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REVISED CHECKLIST OF THE TRIBUS DAHLICINI ENDERLEIN, 1936 OF SLOVENIA, (LEPIDOPTERA: PSYCHIDAE)

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Abstract – The paper presents an updated list of species from the tribus Dahlicini Enderlein, 1936, found in Slovenia. The checklist includes three species that are new to the Slovenian fauna, while three species have been excluded. For each species, an overview is provided, which includes a list of relevant literature, its bionomy, distribution in Slovenia, and at least one confirmed locality where the species has been recorded.
KEY WORDS: Lepidoptera, Psychidae, Slovenia, Dahlicini, checklist

Izvleček – REVIDIRAN SEZNAM PLEMENA DAHLICINI ENDERLEIN, 1936 SLOVENIJE, (LEPIDOPTERA: PSYCHIDAE)
Prispevek prinaša posodobljen seznam vrst plemena Dahlicini Enderlein, 1936, ki jih najdemo v Sloveniji. V seznam so vključene tri vrste, ki so nove za slovensko favno, medtem ko so tri vrste iz seznama izključene. Za vsako vrsto je podan pregled, ki vključuje seznam literaturnih virov, podatke o biologiji vrste, njeno razširjenost v Sloveniji ter najmanj eno potrjeno lokaliteto, kjer je bila vrsta zabeležena.
KLJUČNE BESEDE: Lepidoptera, Psychidae, Slovenija, Dahlicini, seznam vrst.

Introduction

The earliest known reports of butterfly observations from the tribus Dahlicini Enderlein, 1936 in Slovenia can be traced back to the 19th century. The first reports came from the renowned entomologist G. Höfner in 1898, followed by H. Rebel in 1919. Subsequently, Leo Sieder (Klagenfurt, Österreich), a notable expert on psychids, conducted research in the Austrian Carinthia region. Between 1945 and 1972, his significant contributions greatly enhanced the understanding of this butterfly group and laid the initial groundwork for subsequent Slovenian researchers.

In his illustrious professional career, Jan Carnelutti (Ljubljana, Slovenia) stands out as the first Slovenian entomologist to exhibit a serious interest in Psychidae. He made significant contributions in 1975 and 1992 (Carnelutti 1975, 1992a) through publications that formed the basis and foundation of the checklist. However, a challenge with this Dahlicini list (part of the checklist from his publication: Rdeči seznam ogroženih metuljev v Sloveniji (Carnelutti, 1992a)) arises from its lack of verifiability. In most cases, it lacks specific data regarding localities, also the author was unable to locate a reference collection in the MNHL or a private collection that could authenticate the listed species. However, subsequent authors (Lesar & Govedič 2010, Sobczyk 2011) did not make any corrections to the checklist; instead, they simply combined all the sources known up to that time. Last recent years have the first doubts arisen regarding the presence of certain species in our fauna (Arnscheid & Weidlich 2017). This has indicated the necessity of revising the list of the Dahlicini group.

This publication is the result of personal field and laboratory work, conducted in collaboration with Slovenian entomologist Željko Predovnik, who contributed a substantial amount of data from his own field research. For each species, the author provides a list of literature sources, a brief description of its bionomy, its general distribution in Slovenia, and at least one reliable locality. Additional notes and points of interest have been included where necessary. *Dahlica* (*Dahlica*) *charlottae* (Meier, 1957), *Dahlica* (*Dahlica*) *latisquama* Weidlich, 2015 and *Dahlica* (*Siederia*) *rupicolella* (Sauter, 1954) have been newly recorded in the fauna of Slovenia. Conversely, three other species: *Dahlica* (*Postsolenobia*) *thomanni* (Rebel, 1936), *Dahlica* (*Eosolenobia*) *manni* (Zeller, 1852) and *Dahlica* (*Praesolenobia*) *clathrella* (Fischer von Röslerstamm, 1837) have been excluded from the list. The Slovenian populations of *D. latisquama* were compared to populations from the type locality (Slovakia, Sabinov, and Kozelnik) both from a morphological and genetic perspective. For the first time, the morphology of the female genitalia was described and illustrated.

Material and methods

The material used for this study was obtained by collecting mature larvae or pre-existing fixed larval cases. Male specimens were stored alive in plastic vials and subjected to deep freezing before being spread out. Females were preserved in an alcohol-glycerol solution in small plastic vials. Genitalia were prepared using the standard method described by Robinson (1976).

All photographs were captured using a Canon EOS 40D digital camera. Slide-mounted genitalia were photographed using the same camera, which was attached to an Olympus SZ 51 stereo microscope with an LM-Scope adapter. Drawings illustrating morphological details were created using Indian ink on transparent sheets and subsequently converted into digital format. All images and drawings were later edited using Adobe Photoshop CS5 Master Collection software.

Descriptions of morphological structures for the Tribus Dahlicini follow the current terminology by Sauter (1956), Meier (1958) and Hättenschwiler (1977). The morphological terminology used in this article follows Arnscheid & Weidlich (2017).

For DNA analysis, one or two legs were removed from each dried specimen, which had been stored in ethanol, and then transferred to lysis plates. DNA extraction was performed at the Canadian Centre for DNA Barcoding in Guelph, Ontario, Canada, using high-throughput standard protocols (Ivanova et al. 2006). Publicly available DNA barcode sequences of the *D. latisquama* were downloaded from Barcode of Life Database (BOLD; Ratnasingham & Hebert 2007). The list of all COI sequences used in this study is shown in Table 1. Differences in the sequence within and among species were calculated using the 2-parameter Kimura model, as implemented in the Barcode of Life Data System (BOLD v4, www.barcodinglife.org) (Ratnasingham & Hebert 2007) (Table 2).

The DNA samples listed in the material sections are not specifically analysed in this publication, but they are an important part of the overall research. The author deliberately includes them, as they played a key role in linking Slovenian populations with those already known. All of this data are now publicly available in the Barcode of Life Database, as previously mentioned, and are used as a reliable source by other authors in numerous publications.

Table 1: List of COI sequences used in this study.

Species	BOLD sequence ID	Locality	Source
D. latisquama	POESE390-22	Slovakia, Prešovký kraj, Sabinov	BOLD
	POESE068-15	Slovakia, Prešovký kraj, Sabinov	BOLD
	TIPSY915-19	Slovakia, Banskobystrický kraj, Kozelnik	Our data
	POESE404-22	Slovakia, Banskobystrický kraj, Kozelnik	BOLD
	TIPSY636-12	Slovenia, Kozjamsko, Lesično, Gubno	Our data
	TIPSY740-15	Slovenia, Dolina Gračnice, Mrzlo polje	Our data
	TIPSY638-12	Slovenia, Dolina Gračnice, Mišji dol	Our data
D. triquetrella	TIPSY132-12	Slovenia, Primorska, Podgorje, Praproče	Our data

Abbreviations

♂	Male
♀	Female
BIN	barcode index number
BOLD	barcode of life data system
COI	Cytochrome C Oxidase subunit I
coll.	collection
DNA	deoxyribonucleic acid
e.p.	Ex pupa
e.l.	Ex larva
JRKS	Jurij Rekelj, Kranj, Slovenia
leg.	legit (to collect)
MNHL	Museum of Natural History Ljubljana (Prirodoslovni muzej Slovenije)
ŽPPS	Željko Predovnik, Polzela, Slovenia

Results

Synopsis

About 80 species of tribus Dahlicini known from the Palaearctic region with the subgenera *Postsolenobia*, *Brevantennia*, *Siederia*, *Praesolenobia* and *Eosolenobia*.

The published lists of Dahlicini for Slovenia indicate varying numbers of species, depending on the time period of publication. Carnelutti (1975) list 11 species, Lesar & Govedič (2010) list 13 species, and Arnscheid & Weidlich (2017) list 14 species. The updated checklist shows 15 confirmed species and one subspecies. In addition to the sexual forms of *D. triquetrella* (Hübner, [1813]) and *D. lichenella* (Linnaeus, 1761), parthenogenetic forms of both species also exist.

