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Chrysoclista germanica sp. nov. and *C. gabretica* stat. nov., with an updated checklist of the genus (Lepidoptera: Elachistidae: Parametriotinae)

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Abstract. *Chrysoclista germanica* sp. nov. is described from Germany (Thuringia, Bad Blankenburg). *Chrysoclista gabretica* Šumpich, 2012 stat. nov., originally described as subspecies of *C. abchasica* Sinev, 1986, is elevated to species level. Both taxonomic acts are based on the study of morphological characters of the adults (males). Photographs of voucher specimens including genitalia structures are given.

Key words. Lepidoptera, Elachistidae, Parametriotinae, taxonomy, new species, Czech Republic, Bohemia, Germany, Central Europe, Palaearctic Region

Introduction

The true members of the genus *Chrysoclista* Stainton, 1854 are characterized by considerable similarities in the forewing pattern and were therefore attributed to only four species a few decades ago. Only in the second half of the 20th century three further species were described, two from Georgia (Sinev 1979, 1986) and one from Central Europe (Karsholt 1997). Further three taxa were distinguished and subsequently described after 2000, namely from North America (Koster 2002), Central Europe (Šumpich & Skyva 2012) and Turkey (Seven 2014). Recently, *Chrysoclista* is a genus with 11 species, likely restricted to the Holarctic Region (see Table 1). The generic position of other exotic species previously accommodated in *Chrysoclista* was revised recently or requires revision (Moriuti 1975, Kuroko 1982, Sinev 2015; Sinev, pers. comm.) (see Table 2).

The Central-European taxon, *C. gabretica* Šumpich, 2012, was initially described as subspecies of *C. abchasica* Sinev, 1986, based on high similarity in external characters. Lack of material led to this decision despite of minute differences in male genitalia. Recently *C. gabretica* was recorded from Italy and Austria (Huemer 2016) and the dissection of genitalia as well as comparative study of DNA barcodes showed full compliance of those specimens with the holotype of *C. gabretica*. These additional samples furthermore proved the presence of diagnostic characters and therefore support species-level status of *C. gabretica* stat. nov.

During the recent years, we tried to find additional material of *C. gabretica* in various museum and private collections. With exception of the aforementioned Italian and Austrian records (Huemer 2016), we found only one male specimen from Germany in the Museum für Naturkunde in Berlin resembling *C. gabretica* at first glance. Surprisingly, the dissection of its genitalia undoubtedly proved it belongs to another, yet undescribed species which is described in this paper.

So far only males of *C. abchasica*, *C. gabretica*, *C. germanica* sp. nov., *C. ankaraensis* Seven, 2014, and *C. zagulajevi* Sinev, 1979 are known. Moreover, with the exception of *C. gabretica*, only holotypes are avalaible for all these taxa.

Material and methods

Our study is based on original material from various collections (see below) and also on published records if documented accurately.

We tried to obtain DNA barcode sequences from important material, i.e. a 648 base-pair long segment of the 5' terminus of the mitochondrial COI gene (*cytochrome c oxidase 1*). DNA samples (a dried leg) were prepared according to the prescribed standards in DeWaard et al. (2008). Legs from all three presently known specimens of *C. gabretica* were processed at the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph) using the standard high-throughput protocol described in De Waard et al. (2008). Altogether we had access to 24 sequences of *Chrysoclista* spp. in the Barcode of Life Data Systems (BOLD; Ratnasingham & Hebert 2007). Further details including complete voucher data and images can be accessed in the public dataset "Lepidoptera of Europe – Chrysoclista" dx.doi.org/10.5883/DS-LEEUCHRY in BOLD. Degrees of intra- and interspecific variation of DNA barcode fragment were calculated under Kimura 2 parameter model of nucleotide substitution using analytical tools of BOLD systems v. 3.0. (http:// www.boldsystems.org). A neighbour-joining tree of DNA barcode data of European taxa was constructed using Mega6 (Tamura et al. 2013) under the Kimura 2 parameter model for nucleotide substitutions.

