 8001, PKHH) 1 male; Fröruper Berge, forest, 54.6842° N, 9.4564° E, malaise trap, 11.VII.1997, leg. W. Barkemeyer, 2873, PKHH) 1 male; 27. VI.1997, leg. W. Barkemeyer (no. 2867, PKHH) 1 male; Heikendorf, Haffkamper Weg, beech forest, 54.382° N, 10.217° E, sweep netting, 21.VII.2012, leg. K. Heller (ZFMK-TIS-12015, ZFMK) 1 male; Korügen, beech forest, 54.383° N, 10.208° E, sweep netting, 10.V.1991, leg. K. Heller (no. 22, PKHH) 1 male; 09.V.1990, leg. K. Heller (no. 24, PKHH) 1 male; 11.V.1991, leg. K. Heller, (no. 25, PKHH) 1 male; Kiel, university, garden area, 54.346° N, 10.108° E, malaise trap, 02.VI.1995, leg. K. Heller (no. 998, PKHH) 1 male; 06.X.1995, leg. K. Heller (no. 1249, PKHH) 1 male; 07. VI.1996, leg. K. Heller (no. 1504, PKHH) 1 male; 12.VII.1996, leg. K. Heller (no. 1567, PKHH) 1 male; 12.IX.1997, leg. K. Heller (no. 2515, PKHH) 1 male; Kremper Au, 53.826° N, 9.503° E, emergence trap, 04.V.1990, leg. L. Lietz (no. 739, PKHH) 1 male; Langenhorner Heide, Ochsenweg, spruce/larch forest, 54.667° N, 8.917° E, sweep netting, 19.VI.2000, leg. F. Menzel (no. 2156, SDEI) 1 male; Langenhorner Heide, Ochsenweg, heather, 54.667° N, 8.917° E, sweep netting, 17.VI.2000, leg. K. Heller (no. 3123, PKHH) 1 male; Langenlehsten, pine forest, 53.501° N, 10.738° E, sweep netting, 25.V.2002, leg. K. Heller (no. 3745, PKHH) 1 male; Probsteierhagen, beech forest, 54.364° N, 10.289° E, sweep netting, 01.V.1990, leg. K. Heller (no. 23, PKHH) 1 male; Quickborn, an der Gronau, birch forest, 53.741° N, 9.921° E, sweep netting, 08.V.2014, leg. K. Heller (ZFMK-TIS-2551971, ZFMK) 1 female; Sterley, beech forest, 53.621° N, 10.818° E, sweep netting, 21.V.1996, leg. K. Heller (no. 1583, PKHH) 1 male; Tarp, Norderholz, high beech/spruce forest, 54.667° N, 9.398° E, sweep netting, 16.VI.2000, leg. F. Menzel (no. 2117, 2155, SDEI) 2 males; Trent, Trentmoor, bog, 54.205° N, 10.416° E, malaise trap, 14. IV.1994, leg. C.F. Kassebeer (no. 637, PKHH) 1 male; 15.V.1993, leg. C.F. Kassebeer (no. 630, PKHH) 1 male; Wankendorf, from old alder wood, 54.113° N, 10.202° E, photoeclector, 10. IV.1989, leg. J. Warning (no. 586, PKHH) 1 male; ***Thuringia***, Breitenbach, Vessertal, 50.549° N, 10.763° E, emergence trap, 31.V.1987, leg. R. Bellstedt (no. 2172, SDEI) 1 male; Hainich Nationalpark, Craulaer Kreuz, beech forest, 51.075° N, 10.440° E, sweep netting, 18.VI.2005, leg. F. Menzel, (no. 2203, SDEI) 1 male; Thiemsburg, mixed forest, 51.096° N, 10.481° E, sweep netting, 18.VI.2005, leg. K. Heller (no. 4971, 4972, PKHH) 2 males; NSG Apfelstädter Ried, Kohldistelwiese, 50.900° N, 10.883° E, yellow pan trap, 13.IX.1985, leg. J. Weipert (no. 2103, SDEI) 1 male; NSG Schützenberghochmoor, *Sphagnum*, *Eriophorum*, blueberry, 26.v.1989, leg. F. Menzel (no. 2115, 2116, SDEI) 2 males; Schnellbach, Dörre Flohbach, 50.751° N, 10.500° E, 04.VI.1988, leg. R. Bellstedt (no. 2186, SDEI) 1 male; Silbachtal near Erlau, spruce forest, 50.539° N, 10.730° E, 24.V.1989, leg. F. Menzel (no. 2119, SDEI) 2 males; Veilchenbrunnen near Oberhof, wet meadow, 50.704° N, 10.680° E, 26.V.1989, leg. F. Menzel (no. 2111, SDEI) 2 males; **Luxembourg**, ***Grevenmacher District***, Consdorf, Dewenpetz, 49.769° N, 6.319° E, hand collecting, 12.V.2013, leg. D. Weber (ZFMK-TIS-2502046, ZFMK) 1 female; **Norway**, ***Akershus***, Nesodden, Blåbærstien, 59.852° N, 10.670° E, 07.VI.2012, leg. J.O. Lønnve (BAB374544, NHMO) 3 males; 05.V.2015, leg. J.O. Lønnve (BAB438227, NHMO) 1 male; Flatebybråten vest, AkNo, 59.812° N, 10.625° E, malaise trap, 27.VI.2014, leg. J.O. Lønnve (BAB425843, NHMO) 1 male; Ommen – Sørvendt rasmark, AkNo, 59.803° N, 10.61° E, malaise trap, 03.VII.2011, leg. J.O. Lønnve (BAB374585, NHMO) 1 male; ***Aust-Agder***, Birkenes, Birkeland, Nordåsen, 58.336° N, 8.240° E, VI.2003, leg. S. Svendsen (BAB390092, NHMO, BAB390046, NHMO, BAB415395, BAB415403, BAB390033, BAB390034, BAB-390035, BAB390044, BAB390047, BAB390051, BAB 390052, BAB390068, BAB390070, BAB-390071, BAB390075, BAB390077, BAB390082, BAB390093, SDEI) 18 males; ***Buskerud***, Kongsberg, Haugplassen, 59.534° N, 9.568° E, 26. VI.2013, leg. K.M. Olsen (BAB374227, NHMO) 1 male; Ringerike, S Langmyra – Langs Sibekken, 60.282° N, 10.124° E, 03.VI.2014, leg. K. Heller

