Bonn zoological Bulletin 70 (1): 221–225
2021 · Mengual X. & Ssymank A.
https://doi.org/10.20363/BZB-2021.70.1.221

ISSN 2190–7307
http://www.zoologicalbulletin.de

Research article
urn:lsid:zoobank.org:pub:508524B5-F680-4244-9749-E584F32CC1D1

Psilota exilistyla Smit & Vujić, 2008 (Diptera: Syrphidae), a new species for the German fauna

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Abstract. A new flower fly species for Germany is reported. *Psilota exilistyla* Smit & Vujić, 2008 (Diptera: Syrphidae) is recorded from the Black Forest (Schwarzwald, Baden-Württemberg, south-west Germany). Published records of *P. exilistyla* are given in a distribution map.

Key words. New record, hover fly, hoverfly, flower fly, Germany, Schwebfliegen.

INTRODUCTION

The genus *Psilota* Meigen, 1822 (Diptera, Syrphidae, Eristalinae) is a relatively small group of rarely collected flower flies, with the exception of a few relatively common Australian species (Smit & Vujić 2008; Young et al. 2020). The genus is widely distributed, present in the Nearctic (three species), Palaearctic (nine species), Australian (34 species) and Indomalayan (five species) regions (Thompson 2013; Young et al. 2020; Radenković et al. 2020). In Europe, a total of six species are known: *Psilota aegeae* Vujić, Ståhls & Smit, 2020, *Psilota anthracina* Meigen, 1822, *Psilota atra* (Fallén, 1817), *Psilota exilistyla* Smit & Vujić, 2008, *Psilota innupta* Rondani, 1857, and *Psilota nana* Smit & Vujić, 2008. Adults of European species of *Psilota* are found in forested areas, in habitats with mature *Quercus*, *Carpinus*, *Ulmus*, and/or with coniferous trees (*Picea* and *Pinus*) depending on the particular species (Speight 2020a). *Psilota* can be diagnosed by their densely pilose eye, the presence of a tuft of pile on the meron anteroventral to the posterior spiracle, and a pilose, concave to straight face with a projecting epistoma. All European species are morphologically very similar: medium-sized, compact-build, and with a general dark coloration. Their overall morphological similarity and the incomplete information on the types contribute to the confusion about the identity of the different taxa and their names (Smit & Vujić 2008; Speight 2020a; but see Radenković et al. 2020). Known larvae are short-tailed maggots found in decaying liquid media ranging from sap flows to waste dumps in termite nests (Kassebeer et al. 1998; Thompson 2013).

The German syrphid fauna is well known (Schumann et al. 1999; Schumann 2002, 2005, 2010, Ssymank et al. 2011) and so far, three *Psilota* species have been recorded from Germany, i.e., *P. anthracina*, *P. atra*, and *P. innupta* (Flügel 2001; Smit & Vujić 2008). Here a fourth species is reported for the first time from Germany, *P. exilistyla*.

MATERIAL AND METHODS

Locality

During a field expedition in early July, 2014 two *Psilota* specimens were collected using a hand net in Baden-Württemberg, southwest Germany. The male specimen here reported (Fig. 1) was collected along the path to the Zastler Hütte. Located in the Black Forest (Schwarzwald), the Feldberg (1,493 m asl) is the highest mountain in Germany outside the Alps, and northwest of Feldberg summit is the Zastler Hütte, a low-mountain managed hut. The Feldberg just surpasses the altitude of natural tree growth and has extended high-mountain grasslands of the *Leontodonto-Nardetum* community. The slopes have seminatural forests of *Picea abies* (L.) H.Karst. and *Abies alba* Mill. The collection site along the path had abundant subalpine flowering tall herb vegetation adjacent to the coniferous forest. The specimen was collected into 96% ethanol and later dried in a Critical-Point Dryer.