Checklist for Slovenia

Dahlicini Enderlein, 1936
Subgen. *Dahlica* Enderlein, 1912

1. Dahlica* (*Dahlica*) *charlottae (Meier, 1957)
Fig. 1a, 6c
Citations for Slovenia. New species for Slovenia.
Remarks. The species occurs locally and in scattered colonies in the Karavanke mountains and Pohorje. It inhabits coniferous forests with *Pinus sylvestris* L., *Picea abies* L. and *Larix decidua* Mill. at elevations ranging from 900m to 1200m. Male specimens of this species have the narrowest cloaking scales among the entire *Dahlica* genus, making them easily distinguishable from other species. The genital index of males in Slovenia ranges from 1.45 to 1.62 (with known values between 1.32 and 1.70, according to Arnscheid & Weidlich 2017: 49).
Material. 3♂♂ with larval cases, Karavanke, Jezerski Vrh sattle, 1170–1200m, leg. J. Rekelj, 13.4.2014 (e.p. 17.–19.4.2014) - 3♂♂ genit. prep. №: 145–147, Rekelj, 1♂ DNA barcode sample: STG273, coll. JRKS; 9♂♂ with larval cases, same locality, leg. J. Rekelj, 20.4.2015 (e.p. 25.–30.4.2015) - 2♂♂ genit. prep. №: 241, 455, Rekelj, coll. JRKS; 4♀♀ with larval cases, same locality, leg. J. Rekelj, 3.5.2015 (e.p. 5.–10.5.2015), coll. JRKS; 4♂♂, 4♀♀ with larval cases, same locality, leg. J. Rekelj, 1.4.2017 (e.p. 10.–14.4.2017), coll. JRKS; 17♂♂ with larval cases, same locality, leg. J. Rekelj, 12.4.2019 (e.p. 16.–20.4.2019), coll. JRKS; 5♂♂ with larval cases, same locality, leg. J. Rekelj, 4.4.2021 (e.p. 9.–1.4.2021) - 3♂♂ genit. prep. №: 257–459, Rekelj, coll. JRKS. Lovrenc na Pohorju, Bezjak, 962 m, leg. Ž. Predovnik, 1.4.2018 (e.l. 11.4.2018) - 1♂ with larval case, gen. prep. №: 335, Rekelj, coll. ŽPPS.

2. *Dahlica (Dahlica) croatica* Weidlich, 2016
Fig. 1b
Citations for Slovenia. Rekelj et al. 2022: 220.

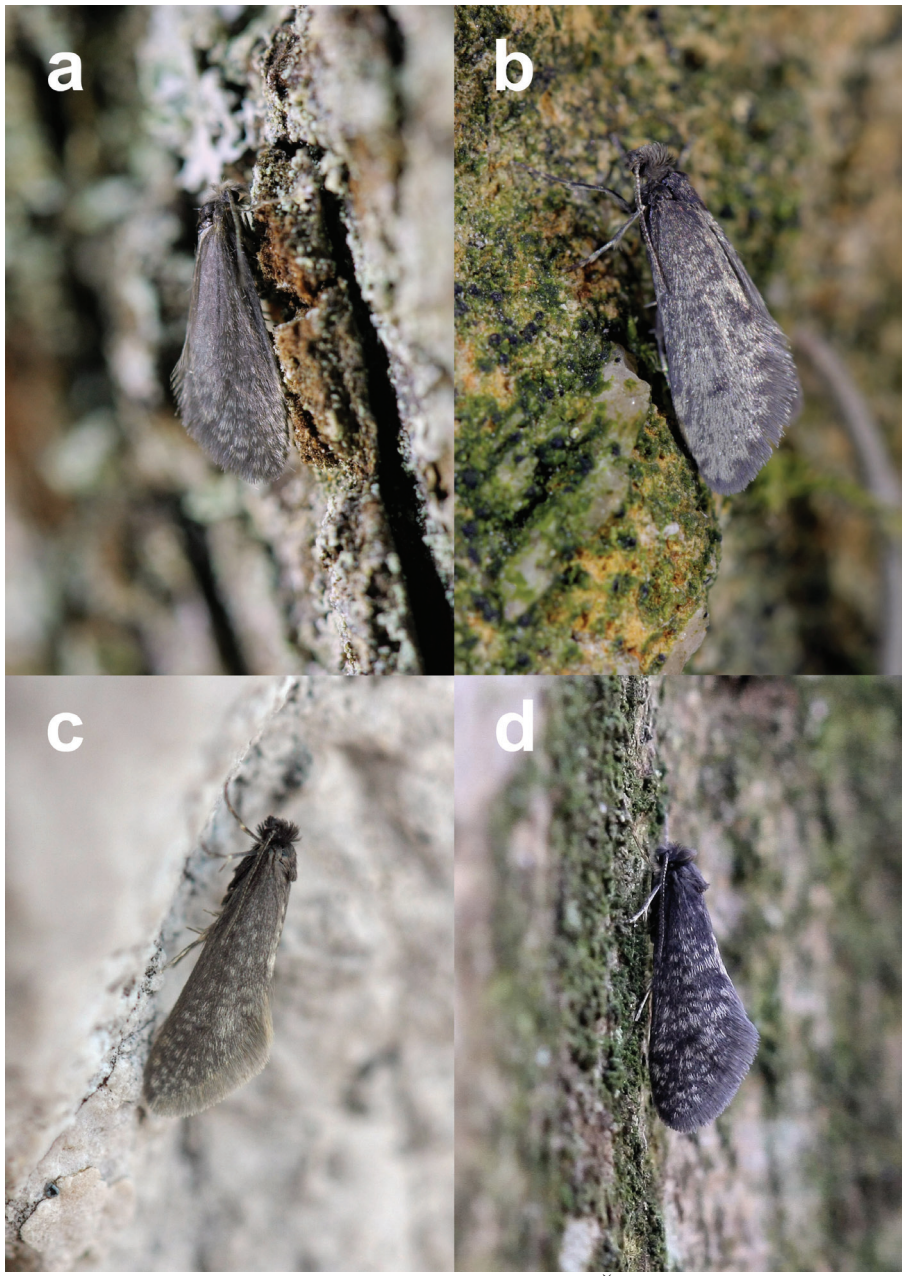

Fig. 1: a. *D.* (*Dahlica*) *charlottae*, Olševa Gora – Žibovt, 1150m, 15.5.2014; **b.** *D.* (*Dahlica*) *croatica*, Orlica, Svete Gore, 500m, 18.3.2012; **c.** *D.* (*Dahlica*) *klimeschi*, Julijske Alpe, Ablanca, 1940m, 15.6.2013; **d.** *D.* (*Dahlica*) *lichenella* f. bisex., Mala polana, Polanski log, 3.4.2010.

Remarks. Recently described species from neighboring Croatia. It is a well-represented and common species in the Dolenjska and Štajerska regions. However, in the Prekmurje, Notranjska, and Gorenjska regions, it is found in isolated colonies, which requires further confirmation. This species primarily inhabits humid lowland mixed forests and beech forests, thriving at altitudes of up to 1700m.

Male specimens of this species exhibit a gray-brown coloration, with irregular and variable lighter spots. In Slovenia, more than 20 localities have been confirmed from both morphological and genetic perspectives and compared with specimens (analyzed in both aspects) from the type locality at Ivanščica, Croatia. The genital index, calculated from over 150 specimens across all localities, demonstrates significant variability within the species, ranging from 1.12 to 1.39. For comparison, known values reported by Weidlich (2016: 202) range from 1.17 to 1.27.

