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Research article

# Floristic updates and a new species record for the Bulgarian flora

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**Abstract:** This paper presents new regional chorological data for eighteen plant taxa, derived from our own collections and personal field observations during the vegetation seasons from 2015 to 2025. One of the recorded species – *Viola hymettia*, is new to the Bulgarian flora. The remaining records document new occurrences of these taxa within different floristic regions of the country. Four of the listed taxa are protected under Bulgaria's Biological Diversity Act and are categorised as threatened in the national Red List: *Geranium palustre* (VU), *Gagea amblyopetala* (VU), *Romulea linaresii* subsp. *graeca* (VU), and *Parvotrisetum myrianthum* (CR). Populations of *Dipsacus gmelinii* consist of critically low numbers of individuals and require urgent conservation measures. Additional information is provided on the habitats at the recorded sites, the state of the populations, the floristic composition, and relevant herbarium records.

**Keywords:** Bulgaria, chorological data, new records, Red List, threatened plants

## Introduction

Floristic studies represent a fundamental component of botanical research, providing essential information on the composition, distribution, and dynamics of plant diversity within a given region. Field surveys facilitate the identification of previously undocumented taxa, the detection of invasive or expanding species, and the monitoring of population trends in rare or endemic plants. Herbarium collections provide verifiable records of species occurrence, phenology, and morphological variation, thereby facilitating taxonomic verification and long-term biodiversity assessments. Chorological data further reveal the spatial distribution of species and their biogeographical relationships. Taken together, the integration of herbarium research, field studies, and chorological data create an essential framework for documenting, interpreting, and conserving representative regional floras.

This paper is the second recent contribution to the knowledge of the distribution of vascular plants in Bulgaria, as published in the *Historia naturalis bulgarica* journal (see Kunev, 2024). The current study aims to continue this effort by presenting new floristic data, refining distributional knowledge, and supporting ongoing assessments of botanical diversity in the country.

## Materials and methods

The new chorological information has been collected during botanical trips taken in the vegetation seasons of 2015–2025. The plant taxa were identified following Stoyanov et al. (2025), except for *Montia fontana* subsp. *amporitana* and *Viola hymettia* being identified via Walters (1993) and Scoppola & Lattanzi (2012), respectively. The nomenclature follows POWO (2025), with the exception of *Juncus capitatus* and *Hainardia cylindrica* for which the names fol-

low Stoyanov et al. (2025). Voucher specimens of all listed taxa have been deposited in at least one of the indexed Bulgarian herbaria: the Herbarium of the National Museum of Natural History at the Bulgarian Academy of Sciences (BNHM), the Herbarium of the Faculty of Biology, Sofia University (SO), and the Herbarium of the Institute of Biodiversity and Ecosystem Research at the Bulgarian Academy of Sciences (SOM). Herbarium acronyms follow Thiers (2025). The plant names are ordered as in the multi-volume edition of Flora Europaea (Tutin et al., 1964–1980). National distributions of the studied taxa are presented according to the accepted floristic regionalisation of Bulgaria (Yordanov, 1966). Their broader geographical range is interpreted based on distributional data from POWO (2025). The habitat notes were based on authors' personal field observations. All the images (Figs 1–4) presented in the text were taken by the authors during their fieldwork.

## Species list

### 1. *Montia fontana* subsp. *amporitana* Sennen (Montiaceae)

Voucher specimens: (1) The Rhodopes (East): Piavets Village, Momchilgrad Municipality, wet spot at a barraged streamlet, next to the Republican Road II-59, 580 m, UTM LF79, 41.487301°N, 25.463538°E, coll. date: 11 May 2025; leg. & det.: Georgi Kunev (SO-108455); (2) The Rhodopes (East): Dobromirski Village, Kirkovo Municipality, alongside temporary streamlet, 350 m, UTM LF58, 41.380766°N, 25.228674°E, coll. date: June 2023; leg. & det.: G. Kunev (BNHM: BG-NMNHS-BOT-000000003163); (3) The Mesta Valley: Kornitsa Village, Gotse Delchev Municipality, temporary streamlet, 650 m, UTM GM21, 41.634265°N, 23.691326°E, coll. date: 16 May 2024; leg. & det.: G. Kunev (BNHM: BG-NMNHS-BOT-000000004443); (4) The Tundzha Hilly Country: Sakar Mts, 'Chernite skali' PA near Topolovgrad, Topolovgrad Municipality, 400 m, UTM MG45, 42.049303°N, 26.358364°E, coll. date: 10 May 2025; leg. & det.: G. Kunev (BNHM: BG-NMNHS-BOT-000000006365).

This taxon was first reported for Bulgaria by Hájek et al. (2005); however, no records from the Eastern Rhodopes and the Mesta Valley were included in their account of the Bulgarian wetland flora. In the Eastern

Rhodopes the taxon participate in a plant community belonging to the alliance *Isoetion* Br.-Bl. 1936. This community includes *Isoetes* cf. *gymnocarpa* (Gennari) A.Braun, *Juncus bufonius* L., *Lotus angustissimus* L., *Menthapulegium* L., *Veronica acinifolia* L., *Poa jubata* A.Kern., *Ranunculus thracicus* Azn., *Tripleurospermum rosellum* (Boiss. & Orph.) Hayek, *Molineriella minuta* (L.) Rouy, *Philonotis* sp., *Pleurochaete squarrosa* (Brid.) Lindb., among others. This taxon has been previously reported in the Tundzha Hilly Country region, specifically at the 'Dervishka Mogila' site, Sakar Mts (SO-18791: Hájek et al., 2005). We provide an additional record of this taxon from the region of Sakar Mts, where it was also collected within a plant community of *Isoetion* alliance.

### 2. *Polycarpon tetraphyllum* subsp. *diphyllum* (Cav.) O.Bolòs & Font Quer (Caryophyllaceae)

Voucher specimens: The Black Sea Coast (South): Sinemorets Village, Tsarevo Municipality, Bourgas Province, 15 m, UTM NG85, 42.053417°N, 27.988706°E, coll. date: 10 June 2025; leg. & det.: G. Kunev & Gabriela Petrova (SO-108430; BNHM: BG-NMNHS-BOT-000000006351).

This taxon was recorded on the cliffs over Butamyata Beach, where it occurs in groups of several dozen individuals growing next to *Juniperus deltoides* R.P.Adams. Associate species include *Urospermum picroides* (L.) Scop. ex F.W.Schmidt, *Silene dichotoma* Ehrh., *Hedypnois rhagadioloides* (L.) F.W.Schmidt, *Jurinea* sp. This represents a new taxon for the Black Sea Coast (South) floristic region. Previously, this taxon was known only from the Struma Valley floristic region (Stoyanov et al., 2025).

### 3. *Sisymbrium irio* L. (Brassicaceae) (Fig. 1)

Voucher specimens: (1) The Balkan Mts (East): Sliven Town, in a green area next to an alley, ruderal site, 230 m, UTM MH42, 42.66711°N, 26.33434°E, coll. date: 14 April 2023; leg.: Ivan Kostadinov, det.: I. Kostadinov & G. Kunev (SO-108457; BNHM: BG-NMNHS-BOT-000000006362); (2) The Black Sea Coast (South): Sozopol Town, ruderal sites in the urban area and along the seaside cliffs, coll. date: 21 May 1971; leg. & det.: Panayot Panov (SO-66263; SOM-128318); (3) The Black Sea Coast (South):



Fig. 1. *Sisymbrium irio* at ruderal stands in Sliven Town, 14.04.2023 (photo I. Kostadinov).

Nessebar Town, ruderal sites along the fences and as a garden weed, coll. date: 22 April 1974; leg. & det.: P. Panov (SO-66264; SOM-129285); (4) The Black Sea Coast (South): Southern coastal area of Black Sea, N of Nessebar, 15 m, NH52, 42.66333°N, 27.71917°E, coll. date: 27 May 1999; leg. & det.: Di Martino et al. OPTIMA Iter IX 24, 1-3-20 (W 2007-0000841) <https://www.gbif.org/occurrence/1848999111>

To date, *S. irio* has been known in Bulgaria from the regions of the North-Eastern Bulgaria and the Black Sea coast (North) floristic regions (Stoyanov et al., 2025). The species is distributed in Mediterranean and Irano-Turanian regions but occurs as a sub-cosmopolitan taxon outside its natural range (POWO, 2025). It is a ruderal species typical of anthropogenically disturbed habitats and was recorded by the fourth author as a roadside weed within the urban area of the town of Sliven. Additional records (Panov, 1975) not considered in the most recent floristic sum-

maries of the Bulgarian flora (Assyov & Petrova, 2012; Stoyanov et al., 2025) are preserved in the collections of SO and SOM herbaria or are available through GBIF (2025).

#### 4. *Lepidium latifolium* L. (Brassicaceae)

Voucher specimens: Sofia Region: Voluyak Village, Stolichna Municipality, Sofia City Province, along the sidewalk on the main road through the settlement, 530 m, UTM FN83, 42.777114°N, 23.249630°E, coll. date: 16 June 2025; leg. & det.: G. Kunev (SO-108422; SOM-179601).

The species is new for the Sofia floristic region (Stoyanov et al., 2025).

#### 5. *Geranium palustre* L. (Geraniaceae)

Voucher specimens: The Rhodopes (West): Sarnitsa Municipality, on the southwestern side of the Dospad Dam, close to the road leading to the Chairdzhik locality, 1262 m, UTM KG52, 41.71079°N, 24.04001°E, coll. date: 11 August 2022; leg. & det.: G. Petrova (SO-108458; BNHM: BG-NMNHS-BOT-000000006363).

Several individuals during the flowering and fruiting stage were observed near to the road leading to the 'Chairdzhik' locality in the Dabrash part of the Western Rhodopes. They occupy a narrow, sun-exposed and moist site at the edge of a spruce forest, which represents the dominant forest type in the region. *G. palustre* is evaluated as 'Vulnerable' according to the national Red List (Petrova & Vladimirov, 2009) and is protected under the Annex 3 of the Biological Diversity Act of Bulgaria. Consequently, the reported population may be negatively affected by ongoing building construction observed nearby by the second author. However, suitable habitats occur in the region and could be surveyed for additional populations under appropriate environmental conditions. The current report confirms the presence of the species in the Western Rhodopes (Petrova and Kozhuharov, 1979).

#### 6. *Erodium botrys* (Cav.) Bertol. (Geraniaceae)

Voucher specimen: The Black Sea Coast (South): Primorsko, approximately 3 km in SW of the mouth



of the Ropotamo River, a rocky grassland off the main road by the bridge over the river, 20 m, UTM NG58, 42.307961°N, 27.723044°E, coll. date: 22 March 2025; leg. & det.: G. Kunev & G. Petrova (BNHM: BG-NMNHS-BOT-000000005725).

This species is reported here as new for the Black Sea Coast (South) floristic region. In Bulgaria, it has so far been recorded only from the vicinity of Kirkovo Village in the Eastern Rhodopes (Kunev & Tsonev, 2018). During our botanical trips, it was also observed in similar habitats at 'Begliktash' locality (Primorsko Municipality). The species was repeatedly documented in the same area between 'Begliktash' locality and cape 'Maslen nos' during the period 2000–2020 by Dr Antoaneta Petrova (Director of the Botanical Garden at the Bulgarian Academy of Sciences during this period) and Zhivko Barzov (experienced nonprofessional naturalist) according to personal communications. It inhabits open grasslands with *Poa bulbosa* L., *Trifolium subterraneum* L., *T. cherleri* L., *Vulpia ciliata* Dumort., *Chrysopogon gryllus* (L.) Trin., *Anemone hortensis* subsp. *pavonina* (Lam.) Arcang., *Asphodeline liburnica* (Scop.) Rchb., *Briza maxima* L., and others.

## 7. *Viola hymettia* Boiss. & Heldr. (Violaceae) (Fig. 2)

Voucher specimens: (1) The Tundzha Hilly Country: Slivenski Mineralni Bani, Sliven Municipality, 160 m, UTM MH31, 42.61351°N, 26.24134°E, coll. date: 21 March 2021; leg.: I. Kostadinov; det.: I. Kostadinov & G. Kunev (SO-108403; SOM-179376); (2) The Tundzha Hilly Country: Seliminovo Village, Sliven Municipality, 500 m to W from the railway station, 205 m, UTM MH22, 42.64225°N, 26.13958°E, coll. date: 13 March 2021; leg.: I. Kostadinov; det.: I. Kostadinov & G. Kunev (SO-108402; SOM-179366); (3) The Balkan Mts (East): Hamam bair, Sliven, Sliven Municipality, 265 m, UTM MH42, 42.66964°N, 26.31815°E, coll. date: 28 March 2021; leg.: I. Kostadinov; det.: I. Kostadinov & G. Kunev (SO-108401; SOM-179368); (4) The North-Eastern Bulgaria: Poveyanovo, Devnya Municipality, 180 m, UTM NH58, 43.22178°N, 27.65922°E, coll. date: 11 April 2021; leg.: I. Kostadinov; det.: I. Kostadinov & G. Kunev (SO-108404); (5) The Black Sea Coast (South): S of Ahtopol, Tsarevo Municipality, in pastures, on the cliffs over the sea, 20 m, UTM NG76, 42.093781°N,

27.952723°E, coll. date: 23 March 2025; leg. & det.: G. Kunev & G. Petrova (SO-108433); (6) The Struma Valley (South): Kresna Gorge, Blagoevgrad province, dry rocky site along goat's path, 280 m, UTM FM73, 41.831513°N, 23.153435°E, coll. date: 29 March 2021; leg. & det.: G. Kunev (BNHM: BG-NMNHS-BOT-000000003201, <https://www.gbif.org/occurrence/4920293607>); (7) The Struma Valley (North): Polska Skakavitsa Village, Kyustendil Municipality, in dry grasslands utilised as pasture, 650 m, UTM FM39, 42.414376°N, 22.682620°E; 9 April 2015; G. Kunev, pers. obs.; (8) The Struma Valley (South): N of Ripite Village, Petrich Municipality, W facing slope of Kozhuh Hill next to the abandoned quarry, on a pile of quarry waste composed of stone fragments, 210 m, FL89, 41.462152°N, 23.258013°E; 2 March 2026; leg. & det.: G. Kunev (BNHM: BG-NMNHS-BOT-000000006848); (9) The Struma Valley (South): Kamentsa Village, Strumyani Municipality, on grazed pasture, 160 m, FM81, 41.650194°N, 23.168028°E; 2 April 2025; leg.: Boris Assyov; det.: G. Kunev (BNHM: BG-NMNHS-BOT-000000006850); (10) The Tundzha Hilly Country: E of Srem Village, Topolovgrad Municipality, on eroded ground along the roadside to stone quarries, 210 m, MG55, 42.04726°N, 26.512111°E; 18 April 2025; leg.: Rossen Vassilev; det.: G. Kunev (BNHM: BG-NMNHS-BOT-000000006849); (11) The Tundzha Hilly Country: Sakar Mts, Dervishka mogila locality, Svilengrad Municipality, dry grassland near abandoned orchard, 480, MG43, 41.906186°N, 26.351161°E; leg.: R. Vassilev; det.: G. Kunev (BNHM: BG-NMNHS-BOT-000000006851).

The species is reported here as new to the Bulgarian flora (Delipavlov, 1979; Assyov & Petrova, 2012; Stoyanov et al., 2025). There is an earlier report of this taxon from the vicinity of 'Nova mahala', Zemen Town (Stoyanov & Stefanov, 1925); however, this report was not confirmed in the subsequent monographic treatment of the genus *Viola* in the multivolume Flora of Bulgaria (Delipavlov, 1979). No further collections from within the borders of Bulgaria were traced, as verified by our revision of the available herbarium material.

