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A review of the Palaearctic *Anthrenus pimpinellae* (Fabricius, 1775) complex species in Spain (Coleoptera, Dermestidae, Megatominae)

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Abstract: This review examines the *Anthrenus pimpinellae* (Fabricius, 1775) complex species (Coleoptera, Dermestidae, Megatominae) in Spain, from where seven species and one subspecies of this complex are currently listed. Further taxonomic research on this group leads to the removal of three species and one subspecies from the Spanish list, a modification of the taxonomy for one species, and the addition of one new species. As a result, there is strong evidence for the presence of five *A. pimpinellae* complex species in Spain. Additionally, the evidence supporting *A. valenzuelai* Holloway & Herrmann, 2024 is analysed, along with methods to distinguish it from *A. isabellinus* Küster, 1848.

Key words: Coleoptera, Dermestidae, *Anthrenus pimpinellae* complex, checklist, distribution, genitalia, dissection, aedeagus, Mallorca, Spain.

Resumen: Revisión de las especies paleárticas del complejo de *Anthrenus pimpinellae* (Fabricius, 1775) (Coleoptera, Dermestidae, Megatominae) en España. En esta revisión se examinan las especies paleárticas del complejo de *Anthrenus pimpinellae* (Fabricius, 1775) (Coleoptera, Dermestidae, Megatominae) en España, de donde se conocen siete especies y una subespecie. Nuevos estudios sobre la taxonomía de este grupo conducen a la eliminación de tres especies y una subespecie de la lista española, una modificación de la taxonomía para una especie y la adición de una nueva especie. Como resultado, existe una fuerte evidencia de la presencia de cinco especies del complejo *A. pimpinellae* en España. Además, se analiza la evidencia que apoya a *A. valenzuelai* Holloway & Herrmann, 2024, junto con los métodos para distinguirla de *A. isabellinus* Küster, 1848.

Palabras clave: Coleoptera, Dermestidae, complejo de *Anthrenus pimpinellae*, lista de especies, distribución, genitalia, disección, edeago, Mallorca, España.

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Introduction

The Dermestidae are not a well-studied family of Coleoptera so that there remains a great deal to be discovered. One of the largest genera within the family is *Anthrenus* Geoffroy, 1762 with nearly 300 species (HÁVA, 2024a) and sitting within *Anthrenus* is the Palaearctic *A. (s. str.) pimpinellae* (Fabricius, 1775) complex (HÁVA, 2024a). HOLLOWAY *et al.* (2019a) identified seven species from this complex in Spain according to published material. However, recent studies question the accuracy of this number. The current study critically reviews the evidence to determine which *A. pimpinellae* complex species should remain on the list and which should be excluded.

HÁVA (2024b) claims *Anthrenus valenzuelai* Holloway & Herrmann, 2024 from Spain whilst noting the difficulty in distinguishing it from *Anthrenus isabellinus* Küster, 1848. This claim is examined, and images are provided to assist researchers differentiate between *A. valenzuelai* and *A. isabellinus*. The current study also considers the reliability of *A. pimpinellae* complex species records in faunistics publications.

Materials and methods

Specimens of *Anthrenus pimpinellae* complex species collected from Spain presented here were either found on Mallorca (*A. amandae* Holloway, 2019, *A. angustefasciatus* Ganglbauer, 1904, *A. isabellinus* and *A. munroi* Hinton, 1943) or held in the Dermestidae collection at the Natural History Museum, London, (NHML) (*A. chikatunovi* Holloway, 2020). Species not found in Spain (*A. delicatus* Kiesenwetter, 1851, *A. goliath* Saulcy in Mulsant & Rey, 1867, and *A. pimpinellae*) are held in the NHML Dermestidae collection. The identification features of all these species are reported in references included in the Results section.

Results

Species to be retained on the Spanish list

There is strong evidence for five *Anthrenus pimpinellae* complex species occurring in Spain. These species are shown collectively in Fig. 1.