Material. 9♂♂, 19♀♀ with larval cases, Bizeljsko, Orlica, Svete Gore, 500m, leg. J. Rekelj, 20.3.2010 (e.l. 25.–30.3.2010) - 3♂♂, genit. prep. №: 161, 164, Rekelj, 3♂♂ DNA barcode sample: CLV3587, CLV3588, CLV3589, coll. JRKS; 37♂♂, 17♀♀ with larval cases, same locality, leg. J. Rekelj, 11.3.2012 (e.p. 20.–25.3.2012) - 4♂♂, genit. prep. №: 159, 160, 162, 163, Rekelj, coll. JRKS. 49♂♂, 3♀♀ with larval cases, Zg. Poljčane, Bela stream valley, 320–330m, leg. Ž. Predovnik, 1.4.2013 (e.p. 6.–12.4.2013) - 1♂ DNA barcode sample: STG234, coll. ŽPPS; 11♂♂, 2♀♀ with larval cases, same locality, leg. J. Rekelj, 25.2.2014 (2.–4.3.2014) - 5♂♂, genit. prep. №: 174–178, Rekelj, coll. JRKS.

3. *Dahlica (Dahlica) goltella* Rekelj & Predovnik, 2014

Citations for Slovenia. Rekelj & Predovnik 2014: 5, Arnscheid & Weidlich 2017: 256–261, Rekelj et al. 2022: 225.

Remarks. The species is distributed in the central and eastern Karavanke mountains, as well as the eastern part of the Kamniško Savinjske Alpe. They primarily inhabit rocky slopes and cliffs at altitudes ranging from 1200m to 2000m. The larval cases of this species are commonly discovered under rocks, small stones, and cliffs, often in the company of several other Dahlicini species, including *D. klimeschi* and *D. meierella*. Notably, imagines of this species appear at the end of their group sequence.

Material. 5♂♂, 9♀♀ with larval cases, Karavanke, Stol, 2190m, leg. J. Rekelj, 22.6.2014 (e.p. 23.–30.6.2014), coll. JRKS. 22♂♂, 24♀♀ with larval cases, Karavanke, Peca, 2060–2090m, leg. J. Rekelj, 4.6.2016 (e.p. 7.–25.6.2016), coll. JRKS.

4. *Dahlica (Dahlica) klimeschi* (Sieder, 1953)

Fig. 1c

Citations for Slovenia. Sieder 1972: 295 [»*Bielsica in den Karawanken*«]; Carnelutti 1975: 106 (23) in litteris; Lesar & Govedič 2010: 49; Sobczyk 2011: 96, Arnscheid & Weidlich 2017: 256–261, Rekelj et al. 2022: 225.

Remarks. Present in the Julijske Alpe, Karavanke, and Kamniško Savinjske Alpe, *D. klimeschi* is well distributed throughout these mountains but is never com-

mon. In Slovenia, it prefers sunny, rocky slopes, and cliffs situated above the tree line in the alpine zone, ranging from 1900 to 2700 meters in altitude. The larval cases of *D. klimeschi* have been observed under rocks, small stones, and even on walls, particularly on east and north-west facing rocky slopes. However, they are never found in large numbers and are often mixed with a substantial quantity of other *Dahlica* species.

The genital index of males deviates from the known range of 1.55 to 1.89, as reported by Arnscheid & Weidlich (2017: 60). In Slovenia, we observed lower values, ranging from 1.35 to 1.62, which barely overlap with the lower limit of the previously documented range. The index varies depending on locality, but no correlation was found between the values from populations in the Julijske Alpe and those from the Karavanke Mountains. Significant variability was also noted in size and coloration. Notably, in the Karavanke Mountains, the majority of males exhibited a uniform grey coloration, devoid of any distinct patterns.

Material. 1♂ with larval case, Julijske Alpe, Kanin, Podi, 2250m, leg. J. Rekelj, 19.–20.7.2009 - DNA barcode sample: CLV 3642, coll. JRKS; 2♂ with larval cases, same locality, leg. J. Rekelj, 24.-26.7.2009 - 2♂♂, genit. prep. №: 165, 300, Rekelj, 1♂ DNA barcode sample: CLV 3633, coll. JRKS; 3♂♂ with larval case, same locality, leg. Ž. Predovnik, 25.6.2010, - genit. prep. №: 291, 292, Rekelj, DNA barcode sample: CLV 3391, STG 195, coll. ŽPPS. 5♂♂, Karavanke, Stol, 2140m, leg. J. Rekelj, 22.6.2014 (e.p. 7.–11.6.2016) - 4♂♂, genit. prep. №: 169–172, Rekelj, 1♂ DNA barcode sample: STG275, coll. JRKS. 7♂♂, 8♀♀ with larval cases, Karavanke, Peca, 2056m, leg. J. Rekelj, 4.6.2016 (e.p. 7.–11.6.2016) - 4♂♂, genit. prep. №: 303–307, Rekelj, 1♂ DNA barcode sample: STG827, coll. JRKS. Kamniško Savinjske Alpe, Brana, 2112m, 4.7.2016 (e.p. 5.-6.7.2016) - 3♂♂, 1♀, 2♂♂ genit. prep. №: 301, 302, Rekelj, 1♂ DNA barcode sample: STG783, coll. ŽPPS.

5. *Dahlica* (*Dahlica*) *latisquama* Weidlich, 2015

Table 1, 2

Fig. 2, 3a–c, 4a, b, 5a–c

Citations for Slovenia. New species for Slovenia.

Remarks. The first specimens were collected in 2012, but the author was unable to assign them to any known species at the time. Despite the description of a new species, *D. latisquama*, from Slovakia in 2015, the Slovenian population, due to its morphological differences, continued to be considered a potential new species for science for several more years. Recent genetic research revealed a close similarity to the *D. latisquama*. Specimens from the type locality (Slovakia: Sabinov, Kozelnik) and those from Slovenia form two distinct BINs (BOLD:ACX9339 and BOLD:AAM0272). However, these two separate lineages are neither environmentally determined nor geographically defined (Fig. 2). The intraspecific divergence reaches a maximum of 1.6%, which is likely too low to justify the classification as a separate species (Table 2, Fig. 2).

Table 2: Matrix of pairwise distances between samples using in this study, computed using the Kimura 2-parameter method. Data for samples are shown in Table 1.

Sample	Origin	Pairwise divergence (p)						
D. latisquama (TIPSY636-12)	Slovenia, Lesično							
D. latisquama (TIPSY638-12)	Slovenia, Mišji dol	0,002						
D. latisquama (TIPSY740-15)	Slovenia, Mrzlo polje	0,014	0,016					
D. latisquama (POESE404-22)	Slovakia, Kozelnik	0,012	0,014	0,005				
D. latisquama (TIPSY915-19)	Slovakia, Kozelnik	0,012	0,014	0,005	0,000			
D. latisquama (POESE390-22)	Slovakia, Sabinov	0,012	0,014	0,005	0,000	0,000		
D. latisquama (POESE068-15)	Slovakia, Sabinov	0,012	0,014	0,005	0,000	0,000	0,000	
D. triquetrella (TIPSY132-12)	Slovenia, Podgorje	0,063	0,065	0,061	0,063	0,063	0,063	0,063

The species is found locally in the Kozjansko region and in scattered colonies extending to Ivančna Gorica and Ljubljana. Here, it inhabits small valleys along the edges of European broad-leaved deciduous forests [*Carpino-Fagetea*] (Fig. 3c). The larvae live on sandy, humus-rich soil with sparse plant cover. Their larval cases are primarily observed on boulders, stones, retaining walls, bus stops, and other roadside structures, occasionally also on nearby tree trunks.

