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. gabetica* 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. gabetica* was recorded from Italy and Austria (Huemmer 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. gabetica*. These additional samples furthermore proved the presence of diagnostic characters and therefore support species-level status of *C. gabetica* stat. nov.

During the recent years, we tried to find additional material of *C. gabetica* in various museum and private collections. With exception of the aforementioned Italian and Austrian records (Huemmer 2016), we found only one male specimen from Germany in the Museum für Naturkunde in Berlin resembling *C. gabetica* 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 available 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 DeWaard 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
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)*


**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).
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).
**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-

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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.

<table>
<thead>
<tr>
<th><strong>Species</strong></th>
<th><strong>Country/Region</strong></th>
</tr>
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<tbody>
<tr>
<td><em>C. abchasica</em> (Sinev, 1986)</td>
<td>Georgia (Abkhazia)</td>
</tr>
<tr>
<td><em>C. ankaraensis</em> Seven, 2014</td>
<td>Turkey (Ankara)</td>
</tr>
<tr>
<td><em>C. cambiella</em> (Busck, 1915)</td>
<td>U.S.A. (Oregon, Idaho, Montana), Canada (British Columbia, Alberta)</td>
</tr>
<tr>
<td><em>C. gabretica</em> Šumpich, 2012 stat. nov.</td>
<td>Austria, Czech Republic, Italy</td>
</tr>
<tr>
<td><em>C. germanica</em> Šumpich &amp; Huemer, sp. nov.</td>
<td>Germany</td>
</tr>
<tr>
<td><em>C. grandis</em> Koster, 2002</td>
<td>U.S.A. (California, Colorado)</td>
</tr>
<tr>
<td><em>C. lathamella</em> Fletcher, 1936</td>
<td>Central and Northern Europe</td>
</tr>
<tr>
<td>= <em>C. bimaculella</em> sensu Haworth (1828), nec Thunberg (1794)</td>
<td></td>
</tr>
<tr>
<td>= <em>C. razowski</em> Riedl, 1965</td>
<td></td>
</tr>
<tr>
<td><em>C. linneella</em> (Clerck, 1759)</td>
<td>Europe, U.S.A. (eastern part), Canada</td>
</tr>
<tr>
<td>= <em>C. schaefereilla</em> Duponchel, 1828</td>
<td></td>
</tr>
<tr>
<td>= <em>C. gemmatella</em> Costa, 1836</td>
<td></td>
</tr>
<tr>
<td><em>C. splendida</em> Karsholt, 1997</td>
<td>Central Europe</td>
</tr>
<tr>
<td>= <em>C. bimaculella</em> auct.</td>
<td></td>
</tr>
<tr>
<td>= <em>C. razowski</em> auct.</td>
<td></td>
</tr>
<tr>
<td><em>C. villella</em> (Busck, 1904)</td>
<td>U.S.A. (Washington), Canada (British Columbia)</td>
</tr>
<tr>
<td><em>C. zagulajevi</em> Sinev, 1979</td>
<td>Georgia (Adzharia)</td>
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</table>
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.

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>Source Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>C. basiflavella</em> Matsumura, 1931 (Japan)</td>
<td>junior synonym of <em>Stathmopoda auriferella</em> (Walker, 1864) in Stathmopodidae (MORIUTI 1975)</td>
<td></td>
</tr>
<tr>
<td><em>C. bicolorella</em> Matsumura, 1931 (Japan)</td>
<td>unplaced species in Tineidae: Hieroxestinae (Sinev, pers. comm.)</td>
<td></td>
</tr>
<tr>
<td><em>C. hygrophilella</em> Viette, 1957 (Réunion Island)</td>
<td><em>Stathmopoda hygrophilella</em> (Viete, 1957) in Stathmopodidae (SINEV 2015)</td>
<td></td>
</tr>
<tr>
<td><em>C. monotyla</em> Meyrick, 1921 (Australia)</td>
<td>unplaced species in Chrysopeleiidae (Sinev, pers. comm.)</td>
<td></td>
</tr>
<tr>
<td><em>C. thrysiphila</em> Meyrick, 1912 (Ceylon)</td>
<td>unplaced species in Chrysopeleiidae (Sinev, pers. comm.)</td>
<td></td>
</tr>
<tr>
<td><em>C. trilychna</em> Meyrick, 1928 (India)</td>
<td>unplaced species in Chrysopeleiidae (Sinev, pers. comm.)</td>
<td></td>
</tr>
</tbody>
</table>
Acknowledgements

We are indebted to W. Mey (ZMHB) for the loan of museum material, and to P. Kment (NMPC), D. Vondráček (NMPC), O. Karsholt (Copenhagen) and S. Sinev (St. Petersburg) for a critical reading of the manuscript. Sergey Sinev kindly provided us his hitherto unpublished data on systematic placement of some species previously attributed to Chrysoclista. The work of JS was financially supported by the Ministry of Culture of the Czech Republic (DKRVO 2016/14, National Museum, 00023272). PH is grateful to the Promotion of Educational Policies, University and Research Department of the Autonomous Province of Bolzano – South Tyrol for helping to fund the project ‘Genetic biodiversity archive – DNA barcoding of Lepidoptera of the central Alpine region (South, East and North Tyrol)’, and to the Austrian Federal Ministry of Science, Research and Economics for funds received in the framework of ABOL (Austrian Barcode of Life).

We are particularly grateful to Paul Hebert and his team at the Canadian Centre for DNA Barcoding (Guelph, Canada) whose sequencing work was enabled by funding from the Government of Canada to Genome Canada through the Ontario Genomics Institute. We are also grateful to the Ontario Ministry of Research and Innovation and to NSERC for their support of the BOLD informatics platform. Finally we thank Marko Mutanen (University of Oulu, Finland) and Jean-François Landry (Agriculture and Agri-Food, Ottawa, Canada) who made several unpublished barcode sequences available to us.

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