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Fauna of Sakar Mts, Part 1
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Blister beetles (Coleoptera: Meloidae) in Sakar Mountains, Bulgaria

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Abstract. Eighteen species of the family Meloidae (Coleoptera) are reported from the Bulgarian part of Sakar Mountains. In the studied region of southeastern Bulgaria, the species *Mylabris quadripunctata* (Linnaeus, 1767) has an unusual elytral pattern, resembling that of *M. variabilis* (Pallas, 1781) with which it occurs sympatrically. The observed similarity in elytral black pattern of *M. quadripunctata* and *M. variabilis* may represent an example of classical Müllerian mimicry. The presence of the species *Apalus bipunctatus* Germar, 1817 is confirmed for Bulgaria. The number of known species of the family Meloidae in Bulgaria increases to 65.

Key words: Meloidae, distribution, Bulgaria, Sakar Mountains

Introduction

Sakar is a small mountain in the South-East part of the Balkan Peninsula (Bulgaria and Türkiye), with predomination of hilly and low mountainous terrains. The area of the mountain is 1115 square kilometres of which the main part belongs to the territory of Bulgaria (Tzankov *et al.* 2017). The vegetation is represented mainly by xerothermic and mesoxerothermic oak and oak-hornbeam forests, dry grasslands and scrublands, as well as agricultural fields and pastures in the lower parts of the mountain and around the populated areas (Bondev 1991, Abadjiev & Beshkov 2007, Vateva *et al.* 2013, Lacheva 2015). The presence of suitable habitats in the Sakar Mts suggests rich species composition of Meloidae family. At the same time, no special studies of blister beetles have been conducted in this region, and in the available literature concerning the distribution of the Bulgarian fauna of Meloidae (e.g. Kantardjeva 1929, Angelov 1986, Siering & Beier 2019), we did not find any reports from the territory of this mountain. Meloid species *Mylabris quadripunctata* (Linnaeus, 1767), *Mylabris variabilis* (Pallas, 1781) and *Oenas crassicornis* (Illiger, 1800) have been recorded from Svilengrad respectively by Kaszab (1959), Pan & Bologna (2014) and Angelov (1986). The affiliation of these records to the territory of the mountain, however, is questionable.

In the present study we report 18 species of the family Meloidae, collected in the Bulgarian part of Sakar Mountains. All of these species are new records for the territory of the mountain.

Materials and Methods

The material for the present study was collected by the authors in the period 2020 – 2024 from different localities of the Sakar Mountains. Most of the beetle specimens were

collected by hand from herbaceous vegetation. The pictures of the habitats and those of the beetles in nature were taken with digital cameras Canon PowerShot SX420 IS or Canon EOS 250D (Figs 1, 2). The pictures of prepared specimens were taken with Olympus SZ61 stereomicroscope, equipped with Canon EOS 2000D digital camera (Plates I – III). The collected materials are preserved in the Zoological Collection of Sofia University "St. Kliment Ohridski", Faculty of Biology (BFUS).

Results and Discussion

List of species

Family Meloidae Gyllenhal, 1810

Subfamily Meloinae Gyllenhal, 1810

Tribe Cerocomini Leach, 1815

Genus *Cerocoma* Geoffroy, 1762

***Cerocoma dahli* Kraatz, 1863** (Plate I, 1, 2; Fig. 1 A)

Material examined: Bulgaria, Sakar Mts, N of Yerusalimovo Vill., 41°54.303'N 26°06.074'E, 174 m a.s.l., dirt road, xerothermic grasslands (Fig. 1 B), 26.v.2023, 2 ♂♂ (BFUS-MEL000001, BFUS-MEL000002), 1 ♀ (BFUS-MEL000003), on inflorescences of *Matricaria* sp., D. Gradinarov leg.; the same data, 11.v.2024, 1 ♀ (BFUS-MEL000004).

***Cerocoma schreberi* Fabricius, 1781** (Plate I, 3)

Material examined: Bulgaria, Sakar Mts, SE Ustrem Vill., the road to Radovets Vill., 41°58.563'N 26°29.026'E, 203 m a.s.l., meadows, edge of oak forest, 23.vii.2021, 1 ♂ (BFUS-MEL000005), Y. Petrova leg.

Tribe Epicautini Parker & Böving, 1924

Genus *Epicauta* Dejean, 1834

***Epicauta erythrocephala* (Pallas, 1771)** (Plate I, 4; Fig. 1 C)

Material examined: Bulgaria, Sakar Mts, SE Ustrem Vill., the road to Radovets Vill., 41°58.341'N 26°28.983'E, 218 m a.s.l., roadside verges (Fig. 1 D), 16.vii.2020, 8 ♂♂ (BFUS-MEL000006, BFUS-MEL000007, BFUS-MEL000008, BFUS-MEL000009, BFUS-MEL000010, BFUS-MEL000011, BFUS-MEL000012, BFUS-MEL000013), 6 ♀♀ (BFUS-MEL000014, BFUS-MEL000015, BFUS-MEL000016, BFUS-MEL000017, BFUS-MEL000018, BFUS-MEL000019), on Fabaceae [*Melilotus* sp.], D. Gradinarov & Y. Petrova leg.

Tribe Lyttini Streubel, 1846

Genus *Alosimus* Mulsant, 1857

***Alosimus decolor* (Abeille de Perrin, 1880)** (Plate I, 5)

Material examined: Bulgaria, Sakar Mts, NE of Ustremski Manastir Monastery, 42°02.320'N 26°26.410'E, 160 m a.s.l., roadside verges, 28.v.2023, 1 ♂ (BFUS-MEL000117), on flowers of *Papaver* sp., D. Gradinarov & Y. Petrova leg.