In Slovenian populations, males have more contrastingly coloured forewings, with a clearly visible pattern in most specimens. Around 40% show an indistinct pattern in the sub-marginal and marginal areas (Fig. 4a). The cloaking scales (Fig. 4b) are variable, with three to six tines, classified into class III–V, mostly IV and V (fol-

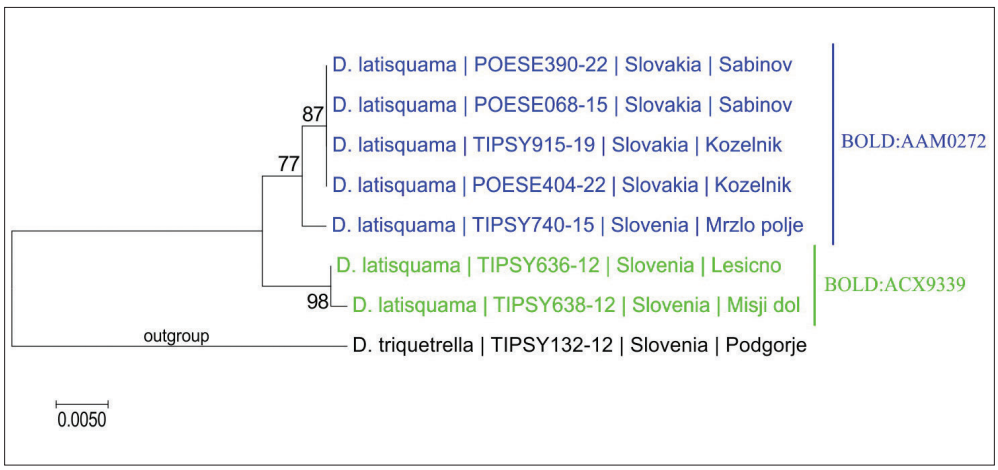

Fig. 2: Neighbor-joining tree of DNA barcodes of *D.* (*Dahlica*) *latisquama*. *D.* (*Dahlica*) *triquetrella* is included as an outgroup representative. Numbers are bootstrap percentages. Scale bar represents 0.5% K2P genetic divergence between sequences.

lowing the method of Sauter, 1956). Specimens from the type locality exhibit noticeably broader scales, classified as class V–VI. The genital index in Slovenia is lower, ranging from 0.98 to 1.17 (compared to known values of 1.17 to 1.19, as reported by Arnscheid & Weidlich 2017: 59, following the method of Sauter, 1956). The genital structures of females in the type population have not yet been described. Here, we provide a description of the females and the first description of their genital structures, based on populations in Slovenia:

Female (Fig. 3b). 2-3 mm in length, apterous. Head black-brown, eyes small, black, ocelli lacking. Antennae short, with 14-16 segments (including scapus and pedicellus). Meso and metanotum brown, well sclerotized. The body segments of the abdomen are white to pale yellow, with dense brown-black hair coverage on the lateral sides. The tergites and sternites are brownish and well-sclerotized. Sternites narrow, reduced to separate triangles, or to the shape of L letter (Fig. 5a). Anal hair-tuft silver-white. Tibiae of forelegs without epiphysis, all legs with four tarsal segments.

Female genitalia (Fig. 5b). Oviscapt and ostium bursae sclerotized. The prebursal spines (Fig. 5c) slightly triangular in shape, individually arranged. They are broad at the base, then rapidly constricted to a thin and narrow process at the end. Lateral plates triangular, pointed, postvaginal plate well expressed.

Material. 2♂♂ with larval cases, Slovenia, Kozjansko, Lesično, Topolovo, 338m, leg. Ž. Predovnik, 23.3.2013 (e.p., 30.–31.3.2013) - 1♂ genit. prep. №: 9, Rekelj, 1♂ DNA barcode sample: STG228, coll. ŽPPS; 4♂♂, 4♀♀ with larval cases, same locality, leg. Ž. Predovnik, 13.3.2014 (e.p., 18.–22.3.2014) - 5♂♂ genit. prep. №: 8, 9–12, Rekelj, coll. ŽPPS; 4♂♂, 5♀♀ with larval cases, same locality, leg. Ž. Predovnik, 9.3.2015 (e.p., 15.–18.3.2015), coll. ŽPPS; 10♂♂, 1♀ with larval cases, same locality, leg. J. Rekelj, 13.3.2016 (e.p. 16.–20.3.2016) - 1♀ gen. prep. Solakryl №: 50, Rekelj, coll. JRKS; 12♂♂, 7♀♀ with larval cases, same locality, leg. J. Rekelj, 2.4.2018 (e.p. 3.–10.4.2018) - 7♀♀ gen. prep. Solakryl №: 51, 61, Rekelj, gen. prep. Glycerol №: 518–521, 523, Rekelj, coll. JRKS. 4♂♂, 2♀♀ with larval cases, Slovenia, Kozjansko, Lesično, Gubno, 379m, leg. Ž. Predovnik, 28.3.2012 (e.p., 29.3.–2.4.2012) - 3♂ genit. prep. №: 4, 6, 7, Rekelj, 1♂ DNA barcode sample: STG162, coll. ŽPPS; 7♂♂, 1♀ with larval cases, same locality, leg. Ž. Predovnik, 23.3.2013, (e.p., 30.3.–2.4.2013) - 1♂ genit. prep. №: 3, Rekelj, 1♀ genit. prep. №: 128, Rekelj, coll. ŽPPS; 6♂♂, 4♀♀ with larval cases, same locality, leg. Ž. Predovnik, 13.3.2014, (e.p., 19.–25.3.2014) - 1♂ genit. prep. №: 5, Rekelj, 1♀ genit. prep. №: 127, Rekelj, coll. ŽPPS; 17♂♂, 7♀♀ with larval cases, same locality, leg. Ž. Predovnik, 9.3.2015, (e.p., 16.–27.3.2015), coll. ŽPPS; 21♂♂, 2♀♀ with larval cases, same locality, leg. J. Rekelj, 13.3.2016 (e.p. 16.–20.3.2016) - 1♂ Forewing scales, prep. Solakryl №: 42, Rekelj, 1♀ genit. prep. Solakryl №: 50, Rekelj, coll. JRKS; 8♂♂, 8♀♀ with larval cases, same locality, leg. J. Rekelj, 2.4.2018, (e.p. 3.–10.4.2018), 2♀♀ genit. prep. Solakryl №: 51, 61, Rekelj, 5♀♀ genit. prep. Glycerol №: 518–523, Rekelj, coll. JRKS; 2♂♂, 1♀ with larval cases, same locality, leg. Ž. Predovnik, 15.3.2020, (e.p., 15.–18.3.2020), coll. ŽPPS.

6. *Dahlica* (*Dahlica*) *lichenella* (Linnaeus, 1761)

Fig. 1d

Citations for Slovenia. Carnelutti 1975: 106 (23) in litteris; Carnelutti 1992a: 79; Lesar & Govedič 2010: 49; Sobczyk 2011: 98, Arnscheid & Weidlich 2017: 256–261, Rekelj et al. 2022: 220, Rekelj et al. 2022: 220.

Remarks. In Slovenia, both bisexual and parthenogenetic forms of the species occur. The parthenogenetic form is widespread and commonly found throughout the country, ranging from the lowlands to the forest border. It prefers humid areas in forests, parks, and valleys. On the other hand, the bisexual form with males is generally widespread across the country, except in the Coastal Region. It is quite common in humid mixed forests in the lowlands and can also be found, although less frequently, in the Alpine coniferous forests, up to an altitude of 1500m. The bisexual form can be easily distinguished from other Slovenian species by its high male genital index, which ranges from 1.77 to 2.03 in Slovenia (with known values between 1.70 and 2.12, according to Arnscheid & Weidlich 2017: 45).

