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Anthrenus (*Anthrenus*) *muehlei*, a new species (Coleoptera: Dermestidae: Megatominae) from Iran

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Abstract. A **new species**, *Anthrenus muehlei* Holloway and Herrmann (Coleoptera: Dermestidae: Megatominae), from Iran is described. Images of internal and external features are presented. Only female specimens were found and described, but the bursa copulatrix contains obvious sclerites enabling easy differentiation from all other known species from the Palaearctic *A. pimpinellae* complex. The possible function and taxonomic implication of the sclerites is mentioned.

Key words. *Anthrenus latefasciatus*, *Anthrenus pimpinellae*, bursa copulatrix, sclerites, taxonomy, identification.

ZooBank registration. urn:lsid:zoobank.org:pub:97661C20-803E-4785-A4B0-58B16C94D9A2

Introduction

Dermestidae Latreille, 1804 are a moderately large family of Coleoptera containing over 1800 species (Háva 2023). With most species poorly known and knowledge of the taxonomy of the family in continual development, the rate of species discovery is high (Háva 2023). *Anthrenus* Geoffroy, 1762 is one of the larger genera within Dermestidae numbering in excess of 280 species and one component of this genus, the Palaearctic *Anthrenus pimpinellae* (Fabricius, 1775) complex, has been the subject of numerous publications, in particular by the first author. Most species within this complex resemble each other closely in having a broad white (or cream) sub-basal fascia on a background of black and orange scales (Holloway and Cañada Luna 2022). Prior to the mid-20th century, only about nine species had been recognized within the complex. Most *Anthrenus* carrying the white sub-basal fascia were assumed to be subspecies or variants of *A. pimpinellae*. Beal (1998) working on Nearctic *Anthrenus*, showed how important it is to dissect specimens for genital inspection to be certain of identification. Kadej et al. (2007) applied Beal's (1998) approach to the Palaearctic *A. pimpinellae* complex species and extended the number of known species to 17. Kadej and Háva (2011) added a further three species and Holloway (2019, 2020, 2021) yet another three bringing the total to 23 species. Here we report on another new species from the Palaearctic *A. pimpinellae* complex from Iran, *Anthrenus* (*Anthrenus*) *muehlei* **new species**.

Materials and Methods

Study specimens, including *A. muehlei* from Andreas Herrmann's private collection (AHEC) and *A. latefasciatus* Reitter, 1892 from AHEC and Natural History Museum, London (NHML), were macerated in a solution of 2% acetic acid for five days to allow their removal from staging 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.

Two females were dissected by detaching the abdomen and peeling back the soft tergites to facilitate inspection of the bursa copulatrix. Images of the habitus, both upper and under sides, were captured at ×20 magnification using a Canon EOS 2000D camera mounted on the BMSL microscope. Images of elements within the bursa copulatrix 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 a card. The antennae were teased out and images were taken at ×200 magnification through the SP28 microscope. All images were fed through Helicon Focus Pro version 6.8.0 focus-stacking software. All measurements were made using DsCap.Ink Software version 3.90. Measurements taken:

Body length (BL): distance from anterior margin of pronotum to the apex of the elytra.
Body width (BW): maximum distance across the elytra.
Antennal club length (AL): length of the last three antennomeres.
Antennal club width (AW): maximum width across the terminal antennomere.
Bursa copulatrix sclerite length (BCL).

The distribution map was generated using SimpleMappr (Shorthouse 2010) using data from the data labels on the specimens.

Results

Anthrenus muehlei Holloway and Herrmann, new species

(Fig. 1–3)

Type specimens. Holotype female. Iran, Bushehr (28.932496°N, 50.847889°E), 2011, H. Mühle coll. The holotype is deposited in AHEC.

Paratype. One female, Iran, Lorestan, (33.4905°N, 48.3958°E), 2011, H. Mühle coll. The paratype is deposited in NHML.

