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Redescriptions of the European *Anthrenus* Geoffroy, 1762 belonging to the subgenus *Helocerus* Mulsant & Rey, 1868 (Coleoptera, Dermestidae, Megatominae)

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Abstract: So far three *Anthrenus* Geoffroy, 1762 species belonging to the subgenus *Helocerus* Mulsant & Rey, 1868 are known from Europe: *Anthrenus (H.) fuscus* Olivier, 1789, *Anthrenus (H.) minutus* Erichson, 1845, and *Anthrenus (H.) polonicus* Mroczkowski, 1951 (Coleoptera, Dermestidae, Megatominae). Only *A. (H.) polonicus* has been adequately described in the literature. In the current study, all three species are redescribed with genitalia and external characters imaged. Differences among the species at the genital level confirm species validity. Among species habitus patterning was described to facilitate field-based identification.
Key words: Coleoptera, Dermestidae, Megatominae, Anthrenini, *Anthrenus*, *Helocerus*, dissection, identification, aedeagus, sternite IX.

Resumen: Redescripciones de los *Anthrenus* Geoffroy, 1762 europeos pertenecientes al subgénero *Helocerus* Mulsant & Rey, 1868 (Coleoptera, Dermestidae, Megatominae). Hasta el momento se conocen de Europa tres especies de *Anthrenus* Geoffroy, 1762 pertenecientes al subgénero *Helocerus* Mulsant & Rey, 1868: *Anthrenus (H.) fuscus* Olivier, 1789, *Anthrenus (H.) minutus* Erichson, 1845 y *Anthrenus (H.) polonicus* Mroczkowski, 1951 (Coleoptera, Dermestidae, Megatominae). Sólo *A. (H.) polonicus* ha sido descrito adecuadamente en la literatura. En el estudio actual, se redescriben las tres especies, aportándose imágenes de genitalia y caracteres externos. Las diferencias entre las especies a nivel genital confirman la validez de las especies. Se describe el patrón de habitus de las especies para facilitar la identificación en el campo.
Palabras clave: Coleoptera, Dermestidae, Megatominae, Anthrenini, *Anthrenus*, *Helocerus*, disección, identificación, edeago, esternito IX.

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Introduction

The Dermestidae is a medium sized family of Coleoptera numbering just over 1900 species (Háva, 2024). The number of species found continues to grow with an increased number of evidence-based studies indicating new species and synonymies more accurate distributions, and highlighting aspects of ecology. Evidence-based studies in conjunction with excellent citizen science platforms, such as iNaturalist, facilitate increased engagement with Dermestidae and raise more questions, particularly concerning identification features. One such question is the difference among the European species within subgenus *Helocerus* Mulsant & Rey, 1868: *Anthrenus (Helocerus) fuscus* Olivier, 1789, *Anthrenus (Helocerus) minutus* Erichson, 1845, and *Anthrenus (Helocerus) polonicus* Mroczkowski, 1951.

The genus *Anthrenus* Geoffroy, 1762 is large with close to 300 species. The genus is split onto 10 subgenera, including *Helocerus* Olivier, 1789, a small subgenus containing just four species: *Anthrenus (Helocerus)* cechovskyi Háva & Kadej, 2015, *A. (H.) fuscus*, *A. (H.) minutus*, and *A. (H.) polonicus*. All four species are covered in dark brown scales with smaller numbers of yellow or whitish scales organised into either loose bands across the elytra or more generally scattered. *Anthrenus (H.) cechovskyi* is from Nepal and not considered here but Háva & Kadej (2015) provide a good description of the species. The similarity in appearance of *Helocerus* species with each other and some species from other subgenera has always caused confusion. For example, Wollaston (1865) initially confused *Anthrenus (Anthrenodes) minor* Wollaston, 1865 with *A. (H.) fuscus*, and later with *A. (H.) minutus* because of colour similarities (Holloway & Herrmann, 2024a). Further evidence suggesting a difficulty to differentiate among the species is provided by the length of time between discoveries. It was more than 50 years after *A. (H.) fuscus* was described that *A. (H.) minutus* was discovered, a further 100 years until *A. (H.) polonicus* was discovered, and finally over 60 more years until *A. (H.) cechovskyi* was described. Part of the issue could be that *A. (H.) fuscus* is widely distributed (Háva, 2024) and considered a well-known species. The incentive to study common, easy to recognise species is low, so it can take a long time for similarly patterned cryptic species to be discovered. For example, the *Anthrenus pimpinellae* (Fabricius, 1775) complex is now known to consist of nearly 30 species (Holloway & Herrmann, in press), whereas throughout the 19th century and into the 20th century most of these species were considered to be variants and subspecies of *A. pimpinellae*. Cryptic species hidden within common species considered easy to recognise is not a problem limited to Dermestidae (Holloway, 2024).