Genus *Lydus* Dejean, 1821

***Lydus trimaculatus trimaculatus* (Fabricius, 1775)** (Plate I, 6)

Material examined: Bulgaria, Sakar Mts, SE Ustrem Vill., the road to Radovets Vill., 41°58.563'N 26°29.026'E, 203 m a.s.l., meadows, edge of oak forest, 23.vii.2021, 3 ♂♂ (BFUS-MEL000020, BFUS-MEL000021, BFUS-MEL000022), 4 ♀♀ (BFUS-MEL000023, BFUS-MEL000024, BFUS-MEL000025, BFUS-MEL000026), copulating pair (BFUS-MEL000027, BFUS-MEL000028), on inflorescences of *Cephalaria* sp., D. Gradinarov leg.

Genus *Lytta* Fabricius, 1775

***Lytta vesicatoria vesicatoria* (Linnaeus, 1758)** (Plate I, 7)

Material examined: Bulgaria, Sakar Mts, SE of Glavan Vill., 42°01.150'N 26°09.864'E, 650 m a.s.l., forest glades, oak forest, 24.v.2023, 1 ♂ (BFUS-MEL000029), Y. Petrova leg.

Genus *Oenas* Latreille, 1802

***Oenas crassicornis* (Illiger, 1800)** (Plate I, 8)

Material examined: Bulgaria, Sakar Mts, SE Ustrem Vill., the road to Radovets Vill., 41°58.563'N 26°29.026'E, 203 m a.s.l., meadows, edge of oak forest, 23.vii.2021, 1 ♂ (BFUS-MEL000030), Y. Petrova leg.

Genus *Teratolytta* Semenov, 1894

***Teratolytta dives* (Brullé, 1832)** (Plate I, 9)

Material examined: Bulgaria, Sakar Mts, SE of Ustrem Vill., the road to Radovets Vill., 41°58.360'N 26°28.960'E, 218 m a.s.l., dirt road, edge of mixed forest, 05.v.2021, 1 ♀ (BFUS-MEL000031), D. Gradinarov & Y. Petrova leg.

Tribe Mylabrini Rafinesque, 1815

Genus *Mylabris* Fabricius, 1775

***Mylabris fabricii* Sumakov, 1924** (Plate II, 10; Fig. 2 A)

Material examined: Bulgaria, Sakar Mts, NE of Balgarska Polyana Vill., 42°02.420'N 26°12.536'E, 431 m a.s.l., dry grasslands, 21.vii.2021, 1 ♀ (BFUS-MEL000032), D. Gradinarov leg.; Bulgaria, Sakar Mts, SE of Knyazhevo Vill., 42°06.017'N 26°30.362'E, 102 m a.s.l., dirt road, riverine vegetation and xerothermic grasslands, 28.vi.2022, 2 ♂♂ (BFUS-MEL000033, BFUS-MEL000034), 3 ♀♀ (BFUS-MEL000035, BFUS-MEL000036, BFUS-MEL000037), Y. Petrova & D. Gradinarov leg.; the same data, 02.vii.2022, 3 ♂♂ (BFUS-MEL000038, BFUS-MEL000039, BFUS-MEL000040); the same data, 22.vi.2023, 6 ♂♂ (BFUS-MEL000041, BFUS-MEL000042, BFUS-MEL000043, BFUS-MEL000044, BFUS-MEL000045, BFUS-MEL000046), 1 ♀ (BFUS-MEL000047), D. Gradinarov leg.; Bulgaria, Sakar Mts, SE of Glavan Vill., 42°01.143'N 26°09.781'E, 646 m a.s.l., dry roadside meadows, 26.vi.2023, 4 ♂♂ (BFUS-MEL000048, BFUS-MEL000049, BFUS-MEL000050, BFUS-MEL000051), 4 ♀♀ (BFUS-MEL000052, BFUS-MEL000053, BFUS-MEL000054, BFUS-MEL000055), D. Gradinarov leg.

***Mylabris quadripunctata* (Linnaeus, 1767)** (Plate II, 11, 12; Fig. 2 C)

Material examined: Bulgaria, Sakar Mts, W of Ustrem Vill., 42°01.434'N 26°26.828'E, 107 m a.s.l., meadows (Fig. 2 D), 22.vii.2021, 1 ♂ (BFUS-MEL000056), 1 ♀ (BFUS-MEL000057), on *Cichorium intybus* L., D. Gradinarov leg.; the same data, 23.vi.2023, 17 ♂♂ (BFUS-MEL000058, BFUS-MEL000059, BFUS-MEL000060, BFUS-MEL000061, BFUS-MEL000062, BFUS-MEL000063, BFUS-MEL000064, BFUS-MEL000065, BFUS-MEL000066, BFUS-MEL000067, BFUS-MEL000068, BFUS-MEL000069, BFUS-MEL000070, BFUS-MEL000071, BFUS-MEL000072, BFUS-MEL000073, BFUS-MEL000074), 4 ♀♀ (BFUS-MEL000075, BFUS-MEL000076, BFUS-MEL000077, BFUS-MEL000078); Bulgaria, Sakar Mts, N of Sakartsi Vill., 42°03.696'N 26°17.567'E, 365 m a.l.s., dirt road, meadows, 23.vii.2023, 3 ♂♂ (BFUS-MEL000079, BFUS-MEL000080, BFUS-MEL000081), 4 ♀♀ (BFUS-MEL000082, BFUS-MEL000083, BFUS-MEL000084, BFUS-MEL000085), on *Cichorium intybus* L. and Apiaceae, Y. Petrova leg.

