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## *Anthrenus* (*Anthrenus*) *valenzuelai* (Coleoptera, Dermestidae, Megatominae): a new species from Sardinia (Italy), Tunisia, and Morocco

GRAHAM J. HOLLOWAY<sup>1</sup> & ANDREAS HERRMANN<sup>2</sup>

<sup>1</sup>Cole Museum of Zoology, Biological Sciences, HLS Building, University of Reading, Whiteknights, Reading RG6 6EX, UK

 [g.j.holloway@reading.ac.uk](mailto:g.j.holloway@reading.ac.uk);  <https://orcid.org/0000-0003-0495-0313>

<sup>2</sup>Bremervörder Strasse 123, 21682 Stade, Germany

 [herrmann@coleopterologie.de](mailto:herrmann@coleopterologie.de);  <https://orcid.org/0000-0001-5700-1125>

The number of species in the family Dermestidae Latreille, 1804 currently stands at about 1900 (Háva 2023), a number that continues to increase through the discovery of new species. *Anthrenus* Geoffroy, 1762 is a large genus within the family containing over 280 species which is split into 10 subgenera (Peacock 1993; Háva 2023), one of the largest being *Anthrenus* (*Anthrenus*) with more than 70 species. Over a third of the *A.* (*Anthrenus*) species belong to the Palearctic *A. pimpinellae* (Fabricius, 1775) complex. The species within this complex are considered difficult to differentiate since they nearly all have very similar colour patterns consisting of a white (or cream) trans-elytral band on a black (or dark brown) background with a scattering of orange or pale brown scales and a few white spots. As a result of this similarity, study of the *A. pimpinellae* complex species requires dissection to examine male genitalia and this approach has yielded many new species over the last 20 years (Kadej *et al.* 2007, Kadej and Háva 2011, Holloway 2019, 2020, 2021). Dissection continues to be the technique of choice to study the *A. pimpinellae* complex, although Holloway and Cañada Luna (2022) have translated aedeagus data into a key enabling identification of some western European complex species using colour pattern features.

Nardi and Háva (2013) produced a checklist of Dermestidae species from Italy. Included are four *A. pimpinellae* complex species: *A. angustefasciatus* Ganglbauer, 1904, *A. delicatus* Kiesenwetter, 1851, *A. munroi* Hinton, 1943, and *A. pimpinellae*. Since Nardi and Háva (2013), another species from the complex, *A. isabellinus* Küster, 1848, has also been added to the Italian species list (Holloway *et al.* 2020, 2023). In the current study, a new *A. pimpinellae* complex species, *A. valenzuelai*, from Sardinia (Italy), Tunisia, and Morocco is described and compared with potential confusion species.

The dry, carded specimens were discovered in Andreas Herrmann's (AHEC) collection. All specimens were macerated in a solution of 2% acetic acid for five days to allow 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. For males, the aedeagus was detached from the ring sclerite, and then sternite IX was detached from the ring sclerite and the aedeagus. Females were similarly dissected to confirm sex, but no further examination of female genitalia was carried out. Habitus images were captured at ×20 magnification using a Canon EOS 2000D camera mounted on the BMSL microscope. Images of aedeagi and (male) sternite IX were captured at ×200 magnification using a Canon EOS 1300D camera mounted on a Brunel monocular SP28 microscope. Aedeagi were suspended in glycerine to obtain the dorso-lateral images. After dissection, all body parts were mounted on card. Antennae were teased out and images were taken at ×200 magnification through the SP28 microscope. All images were fed through Helicon Focus Pro version 8.0 focus-stacking software. All measurements were made using DsCap.Ink software version 3.90. Measurements taken:

