

**Revision of western Palaearctic species
of the *Oulema melanopus* group, with description
of two new species from Europe
(Coleoptera: Chrysomelidae: Criocerinae)**

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Abstract. Five species of the *Oulema melanopus* group are recognized in the western Palaearctic Region: *O. melanopus* (Linnaeus, 1758), *O. rufocyanea* (Suffrian, 1847), *O. duftschmidi* (Redtenbacher, 1874), *O. mauroi* sp. nov. (northern Italy), and *O. verae* sp. nov. (Spain and Portugal). The two new species are described and illustrated. The nomenclature of the group is discussed in detail. *Oulema rufocyanea* is proved to be a validly described species different to *O. duftschmidi*. To fix the nomenclatural stability of the whole group and avoid subsequent misinterpretations, neotypes are designated for *Crioceris melanopoda* O. F. Müller, 1776; *Crioceris hordei* Geoffroy, 1785; and *Lema cyanella* var. *atrata* Waltl, 1835 (all conspecific with *O. melanopus*). The primary type specimens or their photographs were examined if they exist. The spelling *Oulema melanopus* is fixed as correct and explained. Variation in the cytochrome c oxidase (*cox1*) gene across specimens of all the species has been analysed. All species in the group had extremely similar haplotypes, with interspecific sequence similarities between 90.5–99.5 %, compared to intraspecific sequence similarities between 91.6–100 %. As a result, the phylogenetic relationships among species in the group were not well resolved based on *cox1* sequences.

Key words. Coleoptera, Chrysomeloidea, Chrysomelidae, Criocerinae, *Oulema*, taxonomy, neotype, new species, new records, western Palaearctic Region

Introduction

The genus *Oulema* Des Gozis, 1886 comprises 4 subgenera: *Oulema* s. str. (Palearctic, Oriental and African Regions, estimated number of species ca. 60), *Parhapsidolema* Monrós, 1951 (Neotropical, 3 species), *Hapsidolemoides* Monrós, 1951 (Nearctic and Neotropical, ca. 20 species), and *Gracilema* Chûjô, 1964 (2 species, Oriental Region) (cf. MONRÓS 1960, HEINZE & PINSORF 1964, KIMOTO & GRESSITT 1979, RILEY et al. 2003, SCHMITT 2010). In the Palearctic Region, SCHMITT (2010) listed 21 species, all in the nominotypical subgenus.

The species belonging to the *Oulema melanopus* group are characterised by orange or red colour of pronotum and legs (except tarsi, which are black). In the western Palearctic Region the group consists of five species, including *O. mauroi* sp. nov. and *O. verae* sp. nov. described here. The three previously recognized species are clearly delimited by differences in the shape of the flagellum of the aedeagus (for *O. melanopus* vs. *O. duftschmidi* see BERTI 1989) and, additionally, by a shorter elytra and antennae in *O. rufocyanea*, compared to *O. melanopus* and *O. duftschmidi* (see KIPPENBERG 1994). However, the attribution of these names to well delimited species is subject of confusion due to nomenclatural problems and continuous misidentifications.

Oulema melanopus is a well known important pest of cereals through its geographical distribution. The economic importance of *O. duftschmidi* is unknown due to confusion in separation of both species. In many countries (at least in Europe) both species occur sympatrically (e.g. BEZDĚK 2001, CHROBOK & BOROWIEC 1993), thus it is presumed that economic importance should be attributed not only to *O. melanopus* but to the complex of both species. Economically relevant densities of *O. duftschmidi* were recently described in Italy (BECHINI et al. 2013). The same authors also suggested a potential explanation for higher economic importance of *O. melanopus* over *O. duftschmidi* in Italy and Switzerland, which would derive from the higher oviposition rate and the lower mortality of *O. melanopus*, however, comparable data from other countries are missing. Both species are extremely similar, morphological characters are overlapping and correct identification is possible only based on male and female genitalia.

The third species, *O. rufocyanea*, is distributed in central and southern Europe although it is extremely rare. It can be distinguished by shorter elytra, and the shape of the antennomeres and male genitalia. Although *O. rufocyanea* is considered a valid species in many publications and catalogues from the 19th and 20th centuries, its identity was never based on the study of male or female genitalia. However, SCHMITT (1990) studied the holotype (female) of *O. rufocyanea*, published a morphometric analysis to separate *O. melanopus* and *O. rufocyanea*, and illustrated two diagnostic characters, i.e. elytra and antennae. He probably did not know the paper by BERTI (1989) published one year before because *O. duftschmidi* is not included in his study.

Finally, during the preparation of this paper, a new species, *O. verae* sp. nov., was recognized based on specimens from Spain and Portugal originally recorded as *O. rufocyanea* (BASELGA & NOVOA 2002, 2003, 2006) based on the length of elytra and antennae. However, the study of male genitalia revealed that these specimens are not conspecific with those usually identified as *O. rufocyanea* in Central Europe. An additional new species was found in the material from northern Italy and is described as *O. mauroi* sp. nov.

It is surprising, in view of economic importance of *O. melanopus*, that the nomenclature of the whole group is source of many misunderstandings and misinterpretations. The identity of true *O. melanopus* is based on its lectotype designated by BERTI (1989), but the nomenclature of *O. rufocyanea* and *O. duftschmidi* is not stable due to different applications of taxonomical acts by SUFFRIAN (1847) and REDTENBACHER (1874). While REDTENBACHER (1874) explicitly proposed *O. duftschmidi* as a new name for homonymous *Lema cyanipennis* Duftschmid, 1825, the valid description of *O. rufocyanea* Suffrian, 1847 was misinterpreted by COX (1995) as a proposal of a new name (see below for details).

Lema cyanipennis was synonymized with *L. melanopus* by LACORDAIRE (1845). WEISE (1881), followed by CLAVAREAU (1913), listed *Lema cyanipennis* as a synonym of *O. rufocyanea* but, contradictorily, listed its substitute name *Oulema duftschmidi* Redtenbacher, 1874 as a synonym of *O. melanopus*. In the sixth volume of the Palaearctic Catalogue (SCHMITT 2010) *Lema cyanipennis* is listed as a homonym in synonymy with *O. rufocyanea*, but *O. rufocyanea* is not marked as a substitute name. When BERTI (1989) split *O. melanopus* into two species based on the shape of flagellum, she used the name *O. duftschmidi* for the second species. Although she underlined that *O. duftschmidi* is a substitute name of *Lema cyanipennis*, its identity was fixed by the designation of a neotype, not for *Lema cyanipennis* but for its substitute name *O. duftschmidi*. *Oulema rufocyanea* was not mentioned in Berti's paper. After the publication of BERTI's (1989) study, *O. duftschmidi* was subsequently reported from various European countries (e.g. SIEDE 1991, STREJČEK 1993, CHROBOK & BOROWIEC 1993, HANSEN 1994, COX 1995, KIENER 1995, PETITPIERRE 2000, BASELGA & NOVOA 2006, BUKEJS & FERENCA 2010).

COX's (1995) opinion that both *O. rufocyanea* and *O. duftschmidi* were proposed as new names for *Lema cyanipennis* lead to the proposed synonymy *Lema cyanipennis* = *O. rufocyanea* = *O. duftschmidi*, with *O. rufocyanea* as a valid name instead of homonymous *Lema cyanipennis*. This arrangement was adopted in some subsequent publications (e.g. BEZDĚK 2001, COX 2007, SCHMITT & RÖNN 2011). Contrary to that opinion, in widely used recent identification keys (KIPPENBERG 1994; PETITPIERRE 2000; WARCHALOWSKI 2003, 2010) and other publications (e.g. GEISER 2004, KÖHLER & KLAUSNITZER 1998, SCHMITT 2010) *O. melanopus*, *O. rufocyanea* and *O. duftschmidi* are keyed or listed as independent species, attributing the name *O. rufocyanea* to the species with short elytra and antennae. In this arrangement, the three species have differently shaped sclerite inside the aedeagus called flagellum as was pictured by BEZDĚK (2003) in a little known faunistic paper, at that time without knowledge of the available type material and taxonomy of the group. Most recently, SCHMITT & RÖNN (2011) recognized 3 species in central Europe, but confused *O. rufocyanea* and *O. duftschmidi*, and taxonomical problems were left open for further studies.

Given the difficult taxonomy and the nomenclatural problems, the aims of the present study are (i) to definitely confirm the validity of the three previously known European species in the *Oulema melanopus* group, (ii) to resolve all nomenclatural issues to avoid future nomenclatural instability of the group, (iii) to describe two new species in the group from the Iberian Peninsula and northern Italy, and (iv) to analyse the variation in cytochrome c oxidase (*cox1*) gene across specimens of all the five species.

Material and methods

All measurements were made using an ocular grid mounted on a MBS-10 stereomicroscope (at 16× magnification for the body length and 32× magnification for the remaining measurements). Photographs of specimens were taken with a Canon EOS 550D digital camera with a Canon MP-E 65 mm lens. Images of the same specimen at different focal planes were combined using Helicon Focus 5.3 software.

The examined material is housed in the following collections:

- BASC Andrés Baselga collection, Santiago de Compostela, Spain;
 BMNH The Natural History Museum, London, UK (Michael Geiser, Maxwell V. L. Barclay);
 DSCM Davide Sassi collection, Milano, Italy;
 DSCR Dieter Siede collection, Retterath, Germany;
 EPCP Eduard Petitpierre collection, Palma de Mallorca, Balears, Spain;
 HKCH Horst Kippenberg collection, Herzogenaurach, Germany;
 HNHM Hungarian Natural History Museum, Budapest, Hungary (Ottó Merkl);
 JBCB Jan Bezděk collection, Brno, Czech Republic;
 FFCJ Frank Fritzlar collection, Jena, Germany;
 LFMC Laura Farina collection, Monticello Brianza, Italy;
 MDCV Mauro Daccordi collection, Verona, Italy;
 MHNG Muséum d'Histoire Naturelle, Genève, Switzerland (Ivan Löbl);
 MLUH Martin-Luther-Universität, Zentralmagazin Naturwissenschaftlicher Sammlungen, Halle (Saale), Germany (Karla Schneider);
 MMCM Matteo Montagna collection, Milano, Italy;
 MNCN Museo Nacional de Ciencias Naturales, Madrid, Spain (Mercedes París);
 MNHN Muséum National d'Histoire Naturelle, Paris, France (Antoine Mantilleri);
 MOCP Michal Ouda collection, Plasy, Czech Republic;
 MSNM Museo Civico di Storia Naturale, Milano, Italy (Carlo Leonardi, Fabrizio Rigato);
 MSNV Museo Civico di Storia Naturale, Verona, Italy (Roberta Salmaso);
 MMBC Moravian Museum, Brno, Czech Republic (Petr Baňaf);
 NHRS Naturhistoriska Riksmuseet, Stockholm, Sweden (Johannes Bergsten);
 NMPC Národní muzeum, Praha, Czech Republic (Jiří Hájek);
 NHMW Naturhistorisches Museum, Wien, Austria (Harald Schillhammer);
 RRCM Renato Regalin collection, Milano, Italy;
 ZMCO Zdeněk Malinka collection, Opava, Czech Republic;
 ZMUC Zoological Museum, University of Copenhagen, Copenhagen, Denmark (Alexey Solodovnikov).

Exact label data are cited for all type specimens; a double slash (//) divides the data on different labels and a single slash (/) divides the data in different rows. Type localities are cited in the original spelling. Other comments and remarks are placed in square brackets: [p] – preceding data are printed, [h] – preceding data are handwritten, [w] – white label, [r] – red label, [b] – blue label.

Part of the distributional data of *Oulema duftschmidi*, *O. melanopus* and *O. rufocyanea* published in the Palearctic Catalogue (SCHMITT 2010) is evidently based on misidentifications. The most correct seems to be the data on *O. duftschmidi* because many authors after 1989 explicitly mentioned the examination of flagellum. Because *O. duftschmidi* and *O. melanopus* were not recognized till 1989, some older distributional data were probably simply assigned to *O. melanopus*. The distribution of *O. rufocyanea* listed in the Palearctic Catalogue is probably partly based on misidentifications with *O. duftschmidi* or the newly

described *O. mauroi* sp. nov. and *O. verae* sp. nov. For both widely distributed species, *O. duftschmidi* and *O. melanopus*, we present one verified specimen for each country and one previously published source where the identification was made based on the study of flagellum or where both *O. melanopus* and *O. duftschmidi* are mentioned. On the other hand, for the rare species *O. rufocyanea*, with poorly known distribution, all identified specimens are listed. The distributional maps were created at d-maps.com website.

For the molecular analyses, genomic DNA was extracted from muscle tissue in the prothorax region with Wizard SV 96-well plates (Promega, UK). A 655 base pair region from the 5' end of mitochondrial cytochrome oxidase I was amplified with primers CO1F2 and CO1R2 (BASELGA et al. 2013). Amplification conditions used with Biorun BioTaq were 95°C for 2 min, 35 cycles of 95°C for 30 s, 40°C for 30 s and 72°C for 45 s, and a final extension of 72°C for 5 min. PCR products were cleaned with 96-well Millipore multiscreen plates and sequenced in both directions using ABI dye terminator sequencing. Sequence chromatograms were assembled and manually edited using Geneious 5.6. Specimen information and GenBank accession numbers are available in Table 2. A maximum likelihood phylogenetic tree was built using RAxML 7.0 (STAMATAKIS 2006) under the GTR+G model. The best tree and clade support values were computed using the rapid bootstrap algorithm with 100 replicates.

Nomenclatural problems and decisions

During the accumulation of the data necessary to resolve the nomenclature in *Oulema melanopus* group several important questions arose:

1) The identity of *Lema cyanipennis* Duftschmid, 1825. The Duftschmid's collection is dispersed in the historical collection in the Linz museum and the original labels of specimens were removed (cf. GUSENLEITNER 1984), thus the type specimens of *Lema cyanipennis* cannot be traced. BERTI (1989) surprisingly did not designate the neotype for *Lema cyanipennis* but for its substitute name *O. duftschmidi*. Such neotype designation is very unusual, however, it is a valid act as *O. duftschmidi* is nominal taxon sharing the type specimen(s) with its senior objective synonym *Lema cyanipennis* Duftschmid, 1825 (Art. 72.7 of ICZN 1999). Thus the identity of *Lema cyanipennis* Duftschmid, 1825 is correctly fixed by the neotype designation for *O. duftschmidi*. Any other neotype designation for *Lema cyanipennis* itself would be in conflict with Art. 75.4 of the Code.