The species is an annual plant belonging to *Viola* sect. *Melanium* Ging. The material collected by us was identified via Valentine et al. (1968); Scoppola & Lattanzi (2012), and Čičmir (2025). It is a Mediterranean-Caucasian element in Bulgarian flora,

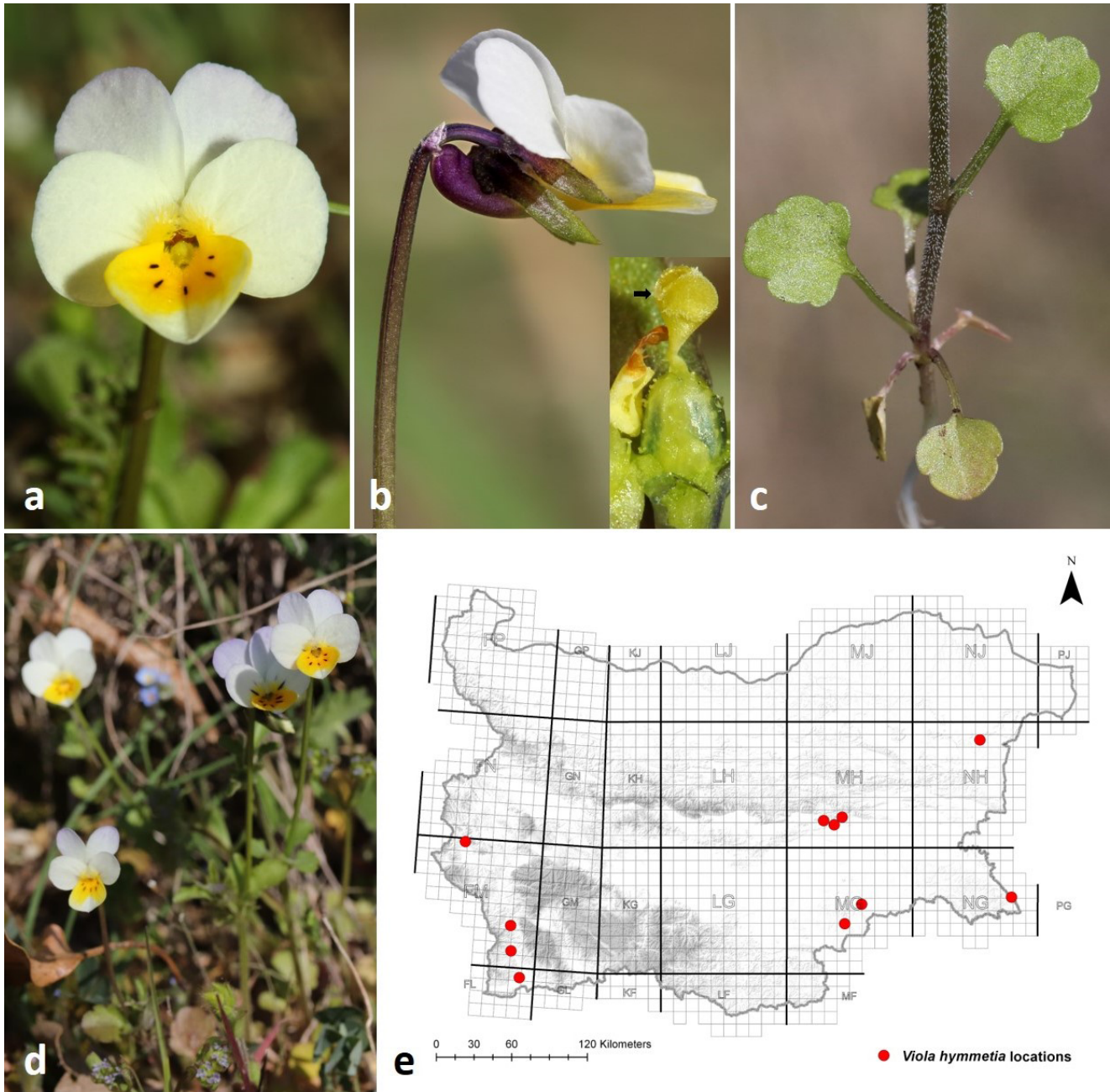


Fig. 2. *Viola hymettia*: a) first flower front view; b) first flower side view and side view of the ovary with black arrow pointing the stigmatic lip; c) lower leaves; d) general habit; e) distribution in Bulgaria (photos: a, b, d – G. Kunev; d – I. Kostadinov; map – G. Petrova).

possibly broadly distributed in Bulgaria. It was probably misidentified in the past as *V. kitaibeliana* Schult. or *V. arvensis* Murray, which may explain why it has remained unreported until now.

*V. hymettia* is distinctive by its flat corolla, 1.0–1.5 mm in dia.; petals longer than sepals; lateral petals orbicular–obovate, spread laterally or slightly upwards; stigmatic lip present. In contrast, *V.*

*kitaibeliana* exhibits cyanthiform (cup-shaped) flowers, 0.4–1.0 mm in dia., and absence of stigmatic lip. Both, *V. kitaibeliana* and *V. arvensis* show petals equal to or shorter than sepals and oblong-obovate lateral petals spreading somewhat upwards. In Bulgaria *V. hymettia* is an early ephemeral species of rocky pastures, dry open grasslands or open shrub-grassland vegetation, flowering from February to





Fig. 3. *Dipsacus gmelinii*: a) newly established plant groups recorded in 2025 on Persin Island; b) showing specific details on the flower head: bluish flowers shorter than bracteoles and upcurved bracts shorter than flower head (photos D. Mihova).

April, similarly to *V. kitaibeliana*. In contrast, *V. arvensis* occupies mesic, rather ruderal-segetal weed vegetation types and flowers from (March) April to October (November) (Delipavlov, 1979).

#### 8. *Lythrum hyssopifolia* L. (Lythraceae)

Voucher specimens: (1) The Mesta Valley: NE from Valkosel Village, Satovcha Municipality, exposed terraces of a temporary streamlet within *Isoetion* communities 840 m, UTM KG50, 41.537517°N, 24.006508°E, coll. date: 29 June 2025, leg. & det.: G. Kunev (SO-108451; BG-NMNHS-BOT-000000006360); (2) The Rhodopes (East): W from Mogilyane Village, Kirkovo Municipality, exposed terraces of a temporary streamlet within *Isoetion* communities, 355 m, UTM LF58, 41.367346°N,

25.221936°E, coll. date: 12 June 2025, leg. & det.: G. Kunev (SO-108456; BNHM: BG-NMNHS-BOT-000000006359).

Although this annual hygrophyte, typical of seasonal waterbodies, is seemingly widely distributed in Bulgaria, it was not previously been reported from the Mesta Valley or the Eastern Rhodopes floristic regions (Stoyanov et al., 2025). Earlier records of the species from the Eastern Rhodopes are preserved in the vascular plant collection of BNHM and in the SO herbarium.

#### 9. *Dipsacus gmelinii* M.Bieb. (Caprifoliaceae) (Fig. 3)

Voucher specimen: The Danubian Plain: Belene island, Pleven province, Persina Nature Park, marsh

peripheries, 20 m, UTM LJ53, 43.670849°N, 25.187435°E, coll. date: 19 August 2024, leg. & det.: G. Kunev, Daniela Mihova and Rosen Tzonev (BNHM: BG-NMNHS-BOT-000000004448).

The first record for Bulgaria of *D. gmelinii* was reported from the island of Belene (Persin) following botanical expedition carried out in the summer of 2022 (Kunev et al., 2024). The species was observed at two microsites (coord.: 43.66250°N, 25.24222°E; 43.66111°N, 25.24167°E) with a total of 20 individuals participating in plant communities developed in wet depressions along a drainage channel.

Additional localities of *D. gmelinii* were observed by the third author during the vegetation seasons of 2024–2025 on Persin Island, approximately 4.5 km west of the previously known sites. In 2024, the micropopulations were distributed along both sides of a 420 m stretch of a road at the periphery of a marsh. Observations, made on 2 August 2024 within the territory of the Persin Protected Area, included the following sites: (1) 43.6708806°N, 25.1874335°E – 1 plant; (2) 43.6708287°N, 25.1877193°E – 3 plants; (3) 43.6707713°N, 25.1881836°E – 29 plants; (4) 43.6707115°N, 25.1881836°E – 3 plants; (5) 43.670671°N, 25.1885084°E – 14 plants; (6) 43.6706081°N, 25.1889176°E – 33 plants; (7) 43.6705856°N, 25.1890679°E – 11 plants; (8) 43.6705362°N, 25.1892905°E – 19 plants; (9) 43.670418°N, 25.1896241°E – 1 plant; (10) 43.6699247°N, 25.1925294°E – 1 plant. The total number of individuals recorded in 2024 was 115.

The botanical trips taken in 2025 confined to the same general area as in 2024 yielded markedly fewer observations and substantially reduced number of individuals. During a field excursion held on 25 July 2025 only 7 plants were recorded at the following sites: (1) 43.67082636°N, 25.18773431°E – 2 plants; (2) 43.67084444°N, 25.18775303°E – 1 plant; (3) 43.67103501°N, 25.18690916°E – 1 plant; (4) 43.67100781°N, 25.18698738°E – 1 plant; (5) 43.67100205°N, 25.18680893°E – 2 plants (Fig. 3).

The low number of individuals recorded in 2025 may be explained by the biennial life cycle of the species and its probable recent introduction. Following three years of monitoring of the species it could be concluded that the occurrence of *D. gmelinii* in Bulgaria is highly vulnerable due to a single known locality on Belene Island, the limited number of microsites and individuals, and considerable distance from the closest stable population in Romania (Kunev

et al., 2024). We therefore recommend the inclusion of *D. gmelinii* in next edition of the Red Data Book of Bulgaria and Annex 3 of Biological Diversity Act, as well as its regular monitoring within the framework of the National Biodiversity Monitoring System, coordinated by the Executive Environment Agency of Bulgaria.

#### 10. *Rhagadiolus stellatus* (L.) Gaertn. (Asteraceae)

Voucher specimens: The Thracian Plain: W from Harmanli, on the slopes over Harmanlyiska River, at 'Defileto' PA, 100 m, UTM MG04, 41.919587°N, 25.885408°E, coll. date: 10 May 2025; leg. & det.: G. Kunev (SO-108439; SOM-179598; BNHM: BG-NMNHS-BOT-000000006353).

This species represents an Atlantic-Mediterranean element in the Bulgarian flora and has so far been recorded from the Struma Valley (South), the Eastern Rhodopes, the Tundzha Hilly Country, the Strandzha, and the Black Sea Coast (South) floristic regions of Bulgaria (POWO, 2025; Stoyanov et al., 2025). It was observed at three closely situated sites, each supporting of up to ten individuals, on steep slopes occupied by open shrub-grassland communities with *Paliurus spina-christi* Mill., *Orlaya grandiflora* (L.) Hoffm., *Avena* sp., *Poa bulbosa*, *Trifolium cherleri*, *T. incarnatum* subsp. *molinerii* (Hornem.) Ces., *Thymus striatus* Vahl, among others.

#### 11. *Gagea amblyopetala* Boiss. & Heldr. (Liliaceae)

Voucher specimens: (1) The Black Sea Coast (South): Primorsko, approx. 1.2 km N from the bridge over Ropotamo river on E99, in grass-shrub communities of SE facing slope, 25 m, UTM NG58, 42.311936°N, 27.725242°E, coll. date: 22 March 2025; leg. & det.: G. Kunev & G. Petrova (SO-108424); (2) Strandzha: Kondolovo village, Tsarevo Municipality, approx. 700 m NW from the village on the side of E99 road, in grasslands with *Poa bulbosa*, 310 m, UTM NG56, 42.096575°N, 27.674476°E, coll. date: 23 March 2025; leg. & det.: G. Kunev & G. Petrova (SO-108425).

In Bulgaria this species has been keyed out under the name *Gagea chrysantha* (Jan) Schult. & Schult.f. in Stoyanov et al. (2025). It has been reported from the following floristic regions: the Struma Valley (South), the Eastern Rhodopes, the Thracian Plain,



and the Tundzha Hilly Country. It is a legally protected species listed in Annex 3 of the Biological Diversity Act of Bulgaria and is evaluated as 'Vulnerable' in the national Red List (Petrova & Vladimirov, 2009). However, *G. chrysanth* s.s. is currently regarded narrow endemic restricted to Sicily (Peruzzi et al., 2015). Consequently, we assign our collections to *G. amblyopetala*, treated as part of *G. chrysanth* aggr. (Peruzzi et al., 2015; POWO, 2025). These records represent the first confirmed occurrences of *G. amblyopetala* in the Black Sea Coast (South) and the Strandzha floristic regions of Bulgaria (Stoyanov et al., 2025).

## 12. *Romulea linaresii* subsp. *graeca* Bég. (Iridaceae)

Voucher specimen: The Pirin Mts (South): Rozhen Village, Sandanski Municipality, Rozhen Monastery, near shelter on the path to Melnik pyramids, 41.530815°N, 23.421216°E, 640 m, UTM GM00, coll. date: 20 March 2025; leg. & det.: G. Kunev (BNHM: BG-NMNHS-BOT-000000005721).

This taxon is a Balkan endemic. It is assessed as 'Vulnerable' in the national Red List (Petrova & Vladimirov, 2009). It is also included in the Annex 3 of the Biological Diversity Act of Bulgaria. The newly discovered locality occupies low inclined slope of SE exposition, covered by mosaic of shrub-grassland communities with *Paliurus spina-christi*, *Juniperus deltoides* and *Chrysopogon gryllus*, *Poa bulbosa*, and many annuals as *Sabulina tenuifolia* (L.) Rchb., *Teesdalia coronopifolia* (J.P. Bergeret) Thell., *Draba verna* aggr., *Erodium cicutarium* (L.) L'Hér., *Molineriella minuta*, etc. The micropopulation consisted of about 50 individuals. This represents the first record of the taxon for the Pirin Mts (South) floristic region (Stoyanov et al., 2025).

## 13. *Juncus capitatus* Weigel (Juncaceae)

Voucher specimens: (1) The Black Sea Coast (South): Begliktash locality, Primorsko Municipality, temporary wet habitats amongst rock outcrops, 170 m, UTM NG68, 42.309428°N, 27.746384°E, coll. date: 9 June 2025; leg. & det.: G. Kunev & G. Petrova (SO-108453); (2) the Tundzha Hilly Country: NW from the archaeological complex Paleokastro, Topolovgrad Municipality, 380 m, UTM MG45,

42.081618°N, 26.300408°E, coll. date: 10 May 2025; leg. & det.: G. Kunev (SO-108454).

The species is a hygrophilous dwarf annual, known from the lowlands and sub-mountainous areas of southern Bulgaria (Stoyanov et al., 2025). In the country, it occupies pioneer substrates, predominantly siliceous, associated with temporary waterbodies. However, it has not previously been reported from the Black Sea Coast (South) or the Tundzha Hilly Country floristic regions. It is a diagnostic species for the class *Isoëto-Nanojuncetea* Br.-Bl. et Tx. in Br.-Bl. et al. 1952. (Mucina et al., 2016), and commonly co-occurs with *Juncus bufonius*, *Isolepis setacea* (L.) R.Br., *Lysimachia arvensis* (L.) U.Manns & Anderb., *Molineriella minuta*, and others.

## 14. *Hainardia cylindrica* (Willd.) Greuter (Poaceae)

Voucher specimen: (1) The Rhodopes (East): E from Zagorsko Village, Momchilgrad Municipality, 280 m, UTM LF69, 41.487319°N, 25.385802°E, coll. date: 11 June 2025; leg. & det.: G. Kunev & G. Petrova (SO-108424; SOM-179597; BNHM: BG-NMNHS-BOT-000000006354); (2) The Thracian Plain: Manole Village, Maritsa Municipality, a small group of plants observed in the ruts of a dirt road, 160 m, 42.204426°N, 24.897341°E, 23.06.2019; G. Kunev (pers. obs.).

These records represent new localities and floristic regions for the species in Bulgaria, which was previously known only from the Black Sea Coast and the Tundzha Hilly Country regions (Stoyanov et al., 2025). The substrates at both sites were slightly saline due to intense soil moisture evaporation. Only solitary individuals or small groups composed of up to fifty plants were observed.

## 15. *Poa infirma* Kunth (Poaceae)

Voucher specimens: (1) The Tundzha Hilly Country: Sakar Mts, on a dirt road at Chernite skali PA, Topolovgrad Municipality, 410 m, UTM MG45, 42.049398°N, 26.357240°E, coll. date: 29 March 2025; leg. & det.: G. Kunev (SO-108429); (2) The Black Sea Coast (South): In trampled area of a pasture, on the side of the road to Begliktash locality, Primorsko Municipality, 40 m, UTM NG68, 42.292344°N, 27.750252°E, coll. date: 22 March 2025; leg. & det.: G. Kunev & G. Petrova (SO-108426; SOM-179600;





Fig. 4. *Parvotrisetum myrianthum*: a) dry specimens cataloged at BNHM Herbarium (BG-NMNHS-BOT-000000006361); b) panicle with erect branches; c) details on spikelets each bearing two awned florets (photos G. Kunev).

BNHM: BG-NMNHS-BOT-000000006356); (3) The Rhodopes (East): E from Zagorsko Village, Momchilgrad Municipality, along temporary streamlet, 270 m, UTM LF69, 41.487262°N, 25.386214°E, coll. date: 15 March 2025; leg. & det.: G. Kunev (SO-108428); (4) The Rhodopes (East): E from Dobromirski Village, Kirkovo Municipality, in pasture, 380 m, UTM LF58, 41.380148°N, 25.221857°E, coll. date: 15 March 2025; leg. & det.: G. Kunev (SO-108427; SOM-179604).

The species was only recently reported in Bulgaria, based on collections from the Struma Valley (South) floristic region (Tomović et al., 2025). Here, we add new localities and regions for the species in Bulgaria. It often co-occurs with the somewhat similar *Poa annua* L., with which it can be distinguished by its yellowish-green appearance; lower and more compressed habit; lower number of florets per spikelet; shorter anthers (0.2–0.5 mm); and somewhat early flowering period from February to April. It is a Mediterranean element in Bulgarian flora found on flat terrains or in shallow depressions where meteoric water retained for extended periods. It typically occupies trampled and overgrazed areas in regions with Mediterranean climatic influence.

#### 16. *Parvotrisetum myrianthum* (Bertol.) Chrték (Poaceae) (Fig. 4)

Voucher specimens: The Struma Valley (South): S from Ribnik Village, Petrich Municipality, at the bed of a temporary wet and exposed drainage canal, 120 m, UTM FL89, 41.471647°N, 23.253184°E, coll. date: 26 May 2025; leg. & det.: G. Kunev (SO-108452; BNHM: BG-NMNHS-BOT-000000006361).

