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CHESIAS PLUMBEATA STAUDINGER, 1901 (GEOMETRIDAE LARENTIINAE CHESIADINI) NEW SPECIES FOR THE EUROPEAN FAUNA DISCOVERED ON THE ISLAND OF PANTELLERIA (ITALY, SICILY).

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Timossi G., Lo Verde G., Scalercio S. - *Chesias plumbeata* Staudinger, 1901 (Geometridae Lerentiinae Chesiadini) new species for the European fauna discovered on the Island of Pantelleria (Italy, Sicily).

Chesias plumbeata Staudinger, 1901 is recorded for the first time from Europe based on some adults collected in the island of Pantelleria (Strait of Sicily, Italy), near Bagno dell'Acqua lake. The species was previously known from North Africa. Identification was confirmed by using morphological and molecular taxonomic characters. Male genitalia of *C. plumbeata* are here described for the first time. Biological information and illustrations useful for the moth identification are provided. The finding of this species shows that the inventorying of the lepidoptera fauna of Pantelleria, from where 152 species have so far been recorded, is still far away from completion and needs further efforts.

Key Words: Lepidoptera, Geometridae, European fauna, Pantelleria island, Sicily, Italy.

INTRODUCTION

The genus *Chesias* Treitschke, 1825 includes 12 species and subspecies of which 8 are present in Europe, *Chesias angeri* Schawerda, 1919, *Chesias isabella* Schawerda, 1915, *Chesias legatella capriata* Prout, 1904, *Chesias legatella legatella* ([Denis & Schiffermüller], 1775), *Chesias linogrisearia* Constant, 1888, *Chesias rufata cinereata* Staudinger, 1901, *Chesias rufata rufata* (Fabricius, 1775), *Chesias pinkeri* Schawerda, 1939 while the four remaining species are distributed outside Europe, and precisely: *Chesias lecerfi* Lucas, 1937 from Morocco, *Chesias rhegmatica* Prout, 1937 from Cyprus , *Chesias rufata plumbeata* Staudinger, 1901 is known from Mauritania, Morocco, Algeria, Tunisia, *Chesias sureyata* (Rebel, 1933) from Turkey (Rajaei *et al*., 2022). In Italy there are *C. legatella*, *C. l. capriata*, *C. r. rufata*, and the endemics *C. angeri*, known from a small area in the north-east of Italy, and *C. linogrisearia*, from Sardinia and Corsica (Hausmann & Viidalepp, 2012). This work deals with *C. plumbeata*, a species described from Mauritania by Staudinger as a variety of *C. rufata* (Staudinger & Rebel, 1901) which was elevated to the rank of species by Leraut (2009) and accepted by Hausmann & Viidalepp (2012) and Müller *et al.* (2019). As the recent Rajaei *et al.* (2022) report *plumbeata* as subspecies of *C. rufata* without providing further details, and based on morphological and molecular analysis of specimens collected in the island of Pantelleria during this study, we agree with the species rank classification of *Chesias plumbeata*, and report here this species for the first time for the European territory.

MATERIALS AND METHODS

Specimens were collected in February 2024 on the Pantelleria island, near the shore of Bagno dell'Acqua lake, during a nocturnal sampling session carried out using LED lights of different wavelengths (mod. entoLED1 w/15 led Nichia) placed inside a light tower 70x180 cm.

The collected specimens were prepared in the laboratory according to the techniques indicated by Parenti (2000). All digital pictures were taken with a Nikon D610 DSLR camera equipped with a Nikon Micro-Nikkor AI-s 105mm f/2.8 lens, mounted on a macro repro stand with Nikon extension bellows PB-6. The settings used were ISO 100, f/5.6 aperture, and a shutter speed ranging from 1/2 to 1/16 s. White and color calibrations were performed for each picture using an X-Rite M50103 ColorChecker GreyScale 3-Step Balance Card. The original photographs were stacked using CombineZP software. Wingspan has been measured at the tip of forewings including fringes with a calliper (precision 0.05 mm). Slide mounting of the genitalia was arranged following the procedure described by Robinson (1976), with some modifications. Abdomen from two specimens and foretibia from a single specimen were detached and put in boiling 10% KOH solution (10-20 minutes). Afterwards, they were washed in distilled water with the addition of a few drops of glacial acetic acid and then soaked again in

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distilled water. Genital and foretibia structures were dissected and dehydrated through immersion in ethanol at increasing concentrations, then mounted in Euparal onto a standard slide with an 8 mm diameter coverslip. Slide photographs were taken with a Nikon Eclipse E100 trinocular microscope equipped with a Sony Color CCD 5.1 Mp TP 5100 microcamera managed by X-Entry software. The morphometric measurements of the genitals were taken using a Zeiss Stemi 508 microscope and Zeiss camera mod. Axiocam 208 color whit ZEN software. The DNA barcode analysis of a single specimen was carried out to confirm the results of morphological identification. One dry leg was sent to the BMR Genomics s.r.l. laboratory, where the 658 bp long sequence near the 5 end of the cytochrome c oxidase I (COI-5P) mitochondrial gene was obtained following the standard protocols described by deWaard *et al.* (2008). Then, the sequence was compared with those available in the Barcode of Life Data system (BOLD) (Ratnasingham & Hebert, 2007) and an identification was returned by the BOLD Identification Engine.

