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(Coleoptera: Dermestidae: Megatominae),
the type species for the subgenus
Anthrenops Reitter*

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Holloway, G. J., Querner, P. and Foster, C. W. (2025) An extended description of *Anthrenus (Anthrenops) coloratus* Reitter (Coleoptera: Dermestidae: Megatominae), the type species for the subgenus *Anthrenops* Reitter. *Israel Journal of Entomology*, 54. pp. 33-43. ISSN 2224-6304 Available at <https://centaur.reading.ac.uk/125550/>

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Publisher: Entomological Society of Israel

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An extended description of *Anthrenus* (*Anthrenops*) *coloratus* Reitter (Coleoptera: Dermestidae: Megatominae), the type species for the subgenus *Anthrenops* Reitter

GRAHAM J. HOLLOWAY¹*, PASCAL QUERNER² & CHRISTOPHER W. FOSTER¹

¹Cole Museum of Zoology, School of Biological Sciences, HLS Building, Whiteknights, University of Reading, UK. E-mail: g.holloway@reading.ac.uk; c.w.foster@reading.ac.uk

²Natural History Museum Vienna, Burgring 7, 1010 Vienna, Austria.

E-mail: pascal.querner@nhm.at

*Corresponding author: g.holloway@reading.ac.uk

ABSTRACT

The descriptions of many Dermestidae species are brief, often inadequate for modern day taxonomic purposes, especially for species described in the 18th and 19th centuries. *Anthrenus coloratus* is such a species. *Anthrenus coloratus* from Italy is described in detail. Images of external (habitus, ventrites, antennae) and internal (aedeagus, male sternite IX, female sternite VIII, female tergite VIII, bursal copulatrix sclerites) characters are provided. Even though *A. coloratus* is the type species for the subgenus *Anthrenops*, images of most of these structures are published for the first time.

KEYWORDS: *Anthrenops*, *Anthrenus*, Dermestidae, carpet beetles, skin beetles, Afrotropical, Palearctic, genitalia, redescription, taxonomy.

INTRODUCTION

The Dermestidae is a medium-sized family containing over 1900 species (Háva 2024). The number of species described has more than doubled from just over 800 in Mroczkowski's (1968) World Catalogue to the present day, indicating the effort made by the very few scientists working on Dermestidae to find and describe new species. In the pursuit of new species, the accurate description of species named long ago has been low priority, even though the discovery of new species is predicated on good descriptions of known species. Of course, many of the species named in the 18th and 19th century are based on brief descriptions. Scientists working at that time would not have realised how many undescribed species might be encapsulated within a very short description, nor did they have the imaging opportunities the 21st century taxonomist has at their disposal. Efforts have begun to extend the brief descriptions of some Dermestidae holotypes, for example *Anthrenus pimpinellae* (Fabricius, 1775) (Holloway & Bakaloudis 2020), *A. munroi* Hinton, 1943 (Holloway & Cañada Luna 2022), *A. flavipes* LeConte, 1854 (Armstrong *et al.* 2023), *A. minor* Wollaston, 1865 (Holloway & Herrmann 2024a), *A. senegalensis* Pic, 1927 (Holloway 2024a), *A. oceanicus* Fauvel, 1903 (Holloway 2025a), *Attagenus rufiventris* Pic, 1927 (Hermand & Holloway 2020), and *Att. angustum* Solier in Gay, 1849 (Holloway & Sparks 2023). Given the number of species requiring extended descriptions, this

DOI: [10.5281/zenodo.17161768](https://doi.org/10.5281/zenodo.17161768); ISSN (online) 2224-6304

Received: 27 May 2025 / Revised: 16 September 2025 / Accepted: 17 September 2025

[urn:lsid:zoobank.org:pub:56357F88-653B-47C0-83EE-0CFC11336EBF](https://zoobank.org/pub:56357F88-653B-47C0-83EE-0CFC11336EBF)

list is modest, but the approach has already exposed some synonyms (Holloway *et al.* 2020; Holloway & Herrmann 2024b, c) as well as elucidating distributions (Holloway *et al.* 2021, 2022, 2023). A major issue with brief or weak descriptions is that several species might remain hidden. Such has been the case with the *A. pimpinellae* group of species. Well into the 20th century, many species were considered to be subspecies or variants of *A. pimpinellae* (e.g. Hinton 1945). Only following the publication of a better description of *A. pimpinellae* associated with clear images (Holloway & Bakaloudis 2020) were other similar species revealed, such as *A. amandae* Holloway, 2019, *A. chikatunovi* Holloway, 2020, *A. queneri* Holloway, 2024b, and *A. algeriensis* Holloway, 2024c.

