

Article

Carabus (Tomocarabus) bessarabicus Fischer von Waldheim, 1823 (Coleoptera: Carabidae)—New Steppe Element for the Bulgarian Fauna from the Karst Refugium of the Chepan Planina Mt.

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Abstract: During a study of the distribution and status of *Carabus hungaricus* Fabricius, 1792 (Coleoptera: Carabidae), with pitfall traps exposed between November 2021 and April 2022, immediately south of Petrovski Krast Peak (1206 m a.s.l.) in the Chepan Planina Mt., at 1188 m a.s.l., the rare and stenotopic steppe species *Carabus bessarabicus* Fischer von Waldheim, 1823, was found for the first time in Bulgaria and the European Union. In October 2022, elytra of both species were also found by handpicking in the same area. The coexistence of these two specific and rare steppe species has been recorded only in few localities in Ukraine and Russia and in no EU country. This finding is also very interesting given the high conservation status of *Carabus bessarabicus*, the significant remoteness of its newly established locality (more than 1200 km) from its previously known range, and its strong south-westward drift. The species is used as a bioindicator for the anthropogenically uninfluenced steppe environment, which can also probably be applied in Bulgaria. The establishment of this first record for the EU also implies an increase in the conservation status of the species through its inclusion in the Union-wide conservation documents and ecological networks.

Keywords: new record; *Carabus bessarabicus*; steppe fauna; conservation



Citation: Teofilova, T.M.; Kodzhabashev, N.D. *Carabus (Tomocarabus) bessarabicus* Fischer von Waldheim, 1823 (Coleoptera: Carabidae)—New Steppe Element for the Bulgarian Fauna from the Karst Refugium of the Chepan Planina Mt. *Diversity* **2022**, *14*, 1123. <https://doi.org/10.3390/d14121123>

Academic Editors: Hongzhang Zhou and Roberto Pizzolotto

Received: 11 November 2022

Accepted: 10 December 2022

Published: 15 December 2022

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1. Introduction

One of the most studied and widespread families of Coleoptera are the ground beetles (Carabidae), which specialists around the world have successfully used as a model to demonstrate zoogeographic, phylogenetic, faunistic and ecological patterns [1–6]. Of particular interest to worldwide research on this well-studied family is the genus *Carabus* Linnaeus, 1758, which includes relatively large and attractive species [7,8]. There are 25 species of this genus in Bulgaria, belonging to 17 subgenera: *Archicarabus* (Seidlitz 1887), *Carabus* Linnaeus, 1758, *Chaetocarabus* C.G. Thomson, 1875, *Eucarabus* Géhin, 1876, *Heterocarabus* Morawitz, 1886, *Hygrocarabus* C.G. Thomson, 1875, *Lamprostus* Motschoulsky, 1865, *Limnocarabus* Géhin, 1876, *Megodontus* Solier, 1848, *Morphocarabus* Géhin, 1885, *Oreocarabus* Géhin, 1885, *Pachystus* Motshculsky, 1865, *Procerus* Dejean, 1826, *Procrustes* Bonelli, 1809, *Tachypus* Weber, 1801, *Tomocarabus* Reitter, 1896 and *Trachycarabus* Géhin, 1876 [9]. Of these, only a few species can be recognized as common: *C. coriaceus* Linnaeus, 1758, *C. violaceus* Linnaeus, 1758, *C. convexus* Fabricius, 1775, *C. montivagus* Palliardi, 1825, and *C. hortensis* Linnaeus, 1758 (the last two being typical mostly in forests), whereas the rest can be considered as rare or very rare, or having restricted or specific distributions [7,8]. Three of the species (*C. linnei* Panzer, 1810, *C. menetriesi pacholei* Sokolář, 1911 and *C. variolosus* Fabricius, 1787) had been found once or twice with one or two specimens from a single locality [7–11].