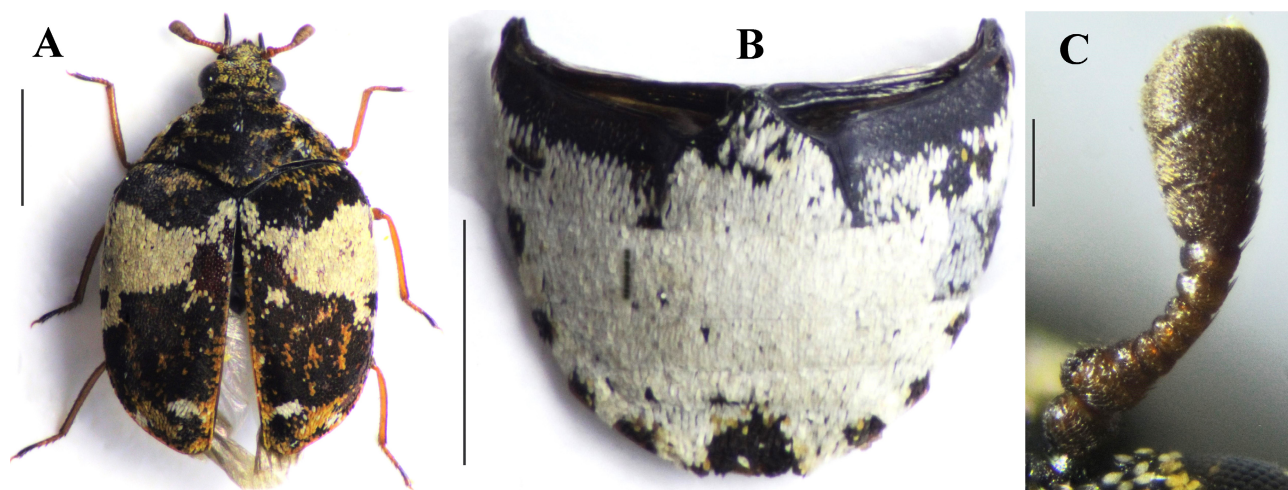
- Body length (BL): distance from anterior margin of pronotum to the apex of the elytra.
- Body width (BW): maximum distance across the elytra
- Antennal club length (AL): length of the last three antennomeres
- Antennal club width (AW): maximum width across the terminal antennomere
- Paramere length (PL): distance from the base to the apex of the parameres
- Sternite IX length (SL): distance from the tip of one anterior horn to the tip of the posterior lobe

The data for the distribution map (Shorthouse 2010) were derived from data associated with the study specimens. NHML = Natural History Museum, London. AHEC = Andreas Herrmann's entomological collection. GHEC = Graham Holloway entomological collection.

***Anthrenus (Anthrenus) valenzuelai* sp. nov. (Figures 1–3)**

*Specimen examined.* Holotype: *Anthrenus (Anthrenus) valenzuelai* sp. nov. Italy, Sardinia, Siniscola, Graniro Beach (40.5868N 9.7522E), 11<sup>th</sup> May 2022, A. Link leg., holotype male, one paratype (female) (AHEC). One paratype (male), Bonachir, Zaghuam, Tunisia, 8<sup>th</sup> May 2012, W. Ziegler leg. (NHML). One paratype (male), S. Beni-Mellal, Afourer, Morocco (32.21079, -6.541244), 27<sup>th</sup> May 1972, E. Konzelmann leg. (GHEC). One paratype (female), Gafsa env., Tunisia centr. (34.431843, 8.780872), 5<sup>th</sup> April 2001, M. Snížek leg. (GHEC). One paratype (male) Azrou, Morocco [from flowers] (33.426164N -5.196789) 14<sup>th</sup> May 2023, E. Valenzuela leg (AHEC).