Genitalia preparation included the maceration of broken abdomen in 20% potassium hydroxide (KOH) solution in a double-boiler for 4 minutes and subsequent dissection of genitalia from abdomen and repetitive washing in water with additive of soaking agent (ca. 2%). Clean genitalia are stored in plastic tube with glycerol on the pin together with the specimen. Photographic documentation of adults was made by using of Canon G12 with B.I.G. Medical macro CU +8dpt. Photograph of genitalia were taken with a Canon EOS 1100D installed in microscope Olympus BX41 with a 10× objective and 10× ocular. All photos were edited in

Helicon Focus 6.3.5 Pro and Adobe Photoshop CC.

Examined material is deposited in the following collections:

NMPC National Museum, Praha, Czech Republic;
TLMF Tiroler Landesmuseum Ferdinandeum, Innsbruck, Austria;
ZMHB Museum für Naturkunde, Berlin, Germany.

Taxonomy

Chrysoclista gabretica Šumpich, 2012 stat. nov.

(Figs 1–3, 6–7, 11–13)

Chrysoclista abchasica gabretica Šumpich, 2012 in Šumpich & Skyva (2012): 164–165 (original description).

Type material examined. Holotypus: ♂, **CZECH REPUBLIC: Bohemia:** 'Bohemia mer.[idionalis] (CZ) / Šumava M[oun]t[ain]s. – 1195 m / Smrčina – Seitz.[ova] cesta / 48°45′01″N 13°55′41″E / 19.9.2005 / Jan Šumpich leg.' (NMPC).

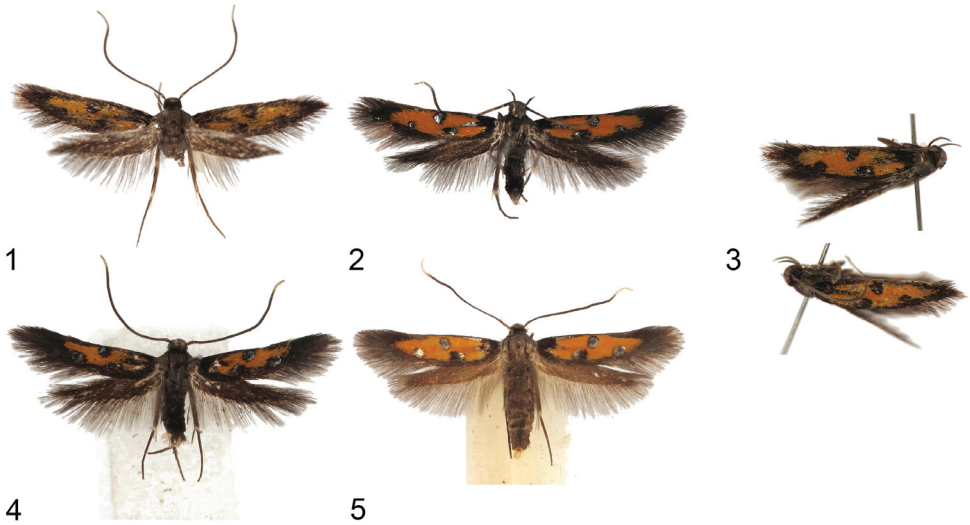
Additional material examined. AUSTRIA: Tirol: Innsbruck, Kranebitter Klamm, 750–780 m a.s.l., 47°16′21″N, 11°19′45″E, 26.vi.2005, 1 ♂, P. Huemer leg. (TLMF). **ITALY: Trentino-Südtirol:** Eppan, Mendel Furgglauer Schlucht env., 940 m a.s.l., 46°39′26″N, 10°28′41″E, 18.vi.2014, 1 ♂, P. Huemer leg. (TLMF).

