European Journal of Taxonomy 987: 26–60
https://doi.org/10.5852/ejt.2025.987.2857
ISSN 2118-9773
www.europeanjournaloftaxonomy.eu
2025 · Likov L. *et al.*

Research article

urn:lsid:zoobank.org:pub:D476F215-512D-4E4A-B4A4-E04B42125765

Two new hoverfly species of the *Merodon desuturinus* lineage (Diptera: Syrphidae: Merodontini)

Laura LIKOV[1], Ante VUJIĆ[2], Snežana RADENKOVIĆ[3], Ljiljana ŠAŠIĆ ZORIĆ[4,*], Mihajla DJAN[5], Kurt JORDAENS[6] & Sonja MUDRI-STOJNIĆ[7]

[1, 2, 3, 5, 7] University of Novi Sad, Faculty of Sciences, Trg Dositeja Obradovića 2, 21000 Novi Sad, Serbia.
[4] University of Novi Sad, BioSense Institute, Dr Zorana Đinđića 1, 21000 Novi Sad, Serbia.
[6] Department of Biology, Entomology Section, Royal Museum for Central Africa, Leuvensesteenweg 13, B-3080 Tervuren, Belgium.

[*] Corresponding author: ljsasic@biosense.rs
[1] Email: laura.likov@dbe.uns.ac.rs
[2] Email: ante.vujic@dbe.uns.ac.rs
[3] Email: snezana.radenkovic@dbe.uns.ac.rs
[5] Email: mihajla.djan@dbe.uns.ac.rs
[6] Email: kurt.jordaens@africamuseum.be
[7] Email: sonja.mudri-stojnic@dbe.uns.ac.rs

[1]urn:lsid:zoobank.org:author:6787F9E8-3EA9-4695-B8A1-725787BCB9DD
[2]urn:lsid:zoobank.org:author:A20D5863-CF18-4BF7-BB68-0DA75D34B7A8
[3]urn:lsid:zoobank.org:author:26DF35D9-55FA-4485-8E8C-C1F90EFE1036
[4]urn:lsid:zoobank.org:author:C574B834-5504-4D2A-8808-8D733CD8BD7B
[5]urn:lsid:zoobank.org:author:BE29D9A9-CC69-416C-8F85-4B8AA99A6C71
[6]urn:lsid:zoobank.org:author:9E6F237E-BC90-4F8F-891F-798347E9A3F9
[7]urn:lsid:zoobank.org:author:BE29A972-EFC5-4CFC-9E20-47BD0F58DBF0

Abstract. The hoverfly genus *Merodon* Meigen, 1803 (Diptera: Syrphidae) comprises five monophyletic lineages. Here, we describe two new species of the *murorum* species group and *melanocerus* species group from the *desuturinus* lineage. One species, *Merodon spinolobus* Vujić, Radenković & Likov sp. nov., belongs to the Afrotropical *melanocerus* species group, and is recorded from the Republic of South Africa. The other species, *M. sublustris* Likov, Vujić & Radenković sp. nov., is recorded from Iran and belongs to the Palaearctic *murorum* species group. New species are recognized and described based on morphology and molecular data (3' and 5' COI regions). Additionally, the identification key for the *desuturinus* lineage is updated and distribution maps for the two new species are provided. Finally, the first distribution data for *Merodon cabanerensis* Marcos-García, Vujić & Mengual, 2007 (of the *murorum* species group) from outside of Europe (Morocco) is reported.

Keywords. Taxonomy, distribution, hoverflies, new species, COI gene sequences.

Likov L., Vujić A., Radenković S., Šašić Zorić L., Djan M., Jordaens K. & Mudri-Stojnić S. 2025. Two new hoverfly species of the *Merodon desuturinus* lineage (Diptera: Syrphidae: Merodontini). *European Journal of Taxonomy* 987: 26–60. https://doi.org/10.5852/ejt.2025.987.2857

Introduction

Hoverflies (or flower flies; Diptera: Syrphidae) represent a large family within the order Diptera. Currently, more than 6000 species belonging to 200 genera have been described (Pape & Thompson 2013), but this number is constantly increasing. One of the most species-rich hoverfly genera is the genus *Merodon* Meigen, 1803, which is distributed across the Palaearctic and Afrotropical regions (Ståhls *et al*. 2009; Vujić *et al*. 2012, 2021), except for *M. equestris* (Fabricius, 1794) that has been introduced into the Nearctic region and New Zealand (Speight 2020).

Vujić *et al*. (2019, 2021) recognized five monophyletic lineages within the genus *Merodon*, i.e., *albifrons*, *aureus*, *avidus-nigritarsis*, *desuturinus* and *natans*. The *desuturinus* lineage contains two species groups: the Palaearctic *murorum* species group and the Afrotropical *melanocerus* species group (Vujić *et al.* 2018, 2021).

The *murorum* species group, characterized by the absence of a patch of dense yellow pile on the metatrochanter, comprises four species: *M. desuturinus* Vujić, Šimić & Radenković, 1995 from the high mountains of the Balkan Peninsula, *M. cabanerensis* Marcos-García, Vujić & Mengual, 2007 from central Spain, *M. neolydicus* Vujić, 2018 from the Eastern Mediterranean, and *M. murorum* Fabricius, 1794 from North-West Africa (Vujić *et al*. 2018).

The *melanocerus* species group, characterized by the presence of a patch of dense yellow pile on the metatrochanter, is composed of the *melanocerus* and *planifacies* species subgroups and the unplaced species *M. cuthbertsoni* Curran, 1939 (Radenković *et al*. 2018; Djan *et al*. 2020; Vujić *et al*. 2021). Species of the *melanocerus* species subgroup, where all species have a produced, bare oral margin, are found in South Africa. This species subgroup has been revised by Radenković *et al*. (2018) who (re)described five species: *M. capensis* Hurkmans, 2018, *M. commutabilis* Radenković & Vujić, 2018, *M. drakonis* Vujić & Radenković, 2018, *M. flavocerus* Hurkmans, 2018 and *M. melanocerus* Bezzi, 1915. The *planifacies* species subgroup, where all species have a reduced and microtrichose oral margin, has a broad distribution in the Afrotropical region, spanning large parts of west, central, and southern Africa. It comprises *M. stevensoni* Curran, 1939 with an unclear taxonomic position, the *capi* species complex (two species: *M. capi* Vujić & Radenković, 2020 and *M. roni* Radenković & Vujić, 2020) and *M. planifacies* Bezzi, 1915. The latter, however, seems a complex of geographically isolated species, and requires further taxonomic research (Djan *et al*. 2020).

The species diversity within the *Merodon desuturinus* lineage was previously analyzed using the integrative taxonomy approach that relies on multiple lines of evidence for species delineation, including molecular data. Radenković *et al*. (2018) confirmed the delineation of four species within the *M. melanocerus* species subgroup by applying molecular analysis based on combined sequences of 3' and 5' ends of the mitochondrial cytochrome *c* oxidase subunit I gene (COI). *Merodon melanocerus*, *M. capensis*, *M. drakonis* and *M. commutabilis* were all resolved as highly supported monophyletic species, while *M. drakonis* and *M. commutabilis* were confirmed as closely related species. Two closely related and cryptic species, *M. roni* and *M. capi* were described in the *M. planifacies* subgroup. These two species were confirmed as separate and divergent from *M. planifacies* based on a COI gene sequence analysis, while a 28S rRNA gene sequence analysis failed to differentiate between *M. roni* and *M. capi*. However, species delineation was additionally confirmed based on wing geometric morphometry (Djan *et al*. 2020). Regarding genetic divergence among species of the Palaearctic *M. murorum* species group, the only available information is the high COI sequence divergence (7.32% uncorrected pairwise distance) between *M. desuturinus* and *M. cabanerensis* (Mengual *et al*. 2006; Milankov *et al*. 2008).

During the last couple of years, we have traced additional specimens whose morphological characters fit within the *M. desuturinus* lineage but could not be assigned to currently known species. Here, we describe two new species of the *M. desuturinus* lineage and provide distribution maps for both species; provide new molecular diagnostic data for the lineage; and update the identification key of the *M. desuturinus* lineage. Finally, we report the first distribution data for *Merodon cabanerensis* Marcos-García, Vujić & Mengual, 2007 from outside of Europe (Morocco).

Material and methods

Material studied and morphology

The new species were described based on the examined material containing thirteen males and seven females.

The preparation of the male genitalia took place in the following order: separation of the genitalia from the rest of the specimen using an entomological pin; boiling in 10% KOH solution for a few minutes; brief immersion in acetic acid and then in ethanol; and finally placing the finished preparation into the vial containing glycerol.

The terminology adopted in the morphological descriptions follows Thompson (1999), except terms according to male genitalia which follow Marcos-García *et al*. (2007), and "fasciate maculae" follows Vujić *et al*. (2021). Distribution maps were made with QGIS ver. 3.30.0 (QGIS Development Team 2023) mapping software.

A Leica MZ16 binocular microscope with an FSA 25 PE drawing tube was used to make drawings. Photographs were made using a Nikon Digital Sight 10 digital camera attached to a Nikon SMZ18 stereomicroscope. Photographs were stacked in CombineZ software (Hadley 2006). Fig. 7B was taken with a JEOL JSM 6460LV scanning electron microscope (SEM) operated at 20 kV.

Repositories

Coll. MB	=	Miroslav Bartak collection, Czech Republic
Coll. VWG	=	Guy van de Weyer collection, Belgium
FSUNS	=	Faculty of Sciences, Department of Biology and Ecology, University of Novi Sad, Serbia
MMBC	=	Moravian Museum in Brno, Czech Republic
MZH	=	Finnish Museum of Natural History, University of Helsinki, Finland
NMSA	=	KwaZulu-Natal Museum, Pietermaritzburg, Republic of South Africa

Abbreviations for genitalia drawings

AL	=	anterior surstylar lobe
C	=	cercus
IT	=	inner thorn on medial part of surstylus
PL	=	posterior surstylar lobe
S	=	lateral sclerite of aedeagus
VMS	=	ventral margin of surstylus
VR	=	ventral ridge of theca

Molecular study

We performed a molecular analysis using concatenated sequences from the 3' and 5' ends of COI gene from Radenković *et al*. (2018) supplemented with additional sequences of specimens from RSA (AU1709) and Iran (AU1518, AU1519, AU1520 and AU1522) (Supp. file 1). DNA extraction, PCR amplification and DNA sequencing were done as described in Šašić Zorić *et al*. (2020).

Newly produced DNA sequences were edited for base-calling errors in BioEdit ver. 7.7.1. (Hall 1999), while others were downloaded from GenBank. 3' and 5' COI sequences were aligned manually, and alignments were concatenated for maximum-parsimony (MP), maximum likelihood (ML) and uncorrected pairwise p-distance analyses. The concatenated sequence matrix included 35 specimens from the *M. desuturinus* lineage and three outgroup specimens and comprised a total length of 1237 bp.

MP analysis was done in NONA (Goloboff 1999), spawned with the aid of ASADO (Nixon 2008) using the heuristic search algorithm with 1000 random addition replicates (mult_1000), holding 100 trees per round (hold/100), max trees set to 100 000 and applying tree-bisection-reconnection branch swapping. ML analysis was done in RAxML ver. 8.2.8 (Stamatakis 2014) using the CIPRES Science Gateway web portal (Miller *et al*. 2010) under the general time-reversible (GTR) evolutionary model with a gamma distribution (GTRGAMMA) (Rodríguez *et al*. 1990). Bootstrap values were calculated with 1000 (pseudo) replicates. *Eumerus pulchellus* Loew, 1848, *M. natans* (Fabricius, 1794) and *M. luteofasciatus* Vujić, Radenković & Ståhls in Vujić *et al*., 2018 (for GenBank accession numbers of all outgroups see Supp. file 1) were used as outgroups. The trees were rooted on *E. pulchellus*. Uncorrected pairwise p-distances among (putative) species, and the number of variable positions, were calculated in MEGA 11 (Tamura *et al*. 2021) with pairwise deletion of missing data.

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Diptera Linnaeus, 1758
Family Syrphidae Latreille, 1802
Subfamily Eristalinae Newman, 1834
Tribe Merodontini Edwards, 1915

Genus ***Merodon*** Meigen, 1803

Diagnosis of the *Merodon desuturinus* lineage

The specific shape of the lateral sclerite of the aedeagus (gradually tapered, with the tip curved downwards) is the main synapomorphic character that connects all species of the group (Fig. 1C: s). Species in this group have pile on the posterior side of mesocoxa, a curved distal prolongation of anterior surstylar lobe (Fig. 1B: al), basoflagellomere less than two times as long as wide (Fig. 2A), scutum without pollen (Fig. 2B) or with less distinct pollinose longitudinal vittae, wing microtrichose between veins R1 and RS (Fig. 2C: marked with arrow) contrary to bare area in species from the morphologically related *M. albifrons* lineage, postpronotum usually brown or yellow-reddish, and pilosity on lateral side of tergum 4 in female long, medially short and mostly adpressed (Fig. 2D).

Diagnosis of the *melanocerus* species group

The main diagnostic character of the *Merodon melanocerus* species group is the presence of a patch of dense and strong yellow pile on the metatrochanter (Fig. 3A: marked with arrow). The *melanocerus* species subgroup has the oral margin notched, produced forward, and bare (Fig. 3B: marked with arrow), while the *planifacies* species subgroup has the oral margin reduced and microtrichose.

Merodon spinolobus Vujić, Radenković & Likov, sp. nov.
urn:lsid:zoobank.org:act:15A66BE1-CD1A-4802-A354-12A4F87C8FA3
Figs 4A–C, 5, 7A, C, 8

Diagnosis

Mesoscutum with fascia of black pile between wing bases (Fig. 4A), usually non-pollinose. Terga black; transversal pollinose fasciate maculae on terga 2–4 broad, about ⅕ of their length (Fig. 4B). Tibiae and tarsi partly yellow brown. Thecal ridge of hypandrium of male genitalia folded (Fig. 5C: vr).

Etymology

Latin noun '*spina*' meaning 'thorn', 'spine', or 'prickle'; latin noun '*lobus*' meaning 'lobe', which indicates the distinct morphological character of this species: long and strong medial spinal prolongation on surstylus medially.

Type material

Holotype

REPUBLIC OF SOUTH AFRICA • ♂; Free State, Mapaya Mt Groenhoek Farm, ca 15 km E of Zastron; 30°15′59.976″ S 27°12′59.997″ E; 1750 m a.s.l.; 13–16 Mar. 2009; J. and A. Londt leg.; montane grass and woodland, *Rhus*, *Diospyros*, *Celtis*, etc.; FSUNS 68231, AU1709, NMSA-DIP 65232; NMSA.

Paratype

REPUBLIC OF SOUTH AFRICA • ♂; Free State, Mapaya Mt Groenhoek Farm, ca 15 km E of Zastron; 30°15′59.976″ S 27°12′59.997″ E; 1750 m a.s.l.; 13–16 Mar. 2009; J. and A. Londt leg.; montane grass and woodland, *Rhus*, *Diospyros*, *Celtis*, etc.; FSUNS 68232, AU1921, DNA-RMCA K. Jordaens 2014 111E06, NMSA-DIP 65242; NMSA.

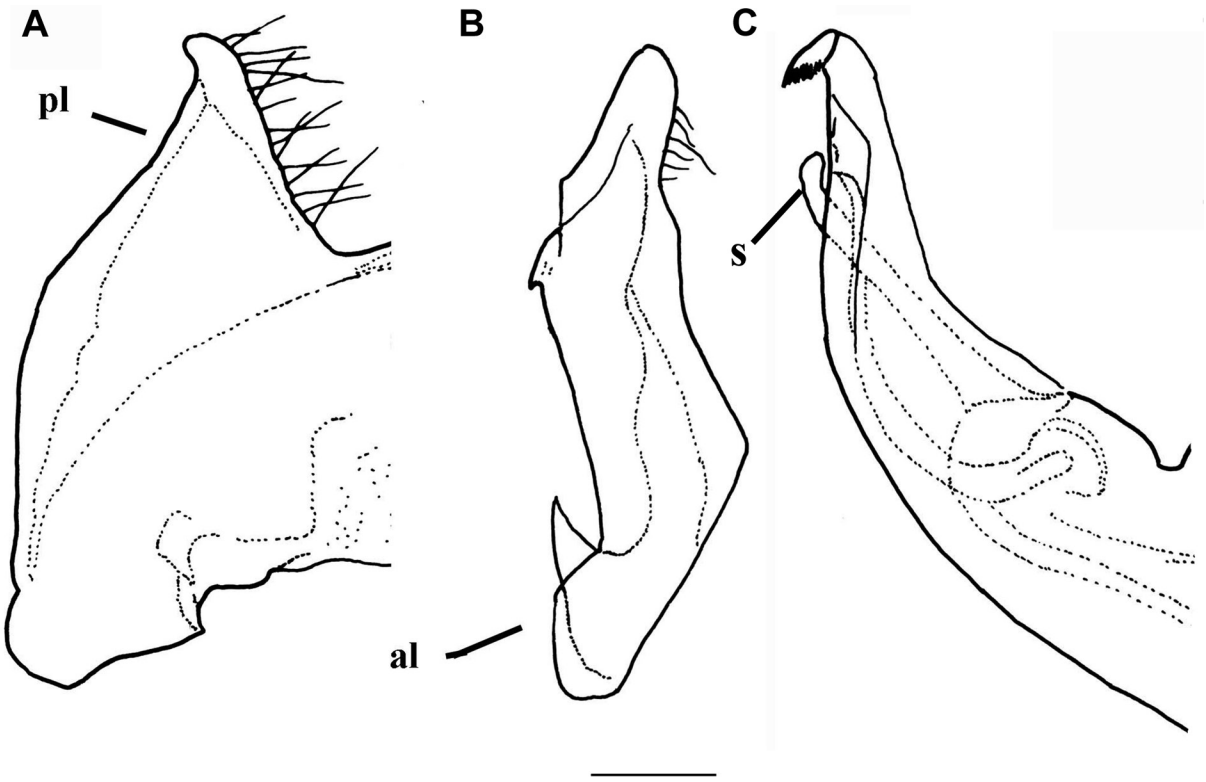

Fig. 1. *Merodon melanocerus* Bezzi, 1915 (RSA, Mount Gilboa, FSUNS), male genitalia. **A**. Surstyle lobe, lateral view. **B**. Surstyle lobe, ventral view. **C**. Hypandrium, lateral view. Abbreviations: al = anterior surstylar lobe; pl = posterior surstylar lobe; s = lateral sclerite of aedeagus. Scale bar: 0.2 mm.

Description

Body pile generally branched (as in Fig. 7B).