Notes: All examined specimens from both localities (near Ustrem and near Sakartsi villages) have an unusual elytral black pattern in which the spots in the basal third of the elytra and the middle spots are almost or completely fused into two fasciae (Plate II, 11, 12). This pattern resembles that of *M. variabilis*, with which such individuals can be accidentally confused. In our study, the two species occur sympatrically (see below for the distributional data of *M. variabilis*), and in such mixed populations, the most reliable distinguishing feature is the morphology of the male genitalia (Plate II, 11a, 11b, 13a, 13b; Pan & Bologna 2014). The observed similarity in elytral black pattern of *M. quadripunctata* and *M. variabilis* may represent an example of classical Müllerian mimicry, where two different defended species share the same warning signal (Speed 1999).

***Mylabris variabilis* (Pallas, 1781)** (Plate II, 13, 14)

Material examined: Bulgaria, Sakar Mts, W of Ustrem Vill., 42°01.434'N 26°26.828'E, 107 m a.s.l., meadows (Fig. 2 D), 22.vii.2021, 1 ♀ (BFUS-MEL000086), on *Cichorium intybus*, D. Gradinarov leg.; the same data, 23.vi.2023, 4 ♂♂ (BFUS-MEL000087, BFUS-MEL000088, BFUS-MEL000089, BFUS-MEL000090), 1 ♀ (BFUS-MEL000091); Bulgaria, Sakar Mts, SE Ustrem Vill., the road to Radovets Vill., 41°58.563'N 26°29.026'E, 203 m a.s.l., meadows, edge of oak forest, 23.vii.2021, 2 ♂♂ (BFUS-MEL000092, BFUS-MEL000093), 1 ♀ (BFUS-MEL000094), D. Gradinarov leg.; Bulgaria, Sakar Mts, E Oreshnik Vill., 42°04.100'N 26°23.179'E, 278 m a.s.l., roadside verges, 24.vii.2021, 1 ♂ (BFUS-MEL000095), D. Gradinarov & Y. Petrova leg.; Bulgaria, Sakar Mts, E of Oreshnik Vill., 42°04.155'N 26°23.043'E, 278 m a.s.l., dry meadows, ruderal vegetation, 21.vi.2023, 1 ♂ (BFUS-MEL000096), 1 ♀ (BFUS-MEL000097), D. Gradinarov & Y. Petrova leg.; Bulgaria, Sakar Mts, W of Branitsa Vill., 42°00.466'N 26°04.582'E, 386 m a.s.l., 26.vi.2023, 1 ♂ (BFUS-MEL000098), on *Cichorium intybus* L., D. Gradinarov & Y. Petrova leg.; Bulgaria, Sakar Mts, N of Sakartsi Vill., 42°03.696'N 26°17.567'E, 365 m a.s.l., dirt road, meadows, 23.vii.2023, 1 ♂ (BFUS-MEL000099), 1 ♀ (BFUS-MEL000100), on *Cichorium intybus* L. and Apiaceae, Y. Petrova leg.

Tribe Meloini Gyllenhal, 1810

Genus *Meloe* Linnaeus, 1758

***Meloe scabriusculus* (Brandt & Erichson, 1832)** (Plate II, 15; Fig. 2 E)

Material examined: Bulgaria, Sakar Mts, SE of Kolarovo Vill., 41°57.805'N 26°02.298'E, 198 m a.s.l, xerothermic grasslands, edge of oak forest (Fig. 2 F), 11.v.2024, 1 ♀ (BFUS-MEL000101), on grasses, Y. Petrova & D. Gradinarov leg.