Protected under Bulgarian legislation are two species of the genus *Carabus*: *C. variolosus* and *C. hungaricus* Fabricius, 1792, and, in addition to these, *C. menetriesi pacholei* is included in Annexes 2 and 4 of the Habitats Directive. With a conservation status of European importance, *Carabus bessarabicus* Fischer von Waldheim, 1823, which is the subject of the present work, is included in Annex II of the Bern Convention as “strictly protected”. The latter species should be assigned to the complex of typical stenobiont steppe species found only in natural and specific steppe habitats of Eastern Europe and Central Asia [12–14]. Five species of *Carabus* can be characterized as similar xerophilous and steppe species with established localities in natural xerothermic habitats of Bulgaria—*C. hungaricus*, *C. cavernosus* I. Frivaldszky von Frivald, 1835, *C. morio* Mannerheim, 1830, *C. scabriusculus* Olivier, 1795 and *C. torosus* I. Frivaldszky von Frivald, 1835.

Steppe and mesoxerophilous carabids in Europe and Asia have ranges of different size and structure in open landscapes. While some species have extensive but fragmented ranges, others are highly concentrated within relatively narrow boundaries [7,8]. The xerophilous and mesoxerophilous open habitat dwellers in Bulgaria have three different basic distribution types and their overlap is only partial or completely absent [7,8]. Two of the species, *C. morio* and *C. torosus*, have ranges covering the southern parts of the Balkan Peninsula, European Turkey, much of Asia Minor, and the western coastal part of the Black Sea, reaching as far north as the Romanian Black Sea coast of southern Dobruzha to the Danube delta. The other two species, *C. cavernosus* and *C. scabriusculus*, are mesoxerophiles, the first distributed mainly in mountainous open landscapes, and the latter in natural and semi-natural treeless and agricultural lowland areas. *Carabus hungaricus* is a typical steppe inhabitant of Central and Eastern European steppe areas, and its range has a large disjunction between these two parts [7,8]. Outside these two main parts of its range, the species is found in several localities in Western Bulgaria, located in close proximity to each other [7,8,11,15–18].

The question of the origin, autochthony and contemporary status of steppe habitats in Bulgaria is much discussed among Bulgarian biologists [19–21], and there has never been a unified opinion among botanists and zoologists. In spite of the numerous scientific speculations about the primary and secondary nature of the preserved xerothermic habitats [22], there are a number of steppe elements in Bulgarian fauna that indicate the presence of refugia, where they have managed to preserve and exist [21,23]. One of these thermophilic karst refugia of steppe stenobionts is the Chepan Planina Mt., where the opinion of many Bulgarian biologists coincides regarding the preservation of primary steppe elements [24,25]. This mountain is part of the Natura 2000 SCI BG0000322 “Dragoman” and is the locality of the steppe stenobiont *Carabus hungaricus*, and the natural steppe habitats 62A0, 6210, 6110 and 40A0* are registered as its habitats [24,25].

This paper presents the first geographic report for Bulgaria and the European Union of the rare and stenotopic Bessarabian ground beetle (*Carabus bessarabicus*), also providing information on the nature of its habitat and some relationships with other species.

2. Materials and Methods

During a survey of the distribution and status of the Hungarian ground beetle (*Carabus hungaricus*) in Bulgaria, more than 150 pitfall traps were set in more than 30 sampling sites in Western Bulgaria, mainly in the Sofia basin, its adjacent mountains (parts of the Western Stara Planina Mts. range) and part of the Western Forebalkan. Pitfall traps were made of cut 2 L plastic bottles, buried at the level of the ground surface and filled with 10% formaldehyde.

The first specimen of *Carabus bessarabicus* was collected in April 2022 in a pitfall trap under and south of the Petrov Krast Peak (1206 m a.s.l.)—the highest point of the Chepan Planina Mt. The sampling site represents a dry stony slope with low grasses, dwarf almond (*Prunus tenella* Batsch, 1801 = *Amygdalus nana* L.) and single lilac (*Syringa vulgaris* L.) bushes. Later, in October, a pair of elytra was collected under a stone in a similar habitat, south-west of the Petrov Krast Peak.

Specimens were identified by the first author. The identification at the subgenus and species levels is according to Kryzhanovskij [5,13] and Turin et al. [7].