2) Was *O. rufocyanea* described as a new species or proposed as a substitute name? This question is of high importance for the taxonomy of the group. WEISE (1881) and CLAVAREAU (1913) considered *Lema cyanipennis* a synonym of *O. rufocyanea*. Recently, COX (1995) stated that both *O. duftschmidi* and *O. rufocyanea* were substitute names of *Lema cyanipennis* and, consequently, synonymized *O. duftschmidi* with *O. rufocyanea*. We do not agree with this decision as SUFFRIAN (1847: page 100) published a valid description and clearly stated that *O. rufocyanea* is not a substitute name: '... ich nenne sie daher *rufocyanea*, und sie wird diesen Namen auch behalten können, wenn sie sich als identisch mit *cyanipennis* Duft. Küst. erweisen sollte, da bereits eine ältere *L. cyanipennis* Fab. aus Ostindien vorhanden ist... [= ... I name it *rufocyanea*, and this name should be conserved even if it proves identical with

cyanipennis Duft. because older *L. cyanipennis* Fab. is described from eastern India ...]'. Based on this sentence, we consider *O. rufocyanea* a validly described species. Therefore, the objective synonymy *O. rufocyanea* = *O. duftschmidi* based on the fact that both names were proposed as new names for *Lema cyanipennis* as suggested by COX (1995) is not justified. It is also necessary to note that REDTENBACHER (1874) treated *O. rufocyanea* and *Lema cyanipennis* as two different species. In sum, we consider *O. rufocyanea* a valid species different from *O. duftschmidi*.

3) Type material of *O. rufocyanea*. Suffrian's collection deposited in MLUH contains two specimens (females) of *O. rufocyanea* (Suffrian's catalogue Nos. 23261 and 30066) labelled as lectotype (No. 23261) and paralectotype (No. 30066) by Michael Schmitt. Data from Suffrian's catalogue referring to the mentioned numbers are as follows:

23261: *Lema rufocyanea* aus Kärnten von Dr. Müller 1839 erhalten [= from Carinthia, received in 1839 from Dr. Müller].

30066: *Lema rufocyanea* aus Kärnten, das von mir in Ent. Zeit. 1847 auf Seite 100 beschriebene Exemplar, bekam ich von Dr. Dohrn [president of the Entomological Society of Stettin] 1866 geschenkt. [= from Carinthia, the specimen described by me in Ent. Zeit. 1847 on the page 100, received as a gift from Dr. Dohrn 1866].

However, SCHMITT (1990) in his paper devoted to *O. rufocyanea* considered female No. 30066 to be the holotype and the second female (No. 23261) was treated as nontype.

Probable explanation of lectotype and paralectotype labels under the specimens is that Schmitt labelled them before he received the information from Suffrian's catalogue and after that the labels were not removed from the specimens. Because the lectotype designation was never published by Schmitt, it is not a valid taxonomical act. SUFFRIAN (1847: 99) clearly stated that he had just a single specimen: '..., wenigstens kann ich ein wahrscheinlich von Kahr [= collector and insect trader] stammendes Exemplar in der Vereinsammlung nich mit *L. melanopa* vereinigen' [..., at least I have [seen] one specimen from Kahr [deposited] in the society collection [Entomological Society of Stettin] which I cannot assign to *L. melanopa*]. Based on the statement by SUFFRIAN (1847) and the text under specimen No. 30066 in Suffrian's catalogue we concur with SCHMITT (1990) that female No. 30066 is the holotype by monotypy of *O. rufocyanea* in accordance with Art. 72.4.1.1 (ICZN 1999).

4) Identity of taxa listed in synonymy with *O. melanopus*. The type specimens of *Crioceris melanopoda* O. F. Müller, 1776, *Crioceris hordei* Geoffroy, 1785, *Lema cyanella* var. *atrata* Waltl, 1835, and *Lema melanopa* var. *nigricans* Westhoff, 1882 were not traced and all the taxa are traditionally listed in synonymy with *O. melanopus*. To prevent any future confusions or misapplications we decided to designate the neotypes for *Crioceris melanopoda*, *C. hordei* and *Lema cyanella* var. *atrata* conspecific with *O. melanopus* (see p. 286).

5) Spelling *O. melanopus* or *O. melanopa*? LINNAEUS (1758) described the species as '*Chrysomela melanopus*'. Probably because Linnaeus himself was using the form '*melanopa*' in his subsequent publications (e.g. LINNAEUS 1760, 1767), in papers published in the following two centuries we can find both spellings, although '*melanopus*' probably prevails.

The word '*melanopus*' is a Greek adjective composed from two Greek words: *melas* (= black) and *pus* (= leg). Because Greek adjectives with terminal part *-pus* are adjectives of two endings, they have the same ending for both masculine and feminine gender. In turn,

'*melanopa*' was created as a Latinized form, which does not respect Greek grammatical principles. Despite the fact DES GOZIS (1886) used the form '*melanopa*' when he proposed the genus *Oulema*, it has to be treated as incorrect subsequent spelling. Such application is also in full agreement with Articles 26 and 31.2.3 of the Code (ICZN 1999). Therefore, the correct spelling of the name is here fixed as *O. melanopus*.

Taxonomy of the *Oulema melanopus* species group

Given the extreme similarity among species belonging to the *O. melanopus* species-group, we provide a general description first, and then specific diagnoses for previously described species, and detailed descriptions for new species.

Species included. *Oulema duftschmidi* (Redtenbacher, 1874), *O. melanopus* (Linnaeus, 1758), *O. rufocyanea* (Suffrian, 1847), *O. mauroi* sp. nov., *O. verae* sp. nov., and eastern Palaearctic *O. oryzae* (Kuwayama, 1931).

Description. Male. Colouration (Figs 1–5). Head dark metallic blue, antennae black with antennomeres I and II dark metallic blue. Pronotum orange-red, anterior and posterior margins sometimes thinly black. Scutellum and elytra metallic blue to black. Meso-, metathorax and abdominal ventrites metallic blue to metallic black. Legs: coxae, trochanters, tarsi and apices of tibiae black, femora and tibiae orange.

Body moderately flat, parallel, glabrous, lustrous.

Head. Frontoclypeus triangular, punctate and covered with setae, anterior margin more or less straight; frontal tubercles not elevated, smooth, glabrous; frontal grooves very deep, V-shaped, frons covered with large punctures, each bearing long pale seta; vertex covered with small punctures, almost glabrous, with distinct median line. Antennae slender, 0.45–0.61 times as long as body, antennomere I bulbous, antennomere II smallest, almost as wide as long (Figs 11–15).

Pronotum quadratic or subquadratic (Figs 6–10), widest at midlength or just before midlength, convex, lustrous. Surface shallowly constricted before base. Disc covered with sparse large punctures, basal constriction and area around posterior corners usually covered with very small dense punctures. Anterior margin thinly bordered, lateral margins almost parallel to widely rounded, unbordered, in posterior half always convergent, posterior margin slightly rounded, thinly bordered. Anterior angles more or less rectangular with swollen tip, posterior ones only slightly indicated. All angles bearing setigerous pore with erect long pale seta.

Scutellum trapezoidal, ca. as wide as long, lateral margins slightly convergent, posterior margin slightly concave, straight or slightly rounded, surface glabrous, impunctate.

Elytra moderately flat, 1.69–2.05 times as long as wide at humeral part, glabrous, lustrous, covered with 10 striae composed of large deep punctures (smaller and shallower near basal margin and in apical area) and short scutellar stria composed of 4–6 small shallow punctures; distance between punctures on elytral disc ca. as wide as diameter of puncture. Humeral calli well developed, impunctate. Epipleura very narrow, disappearing towards apex.

Legs. Femora lustrous, moderately covered with pale setae. Tibiae slender, slightly tapering basally, covered with dense pubescence, outer side on basal half nearly glabrous, apices armed with pair of short, subequal, black-brown spines ventrally.

Tarsi relatively slender. Tarsomeres I elongate triangular, shorter than two following tarsomeres combined, tarsomeres II triangular. Claws simple.

Ventral part. Prosternal projection not visible between procoxae. Mesoventrite densely covered with small punctures bearing pale setae, mesoventral process wide, separating mesocoxae, ca. 0.5 times as wide as diameter of mesocoxa. Metaventrite laterally and anteriorly subopaque, covered with large punctures bearing pale setae; medially and towards posterior margin lustrous, nearly impunctate; medially at posterior quarter with impressed line; posterior margin shallowly incised in middle. Abdominal ventrites lustrous, uniformly covered with small punctures bearing pale setae; ventrite I twice as long as II and III combined, ventrite V 1.5 time as long as IV.

Male genitalia. Aedeagus of relatively uniform structure, but with specific internal sclerite (flagellum) possessing short posterobasal arms (Figs 16–23).

Female. Sexual dimorphism indistinct. Females have usually more convex abdomen. Spermatheca with duct heavily sclerotized in proximal part, soft in shorter basal part, with specific junction to bursa copulatrix (Figs 26–30). Nodulus poorly developed, gradually connected with cornu.

Host plants. *Oulema duftschmidi* and *O. melanopus* are well known European pests of cereals (*O. melanopus* introduced also to North America) and can be frequently found on various Poaceae. Host plants of *O. rufocyanea* (Suffrian, 1847), *O. mauroi* sp. nov., *O. verae* sp. nov. are not known, but we presume also some Poaceae species. ROZNER & ROZNER (2008) published *Lamium* spp. as host plant of *O. rufocyanea* in Macedonia but as other species of this group are associated with Poaceae, the occurrence on *Lamium* spp. should be verified. Eastern Palearctic *O. oryzae* is associated with *Oryza sativa*.

Comments on identification. All European species are habitually extremely similar. As shown in Tab. 1, ratios of the main measurements widely overlap and cannot be used for

Tab. 1. Measurements of *Oulema* species.

| | <i>O. duftschmidi</i> | <i>O. melanopus</i> | <i>O. rufocyanea</i> | <i>O. mauroi</i> sp. nov. | <i>O. verae</i> sp. nov. |
|----------------------------------|-----------------------|---------------------|----------------------|------------------------------|-----------------------------|
| Body length (BL) | 4.2–5.7 mm | 4.5–6.2 mm | 4.0–4.6 mm | 3.7–4.6 mm | 3.8–4.3 mm |
| Elytra length (EL) | 3.2–3.9 mm | 3.2–4.1 mm | 2.8–3.1 mm | 2.6–3.1 mm | 2.6–3.0 mm |
| Elytra width (EW) | 1.6–2.1 mm | 1.7–2.2 mm | 2.0–2.4 mm | 1.5–1.7 mm | 1.4–1.6 mm |
| Antenna length (AL) | 2.3–3.1 mm | 2.4–3.0 mm | 2.2–2.4 mm | 2.1–2.5 mm | 1.8–2.1 mm |
| Pronotum length (PL) | 0.9–1.4 mm | 1.0–1.3 mm | 1.0–1.2 mm | 1.0–1.2 mm | 0.8–1.1 mm |
| Pronotum width (PW) | 1.0–1.4 mm | 1.1–1.3 mm | 1.0–1.2 mm | 1.0–1.2 mm | 0.8–1.1 mm |
| EL/BL | 0.66–0.69 | 0.67–0.71 | 0.66–0.73 | 0.65–0.70 | 0.66–0.75 |
| EL/EW | 1.87–2.05 | 1.92–2.00 | 1.71–1.87 | 1.69–1.82 | 1.75–2.00 |
| AL/BL | 0.51–0.55 | 0.49–0.58 | 0.45–0.58 | 0.52–0.61 | 0.46–0.50 |
| PL/PW | 0.98–1.20 | 0.96–0.99 | 0.95–1.02 | 0.95–1.00 | 0.97–1.02 |
| Protarsomere I (length/width) | 1.65–2.00 | 1.65–1.80 | 1.30–1.60 | 1.45–1.65 | 1.25–1.40 |

species separation – with the exception of the elytral length / elytral width ratio which helps to separate three units: *O. duftschmidi* and *O. melanopus*, intermediate *O. verae* sp. nov. and finally, *O. rufocyanea* and *O. mauroi* sp. nov. The absolute measurements seem to be more useful, particularly body length, elytral length, elytral width and length of antennae, but also here the measurements partially overlap. The only really reliable characters to distinguish the species are the shape of the flagellum in males and the shape of the spermatheca in females, particularly the length and shape of the soft distal part of ductus spermathecae and its junction to bursa copulatrix. Surprisingly, the shape of spermatheca itself is almost invariable in this group and, on the contrary, the shape and number of coils of the well sclerotized proximal part of ductus spermathecae seem to be too variable and can only partially be used for identification.

Oulema duftschmidi (Redtenbacher, 1874)

(Figs 1, 6, 11, 16, 26)

Lema cyanipennis Duftschmid, 1825: 243 (original description; junior primary homonym).

Lema duftschmidi Redtenbacher, 1874: 446 (new substitute name for *Lema cyanipennis* Duftschmid, 1825, not *Lema cyanipennis* Fabricius, 1801: 472).

Type locality. *Lema cyanipennis*: original type locality: Austria: ‘Wien’ (DUFTSCHMID 1825), replaced by the act of neotype designation as ‘Austria’ (BERTI 1989).

Type material. *Lema cyanipennis*: lost, not traceable in the collection (see point 1 on p. 277). *Lema duftschmidi*: NEOTYPE: ♂, ‘Austria [w, h] // Museum Paris / ex Coll. / R. Oberthur [p] / REICHE [w, h] // NEOTYPE [r, p] // L. (Oulema) / duftschmidi Redt [h] / N. BERTI det. 19 [p] 88 [w, h]’ (MNHN).