Material. Bisexual form. 2♂♂ with larval cases, Prekmurje, Mala Polana, Polanski log, leg. J. Rekelj, 17.3.2007 - 1♂ DNA barcode sample: CLV3585, coll. JRKS; 3♂♂, 1♀ with larval cases, same locality, leg. J. Rekelj, 3.4.2010 (e.p. 4.4.2010) - 1♂ genit. prep. №: 173, Rekelj, 2♂♂ DNA barcode sample: CLV3584, CLV3586, coll. JRKS. 8♂♂, 11♀♀ with larval cases, Valley of the river Mirna, Gabrje vicinity, 226m, leg. J. Rekelj, 2.3.2014 (e.p. 20.–22.3.2014) - 4♂♂ genit. prep. №: 150–153, Rekelj, 1♂ DNA barcode sample: STG806, coll. JRKS; 22♂♂, 8♀♀ with larval cases, same locality, leg. J. Rekelj, 13.3.2016 (e.p. 16.–20.3.2016), coll. JRKS. **Parthenogenetic form.** 18♀♀, 2 larvae, with larval cases, Gorenjska, Valley of the river Kokra, Hude stene, 580m, leg. J. Rekelj, 27.2.2011 (e.l. 5.–10.3.2011) - 1♂ genit. prep. №: 13, Rekelj, 2 larvae DNA barcode sample: CLV3601, CLV3602, coll. JRKS. 13♀♀, with larval cases, Golte, Mozirska koča vicinity, 1340m, leg. J. Rekelj, 1.5.2013 (e.p. 3.–4.5.2013) - genit. prep. №: 21, 52, coll. JRKS.

7. *Dahlica* (*Dahlica*) *triquetrella* (Hübner, [1813])

Citations for Slovenia. Carnelutti 1975: 106 (23) in litteris; Carnelutti 1992a: 79; Gomboc 1999: 41; Lesar & Habeler 2005: 23; Gokhman 2007: 73; Lesar & Govedič 2010: 49; Sobczyk 2011: 102; Weidlich 2012a: 18; Weidlich 2013: 163; Rekelj & Predovnik 2014: 13; Weidlich 2014: 65, Arnscheid & Weidlich 2017: 256–261, Rekelj et al. 2022: 220, 225.

Remarks. In Slovenia, both bisexual and parthenogenetic forms are found. The parthenogenetic form is highly prevalent and widespread, occurring across the country from the lowlands to the forest edge. In contrast, the bisexual form with males, has a more localized distribution and is absent in the Štajerska and Prekmurje regions. It is common on the plateaus of Trnovski gozd up to an elevation of 1200 meters and along the Karst edge, where it can be found under rocks and in the crevices of stone walls. In the interior of the country, it prefers deciduous forests dominated by *Fagus sylvatica* L., at elevations up to 900 meters.

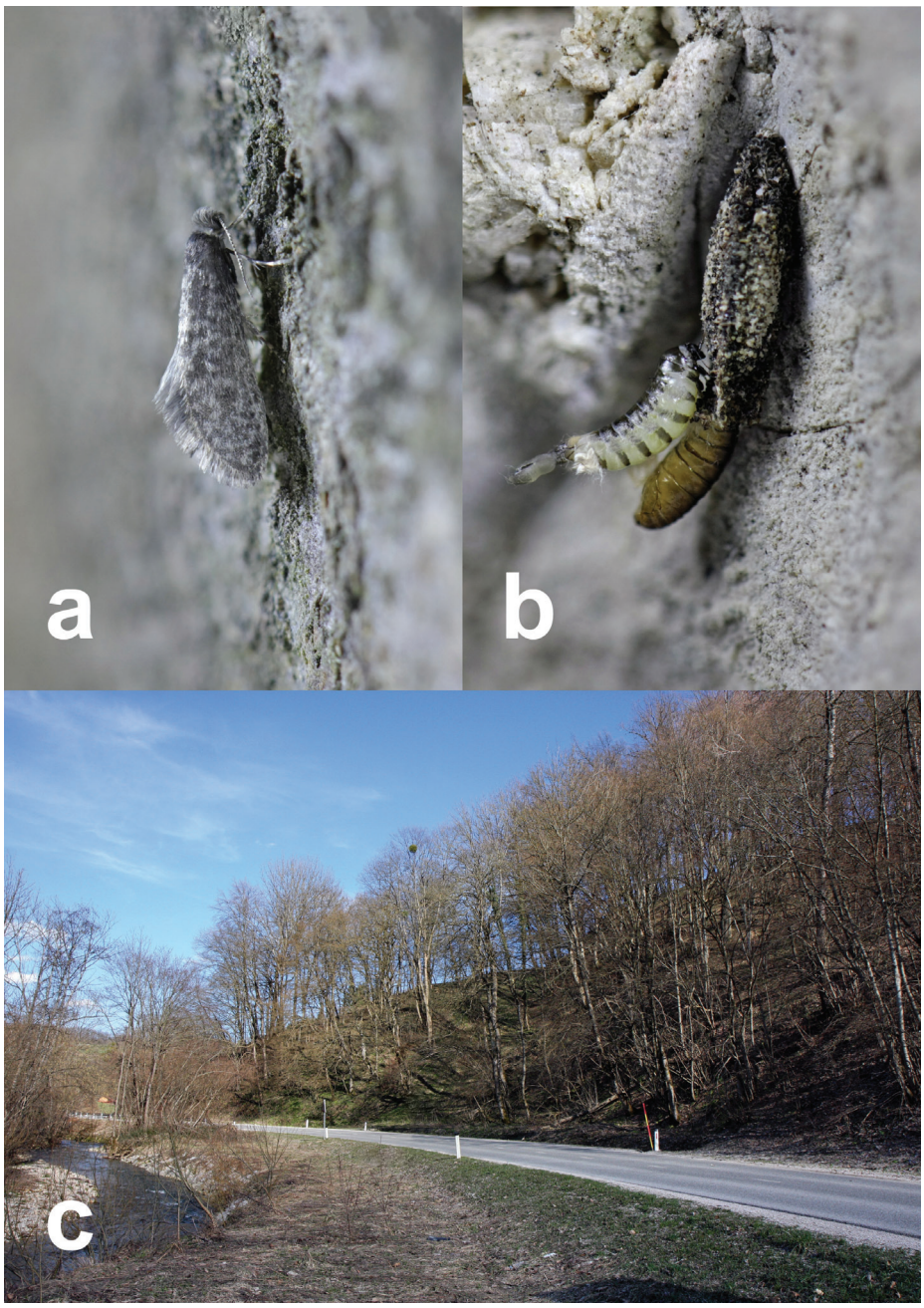

Fig. 3: *D.* (*Dahlica*) *latisquama*, Topolovo, 2.4.2016: **a.** Fresh adult male on rock; **b.** Fresh adult female, transmitting pheromones; **c.** Habitat, embankment of the Bistrica stream valley near the village of Topolovo, 2.4.2016.

Material. Bisexual form. 15♂♂ with larval cases, Gorenjska, Jošt mt., Pševo, 600m, leg. J. Rekelj, 2.4.2008 (e.p. 5.–8.4.2008), coll. JRKS; 3♂♂, 4♀♀ with larval cases, same locality, leg. J. Rekelj, 24.3.2011 (e.p. 30.3.2011) - 3♂♂ DNA barcode sample: CLV3605, CLV3606, CLV360711, coll. JRKS. 4♂♂, 2♀♀ with larval cases, Trnovski gozd, Čaven mt., Kucelj, 1150m, leg. J. Rekelj, 27.4.2008 (e.p. 27.4.–1.5.2008) - 2♂♂ DNA barcode sample: CLV3612, CLV3613, coll. JRKS. 1♂ with larval case, Črnivec sattle, r. to Gornji Grad, 885m, leg. J. Rekelj, 15.4.2012 (e.p. 16.4.2012), coll. JRKS. 2♂♂ with larval cases, Fara, Krkovo nad Faro, 290m, leg. J. Rekelj, 26.3.2011 (e.p. 30.3.2011) - 2♂♂ DNA barcode sample: CLV360811, CLV360911, coll. JRKS. **Parthenogenetic form.** 43♀♀ with larval cases, Gorenjska, Jošt mt., Pševo, 600m, leg. J. Rekelj, 24.3.2011 (e.p. 30.3.–8.4.2011) - 3♀♀ DNA barcode sample: CLV3614, CLV3615, CLV3616, coll. JRKS. 24♀♀ with larval cases, Daljnje Njive, 420m, leg. J. Rekelj, 26.3.2011 (e.p. 4.–8.4.2011) - 2♀♀ DNA barcode sample: CLV3617, CLV3618, coll. JRKS.