The identified whole specimen is pinned and deposited in the first author's collection in the Institute of Biodiversity and Ecosystem Research (BAS, Sofia), and the elytra of the second specimen are preserved in ethanol.

3. Results

The present study gives information about one new species record for the country. Two specimens of *Carabus bessarabicus* were collected and photographed for the first time in Bulgaria. This finding is also the first record of the species in the whole European Union.

Family: Carabidae Latreille, 1802

Subfamily: Carabinae Latreille, 1802

Tribe: Carabini Latreille, 1802

Species: *Carabus (Tomocarabus) bessarabicus* Fischer von Waldheim, 1823

Synonyms: *tauricus* Roeschke, 1897; *melambaphus* Fischer von Waldheim, 1832; *platyscelis* Fischer von Waldheim, 1828; *steppensis* Motschulsky, 1844.

Data: Western Stara Planina Mts. region, Chepan Planina Mt., NE Dragoman: (1) south of Petrovski Krast Peak, 42°56'49.3" N, 22°57'34.2" E, 1188 m, 1♀ (Figure 1), 20 November 2021–16 April 2022, pitfall trap, leg. T. Teofilova, N. Kodzhabashev, G. Hristov; (2) southwest of Petrovski Krast Peak, 42°56'41.7" N, 22°56'58.4" E, 1020 m, similar habitat, 1 ex. (found dead under stone), 16 October 2022, leg. T. Teofilova. Localities are presented on Figure 2. During the review process of this paper, we collected two male specimens. They were found in the pitfall traps (sampling period 22 August–19 November 2022) in our sampling site under the Petrov Krast Peak. We have not included them in the analysis since we are still processing the material and we think it is possible that other specimens may appear. Including them in the present paper will require serious rearrangement of all data. Furthermore, we intend to prepare another paper with detailed taxonomical and morphological data, pictures and diagnostic analysis of the subspecies belonging of the Bulgarian population.



Figure 1. Habitus of the female *Carabus bessarabicus* from the Chepan Planina. Scale bar 5 mm.

