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Identity of some recently described Lepidoptera from France—re-assessed with DNA barcodes and morphology

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Abstract

Seventy-three species of Lepidoptera described from France since 2000, particularly by Jacques Nel and Thierry Varenne, are re-assessed from largely unpublished molecular data. We tried to obtain DNA barcode sequences from 62 holotypes, supplemented by paratypes of eight species and on one case by non-type material, whereas one previously synonymized species was not sequenced. Altogether we obtained 78 DNA barcode sequences for 65 nominal taxa while sequencing failed for six holotypes. An integrative analysis from molecular data and morphology supports the validity of the majority of species but also resulted in the re-assessment of several taxa. The following 13 new synonymies are established: *Stigmella cyrneorolandi* Nel & Varenne, 2013 **syn. nov.** of *Stigmella rolandi* van Nieukerken, 1990; *Stigmella thibaulti* Varenne & Nel, 2019 **syn. nov.** of *Stigmella nivenburgensis* (Preissecker, 1942) (Nepticulidae); *Nemapogon peslieri* Varenne & Nel, 2017 **syn. nov.** of *Nemapogon inexpectata* Varenne & Nel, 2017 (Tineidae); *Phyllonorycter acericorsica* Varenne & Nel, 2015 **syn. nov.** of *Phyllonorycter ochreojunctella* (Klimesch, 1942) (Gracillariidae); *Ancylis paraobtusana* Varenne, Nel, & Peslier, 2020 **syn. nov.** of *Ancylis comptana* (Frölich, 1828) (Tortricidae); *Celypha paludicolella* Varenne & Nel, 2017 **syn. nov.** of *Celypha doubledayana* (Barrett, 1872) (Tortricidae); *Cydia oxytropidana* Nel & Varenne, 2016 **syn. nov.** of *Cydia oxytropidis* (Martini, 1912) (Tortricidae); *Sorhagenia orocorsa* Varenne & Nel, 2016 **syn. nov.** of *Sorhagenia janiszewskae* Riedl, 1962 (Cosmopterigidae); *Chionodes cerdanica* Peslier, Nel & Varenne, 2020 **syn. nov.** of *Chionodes distinctella* (Zeller, 1839) (Gelechiidae); *Elachista bidentata* Varenne & Nel, 2019 **syn. nov.** of *Elachista orstadii* Palm, 1943; *Elachista karsticola* Varenne & Nel, 2018 **syn. nov.** of *Elachista maculosella* Chrétien, 1896 (Elachistidae); *Scythris chablaisensis* Delmas, 2018 **syn. nov.** of *Scythris laminella* ([Denis & Schiffermüller], 1775) (Scythrididae); *Epermenia pumila* (Buvat & Nel, 2000) **syn. nov.** of *Epermenia profugella* (Stainton, 1856) (Epermeniidae). Finally, the status of some taxa still remains unclear due to the lack of DNA barcodes of closely related species and the absence of convincing diagnostic characters in morphology.

Key words: holotypes, taxonomy, sequencing, morphology, new synonymies

Introduction

The fauna of Lepidoptera of Europe is generally considered to be well explored and new species are rarely found. An exception, however, are Mediterranean areas, as recently demonstrated for the families Gelechiidae and Gracillariidae (Huemer and Karsholt 2020; Lopez-Vaamonde *et al.* in press). In the southern regions of the continent in particular, taxonomic research is still far from complete and ongoing new discoveries of species confirm this impressively. It is therefore not surprising that several new species have been described from large countries such as France in recent years. Unfortunately, many recent descriptions are based on inadequate material and lack molecular data. As a consequence, many of these taxa have been considered questionable in published literature and in relevant online forums (e.g. Lepiforum e.V. 2002–2020).

The present work is a first attempt to clarify the uncertainties in the taxonomy of most taxa using molecular methods (DNA barcoding), supplemented by morphological data. We essentially limit the work to species described by our colleagues Jacques Nel and Thierry Varenne. Special emphasis was placed on obtaining barcode sequences from holotypes, and only exceptionally complementary paratypes.

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Material and methods

DNA barcoding is based on 62 holotypes and 24 paratypes, supplemented by a single non-type specimen from altogether 73 nominal taxa.

DNA samples to obtain the 658 base-pair long barcode segment of the mitochondrial COI gene (cytochrome c oxidase I) (from dried legs) were prepared according to the prescribed standards and processed at the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph) to obtain DNA barcodes using the standard high-throughput protocol described in (deWaard *et al.* 2008). DNA sequences of 15 holotypes were recovered using a Next-Generation-Sequencing method developed for historical specimens (Prosser *et al.* 2016). For a few species of Nepticulidae and Opostegidae, the DNA barcoding was performed at Naturalis Biodiversity Center following similar protocols (van Nieukerken *et al.* 2012a; Doorenweerd *et al.* 2016).

Sequences were submitted to GenBank, further details including complete voucher data and images can be accessed in the public dataset "DS-LEPNELVA Lepidoptera - primary types France" https://dx.doi.org/10.5883/DS-LEPNELVA in the Barcode of Life Data Systems (BOLD systems v. 4.0. http://www.boldsystems.org (Ratnasingham and Hebert 2007). Intra- and interspecific distances of DNA barcode fragment were calculated using analytical tools of BOLD with the Kimura 2-parameter model of nucleotide substitution. Neighbor-joining trees were constructed using MEGA 6 (Tamura *et al.* 2013) under the Kimura 2-parameter model for nucleotide substitutions with the closest European species in BOLD as outgroups.

For each species we provide the Barcode Identification Number, that is automatically calculated for records in Bold Data Systems that are compliant with the DNA Barcode standard (Ratnasingham & Hebert 2013), otherwise we will cite it as "not barcode compliant".

We examined the morphology from the specimens themselves as much as possible, otherwise we used the original publications.

Abbreviations:

RCJN = Research collection of Jacques Nel, La Ciotat France
RCTV = Research collection of Thierry Varenne, Nice, France
RMNH = Naturalis Biodiversity Center, Leiden, Netherlands
TLMF = Tiroler Landesmuseum Ferdinandeum, Innsbruck, Austria

Results

DNA barcode sequences of 65 nominal taxa were successfully recovered

In the following, all 73 examined species are listed, regardless of molecular results that have already been published. Families are presented in systematic order, mainly after Aarvik *et al*. (2017), within each of which the species are listed alphabetically.

Nepticulidae

Stigmella cyrneorolandi Nel & Varenne, 2013

Stigmella cyrneorolandi Nel & Varenne 2013c: 18, figs. 1–3.

Examined material. Holotype ♂: France, Corse-du-Sud, Linguizetta, 2 m, 6.X.2012, uv, Th. Varenne leg., genitalia slide TV n°5215 (RCTV).

BOLD Specimen ID TLMF 28229; BOLD Sequence ID PALEA219-20.

BIN: BOLD:ACC2707

Identity: *Stigmella rolandi* van Nieukerken, 1990, **syn. nov.** (Fig. 1)

Remarks. *Stigmella cyrneorolandi* was described from a male holotype and compared with *Stigmella rolandi* and other species in the *S. sanguisorbae* group. We obtained a short sequence of 307 bp that is more than 99%

similar to most specimens of *S. rolandi*, that all fall in the same BIN. The described difference is mainly in the tip of the valvae, that may be either damaged or deformed in the Corsican specimen (we did not study the slide). The description did not mention the important character of male *S. rolandi*, the very long hairpencil on the hindwing and the associated groove in the forewing underside scaling (van Nieukerken 1990), but the upperside photo just shows some of the long hairs extending beyond the right forewing. We consider *S. cyrneorolandi* as synonym of *S. rolandi*. This species is widespread in the southern half of Europe from Spain eastwards to west Siberia. It also occurs on Sardinia.

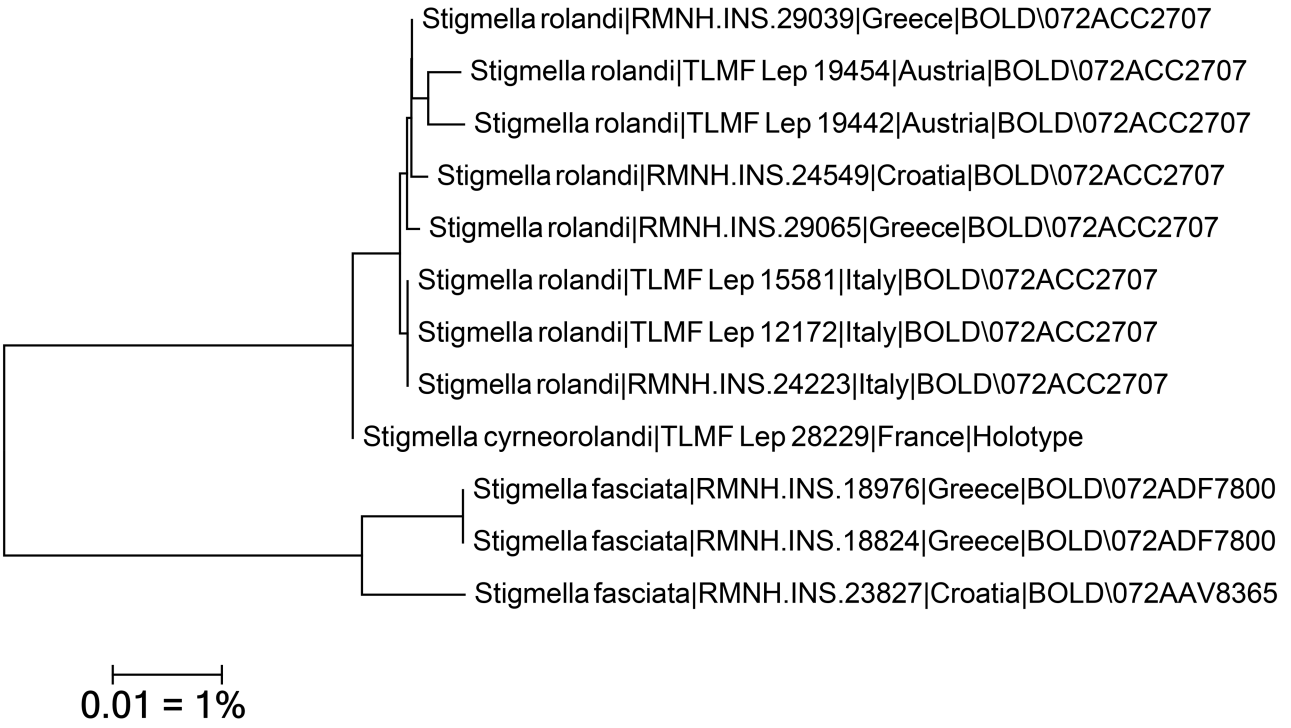

FIGURE 1. Neighbor-joining tree of *Stigmella rolandi* incl. *S. cyrneorolandi* and the closest European species *S. fasciata* van Nieukerken & Johansson, 2003 in BOLD.

Stigmella thibaulti Varenne & Nel, 2019

Stigmella thibaulti Varenne & Nel 2019: 85, figs. 1–3.

Examined material. Holotype ♂: France, Bouches-du-Rhône, Arles, Tourtoulen, 3 m, uv, 21.VI.2018, Th. Varenne leg., genitalia slide TV n°6721 (RCTV).

BOLD Specimen ID TLMF 27071; BOLD Sequence ID LEASV319-19.

BIN: not barcode compliant, but identical to BOLD:AAV7002

Identity: *Stigmella nivenburgensis* (Preissecker, 1942), **syn. nov.** (Fig. 2)

Remarks. *Stigmella thibaulti* was described from a male holotype and compared with *S. betulicola* (Stainton, 1856) and *S. nivenburgensis* (Preissecker, 1942) (Varenne & Nel 2019). The successfully sequenced specimen fully matches *S. nivenburgensis* in DNA barcode, and although this sequence is not considered barcode compliant, it falls within the BIN that all European specimens share. The alleged diagnostic characters are due to different preparation techniques (i.e. pressure on coverslip); the triangular "flap" on the valval tip is present in all species in the *betulicola* species group, but usually invisible as it is positioned ventrally, but pressure moves it laterally (see figures in Johansson & Nielsen 1990). *Stigmella nivenburgensis* was recorded recently as new for France (van Nieukerken *et al.* 2012b). *Stigmella thibaulti* is considered to be a junior synonym of *S. nivenburgensis*.

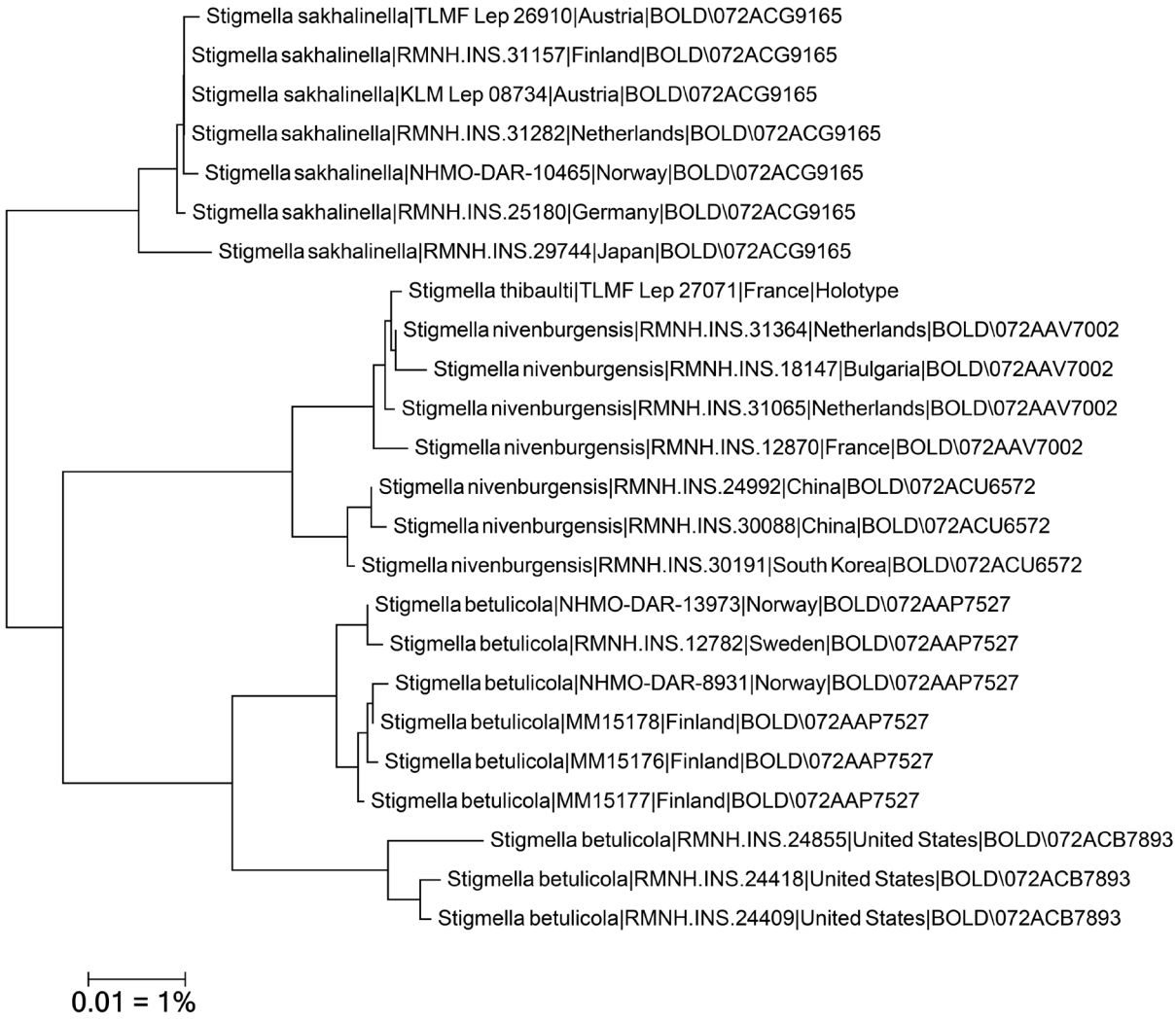

FIGURE 2. Neighbor-joining tree of *Stigmella nivenburgensis* incl. *S. thibaulti* and the closest European species *S. sakhalinella* Puplesis, 1984 and *S. betulicola* (Stainton, 1856) in BOLD.

