

A new species of *Cheilosia* Meigen from Thessaly /Greece, and its phylogenetic position (Diptera, Syrphidae)

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

Cheilosia thessala **spec. nov.** is described from the Mediterranean pine forests of south east Thessaly, Greece. The phylogenetic position of the new taxon within the *longula* species-group is analysed using parsimony analysis and DNA characters of mitochondrial COI gene. The *Cheilosia longula* species-group is redefined as a monophyletic unit. *Cheilosia flavissima* Becker, 1894, **stat. rev.**, is considered to be a distinct species and not a junior synonym of *Cheilosia pallipes* Loew, 1863. A key for the European species of the *Cheilosia longula* species-group is provided.

Key words: Syrphidae, *Cheilosia*, Greece / Thessaly, new species, *Cheilosia longula* species-group, key, phylogeny.

Zusammenfassung

Cheilosia thessala **spec. nov.** wird aus der planar-kollinen Vegetationsstufe Südost-Thessaliens/Griechenland beschrieben. Die phylogenetische Stellung des neuen Taxon innerhalb der *longula*-Artengruppe wird mittels Maximum-Parsimony-Analyse und unter Verwendung von DNA-Merkmalen des mitochondrialen COI-Gens ermittelt. Die *Cheilosia longula*-Artengruppe wird als Monophylum neu definiert. *Cheilosia flavissima* Becker, 1894, **stat. rev.**, wird als distinkte Art betrachtet und nicht als jüngeres Synonym von *Cheilosia pallipes* Loew, 1863. Ein Bestimmungsschlüssel für die europäischen Arten der *Cheilosia longula*-Artengruppe wird vorgelegt.

1 Introduction

In the course of investigations on the syrphid fauna of the lowland/hill-land vegetation zone of south east Thessaly / Greece (Standfuss & Claußen 2006), a series of an apparently undescribed *Cheilosia* related to the *longula* species-group, was discovered. The primary purpose of this paper is to describe the new species and to analyse and discuss its phylogenetic position within the *Cheilosia longula* species-group. This necessitates re-definition of the *longula* species-group, its re-evaluation as a supposedly monophyletic unit, and the recognition of its European components. DNA sequence characters of the mitochondrial gene cytochrome c oxidase subunit I (hereafter COI) for

Palaeartic representative members of the *Cheilosia longula* and *angustigenis* species-groups and one representative from the Nearctic region were available from Ståhls et al. (2004) or generated for the present study. The dataset was subjected to parsimony analysis with the aim of studying the phylogenetic placements and relationships of *C. longula* species group taxa.

The finding of a new taxon, and its close morphological similarity with some of the related species, has provided an opportunity to construct an identification key for the European members of the *longula* species-group.

2 Material and methods

Morphological studies: The material dealt with for taxonomic studies consists of dry, pinned specimens that have been deposited in the collections listed below, under the corresponding species. Figures of the male genitalia have been prepared from macerated material, with the aid of a drawing tube attached to a microscope. Drawings of other morphological features have been made from dry specimens, using hard-copies of images taken as models with the aid of a digital camera system.

Measurements of body length have been taken from the central prominence of face to the apex of the abdomen. Other measurements are explained in the text.

The terminology followed is that of Thompson (1999), except for terms of the male genitalia which have been adopted from Cumming et al. (1995) and Hippa & Ståhls (2005).

Acronyms: NMW – Naturhistorisches Museum, Vienna, Austria; ZMH – Zoological Museum, Helsinki, Finland; ZMHU – Zoologisches Museum, Museum für Naturkunde der Humboldt-Universität zu Berlin, Germany; ZMISEA – Zoological Museum of the Institute of Animal Systematics and Ecology, Novosibirsk, Russia.

Private collections: CC – Coll. C. Claußen; HB – Coll. H. Bartsch.

COI sequencing: COI sequences were generated for *C. thessala* spec. nov., *C. flavissima*, *C. longula*, *C. scutellata*, and *C. soror*. DNA was extracted from dry, pinned specimens using legs and/or parts of the abdomen. Male genitalia were always conserved for the purpose of morphological studies. DNA voucher specimens have been deposited in the ZMH (Helsinki, Finland). DNA was extracted from single individuals using the Nucleospin Tissue DNA extraction kit (Machery-Nagel) following manufacturer's protocols and re-suspended in 50 µl of ultra-pure water.

PCR reactions for both gene fragments were carried out in 25 µl reactions containing 2 µl DNA extract, 1 µl of each primer (at 10 pmol/µl), 0.25 µl of DNA polymerase (5U / µl), 2 µl 2.5 mM MgCl₂, 2.5 µl 10X Buffer II (MBI Fermentas) and 4 µl 200 mM dNTP (GeneAmp) and ultrapure water. Thermocycler conditions were initial denaturing at 95 °C 2 min; 29 cycles of 30 s denaturing at 94 °C; 30 s annealing at 49 °C; 2 min extension at 72 °C and then a final extension of 8 min at 72 °C. PCR products were purified using the GFX PCR Purification Kit (Amersham Biotech) and then sequenced (with the PCR

primers) in both directions using the Big Dye Terminator Cycle Sequencing Kit vs. 1.1 (Applied Biosystems) at one-fourth of the recommended volumes on an ABI Prism 377 (Applied Biosystems) semi-automated DNA sequencer. The universally conserved primers used for amplifying and sequencing the COI fragment were the forward primer C1-J-2183 (alias Jerry) (5'-CAACATTTATTTTGATTTTTTGG-3') and reverse primer TL2-N-3014 (alias Pat) (5'-TCCAATGCACTAATCTGCCATATTA-3') (Simon et al. 1994). Forward and reverse sequences were assembled and edited for base-calling errors Sequence Navigator™ (version 1.01). GenBank accession numbers for COI sequences of the previously sequenced species (Ståhls et al. 2004) were AY533359 *C. aokii* Shiraki, AY533357 *C. angustigenis* Becker, AY533338 *C. chrysocoma* (Meigen), AY261693 *C. illustrata* (Harris), DQ356270 *C. latrans* (Walker, 1849) (= *tristis* Loew, 1863), AY533369 *C. nigripes* (Meigen), AY533339 *C. pubera* (Zetterstedt), AY533370 *C. vicina* (Zetterstedt). GenBank accession numbers for taxa sequenced in this study are listed in Table 1.