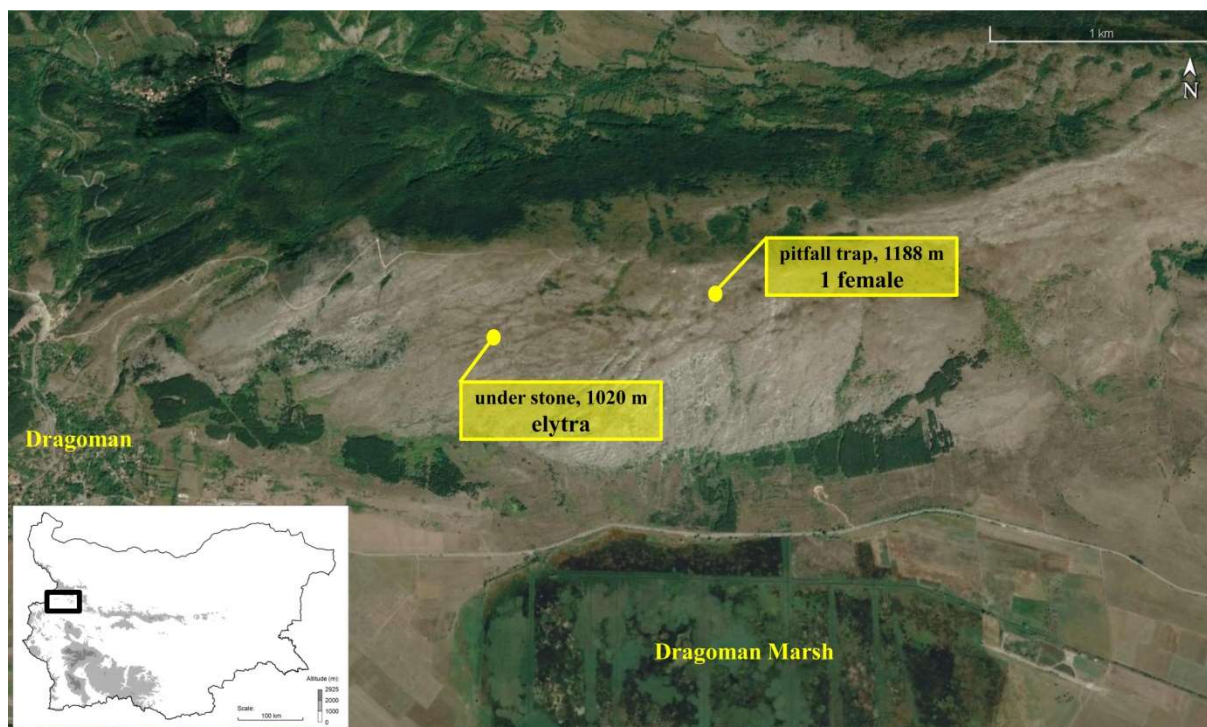


Figure 2. Location of the Chepan Planina Mt. and the two localities where *Carabus bessarabicus* was found.

4. Discussion

4.1. Range

The range of *Carabus bessarabicus* includes Moldova (Bessarabia) (town of Bendery), Ukraine (Crimea, Kherson Oblast (province), Zaporozhye Oblast, Donetsk Oblast and Lugansk Oblast), Russia (North Caucasus, Kalmykia, Dagestan, Krasnodar, Rostov Oblast, Volgograd Oblast, Saratov Oblast, Altai), central and south-eastern Kazakhstan and Kyrgyzstan; alternatively, for short, the continental steppe region of south-eastern Europe and central Asia [7,13].

According to the last edition of the Catalogue of the Palaearctic Carabidae, the species currently includes two subspecies: *C. bessarabicus bessarabicus* Fischer von Waldheim, 1823 from Moldova and Ukraine, and *C. bessarabicus concretus* Fischer von Waldheim, 1823 distributed in the Central European Territory and South European Territory of Russia, and in West Siberia in Asia [26].

We believe that *Carabus bessarabicus* has an isolated relict population in Bulgaria and, so far, we exclude the chance of introduction, since the specimens were found in a specific and quite isolated habitat with no serious anthropogenic disturbance and human presence (except some mostly walking or bicycle-riding tourists and nature admirers).

4.2. Diagnostics

The identified female specimen possesses all taxonomic characteristics proving its subgenus and species. The subgeneric specifics of *Tomocarabus* are [7,13]: body size average for the genus (14–25 mm); body relatively short, broad, and convex; labial palps have two setae in the middle; apical segments of all palps expanded, triangular in shape and axelike in males; submentum with setae-bearing pores; laterally, the pronotum is narrowly edged and has 1–3 setae-bearing pores in the middle, at its widest part; and ventral sternal furrows are well developed, and may sometimes be interrupted. In representatives of the subgenera *Pachystus* and *Procrustes*, which in the same habitat types in Bulgaria are represented by the species *C. hungaricus*, *C. cavernosus* and *C. coriaceus*, the significant differences are

the absence of setiferous pores on the pronotum and the presence of numerous setae on labial palps.

The specific diagnostic characters of *Carabus bessarabicus* are [7,13]: length 18–26 mm; body moderately convex, monochrome black, with a weakly expressed luster; head with strongly convex eyes; antennae relatively short, not reaching the end of the metepisterna; maxillae short, weakly punctate, with a curved and pointed tip, sometimes with small and fine superficial furrows; pronotum is strongly convex, with maximum width in the middle, narrowly edged and evenly curved in both directions lateral beads, and relatively short, rounded at the apex and slightly back and down curved, barely protruding from the base of the pronotum posterior angles; elytra moderately convex, oval, with rounded shoulders and narrowly edged lateral margin; their sculpture is composed of very small, weakly convex and uniform denticles forming numerous longitudinal irregular rows; striae of elytra are hardly discernible, finely punctate, with barely seen and small primary pores; metepisterna are slightly longer than wide and weakly punctate; furrows of the abdominal sternites are sharp and well-distinguished; males have four enlarged protarsomeres; aedeagus is considerably broad, strongly and evenly curved, gradually narrowed, and hook-shaped and enlarged towards the apex.