Diagnosis. ***Adult.*** *Chrysoclista gabretica* is externally very similar to *C. linneella* (Clerck, 1759), *C. abchasica* and *C. germanica* sp. nov. Unlike all other species, *C. linneella* has the most bright and extensive orange coloration of the forewings, the black basal streak with silver scales is very short or absent (Fig. 5), and the labial palpi are mostly ochreous, only the third segment can be brown (Figs 9–10). Based on the original description (Sinev 1986) and later diagnosis (Koster & Sinev 2003), *C. abchasica* has a slightly deviating dark edge of the forewings (Fig. 4) but reliable differentiation of *C. gabretica* and *C. abchasica* should be based on genitalia characters. *Chrysoclista germanica* sp. nov. has the darkest overall appearance and furthermore differs from related species by the short and silvery labial palpi (Fig. 8).

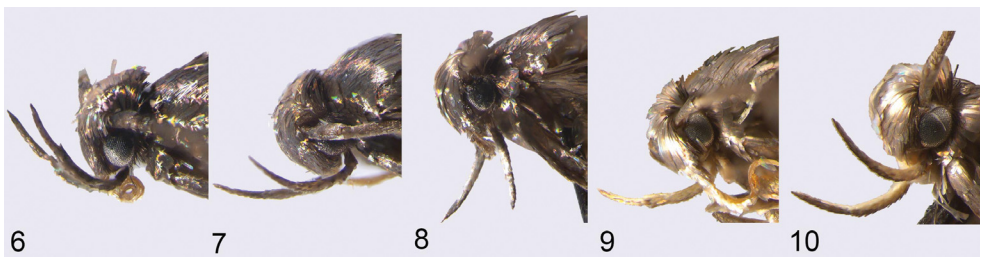
Male genitalia. Very similar to *C. abchasica* and to some extent also to *C. zagulajevi*. From *C. zagulajevi* it differs mainly by the shape of the valva and by the characteristic row of cornuti in the phallus. Unlike *C. abchasica*, *C. gabretica* has a distinctly curved phallus (almost 90 degrees), and a more regularly rounded distal part of the valva (Figs 11–12). Furthermore the sclerotized apical ridge of the phallus has a larger number of thorns (ca. 9 in *C. gabretica*, 5 in *C. abchasica*) (Figs 12a, 14). Finally the shape of the anellus lobes is species specific. It is nearly rectangular and dorsally only slightly bulged in *C. gabretica* but distinctly bulged with conspicuous caudo-ventral prolongation in *C. abchasica*.

Female genitalia. Unknown.

Molecular data. BIN URI: BOLD: ACR3890. The intraspecific divergence of the barcode region is 0.0% (n = 3). The minimum distance to the nearest neighbor in BOLD, *C. linneella* (BOLD:AAD0241), is 7.26%. Similarly the interspecific distances of both additional barcoded species of *Chrysoclista* in BOLD, viz. *C. linneella* and *C. lathamella* Fletcher, 1936 are large but the intraspecific divergence in both taxa is considerable with two BIN-clusters in each, indicating possible cryptic diversity (Fig. 18).