Parsimony analysis: The data set included for 14 terminals and one outgroup, e.g.

Taxon	Lab code	Locality information	GenBank accession
<i>C. flavissima</i> Becker, 1894 (= <i>pallipes</i> auctt. nec Loew, 1863)	ZMH_Y186	Finland, Ta: Pihtipudas 7013:449, 1.VII.2004, A. Haarto leg.	DQ356271
<i>C. flavissima</i> Becker, 1894 (= <i>pallipes</i> auctt. nec Loew, 1863)	ZMH_Y187	Russia, Gornyi altai, 16.VI.2003, 1100 m, Kropatsheva leg.	DQ356272
<i>C. longula</i> (Zetterstedt, 1838)	ZMH_Y317	Finland, Le: Kilpisjärvi, Saana, suo, 19.7.2005, 76739:2538, Sakari Kerppola leg.	DQ356273
<i>C. aff. longula</i> (Zetterstedt, 1838)	ZMH_Y318	Finland, Le: Kilpisjärvi, Saana, suo, 17.7.2005, 76739:2538, Sakari Kerppola leg.	DQ356274
<i>C. scutellata</i> (Fallén, 1817)	ZMH_Y188	Finland, Al: Geta, Höckböle, 15.VII.2004, G. Ståhls leg.	DQ356275
<i>C. soror</i> (Zetterstedt, 1843)	ZMH_Y273	Greece Lesbos, nr. Agiasos, 8.VI.2005, G. Ståhls leg.	DQ356276
<i>C. thessala</i> spec. nov.	ZMH_Y240	Greece, Thessaly. "Platania/Volos GR, 23.9.2004, leg. K. Standfuss	DQ356277

Table 1: GenBank accession numbers for taxa sequenced in this study.

the *longula*-group taxa, two representatives of the *angustigenis*-group, three representatives of subgenus *Taeniochilosia*, *Cheilosia chrysocoma* and *Cheilosia illustrata* of *Cheilosia* s.str., with the latter used as outgroup. Sequences were assembled and edited for base-calling errors using Sequence Navigator™ (version 1.01). The alignment of the protein-coding COI was straightforward. Phylogenetic relationships of included terminals was conducted (using equal weights) using the parsimony program NoNa vs. 2.0 (Goloboff 1999), using the command line "hold 100000; hold*; hold/50, mult*500;". Bremer support values (Bremer 1988, 1994) were calculated by stepwise increasing number of trees to hold, to avoid overestimating the values.

3 Results

3.1 Molecular data

We used a fragment of 660 nucleotide characters of the 3' end of the COI gene. The number of parsimony informative sites was 63. Uncorrected pairwise divergences within the *longula*-group ranged from 2.88% between *C. longula* and *C. aff. longula*, to 6.21% between *C. soror* and *C. flavissima*. The two sequenced specimens of *C. flavissima* (Russia and Finland) presented an identical sequence.

The parsimony analysis using equal weights resulted in one most parsimonious tree of length 291 steps, CI=0.69, RI=0.65 (Fig. 26). Bremer support values are shown below the branches.

3.2 Taxonomy

3.2.1 The *Cheilosia longula* species-group

The *longula* species-group was introduced as an infrageneric unit, based on features of the male genitalia (Barkalov 1983). It was subsequently formally raised to subgeneric rank under the name *Cheilosia (Eucartosyrphus)* Barkalov, with *Eristalis longula* Zetterstedt, 1838 as the subgenustype (Barkalov 2002).

Cheilosia (Eucartosyrphus) was not resolved as monophyletic unit in the parsimony analysis based on molecular characters of the COI gene (Ståhls et al. 2004). It is polyphyletic based on both molecular (Ståhls et al. 2004) and morphological data (Claußen 2000). For this reason the *longula* species-group is re-defined below as a monophyletic group and restricted to those species of *Cheilosia* with the following morphological and biological features:

- Colour of the integument: Black, in some species with yellowish portions on the following parts: Lower sides of face, postpronotum, scutellum, legs.
- Head: Facial tubercle (viewed in profile) protruding as far as or slightly more than lower anterior corner of subcranial cavity (fig. 3). Sides of face without long, outstanding pile. Parafacialia conspicuously narrow, about 1-1,5 times as wide as the diameter of anterior ocellus. Eyes apparently bare, but sparse short pile may be discernible under

strong light and high magnification. Antennal fossa confluent, the medial process of the lunula may reach the upper margin of the face, but is not merged with it.

- **Thorax:** Prothoracic basisternum clearly differentiated from the adjacent propleural sclerites, its dorsal margin much shorter than half the dorso-ventral extension of the basisternum. Dorsal part of propleura pilose, but not setulose on its ventral portion. Katepisternum with upper and lower pile patches fused or narrowly separated on lower third of sclerite. Thorax usually with black setae on the following parts: notopleuron, supra-alar region, postalar callus, hind margin of scutellum and posterodorsal corner of posterior anepisternum. Tarsomeres 4 (and 3) of mid and hind legs dilated in the females of some of the species (fig. 2). Wing not distinctly darkened along inner cross-veins, but the surface of wing may be brownish infuscated to a varying extent.