*External characteristics.* Holotype (Fig. 1A, BL = 3.1 mm, BW = 2.2 mm) has small, amber coloured ocellus on centre of head just below level of top of eyes. Lower half of inner margin of each eye emarginated. Integument on head, thorax and basal part of elytra very dark brown, becoming reddish on elytra away from dark base towards apices. Dorsal surface covered in very dark brown, pale orangey brown, cream, and white scales. Cream scales largely restricted to and forming a pale trans-elytral sub-basal fascia broadest at outer margins, becoming progressively narrower towards elytral suture until about  $\frac{3}{4}$  across each elytron where the fascia sweeps up to meet small, dark, triangular scutellar shield. Each elytron has two spots of white scales, one sub-apical and close to elytral suture, the other at the same level on outer margin. Pale brown scales lie along elytral suture, around apex, and up outer margin towards pale fascia. An oblong spot of pale brown scales lies between the two spots of white scales described above. On elytral disc below pale fascia, a small number of pale brown scales line up to form three weakly defined longitudinal lines. Pronotum covered in dark brown scales with pale brown and intermixed white scales toward lateral margins. The pale brown and white scales join up across the pronotum forming four narrow bands, one along anterior margin, another at about  $\frac{1}{4}$  along pronotum, a third just past halfway, and a fourth along the posterior margin. Head covered mostly in pale brown and admixed white scales with two small patches of dark brown scales above attachment points of each antenna. Legs are pale reddish brown. The hind femora are covered in dark brown, pale brown and white scales on anterior face. Fewer scales on mid femora, and barely any on front femora. Tibiae and tarsi devoid of scales. Ventrites (Fig. 1B) covered in white scales. The outer margins of ventrites 2–5 carry elongated spots of black scales, more or less equally sized on each sternite. The whole ventrite margin is covered by these black scales apart from a narrow patch of white scales on the posterior end of each margin. Ventrite 5 also has a single semi-circular black apical spot. Ventrite 1 has sub-marginal spots of black scales. The 11-segmented antennae (Fig. 1C, AL = 242  $\mu$ m, AW = 140  $\mu$ m) is the same pale reddish brown as legs. The three segmented antennal club is narrow, gradually expanding to an asymmetric terminal segment.