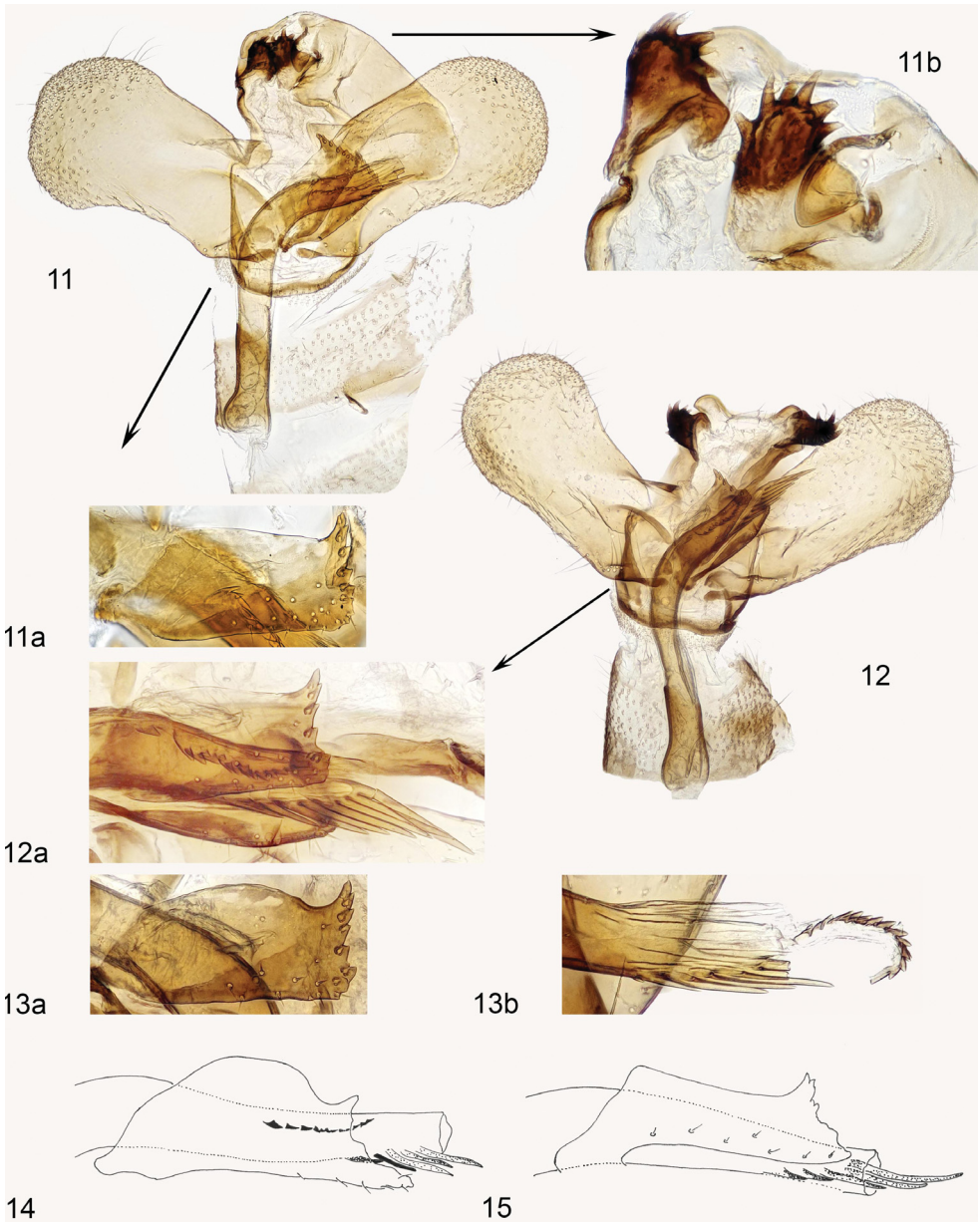
Figs 1–5. Voucher specimens of *Chrysoclista*, males. 1–3 – *C. gabretica* Šumpich, 2012: 1 – Czech Republic, holotypus (10.5 mm); 2 – Italy (12 mm); 3 – Austria (12 mm). 4 – *C. germanica* sp. nov., holotypus (12 mm). 5 – *C. linneella* (Clerck, 1759), Poland, Wrocław, 1.viii.1881, ex. coll. O. Staudinger (ZMHB) (12.5 mm).



Figs 6–10. Heads of *Chrysoclista* species. 6–7 – *C. gabretica* Šumpich, 2012: 6 – Italy; 7 – Austria. 8 – *C. germanica* sp. nov. 9–10 – *C. linneella* (Clerck, 1759): 9 – Czech Republic, Prag (= Praha), 1870, ex. coll. F. A. & O. Nickerl (NMPC); 10 – Prag, 22.viii.1940, V. Vlach leg. (NMPC).

Biology. Early stages and host-plants are unknown but likely the species lives under the bark of a trunk of various tree, similar to the few documented observations in related species, e.g. *Ch. linneella* (Koster & Sinev 2003). The few adults known to date have been collected at artificial light. The habitat is similar at all known sites, with predominant montane *Piceetum* to *Fago-Piceetum*.