Description. Holotype *Anthrenus* (*Anthrenus*) *muehlei* (BL = 3.1 mm, BW = 2.1 mm [paratype BL = 2.85 mm, BW = 2.0 mm]) (Fig. 1A) with single, amber coloured ocellus on the vertex and an emarginated eye. *Elytral pattern*. Dominated by a sub-basal fascia composed of oval, white scales. Fascia deep, anterior edge two-tiered but flat on both tiers. White scales reach forward to scutellum and lie close to elytral suture until beyond elytral mid-point. Fascia deep along lateral margins. A narrow sub-apical white mark shaped like a forward pointing chevron on each elytron. A small apical white spot on each elytron. Scales at elytral bases mainly pale brown. Pale brown scales lie along elytral suture from about midway down to elytral apices. Brown scales curve around the apices and reach a spot of scales at elytral margins at level of the chevron shaped white marks on each elytron. A few pale brown scales between white fascia and elytral apices forming three small longitudinal streaks. *Pronotum*. Numerous loose patches of pale brown scales on pronotum interspersed with some white scales. All white and pale brown scales set in background of black scales. *Ventrites* (Fig. 1B). Covered in white scales apart from spots of black scales at lateral margins of each sternite. These black spots get progressively smaller from sternite I to sternite V. Lateral black spot on sternite I large and triangular, and separated from black spot on sternite II by a very thin broken line of white scales. Virtually no white scales along anterior edge of black spot on sternite I. Black spot on sternite I covers entire lateral margin, as does black spot on sternite II apart from a line of white at posterior end about three scales thick. *Antenna* (Fig. 1C). Eleven-segmented with well-defined 3-segmented club. Antennomere 9 asymmetrical with anterior margin shorter than posterior margin. Anterior edge of club relatively straight, posterior margin convex. Tip of terminal antennomere evenly rounded. AL = 165 μm and AW = 119 μm. Just over 50% of AL consists of terminal antennomere. Antennal club not quite cubic but expansion from 9th to 11th antennomere slight. Club consists of brown antennomeres, antennomeres 1–8 yellowish with brown tips to anterior edges of antennomeres 3–8.

Bursal sclerites. Figures 2A and 2B show bursal sclerites. Hemispherical laterally flattened sclerites (Fig. 2A) attached to ventral surface and converging towards anterior end of bursa copulatrix (Fig. 2B). Sclerites are 190 μm long. Heavily sclerotinized edges of sclerites crenulate.