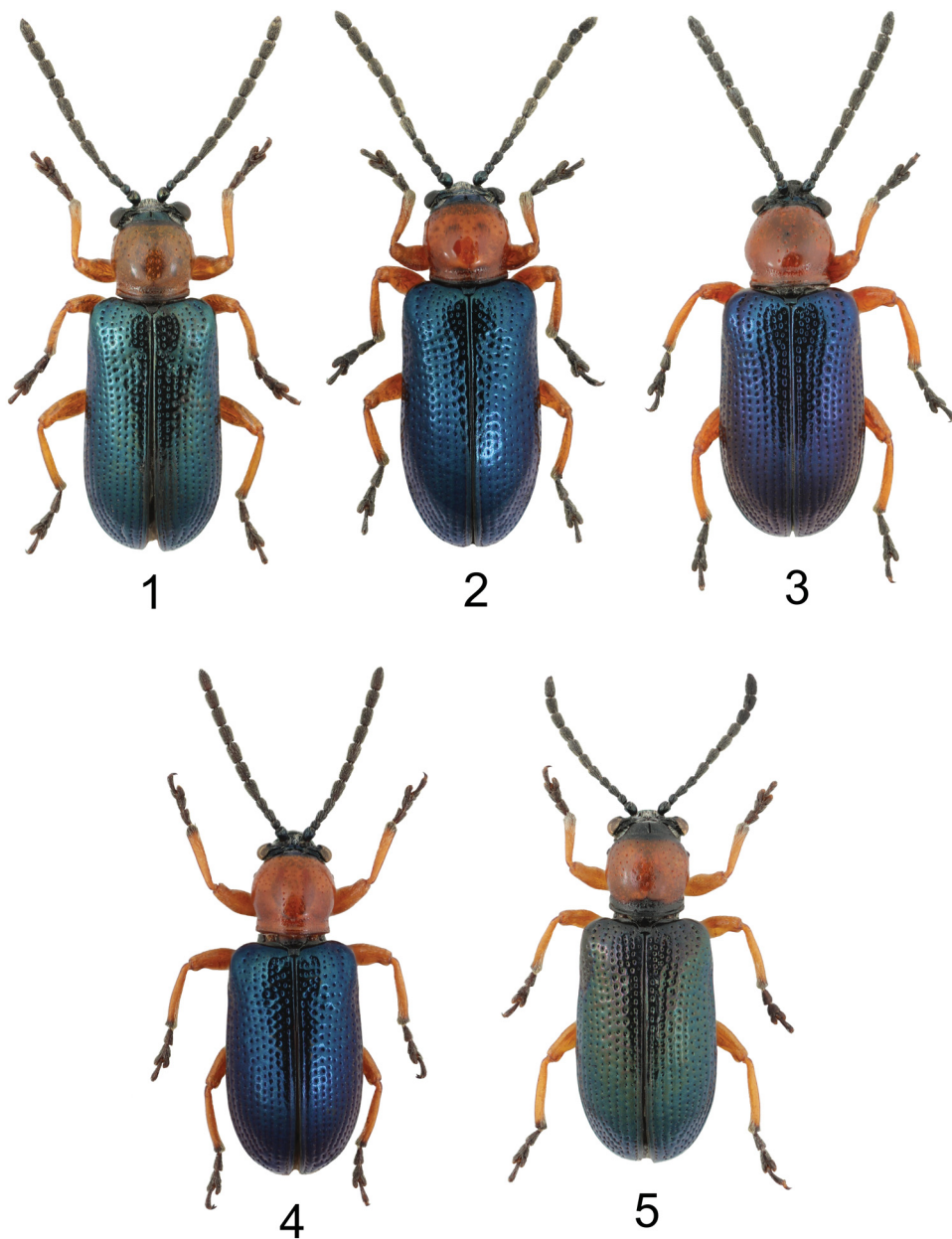
Additional material examined. **EUROPE:** **AUSTRIA:** NIEDERÖSTERREICH: Rossatz, 1 ♀ (NHMW). **BELGIUM:** Bruxelles, 3.ix.1882, 1 ♂ (MNHN). **BOSNIA AND HERZEGOVINA:** Ostrelj [= Oštrej], 1 ♂ (NMPC). **BULGARIA:** Nos Emine, 11.vii.1971, 1 ♂, Grulich leg. (MMBC). **CZECH REPUBLIC:** **MORAVIA:** Čejč, 8.v.1998, 1 ♂, J. Bezděk leg. (JBCB). **DENMARK:** Holbaek, 10.viii.1947, 1 ♂ (ZMUC). **FRANCE:** **CORSICA:** Corse, Ajaccio, 1 ♂ (NMPC). **SEINE-ET-MARNE:** Vosves, 9.iii.1913, 1 ♂ (NMPC). **GERMANY:** **BAVARN:** Günzburg, 1 ♂ (NMPC). **GREECE:** **CENTRAL MACEDONIA:** Agios Vasillios, Lake Koroneia near Thessaloniki, 13.x.2002, 1 ♂, Olejníček leg. (NMPC). **CORFU:** Gouvia, 1.vi.1981, 1 ♂, J. Olsson leg. (NHRS). **CRETE:** Creta, 1884, 1 ♂, Oertzen leg. (NHMW). **HUNGARY:** Budapest, Fenyőgyöngye, 4.v.1985, 1 ♂, O. Merkl leg. (HNHM). **ITALY:** **ELBA:** Elba Isl., 1908, 1 ♂, Paganetti leg. (NMPC). **RAVENNA:** Savio, 14.iv.1990, 1 ♂, I. Kovář leg. (NMPC). **SARDINIA:** Sardegna, v.1948, 1 ♀, M. Burlini leg. (NMPC). **SICILY:** Taormina, 27.iii.1970, 1 ♂, S. Erlandsson leg. (NHRS). **MACEDONIA:** Skopje, 25.vi.1954, 1 ♂, F. Schubert leg. (NHMW). **MACEDONIA/KOSOVO:** Ljuboten Mt., vi.1930, 1 ♂, Dr. Purkyně leg. (NMPC). **MONTENEGRO:** Herceg Novi, 1936, 1 ♂, A. Matějka leg. (NMPC). **POLAND:** Warszawa, 21.ii.1949, 1 ♂, R. Bielawski leg. (NMPC). **PORTUGAL:** **ALGARVE:** Monchique, 600 m, 7.iv.2004, 1 ♂ 1 ♀, F. Fritzlar leg. (FFCJ). **ROMANIA:** Retezat Mts., vii.1922, 1 ♂, Pfeffer leg. (NMPC). **RUSSIA:** **VOLGOGRAD:** Sarepta, 1 ♂ (MNHN). **SERBIA:** Fruška gora Mt., vi.1966, 1 ♂ (MMBC). **SLOVAKIA:** Zemplinská Nová Ves, 24.v.1990, 1 ♂, I. Kovář leg. (NMPC). **SLOVENIA:** Savinske Alpe, Logar valley, 700–1100 m, 21.–24.vi.2005, 1 ♀, J. Kolibáč leg. (MMBC). **SPAIN:** **ANDALUSIA:** Sevilla, 12.v.1991, 1 ♂, F. Kantner leg. (FKCC). **SWITZERLAND:** Vaud, Cheserex, 2.ix.1931, 1 ♂ 1 ♀, E. Roman leg. (MNHN). **UNITED KINGDOM:** **ENGLAND:** Wicken Fen, 1 ♂, H. L. Andrewes leg. (BMNH). **NORTH AFRICA:** **ALGERIA:** Batna, 1 ♂, Exp. Obenberger (NMPC). **CANARY ISLANDS:** Tenerife, S. Cruz, Pico de Oro, 1 ♂ (NMPC). **MADEIRA:** ‘Madeira’, 1 ♀ (BMNH). **MOROCCO:** Zagora env., 15.v.1997, 1 ♂, P. Průdek leg. (JBCB). **TUNISIA:** Ain el Hamaraya env., 20 km E of Ain Draham, 7.–8.vi.1994, 1 ♂, S. Bečvár leg. (JBCB). **ASIA:** **AFGHANISTAN:** **HERAT:** Bala Murghab, 470 m, 20.iii.–1.iv.1964, 1 ♂, O. Jakeš leg. (MMBC). **ARMENIA:** **ARMAVIR:** Markara, Arax river coast, 13.vii.2002, 1 ♂, M. Kalashian leg. (JBCB). **AZERBAIJAN:** Gobustan, 20.–22.vi.1986, 1 ♂ (NMPC). **CYPRUS:** **NORTHERN CYPRUS:** Kyrenia, Karavas, v.1973, 1 ♂, A. Pfeffer leg. (NMPC). **IRAN:** **OSTAN-E-KHORASAN:** Elburz Mts., 60 km E of Minudasht, 37°20'N, 56°01'E, 1280 m, 26.v.2007, 2 ♂♂, O. Šauša leg. (JBCB). **ISRAEL:** North Negev, Be'eri, 22.iv.1981, 1 ♂, Wewalka leg. (NHMW). **JORDAN:** ca 20 km N of Amman, 32°12.906'N 35°53.093'E, 19.v.2007, 1 ♂, J. Bezděk leg. (JBCB).

KAZAKHSTAN: ALMATY: Alma Ata, Medeo, 25.iv.1972, 1 ♂, A. Olexa leg. (NMPC). **LEBANON:** Beirut, 1878, 1 ♂, Appl leg. (NHMW). **SYRIA:** An Nasreh env., 8.–13.iv.2005, 2 ♂♂, M. Obořil leg. (JBCB). **TAJKISTAN:** Dushanbe env., 16.–18.vi.1981, 1 ♂, K. Majer leg. (BMNH). **TURKEY:** MERSIN: Aslanli, v.1994, 1 ♂, D. Hauck leg. (JBCB). **TURKMENISTAN:** Merw [= Mary], iv.1900, 1 ♂, Hauser leg. (NMPC).

Differential diagnosis. Both *O. melanopus* and *O. duftschmidi* share longer body (4.7–6.2 mm), elytra (3.2–4.1 mm), antennae (2.4–3.1 mm), longer antennomeres IV–VII (particularly noticeable in antennomeres V and VII where the length/width ratios are always more than 2.0) and length/width ratio of protarsomere I (at least 1.65), and these characters separate them from the other three European species as well. The respective measurements for *O. rufocyanea*, *O. mauroi* sp. nov. and *O. verae* sp. nov. do not exceed 4.6 mm (body length), 3.1 mm (length of elytra), 2.5 mm (length of antennae), up to 2.0 (length/width ratio of antennomere V), up to 1.8 (length/width ratio of antennomere VII) and up to 1.65 (length/width ratio of protarsomere I). *Oulema rufocyanea* and *O. mauroi* sp. nov. have also distinctly wider elytra (elytral length/width ratio 1.69–1.87) compared to the longer elytra in *O. melanopus* and *O. duftschmidi* (elytral length/width ratio 1.87–2.05).

Oulema duftschmidi is extremely similar to *O. melanopus*. Both species differ in the shape of flagellum (shorter and more robust in *O. melanopus*, longer and thinner in *O. duftschmidi*, cf. Figs 16–18) and in the junction of ductus spermathecae and bursa copulatrix (short and abruptly connected to finger-like process of bursa copulatrix in *O. melanopus*, long and gradually extended in *O. duftschmidi* (cf. Figs 26, 27).

Distribution. Europe: Albania (SCHMITT 2010), Andorra (SCHMITT 2010), Austria (SCHMITT & RÖNN 2011, present paper), Belarus (NESTEROVA 2006), Belgium (SCHMITT & RÖNN 2011, present paper), Bosnia and Herzegovina (present paper), Bulgaria (present paper), Czech Republic (STREJČEK 1993, present paper), Denmark (HANSEN 1994, present paper), Finland (CLAYHILLS 2014), France (incl. Corsica) (BERTI 1989, present paper), Germany (SCHMITT & RÖNN 2011, present paper), Greece (BERTI 1989, present paper), Greece (Crete, Corfu) (present paper), Hungary (POZSGAI & SÁRINGER 2004, present paper), Italy (BERTI 1989, present paper), Italy (Sicily) (BERTI 1989, present paper), Italy (Sardinia) (D'ALESSANDRO & BIONDI 2011, present paper), Italy (Elba) (present paper), Kosovo (present paper), Latvia (BUKEJS 2013), Liechtenstein (BRANDSTETTER & KAPP 1996), Lithuania (BUKEJS & FERENCA 2010), Macedonia (present paper), Malta (Mifsud, pers. comm.), Montenegro (present paper), Netherlands (WINKELMANN & BEENEN 2010), Norway (BEETLEBASE 2015), Poland (CHROBOK & BOROWIEC 1993, present paper), Portugal (present paper), Romania (BERTI 1989, present paper), Russia (European part) (BIENKOWSKI 2011, present paper), Russia (Kaliningrad region) (BUKEJS & ALEKSEEV 2009), Serbia (present paper), Slovakia (present paper), Slovenia (present paper), Spain (BERTI 1989, present paper), Spain (Balearic Isl.) (PETITPIERRE 2000), Sweden (SILFVERBERG 2004, 2010), Switzerland (KIENER 1995, present paper), United Kingdom (COX 1995, 2007, present paper), Ukraine (SERGEEV 2011). **North Africa:** Algeria (BERTI 1989, present paper), Canary Islands (BERTI 1989, present paper), Madeira (BERTI 1989, present paper), Morocco (BERTI 1989, present paper), Tunisia (BERTI 1989, present paper). **Asia:** Afghanistan (LOPATIN 1967, as *O. melanopus*; present paper), Armenia (NESTEROVA & LOPATIN 2002, present paper), Azerbaijan (present paper), China: Xinjiang (NESTEROVA & LOPATIN 2002), Cyprus (present paper), Iran (BERTI 1989, present paper), Israel (BERTI 1989, present paper), Jordan (present



Figs 1–5. Male habitus: 1 – *Oulema dufschmidi* (Retdenbacher, 1874) (4.6 mm); 2 – *O. melanopus* (Linnaeus, 1758) (4.5 mm); 3 – *O. rufocyanea* (Suffrian, 1847) (4.2 mm); 4 – *O. mauroi* sp. nov., holotype (4.4 mm); 5 – *O. verae* sp. nov., holotype (4.0 mm).



Figs 6–15. Male pronotum: 6 – *Oulema dufschmidi* (Redtenbacher, 1874); 7 – *O. melanopus* (Linnaeus, 1758); 8 – *O. rufocyanea* (Suffrian, 1847); 9 – *O. mauroi* sp. nov.; 10 – *O. verae* sp. nov. Left male antenna: 11 – *O. dufschmidi*; 12 – *O. melanopus*; 13 – *O. rufocyanea*; 14 – *O. mauroi* sp. nov.; 15 – *O. verae* sp. nov. .