- **Abdomen:** Male genitalia (figs 18-25): Dorsal lobe of gonostylus usually rudimentary, with remnant of a ctenidion; in *C. scutellata* the dorsal lobe is greatly enlarged and widened apically, with the ctenidion entirely reduced. Ventral lobes of gonostyli usually elongated and much longer than dorsal lobes. Ventral lobes of right and left gonostylus asymmetrical, the left one slightly bent mediad, subapically excavated with convex apical margin; the right lobe longer than the left one, with pointed apex, strongly curved mediad and usually crossing the left lobe; in *C. scutellata* both ventral lobes are almost equal in length and without apical modifications.

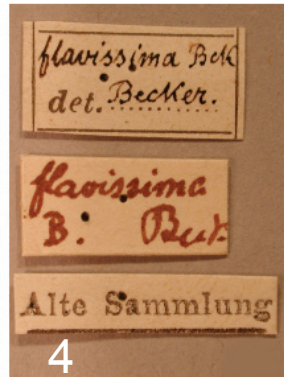
- **Biology:** Known larvae feeding in the fruiting bodies of fungi (Basidiomycetes) (Stuke 2000).

Supposed synapomorphies: (1) Larval biology: Larvae from the *Cheilosia longula* species-group are known for *C. longula*, *C. pallipes* Loew, *C. scutellata* and *C. soror*. All these larvae are internal feeders in the fruiting bodies of multiple groups of fungi (Basidiomycetes), an important host family being Boletaceae. No other *Cheilosia* larvae with this feeding mode are known (Stuke 2000). For this reason this feeding mode is supposed to be synapomorphic. – (2) Ventral lobes of gonostyli elongated and narrow, usually with modified apices; right and left lobes usually asymmetrical; bent or curved mediad and crossing each other.

The following European species are assigned to the *Cheilosia longula* species-group: *C. flavissima* Becker, 1894 (= *C. pallipes* of authors, not Loew, 1863 – misidentification), *C. longula* (Zetterstedt, 1838), *C. scutellata* (Fallén, 1817), *C. soror* (Zetterstedt, 1843), *C. thessala* spec. nov., *Cheilosia* spec. aff. *longula*. *C. aff. longula* will be described in a separate paper.

3.2.2 *Cheilosia flavissima* Becker, 1894; **stat. rev.** (figs 4, 5)

Material studied: Holotype ♀, with the following labels (fig. 4): 1) "*flavissima* Beck. det. Becker.", 2) "*flavissima* B: Beck." [in Beckers hand], 3) "Alte Sammlung", 4) "Holotype *Cheilosia flavissima* Beck. det. Claußen & Stähls 2006" [red label, added by the authors], NMW. – 1 ♀ Finland, N: Helsinki, 667:38, Herttoniemi, 25.06.2004, Sakari Kerppola leg. DNA voucher specimen, No. Y206, G.Stahls, FMNH, Helsinki, Finland





Figs 1-3: *Cheilosia thessala* spec. nov. – 1. ♀ head, lateral (photo J.-H. Stuke); – 2. ♀ hind tarsus; – 3. ♂ head, lateral. – **Fig. 4:** *Cheilosia flavissima* Becker; labels of holotype. – lc sc = lower corner of subcranial cavity; ta = tarsomere.
Fig. 5-6: *Cheilosia* spec., ♀ frons. – 5. *Cheilosia flavissima* Becker; – 6. *Cheilosia pallipes* Loew. – **Fig. 7:** *Cheilosia thessala* spec. nov., ♂ right wing.

(in ZMH). 1 ♀ Finland, Obs: Liminka, 719: 42, Tupos, 4.7.2002, Teppo Mutanen leg. (in ZMH). 1 ♀ Sweden, "Nb, Högsböle, S. Lundberg, 6/8 – 00", HB. 2 ♀ Bajkalskij zap., Tanhoj, 19.-20. VIII. 1980, A. Barkalov leg; Flower Angelica spp. 2 ♂ Altai, 7 km west of Katanda, 27.06.1983, A. Barkalov leg., all CC.

C. flavissima was described from an unique female in the 'Vienna collection' ("Wiener Sammlung"), at that time labelled by J. Winnertz as "nov. spec." (Becker 1894: 371). A type locality is not given. However, the species was erroneously listed under the species known from that part of Central Europe which includes Germany, Denmark, Bohemia and Lower Austria (Becker 1894: 511). The specimen now in the NMW lacks the Winnertz label, but otherwise fits fully with the original description, and is accepted here as the holotype.

Doesburg (1959) introduced to the list of palaearctic *Cheilosia* species the name *Cheilosia pallipes* Loew, 1863, as a supposed senior synonym of *C. flavissima*. From the descriptions of both included species (Becker 1894, Fluke & Hull 1945), and on the base of material of *C. pallipes* from Canada (Ontario) and the United States (Maine), we are of the opinion that two different species are involved. Based on the diagnostic characters given in the key below, *Cheilosia flavissima* Becker, 1894, stat. rev., is considered to be a distinct species and not a junior synonym of *Cheilosia pallipes* Loew, 1863.

3.2.3 *Cheilosia thessala* spec. nov. (figs 1-3, 7-9, 14, 15, 17, 20-25)

Holotype: ♂, Greece, Thessaly. "Platania/Volos GR 21.10.2000 leg. Lisa Standfuss".

