





Research article

A contribution to Bulgarian ground beetle fauna (Coleoptera: Carabidae) with the first record of *Agonum carbonarium* Dejean, 1828 for the country

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Abstract: Bulgarian ground beetles (Coleoptera: Carabidae) have been studied intensively by many native and foreign scientists. The various field observations presented here contain data on the distribution of 94 Bulgarian carabid species from 19 tribes, collected in nine zoogeographical regions and subregions, mostly in the mountains in Southwestern Bulgaria. These records expand the range of seven species to new zoogeographical (sub)regions. The polytypic high mountain bog dwelling species *Agonum carbonarium* Dejean is reported for the first time for the Bulgarian fauna, with the taxonomic status of the Bulgarian (and Balkan) populations remaining unclear. New altitude limits are given for eight species.

Keywords: Bulgaria, distribution, ground beetles, high-mountain *Agonum*, new records, regional studies

Introduction

Bulgaria and the Balkan Peninsula are part of the Mediterranean Basin and represent one of the world's 25 most important biodiversity hotspots hosting diverse fauna and flora with a high degree of endemism (Myers et al., 2000). The country keeps very rich and interesting fauna, flora and mycota, which over the last decades has attracted a great number of scientists from around the globe to travel, explore and benefit the knowledge on Bulgarian biological diversity.

Ground beetles (Coleoptera: Carabidae) in particular have been studied intensively in Bulgaria by both Bulgarian and foreign scientists, especially in the popular holiday destinations on the Black Sea Coast (e.g. Müller, 1929; Luchnik, 1934; Panin, 1941; Karnoschitzky, 1949; Šustek, 1975) or the mountains (e.g. Donabauer, 2020), but also in various locations throughout the country (e.g. Apfelbeck, 1904; Rambousek, 1912; Breuning, 1928; Roubal, 1931, 1932, 1933, 1934; Pawlowski, 1973; Hieke & Wrase, 1988; Wrase, 1991; Jocque et al., 2016).

Here, we present data predominantly obtained by the second author in the period between 2013 and 2021, on several trips to Bulgaria. With this data, we contribute to the knowledge on Bulgarian Carabidae with new records for the country and for several regions, as well as many additional locations for 94 of the previously known 750 carabid species (Teofilova, in prep.). This study raises the number of carabid species from Bulgaria, adding the high mountain bog dwelling species *Agonum carbonarium* Dejean, 1828.

Material and methods

The material presented here was predominantly collected on field trips to Bulgaria in 2013, 2015, 2019 and 2021. The collection locations cover different regions in Bulgaria, mostly the mountainous regions in the south-western part of the country. Beetles were collected by hand or using pitfall traps.

The 299 specimens reported below are located in three collections: cFB – Working collection of Fabian

Bötzl; cUW – Collection of the department of Animal Ecology and Tropical Biology, University of Würzburg; cTT – Working collection of Teodora Teofilova (IBER-BAS).

The zoogeographical regions and subregions (eastern, western or middle part) follow the zoogeographical division used in the last catalogue of Bulgarian carabids (Guéorguiev & Guéorguiev 1995) and are abbreviated as follows: BS – Black Sea Coast, PRW – Western Predbalkan (Forebalkan), SPM – Middle Stara Planina Mts, WB – Western Bulgaria (Sofia Basin), SPT – Sandanski-Petrich Valley, V – Vitosha Mts, R – Rila Mts, P – Pirin Mts, RDW – Western Rhodope Mts.

All material was identified by the second author and, where it seemed necessary identifications were confirmed by the first author or other experts. The systematic order follows Kryzhanovskij et al. (1995) and the nomenclature is in accordance with Löbl & Löbl (2017) and Kataev (2023).

Results

We present data on the distribution of 94 Bulgarian carabid species from 19 tribes (out of 37 in Bulgaria): Cicindelini (8 sp.), Omophronini (1), Nebriini (3), Notiophilini (1), Carabini (7), Trechini (4), Tachyini (1), Bembidiini (5), Pterostichini (11), Sphodrini (7), Platynini (3), Atranini (1), Zabryni (11), Harpalini (19), Chlaeniini (4), Lebiini (5), Dryptini (1), Zuphiini (1), and Brachinini (1) collected in 9 zoogeographical regions and subregions. There are 7 species recorded for the first time in different (sub)regions, and *Agonum carbonarium* is new to the Bulgarian fauna.

Species list

1. *Cylindera (Cylindera) germanica germanica* (Linnaeus, 1758). Material: BS (Balchik, 1 ♀, 1 ♂, 10.VII.1988 [cFB]).

2. *Cylindera (Eugrapha) arenaria viennensis* (Schränk 1781). Material: BS (Balchik, 2 ♀♀, 10.VII.1988 [cFB]).

3. *Calomera littoralis nemoralis* (Olivier, 1790). Material: BS (Kranevo, 1 ♀, VIII.1969 [cFB], 1 ♂, VIII.1988 [cFB]).

4. *Calomera fischeri fischeri* (M. F. Adams, 1817). Material: SPT (W Sandanski, river banks of

Struma River near Struma Village, 41°33'13.4"N, 23°14'17.7"E, 104 m, 1 ♀, 22.VII.2015 [cFB]; S Sandanski, Struma River near Ribnik Village, 41°29'14.6"N, 23°15'53.4"E, 91 m, 2 ♀♀, 7 ♂♂ [cFB], 1 ♂ [cUW], 22.VII.2015, 4 ♀♀, 2 ♂♂, 31.VII.2019 [cFB]). Remarks: This species was last recorded from the Sandanski-Petrich Valley in Guéorguiev (2001).

5. *Cicindela (Cicindela) hybrida* Linnaeus, 1758. Material: SPT (S Sandanski, Struma River near Ribnik Village, 41°29'14.6"N, 23°15'53.4"E, 91 m, 2 ♂♂, 31.VII.2019 [cFB]). Remarks: The last record of this species from the Sandanski-Petrich Valley is cited by Guéorguiev & Guéorguiev (1995). The populations in the Struma Valley are of unclear taxonomic status. It is currently unknown whether these populations belong to *C. hybrida*, *C. transversalis* Dejean, 1822 (sensu Löbl & Löbl, 2017) or *C. monticola* Menetries, 1832, with the latter two historically having been lumped under *C. hybrida* by many authors. A comprehensive morphological and phylogenetic revision of the *C. hybrida* species group is needed to resolve these issues. For matters of consistency, we report these findings under the name *C. hybrida* that was also used in previous works (Hieke & Wrase, 1988; Guéorguiev & Guéorguiev, 1995).

6. *Cicindela (Cicindela) sylvicola* Dejean, 1822. Material: SPM (Central Balkan Mts, Shipka, 1 ♀, 1 ♂, 7.VII.1969 [cFB]). Remarks: This species was last recorded from the Middle Stara Planina Mts in Hieke & Wrase (1988).

7. *Cicindela (Cicindela) campestris campestris* Linnaeus, 1758. Material: RDW (S Yundola, 42°03'11.3"N, 23°50'46.1"E, 1367 m, pine forest clearance, 1 ♂, 21.VII.2013 [cFB]). Remarks: The populations in south-western Bulgaria are in the zone of intergradation between *Cicindela campestris campestris* Linnaeus, 1758 and *Cicindela campestris olivieria* Brulle, 1832 and may resemble one or both subspecies. Their taxonomic status needs to be clarified in the upcoming revision of the *Cicindela campestris* species group (see Gebert et al., 2021). For matters of consistency, we report these findings under the nominate subspecies also used in previous works (e.g. Hieke & Wrase, 1988; Guéorguiev & Guéorguiev, 1995).