Figs 16–23. Flagellum of aedeagus in lateral (upper) and dorsal (below) view: 16 – *Oulema duftschmidi* (Redtenbacher, 1874); 17 – *O. melanopus* (Linnaeus, 1758) (Czech Republic); 18 – *O. melanopus* (Suffrian, 1847) (Spain); 19 – *O. rufocyanea* (Slovakia); 20 – *O. rufocyanea* (Hungary); 21 – *O. rufocyanea* (Italy); 22 – *O. mauroi* sp. nov.; 23 – *O. verae* sp. nov. Scale bar: 0.5 mm.

paper), Kazakhstan (present paper), Kyrgyzstan (NESTEROVA & LOPATIN 2002), Lebanon (present paper), Syria (BERTI 1989, present paper), Tajikistan (NESTEROVA & LOPATIN 2002, present paper), Turkey (ÖZDIKMEN & ÖZBEK 2014, present paper), Turkmenistan (NESTEROVA & LOPATIN 2002, present paper), Uzbekistan (NESTEROVA & LOPATIN 2002).

LOPATIN (1967) published a series of *O. melanopus* from Afghanistan, but the voucher specimens deposited in MMBC proved to be *O. duftschmidi*. We do not know the original data on occurrence of *O. duftschmidi* in Albania and Andorra as listed by SCHMITT (2010) but due to the confirmed occurrence in adjacent countries we consider the occurrence highly probable.

Comments. *Lema cyanipennis* Duftschmid, 1825 was described from Vienna and its true identity cannot be recognized from the original description. Duftschmid's collection is deposited in the Linz museum. Unfortunately, the specimens are dispersed in the historical collection and their labels were removed, thus it is impossible to recognize the true Duftschmid's specimens (cf. GUSENLEITNER 1984).

Lema cyanipennis Duftschmid, 1825 is a junior primary homonym of *Lema cyanipennis* Fabricius, 1801: 472 (described from Sumatra). REDTENBACHER (1874) explicitly proposed *Lema duftschmidi* as a new substitute name. The identity of both *Lema cyanipennis* Duftschmid, 1825 and *Lema duftschmidi* was fixed by a neotype designation for *Lema duftschmidi* Redtenbacher, 1874 by BERTI (1989).

Oulema melanopus (Linnaeus, 1758)

(Figs 2, 7, 12, 17–18, 27)

Chrysomela melanopus Linnaeus, 1758: 376 (original description).

= *Crioceris melanopoda* O. F. Müller, 1776: 85 (original description).

= *Crioceris hordei* Geoffroy, 1785 in FOURCROY (1785): 95 (original description).

= *Crioceris azurea* Voet, 1806: 37 (unavailable name).

= *Lema cyanella* var. *atrata* Waltl, 1835: 81 (original description).

= *Lema melanopa* var. *nigricans* Westhoff, 1882 (original description).

= *Lema melanopa* var. *waltli* Heinze, 1927 (new substitute name for *atrata* Waltl, 1835).

Type localities. *Chrysomela melanopus*: 'Europa'. *Crioceris melanopoda*: 'Denmark, Sjaelland / Føllenslev' [neotype], not stated in original description. *Crioceris hordei*: 'Paris, Montrouge' [neotype], ['Paris', in original description]. *Lema cyanella* var. *atrata*: 'Málaga, Ronda' [neotype], ['Andalusiens', by the title of original description]. *Lema melanopa* var. *nigricans*: 'Münster' [in original description].

Type material. *Chrysomela melanopus*: The photographs of a lectotype (male, designated by BERTI 1989), labelled: 'melanopus [w, h] // 105 [w, p]' and 1 paralectotype (female), without any labels, both deposited at The Linnean Society, London, UK, are available at <http://www.linnean.org/Library-and-Archives/online-collections.htm>.

Crioceris melanopoda: NEOTYPE (designated here): ♂, 'Sjaelland / Føllenslev / 18-8-1990 / H. Hendriksen [w, h] // NEOTYPUS, / *Crioceris melanopoda* / O. F. Müller, 1776 / des. J. Bezděk & / A. Baselga, 2014 [r, p] // *Oulema melanopus* / (Linnaeus, 1758) / J. Bezděk det. 2014 [w, p]' (ZMUC).

Crioceris hordei: NEOTYPE (designated here): ♂, 'FRANCE, Paris, / Montrouge (14e distr.) / 28.v.2014, / J.-D. Chapelin-Viscardi leg. [w, p] // NEOTYPUS, / *Crioceris hordei* / Geoffroy, 1785 / des. J. Bezděk & / A. Baselga, 2014 [r, p] // *Oulema melanopus* / (Linnaeus, 1758) / J. Bezděk det. 2014 [w, p]' (MNHN).

Lema cyanella var. *atrata*: NEOTYPE (designated here): ♂, 'HISPANIA Málaga Ronda / 30/05/1983 Sierra Nieves / Cortijo Quejigales / 1250m, G. Bastazo leg. [w, p] // NEOTYPUS, / *Lema cyanella* var. *atrata* / Waltl, 1835 / des. J. Bezděk & / A. Baselga, 2014 [r, p] // *Oulema melanopus* / (Linnaeus, 1758) / J. Bezděk det. 2014 [w, p]' (MNCN).

Lema melanopa var. *nigricans*: Not examined. Not found in Westhoff's collection in Münster.

Additional material examined. **EUROPE:** **ALBANIA:** Starova, Koritza env., 1918, 1 ♀, Vuillaume leg. (MNHN). **AUSTRIA:** NIEDERÖSTERREICH: Pitten, 25.vii.1973, 1 ♂, P. Magrini leg. (MMCM). **BELGIUM:** Bruxelles, 14.ix.1890, 2 ♂♂ (MNHN). **BOSNIA AND HERZEGOVINA:** Trebević Mt., v.1907, 1 ♂, Dr. Lokay leg. (NMPC). **BULGARIA:** Harmanli, 17.vii.1991, 1 ♂, V. Kubán leg. (JBCB). **CROATIA:** Plitvice, 1.vi.1987, 1 ♂, Z. Malinka leg. (ZMCO). **CZECH REPUBLIC:** **MORAVIA:** Hranice-Drahotuše, 3.v.1997, 1 ♂, J. Bezděk leg. (JBCB). **DENMARK:** **SJAELLAND:** Lillerød øst, 2.v.1986, 3 ♂♂, H. Hendriksen leg. (ZMUC). **FINLAND:** 'Finland', 1 ♀ (MNHN). **FRANCE:** **RHÔNE-ALPES:** Haute-Savoie, Viry, 1 ♂, J. Hamon leg. (MNHN). **GERMANY:** **BADEN-WÜRTTEMBERG:** Leingarten, 11.x.1998, 1 ♂, D. Borisch leg. (NHRS). **GREECE:** **CENTRAL MACEDONIA:** Litokhoro env. [= Litochoro], 28.–30.iv.1989, 1 ♂, J. Ježek leg. (NMPC). **RHODOS:** 'Rhodus', 1 ♀, Hedeberg leg. (NHRS). **HUNGARY:** **SOMOgy:** Siófok, 1 ♂, Lichtneckert leg. (HNHM). **ITALY:** **SICILY:** Ficuzza, 1 ♂, Holdhaus leg. (NHMW). **TOSCANA:** Gabbro, 5.vii.1990, 1 ♂, D. Sassi leg. (DSCM). **MOLDOVA:** Vall. du Berlad, 1 ♂ 2 ♀♀, A. L. Montandon leg. (MNHN). **ROMANIA:** București, 1 ♀, Montandon leg. (MNHN). **RUSSIA:** **SAMARA:** Tockoye, 1917, 2 ♀♀, Dr. Jureček leg. (NMPC). **SERBIA:** Kragujevac, 4.iv.1992, 1 ♀, M. Rozsival leg. (JBCB). **SLOVAKIA:** Gemerský Jablonec, 4.vii.1994, 1 ♂, J. Bezděk leg. (JBCB). **SLOVENIA:** Litija env., Zgornji Hotič, 4.–5.vii.1999, 1 ♂, Z. Malinka leg. (ZMCO). **SPAIN:** **ANDALUSIA:** Nigüelasa, 19.iv.1995, 1 ♂, P. Průdek leg. (JBCB). **SWEDEN:** Uppsala, 10.iv.1954, 1 ♂, O. Lundblad leg. (NHRS). **SWITZERLAND:** autostrada Bern, Parc Lindenerin, 23.viii.1996, 1 ♀, P. Montemurro leg. (MMCM). **UNITED KINGDOM:** **ENGLAND:** Cumbria, Silecroft, 16.viii.1980, 1 ♂, R. W. J. Read leg. (BMNH). **NORTH AFRICA:** **MOROCCO:** Pilote vill., near Khemisset, 19.v.1997, 1 ♂, P. Průdek leg. (JBCB). **ASIA:** **GEORGIA:** Sukhumi, 10.viii.1976, 1 ♀, J. Pradáč leg. (NMPC). **RUSSIA:** **FAR EAST:** Primorský kray, Lazovskí zapovednik, Lazo, 1375 m, 2.vi.–3.vii.2001, 1 ♂, M. Quest leg. (BMNH). **SYRIA:** Slinfah env., 700–1000 m, 29.v.–3.vi.2007, 1 ♀, L. Saltini leg. (DSCM). **TURKEY:** 'Anatolie', 1888, 1 ♀, C. Delagrangé leg. (NMPC). **NORTH AMERICA (established):** **UNITED STATES:** **MICHIGAN:** Galien, 25.vi.1963, 1 ♂ (NHRS).

Differential diagnosis. See diagnosis under *O. duftschmidi*.

Comments. *Crioceris melanopoda* is missing in many publications on *Oulema*. If present, it is mentioned without any comments under *O. melanopus* (e.g. BERTI 1989), or considered an unjustified emendation of *O. melanopus* (PETITPIERRE & ALONSO-ZARAZAGA 2000), or its synonym (RILEY et al. 2003, SCHMITT 2010). We cannot agree with BERTI's (1989) and PETITPIERRE & ALONSO-ZARAZAGA's (2000) opinions. In all previously described species MÜLLER (1776) strictly gave a reference to the description, but in *Crioceris melanopoda* such reference is missing. In accordance with WELTER-SCHULTES (2013) we consider *Crioceris melanopoda* a validly described species. The type locality of *Crioceris melanopoda* is not specified in the original description. BERTI (1989) mentioned 'Hartouk' as its type locality but her interpretation is evidently false, as she mistakenly used page number instead of serial number to find the locality name in index. In order to prevent the nomenclatorial instability in *O. melanopus* species group, a neotype conspecific with *O. melanopus* originated from Denmark where Müller lived and frequently collected is designated for *Crioceris melanopoda*.

Crioceris hordei is listed in synonymy with *O. melanopus* in OLIVIER (1791, 1808), LA-CORDAIRE (1845), KITTEL (1883) or PETITPIERRE & ALONSO-ZARAZAGA (2000). Because neither Geoffroy's or Fourcroy's collection exists, its true identity is unknown. In order to prevent the nomenclatorial instability in *O. melanopus* species group, a neotype conspecific with *O. melanopus* is designated for *Crioceris hordei*.

Crioceris azurea is an unavailable name. VOET (1806) did not consistently apply the principle of binominal nomenclature, thus his work does not meet the criteria of availability (cf. WHITE 1981, LÖBL & SMETANA 2011). The citation of 'azurea' Voet in synonymy with *O. melanopus* by GEMMINGER & HAROLD (1874: 3257) and KITTEL (1883) does not validate the name *azurea* (Art. 11.6 of ICZN).

Although ‘var. *atrata*’ was described as a variety of *Lema cyanella* (species with completely metallic blue dorsum), there is no doubt that, due to its red pronotum, it belongs to the *Oulema melanopus* group. Waltl’s collection is deposited in NHMW but the relevant type specimens were not found either there or in ZMHB where some Waltl’s types are also deposited (Schillhammer 2013, pers. comm.; Willers 2013, pers. comm.). To prevent the instability of the *O. melanopus* group nomenclature, a neotype, conspecific with *Oulema melanopus*, is designated for *Lema cyanella* var. *atrata*. Due to the primary homonymy with *Lema atrata* Fabricius, 1801 (South America), a new substitute name *Lema melanopa* var. *waltli* was proposed by HEINZE (1927).

WESTHOFF (1882) described *Lema melanopa* var. *nigricans* and attributed it to Suffrian. After checking all Suffrian’s publications this taxon was not found, and in accordance with all subsequent catalogues Westhoff has to be treated as its author. The type material was not found either in Westhoff’s collection in Münster (Terlutter 2014, pers. comm.) or in MLUH (Schneider 2014, pers. comm.). A neotype is not designated due to lack of available specimens with black elytra originated from Münster or its vicinity.

Distribution. Europe: Albania (BERTI 1989, present paper), Andorra (SCHMITT 2010), Austria (SCHMITT & RÖNN 2011, present paper), Belarus (NESTEROVA 2006), Belgium (SCHMITT & RÖNN 2011, present paper), Bosnia and Herzegovina (present paper), Bulgaria (present paper), Croatia (present paper), Czech Republic (BENEDIKT 2011, present paper), Denmark (HANSEN 1994, present paper), Estonia (BUKEJS 2012), Finland (SILFVERBERG 2010, present paper), France (BERTI 1989, present paper), France (Corsica) (BERTI 1989), Germany (SCHMITT & RÖNN 2011, present paper), Greece (present paper), Greece (Rhodos) (present paper), Hungary (POZSGAI & SÁRINGER 2004, present paper), Ireland (COX 2007), Italy (SCHMITT & RÖNN 2011, present paper), Italy (Sicily) (present paper), Latvia (BUKEJS 2013), Liechtenstein (BRANDSTETTER & KAPP 1996), Lithuania (BUKEJS & FERENCA 2010), Luxembourg (SCHMITT 2010), Malta (CAMERON & CARUANA GATTO 1907), Macedonia (SCHMITT 2010), Moldova (present paper), Netherlands (WINKELMAN & BEENEN 2010), Norway (SILFVERBERG 2010), Poland (CHROBOK & BOROWIEC 1993), Portugal (SCHMITT 2010), Romania (BERTI 1989, present paper), Russia (European part) (BIENKOWSKI 2011, present paper), Serbia (present paper), Slovakia (present paper), Slovenia (present paper), Spain (BERTI 1989, present paper), Sweden (SILFVERBERG 2010, present paper), Switzerland (SCHMITT & RÖNN 2011, present paper), United Kingdom (COX 2007, present paper), Ukraine (SERGEEV 2011). **North Africa:** Morocco (BERTI 1989, present paper). **Asia:** Armenia (SCHMITT 2010), Azerbaijan (SCHMITT 2010), Georgia (present paper), Iran (BERTI 1989), Iraq (SCHMITT 2010), Israel (SCHMITT 2010), Kazakhstan (BIENKOWSKI 2011), Kyrgyzstan (BIENKOWSKI 2011), Lebanon (BERTI 1989), Russia (Far East) (MIKHAILOV & CHASHCHINA 2009, present paper), Russia (Siberia) (SCHMITT 2010), Syria (BERTI 1989, present paper), Turkey (ÖZDIKMEN & ÖZBEK 2014, present paper). **North America** (introduced, established): Canada (LESAGE et al. 2007), United States (WHITE 1993, present paper).