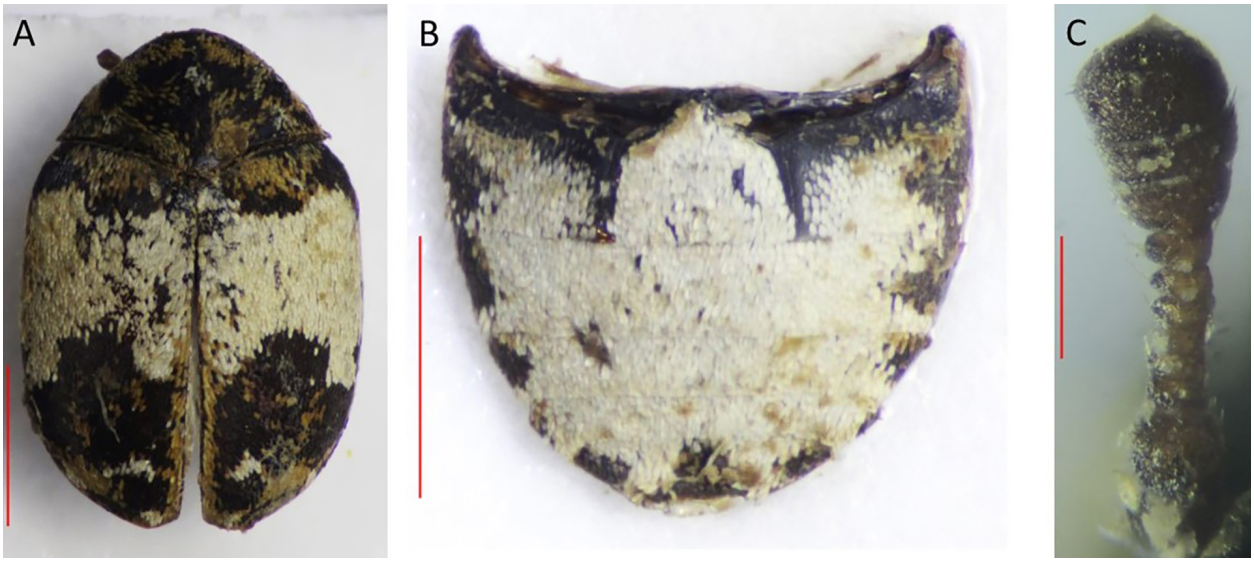

Figure 1. *Anthrenus muehlei* holotype. **A)** habitus dorsal aspect (scale bar = 1 mm). **B)** Sternites (scale bar = 1 mm). **C)** Antenna (Scale bar = 100 µm).