8. *Cicindela (Cicindela) monticola rumelica* Apfelbeck, 1904. Material: BS (Primorsko, 2 ♂♂, 20.VII.1973 [cFB]; Burgas env., Tsarevo City env., 3 ♀♀, 28.VI.2019 [cFB]).

9. *Omophron (Omophron) limbatum* (Fabricius, 1777). Material: SPT (W Sandanski, banks of Struma River N Struma Village, 41°32'43.4"N, 23°14'11.6"E, 104 m, 1 ♀, 2 ♂♂, 1.VIII.2019 [cFB]). Remarks: The last record of this species from the Sandanski-Petrich Valley is in Guéorguiev (2001).

10. *Leistus (Pogonophorus) spinibarbis rufipes* Chaudoir, 1843. Material: R (Panichishte, 42°15'35.2"N, 23°17'39.3"E, 1424 m, 1 ♂, 16.IX.2021 [cFB]). Remarks: First record from the Rila Mts.

11. *Nebria (Nebria) brevicollis* (Fabricius, 1792). Material: R (Gorski Kat hotel SW Rila Monastery, 42°06'58.3"N, 23°17'51.2"E, 970 m, *Fagus* forest, 3 ♀♀, 18.IX.2021 [cFB]). Remarks: This species was last recorded from the Rila Mts in Guéorguiev & Guéorguiev (1995), most probably repeating the record of Rambousek (1912).

12. *Nebria (Eunebria) jockischii jockischii* Sturm, 1815. Material: R (Ribni Ezera ("Fish Lakes") Hut, 42°06'42"N, 23°29'36"E, 2240 m, alpine meadows, 2 ♀♀, 3 ♂♂, 30.VII.2019 [cFB]). Remarks: First record from the Rila Mts.

13. *Notiophilus aquaticus* (Linnaeus, 1758). Material: RDW (SW Yundola, 42°03'06.6"N, 23°50'38.3"E, 1345 m, *Pinus* forest near Pashovi Skali Rocks Natural Monument, pitfall traps, 1 ex., 25.VII.2015 [cFB]).

14. *Calosoma (Calosoma) sycophanta sycophanta* (Linnaeus, 1758). Material: RDW (near Yundola Village, mixed *Pinus* forest, 1 ex., 21–31.VII.2012 [cUW]).

15. *Carabus (Tomocarabus) convexus dilatatus* Dejean, 1826. Material: R (Panichishte, 42°15'35.2"N, 23°17'39.3"E, 1424 m, 1 ♀, 16.IX.2021 [cFB]); between Sedemte Ezera and Ivan Vazov Hut, 42°11'31"N, 23°18'52"E, 2615 m, alpine meadows, 1 ♂, 17.IX.2021 [cFB]); P (Popina Laka, 41°40'22.6"N, 23°23'40.3"E, 1248 m, 1 ♀, 2.VIII.2019 [cFB]).

16. *Carabus (Pachystus) hortensis hortensis* Linnaeus, 1758. Material: R (W Rila Monastery, 42°07'53"N, 23°19'43"E, 1430 m, mixed *Fagus* forest, 1 ex., 21.VII.2015 [cFB]); between Rila Monastery and Ribni Ezera ("Fish Lakes") Hut, 42°08'58"N, 23°25'25"E, 1680 m, roadside, under stone, 1 ♂, 30.VII.2019 [cFB]; Panichishte, 42°15'35.2"N, 23°17'39.3"E, 1424 m, 1 ♂, 16.IX.2021 [cFB]); P (E Popina Laka, Begovitsa Hut, 41°40'25.9"N, 23°25'39.0"E, 1804 m, 1 ♀,

2.VIII.2019 [cFB]; Popina Laka, 41°40'22.6"N, 23°23'40.3"E, 1248 m, 1 ♀, 2.VIII.2019 [cFB]); RDW (between Yundola and Belmeken, 42°06'01.7"N 23°48'17.9"E, *Pinus* forest, 1 ♀, 22.07.2013 [cUW]); SW Yundola, *Pinus* forest near Pashovi Skali Rocks Natural Monument, 42°03'06.6"N, 23°50'38.3"E, 1345 m, 1 ♂, 27.VII.2015 [cFB]).

17. *Carabus (Chaetocarabus) intricatus intricatus* Linnaeus, 1760. Material: R (Panichishte, 42°15'35.2"N, 23°17'39.3"E, 1424 m, 1 ♂, 16.IX.2021 [cFB]); P (Popina Laka, 41°40'22.6"N, 23°23'40.3"E, 1248 m, 1 ex., 22–24.VII.2017 [cUW]).

18. *Carabus (Megodontus) violaceus azuresens* Dejean, 1826. Material: V (Boyana Waterfall, 42°37'46.3", 23°15'15.3", 1295 m, 1 ♂, 30.IV.2018 [cFB]); P (Popina Laka, 41°40'22.6"N, 23°23'40.3"E, 1248 m, 1 ♀, 2.VIII.2019 [cFB]); RDW (SW Yundola, 42°03'06.6"N, 23°50'38.3"E, 1345 m, *Pinus* forest and meadows near Pashovi Skali Rocks Natural Monument, pitfall traps, 1 ♀, 25–27.VII.2015 [cFB]; same place, *Pinus* forest, 2 ♀♀, 2 ♂♂, 27.VII.2015 [cFB]; NE Trigrad, 41°36'14.4"N, 24°22'55.2"E, 1217 m, 1 ♀, 1 ♂, 6.VIII.2019 [cFB]).

19. *Carabus (Procrustes) coriaceus cerisyi* Dejean, 1826. Material: P (Popina Laka, 41°40'22.6"N, 23°23'40.3"E, 1248 m, 1 ex., 22–24.VII.2017 [cFB]); RDW (Yundola Village env., 1 ex., 21–31.VII.2012 [cFB]; SE Yagodina Village, 41°37'37"N, 24°22'16"E, 1300 m, mixed coniferous forest, 1 ♀, 5.VIII.2019 [cFB]).

20. *Carabus (Procerus) scabrosus bureschianus* Breuning, 1928. Material: RDW (NE Trigrad, 41°36'14.4"N, 24°22'55.2"E, 1217 m, 1 ♀, 5.VIII.2019 [cFB]).

21. *Trechus (Trechus) quadristriatus* (Schrank, 1781). Material: WB (N Kostinbrod, 42°52'11"N, 23°11'51"E, 680 m, cow meadow, 2 ♀♀, 29.VII.2019 [cFB]).

22. *Trechus (Trechus) obtusus obtusus* Erichson, 1837. Material: R (Ribni Ezera ("Fish lakes") Hut, 42°06'42"N, 23°29'36"E, 2240 m, alpine meadows, 1 ♀, 30.VII.2019 [cFB]). Remarks: New elevation range. This species was previously only known from 600–2100 m a.s.l.

23. *Trechus (Trechus) rhilensis* Kaufmann, 1884. Material: R (between Sedemte Ezera Site and Ivan Vazov Hut, 42°11'31"N, 23°18'52"E, 2615 m, alpine meadows, 1 ♂, 17.IX.2021 [cFB]).

