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First record of the invasive *Lagria villosa* (Fabricius, 1781) (Coleoptera: Tenebrionidae: Lagriinae) in Europe

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The lagriid beetle *Lagria villosa* (Fabricius, 1781), an invasive species of African origin, is recorded for the first time in Europe. A single specimen was found in November 2020 in Turku (Finland) inside a box of table grapes from a local supermarket. This species, included in the EPPO Global Database and in the CABI Invasive Species Compendium, is widely recognized as a significant pest of crops.

On November 13, 2020 the second author (CM) purchased a pack of grapes from a local supermarket. The plastic box, perfectly sealed, contained red grapes produced in Brazil, processed and packaged in the Netherlands (Fig.1B). Upon arriving home, CM noticed the presence of an insect inside the package. The insect, at the time of discovery, was already dead but did not present *rigor mortis*. The beetle was then identified by the first author as belonging to the invasive alien species *Lagria villosa* (Fabricius, 1781), an African member of Lagriini Latreille, 1825 (Coleoptera: Tenebrionidae). The specimen is deposited at the Zoological Museum, University of Turku, Finland (ZMUT): http://mus.utu.fi/HT.31976

FIGURE 1. A) *Lagria villosa*; 17.xi.2020. ZMUT photography setup. Software: QuickPHOTO and Zerene Stacker. Photo by Carlos Martínez. **B)** Package where *L. villosa* was found, with highlighted origin and country of processing and packaging.

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Description and distribution

Lagria villosa is a polyphagous species feeding at both larval and adult stage on flowers, leaves and fruits of several crops, causing consistent damage on: *Sorghum bicolor* (L.) Moench, *Ananas comosus* (L.) Merr., *Musa* × *paradisiaca* L., *Manihot carthaginensis glaziovii* (Müll. Arg.) Allem (Spilman 1978), *Centrosema* spp. (Lenné *et al.* 1997), *Brassica campestris* L., *Coffea arabica* L., *Conyza bonariensis* (L.), *Echinochloa colonum* (L.) Link., *Flaveria bidentis* (L.) O. Kuntze, *Glycine max* L. Merr., *Lactuca sativa* L., *Phaseolus vulgaris* L., *Solanum lycopersicum* L., *Solanum tuberosum* L., *Sorghum halepense* (L.) Pers., *Zea mays* L. (Azeredo & Cassino 2004; Cordo *et al.* 2004), *Fragaria* × *ananassa* Duchesne (de Liz *et al.* 2009), *Abelmoschus esculentus* (L.) Moench (Silva *et al.* 2016), *Prunus persica* (L.) Batsch (Uberti *et al.* 2017), *Salvia hispanica* L. (Vitali 2017); *Cucumis sativus* (L.) (Assi *et al*. 2018). The species has also been documented, with minor and sometimes negligible damage, on *Arachis hypogaea* L., *Cajanus cajan* L., *Gmelina arborea* Roxb., *Gossypium* spp. L., *Hibiscus cannabinus* L., *Oryza* sp. L., *Phaseolus lunatus* L., *Phaseolus acutifolius* A.Gray, *Pinus radiata* D.Don, *Senna siamea* (Lam.) Irwin et Barneby, *Triticum aestivum* L. and *Tectona grandis* L.f. (Spilman 1978). Besides direct attack to cultivated plants, *L. villosa* is also responsible for the transmission of phytopathogens (Link *et al.* 1981), including *Pseudomonas syringae* pv. *garcae* (Amaral Teixeira & Pinheiro) Young, Dye & Wilkie, *Pseudomonas cichorii* (Swingle) Stapp (Robbs *et al.* 1976) and *Fusarium subglutinans* (Wollenweber & Reinking) P.Nelson, Toussoun & Marasas (Pires de Matos 1985; Ventura *et al.* 1993). *L. villosa* can be distinguished from the European *Lagria* thanks to its stout appearance, dark integuments with strong purple-green metallic reflections and elytra copper-golden colored (integuments brown to black with pale yellow to black-brown elytra in the European species) (Borchmann 1936; Spilman 1978). The species, native of Africa south of Sahara (Borchmann 1936), is highly invasive in South America where, after having been first recorded in Brazil in 1976 (Azeredo & Cassino 2004), is now present in a large part of Brazil, Bolivia, Paraguay and northern Argentina. *Lagria villosa* was intercepted in Puerto Rico (1977) in a batch of *Allium sativum* L. from Argentina (Spilman 1978) but has never been collected or intercepted in Europe until now (Denux & Zagatti 2010).

Risks

The conditions and bioclimatic context of the discovery suggest a low probability that *Lagria villosa*, a species associated with tropical and subtropical environments, could acclimatize in northern-central Europe. However, the risk of establishment of the species in the circum-Mediterranean region is not negligible and deserves an appropriate level of attention.

Identification key of *Lagria* species in Europe

The following key, modified from Borchmann (1936), Merkl (2006) and Prisniy *et al.* (2011) is intended to facilitate the identification of *Lagria* species occurring in Europe and separate them to *L. villosa*.