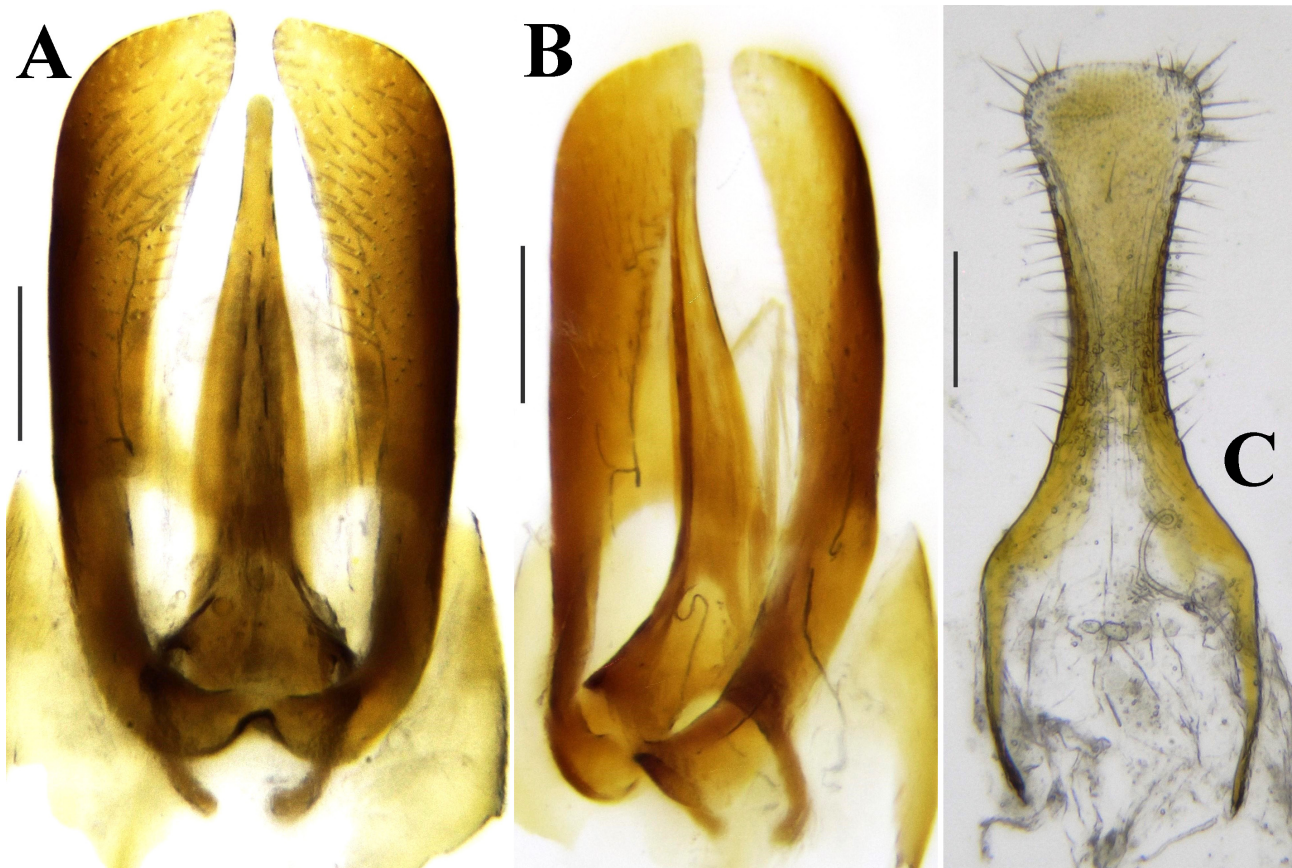


**FIGURE 1.** Holotype *Anthrenus valenzuelai* sp. nov., A: habitus dorsal aspect (scale bar = 1 mm), B: ventrites (scale bar = 1 mm), C: antenna (scale bar = 100  $\mu$ m).

*Internal characteristics.* Aedeagus (Fig. 2A) has broad, paddle-shaped parameres (PL = 484  $\mu$ m), with more or less parallel outer margins giving the aedeagus a rectangular appearance. Surface of each paramere covered in thick hairs, all pointing backwards towards blunt, squared off tips. Outer edges of parameres dark brown and disc and tip of each paramere paler probably reflecting the width of the material forming parameres (pale = thin). Median lobe (ML = 466  $\mu$ m) base is broad, margins bowing out slightly before converging towards finger shaped, rounded tip. A dorso-lateral aspect of aedeagus (Fig. 2B) shows median lobe is highly sinuate, bowed towards ventral, tip slightly turned down ventrally. Two hooked stirrups emerge from base of median lobe and point antero-ventrally. Sternite IX (Fig. 2C) has broad, flat-topped

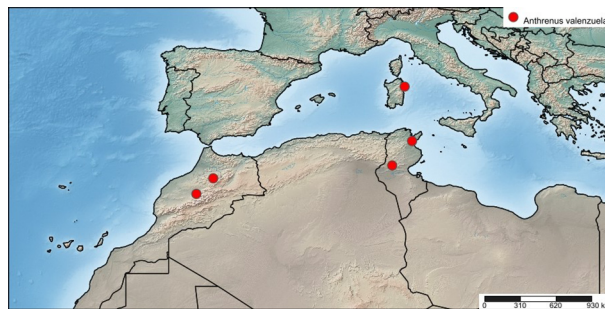


posterior lobe, margins converging below the posterior lobe to form well-defined neck. From neck, margins diverge towards two anterior pointing horns.



**FIGURE 2.** Holotype *Anthrenus valenzuelai* sp. nov., A: aedeagus dorsal aspect, B: aedeagus dorsolateral aspect, C: sternite IX. Scale bars = 100 µm.