24. *Trechus (Trechus) rhodopeius* Jeannel, 1921. Material: R (Rilomanastirska Gora Reserve, between Rila Monastery and Ribni Ezera (“Fish Lakes”) Hut, 42°09'13"N, 23°25'03"E, 1600 m, mixed forest and open soil along road, 1 ♂, 31.VII.2019 [cFB]).

25. *Tachyura (Tachyura) diabrachys* (Kolenati, 1845). Material: SPT (Kozhuh Hill, NE Petrich, Rupite / St Petka, 41°27'09"N, 23°15'56"E, 107 m, dry grasslands, 3 ♀♀, 3 ♂♂, 3.VIII.2019 [cFB]). Remarks: This species was last recorded from the Sandanski-Petrich Valley in Guéorguiev (2001).

26. *Bembidion (Emphanes) azureus azurescens* Dalla Torre, 1877. Material: SPT (Kozhuh Hill, NE Petrich, Rupite / St Petka, 41°27'09"N, 23°15'56"E, 107 m, 2 ♀♀, 1 ♂, 3.VIII.2019 [cFB]).

27. *Bembidion (Bembidionetolitzkya) tibiale* (Duftschmid, 1812). Material: R (Belmeken, about 42°11'10"N, 23°46'38"E, about 2300 m, 1 ♀, 26.VII.2015 [cFB]). Remarks: New elevation range. This species was currently only known from 200–1800 m a.s.l.

28. *Bembidion (Peryphus) bualei bualei* Jacquelin du Val, 1852. Material: P (E Melnik, 41°31'31"N, 23°23'53"E, 420 m, dry bed of small river, 1 ♀, 1.VIII.2019 [cFB]; E Melnik, 41°31'33"N, 23°24'07"E, 440 m, dry bed of small river, 1 ♀, 2 ♂♂, 20.VIII.2021 [cFB]). Remarks: First record from the Pirin Mts.

29. *Bembidion (Ocyturanus) balcanicum* Apfelbeck, 1899. Material: R (Ribni Ezera (“Fish Lakes”) Hut, 42°06'42"N, 23°29'36"E, 2240 m, 3 ♀♀, 30.VII.2019 [cFB]; between Sedemte Ezera Site and Ivan Vazov Hut, 42°11'31"N, 23°18'52"E, 2615 m, alpine meadows, 2 ♀♀, 3 ♂♂, 17.IX.2021 [cFB]).

30. *Bembidion (Testedium) bipunctatum bipunctatum* (Linnaeus, 1760). Material: R (Ribni Ezera (“Fish Lakes”) Hut, 42°06'42"N, 23°29'36"E, 2240 m, alpine meadows, 3 ♀♀, 3 ♂♂, 30.VII.2019 [cFB]; Rilomanastirska Gora Reserve, between Rila Monastery and Ribni Ezera (“Fish Lakes”) Hut, 42°09'13"N, 23°25'03"E, 1600 m, mixed forest and open soil along road, 1 ♀, 31.VII.2019 [cFB]).

31. *Xenion ignitum* (Kraatz, 1875). Material: P (NE Sandanski, Popina Laka, 41°40'22.6"N, 23°23'39.8"E, 1243 m, at light, 2 ♀♀, 21–23.VII.2015 [cFB]; Popina Laka, 41°40'22.6"N, 23°23'40.3"E, 1248 m, 1 ♂, 2.VIII.2019 [cFB]); RDW (Yundola, meadows near pine forest, 42°03'43.9"N, 23°51'17.8"E, 1386 m, pitfall traps, 2 ♀♀, 25–27.VII.2015 [cFB]; SW Yundola, *Pinus* for-

est near Pashovi Skali Rocks Natural Monument, 42°03'06.6"N, 23°50'38.3"E, 1345 m, 1 ♂, 25.VII.2015 [cFB]; N Dospat, 41°39'18"N, 24°09'34"E, 1200 m, S shore of Dospat Dam, 1 ♂, 4.VIII.2019 [cFB]).

32. *Myas (Myas) chalybaeus* (Palliard, 1825). Material: R (Gorski Kat hotel SW Rila Monastery, 42°06'58.3"N, 23°17'51.2"E, 970 m, *Fagus* forest, 1 ♀, 3 ♂♂, 18.IX.2021 [cFB]).

33. *Poecilus (Poecilus) lepidus lepidus* (Leske, 1785). Material: RDW (N Dospat, 41°39'18"N, 24°09'34"E, 1200 m, S shore of Dospat Dam, 1 ♀, 4.VIII.2019 [cFB]; SE Yagodina, 41°37'38"N, 24°21'52"E, 1200 m, meadows, 1 ♂, 5.VIII.2019 [cFB]; NE Trigrad, 41°36'14"N, 24°22'55"E, 1225 m, 1 ♀, 5.VIII.2019 [cFB]; NE Trigrad, 41°37'30"N, 24°23'19"E, 1030 m, gorge, 1 ♂, 5.VIII.2019 [cFB]).

34. *Pterostichus (Platysma) niger niger* (Schaller, 1783). Material: R (W Rila Monastery, 42°07'53"N, 23°19'43"E, 1430 m, mixed *Fagus* forest, 2 ♂♂, 21.VII.2015 [cFB]); P (between Popina Laka and Begovitsa Hut, 41°40'30"N, 23°24'48"E, 1590 m, forest, 1 ♀, 2.VIII.2019 [cFB]); RDW (SW Yundola, 42°03'06.6"N, 23°50'38.3"E, 1345 m, *Pinus* forest near Pashovi Skali Rocks Natural Monument, pitfall traps, 1 ♀, 25.VII.2015 [cFB]; SW Velingrad, near Ostrets Stop, 41°59'24.5"N, 23°55'29.6"E, 915 m, 1 ♂, 27.VII.2015 [cFB]; NE Trigrad, 41°36'14.4"N, 24°22'55.2"E, 1217 m, 1 ♀, 1 ♂, 6.VIII.2019 [cFB]; E Kovachevitsa, 41°41'04.6"N, 23°49'52.5"E, 1123 m, encapsulated for hibernation, 1 ♀, 22.IX.2021 [cFB]).

35. *Pterostichus (Pseudomaseus) anthracinus anthracinus* (Illiger, 1798). Material: RDW (Tsigov Chark Site, Batak Dam, western shore near Mantaritsa Reserve, 41°57'09.5"N, 24°09'17.4"E, 1106 m, 1 ♂, 28.VII.2015 [cFB]). Remarks: First record from the whole Rhodope Mts.

36. *Pterostichus (Bothriopterus) oblongopunctatus oblongopunctatus* (Fabricius, 1787). Material: R (W Rila Monastery, 42°07'53"N, 23°19'43"E, 1430 m, mixed *Fagus* forest, 2 ♂♂, 21.VII.2015 [cFB]); P (between Popina Laka and Begovitsa Hut, 41°40'30"N, 23°24'48"E, 1590 m, forest, 1 ♂, 2.VIII.2019 [cFB]); RDW (SW Velingrad, near Ostrets Stop, 41°59'24"N, 23°55'30"E, 915 m, 1 ♂, 27.VII.2015 [cFB]; Trigradski Skali Hut, 41°36'25"N, 24°22'60"E, 1189 m, 1 ♀, 4.VIII.2019 [cFB]).