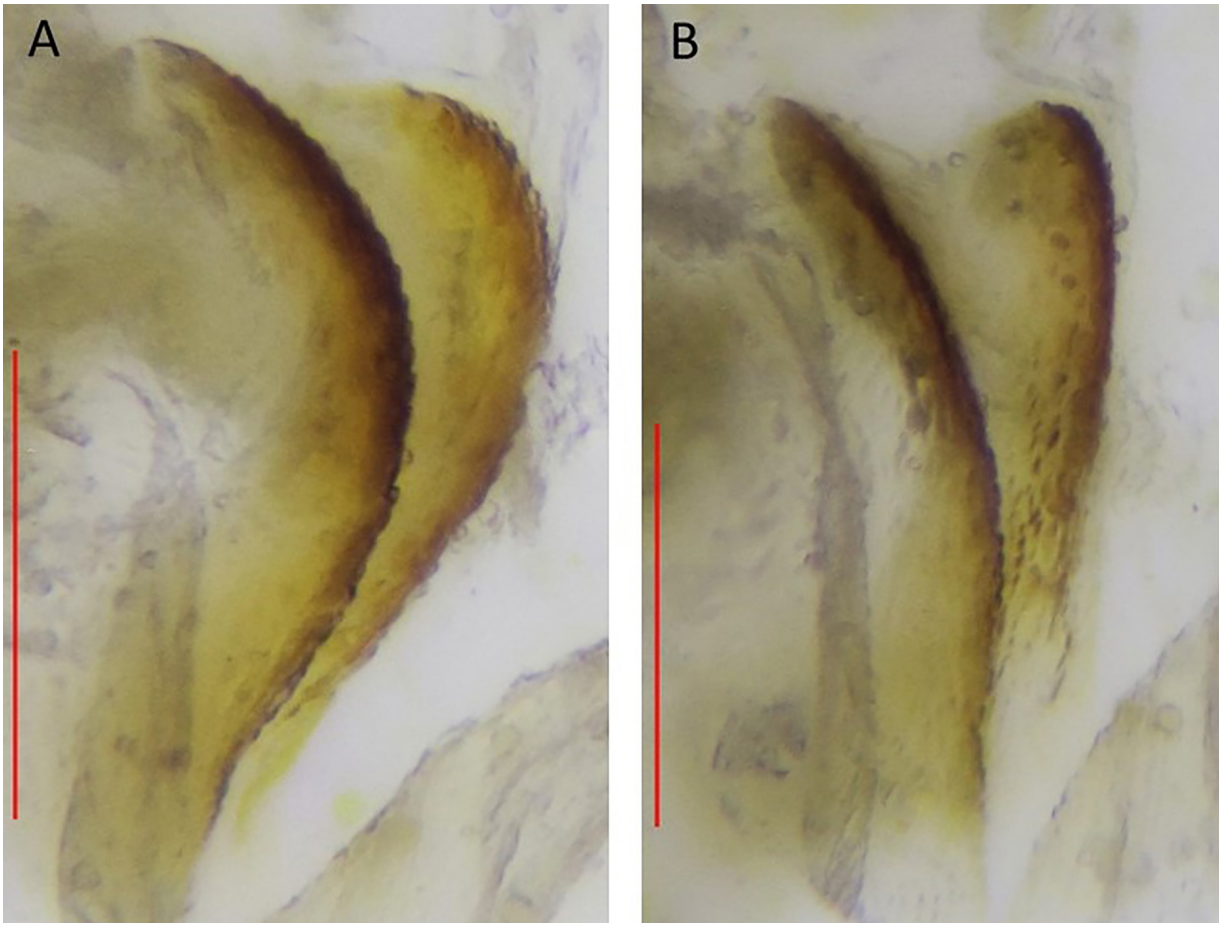

Figure 2. *Anthrenus muehlei* holotype, sclerites in bursa copulatrix. **A)** Lateral aspect. **B)** Dorsal aspect. Scale bar for both = 100 µm.

Figure 3. Locations of collection of *Anthrenus muehlei* from Iran.

Distribution. Locations of collection of holotype and paratype are shown in Fig. 3.

Etymology. *Anthrenus muehlei* is named after the German Coleopterist Hans Mühle, a specialist of Palaearctic Buprestidae, who collected the specimens.

Differential diagnosis. Both specimens of *A. muehlei* were initially identified as *A. latefasciatus*, the most likely confusion species, especially given that *A. latefasciatus* is also believed to occur in Iran (Háva 2023).

***Anthrenus latefasciatus*.** The overall coloration of the scales of *A. latefasciatus* (Fig. 4A) is similar to *A. muehlei* (Fig. 1A). The major difference on the dorsal surface is that the white fascia is narrower in *A. latefasciatus*, especially from about 1/3 away from the elytral suture up to the scutellum. The sub-apical white marks are chevron shaped but much broader than *A. muehlei*. The small apical spots are reduced to a single scale or two. The sternites (Fig. 4B) are covered in white scales, apart from the usual patches of black scales at the sternite lateral margins. The main difference between Fig. 4B and Fig. 1B is that the lateral black patches on sternite I are relatively small in *A. latefasciatus* (Fig. 4B), isolated at the anterior edge and along the lateral margin by strips of white scales. The black patches on sternites I and II are separated by a wide band of white scales. *Anthrenus latefasciatus*' antenna (Fig. 4C) has a very broad antennal club (AL = 177 µm, AW = 150 µm), much broader than *A. muehlei*, with a flatter, less convex end to the terminal antennomere than *A. muehlei*. No sclerites within the bursa copulatrix of *A. latefasciatus* could be found.

Other species. Kadej et al. (2007) described three new species from Iran: *Anthrenus hoberlandti* Kadej, Háva and Kalík, 2007; *A. similaris* Kadej, Háva and Kalík, 2007; and *A. warchalowskii* Kadej, Háva and Kalík, 2007. All three species are illustrated by Kadej et al. (2007) and none of them can be confused with *A. muehlei* as all of them have differently patterned sternites, the antennal structures differ from *A. muehlei*, and they are all smaller than *A. muehlei*.

Discussion

The addition of *A. muehlei* brings the number of known and published Palaearctic *A. pimpinellae* complex species to 24. It is very likely that more species remain undiscovered, but their discovery will be predicated on careful study associated with dissection to inspect genitalia. Basing initial descriptions of new species on genital structure