Distribution. Czech Republic (Šumpich & Skyva 2012), Austria, Italy (Huemer 2016).



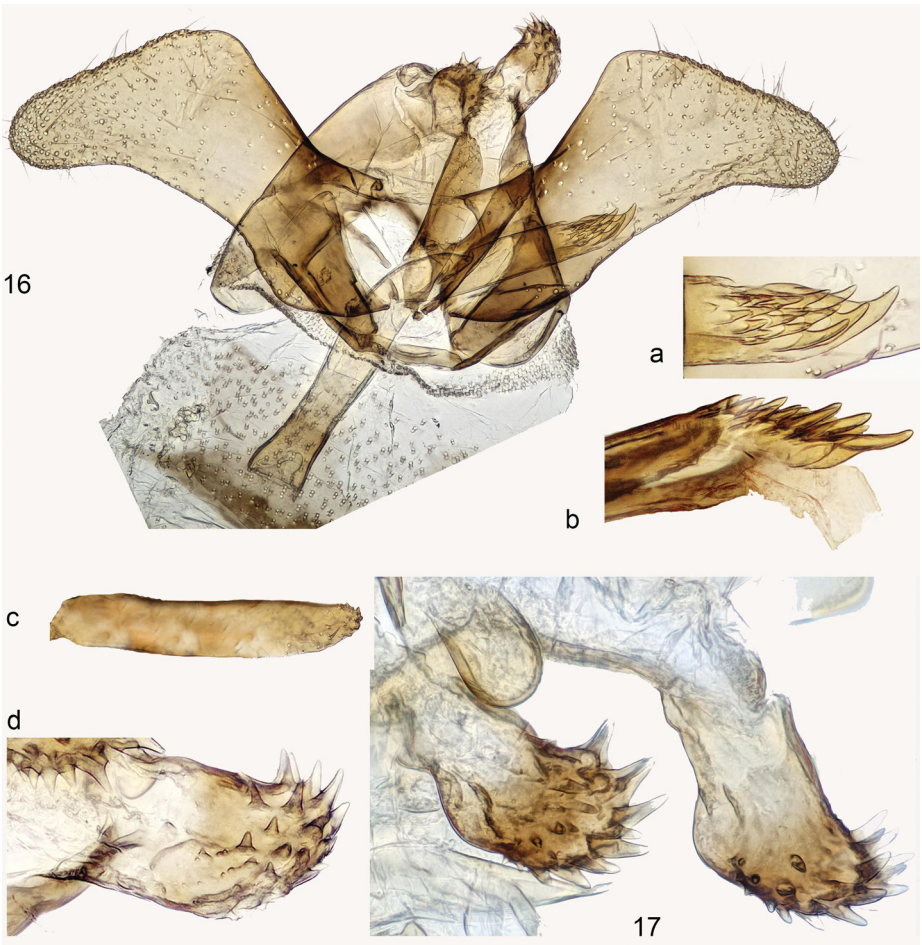
Figs 11–15. Genitalia of *Chrysoclista* species. 11–13 – *C. gabretica* Šumpich, 2012: 11 – Czech Republic, holotypus, general view (a – detail of anellus lobe, b – detail of gnathos); 12 – Italy, general view (a – detail of anellus lobe and terminal part of phallus with cornuti and apical thorns); 13 – Austria (a – detail of anellus lobe, b – terminal part of phallus with cornuti and apical thorns). 14 – *C. abchasica* (Sinev, 1986), detail of anellus lobe. 15 – *C. zagulajevi* (Sinev, 1979), detail of anellus lobe. (14–15 redrawn according to Koster & Sinev 2003).

Chrysoclista germanica sp. nov.

(Figs 4, 8, 16)

Type locality. Germany, Thuringia, Bad Blankenburg.
Type material. Holotype: ♂, '4.VII.1977 c [handwritten] / Blankenburg / Buntsandstein / Dr. Steuer' (ZMHB).

