European Journal of Taxonomy 997: 1–27
https://doi.org/10.5852/ejt.2025.997.2917
ISSN 2118-9773
www.europeanjournaloftaxonomy.eu
2025 · Bot S. *et al.*

Research article

urn:lsid:zoobank.org:pub:BC28A307-3341-4A33-95D9-112B459850CA

Revision of the European species of the subgenus *Neocheilosia* Barkalov (Diptera, Syrphidae: *Cheilosia*)

Sander BOT [1,*], Gunilla STÅHLS [2], Rune BYGEBJERG [3], Dieter DOCZKAL [4] & Ante VUJIĆ [5]

[1]Gasterenseweg 1, NL-9467TA Anloo, the Netherlands.
[2]Zoology Unit, Finnish Museum of Natural History Luomus, PO Box 17, 00014 University of Helsinki, Finland.
[3]Biological Museum (Entomology), Ecology Building, Sölvegatan 37, SE-223 62 Lund, Sweden.
[4]Klingelackerweg 10, 76571 Gaggenau, Germany.
[5]University of Novi Sad, Faculty of Sciences, Department of Biology and Ecology, Trg Dositeja Obradovića 2, 21000 Novi Sad, Serbia.

[*]Corresponding author: botsander@gmail.com
[2]Email: gunilla.stahls@helsinki.fi
[3]Email: rune.bygebjerg@biol.lu.se
[4]Email: doczkal@snsb.de
[5]Email: ante.vujic@dbe.uns.ac.rs

[1]urn:lsid:zoobank.org:author:E40B61D9-87D8-43F9-AE84-078F10973F97
[2]urn:lsid:zoobank.org:author:BE5759AC-A96C-47E9-88D0-F75176EFDA18
[3]urn:lsid:zoobank.org:author:13510A42-3DA7-44E5-9E32-E297A7A08614
[4]urn:lsid:zoobank.org:author:79800F7A-AA21-4948-AD64-619BD5FCBB98
[5]urn:lsid:zoobank.org:author:A20D5863-CF18-4BF7-BB68-0DA75D34B7A8

Abstract. The European species of the *Cheilosia* subgen. *Neocheilosia* Barkalov, 1983 (Diptera, Syrphidae) are revised. The identities of *Cheilosia morio* (Zetterstedt, 1838) and of its synonyms are reviewed, and *C. scanica* Ringdahl, 1937 is established as a junior synonym of *C. morio*. *Cheilosia luteicornis* (Zetterstedt, 1838) is re-installed as the name for *C. morio* of authors pro parte, not Zetterstedt. *Cheilosia morio* and *C. luteicornis* are redescribed, and lectotypes are designated for *Eristalis lineata* Wahlberg, 1843 and for *E. luteicornis* Zetterstedt, 1838 in order to ensure the consistent future interpretation of the names. The hitherto unknown male of *Cheilosia barovskii* Stackelberg, 1930 is described, and the female of *C. barovskii* is redescribed. We also provide updated distributional records and an identification key. Finally, we present a Neighbor-Joining tree for mtDNA COI barcodes of four species of the subgen. *Neocheilosia*.

Keywords. *Cheilosia*, COI barcodes, new synonyms, revision, species key.

Bot S., Ståhls G., Bygebjerg R., Doczkal D. & Vujić A. 2025. Revision of the European species of the subgenus *Neocheilosia* Barkalov (Diptera, Syrphidae: *Cheilosia*). *European Journal of Taxonomy* 997: 1–27. https://doi.org/10.5852/ejt.2025.997.2917

Introduction

Within Diptera Linnaeus, 1758, the hoverflies (Syrphidae) are a species rich family with over 6000 described species (Evenhuis & Pape 2023). One of the largest genera of hoverflies is *Cheilosia* Meigen, 1822 (Eristalinae: Rhingiini) with about 453 described species (Vujić *et al.* 2018; S. Bot unpubl. data). The genus *Cheilosia* is classified into thirteen subgenera (Barkalov 1983, 2002), one of which is *Neocheilosia* Barkalov, 1983. In the Palaearctic region the subgenus *Neocheilosia* has a broad distribution and includes eight described species (Table 1). Barkalov (1983) established the following combination of diagnostic characters for the males of *Neocheilosia*: eye haired, antennal pits separated, face and frons usually broad, apical sclerite of aedeagus [distiphallus] lacking process anteriorly and with very big process posteriorly. The identification key in Barkalov (2002) used as a diagnostic character a bare or almost bare arista and the provided drawing of a male head in lateral view shows a bare face (the diagnosis mentions facial hairs only near the posterior part of the eye margin). In fact, in Barkalov (2002) all images illustrating the subgenera are of the male sex only, and female characters are not mentioned in the diagnoses.

In Europe the species of *Neocheilosia* are mainly recorded as adults in early spring, April and/or May, and are often found feeding on flowering male catkins of willows (*Salix* spp.) in forests or at forest margins (e.g., Bartsch *et al.* 2009; Speight 2020; Bot & Van de Meutter 2023). Larval biology for most species of *Neocheilosia* is unknown, but for some species the larva is described as being saproxylic: they live in sap runs of conifers and deciduous trees (Burke 1905; Hellrigl 1992; Bartsch *et al.* 2009; Krivosheina 2019) presumably feeding on the microbiota in the sap. This is rare within the genus *Cheilosia* where larvae of most species are phytophagous in herbaceous plants (Rotheray 1993).

Two species of the subgenus *Neocheilosia* have for a long time been listed for European countries, namely *Cheilosia morio* (Zetterstedt, 1838) and *C. scanica* Ringdahl, 1937 (e.g., Stackelberg 1970; van der Goot 1981; Violovitsh 1983). Since the late 1980s, it has been noticed that the name *Cheilosia morio* was in fact used for two closely similar species. The two species in question were described by Zetterstedt (1838: 612); a single male was named *Eristalis morio* and an unspecified number of females from three different localities in northern Sweden were described as *Eristalis luteicornis* Zetterstedt, 1838. Subsequently, Zetterstedt (1849: 3171) placed *C. luteicornis* as the female sex of his *C. morio*. This synonymization has resulted in a considerable confusion of the identity and nomenclature of the included species. The use of the name *Cheilosia scanica* has also added to the taxonomic confusion, as *C. scanica* has been applied to specimens with a bare face (e.g., van der Goot 1981) or a hairy face (e.g., Heimburg *et al.* 2022). A study by Nilsson *et al.* (2012) listed specimens of *Cheilosia luteicornis* and *C. morio* from an inventory of hoverflies in southern Sweden. The type materials of *Eristalis luteicornis* Zetterstedt, 1838 and *E. morio* Zetterstedt, 1838 had been studied, and the identity of the specimens listed for each taxon was by morphological study in agreement with the Zetterstedt types, respectively. However, the study did not provide any morphological information on the taxa.

The species *Cheilosia barovskii* Stackelberg, 1930 was described from the female sex only, and the type locality is situated in the European part of Russia (Gatchina, Leningrad Oblast). *Cheilosia barovskii* remained a poorly known species, no records were published outside of Russia after its original description in 1930, and only Stackelberg (1958) mentions a single additional female from the European part of Russia. This resulted in the species being assigned as a doubtful European *Cheilosia* taxon by Claußen & Speight (2007). Barkalov (2002) in his review of the known subgenera of genus *Cheilosia* noted *Cheilosia barovskii*, and listed it in the nominal subgenus (albeit with a question mark), as did Barkalov & Mutin (2018). However, the species was listed for the Finnish fauna by Haarto & Kerppola (2014). The listing was based on five previously overlooked females collected already in 1937, and a recent finding of one female specimen in 2013 from Sipoo (Uusimaa, Southern Finland) which was used to obtain the mtDNA COI barcode sequence. In their review of the *Cheilosia* of Nepal, Barkalov &

Table 1. The species of the subgenus *Neocheilosia* Barkalov, 1983 and their occurrence in Asia and Europe.

	Distribution	
Species	**Asia**	**Europe**
C. barovskii Stackelberg, 1930	x	x
C. convexifrons Stackelberg, 1963	x	
C. hebeiensis Huo *et al.*, 2021	x	
C. komabaensis Shiraki, 1968	x	
C. luteicornis (Zetterstedt, 1838)		x
C. morio (Zetterstedt, 1838)	x	x
C. pseudomorio Barkalov & Cheng, 2004	x	
C. shiranesana Barkalov & Ichige, 2016	x	

Ståhls (2022: supp. files 1–2) provided a Neighbor-Joining (NJ) distance tree based on COI barcode sequences and included (multiple) representatives of all Palaearctic subgenera of *Cheilosia*, and also included barcodes of the two European *Neocheilosia* taxa and of the female of *C. barovskii*. Their NJ tree consistently resolved the barcode sequence of *C. barovskii* in the same cluster with the barcodes of the two European species of *Neocheilosia* (there called *C. morio* and *C.* aff. *morio*). The four species of *Neocheilosia* occurring in Asia, *Cheilosia convexifrons* Stackelberg, 1963, *C. komabaensis* Shiraki, 1968, *C. morio* and *C. mutini* Barkalov, 1984, were reviewed by Barkalov & Ichige (2016). In their study they described as new to science the species *Cheilosia* (*Neocheilosia*) *shiranesana* and synonymized *C.* (*N.*) *mutini* under *C.* (*N.*) *convexifrons*. Later, two additional species of *Neocheilosia* from Asia, *Cheilosia pseudomorio* Barkalov & Cheng, 2004 and *C. hebeiensis* Huo *et al.*, 2021 were described from China. Thus, the present number of Asian species of *Neocheilosia* is six. The actual number of species in Asia of the subgenus *Neocheilosia*, however, will probably be greater, since we are aware of several undescribed species from the Eastern Palaearctic. Additionally, several species of *Cheilosia* described from the Nearctic region which are presently being classified as belonging to the nominal subgenus *Cheilosia*, are, based on their diagnostic characteristics, actually members of *Neocheilosia* (pers. obs.).

Thus, due to the circumstances described above, the aim of the present study is to 1) clarify the taxonomy and revise the nomenclature, 2) to provide (re)descriptions of the valid species and 3) to present a comprehensive genetic tree based on mtDNA COI barcode sequences for four species of *Neocheilosia* (the three European and one Asian species including both sexes as available).

Material and methods

The following acronyms are used to indicate entomological collections:

CNC = Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada
FSUNS = Entomological collection of University of Novi Sad, Serbia
JKA = Private collection of Jere Kahanpää, Helsinki, Finland
JSB = Private collection of Jeroen van Steenis, Baarn, the Netherlands
MZH = Finnish Museum of Natural History Luomus, Helsinki, Finland
MZLU = Biological Museum, Entomology, Lund University, Lund, Sweden
NRM = Naturhistoriska Riksmuseet, Stockholm, Sweden

SBA = Private collection of Sander Bot, Anloo, the Netherlands
TJA = Private collection of Tapani Järveläinen, Hämeenlinna, Finland
ZIN = Zoological Institute of the Russian Academy of Sciences, St Petersburg, Russia
ZFMK = Museum Koenig Bonn, Leibniz-Institut zur Analyse des Biodiversitätswandels, Bonn, Germany

Dry pinned specimens originating from the above listed collections were studied. Additionally, the specimens used for molecular work and listed in Table 2 were also morphologically studied. Photographs of specimens were taken with a Canon EOS 6D camera body and a Mejiro Genossen FL0530 4.0/110 Float Lens (habitus photos) or Leitz-Wetzlar Photar 1:2/25 macro lens (remaining photos). Before stacking in Helicon Focus ver. 7.7.5 (Kharkiv, Ukraine), exposure and sharpening of the photos was adjusted in Adobe Lightroom Classic ver. 10.4. The body length is measured as the distance between the facial tubercle and the apex of the abdomen. The morphological terminology widely follows Cumming & Wood (2017).

DNA barcoding

Laboratory procedures

DNA was extracted from one leg using the Phire™ Tissue Direct PCR master Mix #F-170S kit (Thermo Scientific Baltics UAB, Vilnius, Lithuania) following the Dilution & Storage protocol provided by the manufacturer. The Phire™ Tissue Direct PCR master Mix is designed to perform PCR directly from tissue samples with no prior DNA purification. The sample was placed in an Eppendorf tube in 40 µl of Dilution Buffer, and 0.8 µl of DNA Release Additive was added. The tube was briefly vortexed and centrifuged and then 1) incubated at room temperature for about 20 min, 2) placed in +56° C for 10 min and 3) placed in a pre-heated block at 98° C for 2 minutes, and finally centrifuged at 11 000 rpm for 1 min. One µl of supernatant was used in a 25 µl PCR reaction using the PCR Master Mix solution provided with the kit. The mtDNA COI barcode was PCR amplified using universal primers LCO1490 and HCO2198 (Folmer *et al.* 1994). Amplified PCR products were visualized by electrophoresing on 1.5% agarose gels, and treated with Exo-SapIT (USB Affymetrix, Ohio, USA) prior to sequencing. The PCR primers were used for sequencing, which was outsourced to the Sequencing Service Laboratory of the Institute for Molecular Medicine Finland (www.fimm.fi). The sequences were edited for base-calling errors and assembled using Sequencher™ (ver. 5.0) (Gene Codes Corporation, Ann Arbor, MI, USA), and obtained barcode sequences were submitted to GenBank. GenBank accession codes and other data for specimens used for molecular work are listed in Table 2.