Trifurcula angustivalva Varenne & Nel, 2016

Trifurcula angustivalva Varenne & Nel 2016: 51, figs. 1–2, 4a, 5.

Examined material. Holotype ♂: France: Haute-Corse, Canavaggia, 260 m, 12.X.2015, uv, Th. Varenne leg., genitalia slide JN29818 (RCTV).

Paratype ♀: same data, genitalia slide TV n°5646 (RCTV).

Holotype: BOLD Specimen ID JN29818; BOLD Sequence ID NEPTA1932-17.

Paratype: BOLD Specimen ID TLMF 28224; BOLD Sequence ID PALEA214-20.

BIN: BOLD:AEC3873

Identity: *Trifurcula angustivalva* Varenne & Nel, 2016

Remarks. *Trifurcula angustivalva* was described from a male holotype and a female paratype and compared with several other congeneric species, particularly *T. squamatella* Stainton, 1849. We have been able to obtain a short sequence of the holotype with 242 bp and a complete DNA barcode of the paratype. Both sequences fully correspond to each other with ca. 7.5% distance to the nearest neighbour in BOLD, an unnamed species of *Trifurcula* from Slovenia. Morphologically the species is well characterised, and belongs to the group of species around *T. squamatella* and *T. beirnei* Puplesis, 1984, that probably all make hidden mines inside stems or galls on brooms (Laštůvka & Laštůvka 2005).

Trifurcula aureacorsa Varenne & Nel, 2016

Trifurcula aureacorsa Varenne & Nel 2016: 53, figs. 7–8, 10a, 11.

Examined material. Holotype ♂: France, Haute-Corse, Calacuccia, Sovenzia, 960 m, 10.VII.2013, uv, Th. Varenne leg., genitalia slide JN n°27498, (RCTV).

Paratype ("allotype") ♀: same locality, but 4.VIII.2015, genitalia slide TV5649, slide of right wing TV5692 (RCTV); Paratype ♀: same locality data, (RCTV).

Paratype (allotype): BOLD Specimen ID TV5692; BOLD Sequence ID LEASV317-19;

Paratype: BOLD Specimen ID TLMF 28223; BOLD Sequence ID PALEA213-20.

BIN: none

Identity: *Trifurcula aureacorsa* Varenne & Nel, 2016

Remarks. *Trifurcula aureacorsa* was described from a male holotype and three female paratypes and compared with *Trifurcula immundella* (Zeller, 1839). The holotype was examined by EvN, but not sequenced due to lack of sufficient tissue to sample without damaging the specimen. We obtained two short sequences from female paratypes, both from a different part of the barcode, without overlap, which makes them not comparable. On the basis of the male and female genitalia, the species is considered to be the same as a taxon from Sardinia as assessed by EvN (cited by Triberti & Braggio 2011), and is assigned to BIN BOLD:ACG9232. In different neighbor-joining analyses the barcode sequences of the paratype specimens grouped with the Sardinian specimens, albeit at some distance. We consider this to be a Tyrrhenian endemic species.

Trifurcula collinella Nel, 2012

Trifurcula (Glaucolepis) collinella Nel, 2012: 24, figs. 1–3.

Examined material. Holotype ♂: France, Var, Tourves, D64, Rte de Mazaugues, Malausse, 25.IV.2011, Jacques Nel, Genitalia slide JN25662 (TLMF).

BIN: none

Identity: *Glaucolepis magna* (A. Laštuvka & Z. Laštuvka, 1997), synonymised by van Nieukerken *et al.* (2016).

Remarks. We did not barcode the holotype, but the synonymy was clearly explained by van Nieukerken *et al.* (2016). The species is included here for completeness.

Trifurcula guercheae Varenne & Nel, 2019

Trifurcula guercheae Varenne & Nel, 2019: 88, figs. 11–16.

Examined material. Holotype ♂: France, Alpes-Maritimes, Isola-sur-Tinée, 1670 m, uv, 11.VII.2018, Th. Varenne leg., genitalia slide TV n°6770 (RCTV).

BOLD Specimen ID TLMF 27069; BOLD Sequence ID LEASV317-19.

BIN: none

Identity: *Trifurcula guercheae* Varenne & Nel, 2019, identity uncertain.

Remarks. *Trifurcula guercheae* was described from a male holotype and briefly compared with *Trifurcula immundella* (Zeller, 1839) and *T. beirnei* Puplesis, 1984 (Varenne & Nel 2019). Both are indeed rather different species, but the genitalia of *T. guercheae* are almost completely identical to *T. pallidella* (Duponchel, 1843) (van Nieukerken & Johansson 1986; van Nieukerken *et al.* 2004b), a species currently unknown from France, although it is found in the Ligurian Alps not far from the French border (van Nieukerken *et al.* 2004b).

A short DNA barcode sequence of 406bp of the specimen is about 3% divergent from *T. pallidella* (Duponchel, 1843), the nearest known neighbour in BOLD. For the time being we refrain from synonymising *T. guercheae*, as further material is needed to assess the barcode variation in *T. pallidella*.

Trifurcula lastuvkaorum Varenne & Nel, 2019

Trifurcula (*Levarchama*) *lastuvkaorum* Varenne & Nel 2019: 86, figs. 4–9.

Examined material. Holotype ♂: France, Pyrénées-Orientales, Ille-sur-Têt, 240 m, uv, 12.IX.2018, Th. Varenne leg., genitalia slide TV n°6856 (RCTV).

BOLD Specimen ID TLMF 27071; BOLD Sequence ID LEASV319-19.

BIN: BOLD:ACY4123

Identity: *Trifurcula lastuvkaorum* Varenne & Nel, 2019

Remarks. *Trifurcula lastuvkaorum* was described from a male holotype and a male paratype and superficially compared with *T. mediocorsa* in the subgenus *Levarchama* (Varenne & Nel 2019). Morphologically, however, *T. lastuvkaorum* has nothing to do with that subgenus, which is now no longer considered as subgenus, but as the *T. cryptella* species group (van Nieukerken *et al.* 2016). *Trifurcula lastuvkaorum* clearly belongs to the *pallidella* species group. The species was known to us as an unnamed stem miner of *Genista scorpius*, common in Mediterranean France and the Iberian Peninsula.The DNA barcode sequence of the holotype with 574bp falls with the BIN of this species of *Trifurcula*.

Trifurcula mediocorsa Varenne & Nel, 2017

Trifurcula (*Levarchama*) *mediocorsa* Varenne & Nel, 2017: 46, figs. 1–3.

Examined material. Holotype ♂: France, Corse-du-Sud, Zicavo, 1360 m, uv., 12.VII.2016, Th. Varenne leg., genitalia slide JN n°30723, (RCTV); Paratypes 1♂: same data, genitalia slide TV n°6082 (RCTV); 1♂: Haute-Corse, Santa-Lucia-di-Mercurio, 770 m, uv., 6.VII.2013, Th. Varenne leg., genitalia slide TV n°5321(RCTV).

Paratype BOLD Specimen ID TV6082; BOLD Sequence ID NEPTA2012-17.

BIN: BOLD:ADI4051

Identity: *Trifurcula mediocorsa* Varenne & Nel, 2017

Remarks. *Trifurcula mediocorsa* was described from a male holotype and two male paratypes, and compared with other species in the subgenus *Levarchama* Beirne, 1945 (now the *cryptella* species group). The holotype was not sequenced, one of the paratypes gave a full barcode, the other one failed. The barcode has a distance of more than 10% to its nearest neighbour, *Trifurcula ortneri* (Klimesch, 1951). The genitalia resemble the other species in this species group (van Nieukerken 2007), and more study is needed to define diagnostic characters. This is a potential endemic species for Corsica.

Opostegidae

Pseudopostega cyrneochalcopepla Nel & Varenne, 2012

Pseudopostega cyrneochalcopepla Nel & Varenne, 2012a: 11

Examined material. Paratype ♂: France, Corse du Sud, Pertusato, Bonifacio, 80 m, uv, 24.V.2011, Th. Varenne, genitalia slide JN no 24980 (RCJN).

BOLD Specimen ID RMNH.INS.550071; BOLD Sequence ID NEPTA1366-15.

BIN: BOLD:ACU8218

Identity *Pseudopostega chalcopepla* (Walsingham, 1908), synonymised by van Nieukerken *et al.* (2016).

Remarks. *Pseudopostega cyrneochalcopepla* was described from two males with identical collection data (Nel & Varenne 2012a). We studied and sequenced the paratype, resulting in a full barcode, with a distance of 4.3% to its nearest neighbour, continental *P. chalcopepla* (Walsingham, 1908). Despite this difference, the species was synonymised with *P. chalcopepla* on the basis of the virtual identical genitalia and external characters (van Nieukerken *et al.* 2016). This was challenged by Nel & Varenne (2016c) who detailed additional morphological differences. However, after studying a larger number of specimens, we still failed to see differences. Nel & Varenne

(2012a, 2016c) gave the wingspan of 10 mm as a difference, but van Nieukerken *et al.* (2004a) gave a range of 10.5–14 mm, which is hardly different. The number of pecten sensilla is another character mentioned by these authors: 32–34 in *cyrneochalcopepla* versus 43–49 in *chalcopepla*. However, we examined several specimens from continental France with 36–37 sensilla, showing a much larger range for this character. Other characters used are variable even within populations. Following van Nieukerken *et al.* (2016) we prefer to keep the island populations within one species, until more is known of these and other island populations. Island populations often have large barcoding gaps to mainland populations, which taken alone is in our opinion not sufficient for species status.

Prodoxidae

Lampronia aenigma Varenne & Nel, 2019

Lampronia aenigma Nel & Varenne 2019a: 9, figs. 1–2, 4–5.

Examined material. Holotype ♂: France, Alpes-Maritimes, Tende, 1700 m, 10.VI.2017, Th. Varenne leg., genitalia slide TV n°5885 (RCTV).

BOLD Specimen ID TLMF Lep 27059; BOLD Sequence ID LEASV307-19.

BIN: none

Identity: *Lampronia aenigma* Varenne & Nel, 2019, identity uncertain.

Remarks. *Lampronia aenigma* was described from the male holotype and compared with *L. aeripennella* (Rebel, 1889) externally, but the genitalia were considered similar to *L. pubicornis* (Haworth, 1828) which is very different externally (Nel & Varenne 2019a). However, externally it also matches very well *L. provectella* (Heyden, 1865) and *L. psychidella* (Millière, 1854), two montane species not considered by Nel & Varenne (2019a). Whereas *L. aenigma* differs from *L. provectella* in structures of the phallus, the genitalia of *L. psychidella* are unknown, hence the latter species should be re-assessed for possible conspecitity. Unfortunately DNA barcoding of the holotype specimen of *L. aenigma* failed.

Adelidae

Nematopogon caliginella Varenne & Nel, 2018

Nematopogon caliginella Varenne & Nel 2018: 3, figs. 1–4.

Examined material. Paratype ♂: France, Hautes-Alpes, Champcella, 920 m, 16.V.2017, Th. Varenne leg., genitalia slide TV n°6211 (RCTV).

BOLD Specimen ID TLMF Lep 27003; BOLD Sequence ID LEASU1167-18.

BIN: BOLD:AAC5324

Identity: *Nematopogon pilella* ([Denis & Schiffermüller, 1775), synonymized by Bryner & Huemer (2019).

Remarks. *Nematopogon caliginella* was described from two males with identical collection data (Varenne & Nel 2018). The successfully sequenced paratype fully corresponds to *Nematopogon pilella* ([Denis & Schiffermüller], 1775) both in morphology and in DNA barcode, and based on these results it was already synonymized with this species (Bryner & Huemer 2019; Bryner 2020).

Psychidae

Penestoglossa gallica Nel & Varenne, 2018

Penestoglossa gallica Nel & Varenne 2018b: 75, figs. 1A, 2B, 3A, 4B.

Examined material. Holotype ♀: France, Var, environs de Draguignan, vm, 11.VII.1998, Th. Varenne leg. (RCTV).

BOLD Specimen ID TLMF 28217; BOLD Sequence ID PALEA207-20.

BIN: none

Identity: *Penestoglossa gallica* Nel & Varenne, 2019.

Remarks. *Penestoglossa gallica* was described from five females and compared with the related *P. dardoinella* (Millière, 1863) which clearly differs externally and in genitalia (Nel & Varenne 2018b). Unfortunately DNA barcoding of the holotype failed.

Meesiidae

Eudarcia prealpina Varenne & Nel, 2017

Eudarcia (*Meessia*) *prealpina* Varenne & Nel 2017a: 48, figs. 5–6, 8a, 9b, 10a, 11.

Examined material. Holotype ♂: France, Alpes-Maritimes, Malaussène, 250 m, e.l., 24.V.2016, Th. Varenne leg., genitalia slide TV n°5832 (RCTV).

BOLD Specimen ID TLMF Lep 28220; BOLD Sequence ID PALEA210-20.

BIN: BOLD:ADI8760

Identity: *Eudarcia prealpina* Varenne & Nel, 2017, possible synonym of *E. palanfreella* Baldizzone & Gaedike, 2004.

Remarks. *Eudarcia prealpina* was described from a male holotype and three female paratypes and compared with the similar *E. palanfreella* Baldizzone & Gaedike, 2004 (Varenne & Nel 2017). According to Gaedike (2019) the species status is doubtful with only subtle genital differences. The DNA barcode of the successfully sequenced holotype does not match any other species of the genus *Eudarcia* in BOLD, but, unfortunately, no barcode of *E. palanfreella* exists so far.

Tineidae

Infurcitinea paratrifasciella Varenne & Nel, 2018

Infurcitinea paratrifasciella Varenne & Nel 2018: 5, figs. 5–8.

Examined material. Holotype ♂: France, Pyrénées-Orientales, Ille-sur-Têt, 300 m, uv, 1.VI.2017, Th. Varenne leg., genitalia slide TV n°6314 (RCTV).

BOLD Specimen ID TLMF 28216; BOLD Sequence ID PALEA206-20.

BIN: none

Identity: *Infurcitinea paratrifasciella* Varenne & Nel, 2018, identity uncertain.

Remarks. *Infurcitinea paratrifasciella* was described from a male holotype and a female paratype and compared with *I. atrifasciella* (Staudinger, 1871) as the closest species (Varenne & Nel 2018). DNA barcoding of the holotype failed.

Infurcitinea restonicae Varenne & Nel, 2016

Infurcitinea restonicae Varenne & Nel 2016: 55, figs. 12–13.

Examined material. Holotype ♂: Haute-Corse, Corte, Restonica, 1320 m, 2.VIII.2015, uv, Th. Varenne leg., genitalia slide JN n°29328 (RCTV).

BOLD Specimen ID TLMF Lep 28225; BOLD Sequence ID PALEA215-20.

BIN: BOLD:AEC4078

Identity: *Infurcitinea restonicae* Varenne & Nel, 2016

Remarks. *Infurcitinea restonicae* was described from a male holotype and compared with the eastern

Mediterranean *I. hellenica* Gaedike, 1997. The DNA barcode of the successfully sequenced holotype does not match any other species of the genus *Infurcitinea* in BOLD, but several congeneric taxa including *I. hellenica* are not barcoded so far.

Nemapogon inexpectata Varenne & Nel, 2017

Nemapogon inexpectata Varenne & Nel 2017a: 50, figs. 12–13.

Examined material. Holotype ♀: France, Var, Puits de Rians, La Planée, uv., 29.VII.2016, J. Nel leg., genitalia slide JN n°30881 (RCJN) [TLMF].

BOLD Specimen ID TLMF 28221; BOLD Sequence ID PALEA211-20.