According to Háva (2024), *A. (H.)* fuscus is widely spread across the whole of Europe, whilst *Anthrenus (H.) minutus* is essentially an Iberian species, perhaps extending to Corsica and Sardinia (Háva, 2024). The distribution of *A. (H.) polonicus* is less clear but believed to extend across central Europe from Germany, east to Latvia, and south to Ukraine (Háva, 2024). There are two potential confusion cases: *A. (H.) minutus* confused with *A. (H.) fuscus* in Iberia, and *A. (H.) polonicus* confused with *A. (H.)* fuscus in central Europe. Mroczkowski (1951) delivered beautiful work describing *A. (H.) polonicus* and outlining the differences between that species and *A. (H.) fuscus*. *Anthrenus (H.) minutus*, however, is less well presented extending to just a single sentence (Erichson, 1845). None of these publications presents images of the various species, so here we provide colour images of internal and external features to help both the taxonomist and the citizen scientist to differentiate among *A. (H.) fuscus*, *A. (H.) minutus*, and *A. (H.) polonicus*.

Material and methods

Anthrenus (H.) fuscus specimens were obtained from Austria, two specimens of *A. (H.) minutus* collected from Spain were borrowed from the Natural History Museum, London (BNHM) along with six *A. (H.) polonicus* paratypes from Poland. 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 peeled away from the harder ventrites to expose the genitalia. The aedeagus was detached from the ring sclerite, and then sternite IX was detached from the ring sclerite and aedeagus. Habiti, both upper and lower sides, were captured at ×20 magnification using a Canon EOS 2000D camera mounted on the BMSL microscope. Aedeagus and sternite IX images were captured at ×200 magnification using a Canon EOS 1300D camera mounted on a Brunel monocular SP28 microscope. Aedeagi were suspended in glycerol to produce lateral aspect images. After dissection, all body parts were mounted on card. The antennae were teased out and images taken 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:

- Body length (BL): distance from anterior margin of pronotum to the apex of elytra.
- Paramere length (PL): distance from the anterior end to posterior apex of parameres
- Sternite IX length (SL): distance from the tip of one anterior horn to tip of posterior lobe

Scale bars were added using ImageJ 1.53M (Schneider *et al.*, 2014).

Results

Fig. 1 shows the aedeagi of the three study species. *Anthrenus (H.) minutus* aedeagus (Fig. 1b) is distinctive with straight, slim parameres, thickened along their outer edges, and carrying long spikey setae along the inner margin from the paramere tip spreading into the paramere disc. It is easy to differentiate *A. (H.) minutus* aedeagus from the other two species, so there is no reason to examine its aedeagus further. *Anthrenus (H.) fuscus* (Fig. 1a) and *A. (H.) polonicus* (Fig. 1c) are very similar in dorsal aspect. *Anthrenus (H.) fuscus* parameres carry long setae along the inner margin from the tip and spreading across the paramere disc at about halfway. *Anthrenus (H.) polonicus* has straight spikey setae from the tip that run down the inner margin and follow a straight line into the paramere disc, stopping at about halfway. Mroczkowski's (1951) illustration of *A. (H.) polonicus* aedeagus is very accurate, including the setal distribution but his illustration of *A. (H.) fuscus* aedeagus deviates slightly from Fig. 1a. Mroczkowski (1951) suggests that *A. (H.) fuscus* paramere tips are shorter, blunt and tilt in towards each other. That is not evident in Fig. 1a.

Fig. 1.- Aedeagi dorsal aspect. **1a.-** *Anthrenus (H.) fuscus*. **1b.-** *Anthrenus (H.) minutus*. **1c.-** *Anthrenus (H.) polonicus*. Scale bars = 100 μm.