Male (Fig. 4C)

Head (Fig. 7A). Antenna dark brown; basoflagellomere about two times as long as wide (Fig. 7A), concave dorsally; arista dark brown, thickened basally, covered with dense brown microtrichia. Face shiny black, with narrow white pollinose stripe along eye margin (missing in lower third), long white pilose, except on median bare stripe that occupies ⅓ to ¼ width of face. Oral margin shiny black, well protruded (Fig. 7A). Frons black, with gray microtrichia. Vertical triangle black, shiny, except for anterior end where microtrichose; predominantly long, black, thick pilose, pale yellow pilose at posterior end; ocellar triangle isosceles. Eye pile dense, as long as length of scape, predominantly grayish, darker dorsally. Occiput whitish pilose; dorsally with metallic, bluish-bronze lustre; gray microtrichia start from upper eye corner as a narrow line dorsally, becoming dense and wide laterally and ventrally, occupying lower ⅔ of occiput.

Thorax. Mesoscutum and scutellum black with bronze lustre, without microtrichia; relatively long (as long as, or a little longer than length of basoflagellomere), dense, erect, more or less branched, yellow to reddish pilose, except between wing bases where black pilose (Fig. 4A). Pleurae shiny; the following parts long yellow pilose: anterior part of proepimeron, posterior part of anterior anepisternum, most of

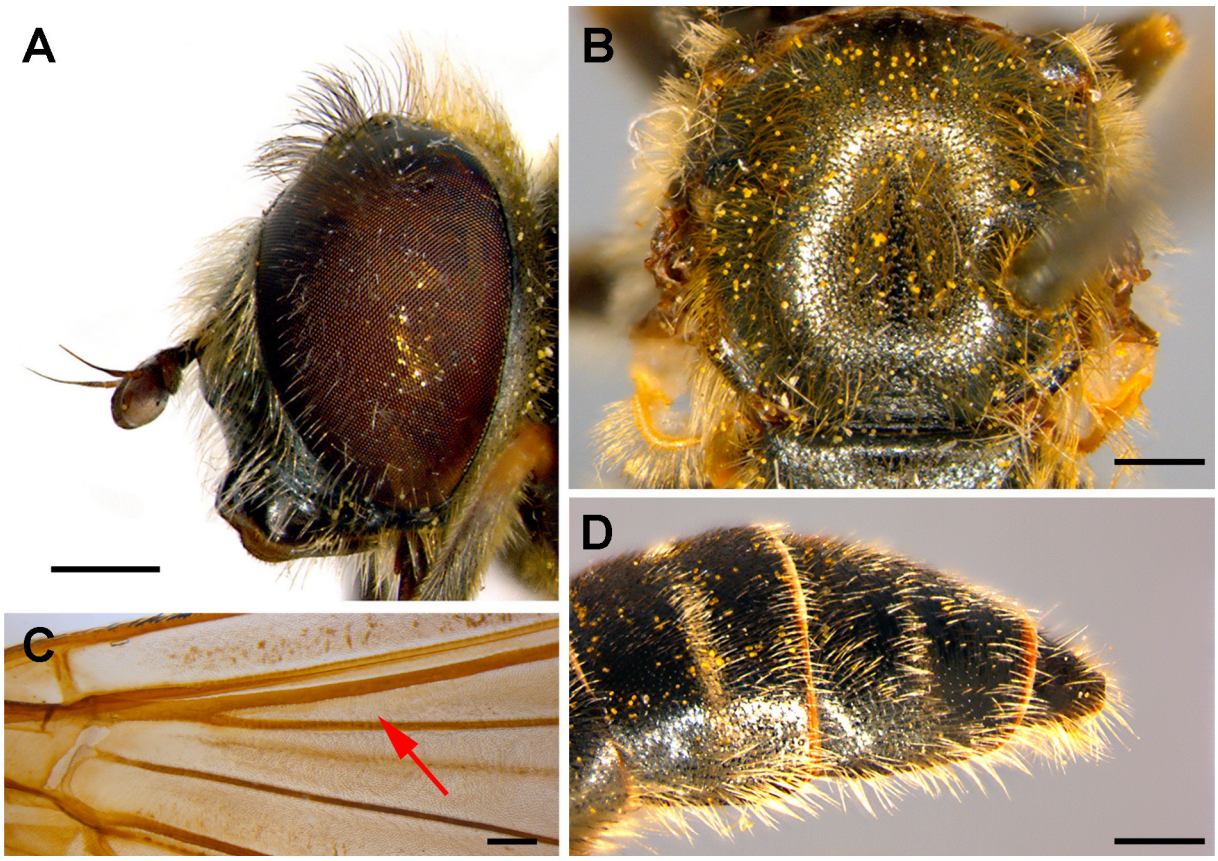

Fig. 2. *Merodon desuturinus*Vujić, Šimić & Radenković, 1995 (Serbia, Kopaonik, FSUNS). **A**. Head, lateral view. **B**. Thorax, dorsal view. **C**. Part of the wing, dorsal view, microtrichose part of wing between veins R1 and RS marked with arrow. **D**. Abdomen, lateral view. **A**–**C**. Male. **D**. Female. Scale bars: A = 2 mm; B–D = 1 mm.

the posterior anepisternum except for anterior end, anteroventral and posterodorsal part of katepisternum, anepimeron, metasternum; katatergite dense, erect, short, yellowish pilose. Wing hyaline, with dense microtrichia and dark brown veins. Calypter yellow. Haltere with brown pedicel and yellow to brown capitulum. Legs dark brown to black, except yellowish apex of femora, and base and apex of tibiae; tarsi brown ventrally. Metatrochanter without process, covered with brush of yellow, dense, strong pile (Fig. 7C). Metafemur moderately broad and straight ventrally, long yellowish pilose (Fig. 7C). Metatibia with apical, inconspicuous anteroventral spur and with indication of posteroventral spur. Legs predominantly yellow pilose, except dorsally on tarsi where short, black pilose, and a few black pile on apical part of femora.

Abdomen. Black with bronze reflections, slightly tapering, as long as mesonotum. Terga 2–4 black, with more or less distinct white pollinose fasciate maculae interrupted in the middle of terga 2–3, connected on tergum 4; lateral sides of terga long, erect and whitish pilose, but adpressed on medial parts; pollinose fasciate maculae white pilose, posterior ⅔ of tergite 4 and posterior margin of terga 2–3 of most specimens white pilose, otherwise black pilose. Sternites shiny, dark brown, long whitish pilose.

Genitalia. Posterior lobe of surstyle triangular, pointed apically and curved outwards (Fig. 5A: pl); anterior lobe of surstyle bent inwards (Fig. 5B: al); median part of surstyle with one very long inner thorn (Fig. 5B); cercus elongated (Fig. 5A: c). Hypandrium with broad theca, ventral margin folded (Fig. 5C). Lateral sclerite of aedeagus narrow, gradually tapering, with the tip curved downwards (Fig. 5C: s).

Female

Unknown.

Distribution and biology

Republic of South Africa (Fig. 8). Collected in montane grass and woodland, with *Rhus* sp., *Diospyros* sp., *Celtis* sp., etc.

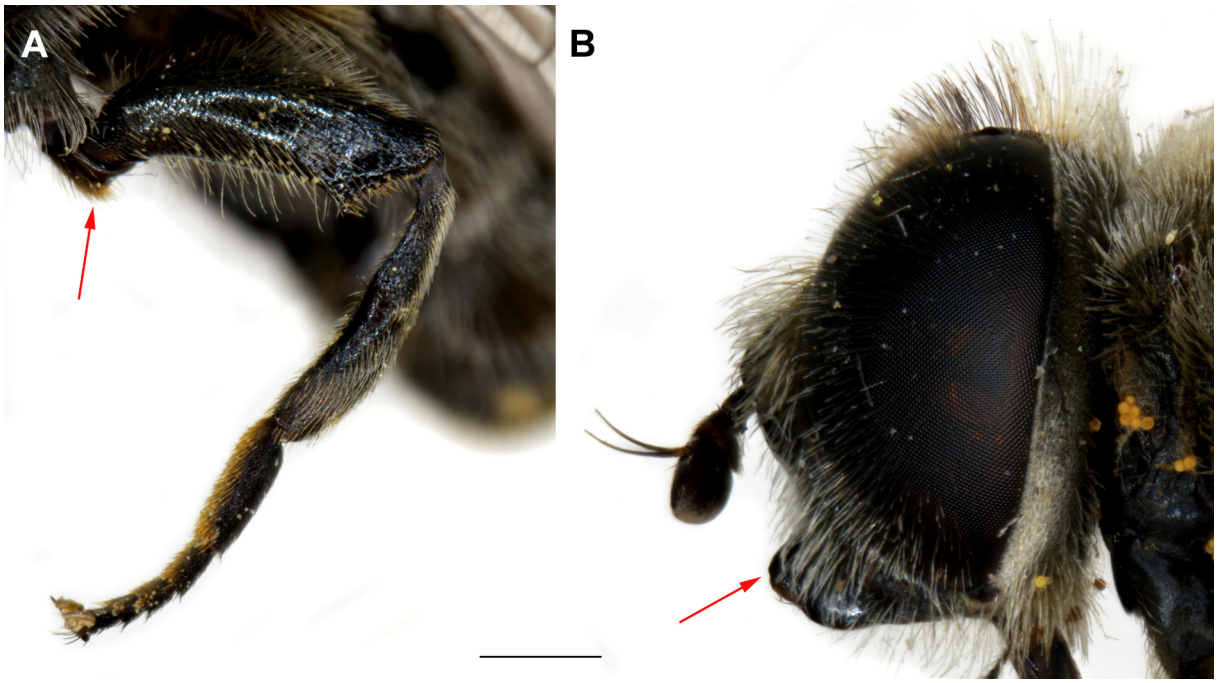

Fig. 3. A. *Merodon commutabilis* Radenković & Vujić, 2018 (RSA, Kwa Zulu Natal, Howick, FSUNS), male, metaleg. **B**. *M. draconis* (RSA, Drakensberg mountains, FSUNS), male, head lateral view. Lateral view notched oral margin marked with arrow. Scale bar: A = 2 mm; B = 1 mm.

Differential diagnosis

The most closely related species is *M. capensis*, from which it can be distinguished by the presence of a large inner thorn on the surstyle medially (Fig. 5B: it) (small in *M. capensis* (Fig. 6B: it)), and the broader pollinose fasciate maculae on terga 2–4 (Fig. 4B) (less than ⅛ of their length in *M. capensis* (Fig. 4D)). It differs from *M. commutabilis* by the dark brown to black legs with yellowish apex of the femora, base and apex of tibiae and the ventrally brown tarsi (entirely black in *M. commutabilis*), the broad posterior lobe of the surstyle of the male genitalia (Fig. 5A: pl) (narrow in *M. commutabilis*) (Fig. 6D: pl), and the folded theca without additional structures of the hypandrium in *M. spinolobus* sp. nov. (Fig. 5C: vr) (theca unfolded (Fig. 19C), and with distinct subapical lamellas and lateral wings in *M. commutabilis*).

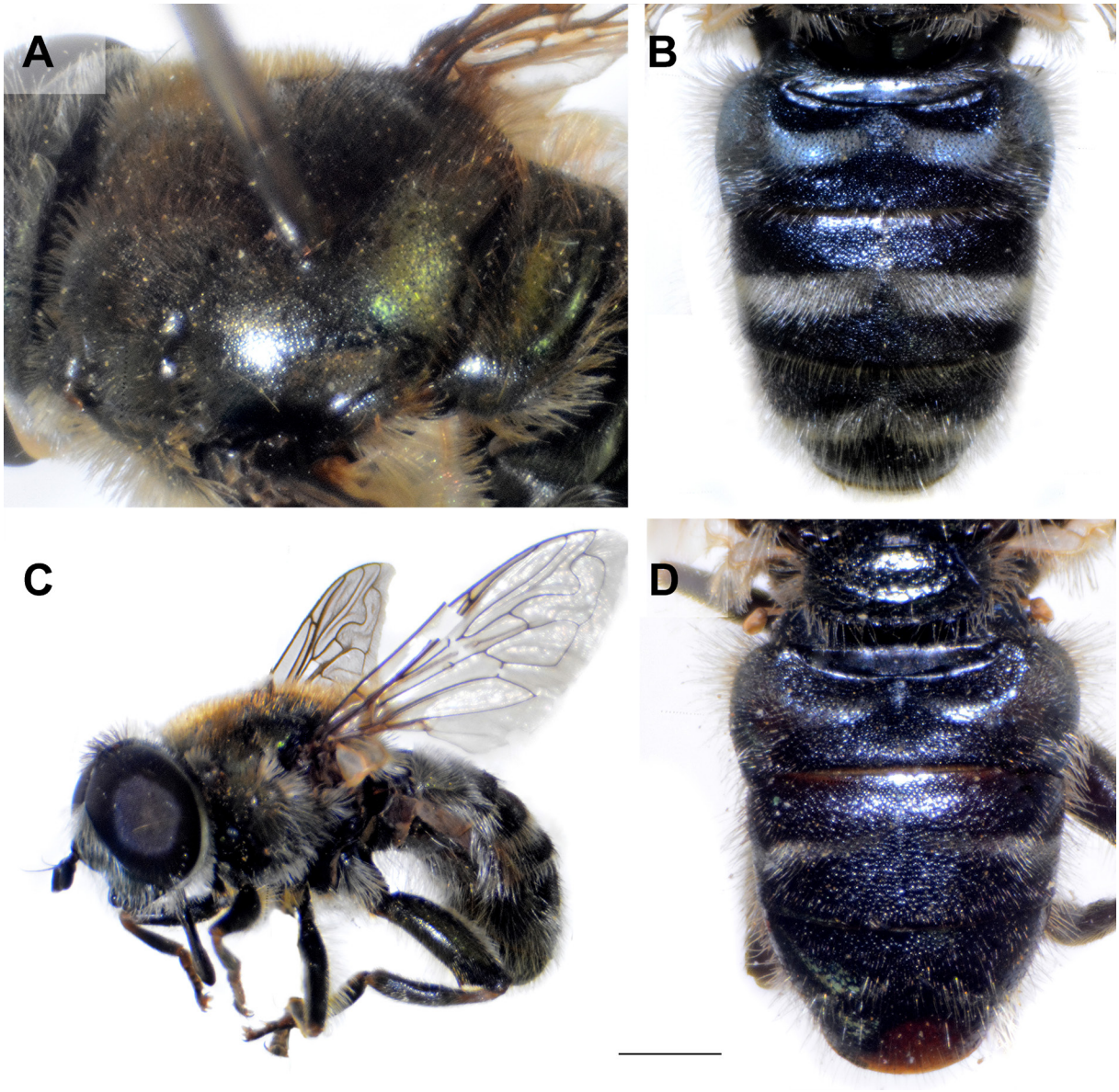

Fig. 4. A–C. *Merodon spinolobus* Vujić, Radenković & Likov sp. nov. (paratype, RSA, NMSA), male. **D**. *M. capensis* Hurkmans, 2018 (RSA, Northern Cape, NMSA), male. **A**. Thorax, dorsolateral view. **B, D**. Abdomen, dorsal view. **C**. Body, lateral view. Scale bar: A = 0.75 mm; B, D = 1 mm; C = 2 mm.

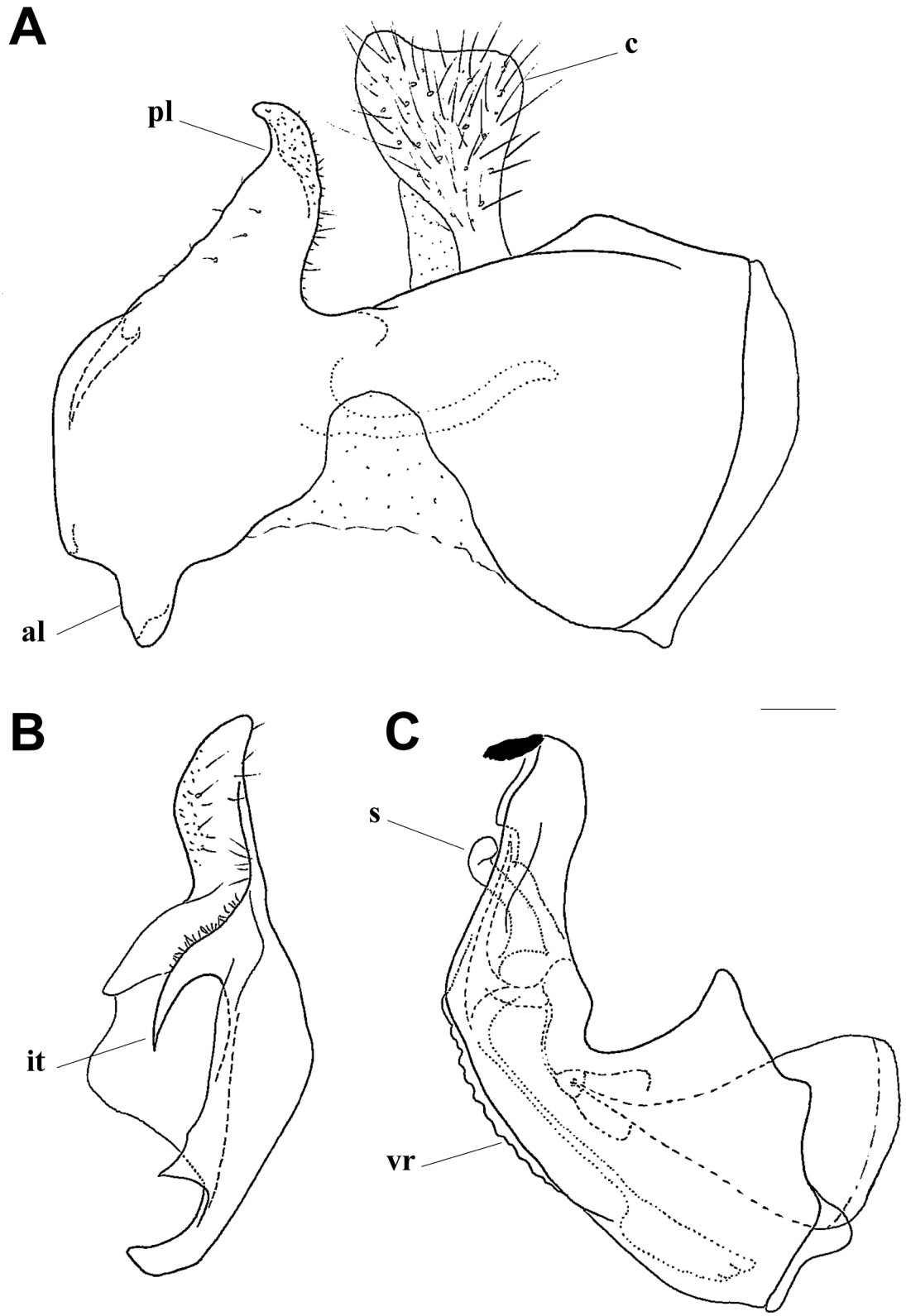

Fig. 5. *Merodon spinolobus* sp. nov. (paratype, RSA, NMSA), male genitalia. **A**. Epandrium, lateral view. **B**. Epandrium, ventral view. **C**. Hypandrium, lateral view. Abbreviations: al = anterior surstylar lobe; c = cercus; it = inner thorn on medial part of surstylus; pl = posterior surstylar lobe; s = lateral sclerite of aedeagus; vr = ventral ridge of theca. Scale bar: 0.2 mm.