BIN: not barcode compliant, but 100% identical to BOLD:ABW0513

Identity: *Nemapogon inexpectata* Varenne & Nel, 2017

Remarks. *Nemapogon inexpectata* was described from a female holotype and superficially compared with several congeneric species. The DNA barcode of the successfully sequenced holotype does not match any other species of the genus *Nemapogon* in BOLD, except for *N. peslieri* Varenne & Nel, 2017 (see below).

Nemapogon peslieri Varenne & Nel, 2017

Nemapogon peslieri Varenne & Nel 2017b: 107, figs. 1, 3, 5a.

Examined material. Holotype ♀: France, Alpes-Maritimes, Sospel, 477 m, uv, 5.VI.2016, Th. Varenne leg., genitalia slide TV n°5903 (RCTV).

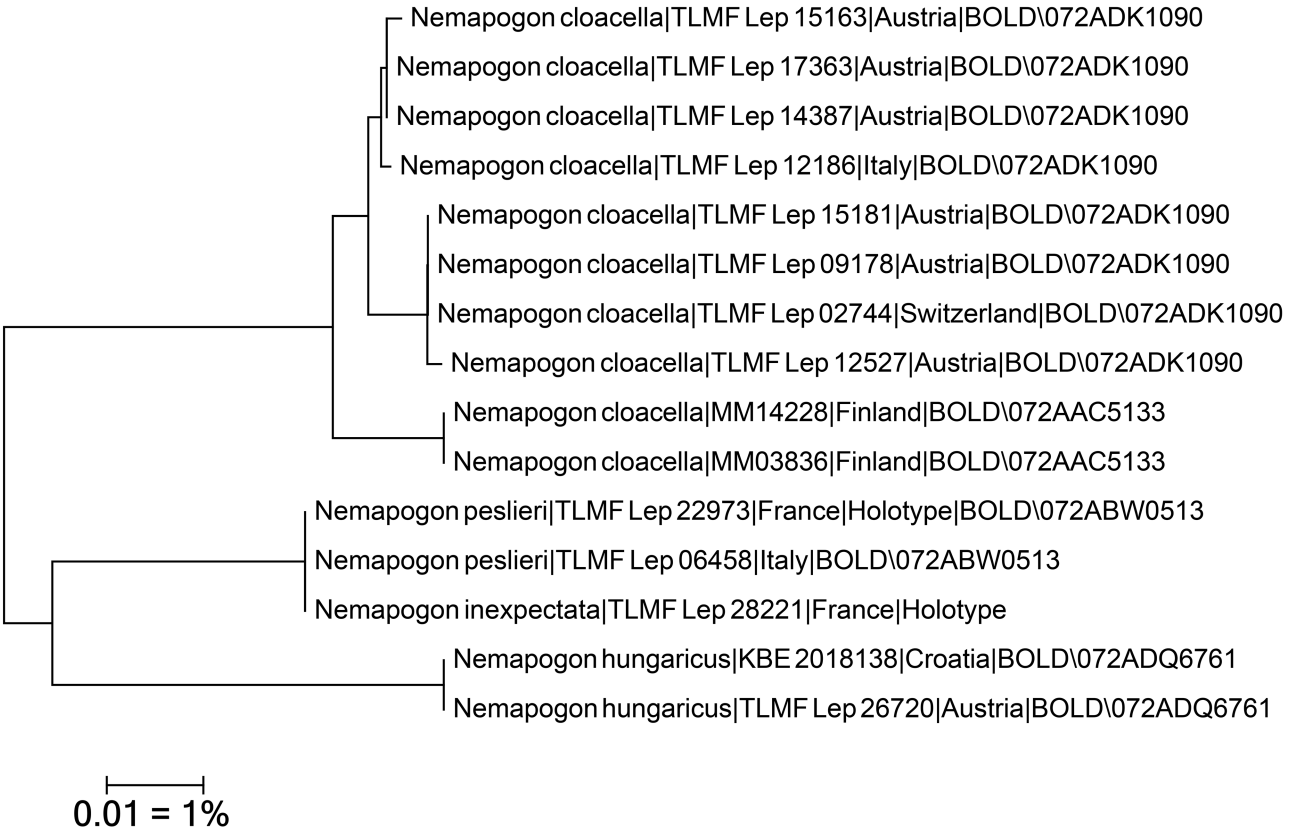

FIGURE 3. Neighbor-joining tree of *Nemaogon peslieri* incl. *N. inexpectata* and the closest European species *N. hungaricus* Gozmány, 1960 and *N. cloacella* (Haworth, 1828) in BOLD.

BOLD Specimen ID TLMF 22973; BOLD Sequence ID LEAST375-17.

BIN: BOLD:ABW0513

Identity: *Nemapogon inexpectata* Varenne & Nel, 2017, **syn. nov.** (Fig. 3)

Remarks. *Nemapogon peslieri* was described from a female holotype and two female paratypes and compared with *N. agenjoi* Petersen, 1959. Unfortunately no DNA barcode sequence is yet available in BOLD for *N. agenjoi*. However, the DNA barcode of the successfully sequenced holotype of *N. peslieri* fully agrees to that of the holotype of *N. inexpectata,* and from the original figures the female genitalia of both species also largely agree. We therefore synonymize *N. peslieri* with *N. inexpectata*. The male sex of *N. peslieri* published by Huemer (2019) consequently depicts *N. inexpectata*.

Gracillariidae

Phyllonorycter acericorsica Varenne & Nel, 2015

Phyllonorycter acericorsica Nel & Varenne 2015: 162, figs. 1, 2b, 3a.

Examined material. Holotype ♂: France, Haute-Corse, Santa-Lucia-di-Mercurio, 6.VII.2013, uv, 770 m, Th. Varenne leg., genitalia slide JN n°26972 (RCTV).

BOLD Specimen ID TLMF 28227; BOLD Sequence ID PALEA217-20.

BIN: none

Identity: *Phyllonorycter ochreojunctella* (Klimesch, 1942), **syn. nov.**

Remarks. *Phyllonorycter acericorsica* was described from two male specimens and compared with several other *Acer*-feeding congenerics, particularly *P. acerifoliella* (Zeller, 1839) (Nel & Varenne 2015). Unfortunately DNA barcoding of the holotype failed. On the basis of the forewing pattern and genitalia we follow Z. Laštůvka (in Lopez-Vaamonde *et al.* 2021) who regards this as *Phyllonorycter ochreojunctella*, a species not considered by Varenne & Nel (2015), and we hereby introduce the synonymy.

Phyllonorycter argyrolobiella Nel, 2009

Phyllonorycter argyrolobiella Nel 2009: 42, figs. A, 10, 14.

Examined material. Paratype ♂: France, Var, Evenos, adret du mont Caume, 05.II.2004 e.l./*A. zanonii*, J. Nel leg. (TLMF).

BOLD Specimen ID TLMF Lep 06733; BOLD Sequence ID PHLAG339-12.

BIN: not barcode compliant, but 100% identical to BOLD:ABW0513

Identity: *Phyllonorycter triflorella* (Peyerimhoff, 1872), synonymized by Nel (2013).

Remarks. *Phyllonorycter argyrolobiella* was described from a series of ten specimens of both sexes, bred from *Argyrolobium zanonii* (Turra), P.W. Ball. The short DNA barcode sequence of a paratype (258 bp) confirms the earlier synonymization with *Phyllonorycter triflorella* (Peyerimhoff, 1872) by Nel (2013).

Phyllonorycter lobeliella Nel, 2009

Phyllonorycter lobeliella Nel 2009: 44, figs. B, 11, 15.

Examined material. Paratype ♂: France, Var, Plan d´Aups, Hotellerie, taken on *Genista lobelii* DC., 18.V.2007, J. Nel leg. (TLMF).

BOLD Specimen ID TLMF 03565; BOLD Sequence ID PHLD390-11.

BIN: BOLD:AAC4267

Identity: *Phyllonorycter baetica* Laštůvka & Laštůvka, 2006, synonymised by Laštůvka *et al.* (2013).

Remarks. *Phyllonorycter lobeliella* was described from a series of ten specimens of both sexes, bred from

Genista lobelii DC. The species was synonymized with *Phyllonorycter baetica* Laštůvka & Laštůvka, 2006 by Laštůvka *et al.* (2013) but resurrected at subspecies level by Nel (2013). As the DNA barcode is identical throughout its distribution area, we see no grounds for maintaining a split at subspecies level.

Phyllonorycter corsica Varenne & Nel, 2016

Phyllonorycter corsica Varenne & Nel 2016: 56, figs. 15–16.

Examined material. Holotype ♂: France, Haute-Corse, Calacuccia, 960 m, 4.VIII.2015, uv, Th. Varenne leg., genitalia slide JN n°29354 (RCTV).

BOLD Specimen ID TLMF 21932; BOLD Sequence ID LEASS474-17.

BIN: BOLD:ADF8325

Identity: *Phyllonorycter corsica* Varenne & Nel, 2016

Remarks. *Phyllonorycter corsica* was described from a male holotype and compared with several congeners, particularly *P. echinosparti* Laštůvka & Laštůvka, 2006 and *P. baetica* Laštůvka & Laštůvka, 2006. The full DNA barcode of the holotype with ca. 5.5% divergence to the nearest neighbour in BOLD, *P. eugregori* Laštůvka & Laštůvka, 2006 supports a separate species status, possibly as an endemic species for Corsica, feeding on a species of broom.

Yponomeutidae

Cedestis civitatensis Nel & Varenne, 2015

Cedestis civitatensis Nel & Varenne 2015: 163, figs. 4, 6a, 7a.

Examined material. Holotype ♂: France, Bouches-du-Rhône, la Basse Bertrandière, La Ciotat, 21.VIII.2014, uv, 40 m, J. Nel leg., genitalia slide JN n°28865 (RCJN) [TLMF]. Paratype ♀, idem, 17.VIII.2014, uv, 40 m, J. Nel leg., genitalia slide JN n°28477 (RCJN) [TLMF].

Holotype: BOLD Specimen ID TLMF 22250; BOLD Sequence ID LEASS602-17. Paratype: BOLD Specimen ID TLMF 22251; BOLD Sequence ID LEASS603-17.

BIN: BOLD:ADG4688

Identity: *Cedestis civitatensis* Nel & Varenne, 2015

Remarks. *Cedestis civitatensis* was described from a male holotype and a female paratype and compared with other known European congeneric taxa. Both type specimens were sequenced successfully with 550 and 587 bp respectively. The distance to the nearest congeneric neighbour *C. subfasciella* (Stephens, 1834) is 11.57%. Other species with lower distances in BOLD are, for example, a likely misidentified *Elachista* with only ca. 3.5% divergence, but the status of these taxa requires further assessment.

Kessleria lativalva Nel & Varenne, 2016

Kessleria lativalva Nel & Varenne 2016a: 31, figs. 9–10.

Examined material. Holotype ♂: France, Alpes-Maritimes, Belvédère, 29.VI.2012, uv, 1130 m, Th. Varenne leg., genitalia slide JN n°26261 (RCTV).

BOLD Specimen ID TLMF 21929; BOLD Sequence ID LEASS471-17.

BIN: BOLD:ADF8352

Identity: *Kessleria lativalva* Nel & Varenne, 2016

Remarks. *Kessleria lativalva* was described from a male holotype and superficially compared with several congeneric species. The nearest neighbour in BOLD is *Kessleria petrobiella* (Zeller, 1868) with ca. 7% distance. Taking into account the almost complete sequencing of the European *Kessleria*, a separate species status appears to be correct (Huemer 2018).

Plutellidae

Plutella angulivalva Nel & Varenne, 2019

Plutella angulivalva Nel & Varenne 2019a: 11, figs. 6–9, 12, 14.

Examined material. Holotype ♂: France, Hautes-Pyrénées, Aragnouet, Estaragne, 2780 m, 3.VIII.2008, Th. Varenne leg., genitalia slide JN n°33108.

BOLD Specimen ID TLMF 27061; BOLD Sequence ID LEASV309-19.

BIN: none

Identity: *Plutella angulivalva* Nel & Varenne, 2019, identity uncertain.

Remarks. *Plutella angulivalva* was described from four specimens of both sexes, collected in the French Pyrénées and compared with two species from the Alps, namely *P. geniatella* (Zeller, 1839) and *P. huemerella* (Baraniak, 2007) (Nel & Varenne 2919a). Unfortunately DNA barcoding of the male holotype failed.

Glyphipterigidae

Digitivalva piozae Varenne & Nel, 2014

Digitivalva piozae Varenne & Nel 2014a: 30, figs. 9–10, 12.

Examined material. Holotype ♂: France, Haute-Corse, Santa-Lucia-di-Mercurio, 6.VII.2013, uv, 770 m, Th. Varenne leg., genitalia slide JN n°26935 (RCTV).

BOLD Specimen ID TLMF 22313; BOLD Sequence ID LEASS665-17.

BIN: BOLD:ADM0567

Identity: *Digitivalva piozae* Varenne & Nel, 2014

Remarks. *Digitivalva piozae* was described from a male holotype and a female paratype and separated from other species of the genus, namely *D. occidentella* (Klimesch, 1956) and *D. solidaginis* (Staudinger, 1859), by genitalia structures (Varenne & Nel 2014a). However, the nearest neighbour to the successfully sequenced holotype is *D. reticulella* (Hübner, 1796) with 6.1% divergence. Surprisingly the species is more widely distributed than indicated in the original description, with a sequenced record from Greece (Crete).

Choreutidae

Prochoreutis constellata Nel, 2014

Prochoreutis constellata Nel, 2014b: 4, figs. 1, 6, 11.

Examined material. Holotype ♂: France, Hautes Alpes, Col du Lautaret, 5.VII.2003, 2000 m, J. Nel leg., genitalia slide JN n°16204 (TLMF).

BOLD Specimen ID TLMF 14502; BOLD Sequence ID LASTS050-14.

BIN: BOLD:ADR7881

Identity: *Prochoreutis constellata* Nel, 2014

Remarks. *Prochoreutis constellata* was described from a male holotype and a single female and compared with several other congeneric species (Nel 2014b). We obtained a full DNA barcode sequence of the holotype which is 6.3% divergent from the nearest neighbour in BOLD, the northern Palearctic *P. ultimana* (Kurlikovsky, 1909) a species not considered in the original description.

Tortricidae

***Acleris brigantiensis* Nel & Varenne, 2013**

Acleris brigantiensis Nel & Varenne, 2013c: 19, figs. 7–8.

Examined material. Holotype ♂: France, Hautes-Alpes,bord de la Clarée, Le Rosier, 1370 m, 7-IX-2012, J. Nel leg., genitalia slide JN n° 6674 (TLMF).

BOLD Specimen ID TLMF 28233; BOLD Sequence ID PALEA223-20.

BIN: [BOLD:AAB3524]

Identity: *Acleris emargana* (Fabricius, 1775), synonymized by Nel (2014c).

Remarks. *Acleris brigantiensis* was described from a single male and compared with the widespread *A. emargana* (Nel & Varenne 2013c). However, Nel (2014c) later considered alleged differences in male genitalia as artefacts and consequently synonymized both taxa. We obtained a short sequence of 305 bp of the holotype which matches *A. emargana* and so confirms the synonymy.