Two subspecies of *C. bessarabicus* are recognized [5,7,13,26,27]—eastern (ssp. *concretus*) and western (ssp. *bessarabicus*), with a presumed border of distribution at the river of Don, and a kind of hybrid zone between the rivers of Don and Volga. According to Kryzhanovskij [13], the southeastern border of the species is not clear and requires further investigation. For this part of the range, from the Kyrgyzstan area, Lassalle [28] reported a third subspecies, *C. b. melambaphus*, which according to all modern catalogues is currently considered synonymous with *C. b. concretus*.

According to Kryzhanovskij [5], the westernmost part of the species range is Moldova (Bessarabia), from where the species name comes. According to the same author, the essential differences between the two subspecies are the following: (1) in the nominate subspecies, the body is relatively wider and the elytra are relatively more elongate; (2) in the nominate subspecies, the elytral structure is composed of well-defined grains forming distinct rows; and (3) in the nominate subspecies, the primary pores are small but clearly distinguishable.

Morphologically, the specimens we captured have some characters of the eastern subspecies *concretus*, whose body is relatively narrower, and elytra are relatively longer, with very small, hardly discernible granules forming inconspicuous rows, and primary pores are very small and difficult to distinguish [13]. However, they have some characteristics of both subspecies, and cannot be attributed to either. We suggest that it is most likely that Bulgarian specimens belong to an entirely separate subspecies, given the enormous distance from the known modern range limits. The region where *Carabus bessarabicus* was collected has never been studied in respect of its carabid fauna, so it is normal that surprising data are found. The collection and study of morphological characters of more individuals of both sexes and larvae are necessary to prove the subspecies belonging of Bulgarian population, and modern phylogenetic methods should also be applied as confirmation.

4.3. Relative Density

The pitfall-trapping method allows the calculation and comparison of some basic biotic parameters of the environment. In total, the seven traps set in the sampling site in the Chepan Planina have realized 2016 trap-days (288 days × 7 traps) during the whole study period (25 May 2021–16 April 2022). A total of 453 carabid specimens were collected. The mean active dynamic density was 22.47 individuals per 100 trap-days. The activity density of the captured *C. bessarabicus* individual is 0.05 ex. per 100 trap-days, which indicates its very low occurrence. In comparison, in the same habitat, the maximum activity density is 12.5 ex./100 trap-days of *Calatus distiguendus*, and 3.6 ex./100 trap-days for the ecologically plastic *Carabus coriaceus*.

Only 24 specimens of five species were captured during the sampling period when *C. bessarabicus* was collected (22 November 2021–16 April 2022), and the average activity density for this period was only 3.23 ex./100 trap-days. The dominant species during this period was *C. convexus* with 18 specimens and activity density of 2.42 ex./100 trap-days, while the activity density of *C. bessarabicus* was 0.13 ex./100 trap-days.

During a survey of the abundance, biotopic distribution and ecological features of the habitats of *C. bessarabicus* in the “Rostovsky” Reserve, over a five-year period (2007–2011), Arzanov et al. [14] recorded strong fluctuations ranging from 0 to 10.9 ex./100 trap-days. Averaged over the five-year period, including the two years with zero activity, the dynamic density was 2.9 ex./100 trap-days. Considering the method applied by the researchers—setting a large number of traps (20–50) for a short period (2–5 days) coinciding with the active season of *C. bessarabicus*, it can be assumed that, in an annual aspect, the dynamic density of the species is many times lower, i.e., the species is much rarer.

