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Scopula orientalis (Alphéraky, 1876) (Lepidoptera: Geometridae, Sterrhinae) in the Carpathian Basin

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Abstract. The material of *Scopula* spp. specimens (n = 1181) in the Hungarian Natural History Museum is revised in the light of recent publications. The museum hosts vouchers of three species from the white-coloured taxa of the "*ornata* species-group" from the Carpathian Basin and six species from the Palaearctic Region. A historical specimen of *S. orientalis*, undoubtedly collected in the Carpathian Basin, was found amongst Palaearctic material. This is the first record of this species from the area and its most inland occurrence in Europe. A key to the identification of the three species recorded from the Carpathian Basin is given. With eight figures.

Keywords. Collection, distribution, Frivaldszky, genitalia, *Scopula decorata*, *Scopula ornata.*

INTRODUCTION

Scopula orientalis (Alphéraky, 1876) is a handsome, rare and local geometrid moth, with a disjunct distribution pattern from Macedonia to Northern Iran throughout coastal Ukraine, Asia Minor, Caucasus and the southern Urals (Hausmann 2004). This range was recently extended by the Albanian records of Beshkov (2017) and by Dincă & Székely (2018), who found the species in Dobrogea (Romania).

The latter work inspired us to revise the material of the white-coloured taxa of the "*ornata* species-group" (Hausmann 2004) *i.e.* this group without *S. submutata* (Treitschke, 1828) and *S. vigilata* (Wagner, 1826) originated from the Carpathian Basin and the Palaearctic Region, preserved in the Hungarian Natural History Museum (HNHM).

The aim of our article is to present a brief review on the material of this species-group of HN HM, to give the first record of *S. orientalis* from the Carpathian Basin and to facilitate its identification by publishing a brief identification key.

MATERIAL AND METHODS

Specimens of *Scopula concinnaria* (Duponchel, 1842) (Fig. 1), *S. ornata* (Scopoli, 1763) (Fig. 2), *S. honestata* (Mabille, 1869) (Fig. 3), *S. orientalis* (Fig. 4), *S. decorata* ([Denis & Schiffermüller], 1775) (Fig. 5) and *S. subtilata* (Christoph, 1867) (Fig. 6) from the Palaearctic Region are located in the drawers Nos 8F/15 and 8F/16 of HNHM. Drawers Nos 38A/19 and 38A/20 contain the *S. ornata* specimens from the Carpathian Basin and the drawer No. 38A/21 contains the *S. decorata* specimens, also from that territory. Altogether 1181 specimens were examined and their identity checked. The material has been re-curated according to geographical regions.

All the specimens are dried, pinned, set and labelled. Dissections were performed where necessary (slide Nos TB1847m, TB1851m, TB1852f, TB1853m, TB1854m, TB1855f, TB1861m, TB1862f, TB1863m), using traditional method with maceration in KOH solution, staining in eosine and mounting in Euparal on standard microscopic slides.