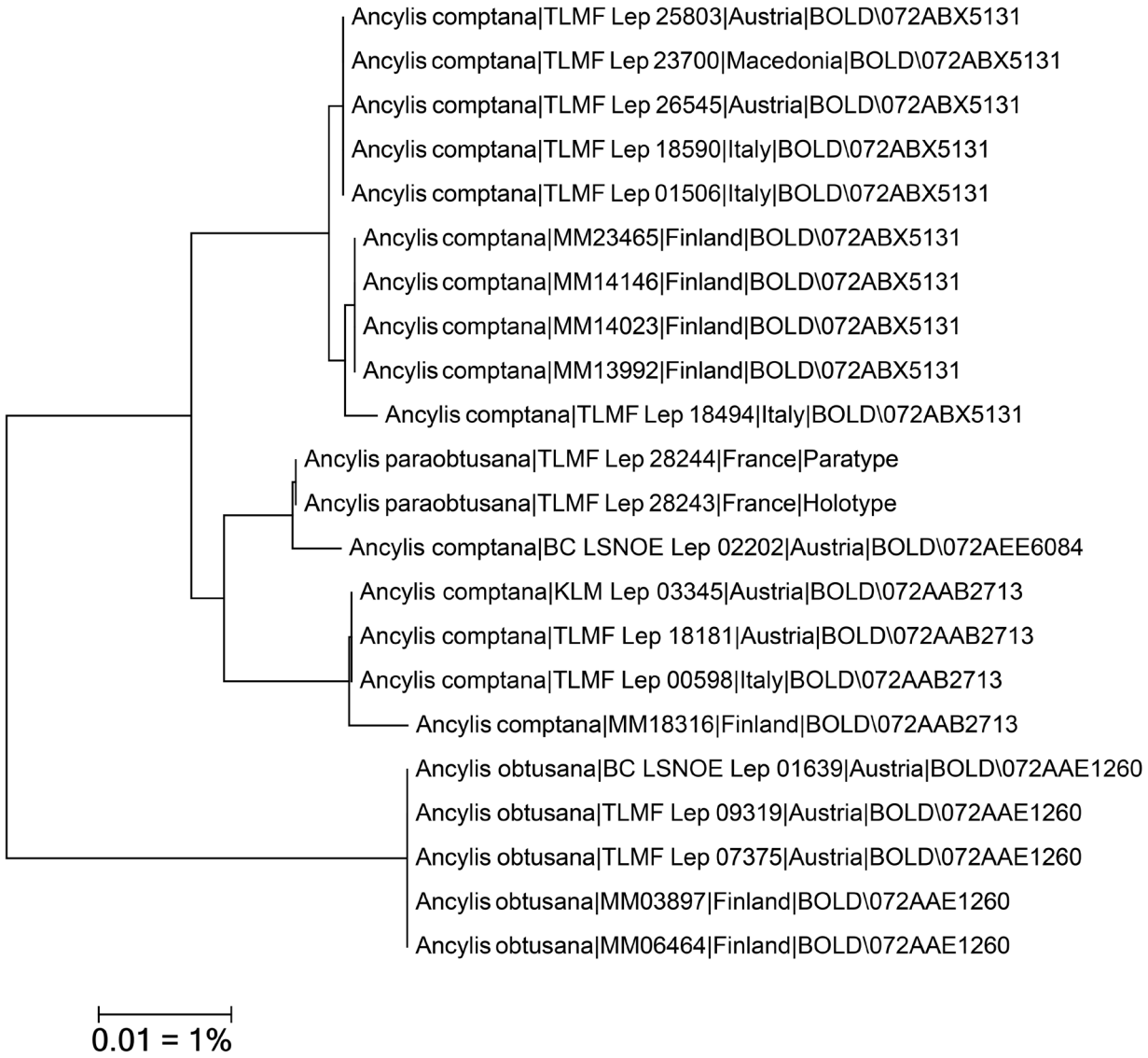

FIGURE 4. Neighbor-joining tree of *Ancylis comptana* incl. *A. paraobtusana* and the closest European species *A. obtusana* (Haworth, 1811) in BOLD.

Ancylis paraobtusana Varenne, Nel & Peslier, 2020

Ancylis paraobtusana Nel, Varenne & Peslier 2020: 69, figs. 13–18.

Examined material. Holotype ♂: France, Alpes-Maritimes, Le Broc, 600 m, uv, 23.V.2019, Th. Varenne leg., genitalia slide TV n°6928 (RCTV). Paratype ♀: France, Alpes-Maritimes, Lucéram, 700 m, e.l./ *Rosa* sp., 15.IV.2018, Th. Varenne leg., genitalia slide TV n°6670 (RCTV).

Holotype: BOLD Specimen ID TLMF 28243; BOLD Sequence ID PALEA233-20. Paratype: BOLD Specimen ID TLMF 28244; BOLD Sequence ID PALEA234-20.

BIN: none [not yet available in BOLD]

Identity: *Ancylis comptana* (Frölich, 1828), **syn. nov.** (Fig. 4)

Remarks. *Ancylis paraobtusana* was described from a male holotype and a female paratype and compared with several congeneric species, particularly with its alleged closest taxon *A. obtusana* (Haworth, 1811) (Nel *et al*. 2020). However, DNA barcodes of the successfully sequenced holotype and paratype cluster together with a specimen of *A. comptana* (Frölich, 1828) from Lower Austria with only 0.4% divergence; these are in turn nested among three clusters of European samples without geographic structure. On the basis of uniform morphology, these clusters are considered to belong to a single, genetically variable species. Another strongly divergent cluster from North America with ca. 2.7% divergence to the nearest neighbour in Europe remains unrevised and possibly represents a different species. We consider the described phenotypical and genital differences in the original description as individual variation and therefore synonymize *A. paraobtusana* with *A. comptana*.

Celypha paludicolella Varenne & Nel, 2017

Celypha paludicolella Varenne & Nel 2017a: 109, figs. 6–7.

Examined material. Holotype ♀: France, Alpes-Maritimes, Sospel, 477 m, uv, 5.VI.2016, Th. Varenne leg., genitalia slide TV n°5903 (RCTV).

BOLD Specimen ID TLMF 27002; BOLD Sequence ID LEASU1166-1818.

BIN: BOLD:AAY7649

Identity: *Celypha doubledayana* (Barrett, 1872), **syn. nov.** (Fig. 5)

Remarks. *Celypha paludicolella* was described from a female holotype and a female paratype and compared with *C. rivulana* (Scopoli, 1763) and *C. lacunana* ([Denis & Schiffermüller], 1775) (Varenne & Nel 2017a). However, the DNA barcode sequence of the holotype as well as adult morphology correspond to *C. doubledayana* (Barrett, 1872), a species known from the same type of habitat, wet meadows and fens. We therefore synonymize *C. paludicolella* with *C. doubledayana*.

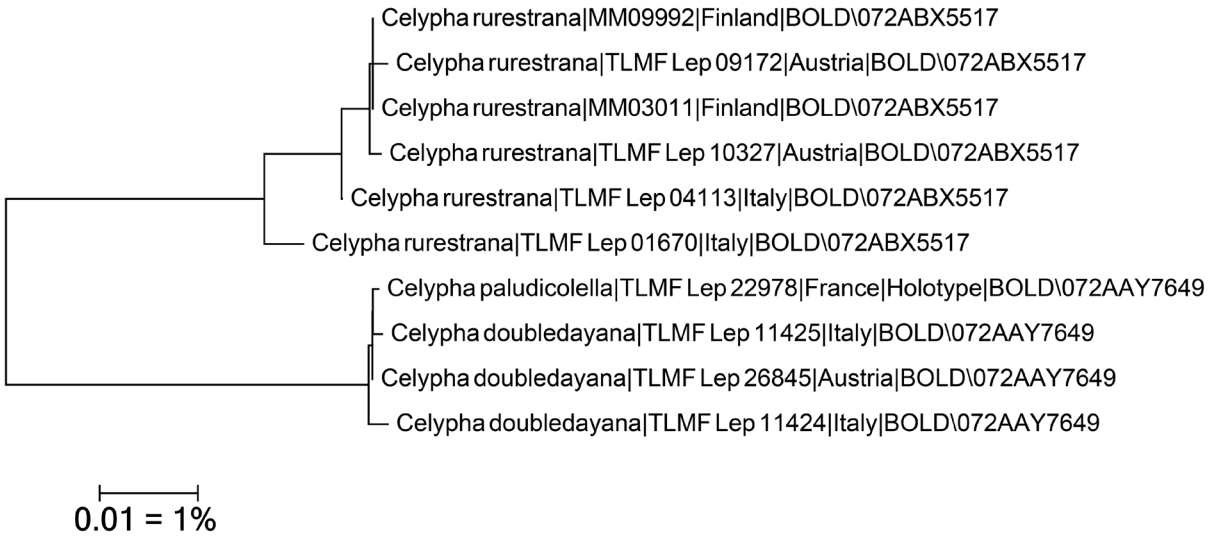

FIGURE 5. Neighbor-joining tree of *Celypha doubledayana* incl. *C. paludicolella* and the closest European species *C. rurestrana* (Duponchel, 1843) in BOLD.

Cydia mogeae Varenne & Nel, 2014

Cydia mogeae Varenne & Nel 2014a: 31, figs. 15–16, 18.

Examined material. Holotype ♂: France, Hautes-Alpes, La Grave, 2.VII.2013, uv, 1390 m, Th. Varenne leg., genitalia slide JN n°27078 (RCTV); Paratype ♀, idem, but genitalia slide JN n°27072 (RCJN) [TLMF].

Holotype: BOLD Specimen ID TLMF 22302; BOLD Sequence ID LEASS654-17. Paratype: BOLD Specimen ID TLMF 22972; BOLD Sequence ID LEAST374-17.

BIN: BOLD:AAB6550

Identity: *Pammene obscurana* (Stephens, 1834), synonymized by Nel & Varenne (2018).

Remarks. *Cydia mogeae* was described from a male holotype and a female paratype and compared with *Cydia illutana* (Herrich-Schäffer, 1851) (Varenne & Nel 2014a). However, the successful sequencing of both type specimens showed that the holotype matches *Pammene obscurana*, i.e. a representative of another genus, whereas the paratype showed no genetic distance to *C. illutana*. Nel & Varenne (2018a) followed these results after re-examination of the morphology and consequently synonymized *C. mogeae* with *P. obscurana*.

Cydia oxytropidana Nel & Varenne, 2016

Cydia oxytropidana Nel & Varenne 2016a: 36, figs. 18, 19a, 20a.

Examined material. Holotype ♂: France, Hautes-Alpes, La Roche-de-Rame, 30.V.2015, J. Nel leg. (TLMF). Paratype ♂, idem (TLMF). Paratype ♀, idem (TLMF).

Holotype: BOLD Specimen ID TLMF 21933; BOLD Sequence ID LEASS475-17. Paratype: BOLD Specimen ID TLMF 22248; BOLD Sequence ID LEASS600-17. Paratype: BOLD Specimen ID TLMF 22249; BOLD Sequence ID LEASS601-17.

BIN: BOLD:ACZ9660

Identity: *Cydia oxytropidis* (Martini, 1912), **syn. nov.** (Fig. 6)

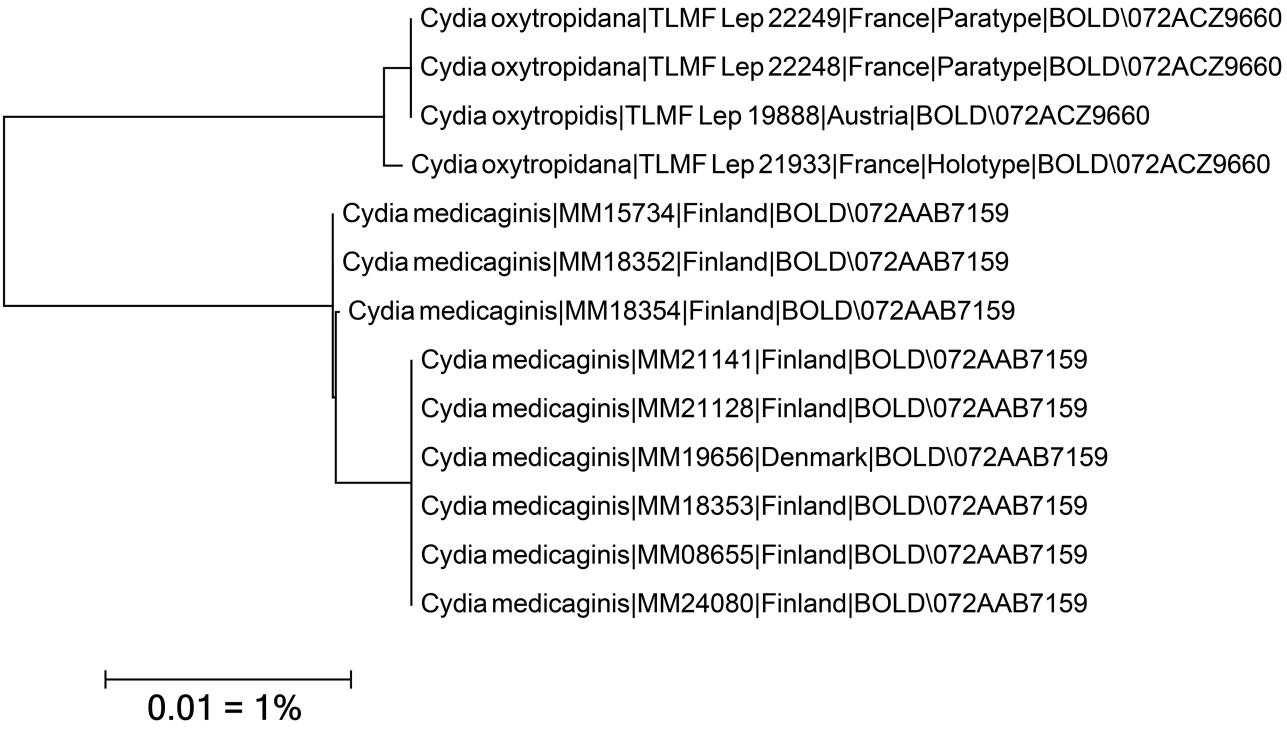

FIGURE 6. Neighbor-joining tree of *Cydia oxytropidis* incl. *C. oxytropidana* and the closest European species *C. medicaginis* (Kuznetsov, 1962) in BOLD.

Remarks. *Cydia oxytropidana* was described from a male holotype and several paratypes of both sexes. Nel & Varenne (2016a) compared the species with *C. oxytropidis* (Martini, 1912) but based their diagnosis exclusively on genitalia figures published by Razowski (2003). Whereas the discussed differences in male genitalia are subtle, the females of both species seemed to differ strikingly e.g. by the lack of signa in *C. oxytropidis* vs well developed in *C. oxytropidana*. However, re-assessment of allegedly diagnostic characters gave a different picture. Male genitalia show intraspecific variation that does not support two species. Similarly female genitalia characters underly some variation as shown by Nel & Varenne (2016a) for *C. oxytropidana*. Paired signa in female genitalia are a basic structure in *Cydia* and well developed in all European species. It is therefore suspected that the figure of *C. oxytropidis* in Razowski (2003), based on a specimen from Ukraine, is erroneous. Other specimens of *C. oxytropidis* from the Ukraine have normally developed signa (Kavurka 2010) and the same applies to material from Central Europe dissected by PH. Finally we have been able to obtain DNA barcode sequences of the holotype and two paratypes of *C. oxytropidana* which also fully correspond to *C. oxytropidis*. We therefore synonymize *C. oxytropidana* with *C. oxytropidis*.

Cydia rymarczyki Varenne & Nel, 2013

Cydia rymarczyki Varenne & Nel 20132013c: 19, figs. 3, 9–10, 13.

Examined material. Holotype ♂: France, Alpes-Maritimes, Tamarin, Biot, 100 m, uv, 7.IX.2012, Th. Varenne leg., genitalia slide JN n°26239 (RCTV).

BOLD Specimen ID TLMF 08949; BOLD Sequence ID PHLAI195-13.

BIN: BOLD:ACF9264

Identity: *Cydia rymarczyki* Varenne & Nel, 2013

Remarks. *Cydia rymarczyki* was described from four male specimens and a single female and compared with the morphologically similar *C. amplana* (Hübner, 1800) and *C. molybdana* (Constant, 1884) (Varenne & Nel 2013a). We obtained a 636 bp DNA barcode sequence of the holotype which is ca. 5.9% divergent to *C. amplana*, the nearest neighbour in BOLD.

Dichrorampha melaniana Nel & Varenne, 2016

Dichrorampha melaniana Nel & Varenne 2016a: 38, figs. 22, 23a, unnumbered figure.

Examined material. Holotype ♀: France, Alpes-Maritimes, Roubion, Vignols, 11.VI.2015, Th. Varenne leg., genitalia slide JN n°29316 (RCTV).