MIKHAILOV & CHASHCHINA (2009) newly recorded *O. melanopus* from the Far East of Russia but the examination of flagellum was not explicitly noted. Correct identification of the specimens based on the shape of the flagellum was confirmed by Yuri Mikhailov (2014, pers. comm.). We did not examine any specimens from Andorra, Armenia, Azerbaijan, Luxembourg, Malta, Macedonia, Portugal, Iraq, Israel, Siberia, and Tajikistan – countries listed for *O. melanopus* by SCHMITT (2010). However, because *O. melanopus* is confirmed in

adjacent countries we consider the occurrence there highly probable. On the other hand, the occurrence in the Canary Islands, Madeira Archipelago, Libya, Cyprus (SCHMITT 2010), Algeria (e.g. ROZNER & ROZNER 2013), Tunisia (e.g. MAICAN 2007) and India (Kashmir) (HUSSAIN & AHMAD 2006) should be confirmed and may refer to *O. duftschmidi*. Especially from the Canary Islands and North African countries (except Morocco) we examined large series of specimens of *O. duftschmidi* but no specimen of *O. melanopus*. The occurrence of *O. melanopus* in Afghanistan as listed by SCHMITT (2010) was very probably based on the specimens published by LOPATIN (1967) – the voucher specimens deposited in MMBC proved to be *O. duftschmidi*. The distribution in some eastern Palaearctic countries is unclear. SCHMITT (2010) listed *O. melanopus* also from China, Mongolia and Japan, but we don't know any published paper where the genitalia of the specimens from these countries were examined. The occurrence in Japan is doubtful, the old data on *O. melanopus* refer to *Oulema oryzae* (Kuwayama, 1931) (see KIMOTO & TAKIZAWA 1994). From Mongolia it was recorded by LOPATIN (1977) and commented by MEDVEDEV (1982) but the correct identity is unknown, as it might refer either to *O. melanopus* or *O. duftschmidi*. The same can be said for the records from China.

Oulema rufocyanea (Suffrian, 1847)

(Figs 3, 8, 13, 19–21, 28)

Lema rufocyanea Suffrian, 1847: 100 (original description).

Type locality. Not stated in the original description, 'Kärnten' [= Carinthia; based of on the catalogue of Suffrian's collection].

Type material. HOLOTYPE: ♀, '30066 [b, h] // *Oulema rufocyanea* / (Suffrian) / Paralectotypus [sic!, for explanation see above] / M. Schmitt, design. [r, h]' (MLUH).

Additional material examined. **EUROPE:** **AUSTRIA:** 'Austria, Walt', 1 spec. unsexed (MNHN). **NIEDERÖSTERREICH:** Mödling, 1 ♀, Scheerpeltz leg. (NMP); Sparbach bei Mödling, viii.1913, 1 spec. unsexed, J. Grätz leg. (NHMW, coll. Franz); Prater, 1 ♂, Dr. Knirsch leg. (NHMW, coll. Kühnelt); Bisamberg, 1 ♂, Dr. Knirsch leg. (NHMW, coll. Kühnelt); Wienerwald, 1 spec. unsexed (NHMW); Leithagebirge, Winden, 1 spec. unsexed, H. Franz leg. (NHMW, coll. Franz); Oberweiden, 1 spec. unsexed, Pachole leg. (NHMW, coll. Franz); Vöslau, 1 spec. unsexed, Paganetti leg. (NHMW); Rekawinkel, 1890, 1 spec. unsexed, Ganglbauer leg. (NHMW). **ÖBERÖSTERREICH:** 'Oberösterreich, Kreuze' [= Kreuzen?], 1 spec. unsexed (NHMW, coll. Franz). **STEIERMARK:** 'Styria', 2 ♂♂ (NMP); Toblbach, 1 ♂ (MSNV); Graz Umgebung, 1 ♂ (MSNV); Graz env., 1 ♂ (MSNM). **TIROL:** Reutte, Breitenwang, Steeger Berg, 900 m, 28.vi.1992, 1 ♂, D. Siede leg. (DSCR); Breitenwang, Stegerberg, 28.vii.1994, 1 ♂, M. Bergeal leg. (MSNM); Reutte, 29.vii.1991, 1 ♂, M. Bergeal leg. (MSNM); Innsbruck, Arzl, 31.i.1965, 1 ♂, 2 spec. unsexed, H. Kippenberg leg. (HKCH). **KÄRNTEN:** Villach, Eichholzgraben, 1 ♀, A. Sazmaier leg. (MSNM). **BOSNIA AND HERZEGOVINA:** Brčko: Brčka [= Brčko], 1 ♀ (NMP). **BULGARIA:** Rila, vi.1929, 2 ♀♀, Pfeffer leg. (NMP). **CROATIA:** ISTRIA: 10 km N of Buzet, near Slum, 550 m, 30.iv.–2.v.2010, 1 ♂, A. Kotán, T. Németh & K. Székely leg. (HNHM). **POŽEGA-SLAVONIA:** Pakrac, 1 ♀, Apffelbeck leg. (HNHM). **CZECH REPUBLIC:** **BOHEMIA:** Sv. Prokop [= Praha-Prokopské údolí], 1 ♂ (NMP); Lány, 35 km W of Prague, 2 ♂♂ (NMP). **MORAVIA:** Rovečín [= Rovečné], 1 ♀ (NMP). **FRANCE:** **RHÔNE-ALPES:** Vuache hill, 1 ♂, 5.v.1951 (MHNG). **SARTHE:** La Fresnaye, v.1929, 1 ♂, H. Coiffait leg. (MNHN). **AISNE:** Chierry, iv.1910, 1 ♀, Bedel leg. (MNHN). **MEURTHE-ET-MOSELLE:** Manonville, 1929, 1 ♀, J. Briel leg. (MNHN). **GERMANY:** 'Allemagne', 1 spec. unsexed (MNHN). **BAYERN:** Günzburg, 1 ♂ (NMP); 'Fränkische Schweiz', 1 ♂, G. Vetter leg. (MSNV). **GREECE:** Peristeri, Pindos Mts., 1 ♂ (NMP). **HUNGARY:** **BARANYA:** Mecsek, Zobákpuszta, Hidas-völgy, 27.v.1954, 1 ♂, Z. Kaszab leg. (HNHM). **GYŐR-MOSON-SOPRON:** Győr-Abda, 3.vii.1951, 1 spec. unsexed, O. Dely leg. (HNHM). **KOMÁROM-ESZTERGOM:** Esztergom, 1 spec. unsexed, E. Bokor leg. (HNHM); Legénd, 1 spec. unsexed, Tunkl leg. (HNHM). **PEST:** Davas, Gyón, 1 ♂, 9.vi.2012, O. Merkl leg. (HNHM); Budapest, 1 spec. unsexed, Gurányi leg. (HNHM); Pécel, 1 spec. unsexed, Csiki leg. (HNHM); Piliscsaba, vi.1903, 1 spec. unsexed, Wachsman leg. (HNHM). **SOMOgy:** Bonnya, 1 spec. unsexed, V. Stiller leg. (HNHM); Zamárdi, 26.v.1953, 1 spec.

unsexed, É. Kovács leg. (HNHM). **SZABOLCS-SZATMÁR-BEREG:** Nyírség, Bátorliget, 7.–19.vi.1949, 1 spec. unsexed, Kaszab & Székessy leg. (HNHM); same data, 25.vi.–3.vii.1949, 1 spec. unsexed (HNHM). **TOLNA:** Dombóvár, 10.iii.1947, 1 ♂, Gebhardt leg. (HNHM). **VAS:** Kőszegi Hills, 20.–22.v.1936, 1 ♂, Exc. Inst. Zool. Syst. Univ. Budapest leg. (HNHM). **VESZPRÉM:** Pét [= Pétfürdő], 1 spec. unsexed, Lichtneckert leg. (HNHM); Bakonybél, 1 spec. unsexed, Wachsmann leg. (HNHM). **ITALY:** ‘Italia’, 1 ♂ (BMNH). **ABRUZZO:** Gran Sasso, Prati di Tivo, 1450 m, 26.–27.viii.1996, 1 ♀, P. Montemurro leg. (MMCM). **BASILICATA:** Lucania, M. Vulture, vii.1960, 1 ♂ (MSNV). **CAMPANIA:** Omignano sc. (Cilento), v.1965, 1 ♀ (MSNV). **FRIULI-VENEZIA GIULIA:** Monfalcone, 1 ♂, Reitter leg. (HNHM); Trieste, Sgonico, 16.iv.1993, 1 ♂, F. Fritzlär leg. (FFCJ); Isonzo, Papaveriana, 2.ii.1952, 1 ♀, Springer leg. (MSNM); Doberdo del Lago, 30.vi.1946, 1 ♀, Sauli leg. (MSNM); Gorizia, 28.viii.1940, 1 ♀, Springer leg. (MSNM); dint. Samatorza, 8.vi.2009, 1 ♀, L. Diotti leg. (DSCM). **LIGURIA:** Genova, S. Eusebio, 12.iv.1936, 1 ♂ 1 ♀, F. Solari leg. (MSNV); Genova, 1 ♂, A. Baliani leg. (MSNV); Genova, v.1946, 1 ♂, A. Festa leg. (MSNV); Genova, v.1928, 1 ♂ (NMPC); Savona, Finale L., S. Bernardino, 19.vi.1992, 1 ♀, R. Regalin leg. (RRCM); Savona, Finale L., Perti, 23.iv.1994, 1 ♂ 1 ♀, R. Regalin leg. (RRCM); Monti di Alassio, S. Bernardo, 400 m, 1.vi.1960, 1 ♀, Liberti leg. (MSNV). **MOLISE:** Guardiaregia, Matese, vi.1962, 1 ♂ 1 ♀ (MSNV). **TOSCANA:** Alpi Apuane, Reseto (MS), 8.vii.1977, 1 ♂, M. Daccordi leg. (MDCV). **UMBRIA:** Marche, Monti Sibillini, Pendici Sibilla, vi.1955, 1 ♀ (MSNV). **KOSOVO:** PEJA: Rugova, Žleb Mts., 700–2000 m, 16.v.1971, 1 ♂, Papp & Horvatovich leg. (HNHM); Radavac, 700 m, 17.v.1971, 1 ♂ 1 ♀, 1 unsexed, Papp & Horvatovich leg. (HNHM). **MACEDONIA:** Skopje, vii.1914, 1 ♀, J. Matcha leg. (NMPC). **MONTENEGRO:** Fort Vermač [42°25'15"N 18°44'57"E, near Tivat], 1 ♂ (NMPC); Plužine, 1 ♀, Grabowski leg. (HNHM). **ROMANIA:** CARAȘ-SEVERIN: Herkulesbad [= Băile Herculane], 1 spec. unsexed, Wingelm. leg. (NHMW); Herkulesbad [= Băile Herculane], 1895, 2 spec. unsexed, Ganglbauer leg. (NHMW). **HARGHITA:** Tusnád [= Tușnad], 1 ♂, Kuthy leg. (HNHM). **MUREȘ:** Mezö Záh Tr. [= Zau de Câmpie], 1 ♂ (MSNV); Mezö Záh [= Zau de Câmpie], 1 spec. unsexed, Horváth leg. (HNHM); Várhegy [= Chinari], 2 ♂♂ 1 ♀ (MSNV). **SLOVAKIA:** Muráň, Dolinský potok [stream] valley, 16.v.2013, 2 ♀♀, M. Ouda leg. (MOCP); Muráň, 13.v.2004, 1 ♂, M. Mantič leg. (JBCB); Zadielská dolina, 1 ♀, A. Hoffer leg. (NMPC); Slovenský Ráj, 1 ♀, Wadas leg. (NMPC); Losonc [= Lučenec], 1 spec. unsexed, Gy. Fekete leg. (HNHM). **SLOVENIA:** LITTORAL: Bressenza [= Prešnica], 21.vi.1945, 1 ♀ (MSNV); Heidenschaft [= Ajdovščina], 5.vi.1913, 1 ♀, Springer leg. (MSNM); Predmeja, 9.vii.1933, 1 ♂, Springer leg. (MSNM); Schön-pass [= Šempas], 16.vii.1910, 1 ♂, Springer leg. (MSNM). **UPPER CARNIOLIA:** Bled env., 2003, 2 ♀♀, M. Sieber leg. (FFCJ); Koritno-Saya, 23.vii.1996, 1 ♂, B. Drovenik leg. (DSCR); Wochein [= Bohinj], 1 ♀, Schmidl leg. (MSNV). **SWITZERLAND:** BERN: Grindelwald, 1 spec. unsexed, Haag leg. (HNHM). **FRIBOURG:** Gruyères, 1 ♂, De Buffévent leg. (MNHN). **GENEVA:** Chancy, 3.v.1959, 1 ♂, C. Besuchet leg. (MHNG). **GRAUBÜNDEN:** Unter Engadin [valley], Tarasp, Anfang [= beginning of] vi.1905, 1 spec. unsexed (NMPC). **VAUD:** Cheserex, 10.iii.1939, 1 ♂, E. Roman leg. (MNHN); Chesières, 7.–13.vi.1897, 1 ♂ (NMPC); Chesières, 22.–24.v.1899, 1 spec. unsexed (NMPC). **ZÜRICH:** Zürich, 24.–29.vi.1901, 1 spec. unsexed (NMPC). **UKRAINE:** VOLYN: Olyka, 1 ♀, Biró leg. (HNHM). **ASIA: TURKEY:** ANKARA: Beynam, 28.vi.1947, 1 ♂, National Museum Prague expedition (NMPC).