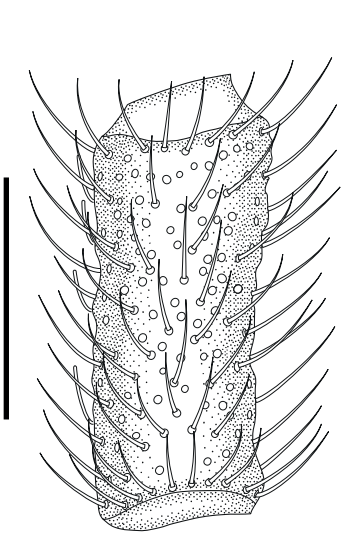
(BAB374177, NHMO) 1 male; Synneren NR, 60.1228° N, 10.211° E, 03.VI.2014, leg. A. Köhler (BAB377025, SDEI) 1 male; Veksalbekken, 60.175° N, 10.200° E, 03.VI.2014, leg. Ø. Gammelmo, K.M. Olsen & K. Heller (BAB-378371, BAB390519, BAB373271; BAB373278, NHMO) 3 males, 1 female; ***Hedmark***, Kongsvinger, Abborhøgda, 60.184° N, 12.459° E, 22. VI.2003, leg. K. Sund (BAB415646, SDEI, BAB415647, NHMO) 2 males; ***Hordaland***, Bergen, Fløyfjellet, swampy old spruce forest, 60.396° N, 5.346° E, 07.VI.2014, leg. K. Heller & A. Köhler (BAB372692, BAB376789, BAB-376790, SDEI, NHMO) 8 males; Litlelia – Valley Sædalen N of Sædalen skole, HoBe, 60.354° N, 5.394° E, malaise trap, 18.VIII.2015, leg. Ø. Gammelmo (BAB431496, NHMO) 1 female; N Langetoen, young spruce forest, 60.393° N, 5.356° E, 07.VI.2014, leg. A. Köhler (BAB377021, BAB377022, BAB377023, NHMO, SDEI) 3 males; Skansemyren, old beech forest, 60.393° N, 5.343° E, 07.VI.2014, leg. K. Heller (BAB372642, BAB372659, no. 8414, NHMO, PKHH) 4 males; Eidfjord, Simadalen, Tveit, 60.501° N, 7.190° E, 12.VII.2004, leg. E. Rindal & T. Darup (BAB415782, NHMO, BAB415772, BAB415778, BAB 415779, BAB415780, BAB415781, BAB-415785, SDEI) 6 males, 1 female; Simadalen, Tveit, 60.501° N, 7.190° E, 09.IX.2005, leg. E. Rindal & T. Darup (BAB389685, BAB389687, BAB389689, SDEI) 1 male; ***Oslo***, Oslo Gaustad – 'Jubileumsenga', Nyrestaurert slåtteng, 59.948° N, 10.712° E, 29.VI.2014, leg. K.M. Olsen (BAB410650, NHMO) 1 male; 04.VII.2013, leg. K.M. Olsen (BAB383636, NHMO) 1 male; Ljabru, Ljanselva, 59.851° N, 10.810° E, 19.V.2007, leg. G. Søli (BAB389873, SDEI) 1 male; Nordstrand, Ljanselva, Liadalen, 59.848° N, 10.793° E, 14.VI.2010, leg. G. Søli & M. Steinert (BAB415541, BAB415568, SDEI) 2 males; 02.VI.2010, leg. G. Søli & M. Steinert (BAB417032, BAB417046, BAB417073, SDEI) 3 males; ***Sogn og Fjordane***, Høyanger, N Furehaugen, 61.052° N, 5.832° E, 19.VIII.2015, leg. K.M. Olsen (BAB440625, NHMO) 1 male; Vårstølen –Nedenfor veien, 61.098° N, 5.888° E, 19.VIII.2015, leg. K.M. Olsen (BAB429656, BAB429657, NHMO) 1 male, 2 