COI barcode data and identification

The newly obtained COI barcodes were added to a COI barcode data matrix including four public nucleotide sequences of the *Neocheilosia* spp. mined from the BOLD database (Ratnasingham *et al.* 2024). The Neighbor-Joining (NJ) method (Saitou & Nei, 1987) under the Kimura 2-parameter substitution model (Kimura 1980) and the software MEGA11 (Tamura *et al.* 2021) was used to cluster the sequences based on similarity from a distance matrix and for calculating branch support using non-parametric bootstrap (1000 replications). All positions with less than 95% site coverage were eliminated, i.e., fewer than 5% alignment gaps, missing data, and ambiguous bases were allowed at any position (partial deletion option). The DNA barcode of *Rhingia laevigata* Loew, 1858 (GenBank accession number MH521936) was constrained as the root of the NJ tree to facilitate visualization. The NJ method employs an algorithm to group the included sequences based on similarity implementing the user defined evolutionary model. The NJ algorithm is not designed as a species delimitation tool; thus the bootstrap values cannot be interpreted as direct support for species hypotheses. An NJ tree clusters the included sequences based on similarity and is useful for linking and visualizing, e.g., conspecific male and female specimens, and for calculating evolutionary distances among the included taxa.

Table 2 (continued on next page). List of molecular specimens.

Lab code/sample code and repository	Taxon	Collecting locality	Sex	GenBank accession code/BOLD process ID
MZH_Y2340 MZH	*C.* (*Convocheila*) *arkita* Zimina, 1970	Tajikistan, Tavildarinskiy area, kishlak Dehi-Kolon, 38.65° N, 70.52° E, 1800–2000 m, 10 May 2016, A. Barkalov leg.	♀	GenBank OU773614
MZH_Y3075 MZH	*C.* (*Convocheila*) *hypena* Becker, 1894	France, Haute-Savoie, Passy, near Refuge d'Anterne, 46.0038° N, 6.7924° E, 1885 m, 20 Jun. 2023, G. Ståhls leg. http://id.luomus.fi/GJ.6312	♂	GenBank PV000884
MZH_Y2664 MZH	*C.* (*Montanocheila*) *alpina* (Zetterstedt, 1838)	Finland, Kilpisjärvi, Saana nature trail, 12 Jul. 2019, G. Ståhls leg. http://id.luomus.fi/GJ.6980	♂	GenBank OU452375
CNC	*C.* (*Neocheilosia*) *barovskii* Stackelberg, 1930	Russia, Amut lake, 50.811° N, 136.4° E, 2 Jun. 2013, J. Skevington leg. Identifier: Jeffrey H. Skevington (as *C. convexifrons*)	♂	BOLD process ID SYJU151-14. Accessed 17 Jan. 2025 via boldsystems.org
MZH_Y1887 in TJA	*C.* (*Neocheilosia*) *barovskii* Stackelberg, 1930	Finland, U: Sipoo, Hindsby, 20 May 2013, T. Järveläinen leg.	♀	GenBank LN846974
MZH_Y1550 MZH	*C.* (*Neocheilosia*) *luteicornis* (Zetterstedt, 1838)	Sweden, Småland, Stenbrohult, Djäknabygd, 29 Apr. 2010, S.G. Nilsson leg. http://id.luomus.fi/GJ.6754	♂	GenBank PQ356904
MZH_Y2762 MZH	*C.* (*Neocheilosia*) *luteicornis* (Zetterstedt, 1838)	Switzerland, Berner Oberland, Grindelwald, 46°39′02.39″ N, 8°03′01.68″ E, 24 May 2019, G. Ståhls leg. http://id.luomus.fi/GJ.6755	♀	GenBank PQ356902
CNC DIPTERA 101715	*C.* (*Neocheilosia*) *luteicornis* (Zetterstedt, 1838)	Germany, Baden-Württemberg, Schwarzwald, 22 May 1992, J.-H. Stuke leg. Identifier: Jens-Hermann Stuke	♀	BOLD process ID CNCDB322-11. Accessed 17 Jan. 2025 via boldsystems.org
CNC DIPTERA 101716	*C.* (*Neocheilosia*) *luteicornis* (Zetterstedt, 1838)	Germany, Baden-Württemberg, Schwarzwald, 15 May 1992, J.-H. Stuke leg. Identifier: Jens-Hermann Stuke	♀	BOLD process ID CNCDB323-11. Accessed 17 Jan. 2025 via boldsystems.org
CNC DIPTERA 101818	*C.* (*Neocheilosia*) *luteicornis* (Zetterstedt, 1838)	Germany, Niedersachsen, Lopautal, 12.4.1991, C. Kassebeer leg. Identifier: C. Kassebeer	♀	BOLD process ID CNCDB425-11. Accessed 17 Jan. 2025 via boldsystems.org
FSUNS LK293_G1292 FSUNS	*C.* (*Neocheilosia*) *luteicornis* (Zetterstedt, 1838)	Serbia, Kopaonik, 43.435° N, 21.0175° E, 1 May 2012, Vujić, Radenković and Likov leg. Identifier: Ante Vujić	♂	GenBank PQ356906
MZH_Y1549	*C.* (*Neocheilosia*) *morio* (Zetterstedt, 1838)	Sweden, Småland, Stenbrohult, Djäknabygd, 26 Apr. 2010, S.G. Nilsson leg. Identifier: Sven G. Nilsson http://id.luomus.fi/GJ.6753	♂	GenBank PQ356903

Table 2 (continued). List of molecular specimens.

Lab code/sample code and repository	Taxon	Collecting locality	Sex	GenBank accession code/BOLD process ID
MZH_Y2604	*C.* (*Neocheilosia*) *morio* (Zetterstedt, 1838)	Switzerland, Berner Oberland, Grindelwald, 46°39′02.39″ N, 8°03′01.68″ E, 24 May 2019, G. Ståhls leg. http://id.luomus.fi/GJ.6756	♂	GenBank PQ356905
MZH_HP.2217 AHa12-000916	*C.* (*Neocheilosia*) *morio* (Zetterstedt, 1838)	Finland, Ab: Laitila, Krouvinummi, 58.9971° N, 22.1167° E, 29 Apr. 2012, A. Haarto leg. Identifier: Antti Haarto	♂	GenBank MZ631257
MZH_Y2881 MZH	*C.* (*Neocheilosia*) *morio* (Zetterstedt, 1838)	Finland, Sibbo, Hindsby, 18 May 2022, T. Neuvonen leg. http://id.luomus.fi/GJ.6271	♂	GenBank PQ356900
MZH_Y2882 MZH	*C.* (*Neocheilosia*) *morio* (Zetterstedt, 1838)	Finland, Sibbo, Hindsby, 18 May 2022, T. Neuvonen leg. http://id.luomus.fi/GJ.6270	♀	GenBank PQ356901
KBE 2019028	*C.* (*Neocheilosia*) *morio* (Zetterstedt, 1838)	Norway, Vest-Agder, Vennesla, 11 May 2018, F. Strömmen leg.	No data	BOLD Seq. ID NLON169-19. Accessed 17 Jan. 2025 via boldsystems.org
MZH_Y3016 MZH	*C.* (*Neocheilosia*) *morio* (Zetterstedt, 1838)	Finland, Lovisa, near Vahterpää, 60.3687° N, 26.4644° E, 13 May 2024, G. Ståhls leg. http://id.luomus.fi/GJ.6757	♀	GenBank PQ356907
MZH_Y3017 MZH	*C.* (*Neocheilosia*) *morio* (Zetterstedt, 1838)	Finland, Lovisa, near Vahterpää, 60.3687° N, 26.4644° E, 13 May 2024, G. Ståhls leg. http://id.luomus.fi/GJ.6758	♀	GenBank PQ356908
MZH_Y2780 SBA	*C.* (*Neocheilosia*) *shiranesana* Barkalov & Ichige, 2016	Japan, Yamanashi, Chichibu-Tama-Kai NP, 35.822° N, 138.654° E, 1632 m, 3 Jun. 2016, S. Bot leg.	♀	GenBank PQ356898
MZH_Y2781 SBA	*C.* (*Neocheilosia*) *shiranesana* Barkalov & Ichige, 2016	Japan, Yamanashi, Chichibu-Tama-Kai NP, 35.822° N, 138.654° E, 1632 m, 3 Jun. 2016, S. Bot leg.	♀	GenBank PQ356899
MZH_Y1997 MZH	*Rhingia laevigata* Loew, 1858	Russia, Russian Far East, Sikhote-Alin reserve, 31 Aug. 2014, G. Ståhls leg.	♂	GenBank MH521936

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Diptera Linnaeus, 1758
Family Syrphidae Latreille, 1802
Subfamily Eristalinae Newman, 1834
Genus *Cheilosia* Meigen, 1822

Subgenus ***Neocheilosia*** Barkalov, 1983

Remark

Subgeneric characters given by Barkalov (1983) are marked by an circumflex accent (^).

Diagnosis

Eye pilose^; frons swollen [especially so in the ♂]^; antennal fossa separated by a median process of lunule^; face haired only near eye marginv or bare; face and frons exceptionally wide^ [in most of the species]; ♀ frons: inner margin of lateral channel strongly arched anteriorly; anterior portion of scutum often with a pair of submedian pruinose vittae [non-vittate in the ♀ of *C. barovskii*]; dorsal and ventral katepisternal hair patch at least posteriorly confluent or only narrowly separated on lower one third of sclerite; vein M1 meeting vein R4+5 at an acute angle; membrane of wing beyond the veins dm-cu and M1 narrow; sclerites of distiphallus without ventral projections^; dorsal lobe of gonostylus rudimentary or missing; right and left surstyli and gonostyli (slightly) asymmetrical.

Cheilosia barovskii Stackelberg, 1930
Figs 1, 5C, H

Chilosia barovskii Stackelberg, 1930: 223. Type locality: "Gouv. Petrograd, Nordwest-Russland, Gatschina" (holotype ♀, ZIN, not studied, collection currently not possible to visit).

Cheilosia barovskii – Haarto & Kerppola 2014: 240. — Barkalov & Ståhls 2022: 118.

Material examined

FINLAND • 1 ♀; biogeographical province of Southern Häme [Etelä Häme EH], Valkeakoski, Sääksmäki; 15 Jun. 1932; E. Kivirikko leg.; http://tun.fi/GAVK.2281; JKA • 1 ♀; Tavastia australis [Etelä Häme EH], Valkeakoski, Sääksmäki; 27 Jun. 1935; E. Kivirikko leg.; http://tun.fi/GAVK.2280; JKA • 1 ♀; Southern Häme [Etelä Häme EH], Valkeakoski, Sääksmäki; 30 May 1937; E. Kivirikko leg.; http://tun.fi/JX.925264; MZH • 1 ♀*; Uusimaa, Sipoo; 20 May 2013; T. Järveläinen leg.; TJA.

RUSSIA • 1 ♀; Leningradskii oblast, Luschkij raion, Tolmatshevo; 18 May 1936; [?Stackelberg]; ZISP • 1 ♂*; Khabarovskij krai, Lake Amut; 50.81059° N, 136.40042° E; 735 m a.s.l.; 11 Jun. 2013; J.H. Skevington leg.; CNC Diptera 229791.

The specimens used for molecular analysis are indicated with an * (see Table 2).

Description

Male

Although only the female of *C. barovskii* has been described, the molecular evidence presented here links the described female sex with a male specimen, thus confirming its identity, allowing us to here

provide the description of the male sex of *C. barovskii*, based on a single specimen collected in the Russian Far East.

Length. Body 7 mm; wing 6.5 mm.

Head. Eye brownish pilose, hairs on dorsal part of eye about as long as half width of 3rd antennal segment. Anterior eye angle ca 90°. Frons slightly swollen, with a shallow median furrow, shiny on anterior one-third, pruinose on posterior two thirds, with long, erect black hairs. Ocellar triangle about equilateral, long black pilose. Gena wide, viewed obliquely from below about as wide or slightly wider than oral cavity. Face not wide, ratio of width of face at level of facial tubercle to maximum width of head = 0.44 : 1; face shiny, very faintly pruinose, with a broad fascia of dense pruinosity just below base of antennae. Sides of face bare, without hairs. Parafacia narrow, at level of facial tubercle about one third as wide as 3rd antennal segment, fully developed only lateral facial tubercle, above level of facial tubercle compressed toward eye margin by a bulge, with black hairs, hairs in upper part slightly longer than in lower part. Lunule dark-brown to black. Antenna with scape, pedicel and 3rd antennal segment black to dark brown, 3rd antennal segment about as long as wide. Arista black, with very short hairs.