Key to the subgenera

1 Membranous wings strongly reduced or absent in females . . . . . ***Apteronympha* Seidlitz,1898**
- Membranous wings present and well-developed in females . . . . . ***Lagria* Fabricius, 1775**

Key to species of the subgenus *Lagria* (*Apteronympha*)

1 Male with interocular distance more than half of eye diameter. Legs, antennae, head and pronotum entirely black. Elytral pubescence shorter. Female with shallow midlongitudinal impression restricted to posterior half of pronotum (Spain) . . . . . ***Lagria rubida* Graells, 1855**
- Male with interocular distance less than half of eye diameter. Legs and antennae (frequently also pronotum and head) at least partly reddish brown. Elytral pubescence somewhat longer. Female with deep midlongitudinal impression almost reaching anterior margin of pronotum (South-western Europe to Switzerland, Morocco). . . . . ***Lagria rugosula* Rosenhauer, 1856**

Key to species of the subgenus *Lagria* (*Lagria*)

1 Antennae filiform, relatively gracile, with the antennomers not closely attached to each other. Body integument usually black or brown; elytra varying in color from light yellow to black-dark brown (species indigenous in the Palaearctic). **2**
- Antennae moniliform, antennomeres slightly enlarged and close to each other. Body integument dark with strong purple-green metallic reflections, elytra copper-golden colored with faint metallic shine (Alien species of African origin) . . . . . ***Lagria villosa* (Fabricius, 1781)***
2 Elytra oblong, slightly enlarged only in the distal part; contour of elytral disc arched in lateral view **3**
- Elytra stout, enlarged and almost ellipsoidal in dorsal view; contour of elytral disc almost flat in lateral view. **5**
3 Male: pronotum widest at base, strongly narrowing anteriorly; disc of the pronotum finely punctate to impunctate; relative

width of horizontal eye diameter and interocular distance 1:0.3; dorsal part of eye (i.e. in dorsal view, part between deepest point of genal encroachment and inner margin of eye) slightly wider than long; temple (i.e. distance between posterior margin of eye and "neck" of the head) shorter than 0.3× longitudinal eye diameter; relative length of apicale and basale of aedeagus 1:2–2.5. Female: elytra nearly parallel-sided. Body larger: length of male 8.5–9.0, female 10–10.5 mm (Europe to Central Asia) . . . . . ***Lagria atripes*** **Mulsant & Guillebeu, 1855**

- Male: width of pronotum at base and at apex nearly equal, sides virtually not narrowing anteriorly, with slight lateral sinuation before base; disc of pronotum clearly punctate; relative width of horizontal eye diameter and interocular distance 1:0.4–0.7; dorsal part of eye (i.e. in dorsal view, part between deepest point of genal encroachment and inner margin of eye) as long as or slightly longer than wide; temple (i.e. distance between posterior margin of eye and "neck" of the head) about 0.5× longitudinal eye diameter; relative length of apicale and basale of aedeagus 1:4–4.5. Female: elytra widening posteriorly, widest in posterior one-third. Body smaller: length of male 7–7.5, female 8–8.5 mm. **4**

4 Elytra straw yellow to light brown, with more regular punctuation, punctural interspaces not raised, surface not rugose. Male: relative width of horizontal eye diameter and interocular distance 1 : 0.4–0.5; pronotum slightly longer than wide, with coarser and deeper punctures. Female: vertex (not frons!) without impression; antennomere 7 nearly 2× longer than wide; pronotum subquadrate; mid longitudinal depression of pronotum shallow, relative width of horizontal eye diameter and interocular distance 1:2 (Europe to Western Siberia and Central Asia, Morocco) . . . . . ***Lagria hirta*** **Linnaeus, 1758**

- Elytra dark brown, with more irregular punctuation, punctural interspaces partly raised, making surface rugose. Male: relative width of horizontal eye diameter and interocular distance 1 : 0.6–0.7; pronotum subquadrate, with finer punctures. Female: vertex (not frons!) with shallow elongate impression; antennomere 7 as long as or barely longer than wide; pronotum slightly wider than long; mid longitudinal depression of pronotum deep, relative width of horizontal eye diameter and interocular distance 1:3 (NE Ukraine and South-eastern Russia to Russian Far East). . . . . ***Lagria laticollis*** **Motschulsky, 1860**

5 Pronotum transverse in both sexes. Anterior margin of pronotum wider or as wide as head. Pronotum with scattered fine punctures, glossy; male with two deep impressions on pronotum. Lateral margins of pronotum always visible. 11th antennomere of male as long as four preceding antennomeres combined. Species not sexually dimorphic. Length: 9-12 mm (North-western Africa and Spain) . . . . . ***Lagria lata*** **(Fabricius, 1801)**

- Pronotum of male as long as wide. Anterior margin of pronotum narrower than width of head. Pronotum with deep and coarse punctures. Male without two deep impressions on pronotum. Lateral margins of pronotum not always visible. 11th antennomere of male as long as five preceding antennomeres combined. Species sexually dimorphic: males with narrower and oblong elytra compared to females. Length: 11 mm (Southern France and Iberian Peninsula). . . . . ***Lagria grenieri*** **Brisout de Barneville, 1867**

*Among the European Lagriini *Chrysolagria viridipennis* (Fabricius, 1798) (Spain) presents females that can be potentially confused with *L. villosa*. The females of the two taxa can be distinguished using the pronotum proportions: subquadrate in dorsal view (ratio 1.0) in *C. viridipennis*, wider than long in *L. villosa* (ratio 1.4). Males are clearly identifiable using Labrique & Merkl (2015).

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