- *Anthrenus amandae* (Fig. 1a) has only been noted from Mallorca (HOLLOWAY, 2019; HOLLOWAY & BAKALOUDIS, 2020) and could be a species endemic to the Balearics (HOLLOWAY et al., 2024).
- *Anthrenus angustefasciatus* (Fig. 1b) is a common species distributed throughout western Europe (HOLLOWAY & HERRMANN, in press), including Spain (HOLLOWAY et al., 2024).
- *Anthrenus chikatunovi* (Fig. 1c) is described from the French Pyrenees (HOLLOWAY, 2020). In addition, there are a few online records from Girona (Spain) that are likely to be *A. chikatunovi* (INATURALIST, 2024). The aedeagus of *A. chikatunovi* is distinctive (HOLLOWAY, 2020) and easy to differentiate from other *A. pimpinellae* complex species in Spain. It is even possible to identify them using habitus colour pattern (HOLLOWAY & CAÑADA LUNA, 2022). Given this, it is not clear why the species is synonymized with *A. isabellinus* in the World Catalogue (HÁVA, 2024a). *A. chikatunovi* and *A. isabellinus* differ substantially across many internal and external characteristics.
- *Anthrenus isabellinus* (Fig. 1d) is recorded as *A. dorsatus* Mulsant & Rey, 1868 by HOLLOWAY et al. (2019b). HOLLOWAY et al. (2020) established that *A. dorsatus* is a synonym of *A. isabellinus*, that is distributed around the entire Mediterranean (HOLLOWAY et al., 2023).
- *Anthrenus munroi* (Fig. 1e) has a wide distribution around the Mediterranean and into some eastern European countries (HÁVA, 2024a). HOLLOWAY & CAÑADA LUNA (2022) have described this species in detail from Spain.

Species to be removed from the Spanish list

Three *Anthrenus pimpinellae* complex species and one subspecies listed for Spain should be removed. These species (apart from the subspecies) are shown collectively in Fig. 2.

- *Anthrenus delicatus* (Fig. 2a) is quite easy to distinguish from other *A. pimpinellae* complex species occurring in western Europe on the basis of colour pattern (HOLLOWAY & CAÑADA LUNA, 2022) coupled with antennal structure. The distribution of this species is concentrated around eastern Mediterranean (INATURALIST, 2024) reaching as far west as Sardinia. All specimens labelled as *A. delicatus* and coming from Spain in NHML and Andreas Herrmann's private entomological collection (AHEC) have turned out to be *A. angustefasciatus* or *A. isabellinus* (GJH pers. obs.). Contrary to the list provided by HOLLOWAY et al. (2019a), there is no evidence that *A. delicatus* occurs in Spain.

- *Anthrenus goliath* (Fig. 2b) seems to be commonly misidentified. This species is currently only known with certainty from Egypt (HOLLOWAY & HERRMANN, 2023). HÁVA (2015) lists it as occurring across much of eastern and southern Europe, although the current World Catalogue (HÁVA, 2024a) suggests a more restricted distribution across north Africa, perhaps including Syria. However, prior to HOLLOWAY & HERRMANN (2023) no images of definitive *A. goliath* had ever been published so claims concerning distribution cannot be verified by the wider community. KADEJ *et al.* (2007) provided a habitus image claiming it to be *A. goliath*, but produced different images of aedeagi argued as belonging to *A. goliath*, so it was not certain which species each KADEJ *et al.* (2007) aedeagus image related to. Unfortunately, the original holotype of *A. goliath* had been lost prior to the move of Mulsant's collection to Muséum National d'Histoire Naturelle, Paris, France (HOLLOWAY & HERRMANN, 2023). Consequently HOLLOWAY & HERRMANN (2023) gathered all information available to raise a neotype which has been deposited in NHML.
- Regarding *Anthrenus pimpinellae pimpinellae* (Fig. 2c) and *A. p. isabellinus*, HOLLOWAY *et al.* (2020) established that *A. dorsatus* and *A. pimpinellae isabellinus* were both synonyms of the same species, *A. isabellinus*. Having confirmed the taxonomy, HOLLOWAY *et al.* (2021, 2023) demonstrated that *A. pimpinellae* has a distribution restricted to northwestern Europe across to eastern Europe and down into southeastern Europe but does not include the Iberian Peninsula. It is understandable how *A. pimpinellae* is on the Spanish list given that it was not until 2020 that *A. p. isabellinus* was synonymized. *Anthrenus p. isabellinus* were simply paler examples of *A. isabellinus* (HOLLOWAY *et al.*, 2022).