37. *Pterostichus (Morphnosoma) melanarius bulgaricus* (Lutshnik, 1915). Material: RDW (near Yundola Village, meadow, 1 ♀, 27.VII.2013 [cUW]).

38. *Pterostichus (Pterostichus) rhilensis kourili* Mařan, 1933. Material: P (Mount Vihren, 1 ♀, 1 ♂, 8.VII.2010 [cFB]); SW Bansko, SE Vihren Hut, 41°44'26.1"N, 23°25'50.6"E, 2573 m, alpine zone, under stone, 1 ♂, 24.VII.2015 [cFB]).

39. *Abax (Abax) ovalis* (Duftschmid, 1812). Material: R (Panichishte, 42°15'35.2"N, 23°17'39.3"E, 1424 m, 1 ♂, 16.IX.2021 [cFB]); RDW (Entrance of Mantaritsa Reserve SW lake Batak, 41°55'55.3"N 24°07'44.5"E, 1327 m, mixed forest, 1 ex., 28.VII.2013 [cUW]); SE Yagodina Village, 41°37'37"N, 24°22'16"E, 1300 m, mixed coniferous forest, 1 ♀, 2 ♂♂, 5.VIII.2019 [cFB]; Trigrad Gorge, 41°37'29.6"N, 24°23'19.4"E, 1029 m, 1 ♀, 5.VIII.2019 [cFB]).

40. *Molops (Molops) dilatatus dilatatus* Chaudoir, 1868. Material: R (between Ivan Vazov Hut and Rila Monastery, 42°08'26.5"N, 23°18'43.4"E, 2130 m, alpine meadows, 1 ♂, 18.IX.2021 [cFB]).

41. *Tapinopterus (Tapinopterus) balcanicus balcanicus* Ganglbauer, 1891. Material: R (W Rila Monastery, 42°07'53"N, 23°19'43"E, 1430 m, mixed *Fagus* forest, 1 ♂, 21.VII.2015 [cFB]); Panichishte, 42°15'35.2"N, 23°17'39.3"E, 1424 m, 1 ♂, 16.IX.2021 [cFB]); RDW (Yagodinska Cave, 41°37'25.4"N, 24°19'23.4"E, 1030 m, mixed forest, 1 ♀, 5.VIII.2019 [cFB]).

42. *Calathus (Calathus) fuscipes fuscipes* (Goeze, 1777). Material: R (Gorski Kat hotel SW Rila Monastery, *Fagus* forest, 42°06'58.3"N, 23°17'51.2"E, 970 m, 2 ♀♀, 18.IX.2021 [cFB]); P (E Melnik, 41°31'33"N, 23°24'07"E, 440 m, dry bed of small river, 3 ♀♀, 20.VIII.2021 [cFB]); RDW (NE Trigrad, 41°36'14"N, 24°22'55"E, 1225 m, 1 ♀, 2 ♂♂, 5.VIII.2019 [cFB]).

43. *Calathus (Neocalathus) erratus erratus* C. R. Sahlberg, 1827. Material: R (Belmeken Mount, N Hristo Smirnenki Hut, 42°06'46"N, 23°47'39"E, 1780 m, 1 ♂, 24.IX.2021 [cFB]); RDW (N Dospat, 41°39'18"N, 24°09'34"E, 1200 m, S shore of Dospat Dam, 1 ♂, 4.VIII.2019 [cFB]). Remarks: This species was last recorded from the Western Rhodope Mts by Guéorguiev & Lobo (2006).

44. *Calathus (Neocalathus) melanocephalus melanocephalus* (Linnaeus, 1758). Material: R (Ribni Ezera ("Fish Lakes") Hut, 42°06'42"N, 23°29'36"E,

2240 m, alpine meadows, 3 ♀♀, 2 ♂♂, 30.VII.2019 [cFB]); Rilomanastirska Gora Reserve, between Rila Monastery and Ribni Ezera Hut, 42°09'13"N, 23°25'03"E, 1600 m, mixed forest and open soil along road, 1 ♀, 31.VII.2019 [cFB]; between Sedemte Ezera and Ivan Vazov Hut, 42°11'31"N, 23°18'52"E, 2615 m, alpine meadows, 1 ♀, 17.IX.2021 [cFB]; between Ivan Vazov Hut and Rila Monastery, 42°10'20"N, 23°18'44"E, 2450 m, alpine meadows, 1 ♀, 18.IX.2021 [cFB]); RDW (SW Yundola, 42°03'06.6"N, 23°50'38.3"E, 1345 m, *Pinus* forest near Pashovi Skali Rocks Natural Monument, 1 ♀, 25.VII.2015 [cFB]). Remarks: New altitude range. This species was previously known only from elevations up to 2400 m a.s.l. Now it is reported from alpine meadows at 2450 m and 2615 m in the Rila Mts.

45. *Calathus (Neocalathus) metallicus* Dejean, 1828. Material: R (Belmeken, about 42°11'10"N, 23°46'38"E, about 2300 m, 2 ♀♀, 1 ♂, 26.VII.2015 [cFB]); Ribni Ezera ("Fish Lakes") Hut, 42°06'42"N, 23°29'36"E, 2240 m, alpine meadows, 4 ♀♀, 4 ♂♂, 30.VII.2019 [cFB]; Rilomanastirska Gora Reserve, between Rila Monastery and Ribni Ezera Hut, 42°09'13"N, 23°25'03"E, 1600 m, mixed forest and open soil along road, 1 ♀, 31.VII.2019 [cFB]; between Sedemte Ezera and Ivan Vazov Hut, 42°11'31"N, 23°18'52"E, 2615 m, alpine meadows, 1 ♀, 1 ♂, 17.IX.2021 [cFB]; between Ivan Vazov Hut and Rila Monastery, 42°10'20"N, 23°18'44"E, 2450 m, alpine meadows, 1 ♀, 1 ♂, 18.IX.2021 [cFB]; Panichishte, 42°15'35.2"N, 23°17'39.3"E, 1424 m, 1 ♀, 1 ♂, 16.IX.2021 [cFB]); P (E Begovitsa Hut, Zabat Mount, 41°40'19.4"N, 23°28'02.3"E, 2364 m, lakeside, under stone, 1 ♂, 2.VIII.2019 [cFB]); E Popina Laka, Begovitsa Hut, 41°40'25.9"N, 23°25'39.0"E, 1804 m, 1 ♀, 2.VIII.2019 [cFB]; S Bezbog Hut, 41°43'25.4"N, 23°31'00.3"E, 2355 m, 1 ♀, 23.IX.2021 [cFB]).

46. *Calathus (Neocalathus) cinctus* Motschulsky, 1850. Material: WB (N Kostinbrod, 42°52'11"N, 23°11'51"E, 680 m, cow meadow, 2 ♂♂, 29.VII.2019 [cFB]); P (E Melnik, 41°31'33"N, 23°24'07"E, 440 m, dry bed of small river, 1 ♂, 20.VIII.2021 [cFB]). Remarks: The only previous record of this species from the Pirin Mts was in Teofilova (2020).

47. *Laemostenus (Actenipus) plasoni plasoni* (Reitter, 1885). Material: RDW (NE Trigrad, 41°36'14"N, 24°22'55"E, 1225 m, 1 ♀, 5.VIII.2019 [cFB]).