4.4. Coexistence with Other Species

During our study, 29 carabid species were collected in the pitfall traps (see Appendix A). The representatives of the large beetles of the genus *Carabus* were five species—*C. coriaceus*, *C. convexus*, *C. bessarabicus*, *C. hungaricus* and *C. cavernosus*. While the first two species are usual and common for this area (and Bulgaria as a whole), the remaining three species are relatively rare and have restricted ranges. In the same area, in October 2022, elytra of both *C. bessarabicus* and *C. hungaricus* were collected under stones in close proximity to each other (about 25 m). The coexistence of the two specifically rare steppe species has been recorded in only a few localities of Ukraine and Russia and in no European Union country. According to the literature [5,7,13,14], the combination of the two species inhabiting the same localities has also not been recorded, at least not in the last 50 years. The occurrence of *C. bessarabicus* in the same habitat as the *C. hungaricus* and *C. cavernosus* makes the site even more unique for the genus *Carabus*. Another large-sized carabid found both in traps and with handpicking is *Zabrus spinipes* (Fabricius, 1798). While searching for specimens under stones, we also found many elytra of large Tenebrionidae species (most probably *Gnaptor* Brullé, 1832 or *Blaps* Fabricius 1775).

4.5. Coexistence with Potential Predators and Facultative Commensal Vertebrates

During our study of the fauna in the area where we recorded the Bessarabian ground beetle, we also found some of its potential invertebrate predators—the banded centipede *Scolopendra cyngulata* Latreille, 1829 (Chilopoda: Scolopendridae) and some wolf spiders (Arachnida: Lycosidae), such as *Hogna radiata* (Latreille, 1817) and *Lycosa* Latreille, 1804. We also established the following potential vertebrate predators: three species of lizards—copper skink *Ablepharus kitaibelii* (Bibron & Bory de Saint-Vincent, 1833), wall lizard *Podarcis muralis* (Laurenti, 1768), green lizard *Lacerta viridis* (Laurenti, 1768); and three species of insectivorous mammals—European mole *Talpa europaea* Linnaeus, 1758, lesser white-toothed shrew *Crocidura suaveolens* (Pallas, 1811) and bicolored white-toothed shrew *Crocidura leucodon* (Hermann, 1780). Regarding the potential commensals of *C. bessarabicus*, according to some researchers, during daylight hours and during diapause periods, the Bessarabian ground beetle inhabits the burrows of different small mammals [14,29–31]. In the area of its new locality, we recorded three rodent species: Ural field mouse *Apodemus uralensis* (Pallas, 1811), common vole *Microtus arvalis* (Pallas, 1778) and pine vole *Microtus subterraneus* (de Selys-Longchamps, 1836).

4.6. Description of the Habitat and the Present Steppe Elements

According to the available literature [5,7,8,13,29–37], it seems that *C. bessarabicus* has no strict dependence on the exact type of steppe habitat. It inhabits virgin steppes, grassland steppes in varying degrees of degradation, mountain steppes (in the Caucasus up to 2000 m), semi-desert steppes, etc. The main threats to the species are ploughing,

overgrazing by livestock, fires and chemical contamination with pesticides and fertilizers, even when used in adjacent areas.

The habitat where *C. bessarabicus* was found (Figure 3) is a montane petrophytic (karst) steppe, with many steppe elements that provide the requirements of specific stenobionts; *C. hungaricus* has also been found in the same location, as well as many other specific animal and plant species. The exposure of the site is southerly and sunny, and the substrate is of rendzina soils (humic-carbonate). The surface is strewn with numerous large limestone rock fragments, which during the summer months accumulate hot air and during cold sunny days warm the ground surface. The altitude of about 1000 to 1200 m a.s.l. determines the mountainous climatic conditions which, in combination with the karst bedrock, have been the determining factors in the formation of this peculiar steppe complex. The sparse vegetation at the Chepan mountain ridge, which dries out during the summer months, and the lack of woody vegetation for resting of animals have made this part unsuitable for livestock grazing, which has been crucial for the conservation of the steppe biota. The territory is also unsuitable for agriculture, given the slope, the stony soil, the lack of water sources for irrigation, and the prolonged period of drought during the summer months. Afforestation, which has taken place in the foothills, is impossible in the ridge parts, given the soil substrate and the long seasonal drought. The only serious problems facing the conservation of the area are fires, which have been recorded annually, but mainly in the lower parts, and quarrying, which is the greater threat to the biodiversity.