The species was first reported for the Bulgarian flora by Delipavlov (1992) on the basis of a single collection made on 02 June 1987, at the foothills of ‘Malkiya kozhuh’ height (Pchelina height, a/n), Petrich Municipality. Dried specimens of his gathering are kept in the indexed herbarium of the Agricultural University of Plovdiv, Bulgaria (SOA), mounted on a single sheet. The species has not been recollected since. Furthermore, it was evaluated as ‘Critically Endangered’ for the national Red List (Stoyanov, 2015). The label information on Delipavlov’s material (SOA-38169) does not specify the precise locality; however, the site documented by us is probably situated approximately 2.5–3.0 km to the northwest of the original collection spot. The species is a Balkan-Apennine element with somewhat

ruderal ecological traits (Mucina et al., 2016; POWO, 2025). The reported micropopulation occupies an area of about 5 m<sup>2</sup>, and is associated with *Poa bulbosa*, *P. infirma* Kunth, *P. annua* L., *Montia fontana* aggr., *Ornithogalum sigmoideum* Freyn & Sint., *Teesdalia coronopifolia*, *Myosurus minimus* L., *Polygonum aviculare* L., etc. This record is of considerable importance for protecting the species in Bulgaria, since it is the only confirmed population documented over the last 38 years.

17. *Polypogon viridis* (Gouan) Breistr. (Poaceae)

Voucher specimen: The Rhodopes (East): E from Zagorsko Village, Momchilgrad Municipality, along temporary streamlet, 270 m, UTM LF69, 41.487193°N, 25.386233°E, coll. date: 11 June 2025; leg. & det.: G. Kunev & G. Petrova (BNHM: BG-NMNHS-BOT-000000006355).

This species is a new for the East Rhodopes floristic region (Stoyanov et al., 2025). An earlier observation was made by the first author in October 2020 along the banks of the Varbitsa River near Dobromiritsi Village, Kirkovo Municipality.

18. *Eleocharis quinqueflora* (Hartmann) O.Schwarz (Cyperaceae)

Voucher specimen: The Rhodopes (East): E from Krilatitsa Village, Kirkovo Municipality, in the ditches of the roadside, 340 m, UTM LF67, 41.351996°N, 25.348624°E, coll. date: 11 May 2025; leg. & det.: G. Kunev (BNHM: BG-NMNHS-BOT-000000006352).

It is a sub-cosmopolitan hygrophilous species (POWO, 2025) known in Bulgaria from several floristic regions, occurring from the lowlands up to 2100 m a.s.l. (Assyov & Petrova, 2012; Stoyanov et al., 2025). It is reported here for the first time from the region of the Eastern Rhodopes.

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## Conflicts of interest

No potential conflict of interest has been reported by the authors, reviewers, or subject editor.

## Author's contributions

(using [CrediT](#) )

Georgi Kunev: conceptualisation, data curation, investigation, supervision, validation, visualisation, writing—original draft, writing—review and editing; Gabriela Petrova: data curation, investigation, validation, visualisation, writing—original draft, writing—review and editing; Daniela Mihova: data curation, investigation, validation, visualisation, writing—original draft; Ivan Kostadinov: data curation, investigation, validation, visualisation.

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Research article

## First record of *Myophthiria zeylanica* Maa, 1980 (Diptera: Hippoboscidae) from India

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**Abstract:** *Myophthiria* is a highly specialised genus of brachypterous hippoboscids parasitising swifts and swiftlets (Apodidae). *Myophthiria zeylanica* Maa, 1980 has been considered endemic to Sri Lanka. Here we report the first record of *M. zeylanica* from India, based on a single female collected from an Indian swiftlet (*Aerodramus unicolor* (Jerdon, 1840)) found dead during a field visit in the Nilgiri Hills, Tamil Nadu, at 2238 m a.s.l. The specimen was identified based on external morphology following Maa (1980). This record provides new distributional data for this rarely collected swiftlet-associated louse-fly.

**Keywords:** Apodidae, host association, louse fly, new distributional data

### Introduction

Hippoboscids (louse-flies) of the genus *Myophthiria* are highly specialised, brachypterous (flightless), and superficially spider-like parasites (Maa, 1980). They exhibit extreme host specificity toward swifts and swiftlets (Apodiformes: Apodidae), primarily the

genera *Collocalia* in the Old World and *Aeronautes* in the New World (Bequaert, 1954; Maa, 1969, 1980).

The genus *Myophthiria* is characterised by a head that is consistently longer than wide, with significantly reduced eyes (approximately 2/7 the length of the head), and with the absence of ocelli. Wings are reduced to pad-like structures with



Fig. 1. Indian swiftlet (*Aerodramus unicolor* (Jerdon, 1840)) found dead along the roadside.

simplified venation, where veins  $M_{1+2}$ ,  $M_{2+3}$  and  $Cu_1+A$  typically coalesce into a thickened stem (Maa, 1980).

The genus is divided into two subgenera: *Myophthiria* s. str. (Old World) and *Brachypteromyia* (New World) (Maa, 1980). Dick (2018) listed 13 species in the genus, including three Old World species, two New World species, and eight incertae sedis taxa. Zootaxonomically, the Old World species are remarkably uniform in structure and body size, necessitating the use of “quantitative” characters and relative measurements for species identification. The key features of the *Myophthiria* s. str. subgenus include palpus subequal in length to the antenna, a scutellum bearing 4–10 bristles in a single transverse series, the presence of 1 or 2 pairs of vertical bristles, and a head that is widest behind the level of the eyes (Maa, 1980).

The aim of this study is to document the first record of *Myophthiria zeylanica* Maa, 1980 from India and provide basic data on this specific organism.

## Material and methods

During a regular field visit in the Nilgiris, Tamil Nadu, India, a freshly dead Indian Swiftlet (*Aerodramus unicolor* (Jerdon, 1840)) was found on the roadside (Fig. 1; cause of death unknown) in a habitat dominated by *Eucalyptus* and tea plantations. A single hippoboscid fly was observed leaving the nape region of the bird and was collected and photographed after it reached the ground. The bird was not handled. The fly was identified based on external morphology following Maa (1980). Material is deposited in the ethanol collection of the Ongil Nature Conservation Trust for study purposes\*. Sample was photographed using an RF4 4K Ultra HD Industrial Camera.

\* Note: At present, this study is based on a single specimen; therefore, full preservation and formal deposition have not yet been completed. Additional field sampling is planned, and any newly collected material will be preserved following standard protocols and deposited in a recognised repository such as the BNHS Museum.



## Results

Diptera: Hippoboscidae

*Myophthiria zeylanica* Maa, 1980 (Fig. 2)

Material examined: India, Tamil Nadu, Ooty, Nilgiri Hills, 11°24'36"N, 76°41'42"E, 2238 m a.s.l., 4 Feb 2026, 1 ♀, host: ex *Aerodramus unicolor* (Jerdon, 1840).

## Distribution and ecology

*Myophthiria zeylanica* has been considered until now endemic to Sri Lanka (formerly Ceylon). While most Old World species are confined to lowlands below 600 metres, *M. zeylanica* is an exception, occurring in highland regions up to 1520 m a.s.l. (Maa, 1980).

The species is typically recovered from the nests or bodies of its primary hosts: the Indian edible-nest swiftlet (*Aerodramus fuciphagus* (Thunberg, 1812)) and the Indian swiftlet (*Aerodramus unicolor* (Jerdon, 1840)). Due to their flightless nature and specialised habitat, these flies are rare in collections and difficult to collect outside of host nesting sites (Maa, 1980). *Myophthiria zeylanica* was known only from Sri Lanka: type locality: Hunasgiriya, and from Namunukula, Uva Hills (Hindagalla Cave), Ella (Rawanaella Cave), and Pundaluoya and Gintota.

This is a new geographical record for the fauna of India (see also Maity et al., 2014).

## Diagnostic features

According to Maa (1980), *M. zeylanica* belongs to the *zeylanica* subgroup (Subgroup 1a). The species is most reliably separated from other Old World taxa by male genital characters; however, the examined female matches the diagnostic external morphology given by Maa (1980), including the head is approximately 1.42 times as long as wide, and the vertex is distinctly longer than the combined lunula and interantennal region. The interantennal area is as wide as its distance to the inner orbit. In the wing, the vein  $R_{2+3}$  is present and clearly developed, although it is weaker than veins  $R_1$  and  $R_{4+5}$ . The thorax is further characterised by the anterior margin of the mesobasis-



Fig. 2. Female of *Myophthiria zeylanica* Maa, 1980, collected in Nilgiris, parasitising Indian swiftlet (*Aerodramus unicolor* (Jerdon, 1840)).

ternum, which is narrowly rounded, produced medially, and shows a distinct submedian sinuation. Finally, the chaetotaxy provides supporting diagnostic information, as the setae and bristles on the dorsal connexivum are markedly finer than those on the thoracic dorsum.

## Discussion

Although the genera *Myophthiria* and *Crataerina* (including *Stenepteryx hirundinis* (Linnaeus, 1758)) are both placed within Ornithomyiinae (Dick, 2018) and share several external similarities, the two genera can be readily confused by non-specialists, particularly when specimens are examined superficially (see Fig. 3). This potential for misidentification is further increased by their broadly comparable ectoparasitic lifestyle and host-associated adaptations, especially in taxa associated with Apodidae and Hirundinidae (Maa, 1980). Nevertheless, detailed morphological examination reveals a consistent set of characters that allows reliable separation (see Maa, 1963, 1980). In

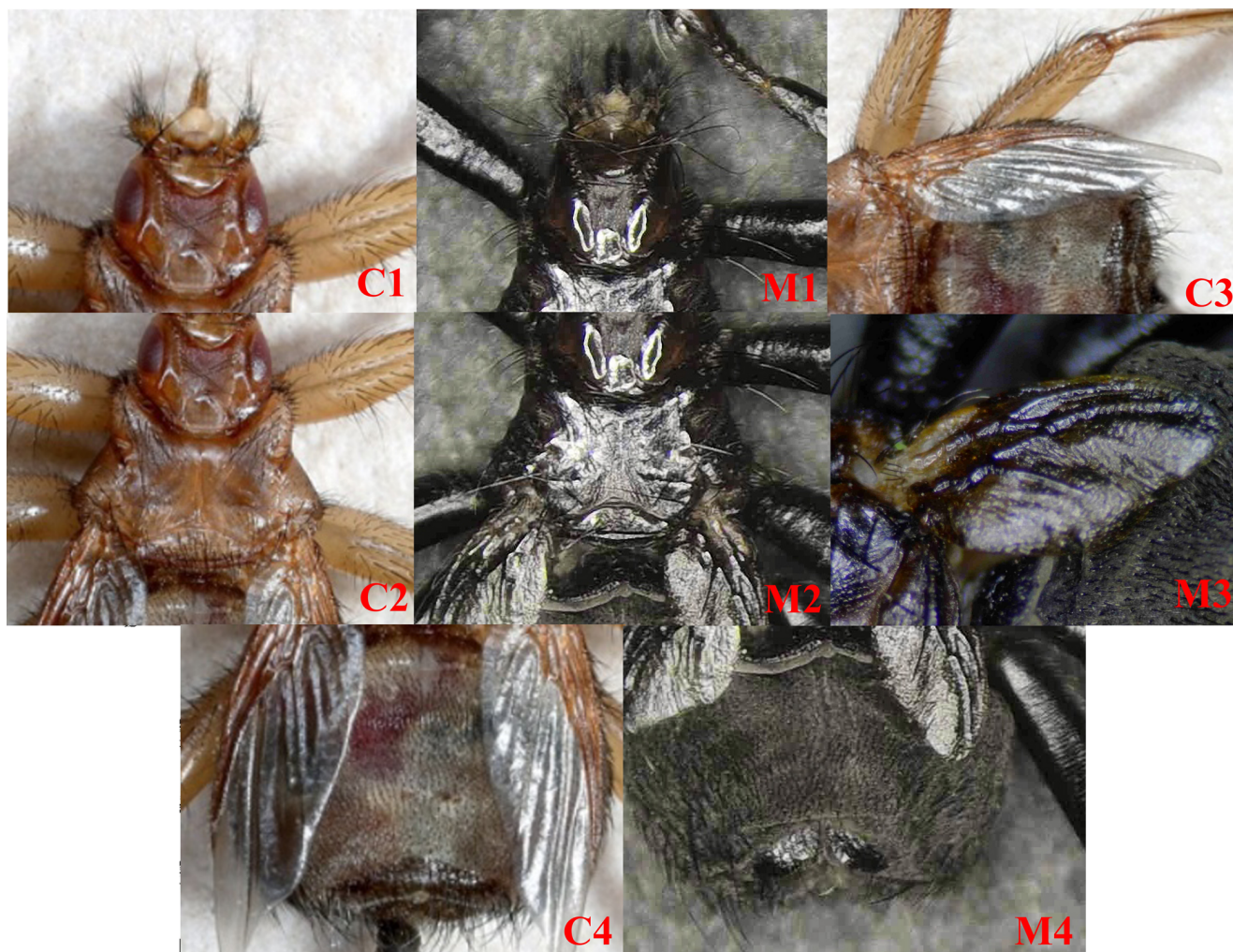


Fig. 3. Overview of the basic differences between the females of genus *Myophthiria* (M1–M4) and genus *Crataerina* (C1–C4). 1. Head. 2. Thorax. 3. Wing. 4. Abdomen.

*Myophthiria*, the head is distinctly longer than wide (Fig. 3 M1), whereas in *Crataerina* head proportions are more variable and may approach a subquadrate condition (Fig. 3 C1). Eye reduction is also more pronounced in *Myophthiria*, with the eyes measuring approximately two-sevenths of head length (Fig. 3 M1), while in *Crataerina* they may reach up to one-half of head length (Fig. 3 C1). Thoracic morphology provides additional diagnostic traits: the median, notal and transverse mesonotal sutures are frequently obsolete in *Myophthiria* (Fig. 3 M2), either partially or completely, but remain at least partly defined in *Crataerina* (Fig. 3 C2). Wing morphology is similarly informative, as *Myophthiria* typically exhibits roundish, pad-like wings (Fig. 3 M3), in contrast to the ribbon-like or elongate wings characteristic of *Crataerina* (Fig. 3 C3). Venational

reduction is also more extensive in *Myophthiria*, where the relevant vein  $R_{2+3}$  is often indistinct and veins  $M_{1+2}$ ,  $M_{2+3}$ , and  $Cu_1+A$  typically coalesce into a single thickened MCuA stem (Fig. 3 M3). Further differences can be observed in the appendages: leg stoutness varies among species of *Myophthiria*, whereas it is consistently robust in *Crataerina*. Finally, female abdominal sclerotisation provides decisive characters, as the supra-anal plate is usually present in *Myophthiria* but entirely absent in *Crataerina*, and the seventh tergite in female *Myophthiria* is often represented by paired sclerites (Fig. 3 M4), whereas in *Crataerina* the corresponding tergite is broad, heavily sclerotised, and integrated into the terminal abdominal region rather than appearing as a separate, narrow plate (Fig. 3 C4).



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## Conflicts of interest

No potential conflict of interest has been reported by the authors, reviewers, or subject editor. As a member of the editorial board Jozef Oboňa recused himself from discussions and decisions on the manuscript.

## Author's contributions

(using [CrediT](#))

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## Three species and two genera of darkling beetles (Coleoptera: Tenebrionidae) new to the Bulgarian fauna

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**Abstract:** *Cnemeplatia atropos* A. Costa, 1847, *Lyphia tetraphylla* (Fairmaire, 1856) and *Uloma rufa* (Piller & Mitterpacher, 1783) as well as the genera *Cnemeplatia* Costa, 1847 and *Lyphia* Mulsant & Rey, 1859 are reported for the first time in Bulgaria. Pictures of the specimens and a map illustrating distribution of these species in the country are provided.

**Keywords:** Bulgaria, *Cnemeplatia atropos*, *Lyphia tetraphylla*, species occurrence, *Uloma rufa*

### Introduction

*Cnemeplatia* Costa, 1847 (Tenebrionidae: Pimeliinae: Cnemeplatiini) is a small genus and consists of 11 primarily Palaearctic species, although some of them also occur in the Afrotropical and Indo-Malayan biogeographic realms (Kaszab, 1966; Ferrer et al., 2009; Schawaller et al., 2014; Merkl et al., 2015; Ferrer, 2016; Iwan et al., 2020). Three of the species are presented in Europe – *Cnemeplatia atropos* Costa, 1847, *Cnemeplatia rufa* Tournier, 1874 and *Cnemeplatia theryi* Kaszab, 1938 (Ferrer et al., 2009). *Cnemeplatia theryi* is endemic to Southern Spain; *C. rufa* is known from the Western Mediterranean – Algeria, Morocco, Portugal, Spain and Tunisia (Ferrer et al., 2009); *C. atropos* is more widespread – Southern and part of Central Europe, Northern Africa, Middle East, Caucasus, Southern Russia and Central Asia (Abdurakhmanov & Nabozhenko, 2011; Iwan et al., 2020).