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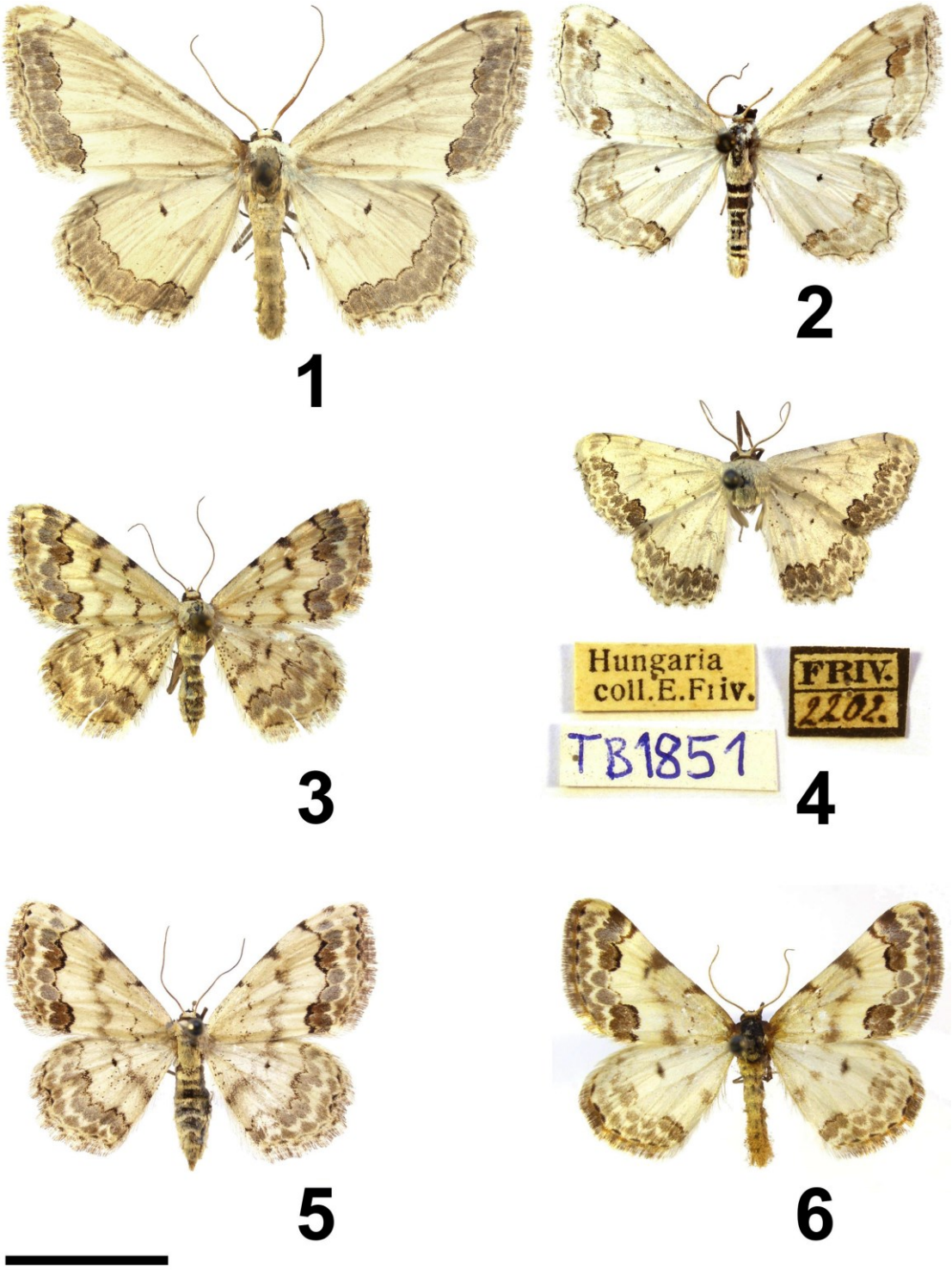

Figures 1–6. *Scopula* adults, museum specimens in dorsal view. 1 = *Scopula concinnaria* (Duponchel, 1842) male, Spain, Andalusia. 2 = *S. ornata* (Scopoli, 1763) male, Northern Macedonia, Babuna Mts. 3 = *S. honestata* (Mabille, 1869) female, Corsica, Col de Vergio. 4 = *S. orientalis* (Alphéraky, 1876) male and its labels. 5 = *S. decorata* ([Denis & Schiffermüller], 1775) female, Kosovo, Rudnik. 6 = *S. subtilata* (Christoph, 1867) male, Russia, Sarepta. Scale bar: 10 mm.

Adults and genitalia slides were digitalised in the HNHM working stations with Olympus C-7070 camera and Olympus SZx12 binocular microscope supplemented by an Olympus DP70 camera. The program Adobe Photoshop CS2 was used to adjust images and prepare tables for this article.

RESULTS

In the national (Carpathian Basin) main collection 608 *S. ornata* specimens and 343 *S. decorata* specimens were identified. According to the material *S. ornata* is widespread and frequent while *S. decorata* is more locally distributed than the former species but can also be frequent. There was no *S. orientalis* specimen amongst the specimens studied.

In the systematic (worldwide) collection eight *S. concinnaria* specimens, 84 *S. decorata* specimens, 17 *S. honestata* specimens, three *S. orientalis* specimens, 117 *S. ornata* specimens and one *S. subtilata* specimen were identified. Most of them were mixed. Amongst them we located five *S. decorata* specimens and four *S. ornata* specimens from "Hungaria", and surprisingly one of the located *S. orientalis* specimens is also labelled as from "Hungaria".

The labels of this *S. orientalis* specimen (Fig. 4) are as follows ("|" stands for the end of a line): (1) "Hungaria | coll. E. Frivaldszky" [thick yellowed paper due to ageing, text printed]; (2) "FRIV. | 2202." [thin, square-shaped paper with broad black edge, letters printed, numbers handwritten with black ink]. This specimen is a male, and has been dissected (slide No. TB1851m). The genitalia structures (Fig. 7) have characteristic features which enable unambiguous identification: posterior margin of sternum A8 is more concave, left ceras is much longer than in *S. decorata* and tips of cerata are spinulose, while they are smooth in *S. decorata*. In the clasping apparatus the fibula is shorter and the ventro-lateral processes of juxta are much shorter than in *S. decorata*.