Paratypes: All paratypes with the same locality as the holotype: 1 ♂ 5.IX.1999, leg. Lisa Standfuss / "*Cheilosia* cf. *soror* (Z.) det. K. Standfuss 2000"; 1 ♀ 23.IX.2001, leg. K. Standfuss; 1 ♀ 23.IX.2002, leg. K. Standfuss / "♀ *longula* Gr."; 1 ♂ 6 ♀ 23.IX.2004, leg. K. Standfuss / (1); 1 ♀ 23.IX.2004, leg. Lisa Standfuss / (1); 1 ♂ 26.IX.2004, leg. K. Standfuss / (1); 1 ♀ 2.X.2004, leg. K. Standfuss / (1); 1 ♀ 5.X.2000, leg. Lisa Standfuss; 1 ♂ 7.X.2000, leg. Lisa Standfuss; 1 ♂ 1 ♀ 7.X.2000, leg. K. Standfuss; 2 ♂ 8.10.2000, leg. Lisa Standfuss; 3 ♀ 10.X.2000, leg. K. Standfuss; 2 ♀ 12.X.2000, leg. K. Standfuss; 1 ♀ 15.X.2000, leg. K. Standfuss; 1 ♀ 21.X.2000, leg. Lisa Standfuss; 1 ♂ 22.X.2000, leg. Lisa Standfuss.

Holotype and paratypes have been labelled accordingly. Provisional identification labels have been left on the pins of individual paratypes as follows: (1) = "*Ch. longula* Gr. ♂ (♀) det. K. Standfuss 2004".

Deposition of holotype and paratypes: Holotype and female paratype in ZMHU, 1 ♂ and 1 ♀ paratypes in ZMH, 1 ♂ and 1 ♀ paratypes in ZMISEA, 1 ♀ paratype in coll. J.-H. Stuke, 3 ♂ and 3 ♀ paratypes in coll. CC, other paratypes in coll. Lisa and K. Standfuss.

Etymology: named after the Greek region Thessaly, where the type locality is situated.

Diagnosis: Closely resembling *C. scutellata*. Male and female of *C. thessala* spec. nov. may be separated from other European species of the *longula*-group by the features given in the key below.

Distribution: Up to now known only from the type locality.

Ecology: *Cheilosia thessala* spec. nov. was netted along tracks and at the edges of pine forest (*Pinus pinea* L., *Pinus halepensis* Mill.) or its remnants, in the olive-tree-zone. The flight period is restricted to September and October, following the first rainfalls after the summer drought, and coincides with the fruiting of some large basidiomycete fungi (e.g. *Amanita caesarea* and *Suillus granulatus*). However, breeding records for *C. thessala* are lacking.

Description:

♂: Ground colour of integument black, with pale reddish-yellow portions of the legs.

Head (fig. 3): Eyes bare, except for scattered very short pile, discernable under strong light and high magnification. Angle of approximation of eyes 94-97°. Frons non-pollinose, with longitudinal sulcus, densely punctured, long black pilose, except for glossy lateral margins. Lunule brownish-black, its medial process short and pointed, not fused with facial integument. Antennal fossae confluent. Eye contiguity somewhat variable, a:b ratio = 1.4-1.8 (fig. 8). Vertex usually faintly pollinose, with dense black or mixed black and yellowish pile. Ocellar triangle elongate, distance between anterior and posterior ocelli about 1.3 times as long as distance between posterior ocelli. Face thinly, whitish pollinose laterally, below facial tubercle, with grey pollinose triangular spots at each side below antennae and with a small pollinose patch medially below antennal fossae, forming an incomplete pollinose fascia. Facial tubercle exceptionally broad (fig. 9), reaching parafacialia on each side, usually appearing semicircular viewed from above, but vaguely conical in individual specimens. Lower anterior corner of subcranial cavity much less protruding than facial tubercle. Parafacialia narrow, not wider than diameter of scape, thinly grey pollinose, with short whitish pile. Occiput greyish pollinose, whitish pilose below and at sides, with yellowish and black pile and a few black setulae behind upper eye margin. Antennae (fig. 14) with basoflagellomere somewhat variable, 1.1-1.2 times as long as wide, usually obscurely orange-yellow, but almost entirely black in one of the specimens; arista pale or more or less darkened apically, distinctly pilose.

Thorax: Scutum and scutellum shining, moderately fine punctate, thinly grey pollinose on posterior part of postpronotum and on notopleuron, brownish pollinose on base of scutellum, pile longish of about the same length, but becoming longer in front of scutellum and on scutellar disc, erect, predominantly yellowish or pale reddish-yellow centrally, but with black pile intermingled or almost entirely black pilose on presutural scutum, notopleuron, supraalar region and postalar callus. Black setae of varying thickness, length and number on notopleuron, supraalar region, postalar callus and hind margin of scutellum. Pleurae thinly grey pollinose, posterior anepisternum