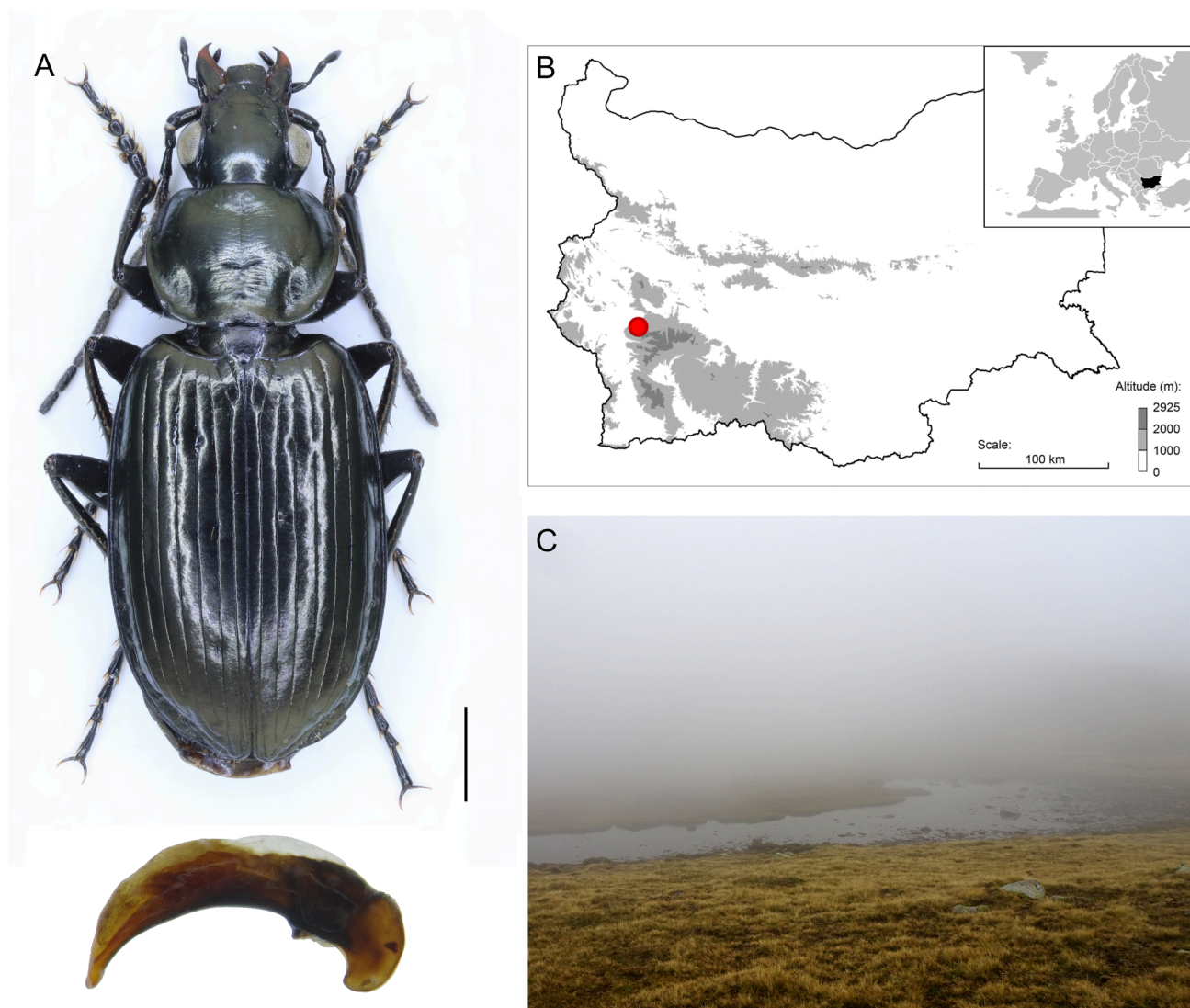


Fig. 1. Habitus of the male specimen of *Agonum (Agonum) carbonarium* Dejean, 1828 collected in the Northwestern Rila Mts with the male aedeagus (A; scale bars: 1 mm), the collection location within Bulgaria (B) and a picture of the habitat on the collection day (C).

48. *Synuchus (Synuchus) vivalis vivalis* (Illiger, 1798). Material: P (between Popina Laka and Begovitsa Hut, 41°40'30"N, 23°24'48"E, 1590 m, forest, 1 ♀, 2.VIII.2019 [cFB]). Remarks: This species was last recorded from the Pirin Mts in Guéorguiev & Guéorguiev (1995).

49. *Agonum (Agonum) carbonarium* Dejean, 1828. Material: R (Rilski Manastir Natural Park, between Ivan Vazov Hut and Rila Monastery, 42°10'20"N, 23°18'44"E, 2450 m, alpine meadows, 5 ♀♀, 1 ♂ (Fig. 1A), 18.IX.2021, leg./det. FB, vid. J. Schmidt & TT [cFB]; 1 ♀, same information, [cTT]). Remarks: This is the first record of the species in Bul-

garia (location indicated on Fig. 1B). The specimens were collected in the typical habitat described by Schmidt & Liebherr (2009), high montane to alpine, at the shore of a small puddle where water came to the surface and that is the source of a small brook (Fig. 1C). The specimens were found together under a small rock in moist to wet substrate.

50. *Agonum (Olisares) sexpunctatum* (Linnaeus, 1758). Material: RDW (Yundola, 1 ♀, 25.VII.2012 [cFB]).

51. *Limodromus assimilis* (Paykull, 1790). Material: R (Gorski Kat hotel SW Rila Monastery, 42°06'58.3"N, 23°17'51.2"E, 970 m, *Fagus* forest, 1

♀, 18.IX.2021 [cFB]); RDW (Entrance of Mantaritsa Reserve SW lake Batak, 41°55'55.3"N 24°07'44.5"E, 1327 m, mixed forest, 1 ex., 28.VII.2013 [cUW]).

52. *Atranus ruficollis* (Gautier des Cottés, 1858). Material: P (E Melnik, Melnik-Rozhen trail, 41°31'33.4"N, 23°24'06.7"E, 442 m, dry bed of small river, 1 ♀, 20.VIII.2021 [cFB]). Remarks: First record in the Pirin Mts. New altitude range. This species was previously known only from elevations between 130–300 m a.s.l.

53. *Amara (Zezea) reflexicollis reflexicollis* Motschulsky, 1844. Material: BS (Byala env., 1 ♀, 12–18.VII.1984 [cFB]).

54. *Amara (Amara) aenea* (De Geer, 1774). Material: R (W Belmeken Dam, peak, below rock in ant nest, 42°10'49"N, 23°46'17"E, 2627 m, 1 ♀, 26.VII.2015 [cFB]); Granchar, 1 ♀, 3.VII.1981 [cFB]); P (NE Sandanski, Popina Laka, 41°40'22.6"N, 23°23'39.8"E, 1243 m, 1 ♀, 22.VII.2015 [cFB]). Remarks: New altitude range. This species was previously only known from elevations up to 2200 m a.s.l., now it is reported from 2627 m a.s.l. near the Belmeken Dam. This species was last recorded from the Rila Mts by Guéorguiev & Guéorguiev (1995).