*Cnemeplatia atropos* appears to be rare across much of its range (Scupola, 1982; Lencina Gutiérrez et al., 2007; Lillig et al., 2012b) although the records

might be sporadic due to its cryptic lifestyle combined with the small size (2–3 mm in length), specific colour and body coated with soil particles, as these features allow it to blend seamlessly with the surrounding environment (Lencina Gutiérrez et al., 2007; Soldati, 2010; Merkl & Szénási, 2018). This species is terricolous (Bouget et al., 2019) and occurs in places with either wet (Ponel et al., 2013) or dry soil (Merkl & Szénási, 2018). Despite of being considered halophilic it also inhabits non-saline areas (Nabozhenko & Chigray, 2014). Occasionally, it can be found at the roots of *Olea europaea* L. (Kiesenwetter, 1861), *Ceratonia siliqua* L. (Mifsud & Scupola, 1998) and species of the genus *Asphodelus* (Ponel et al., 2013) as well as under mosses (Costa, 1847), in anthills (Kaszab, 1957; Merkl & Szénási, 2018) and decomposing plant matter (e.g. oak, poplar and carob leaf litter, wood crumbs and compost piles) (Sahlberg, 1903, 1913; Scupola, 1982; Koch, 1989; Lillig et al., 2012b; Bouget et al., 2019). Furthermore, *Eucalyptus* sp. (Mifsud & Scupola, 1998 Lillig et al., 2012b) and species of the genus *Olea* (Bouget et al., 2019) have been reported as hosts for this facultative

saproxyllic species. *Cnemeplatia atropos* is nocturnal and attracted to light (Kaszab, 1969; Novák, 2014).

The genus *Lyphia* Mulsant & Rey, 1859 (Tenebrionidae: Tenebrioninae: Triboliini) contains 24 valid species spread worldwide except for the Neotropical and Antarctic biogeographic realms (Kaszab, 1974; Ferrer, 2007; Matthews & Bouchard, 2008; Schawaller, 2017; Iwan et al., 2020). Only two of the species are presented in Europe – *Lyphia angusta* (Lucas, 1846) and *Lyphia tetraphylla* (Fairmaire, 1856) (Iwan et al., 2020). *Lyphia angusta* is recorded from France (Corsica), Spain (south continental part of the country, Mallorca, Canary Islands), Algeria (Ferrer, 2007) and Morocco (Mouna et al., 2011). *Lyphia tetraphylla* has wider distribution range than the previous species: Central Europe (Horion, 1956; Černý, 1992), Southern Europe, Anatolia, Levant, Eastern and Southern United States (Bousquet et al., 2018; Iwan et al., 2020; GBIF, 2026b).

*Lyphia tetraphylla* is considered rare across its range and has patchy distribution in Europe (Aliquò et al., 2006; Aliquò & Soldati, 2010; Lillig et al., 2012a; Soldati et al., 2024). This saproxyllic beetle prefers small dead branches or trunks (diameter < 10 cm) of species of the genera *Ficus*, *Quercus* and *Vitis* or sometimes *Ceratonia* (Bouget et al., 2019) as well as *Pistacia lentiscus* L. (Yus Ramos & Coello García, 2008) and persimmon tree (Blackman & Stage, 1924). According to Novák (2014) it can also be found in the fruiting bodies of the polypore fungus *Laetiporus sulphureus* (Bull.) Murrill (1920). It is thought that *L. tetraphylla* feeds on some bostrichid beetles but remains unclear if it actively predares them or scavenges their remains; however, the species was found in the galleries of *Xylopertha praeusta* (Germar, 1817), *Sinoxylon sexdentatum* (Olivier, 1790), *Amphicerus bimaculatus* (Olivier, 1790) and *Xyloperthella picea* (Olivier, 1790) (Perris, 1877; Saint-Albin, 1960; Español, 1971; Aliquò et al., 2006; Soldati, 2007; Aliquò & Soldati, 2010; Soldati et al., 2024). Liberto & Leo (2006) also found several specimens on branches of *Quercus* sp. infested by the following buprestid and cerambycid beetles: *Coraebus fasciatus* (Villers, 1789), *Agrilus angustulus* (Illiger, 1803) and *Phymatodes alni* (Linnaeus, 1767). *Lyphia tetraphylla* overwinters as adult (Saint-Albin, 1960). It is nocturnal and attracted to light (Lillig et al., 2012b).

*Uloma* Dejean, 1821 (Tenebrionidae: Tenebrioninae: Ulomini) is a speciose genus that comprises around 250 species (Kaszab, 1982) and its

representatives are found in all biogeographic realms except Antarctica (Merkl & Ando, 2018). This genus is particularly diverse in the tropics and subtropics (Nabozhenko & Ivanov, 2024), especially in the Indo-Malayan and Australian realms, excluding the arid regions (Kaszab, 1982; Stebnicka, 1991). The highest diversity of *Uloma* species in the Palearctic occurs in its southeastern parts (Himalayas, South and East China as well as Japan) near the border with the Indo-Malayan realm. Only four species are recorded from Europe (Iwan et al., 2020): *Uloma culinaris* (Linnaeus, 1758), *Uloma rufa* (Piller & Mitterpacher, 1783), *Uloma picea* Küster, 1846 and *Uloma cypraea* Kraatz, 1873. The last two species have limited distribution: *U. picea* – Croatia; *U. cypraea* – Greece, Cyprus, the Asian part of Turkey (Iwan et al., 2020) and Syria (GBIF, 2026c). The other two have a wider range: *U. culinaris* – almost entire Europe (from Spain, Central England and Norway to the Urals in Russia as well as Caucasus) and northern Iran (Iwan et al., 2020; Clayhills, 2020; Smets et al., 2021; Bacal & Buşmachiu, 2022; Nabozhenko & Ivanov, 2024); *U. rufa* – a trans-Palearctic species known from Spain and Morocco in the west to the Primorsky Krai in Russia in the east (Alekseev, 2008; Efimov, 2008; Medvedev & Sundukov, 2009; Iwan et al., 2020).

Despite being widespread, *Uloma rufa* typically exists in low densities (Bouget et al., 2019). This sapro-xylophagous beetle lives in coniferous or mixed forests and prefers but is not confined to coniferous hosts: primary – species of the genus *Pinus*; secondary – species of the genera *Abies*, *Picea*, *Betula*, *Robinia*, *Quercus* and *Fagus* (Wenzel, 2002; Cherney, 2005; Nikitsky, 2016; Bouget et al., 2019). It may also supplement its diet with wood-decay fungi (Iwan et al., 2012; Tsinkevich & Prishchepchik, 2014) and has been found in decaying wood infested with white- and brown-rot fungi (Wenzel, 2002; Schmidl et al., 2005; Alekseev, 2008; Tsinkevich & Prishchepchik, 2014) as well as in red-rotten wood (Koch, 1989; Schawaller, 2015). *Uloma rufa* often colonises deadwood in open or semi-open forest areas (Nikitsky et al., 1996; Wikars, 2014; Nikitsky, 2016; Ulfsson & Swenson, 2018; Karjalainen, 2020), generally prefers large-sized deadwood (diameter > 40 cm) (Bouget et al., 2019) but can also be found in sawdust piles (Karjalainen, 2020). The flight period is from May–June to August (Nikitsky et al., 1996; Nikitsky, 2016) when beetles can also be spotted flying in forest meadows (Efimov, 2008). Its life cycle





Fig. 1. *Cnemeplatia atropos*, habitus, dorsal view. Scale line: 500  $\mu$ m.

lasts two years, both adults and larvae can overwinter, pupates in wood (Nikitsky et al., 1996; Nikitsky, 2016) and new adults emerge in summer (Perris, 1857). This species is nocturnal and attracted to light (Ulfsson & Swenson, 2018).

## Methods

Material was collected in the period 2008–2025. Specimens were caught by hand or using a light “tower” device with 160W mercury-vapour lamp and 8W actinic tube lamp. Exemplars were subsequently fixed in a mixture of 70 % ethanol and acetic acid, an absolute ethanol or in cork with ethyl acetate. Genitalia were extracted, macerated in KOH and stained in chlorazol black.

The specimens were photographed with a Canon EOS R50 camera with Laowa 25mm f/2.8 2.5-5X Ultra Macro and Laowa Aurogon FF 10-50X NA0.5 Supermicro APO lenses attached to a WeMacro rail. Genitalia of *L. tetraphylla* were photographed with a

Canon EOS 2000D attached to a Zeiss Jena Amplival compound microscope. Genitalia of *U. rufa* were photographed with the same camera attached to Zeiss Stemi 2000-C stereo microscope. Different focal planes were stacked with Helicon focus Pro 8.3.11.

Distribution map was created using ArcGIS 10.9.1. software. Background layers were downloaded from the following scientific and free websites: SRTM 90m Digital Elevation Database v4.1 (Jarvis et al., 2008), Black Sea bathymetry (EMODnet Bathymetry Consortium, 2024), country borders (Sevdari & Marmullaku, 2023), rivers and lakes (EEA / CLMS, 2020). All raster and vector layers were processed with ArcGIS 10.9.1. software to account for the map scale (1: 3600000) and visualisation requirements.

Collected specimens were deposited in the zoological collections of Sofia University St. Kliment Ohridski, Bulgaria (BFUS), Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences (IBER-BAS) and National Museum of Natural History, Bulgarian Academy of Sciences (NMNHS-BAS).

## Results and discussion

*Cnemeplatia atropos* Costa, 1847 (Fig. 1)  
= *Autocera antcipies* Wollaston, 1857

Material: Bulgaria, Burgas Lowland, Sredets County, Suhodol Vill., N42.440697° E27.084138°, 126 m a.s.l., 7.VI.2024, 1 ex. (BFUS-TEN000076), in funnel-shaped antlion pit of *Euroleon nostras* (Geoffroy, 1785), leg. V. Vassilev.

Distribution: Afghanistan, Algeria, Azerbaijan (including Nakhichevan), Bulgaria (new country record, see Fig. 2), Croatia, Cyprus, Egypt, France (including Corsica), Greece (including Cephalonia, Corfu, Crete, Naxos, Zakynthos), Hungary, Iran, Iraq, Israel, Italy (including Capri, Sicily), Kazakhstan, Malta, Morocco, Portugal (Madeira Archipelago), Romania, Russia (Dagestan, Volgograd Oblast), Saudi Arabia, Spain (including Canary Islands), Sudan, Syria, Tajikistan, Tunisia, Turkey (European and Asian territories), Turkmenistan, Uzbekistan, Yemen (Faust, 1877; Porta, 1934; Kühnelt, 1965; Ferrer et al., 2009; Abdurakhmanov & Nabozhenko, 2011; Schawaller et al., 2014; Iwan et al., 2020; Nabozhenko et al., 2021).

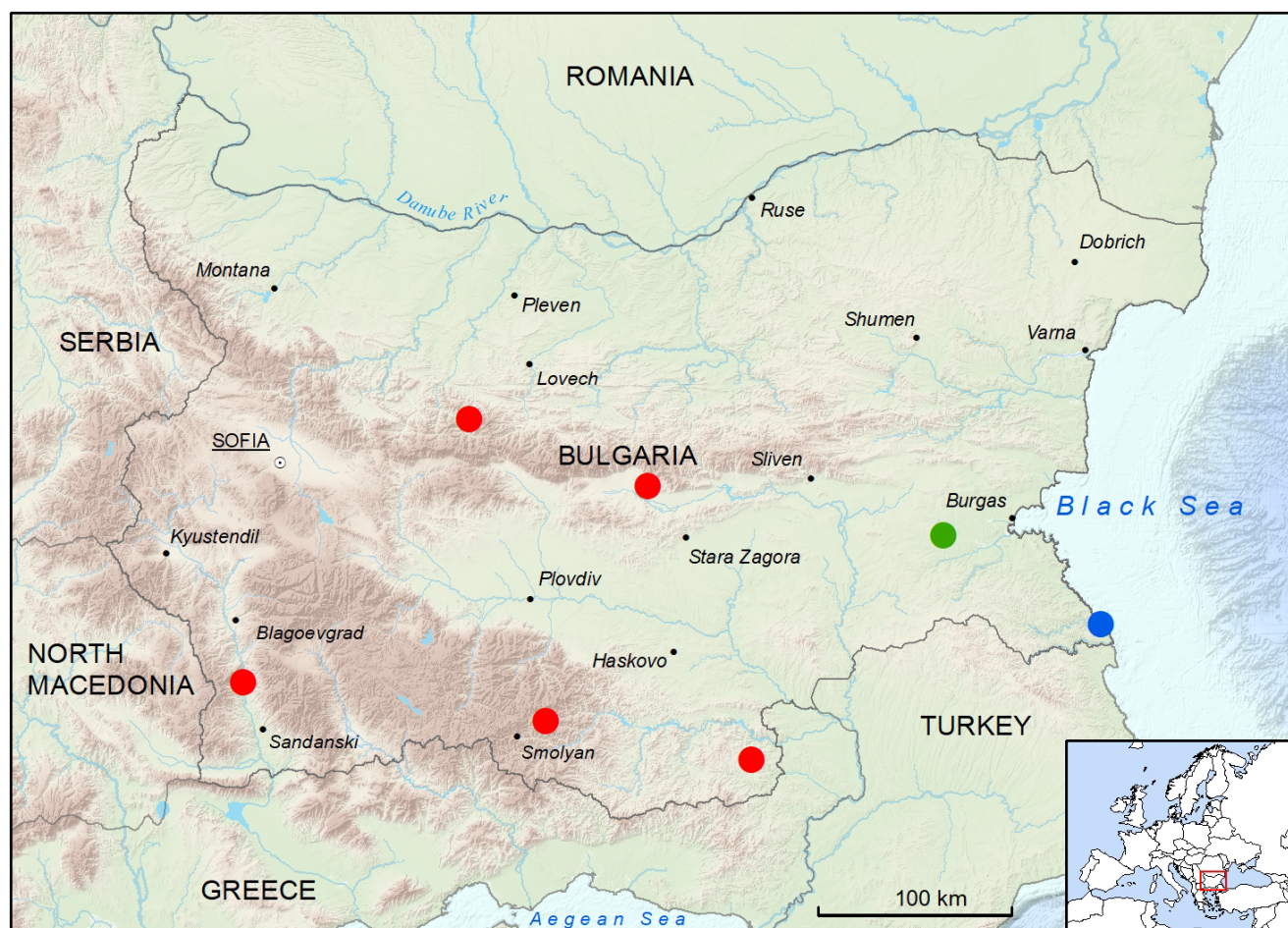


Fig. 2. Distribution of *Cnemeplatia atropos* (green circle), *Lyphia tetraphylla* (blue circle) and *Uloma rufa* (red circles) in Bulgaria.

Notes: *Cnemeplatia atropos* was initially reported from Bulgaria on social media [iNaturalist and Global Biodiversity Information Facility (GBIF, 2026a)] without mentioning that it is a new country record. This shows that information published on the citizen science platforms should be approached with caution since its accuracy is not guaranteed. Besides that, the following records of *C. atropos* are not listed in the “Distribution” section as they need further confirmation. Nabozhenko et al. (2021) do not support the Armenian record (Abdurakhmanov & Nabozhenko, 2011) due to the lack of material, so the authors excluded the species from the checklist of the country’s darkling beetles. The records from Gibraltar and mainland Portugal are erroneous since *C. rufa* was misidentified as *C. atropos* (López-Colón et al., 2021). Gambian record presented on the website of the Biological Museum at Lund University (MZLU, 2026) also requires confirmation.

Liberto & Leo (2023) quoted Ferrari’s (2021) bachelor’s thesis incorrectly by reporting the species from the Greek island of Gavdos instead of Crete. Additionally, we didn’t find any data that substantiates the records from Sardinia, San Marino and Western Sahara published by Abdurakhmanov & Nabozhenko (2014). In conclusion, proper species identification and thorough bibliographic search are equally important for determining current distribution of any taxon.