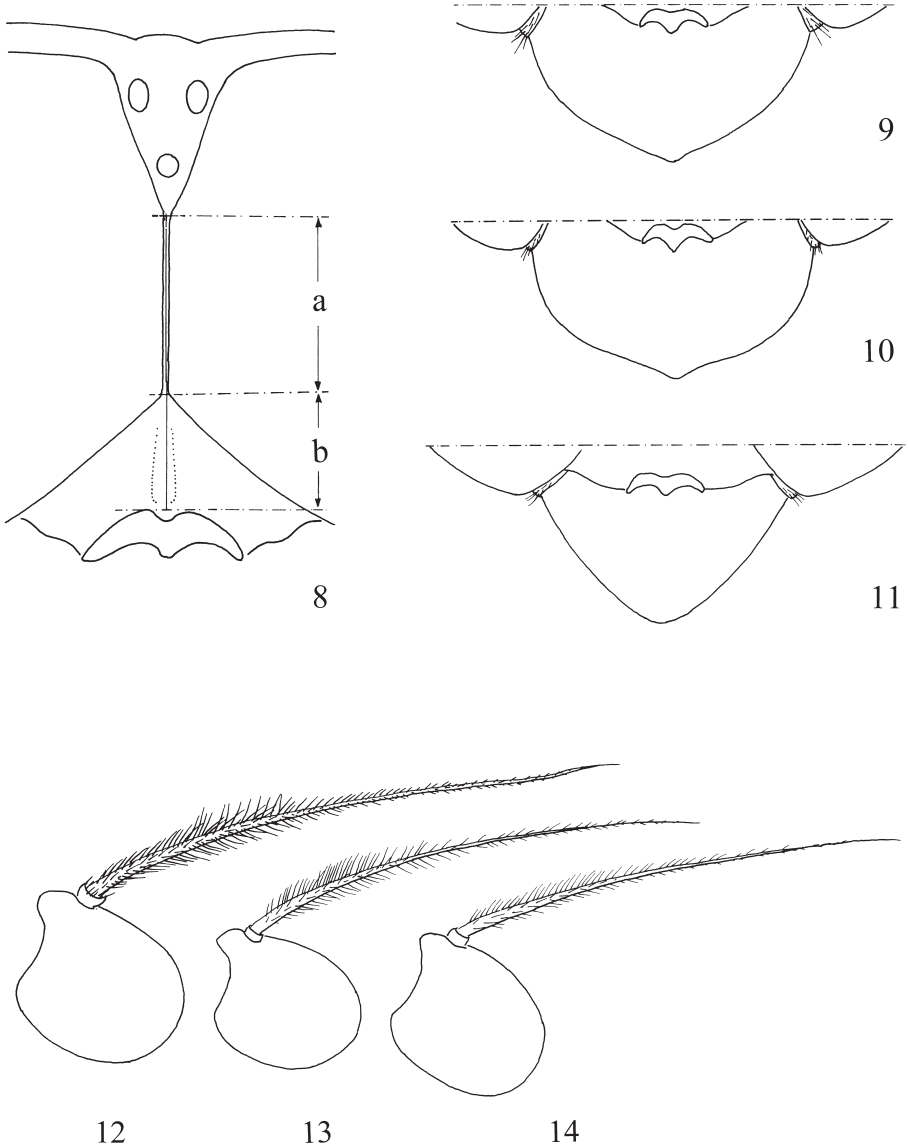


Fig. 8: *Cheilosia thessala*, ♂ head, detail. – **Figs 9-11:** *Cheilosia* spec., ♂ facial tubercle, dorsal. – 9. *C. thessala*; – 10. *C. scutellata*; – 11. *C. longula*. – **Figs 12-14:** *Cheilosia* spec., ♂ antenna, detail, inner surface. – 12. *C. soror*; – 13. *C. scutellata*; – 14. *C. thessala*.

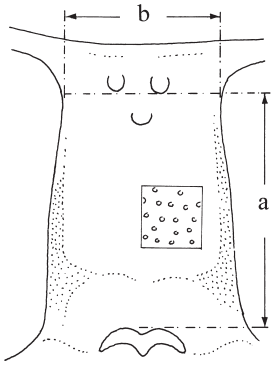
and anepimerum with mixed, pale and black pile; katepisternum with upper and lower patches of pale pilosity narrowly separated on ventral one third of sclerite, anterior anepisternum non-pilose. Posterodorsal corner of posterior anepisternum usually with a black seta. – Legs: Coxae black, grey pollinose, but fore coxae usually brownish apically. Trochanter brownish. Femora black, grey pollinose, with extreme bases and apices yellowish, the yellow portions on anterior surface of femora more extended than posteriorly, occupying up to apical one third of femur. Tibiae yellow with submedial black ring, occupying one third to two fifths of fore and mid tibiae and about one half of hind tibia. Tarsi somewhat variable, usually 2-3 basal tarsomeres of fore and mid legs yellow, at least so at sides and below, dorsally often darkened; hind tarsi black dorsally. Vestiture of legs: Fore and mid femora anteriorly with short pale pile, posteriorly with a fringe of longish, mixed pale and black pile on fore femur and long pale pile on mid femur; hind femur anteriorly with short, pale pile in basal half and short, black pile in about apical half, anterodorsally with a fringe of long pale pile, but without an antero-ventral row of widely spaced, long, pale setae, as found in the males of *C. scutellata* and *C. soror*. Full length of ventral surface of hind femur usually with black setulae. Tibiae and tarsi with short, mixed pale and black pile; mid tarsi ventrally with the usual set of black setulae. – Wing (Fig. 7) distinctly brownish infuscated in apical half, between costa and about the middle of cell R4+5. Calypters whitish to pale brownish. Haltere with pale yellow capitulum and brownish stem.

Abdomen: dorso-ventrally compressed, tergites entirely brownish pollinose, but less thickly so on anterior lateral corners of tergites 2-4; pile on tergum 1 whitish-yellow, long and erect laterally, short and depressed medially; tergites 2-4 with erect pale pile laterally and depressed, mixed pale and black pile medially; hind corners of tergum 3 with a few thin black setae, hind corners of tergum 4 with some black pile and longish black setae, individual thin black setae also extend along hind margin of tergum 4. Sternum 1 entirely grey pollinose; sternites 2-4 usually with weakly pollinose areas along base and sides; pile on the two basal sternites long, pale erect; sternites 3 and 4 mainly with depressed, short black setulae, however some erect pale pile along pollinose areas.