Thorax. Scutum centrally faintly pruinose, anterior half with a pair of grey pruinose vittae, best visible if viewed from behind, laterally almost shiny; scutal hairs long black, erect, of about even length; hairs on scutellum similar to those on scutum, with marginal setae. Sub-scutellar fringe black and long. Pleurae long black pilose on posterior anepisternum, anepimeron and on katepisternum, dorsal and ventral katepisternal hair patches confluent.

Wing. Membrane entirely microtrichose, hyaline; veins in basal half bright yellow, in apical half dark, basal half of RS without long dark setulae; M1 meeting R4+5 at an acute angle; calypter whitish to yellowish, with orange or brownish rim, marginal fringe on dorsal lobe partly with brown setulate. Haltere with brownish stem and yellow capitulum.

Legs. Legs black, brownish-grey pruinose, but basal 1/4 of protibia, 1/7 of mesotibia, 1/10 of metatibia and extreme apices of femora usually reddish-yellow; hairs on femora nearly all black, but with a set of yellow hairs posteriorly on metafemur; ventral surface of metafemur with black setulate on basal 2/3, apical 1/3 with a set of antero-ventral black hairs. Tibiae mixed black and yellow pilose. Tarsi short black pilose or mixed black and reddish-brown pilose dorsally, ventral surface of pro- and metatarsi usually reddish-brown pilose, or intermixed with black hairs. Tarsi of mesoleg ventrally with black setulae.

Abdomen. Tergites medially brownish pruinose (best seen if viewed obliquely from front), shiny on sides of tergites 2–4; tergites 1–3 with long mixed black and yellow hairs on disc, sides of tergite 1 and anterolateral corners of tergite 2 with long yellow hairs, remainder of lateral margin of tergite 2 and entire margin of tergite 3 with black hairs, tergite 4 with black hairs. Sternites faintly greyish-brown pruinose; sternite 1 yellow pilose; base and sides of sternite 2 with long mixed black and yellow hairs, sides of sternites 3–4 long black pilose, hairs on the median parts of sternites 2–4 black and appressed.

Genitalia. Right and left surstyli and gonostyli slightly asymmetrical; ventral margin of surstylus with a shallow basal convexity; hypandrium in lateral view about 1.2 times as long as wide; sclerite of distiphallus broadly fused dorsally, with long dorsal lobes.

Female

Length. Body 6–7 mm; wing 5.4–6.2 mm.

The ♀ differs from the ♂ in the following characters: integument more shiny; pilosity much shorter.

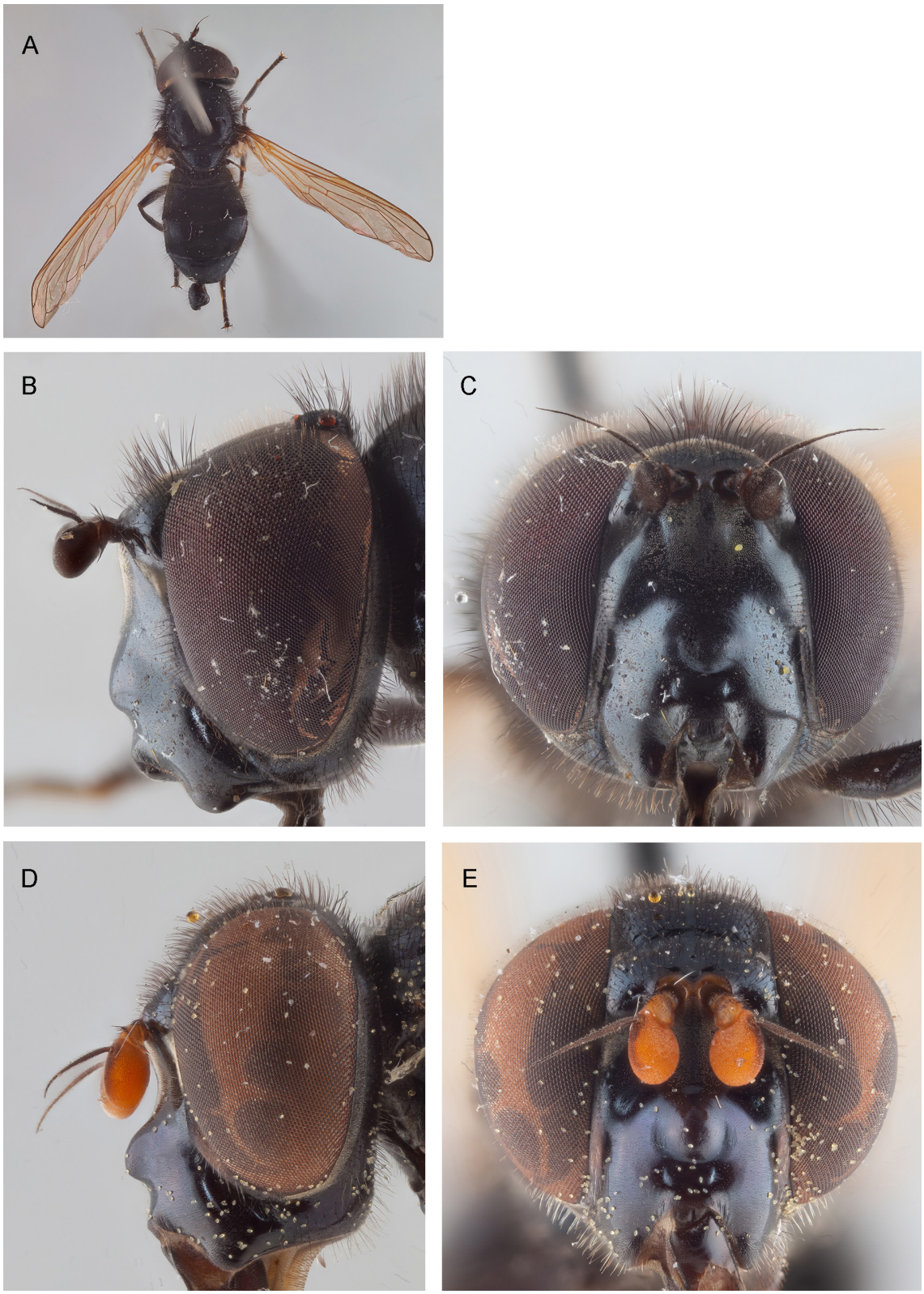

Fig. 1. *Cheilosia barovskii* Stackelberg, 1930. **A–C**. ♂ (CNC Diptera 229791); collected in Russia. **D–E**. ♀ (http://tun.fi/JX.925264; THA); collected in Finland. **A**. Habitus dorsal view; body length 7 mm. **B**. Head lateral view; head height 2.3 mm. **C**. Head anterior view; head height 2.3 mm. **D**. Head lateral view; head height 2.2 mm. **E**. Head anterior view; head height 2.2 mm. Not to scale.

Head. Eye hairs short, about ¼ or less of width of postpedicel. Frons not wide, at level of lunule about 0.3 times as wide as maximum width of head, with a shallow transverse sulcus at level of about lower 1/3 of frons; lateral channels narrow, widening from inner dorsal corner of eye towards transverse sulcus, enclosing a small semicircular area of dense grey pruinosity at about median 1/3 of frons, remainder of frons shiny; hairs on frons erect, as long as one third width of postpedicel, black. Occiput dorsally much wider than in male, grey pruinose, with short black hairs. Gena long yellow pilose. Face bare, at level of facial tubercle about 0.3 times as wide as maximum width of head, shiny; parafacia orange on dorsal half, at level of tentorial groove about half as wide as diameter of protibia, pale pruinose and with short yellow hairs. Lunule orange. Scape, pedicel and 3rd antennal segment bright orange, 3rd antennal segment larger than in male.

Thorax. Scutum and scutellum shiny, pale pruinose sub-median vittae anterior on scutum reduced to spots; scutum with semi-erect short black hairs. Pleurae faintly grey pruinose, hairs yellow and black, shorter and less dense than in male. Calypter whitish, with orange rim and yellow fringe. Haltere with brownish or yellowish stem and yellow knob.

Legs. Legs black, but basal 1/4 of protibia, 1/3 of mesotibia and basal 1/10 of metatibia, and often extreme apices of tibiae and femora reddish-yellow; femora with both black and yellow hairs; ventral surface of metafemur basally without black setulae; tibial hairs and tarsi as in male.

Abdomen. Tergites with less dense pruinosity compared to male, mainly with black hairs, except on tergite 1 and in anterolateral corners of tergite 2 with yellow hairs. Sternites lightly pruinose, short black and yellow pilose; hairs erect on sternites 1–2 and on anterior corners of sternite 3, remaining hairs more or less appressed.

Distribution

Finland, Russia.

Differential diagnosis

Similar in appearance to extralimital *Cheilosia komabaensis*, see Barkalov & Ichige (2016) for a differential diagnosis with that species. Similar in appearance to *Cheilosia luteicornis* and *C. morio* but differs as follows: body length shorter. Face narrower. Basal half of wing with yellow veins. Legs with less extensive yellowish parts. ♂: anterior eye angle smaller. Anterior part of frons shiny. Haltere knob yellow. Lateral margin of tergite 1 and anterolateral corner of tergite 2 with yellow hairs. Surstylus basally narrower than in *C. morio*, and shorter than in *C. luteicornis*. ♀: scape and pedicel orange. Postocular orbit dorsally with black hairs. Scutum with semi-erect black hairs. Tergites 3–4 with black hairs. Moreover, both sexes differ from *C. morio* by having sides of face not haired and from *C. luteicornis* by having parafacia above posterior tentorial pit strongly compressed.

Cheilosia luteicornis (Zetterstedt, 1838) stat. nov.
Figs 2, 5A, D, F

Eristalis luteicornis Zetterstedt, 1838: 612. Type localities: "Juckasjarvi; Pello, Lapponiae Tornensis; Lycksele Lapponiae Umensis" [Juckasjärvi and Lycksele in Swedish Lapland, and Pello in Finnish Lapland] (lectotype, selected by Claußen, **designated here**, ♀, MZLU).

Eristalis lineata Wahlberg in Zetterstedt, 1843. Type locality: "ad Holmiam" [surroundings of Stockholm, Sweden] (lectotype, ♂, NRM, examined by Claußen). **Syn. nov.**

Cheilosia morio – Schiner 1862: 283. — Becker 1894: 448. — Hellén 1912: 157. — Sack 1930: 39; 1932: 88. — Séguy 1961: 43. — Bańkowska 1963: 125. — Stackelberg 1970. — van der Goot 1981: 168. — Violovitsh 1983: 85. — Mutin & Barkalov 1999: 436 (in part). — van Veen 2004: 65–66,

fig. 174 (in part). — Mazánek 2006: 83. — Haarto & Kerppola 2007: 254 (in part). — Barkalov & Ichige 2016: 571–580. — Bot & Van de Meutter 2019: 58, 233. — Heimburg *et al.* 2022: 169.
Cheilosia "*morio* A" – Bartsch *et al.* 2009: 57, 106. — van Steenis 2011: 188.
Cheilosia luteicornis – Nilsson *et al.* 2012: 148. — Bot & Van de Meutter 2023: 50, 227.

Material examined

FINLAND – **Åland** • 1 ♀; Åland, Lemland, Flaka; 60.006127° N, 20.138916° E; 20 May 2012; Raekunnas leg.; http://id.luomus.fi/HT.3488; MZH. – **Pohjois-Pohjanmaa** • 1 ♀; Rovaniemi; 66.27° N, 25.11° E; 19 June 1951; Stenberg leg.; http://id.luomus.fi/GV.93913; MZH. – **South Hame** • 1 ♀; Hattula; 61.03° N, 24.27° E; 1906; Wegelius leg.; http://id.luomus.fi/GV.93924; MZH 1 ♀; Forssa; 60.85° N, 23.62° E; 12 May 1962; Nylund leg.; http://id.luomus.fi/GV.93910; MZH • 1 ♀; Forssa; 60.85° N, 23.62° E; 14 May 1964; Käpylä leg. ; http://id.luomus.fi/GV.93920; MZH • 1 ♂; Somero; 60.63° N, 23.46° E; 21 May 1964; Maaniitty leg.; http://id.luomus.fi/GV.93916; MZH. – **South Karelia** • 1 ♂; Kotka, Mussalo; 60.455875° N, 26.906058° E; 17 May 1918; Ulvinen leg.; http://id.luomus.fi/GV.23565; MZH • 1 ♂; Hamina; 60.67577° N, 27.079224° E; 10 May 1964; Tiensuu leg.; http://id.luomus.fi/GV.93911; MZH • 1 ♀; same data as for preceding; http://id.luomus.fi/GV.93921. – **Uusimaa** • 2 ♀♀; Loviisa; 60.44° N, 26.03° E; Nordström leg.; http://id.luomus.fi/GV.93922, http://id.luomus.fi/GV.93915; MZH • 1 ♀; Helsinki; 60.191° N, 24.875° E; Johansson leg.; http://id.luomus.fi/GV.93912; MZH • 1 ♀; Helsinki; 60.19° N, 25.02° E; Tuomikoski leg.; http://id.luomus.fi/GV.93927; MZH • 1 ♂; Helsinki; 60.19° N, 25.02° E; Tiensuu leg.; http://id.luomus.fi/GV.93909; MZH • 1 ♀; Vantaa; 60.27° N, 24.96° E; 1 Apr.–31 May 1906; Frey leg.; http://id.luomus.fi/GV.93907; MZH • 1 ♂; Espoo, Bodom träsk; 60.256° N, 24.665° E; 16 May 1932; Frey leg.; http://id.luomus.fi/GV.93923; MZH • 1 ♀; Helsinki, Munksnäs; 60.198° N, 24.874° E; 6 May 1937; Hellén leg.; http://id.luomus.fi/GV.93917; MZH • 1 ♀; Helsinki; 60.191° N, 24.875° E; 25 May 1942; Frey leg.; http://id.luomus.fi/GV.93926; MZH • 2 ♀♀; Loviisa, Vahterpää; 60.369558° N, 26.462275° E; 10 May 1975; Albrecht leg.; http://id.luomus.fi/GV.23567, http://id.luomus.fi/GV.23566; MZH • 1 ♀; Loviisa, Vahterpää; 60.369327° N, 26.407907° E; 4 May 1975; Albrecht leg.; http://id.luomus.fi/GV.23568; MZH. – **Varsinais-Suomi** • 1 ♀; Varsinais-Suomi, Eriksberg; 60.374° N, 23.296° E; von Bonsdorff leg.; http://id.luomus.fi/GV.93914; MZH • 1 ♀; Lohja; 60.26° N, 24.01° E; 6 May 1918; Lindberg leg.; http://id.luomus.fi/GV.93918; MZH • 1 ♀; Salo; 60.189835° N, 22.876551° E; 17 May 1944; Hellman leg.; http://id.luomus.fi/GV.21350; MZH.