Mroczkowski (1951) illustrated the aedeagi of *A. (H.) fuscus* and *A. (H.) polonicus* in lateral aspect to further confirm species validity, shown here in Fig. 2. *Anthrenus (H.) fuscus* parameres (Fig. 2a) are concave along the ventral (upper side in Fig. 2) margin, sweeping very slightly upwards, ending in

blunt, rounded tips (NB the parameres could also appear to sweep upwards slightly if they curved in towards each other as proposed by Mroczkowski, 1951). *Anthrenus (H.) polonicus* parameres (Fig. 2b) are not concave along the ventral or the dorsal margins which terminate at a sharper tip pointing directly posterior. The median lobes are visible through the parameres. The main difference is that there is a knob (indicated) or angle on the ventral surface of *A. (H.) polonicus* median lobe at the point where the lobe bifurcates (see Fig. 1). This species-specific feature was noted and illustrated by Mroczkowski (1951). No such knob or angle can be seen on *A. (H.) fuscus* median lobe.

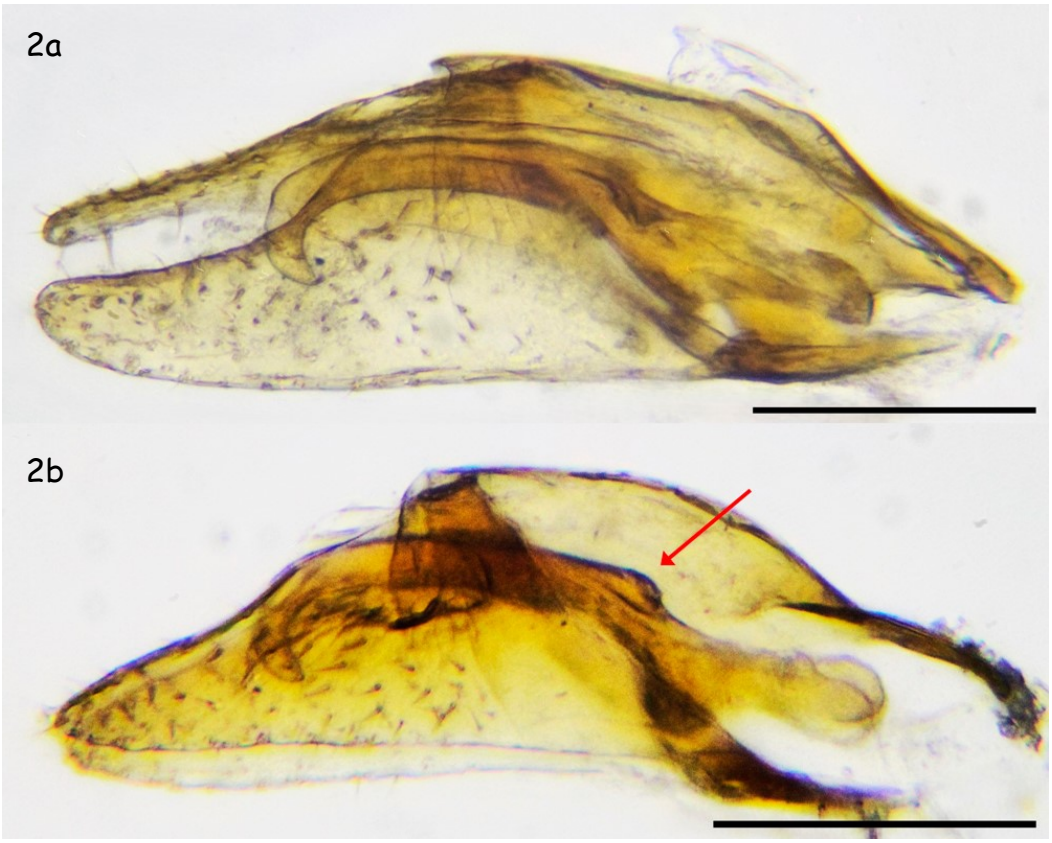

Fig. 2.- Aedeagi lateral aspect. **2a.-** *Anthrenus (H.) fuscus*. **2b.-** *Anthrenus (H.) polonicus*, with diagnostic knob on ventral side of median lobe indicated. Scale bars = 100 µm.