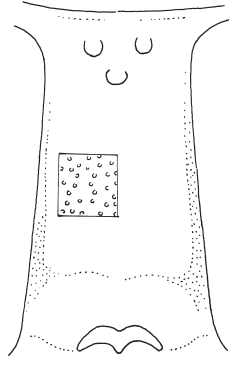
Terminalia (figs 20-25): Epandrium normal, apicodorsal emargination distinctly deeper than in *C. scutellata*; surstylus, in dorsal view, with almost straight inner margin; gonostyli asymmetrical, dorsal lobes of gonostyli rudimentary, with remnant of a ctenidion; ventral lobe of left gonostylus with shallow convex apical margin and subapical emargination; right ventral lobe longer than left one, with pointed apex, strongly curved mediad and crossing left lobe.

Size: Body length 7.8-9.3 mm, wing length 6.3-7.5 mm.

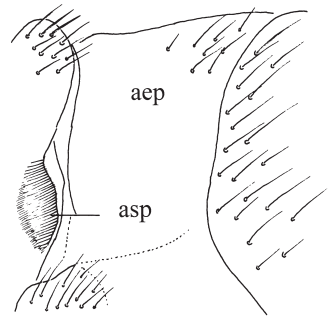
♀: Head: Frons wide, a:b ratio = 1.6 (fig. 15), with a shallow, transverse sulcus above lunule and with narrow, somewhat ill-defined lateral channels along eye margins; frons less densely punctate than in *C. scutellata*, glossy, except for partly pollinose lateral channels and some faint dusting along transverse sulcus; frontal pile erect, distinctly shorter than in *C. scutellata*, mainly pale, but often black laterally in front of ocellar



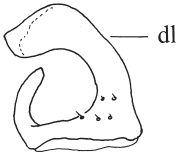
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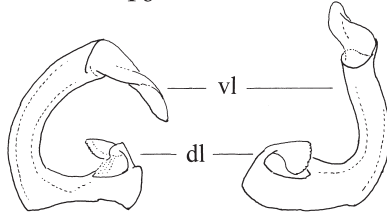
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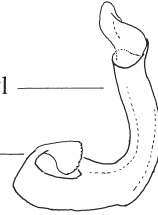
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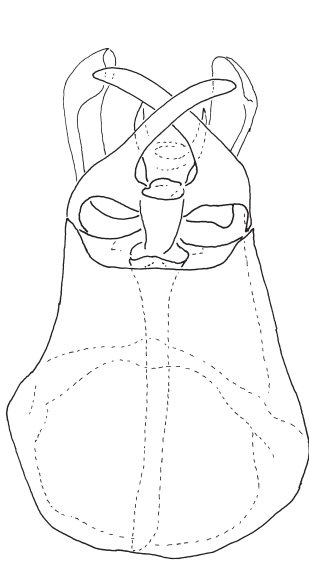
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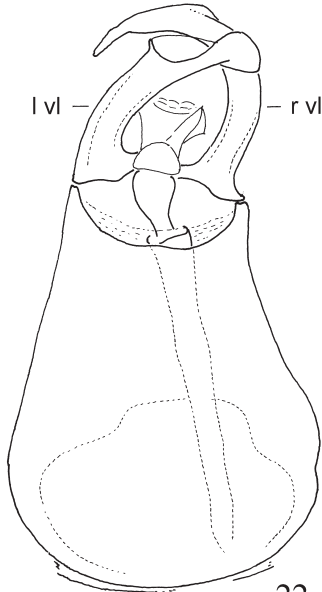
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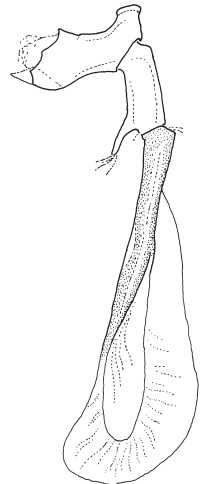
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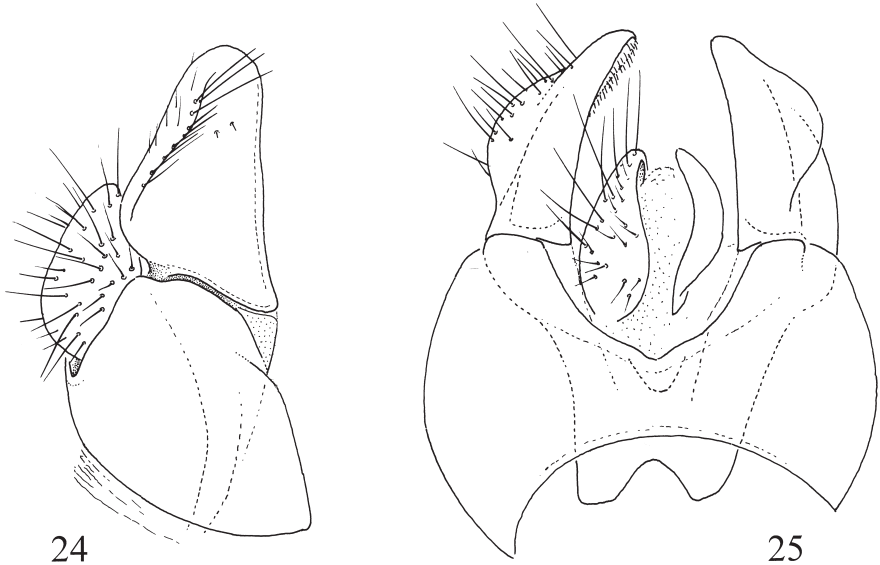
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Figs 24-25: *Cheiliosia thessala* spec. nov. ♂. – 24. epandrium, lateral; – 25. epandrium, dorsal.

triangle and adjacent to frontal lunule. Face below facial tubercle at each side with a yellow macula (fig. 1). Basoflagellomere slightly larger than in the male.