Subgen. *Postsolenobia* Meier, 1958

8. *Dahlica (Postsolenobia) juliella* (Rebel, 1919)

Citations for Slovenia. Rebel 1919; 101; Carnelutti 1992a: 79; Verovnik 2003: 444 [»Julijci«]; Lesar & Habeler 2005: 23; Lesar & Govedič 2010: 49; Sobczyk 2011: 241; Rekelj & Predovnik 2014: 14, Arnscheid & Weidlich 2017: 256–261.

Remarks. Distributed in the far west of the country, in the surroundings of Gorica, Goriška Brda, and the hills surrounding the Soča valley, this species inhabits xerothermic habitats ranging from lowlands up to 1200m. The discovery of this species, recorded by Lesar & Habeler in 2005: 23 from Golte-Bela Peč (leg. Lichtenberger, 10.4.2001), was likely confused with *D. goltella*.

Material. 47♂♂, 5♀♀ with larval cases, Solkan, Sv. Gora, Skalnica, 300m, leg. J. Rekelj, 1.5.2011 (e.p. 15.–22.5.2011) - 2♂♂ DNA barcode sample: CLV3581, CLV3582, coll. JRKS. 25♂♂, 3♀♀ with larval cases, Kanin, V. Škedenj, Gozdec, 1150m, leg. J. Rekelj, 21.5.2017 (e.p. 1.–5.6.2017), coll. JRKS.

9. *Dahlica (Postsolenobia) juliella* ssp. *nanosella* Petrů & Liška, 2003

Citations for Slovenia. Petrů & Liška 2003: 3; Lesar & Govedič 2010: 49; Sobczyk 2011: 242; Rekelj & Predovnik 2014: 14, Arnscheid & Weidlich 2017: 256–261.

Remarks. This species is widely distributed in the Trnovski Gozd area between Mt. Nanos and Mt. Čaven. It inhabits rocky areas on the southern grassy slopes at elevations ranging from 800 to 1100 m. Recently decreased to subspecies level by Arnscheid & Weidlich 2017: 69. However, specimens from Mt. Čaven have been found to form their own BIN (BOLD: ABY8014), indicating that further investigations are required. As of now, the author will adhere to the current nomenclature.

Material. 46♂♂, 24♀♀ with larval cases, Nanos, Sv. Hieronim, 984m, leg. J. Rekelj, 2.6.2013 (e.p. 5.–10.6.2013), coll. JRKS. 12♂♂, 6♀♀ with larval cases,

Čaven, Kucelj, 1150m, leg. J. Rekelj, 25.4.2009 (e.l. 22.–30.5.2009) - 1♂ DNA barcode sample: CLV3579, CLV3580, coll. JRKS.

Subgen. *Brevantennia* Sieder, 1953

10. *Dahlica (Brevantennia) adriatica* (Rebel, 1919)

Citations for Slovenia. Rebel 1919: 110; Weidlich 2012a: 15; Rekelj & Predovnik 2014: 5, Arnscheid & Weidlich 2017: 256–261, Rekelj et al. 2022: 207–232.

Remarks. The species is found in the region of the Dinaric Alps, with its presence in Slovenia extending to Brkini and surrounding hills: Snežnik in the east, Vremščica in the north and Slavnik in the west (Rekelj et al. 2022). *D. adriatica* primarily inhabits south to south-west facing slopes within the Illyrian (*Ostryo-Quercetum* and *Aremonio-Fagion*) forests, at elevations ranging from 400 to 900 meters above sea level.

Material. The material from Slovenia is precisely listed in Rekelj et al. (2022: 212).

11. *Dahlica (Brevantennia) santicensis* Sieder, 1957

Citations for Slovenia. Rekelj et al. 2022: 207–232.

Remarks. The Slovenian populations were initially confused with *D. styriaca* and later identified as *D. santicensis* in Rekelj et al. 2022. *D. santicensis* is widely distributed in Slovenia, found in the Gorenjska, Notranjska, Dolenjska, and Štajerska regions. It is a highly adaptable species that occurs in various habitats. It primarily inhabits shaded and humid areas within mixed forests, dominated by conifers such as *Pinus sylvestris* and *Picea abies*, ranging from lowlands to the subalpine zone, between 400 and 1600 meters above sea level.

Material. The material from Slovenia is precisely listed in Rekelj et al. (2022: 214–216).

12. *Dahlica (Brevantennia) triglavensis* (Rebel, 1919)

Citations for Slovenia. Rebel 1919: 110; Kusdas 1944: 247; Sieder 1953a: 120; Sieder 1956: 225; Forster & Wohlfahrt 1960: 201; Sieder 1972: 297; Carnelutti

Fig. 4: *D.* (*Dahlica*) *latisquama*, male, Slovenia, Topolovo: **a.** Intraspecific variability of forewing pattern; **b.** Cloaking scales.

1978a: 87, Carnelutti 1992a: 79; Weidlich 1996: 166; Verovnik 2003: 444 [»Julijci«]; Lesar & Govedič 2010: 49; Sobczyk 2011: 78; Arnscheid & Weidlich 2017: 256–261, Rekelj et al. 2022: 207–232.

Remarks. This species is restricted to montane-alpine areas in Julijske Alpe and Karavanke. It primarily inhabits rocky habitats on south and south-eastern facing slopes where the subsoil consists of limestone, at altitudes ranging from 800 to 2500m.

Material. The material from Slovenia is precisely listed in Rekelj et al. (2022: 223).

Subgen. *Siederia* Meier, 1953

13. *Dahlica (Siederia) alpicolella* (Rebel, 1919)

Fig. 6a

Citations for Slovenia. Rebel 1919: 106; Meier 1955: 23; Sieder 1953a: 126; Sieder 1956: 193; Sieder 1972: 296; Carnelutti 1975: 107 (24) in litteris; Carnelutti 1992a: 79; Liška & Skyva 2000: 7; Lesar & Govedič 2010: 49; Sobczyk 2011: 294, Arnscheid & Weidlich 2017: 256–261.

Remarks. Earlier reports by Rebel (1919) and Meier (1955) mention specimens collected from Triglav in the Julijske Alpe and from Karavanke mountains. Sieder

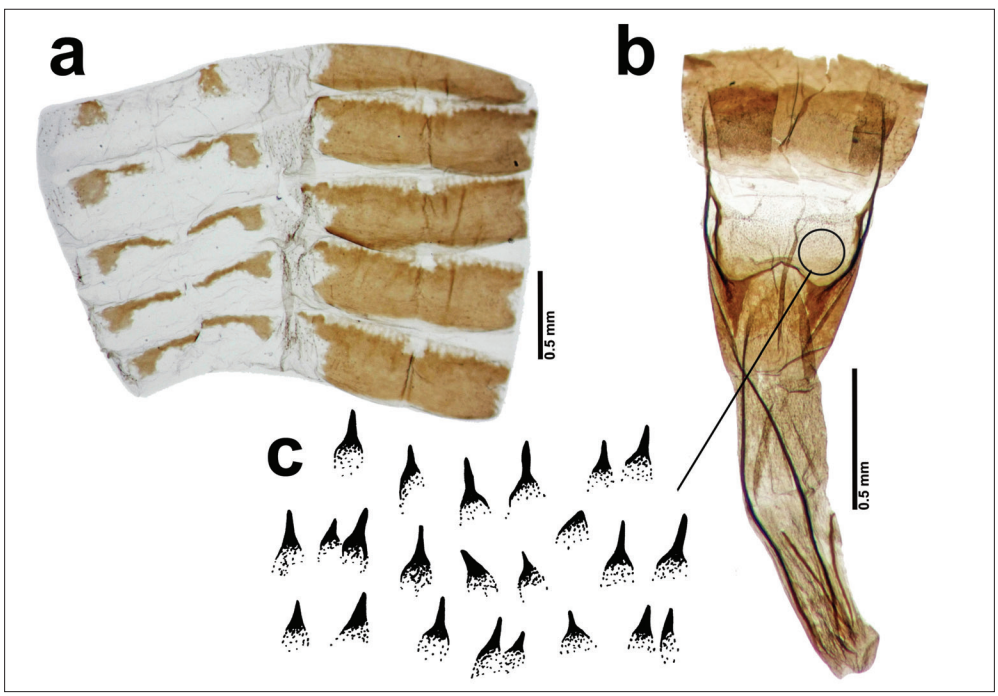

Fig. 5: *D.* (*Dahlica*) *latisquama*, female, Slovenia, Topolovo: **a.** Abdominal sternites end tergites; **b.** Genitalia ventral view; **c.** Prebursal spines.