Anthrenus valenzuelai Holloway & Herrmann, 2024 (Fig. 3)

HÁVA (2024b) claimed *A. valenzuelai* from Spain and in doing so raised a number of points that require attention. Fig. 3 shows images of five *A. valenzuelai*, two males and three females. HÁVA (2024b) commented that *A. valenzuelai* can be very difficult to distinguish from *A. isabellinus*, raising variation in the colour of the apical spots on the elytra as an issue. No variation in the colour of the apical spots has been recorded although there is variation in the size of the sub-apical spots (see Fig. 4) which can be tiny. The size and shape (or colour) of the (sub) apical spots is not useful as far as known in the identification of any of the Palaearctic *A. pimpinellae* complex species, except perhaps *A. munroi* (HOLLOWAY & CAÑADA LUNA, 2022).

Fig. 5 shows images of five *A. isabellinus* from Spain and Fig. 4 shows how to measure the relative width of the white fascia. HOLLOWAY & CAÑADA LUNA (2022) argued that distance A is always less than (or sometimes equal to) distance B in *A. isabellinus*. In all other Spanish species distance A is greater than distance B. In *A. valenzuelai* this is not a good character as in some cases distance A exceeds distance B and sometimes the other way round (Fig. 5). In most cases, the author agrees with HÁVA (2024b) that *A. valenzuelai* and *A. isabellinus* are not easy to separate with the exception of entirely (or mostly) white *A. isabellinus*.

A more reliable way of separating *A. isabellinus* and *A. valenzuelai* (or to confirm a suspected *A. valenzuelai*) is to examine antennal structure (Figs. 3 and 5). In *A. valenzuelai* the antennal club is a narrow cone shape, straight along the ventral margin and only very slightly curved along the dorsal margin (Fig. 3). Male antennae are longer and slimmer than female antennae (a point not noted by HOLLOWAY & HERRMANN, 2024, who focused on males). In both sexes the terminal antennomere is asymmetric (Fig. 3). The antennal clubs of *A. isabellinus* are considerably broader, straight along the ventral margin but much more curved along the dorsal margin. The terminal antennomere is symmetrical (Fig. 5).

HÁVA (2024b) agrees with HOLLOWAY & HERRMANN (2024) that males can be identified courtesy of genital structure, but he goes on to say that females are 'more or less indeterminable'. Given the record of *A. valenzuelai* claimed from Zaragoza, Spain is of a female (HÁVA, 2024b), it does not constitute convincing evidence to add *A. valenzuelai* to the Spanish list at present. It is not

inconceivable that *A. valenzuelai* could occur in Spain (at least southern Spain) since it has been found in Morocco.

Discussion

Extensive new research into the *A. pimpinellae* complex has significantly enhanced species identification and our understanding of their distributions. In the current study, three of the originally listed seven species have been removed from the Spanish checklist, the taxonomy of one species has been revised, and one species recently new to science has been added, resulting in a total of five confirmed species. While this is not claimed to be a definitive list, the evidence supporting the presence of these five species in Spain is robust.

HOLLOWAY *et al.* (2019a) compiled a Spanish checklist of Dermestidae based on published literature that was then considered valid evidence, primarily in the form of faunistic studies. However, much of the data from these studies is unreliable, especially when only species names are provided without supporting evidence, relying only on the reader's trust in the correctness of the identification. The Palaearctic *A. pimpinellae* complex is particularly problematic due to the historically challenging differentiation of its species, with significant taxonomic, identification, ecological, and distributional research being conducted only recently.