Differential diagnosis. *Oulema rufocyanea* differs from *O. melanopus* and *O. duftschmidi* in wider elytra (elytral length/width ratio 1.71–1.87 in *O. rufocyanea*, 1.87–2.05 in *O. melanopus* and *O. duftschmidi*), shorter antennomeres V and VII with length/width ratio about 1.9 and 1.7 respectively (more than 2.0 in *O. melanopus* and *O. duftschmidi*) (cf. Figs 11–13) and shorter protarsomere I (length/width ratio 1.30–1.60 in *O. rufocyanea*, 1.65–2.00 in *O. melanopus* and *O. duftschmidi*). Additionally, elytra are often of dark pure blue metallic colour in *O. rufocyanea*, while elytra of *O. melanopus* and *O. duftschmidi* are of slightly paler blue. In absolute measurements, *O. rufocyanea* is, on average, smaller (4.0–4.6 mm) with shorter antennae (2.2–2.4 mm), while *O. melanopus* and *O. duftschmidi* are larger (*O. melanopus* 4.5–6.2 mm, *O. duftschmidi* 4.2–5.7 mm) with longer antennae (2.3–3.1 mm).

Based on the habitus, it is impossible to separate *Oulema rufocyanea* and *O. mauroi* sp. nov. Both species share widely overlapping absolute measurements and ratios (see Tab. 1). They differ in the structure of flagellum which is extremely thin in *O. mauroi* sp. nov. but

more robust in *O. rufocyanea*. It is necessary to note that the shape of flagellum of *O. rufocyanea* slightly varies throughout its range. Variation includes the degree of bend in lateral view and the width of basal part in dorsal view (for examples see Figs 19–21). The proximal part of ductus spermathecae in *O. rufocyanea* forms one simple coil, distal part is gradually slightly extended towards bursa copulatrix. In *O. mauroi* sp. nov. the proximal part of ductus spermathecae has three coils and distal part is slightly extended in the middle (Figs 28–29).

Oulema rufocyanea differs from *Oulema verae* sp. nov. in the basal margin of pronotum, which is widely darkened in the latter, and in the shapes of flagellum and spermathecal structure.

Host plants. Unknown. The only host plants, *Lamium* spp. (Lamiaceae), were published by ROZNER & ROZNER (2008) from Macedonia. However, as other species of this group are associated with Poaceae, the occurrence on *Lamium* is uncertain and should be verified.

Comments. All taxonomical and nomenclatural problems concerning *O. rufocyanea* are described above in introduction and results.

Distribution. Europe: Austria (present paper), Bosnia and Herzegovina (GRUEV 2005, present paper), Bulgaria (present paper), Croatia (GRUEV 2005, present paper), Czech Republic (BEZDĚK 2003, present paper), France (present paper), Germany (present paper), Greece (present paper), Hungary (POZSGAI & SÁRINGER 2004, present paper), Italy (GRUEV 2005, present paper), Kosovo (present paper), Macedonia (ROZNER & ROZNER 2008, present paper), Montenegro (present paper), Netherlands (WINKELMAN & BEENEN 2010), Romania (MAICAN 2005, present paper), Serbia (GRUEV 2005), Slovakia (BEZDĚK 2003, present paper), Slovenia (present paper), Switzerland (present paper), Ukraine (present paper). **Asia:** Turkey (present paper).

In the Palearctic Catalogue (SCHMITT 2010), *O. rufocyanea* is listed also from Belgium, Denmark, Ireland, Poland, and Sweden. The occurrence in Belgium is possible due to the confirmed specimens in adjacent countries. The occurrence in Ireland is probably based on misidentification; COX (2007) shows the data on *O. melanopus* for Ireland only. Also the distribution in Denmark and Sweden is doubtful and probably based on misidentification with *O. duftschmidi*. The occurrence of *O. rufocyanea* in Poland needs verification as the only existing old record is doubtful (BOROWIEC et al. 2011).

Oulema mauroi sp. nov.

(Figs 4, 9, 14, 22, 24, 29, 31)

Type locality. Italy, Trentino-Alto Adige Region, Avio.

Type material. HOLOTYPE: ♂, 'TRENTINO / Val Lagarina [p] / Avio. 15.VI.950 [w, h] // Massa.- / struscio [reverse of previous label] // rufocyanea / Suffr. [w, h] // ex coll. / Brasavola [pale green, p]' (MSNV). PARATYPES: **ITALY:** **TRENTINO-ALTO ADIGE:** 1 ♂, 'Avio Trentino [p] / Massa 8.V. [w, h] // con lo / struscio [reverse of previous label] // ex coll. / Brasavola [pale green, p]' (MSNV); 1 ♂, 'TRENTINO [p] / Avio / 18.VI.948 [w, h] // Massa / Struscio [reverse of previous label] // ex coll. / Brasavola [pale green, p]' (MSNV); 1 ♀, 'TRENTINO [w, p] // Avio. 15.5 / Massa [reverse of previous label] // ex coll. / Brasavola [pale green, p]' (MSNV); 1 ♂, 'Avio Trentino [p] / Massa 10.V [w, h] // struscio [reverse of previous label] // Oulema / rufocyanea / Suff. / det. [h] Daccordi [p] '84 [w, h]' (HNHM); 1 ♀, 'Toblino / Trento, 300m / 11.9.67 Hbth [w, p] // Oulema / rufocyanea (Suff.) / det. Kippenberg 88 [w, h]' (DSCR); 2 ♀♀, 'I. Trentino / Pietramurata [w, h] // Sarca, 14.VI.69 / Kippenberg [w, h] // Oulema [p] / rufocyanea (Suff.) [h] / d. Kippenberg [w, p]' (HKCH). **VENETO:** 1 ♂, 'Novaglie (VR) / 25-IV-1970 [h] / leg. Daccordi Mauro [w, p] // COLLEZIONE / M. DACCORDI [pale blue, p]' (MDCV); 1 ♂, 'Italia 9.7. / Teolo 1962 / Dlabola [w, p]' (NMPC); 1 ♂, 'Ital., Lago di Garda / Torri del Benaco / Albisano, Spighetta / 21.07.1998 D. Siede [w, p] // Lema / rufocyanea

[h] / det. D. Siede 1988 [w, p]' (DSCR); 1 ♀, 1 spec. unsexed, same data as preceding but 25.07.1998 (DSCR); 1 ♀, 'Prealpi Venete / dint. Marostica / IV – 72 [w, h] // COLLEZIONE / DACCORDI [w, p] // MUSEO MILANO [w, p]' (MSNM); 2 ♂♂, 'VENETO [p] VR / Fumane / 19/VI/1983 [h] / I. M. Rizzotti V. [w, p] // *Oulema / rufocyanea* [h] / det. M. Daccordi 19 [w, p] / COLLEZIONE / DACCORDI [w, p] // MUSEO MILANO [w, p]' (MSNM). **LOMBARDIA**: 1 ♂, 'GALBIATE (LO) / 12.V.1978 / lg. Spreatico [w, p]' (DSCM); 1 ♂ 1 ♀, 2 spec. unsexed, 'Lombardia ITA / Mt. Grigna 14-VI-12 / Somana Lg. D. Sassi [w, p]' (DSCM); 1 ♂, 27 spec. unsexed, 'M. Grigna, Lierna / Alpe di Mezzedo, 865m / 6.IX.2014, R. Regalin leg. [w, p]' (RRCM); 1 ♀, 'Mandello L. (LO) / V. Meria / 29.V.1997 / L. Regalin [w, h] // *Lema / rufocyanea* [h] / det. R. Regalin 19 [p] 78 [w, h]' (RRCM); 5 spec. unsexed, 'LOMBARDIA, Lecco / Mandello L., Sonvico / 450 m, 28.IV.2012 / R. Regalin leg. [w, p]' (RRCM, 1 spec. in BMNH, 1 spec. in MNCN); 3 ♂♂, 7 spec. unsexed, 'LOMBARDIA, Lecco / Mandello L., Sonvico / 450 m, 19.V.2012 / R. Regalin leg. [w, p]' (RRCM, 2 spec. in BASC, 2 spec. in NMPC); 1 spec. unsexed, 'LOMBARDIA, Lecco / Mandello L., Sonvico / 450 m, 17.IV.2013 / R. Regalin leg. [w, p]' (RRCM); 1 spec. unsexed, 'Lecco, Mandello Lario / Somana, 300 m / 17.IV.2013 / R. Regalin leg. [w, p]' (RRCM); 1 ♀, 1 spec. unsexed, 'Lecco, Mandello Lario / Olcio, loc. Galdano / 320-370m, 17.IV.2013 / R. Regalin leg. [w, p]' (RRCM); 1 ♂, 8 spec. unsexed, 'Lecco, Mandello Lario / Olcio, loc. Galdano / 320-370m, 15.VII.2012 / R. Regalin leg. [w, p]' (RRCM, 2 spec. in JCB); 1 spec. unsexed, 'Lecco, Mandello Lario / Olcio, loc. Galdano / 320-370m, 9.IX.2012 / R. Regalin leg. [w, p]' (RRCM); 1 ♂, 'Lecco, Mandello Lario / Olcio, loc. Galdano / 320-370m, 19.X.2014 / R. Regalin leg. [w, p]' (RRCM); 1 ♂, 'LOMBARDIA, Lecco / Mandello L., S. Preda / 590 m, 19.VII.2014 / R. Regalin leg. [w, p]' (RRCM); 1 ♂ [preserved in 96% alcohol], 'ITALY, LC, 19.vi.2011, / Corno Medale, 400 m, / 45.8685389N-9.3908472E, / M. Montagna leg. [w, p]' (MMCM); 1 ♀, 'Gargnano / Gardasee. V. 03. [w, p] // *Oulema / rufocyanea* (Suff.) / det. Kippenberg 88 [w, h]' (HKCH); 1 ♂, '(Lo) VII.953 / Val Ponzate [h] / coll. A. Porta [w, p] // *Lema / rufocyanea* [h] / det. C. Leonardi [w, p] // COLLEZIONE / MUSEO MILANO [w, p]' (MSNM); 1 ♀, 'LOMBARDIA Parco Curone / LC Pereo prati magri / 18.VI.2013 m. 370 / Farina leg. [w, p]' (LFMC). The specimens are provided with additional printed red labels: 'HOLOTYPUS, [or PARATYPUS] / *Oulema mauroi* sp. nov. / det. J. Bezděk & / A. Baselga 2014'.

Description. Body length: ♂♂ 3.7–4.4 mm (holotype 4.4 mm); ♀♀ 4.2–4.6 mm.

Male (holotype, Fig. 4). Pronotum orange with slightly darkened extreme anterior and posterior margins, pronotal hypomeron orange, prosternum black.

Antennae (Fig. 14) slender, 0.57 times as long as body, length ratio of antennomeres I–XI equal to 100 : 71 : 100 : 114 : 157 : 143 : 143 : 143 : 129 : 129 : 186.

Pronotum (Fig. 9) as wide as long, widest in middle. Surface weakly constricted before base, constriction densely covered with fine punctures. Anterior margin nearly straight, thinly bordered, lateral margins distinctly rounded, anterior half of lateral margins moderately convergent anteriorly, posterior half convergently rounded to basal constriction.

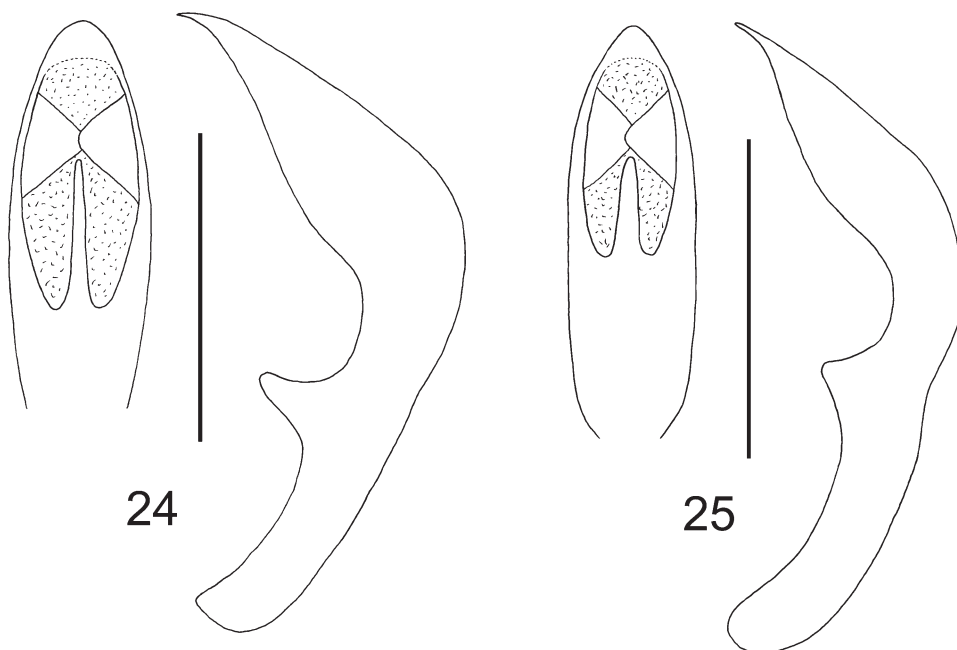
Scutellum as wide as long, lateral margins convergent posteriorly, posterior margin shallowly emarginated.

Elytra 0.66 times as long as body, 1.81 times as long as wide in humeral part.

Tarsi. Protarsomere I elongate triangular, 1.5 times as long as broad, 0.69 times as long as two following tarsomeres combined, protarsomere II triangular, as wide as long, length ratios of protarsomeres I–IV equal to 100 : 67 : 78 : 122. Metatarsomere I elongate triangular, 1.81 times as long as broad, 0.83 times as long as two following tarsomeres combined, length ratios of metatarsomeres I–IV equal to 100 : 60 : 60 : 120.

Male genitalia. Aedeagus as in Fig. 24. Flagellum very thin, in lateral view rounded, apex sharp, base wide directed anteriorly; posterobasal arms long, wide basally, slender apically, turned in apical half (Fig. 22).