Anthrenus is split into 10 subgenera (Peacock 1993; Háva 2004), one of which is *Anthrenus* (*Anthrenops*) Reitter, 1881. The type species for *Anthrenops* is *A. coloratus* Reitter, 1881 (Háva 2024). Reitter (1881: 91) describes *A. coloratus* as follows:

“Fühlerfurchen die Mitte des Halsschildes erreichend, oder etwas überragend. Unten weiss, oben schwarzbraun, auf dem Halsschild dunkler beschuppt; die Stirn, die Seiten des Halsschildes breit, eine kleine Basalmakel vor dem Schildchen an der Basis desselben, die Naht der Flügeldecken schmal und drei gerade, nirgends unterbrochene Binden hell weiss beschuppt. Die erste Binde befindet sich unter der Basis, weit oben, die zweite in der Mitte, die dritte vor der Spitze. Zwischen der ersten und zweiten Binde befindet sich häufig ein weissbeschuppter Flecken, Bauchringe an den Seiten mit einem schwarz- oder gelbbraun beschuppten Flecken; Analsegment in der Mitte mit einem braunen Längsstreifen.” [Antennal furrows reaching the middle of the pronotum, or slightly beyond. White below, black-brown above, darker scaled on the pronotum; the forehead, the sides of the pronotum broad, a small basal spot in front of the scutellum at the base of pronotum, elytra narrow with three straight, uninterrupted <transverse> bands of bright, white scales. The first band under the <elytral> base close to the top, the second in the middle, the third in front of the <elytral> apex. Between the first and second bands there is often a white-scaled spot, sides of abdominal sternites with black- or yellow-brown scaled spot; anal segment with a brown longitudinal central stripe.]

Reitter's (1881) description of *A. coloratus* is not as brief as some from that period, but has become inadequate following the discovery of many more species. Háva (2024) lists 30 species in the subgenus *Anthrenops*, 28 of which were described after 1881. Reitter (1881) would not have seen the need to describe the species in more detail, for example there is no mention of the number of antennal segments and the description of the ventrites could be appropriate for many *Anthrenus* species. There was also no mention of the structure of the genitalia, but from the late 20th century onwards the importance of the genital structure in species descriptions has been realised (e.g. Mroczkowski 1964; Beal 1998; Kadej *et al.* 2007). In the current study, an extended description of *A. coloratus* is provided as a basis for future taxonomic work on *Anthrenops*.

MATERIALS AND METHODS

Thirteen specimens were obtained for study, nine (six males, three females) from Florence, central Italy, two females from Milan, northern Italy, and two females from Khartoum, Sudan. The Florence specimens were all on sticky blunder traps, those from Milan were collected from Apiaceae, and at least one specimen from Khartoum was taken from an uncured antelope head. Individuals were lifted from sticky traps using ethyl acetate, which makes the glue temporarily fluid, and then dropped into dry cleaning fluid (K2r®) to remove any remaining surface glue. All specimens were macerated in a solution of 2% acetic acid for five days to soften prior to dissection. Dissection was carried out under a Brunel BMSL zoom stereo LED microscope and involved detaching the abdomen from the rest of the insect using two entomological pins. The soft tergites were then peeled away from the harder ventrites to expose the genitalia. The aedeagus was detached from the ring sclerite, and sternite IX was detached from the ring sclerite and the aedeagus. Habitus and ventrite images were captured at 20× magnification using a Canon EOS 2000D camera mounted on the BMSL microscope. Images of aedeagus and sternite IX were captured at 200× magnification for measurement using a Canon EOS 1300D camera mounted on a Brunel monocular SP28 microscope. After dissection, all body parts were mounted on card. The antennae were imaged at ×200 magnification through the SP28 microscope. All images were fed through Helicon Focus Pro version 8.2.2 focus-stacking software. All measurements were made using DsCap. Ink software version 3.90. Measurements taken: BL – body length from anterior margin of pronotum to the apex of the elytra, BW – body width (measured across both elytra), AL – antennal club length (length of the last three antennomeres), AW – antennal club width (maximum width across the terminal antennomere),