The other internal character that is often useful when differentiating among species or describing new species is sternite IX (Fig. 3). Sternite IX in the three *Helocerus* species studied here is a very thin, fragile sheet. All three are pale brown across the central component and down to the anterior attachment point. Around the brown component is a whitish edge to the lateral margin from about halfway, up around the posterior margin and down the other lateral margin. The whiter tissue indicates less sclerotinisation. In *A. (H.) fuscus* (Fig. 3a) the white zone is broad and carries many straight setae along both lateral zones up to and including the outer corners of the posterior margin. The centre of the evenly rounded posterior margin is devoid of long setae but perhaps carries numerous small setae. *Anthrenus (H.) minutus* sternite IX (Fig. 3b) is again distinctive. The white edging is not as wide and obvious as *A. (H.) fuscus* but the setae emerging from the white tissue are very stout and thick, and less numerous than *A. (H.) fuscus*. The posterior margin is flat rather than rounded and the centre of the posterior margin carries no thick bristles but perhaps has a row of finer bristles. *Anthrenus (H.) polonicus* sternite IX (Fig. 3c) has a rounder profile than both *A. (H.) fuscus* and *A. (H.) minutus* and the browner tissue extends almost to the posterior margin. The bristles are longer, finer, and many are curved. There are more bristles along the posterior margin.

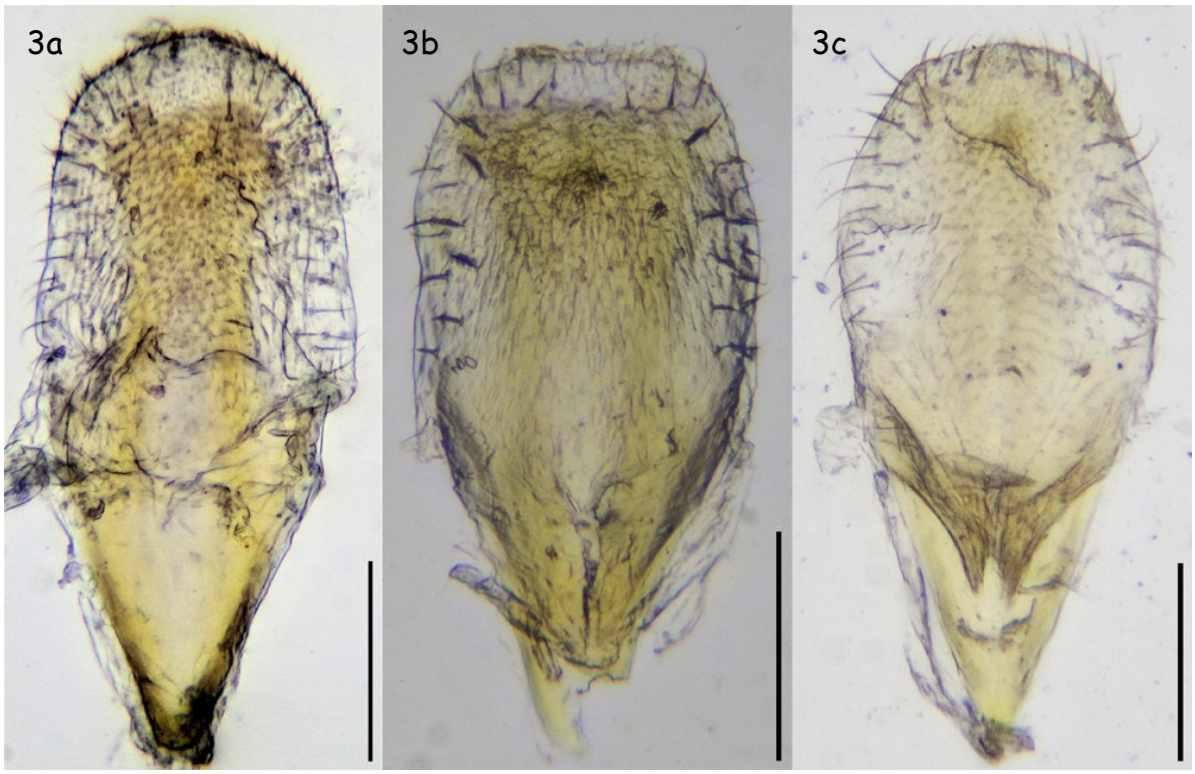

Fig. 3.- Sternite IX. **3a.-** *Anthrenus (H.) fuscus*. **3b.-** *Anthrenus (H.) minutus*. **3c.-** *Anthrenus (H.) polonicus*. Scale bars = 100 μm.