females; Lærdal, Eisurda, 61.068° N, 7.820° E, 04.VI.2014, leg. Ø. Gammelmo & K.M. Olsen (BAB388854, NHMO) 1 male; Eråksdalen, 61.058° N, 7.963° E, 04.VI.2014, leg. A. Köhler (BAB377018, BAB-377019, SDEI) 2 males; Luster, Flatelvi – Ved Rv334, 61.667° N, 7.319° E, 06.VI.2014, leg. A. Köhler (BAB377020, SDEI) 1 male; N Hesjevoll, 61.619° N, 7.275° E, 06.VI.2014, leg. K. Heller & A. Köhler (BAB373161, BAB377017, NHMO) 2 males; N Nigardsbrevatnet, 61.672° N, 7.236° E, 06.VI.2014, leg. Ø. Gammelmo & K.M. Olsen (BAB378388, BAB378389, NHMO) 3 males; SW Hurrene, 61.445° N, 7.262° E, 06.VI.2014, leg. K. Heller & A. Köhler (BAB373239, BAB373244, BAB376818, NHMO, SDEI) 3 males; Sogndal, W Steig –, 61.278° N, 7.152° E, 05.VI.2014, leg. A. Köhler, Ø. Gammelmo & K.M. Olsen (BAB377024, BAB388909, NHMO) 3 males; ***Sør-Trøndelag***, Trondheim, M. Sommerlystvegen – in the garden of nr. 22, 63.405° N, 10.383° E, 25.V.2014, leg. E. Stur & T. Ekrem (BIOUG15464-B04, BIOUG15540-A12, BIO-UG15545-E01, BIOUG15565-C07, BIOUG155-65-C09, NTNU) 2 males, 3 females; 08.VI.2014, leg. E. Stur & T. Ekrem (BIOUG15675-F12, NTNU) 1 female; ***Telemark***, Bamble, Langøya – Bukt på østsiden (Langøya I), 59.007° N, 9.756° E, 01.VI.2009, leg. Ø. Gammelmo, S. Olberg & K.M. Olsen (BAB404039, BAB404228, NHMO) 3 males; Porsgrunn, Brevik, Dammane, 59.057° N, 9.67° E, 17.IX.1988, leg. G. Søli (BAB390717, SDEI) 1 male; Tinn, Hovin, Spjeldset, 59.941° N, 9.038° E, 11.VIII.2004, leg. O. Lønnve (BAB-390680, SDEI) 1 male; Tokke, WNW Gunnarshelle, 59.445° N, 8.035° E, 07.VI.2014, leg. K.M. Olsen (BAB381123, NHMO) 1 male; ***Vestfold***, Larvik, Farmenrøysa Ø, 59.229° N, 10.025° E, 27.V.2014, leg. S. Olberg (BAB378100, NHMO) 1 male; Fjære, 59.187° N, 10.077° E, 02.VI.2014, leg. A. Köhler (BAB376739, SDEI) 1 male; Jordstøyp N, 59.194° N, 9.937° E, 02.VI.2014, leg. A. Köhler (BAB376803, SDEI) 1 male; Nevlungstranda – Mølen II, 58.968° N, 9.848° E, 01.VI.2009, leg. Ø. Gammelmo, S. Olberg & K.M. Olsen (BAB380621, BAB403001, NHMO) 4 males; 26.VI.2009, leg. Ø. Gammelmo, S. Olberg, & K.M. Olsen (BAB403161, NHMO) 1 male; Larvik: Småås, 59.211° N, 10.010° E,