GERMANY – **Baden-Württemberg** • 1 ♀; Baden-Württemberg, Schwarzwald, Rinken; 15 May 1992; Stuke leg.; CNC Diptera 101716 • 1 ♀; Baden-Württemberg, Schwarzwald, SE of Todtnauer Hütte; 15 May 1992; Stuke leg.; CNC Diptera 101715. – **Lower Saxony** • 1 ♀; Lopautal; 12 Apr. 1991; Kassebeer leg.; CNC Diptera 101818.

NETHERLANDS – **Drenthe** • 1 ♂, 1 ♀; Drouwenerveld; 52.957° N, 6.766° E; 21 Apr. 2016; Bot leg.; SBA • 1 ♂, 2 ♀♀; Drouwenerveld; 52.957° N, 6.765° E; 6 Apr. 2019; Bot leg.; SBA • 1 ♀; Drouwenerveld; 52.957° N, 6.765° E; 17 Apr. 2019; Bot leg.; SBA • 1 ♂; Drouwenerveld; 52.957° N, 6.763° E; 5 Apr. 2020; Bot leg.; SBA • 1 ♂; Drouwenerveld; 52.952° N, 6.770° E; 23 Mar. 2022; Bot leg.; SBA.

The molecular specimens are listed in Table 2.

Description

Male

Length. Body 9.1–12.0 mm, wing 8.1–9.1 mm.

Head. Eye with brownish hairs. Anterior eye angle ca 110°–120°. Frons swollen, with a shallow median furrow, greyish-brown pruinose, with long, erect black hairs. Ocellar triangle about equilateral, with long black hairs. Gena wide, viewed obliquely from below about as wide or slightly wider than oral cavity. Face wide, ratio of width of face at level of facial tubercle to maximum width of head = 0.53–

0.58 : 1; face faintly pruinose, with a broad fascia of dense pruinosity just below base of antennae. Sides of face not haired. Parafacia at level of facial tubercle about half as wide as 3rd antennal segment, with short black hairs. Facial surface at sides just above posterior tentorial pits weakly convex. Lunule dark-brown to black. Antenna with scape and pedicel usually black, 3rd antennal segment usually reddish, but partly to entirely brownish to black in some specimens. Arista usually black, practically bare.

Thorax. Scutum faintly pruinose, anterior half with a pair of pale pruinose vittae, best visible if viewed from behind; in well preserved specimens two less distinct lateral vittae are perceptible; scutal hairs long black, erect, of about even length; hairs of scutellum similar to those of scutum, scutellum without distinct marginal setae, but occasionally with some marginal hairs slightly stronger than on disc. Subscutellar fringe black and long. Pleurae with long black hairs on posterior anepisternum, anepimeron and on katepisternum, dorsal and ventral katepisternal hair patches confluent.

Wing. Membrane entirely microtrichose, more or less brownish tinged, especially so in anterior half; veins dark, basal half of RS usually without long dark setulae; calypter whitish to yellowish, with orange or brownish rim, marginal fringe on dorsal lobe partly with black setulae. Haltere with brownish stem and black knob.

Legs. Legs black, but basal 1/3 of pro- and metatibia, basal 2/5 of mesotibia and extreme apices of femora reddish-yellow, rarely also extreme apices of tibiae yellow; hairs of femora nearly all black, but with a set of yellow hairs posteriorly on metafemur; ventral surface of metafemur with black setulae on basal 2/3, apical 1/3 with a set of antero-ventral black hairs. Tibiae with anterior surface and basal part of ventral surface of protibia and ventral and posterior surface of metatibia with short reddish-yellow hairs, tibiae otherwise with mixed black and yellow hairs. Tarsi with short black hairs or mixed black and reddish-brown haired dorsally, ventral surface of pro- and metatarsi usually reddish-brown haired, or intermixed with black hairs. Tarsi of mesolegs ventrally with black setulae.

Abdomen. Tergites entirely brownish pruinose, densely on disc, less densely on sides of tergites 1–3 and on tergite 4 (best seen when viewed obliquely from front); tergites 1–3 long yellow pilose on disc, sides of tergites 1–3 and tergites 4 with long black hairs. Sternites faintly greyish-brown pruinose; sternite 1 predominantly yellow haired, often with some black hairs intermixed medially and along posterior margin; base of sternite 2 and sides of sternites 2–4 usually with long black hairs, hairs on median parts of sternites 2–4 more or less appressed, yellow and/or black to varying extents.

Genitalia. Right and left surstylus and gonostyli slightly asymmetrical; ventral margin of surstylus with a shallow basal convexity; hypandrium in lateral view about 1.4 times as long as wide; sclerite of distiphallus broadly fused dorsally, with long dorsal lobes.

Female

Length. Body 9.5–12.0 mm; wing 8.0–9.5 mm.

The ♀ differs from the ♂ in the following characters: hairs much shorter and predominantly pale yellowish-brown.

Head. Hairs of eyes short, about 1/4 or less width of postpedicel. Frons exceptionally wide, at level of lunule about 0.45 times as wide as maximum width of head, with a shallow transverse sulcus at level of about lower 1/3 of frons, and with a more or less faint median furrow between lunule and front ocellus; lateral channels narrow, widening from inner dorsal corner of eye towards transverse sulcus, enclosing a small semicircular area of dense grey pruinosity at about median 1/3 of frons; dorsal portion of frons, between lateral channels, transverse sulcus and ocellar triangle and a small area on each side of antennal base more or less shining, remaining parts of frons more or less pruinose; hairs of frons erect,

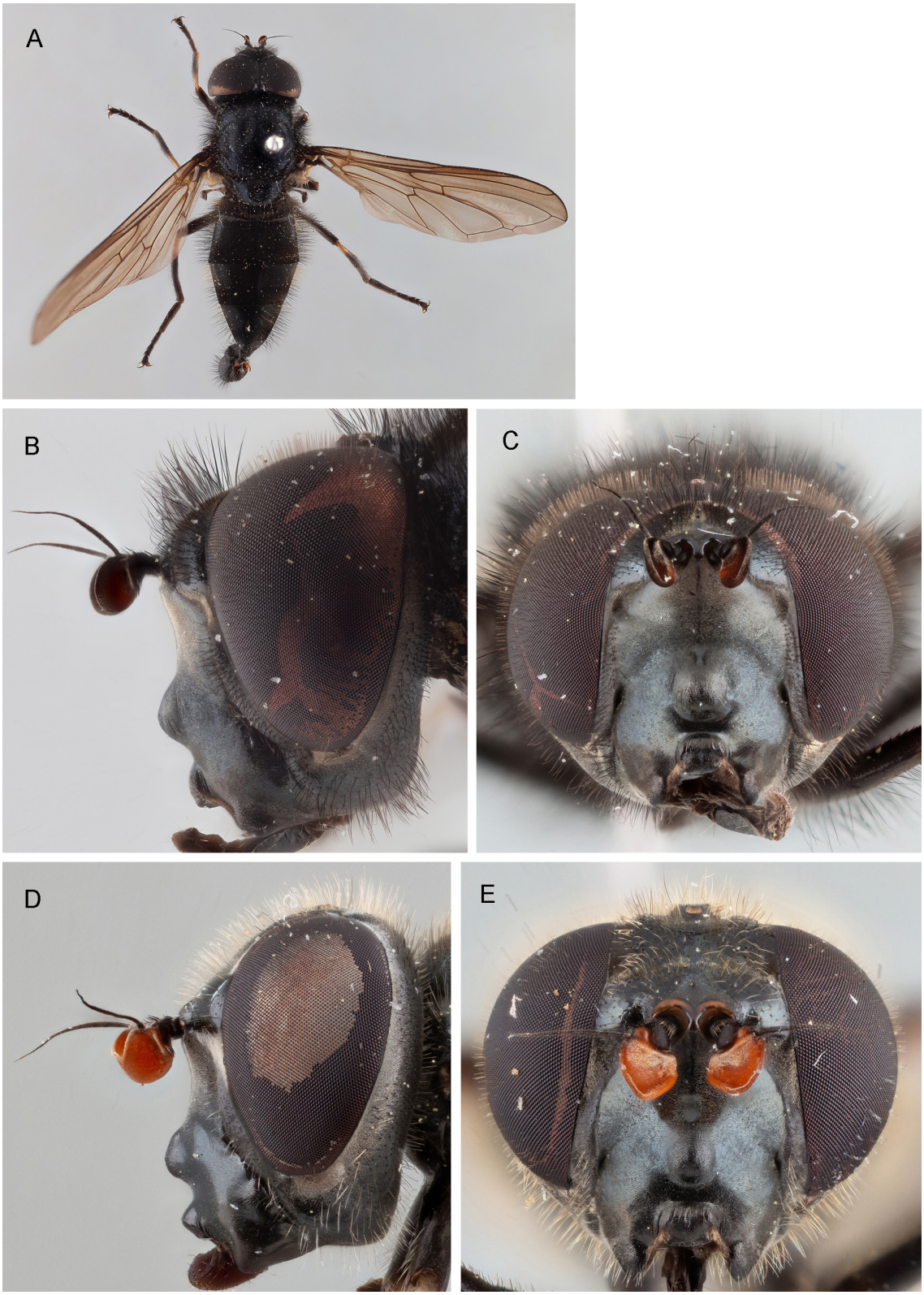

Fig. 2. *Cheilosia luteicornis* (Zetterstedt, 1838) (SBA); collected in the Netherlands. **A**. ♂; habitus dorsal view; body length 10 mm. **B**. ♂; head lateral view; head height 3.2 mm. **C**. ♂; head anterior view; head height 3.2 mm. **D**. ♀; head lateral view; head height 2.5 mm. **E**. ♀; head anterior view; head height 2.5 mm. Not to scale.

slightly longer than half width of 3rd antennal segment, varying in colour from predominantly yellow to predominantly black. Occiput dorsally much wider than in male, faintly grey pruinose, with short yellow hairs, or with a few black setulae intermixed dorso-laterally. Gena with long yellow hairs. Face not haired, at level of facial tubercle almost 0.5 times as wide as maximum width of head, faintly grey pruinose; parafacia at level of facial tubercle about as wide as diameter of protibia, pale pruinose and with short yellow hairs. 3rd antennal segment larger than in male, most often bright orange, or with a black apico-dorsal rim.

Thorax. Scutum and scutellum less densely pruinose, but with pale pruinose sub-median vittae anterior on scutum, usually distinct; hairs clearly unequal in length, erect, predominantly yellow, intermixed with scattered, somewhat longer black hairs; scutellum usually with 6–10 black marginal setae, sub-scutellar fringe short and yellow. Pleurae grey pruinose, with yellow hairs, but hairs shorter and less dense than in male. Calypter whitish, with orange rim and yellow fringe. Haltere with brownish stem and yellowish capitulum.

Legs. Legs black, but basal 1/3 of pro- and metatibia, and basal 2/5 of mesotibia, and often extreme apices of tibiae and femora reddish-yellow; femora predominantly with yellow hairs, but apices anteriorly and dorsally with short appressed black hairs, posteriorly occasionally with a few longer, thin black setae; ventral surface of metafemur basally without black setulae.

Abdomen. Tergites entirely but faintly grey pruinose, especially tergites 2–3 on disc much less pruinose than in male, hairs of tergites entirely yellow, short, erect. Sternites greyish pruinose to varying extents, from entirely matt to slightly shining, with short yellow hairs; hairs erect on sternites 1–2 and on anterior corners of sternite 3, remaining hairs more or less appressed.