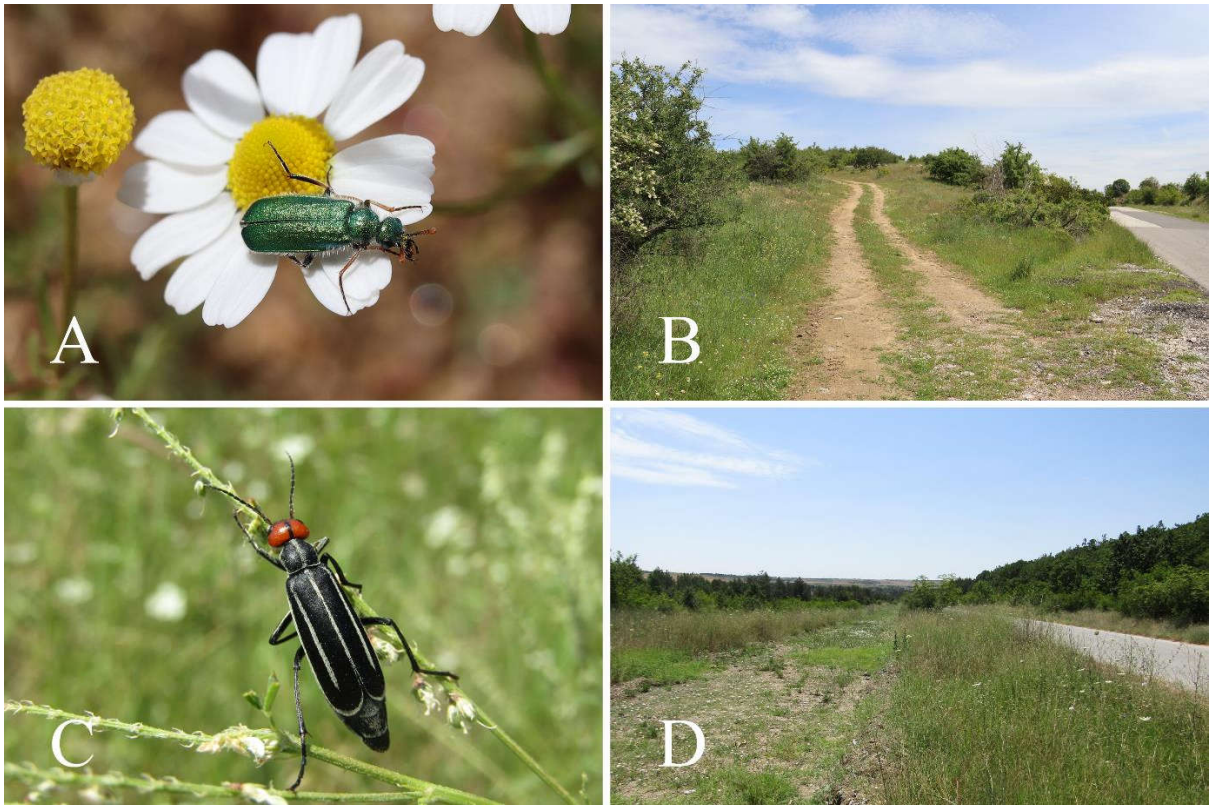

Fig. 1. Species of Meloidae and their habitats in Sakar Mts. Tribes Cerocomini and Epicautini. A – *Cerocoma dahli* on *Matricaria* sp., N of Yerusalimovo Village, 11.v.2024; B – habitat of *C. dahli* N of Yerusalimovo Village, 11.v.2024; C – *Epicauta erythrocephala* on *Melilotus* sp., SE of Ustrem Village, 16.vii.2020; D – habitat of *E. erythrocephala* SE of Ustrem Village, 16.vii.2020.

Subfamily Nemognathinae Laporte, 1840

Tribe Nemognathini Laporte, 1840

Genus *Apalus* Fabricius, 1775

***Apalus bipunctatus* Germar, 1817** (Plate III, 16)

Material examined: Bulgaria, Sakar Mts, SE Ustrem Vill., the road to Radovets Vill., 41°58.352'N 26°28.818'E, 233 m a.s.l, dirt road, edge of oak forest, 01.v.2021, 1 ♂ (BFUS-MEL000102), D. Gradinarov & Y. Petrova leg.

Notes: *Apalus bipunctatus* has been reported from Bulgaria by Nedelkov (1905) with locality Stara Zagora, but this record was not cited in the species list of Bulgarian Meloidae

by Kantardjeva (1929). The species is also omitted for Bulgaria in both editions of the Catalogue of Palaearctic Coleoptera (Bologna 2008, 2020). The specimen of Nedyalkov from Stara Zagora (Nedelkov 1905) was not found in the Meloidae collection in the National Museum of Natural History (Sofia, Bulgaria), but another male specimen of *A. bipunctatus* from Bulgaria is preserved in the Zoological Collection of Sofia University, labelled "Bulgaria: Ograzhden Mts, 1 km NW Strumeshnitsa Vill., 41°24.065'N 23°02.363'E, 270 m a.s.l, meadows next to cork oak plantations, 30.iv.2018, Y. Petrova leg. (BFUS-MEL000115). Confirmed presence of the species in Bulgaria.

Genus *Euzonitis* Semenov, 1893

***Euzonitis fulvipennis* (Fabricius, 1792)** (Plate III, 17)

Material examined: Bulgaria, Sakar Mts, SE of Glavan Vill., 42°01.143'N 26°09.781'E, 646 m a.s.l., dry roadside meadows, 26.vi.2023, 1 ♂ (BFUS-MEL000103), D. Gradinarov leg.

***Euzonitis quadrimaculata* (Pallas, 1782)** (Plate III, 18 – 20)

Material examined: Bulgaria, Sakar Mts, SE of Knyazhevo Vill., 42°06.017'N 26°30.362'E, 102 m a.s.l., dirt road, riverine vegetation and xerothermic grasslands, 22.vi.2023, 1 ♀ (BFUS-MEL000104), D. Gradinarov leg.; Bulgaria, Sakar Mts, W of Ustrem Vill., 42°01.434'N 26°26.828'E, 107 m a.s.l., meadows, 23.vi.2023, 1 ♀ (BFUS-MEL000105), D. Gradinarov leg.; Bulgaria, Sakar Mts, SE of Glavan Vill., 42°01.143'N 26°09.781'E, 646 m a.s.l., dry roadside meadows, 26.vi.2023, 1 ♂ (BFUS-MEL000106), on Dipsacaceae, D. Gradinarov leg.

Genus *Zonitis* Fabricius, 1775

***Zonitis flava* Fabricius, 1775** (Plate III, 21)

Material examined: Bulgaria, Sakar Mts, SE Ustrem Vill., the road to Radovets Vill., 41°58.563'N 26°29.026'E, 203 m a.s.l., meadows, edge of oak forest, 23.vii.2021, 2 ♂♂ (BFUS-MEL000107, BFUS-MEL000108), 1 ♀ (BFUS-MEL000109), Y. Petrova leg.; Bulgaria, Sakar Mts, W of Ustrem Vill., 42°01.434'N 26°26.828'E, 107 m a.s.l., meadows, 22.vii.2021, 1 ♂ (BFUS-MEL000110), on inflorescences of Apiaceae, D. Gradinarov leg.