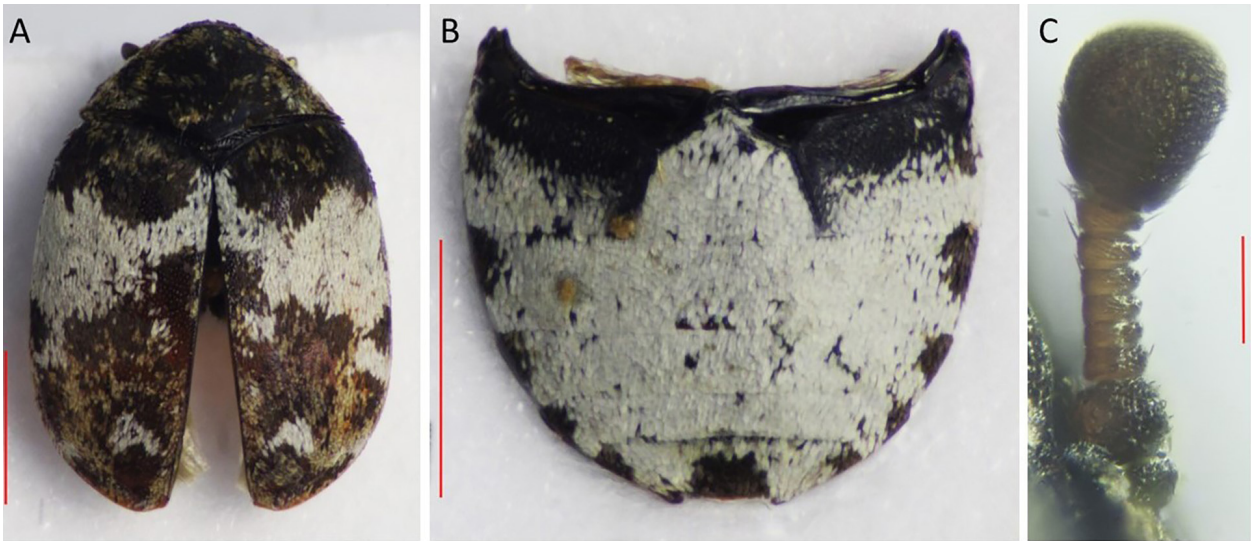

Figure 4. *Anthrenus latefasciatus*. **A)** Habitus dorsal aspect (scale bar = 1 mm). **B)** Sternites (scale bar = 1 mm). **C)** Antenna (Scale bar = 100 µm).

is vital since some species display considerable color pattern variation, such as *A. isabellinus* Küster, 1848 (Holloway et al. 2022) and *A. delicatus* Kiesenwetter, 1851 (Herrmann 2023). After distinguishing between species using genital structure, work can proceed to highlight other morphological and colour pattern features that might be used to recognize species without the need to dissect (Holloway and Cañada Luna 2022). This latter step has become even more important with the advent of web-based platforms enabling citizen scientists to upload images of Dermestidae taken under field conditions (Holloway and Cañada Luna 2022; Holloway et al. 2023, in press).

The male of *A. muehlei* is currently unknown; both the holotype and paratype are females. Naming new *A. pimpinellae* complex species from females only is generally not good practice as the bursa copulatrix usually contains no discernable sclerites that might facilitate differentiation among species. In this respect, *A. muehlei* is unique within known *A. pimpinellae* complex species in that it contains large and obvious sclerites. Having a unique and major feature within the bursa copulatrix might have implications for taxonomic classification, but this question cannot be considered in a satisfactory manner without description of the male of the species. Structure within the bursa copulatrix is thought to influence the shape of the male aedeagus (Eberhardt 1985; Hosken and Stockley 2004; Simmons 2014) and so it is possible that the *A. muehlei* aedeagus differs from the types of aedeagal structure usually noted in *A. pimpinellae* complex species. There are two sclerites within the bursa copulatrix of *A. muehlei* that converge to meet at the anterior end of the ventral side of the bursa copulatrix. This is the point that most likely receives the tip of the median lobe of the aedeagus, so the sclerites might form a target into which the median lobe fits for optimum penetration.

Remarks. The paratype was parasitized and no sclerites could be found within the bursa copulatrix. All other features aligned with the holotype.

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