malaise trap, 10.VII.2014, leg. S. Olberg (BAB-433904, NHMO) 1 male; 27.V.2014, leg. S. Olberg (BAB383897, NHMO) 4 males; **Poland**, ***Warmian-Masurian Voivodeship***, Elblag, 54.167° N, 19.400° E, V.1893, leg. B. Lichtwardt (no. 2137, SDEI) 1 male; **Sweden**, ***Bohuslän***, Ödsmal, Hällsberget, broad leaved deciduous forest, 58.141° N, 11.856° E, malaise trap, 11.VIII.2004, leg. Swedish Malaise Trap Project (no. 5804, PKHH) 1 male; ***Östergötland***, Omberg, Boskogs-reservatet Omberg, beech forest, 58.297° N, 14.635° E, malaise trap, 05.VII.2005, leg. Swedish Malaise Trap Project (no. 1476, 1465, 1466, 1467, 1468, 1469, 1470, 1471, 1472, 1473, 1474, 1475, NHRS) 12 males; Storpissan, old Norway spruce wood, 58.335° N, 14.655° E, malaise trap, 05. VII.2005, leg. Swedish Malaise Trap Project (no. 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2094, 2095, 2096, 2097, 3545, 3546, 3547, 3548, NHRS) 15 males; 28.V.2005, leg. Swedish Malaise Trap Project (no. 1853, 1851, 1852, 1854, NHRS) 4 males; ***Skåne***, Simrishamn, Stenshuvud National Park: Svabeholmsskog, hornbeam forest, 55.661° N, 14.269° E, malaise trap, 20.VI.2005, leg. Swedish Malaise Trap Project (no. 7240, 2984, PKHH, NHRS) 2 males; ***Småland***, Bäckebo, Grytsjöns naturreservat, Old moisty hay-making meadow in forest edge, 56.883° N, 16.066° E, malaise trap, 15.VI.2006, leg. Swedish Malaise Trap Project (no. 6871, PKHH) 1 male; Gränna, Lönnemålen, next to old cellar, 58.049° N, 14.573° E, malaise trap, 24.IX.2003, leg. Swedish Malaise Trap Project (no. 3158, 3159, 3628, NHRS, 9 males; ***Södermanland***, Nämdö, Krokudden, Krokvik, spruce and pine forest, 59.208° N, 18.696° E, malaise trap, 29.VII.2009, leg. Williams & Malm (no. 5173, 5133, 5073, 5075, 5077, 5079, 5080, 5081, 5082, 5083, 5127, 5128, 5129, 5131, 5132, 5135, 5136, 5137, 5139, 5162, 5174, 5130, NHRS, 22 males); 23.v.2009, leg. Williams & Malm (no. 4692, 4693, 4694, 4695, 4696, 4697, 4698, 4923, 4924, 4925, NHRS) 10 males; Tyresta Nationalpark, Stockholms län, pine forest, 59.167° N, 18.300° E, malaise trap, 06.VI.2002, leg. B. Viklund & L.O. Wikars (no. 2121, SDEI) 1 male; 24.IX.2000, leg. B. Viklund & L.O. Wikars (no. 2122, SDEI) 1 male; small fire area north of bus stop Hanigealpen, 59.167° N, 18.300° E, malaise trap, 17.VI.2002, leg. B. Viklund & L.O. Wikars (no. 2125, SDEI) 1 male; **Switzerland**, ***Canton of Zürich***, Zürich, Sihlwald, 47.269° N, 8.557° E, photoeclector, 19.VI.1996, leg. K. Schiegg (no. 2445, PKHH) 1 male. **China**, ***Heilongjiang province***, Wujingqu, Fenglin Protection, Liushili, 48.547° N, 129.014° E, sweep netting, leg. Zhang Su Jiong (ZAFU), 21.VI. 2008, 1 male.