BOLD Specimen ID TLMF 22299; BOLD Sequence ID LEASS651-17.

BIN: BOLD:AAA8637

Identity: *Dichrorampha melaniana* Nel & Varenne, 2016

Remarks. *Dichrorampha melaniana* was decribed from three female specimens from the French Alps and compared with *D. alpigenana* Heinemann, 1863. The male sex was published only a year later by Nel & Varenne (2017a), based on a single specimen. The authors had not been aware of another related species, namely *D. tarmanni* Huemer, 2009, which occurs in nearby Italy. Both species are close in genitalia with only subtle differences in the female but seemingly better separated in the male. The successfully sequenced holotype of *D. melaniana* fully corresponds to *D. tarmanni* as well as to several other species of *Dichrorampha.* It appears that barcode sharing is widespread in this group of closely related species. Though the validity of *D. melaniana* seems well supported from available figures it will be necessary to study the intraspecific variation and to re-assess the species group of *D. plumbana* (Scopoli, 1763).

Dichrorampha minutiana Nel & Varenne, 2012

Dichrorampha minutiana Nel & Varenne 2012b: 43, figs. 1–3.

Examined material. Holotype ♂: France, Lantisolon, Saint-Paul-en-Forêt, 220 m, Var, 3.VI.2011, Th. Varenne leg., genitalia slide JN n°25350 (RCTV).

BOLD Specimen ID TLMF 22303; BOLD Sequence ID LEASS655-17.

BIN: BOLD:ADM1228

Identity: *Dichrorampha minutiana* Nel & Varenne, 2012

Remarks. *Dichrorampha minutiana* was described from a male holotype and a female paratype and compared particularly with *D. distinctana* (Herrich-Schäffer, 1851) which differs in some details of genitalia (Nel & Varenne 2012b). We were able to obtain a full DNA barcode sequence of the holotype but unfortunately no comparative sequences of *D. distinctana* is available on BOLD. The nearest neighbour known to date is *D. agilana* (Tengström, 1847) with ca. 4.6% divergence.

Epiblema bonifaciensis Nel, Varenne & Peslier, 2020

Epiblema bonifaciensis Nel, Varenne & Peslier 2020: 71, figs. 19–21.

Examined material. Holotype ♂: France, Corse-du-Sud, Bonifacio, 80 m, uv, 6.VI.2019, Th. Varenne leg., genitalia slide TV n°6964 (RCTV).

BOLD Specimen ID TLMF 28240; BOLD Sequence ID PALEA230-20.

BIN: not barcode compliant.

Identity: *Epiblema bonifaciensis* Nel, Varenne & Peslier 2020, identity uncertain.

Remarks. *Epiblema bonifaciensis* was described from a single male holotype and compared with several congeneric species, particularly the closest taxon *E. graphana* (Treitschke, 1835) (Nel et al 2020). The DNA barcode of the successfully sequenced holotype is not barcode compliant and ca. 1.4% divergent from the nearest neighbour, *E. graphana*. The latter species shows considerable intraspecific barcode variation with altogether three BINs, and *E. bonifaciensis* nests in a group near the most widespread cluster. The small differences in male genitalia and also in the later described female (Varenne *et al.* 2020) may be due to individual variation and distortion of genitalia (female ostium), and require careful re-assessment in the context of a revision of the intraspecific variation of *E. graphana*.

Eucosma bimaculatana Labonne, Nel & Varenne, 2017

Eucosma bimaculatana Labonne, Nel & Varenne 2017: 201, figs. 1–2, 5.

Examined material. Holotype ♂: France, Corse-du-Sud, Propriano, uv, 10.VI.2017, G. Labonne leg., genitalia slide Gla-017-1376 (RCTV).

BOLD Specimen ID TLMF 28222; BOLD Sequence ID PALEA212-20.

BIN: BOLD:AEC6043

Identity: *Eucosma bimaculatana* Labonne, Nel & Varenne, 2017, identity uncertain.

Remarks. *Eucosma bimaculatana* was described from two males from Corsica (Labonne *et al.* 2017), whereas the female was reported two years later (Varenne *et al*. 2019). The successfully sequenced holotype clusters separately from other barcoded *Eucosma* in a unique BIN with a distance of ca. 4% to the nearest neighbour, *E. glomerana* (Walsingham, 1879) from North America and ca. 5% to the nearest neighbour in Europe, the morphologically similar *E. tripoliana* (Barrett, 1880). However, the relationship to *E. fervidana* (Zeller, 1847), a species without barcode sequence so far, needs re-assessment.

Oecophoridae

Denisia lutea Varenne & Nel, 2019

Denisia lutea Nel & Varenne 2019a: 15, figs. 18–21.

Examined material. Holotype ♂: France, Var, Le Muy, 25 m, uv, 7.IV.2018, Th. Varenne leg., genitalia slide TV n°6629 (RCTV).

BOLD Specimen ID TLMF 27058; BOLD Sequence ID LEASV306-19.

BIN: none

Identity: *Denisia lutea* Varenne & Nel, 2014

Remarks. *Denisia lutea* was described from a male holotype and a female and male paratype. It was distinguished from congeneric species particularly by the unique phenotypic appearance of the adult and diagnostic characters of genitalia (Nel & Varenne 2019a). DNA barcoding of the holotype resulted in a non barcode-compliant sequence of 560 bp which is about 7% divergent from the nearest congeneric species *D. haydenella* (Chambers, 1877) from North America.

Pleurota castagniccia Varenne & Nel, 2013

Pleurota castagniccia Varenne & Nel 2013b: 29, figs. 5, 12, 13a.

Examined material. Holotype ♂: France, Querticelli, Santa-Lucia-di-Mercurio, 770 m, Haute Corse, 27.VI.2010, Th. Varenne leg., genitalia slide JN n°26271 (RCTV).

BOLD Specimen ID TLMF 28231; BOLD Sequence ID PALEA221-20.

BIN: BOLD:ADL5105

Identity: *Pleurota castagniccia* Varenne & Nel, 2013

Remarks. *Pleurota castagniccia* was described from four males and compared with the morphologically similar *P. aristella* (Linnaeus, 1767) (Varenne & Nel 2013b). The successfully sequenced holotype shows a considerable divergence of ca. 5.8% from the nearest neighbour, *P. staintoniella* Baker, 1888 from North Africa, which supports the separate species status of both taxa.

Depressaridae

Depressaria pseudobadiella Nel, 2011

Depressaria pseudobadiella Nel 2011: 4, figs. 1, 3–4.

Examined material. Paratype ("allotype") ♀: France, le Mirail, Lubéron, Vaucluse, 9.IX.1991, J. Nel leg., genitalia slide JN n°2513 (RCJN [TLMF].

BOLD Specimen ID TLMF 08582; BOLD Sequence ID PHLAH778-12.

BIN: BOLD:ACC4792

Identity: *Depressaria pseudobadiella* Nel, 2011, identity uncertain.

Remarks. *Depressaria pseudobadiella* was described from a male holotype and four paratypes of both sexes and compared with the morphologically similar *D. badiella* (Hübner 1796). We successfully sequenced a female paratype ("allotype"). Following Buchner & Šumpich (2018) both species are separable only in female genitalia whereas the DNA barcode is specifically distinct. However the latter authors found a considerable intraspecific divergence which requires further assessment.

Cosmopterigidae

***Coccidiphila camai* Varenne & Nel, 2018**

Coccidiphila camai Varenne & Nel 2018: 3, figs. 1–4.

Examined material. Holotype ♀: France, Var, Le Muy, 20 m, uv, 30.IV.2017, Th. Varenne leg., genitalia slide TV n°6304 (RCTV). Paratype ♀, idem, genitalia slide TV n°6306 (RCTV).

Holotype: BOLD Specimen ID TLMF 27003; BOLD Sequence ID LEASU1167-18. Paratype: BOLD Specimen ID TLMF 25312; BOLD Sequence ID LEGEL366-18.

BIN: BOLD:ADL5754

Identity: *Coccidiphila camai* Varenne & Nel, 2018, identity uncertain

Remarks. *Coccidiphila camai* was described from two females with identical collection data (Varenne & Nel 2018). The successfully sequenced holotype and paratype are ca. 6–7% divergent from the congeneric species *C. gerasimovi* Danilevsky, 1950 and *C. danilevskyi* Sinev, 1997. However, no barcode is available for the morphologically more closely related *C. ledereriella* (Zeller, 1850).

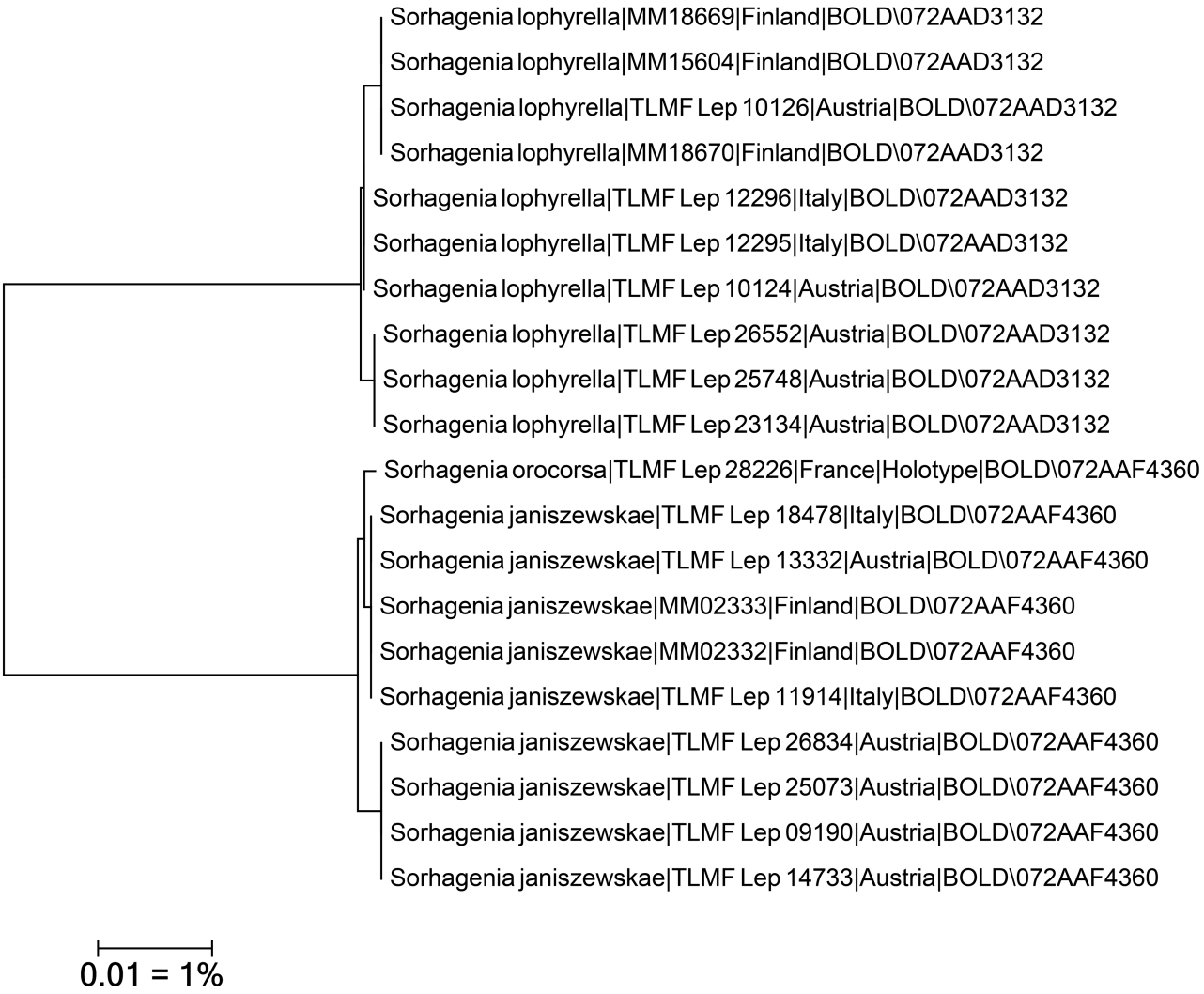

FIGURE 7.Neighbor-joining tree of *Sorhagenia janiszewskae* incl. *S. orocorsa* and the closest European species *S. lophyrella* (Douglas, 1846) in BOLD.

Sorhagenia orocorsa Varenne & Nel, 2016

Sorhagenia orocorsa Varenne & Nel 2016: 58, figs. 19–20.

Examined material. Holotype ♂: France, Haute-Corse, Corte, Restonica, 1320 m, 2.VIII.2015, uv, Th. Varenne leg., genitalia slide TV n°5605 (RCTV).

BOLD Specimen ID TLMF 28226; BOLD Sequence ID PALEA216-20.

BIN: BOLD:AAF4360

Identity: *Sorhagenia janiszewskae* Riedl, 1962, **syn. nov.** (Fig. 7)

Remarks. *Sorhagenia orocorsa* was described from a male holotype and separated from *S. janiszewskae* Riedl, 1962 by characters of the male genitalia (Varenne & Nel 2016). However, the DNA barcode of the holotype fully corresponds with the latter species. A careful re-examination of alleged diagnostic characters showed that they underlie considerable intraspecific variation (Wheeler *et al*. 2021).

Pterolonchidae

Pterolonche douxi Varenne & Nel, 2018

Pterolonche douxi Varenne & Nel 2018: 8, figs. 13–14, 16–18.

Examined material. Holotype ♂: France, Alpes-de-Haute-Provence, Riez, Mauras, 640 m, uv, 10.VI.2017, Yves Doux leg., genitalia slide JN n°31546 (RCJN) [TLMF].

BOLD Specimen ID TLMF 27071; BOLD Sequence ID LEASV319-19.

BIN: BOLD:AAD3841

Identity: *Pterolonche douxi* Varenne & Nel, 2018

Remarks. *Pterolonche douxi* was described from a male holotype and three female paratypes and distinguished from the morphologically similar *P. inspersa* Staudinger, 1859, originally described from Spain (Varenne & Nel 2018). The successfully sequenced holotype of *P. douxi* shows a considerable divergence in the DNA barcode of ca. 3% which supports the separate species status of both taxa.

Gelechiidae

Aproaerema cinctelloides (Nel & Varenne, 2012)

Syncopacma cinctelloides Nel & Varenne 2012a: 12, figs. 9–19, 12.

Examined material. Holotype ♂: France, Haute-Corse, Santa Lucia di Mercurio, 780 m, uv, 14.V.2011, Th. Varenne leg., genitalia slide JN n°24904 (RCTV).

BOLD Specimen ID TLMF 22309; BOLD Sequence ID LEASS661-17.

BIN: BOLD:ABX8391

Identity: *Aproaerema cinctelloides* (Nel & Varenne, 2012)

Remarks. *Aproaerema cinctelloides* was described from a male holotype and a female paratype and morphologically compared with *A. cinctella* (Clerck, 1759) (Nel & Varenne 2012a). The DNA barcode sequence of the holotype was already published by Huemer *et al.* (2020) and clearly differs from all other European with ca. 5.4% distance to the nearest neighbour, *A. sangiella* (Stainton, 1863).

Aproaerema cottiennella (Nel, 2012)

Syncopacma cottiennella Nel 2012: 102, figs. 1–4.

Examined material. Holotype ♂: France, Bauchas, col de Montgenèvre, 1850 m, Hautes-Alpes, 26.VII.2011, J. Nel leg., genitalia slide JN n°25656 (RCJN) [TLMF].

BOLD Specimen ID TLMF 28238; BOLD Sequence ID PALEA228-20.

BIN: BOLD:AEC2352

Identity: *Aproaerema cottiennella* (Nel, 2012)

Remarks. *Syncopacma cottiennela* was described from a male holotype and a female paratype (Nel 2012) and separated from several externally similar species by characters of the male genitalia. The DNA barcode sequence of the holotype was already published by Huemer *et al.* (2020) and clearly differs from all other European *Aproaerema* (a senior synonym of *Syncopacma*), thus supporting a separate species.