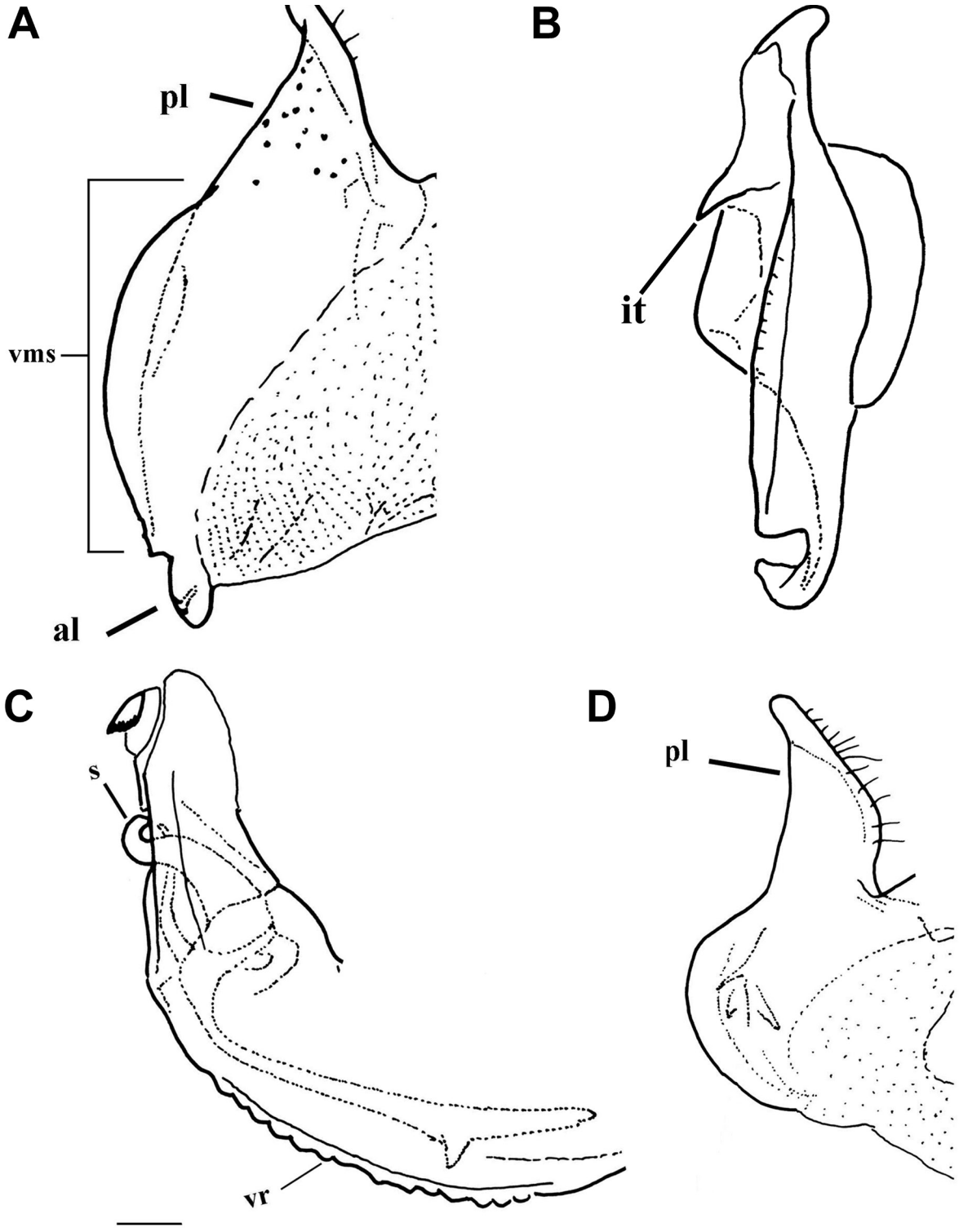

Fig. 6. Male genitalia of **A**–**C**. *Merodon capensis* (RSA, Northern Cape, FSUNS). **D**. *M. commutabilis* (RSA, Kwa Zulu Natal, Howick, FSUNS). **A**, **D**. Surstylus, lateral view. **B**. Surstylus, ventral view. **C**. Hypandrium, lateral view. Abbreviations: al = anterior surstylar lobe; it = inner thorn on medial part of surstylus; pl = posterior surstylar lobe; s = lateral sclerite of aedeagus; vms = ventral margin of surstylus; vr = ventral ridge of theca. Scale bar: 0.2 mm.

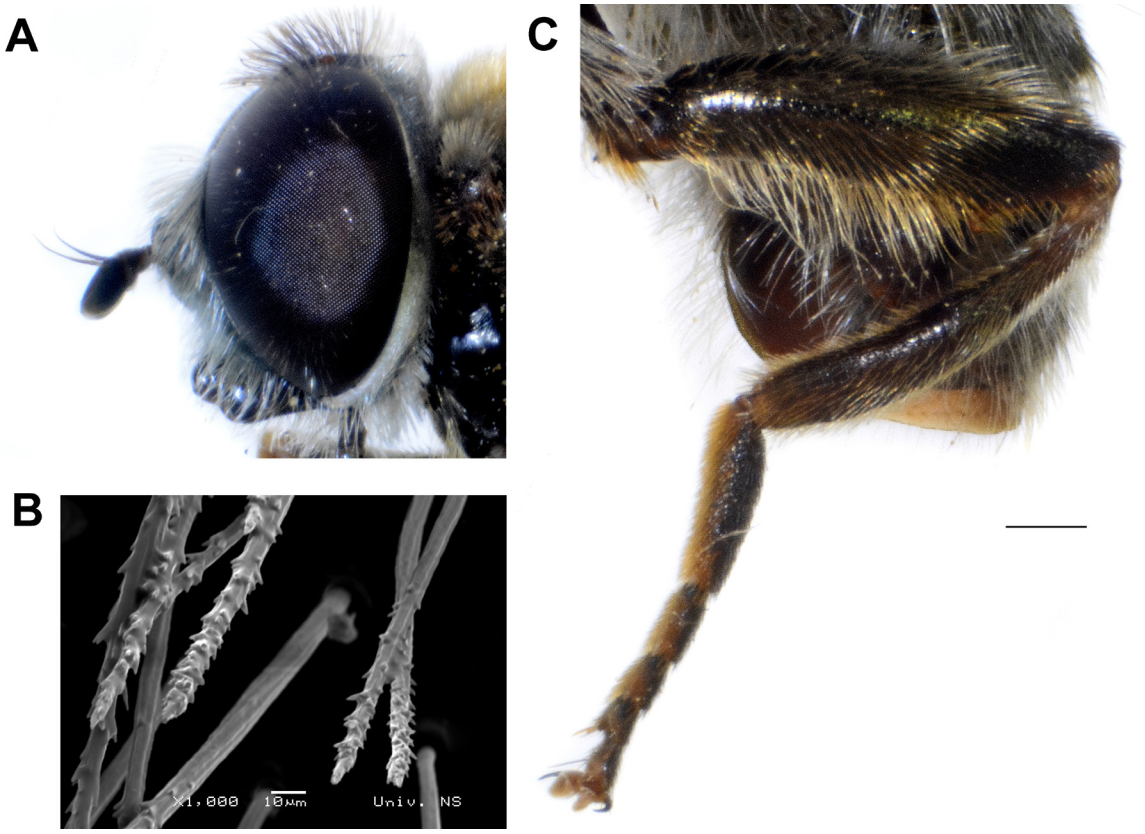

Fig. 7. A, **C**. *Merodon spinolobus* sp. nov. (paratype, RSA, NMSA), male. **B**. *M. draconis* Vujić & Radenković, 2018 (RSA, Drakensberg mountains, FSUNS). **A**. Head, lateral view. **B**. Pile on ocellar triangle (SEM). **C**. Metaleg, lateral view. Scale bar: A, C = 1 mm.

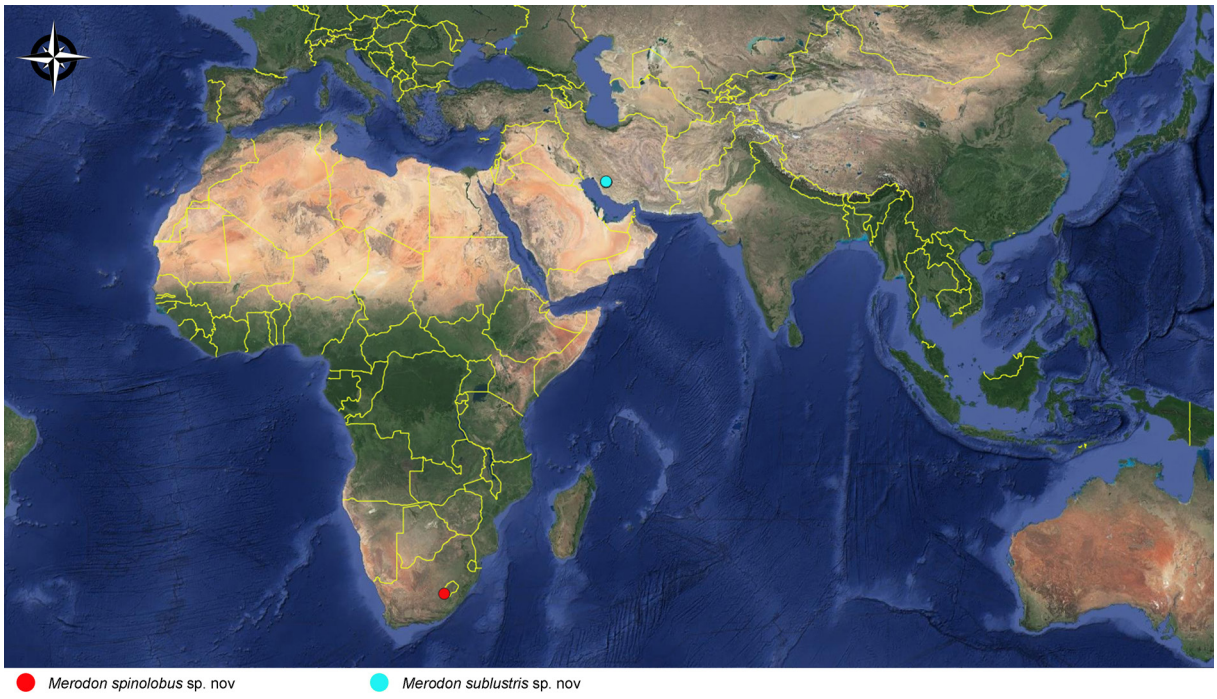

Fig. 8. Distribution map of *M. spinolobus* sp. nov. and *M. sublustris* sp. nov.

Diagnosis of the *murorum* species group

Species without patch of dense yellow pile on metatrochanter, present in *melanocerus* species group.

Identification

Vujić *et al*. (2018) recently revised these species groups and provided an identification key for the *desuturinus* lineage, including the *M. murorum* species group.

Merodon cabanerensis Marcos-García, Vujić & Mengual, 2007

Examined material

MOROCCO • ♂; Azilal, Ait Mhamed; 31°53′22.848″ N 6°29′38.868″ W; 1700 m a.s.l.; 26 Mar. 2013; J. Dils leg.; FSUNS 10395; coll. VWG.

Merodon sublustris Likov, Vujić & Radenković, sp. nov.
urn:lsid:zoobank.org:act:7F418A9F-36D6-4EF1-9FCD-9D8680B98FE1
Figs 8, 9A–B, D, 10–11, 12A

Diagnosis

Dark species with broad abdomen. The oral margin slightly notched. Basoflagellomere short, 1–1.2 times as long as wide (Fig. 9D). Legs mostly dark, except for pale apex of femora and paler bases and apexes of tibiae. Metafemur with weakly developed apical triangular process, with distinct apical thorn (Fig. 10A–B). Terga mostly black, terga 2 and 3 each sometimes with small reddish lateral fasciae or maculae,with a transverse pair of distinct, narrow microtrichose fasciate maculae on terga 2–4 which are approx. ⅙ to ⅛ of tergal length (Fig. 10C–D). Males: eye contiguity 5–12 facets long (Fig. 9A). Male genitalia with smooth thecal ridge, posterior surstylar lobe with parallel margins (Fig. 11A: pl).

Etymology

Latin adjective '*sublustris*' (faintly lit, dim) referring to predominantly dull and pollinose scutum and frons.

Type material

Holotype

IRAN • ♂; Fars Province, 15 km S of Dasht Arjan; 29°33′8.57″ N 51°56′22.22″ E; 2261 m a.s.l.; 2–6 May 2016; Martin Obořil leg.; FSUNS 18285; MMBC.

Paratypes

IRAN • 2 ♂♂; FSUNS 18287, 18283 • 2 ♀♀; Fars Province, 15 km S of Dasht Arjan; 29°33′8.57″ N 51°56′22.22″ E; 2261 m a.s.l.; 2–6 May 2016; Martin Obořil leg.; FSUNS 18288, 18292; FSUNS • 2 ♂♂; FSUNS 18284, 18286 • 2 ♀♀; same collecting data as for preceding; FSUNS 18291, 18289; MMBC • 1 ♀; Fars Province, Dasht Arjan; 29°33′7.2″ N 51°56′31.2″ E; 2260 m a.s.l.; 5 May 2016; M. Kafka leg.; FSUNS 68223; FSUNS • 3 ♂♂; FSUNS 68230, 68226, 68227 • 2 ♀♀; same collecting data as for preceding; FSUNS 68224, 68225; coll. MB • 1 ♂; Fars Province, Dasht Arjan; 29°37′48″ N 51°54′43.199″ E; 2040 m a.s.l.; 5 May 2016; M. Kafka leg.; FSUNS 68228; FSUNS • 1 ♂; same collecting data as for preceding; FSUNS 68229; coll. MB • 1 ♂; locality unknown; 1 Apr. 1936; F. Brandt leg.; FSUNS 02608; MZH; published as *Merodon neolydicus* in Vujić *et al.* (2018).

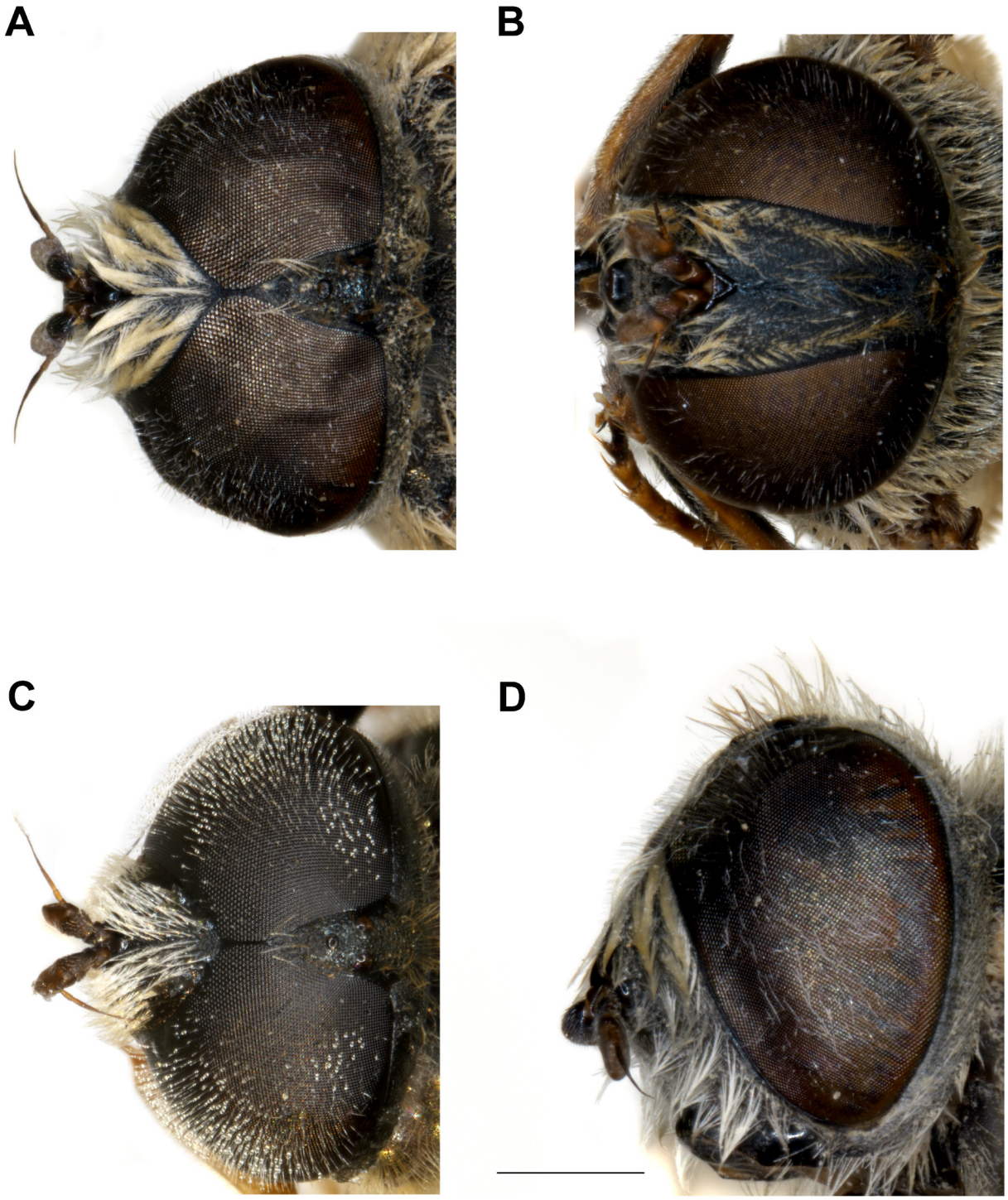

Fig. 9. A–**B**, **D**. *Merodon sublustris* sp. nov. (paratype, Iran, FSUNS). **C**. *M. neolydicus* Vujić, 2018 (Greece, Chios, FSUNS). **A**, **C**. Head, dorsal view. **B**. Head, frontal view. **D**. Head, lateral view. **A, C**–**D**. Male. **B**. Female. Scale bar: 1 mm.

Description

Male

Head (Fig. 9A, D). Antenna reddish to dark brown; basoflagellomere short, as long as broad, concave dorsally; arista light to dark brown, thickened basally, about 2 times as long as basoflagellomere; first and second segment of arista long and reddish. Face microtrichose and long whitish to yellow pilose, except on median bare vitta that occupies ¼ width of face. Frons black, microtrichose, whitish yellow pilose. Vertical triangle black and shiny, microtrichose, predominantly long whitish pilose, with a few black pile interspersed; ocellar triangle isosceles. Eyes densely whitish yellow pilose, as long as scape. Occiput whitish pilose, white microtrichose.