The female specimen was collected approximately 8 km south of this point, along the path to the Berggasthof Präger Böden, in the Gletscherkessel Präg Nature Reserve, and kept in 96% ethanol. The path crosses high-mountain *Nardion*-grasslands, and extensive pas-

Received: 04.03.2021
Accepted: 18.05.2021

Corresponding editor: R. Peters
Published: 22.05.2021

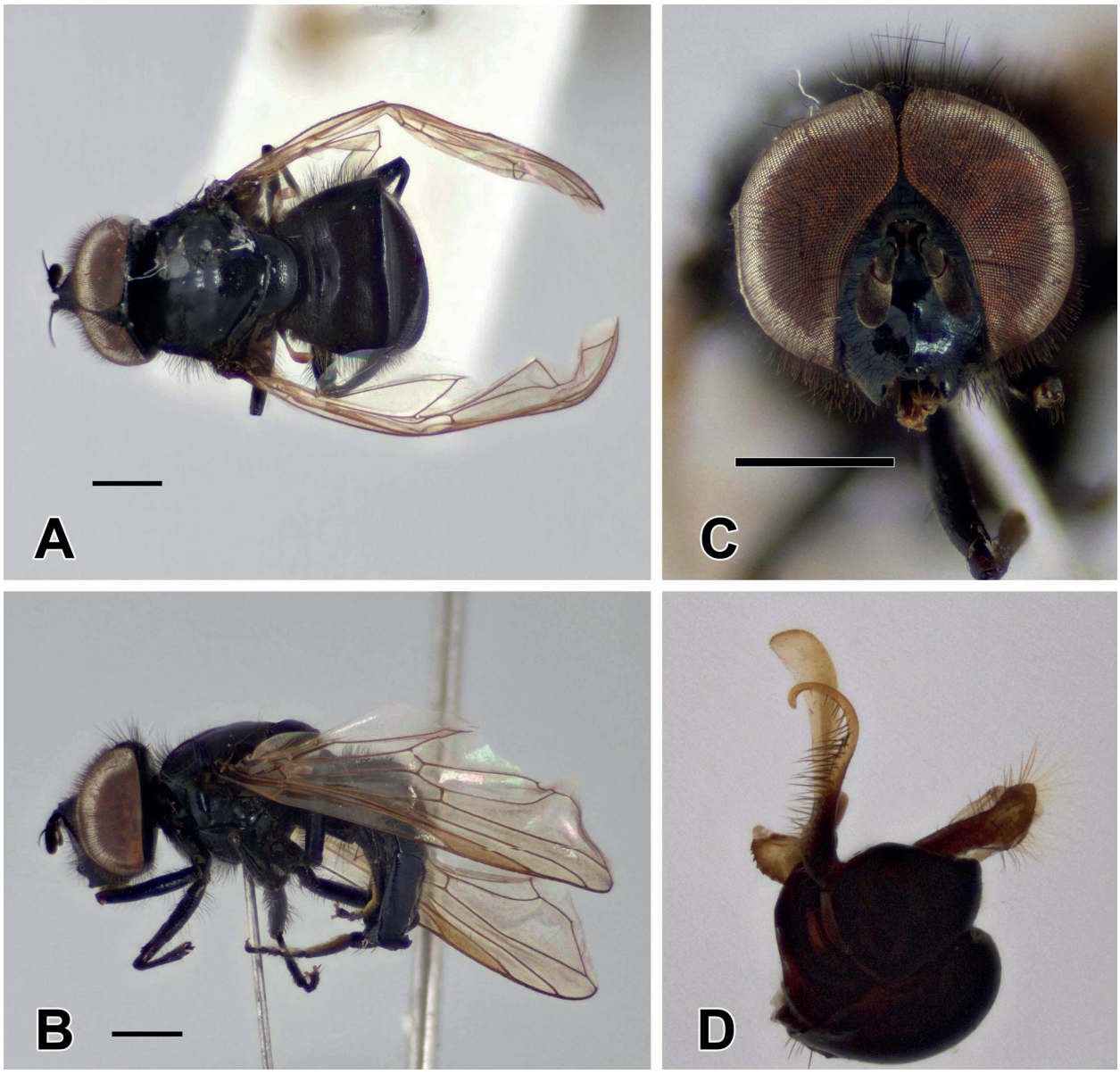

Fig. 1. Male specimen of *Psilota exilistyla* (ZFMK-DIP-00075145). **A**. Habitus, dorsal view. **B**. Habitus, lateral view. **C**. Head, frontal view. D. Male genitalia: hypandrium, epandrium, cerci and surstyli in lateral view. Scale = 1 mm.

tures of the *Festuco-Genistetum sagittalis* community, with montane tall herb stands with *Chaerophyllum hirsutum* L. and adjacent semi-natural *Picea abies* and mixed *Abies alba* forests of the *Abieti-Fagetum* community. The Präger Böden and Gletscherkessel Präg is an old glacial valley where six different glaciers met during the Würm-glaciation period. It is well known due to the cold stenotherm fauna including relicts and endemic beetles in the huge siliceous screes and block fields (LUBW 1986; Regierungspräsidium Freiburg 2011).