Fig. 4 shows *A. (H.) minutus*, a male (Figs. 4a and 4b) and a female (Figs. 4c and 4d). The basal sections of the elytra and the pronotal disc have been rubbed in the male (Fig. 4a) but, despite that, it is clear that both the male and the female (Fig. 4c) carry many pale-yellow scales on the elytra. Three bands of pale scales are present, basal, pre- and sub-medial but all are so broad that between them they cover most of the elytral surface. In addition to the bands there is an apical mass of yellow scales. The yellow scales are set in a background of brown scales. The pronotum is likewise covered in many pale scales, whitish at the pronotal posterior angles and mostly yellow elsewhere. The male antenna (Fig. 4b) is 5 five-segmented, the two basal segments are large and rounded, the 3rd and 4th segments are narrower, transverse oblongs; all four of these segments are yellow. The terminal segment is very long, slim, dark brown and hirsute, the lateral margins diverging very slightly to a rounded terminal margin. The female has a six-segmented antenna (Fig. 4d), the first five yellow and segments 3-5 squarer than male 3 and 4 segments. Segment 6 forms a more accentuated, shorted club than the male, but again it is dark brown and hirsute.

Fig. 5 shows the colour patterning and antennae of *A. (H.) fuscus*. Within sex there is some colour variation, although males (Figs. 5a and 5b) are darker than females (Figs. 5d and 5e). As with *A. (H.) minutus*, there are three bands of pale scales crossing an otherwise dark background of dark brown scales. However, the two *A. (H.) minutus* specimens were much paler than all *A. (H.) fuscus* and if this is consistent across all *A. (H.) minutus*, differentiating between the two species on the Iberian Peninsula should be straight forward. In addition, and as Erichson (1845) pointed out, the antennal clubs of *A. (H.) minutus* are dark contrasting with the first four segments whereas *A. (H.) fuscus* antennae (Figs. 5c and 5f) are all red.

The posterior pronotal corners are covered in a patch of bright, mostly white, scales that form a transverse oblong. This oblong is tightest in males (Figs. 5a and 5b) whereas yellow scales bleed forward and inwards from the white oblong in females (Figs. 5d and 5e). The area between the oblongs and up onto the pronotal disc is largely devoid of scales, especially in male whereas there are a few yellow scales scattered across the area in females.

Fig. 4.- *Anthrenus (H.) minutus*. Male: **4a.-** Habitus. **4b.-** Antenna. Female: **4c.-** Habitus. **4d.-** Antenna. Scale bars: habiti = 1 mm; antennae = 100 μm.