*Lyphia tetraphylla* (Fairmaire, 1856) (Fig. 3)  
 = *Bius tetraphyllus* Fairmaire, 1856  
 = *Lyphia ficicola* Mulsant & Rey, 1859  
 = *Hypophloeus rugosa* Dury, 1902

Material: Bulgaria, Strandzha Mt., Black Sea Coast, NW of Sinemorets Vill., near Veleka river mouth,



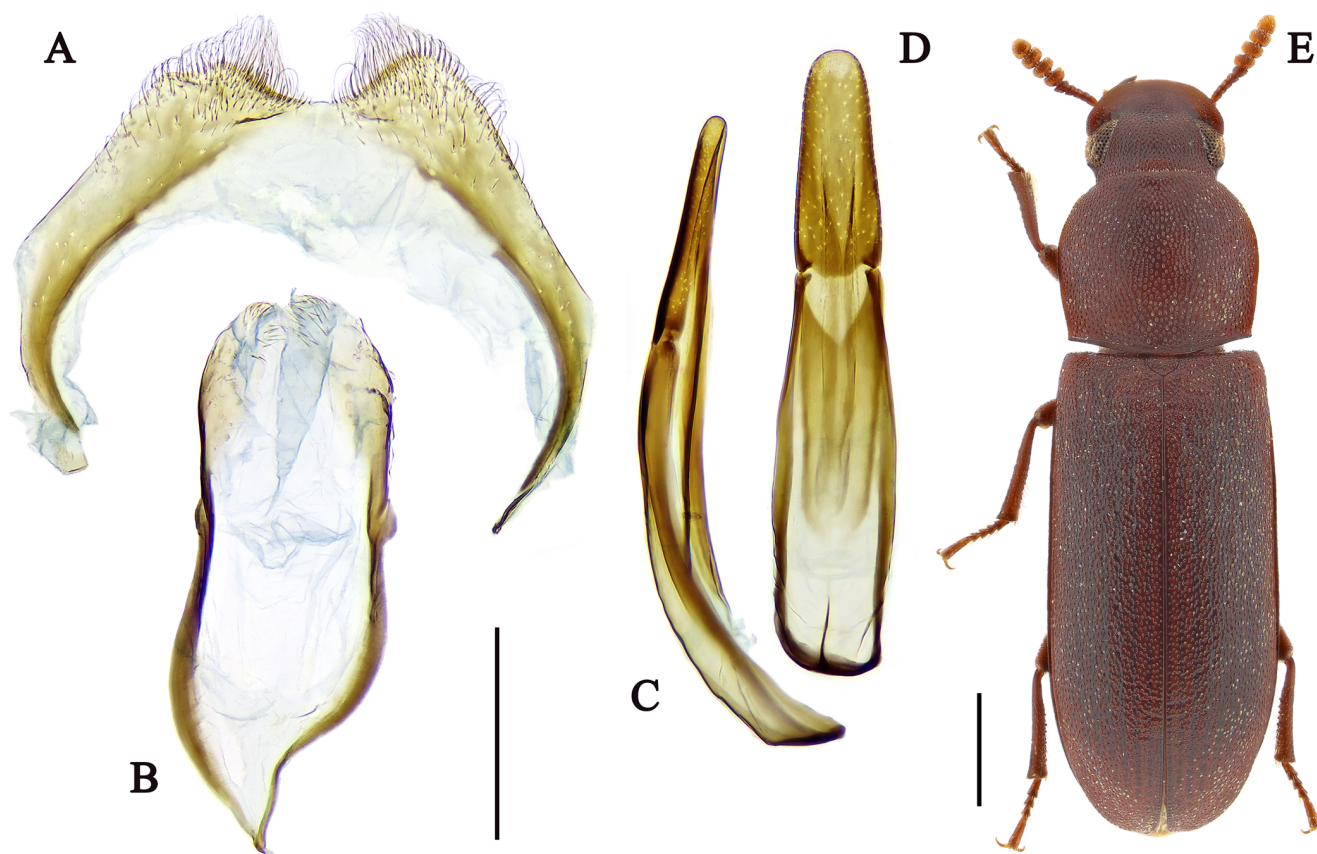


Fig. 3. *Lyphia tetraphylla*, male: (A) inner sternite VIII, outer side view; (B) spiculum gastrale, ventral view; (C) aedeagus, lateral view; (D) aedeagus, ventral view; (E) habitus, dorsal view. Scale lines: (A–D) 250  $\mu$ m; (E) 1 mm.

N42.064791° E27.971140°, 4 m a.s.l., 14–15. VIII.2010, 1 ♂ (BFUS-TEN000077), at light, leg. O. Sivilov & B. Zlatkov.

Distribution: Bosnia and Herzegovina, Bulgaria (new country record, see Fig. 2), Croatia (including Krk, Mljet, Pag), Cyprus, France (including Corsica), Greece, Israel, Italy (including Sardinia, Sicily), Malta, Montenegro, Slovakia, Spain (including Balearic Islands), Turkey (Asian territories), United States of America (District of Columbia, Florida, Georgia, Kentucky, Maryland, Ohio, Oklahoma) (Müller, 1920–1921; Aliquò et al., 2006; Ferrer, 2007; Denux & Zagatti, 2010; Novák, 2014; Lillig et al., 2012b; Bousquet et al., 2018; Iwan et al., 2020; Kazilas, 2021; GBIF, 2026b).

Notes: Although some authors state that *Lyphia tetraphylla* is of Nearctic origin and was introduced to Europe (Horion, 1956; Černý, 1992; Šefrová & Laštůvka, 2005; Löbl et al., 2008; Novák, 2014; Iwan et al., 2020) the genus itself originated in the Old World (Kaszab, 1979; Soldati et al., 2024). This

species is adventive to North America (Bousquet et al., 2018; Bouget et al., 2019; Soldati et al., 2024) and remains the only member of the genus that occurs in the Nearctic realm (Aalbu et al., 2002; Bousquet et al., 2018). In this regard, the reports suggesting that it is a cosmopolitan species (Leng, 1920; Swezey, 1942; Aalbu et al., 2002) or invasive to some European countries (e.g. Montenegro or Greece) (Bulatović et al., 2016; Korakaki et al., 2021) are incorrect. This species was recorded from the Czech Republic back in 1934 (Horion, 1956) but according to Novák (2014) it went extinct in the country. It was also listed as endangered in the Red List of Italian saproxylic beetles (Audisio et al., 2014). Swezey (1942) reported *L. tetraphylla* from Hawaii but also noted that the specimens probably belong to the species *L. angusta*, as indicated by Dr F. E. Blaisdell. Finally, the Kenyan record (Kahuthia et al., 2019) requires confirmation as the identification of the specimens was based on keys to genus level.



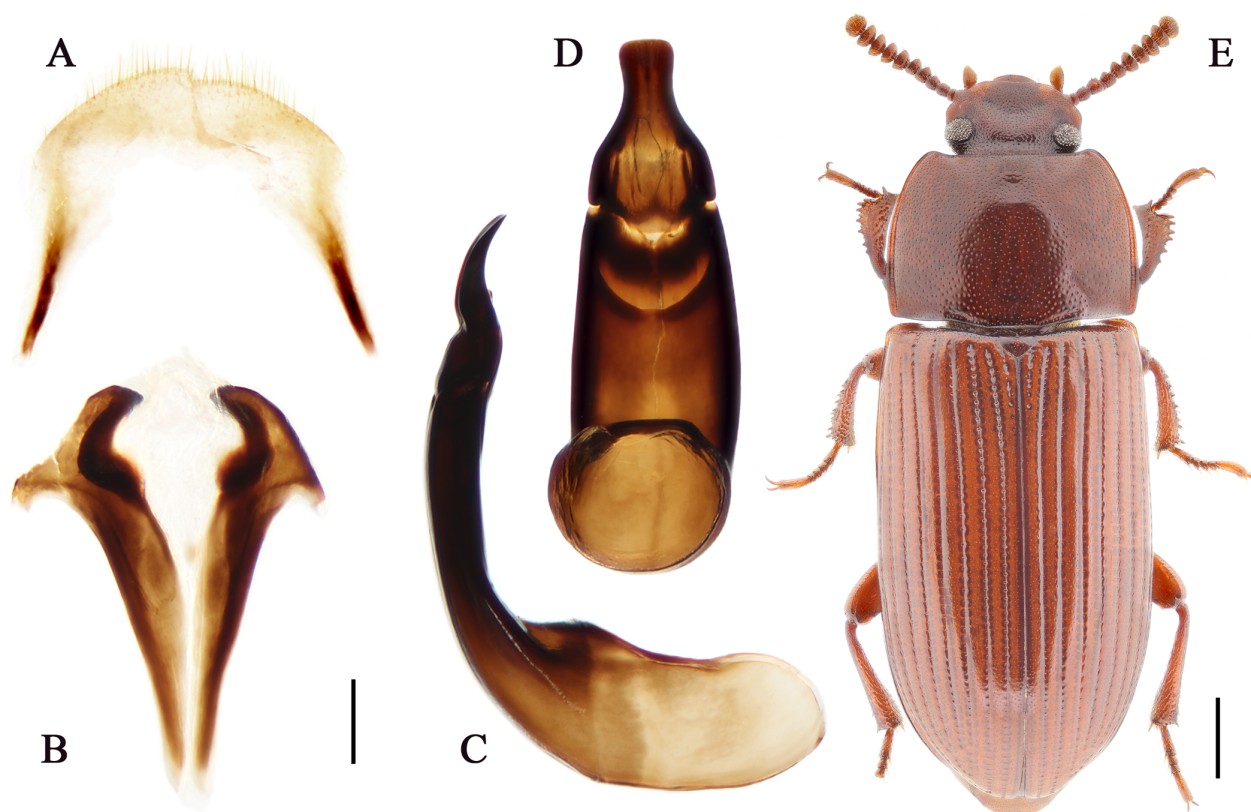


Fig. 4. *Uloma rufa*, male: (A) inner sternite VIII, outer side view; (B) spiculum gastrale, ventral view; (C) aedeagus, lateral view; (D) aedeagus, ventral view; (E) habitus, dorsal view. Scale lines: (A–D) 250 µm; (E) 1 mm.

*Uloma (Uloma) rufa* (Piller & Mitterpacher, 1783)

(Fig. 4)

= *Tenebrio rufus* Piller & Mitterpacher, 1783

= *Uloma perroudi* Mulsant & Guillebeau, 1855

Material: Bulgaria, Pirin Mts, Kresna Gorge, SW of Stara Kresna Vill., Sheytan dere Place, N41.759981° E23.158233°, 288 m a.s.l., 11–12.VI.2008, 1 ♂ (BFUS-TEN000078), at light, leg. O. Sivilov & B. Zlatkov; Central Predbalkan, Vasilyovska planina Mt., NE of Vasilyovo Vill., Kozi dol Place, 5–7.V.2015, N42.8953° E24.3817°, 769 m a.s.l., 5 ex. (NMNHS-BAS), leg. R. Bekchiev & K. Smets; W Rhodopes Mts, Slaveyno Vill., approx. N41.64° E24.86°, 1290 m a.s.l., 18–25.VII.2016, 1 ♂ (BFUS-TEN000079), leg. A. Palov; Kazanlak Valley, Kazanlak, N42.634351° E25.404707°, 464 m a.s.l., 26.III.2025, 1 ♂ (BFUS-TEN000080), 1 ♀ (BFUS-TEN000081), 2 ♂♂ & 2 ♀♀ (IBER-BAS), in dead *Pinus sylvestris* tree, leg. V. Vassilev; E Rhodopes Mts, Sarta ridge, SE of Kobilino Vill., N41.493971° E26.013099°, 493 m a.s.l., 5–6.VII.2025, 1 ♀ (BFUS-TEN000082), at light, leg. O. Sivilov & V. Gashtarov.

Distribution: Albania, Austria, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria (new country record, see Fig. 4), Croatia (including Mljet), Czech Republic, Denmark (Bornholm, Sjælland), Estonia (including Hiiumaa), Finland (including Iso-Nauvo, Norstö, Ruissalo and some small islands), France (including Corsica), Georgia, Germany, Greece (including Corfu, Crete, Thasos), Hungary, Italy (including Sardinia), Kazakhstan, Latvia, Lithuania, Moldova, Morocco, Norway (including Barmen [Aust-Agders], Jomfruland, Skåtøy, Tromøy and some small islands), Poland, Romania, Russia (from the Baltic region in the west to Primorsky Krai in the east), Serbia, Slovakia, Spain, Sweden (including Djursö, Gotland, Gotska Sandön, Öland, Vaddö, Yxnö and some small islands), Switzerland, Ukraine (Horion, 1956; Kühnelt, 1965; Kaszab, 1967; Kotomina & Sheshnitsan, 2010; Iwan et al., 2020; Nabozhenko & Ivanov, 2024; GBIF 2026d; Fowles, 2026; Naturbasen, 2026).

Notes: *Uloma rufa* is generally less common than *U. culinaris* in many countries (Reitter, 1911; Stebnicka, 1991; Merkl, 1998; Soldati, 2007;

Abdurakhmanov & Nabozhenko, 2011; Novák, 2014; Brůha et al., 2022), including Bulgaria (this record). This is a species with low population density (Kaszab, 1969; Nikitsky et al., 1996; Alekseev, 2008; Nikitsky, 2016; Bouget et al., 2019) but sometimes locally abundant (Bouget et al., 2019). It was listed as Endangered in the national Red Lists of Italy (Audisio et al., 2014) and Germany (Bense, 2002) but subsequently was downgraded to Near Threatened in Germany's Red List of threatened species (Schmidl et al., 2021). On the other hand, *U. rufa* is numerous and widespread in some European regions: Boronka-mellék in Hungary, the Carpathians and Croatia (József, 1992); Poland (Iwan et al., 2012; Konwerski et al., 2024); Lot-et-Garonne and Corsica, France (Tamisier, 2005; Soldati, 2007); Zhytomyr Oblast, Ukraine (Andreieva et al., 2019); Upper Lusatia, Germany (Brůha et al., 2022). Horion (1956) considers it a boreo-montane species, but our data do not support this opinion as *U. rufa* was found in some warm lowland habitats in Bulgaria.

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## Conflicts of interest

No potential conflict of interest has been reported by the authors, reviewers, or subject editor.

## Author' contributions

(using [CrediT](#))

Ognyan Sivilov: data curation, investigation, resources, visualisation, writing—original draft; Vassil Vassilev: investigation, resources, visualisation; Rostislav Bekchiev: investigation, resources; Maria

Naumova: funding acquisition, project administration; Hristina Hristova: investigation, writing—original draft.

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Research article

# A key to the taxa of the genus *Agrilus* Curtis, 1825 (Coleoptera: Buprestidae: Agrilinae) in Bulgaria. I

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<https://zoobank.org/5DE2CDC6-6FED-4F63-B0A1-F84C63C6DEC2> 

**Abstract:** *Agrilus* (*Quercuagrilus*) *ziegleri* Niehuis, 2006 **syn. n.** is established as a new junior subjective synonym of *A. (Q.) relegatus* Curletti, 1990. The revision of the specimens reported as belonging to *A. (Q.) curtulus* Mulsant & Rey, 1863 from Bulgaria shows that they belong to *A. (Q.) litura* Kiesenwetter, 1857. *Agrilus (Q.) curtulus* is not distributed in Bulgaria. Key to all 10 representatives of subgenus *Quercuagrilus* in Bulgaria is presented. *Agrilus (Q.) sulcicollis* Lacordaire, 1835 is also included in the key because it is distributed on the Balkan Peninsula closest to Bulgaria in North Macedonia and Romania and it is possible to collect it in Bulgaria as well.

**Keywords:** Agrilinae, *Agrilus*, Balkan Peninsula, Bulgaria, Buprestidae, Coleoptera, key, *Quercuagrilus*, taxonomy

## Introduction

The Bulgarian representatives of subgenus *Quercuagrilus* of the genus *Agrilus* are the subject of study in this article. Subgenus *Quercuagrilus* was defined by Alexeev (1998). It embraces 29 species (Jendek, 2026) with 11 inhabiting in Bulgaria (Sakalian, 2003). The number of *Quercuagrilus* taxa reported in the second publication needs correction and this is one of the aims of this study. The other ones are to demonstrate our opinion about synonymising of *Agrilus (Quercuagrilus) ziegleri* Niehuis, 2006 **syn. n.** and to present a key to the taxa of this subgenus in Bulgaria.

## Material and methods

Specimens were collected by traditional entomological methods: collecting on leaves and branches by en-

tomological net; shaking tree branches and crowns; collecting by the different coloured tree traps; rearing of adults in laboratory conditions from infested parts of host plants.

Morphological structures illustrated in the key to species were examined with a scanning electron microscope Tescan LYRA 3. The images were produced with a secondary electron detector at high vacuum. The magnification used to take each photomicrograph is shown in the figure captions. The copyright of the Fig. 1 belongs to the State Museum of Natural History Stuttgart (Germany). The copyright of the Fig. 2 belongs to the National Museum of Natural History Smithsonian Institution (Washington, DC, USA).

The studied specimens for the key are housed in the collection of Vladimir Sakalian (Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences). All specimens of the species included in the key to the Bulgarian *Quercuagrilus*

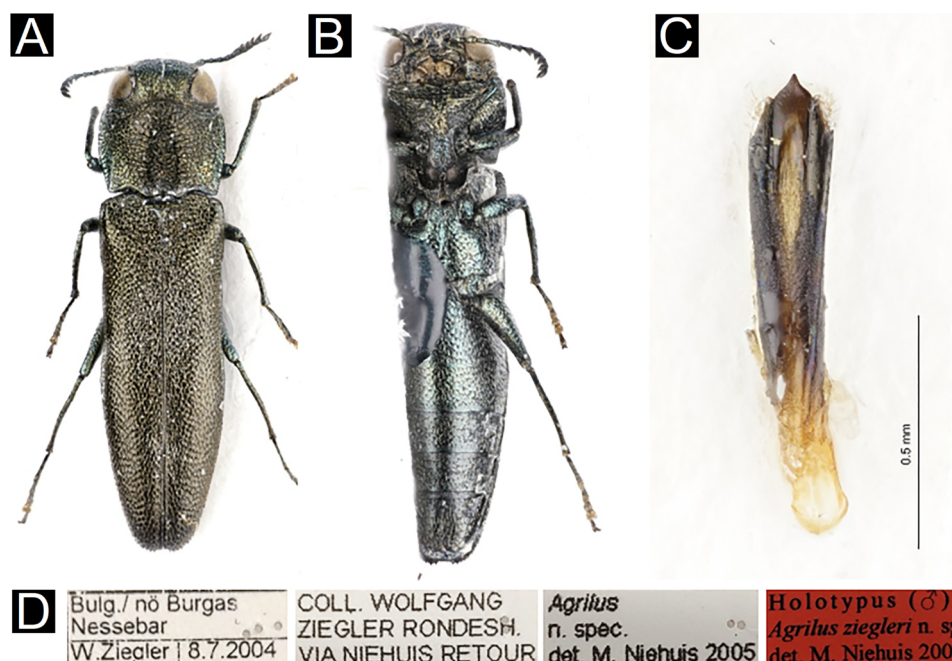


Fig. 1. Holotype of *Agrilus ziegleri* Niehuis, 2006 from Nesebar (male). A. Dorsal view. B. Ventral view. C. Aedeagus. D. Labels. (Credits: Arnaud Faille and Aron Bellersheim).

are from this country with the exception of two specimens (one male and one female) of *Agrilus* (*Quercuagrilus*) *litura* Kiesenwetter, 1857 originated from Slovakia and eight (four male and four female) of *A. (Q.) sulcicollis* Lacordaire, 1835 – originated from Czech Republic. These specimens were kindly provided us by Vítězslav Kubáň.