Taxonomy and photography

Identification was conducted using the species key of Smit & Vujić (2008) and Radenković et al. (2020) after using Speight (2020b) to identify the genus. The male specimen is deposited at the Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany (ZFMK) and the female specimen is housed at the private collection of Axel Ssymank, Wachtberg, Germany (PCAS).

Focus stacked images were created using the software Zerene Stacker® ver. 1.04 (Richland, Washington, USA), based on photographs of pinned specimens taken with a Canon EOS 7D® mounted on a P–51 Cam-Lift (Dun Inc., VA, USA) and with the help of Adobe Lightroom® ver. 5.6. Figure 2 was created with the help of SimpleMappr (Shorthouse 2010).

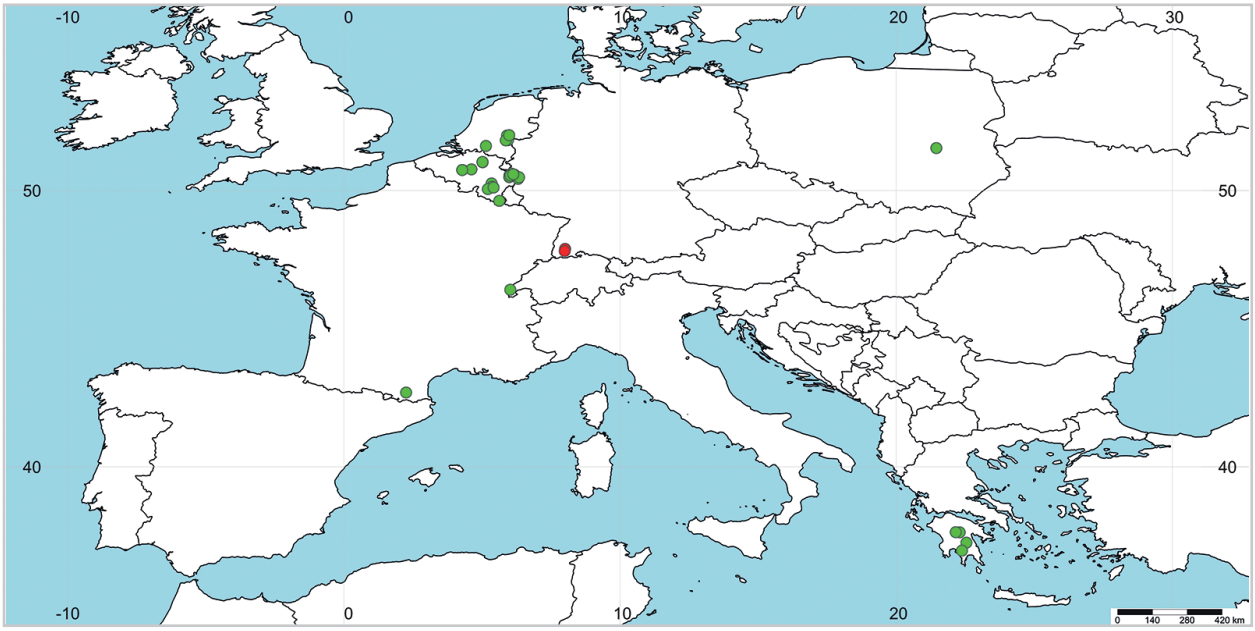

Fig. 2. Known records of *P. exilistyla*. Green = published records; red = new records from Germany.

DNA barcoding

The 5′-end of the mitochondrial cytochrome *c* oxidase subunit I (COI) gene, the so called DNA barcode (Hebert et al. 2003a, 2003b), was obtained from the female specimen using a metaleg for the DNA extraction. We used the extraction protocol by Mengual et al. (2018) and the specimen was labelled as DNA voucher for the purpose of morphological studies. DNA primers and PCR amplification protocols follow Rozo-Lopez & Mengual (2015).

The sequences were edited for base-calling errors and assembled using Geneious R7 (ver. 7.1.9, Biomatters Ltd). From Smit et al. (2015) we included all the COI sequences they used in their analysis. The alignment of the COI sequences was done using Geneious Alignment and a Neighbour-Joining (NJ) tree was inferred using the Jukes-Cantor model as implemented in Geneious R7. Bootstrap support values were estimated from 1,000 replicates as spawned in Geneious R7.