Aristotelia billii Varenne & Nel, 2013

Aristotelia billii Varenne & Nel 2013a: 17, figs. 1–2, 4.

Examined material. Holotype ♂: France, Alpes-Maritimes, Chabanes, Toudon, 1070 m, u.v., 10.VIII.2012, Th. Varenne leg., genitalia slide JN n°26073 (RCTV).

BOLD Specimen ID TLMF 22304; BOLD Sequence ID LEASS656-17.

BIN: BOLD:AAW5816

Identity: *Aristotelia billii* Varenne & Nel, 2013, identity uncertain.

Remarks. *Aristotelia billii* was described from a male holotype and from two male and five female paratypes (Nel & Varenne 2013a) and separated from the similar *A. subericinella* Duponchel, 1843 by characters of the male genitalia. The DNA barcode sequence of the holotype was already published by Huemer *et al.* (2020) and clearly differs from topotypical *A. subericinella* collected in eastern Austria. Moreover, it differs externally from *A. leonhardi* Krone, 1907, the only European species of the *A. subericinella* species-group without barcode (Huemer et al. 2020). However, the genus *Aristotelia,* and particularly the *A. subericinella* species group including *A. billii,* are in need of a taxonomic revision.

Aroga corsa Varenne & Nel, 2019

Aroga corsa Nel & Varenne 2019a: 19, figs. 26–27, 29–30.

Examined material. Holotype ♂: France, Corse-du-Sud, Bonifaciu, 80 m, ex larva, 25.VI.2018, Th. Varenne leg., genitalia slide TV n°6728 (RCTV).

BOLD Specimen ID TLMF 28215; BOLD Sequence ID PALEA205-20.

BIN: BOLD:AEC5790

Identity: *Aroga corsa* Varenne & Nel, 2019

Remarks. *Aroga corsa* was described from four males and four females bred from the Corsican endemic *Astragalus terraccianoi* (Fabaceae) and compared with the closely related *A. aristotelis* (Nel & Varenne 2019a). However, genitalia in this species had been considered as highly variable so far (Sattler 1960). We have been able to obtain a complete DNA barcode sequence of the holotype which strongly differs from *A. aristotelis* by ca. 4.9% and therefore supports a separate species status.

Chionodes cerdanica Peslier, Nel & Varenne, 2020

Chionodes cerdanica Nel, Varenne & Peslier 2020: 71, figs. 11–12.

Examined material. Holotype ♀: France, Pyrénées-Orientales, Dorres (Ventajols), 1600 m, 9.VIII.2019, S. Peslier leg., genitalia slide JN n°33968 (S. Peslier, Perpignan).

BOLD Specimen ID TLMF 28241; BOLD Sequence ID PALEA231-20.

BIN: none

Identity: *Chionodes distinctella* (Zeller, 1839), **syn. nov.** (Fig. 8)

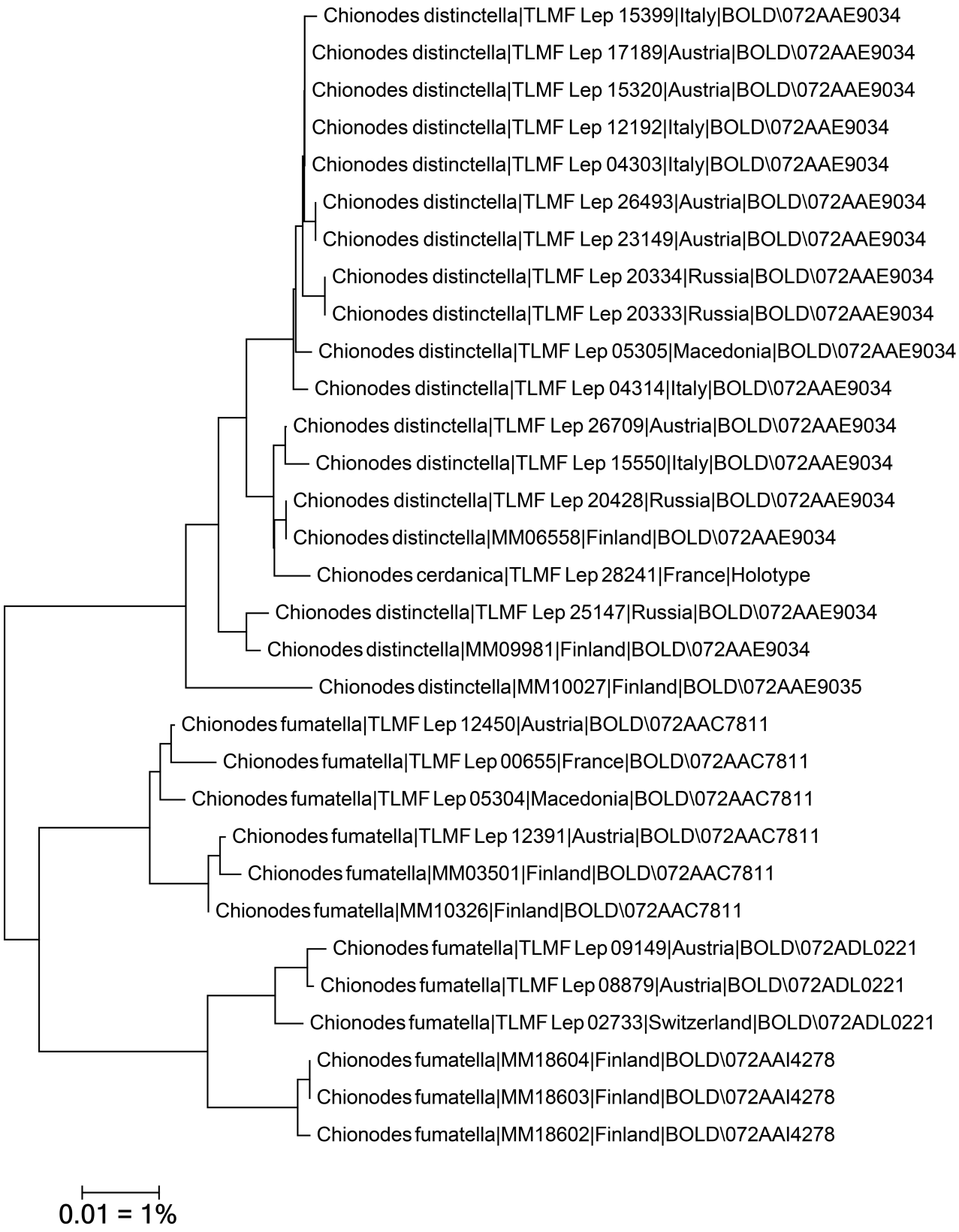

FIGURE 8. Neighbor-joining tree of *Chionodes distinctella* incl. *C. cerdanica* and the closest European species *C. fumatella* (Douglas, 1850) in BOLD.

Remarks. *Chionodes cerdanica* was described from a single female and superficially compared with *C. ignorantella* (Herrich-Schäffer, 1854) (Nel *et al.* 2020). The holotype shows some unique features in genitalia, particularly the short and triangular antrum and the digitate distal part of the apophyses anteriores. However, the fully recovered DNA barcode despite not being barcode compliant, clearly indicates possible conspecifity with *C. distinctella* (Zeller, 1839). This species shows some genetic variation represented by a barcode cluster occurring in Finland and a widespread cluster in Europe with considerable genetic variation of 2.15% within this BIN (Huemer *et al.* 2020). The holotype of *C. cerdanica* nests in a geographically widespread cluster with only ca. 0.6% divergence from the nearest neighbour. Furthermore the female genitalia of both taxa are at least partially similar in the broad apophyses anteriores. Curiously, Nel *et al.* (2020) described the ductus and corpus bursae of *C. cerdanica* as transparent whereas they also stated that these structures were not found during preparation. Whereas the entrance of the ductus bursae is always visible at the anterior end of the antrum in *Chionodes,* it seems to be completely reduced in this specimen. Therefore we believe that the specimen is likely the result of a rare mutation or of a developmental anomaly that led to genitalia malformation. We consider that it is conspecific with *C. distinctella* and synonymize them. A similar case was recently exposed for the long-disputed taxon "*Mesapamea remmi*" (Sihvonen *et al.* 2019).

Isophrictis lineatella littorella Varenne, Nel & Peslier, 2020

Isophrictis lineatella littorella Nel, Varenne & Peslier 2020: 66, figs. 1, 3–4, 7, 9.

Examined material. Holotype ♂: France, Pyrénées-Orientales, Canet-en-Roussilon, beach, 2 m, 19.V.2007, Th. Varenne leg., genitalia slide JN n°34029 (RCTV).

BOLD Specimen ID TLMF 28245; BOLD Sequence ID PALEA235-20.

BIN: BOLD:AEC5068

Identity: *Isophrictis lineatella littorella* Varenne, Nel & Peslier, 2020, identity uncertain.

Remarks. *Isophrictis lineatella littorella* was described from five males, a single female and specimens without information on sex (Nel *et al.* 2020). We have been able to obtain a full barcode sequence of a paratype from Corsica which clusters separately from material collected in Italy (country of type locality of *lineatella*) and Spain. Unfortunately Nel *et al.* (2020) did not figure the holotype of ssp. *littorella* from mainland France but only paratypes from Corsica, and it is therefore impossible to assess the status of this taxon with certainty. Cryptic diversity seems not unlikely from the three currently known barcode clusters.

Ivanauskiella occitanica (Nel & Varenne, 2013)

Spatuncusella occitanica Nel & Varenne 2013b: 40, figs. 1–6, 19.

Examined material. Holotype ♂: France, Ramada, Saint-Laurent de la Salanque, Pyrénées-Orientales, 1.VIII.2008, uv, 2m, Th. Varenne leg., genitalia slide JN n°22679 (RCTV).

BOLD Specimen ID TLMF 22305; BOLD Sequence ID LEASS657-17.

BIN: BOLD:ABW5477

Identity: *Ivanauskiella occitanica* (Nel & Varenne, 2013)

Remarks. *Spatuncusella occitanica*, the type species of the simultaneously described genus *Spatuncusella*, was described from a male holotype and three male and three female paratypes (Nel & Varenne 2013b). Nel & Varenne (2017) synonymized the species with *Ivanauskiella psamathias* (Meyrick, 1891) and thus the genus with *Ivanauskiella* Ivinskis & Piskunov, 1980. However, it was re-established as a valid species by Huemer & Karsholt (2020), both from morphology and particularly the strongly divergent DNA barcode of the holotype and examination of additional specimens.

Iwaruna robineaui Nel, 2008

Iwaruna robineaui Nel 2008: 339, figs. 1, 4.

Examined material. Holotype ♂: France, Puits-de-Rians, bois de la Gardiole, Var, 12.VI.1998, J. Nel leg., genitalia slide JN n°10527 (TLMF).

Paratype ("allotype") ♀: montagne du Lubéron, le Gros Collet, 900 m, Vaucluse, 15.VI.1982, R. Robineau leg., genitalia slide JN n°22242 (TLMF).

Holotype: BOLD Specimen ID TLMF Lep 25553; BOLD Sequence ID LEASU132-18. Paratype (allotype): BOLD Specimen ID TLMF 06738; BOLD Sequence ID PHLAG344-12.

BIN: BOLD:AAU3602

Identity: *Iwaruna robineaui* Nel, 2008

Remarks. *Iwaruna robineui* was described from a male holotype supplemented by several paratypes of both sexes and compared with *I. klimeschi* Wolff, 1958 and *I. biguttella* (Duponchel, 1843) (Nel 2008). The DNA barcode of the successfully sequenced holotype is about 2% divergent from these species which share the BIN with *I. robineaui* (Huemer & Karsholt 2020, Huemer *et al.* 2020).

Megacraspedus andreneli Varenne & Nel, 2014

Megacraspedus andreneli Varenne & Nel 2014: 61, figs 7–9.

Examined material. Holotype ♂: France, Alpes-Maritimes, Saint-Sauveur-sur-Tinée, Lac Nègre, Parc national du Mercantour, 10.VIII.2013, 2450 m, Th. Varenne leg., gentalia slide JN n°27182 (RCTV) [photographs examined].

BOLD Specimen ID TLMF 22312; BOLD Sequence ID LEASS664-17.

BIN: BOLD:ADG6163

Identity: *Megacraspedus andreneli* Varenne & Nel, 2014

Remarks. *Megacraspedus andreneli* was described from two males (Varenne & Nel 2014). We were able to obtain DNA barcode sequences of both specimens which show a marked genetic distance and cluster in separate BINs with 4.3% divergence (Huemer & Karsholt 2018). The identity of the paratype therefore has to be re-assessed in future studies.

Mondeguina mediterranella (Nel & Varenne, 2012)

Apatetris mediterranella Nel & Varenne 2012c: 27, figs. 1–3, 6–7, 9.

Examined material. Holotype ♂: France, Mas Fondame, Salses-le-Château 4 m, Pýrenées-Orientales, 1.VII.2006, uv, Th. Varenne leg., genitalia slide JN n°20558 (RCTV).

BOLD Specimen ID TLMF 22306; BOLD Sequence ID LEASS658-17.

BIN: [BOLD:ABA4798]

Identity: *Mondeguina mediterranella* (Nel & Varenne, 2012)

Remarks. *Apatetris mediterranella* was described from a male holotype and eleven male and eight female paratypes (Nel & Varenne 2012c). The short DNA barcode sequence of the holotype (325 bp) was previously published by Huemer *et al.* (2020). The species and its close relative were recently revised and combined in a new genus *Mondeguina* (Corley *et al.* 2020).

Pragmatodes albagonella (Varenne & Nel, 2010)

Monochroa albagonella Varenne & Nel 2010: 18, figs. 3–4, 6.

Examined material. Holotype ♂: France, Gourdoulon, l'Escarène, 430 m, Alpes-Maritimes, 18.VII.2009 (uv), Th. Varenne leg., genitalia slide JN n°23735 (RCTV).

BOLD Specimen ID TLMF 22308; BOLD Sequence ID LEASS659-17.

BIN: BOLD:ADM0124

Identity: *Pragmatodes albagonella* (Varenne & Nel, 2010)

Remarks. *Pragmatodes albagonella* was described from a male holotype and additional three male paratypes. The species was compared with *P. melagonella* (Constant, 1895) (Nel & Varenne 2012a). Huemer & Karsholt (2020) transferred it to the genus *Pragmatodes* and confirmed the status of *P. albagonella* with a supportive DNA barcode sequence of the holotype.

Pragmatodes cyrneogonella (Nel & Varenne, 2012)

Monochroa cyrneogonella Nel & Varenne 2012a: 11, figs. 4–5, 8.

Examined material. Holotype ♂: France, Pertusato, Bonifacio, 80 m, Corse du Sud, uv, 24.V.2011, Th. Varenne leg., genitalia slide JN n°24833 (RCTV).

BOLD Specimen ID TLMF 22307; BOLD Sequence ID LEASS659-17.

BIN: BOLD:AEW2356

Identity: *Pragmatodes cyrneogonella* (Nel & Varenne, 2012)

Remarks. *Pragmatodes cyrneogonella* was described from a male holotype and additional five males and a single female as paratypes. The species was compared with other congeneric taxa, in particular *P. albagonella* (Varenne & Nel, 2010), *P. parvulata* (Gozmany, 1957), and *P. melagonella* (Constant, 1895) (Nel & Varenne 2012a). Huemer & Karsholt (2020) transferred these taxa to the genus *Pragmatodes* and confirmed the status of *P. cyrneogonella* with a supportive DNA barcode sequence of the holotype.

Sattleria taurandi Nel & Varenne, 2019

Sattleria taurandi Nel & Varenne 2019b: 139, figs. 1A–C, 2A, 3.

Examined material. Holotype ♂: France, Ariège, Mérens-les Vals, 2800 m, 27.VII.2018, L. Taurand leg., genitalia slide LT n°9 (Muséum d'Histoire Naturelle de Toulouse).

BOLD Specimen ID TLMF 28116; BOLD Sequence ID PALEA106-20.