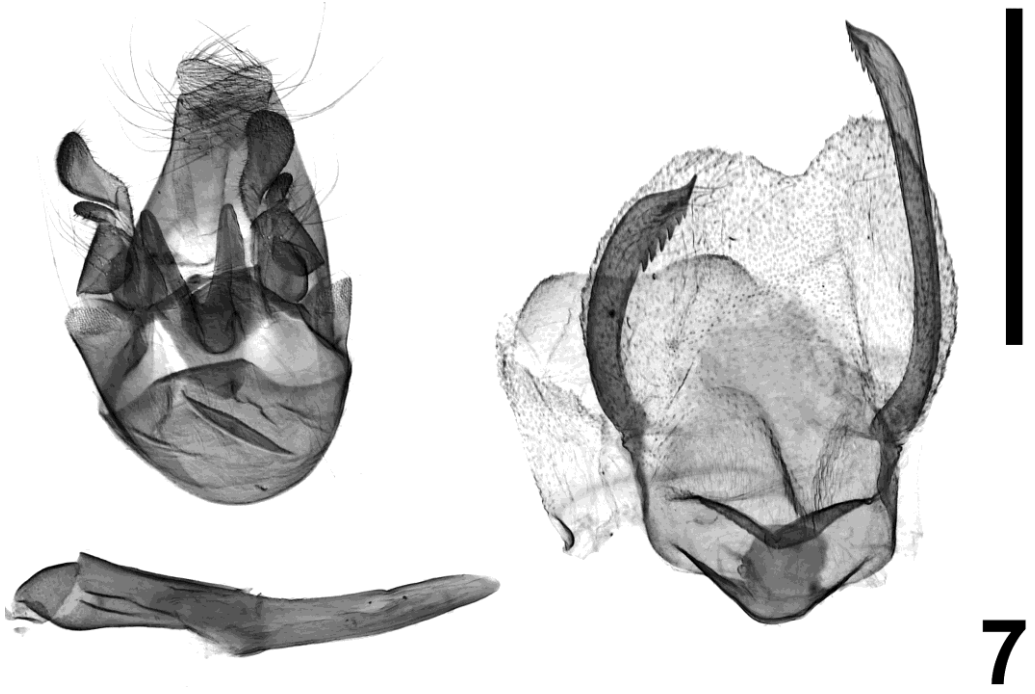

Figure 7. Genitalia of the *Scopula orientalis* specimen depicted as Fig. 3 (TB1851m). Scale bar: 1 mm.

DISCUSSION

Labels of the historical Scopula orientalis *specimen*

Like his contemporaries, Imre Frivaldszky (1799–1870) assigned serial numbers to his specimens, and gave the appropriate location to each number in a catalogue (Frivaldszky 1864). In this register the species names matched to serial numbers, and in these relevant numbered lines the quantity of the specimens with the places of origin were also indicated – thus providing a tool for tracing back some crucial information. Later on, in the 1950ies additional labels with location were assigned to Frivaldszky's specimens (Bálint 2008).

Accordingly the label no. 1 of the specimen is the recent one as testified the style of labels used after the 2nd World War staff in the museum, whilst the label no. 2. is the original Frivaldszky label, containing the serial number indicating the relevant numbered line in the catalogue. The place of origin of the *S. orientalis* specimens is "H." (= Hungarian Kingdom, Hungary) (Fig. 8).

Collecting localities

As it was the general practice in the 18–19th centuries Frivaldszky did not write precise collecting date on the labels of his specimens. The standard of Frivaldszky's era was giving large regions as collecting localities in catalogues, but exact localities could be traced back by diaries, field notes or published accounts on the expeditions. In the case of Frivaldszky it is a difficult task to trace back the exact collecting sites as the personal diaries could survive the centuries only in fragments, and only documentation of the Balkan expeditions remained intact (Bálint & Frivaldszky 2009).

The term "Hungaria" of Frivaldszky era means the Carpathian Basin but without Transylvania. The closest parts of this area to the known range of *S. orientalis* are the Banat (at present Northern Serbia and Southwestern Romania) and the vicinity of Băile Herculane (Romania). These are the most probable collecting sites of Frivaldszky's *S. orientalis* specimen but unfortunately nothing can be stated precisely. However, we cannot see any reason to raise doubts either on the origin of the specimen or the pertinence of the collecting area.