**Diagnostic characters**: Males of *Trichosia lengersdorfi* can be identified by the combination of the following characters: Legs yellow, wing membrane without macrotrichia and gonostyli long-oval.

**Description**

**Male**: *Head*. Eye bridge 5 rows of facets. Antennae unicoloured. Length-width index of 4th flagellomere = 2.2–3.0; length of neck of 4th flagellomere 0.25–0.38 of segment width; transition from basal part to neck pronounced (Figure 8). Colour of neck unicoloured. Antennal setae shorter than segment width; fine; dense. Sensillae present. Antennal setae salient. Palpi darkened; long; palpomeres 3. First segment elongate; with 3–7 bristles; with only sparse sensillae. Second segment elongate. Third segment longer than first. *Thorax*. Colour brown. Notum unicoloured. Thoracic setae long and strong; black. Posterior pronotum setose. Postpronotum with 1–4 strong setae. Mesothoracic sclerites bare. *Legs*. Colour yellow. Hairs on fore coxae bright. Front tibia apically with a patch of setae. Front tibial organ dark. Front tibial organ not bordered. Hind coxae of same colour as femora. Tibial setae on hind legs normal, shorter than tibial width. Tibial spurs of equal length. Claws untoothed. *Wings*. Wings slightly darkened; of normal shape. Wing membrane without macrotrichia, or partially with macrotrichia. Wing venation weak, with faint stem of M. M-fork of normal shape. $R_1$ inserting at or slightly before base of m-fork; posterior veins with macrotrichia; stem of M mainly with macrotrichia; $CuA_1$ and $CuA_2$ mainly with macrotrichia; bM bare; r-m with a few setae; bM/r-M = 0.8–1.0; stem CuA/bM = 0.30–0.45; $R_1$/R = 1.2–1.6; c/w = 0.63–0.75. Halteres bright; of normal length. *Abdomen*. Abdominal setae strong and dense. Both tergal and sternal setae black.