RESULTS

Morphological identification

Chesias plumbeata Staudinger, 1901

Material examined

1♂, Italy, Sicily, Pantelleria Island, lago Bagno dell'Acqua, 36.81538 N 11.98945 E, 2 m s.l.m., 17.II.2024, leg. G. Timossi, slide 2211 TG (GenBank accession number PV131712);1♂, idem, m.s. 2259 TG, (Department of Agricultural, Food and Forest Sciences, University of Palermo); 2♂♂, idem, m.s. 2260 TG, G. Timossi Research Collection (GTRC).
Slide mounted genitalia and foretibia are preserved in GTRC.

Description

Male (Fig. I, II). Wing length mm 2.92 - 3.53; forewings: basal area grey; basal line brown fading towards the medial area with marked medial line at the costa and evanescent towards the dorsum; post medial line brown closing on CuA1 drawing a wide curve towards the termen; sub terminal line white, apical steak ochre, terminal line dark (Fig. I). Sclerite of foretibia short (Fig. III c).
Male genitalia (Fig. III a, b): short conical saccus with rounded apex; uncus thick and as long as the distance of the ends of the costa of the valve; juxta sturdy thicker than in *C. rufata*; valve short with strongly concave costa; aedeagus short, length about 1.2- 1.3 mm (n = 3).
Female: not found.

Diagnosis

C. plumbeata is very similar to *C. rufata cinereata* Staudinger, 1901, from which it can be distinguished by the interrupted postmedial line on CuA1 and widely curved on the discoid cell; the genitalia of the male are distinguished by the short saccus and the short aedeagus (1.2 -1.7 mm).

molecular identification

The sequence of 658 base pairs was uploaded to GenBank (ID PV131712). It showed a perfect identity with the sequence of a Tunisian specimen available in BOLD belonging to *Chesias plumbeata* (BOLD ID: GWOSP951-11) and differs by the 0.76% from two Moroccan specimens of the same species (BOLD ID: GWOTM876-14 and GWOTM890-14). *Chesias plumbeata* belongs to the Barcode Index Number (BIN) BOLD: AAZ8650, showing a distance to *C. linogrisearia*, its Nearest Neighbour (BOLD: AAE9255), of 2.36%. The nearest specimen belonging to *Chesias rufata*, collected in Calabria (BOLD specimen ID: BCZSM Lep 63422), differs by 4,32% from our Pantelleria specimen of *C. plumbeata*.

Phenology

Adults have been found in flight in a single generation in February 2024. The species was not recorded neither during a further sampling carried out in April in the same locality, nor in other sampling sessions in Pantelleria throughout the year (April, May, July, October).

Biology

Unknown. In general, the larvae of the species of the genus *Chesias* are oligophagous on Fabaceae, tribe Genisteae (Hausmann & Viidalepp, 2012).

Distribution

Morocco, Algeria, Tunisia (Hausmann & Viidalepp, 2012), Italy (Sicily), Mauritania (locus typicus, Staudinger, 1901); there are no recent records from Mauritania but the chorotype should be 4.02 Afrotropical Mediterranean (Stoch & Vigna Taglianti, 2005).

Taxonomy notes

Chesias plumbeata was described as *C. rufata* var. *plumbeata* by Staudinger (Staudinger & Rebel, 1901) and recently elevated to species rank by Leraut (2009). Hausmann & Viidalepp (2012) and Müller *et al.* (2019), in their comprehensive volumes on Geometrid fauna of Europe, consider *plumbeata* as *bona species*, while in Rajaei *et al.* (2022) it is reported as a *C. rufata* subspecies, without providing further details. We agree with the classification reported by Leraut (2009) and accepted by Hausmann & Viidalepp (2012) and Müller *et al.* (2019), on the basis of male morphological characters and the DNA barcoding. To the best of our knowledge, the male apparatus of *C. plumbeata* had never been described before, as well as the tibia of the forelegs. The original description by Staudinger does not include any iconography: *"al. ant. obscure plumbeo-griseis et fere non vel haud rufo-signatis"* Mauritania (Staudinger & Rebel, 1901, page 286 n° 3230). An excellent reproduction of two different specimens is reported by Culot (1917 – 1919); the author illustrates a specimen from Algeria (Figure 385), and a specimen from Tunisia (Figure 386), the latter identified by Staudinger (and donated to

FIG. I *C. plumbeata* recto TGRC (scale 3 mm), photo D. Vallotto.