It is possible that unreliable faunistics data is restricted just to this complex of species within the Dermestidae. Nevertheless, this raises concerns about the reliability of the Spanish checklist. It suggests the need for a careful review, focusing on species for which strong evidence is available, thereby allowing for independent verification of species authenticity.

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Fig. 1.- Palaearctic *A. pimpinellae* complex species definitively collected from Spain. All scales bars = 1 mm.

1a.- *Anthrenus amandae*.

1b.- *Anthrenus angustefasciatus*.

1c.- *Anthrenus chikatunovi*.

1d.- *Anthrenus isabellinus*.

1e - *Anthrenus munroi*.



Fig. 2.- Palaearctic *A. pimpinellae* complex species not found in Spain. All scale bars = 1 mm.

2a.- *Anthrenus delicatus*.

2b.- *Anthrenus goliath*.

2c.- *Anthrenus pimpinellae*.

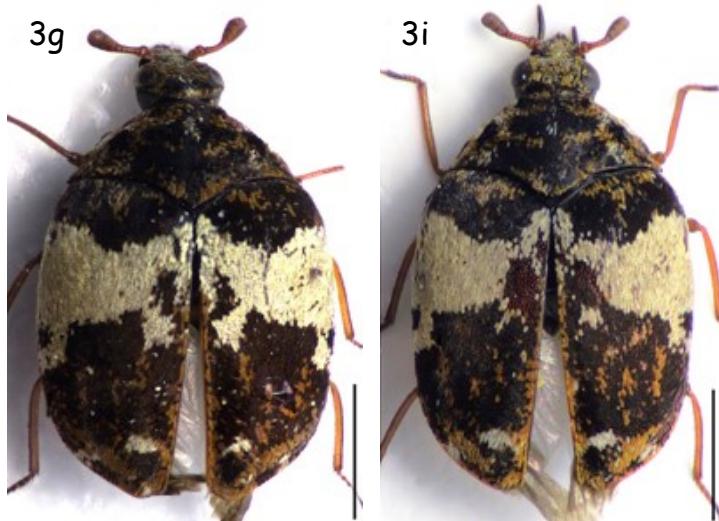


Fig. 3.- Habiti and antennae of *Anthrenus valenzuelai*. All habiti scale bars = 1 mm; all antennae scale bars = 100 μ m.

3a-b. - Female (Tunisia).

3c-d.- Female (Tunisia).

3e-f.- Female (Italy, Sardinia).

3g-h. - Male (Morocco).

3i-j.- Male (Italy, Sardinia).

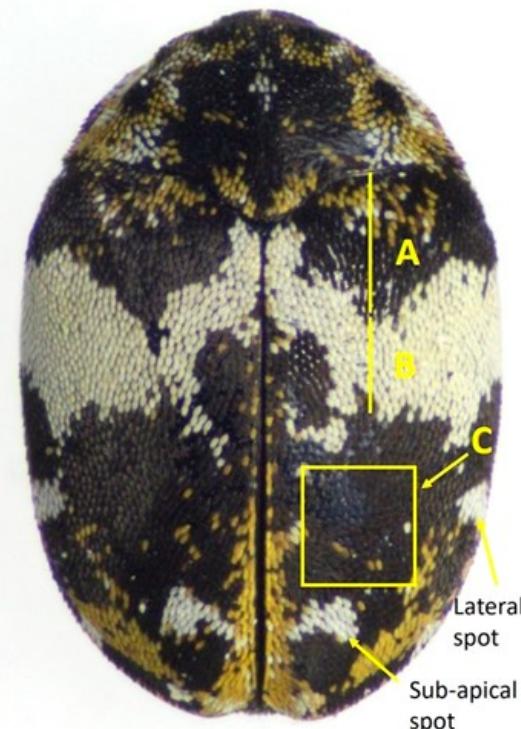


Fig. 4.- Linear elytral features used to measure relative width of white elytral fascia (image first appeared in HOLLOWAY & CAÑADA LUNA, 2022). Neither area C nor the lateral spot are relevant for the current study.