***Zonitis immaculata* (A. G. Olivier, 1789)** (Plate III, 22)

Material examined: Bulgaria, Sakar Mts, SE of Knyazhevo Vill., 42°06.017'N 26°30.362'E, 102 m a.s.l., dirt road, riverine vegetation and xerothermic grasslands, 28.vi.2022, 1 ♀ (BFUS-MEL000111), Y. Petrova leg.; Bulgaria, Sakar Mts, W of Ustrem Vill., 42°01.419'N 26°26.978'E, 101 m a.s.l., riverine meadows, next to agricultural fields, 25.vi.2023, 1 ♀ (BFUS-MEL000112), on *Onopordum* sp., D. Gradinarov leg.

Tribe Stenoderini Selander, 1991

Genus *Stenodera* Eschscholtz, 1818

***Stenodera caucasica* (Pallas, 1781)** (Plate III, 23)

Material examined: Bulgaria, Sakar Mts, W of Ustrem Vill., 42°01.374'N 26°26.975'E, 104 m a.s.l., riverine vegetation, agricultural field boundaries, 03.vii.2022, 1 ♀ (BFUS-MEL000113), D. Gradinarov leg.; Bulgaria, Sakar Mts, N of Yerusalimovo Vill., 41°54.303'N 26°06.074'E, 174 m a.s.l., dirt road, xerothermic grasslands (Fig. 1 B), 26.v.2023, 1 ♀ (BFUS-MEL000114), D. Gradinarov leg.

In the revised edition of the Catalogue of Palaearctic Coleoptera (Bologna 2020), 60 species of Meloidae are listed for Bulgaria. However, firstly reported by Nedelkov (1905) and found also in the present study *Apalus bipunctatus*, the reported by Angelov (1986) and Siering & Beier (2019) *Sitaris muralis* (Förster, 1771), as well as *Nemognatha chrysomelina* (Fabricius, 1775) (Siering *et al.* 2017), *Mylabris olivieri* Billberg, 1813 and *Euzonitis adustipennis* (Motschulsky, 1872) (Siering & Beier 2019) are omitted in the Catalogue. With this inclusion the number of known species of the family Meloidae in Bulgaria is 65.