BIN: BOLD:AEC3328

Identity: *Sattleria taurandi* Nel & Varenne, 2019, identity uncertain.

Remarks. *Sattleria taurandi* was described from a male holotype and a male paratype, and compared with three other species of *Sattleria* from the Pyrenees (Nel & Varenne 2019b). The DNA barcode of the successfully sequenced holotype is about 2.3% divergent from the nearest species *S. pyrenaica* (Petry, 1904). However, unfortunately no DNA barcode exists for *S. angustispina* Pitkin & Sattler, 1991, the nearest species from morphology. Both species can only be separated by subtle genitalia characters which are based on slides made with different preparation techniques, and thus need careful re-assessment.

Scrobipalpa corsicamontes Varenne & Nel, 2013

Scrobipalpa corsicamontes Varenne & Nel 2013b: 30, figs. 6, 14.

Examined material. Holotype ♂: France, Piane, Castifao, 310 m, Haute Corse, uv, 10.X.2012, Th. Varenne leg., genitalia slide JN n°26332 (RCTV).

BOLD Specimen ID TLMF 28230; BOLD Sequence ID PALEA220-20.

BIN: BOLD:AEC1903

Identity: *Scrobipalpa corsicamontes* Varenne & Nel, 2013

Remarks. *Scrobipalpa corsicamontes* was described from two males and two females and randomly compared with *S. voltinella* (Chrétien, 1898) (Varenne & Nel 2013b). However, the nearest neighbour of the successfully sequenced holotype with ca. 6.6% divergence is *S. eremica* Povolný, 1967, a species known from the Middle East. The systematic position of the species requires further study.

Scrobipalpa fontanensis Varenne & Nel, 2017

Scrobipalpa fontanensis Varenne & Nel 2017a: 51, figs. 14–15, 15a, 16.

Examined material. Holotype ♂: France, Alpes-Maritimes, Fontan, 1100 m, e.l., 28.IV.2016, Th. Varenne leg., genitalia slide JN n°30456 (RCTV).

BOLD Specimen ID TLMF 22975; BOLD Sequence ID LEAST377-17.

BIN: BOLD:ADJ0760

Identity: *Scrobipalpa fontanensis* Varenne & Nel, 2017, identity uncertain.

Remarks. *Scrobipalpa fontanensis* was described from a male holotype as well as another male and two female paratypes, and compared with the morphologically very similar *S. mixta* Huemer & Karsholt, 2010 (Varenne & Nel 2017a). The DNA barcode of the successfully sequenced holotype does not match to any other species of the genus *Scrobipalpa* in BOLD. The nearest neighbour *S. disjectella* (Staudinger, 1859) is about 2.9% divergent; unfortunately, no DNA barcode sequence of *S. mixta* is currently available.

Scrobipalpa hyssopi Nel, 2003

Scrobipalpa hyssopi Nel 2003b: 49, figs. 9–10.

Examined material. Holotype ♂: Villard de Saint-Crépin, 1370 m (Hautes-Alpes), 17 julliet 2002, e.l. on *Hyssopus officinalis*, genitalia slide JN 14755, J. Nel leg. (TLMF).

BIN: BOLD:ADL8424

Identity: *Scrobipalpa hyssopi* Nel, 2003

Remarks. *Scrobipalpa hyssopi* was described from a single male holotype and separated from congeneric taxa based on characters of the sacculus in male genitalia (Nel 2003b). The successfully sequenced holotype is very close to *S. amseli* Povolný, 1966 with only 1.2% divergence but further differs by genitalia characters.

Scrobipalpa mercantourica Varenne & Nel, 2018

Scrobipalpa mercantourica Varenne & Nel 2018: 12, figs. 22–24.

Examined material. Holotype ♂: France, Isola-sur-Tinée, 2200 m, 7.VI.2017, Th. Varenne leg., genitalia slide JN n°31726 (RCTV).

BOLD Specimen ID TLMF 25314; BOLD Sequence ID LEGEL368-18.

BIN: BOLD:ACU4764

Identity: *Scrobipalpa mercantourica* Varenne & Nel, 2018, identity uncertain.

Remarks. *Scrobipalpa mercantourica* was described from a male holotype and compared with the morphologically very similar *S. arenbergeri* Povolný, 1973 (Varenne & Nel 2018). Both species share the BIN and the successfully sequenced holotype is only about 1% divergent to *S. arenbergeri*. However, in consideration of the subtlety of diagnostic genitalia characters and the limited material, we maintain the species status of both taxa for the time being.

Stomopteryx alpinella Nel & Varenne, 2016

Stomopteryx alpinella Nel & Varenne 2016a: 33, figs, 13, 14a-b, 15a.

Examined material. Holotype ♂: France, Alpes-Maritimes, Tende, Peyrefique, 2000 m, 11.VII.2015, Th. Varenne leg., genitalia slide JN n°29435 (RCTV).

BOLD Specimen ID TLMF 21931; BOLD Sequence ID LEASS473-17.

BIN: BOLD:ADF6169

Identity: *Stomopteryx alpinella* Nel & Varenne, 2016

Remarks. *Stomopteryx alpinella* was described from nine males and a single female (Nel & Varenne 2016a). The successfully sequenced holotype clusters in a unique BIN with ca. 4% divergence to the nearest neighbour in BOLD, *Stomopteryx remissella* (Zeller, 1847), which is an unresolved species complex (Huemer & Karsholt 2020).

Stomopteryx spathulella Nel, Varenne & Labonne, 2019

Stomopteryx spathulella Nel, Varenne & Labonne 2019: 14, figs. 1A, 2, 5–7.

Examined material. Holotype ♂: France, Alpes-Maritimes, Courségoules, 945 m, 06.VII.1995, Th. Varenne leg., genitalia slide JN n°4082 (RCTV).

BOLD Specimen ID TLMF 28201; BOLD Sequence ID PALEA191-20.

BIN: none

Identity: *Stomopteryx spathulella* Nel, Varenne & Labonne, 2019, identity uncertain.

Remarks. *Stomopteryx spathulella* was described from several specimens of both sexes (Nel *et al.* 2019). DNA barcoding of the holotype failed but the species belongs to an unresolved species complex, reflected in the extraordinarily divergent barcodes comprising eight different BINs as well as differences in phenotype. However, as pointed by Huemer & Karsholt (2020), the whole complex requires thorough revisionary work and a re-evaluation of available names.

Elachistidae

Elachista anserinelloides Nel, 2003

Elachista anserinelloides Nel 2003a: 492, figs. 7–8, 10–11.

Examined material. Holotype ♂: France, Var, montagne de Lachens, 1600 m, 11.VII.1995, J. Nel leg., genitalia slide JN n°3843 (TLMF).

Paratype ("allotype") ♀: France, Alpes-Maritimes, Saint-Vallier-de-Thiey, route D5 vers Coussols, 1200 m, 16.VI.2001, J. Nel leg., genitalia slide JN n°13253 (TLMF). Holotype: BOLD Specimen ID TLMF 06747; BOLD Sequence ID PHLAG353-12. Paratype (allotype): BOLD Specimen ID TLMF 06748; BOLD Sequence ID PHLAG354-12.

BIN: BOLD:ABY3837

Identity: *Elachista anserinelloides* Nel, 2003

Remarks. *Elachista anserinelloides* was described from a male holotype and six other specimens of both sexes (Nel 2003a). The species was superficially compared with a larger number of species. We were able to obtain a complete DNA barcode sequence of the holotype, although with 89 ambiguous bases, and a further complete DNA barcode of the paratype published as allotype. Both sequences are largely similar and group within the same BIN, with ca. 2.8% distance to the nearest neighbour in BOLD, *Elachista clivella* Kaila, 2015 from Russian Altai, a species quite different externally and in genitalia morphology.

Elachista bidentata Varenne & Nel, 2019

Elachista bidentata Varenne & Nel 2019: 89, figs. 17–19.

Examined material. Holotype ♂: France, Isère, Auris-en-Oisans, 1700 m, 7.VI.2018, Th. Varenne leg., genitalia slide TV n°6724 (RCTV).

BOLD Specimen ID TLMF 27072; BOLD Sequence ID LEASV320-19.

BIN: not barcode compliant, but clusters with BOLD:AAP5716

Identity: *Elachista orstadii* Palm, 1943, **syn. nov.** (Fig. 9)

Remarks. *Elachista bidentata* was described from a male holotype and separated from *E. orstadii* on subtle differences in genitalia (Varenne & Nel 2019). However, the DNA barcode sequence of the holotype fully corresponds with the latter species and the alleged genitalia differences are within the intraspecific variation of large samples from Europe and Siberia (Kaila in litt.). We therefore synonymize *E. bidentata* with *E. orstadii*.

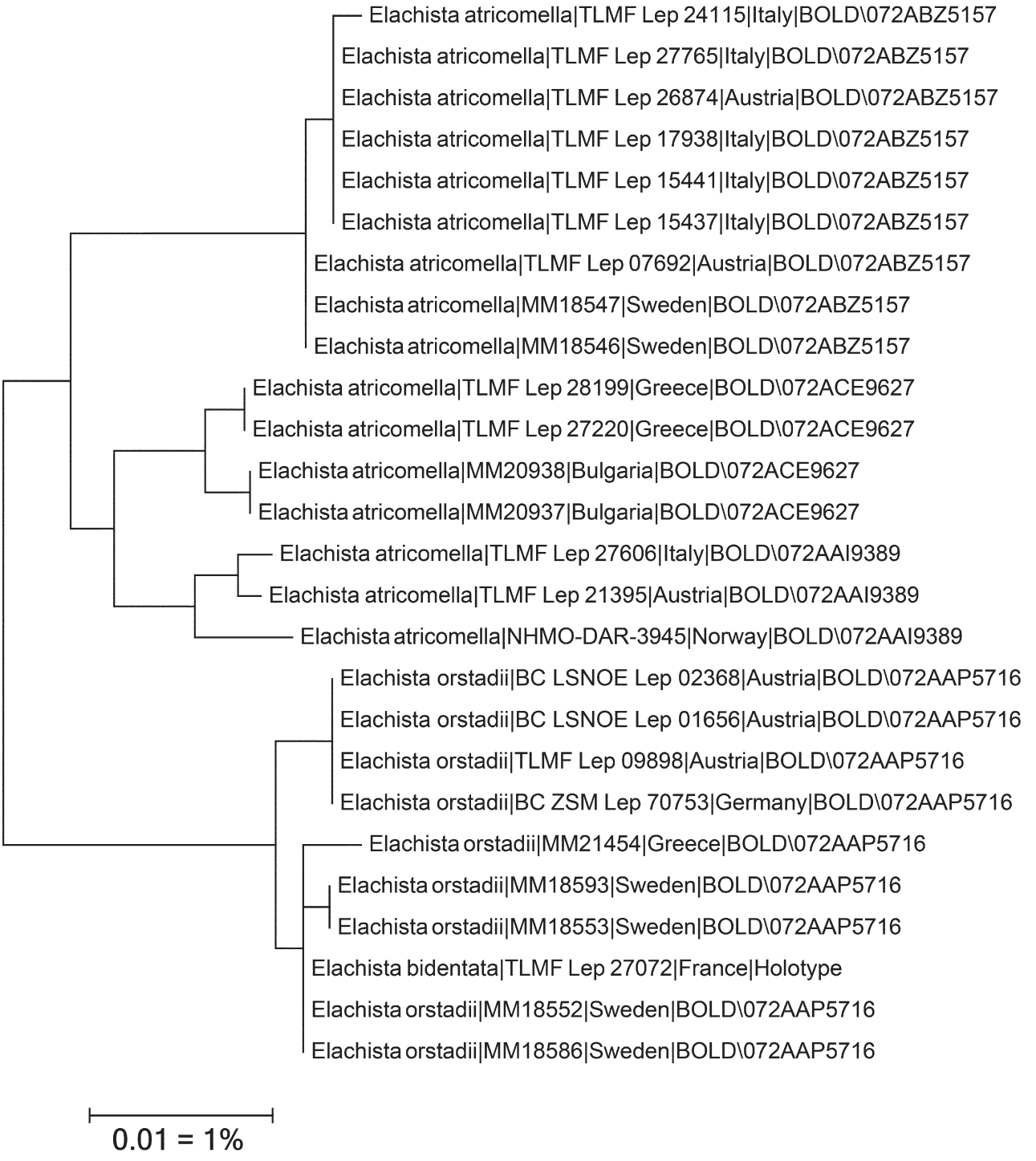

FIGURE 9. Neighbor-joining tree of *Elachista orstadii* incl. *E. bidentata* and the closest European species *E. atricomella* Stainton, 1849 in BOLD.

Elachista karsticola Varenne & Nel, 2018

Elachista karsticola Varenne & Nel, 2018: 6, figs. 10–11.

Examined material. Holotype ♂: France, Alpes-Maritimes, Courségoules, 950 m, 12.IV.2017, Th. Varenne leg., genitalia slide JN n°31706 (RCTV).

BOLD Specimen ID TLMF 25313; BOLD Sequence ID LEGEL367-18.

BIN: BOLD:ABW4899

Identity: *Elachista maculosella* Chrétien, 1896, **syn. nov.** (Fig. 10)

Remarks. *Elachista karsticola* was described from a male holotype and separated from the randomly selected species of the *E. bifasciella* species-group *E. sebastella* Kaila, 2015, *E. sulcsiella* Savenkov, 2013, *E. orstadii* Palm, 1943 and *E. gruenewaldi* Parenti, 2002 on genitalia characters (Varenne & Nel 2018). The species was recently included in the World Catalogue of Elachistidae as valid taxon (Kaila 2019). However, the successfully sequenced holotype shares the barcode with *E. maculosella*, a species described from France and corresponding in morphology but not considered as potential conspecific by Varenne & Nel (2018). According to Kaila (pers. comm.) the taxon falls in the range of intraspecific variation of *E. maculosella*. We therefore synonymize *E. karsticola* with *E. maculosella*.

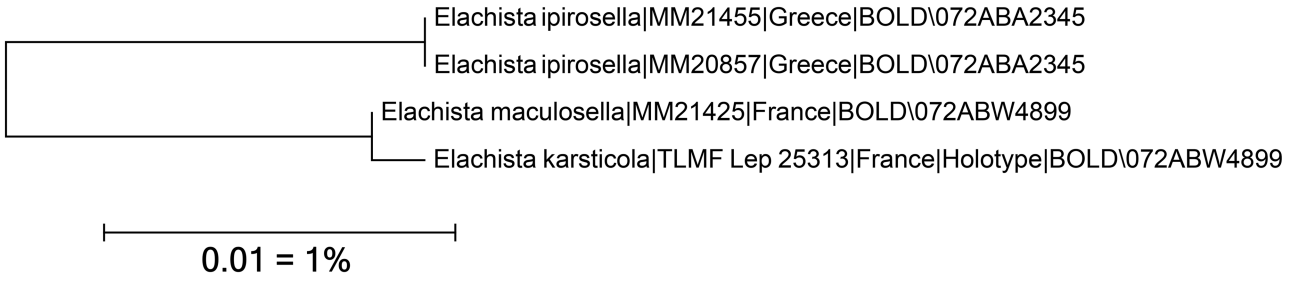

FIGURE 10. Neighbor-joining tree of *Elachista maculosella* incl. *E. karsticola* and the closest European species *E. ipirosella* Kaila, 2015 in BOLD

Elachista paracollitella Nel & Varenne, 2016

Elachista paracollitella Nel & Varenne 2016b: 77, figs. 9–10.

Examined material. Holotype ♂: France, Hérault, Aumelas, 180 m, 26.IV.2004, Th. Varenne leg., genitalia slide JN n°17544 (RCTV).

BOLD Specimen ID TLMF 22310; BOLD Sequence ID LEASS662-17.

BIN: none

Identity: *Elachista paracollitella* Nel & Varenne, 2016, possible synonym of *E. gormella* Nielsen & Traugott-Olsen, 1987.