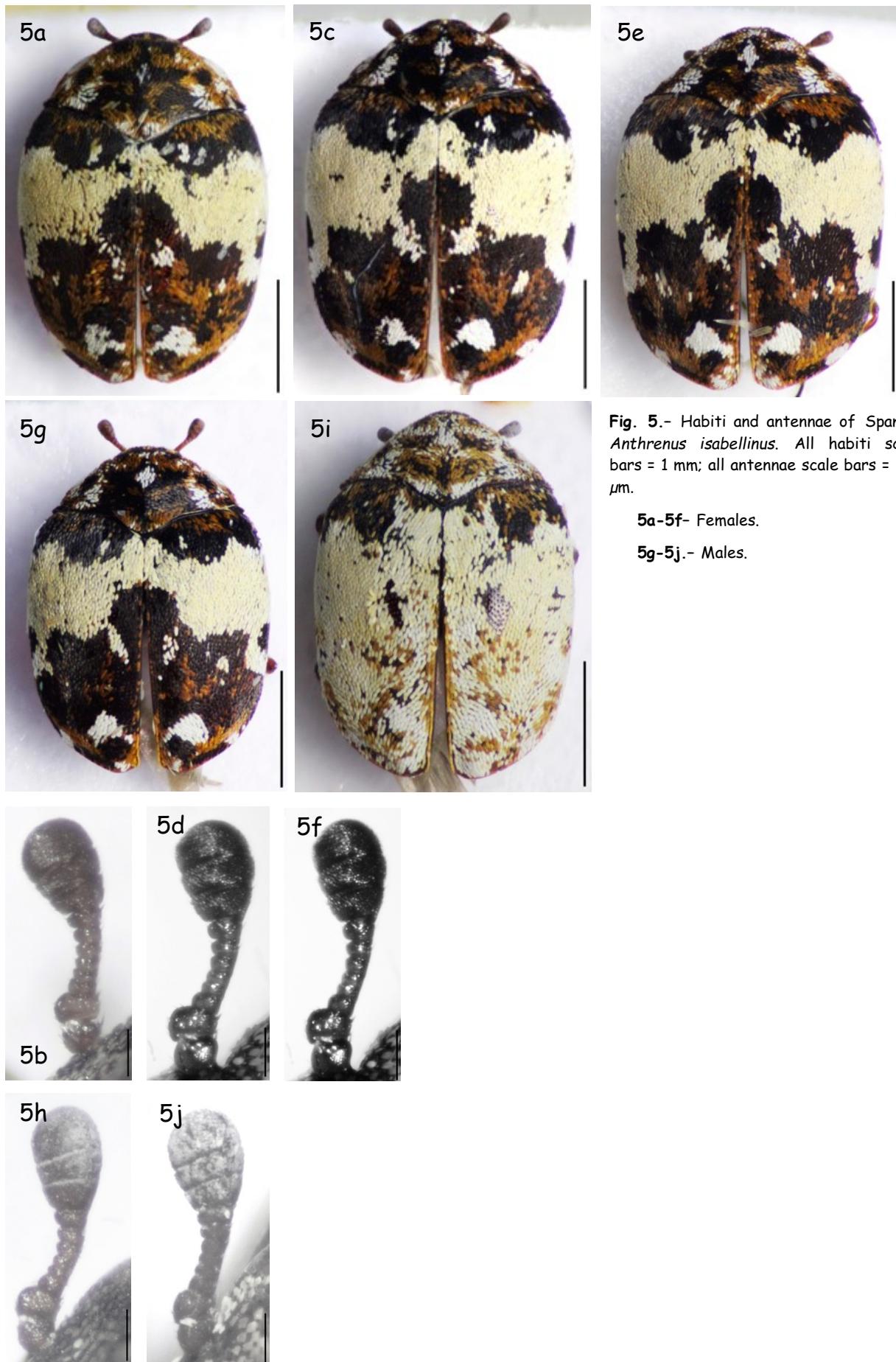


Fig. 5.- Habiti and antennae of Spanish *Anthrenus isabellinus*. All habiti scale bars = 1 mm; all antennae scale bars = 100 μ m.

5a-5f.- Females.

5g-5j.- Males.