Distribution

Austria (H. Heimburg pers. com.), Belgium, Bosnia and Herzegovina, Bulgaria, Czechia, Finland, France, Germany, Italy, Lithuania, Montenegro, Netherlands, Norway, Poland, Serbia, Slovenia, Sweden, Switzerland, Ukraine.

Distribution reported here for Belgium and Switzerland were not reported before in the IUCN Red List assessment (Vujić & Likov 2021).

Differential diagnosis

Very similar to *Cheilosia morio*, but differing as follows: sides of face not haired. The parafacia width is about half of the width of the postpedicel. Face and frons are a little less wide than in *C. morio*. The basal 1/3–2/5 of the tibiae are yellow in both sexes. Calypter is pale yellowish, fringe in the male partly dark brown. ♀ with scutal pilosity of unequal length, with numerous black hairs intermixed. ♂: abdominal tergites 2–3 at least partly yellow haired on disc, tergite 3 often predominantly yellow haired. Genitalia: surstylus with a shallow basal convexity; hypandrium about 1.4 times as long as wide.

Remarks

Zetterstedt received the description of "*Eristl. lineata* nov. spec. ♂" in a letter from P. Wahlberg, but he did not study the underlying specimen(s), nor other specimens of *E. lineata* (1843: 807–808). Subsequently Zetterstedt (1849: 3173, in a note under "31. *E. melanopa*") synonymized *E. lineata* under his *C. morio*. Among the *Cheilosia* materials in the Wahlberg and Boheman collections, now incorporated in the general Diptera collection of the NRM (H. Bartsch personal communication), the following historical specimens under the name *Cheilosia morio* could be located: 1) Wahlberg collection: 3 ♀♀ *C. luteicornis*, 1 ♀ *C. morio*; the specimens are without locality and other data but marked by a small coloured tag. These specimens cannot be syntypes, because of the female gender. 2) Boheman collection: under the

name *C. morio*, there are 1 ♂ and 2 ♀♀ from "Holmiae" (= Stockholm), collected by Wahlberg and labelled by Boheman "Hlm./P.Wg.". The label of the male agrees well with the type locality and the characters of the specimen agree with those given in the original description of *E. lineata* Wahlberg, and it is here accepted as the lectotype.

Cheilosia morio (Zetterstedt, 1838)
Figs 3–4, 5B, E, G

Eristalis morio Zetterstedt, 1838: 612. Type locality: "in Lapponia septentrionali … ad Juckasjervi Lapponia Tornenesis … Lapponia" [Sweden] (holotype, ♂, MZLU, Fig. 4, examined by Claußen).
Chilosia scanica Ringdahl, 1937: 27. Type locality: "Söderåsen" [Sweden] (holotype, ♂, MZLU, Fig. 4, examined by Claußen). The holotype is in good condition. Identity: a junior synonym of *C. morio* (Zetterstedt, 1838). **Syn. nov.**

Cheilosia scanica – Bańkowska 1963: 114. — Stackelberg 1970. — van der Goot 1981: 162. — Violovitsh 1983: 78. — Mazánek 2006: 83. — Heimburg *et al.* 2022: 169.
Cheilosia morio – Kassebeer 1993: 89. — Dziock 1997: 134. — Mutin & Barkalov 1999: 422 (in part). — Veen 2004: 61 (in part). — Haarto & Kerppola 2007: 254 (in part). — Nilsson *et al.* 2012: 148. — Bot & Van de Meutter 2023: 48, 227.
Cheilosia "*morio* B" – Bartsch *et al.* 2009: 55, 106. — van Steenis 2011: 188.

Material examined

FINLAND – **Åland** • 1 ♂; Jomala; 60.158572° N, 19.829543° E; 10 May 2005; Milankov and Ståhls leg.; http://id.luomus.fi/GJ.6062; MZH. – **Etelä Häme** • 1 ♂; Somero; 60.63° N, 23.46° E; 19 May 1962; Nurminen leg.; http://id.luomus.fi/GV.93934; MZH • 1 ♀; same data as for preceding; http://id.luomus.fi/GV.93933; MZH • 1 ♂; Urjala; 61.08° N, 23.49° E; 28 Apr. 1964; Brander leg.; http://id.luomus.fi/GV.93931; MZH • 1 ♀; Forssa; 60.85° N, 23.62° E; 14 May 1964; Käpylä leg.; http://id.luomus.fi/GV.93945; MZH • 1 ♂; Urjala; 61.08° N, 23.49° E; 30 April 1965; Brander leg.; http://id.luomus.fi/GV.93943; MZH. – **Etelä-Savo** • 1 ♂; Savonlinna; 61.781651° N, 29.36578° E; 29 May 1936; http://id.luomus.fi/GV.21422; MZH. – **Ladoga Karelia** • 3 ♂♂; Rautjärvi; 61.41° N, 29.39° E; 15 May 1944; Tiensuu leg.; http://id.luomus.fi/GV.93930, http://id.luomus.fi/GV.93938, http://id.luomus.fi/GV.93941; MZH. – **South Karelia** • 1 ♀; Summajoki, Pitkäkoski; 60.67577° N, 27.079224° E; 10 May 1964; Tiensuu leg.; http://id.luomus.fi/GV.93936; MZH • 1 ♂; Hamina, Leluntie; 60.558704° N, 27.33415° E; 10 May 1970; Tiensuu leg.; http://id.luomus.fi/GV.93929; MZH • 1 ♂; Hamina Kitula, Tupenmäki; 60.734° N, 27.211° E; 11 May 1976; Tiensuu leg.; http://id.luomus.fi/GV.93940; MZH. – **Uusimaa** • 1 ♂; Helsinki; 60.191° N, 24.875° E; Johansson leg.; http://id.luomus.fi/GV.93935; MZH • 1 ♂; Hanko, Tvärminne; 59.843° N, 23.206° E; Häyren leg.; http://id.luomus.fi/GV.93932; MZH • 1 ♂; Vantaa; 60.27° N, 24.96° E; 1–31 May 1905; Frey leg.; http://id.luomus.fi/GV.93946; MZH • 1 ♀; Vantaa; 60.27° N, 24.96° E; 1920; Wegelius leg.; http://id.luomus.fi/GV.93937; MZH • 1 ♀; Helsinki; 12 May 1945; Nuorteva, Matti leg.; http://id.luomus.fi/GV.93942; MZH • 1 ♀; Mäntsälä, Sahajärvi; 60.7159° N, 25.4429° E; 10 May 2005; Ståhls leg.; http://id.luomus.fi/GJ.6063; MZH • 1 ♂*; Sipoo, Hindsby; 60.3508° N, 25.2001° E; 18 May 2022; Neuvonen leg.; http://id.luomus.fi/GJ.6271; MZH • 1 ♀*; same data as for preceding; http://id.luomus.fi/GJ.6270; MZH. – **Varsinais-Suomi** • 1 ♀; Salo, Eriksberg; 60.374° E, 23.296° N; von Bonsdorff leg.; http://id.luomus.fi/GV.93939; MZH • 1 ♂; Lieto; 60.54° N, 22.5° E; Niemelä leg.; http://id.luomus.fi/GV.93944; MZH • 1 ♀; Salo; 60.189835° N, 22.876551° E; 16 May 1944; Hellman leg.; http://id.luomus.fi/GV.21348; MZH • 1 ♀; Salo; 60.189835° N, 22.876551° E; 17 May 1944; Hellman leg.; http://id.luomus.fi/GV.21349; MZH.

GERMANY – **Baden-Württemberg** • 1 ♂; Schwarzwald, Zastler Hütte; 1256 m a.s.l.; 15 May 1992; Stuke leg.; CNC Diptera 101714. – **Lower Saxony** • 1 ♂; Lopautal; 12 Apr. 1991; Kassebeer leg.; CNC Diptera 101817.

ITALY – **Val Pusteria** • 1 ♀; Monguelfo, Rienzi; 1000 m a.s.l.; 14 May 1985; Verlinden leg.; • 1 ♀; same data as for preceding; 16 May 1985. Most of Verlindens collection is destroyed now by *Anthrenus museorum* (Linnaeus, 1761) and not accessible anymore.

SWEDEN – **Småland** •1 ♂*; Stenbrohult; 26 Apr. 2010; Nilsson leg.; MZH. – **Uppland** • 1 ♀; Uppsala, Dalkarlskärret; 1 May 1997; J. van Steenis leg.; JSB • 1 ♀; Halstavik, Pansarudden; 8 May 1997; J. van Steenis leg.; JSB • 1 ♀; Uppsala, Kodöden; 11 May 1997; J. van Steenis leg.; JSB • 1 ♀; Uppsala, Nåsten; 9 May 2002; J. van Steenis leg.; JSB.

Specimens used for molecular analysis are indicated with an asterisk (*) and listed in Table 2.

Description

Male

Length. Body 7.5–9.5 mm, wing 6–8.1 mm.

Head. Eye with brownish hairs. Anterior eye angle 120°–130°. Frons swollen, with median furrow running over entire length, obscured by faint pruinosity, with long, erect black hairs. Ocellar triangle equilateral, with long black hairs. Gena wide, viewed obliquely from below about as wide as 3/5 length of protibia. Face wide, ratio of width of face at level of facial tubercle to maximum width of head = 0.60–0.66 : 1; face slightly shining, obscured by faint pruinosity and a narrow streak of pruinosity just below antennal insertion. Sides of face with long black hairs, spreading from level of antennal insertion towards level of facial tubercle. Parafacia narrow, fully developed only lateral to facial tubercle, about as wide as one third width of 3rd antennal segment, above posterior tentorial pit strongly compressed toward eye margin by a haired bulge. Antennal pits separated. Lunule dark-brown to black. Antenna with scape and pedicel usually black, pedicel reddish to varying extents in individual specimens. 3rd antennal segment sub-circular, usually velvet-black, but partly or entirely reddish in some specimens. Arista usually black, but occasionally more or less reddish in correspondence with colour of basoflagellomere; hairs on arista much shorter than maximum thickness of arista.

Thorax. Scutum faintly brownish pruinose, anteriorly with a pair of contrasting sub-median pale pruinose vittae, best visible if viewed from behind; in well preserved specimens two less distinct lateral vittae perceptible; occasionally scutal vittae more or less confluent, displaying a joined pruinose area; hairs long black, erect, of about even length. Colour and hairs of scutellum similar to those of scutum, without distinct marginal setae, but occasionally with some marginal hairs slightly stronger than on disc. Subscutellar fringe black and long. Pleurae with long black hairs on posterior anepisternum, anepimeron and on katepisternum, dorsal and ventral katepisternal hair patches confluent. Metasternum haired.

Wing. Membrane entirely microtrichose, more or less brownish tinged, especially so in anterior half; veins dark, basal half of RS usually with a few dark setulae. Calypter brownish-grey to blackish, with dark rim; marginal fringe on dorsal lobe partly with black setae. Haltere with stem brownish and black knob.

Legs. Pro- and metalegs usually black, mesotibia often reddish basally, but sometimes up to basal one third and extreme apices of all tibiae, and apices of femora may be more or less reddish-yellow to brownish in individual specimens. Femora with black to brownish hairs, occasionally intermixed with a few paler hairs, especially so posteriorly on metafemur; ventral surface of metafemur with black setae on basal two thirds, but without setae apically. Tibiae covered in short, dark reddish-brown and