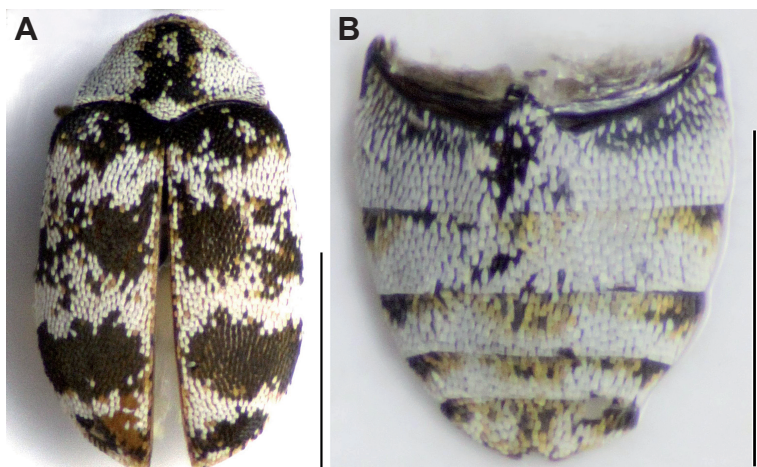


Fig. 1. *Anthrenus coloratus*, male: (A) habitus, (B) ventrites. Scale bars = 1 mm.

PL – paramere length (distance from the anterior end of the parameres to the apex of the parameres), PW – paramere width (the longest distance across parameres) SL – sternite IX length (distance from the tip of one anterior horn to the tip of the posterior lobe).

Scale bars were added using ImageJ 1.53M (Schneider *et al.*, 2012). Statistical analysis (Mann Whitney U test) carried out using Jamovi version 2.6 (The jamovi project 2024).

Material is deposited in the following collections: GHEC – Graham Holloway Entomological Collection (Italian specimens), NHMUK – Natural History Museum, London, UK (Sudanese specimens).

TAXONOMY

Genus *Anthrenus* Geoffroy, 1762

Subgenus *Anthrenops* Reitter, 1881

Anthrenus (Anthrenops) coloratus Reitter, 1881

Figs 1–5

Anthrenus (Anthrenops) coloratus Reitter, 1881: 91; Háva 2007: 49.

Anthrenus rufescens Pic, 1923: 3; Háva 2007: 49.

Description: Male. Overall appearance black (or dark brown) and white (Fig. 1A) with little variation among males studied. Slim, slightly globular posteriorly, BL=1.85–2.05 mm, BW/BL=0.512–0.561. Head with single dark amber coloured ocellus on midline below level of top of eyes. Face covered with white scales, becoming slightly browner towards vertex with a few dark brown scales along anterior edge of vertex. Eyes slightly protruding, oval with complete inner margin. Pronotum integument dark brown with two large, lateral patches of mostly white scales extending from pronotal corners forward to anterior margin, and along posterior margin. Inner margins of two lateral patches and anterior pronotal margin with lines of orange scales. Patch of white scales in centre of posterior margin in front of scutellar shield. Anterior to patch of white scales in middle of posterior margin is another spot of white scales in centre of pronotum. Central spot of white scales sits within broad strip of dark brown scales running anterior to posterior. Specimens from Khartoum with more orange scales but white scales are still evident.

Elytral integument brown at base, becoming pale brown at elytral apices. Elytra narrow, each bearing three prominent fasciae of white scales, one sub-basal, one medial, and one sub-apical. Spot of white scales varying in size among individuals situated between sub-basal fascia and elytral base. Spot of white scales varying in size among individuals is located between sub-basal fascia and medial fascia. Apices of elytra with narrow strips of white scales. Orange scales scattered in white fasciae, especially on fascial margins, as well as lining elytral suture. White and orange scales set in background of dark brown scales.

Ventrites (Fig. 1B) covered in mostly white scales. Ventrite 1 possesses some pale orange scales on upper anterior corners. Ventrites 2–5 with patch of dark brown