Thorax. Mesoscutum and scutellum black with bronze lustre, relatively long (as long as or a little longer than basoflagellomere), dense, erect whitish yellow pilose; three longitudinal microthichose vittae well-developed (Fig. 12A). Pleuron often covered with whitish microtrichia and the following parts long yellow pilose: posterior part of anterior anepisternum, posterior anepisternum (except anteroventral part), anepimeron, metasternum, and anterior, posterodorsal and posteroventral parts of katepisternum. Wing hyaline, with dense microtrichia and light brown to dark brown veins. Calypter yellow. Haltere with brown pedicel and yellow to brown capitulum. Legs mostly dark brown-black, except for paler apex

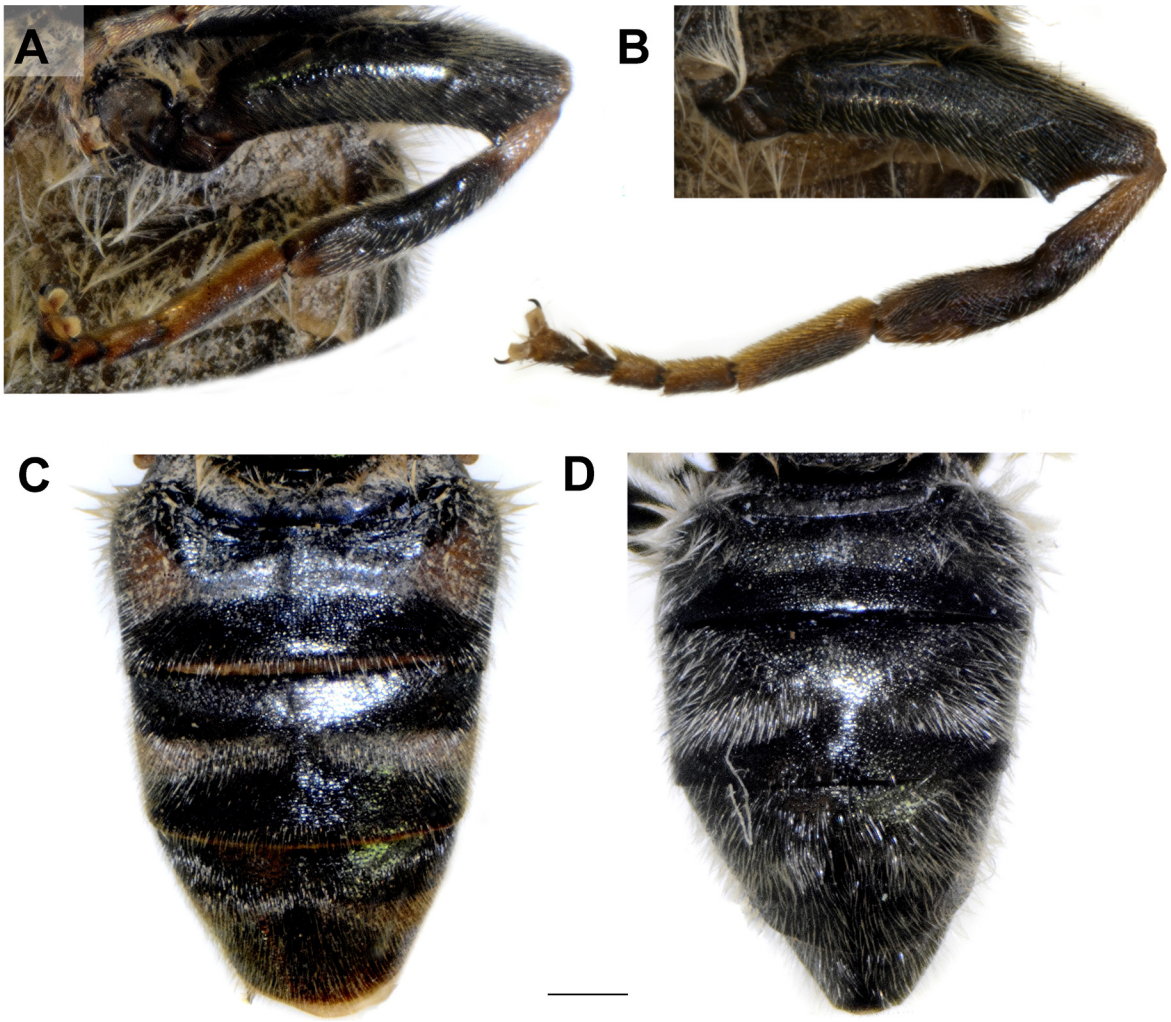

Fig. 10. *Merodon sublustris* sp. nov. (paratype, Iran, FSUNS). **A**–**B**. Metaleg, lateral view. **C**–**D**. Abdomen, dorsal view. **A**, **C**. Male. **B**, **D**. Female. Scale bar: 1 mm.

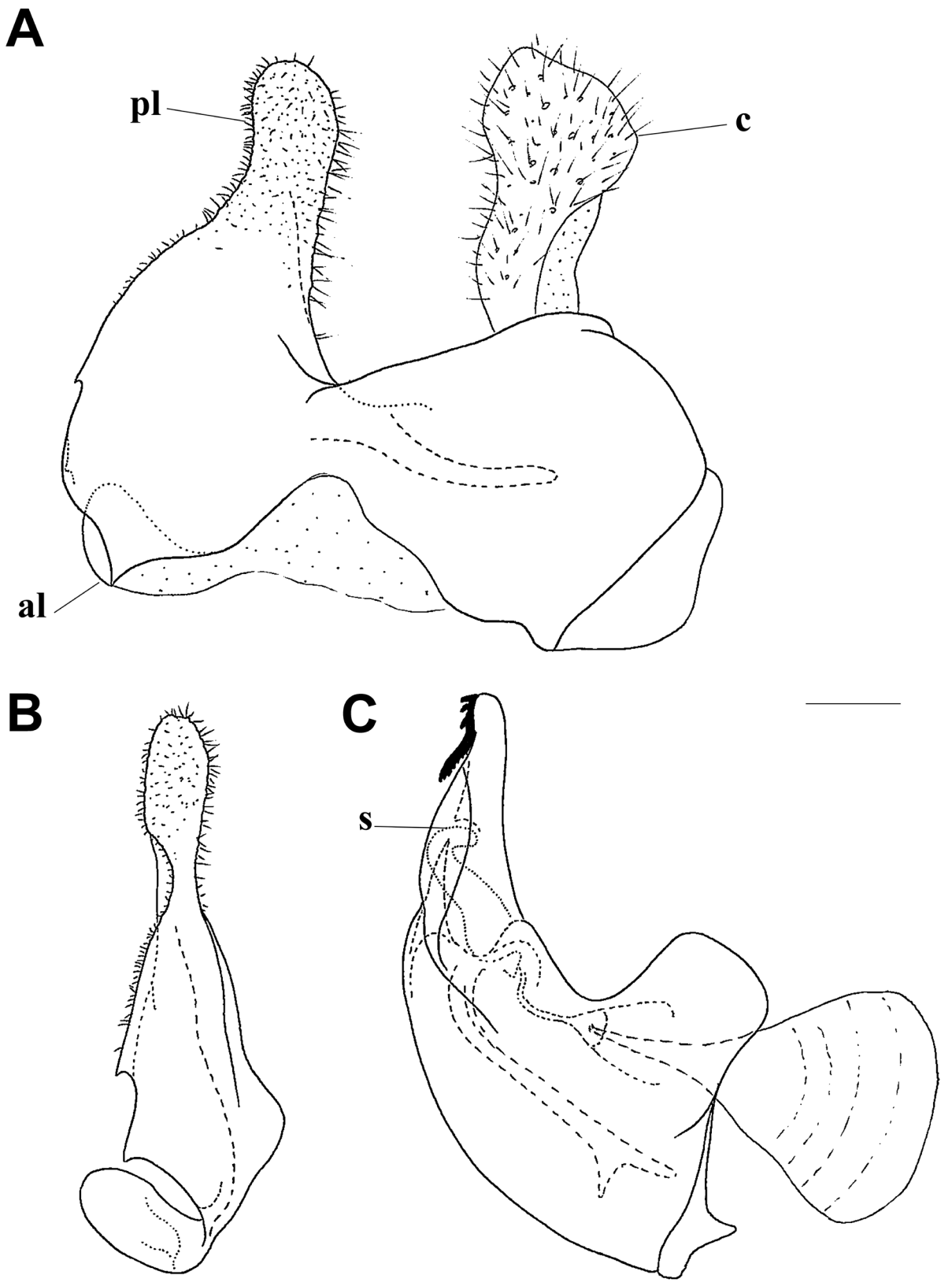

Fig. 11. *Merodon sublustris* sp. nov. (paratype, Iran, FSUNS), male genitalia. **A**. Epandrium, lateral view. **B**. Epandrium, ventral view. **C**. Hypandrium, lateral view. Abbreviations: al = anterior surstylar lobe; c = cercus; pl = posterior surstylar lobe; s = lateral sclerite of aedeagus. Scale bar: 0.2 mm.

of femora and paler bases and apexes of tibiae; colour of tarsi variable, at least partly yellow-brown. Metatrochanter lacks processes, short yellow pilose. Metafemur moderately thickened and straight, with small apical triangular process (Fig. 10A). Metatibia with inconspicuous apical, antero-ventral spur and indications of a postero-ventral spur. Pile on legs short, predominantly whitish, except for some short black pile on tarsi dorsally.

Abdomen (Fig. 10C). Black with bronze reflections, slightly tapering, as long as mesonotum. Tergite 1 microtrichose; terga 2–4 black, with more or less distinct transverse fasciae of white microtrichia interrupted in the middle (sometimes connected on tergum 4); terga 2–3 with pair of anterolateral orange maculae; pilosity on lateral sides of terga erect and whitish, adpressed on central parts; colour of pile white on mictrotichose transversal fasciae, and on terga 2 and 5; on terga 2–3 pilosity predominantly black medially. Sternum dark brown, long, pale yellow pilose.

Genitalia. Posterior surstylar lobe broader basally, narrow apically, with parallel margins (Fig. 11A: pl); apical parts of anterior surstylar lobe long and bent inwards; median part of surstylus with two inner thorns (Fig. 11B); cercus elongated and broadened apically (Fig. 11A: c). Hypandrium with broad theca and smooth thecal ridge (Fig. 11C). Lateral sclerite of aedeagus narrow, gradually tapered, with the tip curved downwards (Fig. 11C: s).

Female

Similar to the male except for typical sexual dimorphism (Figs 9B, 10B, D).

Distribution

Registered only in Iran (Fig. 8).

Differential diagnosis

Merodon sublustris sp. nov. is morphologically most similar to *M. neolydicus* Vujić, 2018 from which it differs by the dull scutum with three clearly visible pollinose vittae medially (Fig. 12A: marked with arrows) (shiny and with indistinct narrow medial pollinose vittae in *M. neolydicus* (Fig. 12B)), the vertical triangle of the male, and frons of the female which are mostly pollinose (Fig. 9A–B), (mostly shiny in *M. neolydicus* (Fig. 9C)), and by distribution (*M. sublustris* sp. nov. is found only in Iran while *M. neolydicus* occurs in the Eastern Mediterranean).

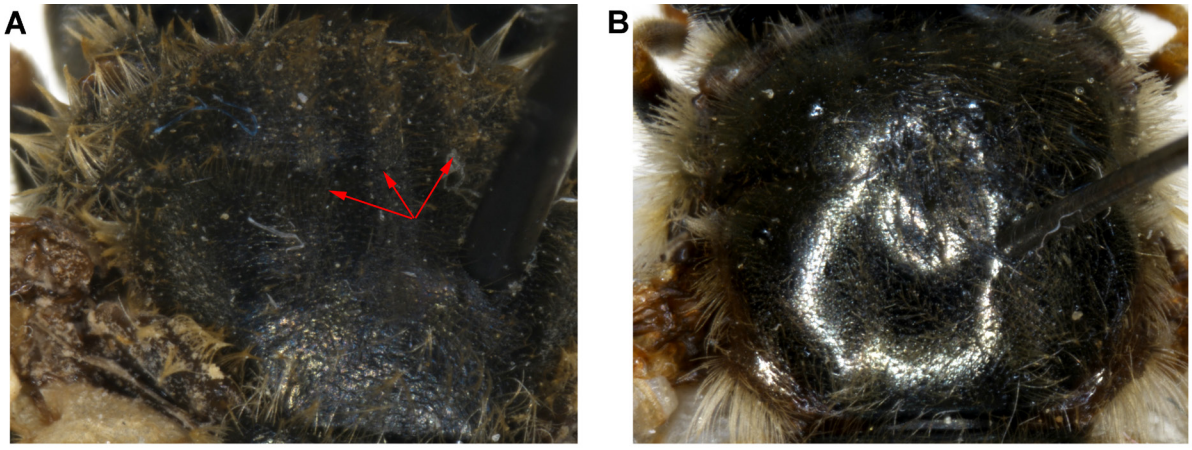

Fig. 12. Thorax, dorsal view, male. **A**. *Merodon sublustris* sp. nov. (paratype, Iran, FSUNS), pollinose vittae marked with arrows. **B**. *M. neolydicus* (Greece, Chios, FSUNS). Scale bar: 1 mm.

Key to the species of the **Merodon desuturinus** *lineage – males*

1. Eyes holoptic (i.e. touching) (as on Fig. 13C) 3
– Eyes dichoptic (i.e. separated or slightly touching) (as on Fig. 13A, D) 2

2. Basoflagellomere elongated, 1.5 times as long as wide (Fig. 14A); male genitalia with posterior surstylar lobe very short, broad and triangular (Fig. 14C: pl) (Republic of South Africa) ..... ***Merodon flavocerus*** Hurkmans, 2018
– Basoflagellomere shorter, almost as long as wide (Fig. 14B); male genitalia with posterior surstylar lobe elongated and triangular (Fig. 14D: pl) (Balkan Peninsula: Serbia, Montenegro) ..... ***Merodon desuturinus*** Vujić, Šimić & Radenković, 1995

3. Oral margin reduced (Fig. 13B), microtrichose (central and southern Africa)..... ***Merodon planifacies*** subgroup (key published in separated paper, Vujić *et al.* in prep.)
– Oral margin notched, slightly produced forward (as on Fig. 3B) 4

4. Male genitalia: hypandrium with folded thecal ridge (as on Fig. 15A: vr) 5
– Male genitalia: hypandrium with smooth thecal ridge (as on Fig. 15B: vr) 7

5. Scutum with fascia of black pile between wing bases, or black pile around wing bases; male genitalia: ventral margin of surstylus (as on Fig. 15C: vms) and hypandrium slightly angular (as in Fig. 5C) (Republic of South Africa) 6
– Scutum entirely with pale pile; male genitalia: ventral margin of surstylus (Fig. 15D: vms) and hypandrium distinctly angular (Fig. 15E: marked with arrow) (Zimbabwe) ..... ***Merodon cuthbertsoni*** Curran, 1939

6. Scutum with black pile around wing bases; inner thorn of surstyle medially very long and strong (Fig. 5B: it); fasciate maculae of microtrichia on terga 2–4 broader, about ⅕ of their length ..... ***Merodon spinolobus*** Vujić, Radenković & Likov sp. nov.
– Scutum with fascia of black pile between wing bases or black pile around wing bases; inner thorn on surstyle smaller (Fig. 6B: it); fasciate maculae of microtrichia on terga 2–4 narrow, less than ⅛ of their length ..... ***Merodon capensis*** Hurkmans, 2018

7. Male genitalia: posterior surstylar lobe with parallel margins in apical half (as on Fig. 16A: pl) .. 8
– Male genitalia: posterior surstylar lobe triangular (as on Fig. 18C: pl) or with hook-like apex (as on Fig. 18A: pl) 10

8. Small species (8–11 mm) with narrow abdomen (Fig. 16D); male genitalia: ventral margin of anterior surstylar lobe angular (Fig. 16A: al), distal prolongation on anterior surstylar lobe broad (Fig. 16B: dp); apical part of hypandrium narrow (Fig. 16C) (Western Mediterranean: central Spain) ..... ***Merodon cabanerensis*** Marcos-García, Vujić & Mengual, 2007
– Large species (10–13 mm) with broader abdomen (as on Fig. 17D); male genitalia: ventral margin of anterior surstylar lobe rounded (as on Fig. 17A: vms), distal prolongation on anterior surstylar lobe narrow and directed towards the central line of symmetry of epandrium (as on Fig. 17B: dp); apical part of hypandrium broad (as on Fig. 17C) 9

9. Scutum dull with three clearly visible pollinose vittae medially (Fig. 12A: marked with arrows); vertex mostly pollinose (Fig. 9A); (distribution: Iran) ..... ***Merodon sublustris*** Likov, Vujić & Radenković sp. nov.
– Scutum shiny (Fig. 12B) and with very indistinct narrow medial pollinose vittae; vertex mostly shiny (Fig. 9C); (distribution: Eastern Mediterranean) ..... ***Merodon neolydicus*** Vujić, 2018

10. Male genitalia: posterior surstylar lobe long and narrow (as on Fig. 18A: pl) 11
– Male genitalia: posterior surstylar lobe broad and triangular (as on Fig. 18C: pl) 12

11. Male genitalia: posterior surstylar lobe with small apical ridge (Fig. 18A: marked with arrow); anterior surstylar lobe evident, strongly protruded; theca of hypandrium in apical fourth broad with oval lateral lamellae and small lateral wings (Fig. 18B: both marked with arrow) (Republic of South Africa) ..... ***Merodon drakonis*** Vujić & Radenković, 2018
– Male genitalia: posterior surstylar lobe with apical globule (Fig. 19A: pl, ag); anterior surstylar lobe less evident (Fig. 19A: al); theca of hypandrium in apical fourth without lateral lamellae or lateral wings (Fig. 15B: t) (North Africa) ..... ***Merodon murorum*** Fabricius, 1794

12. Tergum 2 with orange lateral maculae; male genitalia: anterior surstylar lobe with almost straight ventral margin (Fig. 18C: al) and large inner thorn (Fig. 18C: it); theca of hypandrium narrow in apical quarter, without lateral lamellae or lateral wings (Fig. 18D) (Republic of South Africa) .... ***Merodon melanocerus*** Bezzi, 1915
– Tergum 2 usually black; male genitalia with anterior surstylar lobe with convex ventral margin (Fig. 19B: al), theca of hypandrium in apical quarter broad with oval lateral lamellae (Fig. 19C: sl), and small lateral wings (Republic of South Africa) .... ***Merodon commutabilis*** Radenković & Vujić, 2018

Key to the species of the **Merodon desuturinus** *lineage – females*

Note: the female of *Merodon cuthbertsoni* is unknown, but most probably keys out with *M. capensis*; the female of *Merodon spinolobus* sp. nov. is unknown.