(1956) identified these specimens as belonging to a new species of *D. meierella*. Later, in 1972, he listed *D. alpicolella* for "Bodental und Petzen (Karawanken)" in the Austrian region. The author contends that the species has not been found in Slovenia until now (no reference material has been found in museum or private collections). However, the most recent research indicates that *D. alpicolella* is distributed in very localized and scattered colonies in the Julijske Alpe, Karavanke, and Kamniško Savinjske Alpe.

It primarily inhabits coniferous forests with *Pinus sylvestris*, *Picea abies* and *Larix decidua*, in the montane and subalpine belt at elevations ranging from 900 to 1200m.

Material. 24♂♂ with larval cases, Karavanke, Olševa Gora, Žibovt, 1150m, leg. J. Rekelj, 2.5.2014 (e.p. 10.–13.5.2014) - 3♂♂, genit. prep. №: 488–490, Rekelj, 1♂ DNA barcode sample: STG196, coll. JRKS. 3♂♂ with larval cases, Julijske Alpe, Viševnik, Hrustniki, 1550m, leg. J. Rekelj, 8.6.2014 (e.p. 16.–19.6.2014) - 1♂, genit. prep. №: 487, Rekelj, 1♂ DNA barcode sample: STG272, coll. JRKS.

14. *Dahlica (Siederia) listerella* (Linnaeus, 1758)

Citations for Slovenia. Carnelutti 1992a: 79; Lesar & Govedič 2010: 49; Sobczyk 2011: 297, Arnscheid & Weidlich 2017: 256–261.

Remarks. A highly localized species with a very limited distribution in the northeastern part of Slovenia. Earlier references were likely speculative, as the nearest confirmed locality (Kärnten, Warmbad-Villach, Sieder 1972: 296) is only a few kilometers away from the Slovenian border. Recently confirmed at only one locality in the Goričko in Prekmurje region. Species inhabits the southern slopes overgrown with mostly *Pinus sylvestris* forests with *Quercus petraea* (Matt.) Liebl. and *Castanea sativa* Mill.

Material. 1♂, Goričko, Domanjševci - Šalovci, 335m, leg. P. Davey, 14.4.2015, coll. JRKS; 3♂♂, 1♀ with larval cases, same locality, leg. J. Rekelj, 16.3.2024 (e.p. 22.3.2024), coll. JRKS.

15. *Dahlica (Siederia) meierella* (Sieder, 1956)

Citations for Slovenia. Sieder 1956: 196, 204; Meier 1958: 179; Forster & Wohlfahrt 1960: 201; Sieder 1972: 296; Carnelutti 1975: 107 (24) in litteris; Diller, 1989: 284; Carnelutti 1992a: 79; Verovnik 2003: 444 [»Karavanke«]; Gokhman 2007: 81; Lesar & Govedič 2010: 49; Sobczyk 2011: 297; Rekelj & Predovnik 2014: 13, Arnscheid & Weidlich 2017: 256–261, Rekelj et al. 2022: 220, 225.

Remarks. This species is restricted to montane-alpine areas in the Julijske Alpe and Karavanke mountain ranges. It is highly adaptable and commonly found in these regions. *D. meierella* is prevalent in rocky areas of mountain meadows and can be found up to the rocky regions in the alpine belt, reaching heights of up to 2300m on rocks, boulders, and cliffs. Larval cases have also been discovered in cold areas of alpine valleys, with the lowest distribution limit found at 640m in the valley of the Kokra river.

Material. 38♂♂, 36♀♀ with larval cases, Vršič, Mala Mojstrovka, 1600m, leg. J. Rekelj, 17.4.2011 (e.p. 19.–24.4.2011) - 3♂♂ DNA barcode sample: CLV3627, CLV3628, CLV3629, coll. JRKS. 2♂♂, with larval cases, Kokra river valley, Zg. Kokra, 643m, leg. J. Rekelj, 3.4.2016 (e.p. 5.4.2016), coll. JRKS. 15♂♂, 26♀♀ with larval cases, Karavanke, Peca, 2050m, leg. J. Rekelj, 4.6.2016 (e.p. 7.–11.6.2016), coll. JRKS.

16. ***Dahlica (Siederia) rupicolella*** (Sauter, 1954)

Fig. 6b, c

Remarks. New species for Slovenia. This species has a very limited distribution and has so far been confirmed in only one locality. It predominantly inhabits humid coniferous forests with *Picea abies* and *Larix decidua*, found at elevations ranging from 1000 to 1200m. Notably, it occurs syntopically with two other Dahlicini species: *D. lichenella* f. parth. and *D. charlottae*.

In Slovenia, all males of this species exhibit broad cloaking scales, class V, with a valva index ranging from 4.9 to 5.9 and a genital index of 1.33 to 1.38 (As per Weidlich 2017: 79, the valva index ranges from 4.62 to 7.00 and the genital index ranges from 1.33 to 1.48). Morphological and genetic comparisons with other European populations are currently underway to gain further insights into this population.

Material. 2♂♂ with larval cases, Karavanke, Jezerski Vrh sattle, 1170–1200m, leg. J. Rekelj, 20.4.2015 (e.p. 1.–5.5.2015), coll. JRKS; 10♂♂ with larval cases, same locality, leg. J. Rekelj, 1.4.2017 (e.p. 10.–14.4.2017) - 2♂♂, genit. prep. №: 431, 449, Rekelj, coll. JRKS; 12♂♂ with larval cases, same locality, leg. J. Rekelj, 12.4.2019 (e.p. 22.–25.4.2019) - 1♂, genit. prep. №: 432, Rekelj, coll. JRKS; 8♂♂ with larval cases, same locality, leg. J. Rekelj, 4.4.2021 (e.p. 14.–17.4.2021), coll. JRKS.

Excluded from the list

Dahlica (Postsolenobia) thomanni (Rebel, 1936)

Citations for Slovenia. Carnelutti 1992a: 79; Lesar & Govedič 2010: 49; Sobczyk 2011: 242; Arnscheid & Weidlich 2017: 256–261.

Remarks. The species has not been found in Slovenia, and there is no reference material available in either museum or private collections to date. Recent research has only confirmed the presence of *D. juliella* and *D. juliella* ssp. *nanosella* in the region. It is likely that previous authors confused it with *D. juliella*.

Dahlica (Eosolenobia) manni (Zeller, 1852)

Citations for Slovenia. Höfner 1895: (*Solenobia manni* Z.); Höfner 1909–1922; Höfner 1911b: 84 (»*S. Manni* Z. (?)«]; Carnelutti 1992a: 79; Lesar & Habeler 2005: 23; Weidlich 2005b: 54; Lesar & Govedič 2010: 49; Sobczyk 2011: 117.