Fig. II *C. plumbeata* verso TGRC (scale 3 mm), photo D. Vallotto.

Culot by Oberthur), with evident reddish shades on the forewings. The identification by Staudinger shows he was aware that in North Africa *C. rufata* var. *plumbeata* could have reddish shades on the forewings, differently from his own original description. Adults of the nominal form (without evident reddish shades on the forewings) are also illustrated in Leraut (2009, plate 123, figures 14 -15). The sequences present in BOLD used for the identification of the specimens of Pantelleria are from Tunisia and Morocco specimens with evident reddish shades, confirming that *C. plumbeata* also has reddish shades of varying intensity throughout its distribution area.

CONCLUSIONS

The Italian fauna of Geometridae is well known and studied by several specialists who have published numerous contributions summarized in the Checklist of the species of the Italian fauna (Raineri & Zangheri, 1995), in which 239 species are listed for Sicily. Thanks to more recent studies, the Sicilian fauna of Geometridae counts 240 species (Parenzan & Porcelli, 2006). An on-line list continuously updated (Rennwald et al., 2023) reports 223 species as found in Sicily: these significant differences highlight to the difficulty of correctly identifying the species of this family, especially for some complex genera such as *Idaea* and *Eupithecia*, and the poor reliability of the data from ancient publications, due to the progress of recent taxonomy and biogeographic knowledge. For the island of Pantelleria the first findings of geometrids are from Ragusa (1875), who listed 5 species. Subsequent investigations conducted by several entomologists are summarized in Romano & Romano (1995) who list 13 species, Romano (2020) adds 17 species, whereas a recent contribution lists 4 new species of Geometridae for Pantelleria (Barberis et al., 2022). The present record brings to 152 the species of Lepidoptera, and to 35 the number of Geometridae found in the island of Pantelleria (about 15% of Sicilian Geometridae), confirming that current knowledge on the lepidopteran fauna of the island is still very poor (Timossi et al., 2024). At present, after the record of *C. plumbeata* in Italy, the European Geometridae fauna counts 1105 species (Rennwald et al., 2023).

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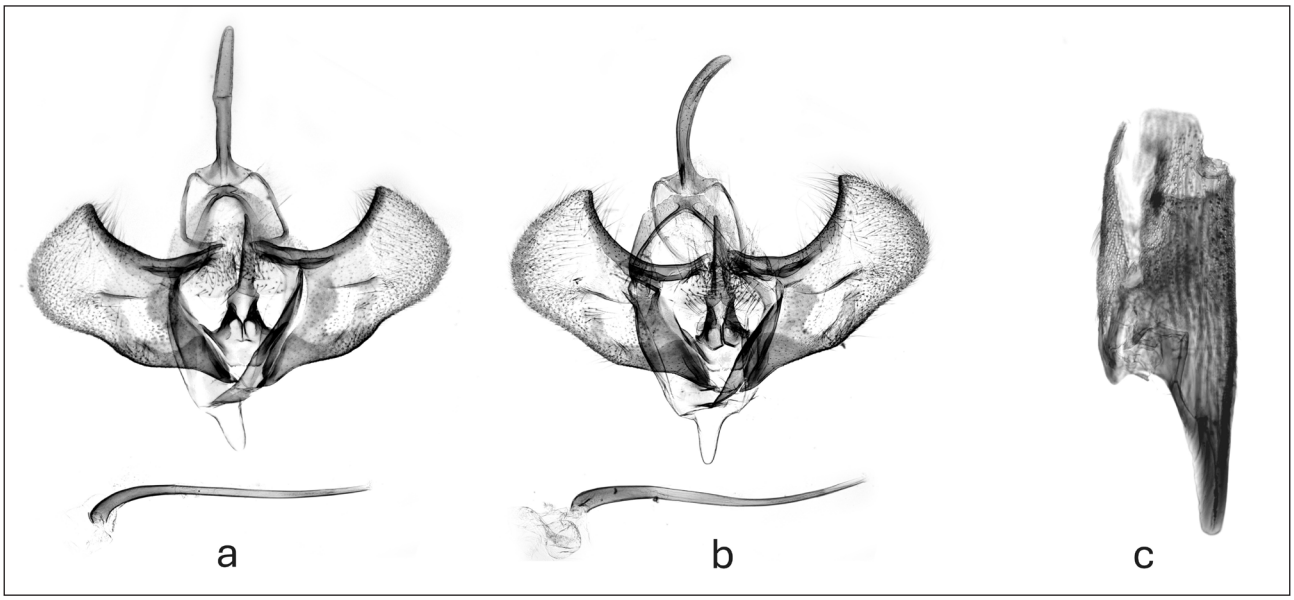

Fig. III a: microscopic slide n° 2259 TG, male apparatus (X 40); b: microscopic slide n° 2260 TG male apparatus (X 40); c: foretibia microscopic slide n° 2272 TG (X 40); photo G. Timossi.

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