RESULTS

Material examine

GERMANY — 1 ♀; ZFMK-DIP-00067465, ZFMK DNA voucher D502; PCAS; Baden-Württemberg, Schwarzwald, Präg/ Geschwend, Präger Böden, Wegabstieg von der [Hütte zum Parkplatz]; alt. 930–1050 m; 47°48’28.5” N, 07°59’38.5” E; 10.vi.2014; A. Ssymank leg. — 1 ♂; ZFMK-DIP-00075145, ZFMK; Schwarzwald, Zastler Tal, Feldberg, Weg zur Zastler Hütte; alt. 960–1060 m.; 47°53’24.8” N, 08°00’55.5” E to 47°53’15.9” N, 08°00’29” E; 09.vi.2014; X. Mengual and M.S. Peiró leg.

The two specimens collected in the Schwarzwald belong to *Psilota exilistyla* and represent the first records of this species from Germany. The identification was confirmed with morphological and molecular characters. This species belongs to the *P. atra* species group as defined by Smit & Vujić (2008) with face shiny, at most only slightly pruinose beneath antennae, and thorax and abdomen bluish-black coloured, entirely shiny (Fig. 1). Among the taxa of the *P. atra* species group, males of *P. exilistyla* can be distinguished by having the face about 2.5 × longer than frons (Fig. 1C) and characters of the male genitalia: epandrium not elongated, broader than long in lateral view; and surstylus very long and slender, inner surstyle lobe about twice as long as the maximum length of the epandrium, and outer surstyle lobe extremely narrow, often not curved but folded backwards (Fig. 1D). The females of *P. exilistyla* can be identified by the short black pile at the posterior margin of tergite 4, metafemur not swollen, and postpedicel (basoflagellomere) about 1.5 times as long as broad.

The COI sequence obtained for the female specimen (GenBank accession number MW703674) is a bit shorter (651 bp) than the COI sequences used by Smit et al. (2015), which are 658 bp long. Nevertheless, our specimen is placed in the NJ tree (Fig. 3) within the *exilistyla* cluster, together with specimens from Greece and the Netherlands.