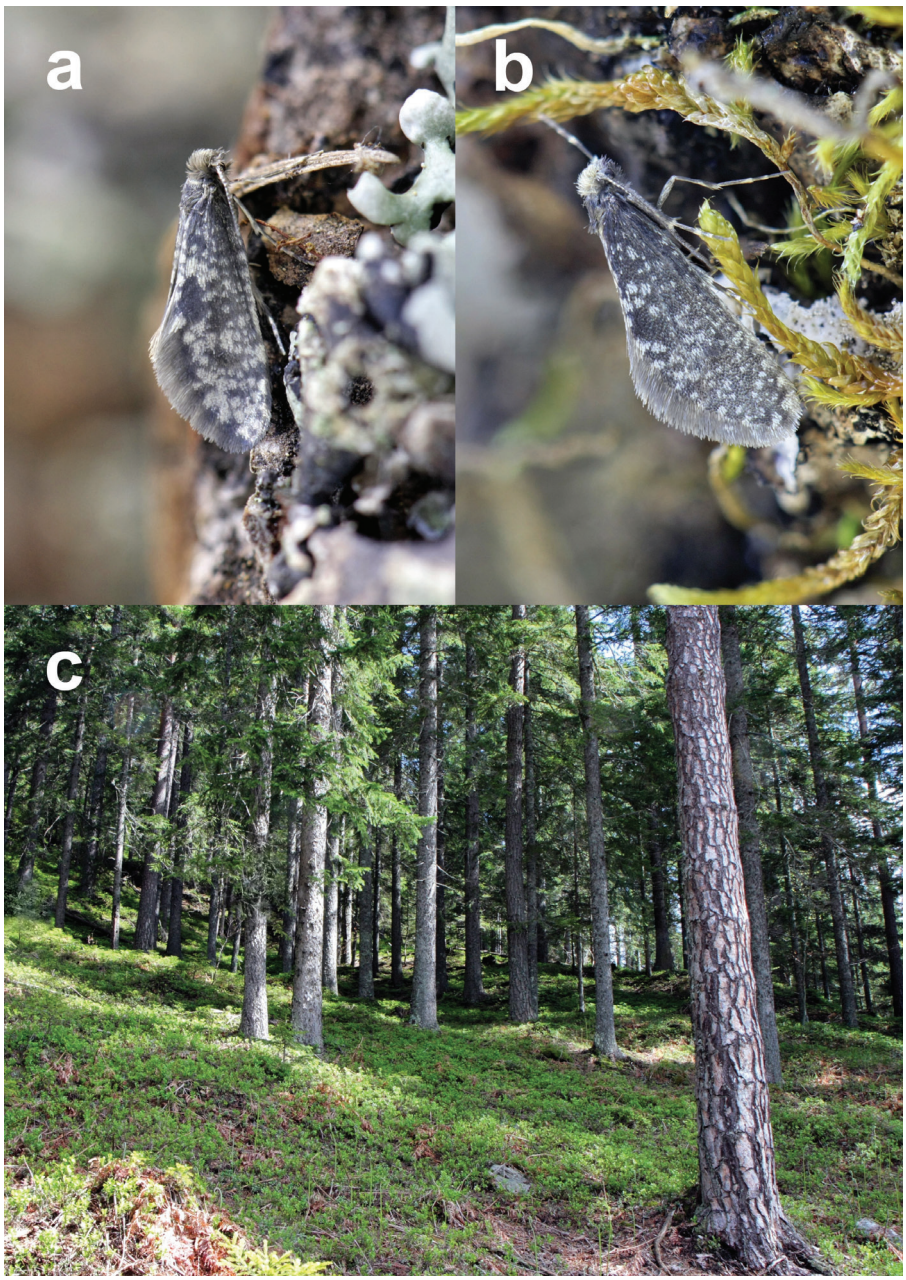

Fig. 6: a. *D.* (*Siederia*) *alpicolella*, Julijske Alpe, Viševnik, Hrustniki, 1550m, 8.6.2014; **b.** *D.* (*Siederia*) *rupicolella,* Karavanke, Jezerski Vrh sattle, 1170–1200m, 16.4.2021; **c.** Habitat of *D.* (*Dahlica*) *charlottae* and *D.* (*Siederia*) *rupicolella* on Jezerski vrh, 1170–1200m, 2.5.2014.

Remarks. This species is not present in Slovenia. So far, no reference material has been found in museums or private collections. Intensive research on this group in recent years has also confirmed the absence of this species.

The mention of *D. manni* for Slovenia dates back to Höfner (1895), who later expressed doubts about his own report regarding this species on Mt. Peca (Höfner 1911b: 84). According to Weidlich (2005b: 54), records of this species from Slovenia are questionable due to species confusion.

Dahlica (Praesolenobia) clathrella (Fischer von Röslerstamm, 1837)

Citations for Slovenia. Carnelutti 1992a: 79; Lesar & Govedič 2010: 49, Sobczyk 2011: 242.

Remarks. This species is not present in Slovenia. The literature data is certainly based on speculation. So far, no reference material has been found in museums or private collections, and recent research has also confirmed the absence of this species. According to Weidlich (2017: 86), records of this species from Slovenia are questionable and likely the result of misidentification.

Discussion

Intensive research on the Dahlicini group has been underway in Slovenia since 2010. From the outset, it became clear that we would need to start from scratch. Besides a few literature sources and rare specimens scattered across foreign museums and private collections, there were no reference collections available in Slovenia, neither in museums nor in private ownership. The only individual who provided initial support was Mojmir Lasan† (Ljubljana, Slovenia). His advice and his partially identified collection of Dahlicini specimens significantly facilitated the beginning of our field research.

As anticipated, the early years of research were characterized by considerable confusion, despite meticulous efforts in collecting and processing a large number of specimens. While common and easily recognizable species were identified without difficulty, numerous populations emerged that we were unable to classify. Initially, we attributed this challenge to the limited knowledge available on the Dahlicini group. However, it soon became evident that these populations represented species either newly recorded in Slovenian fauna or entirely new to science.

In 2014, we identified a group of specimens from Golte as a new species, *D. goltella*, which was subsequently confirmed multiple times as both widespread and a valid species (Rekelj & Predovnik, 2014). Two years later, an excellent paper by Weidlich (2016) resolved the challenge of identifying southern *Dahlica* populations, significantly facilitating further research. *D. croatica* is now recognized as one of the most common species in southern and eastern Slovenia. The discovery of *D. rupicolella* generated significant excitement. This species is currently known from only a single location and exists in very small numbers, making it potentially one of the most vulnerable species today. The *Brevantennia* group posed a particular challenge,

but we believe we have finally resolved the taxonomic issues in the Slovenian region (Rekelj et al., 2022).

D. latisquama was not expected to be found in Slovenia. Initially, due to its broad scales and wide prebursal spines in females, we first equated the specimens with *D. sauteri* (Hättenschwiler, 1977), but we soon realized that this was, in fact, a distinct species. In the past, the tradition of using solely morphological diagnostic traits to define species might have led us to describe a new species or at least a subspecies for science. However, in this case, genetics played a crucial role. Although species can vary within individual populations due to adaptations to local environmental conditions, these differences are generally not considered significant enough to classify populations as separate species. Even in the case of subspecies, the criteria define a subspecies as a potential incipient species in allopatry or parapatry, which can be diagnosed by at least one presumably inherited trait (not influenced by the environment) and has geographically distinct lineages. None of these conditions were met, and despite the significant geographical separation, we consider the Slovenian populations to belong to *D. latisquama*.

Despite the numerous discoveries to date, some *Dahlica* populations remain unclassified. One particularly intriguing case involves a small species inhabiting isolated mountain habitats in the eastern Karavanke. While morphologically unique, genetic research reveals a strong similarity with *D. croatica*. Additionally, in the Koroška region, we have encountered several populations of beautifully colored, larger *Dahlica* species that are also awaiting final confirmation. Beyond these, there are other scattered *Dahlica* populations that differ in various ways from the established species, warranting further investigation and study in the future.

These findings indicate that the current published species list for the tribe Dahlicini is robust and supported by concrete, recent discoveries, but it is far from complete. The advent of new identification techniques offers hope that even the most complex taxonomic challenges can eventually be resolved.

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