55. *Amara (Amarocelia) erratica* (Duftschmid, 1812). Material: P (Vihren Hut, 41°45'22.1"N, 23°24'58.8"E, 1984 m, 1 ♀, 23.VII.2013 [cFB]).

56. *Amara (Paracelia) quenseli quenseli* (Schönherr, 1806). Material: R (W Belmeken Dam, peak, 42°10'49"N, 23°46'17"E, 2627 m, below rocks, 2 ♀♀, 1 ♂, 26.VII.2015 [cFB]); Ribni Ezera ("Fish Lakes") Hut, 42°06'42"N, 23°29'36"E, 2240 m, alpine meadows, 1 ♂, 30.VII.2019 [cFB]).

57. *Amara (Bradytus) consularis* (Duftschmid, 1812). Material: WB (N Kostinbrod, 42°52'11"N, 23°11'51"E, 680 m, cow meadow, 2 ♂♂, 29.VII.2019 [cFB]).

58. *Amara (Bradytus) crenata* Dejean, 1828. Material: BS (Primorsko, 1 ♀, 1 ♂, 20.VII.1973 [cFB]).

59. *Amara (Percosia) equestris equestris* (Duftschmid, 1812). Material: R (Belmeken Mount, N Hristo Smirnenski Hut, 42°06'46"N, 23°47'39"E, 1780 m, 1 ♂, 24.IX.2021 [cFB]); RDW (SW Yundola, 42°03'06.6"N, 23°50'38.3"E, 1345 m, meadow near Pashovi Skali Rocks, pitfall traps, 3 ♂♂, 25–27.VII.2015 [cFB]). Remarks: This species was last recorded from the Rila Mts in Guéorguiev & Guéorguiev (1995).

60. *Amara (Curtonotus) aulica* (Panzer, 1796). Material: RDW (NE Trigrad, 41°36'14"N, 24°22'55"E, 1225 m, 2 ♀♀, 5.VIII.2019 [cFB]).

61. *Zabrus (Zabrus) tenebrioides* (Goeze, 1777). Material: BS (Primorsko, 1 ♀, 9.VII.1976 [cFB]); WB (N Kostinbrod, 42°52'11"N, 23°11'51"E, 680 m, cow meadow, 1 ♂, 29.VII.2019 [cFB]).

62. *Zabrus (Pelor) incrassatus* (Ahrens, 1814). Material: SPT (NE Petrich, Rupite – St Petka complex, 41°27'15"N, 23°15'52"E, 90 m, dry meadows, 1 ♀, 19.IX.2021 [cFB]); P (E Melnik, 41°31'33"N, 23°24'07"E, 440 m, dry bed of small river, 3 ♂♂, 20.VIII.2021 [cFB]). Remarks: New altitude range. This species was previously only known from elevations between 150 and 1000 m a.s.l. Now it is reported from 90 m a.s.l. near Sandanski.

63. *Zabrus (Pelor) balcanicus* Heyden, 1883. Material: P (E Begovitsa Hut, 41°40'40"N, 23°27'22"E, 2083 m, subalpine meadow, under dried cow dung, 1 ♀, 2.VIII.2019 [cFB]); NE Sandanski, Popina Laka, 41°40'22"N, 23°23'40"E, 1245 m, 1 ♀, 4 ♂♂, 1/2.VIII.2019 [cFB]). Remarks: The taxonomic status of *Zabrus (Pelor) balcanicus* Heyden, 1883 and *Zabrus (Pelor) rhodopensis* Apfelbeck, 1904 is, at the moment, insufficiently resolved. The two taxa have been treated as separate species by some authors (e.g. Apfelbeck, 1904) but treated as synonyms or subspecies of the same species by others (e.g. Guéorguiev & Lobo, 2006). To date, this issue remains not clarified. According to Kryzhanovskij (unpublished data), both taxa are likely to be synonymous with *rhodopensis* being at most a southern subspecies of *balcanicus*. We follow this opinion here.

64. *Anisodactylus (Anisodactylus) binotatus* (Fabricius, 1787). Material: RDW (N Dospat, 41°39'18"N, 24°09'34"E, 1200 m, S shore of Dospat Dam, 2 ♀♀, 1 ♂, 4.VIII.2019 [cFB]); NE Trigrad, Trigradski Skali Hut, 41°36'25"N, 24°23'00"E, 1190 m, 1 ♀, 4.VIII.2019 [cFB]).

65. *Scybalicus oblongiusculus* (Dejean, 1829). Material: BS (Nesebar, 1 ♀, 15.VIII.2004 [cFB]).

66. *Ophonus (Metophonus) laticollis* Mannerheim, 1825. Material: P (NE Sandanski, Popina Laka, 41°40'22"N, 23°23'40"E, 1245 m, 1 ♀, 1 ♂, 1/2.VIII.2019 [cFB]).

67. *Ophonus (Metophonus) schaubergerianus* (Puel, 1937). Material: P (NE Sandanski, Popina Laka, 41°40'22.6"N, 23°23'39.8"E, 1243 m, at light, 1 ♀, 21–23.VII.2015 [cFB]).

68. *Harpalus (Pseudoophonus) rufipes* (De Geer, 1774). Material: P (NE Sandanski, Popina Laka, 41°40'22.6"N, 23°23'40.3"E, 1248 m, 1 ♀, 1 ♂, 2.VIII.2019 [cFB]); RDW (S Yundola, 42°03'11.3"N, 23°50'46.1"E, 1367 m, pine forest clearance, 1 ex., 27.VII.2013 [cFB]). Remarks: This species was last recorded from the Pirin Mts in Guéorguiev & Guéorguiev (1995).

69. *Harpalus (Hyloharpalus) laevipes* Zetterstedt, 1828 [= *quadripunctatus* Dejean, 1829]. Material: R (between Rila Monastery and Ribni Ezera ("Fish Lakes") Hut, 42°09'13"N, 23°25'03"E, 1600 m, mixed forest and open soil along road, 1 ♂, 31.VII.2019 [cFB]).

70. *Harpalus (Drymoharpalus) atratus* Latreille, 1804. Material: RDW (NE Trigrad, 41°36'14"N, 24°22'55"E, 1217 m, 1 ♀, 6.VIII.2019 [cFB]).

71. *Harpalus (Amblystus) honestus* (Duftschmid, 1812). Material: R (between Rila Monastery and Ribni Ezera ("Fish Lakes") Hut, 42°09'13"N, 23°25'03"E, 1600 m, mixed forest and open soil along road, 1 ♀, 1 ♂, 31.VII.2019 [cFB]); RDW (NE Trigrad, 41°36'14"N, 24°22'55"E, 1225 m, 3 ♂♂, 5.VIII.2019 [cFB]).

72. *Harpalus (Amblystus) rufipalpis rufipalpis* Sturm, 1818. Material: RDW (Yundola, 42°03'43.9"N, 23°51'17.8"E, 1386 m, meadows near pine forest, pitfall traps, 2 ♂♂, 25–27.VII.2015 [cFB]; N Dospat, 41°39'18"N, 24°09'34"E, 1200 m, S shore of Dospat Dam, 1 ♂, 4.VIII.2019 [cFB]).