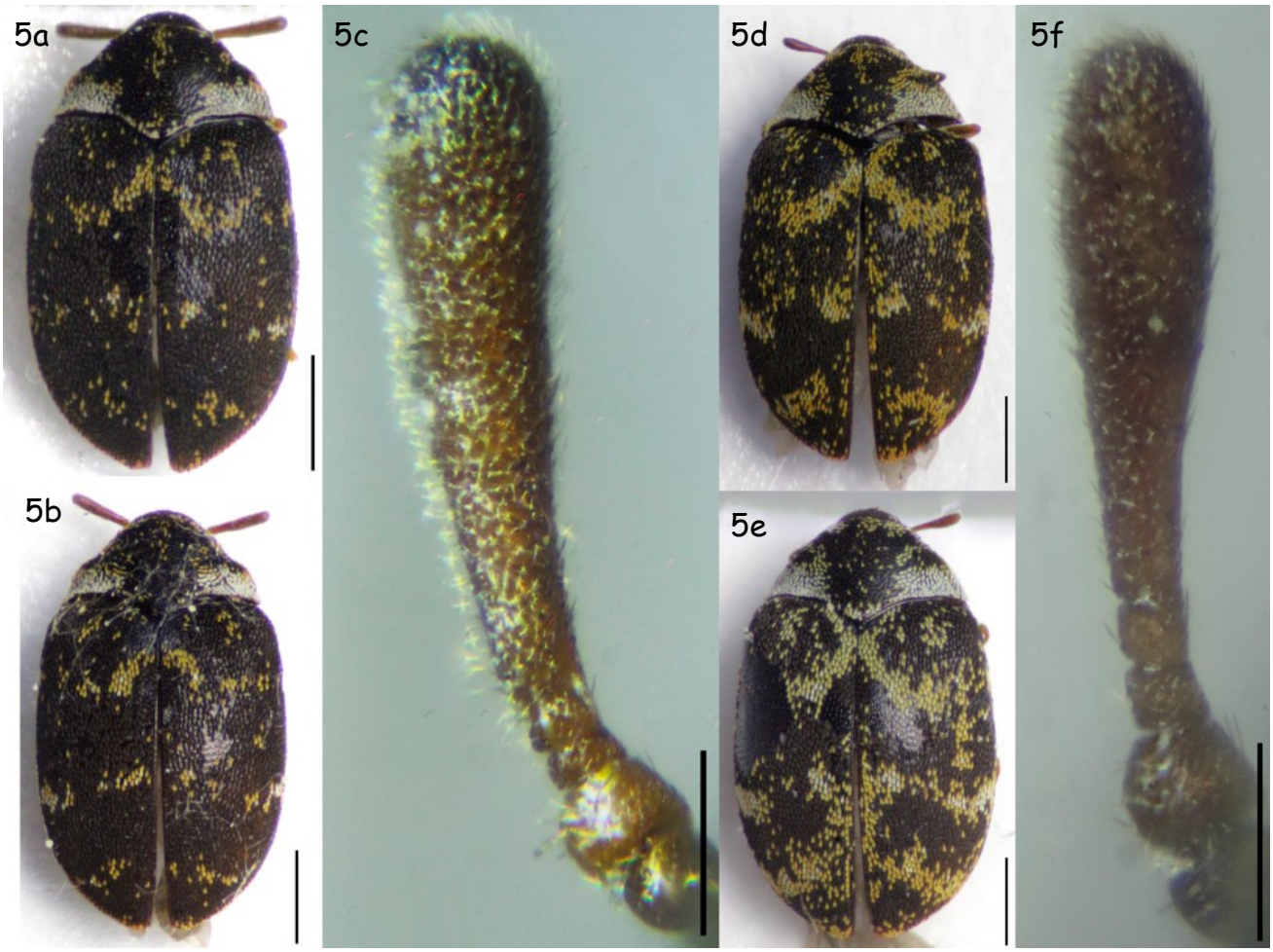

Fig. 5.- *Anthrenus (H.) fuscus*. Male: **5a.-** Habitus. **5b.-** Habitus. **5c.-** Antenna. Female: **5d.-** Habitus. **5e.-** Habitus. **5f.-** Antenna. Scale bars: habiti = 1 mm; antennae = 100 μm.

Fig. 6 shows a range of *A. (H.) polonicus* habiti along with male and female antennae. Both males (Figs. 6a and 6b) and females (Figs. 6d and 6e) display a range of patterning depending on the density and number of yellow scales on the background of brown scales. In all cases three bands are evident: sub-basal, sub-medial and pre-apical. Between the bands (and above sub-basal) there is a scattering of yellow scales. Within the bands, *A. (H.) polonicus* has more white scales mixed in with the yellow scales than *A. (H.) fuscus*.

In most cases there are many yellow and white scales on the pronotum, focussed on and spreading forward from the pronotal hind angles. There are yellow and white scales all along the posterior pronotal margin. Even in specimens with reduced pale scales on the pronotum there is a pale spot four or five scales width in the centre of the posterior margin above the scutellum. *Anthrenus (H.) polonicus* does not display clear oblongs of white scales at the hind pronotal angles (cf. *A. (H.) fuscus*).