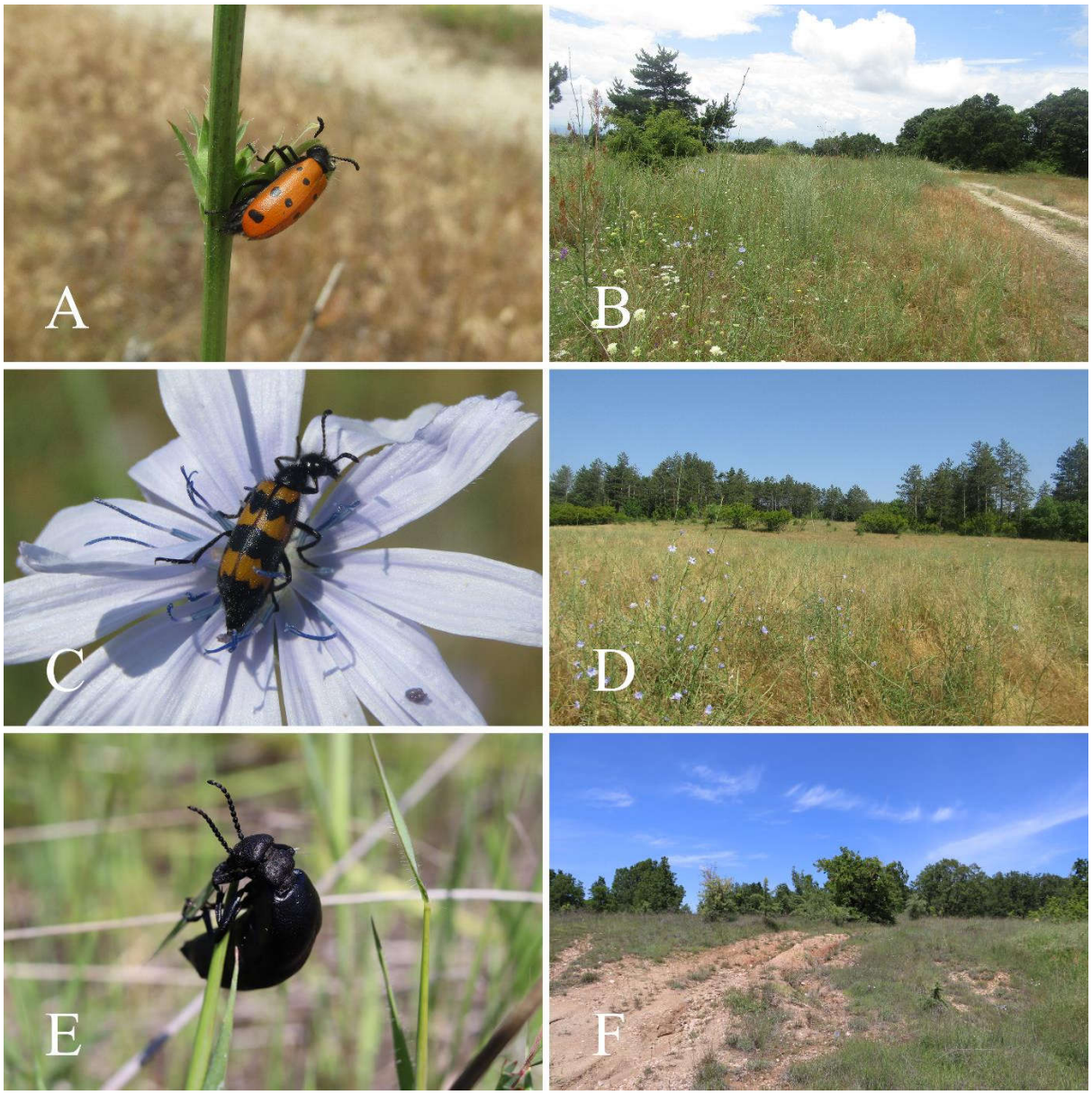

Fig. 2. Species of Meloidae and their habitats in Sakar Mts. Tribes Mylabrini and Meloini. A – *Mylabris fabricii* on *Cichorium inthybus*, SE of Glavan Village, 26.vi.2023; B – habitat of *M. fabricii* SE of Glavan Village, 26.vi.2023; C – *M. quadripunctata* on *C. inthybus*, W of Ustrem Village, 23.vi.2023; D – habitat of *M. quadripunctata* W of Ustrem Village, 23.vi.2023; E – *Meloe scabriusculus* on grasses, SE of Kolarovo Village, 11.v.2024; F – habitat of *M. scabriusculus* SE of Kolarovo Village, 11.v.2024.