Remarks. *Elachista paracollitella* was described from a male holotype and 15 male paratypes (Nel & Varenne 2016b). The species was separated from several related taxa particularly by subtle characters of male genitalia. In particular *E. gormella* was discussed in detail and separated by diagnostic structures, and hence *E. paracollitella* was included in the World Catalogue of Elachistidae as valid taxon (Kaila 2019). However, the holotype of *E. paracollitella* is very close to *E. gormella* in DNA barcode, with 98.65% similarity, indicating possible conspecificity. However, we hesitate to synonymize both species as the species group is in need of thorough revision (Kaila *in litt.*).

Elachista rosselloensis Varenne & Nel, 2019

Elachista rosselloensis Nel & Varenne 2019a: 17, figs. 22–25.

Examined material. Holotype ♂: France, Pyrénées-Orientales, Ille/Têt, 240 m, uv, 12.IX.2018, Th. Varenne leg., genitalia slide JN n°33141 (RCTV).

BOLD Specimen ID TLMF 27062; BOLD Sequence ID LEASV310-19.

BIN: none

Identity: *Elachista rosselloensis* Varenne & Nel, 2019

Remarks. *Elachista rosselloensis* was described from a single male holotype. The worn specimen with overall white appearance was compared with other superficially similar looking species (Nel & Varenne 2019a) but not with the morphologically closest species *E. bedellella* (Sircom, 1848) (Kaila in litt.). We have been able to obtain a short sequence of the holotype with 259bp which, however, corresponds to *E. squamosella* (Duponchel, 1843) with 99.6% similarity. The latter species is quite different externally and in genitalia morphology and similarity in DNA barcode may be due to the short sequence. *E. rosseloensis* was not considered in the almost simultaneously published World Catalogue of Elachistidae (Kaila 2019).

Batrachedridae

Duospina europaea Labonne, Nel & Varenne, 2019

Duospina europaea Labonne, Nel & Varenne 2019: 186, figs 1–2, 3B.

Examined material. Holotype ♂: France, Haute-Corse, Galéria, 63 m, 04.VI.2017, uv, G. Labonne leg. genitalia slide Gla-017—1197 (Coll. G. Labonne, Montpellier).

BOLD Specimen ID TLMF 23907; BOLD Sequence ID LEAST1404-17.

BIN: BOLD:ADL5473

Identity: *Duospina europaea* Labonne, Nel & Varenne, 2019

Remarks. *Duospina europaea* was described from a male holotype which was already successfully sequenced in advance of publication but the barcode was not considered in the description. The species is almost 9% divergent from the nearest extra-European species *Duospina trichella* (Busck, 1908), but only 2.57% divergent from an unpublished congeneric species from Bulgaria in BOLD.

Coleophoridae

Coleophora cyrneogenistae Varenne & Nel, 2014

Coleophora cyrneogenistae Varenne & Nel 2014a: 28, figs. 4–5, 7–8a.

Examined material. Holotype ♂: Corse-du-Sud, Bonifacio, 8.V.2013, uv, 25 m, Th. Varenne leg., genitalia slide JN n°26909 (RCTV).

BOLD Specimen ID TLMF 28822; BOLD Sequence ID PALEA218-20.

BIN: BOLD:AAU4251

Identity: *Coleophora cyrneogenistae* Varenne & Nel, 2014

Remarks. *Coleophora cyrneogenistae* was described from three males and two females and separated from *C. genistae* Stainton, 1857 by characters of the male and female genitalia (Varenne & Nel 2014a). The holotype was successfully sequenced and fully supports a separate species level with 7.06% divergence to the nearest neighbour, *C. accordella* Walsingham, 1882 from North America.

Scythrididae

Scythris argentierella Nel, 2014

Scythris argentierella Nel 2014a: 7, figs. 3, 9.

Examined material. Holotype ♀: France, Hautes-Alpes, L'Argentière-la-Bessée, 16.VII.2013, 1200 m, J. Nel leg., genitalia slide JN n°27703 (RCJN) [TLMF].

BOLD Specimen ID TLMF 28236; BOLD Sequence ID PALEA226-20.

BIN: BOLD:AEC5598

Identity: *Scythris argentierella* Nel, 2014, identity uncertain.

Remarks. *Scythris argentierella* was described from a female holotype and randomly compared with several superficially similar species such as *S. staudingeri* Jäckh, 1978 (Nel 2014a). However, the DNA barcode sequence of the holotype is nearest to *S. laminella* ([Denis & Schiffermüller], 1775), a species belonging to a different species group, with ca. 6% divergence. As several species of *Scythris* remain without sequences, and the male of *S. argentierella* is still unknown, the taxonomic status will have to be re-assessed in the future.

Scythris chablaisensis Delmas, 2018

Scythris chablaisensis Delmas 2018: 21, figs. 1–3.

Examined material. Holotype ♀: France, Haute-Savoie, Taninges, locality: Le Praz de Lys, 25-VII-2016, altitude 1588 m. Genitalia slide SD n°8403 (Muséum National d'Histoire Naturelle, Paris).

BOLD Specimen ID TLMF 27002; BOLD Sequence ID LEASU1166-18.

BIN: BOLD:AAJ7286

Identity: *Scythris laminella* ([Denis & Schiffermüller], 1775), **syn. nov.** (Fig. 11)

Remarks. *Scythris chablaisensis* was described from a female holotype and superficially compared with species of the *Scythris cicadella* group. However, the DNA barcode sequence of 322bp of the holotype matches *S. laminella* ([Denis & Schiffermüller], 1775) and, according to the original figure, the genitalia also fall within the intraspecific variation of this species.

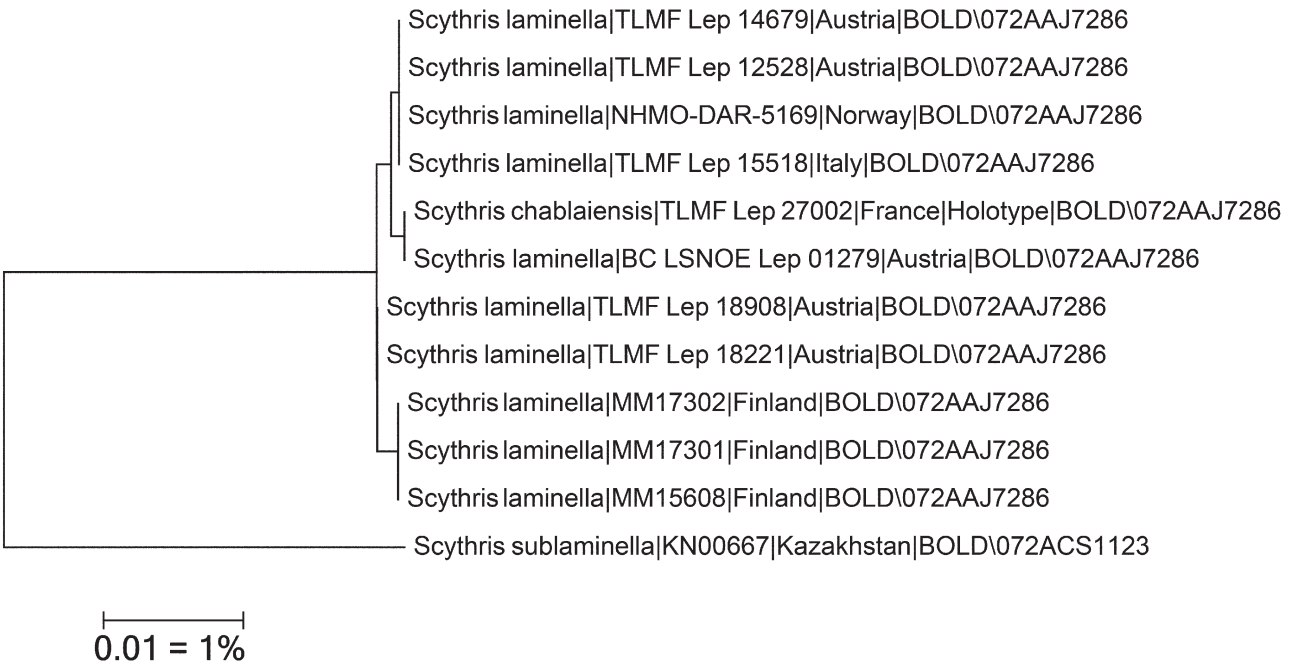

FIGURE 11. Neighbor-joining tree of *Scythris laminella* incl. *S. chablaiensis* and the closest European species *S. sublaminella* K. Nupponen & T. Nupponen, 2000 in BOLD.

Epermeniidae

***Phaulernis laserinella* Nel, 2003**

Phaulernis laserinella Nel 2003b: 51, figs. 11–12, 14.

Examined material. Paratype ♂: France, Vaucluse, Rochers des Rams, 1100 m, Mont Ventoux, 17.VI.2000, genitalia slide JN n°11465, J. Nel leg. (TLMF). Paratype ♂, idem, genitalia slide JN n°14594 (TLMF).

Paratype: BOLD Specimen ID TLMF 06873; BOLD Sequence ID PHLAG479-12. Paratype: BOLD Specimen ID TLMF 06874; BOLD Sequence ID PHLAG480-12.

BIN: BOLD:ABW1117

Identity: *Phaulernis laserinella* Nel, 2003

Remarks. *Phaulernis laserinella* was described from five males and a single female and compared with *P. statariella* (Heyden, 1863) (Nel 2003). Two successfully sequenced paratypes are ca. 5% divergent from this species and undoubtedly depict a different species.

***Epermenia pumila* (Buvat & Nel, 2000)**

Cataplectica pumila Buvat & Nel 2000: 96, figs. 4–5.

Examined material. ♂: France, Rhone-Alpes, Les Houche, 1800 m, 28 julliet 2005, genitalia slide JN 21582, J. Nel leg. (TLMF).

BOLD Specimen ID TLMF 06872; BOLD Sequence ID PHLAG478-12.

BIN: BOLD:AAL0674

Identity: *Epermenia profugella* (Stainton, 1856), **syn. nov.** (Fig. 12)

Remarks. *Epermenia pumila* was described from a male specimen collected in 1948 in the Alpes-Maritimes (Buvat & Nel 2000). We have not been able to examine the holotype, but examined a second specimen identified as *E. pumila* by J. Nel which fully corresponds to the original description. This specimen agrees both morphologically and in the DNA barcode with *E. profugella* (Stainton, 1856) and *E. pumila* is therefore synonymized with that species.

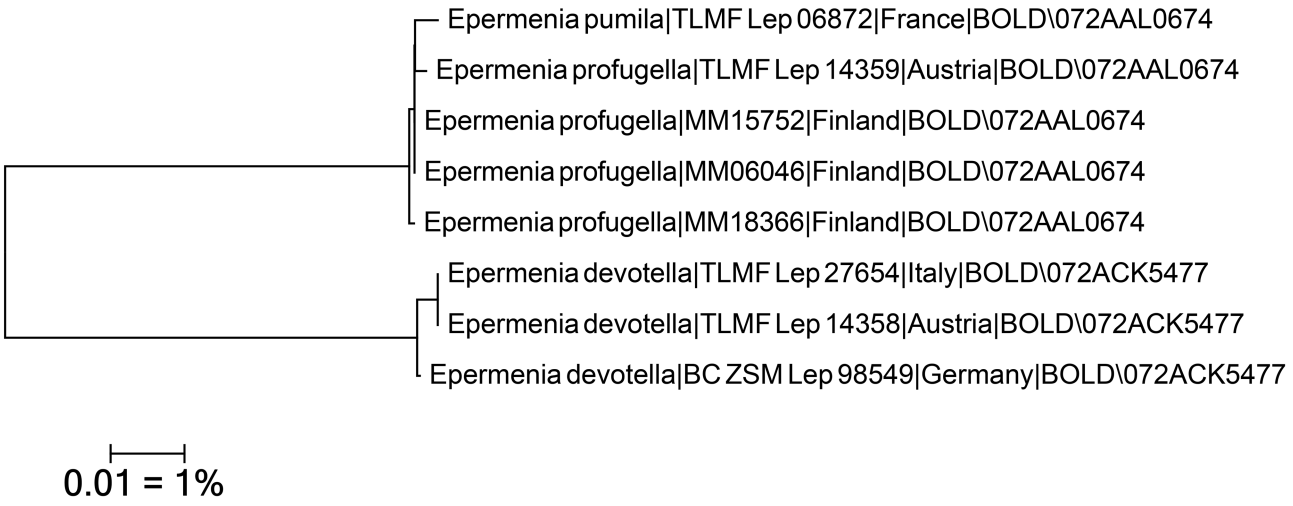

FIGURE 12. Neighbor-joining tree of *Epermenia profugella* incl. *E. pumila* and the closest European species *E. devotella* (Heyden, 1863) in BOLD.

Crambidae

Hyperlais rosseti Varenne, 2009

Hyperlais rosseti Varenne 2009: 15, unnumbered figs. of adults, figs. 1–2.

Examined material. Holotype ♂: France, Hautes-Alpes, La Grave, 7.V.2008 (RCTV).
BOLD Specimen ID TLMF 22311; BOLD Sequence ID LEASS663-17.
BIN: BOLD:ADL9611
Identity: *Hyperlais rosseti* Varenne, 2009, identity uncertain.

Remarks. *Hyperlais rosseti* was described from four males and three females and compared particularly with the related *H. siccalis* (Guenée, 1854) and *H. nemausalis* (Duponchel, 1834) (Varenne 2009). The successfully sequenced holotype is ca. 5% divergent from the nearest neighbour in BOLD, an unnamed species. However, the majority of *Hyperlais* have not been barcoded so far. Leraut (2012) discussed an eventual conspecitify with *H. dulcinalis* (Treitschke, 1835) and *H. glyceralis* (Staudinger, 1859) with subspecific status, but both species lack DNA barcodes.

Discussion

We examined 73 recently described Lepidoptera from France. We succesfully barcoded 65 of these species, in many cases holotypes. For six holotypes, sequencing failed. Even though the barcodes were not all full length or barcode compliant, in most cases they provided sufficient information to allow taxonomic assessment. On the basis of these barcodes, supplemented by information on morphology we were able to establish 13 new synonyms, and seven previously established synonyms were confirmed. For 14 taxa the results were inconclusive as barcodes of related species are still unknown and the published morphological characters not convincing. Five of the species for which sequencing failed are still considered to be of uncertain status. Of a total of 33 accepted new species, 13 are from Corsica, 17 from the Alps-Provence region and three from the Pyrenees.

Although it has not been possible to complete the coverage of species newly described in the past 20 years, an important step towards an undisputed diagnosis of many species has now been taken.

Obviously some French regions still harbour many unnamed taxa and our colleagues have contributed to a better understanding of these faunas by their publications. However, one can pose the question whether describing many new species spread over many small papers, often based on small numbers of, or unique, specimens, is the best way forward for understanding the complex taxonomy of these Microlepidoptera, especially when this is done outside of taxonomic revisions. We hope that our contribution shows that obtaining molecular data from this important material is not only possible but essential for understanding their relationships to other taxa. This is especially the case in very diverse groups where still many new species are expected in southern Europe. We urge authors who consider that they have detected new species for these groups to try to obtain DNA barcodes as well as to try to get more material, if possible in collaboration with specialists, who are often aware of other sources of material. Many specialists are more than willing to collaborate with generalist lepidopterists in such cases. In groups where it is known that the taxonomy is currently too complex and impossible to solve without a full revision, description of single new species should be discouraged.

Undoubtedly, DNA barcodes provide excellent information on species identities. But we caution that several known anomalies in DNA, especially in mitochondrial DNA where the barcode region is located, may result in barcode gaps which are not always indicative of separate species status (e.g. Mutanen *et al.* 2016). We know of such cases in many groups, e.g. in various Gelechiidae (Huemer & Karsholt 2018; Huemer *et al.* 2020), Gracillariidae (Lopez-Vaamonde *et al*. submitted), and as discussed above in *Pseudopostega chalcopepla*, highlighting the need for the integrative assessment of all available evidence with sufficient material in an adequately broad taxonomic context.

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