The five-segmented male antenna (Fig. 6c) has four yellow basal segments, the first two being larger and rounder than the squarish 3rd and 4th segments. The 5th (terminal) segment is brown, long and hirsute. The anterior margin is flat, the posterior margin diverges from the anterior margin before sweeping inwards to form a rounded tip. Overall, the male antenna appears broader than *A. (H.) fuscus* (Fig. 5c). The female antenna (Fig. 6f) is at least six segmented, perhaps even seven. As with the male, the first two segments are (dark) yellow and rounded. The third to the fifth (sixth) are oblong, longer than wide, and dark yellow. The terminal segment is extended, about the length of the other segments added together, so much shorter than the male. No female *A. (H.) fuscus* in the study sample had more than 5 antennal segments (Fig. 5f).

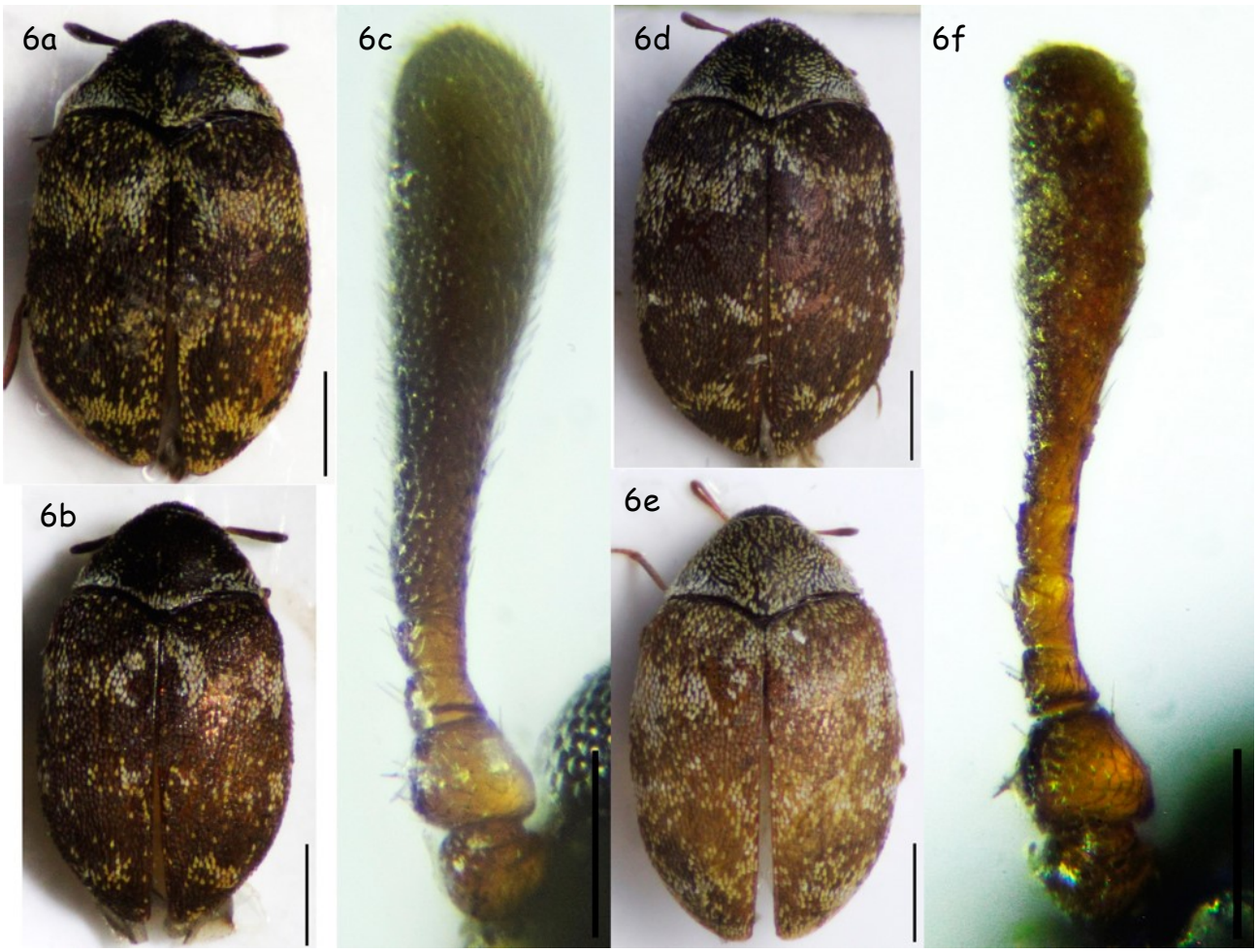

Fig. 6.- *Anthrenus (H.) polonicus*. Male: **6a.-** Habitus. **6b.-** Habitus. **6c.-** Antenna. Female: **6d.-** Habitus. **6e.-** Habitus. **6f.-** Antenna. Scale bars: habiti = 1 mm; antennae = 100 μm.