1. Oral margin reduced (as on Fig. 20A), covered by microtrichia (central and southern Africa) .... ***Merodon planifacies*** subgroup
– Oral margin evident, notched, shiny (as on Fig. 7A) 2

2. Tergum 2 black or at least lateral sides dark (as on Fig. 21C) 3
– Tergum 2 with orange lateral maculae extending along lateral sides (as on Fig. 21A–B) 6

3. Legs partly pale, at least at both ends of tibiae pro- and mesolegs, and the basal tarsomeres 1–2 of pro- and mesolegs; scutum with fascia of black pile between wing bases (Republic of South Africa) ..... ***Merodon capensis*** Hurkmans, 2018
– Legs black, exceptionally tarsi of metalegs brown ventrally; pilosity of scutum variable, can be covered with pale or mixed black and pale pile 4

4. Basoflagellomere elongated, 1.3 times as long as wide (Fig. 22E); terga 2–4 each with clear microtrichose fasciate maculae (Fig. 21D) (Republic of South Africa) .... ***Merodon commutabilis*** Radenković & Vujić, 2018
– Basoflagellomere shorter, almost as long as wide (as on Fig. 22B); terga 2–4 each without or with very narrow microtrichose fasciate maculae 5

5. Distribution: Balkan Peninsula (Serbia, Montenegro) .... ***Merodon desuturinus*** Vujić, Šimić & Radenković, 1995
– Distribution: Western Mediterranean (central Spain) .... ***Merodon cabanerensis*** Marcos-García, Vujić & Mengual, 2007

6. Basoflagellomere elongated, more than 1.5 times as long as wide (as on Fig. 22A, C) 7
– Basoflagellomere shorter, less than 1.5 times as long as wide (as on Fig. 22D) 8

7. Frons with very narrow microtrichose vittae along eye margins (Fig. 23A) (Republic of South Africa) ..... ***Merodon flavocerus*** Hurkmans, 2018
– Frons with broad lateral microtrichose vittae (Fig. 23B) (North Africa) .... ***Merodon murorum*** Fabricius, 1794

8. Body pile very short (as on Fig. 21A); metatrochanter with sparse pale pile (as on Fig. 24A) (distribution: Palaearctic) 9
– Body pile long (as on Fig. 24C); metatrochanter with patch of dense yellow pile (as on Fig. 24B); (distribution: Republic of South Africa) 10

9. Scutum dull, with three clearly visible pollinose vittae medially (as in male in Fig. 12A: marked with arrows); vertex and frons mostly pollinose (Fig. 9B); (distribution: Iran) .... ***Merodon sublustris*** Likov, Vujić & Radenković sp. nov.
– Scutum shiny (as in male in Fig. 12B) and with indistinct narrow medial pollinose vittae; frons mostly shiny; (distribution: Eastern Mediterranean) ..... ***Merodon neolydicus*** Vujić, 2018

10. Frons shiny, almost without microtrichia; distance between posterior ocellus and upper eye corner larger than distance between posterior and anterior ocelli (Fig. 20B) (Republic of South Africa) .... ***Merodon melanocerus*** Bezzi, 1915
– Frons with broad lateral microtrichose vittae along eye margins; distance between posterior ocellus and upper eye corner less than distance between the posterior and anterior ocelli (Fig. 20C) (Republic of South Africa) ..... ***Merodon drakonis*** Vujić & Radenković, 2018

Molecular analysis

The MP analysis yielded a strict consensus tree of four equally parsimonious trees (Fig. 25). The ML tree is depicted in Fig. 26. Based on both analyses, the *planifacies* and *melanocerus* species subgroups were resolved as monophyletic, while the *murorum* species group was not monophyletic. Within the *melanocerus* species subgroup, *M. spinolobus* sp. nov. is resolved as being closely related to (and for the MP analysis sister to) *M. capensis*. *Merodon sublustris* sp. nov., morphologically incorporated within the *murorum* species group, is most closely related to *M. cabanerensis* and *M. neolydicus*. The relationship of the *murorum* group and two species subgroups of the *melanocerus* group were poorly resolved.

The interspecific uncorrected pairwise p-distances in the *murorum* species group ranged from 1.43% *(M. neolydicus* and *M. sublustris* sp. nov.) to 8.87% (*M. desuturinus* and *M. murorum*). Similar wide range of interspecific p-distances from 1.37% (*M. commutabilis* and *M. drakonis*) to 9.34% (*M. mealnocerus* and *M. drakonis*) was observed in the *melanocerus* subgroup. Less variations in interspecific p-distances were observed between species of the *planifacies* species subgroup (2.73% on average) (Table 1).

Discussion

The genus *Merodon* was classified into five monophyletic lineages, 24 monophyletic species groups, two species subgroups and 10 unplaced species (Vujić *et al*. 2021). The majority of *Merodon* species is distributed in Eastern Europe and Asia Minor, and appears associated with the high diversity of bulb plant species, more specifically to families Liliaceae Juss., Amaryllidaceae s. lat. J. St.-Hil., Asparagaceae Juss., and Iridaceae (which are the known larval host plants of *Merodon*) in these regions (Ricarte *et al*. 2008, 2017; Andrić *et al*. 2014; Preradović *et al*. 2018; Aracil *et al*. 2024). Out of the total of 180 described *Merodon* species in the Palaearctic and Afrotropical regions, only 17 are known from the Afrotropical region. Only two *Merodon* lineages, *aureus* and *desuturinus*, have representatives in both the Afrotropical and Palaearctic regions. The *desuturinus* lineage was first delineated by Mengual *et al*. (2006). However, that study included only one species of the group (*M. cabanerensis*) in the analyses.

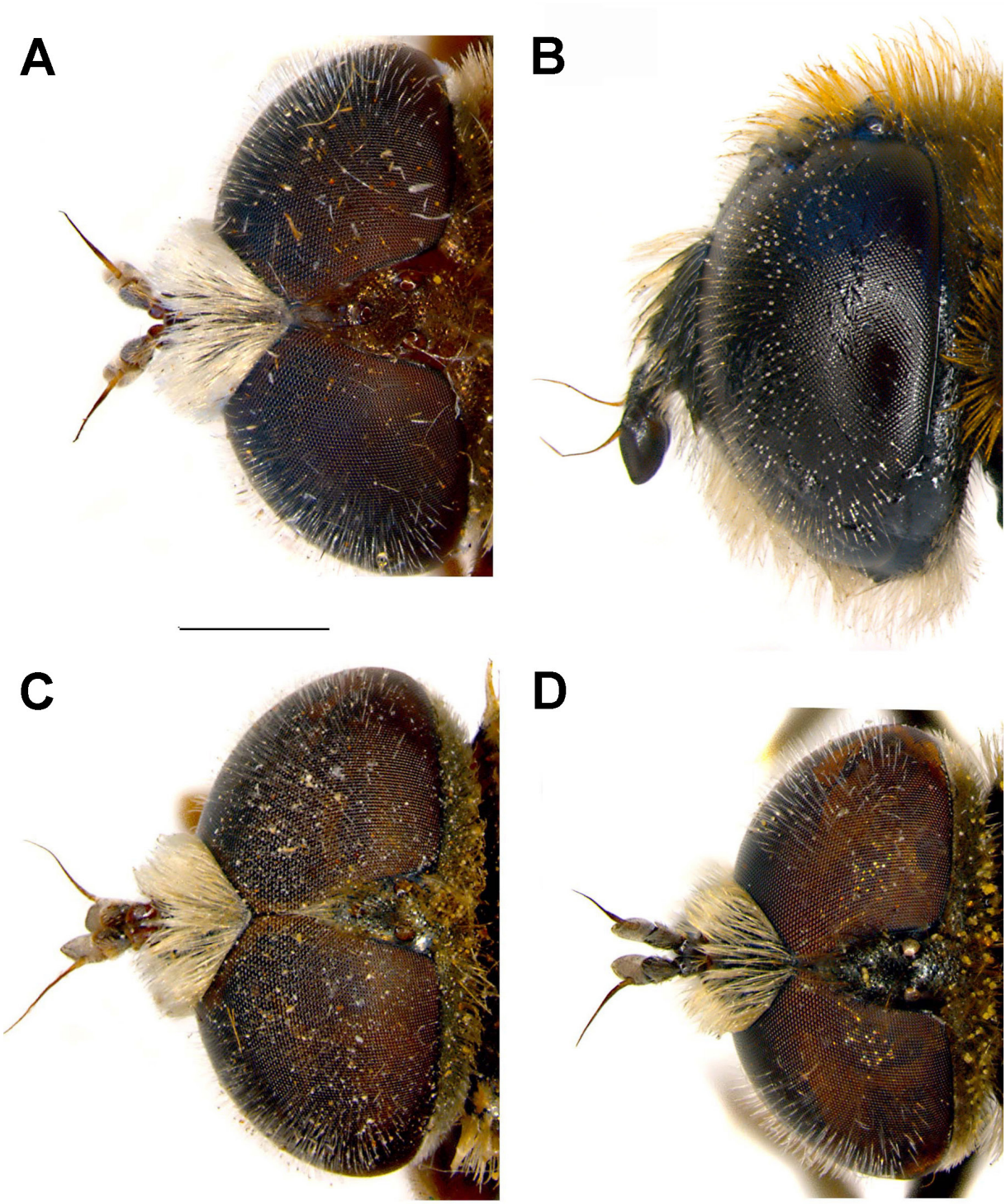

Fig. 13. Male, head. **A**–**B**. *Merodon planifacies* Bezzi, 1915 (RSA, Van Reenen, FSUNS). **C**. *M. murorum* Fabricius, 1794 (Morocco, FSUNS). **D**. *M. desuturinus* Vujić, Šimić & Radenković, 1995 (Serbia, Kopaonik, FSUNS). **A**, **C**–**D**. Dorsal view. **B**. Lateral view. Scale bar: 2 mm.

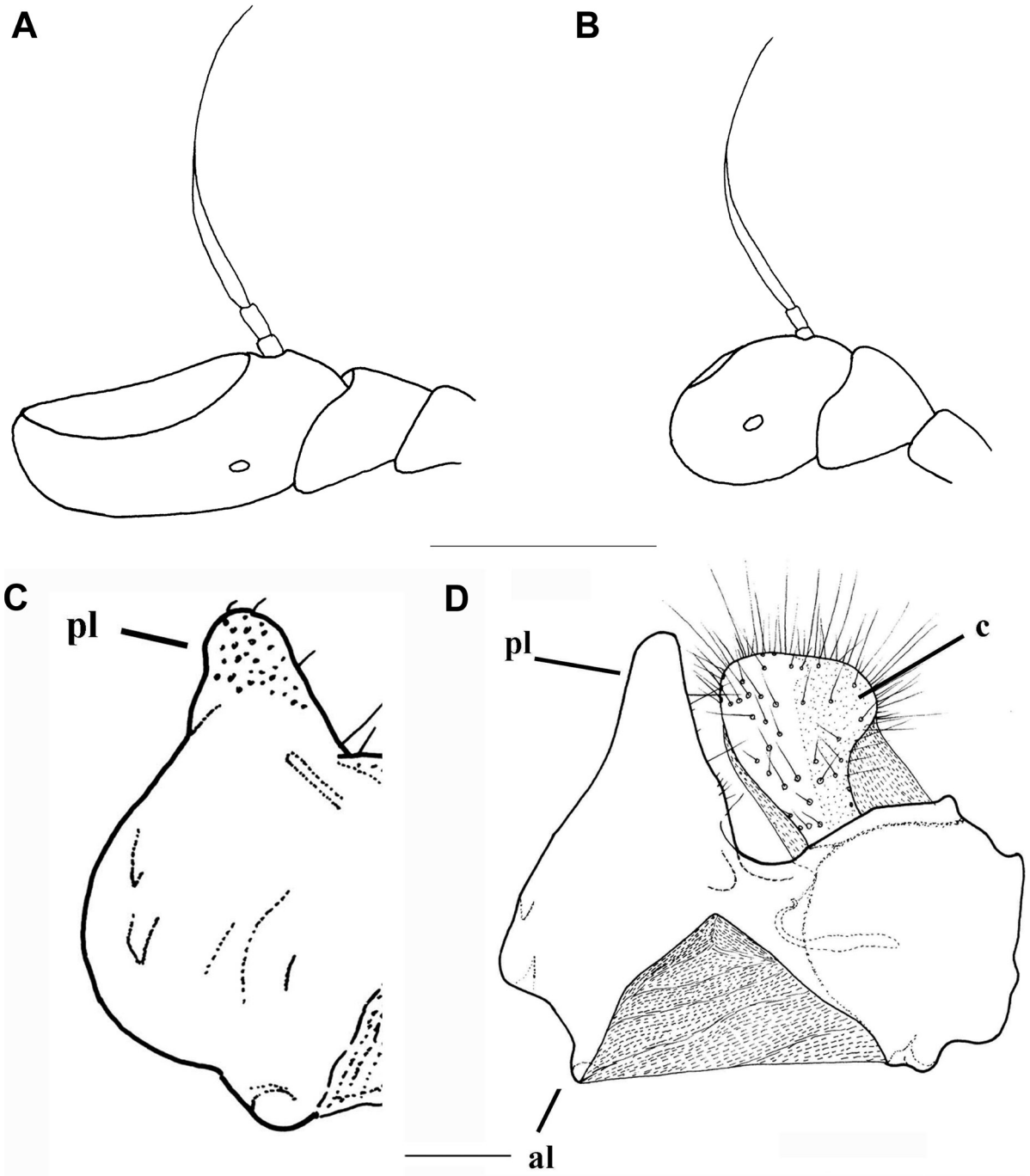

Fig. 14. Males. **A**, **C**. *Merodon flavocerus* Hurkmans, 2018 (RSA, Cape Province, NMSA). **B, D**. *M. desuturinus* (Serbia, Kopaonik, FSUNS). **A**–**B**. Antennae, lateral view. **C**–**D**. Male genitalia, epandrium, lateral view. Abbreviations: al = anterior surstylar lobe; c = cercus; pl = posterior surstylar lobe. Scale bars: A–B = 1 mm; C–D = 0.2 mm.

Radenković *et al*. (2018) recently confirmed the monophyly of the *desuturinus* lineage and classified eight additional species in the lineage. They also showed a close relationship to the *albifrons* group. Based on adult morphological, molecular, and distributional data, Radenković *et al*. (2018) found that the *M. desuturinus* lineage comprises two species groups that represent an important link between the Palaearctic and Afrotropical faunas of the genus *Merodon*. They proposed that the diversification in the *desuturinus* lineage most likely occurred during fundamental shifts in the African climate. During the Pliocene-Pleistocene interval (the last ca 5.3 million years), favorable conditions for *Merodon* species (increased aridity and open grasslands) in Africa most probably allowed faunal transitions from the Eastern Mediterranean (including SW Asia), with one group of species migrating to South Africa and another group of species to the western Palaearctic.

The main morphological diagnostic character that separates Palaearctic *murorum* species group and the Afrotropical *melanocerus* species group is the presence of a dense and strong yellow brush of pile on

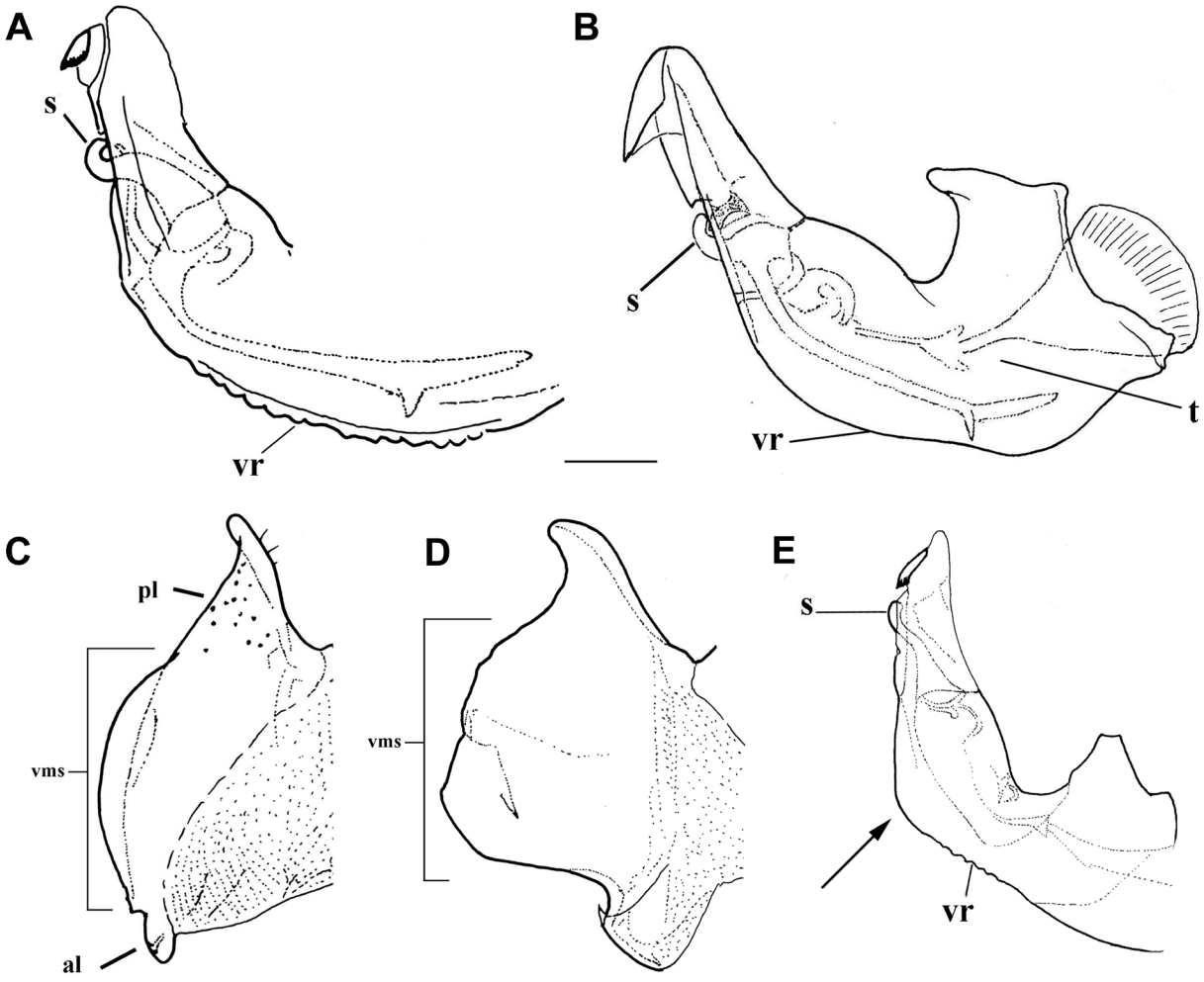

Fig. 15. Male genitalia, lateral view. **A**, **C**. *Merodon capensis* Hurkmans, 2018 (RSA, Northern Cape, NMSA). **B**. *M. murorum* (Morocco, FSUNS). **D**. *M. cuthbertsoni* Curran (Zimbabwe, American Museum of Natural History, New York), 1939. **A**–**B**, **D**. Hypandrium. **C**. Epandrium. Abbreviations: al = anterior surstylar lobe; pl = posterior surstylar lobe; s = lateral sclerite of aedeagus; t = theca; vms = ventral margin of surstylus; vr = ventral ridge of theca. Scale bar: 0.2 mm.