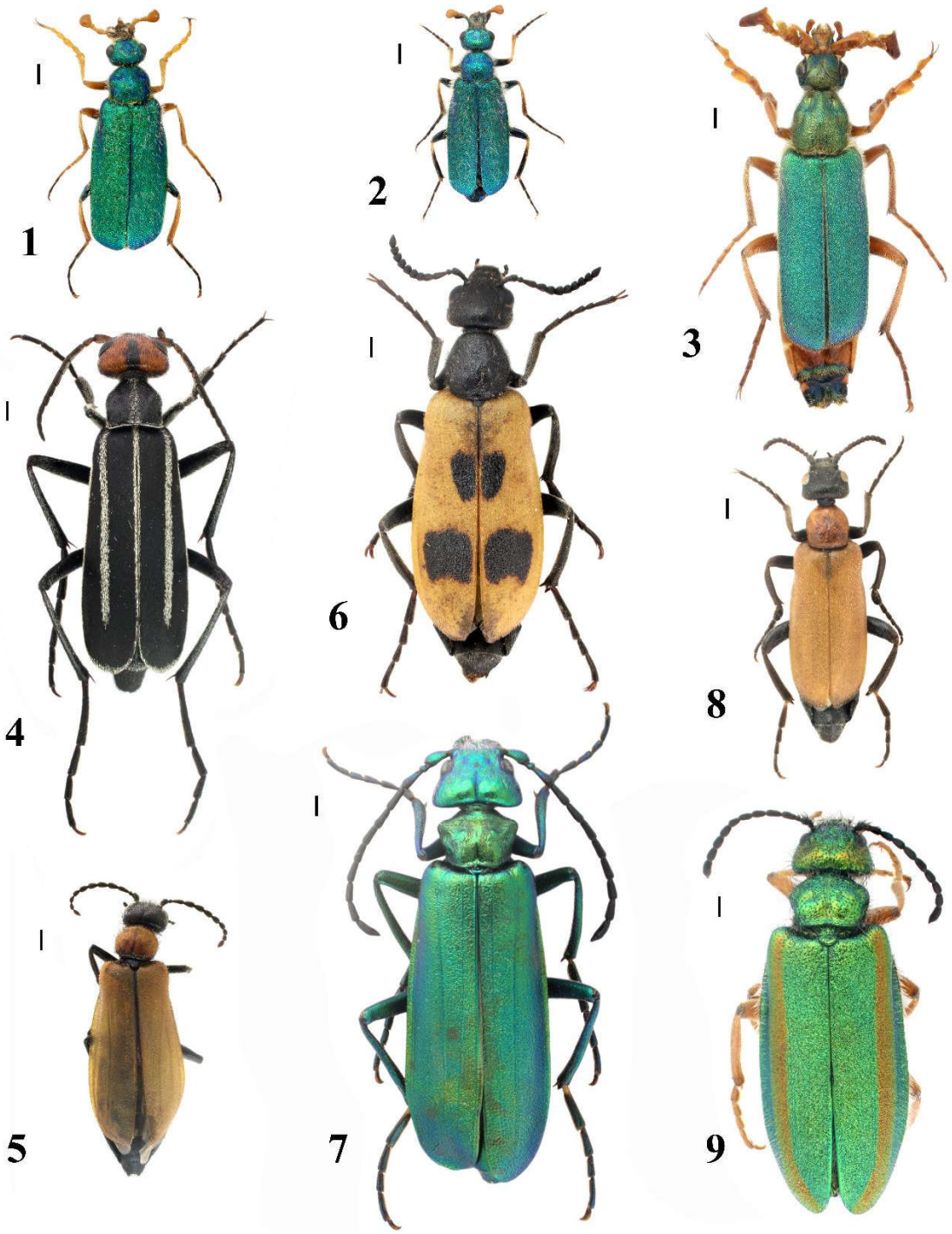

Plate I. Meloidae from Sakar Mts. Tribes Cerocomini, Epicautini and Lyttini. 1 – *Cerocoma dahli*, N of Yerusalimovo Vill., male (BFUS-MEL000001); 2 – *C. dahli*, N of Yerusalimovo Vill., female (BFUS-MEL000004); 3 – *C. schreberi*, SE Ustrem Vill., male (BFUS-MEL000005); 4 – *Epicauta erythrocephala*, SE Ustrem Vill., male (BFUS-MEL000006); 5 – *Alosimus decolor*, NE of Ustremski Manastir Monastery, male (BFUS-MEL000117); 6 – *Lydus trimaculatus trimaculatus*, SE Ustrem Vill., male (BFUS-MEL000020); 7 – *Lytta vesicatoria vesicatoria*, SE of Glavan Vill., male (BFUS-MEL000029); 8 – *Oenas crassicornis*, SE Ustrem Vill., male (BFUS-MEL000030); 9 – *Teratolytta dives*, SE Ustrem Vill., female (BFUS-MEL000031). Scale bars: 1 mm.

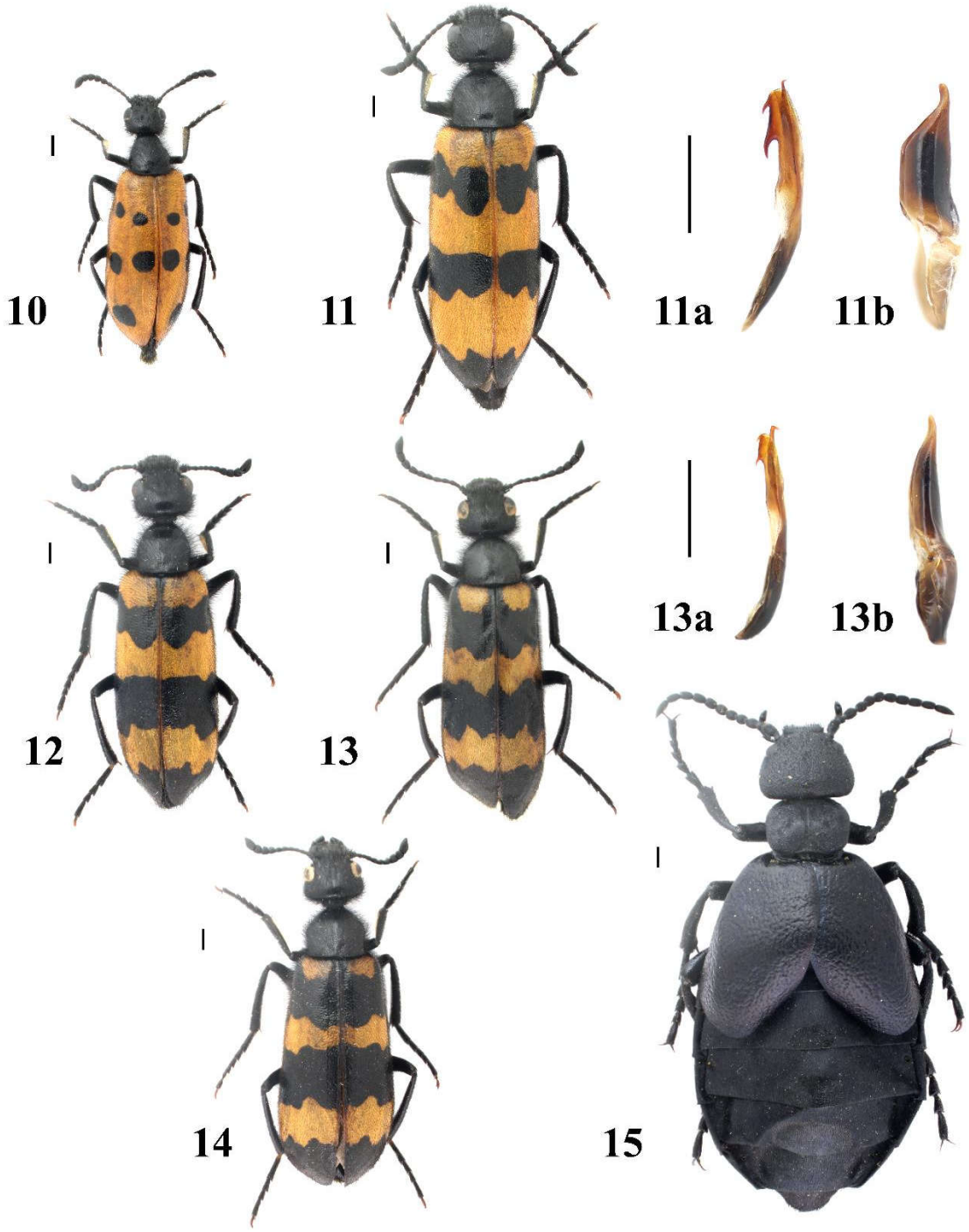

Plate II. Meloidae from Sakar Mts. Tribes Mylabrini and Meloini. 10 – *Mylabris fabricii*, SE of Knyazhevo Vill., male (BFUS-MEL000033); 11 – *M. quadripunctata*, W of Ustrem Vill., male (BFUS-MEL000058); 11a – *M. quadripunctata*, the same specimen, aedeagus; 11b – *M. quadripunctata*, the same specimen, tegmen; 12 – *M. quadripunctata*, W of Ustrem Vill., female (BFUS-MEL000075); 13 – *M. variabilis*, W of Ustrem Vill., male (BFUS-MEL000087); 13a – *M. variabilis*, the same specimen, aedeagus; 13b – *M. variabilis*, the same specimen, tegmen; 14 – *M. variabilis,* E of Oreshnik Vill., female (BFUS-MEL000097); 15 – *Meloe scabriusculus*, SE of Kolarovo Vill., female (BFUS-MEL000101). Scale bars: 1 mm.