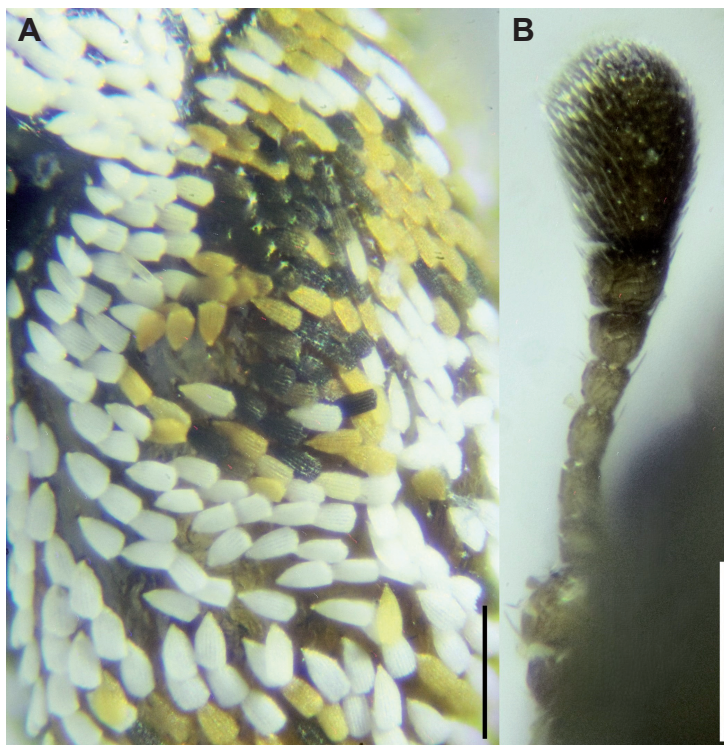


Fig. 2. *Anthrenus coloratus*, male: (A) elytral scales, (B) antenna. Scale bars = 1 mm.

scales covering anterior half of lateral margin. Orange scales lining margins of each dark patch and extending across anterior margin of each ventrite, forming thicker line of orange scales at centre of each ventrite. Ventrite 5 terminates in notch and orange scales extend from anterior margin to terminal notch.

Scales semi-erect (Fig. 2A), joined to integument by sharp end. Elongated cone shape with convex terminal margin. Surface of scales ridged longitudinally. Scales only differ in colour, not structure. Each scale consists of only one colour.

Nine-segmented antenna (typical for *Anthrenops*) (Fig. 2B) brown. Two basal antennomeres globular. Antennomeres 3–5 oblong, antennomere 6 shorter, antennomere 7 slightly broader still and forming the first segment of the 3-segmented club (AL=177 μ m). Antennomere 8 transverse oblong and darker brown. Terminal (ninth) antennomere large, longer than broad (AW=83 μ m), evenly curved along posterior margin, straight to concave along anterior margin, and evenly rounded at tip. Antennomeres 8 and 9 both covered in pale brown hairs.

Small, squat aedeagus (Figs 3A, 3B), PL=175 μ m, PW=135 μ m, PL/BL=0.08. Dorsal (concave) side of aedeagus (Fig. 3A). Median lobe narrow and terminates at anterior end in two straight stirrups that turn at right angles to join median

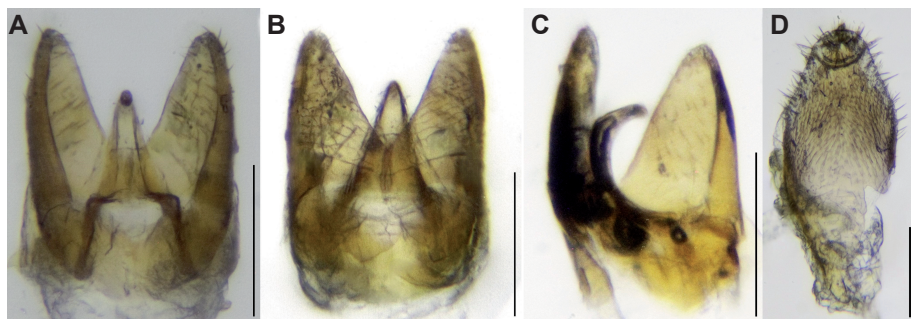


Fig. 3. *Anthrenus coloratus*, male: (A) aedeagus dorsal aspect, (B) aedeagus ventral aspect, (C) aedeagus dorsolateral aspect, (D) sternite IX. Scale bars = 100 μ m.

lobe. Stirrups do not extend beyond anterior paramere margins. Dorsal paramere margins thick and extend plate-like toward ventral margins. Tips of parameres externally carry small number of short, spike-like setae, with more, longer setae across internal paramere margins. Ventral surface of aedeagus (Fig. 3B). Median lobe forms triangle from sharp point down to broad base at anterior end. Sperm duct runs along ventral surface of median lobe, so it is unclear whether sperm duct or median lobe is triangular. Ventrolateral aspect of aedeagus (Fig. 3C) shows slim heavily hooked median lobe.

Sternite IX (Fig. 3D) SL=307 μ m, considerably longer than aedeagus. Sternite IX consists of very thin, delicate membrane. Pale membrane along lateral margin in posterior half and around posterior margin, rest of sternite IX brown. Spikey setae emerge mostly from marginal, pale membranous tissue.