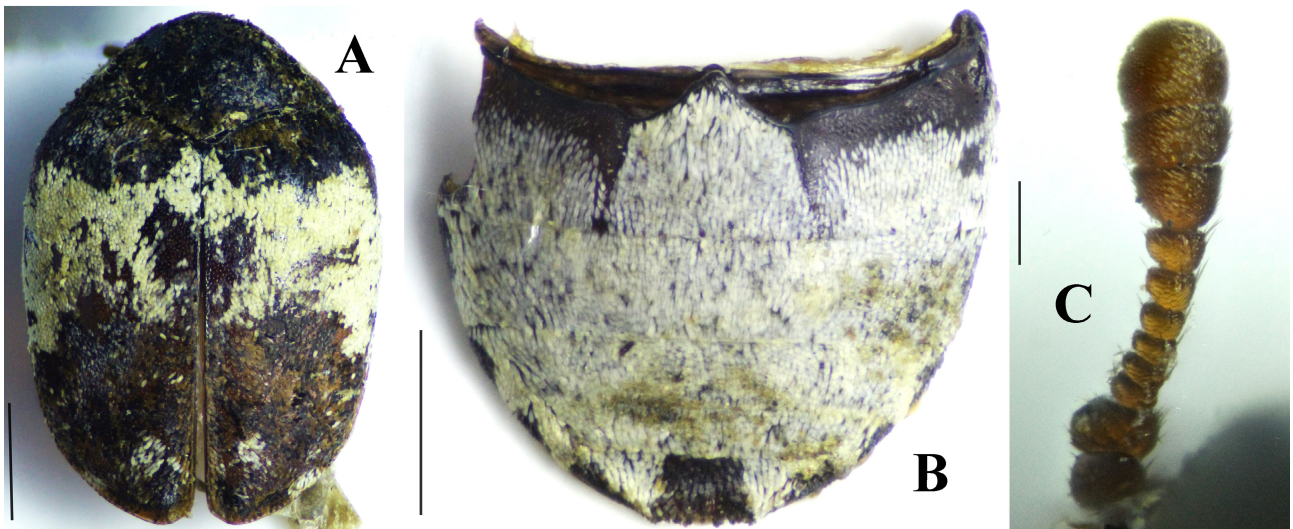
*Distribution.* Fig. 3 shows the collection locations of *A. valenzuelai* reported here. Current evidence indicates that *A. valenzuelai* is distributed at least across northwestern Africa and Sardinia, Italy.



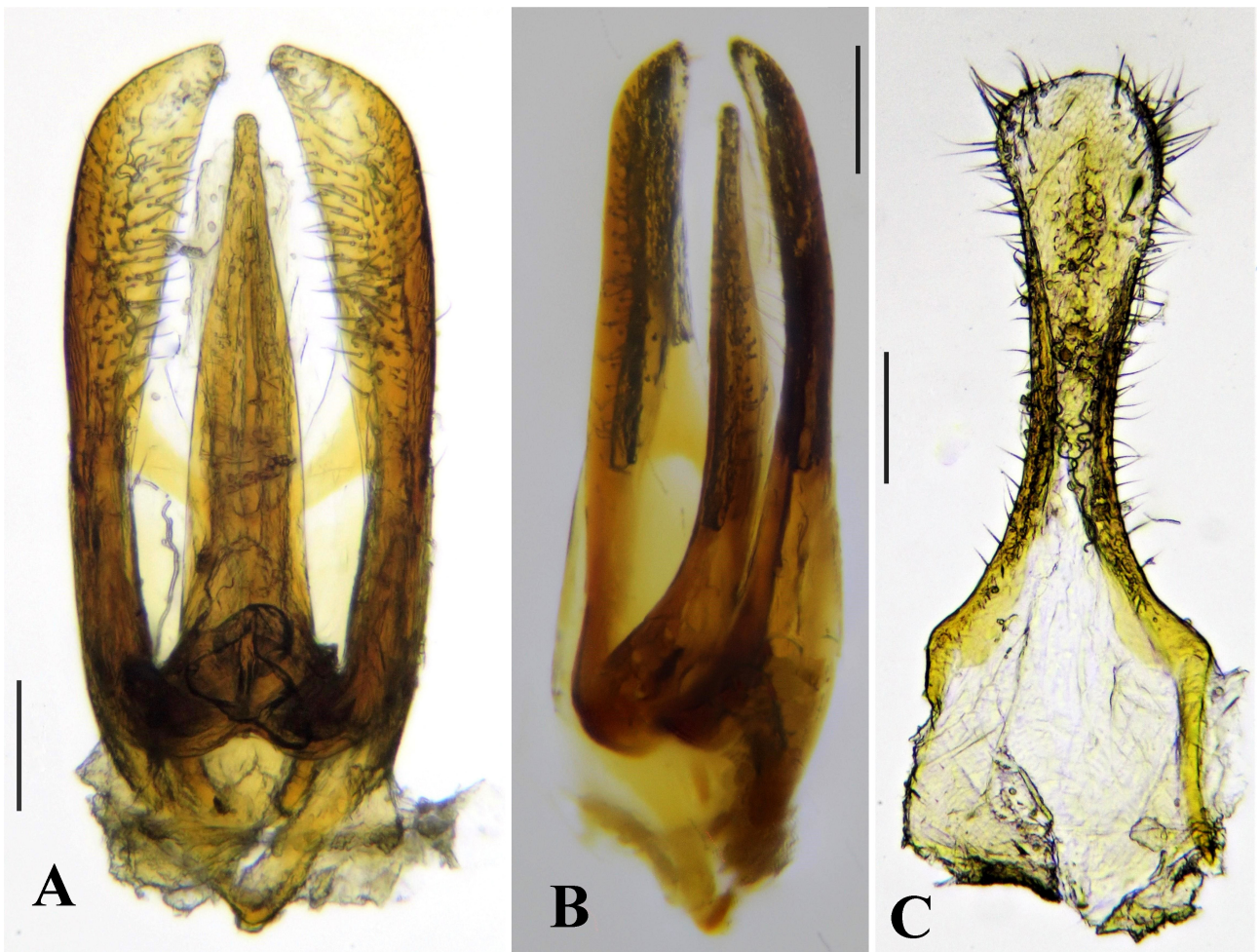
**FIGURE 3.** Distribution of records of *Anthrenus valenzuelai* sp. nov.