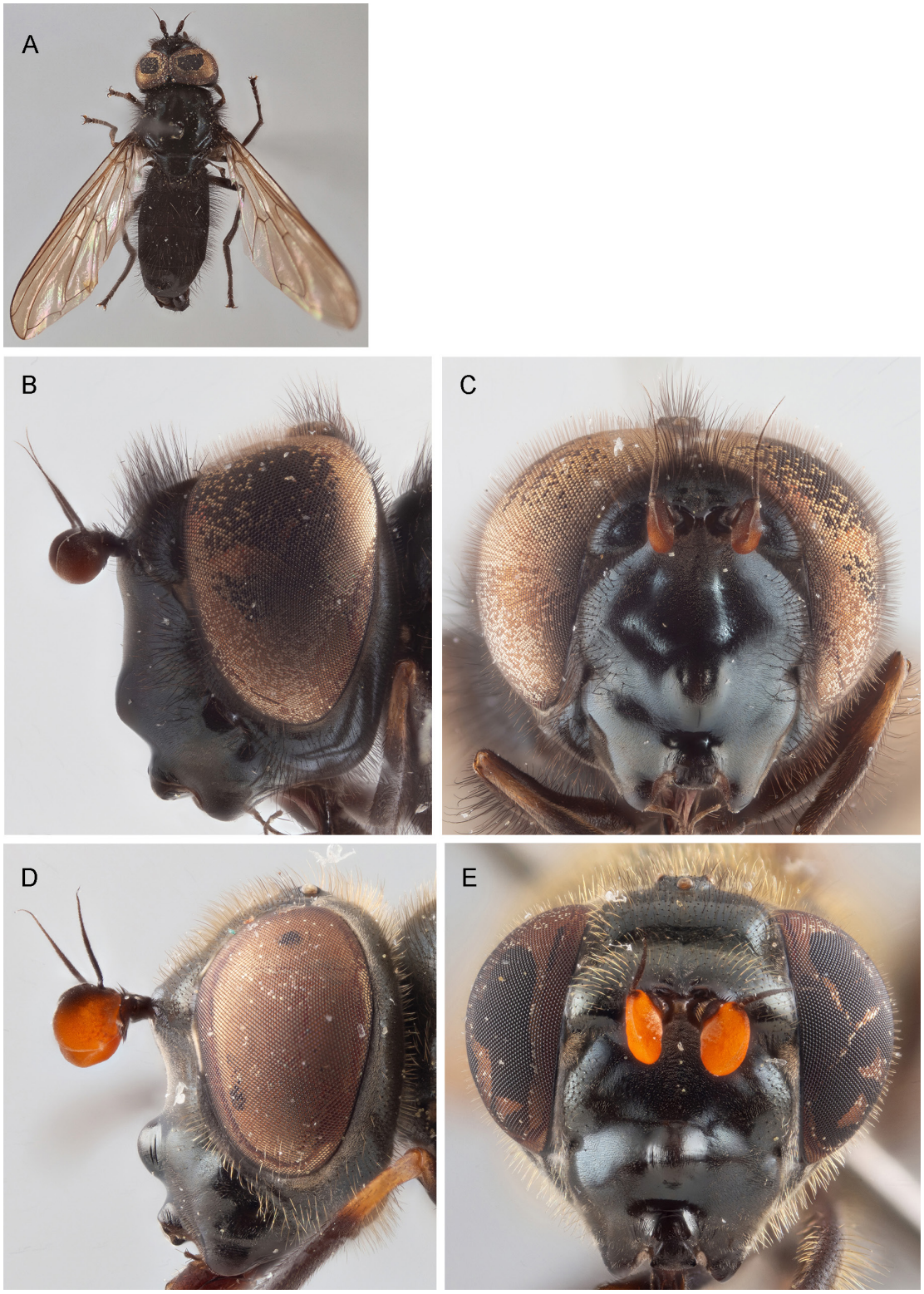

Fig. 3. *Cheilosia morio* (Zetterstedt, 1838). **A**. ♂ (JSB); habitus dorsal view; collected in Sweden; body length 9 mm. **B**. ♂ (CNC); head lateral view; collected in Germany; head height 2.7 mm. **C**. ♂ (CNC); head anterior view; collected in Germany; head height 2.7 mm. **D**. ♀ (JSB); head lateral view; collected in Sweden; head height 2.4 mm. **E**. ♀ (ZFMK); head anterior view; collected in Germany; head height 2.4 mm. Not to scale.

black hairs, but hairs on anterior surface of protibia entirely and densely reddish brown. Tarsi with hairs on dorsal surface short black or mixed black and reddish-brown, hairs on ventral surface of pro- and metatarsi usually reddish-brown, but often intermixed with black hairs. Tarsi of mesolegs ventrally with black setulae.

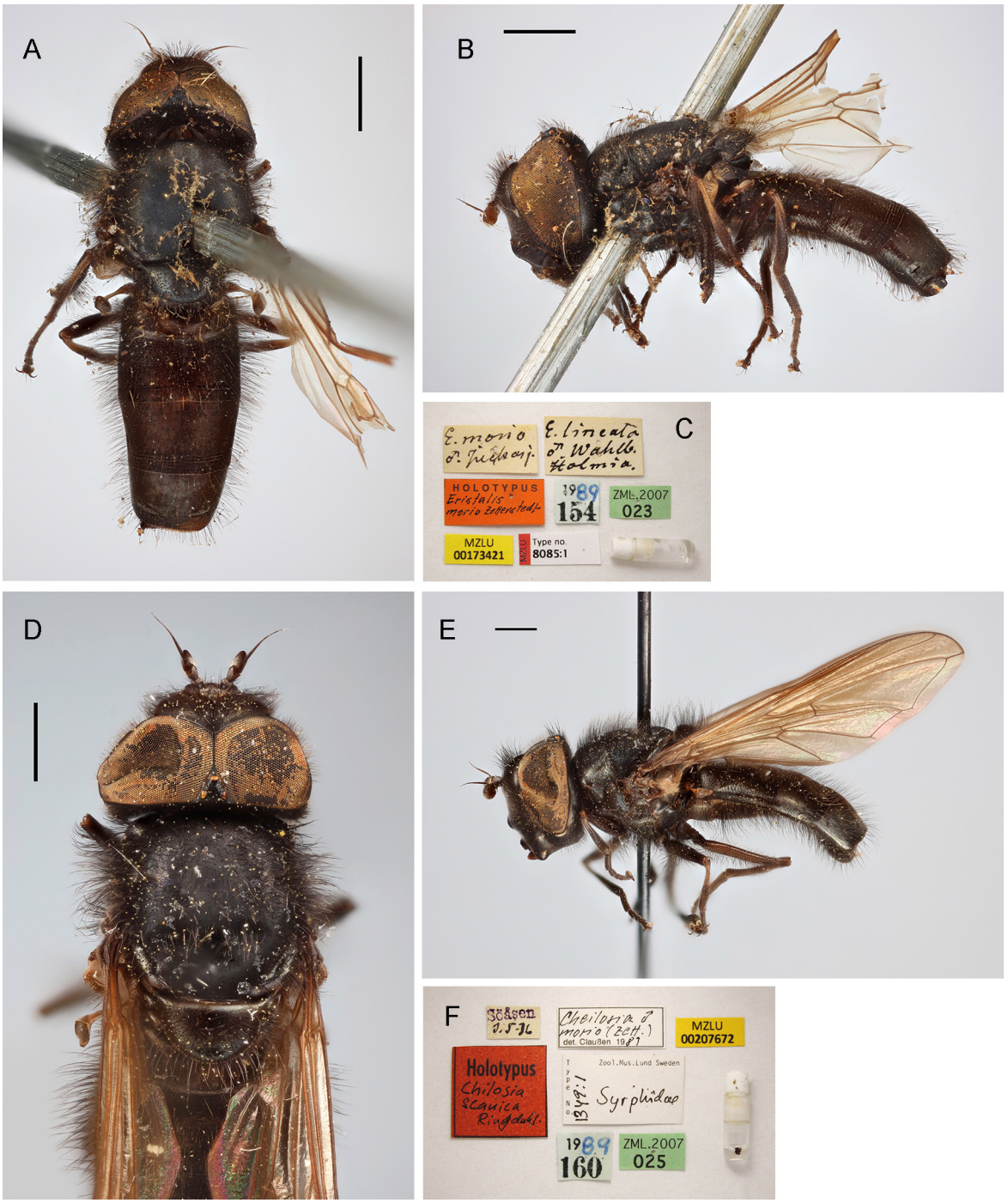

Fig. 4. Holotypes (MZLU). **A–C**. *Cheilosia morio* (Zetterstedt, 1838). **A**. Habitus dorsal view. **B**. Habitus lateral view. **C**. Labels. **D–F**. *Cheilosia scanica* Ringdahl, 1937 syn. nov. of *C. morio*. **D**. Habitus dorsal view. **E**. Habitus lateral view. **F**. Labels. Scale bars = 1 mm. (Photos by C. Fägerström, MZLU.)

Abdomen. Tergite 4 and sides of tergites 1–3 slightly shiny, tergites 2–3 velvet-black on disc; pruinosity of tergites – viewed obliquely from front – dark brown; hairs of tergites long black, erect. Sternites moderately shining, faintly greyish-brown pruinose, with black hairs, hairs long and erect on sternites 1–2 and laterally on sternites 3–4, remaining hairs short, appressed or semi-appressed.

Genitalia. Right and left surstylus and gonostyli slightly asymmetrical. Ventral margin of surstylus with a strong basal convexity; hypandrium in lateral view about as long as wide; sclerite of distiphallus broadly fused dorsally, with short dorsal lobes.

Female

Length. Body 7–8 mm, wing 7–8 mm.

The ♀ differs from the ♂ in the following characters: hairs much shorter and predominantly pale yellowish-brown.

Head. Hairs of eyes obviously shorter than width of postpedicel. Frons exceptionally wide, at level of lunule about half as wide as maximum width of head, with a distinct transverse sulcus at level of about lower one third of frons and with remnant of a median furrow between lunule and transverse sulcus; transverse sulcus and median furrow faintly grey pruinose, frontal areas above and below transverse sulcus otherwise shining; lateral channels narrow, widening from inner dorsal corner of eye toward transverse sulcus, where inner margin of channel encloses a small semicircular area of dense grey pruinosity; hairs of frons erect, not longer than half width of 3rd antennal segment, varying in colour from entirely yellow to entirely black. Occiput dorsally much wider than in male, faintly grey pruinose, with short yellow hairs, or with a mixture of yellow and black hairs. Gena with yellow hairs. Face at level of facial tubercle about 0.5 times as wide as maximum width of head; faintly grey pruinose, except for a narrow non-pruinose stripe, between dorsal margin of facial tubercle and upper margin of oral cavity, spreading toward lower corner of oral cavity. Facial hairs yellow, short, occasionally inconspicuous. Parafacia usually less strongly compressed above level of facial tubercle. 3rd antennal segment larger, most often bright orange-coloured, or with a black apico-dorsal rim.

Thorax. Scutum and scutellum less densely pruinose, but with pair of pale pruinose sub-median vittae anterior on scutum distinct; hairs short, about as long as distance between rear ocelli, yellow, intermixed with scattered, somewhat longer black hairs. Scutellum usually with a few (2–4) black or yellow marginal setae, sub-scutellar fringe short and yellow. Pleurae with yellow hairs, pattern of hairs as in male. Calypter whitish-orange, with darker rim and yellow fringe. Haltere stem brownish, knob yellow.

Legs. Legs black, but basal 1/3–2/5 of tibiae and often extreme apices of tibiae and femora reddish-yellow. Femora predominantly with yellow hairs, but apices anteriorly and dorsally with short appressed black hairs, posteriorly occasionally with a few longer, thin black setae. Ventral surface of metafemur basally without black setulae.

Abdomen. Tergites slightly shiny, especially tergites 2–3 much less pruinose on disc, hairs on tergites entirely yellow, short, erect. Sternites greyish pruinose to varying extents, from entirely pruinose to slightly shiny, with short yellow hairs; hairs erect on sternites 1–2 and on anterior corners of sternite 3, remaining hairs more or less appressed.

Distribution

Austria, Czech Republic, Finland, France, Germany, Greece, Italy, Montenegro, Norway, Poland, Russia, Slovakia, Sweden, Switzerland.

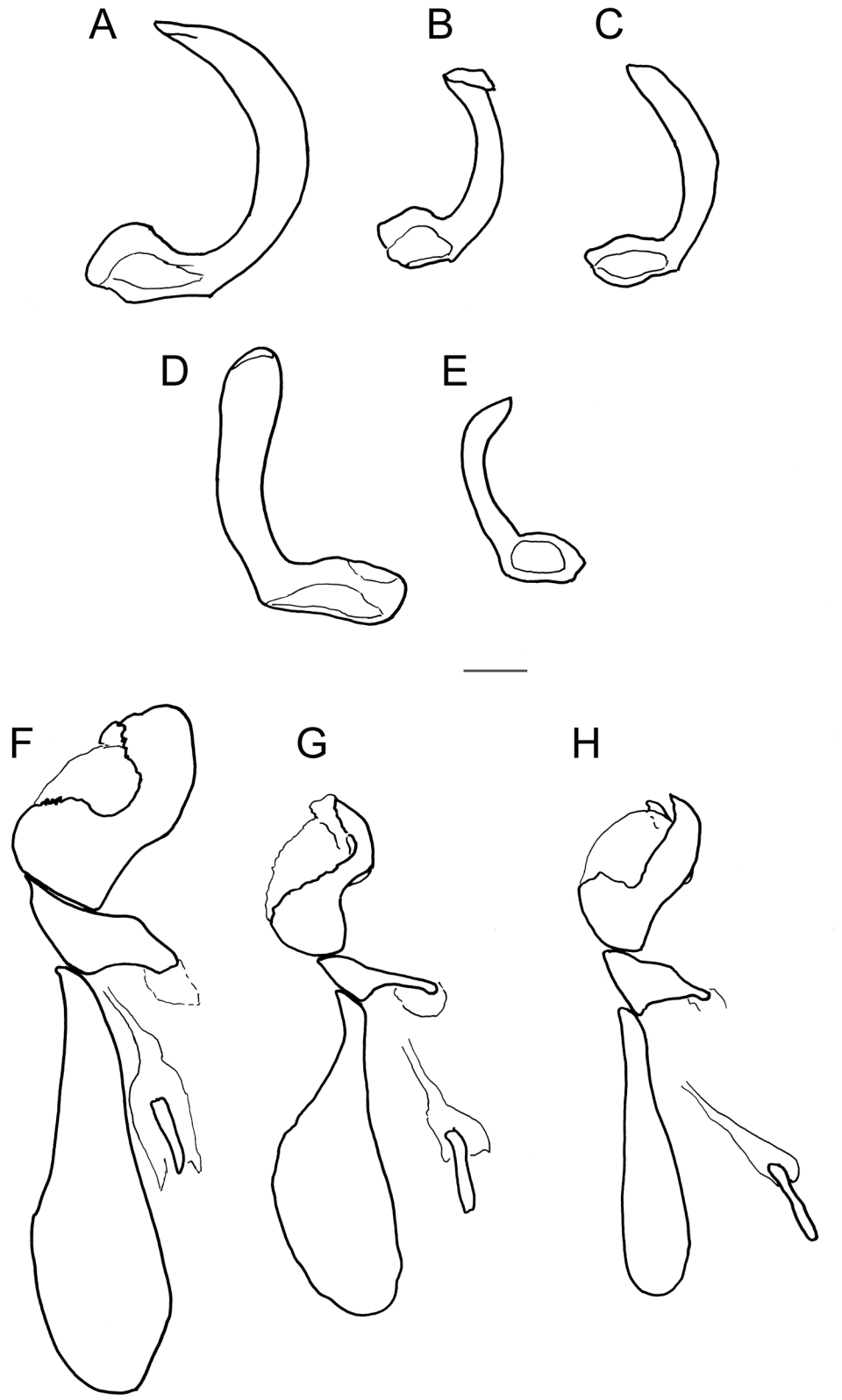

Fig. 5. *Cheilosia* sp., male terminalia. **A–E**. Left superior lobe. **A**. *C. luteicornis* (Zetterstedt, 1838). **B**. *C. morio* (Zetterstedt, 1838). **C**. *C. barovskii* Stackelberg, 1930. **D**. *C. luteicornis*. **E**. *C. morio*. **F–H**. Aedeagus with apodeme. **F**. *C. luteicornis*. **G**. *C. morio*. **H**. *C. barovskii*. Scale bar = 0.2 mm.