Female. Females longer and broader than males (BL=2.05–2.50 mm, female BL significantly greater than male [$U=2.5$, $p<0.05$], BW/BL=0.553–0.592, females with significantly greater BW/BL than males [$U=3$, $p<0.05$]). Distribution of white scales similar to males, but females display more orange from relatively small increase in number of orange scales (Fig. 4A) to elytra mostly covered in orange and white scales with few dark scales (Fig. 4B). Ventrite colour patterning similar to males (figure 1B). Antenna (Fig. 4C) darker and shorter than in males with antennomeres 3–7 shorter, less elongate than in males (AL=133 μ m, AW=74 μ m). Terminal antennomere noticeably shorter than in males.

Fig. 5 shows the fragile terminal female abdominal plates, sternite VIII (Fig. 5A) and tergite VIII (Fig. 5B). Sternite VIII has umbrella-shaped posterior lobe (width 195 μ m, length 180 μ m). Posterior/lateral margin of posterior lobe with angular appearance consisting of six straight edges forming margin. Edge of posterior part of margin consists of pale membrane from which line of straight setae emerge (damaged and detached on one side). Otherwise, posterior lobe pale brown. Anterior stem slightly darker brown than posterior lobe indicating greater degree of sclerotization (or thicker). Darker brown of stem fades into pale brown of posterior lobe where they join.

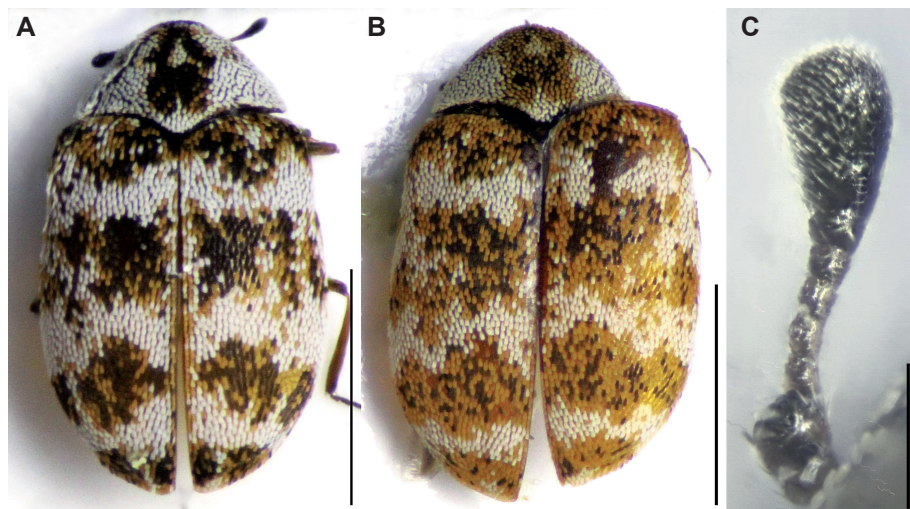


Fig. 4. *Anthrenus coloratus*, female: (A) habitus with few orange scales (scale bar = 1 mm), (B) habitus with more orange scales (scale bar = 1 mm), (C) antenna (scale bar = 100 µm).

Tergite VIII (Fig. 5B) pale brown, width 185 µm. Posterior margin evenly curved (unlike angular appearance of sternite VIII) with dense fringe of straight setae, each individual seta angled in towards centre of margin. Anterior margin of tergite VIII forming inverted ‘V’ shape.

Bursa copulatrix contains complex range of sclerites with about five short, oblong sclerites on one side (Fig. 5C) and about three longer sclerites on other side, two of them V-shaped.

Material examined: **Italy:** 2♀, Milan, 45.471°N 9.152°E, v.2019, C.W. Foster (GHEC); 6♂ 3♀, Florence, 43.784°N 11.218°E, v.2024, G. Giusti (GHEC). **Sudan:** 2♀, Khartoum, 15.554°N 32.545°E, 27.iv.1913, N.H. King (NHMUK).

Distribution: South Palaearctic, extending into the Afrotropical and Oriental regions: from the Canary Islands in the west to at least Nepal (possibly beyond) in the east, and from southern Russia in the north to Saudi Arabia and Sudan in the south (Háva 2024).