Figure 3. Habitat in the Chepan Planina Mt., where *Carabus bessarabicus* was found in pitfall traps. (A) general view of the location; (B) view from the sampling site towards Dragomansko Blato Marsh and a quickly developing quarry (on the hill at the back).

The landscape of the studied localities is primary karst steppe, mainly south or south-east facing with a predominance of xerophytic herbaceous and shrub vegetation. Due to their unsuitability for agricultural and forestry activities, such areas have remained unaffected by anthropogenic interference and have proved to be refugia of the steppe biota. The location of this xerophytic landscape is behind the main range of the Stara Planina Mts. and probably the Iskar Gorge and the Iskar River have functioned as a corridor for the steppe biota, mainly represented in Northern Bulgaria. Similarly, behind the range of the Stara Planina, in the vicinity of the Sofia basin, many animal species widespread in Northern Bulgaria, but absent in other territories of Southern Bulgaria, were found [22]. According to authors of a previous paper [22], the Sofia field and its surroundings have proved to be an important refugium for many steppe species that were widespread in Northern Bulgaria in the past, but the cultivation of soils for agricultural purposes, the drying up of shallow water basins, and the changes in the microclimate have led to their severe degradation or complete extinction. In this way, the range of many steppe

species was disjoined and they were preserved in refugia, in karst terrains unsuitable for agriculture, such as those of the Chepan Planina Mt. At the present moment, there are six quarries already functioning in close vicinity of the Chepan Planina Mt., and there are also other intentions for further development of such investments. We find these concessions endangering the peculiar stenobiont flora and fauna there, which is of great conservation significance. Thus, we intend to start a procedure for the protection of the whole territory of the Chepan Planina Mt.

According to Popov et al. [21], at the end of the Pleistocene and the beginning of the Holocene, significant climatic changes had a considerable impact on the fauna of Bulgaria. For many of the widespread steppe species, and the steppe faunal complex in general, a gradual shift in the eastern limit of distribution to the west began, and they either became rare in Bulgaria or became extinct. Many of these species still inhabit the Ukrainian-Kazakh steppes, while others, mainly distributed in northern Bulgaria, continue to shift their eastern borders westwards. According to the same authors, the disjunctions in the Eurasian steppe faunal complex and steppe refugia arose in this way. Having a similar type of modern distribution are some steppe carabids such as *C. bessarabicus*, *C. hungaricus*, *Calosoma denticolle* Gebler, 1833, *Taphoxenus gigas* (Fischer von Waldheim, 1823). Their ranges have undergone severe shortening and fragmentation, but they have managed to persist in various parts of the eastern and south-eastern European steppes, and many of them also in the northern parts of the central Asian steppes [5,13].

4.7. Conservation Status, Conservation Importance and Necessary Measures for Effective Protection of *Carabus bessarabicus*

The finding of this extremely rare and globally threatened species can be considered, if not a sensation, at least a very interesting scientific event for the Bulgarian and European fauna, given its modern range and the information about its rapid extinction. *Carabus bessarabicus* is rare throughout its range and, according to the literature, it is becoming increasingly rare, mainly due to the destruction of its habitats [5,7,13,14,29,34]. Major problems for the conservation of all stenotopic steppe species are the rapid destruction and increasing threats to the survival of natural steppes on a global scale resulting from their intercontinental location, the lack of synchrony in the conservation institutions of non-EU countries, the lack of up-to-date information on the IUCN listing of such species and the lack of adequate international institutions to take rapid conservation measures for species that are dependent on non-EU countries.

At present, *C. bessarabicus* is enlisted in only one conservation document of Europe—Annex II (Strictly protected fauna species) of the Bern Convention on the Conservation of European Wildlife and Natural Habitats. The species is included in the Red Data Books of all countries and regions where it has been recorded—Moldova (considered extinct), Ukraine and Russia (Federal Red Data Book and more than 20 regional Red Data Books).

The main reason and motive for the lack of adequate conservation measures for the protection of this very rare and globally threatened species are: the lack of registration of the species in an EU country; the lack of information on its current status, given the main part of the species' range being in Russia; and the lack of modern studies on the status of the species, which according to the Red Books of many of the administrative divisions of the Russian Federation is already extinct or in critical condition.