*Differential diagnosis.* Only three other *A. pimpinellae* complex species have been claimed from Italy and Tunisia and Morocco, namely *A. angustefasciatus*, *A. goliath* Saulcy in Mulsant & Rey, 1868, and *A. isabellinus*. *Anthrenus angustefasciatus* can be easily differentiated from *A. valenzuelai* courtesy of its dorsal colour pattern (Holloway and Cañada Luna 2022). *Anthrenus goliath* (Fig. 4A) is larger (BL > 3.9 mm Holloway and Herrmann 2023), the pale scales are a dull brown, and the fascia is ‘squarer’, i.e., it does not become narrower towards the elytral suture. *Anthrenus goliath* ventrites (Fig. 4B) are similarly covered in white scales but the marginal spots of black scales might be narrower than *A. valenzuelai*. *Anthrenus goliath* antennae (Fig. 4C) are very similar to *A. valenzuelai*. *Anthrenus goliath* aedeagus (Fig. 5A) is slimmer, the outer margins are more bowed, and the parameres are narrower and more sharply pointed. In dorso-lateral view (Fig. 5B), *A. goliath* median lobe is less sinuous than *A. valenzuelai*. It is not possible to tell whether *A. goliath*



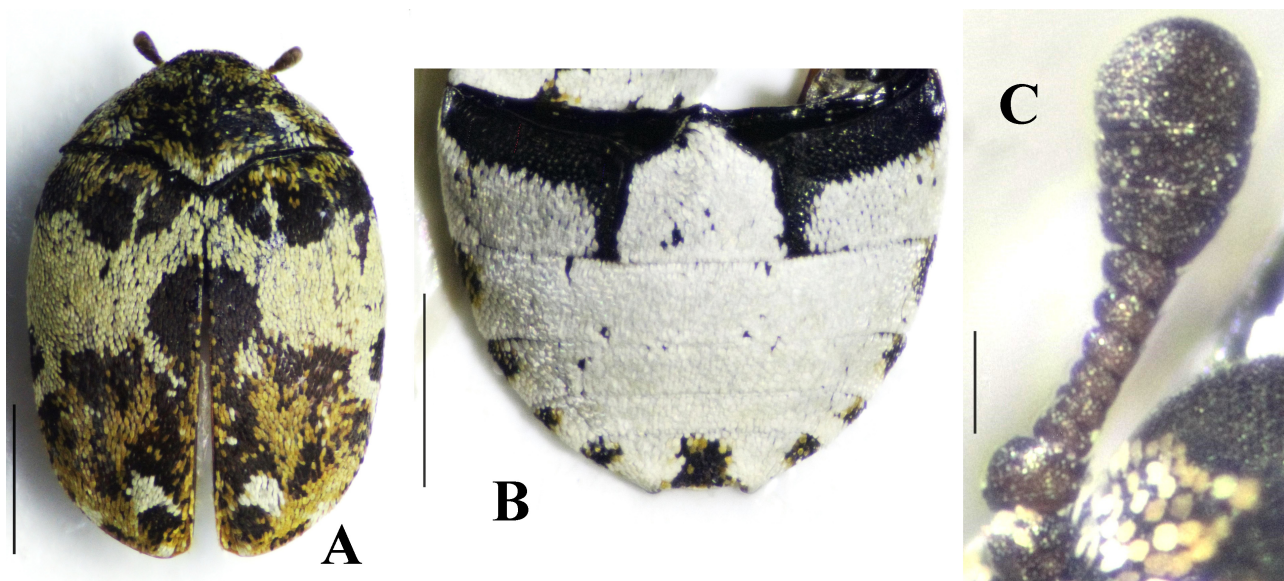


**FIGURE 4.** *Anthrenus goliath*, A: habitus dorsal aspect (scale bar = 1 mm), B: ventrites (scale bar = 1 mm), C: antenna (scale bar = 100  $\mu$ m).



**FIGURE 5.** *Anthrenus goliath*, A: aedeagus dorsal aspect, B: aedeagus dorsolateral aspect, C: sternite IX. Scale bars = 100  $\mu$ m.





**FIGURE 6.** *Anthrenus isabellinus*, A: habitus dorsal aspect (scale bar = 1 mm), B: ventrites (scale bar = 1 mm), C: antenna (scale bar = 100  $\mu$ m).



**FIGURE 7.** *Anthrenus isabellinus*, A: aedeagus dorsal aspect, B: aedeagus dorsolateral aspect, C: sternite IX. Scale bars = 100  $\mu$ m.

sternite IX (Fig. 5C) differs from *A. valenzuelai* given the information available. *Anthrenus isabellinus* (Fig. 6A) is about the same size as *A. valenzuelai* (Holloway *et al.