Thorax: Postpronotum usually pale yellow, rarely partly darkened. Scutum entirely covered in short, depressed yellow pile, with clearly visible setae as follows: 2 notopleural, a set of about 10 supra-alar and 2-3 postalar; anterior corner of postalar callus usually with 1-3 additional, small black setulae. Scutellum with apical one third to one half and ventral surface yellow, pile on scutellar disc similar to that of the scutum, hind margin of scutellum with 6 black or yellow setae, the median ones about 0.8 times as long as length of scutellum. Pleural pile shorter than in the male, entirely pale, usually 1 anepisternal seta. – Legs generally paler than in the male, almost entirely pale pilose, the black rings on fore and mid tibiae usually weak; third and fourth tarsomeres of mid and hind legs dilated (fig. 2). – Wing darkened similarly to the male (fig. 7), with bare areas medially along basal two thirds of cell BM and anterobasally on cell CuP.

Figs 15-16: *Cheiliosia* spec., ♀ frons, inset showing density of punctuation. – 15. *C. thessala*; – 16. *C. scutellata*. – **Fig. 17:** *Cheiliosia soror*, anepisternum. – **Figs 18-19:** *Cheiliosia scutellata*, male terminalia. – 18. right gonostylus; – 19. hypandrium with gonostyli, ventral. – **Figs 20-23:** *Cheiliosia thessala*, male terminalia. – 20. right gonostylus; – 21. left gonostylus; – 22. hypandrium with gonostyli, ventral; – 23. phallus, lateral. – aep = anterior anepisternum; asp = anterior spiracle; dl = dorsal lobe of gonostylus; l vl = left ventral lobe of gonostylus; r vl = right ventral lobe of gonostylus.

Abdomen: flat, tergites 1-3 weakly pollinose, however sides and basal corners glossy; pilosity as in the male, but without black pile and black setae on hind corners of tergites 3 and 4. Sternites entirely pollinose, with the same pattern of pale pile and black setulae as in the male, but the pile generally shorter. In individual mature females sternites 2- 4 can be entirely or partly reddish-yellow.

Size: Body length 6.6-8.8 mm, wing length 5.6-7.7 mm.

4 Key to the known European species of the *Cheilosia longula* species-group, including *C. pallipes* (Nearctic)

Remarks: Pale portions of the integument vary in colour intraspecifically from pale yellow to reddish-yellow. For all pale portions the term "yellow" is used in the key.

- 1 Anterior anepisternum postero-dorsally with some long outstanding pile (fig. 17); basal one third to basal half of arista usually with dense black pile (fig. 12).
..... *C. soror* (Zetterstedt)
[Basoflagellomere orange to brick-red, sometimes with dark apex; pile of arista much shorter than in fig. 12 and pale in specimens from Morocco].
- anterior anepisternum without long outstanding pile postero-dorsally; basal portion of arista with less dense or shorter dense hairs (figs 13,14) 2
- 2 Holoptic: males 3
- dichoptic: females 7
- 3 Frons entirely grey pollinose; scutum almost wholly grey pollinose. Northern Palaearctic *C. flavissima* Becker
- frons black, glossy, or partially rugose and matt, but not pollinose; scutum black, extensively glossy, or with 5 longitudinal, sometimes somewhat indistinct, brownish pollinose vittae 4
- 4 Facial tubercle exceptionally broad, reaching parafacialia on each side, appearing semicircular when viewed from above (figs 9, 10) 5
- facial tubercle appearing conical from above (fig. 11) 6
- 5 Wing anteriorly with apical portion between costa and middle of cell R4+5 distinctly brownish tinged (fig. 7); dorsal lobes of gonostyli rudimentary; ventral lobes of gonostyli asymmetrical (figs 20-22). Greece: Thessaly
..... *C. thessala* spec. nov.
- wing clear, or at most faintly yellowish-brown tinged; dorsal lobes of gonostyli distinct; ventral lobes of gonostyli roughly symmetrical (figs 18, 19)
..... *C. scutellata* (Fallén)
- 6 Basal tarsomeres of all legs normally yellow, except for basotarsomeres of fore and hind legs which may be darkened dorsally; fore coxa yellowish-brown; fore