Discussion

The three species considered here have similar colour patterns and yet no careful study on how to differentiate among them has been carried out. The original descriptions of *A. (H.) fuscus* and *A. (H.) minutus* are brief and largely unhelpful. Mroczkowski's (1951) description of *A. (H.) polonicus* is good but lacks colour images. The images of the genitalia demonstrate that all three are valid species and provide the foundation required for further taxonomic studies into the group. Linking genital structure to external features, such as colour pattern or antennal details, is vital to facilitate identification under field conditions. Citizen science platforms are well-developed and highly active, but their value is predicated on species identification from field-based images (Holloway & Cañada Luna, 2022). When research has been carried out to make this possible, citizen science data are very informative (Holloway *et al.*, 2023; Holloway & Herrmann, 2024b). The current study demonstrates it should be possible to differentiate among the European *Helocerus* species using field-based habitus images.

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References

ERICHSON, W.F. 1845. *Naturgeschichte der Insekten Deutschlands. Erste Abtheilung. Coleoptera. Dritter Band, III*. Berlin: Nicolaischen Buchhandlung, 968 pp.

HÁVA, J. 2024. *Dermestidae World (Coleoptera)*. Available from: http://dermestidae.wz.cz/world-dermestidae/ [Last accessed: 28th January 2025].

HÁVA, J. & KADEJ, M. 2015. Description of a new species of *Anthrenus* Geoffroy 1762, with a key to species from Nepal. *Zootaxa*, **3920**(3): 488-492.

HOLLOWAY, G.J. 2024. *Anthaxia (Anthaxia) amandae* (Coleoptera: Buprestidae: Buprestinae), a new species from Mallorca, Spain. *Insecta Mundi*, **1089**: 1-6.

HOLLOWAY, G.J. & CAÑADA LUNA, I. 2022. A morphometric analysis of *Anthrenus munroi* Hinton, 1943, and a key for citizen scientists to the Western European species in the *Anthrenus pimpinellae* complex (Coleoptera: Dermestidae). *Entomologist's Monthly Magazine*, **158**(4): 289-298.

HOLLOWAY, G.J. & HERRMANN, A. 2024a. Redescription of *Anthrenus (Anthrenodes) minor* Wollaston, 1865 (Coleoptera, Dermestidae, Megatominae). *Arquivos Entomolóxicos*, **30**: 269-276.

HOLLOWAY, G.J. & HERRMANN, A. 2024b. A new species of the genus *Anthrenus* Geoffroy, 1762 (Coleoptera: Dermestidae) from Turkey and Lebanon. *Annales Zoologici*, **74**(4): 641-649.

HOLLOWAY, G.J. & HERRMANN, A. (in press). *Anthrenus (Anthrenus) sexmaculatus* (Coleoptera: Dermestidae: Megatominae), a new species from Turkmenistan. *Insecta Mundi*.

HOLLOWAY, G.J., MACLURE, C.J. & FOSTER, C.W. 2023. Palaearctic distributions of *Anthrenus pimpinellae* (Fabricius) and *Anthrenus isabellinus* Küster (Coleoptera: Dermestidae). *Entomologist's Monthly Magazine*, **159**(4): 23-28.

MROCZKOWSKI, M. 1951. *Anthrenus (Helocerus) polonicus* sp. n. from Central and Eastern Europe with a description of a new subgenus of *Anthrenus* Geoffr. *Annales Zoologici*, **14**(17): 1-9.

SCHNEIDER, C.A., RASBAND, W.S. & ELICEIRI, K.W. 2012. NIH Image to ImageJ: 25 years of image analysis. *Nature Methods*, **9**: 671-675.

WOLLASTON, T.V. 1865. *Coleoptera Atlantidum, being an enumeration of the Coleopterous Insects of the Madeiras, Salvages, and Canaries*. London: J. van Voorst, xlvii + 526 pp. + 140 pp. [Appendix].