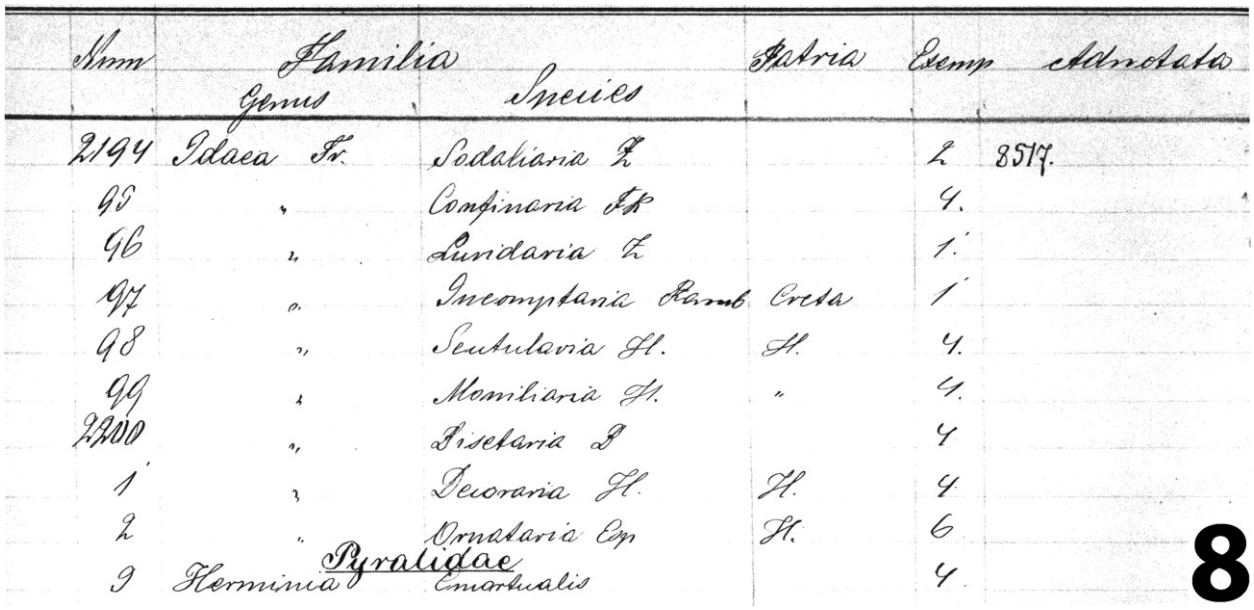

Figure 8. Scanned page of the relevant part of the Frivaldszky's catalogue, showing the numbered lines for *Scopula ornata*, *S. orientalis* (both as "Idaea Ornataria") and *S. decorata* (as "Idaea Decoraria").

Further Frivaldszky specimens

According to the catalogue, No. 2202 refers to "Idaea Ornataria" [= *S. ornata*], from "Hungaria", present in the collection by six specimens. We found five of them; four specimens were identified as *S. ornata*. One of these specimens was the *S. orientalis* mentioned above. We found a further *S. ornata* specimen, mislabelled by Zsigmond Velez (locality: Italy, Piemont). This can be the sixth specimen of Frivaldszky, judging by the style of mounting as well as shape and quality of the pin, which are identical to those of Frivaldszky and it is known that Velez relabelled many museum specimens, often with false data (Bálint 2009).

No. 2201 of Frivaldszky stands for four specimens of "Idaea Decoraria" [= *S. decorata*] also from "Hungaria". We found all of them.

In general the Frivaldszky collection specimens were kept in the Palaearctic material by the previous curators. In the time of its acquisition (1864) the Frivaldszky Lepidoptera collection was one magnitude larger than the collection of the National Museum and contained large amount of species not native in the Carpathian Basin. Consequently all the new exotic (= "non Hungarian") material were incorporated to the Frivaldszky collection which had grown into the main collection. Whilst an extensive development of the national collection had been started from the 1950ies, the Frivaldszky specimens were left in their place. Recent curatorial policy is that the Frivaldszky specimens should be assembled together keeping as a distinct body, curated similarly as the collections of Tobias Koy, Ferdinand Ochsenheimer and Friedrich Treitschke, with great historical interest (Bálint 2008).

The Scopula ornata *species group diversity in the Carpathian Basin*

The first review of the *Scopula* fauna of the Carpathian Basin was provided by Abafi-Aigner (1907) presenting short descriptions and figuring the most common species. Subsequently Kovács (1965) monographed the Hungarian fauna and provided a key for the 16 species he recorded. Later Fajčik (2003) provided an overview and documented the occurrence of 20 species for Central Europe. Székely (2013) monographed the Sterrhinae fauna. None of the mentioned works discussed or figured *Scopula orientalis*. Therefore below we provide a key for the white-coloured taxa of the *Scopula ornata* species-group (sensu Hausmann 2004) to distinguish the three taxa recorded in the Carpathian basin.

1. Forewing with two, hindwing with at least one (often two) distinct brown patches in the marginal field; this field without bluish grey or lead-grey band (Fig. 2).....*Scopula ornata*

– Forewing with two brown, often bluish grey patches in the marginal field, hindwing without distinct patch; all wings with lead-grey or bluish grey band in marginal fields….....2

2. Grey band of forewing reaching costa or at least vein R4; row of terminal grey spots confluent (Fig. 5).....*Scopula decorata*

– Grey band of forewing reaching vein R5 only; apically from this vein the band either disappearing or vanishing to an isolated light grey dot; terminal grey spots separated (Fig. 4)… .....*Scopula orientalis*

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