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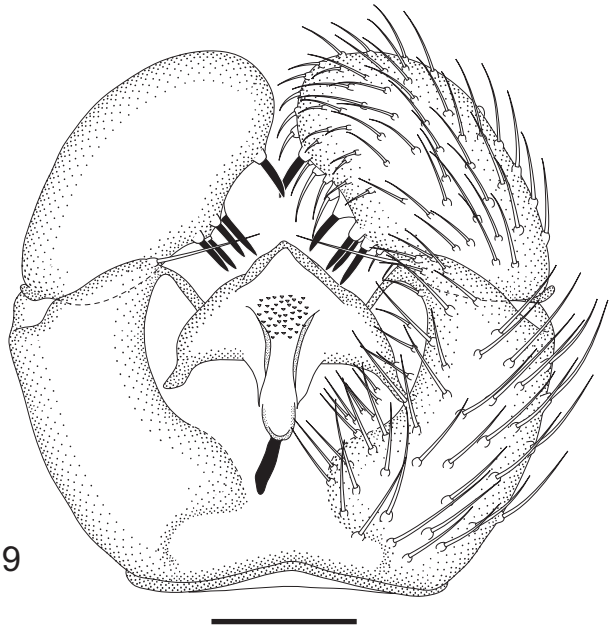

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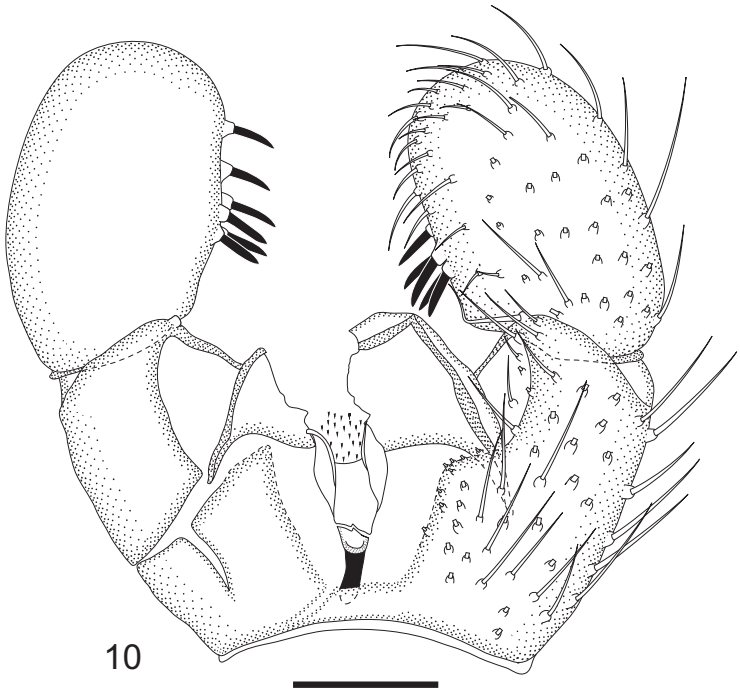

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**FIGURES 8–10**. *Trichosia lengersdorfi* sp. n. and *Trichosia edwardsi* (Lengersdorf, 1930). **8**. *Trichosia lengersdorfi* 4th flagellomere. **9**. *Trichosia lengersdorfi* hypopygium. **10**. *Trichosia edwardsi* (lectotype) hypopygium. Scale bars 0.1 mm.

Hypopygium (Figure 9) same colour as abdomen. Inner membrane of hypopygium densely setose; base of gonocoxites with strong setae; gonocoxites length/width = 0.60–0.75, broadly separated; inner margin of gonocoxites normally U-shaped; elongated setae on gonocoxites absent. Gonostylus elongate, length/width = 1.7–2.0; inner margin straight, or concave; apex evenly rounded. Apical tooth absent. Awl-like setae absent. Subapical megasetae present; number of megasetae 5–6; megasetae thick and straight; separated; apical 1; basal 4–5; position of basalmost megaseta 45–65 % from top. Whiplash-hair absent. Tegmen length/width = 0.50–0.66; triangular; normal; ventral process absent. Length of ejaculatory apodeme/hypopygium = 12–20 %; aeadeagal apical structure present. Field with aedeagal teeth present. *Measurements*. Body size = 3.5–4.8 mm. Hind tibia = 2.1–2.5 mm. Wing length = 4.0–5.0 mm.