- and mid femora frequently extensively yellow, and hind femur frequently yellow basally. Nearctic *C. pallipes* Loew
- tarsomeres usually mostly black dorsally, but basotarsomere of mid leg occasionally yellow; fore coxa black; femora black with apices narrowly yellow
..... *C. longula* (Zetterstedt) (= *C. plumulifera* Loew)
- 7 Femora of fore and mid legs entirely or extensively yellow; hind femur usually extensively yellow on basal half or more 8
- femora of all legs black, but extreme base and up to apical half of anterior surface sometimes yellow 9
- 8 Scutellum entirely yellow; sides of frons right above lateral arms of lunule grey pollinose (fig. 5). Northern Palaearctic *C. flavissima* Becker
- Scutellum yellow with basal one fourth to basal half black to brownish; sides of frons right above lateral arms of lunule glossy (fig. 6). Nearctic
..... *C. pallipes* Loew
- 9 Facial tubercle exceptionally wide, reaching parafacialia on each side, appearing semicircular viewed from above (as in figs 9, 10); 2-3 basal tarsomeres of fore and mid legs usually extensively yellow, tarsomeres 4 (and 3) of mid and hind legs dilated (as in fig. 2); tibia of fore and mid legs yellow, with a submedial black ring not wider than half the length of tibia and often faint; wing with cells BM and CuP basally with small bare areas 10
- facial tubercle appearing conical, viewed from above (as in fig. 11); tarsomeres of fore and mid legs usually blackish dorsally, on mid leg sometimes only faintly so, rarely entirely yellow; tarsomeres 3-4 of mid and hind legs undilated; tibia of fore and mid legs usually predominantly black; wing entirely microtrichose....
..... *C. longula* (Zetterstedt) (= *C. plumulifera* Loew)
- 10 Wing anteriorly with apical portion between costa and middle of cell R4+5 distinctly brownish tinged (as in fig. 7); frons wide, distance between anterior margin of hind ocelli and upper margin of lunula 1.6 times as long as width of frons at level of hind ocelli (fig. 15, a:b = 1.6); puncturation of frons less dense than in *C. scutellata* (fig. 15, inset). Greece: Thessaly ... *C. thessala* spec. nov.
- wing clear, or at most faintly tinged yellowish-brown; frons narrow (fig. 16, a:b = 1.9); puncturation of frons dense (fig. 16, inset). *C. scutellata* (Fallén)

5 Discussion

Ståhls et al. (2004) reported uncorrected pairwise sequence divergences for the COI gene ranging from 5-12% between *Cheilosia* species from different subgenera. Milanov et al. (2005) found 5% uncorrected sequence divergence between *C. canicularis* (Panzer) and *C. orthotricha* Vujić & Claussen, but only 0.68% between *C. canicularis* and *C. himantopus* (Panzer), all belonging to *Cheilosia* s.str. The uncorrected pairwise

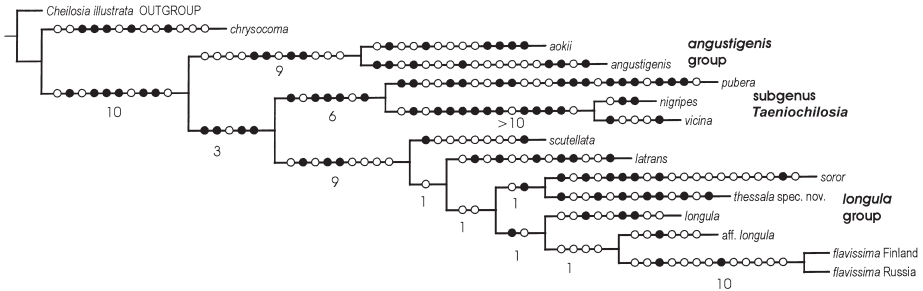


Fig. 26: Most parsimonius cladogram resulting from parsimony analysis of 660 nt of the mitochondrial COI gene. Length 291 steps, CI=0.69, RI=0.65. Bremer support values are shown below the branches. Nonhomoplasious changes indicated as filled circles, homoplasious as open circles.

sequences divergences obtained in the present study are within same order of magnitude as results in these previous studies.

Ståhls et al. (2004) did not recover the subgenus *Eucartosyrphus* sensu Barkalov (2002) as monophyletic, as its putative member species *C. aokii* and *C. angustigenis* grouped in a different clade from members *C. scutellata*, *C. longula* and *C. latrans*. The present analysis is based on a smaller fragment of the COI gene (660 nt vs 1183 nt in the previous study), but our results support earlier conclusions. The *longula*-group was recovered as a monophyletic, well-supported clade, and the two members of the *angustigenis*-group were recovered as sister taxa, also well-supported (fig. 26). *C. scutellata* was recovered as sister group of all *longula*-group taxa. *C. thessala* was resolved as sister taxon to *C. soror*, but support was low (uncorrected pairwise divergence between the taxa was 5%). *C. longula* and *C. aff. longula* are supported as different taxa based on both our molecular and morphological results. *C. aff. longula* will be described in a separate paper.

The *longula*-group is also supported as monophyletic by the supposed morphological and biological synapomorphies mentioned above. *C. scutellata* is segregated from the rest of the included species of the *longula*-group, by primitive character states of the ventral gonostylar lobes: a) right and left lobes roughly symmetrical; b) apices of ventral lobes not structurally modified. This result would support the basal position of *C. scutellata* in the clade.

Acknowledgements

The first author is particularly grateful to Mrs Lisa Standfuss and Prof Dr K. Standfuss (Dortmund) for loan and donation of material, for valuable discussions and for observations on details of the Greek fauna and localities. We thank Mr H. Bartsch (Järfälla), and Mr P. Sehnal, Naturhistorisches Museum Wien (Vienna), for the loan of material. Dr A. V. Barkalov (Novosibirsk), Mr A. Haarto (Mietoinen), Mr S. Kerppola (Helsinki) and Dr J.-H. Stuke (Leer) provided specimens for molecular analysis. We also thank Mr H. Bartsch (Järfälla) for valuable information on the syntypes of *C. longula* and other Scandinavian species of the *longula*-group;

Mrs E. Rätzel (Helsinki) for translations of Russian inscriptions; and Dr J.-H. Stuke (Leer) for providing one of the photographs. We also want to thank Dr. Martin C. D. Speight for kindly improving the English of this contribution.

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Jahr/Year: 2007

Band/Volume: [8](#)

Autor(en)/Author(s): Claußen Claus, Stahls Gunilla

Artikel/Article: [A new species of Cheilosia Meigen from Thessaly /Greece, and its phylogenetic position \(Diptera, Syrphidae\) 45-61](#)