73. *Harpalus (Actephilus) pumilus* Sturm, 1818. Material: P (between Popina Laka and Begovitsa Hut, 41°40'30"N, 23°24'48"E, 1590 m, forest, 1 ♂, 2.VIII.2019 [cFB]). Remarks: New altitude range. This species was previously only known from elevations up to 1340 m a.s.l. in the Rhodope Mts (Teofilova, 2017).

74. *Harpalus (Isoharpalus) serripes serripes* (Quensel, 1806). Material: SPT (Kozhuh Hill, NE Petrich, Rupite / St Petka, 41°27'09"N, 23°15'56"E, 107 m, 2 ♀♀, 3.VIII.2019 [cFB]); R (E Stob Village, Stobski Piramidi (Stob Pyramids) Site, 42°05'36"N, 23°06'46"E, 520 m, dry forest path on sand, 1 ♀, 19.IX.2021 [cFB]).

75. *Harpalus (Ooistus) subcylindricus* Dejean, 1829. Material: WB (N Kostinbrod, 42°52'11"N, 23°11'51"E, 680 m, cow meadow, 1 ♀, 29.VII.2019 [cFB]).

76. *Harpalus (Brachyharpalus) autumnalis* (Duftschmid, 1812). Material: P (E Melnik, Melnik-

Rozhen trail, 41°31'33.4"N, 23°24'06.7"E, 442 m, dry bed of small river, 2 ♂♂, 20.VIII.2021 [cFB]).

77. *Harpalus (Paraharpalus) oblitus oblitus* Dejean, 1829. Material: SPT (Sandanski, 1 ♂, 28–31.V.1967 [cFB]). Remarks: First record in the Sandanski-Petrich Valley. Rare.

78. *Harpalus (Harpalus) affinis* (Schrank, 1781). Material: R (Belmeken, 42°11'10.3"N, 23°46'38.8"E, 2320 m, 1 ♀, 26.VII.2015 [cFB]); Ribni Ezera ("Fish Lakes") Hut, 42°06'42"N, 23°29'36"E, 2239 m, alpine meadows, 2 ♂♂, 30.VII.2019 [cFB]; between Rila Monastery and Ribni Ezera Hut, 42°09'13"N, 23°25'03"E, 1600 m, mixed forest and open soil along road, 1 ♂, 31.VII.2019 [cFB]; P (Popina Laka, 41°40'22.6"N, 23°23'40.3"E, 1248 m, 2 ♀♀, 1 ♂, 2.VIII.2019 [cFB]); RDW (near Yundola Village, meadow, 1 ♀, 27.VII.2013 [cFB]; N Dospat, 41°39'18"N, 24°09'34"E, 1200 m, S shore of Dospat Dam, 1 ♀, 4.VIII.2019 [cFB]; NE Trigrad, 41°36'14.4"N, 24°22'55.2"E, 1217 m, 1 ♀, 1 ♂, 6.VIII.2019 [cFB]).

79. *Harpalus (Harpalus) rubripes* (Duftschmid, 1812). Material: RDW (NE Trigrad, 41°36'14"N, 24°22'55"E, 1225 m, 1 ♀, 2 ♂♂, 5.VIII.2019 [cFB]).

80. *Graniger cordicollis* (Audinet-Serville, 1821). Material: BS (Albena Resort, 1 ♂, VIII.2002 [cFB]). Rare.

81. *Carterus (Pristocarterus) angustipennis lutshniki* Zamotajlov, 1988. Material: BS (Primorsko, 1 ♂, 20.VII.1973 [cFB]). Rare.

82. *Dixus eremita* (Dejean, 1825). Material: BS (Primorsko, 1 ♀, 4.VII.1971 [cFB]).

83. *Chlaenius (Chlaenites) spoliatus spoliatus* (P. Rossi, 1792). Material: SPT (W Sandanski, river banks of Struma River near Struma Village, 41°33'13.4"N, 23°14'17.7"E, 104 m, 1 ♀, 22.VII.2015 [cFB]). Remarks: This species was last recorded from the Sandanski-Petrich Valley in Guéorguiev & Guéorguiev (1995).

84. *Chlaenius (Chlaenius) festivus festivus* (Panzer, 1796). Material: BS (Nesebar, Slanchev Bryag Resort, 1 ♀, 3.VI.1964 [cFB]); SPT (W Sandanski, river banks of Struma River near Struma Village, 41°33'13.4"N, 23°14'17.7"E, 104 m, 1 ♂, 22.VII.2015 [cFB]). Remarks: This species was last recorded from the Sandanski-Petrich Valley in Guéorguiev (2001).

85. *Chlaenius (Chlaeniellus) flavipes* Ménériés, 1832. Material: SPT (W Sandanski, river banks of

Struma River near Struma Village, 41°33'13.4"N, 23°14'17.7"E, 104 m, 3 ♀♀, 1 ♂, 22.VII.2015 [cFB]). Remarks: This species was last recorded from the Sandanski-Petrich Valley in Guéorguiev (2001).

86. *Chlaenius (Agostenus) alutaceus* Gebler, 1830. Material: BS (Lozenez env., 1 ♂, 27.VI–9.VII.1987 [cFB]).

87. *Apristus subaeneus* Chaudoir, 1846. Material: SPT (W Sandanski, river banks of Struma River near Struma Village, 41°33'13.4"N, 23°14'17.7"E, 104 m, 2 ♀♀, 1 ♂, 22.VII.2015 [cFB]; Struma River E Topolnitsa, 41°24'25.2"N, 23°20'07.5"E, 75 m, gravel bank, 1 ♀, 21.VIII.2021 [cFB]). Remarks: New elevation range. This species was previously only known from elevations between 200–1200 m a.s.l. Now it is reported from 75 and 104 m a.s.l. This species was last recorded from the Sandanski-Petrich Valley in Guéorguiev (2001).

88. *Cymindis (Cymindis) axillaris axillaris* (Fabricius, 1794). Material: SPT (Sandanski, 1 ♂, 30.V.1984 [cFB]).

89. *Cymindis (Cymindis) humeralis* (Geoffroy in Fourcroy, 1785). Material: R (Belmeken Mount, N Hristo Smirnenki Hut, 42°06'46"N, 23°47'39"E, 1780 m, 1 ♀, 24.IX.2021 [cFB]). Remarks: This species was last recorded from the Rila Mts in Guéorguiev & Guéorguiev (1995), most probably repeating the record of Apfelbeck (1904).

90. *Cymindis (Cymindis) lineata* (Quensel in Schonherr, 1806). Material: BS (Kavarna, 1 ♀, 24.VI.1995 [cFB]).

91. *Cymindis (Tarulus) vaporariorum* (Linnaeus, 1758). Material: R (Ribni Ezera ("Fish Lakes") Hut, 42°06'42"N, 23°29'36"E, 2240 m, alpine meadows, 1 ♂, 30.VII.2019 [cFB]). Remarks: This species was last recorded from the Rila Mts in Guéorguiev & Guéorguiev (1995).

92. *Drypta (Drypta) dentata* (P. Rossi, 1790). Material: SPT (W Sandanski, river banks of Struma River near Struma Village, 41°33'13.4"N, 23°14'17.7"E, 104 m, 1 ♂, 22.VII.2015 [cFB]). Remarks: This species was last recorded from the Sandanski-Petrich Valley in Guéorguiev & Guéorguiev (1995).