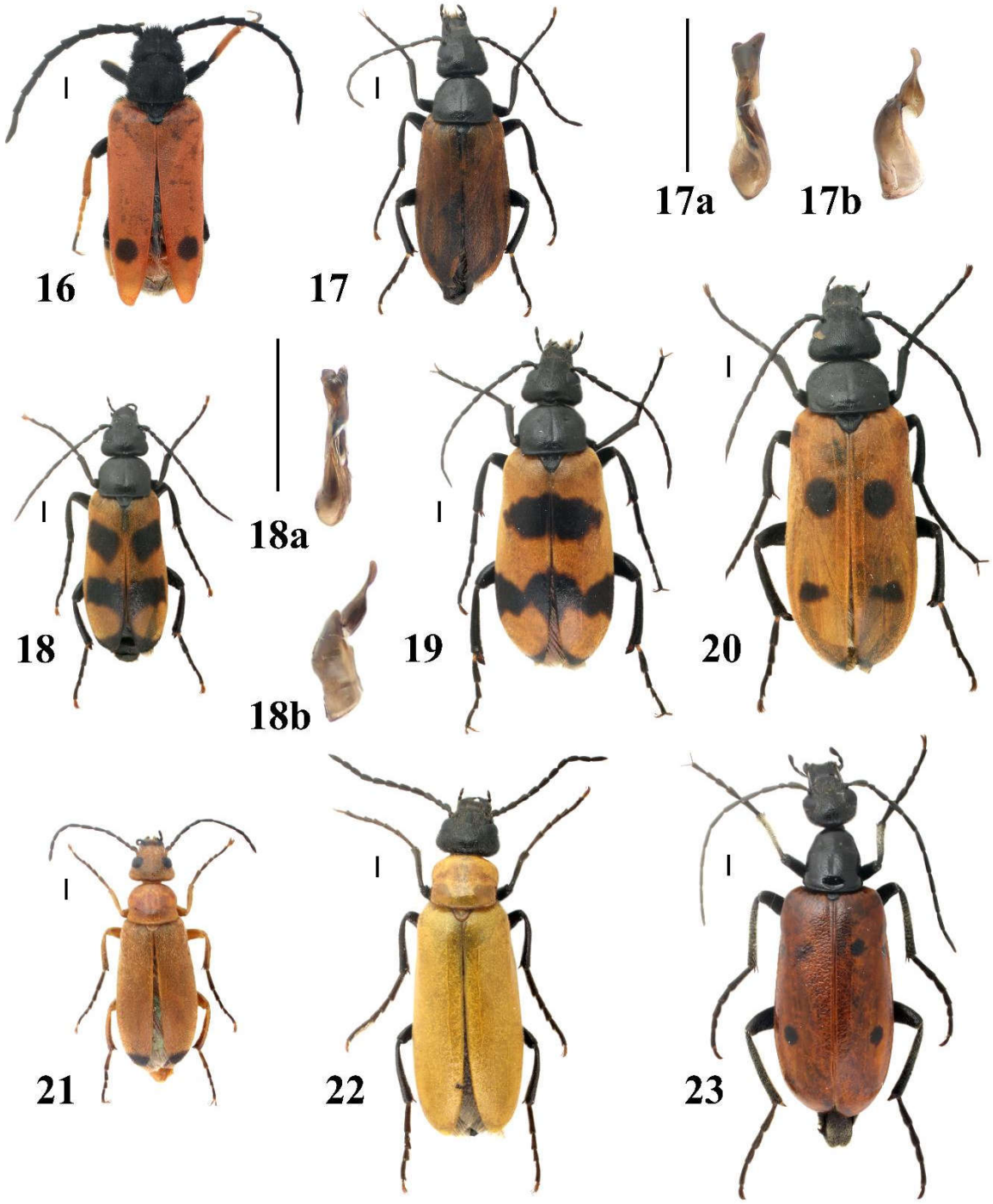

Plate III. Meloidae from Sakar Mts. Tribes Nemognathini and Stenoderini. 16 – *Apalus bipunctatus*, SE Ustrem Vill., male (BFUS-MEL000102); 17 – *Euzonitis fulvipennis*, SE of Glavan Vill., male (BFUS-MEL000103); 17a – *E. fulvipennis*, the same specimen, aedeagus; 17b – *E. fulvipennis*, the same specimen, tegmen; 18 – *E. quadrimaculata*, SE of Glavan Vill., male (BFUS-MEL000106); 18a – *E. quadrimaculata*, the same specimen, aedeagus; 18b – *E. quadrimaculata*, the same specimen, tegmen; 19 – *E. quadrimaculata*, W of Ustrem Vill., female (BFUS-MEL000105); 20 – *E. quadrimaculata*, SE of Knyazhevo Vill., female (BFUS-MEL000104); 21 – *Zonitis flava*, SE Ustrem Vill., male (BFUS-MEL000107); 22 – *Z. immaculata*, SE of Knyazhevo Vill., female (BFUS-MEL000111); 23 – *Stenodera caucasica*, N of Yerusalimovo Vill., female (BFUS-MEL000114). Scale bars: 1 mm.

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