Distribution reported here for Austria, Finland, Norway and Switzerland were not reported before in the IUCN Red List assessment (Vujić *et al.* 2021).

Differential diagnosis

In its overall appearance similar to *Cheilosia luteicornis*, with the following differences: Sides of face haired, ♂ with long black hairs, ♀ with yellowish hairs which are less conspicuous. Parafacia narrow, about 1/3 of the width of postpedicel. Face and frons slightly wider than in *C. luteicornis*. ♀ with hairs on scutum of about equal length, with only individual black hairs intermixed. ♂: face with a slight, but distinct haired bulge on each side, just dorsal to the facial prominence. Bases of pro- and metatibiae usually blackish or obscured reddish. Abdomen entirely black-haired. Calypter brownish-grey to blackish. Genitalia: surstylus with strong basal convexity; hypandrium about as long as wide.

Remarks

The holotype specimen bears labels with what could seem to be contradicting information on the locality, but there is no doubt that this specimen is the holotype collected in Lapland. The label mentioning *E. lineata* and Holmia is similar to other bottom-drawer labels used by Zetterstedt for species of which he had no material, and most likely this label was added to the specimen by Zetterstedt himself when he synonymized *E. lineata* with *E. morio*.

The type accords well with the original diagnosis and morphological description and with its subsequent additions (Zetterstedt 1843: 795), but the description of the facial hairs does not: The face of the male is described as "hypostoma nudum [!], nitidum, atrum [face bare, shiny, black] and later (Zetterstedt 1843: 795) as "epistomate bituberculate, nudo [!], nitido" [face bituberculate, bare, shiny black], by this giving the impression of a species with a face lacking hairs. Actually, the face of the holotype clearly has long, black hairs laterally below the antennal insertion, with individual hairs reaching the level of facial tubercle. As a consequence of this discrepancy between the description and the characters actually observed, *C. morio* was erroneously and almost consistently regarded as a species with a bare face throughout the central European literature. The nomenclatural consequences will be discussed below.

DNA barcoding

A total of 18 COI barcodes of 633 bp length representing four species of the subgenus *Neocheilosia* and additionally the barcodes of two species of the subgenus *Convocheila* (Barkalov 2002) and one species of the subgenus *Montanocheila* Barkalov, 2002 were used for the NJ distance tree (for specimen data and GenBank accession numbers see Table 2). The NJ tree (Fig. 6) consistently resolved the included male and female individuals of *Cheilosia barovskii*, *C. luteicornis*, *C. morio* and *C. shiranesana* in separate clusters, respectively. All the bootstrap values supporting the nodes of the species clusters were high (99–100%). The uncorrected interspecific pairwise distances among the included species of the subgenus *Neocheilosia* ranged from 2.96% (between *C. luteicornis* and *C. morio*) to 7.57% (between *C. barovskii* and *C. shiranesana*).

Key to the known European species of subgenus Neocheilosia Barkalov, 1983

1. Males 2
– Females 4

2. Veins of wing brown or black; anterior eye angle ca 110–130°; lateral margin of tergite 1 and anterolateral corners of tergite 2 with black hairs 3
– Basal half of wing with veins yellow; anterior eye angle ca 90°; lateral margin of tergite 1 and anterolateral corners of tergite 2 with yellow hairs .....***N. barovskii*** Stackelberg, 1930

3. Sides of face with erect, black hairs; tergites entirely black-haired ..... ***N. morio*** (Zetterstedt, 1838)
– Sides of face without erect hairs; tergite 2 at least partly yellow haired, tergite 3 predominantly yellow-haired ..... ***N. luteicornis*** (Zetterstedt, 1838)

4. Veins of wing brown or black; scape and pedicel dark brown or black; tergites 3–4 with yellow hairs …5
– Basal half of wing with veins yellow; scape and pedicel bright orange; tergites 3–4 with black hairs ..... ***N. barovskii*** (Stackelberg, 1930)

5. Sides of face with erect, short yellow hairs [careful observation is necessary since hairs are occasionally inconspicuous]; hairs on scutum of about equal length, with only individual black hairs intermixed; body length 7–8 mm ..... ***N. morio*** (Zetterstedt, 1838)
– Sides of face without erect hairs; hairs on scutum of unequal length, with numerous black hairs intermixed; body length 9.5–12 mm ..... ***N. luteicornis*** (Zetterstedt, 1838)

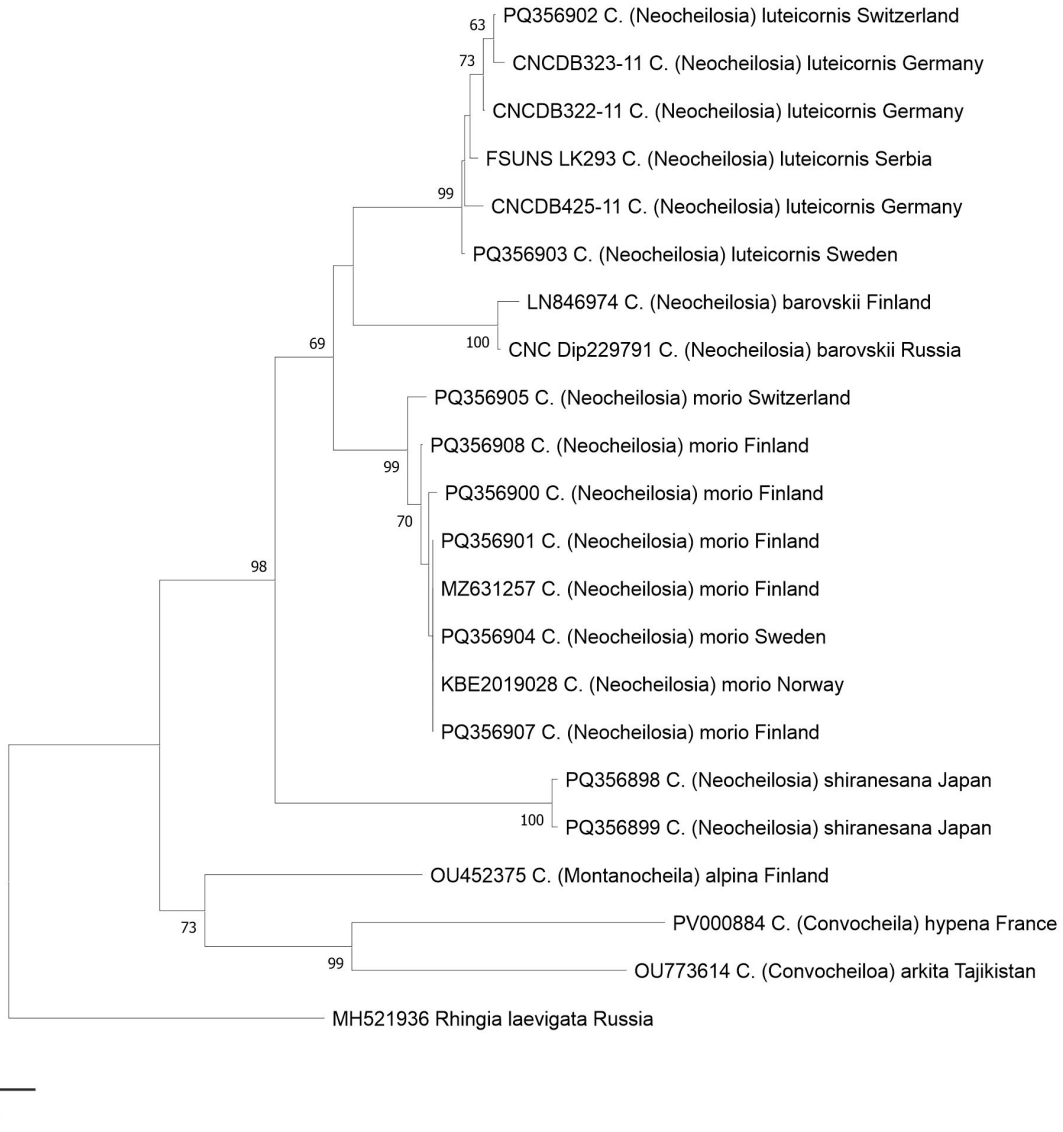

Fig. 6. Neighbor-Joining tree based on COI barcodes and the K2P evolutionary model with non-parametric bootstrap values indicated on nodes (1000 replicates).

Discussion

Cheilosia barovskii was described based on the female sex only, and all subsequently identified specimens are females. The type locality is in European Russia, and additional specimens are only known from two localities in Finland. The molecular evidence presented here links the described female sex with a male specimen thus confirming its identity, allowing us to here provide the description of the male sex of *C. barovskii*. The male was collected in the Russian Far East about 6000 km east of the type locality and the Finnish localities, being the first record of this species in Asia. Thus, *C. barovskii* occurs in sympatry with the very similar *Cheilosia komabaensis* from Asian Russia and Japan (Barkalov & Ichige 2016). The uncorrected interspecific pairwise divergences between the *Neocheilosia* taxa was within the same order of magnitude as those reported between species of the *Cheilosia longula* group (2.88–6.21%) (Claußen & Ståhls 2007).

The interpretation of the name *Cheilosia morio* and of some of the synonyms assigned to this name was in urgent need of clarification. Firstly, the confusion concerned two morphologically similar and sexually strongly dimorphic species, *C. morio* and *C. luteicornis*. The strong morphological similarity particularly applies to the females, which can be separated only by a few, often inconspicuous, features. Secondly, in the original descriptions of species of *Cheilosia* described by Zetterstedt (1838, 1843, as *Eristalis*) the facial hairs were not consistently considered a distinguishing feature. Especially the second item has caused misleading interpretations of the species, as the face of the male *C. morio* is described as bare (Zetterstedt 1838: 612 "hypostoma nudum"; 1843: 795 "epistomate nudo"), despite the fact that the face actually has long black hairs in the type specimen. The consequence of this inconsistency was that *C. morio* has been misinterpreted as a species with a bare face in subsequent taxonomic treatments. Zetterstedt neither considered nor mentioned the facial hairs in some other species later assigned by subsequent authors to the section of *Cheilosia* with a haired face, e.g., *C. latifrons* (Zetterstedt 1843: 811) and *C. variabilis* (Panzer, 1798) (Zetterstedt 1843: 790). The use of facial hairs as a distinguishing group character in the genus *Cheilosia* was first introduced by Loew (1857) and up to the present used as a diagnostic character to segregate this section of species from the remainder of the genus. Becker (1894: 448) was the first to mention the facial pilosity in the male of *C. morio*: "Parafacia ["Wangen" in Becker (1894)] wide, densely black haired. The hairs may be so dense that they spread to the face" (translated from German). Becker obviously interpreted this observation as an exception in individual specimens and not as a stable character, as he did not include the males of *C. morio* in his key to the species of *Cheilosia* with a pilose eye and face. Finally, by studying the type of *C. scanica*, it became clear that this widely used name is a synonym of *C. morio*.

Future work could focus on the relationships between *C. barovskii* and *C. komabaensis*, two similar species occurring in sympatry in Russia. Little is known about the taxonomy of *Neocheilosia* in the Nearctic, and a revision of the Nearctic species is needed.