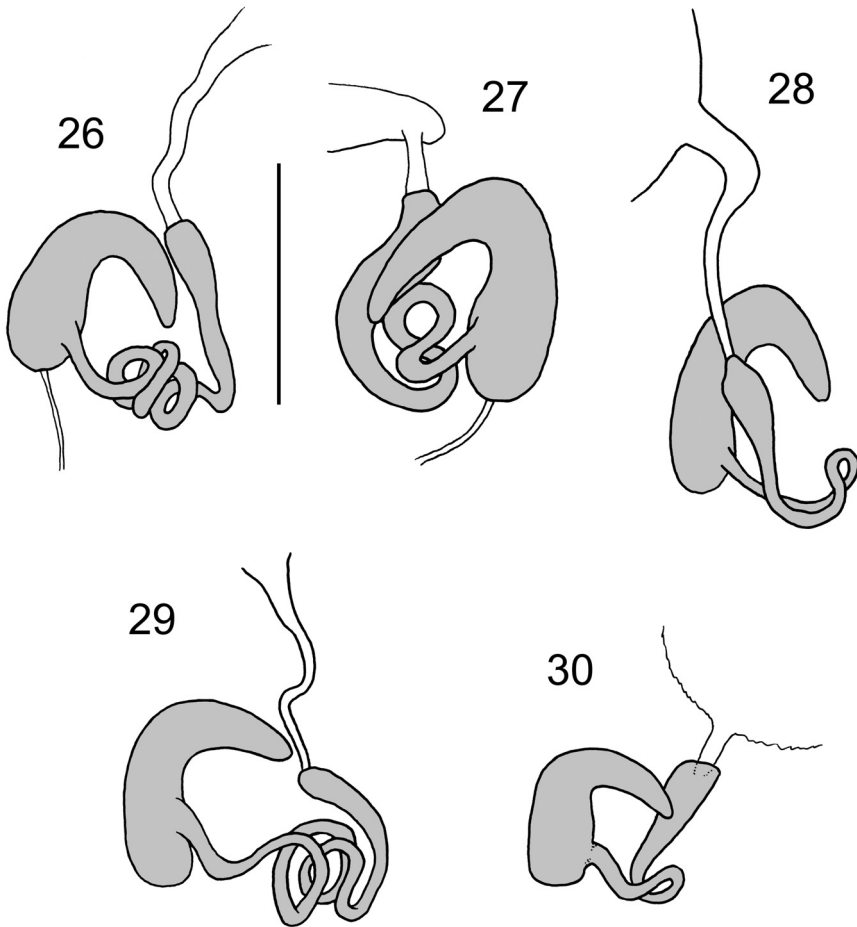
Female. Spermatheca (Fig. 29) with short duct heavily sclerotized in proximal two thirds forming three coils, basal third soft, in middle bent, with no specialized junction to bursa copulatrix. Nodulus poorly developed, gradually connected with cornu, as wide as cornu in middle part, cornu gradually narrowing towards apex.



Figs 24–25. Aedeagus in dorsal (left) and lateral (right) view: 24 – *O. mauroi* sp. nov.; 25 – *O. verae* sp. nov. Scale bar: 0.5 mm.

Variability. Metallic colouration of elytra varies from metallic bright blue (most specimens) to metallic bluish-green or bluish-black (very rare in the population). Antennae 0.52–0.61 times as long as body. Elytra 0.65–0.70 times as long as body. The length/width ratio of elytra varies between 1.69–1.82.

Differential diagnosis. *Oulema mauroi* sp. nov. can be distinguished from *O. melanopus* and *O. duftschmidi* by its wider elytra (length/width ratio of elytra 1.69–1.82 in *O. mauroi* sp. nov., 1.87–2.05 in *O. melanopus* and *O. duftschmidi*) and shorter protarsomere I (length/width ratio 1.45–1.65 in *O. mauroi* sp. nov., 1.65–2.00 in *O. melanopus* and *O. duftschmidi*). Due to its comparatively wider elytra and antennae, *O. mauroi* sp. nov. is similar to *O. verae* sp. nov. and particularly to *O. rufocyanea*. Iberian *O. verae* sp. nov. clearly differs in its pronotum with expanded black colour on posterior margin and less convex lateral margins, and shorter protarsomere I (length/width ratio 1.25–1.40). *Oulema mauroi* sp. nov. shares with *O. rufocyanea* a similar structure and colouration of pronotum (see Figs 8–9), and ratios of antennae/body length and elytral length/body length (see Tab. 1). Both species can only be separated with certainty by the shape of flagellum which in *O. mauroi* sp. nov. is much thinner in both dorsal and lateral views (Fig. 22), in contrast with the wider flagellum of *O. rufocyanea* (Figs 19–21). Flagellum of *Oulema mauroi* sp. nov. is most similar to that of *O. duftschmidi*, but it is smaller, shorter and in lateral view less convexly rounded (Figs 16, 22). The females of *O. mauroi* sp. nov. and *O. rufocyanea* can be distinguished by the structure of



Figs 26–30. Spermatheca and ductus spermathecae: 26 – *Oulema duftschmidi* (Redtenbacher, 1874); 27 – *O. melanopus* (Linnaeus, 1758); 28 – *O. rufocyanea* (Suffrian, 1847); 29 – *O. mauroi* sp. nov.; 30 – *O. verae* sp. nov. Scale bar: 0.25 mm.

spermatheca and ductus spermathecae: proximal sclerotized part of ductus in *O. mauroi* sp. nov. has three coils, while only one in *O. rufocyanea*; soft distal parts are of similar length but turned in the middle in *O. mauroi* sp. nov. but gradually and slightly extended towards the base in *O. rufocyanea* (Figs 28–29).

Etymology. Dedicated to our good friend Mauro Daccordi, an excellent specialist in Chrysomelinae.

Habitat. A large series of *Oulema mauroi* sp. nov. was collected in the surroundings of Mandello del Lario exclusively on dry grasslands. It seems that *O. mauroi* sp. nov. is a xerothermophilous species occurring in xerothermic prealpine oases with submediterranean vegetation. Similar habitats as in Mandello del Lario can be found also in other places where the new species was collected like in Teolo (situated on the Colli Euganei, a complex of vol-

canic hills) or Avio in the Adige valley. The beetle is probably associated with Poaceae and may be connected with calcareous soils and rocks (Regalin 2014, pers. comm.).

Distribution. Italy (Lombardia, Trentino-Alto Adige, Veneto) (Fig. 31).

Oulema verae sp. nov.

(Figs 5, 10, 15, 23, 25, 30, 32)

Type locality. Spain, Castilla y León, Zamora Province, Fornillos de Fermoselle.

Type material. HOLOTYPE: ♂, '18-5-1998 2561 / Fornillos de / Fermoselle / Zamora [h] / A. Baselga [w, p] // Oulema / rufocyanea / (Suffr.) [h] / A. Baselga [p] '98 [w, h]' (MNCN). PARATYPES: **SPAIN: ANDALUSIA:** 1 ♀, '27-4-2010 / Castillo de / Castellar de la Frontera / Cadiz [h] / A. Baselga [w, p]' (BASC); 1 ♂, 1 spec. unsexed, 'K...th 1903 / Andalusia [partly illegible, w, h]' (NHMW); 3 ♂♂ 2 ♀♀, 'Puebla de / D. Fadrique / (Granada) / Escalera 1900 [w, p] // MUSEUM PARIS / COLL. H. MARMOTTAN 1914 [w, p]' (MNHN); 1 ♂, 'La Sagra / (Granada) / Escalera 1900 [w, p]' (MNHN); 1 ♀, 'Sierra / de Alfakar [Alfacar, Granada] / R. Obf. & L. Bl. / Juillet 1879 [w, p] // Museum Paris / ex Coll. / R. Oberthur [w, p]' (MNHN). **ARAGÓN:** 1 spec. unsexed, 'Albarracin, / Spain, / G. C. C. [w, p] // G. C. Champion Coll. / B. M. 1927-409. [w, p]' (BMNH). **CASTILLA Y LEÓN:** 1 ♀, '18-5-1998 2561 / Fornillos de / Fermoselle / Zamora [h] / A. Baselga [w, p]' (BASC); 4 ♂♂ 4 ♀♀, '18-6-2001 4278 / Villadepera / Zamora [h] / A. Baselga [w, p]' (BASC, 1 ♂ JBCB); 1 spec. unsexed, '18-6-2001 2478 / Villadepera / Zamora / A. Baselga [w, h] // Oulema / rufocyanea Suff. / A. Baselga det. [w, p]' (FFCJ); 1 ♂, '18-6-2001 2478 / Villadepera / Zamora [h] / A. Baselga [w, p] // Oulema / rufocyanea / (Suffr.) [h] / A. Baselga [p] 01 [w, h] // coll. F. Fritzlar, Jena / ex coll. Andrés Baselga, / Corunna, 2003 [w, p]' (FFCJ); 1 ♂ 3 ♀♀, '18-6-2001 4306 / Badilla / Zamora [h] / A. Baselga [w, p] // Oulema / rufocyanea / (Suffr.) [h] / A. Baselga [p] 01 [w, h]' (BASC); 6 ♂♂ 1 ♀, '18-5-1998 2561 / Fornillos de / Fermoselle / Zamora [h] / A. Baselga [w, p] // Oulema / rufocyanea / (Suffr.) [h] / A. Baselga [p] '98 [w, h]' (BASC); 3 ♂♂ 3 ♀♀, '19-5-1998 2592 / Pinilla / Fermoselle / Zamora [h] / A. Baselga [w, p] // Oulema / rufocyanea / (Suffr.) [h] / A. Baselga [p] '98 [w, h]' (BASC); 1 ♂, 'CASTILLA-LEON / Luelmo (Zamora) / 7-VI-2004 / leg. E. Petitpierre [w, p] // Oulema / rufocyanea (Suffr.) / det. Petitpierre '04 [w, p]' (EPCP); 3 ♂♂, 'Bejar, / Spain, / G. C. C. [w, p] // G. C. Champion Coll. / B. M. 1927-409. [w, p]' (BMNH); 3 ♂♂ 1 ♀, '19-6-2001 4354 / Cerezal de / Peñahorcada / Salamanca [h] / A. Baselga [w, p] // Oulema / rufocyanea / (Suffr.) [h] / A. Baselga [p] 01 [w, h]' (BASC); 1 ♂ 3 ♀♀, '19-6-2001 4318 / Masueco / Salamanca [h] / A. Baselga [w, p] // Oulema / rufocyanea / (Suffr.) [h] / A. Baselga [p] 01 [w, h]' (BASC); 1 ♂, '19-6-2001 4372 / Saucelle / Salamanca [h] / A. Baselga [w, p] // Oulema / rufocyanea / (Suffr.) [h] / A. Baselga [p] 01 [w, h]' (BASC); 1 ♂ 2 ♀♀, '20-6-2001 4379 / Trabanca / Salamanca [h] / A. Baselga [w, p] // Oulema / rufocyanea / (Suffr.) [h] / A. Baselga [p] 01 [w, h]' (BASC); 2 ♀♀, '19-5-2010 / Vilvestre / Salamanca [h] / A. Baselga [w, p]' (BASC); 1 ♂, 'HISPANIA [p] / Buenamadre / Salamanca [h] / J. Vives Leg. [w, p] // 8-58 [reverse of previous label, h]' (EPCP); 1 spec. unsexed, 'Ponferrada / Paganetti [w, p]' (NHMW); 1 ♀, 'S. Rafael [Segovia] / 29.6.1930 [w, h] // Colección / M. ESCALERA [w, p]' (MNCN). **GALICIA:** 2 ♀♀, '14-6-2010 / San Martiño / Baltar – Ourense [h] / A. Baselga [w, p]' (BASC); 1 ♂, '3-6-2000 3926 / Casaio / Carballeda / Ourense [h] / A. Baselga [w, p] // Oulema / rufocyanea / (Suffr.) [h] / A. Baselga [p] 00 [w, h]' (BASC). **MADRID:** 2 ♂♂, 'Escorial / Espagne / R. Obf. & L. Bl. / Juillet 1879 [w, p] // Museum Paris / ex Coll. / R. Oberthur [w, p]' (MNHN); 1 ♂, 'HISPANIA [p] / Escorial / Madrid 6.5.57 [h] / M. González leg. [w, p]' (EPCP); 1 ♀, 'Galap. [= Galapagar, Madrid] / 14.6.1930 [w, h] // Colección / M. ESCALERA [w, p] // Oulema / melanopa (L.) [h] / det. [p] E. Petitpierre '89 [w, h]' (MNCN); 1 ♀, 'ESCORIAL [w, p] // Colección / LAUFFER [w, p] // Oulema / rufocyanea Suffr. / det. Petitpierre '91 [w, h]' (MNCN); 4 ♂♂ 3 ♀♀, 'ESCORIAL [w, p] // Colección / LAUFFER [w, p]' (MNCN); 1 spec. unsexed, 'Madrid / Escorial [w, p]' (NHMW); 8 spec. unsexed, 'Escorial 4.7.1879 / D. S. [w, h] // Sharp Coll. / 1905-313. [w, p]' (BMNH). **PORTUGAL: TRÁS-OS-MONTES:** 1 ♂ 1 ♀, '20-6-2001 4404 / Castelo Branco / Mogadouro [h] / A. Baselga [w, p] // Oulema / rufocyanea / (Suffr.) [h] / A. Baselga [p] 01 [w, h]' (BASC, NMPC); 1 ♀, '21-6-2001 4458 / Vila Cha / Miranda de Douro [h] / A. Baselga [w, p] // Oulema / rufocyanea / (Suffr.) [h] / A. Baselga [p] 01 [w, h]' (BASC). The specimens are provided with additional printed red labels: 'HOLOTYPUS, [or PARATYPUS] / *Oulema verae* sp. nov. / det. J. Bezděk & / A. Baselga 2014'.

Description. Body length: ♂♂ 3.7–4.2 mm (holotype 4.0 mm); ♀♀ 3.8–4.4 mm.

Male (holotype, Fig. 5). Pronotum orange with narrow black anterior margin, posetrior margin wide, black (including complete basal constriction), pronotal hypomeron with large orange to red triangle connecting with colouration of dorsal side.

Antennae (Fig. 15) slender, 0.48 times as long as body, length ratio of antennomeres I–XI equal to 100 : 71 : 86 : 86 : 129 : 114 : 114 : 114 : 100 : 100 : 143. Pronotum (Fig. 10) quadrate, as wide as long, widest in anterior third. Surface weakly constricted before base, between constriction and posterior margin low thin ridge. Anterior margin nearly straight, thinly bordered, anterior half of lateral margins almost parallel, straight, posterior half convergent.