the metatrochanter in Afrotropical species, which is lacking in Palaearctic taxa. The Afrotropical group comprises the *M. melanocerus* subgroup (Radenković *et al*. 2018), the *M. planifacies* subgroup (Djan *et al*. 2020), and *M. cuthbertsoni* which is endemic to Zimbabwe and has an unclear systematic position since it is morphologically related to *M. desuturinus* of the Palaearctic region. The *M. planifacies* subgroup is characterized by a distinct apomorphic character, i.e., a reduced oral margin covered by microtrichia. The *melanocerus* subgroup was recently revised by Radenković *et al*. (2018) and it now consists of five closely related species distributed in the southeastern part of RSA. The most divergent species is *M. flavocerus* with several autapomorphic characters (basoflagellomere of antenna elongate and paler, katepisternum shiny, male eyes dichoptic, posterior lobe of surstyle shortened). Its distribution is restricted to the southern part of the Cape region. An additional species with an allopatric distribution

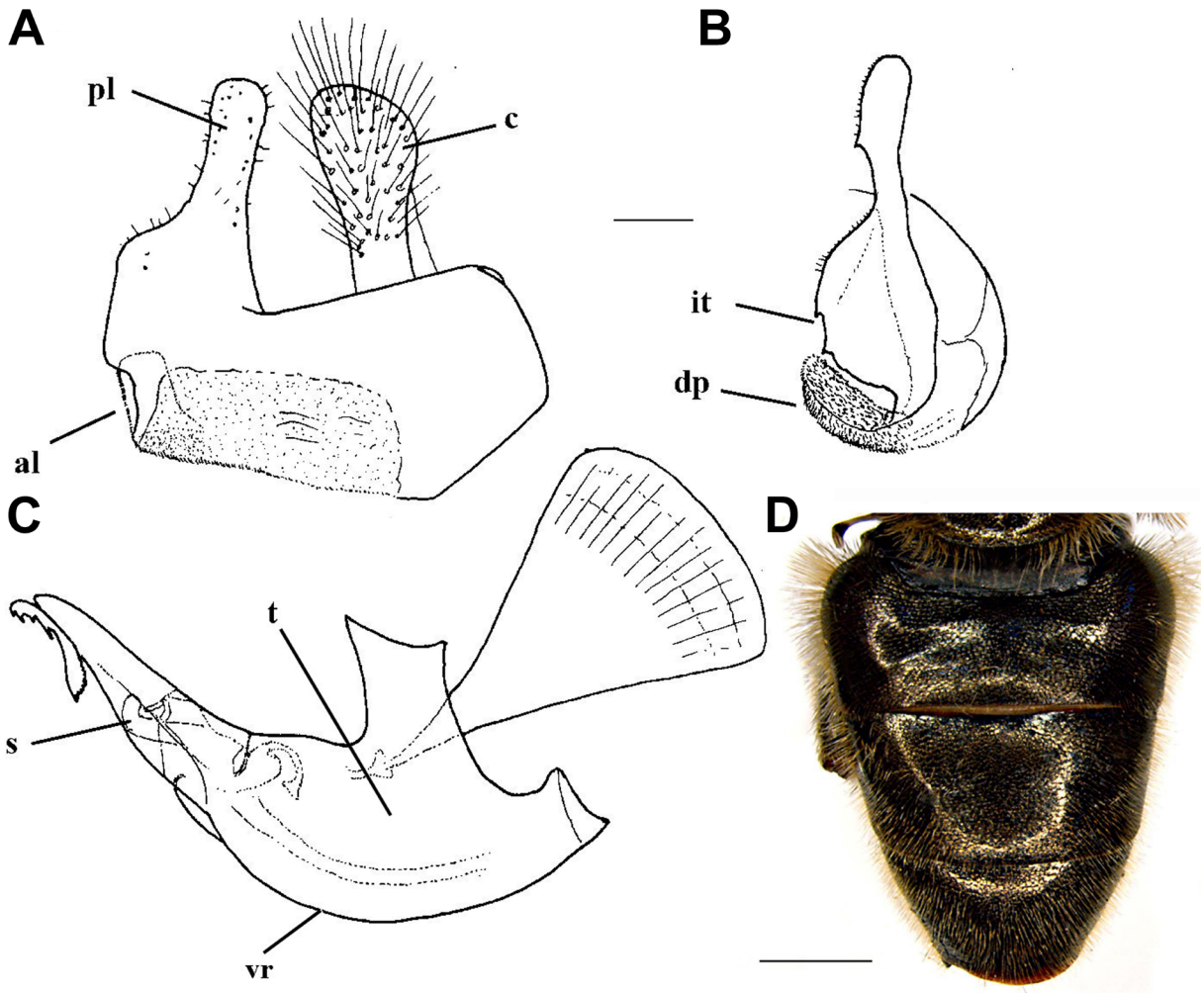

Fig. 16. *Merodon cabanerensis* Marcos-García, Vujić & Mengual, 2007 (Spain, FSUNS), male. **A**. Epandrium, lateral view. **B**. Epandrium, ventral view. **C**. Hypandrium, lateral view. **D**. Abdomen, dorsal view. Abbreviations: al = anterior surstylar lobe; c = cercus; dp = distal prolongation on anterior surstylar lobe; it = inner thorn on medial part of surstylus; pl = posterior surstylar lobe; s = lateral sclerite of aedeagus; t = theca; vr = ventral ridge of theca. Scale bars: A–C = 0.2 mm; D = 2 mm.

is *M. capensis*, localized in the Western Cape Province. According to the structure of male genitalia and molecular data, it is the most closely related to *M. spinolobus* sp. nov. described here from Free State in RSA. Although represented with only one specimen in the molecular analysis, the high mean interspecific p-distances with other species of the lineage suggests that *M. spinolobus* sp. nov. is a valid species. The other three species of the *melanocerus* subgroup (*M. melanocerus*, *M. commutabilis*, *M. drakonis*) are very similar in terms of the morphology of the male genitalia, but are otherwise morphologically different. However, there is no doubt that genetic data and structure of the male genitalia better reflect the true relationships than overall appearance (Radenković *et al*. 2018).

A taxonomic revision of the Palaearctic species of the *murorum* group has resulted in the delimitation of four species (Vujić *et al*. 2018). The most distinct species is *M. murorum*, based on the shape of the male genitalia and its reddish abdomen. It is distributed in Northwest Africa (Algeria, Morocco, Tunisia). Two taxa are endemo-relicts: *M. cabanerensis* is known only from a restricted area in central Spain and Morocco and *M. desuturinus* is only found on five high mountains of the Balkan Peninsula, of which two are in Montenegro (Durmitor and Orijen) and three in Serbia (Kopaonik, Kamenagora and Stara planina).

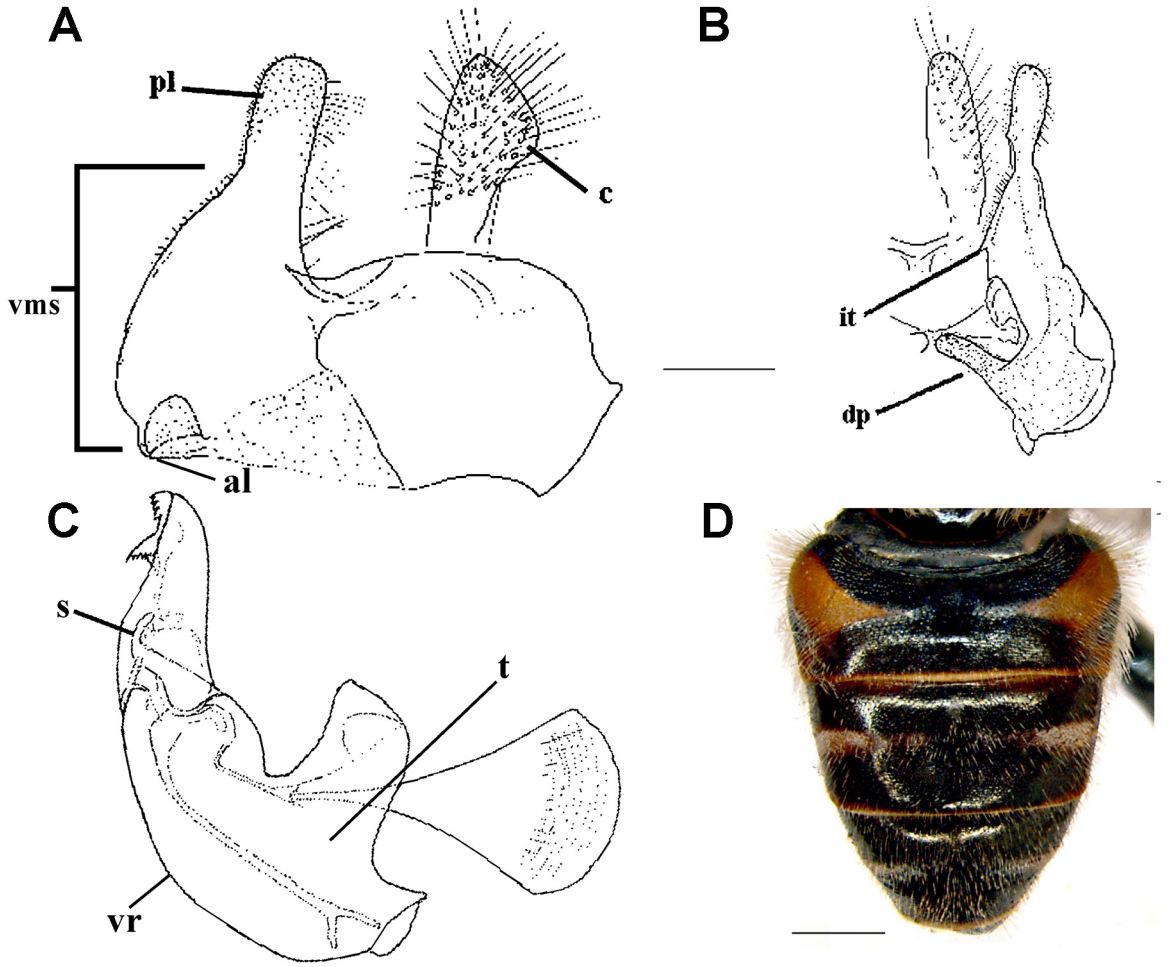

Fig. 17. *Merodon neolydicus* Vujić, 2018 (Greece, Chios, FSUNS), male. **A**. Abdomen, dorsal view. **B**. Epandrium, lateral view. **C**. Epandrium, ventral view. **D**. Hypandrium, lateral view. Abbreviations: al = anterior surstylar lobe; c = cercus; dp = distal prolongation on anterior surstylar lobe; it = inner thorn on medial part of surstylus; pl = posterior surstylar lobe; s = lateral sclerite of aedeagus; t = theca; vms = ventral margin of surstylus; vr = ventral ridge of theca. Scale bars: A–C = 0.2 mm; D = 2 mm.

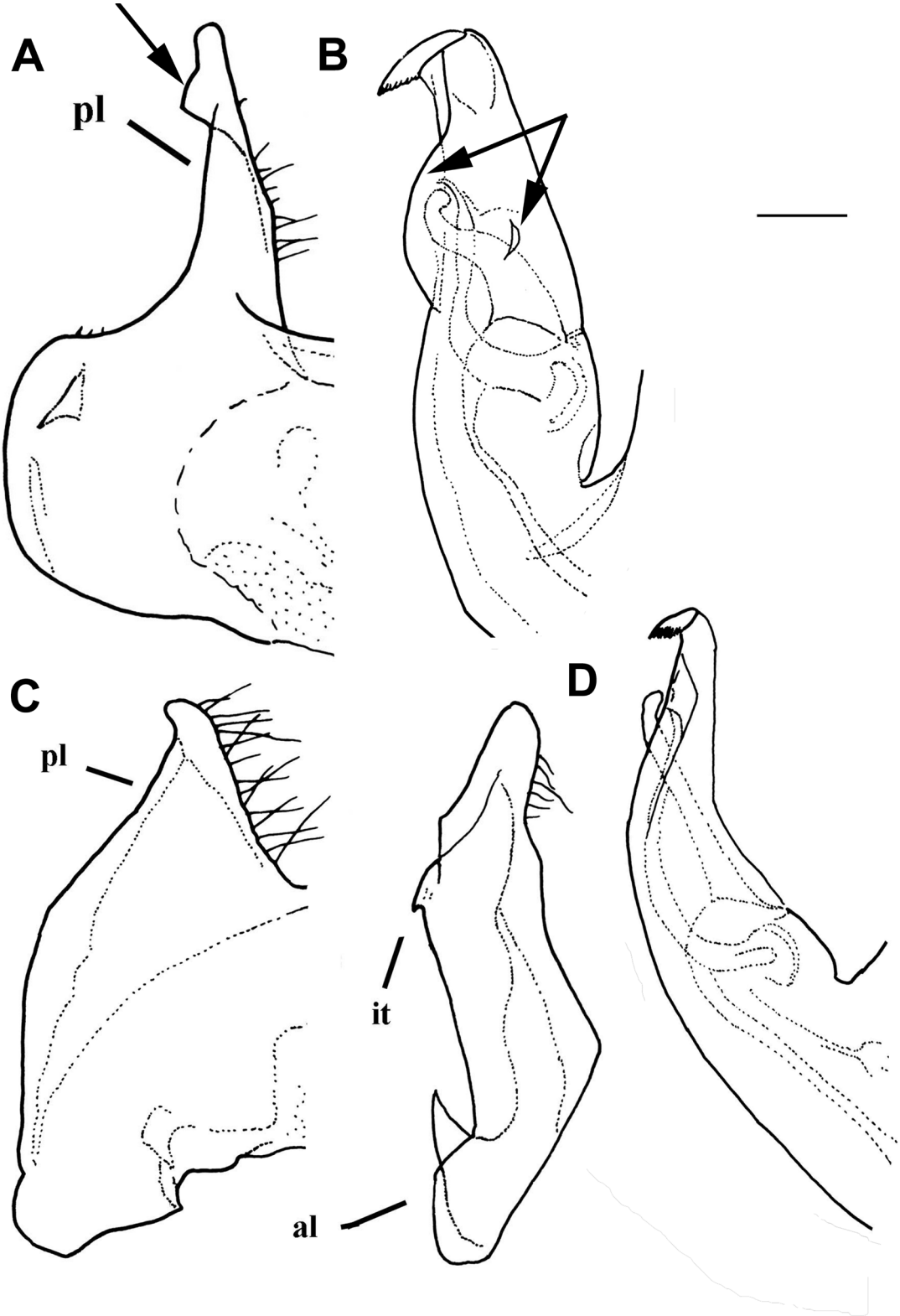

Fig. 18. Male genitalia. **A**–**B**. *Merodon draconis* Vujić & Radenković, 2018 (RSA, Drakensberg mountains, FSUNS). **A**. Apical ridge marked with arrow. **B**. Lateral lamellae and small lateral wings marked with arrow. **C**–**D**. *M. melanocerus* Bezzi, 1915 (RSA, Mount Gilboa, FSUNS). **A**, **C**. Surstyle lobe. **B**, **D**. Hypandrium. **A**–**B**, **D**. Lateral view. **C**. Lateral and ventral view. Abbreviations: al = anterior surstylar lobe; it = inner thorn on medial part of surstylus; pl = posterior surstylar lobe. Scale bar: 0.2 mm.

Merodon neolydicus has been reported from several countries of the Eastern Mediterranean (Greece, Turkey, Syria, Lebanon, Israel), while *M. sublustris* sp. nov., the fifth species reported here, is found only in Iran. Based on the restricted distributions of the Palaearctic group of the *desuturinus* lineage to high mountains of North Africa, the Eastern Mediterranean, and on the Iberian and Balkan peninsulas, this group can be considered as an oromediterranean relict. *Merodon sublustris* sp. nov. is morphologically similar to *M. neolydicus*, and these species also have low interspecific p-distance (p = 1.43%).

Although COI sequences provide useful data for the delimitation of species in the genus *Merodon*, additional molecular markers will be needed to resolve the phylogenetic relationships within and among lineages, species groups, and species subgroups for the genus.

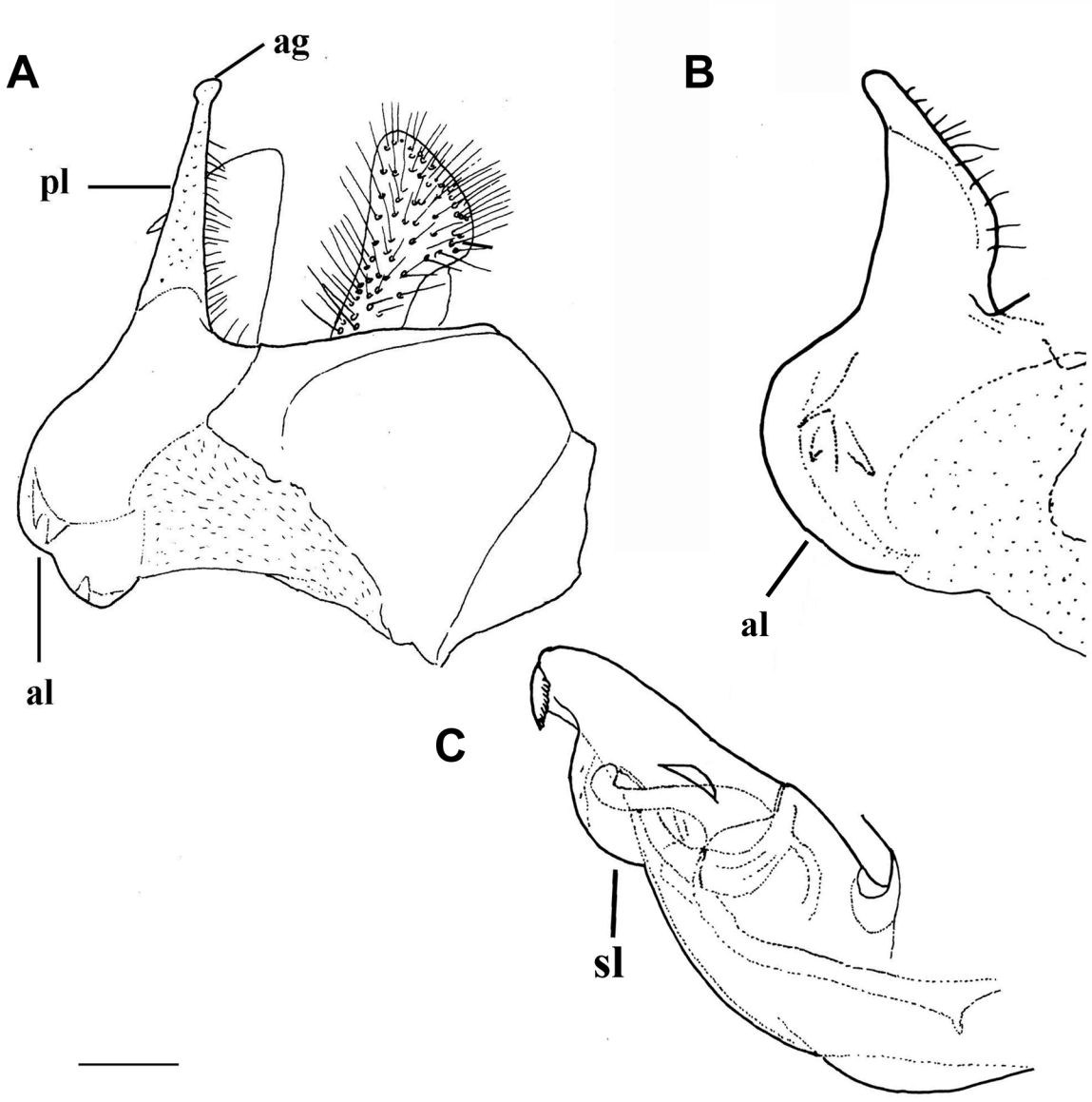

Fig. 19. Male genitalia, lateral view. **A**. *Merodon murorum* (Morocco, FSUNS). **B**–**C**. *M. commutabilis* Radenković & Vujić, 2018 (RSA, Kwa Zulu Natal, Howick, FSUNS). **A**–**B**. Epandrium. **C**. Hypandrium. Abbreviations: ag = apical globule; al = anterior surstylar lobe; pl = posterior surstylar lobe; sl = subapical lamella of theca. Scale bar: 0.2 mm.