DISCUSSION

As for many Dermestidae species discovered in the 18th and 19th centuries, the descriptions of the holotypes are often too brief and sometimes inadequate. This has been noted by other workers and occasionally efforts have been made to address shortcomings (e.g. Mroczkowski 1964). The original *A. coloratus* description is not as brief as for some species and there is no suggestion that Reitter’s (1881) description is incorrect, but it falls short of being adequate given the number of Dermestidae species currently known. Despite being a well-known species, the only images of the genitalia the authors are aware of are provided by Herrmann (2025),



Fig. 5. *Anthrenus coloratus*, female: (A) sternite VIII, (B) tergite VIII, (C) sclerites inside bursa copulatrix. Scale bars = 100 μ m.

but only the aedeagus. Many publications, including several cited here, demonstrate the need for clear images of the genitalia for taxonomic purposes, even for species considered straight-forward to identify or well-known.

Dermestidae taxonomy is usually based on male genital structure, female genital structure is more rarely considered. An exception to this is the genus *Attagenus* in which females have substantial sclerites within the bursa copulatrix. Female sclerite structure has been used in *Attagenus* taxonomy (e.g. Háva *et al.* 2007; Holloway & Herrmann 2024b). Female genitalia in *Anthrenus* have been mostly ignored, but as more attention is given to the contents of the bursa copulatrix, more species are being found containing sclerites that might have taxonomic value, for example *A. olgae* Kalík, 1946 (Adams 1988), *A. muehlei* Holloway & Herrmann, 2024d), *A. sarnicus* Mroczkowski, 1963 (Holloway & Pinniger 2024), *A. oceanicus* Fauvel, 1903 (Holloway 2025a), and *A. corona* Holloway, 2021 (Pintiloaie *et al.* 2025). In addition, the terminal sternite and tergite in females are sometimes of value, but these structures are very fragile and appear even more rarely in publications than bursal sclerites (but see Holloway & Herrmann 2024a). However, the structure of female tergite VIII was instrumental in deciphering the taxonomy of the *A. maculifer* Reitter, 1881 group of species (Holloway 2025b). The images of the female structures presented here (Fig. 5) add to the growing collection of similar images from other Dermestidae.

The *A. coloratus* aedeagus is a very small structure, only 8% of BL. In *Anthrenus* s. str. species examined to date, PL ranges from 12–18% of BL (Holloway 2019, 2020, 2021; Holloway & Bakaloudis 2020; Holloway *et al.* 2020), and for *A. (Anthrenodes) sarnicus* PL is just 5% of BL (Holloway & Pinniger 2024), although *A. sarnicus* is a larger species than *A. coloratus*. It is a small sample size, but the data suggest that PL/BL might vary depending on subgenus.

Herrmann (2025) shows the dorsal surface of an *A. coloratus* aedeagus which does not illustrate the shape of the median lobe. The median lobe is heavily curved to presumably interact with the sclerites within the bursa copulatrix during copulation. The aedeagus is small and therefore could not penetrate the female very far. It is possible the female sclerites are required to grip the aedeagus and hold it in an optimum position during copulation. Such a scenario has been postulated for *A. sarnicus* (Holloway & Pinniger 2024). The median lobe in *A. sarnicus* is heavily

hooked, as it is in *A. coloratus*, and female *A. sarnicus* possess a complex series of sclerites within the bursa copulatrix, most likely to hold the aedeagus in place during copulation. If structures within the female need to be engaged to facilitate successful copulation it would provide females with complete control over whether to accept the male or not. Females could assess the structure of the aedeagus during the early stages of copulation and engage the sclerites within the bursa copulatrix to grip the aedeagus in place only if the male is accepted (Holloway & Pinniger 2024). Such a process could ensure hybrid matings rarely occur and would account for why genital variation is mostly interspecific with barely any intraspecific variation.

The males in the sample of insects studied here display little colour pattern variation, all of them resemble Fig. 1A. The females are more variable, in particular in the number of orange scales (Fig. 4). *Anthrenus coloratus* has a wide geographical range from the Canary Islands in the west to at least Nepal (possibly beyond) in the east, and from southern Russia in the north to Saudi Arabia and Sudan in the south (Háva 2024). To assess whether the colour patterns for males and females are consistent across the entire range, a larger sample size is required. However, the colour pattern variation described here is consistent with colour pattern plasticity as noted in other *Anthrenus* species (Holloway *et al.* 2022).

ACKNOWLEDGEMENTS

The authors are grateful to Max Barclay and the Coleoptera curatorial team at NHMUK for maintaining their collections and making them available for research. Anonymous reviewers are thanked for their comments on the manuscript.

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