## Results and discussion

### Taxonomy

Niehuis (2006) described *Agrilus* (*Quercuagrilus*) *ziegleri* from Bulgaria (Nesebar) based on two male specimens (holotype and one paratype). The holotype is housed in the collection of the State Museum of Natural History Stuttgart (Germany) and the paratype – in the collection of the National Museum of Natural History Smithsonian Institution (Washington, DC, USA).

Alexeev & Bílý (1980) described *Agrilus dualis* from southern Russia and Bulgaria (South Black Sea Coast). Later Curletti (1990) described subspecies *A. (Q.) dualis relegatus* from Crete Island. According to Jendek & Nakládal (2019) “The specific name *dualis* Alexeev & Bílý, 1980 is preoccupied and was replaced

by the name *alexeevi* Bellamy, 1998. However, the name *relegatus* Curletti, 1990 has a priority and therefore it becomes the valid specific name of the species”. In fact, *A. alexeevi* is a junior subjective synonym of *A. relegatus* according to these authors. After the precise study of the photographs of holotype (Fig. 1) and paratype (Fig. 2) of *A. (Q.) ziegleri* comparing to the paratype of *Agrilus dualis* Alexeev & Bílý, 1980 (from the type locality of holotype Krasnodarskij kraj: Gelendzhik) and paratype from Ropotamo (Bulgaria) (Fig. 3), both from the collection of National Museum Prague (Czech Republic) we established that *A. (Q.) ziegleri* is conspecific with *A. dualis* Alexeev & Bílý, 1980. The photographs of paratype of *A. (Q.) dualis relegatus* from type locality (Lefka Ori, Omalos) is also presented (Fig. 4). This paratype is also housed in the collection of National Museum Prague (Czech Republic). The aedeagus of *A. (Q.) relegatus* is illustrated on Fig. 15C. After all, *A. (Q.) ziegleri* **syn. n.** is a junior subjective synonym of *A. (Q.) relegatus*. According to our opinion, the reasons of this synonymising are presented below: The most important morphological characters of *A. (Q.) ziegleri* are identical with those of *A. (Q.) relegatus*. The main difference concerns the size of the species: *A. (Q.) ziegleri* is smaller with length 2.9–3.1 mm, while *A. (Q.) relegatus* is bigger with length 4.3–5.3 mm. The



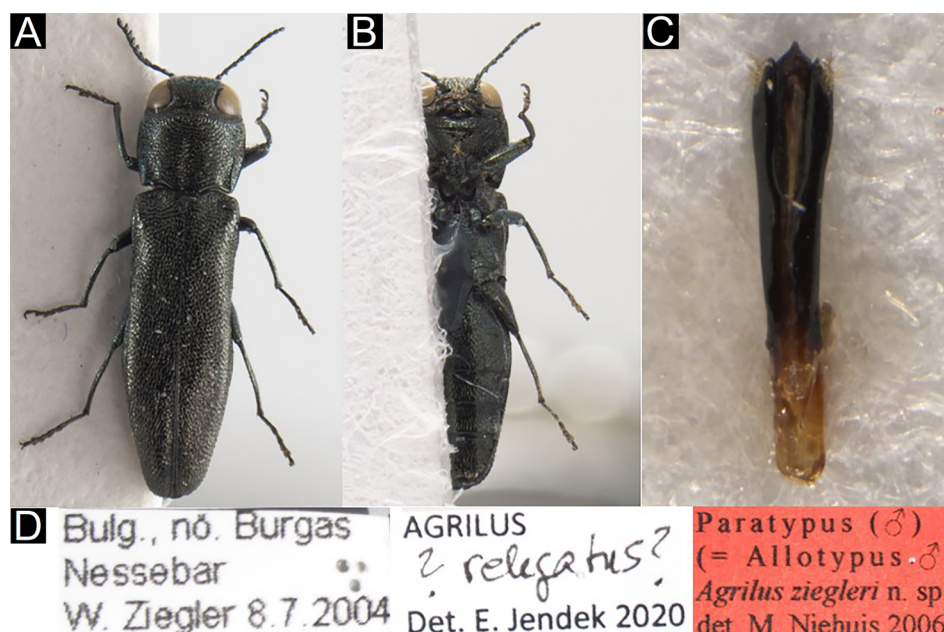


Fig. 2. Paratype of *Agrilus zieglei* Niehuis, 2006 from Nesebar (male). A. Dorsal view. B. Ventral view. C. Aedeagus. D. Labels (Credits: Eugenio H. Nearn and Robert Finn).

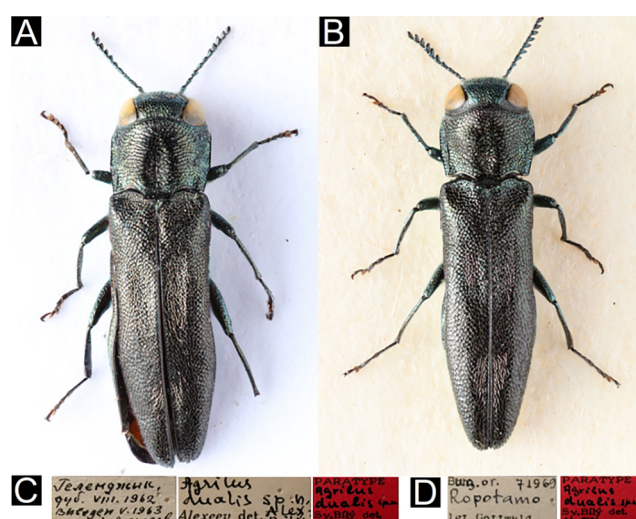


Fig. 3. A. Paratype of *Agrilus dualis* Alexeev & Bílý, 1980 from Gelendzhik (female). B. Paratype from Ropotamo (male). C. Labels (Gelendzhik). D. Labels (Ropotamo). (Photo: Vítězslav Kubáň).

other difference related to the pubescence of elytra. This pubescence in the middle and apical portions of the elytra is not enough clearly visible in *A. (Q.) zieglei* (Fig. 1A and Fig. 2A) if compared with *A. (Q.) relegatus* (Fig. 3A, B) but it is present. According to our opinion, these differences depend of variability of the specimens of *A. (Q.) relegatus*.



Fig. 4. A. Paratype of *Agrilus dualis relegatus* Curletti, 1990 from Lefka Ori, Omalos (male). B. Labels. (Photo: Vítězslav Kubáň).

#### Notes on the distribution of some species of *Quercuagrilus* in Bulgaria

*Agrilus (Quercuagrilus) curtulus* Mulsant & Rey, 1863 was reported from Bulgaria by Gutowski & Lugowoj (1996), Sakalian (2003) and Jendek (2006, 2016). The distribution of this species in the country published by

Sakalian (2003) is based on specimens, which the author found in the collection of National Museum Prague (Czech Republic) and the publication of Gutowski & Lugowoj (1996). After the precise study of the specimens from the Museum as well as the specimens from Bulgaria (one specimen from Sozopol and – one from Varna) kindly provided us by Jerzy Gutowski, Vítězslav Kubáň established that they belong to *A. (Q.) litura* Kiesenwetter, 1857. Two specimens (one from Sozopol and one from Arkutino) cited by Gutowski & Lugowoj (1996) as well as one specimens from “Strandzha Mts: Papija (coll. NMP)” cited by Sakalian (2003) were not checked by Vítězslav Kubáň. The first two specimens are not available and the third one is reported wrongly by the author. Never the less in our opinion, they related to *A. (Q.) litura*. Later, Eduard Jendek (personal communication) informed us that, according to his new opinion, *A. (Q.)*

*curtulus* very probably has western European range and it is not distributed in Bulgaria. In his publication (Jendek, 2026) the distribution of the species in Bulgaria, Greece, Hungary and Romania is under question. According to our understanding the total number of Bulgarian representatives of *Quercuagrilus* is ten species.

According to Jendek (2016) on the Balkan Peninsula, *Agrilus (Quercuagrilus) sulcicollis* Lacordaire, 1835 is distributed in countries close to Bulgaria such as Albania, North Macedonia, Romania and Serbia. In his publication (Jendek, 2026) placed under question the distribution of the species in Albania and Serbia. According to the presented distribution it is possible this species to be collected in northern or western Bulgaria also. By this reason, *A. (Q.) sulcicollis* is included in the key to Bulgarian *Quercuagrilus* taxa (marked in brackets).

#### Key to the taxa of the subgenus *Quercuagrilus*

The most important characters of the subgenus *Quercuagrilus* are: marginal and submarginal carinae of pronotum coalescent (Fig. 14C); posterior border of anal ventrite concave in medial part (Fig. 5E and Fig. 11E); frons of the head with white short pubescence.

- 1 Elytra without white visible pubescence.
  - 1.1 Anterior medial pronotal lobe feebly convex; second sternite of male with two tubercles (Fig. 5D); prosternal process almost subparallel narrowed in apical parts (Fig. 5C).
    - 1.1.1 Smaller, body length 4.1–6.4 mm; microsculpture of vertex with deeper and denser punctuation; pronotum with deeper transverse wrinkles; lateral pronotal sides almost subparallel narrowed in posterior third; prehumeral pronotal carinae longer, extended to the middle of pronotum, almost straight (Fig. 5A). Antennae (Fig. 5B). Aedeagus (Fig. 5F). Body slender, subparallel, narrowed in its apical part, dark green or black. . . . . *Agrilus (Q.) angustulus* (Illiger, 1803)
    - 1.1.2 Bigger, body length 5.9–8.1 mm. Microsculpture of vertex with sparser punctuation; pronotum with slender transverse wrinkles; lateral pronotal sides arcuate, widest in anterior third; prehumeral pronotal carinae shorter, slightly incurved (Fig. 6A). Antenna (Fig. 6B). Aedeagus slightly asymmetrical (Fig. 6C). Body slender, subparallel, narrowed in its apical part, dark with bluish tinge. . . . . *Agrilus (Q.) buresi* Obenberger, 1935
    - 1.1.3 Body length 6.0–8.5 mm. Width of vertex of the head between the lower part of the eyes narrower; lateral pronotal sides widest in middle portion; prehumeral pronotal carinae shorter (Fig. 7A). Antenna (Fig. 7B). Aedeagus strongly asymmetrical (Fig. 7C). Body slender, subparallel narrowed in apical, dark with greenish tinge. . . . . [*Agrilus (Q.) sulcicollis* Lacordaire 1835]
  - 1.2 Anterior medial pronotal lobe more prominent; second ventrite of male without tubercles; prosternal process almost subparallel, narrowed in apical part or rhomboidal.
    - 1.2.1 Vertex with deeper and denser punctuation; width of the vertex of the head between the lower part of the eyes wider (Fig. 8A). Antennae (Fig. 8B); prosternal process almost subparallel, narrowed in apical part. Aedeagus (Fig. 8C). Body subparallel narrowed in its apical part, black. Length 3.4–4.9 mm. . . . . *Agrilus (Q.) obscuricollis* Kiesenwetter, 1857



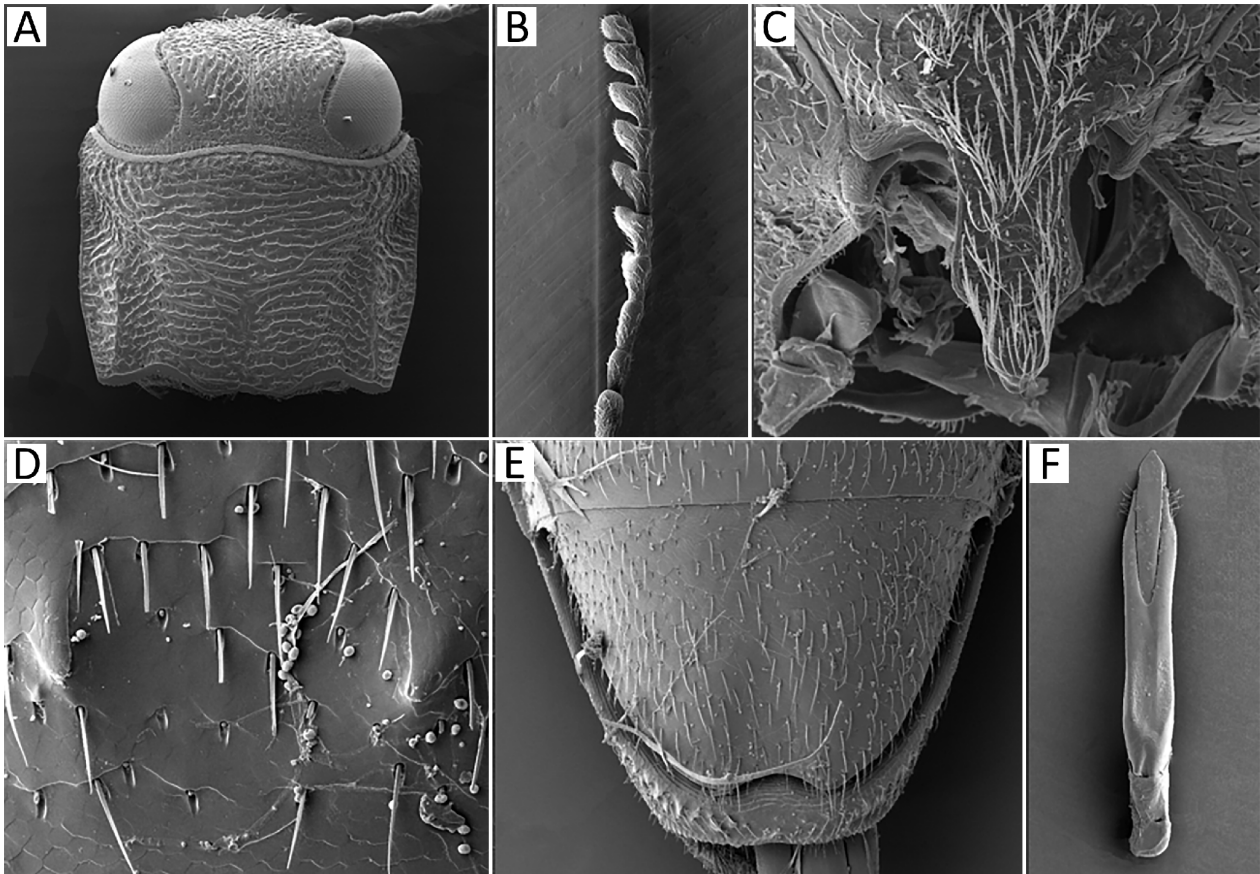


Fig. 5. *Agrilus (Q.) angustulus* (Illiger, 1803). A. Vertex and pronotum (147 $\times$ ). B. Antenna (257 $\times$ ). C. Prosternal process (320 $\times$ ). D. Tubercles male (941 $\times$ ). E. Anal sternite (235 $\times$ ). F. Aedeagus (148 $\times$ ).