Scutellum as wide as long, posterior margin straight.

Elytra 0.68 times as long as body, 1.8 times as long as wide in humeral part.

Tarsi. Protarsomere I elongate triangular, 1.4 times as long as broad, 0.63 times as long as two following tarsomeres combined, protarsomere II triangular, as wide as long, length ratios of protarsomeres I–IV equal to 100 : 71 : 86 : 143. Metatarsomere I elongate triangular, 1.75 times as long as broad, 0.72 times as long as two following tarsomeres combined, length ratios of metatarsomeres I–IV equal to 100 : 63 : 75 : 150.

Male genitalia. Aedeagus as in Fig. 25. Flagellum (Fig. 23) relatively small, wide, shallowly constricted before its midlength, apex with deep elongate-oval incision and sharp thin process; in lateral view bisinuate, apically slightly wider than basally; posterobasal arms dark, slender, regularly turned in apical half.

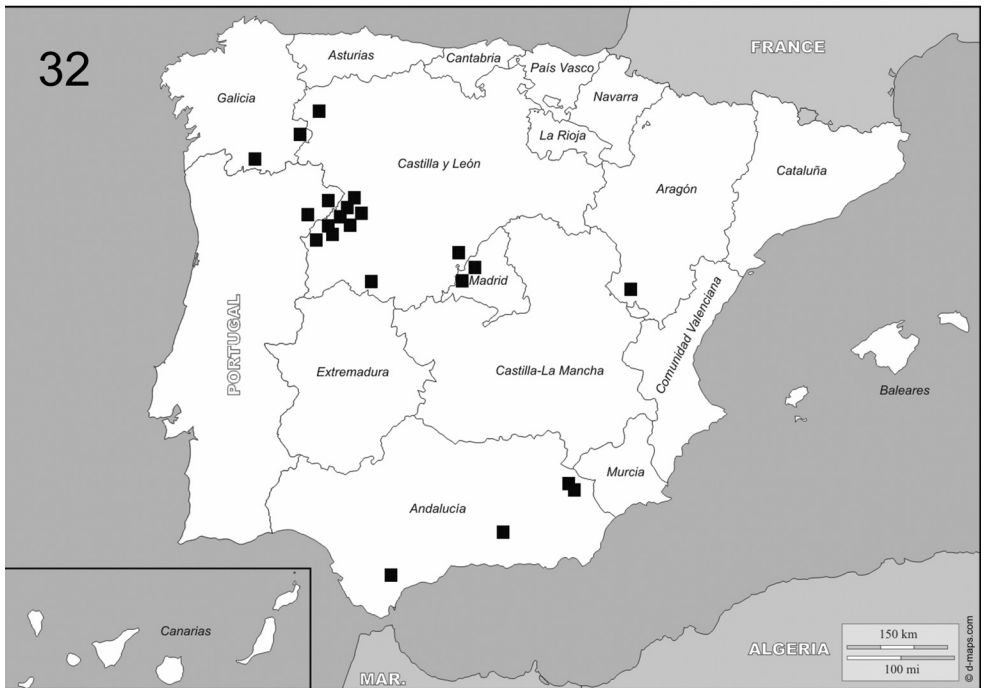
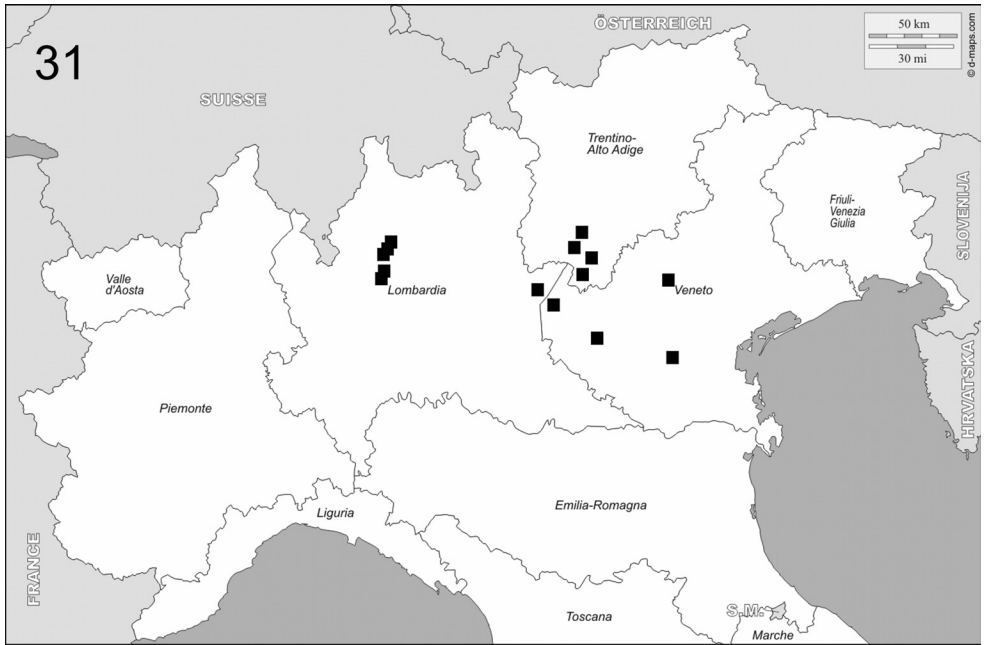
Female. Spermatheca (Fig. 30) with short duct, which is heavily sclerotized in proximal three quarters, soft in basal quarter, with no specialized junction to bursa copulatrix, sclerotized part of duct slender, slightly widened in basal third. Nodulus poorly developed, gradually connected with cornu, about twice wider than cornu in middle part, cornu and nodulus are connected in axis ca 75°, cornu gradually narrowing towards apex.

Variability. Metallic colouration of head, scutellum and elytra varies from metallic bright blue to metallic bluish-black. Pronotum orange to red, posterior margin, usually including complete basal constriction, black, in some specimens only middle of basal constriction darkened or black. Antennae 0.46–0.50 times as long as body. Elytra 0.66–0.75 times as long as body. The length/width ratio of elytra varies between 1.75–2.00.

Differential diagnosis. *Oulema verae* sp. nov. differs from all other European species of the *Oulema melanopus* species group in the anterior and posterior margins of pronotum with wide darkened borders, while pronotum in the rest of species is uniformly orange or with only thin dark borders. Within European species *O. verae* sp. nov. has also shortest protarsomere I (length/width ratio 1.25–1.40). This ratio is higher in remaining species, at least 1.45 (see Tab. 1).

Lateral margins of pronotum in *O. verae* sp. nov. are similar to those of *O. melanopus* and *O. duftschmidi*, as the anterior half of lateral margins is nearly parallel (Figs 6, 7, 10). The best diagnostic character is the flagellum, which is very characteristic in *O. verae* sp. nov. (relatively small, wide, with apex incised, in lateral view bisinuate, apically slightly wider than basally), and slightly resembles only that of *O. melanopus*, which is larger and not incised apically (Figs 17–18, 23). The spermatheca and ductus spermathecae with simple incomplete coil are similar to those of *O. rufocyanea*, but both species differ in the structure of soft distal part of ductus spermathecae which is very short in *O. verae* sp. nov. and about four times longer in *O. rufocyanea* (Figs 28, 30).

Known specimens of *O. verae* sp. nov. are 3.8–4.3 mm long, thus smaller than *O. melanopus* (4.5–6.2 mm) and *O. duftschmidi* (4.2–5.7 mm). However, the elytral length/width ratio (1.75–2.00 in *O. verae* sp. nov.) widely overlaps with this ratio in *O. melanopus* and *O.*



Figs 31–32. Distributional maps: 31 – *O. mauroi* sp. nov.; 32 – *O. verae* sp. nov.

duftschmidi (1.87–2.05) and also in *O. rufocyanea* and *O. mauroi* sp. nov. (1.69–1.87), thus this character cannot be used for correct identification.

Lateral margins of pronotum of *O. verae* sp. nov. are not convexly rounded as in *O. rufocyanea* and *O. mauroi* sp. nov., but the pronotum resembles more that of *O. melanopus* and *O. duftschmidi* in which margins converge only in its anterior parts.

Etymology. Dedicated to Vera, daughter of Andrés Baselga.

Collection circumstances and bionomy. All collections done by A. Baselga correspond to samplings in meadows (particularly wet meadows), using a sweeping net. No specific information on the host plants is available yet.

Distribution. Portugal (Trás-os-Montes), Spain (Andalusia, Aragón, Castilla y León, Galicia, Madrid) (Fig. 32).

Tab. 2. Specimens included in the phylogenetic analyses. All specimens have been identified by the authors based on morphological characters (i.e. genitalia). Species name, country, locality of collection and GenBank accession numbers for *cox1* sequences are provided.

| Species | Country | Locality | GenBank |
|---------------------------|----------------|--------------------------|----------|
| <i>Crioceris asparagi</i> | Spain | Cazalla | KF653551 |
| <i>O. duftschmidi</i> | Czech Republic | Doubravice nad Svitavou | KP406717 |
| <i>O. duftschmidi</i> | Czech Republic | Praha | KP406721 |
| <i>O. duftschmidi</i> | Italy | Colli Berici | KP406714 |
| <i>O. gallaeciana</i> | Spain | San Martiño, Baltar | KF655675 |
| <i>O. gallaeciana</i> | Spain | Pradoalvar | KF656037 |
| <i>O. gallaeciana</i> | Spain | Liber, Ancares | KF656231 |
| <i>O. gallaeciana</i> | Spain | Cabaniños, Ancares | KF656321 |
| <i>O. gallaeciana</i> | Spain | Cabaniños, Ancares | KF656329 |
| <i>O. gallaeciana</i> | Spain | Presa del Eume, A Capela | KF656479 |
| <i>O. gallaeciana</i> | Spain | Piladaleña, Monfero | KF656562 |
| <i>O. gallaeciana</i> | Czech Republic | Doubravice nad Svitavou | KP406716 |
| <i>O. hoffmannseggii</i> | Spain | Cazalla | KF653865 |
| <i>O. hoffmannseggii</i> | Spain | Cazalla | KF653899 |
| <i>O. mauroi</i> sp. nov. | Italy | Corno Medale | KP406718 |
| <i>O. melanopus</i> | Spain | San Martiño, Baltar | KF655607 |
| <i>O. melanopus</i> | Spain | San Martiño, Baltar | KF655647 |
| <i>O. melanopus</i> | Spain | Pradoalvar | KF656072 |
| <i>O. melanopus</i> | Spain | Pradoalvar | KF656078 |
| <i>O. melanopus</i> | Spain | Cabaniños, Ancares | KF656330 |
| <i>O. melanopus</i> | France | Alpes de Haute Provence | KP406719 |
| <i>O. melanopus</i> | Czech Republic | Doubravice nad Svitavou | KP406713 |
| <i>O. melanopus</i> | Czech Republic | Praha | KP406720 |
| <i>O. melanopus</i> | Morocco | Ifrane | KP406715 |
| <i>O. rufocyanea</i> | Slovakia | Muráň | KP406722 |
| <i>O. verae</i> sp. nov. | Spain | Castillo de Castellar | KF653272 |
| <i>O. verae</i> sp. nov. | Spain | Vilvestre | KF654422 |
| <i>O. verae</i> sp. nov. | Spain | Vilvestre | KF654456 |
| <i>O. verae</i> sp. nov. | Spain | San Martiño, Baltar | KF655627 |
| <i>O. verae</i> sp. nov. | Spain | San Martiño, Baltar | KF655628 |

Phylogenetic analysis

At least one specimen of the European species of the *O. melanopus* group was sequenced for the 5' region of the *cox1* gene (barcoding fragment) (see Tab. 2). There were no clear differences between species, with interspecific sequence similarities ranging from 90.5 to 99.5 %, compared to intraspecific sequence similarities between 91.6 and 100 %. As a result, a phylogenetic tree based on *cox1* sequences did not yield clear groupings (Fig. 33). These results suggest that processes of lineage sorting in the *O. melanopus* group are lagging behind the clear morphological and presumably reproductive separation. In practical terms, this implies that the five species in the *O. melanopus* group cannot be identified using the DNA barcoding fragment (*cox1*), what is unfortunate given the economic relevance of the species and the difficulty of morphological identification for the non-specialists. Further efforts, including the sequencing of additional populations and further genetic markers, are needed to investigate the phylogenetic patterns and speciation processes in this species group. The lack of sequence differences between morphologically well delimited species was already observed in Iberian species of the leaf beetle genera *Longitarsus* Latreille, 1829 and *Pachybrachis* Chevrolat, 1836 (BASELGA et al. 2013).

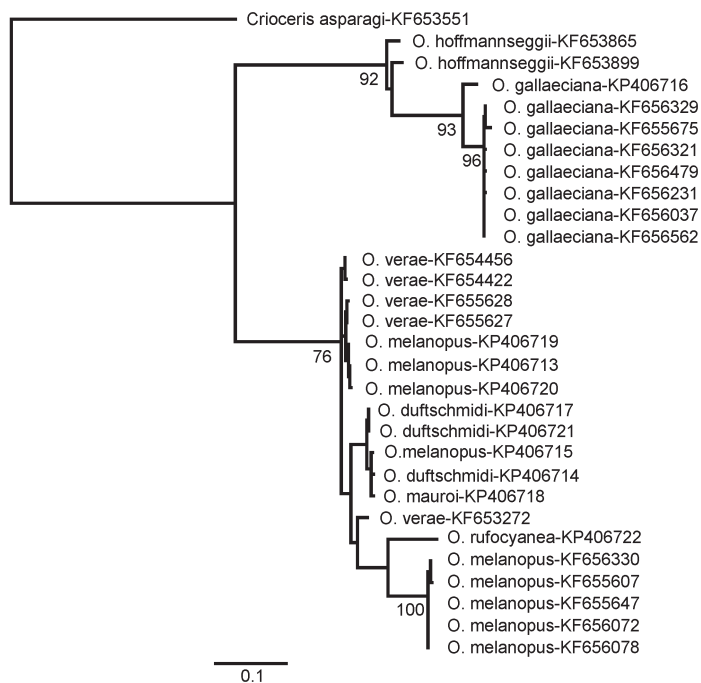


Fig. 33. Maximum likelihood phylogenetic tree based on *cox1* sequences. Node values are bootstrap support values (only those >75 % are shown).

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