* 2020) but it has a broader fascia just before the point where the fascia turns up towards the scutellum, and more orange/pale brown scales, especially posterior to the fascia. *Anthrenus isabellinus* ventrites (Fig. 6B) are covered in white scales but have very small to no spots of black submarginal scales on ventrite 1 and might have a smaller terminal black spot on ventrite 5. *Anthrenus isabellinus* antennae (Fig. 6C) have a broader, darker antennal club than *A. valenzuelai*. *Anthrenus isabellinus* aedeagus (Fig. 7A) is slimmer, narrower in the basal half, and overall, with a less ‘square’ appearance than *A. valenzuelai*. *Anthrenus isabellinus* parameres are long, slimmer, and with a more rounded tip than *A. valenzuelai*. *Anthrenus isabellinus* median lobe is long and slim with a very narrow tapering tip; in dorso-lateral view (Fig. 7B) *A. isabellinus* median lobe is evenly curved dorsally lacking the sinuosity of *A. valenzuelai*. *Anthrenus isabellinus* sternite IX (Fig. 7C) differs from *A. valenzuelai* by having a concave rather than a convex end to the posterior lobe, and obvious flaps on the inner margins of the anterior horns.

This study reinforces the importance of dissection to identify members of the *A. pimpinellae* complex with certainty. Accurate identification is essential to establish true distributions (Holloway *et al.* 2021; 2023). In the current study, *A. valenzuelai* was discovered from Sardinia (Italy), Tunisia, and Morocco. and extends the list of species of *A. pimpinellae* complex known with certainty from Tunisia and Morocco to three: *A. angustefasciatus*, *A. isabellinus*, and *A. valenzuelai* (current study); *A. goliath* is only known with certainty from Egypt (Holloway and Herrmann, 2023). *Anthrenus valenzuelai* is added to the checklist of Dermestidae species from Italy (Nardi and Háva 2013) along with *A. isabellinus* following taxonomic revision (Holloway *et al.* 2020; 2023).

Etymology. *Anthrenus valenzuelai* is named after Enrique Valenzuela who collected one of the paratype specimens.

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