Diagnosis. Externally similar to *C. linneella*, *C. abchasica* and *C. gabretica* but slightly darker with reduced orange pattern and broader blackish-brown edge of the fore wings, particularly in the dorsal and terminal part, with both rounded dots integrated (Fig. 4). Significant diffe-



Figs 16–17. Genitalia of *Chrysoclista* species. 16 – *C. germanica* sp. nov., holotypus, general view (a–b – two different views of the terminal part of phallus with apical thorns, c – anellus lobe, d – gnathos). 17 – *C. linneella* (Clerck, 1759), detail of gnathos, England, ex. coll. Bang-Haas (ZMHB).

rences are found in the labial palpi which are comparatively short, only slightly curved and predominantly silvery. In the male genitalia the shape of the gnathos is similar to *C. linneella* (Fig. 17), whereas the shape of the anellus lobes resembles *C. splendida* Karsholt, 1997 and the Nearctic *C. villella* (Busck, 1904), though the combination of these characters is unique for *C. germanica* sp. nov. Moreover, the shape of the valva is unmistakable.

Description. ***Adult.*** Head and face covered by dark bronze scales with metallic shine. Labial palpi comparatively short, only slightly curved, covered with silvery scales, the third segment predominantly brown on ventral surface. Antennae filiform, brown with yellow tip. Wingspan 12 mm. Ground colour of fore wings dark orange, very broad dark brown edge particularly in the apical and terminal part. In the orange area three rounded silver-dusted black spots are present, one in the middle of the costal margin and two in the dorsum, together creating an almost regular triangle. Fringes dark brown in the colour of the edge. Hindwings dark brown, fringes long, in colour of wings.

Male genitalia. Vinculum broad, rounded. Uncus comparatively narrower. Dorsal processes in distal part of uncus small, rounded. Gnathos arms nearly regularly shaped, short and broad with approximately two dozens of thorns distally. Valva comparatively narrow, distinctly curved ventro-proximally, rounded terminally. Phallus pronouncedly curved, narrow, with a cluster of approximately two dozens of comparatively short spines in its terminal part. Anellus lobes elongated, digitate, rounded with numerous small bumps apically.

Female genitalia. Unknown.

Etymology. The species epithet is Latin adjective *germanicus* (*-a*, *-um*), given after the country of origin of the holotype (Germany).

Biology. Unknown.

Distribution. Germany (Bad Blankenburg) (this paper).

Table 1. Updated checklist of *Chrysoclista* Stainton, 1854.

C. abchasica (Sinev, 1986)	Georgia (Abkhazia)
C. ankaraensis Seven, 2014	Turkey (Ankara)
C. cambiella (Busck, 1915)	U.S.A. (Oregon, Idaho, Montana), Canada (British Columbia, Alberta)
C. gabretica Šumpich, 2012 **stat. nov.**	Austria, Czech Republic, Italy
C. germanica Šumpich & Huemer, **sp. nov.**	Germany
C. grandis Koster, 2002	U.S.A. (California, Colorado)
C. lathamella Fletcher, 1936 = *C. bimaculella* sensu Haworth (1828), nec Thunberg (1794) = *C. razowskii* Riedl, 1965	Central and Nothern Europe
C. linneella (Clerck, 1759) = *C. schaefferella* Duponchel, 1828 = *C. gemmatella* Costa, 1836	Europe, U.S.A. (eastern part), Canada
C. splendida Karsholt, 1997 = *C. bimaculella* auct. = *C. razowskii* auct.	Central Europe
C. villella (Busck, 1904)	U.S.A. (Washington), Canada (British Columbia)
C. zagulajevi Sinev, 1979	Georgia (Adzharia)