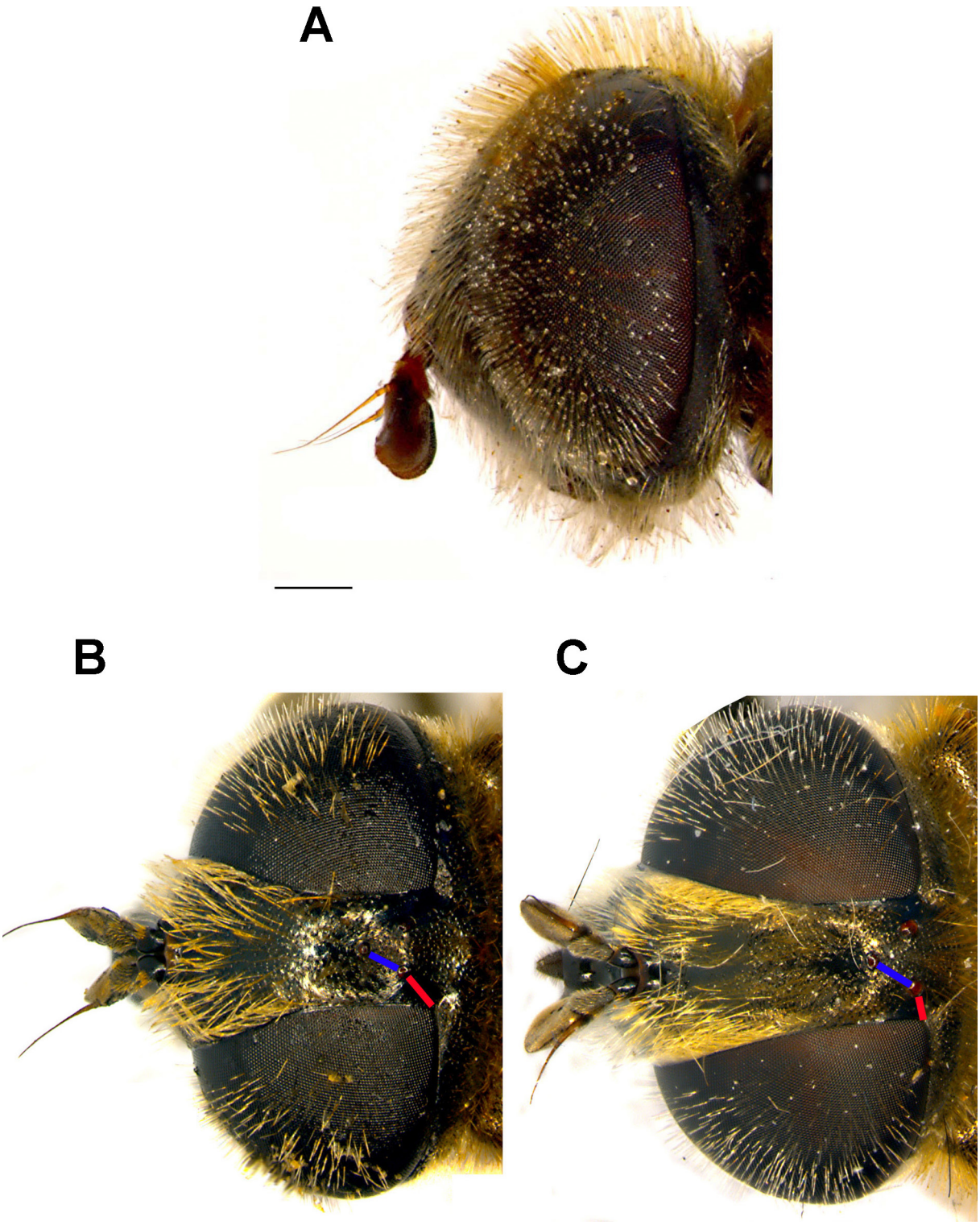

Fig. 20. Head, female. **A**. *Merodon planifacies* (RSA, Van Reenen, FSUNS). **B**. *M. melanocerus* (RSA, Mount Gilboa, FSUNS). **C**. *M. draconis* (RSA, Drakensberg mountains, FSUNS). **A**. Lateral view. **B–C**. Dorsal view. Blue line: distance between posterior and anterior ocelli; red line: distance between posterior ocellus and upper eye corner. Scale bar: 1 mm.

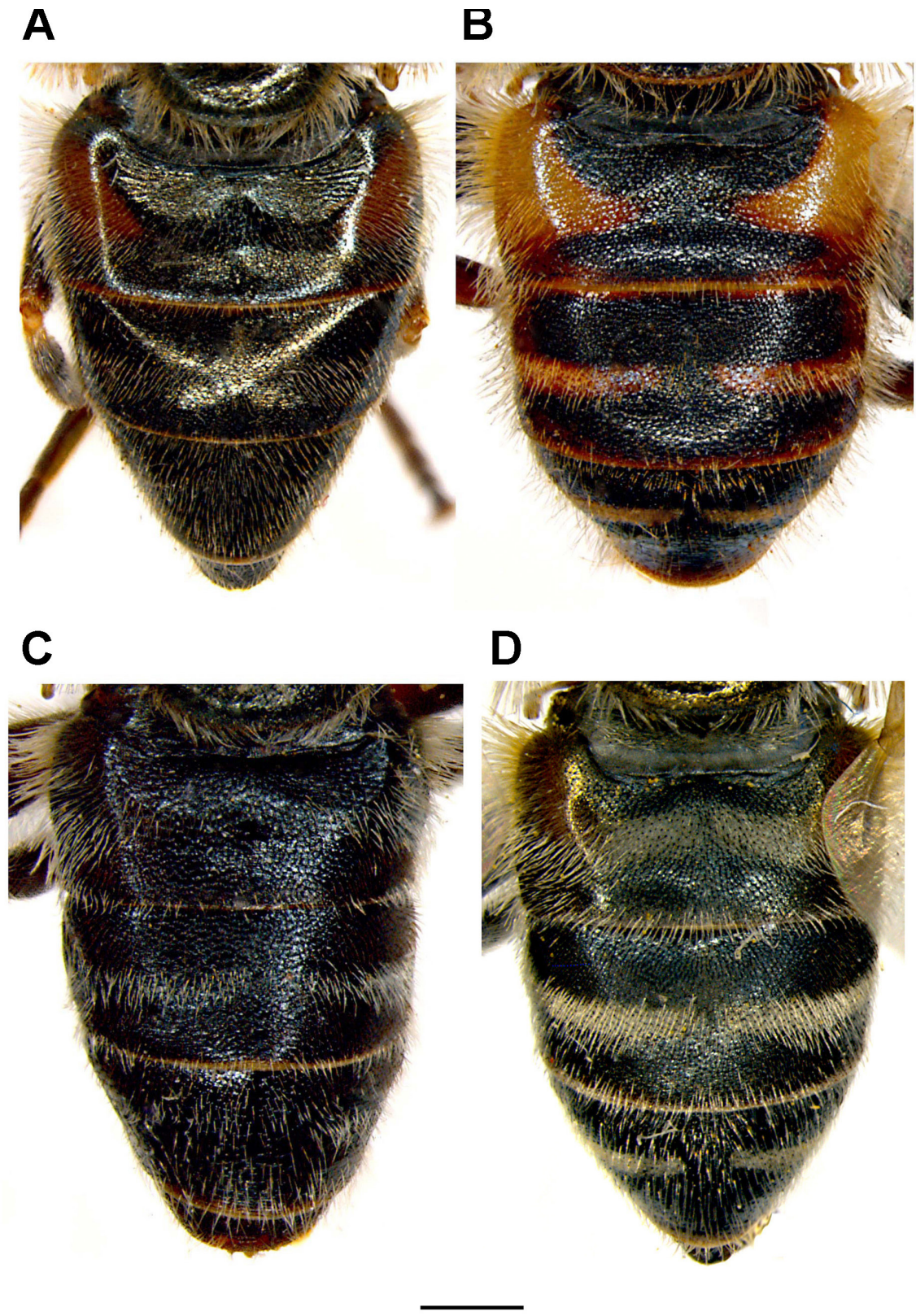

Fig. 21. Abdomen, female, dorsal view. **A**. *Merodon neolydicus* (Greece, Chios, FSUNS). **B**. *M. murorum* (Morocco, FSUNS). **C**. *M. desuturinus* (Serbia, Kopaonik, FSUNS). **D**. *M. commutabilis* (RSA, Kwa Zulu Natal, Howick, FSUNS). Scale bar: 2 mm.

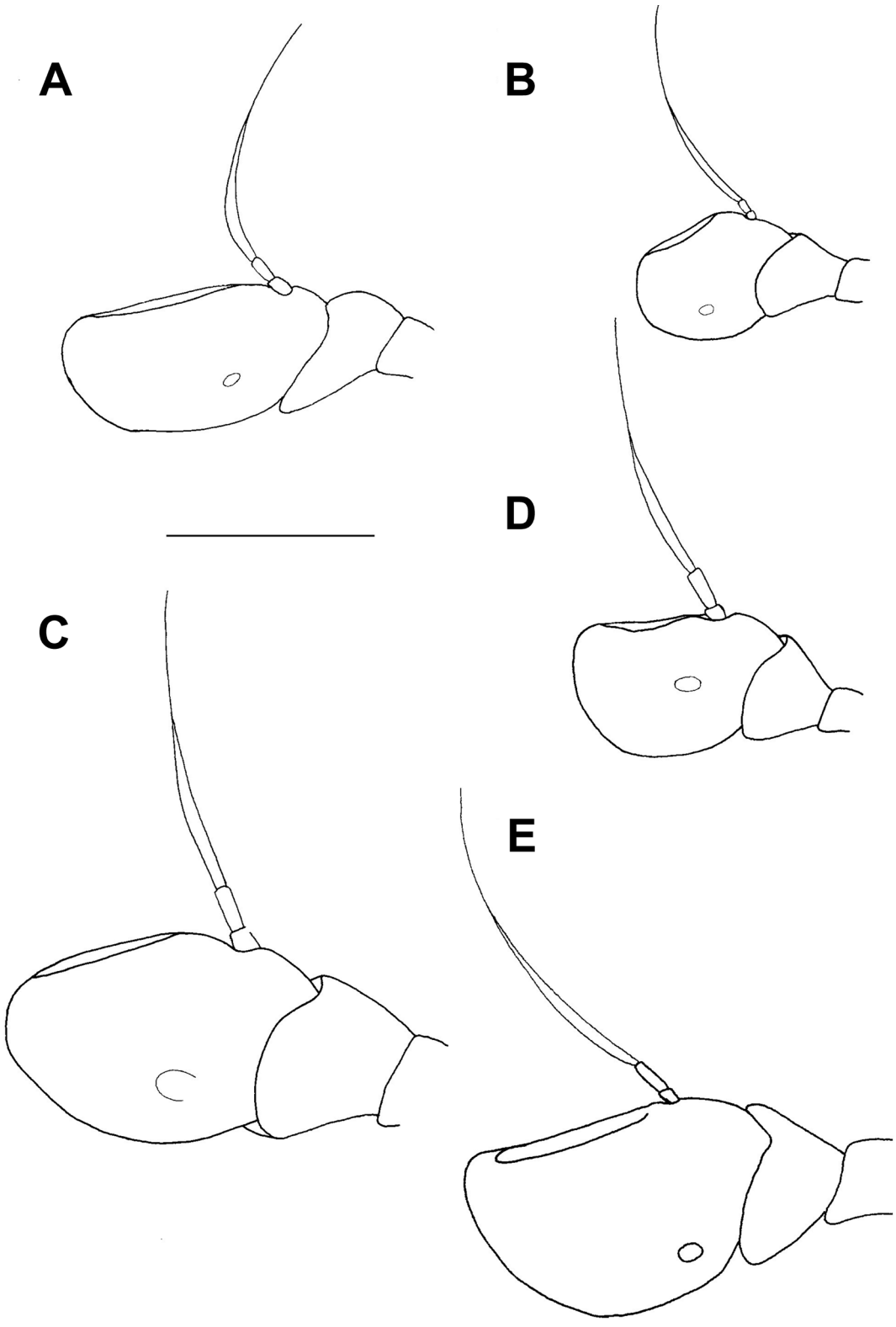

Fig. 22. Antennae, female, lateral view. **A**. *Merodon flavocerus* (RSA, Cape Province, NMSA). **B**. *M. desuturinus* (Serbia, Kopaonik, FSUNS). **C**. *M. murorum* (Morocco, FSUNS). **D**. *M. neolydicus* (Greece, Chios, FSUNS). **E**. *M. commutabilis* (RSA, Kwa Zulu Natal, Howick, FSUNS). Scale bar: 1 mm.

Table 1. COI gene based average uncorrected pairwise p-distances (%) between species of the *Merodon desuturinus* lineage.

		1	2	3	4	5	6	7	8	9	10	11	12
1.	*M. desuturinus*												
2.	*M. murorum*	8.87											
3.	*M. neolydicus*	6.97	7.78										
4.	*M. cabanerensis*	7.61	8.25	2.04									
5.	*M. sublustris* sp. nov.	6.91	7.56	1.43	1.75								
6.	*M. melanocerus*	9.61	10.21	8.93	9.01	8.63							
7.	*M. capensis*	8.36	9.47	7.82	8.05	7.60	8.16						
8.	*M. spinolobus* sp. nov.	8.64	10.05	8.17	8.96	8.27	8.72	2.40					
9.	*M. commutabilis*	9.17	9.47	7.84	8.54	7.69	9.13	7.84	8.60				
10.	*M. drakonis*	9.54	9.21	8.04	8.59	7.91	9.34	8.00	8.67	1.37			
11.	*M. planifacies*	8.88	9.30	8.88	9.21	8.39	9.86	8.20	8.45	8.35	8.32		
12.	*M. capi*	8.62	8.88	8.54	9.13	8.14	9.58	8.37	8.54	8.60	8.74	2.62	
13.	*M. roni*	8.37	8.62	8.45	8.71	7.88	8.99	7.95	8.28	8.47	8.83	2.87	2.70

Acknowledgements

We thank the curators of the museums listed in the Material and methods section for facilitating loans for the study of specimens in their care. We thank David Bennett for linguistic revision. The authors acknowledge the financial support of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grants no. 451-03-66/2024-03/ 200125, 451-03-65/2024-03/200125 and 451-03-66/2024-03/200358), and SYNTHESYS program.

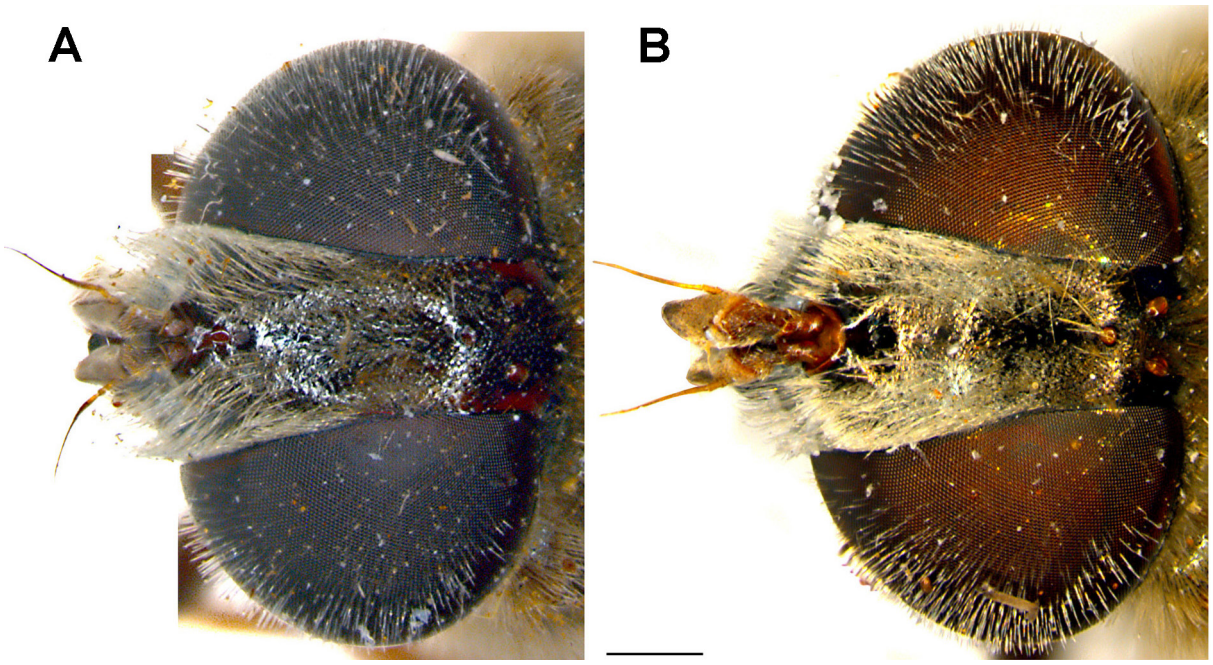

Fig. 23. Head, female, dorsal view. **A**. *Merodon flavocerus* (RSA, Cape Province, NMSA). **B**. *M. murorum* (Morocco, FSUNS). Scale bar: 1 mm.