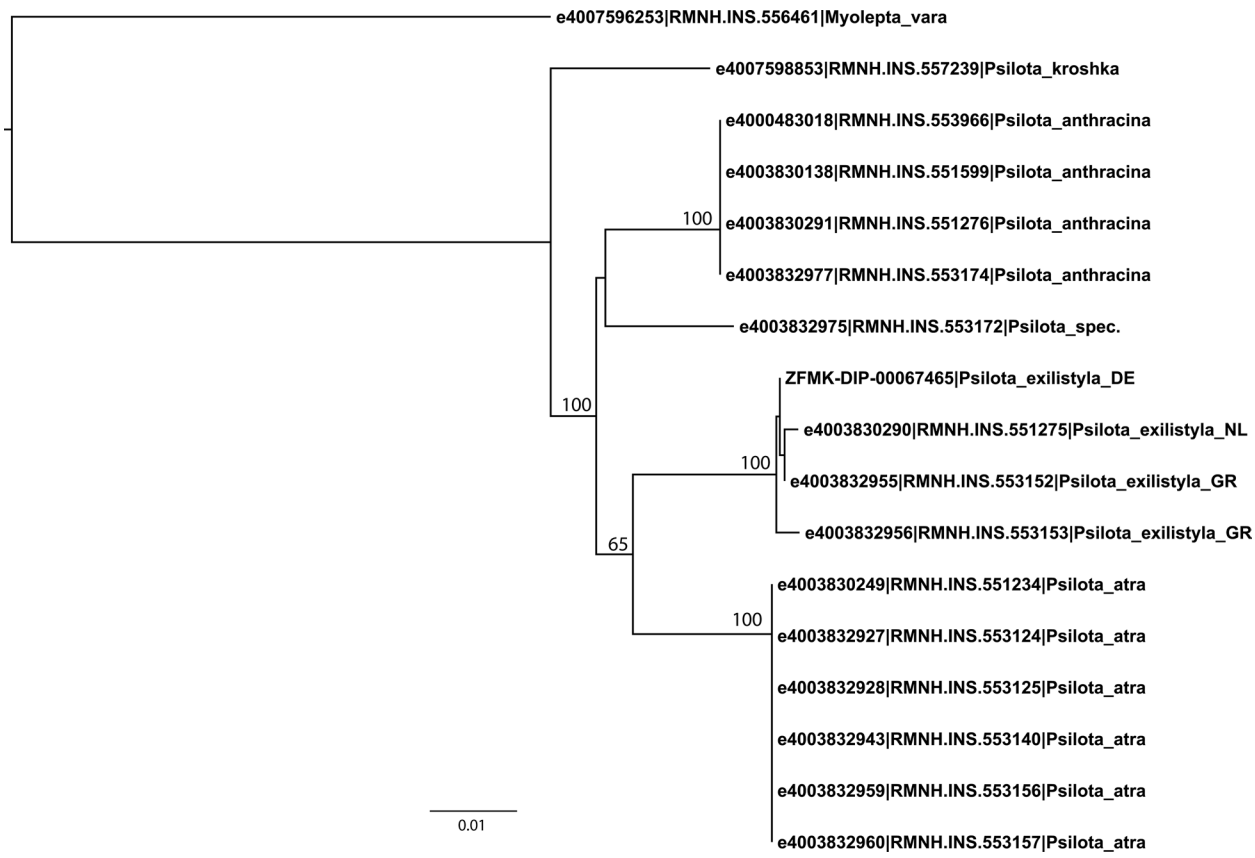

Fig. 3. Neighbour-Joining tree using Jukes-Cantor model of several *Psilota* species based on COI sequences, with *Myolepta vara* (Panzer, 1797) constrained as outgroup. For metadata of the voucher specimens see Smit et al. (2015), except for the female specimen ZFMK-DIP-00067465. GR = Greece; NL = the Netherlands; DE = Germany. Bootstrap support values are given at the nodes.

DISCUSSION

Psilota exilistyla was originally described based on male and female specimens from Greece and France (Smit & Vujić 2008). Since then, new records across Europe have been published from Belgium, Netherlands and Poland (Van de Meutter & Reemer 2012; Smit et al. 2015; Van der Ent 2017; Żóralski 2018; Bot & Van de Meutter 2019), but these records were overlooked by Vujić et al. (2020). Moreover, field observations are graphically documented in online databases, such as Waarneming (https://waarneming.nl/), and incorporated in the Global Biodiversity Information Facility (www.gbif.org). All these records plus online published records (Gilg & Mazuez 2019; Waarnemingen 2020) were summarized in Fig. 2.

The Syrphidae Red List for Germany (Ssymank & Doczkal 2008; Ssymank et al. 2011) lists *P. innupta* as extremely rare in this country. Ssymank & Doczkal (1998) listed *P. anthracina* as endangered based on limited data, but later Ssymank et al. (2011) listed *P. anthracina* and *P. atra* as data deficient. Van de Meutter & Reemer (2012) stated that due to their scarcity and the fact that are infrequently encountered and sampled, the distribution and taxonomy of *Psilota* species may still change when more records become available. After the revision by Smit & Vujić (2008) and good discriminating characters for females found by Bot & Van der Meutter (2019) the European *Psilota* species are better defined. As an example, published records from Belgium were restudied by Opdekamp & Van de Meutter (2019) and now *P. exilistyla* is the most common *Psilota* species in Belgium. More revisionary work is needed since the publications of the last decade to assess precisely the conservation status, distribution and taxonomy of *Psilota* in Europe. More records of *P. exilistyla* are expected from Central Europe in the near future.

Acknowledgments. We thank Marissa S. Peiró for collecting the male specimen of *P. exilistyla*. We also thank Frank van de Meutter for sharing their locality data of *P. exilistyla* in Belgium and for confirming the identification of the female specimen. Claudia Etzbauer is acknowledged for obtaining the molecular sequence for the female specimen and Sander Bot for sharing data on *Psilota*. We are very thankful to John Smit for sharing with us the COI sequences he used in Smit et al. (2015). We

thank Andrew D. Young and John Smit for their helpful comments.

The Regierungspräsidium Freiburg kindly issued the necessary permits for insect research in the two Nature Reserves (AZ 55-8841.06.0, issued on 11.04.2014).

This is a contribution to the German Barcode of Life (Geiger et al. 2016; http://www.bolgermany.de).

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