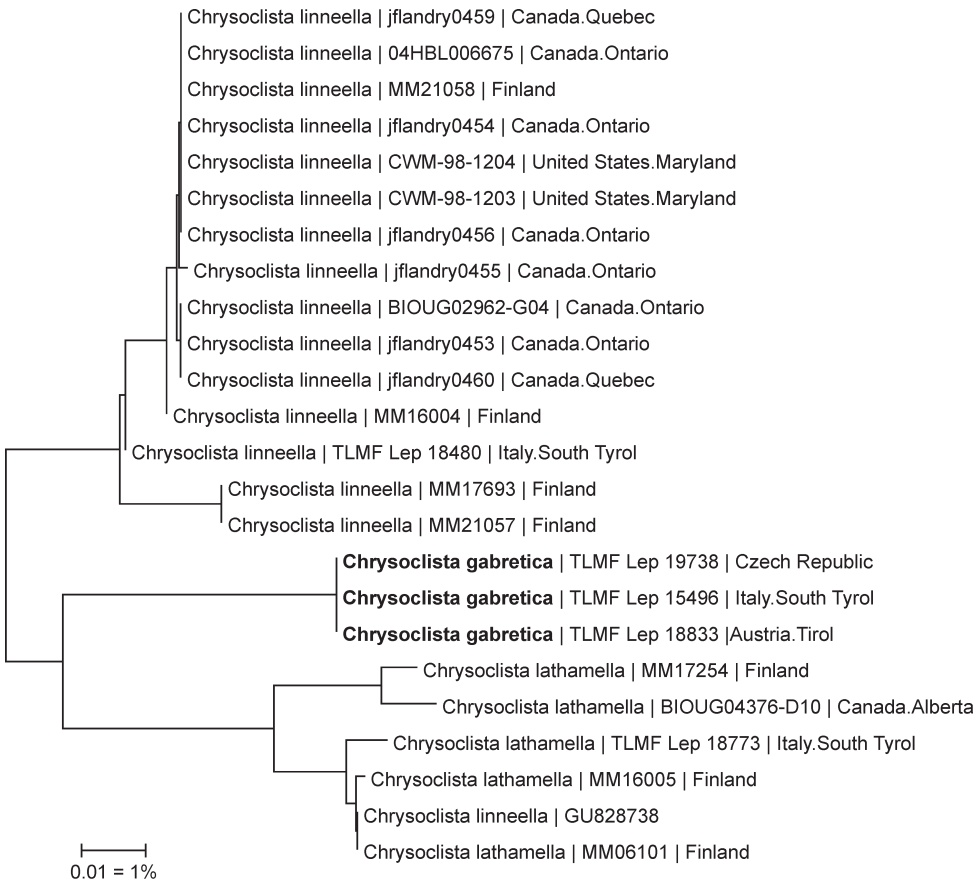


Fig. 18. Neighbour-joining tree (Kimura 2 parameter, built with MEGA 6; cf. Tamura et al. 2013). Source: DNA Barcode data from BOLD (Barcode of Life Database, cf. Ratnasingham & Hebert 2007).

Table 2. Checklist of species excluded or to be excluded from *Chrysoclista* Stainton, 1854.

C. basiflavella Matsumura, 1931 (Japan)	junior synonym of *Stathmopoda auriferella* (Walker, 1864) in Stathmopodidae (Moriuti 1975)
C. bicolorella Matsumura, 1931 (Japan)	unplaced species in Tineidae: Hieroxestinae (Sinev, pers. comm.)
C. hexachrysa Meyrick, 1935 (Japan)	*Pancalia hexachrysa* (Meyrick, 1935) in Cosmopterigidae (Kuroko 1982)
C. hygrophilella Viette, 1957 (Réunion Island)	*Stathmopoda hygrophilella* (Viette, 1957) in Stathmopodidae (Sinev 2015)
C. monotyla Meyrick, 1921 (Australia)	unplaced species in Chrysopeleiidae (Sinev, pers. comm.)
C. thrypsiphila Meyrick, 1912 (Ceylon)	unplaced species in Chrysopeleiidae (Sinev, pers. comm.)
C. trilychna Meyrick, 1928 (India)	unplaced species in Chrysopeleiidae (Sinev, pers. comm.)

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