Acknowledgements

The authors would like to thank the following persons: Roy Danielsson, Museum of Zoology and Entomology Lund University, Lund, Sweden, and Bert Viklund and Niklas Jönsson, Naturhistoriska Riksmuseet, Stockholm, Sweden for the permission to study types and historical material in their care, for sharing photographs of type specimens and for valuable information on their collections. Claus Claußen and Dieter Doczkal are grateful to the late Hans Bartsch, Järfälla, Sweden, who kindly searched for the types of *E. lineata* in the collections of Naturhistoriska Riksmuseet Stockholm and who was of great help to arrange the loan, to Martin C.D. Speight, Dublin, Ireland for discussions on the nomenclatural decisions, to Christoffer Fägerström for photos of the MZLU types and to Jens-Hermann Stuke, Leer, Germany for valuable information on literature of *Cheilosia* larvae. Many colleagues contributed with the donation or exchange of material: Dr Werner Barkemeyer, R. Borcherding, C.F. Kassebeer, Dr Franz

Malec, Sven G. Nilsson, Dr Jens-Hermann Stuke, Reinhold Treiber and Lucien Verlinden. The current authors would like to thank Jeff Skevington for the loan of the only male *C. barovskii* and for the use of the mtDNA COI sequence of this specimen.

References

Bańkowska R. 1963. *Keys for Identification of Polish Insects 28, Diptera. Part 34 Syrphidae*. Państowe Wydawnictwo Naukowe, Warsaw.

Barkalov A.V. 1983. The role of the structure of the hypopygium in the systematics of the genus *Cheilosia* Meigen, 1822 (Diptera, Syrphidae). *In*: Skarlato O. (ed.) *Diptera (Insecta), their Systematics, Geographic Distribution and Ecology*: 3–7. Academica Nauka, Leningrad.

Barkalov A.V. 2002. Subgeneric classification of the genus *Cheilosia* Meigen, 1822 (Diptera, Syrphidae). *Entomological Review* 82 (5): 518–531.

Barkalov A.V. & Ichige K. 2016. Review of the Asian species of the subgenus *Neocheilosia* Barkalov (Diptera, Syrphidae), with description of new species. *Zootaxa* 4150 (5): 571–580. https://doi.org/10.11646/zootaxa.4150.5.4

Barkalov A.V. & Mutin V. 2018. Checklist of the hover-flies (Diptera, Syrphidae) of Russia. *Euroasian Entomological Journal* 17 (6): 466–510. https://doi.org/10.15298/euroasentj.17.6.12

Barkalov A.V. & Ståhls G. 2022. *Cheilosia* (Diptera, Syrphidae: Rhingiini) of Nepal with descriptions of 29 new species. *European Journal of Taxonomy* 829: 1–127. https://doi.org/10.5852/ejt.2022.829.1863

Bartsch H., Binkiewicz E., Klintbjer A., Rådén A. & Nasibov E. 2009. *Nationalnyckeln till Sveriges Flora och Fauna. Tvåvingar: Blomflugor: Eristalinae & Microdontinae. Diptera: Syrphidae: Eristalinae & Microdontinae*. Artdatabanken, SLU, Uppsala, Sweden.

Becker T. 1894. Revision der Gattung *Chilosia* Meigen. *Nova Acta Academiae Caesariae Leopoldino-Carolinae Germanicae Naturae Curiosum* 62 (3): 194–522. https://doi.org/10.5962/bhl.title.10472

Bot S. & Van de Meutter F. 2019. *Veldgids Zweefvliegen*. KNNV-Uitgeverij, Zeist, the Netherlands.

Bot S. & Van de Meutter F. 2023. *Hoverflies of Britain and North-west Europe*. Bloomsbury, London.

Burke H.E. 1905. Black check in Western Hemlock. *U.S.D.A. Bureau of Entomology* Circular No 61: 1–10.

Claußen C. & Speight M.C.D. 2007. Names of uncertain application and some previously unpublished synonyms, in the European *Cheilosia* fauna (Diptera, Syrphidae). *Volucella* 8: 73–86.

Claußen C. & Ståhls G. 2007. A new species of *Cheilosia* (Meigen) from Thessaly/Greece, and its phylogenetic position (Diptera, Syrphidae). *Volucella* 8: 45–62.

Cumming J.M. & Wood D.M. 2017. Chapter 3. Adult morphology and terminology. *In*: Kirk-Spriggs A.H. & Sinclair B.J. (eds) *Manual of Afrotropical Diptera. Volume 1. Introductory Chapters and Keys to Diptera Families. Suricata 4*: 89–133. South African National Biodiversity Istitute, Pretoria.

Dziock F. 1997. Schwebfliegen der Sammlung "Max Nicolaus" und anderer Sammler aus dem Naturkundemuseum in Gera (Diptera, Syrphidae). *Veröffentlichungen der Museen der Stadt Gera - Naturwissenschaftliche Reihe* 24: 131–138.

Evenhuis N. & Pape T. 2023. Syrphidae. Systema Dipterorum, version 4.5.
Available from http://www.diptera.org/Nomenclator [accessed 26 Sep. 2024].

Folmer O., Black M., Hoeh W., Lutz R. & Vrijenhoek R. 1994. DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology* 3: 294–299.

Haarto A. & Kerppola S. 2007. *Finnish Hoverflies and some Species in Adjacent Countries*. Otavan Kirjapaino Oy, Keuruu.

Haarto A. & Kerppola S. 2014. Checklist of the family Syrphidae (Diptera) of Finland. *In*: Kahanpää J. & Salmela J. (eds) Checklist of the Diptera of Finland. *ZooKeys* 441: 233–249. https://doi.org/10.3897/zookeys.441.7251

Heimburg H., Doczkal D. & Holzinger W.E. 2022. A checklist of the hoverflies (Diptera: Syrphidae) of Austria. *Zootaxa* 5115 (2): 151–209. https://doi.org/10.11646/zootaxa.5115.2.1

Hellén W. 1912. Über die finnischen Arten der Gattung *Chilosia* Meig. *Meddelanden af Societas pro Fauna et Flora Fennica* 38: 149–164.

Hellrigl K. 1992. Die Fichtenharzfliege *Cheilosia morio* Zett. (Dipt., Syrphidae) als physiologischer Schädling an Fichten in Südtirol. *Anzeiger für Schädlingskunde, Pflanzenschutz und Umweltschutz* 65: 33–36.

Huo K.K., Cai S.G., Zhang N. & Zhang E.S. 2021. Description of a new species of *Cheilosia* from China and its life cycle. *Journal Anhui Agricultural Science* 49 (17): 11–14, 19.

Kassebeer C.F. 1993. Die Schwebfliegen (Diptera: Syrphidae) des Lopautals bei Amelinghausen. *Drosera* 93 (1/2): 81–100.

Kimura M. 1980. A simple method for estimating evolutionary rateof base substitutions through comparative studies of nucleotidesequences. *Journal of Molecular Evolution* 16: 111–120. https://doi.org/10.1007/BF01731581

Krivosheina N.P. 2019. First record of the biotopic associations of the larvae of the hover-fly genus *Cheilosia* Meigen, 1822 (Diptera, Syrphidae: Eristalinae) with deciduous trees. *Entomological Review* 99 (8): 1083–1089. https://doi.org/10.1134/S0013873819080025

Loew H. 1857. Die europäischen Arten der Gattung *Cheilosia*. *Verhandlungen des zoologischen-botanischen Vereins in Wien* 7: 579–616.
Available from https://www.biodiversitylibrary.org/page/26520439 [accessed 26 Sep. 2024].

Mazánek L. 2006. Additions and corrections to the list of Czech and Slovak hoverflies (Diptera, Syrphidae). *Entomofauna Carpathica* 18: 81–84.

Mutin V. & Barkalov A.V. 1999. 62. Family Syrphidae. *In*: *The Keys-book of Insects of Russian Far East* 6 (1): 342–500. Vladivostok.

Nilsson S.G., Bygebjerg R. & Franzén M. 2012. Biologisk mångfald i Linnés hembygd i Småland. 7. Blomflugor (Diptera, Syrphidae). *Entomologisk Tidskrift* 133: 137–166.

Ratnasingham S., Wei C., Chan D., Agda J., Agda J., Ballesteros-Mejia L., Ait Boutou H., El Bastami Z.M., Ma E., Manjunath R., Rea D., Ho C., Telfer A., McKeowan J., Rahulan M., Steinke C., Dorsheimer J., Milton M. & Hebert P.D.N. 2024. BOLD v4: A centralized bioinformatics platform for DNA-based biodiversity data. *In*: *DNA Barcoding: Methods and Protocols*: 403–441. Springer US, New York.

Ringdahl O. 1937. Eine neue schwedische *Chilosia*-Art. *Opuscula Entomologica* 2: 27–28.

Rotheray G.E. 1993. Colour guide to hoverfly larvae (Diptera, Syrphidae) in Britain and Europe. *Dipterists Digest* 9: 1–156.

Sack P. 1930. Schwebfliegen oder Syrphidae. *In*: *Die Tierwelt Deutschlands und angrenzender Meeresteile* 20: 1–118. Jena.

Sack P. 1932. Syrphidae. *In*: Lindner E. (ed.) *Die Fliegen der paläarktischen Region* IV(6). Stuttgart.

Saitou N. & Nei M. 1987. The neighbor-joining method: A new method for reconstructing phylogenetic trees. *Molecular Biology and Evolution* 4: 406–425.
https://doi.org/10.1093/oxfordjournals.molbev.a040454

Schiner J.R. 1862. *Fauna austriaca. Die Fliegen (Diptera). 1. Theil*. Vienna.
https://doi.org/10.5962/bhl.title.8525

Séguy E. 1961. Diptères syrphides de l'Europe occidentale. *Mémoires du Muséum national d'Histoire naturelle Série A. Zoologie* 23: 1–248.
Available from https://www.biodiversitylibrary.org/page/57432488 [accessed 26 Sep. 2024].

Speight M.C.D. 2020. Species accounts of European Syrphidae, 2020. *Syrph the Net, the database of European Syrphidae (Diptera), Vol. 104.* Syrph the Net publications, Dublin.

Stackelberg A.A. 1930. Beitrage zur Kenntnis der palaearktischen Syrphidae. III. *Konowia* 9: 223–234.

Stackelberg A.A. 1958. List of Diptera of the Leningrad region. IV. Syrphidae. *Trudy Zoologicheskogo Instituta Akademii Nauk SSSR* 24: 192–246.

Stackelberg A.A. 1970. Syrphidae. *In*: Bei-Bienko G.Y. (ed.) *Classification Key to the Insects of the European Part of USSR 5(2). – Opredeliteli po Faune SSSR* 103: 11–96. Leningrad.

Tamura K., Stecher G. & Kumar S. 2021. MEGA11: Molecular Evolutionary Genetics Analysis version 11. *Molecular Biology and Evolution* 38: 3022–3027. https://doi.org/10.1093/molbev/msab120

van der Goot V.S. 1981. *De Zweefvliegen van Noordwest-Europa en Europees Rusland, in het bijzonder van de Benelux*. Koninklijke Nederlandse Natuurhistorische Vereniging, Amsterdam.

van Steenis J. 2011. Swedish hoverfly records (Diptera: Syrphidae). *Entomologisk Tidskrift* 132: 187–193.

van Veen M. 2004. *Hoverflies of Northwest Europe: Identification Keys to the Syrphidae*. KNNV-Uitgeverij, Zeist, the Netherlands.

Violovitsh N.A. 1983. *Siberian Syrphidae (Diptera)*. Novosibirsk.

Vujić A. & Likov L. 2021. *Cheilosia luteicornis* (Europe assessment). *The IUCN Red List of Threatened Species 2021*: e.T176123659A178088273.
https://doi.org/10.2305/IUCN.UK.2021-3.RLTS.T176123659A178088273.en

Vujić A., Ståhls G. & Radenkovic S. 2018. Hidden European diversity: A new monotypic hoverfly genus (Diptera: Syrphidae: Eristalinae: Rhingiini). *Zoological Journal of the Linnaean Society* 20: 1–24.
https://doi.org/10.1093/zoolinnean/zly066

Vujić A., Likov L. & Tot T. 2021. *Cheilosia morio*. *The IUCN Red List of Threatened Species 2021*: e.T149167289A149167292.
https://doi.org/10.2305/IUCN.UK.2021-3.RLTS.T149167289A149167292.en

Zetterstedt J.W. 1838. Dipterologis Scandinaviae. Sect. 3: Diptera. *In*: *Insecta Lapponica*: 477–868. Voss, Lipsiae [Leipzig]. https://doi.org/10.5962/bhl.title.8242

Zetterstedt J.W. 1843. *Diptera Scandinaviae Vol. 2*. Officina Lundbergiana, Lundae [Lund], Sweden.
https://doi.org/10.5962/bhl.title.8143

Zetterstedt J.W. 1849. *Diptera Scandinaviae Vol 8*. Officina Lundbergiana. Lundae [Lund], Sweden.
Available from https://www.biodiversitylibrary.org/page/8199330 [accessed 26 Sep. 2024].

Manuscript received: 24 October 2024
Manuscript accepted: 5 March 2025
Published on: 4 June 2025
Topic editor: Tony Robillard
Section editor: Torbjørn Ekrem
Desk editor: Pepe Fernández