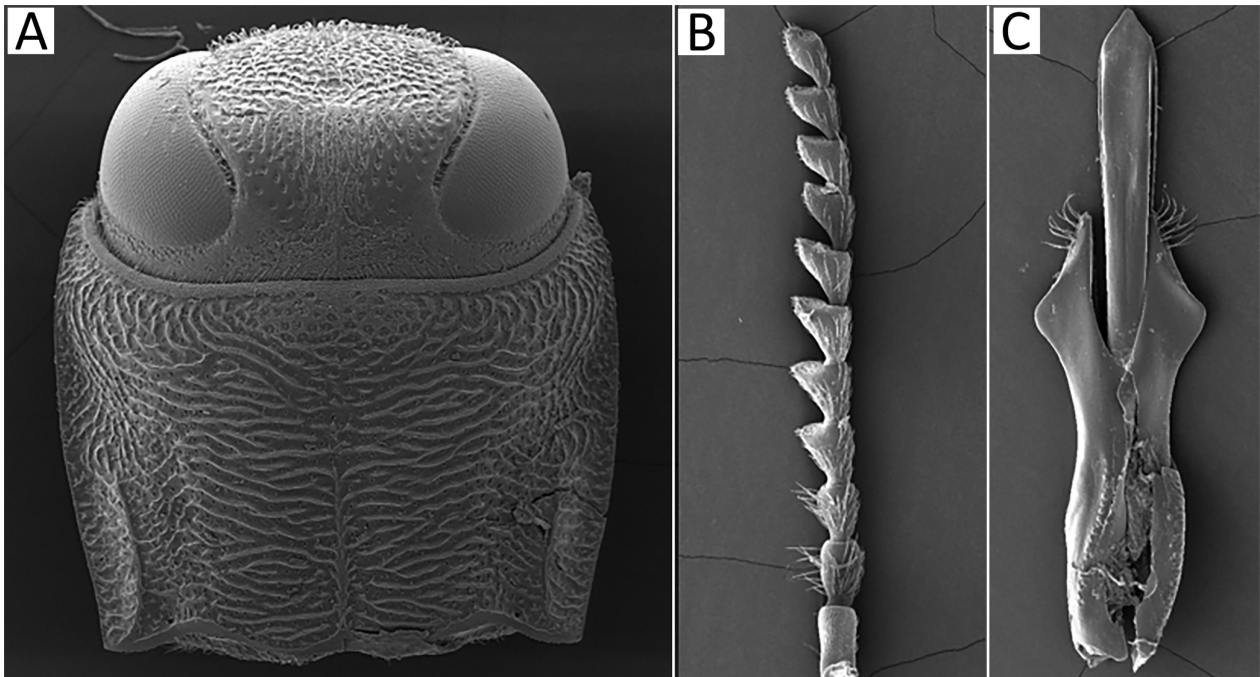


Fig. 6. *Agrilus (Q.) buresi* Obenberger, 1935. A. Vertex and pronotum (119 $\times$ ). B. Antenna (177 $\times$ ). C. Aedeagus (141 $\times$ ).



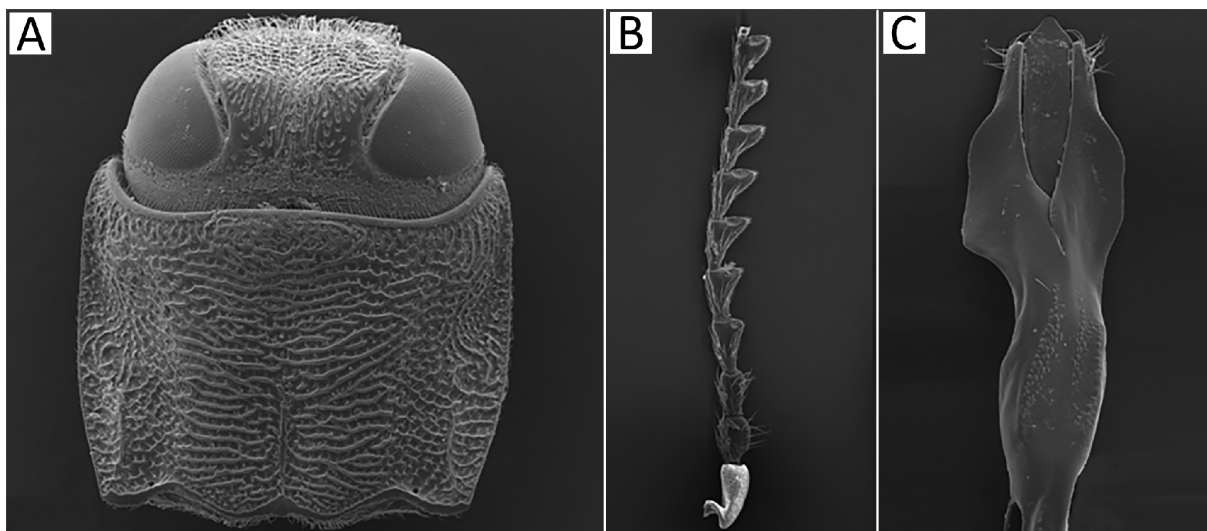


Fig. 7. *Agrilus (Q.) sulcicollis* Lacordaire 1835. A. Vertex and pronotum (173×). B. Antenna (233×). C. Aedeagus (177×).

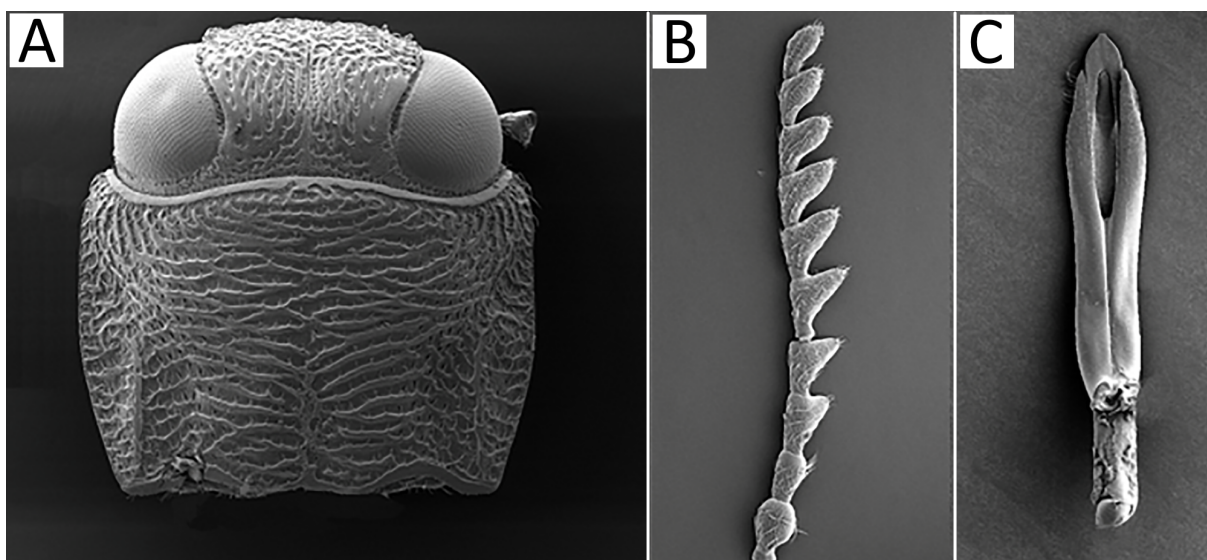


Fig. 8. *Agrilus (Q.) obscuricollis* Kiesenwetter, 1857. A. Vertex and pronotum (151×). B. Antenna (251×). C. Aedeagus (137×).

- 1.2.2 Vertex with sparser punctuation; width of the vertex of the head between the lower part of the eyes narrower (Fig. 9A). Structure of male antenna (Fig. 9B) differs from that of the female (Fig. 9C). Prosternal process rhomboidal (Fig. 9D). Aedeagus (Fig. 9E). Body subcylindrical in male and subparallel in female, narrowed in its apical part, black with bluish tinge in male, black in female. Length 4.3–6.1 mm. . . . . *Agrilus (Q.) laticornis* (Illiger, 1803)
- 2 Elytra with visible white pubescence (Fig. 3A, B).
- 2.1 Prosternal process almost subparallel narrowed in apical part (Fig. 11C).
- 2.1.1 White pubescence of elytra situated in around middle (shorter hairs) and in apical parts (longer hairs). Exact disposition, dimensions and density of this pubescence vary in different specimens.
- 2.1.2 Width of the vertex of the head between the lower part of the eyes wider; microsculpture of vertex and pronotum denser; lateral pronotal sides almost subparallel, narrowed in posterior third (Fig. 10A). Structure of male antenna (Fig. 10B) differs from that of the female (Fig. 10C) and also from the following species; prosternal process with protruding sides and denser pubescence (Fig. 10D); anal

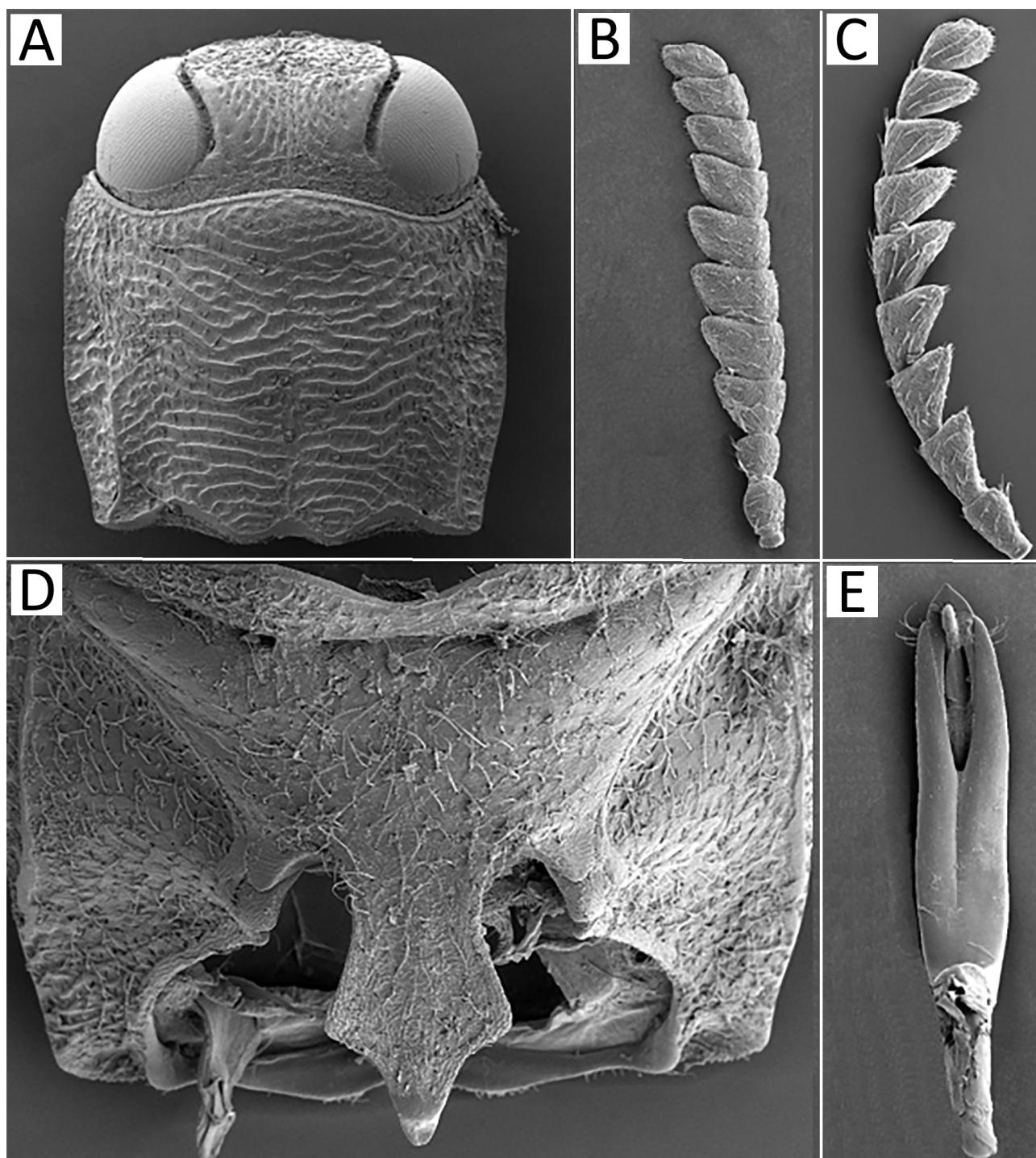


Fig. 9. *Agrilus (Q.) laticornis* (Illiger, 1803). A. Vertex and pronotum (142×). B. Antenna male (210×). C. Antenna female (304×). D. Prosternal process (174×). E. Aedeagus (148×).

sternite longitudinally depressed (Fig. 10E). Aedeagus (Fig. 10F). Body subparallel narrowed in its apical part, black or dark green. Length

4.9–7.0 mm. . . . . *Agrilus (Q.) graminis graminis* Kiesenwetter, 1857

- 2.1.3 Width of vertex of the head between the lower part of the eyes narrower; microsculpture of vertex and pronotum sparser; lateral sides of the pronotum arcuate (Fig. 11A). Antenna (Fig. 11B). Second



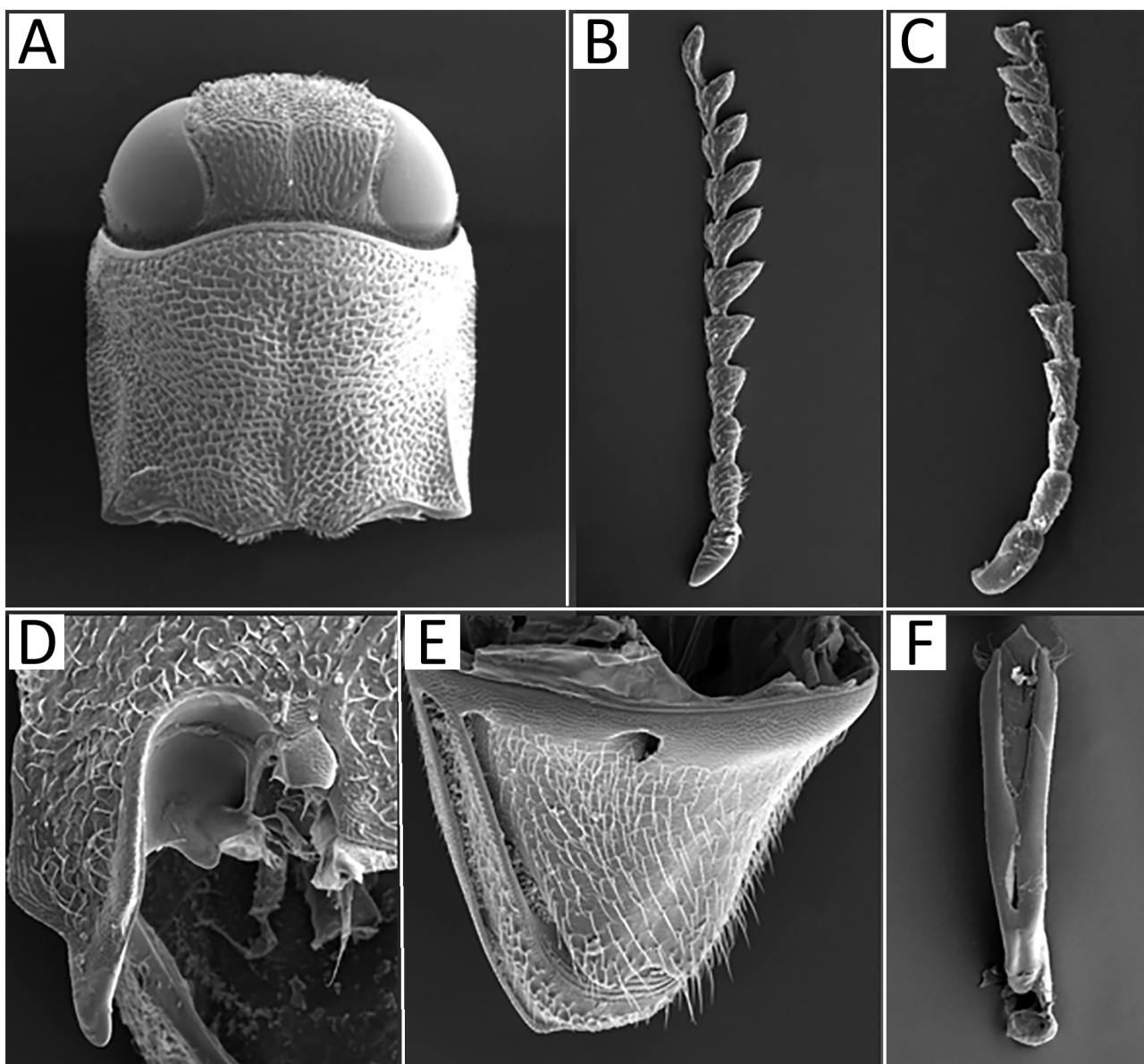


Fig. 10. *Agrilus (Q.) graminis graminis* Kiesenwetter, 1857. A. Vertex and pronotum (115×). B. Antenna male (150×). C. Antenna female (194×). D. Prosternal process (384×). E. Anal sternite (322×). F. Aedeagus (133×).

ventrite of male with two tubercles (Fig. 11D); prosternal process flat with less dens pubescence (Fig. 11C); anal ventrite regularly convex (Fig. 11E). Aedeagus (Fig. 11F). Body subparallel narrowed in its apical part, black or dark green. Length

5.1–7.2 mm. . . . . *Agrilus (Q.) hastulifer* (Ratzeburg, 1837)

2.2 Prosternal process rhomboidal (Fig. 14D).

2.2.1 White pubescence of elytra more or less dispersed concentrated mostly in apical part.

2.2.1.1 Width of the vertex of the head between the lower part of the eyes wider; vertex with denser punctuation; prehumeral pronotal carinae incurved, longer extended almost to the middle of pronotum (Fig. 12A). Antenna (Fig. 12B). White pubescence of elytra concentrated only in apical part. Aedeagus (Fig. 12C). Body widest in posterior third then narrowed apically; dark green, head and pronotum occasionally bronze. Length 5.1–7.2 mm. . . . . *Agrilus (Q.) litura* Kiesenwetter, 1857