**Female**: Legs, particularly the coxae, darker than in the male. Antennae slightly shorter. Abdomen telescope-like elongate as typical for *Trichosia* s. str. Other characters same as for the male.

**Etymology**: The species is dedicated to the eminent German specialist of Sciaridae, Franz Lengersdorf, Bonn (1880–1965), contemporary and friend of F.W. Edwards (1888–1940).

**Distribution and ecology**: *Trichosia lengersdorfi* is currently represented on BOLD by 41 specimens of the BIN ACD8591 from Sweden, Germany, Luxembourg and Norway. Our material extends that range to Denmark and Switzerland. The single specimen from China, however, indicates a distribution throughout the whole Palearctic Region. *Trichosia lengersdorfi* is a locally very common species, which is mostly collected in deciduous forests, and the larvae probably live on dead wood.

**Remarks**: The new species is intermediate between *Trichosia caudata* and *Trichosia edwardsi*, and the unexpected multitude of more or less continuous forms discovered by barcoding (many more of them probably representing separate species), was certainly the reason, why the whole complex was treated as one single species by Menzel & Mohrig (1997). *Trichosia lengersdorfi* and *Tr. caudata* share yellow-coloured legs and long-oval shaped gonostyli. However, *Tr. caudata* is larger, has still brighter legs, longer antennae and macrotrichia on the wing tips. Occasionally some, but fewer, such macrotrichia are present in *Tr. lengersdorfi* as well. The spines on the gonostyli of *Tr. caudata* are thinner and are directed more obliquely basad than in *Tr. lengersdorfi*. On the other hand, *Tr. lengersdorfi* is larger than *Tr. edwardsi,* has brighter legs, longer antennae (Figures 6 & 7), and more elongate gonostyli, with mostly finer spines (Figures 9 & 10). The same is true for most of the other unnamed species in that complex (*Tr. edwardsi* s. l.).

## Discussion

The frequency of cryptic species is taxon-dependent. For beetles, Hendrich *et al.* (2015) list only nine out of more than 3.500 species with barcoding gaps of more than 5 %. On the other hand, for Lumbricidae it is not unusual, that among a single morphological species there may be different clusters with more than 10 % barcoding gaps (see e.g. Shekhovtsov *et al.* 2013). It seems obvious, that cryptic diversity in earthworms is favoured by low mobility and by the lack of a structured morphology. The latter is also true for many microscopic Diptera, in particular for Sciaridae. So it is in fact not surprising, that the observed cryptic diversity in Sciaridae is higher than the average for Diptera, as already the 'normal' species distinction is often challenging. In all the cryptic species complexes, which we have studied to date, morphological differences could be detected when genetic distances were larger than 4 %. Therefore, we are optimistic, that DNA barcoding will continue to be the most important tool for the distinction of cryptic species. Barcoding is not an end in itself, but essential for identification of the true biological units. Even if no morphological distinction was possible at all, it would probably not be justified to blame the problem on DNA sequencing as a method and to doubt its usefulness, as proposed by Jaschhof (2015) for Cecidomyiidae. We

have shown for *Cratyna uliginosa* and *Cr. uliginosoides* different distribution patterns and habitat preferences. Possibly also differences in phenology may help to confirm the existence of cryptic species. There is no such rule, that species *need* to differ morphologically, but, fortunately, they mostly do. Females are in many groups, like Sciaridae, at present mostly impossible to identify. Here again, barcoding opens possibilities, not only to unambiguously assign them to species, but also gives clues to where to subsequently look for morphological differences.

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