93. *Polystichus connexus* (Geoffroy in Fourcroy, 1785). Material: PRW (Belotintsi, 34°N/22°E, 1 ♀, 28–29.VII.2008 [cFB]). Remarks: First record from the whole Predbalkan Region.

94. *Aptinus (Aptinus) bombardata* (Illiger, 1800). Material: RDW (W Velingrad, SE Ostrets train stop,

mixed forest, 41°59'31.0"N 23°55'07.8"E, 1 ♀, 25.07.2013 [cUW]).

Discussion

The present study provides some novel records for the carabid fauna of Bulgaria and expands the known distribution of carabid species within the country. Here we present one new country record, *Agonum carbonarium*, seven new regional records and new elevation limits as well as further distribution records for 12% of the known Bulgarian carabid fauna (Teofilova, in prep.).

Agonum carbonarium is a hygrophilous beetle dwelling bog-like habitats in the high-mountain belts (Schmidt, 2011). It has wide, strongly transverse pronotum with deepened basal furrows, deepened fovea-like setiferous pores on the 3rd elytral interval and strongly protruding eyes, and it could hardly be mistaken with any other *Agonum* known from Bulgaria. In habitus, *Agonum carbonarium* resembles *A. monachum* (Duftschmid, 1812), but the latter is conspicuously slender (head, pronotum and elytra), has a less transverse pronotum (less than 1.2 times wider than long) with shallow basal furrows, its eyes are only flatly protruding from the head outline, and the indentation at the end of the 5th elytral stria is always distinct (Müller-Motzfeld et al., 2006). In addition, *A. carbonarium* has darkened tibiae while they are usually lighter in colour in *A. monachum* and, while the aedeagus is similar in both species, the aedeagus of *A. carbonarium* has a distinctly elongated tip (Müller-Motzfeld et al., 2006; Schmidt & Liebherr, 2009). *Agonum monachum* can also be differentiated from *A. carbonarium* by habitat, as it is a halobiont marsh species known from several regions in Bulgaria below 800 m a.s.l. (Guéorguiev & Guéorguiev, 1995; Teofilova, in prep.).

In Europe, it is strictly limited to alpine refugial habitats and populations are very disjunct (Schmidt & Liebherr, 2009). *Agonum carbonarium* inhabits a vast areal ranging from the Pyrenees over the mountains of Europe and the Caucasus to the Far East of Russia. It is a polytypic species with four subspecies: *A. carbonarium alpestre* (Heer, 1841), distributed along the southern Alps and north-western Balkans; *A. carbonarium carbonarium* Dejean, 1828, distributed in Central and Eastern Siberia; *A. carbonarium hexacoelum* (Chaudoir, 1850), distributed in the Caucasus

and northeastern Anatolia; *A. carbonarium jeannei* Aubry, 1970, distributed in the Atlantic Pyrenees and in the mountains of the Iberian Peninsula. On the Balkan Peninsula, the species was so far only recorded twice with single individuals from the Korab mountain range (on the border between Albania and North Macedonia) and the Voras (Kajmakcalan) mountain range (on the border between Greece and North Macedonia; single female collected in 2008 (Schmidt & Liebherr, 2009; Schmidt, personal communication). According to Schmidt & Liebherr (2009), populations of *A. carbonarium* from the Balkan Peninsula are with still unclear taxonomic status, mostly due to the lack of material (Schmidt, personal communication). In general, the intraspecific taxonomic classification of *A. carbonarium* is currently not sufficiently resolved (Schmidt, personal communication). Further populations in the high mountain chains of Bulgaria and the southern Balkan Peninsula can be expected and have likely been overlooked due to the rather strict specialisation of the species to very specific habitat conditions (Schmidt, personal communication). An extended examination of these microhabitats will likely shed light on the distribution of this species.

Seven species are recorded for the first time in different regions in the country: *Polystichus connexus* is new to the whole Predbalkan Region (collected in its western part); *Harpalus oblitus* is new to the Sandanski-Petrich Valley; *Leistus spinibarbis* and *Nebria jockischii* are new to the Rila Mts; *Bembidion bualei* and *Atranus ruficollis* are new to the Pirin Mts; *Pterostichus anthracinus* is reported for the first time from the whole Rhodope Mts (collected in the western part).

For some species there were only old records for some regions, dating back 20 or more years: *Calomera fischeri*, *Cicindela hybrida*, *Omophron limbatum*, *Tachyura diabrachys*, *Chlaenius spoliatus*, *Chl. festivus*, *Chl. flavipes*, *Apristus subaeneus* and *Drypta dentata* (in the Sandanski-Petrich Valley), *Cicindela sylvicola* (in the Central Balkan Mts), *Nebria brevicollis*, *Amara aenea*, *A. equestris equestris*, *Cymindis humeralis* and *C. vaporariorum* (in the Rila Mts), *Synuchus vivalis* and *Harpalus rufipes* (in the Pirin Mts). *Calathus cinctus* was previously only reported once from the Pirin Mts in a recent publication (Teofilova, 2020).

We found new upper elevation ranges for six species: *Trechus obtusus* (near Ribni Ezera Hut), *Bembidion tibiale* (near Belmeken Dam), *C. melanocephalus* (above Ivan Vazov Hut), *Atranus ruficollis*

(above Melnik), *Amara aenea* (near Belmeken Dam), *Harpalus pumilus* (under Begovitsa Hut). New lower elevation limits were found for two species: *Zabrus incrassatus* (near Sandanski) and *Apristus subaeneus* (near Sandanski). These shifts in elevation limits most likely result from the so far insufficient knowledge of the Bulgarian carabid fauna. Similar patterns have been noticed repeatedly in recent times, but still there is no clear evidence if they could indicate the species' responses to the global environmental changes (e.g. Teofilova, 2017).

All these contributions enrich the knowledge on the distribution of carabids in Bulgaria and complement the older works that were comprehensive for their time (e.g. Hieke & Wrase, 1988; Guéorguiev & Guéorguiev, 1995), as well as more recent research presenting similar data (e.g. Teofilova, 2017, 2020).

Some of the recorded species are significant in relation of their rarity. *Atranus ruficollis* is a hygrophilous stenobiont species, so far only known from the Sandanski-Petrich Valley, Maleshevska Planina Mts and Strandzha Mts (Teofilova, in prep.). Here we present a new locality and upper elevation limit for this rare species. *Graniger cordicollis* is a North-mediterranean open habitat dweller, known in Bulgaria only from the region of the Black Sea Coast (Teofilova, in prep.), and in most cases the species is only occasionally observed. *Harpalus oblitus* is a mesoxerophilous species with relatively wide distribution, but in Bulgaria it was so far known only from the region of the Black Sea Coast, Eastern Stara Planina Mts, Western Bulgaria, Kraishte and Sakar-Tundzha Regions and the Western Rhodope Mts (Teofilova, in prep.). *Chlaenius alutaceus* is a mesohygrophilous species with Balkan-Centralasian distribution that in Bulgaria is only known from the regions of the Black Sea Coast and Sandanski-Petrich Valley (Teofilova, in prep.).

All additional records of rare species significantly contribute to a better understanding of their distribution, ecology and conservation. More such studies are needed to achieve reliable and realistic estimates of population sizes and the conservation status of rare species in Bulgaria.

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Supplementary materials

01

Document title: Full record of all 299 specimens from 94 species formatted according to the guidelines of the Darwin Core (<https://dwc.tdwg.org/>)

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