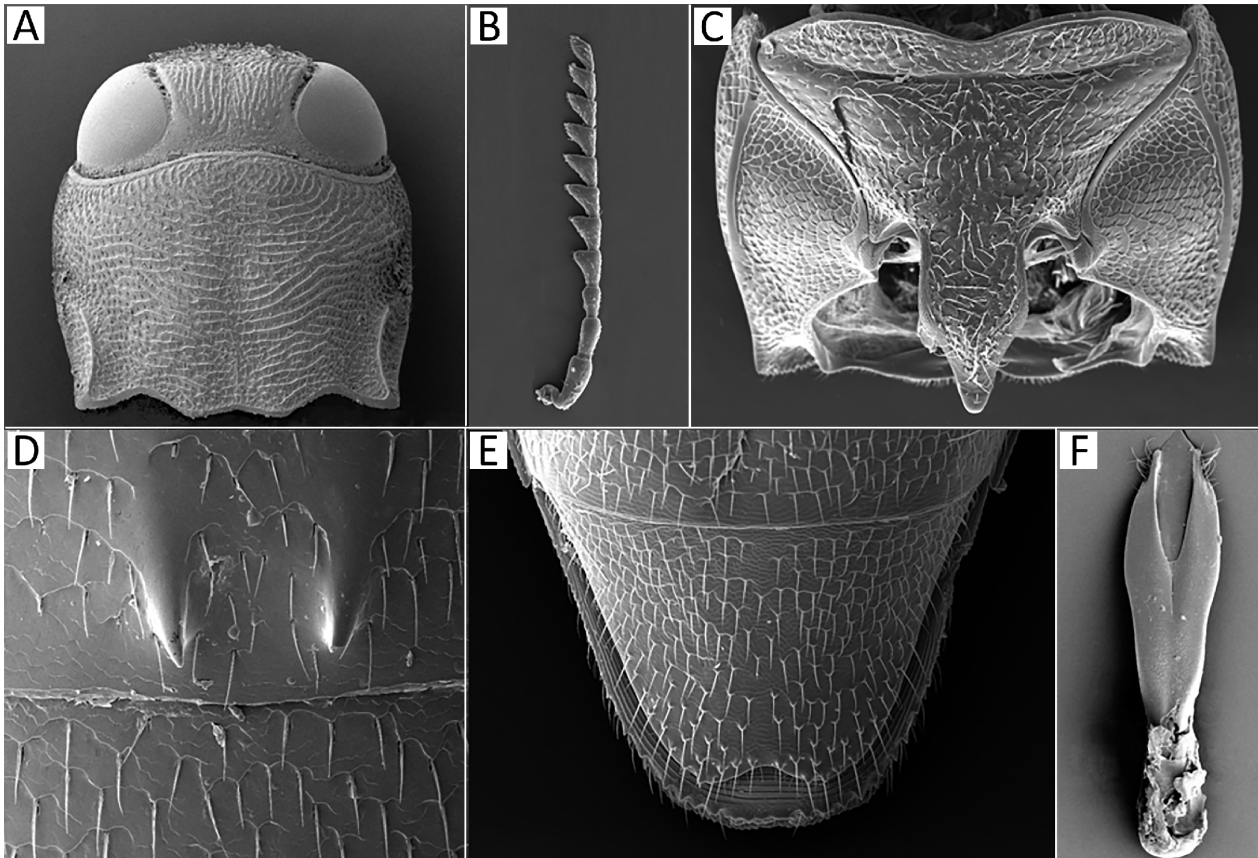


Fig. 11. *Agrilus (Q.) hastulifer* (Ratzeburg, 1837). A. Vertex and pronotum (115×). B. Antenna male (150×). C. Prosternal process (255×). D. Tubercles male (634×). E. Anal sternite (375×). F. Aedeagus (155×).

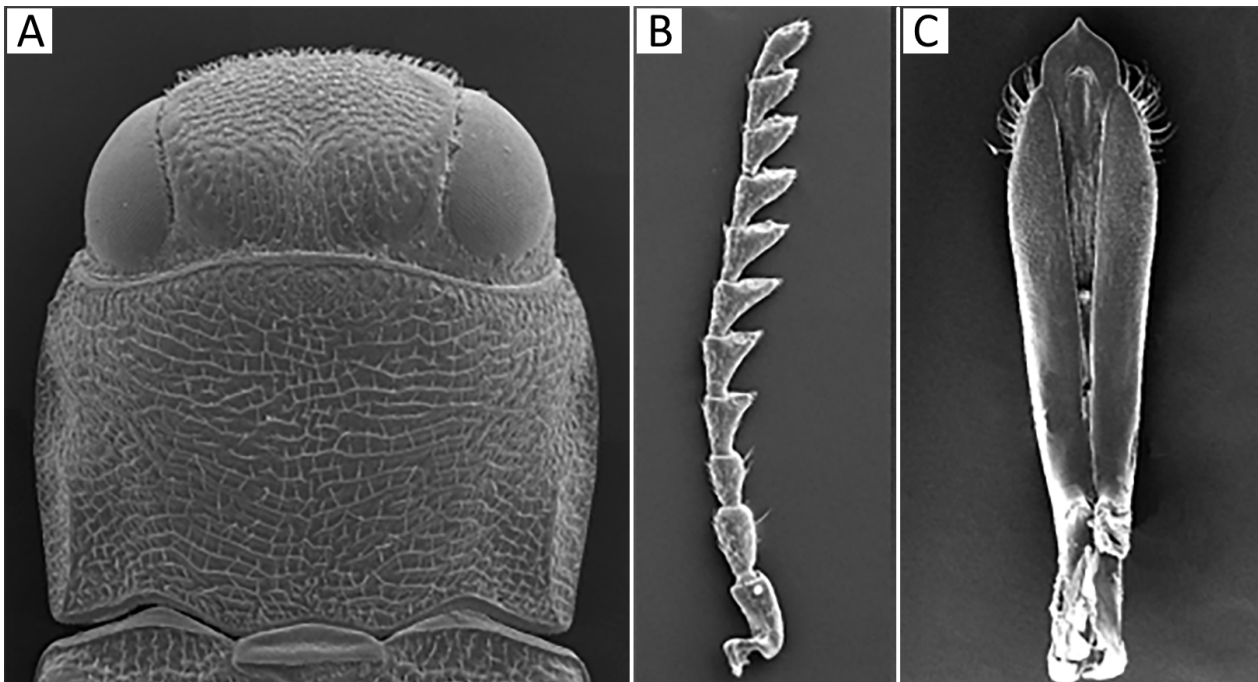


Fig. 12. *Agrilus (Q.) litura* Kiesenwetter, 1857. A. Vertex and pronotum (115×). B. Antenna male (200×). C. Aedeagus (140×).

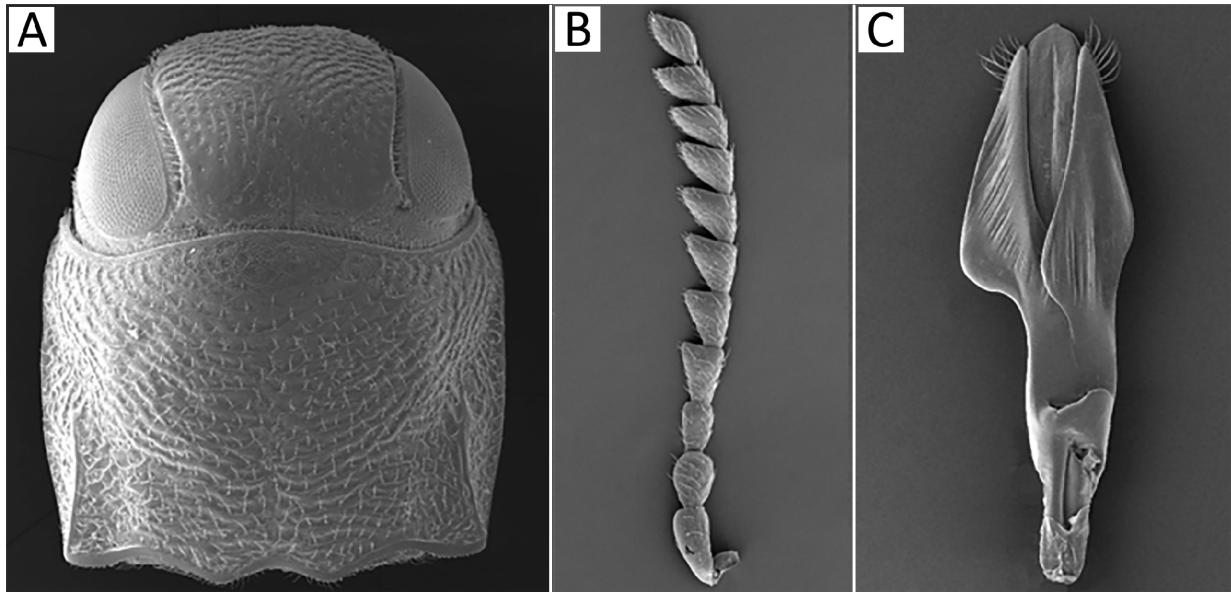


Fig. 13. *Agrilus (Q.) olivicolor* Kiesenwetter, 1857. A. Vertex and pronotum (160×). B. Antenna (238×). C. Aedeagus (153×).

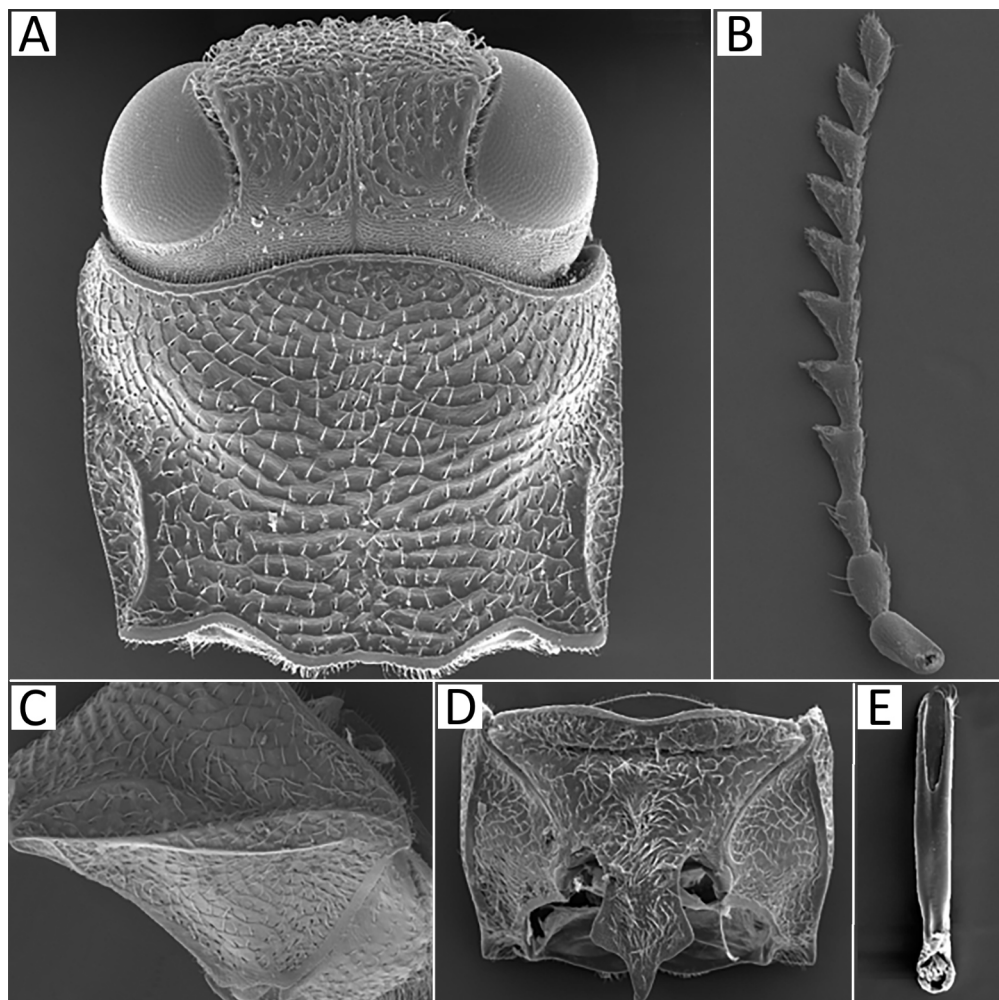


Fig. 14. *Agrilus (Q.) derasofasciatus* Lacordaire, 1835. A. Vertex and pronotum. B. Antenna. C. Marginal and submarginal carinae. D. Prosternal process. E. Aedeagus.



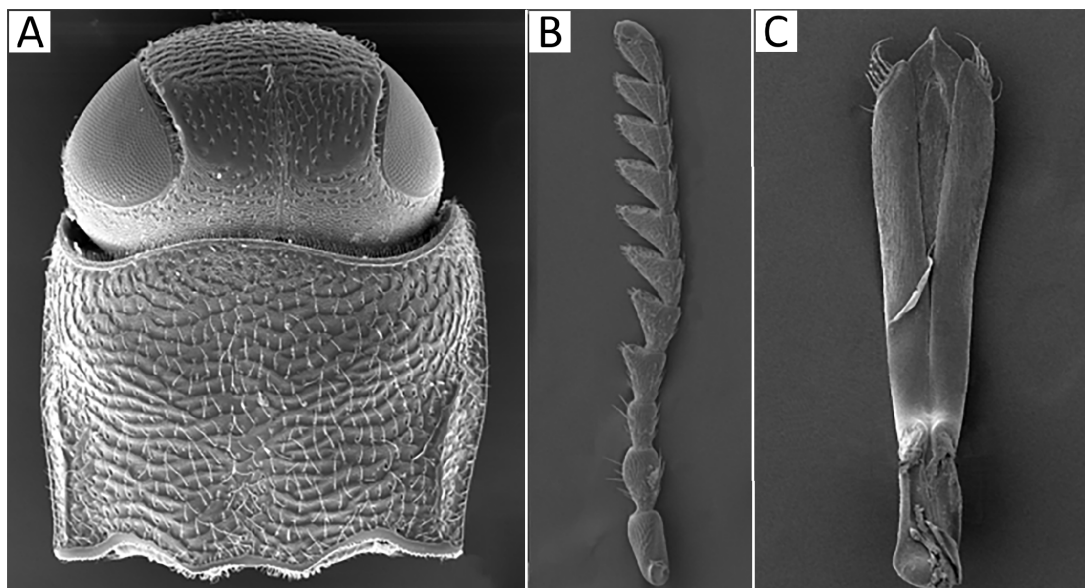


Fig. 15. *Agrilus* (*Q.*) *relegatus* Curletti, 1990. A. Vertex and pronotum (135×). B. Antenna (273×). C. Aedeagus (208×).

- 2.2.1.2 Width of the vertex of the head between the lower part of the eyes slightly narrower; vertex with sparser punctuation; prehumeral pronotal carinae very slightly incurved, shorter (Fig. 13A). Antenna (Fig. 13B). White pubescence of elytra dispersed over the entire surface, concentrated mostly in apical part, rarely concentrated in middle portion also. Aedeagus strongly asymmetrical (Fig. 13C). Body subparallel, narrowed in its apical part, black or dark green. Length 4.7–6.5 mm. . . . . *Agrilus* (*Q.*) *olivicolor* Kiesenwetter, 1857
- 2.2.2 White pubescence of elytra situated around middle and in apical portions.
- 2.2.2.1 Bigger, body length 4.9–6.0 mm. Vertex with denser punctuation; pronotum widest in anterior third then slightly incurved to middle portion which is as wide as anterior third; narrowed in posterior third; prehumeral pronotal carinae incurved (Fig. 14A). Antenna (Fig. 14B). Pubescence of middle part of elytra wider, covers also lower part of anterior third. Aedeagus (Fig. 14E). Body subparallel, narrowed in its apical part. Black or dark green species. Length 4.9–6.7 mm. . . . . *Agrilus* (*Q.*) *derasofasciatus* Lacordaire, 1835
- 2.2.2.2 Smaller, body length 4.3–5.3 mm. Vertex with sparse punctuation; pronotum widest in middle part; prehumeral pronotal carinae almost straight (Fig. 15A). Antenna (Fig. 15B). Pubescence of middle portion of elytra narrower. Aedeagus (Fig. 15C). Body subparallel narrowed in its apical part, black. . . . . *Agrilus* (*Q.*) *relegatus* Curletti, 1990

Balkan Peninsula and Bulgaria as a part of this region has a rich and diverse Buprestidae fauna. To clarify the species composition of jewel beetles, it is necessary to refine taxonomic studies. This article is a step in that direction.

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### Conflicts of interest

No potential conflict of interest has been reported by the authors, reviewers, or subject editor.

### Author' contributions

(using [CrediT](#) )

Vladimir Sakalian: investigation, methodology, project administration, writing—original draft; Toshko Ljubomirov: investigation, methodology, writing—original draft; Georgi Georgiev: investigation, methodology, writing—original draft.

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