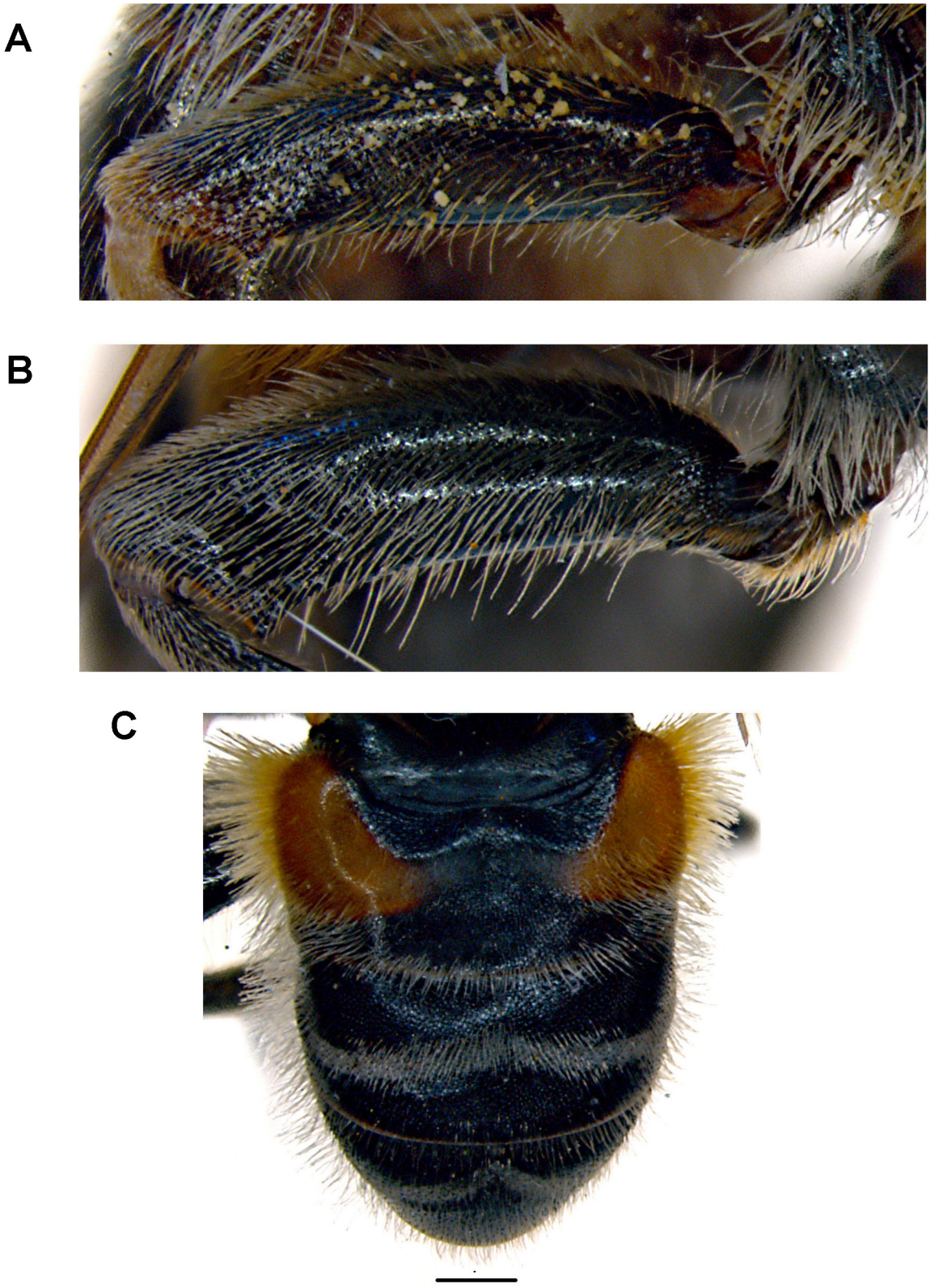

Fig. 24. Female. **A**. *Merodon neolydicus* (Greece, Chios, FSUNS). **B**. *M. draconis* (RSA, Drakensberg mountains, FSUNS). **C**. *M. melanocerus* (RSA, Mount Gilboa, FSUNS). **A**–**B**. Metatrochanter. **C**. Abdomen. Scale bar: 1 mm.

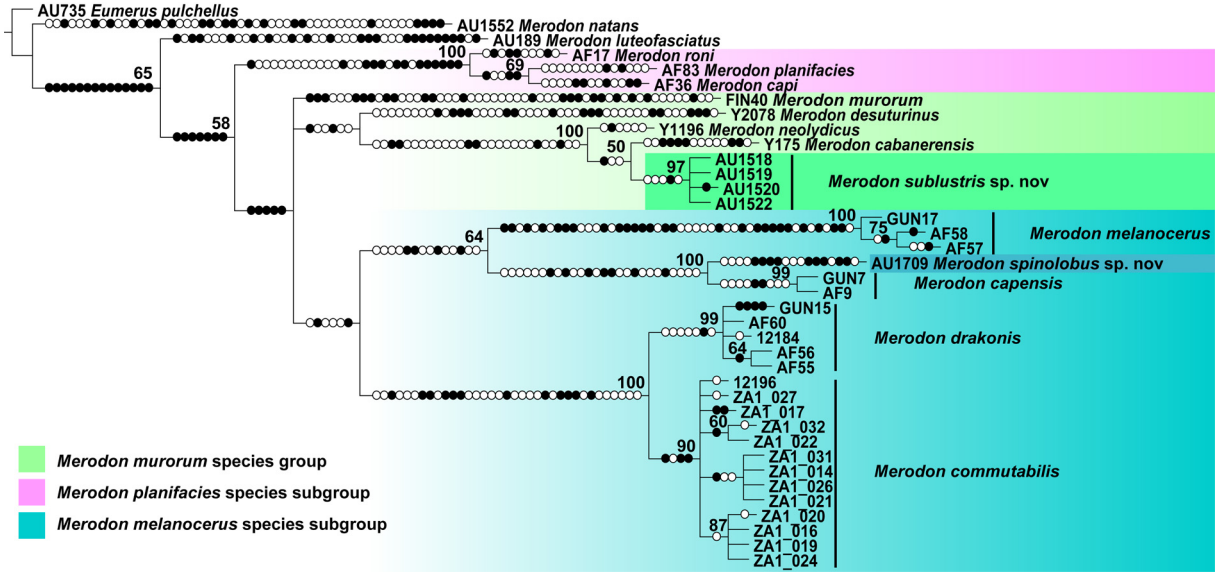

Fig. 25. Strict consensus tree of 4 equally parsimonious trees resulted from Maximum parsimony analysis of combined 3' and 5' COI gene sequences of the *Merodon desuturinus.*

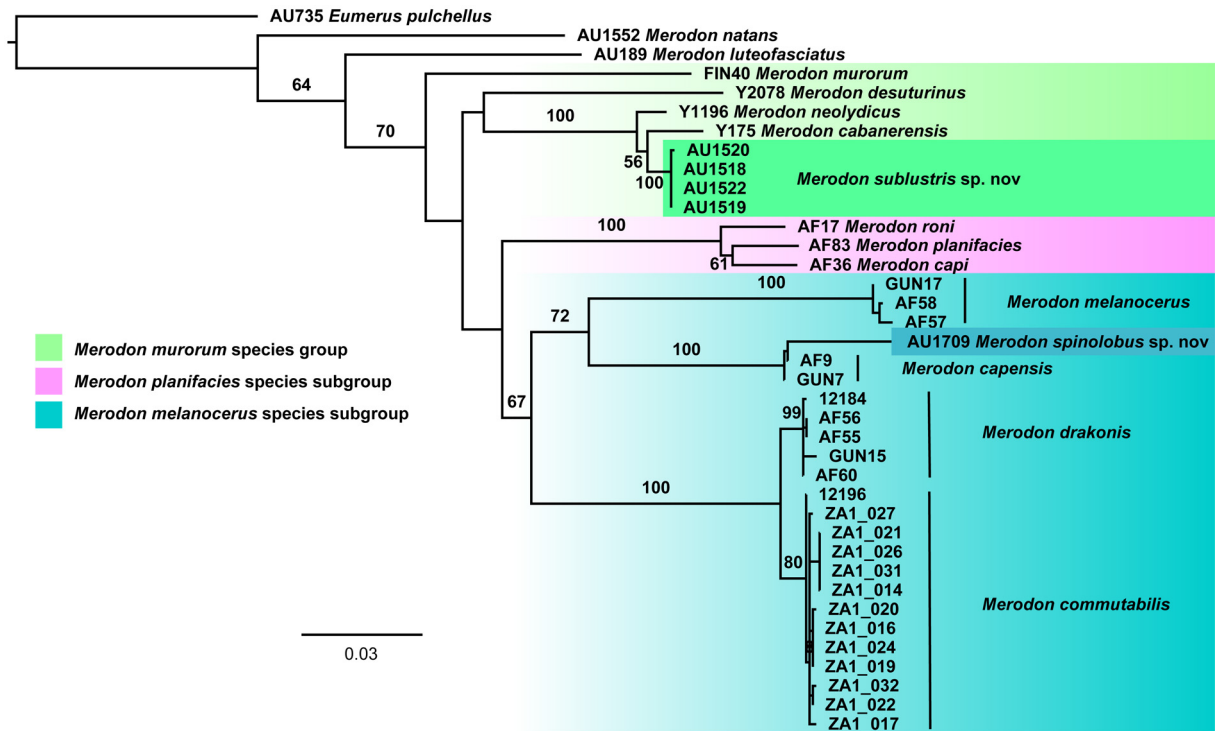

Fig. 26. Maximum likelihood tree of the *Merodon desuturinus* species group constructed using combined 3′ and 5′ COI gene sequences. Bootstrap values ≥50 are indicated near nodes.

References

Andrić A., Šikoparija B., Obreht D., Đan M., Preradović J., Radenković S., Pérez-Bañón C. & Vujić A. 2014. DNA barcoding applied: identification of the larva of *Merodon avidus* (Diptera: Syrphidae). *Acta Entomologica Musei Nationalis Pragae* 54: 741–757.

Aracil A., Andrić A., Rojo S., Shparyk V., Mishustin R., Popov G., Radenković S., Vujić A. & Pérez-Bañón C. 2024. Insights from the preimaginal morphology of the *constans* species-group, to reveal novel morphological patterns of the *Merodon albifrons*-evolutionary lineage (Diptera, Syrphidae). *Zoomorphology* 143: 89–97. https://doi.org/10.1007/s00435-023-00635-2

Djan M., Ståhls G., Veličković N., Ačanski J., Vidaković D.O., Rojo S., Pérez-Bañón C., Radenković S. & Vujić A. 2020. The *Merodon planifacies* subgroup (Diptera: Syrphidae): congruence of molecular and morphometric evidences reveal new taxa in Drakensberg mountains valleys (Republic of South Africa). *Zoologischer Anzeiger* 287: 105–120. https://doi.org/10.1016/j.jcz.2020.05.010

Goloboff P.A. 1999. NONA. – computer program, v.2.0. Tucuman, Argentina, published by the author.

Hadley A. 2006. CombineZ5. Available from https://combinezp.software.informer.com [accessed on 6 Oct. 2020].

Hall T.A. 1999. BioEdit: a user-friendly biological sequence alignment editor and analysis program for windows 95/98/NT. *Nucleic Acids Symposium Series* 41: 95–98.

Marcos-García M.Á., Vujić A. & Mengual X. 2007. Revision of Iberian species of the genus *Merodon* (Diptera: Syrphidae). *European Journal of Entomology* 104: 531–572. https://doi.org/10.14411/eje.2007.073

Mengual X., Ståhls G., Vujić A. & Marcos-García M.A. 2006. Integrative taxonomy of Iberian *Merodon* species (Diptera, Syrphidae). *Zootaxa* 1377 (1): 1–26. https://doi.org/10.11646/zootaxa.1377.1.1

Milankov V., Ståhls G. & Vujić A. 2008. Molecular diversity of populations of the *Merodon ruficornis* group (Diptera, Syrphidae) on the Balkan Peninsula. *Journal of Zoological Systematics and Evolutionary Research* 46 (2): 143–152. https://doi.org/10.1111/j.1439-0469.2007.00448.x

Miller M.A., Pfeiffer W. & Schwartz T. 2010. Creating the CIPRES Science Gateway for inference of large phylogenetic trees. *In*: *2010 Gateway Computing Environments Workshop* (GCE): 1–8. IEE, New Orleans, LA. https://doi.org/10.1109/GCE.2010.5676129

Nixon K.C. 2008. ASADO, Version 1.61. Made available through the author (previously named WinClada, version 1.00.08) (2002). Available from http://www.diversityoflife.org/winclada [accessed on 24 Apr. 2018].

Pape T. & Thompson F.C. 2013. Systema Dipterorum, Version 1.5. Available from http://www.diptera.org [accessed on 28 Jan. 2024].

Preradović J., Andrić A., Radenković S., Šašić Zorić L., Pérez-Bañón C., Campoy A. & Vujić A. 2018. Pupal stages of three species of the phytophagous genus *Merodon* Meigen (Diptera: Syrphidae). *Zootaxa* 4420 (2): 229–242. https://doi.org/10.11646/zootaxa.4420.2.5

QGIS Development Team 2023. QGIS Geographic Information System. Version 3.30.0. Open Source Geospatial Foundation Project. Available from https://qgis.org [accessed on 20 Mar. 2024].

Radenković S., Veličković N., Ssymank A., Obreht Vidaković D., Djan M., Ståhls G., Veselić S. & Vujić A. 2018. Close relatives of Mediterranean endemo-relict hoverflies (Diptera, Syrphidae) in South Africa: Morphological and molecular evidence in the *Merodon melanocerus* subgroup. *PLoS ONE* 13 (7): e0200805. https://doi.org/10.1371/journal.pone.0200805

Ricarte A., Marcos-García M.Á. & Rotheray G.E. 2008. The early stages and life histories of three *Eumerus* and two *Merodon* species (Diptera: Syrphidae) from the Mediterranean region. *Entomologica Fennica* 19: 19–141. https://doi.org/10.33338/ef.84424

Ricarte A., Souba-Dols G.J., Hauser M. & Marcos-García M.Á. 2017. A review of the early stages and host plants of the genera *Eumerus* and *Merodon* (Diptera: Syrphidae), with new data on four species. *PLoS ONE* 12 (12): e0189852. https://doi.org/10.1371/journal.pone.0189852

Rodríguez F., Oliver J.L., Marín A. & Medina J.R. 1990. The general stochastic model of nucleotide substitution. *Journal of Theoretical Biology* 142: 485–501.
https://doi.org/10.1016/S0022-5193(05)80104-3

Šašić Zorić L., Ačanski J., Vujić A., Ståhls G., Djan M. & Radenković S. 2020. Resolving the taxonomy of the *Merodon dobrogensis* species subgroup (Diptera: Syrphidae), with the description of a new species. *The Canadian Entomologist* 152 (1): 36–59. https://doi.org/10.4039/tce.2019.72

Speight M.C.D. 2020. Species accounts of European Syrphidae, 2020. *In*: *Syrph the Net, the database of European Syrphidae (Diptera)*. Syrph the Net publications, Dublin, vol. 104.

Ståhls G., Vujić A., Pérez-Bañón C., Radenković S., Rojo S. & Petanidou T. 2009. COI barcodes for identification of *Merodon* hoverflies (Diptera, Syrphidae) of Lesvos Island, Greece. *Molecular Ecology Resources* 9 (6): 1431–1438. https://doi.org/10.1111/j.1755-0998.2009.02592.x

Stamatakis A. 2014. RAxML version 8: a tool for phylogenetic analysis and post-analysis of large phylogenies. *Bioinformatics* 30: 1312–1313. https://doi.org/10.1093/bioinformatics/btu033

Tamura K., Stecher G. & Kumar S. 2021. MEGA11: Molecular Evolutionary Genetics Analysis version 11. *Molecular Biology and Evolution* 38: 3022–3027. https://doi.org/10.1093/molbev/msab120

Thompson F.C. 1999. A key to the genera of the flower flies (Diptera: Syrphidae) of the Neotropical Region including descriptions of new genera and species and a glossary of taxonomic terms. *Contributions on Entomology, International* 3: 321–378.

Vujić A., Radenković S., Ståhls G., Ačanski J., Stefanović A., Veselić S., Andrić A. & Hayat R. 2012. Systematics and taxonomy of the *ruficornis* group of genus *Merodon* (Diptera: Syrphidae). *Systematic Entomology* 37: 578–602. https://doi.org/10.1111/j.1365-3113.2012.00631.x

Vujić A., Radenković S. & Likov L. 2018. Revision of the Palaearctic species of the *Merodon desuturinus* group (Diptera, Syrphidae). *ZooKeys* 771: 105–138. https://doi.org/10.3897/zookeys.771.20481

Vujić A., Radenković S., Likov L., Andrić A., Gilasian E. & Barkalov A. 2019. Two new enigmatic species of the genus *Merodon* Meigen (Diptera: Syrphidae) from the north-eastern Middle East. *Zootaxa* 4555 (2): 187–208. https://doi.org/10.11646/zootaxa.4555.2.2

Vujić A., Radenković S., Likov L. & Veselić S. 2021. Taxonomic complexity in the genus *Merodon* Meigen, 1803 (Diptera, Syrphidae). *ZooKeys* 1031: 85–124. https://doi.org/10.3897/zookeys.1031.62125

Manuscript received: 14 March 2024
Manuscript accepted: 25 September 2024
Published on: 7 April 2025
Topic editor: Tony Robillard
Section editor: Torbjørn Ekrem
Desk editor: Chris Le Coquet-Le Roux

Printed versions of all papers are deposited in the libraries of four of the institutes that are members of the *EJT* consortium: Muséum national d'Histoire naturelle, Paris, France; Meise Botanic Garden, Belgium; Royal Museum for Central Africa, Tervuren, Belgium; Royal Belgian Institute of Natural Sciences, Brussels, Belgium. The other members of the consortium are: Natural History Museum of Denmark, Copenhagen, Denmark; Naturalis Biodiversity Center, Leiden, the Netherlands; Museo Nacional de Ciencias Naturales-CSIC, Madrid, Spain; Leibniz Institute for the Analysis of Biodiversity Change, Bonn – Hamburg, Germany; National Museum of the Czech Republic, Prague, Czech Republic; The Steinhardt Museum of Natural History, Tel Aviv, Israël.

Supplementary material

Supp. file 1. Data related to the studied specimens and the corresponding GenBank accession numbers.
https://doi.org/10.5852/ejt.2025.987.2857.12987