The necessary measures to protect the species are:

Internationally:

1. Preparation of documentation for inclusion of the species in the IUCN Red List;
2. Proposal for inclusion of the species in the Habitats Directive.

From a national perspective:

1. Inclusion of the species in Annexes 2 and 3 of the Biological Diversity Act;
2. Taking action to designate the Chepan Planina Mt. as a Managed Reserve;
3. Study of the status of the species and preparation of an Action Plan for its protection;
4. Inclusion of the species in the monitoring system of Bulgaria;

5. Inclusion of the species in the Red Data Book of Bulgaria.

5. Conclusions

The record of *Carabus bessarabicus* in Bulgaria represents an extremely interesting finding, given the high conservation status of this beetle, the significant remoteness (more than 1200 km) of the newly established locality from its previously known range and its strong south-westward divergence.

It seems that *Carabus bessarabicus* has an isolated relict population in Bulgaria and we exclude the chance of introduction, since it was found in a specific and quite isolated habitat with no serious anthropogenic disturbance. We also have reasons to suggest that, in Bulgaria, *Carabus bessarabicus* is represented by different, undescribed subspecies. Unfortunately, the material we obtained is not enough for the description of a new taxon.

The species, in the localities where it has been found so far, is used as a bioindicator for anthropogenically unaffected steppe environments, which can probably also be applied in Bulgaria.

Both the species and its location are of conservational importance and we believe that they (*Carabus bessarabicus* and the Chepan Planina Mt.) deserve to be put under protection on a national level.

Furthermore, the finding of new, very rare steppe stenobionts for the EU increases the conservation importance and responsibility of the Natura 2000 network and warrants the inclusion of these species in national and European conservation legislation in order to ensure their future.

Author Contributions: Conceptualization, T.M.T. and N.D.K.; methodology, T.M.T. and N.D.K.; formal analysis, T.M.T. and N.D.K.; investigation, T.M.T. and N.D.K.; data curation, T.M.T.; writing—original draft preparation, T.M.T. and N.D.K.; writing—review and editing, T.M.T. and N.D.K.; visualization, T.M.T.; supervision, T.M.T.; project administration, T.M.T.; funding acquisition, T.M.T. and N.D.K. All authors have read and agreed to the published version of the manuscript.

Funding: In June–August 2022, the field work for this research was partly funded via Project BG16M1OP002-3.020-0002-C01 “Development of an Action plan for the species *Carabus (Carabus) menetriesi pacholei* Sokolář, 1911 and *Carabus (Pachystus) hungaricus* Fabricius, 1792”, funded by Operational Programme Environment 2014–2020, co-financed by the European Union through the European Regional Development Fund.

Institutional Review Board Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: Authors express their gratitude to Boyan Zlatkov for his help with the photograph of the female specimen, and Kalina Miteva and Georgi Hristov (all from IBER–BAS) for their assistance with the collection of the material.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A Species List of the Carabids Collected with Pitfall Traps in the Sampling Site in the Chepan Planina Mt., in the Period 25 May 2021–22 August 2022

Amara (Amara) aenea (De Geer, 1774)
Amara (Amara) familiaris (Duftschmid, 1812)
Amara (Amara) lunicollis Schiødte, 1837
Amara (Xenocelia) bischoffi Jedlička, 1946
Calathus (Calathus) distinguendus Chaudoir, 1846
Calathus (Calathus) fuscipes Goeze, 1777
Carabus (Pachystus) cavernosus I. Frivaldszky von Frivald, 1838
Carabus (Pachystus) hungaricus Fabricius, 1792
Carabus (Procrustes) coriaceus Linnaeus, 1758
Carabus (Tomocarabus) bessarabicus Fischer von Waldheim, 1823
Carabus (Tomocarabus) convexus Fabricius, 1775

Cymindis (Cymindis) humeralis (Geoffroy in Fourcroy, 1785)
Harpalus (Harpalus) caspius (Steven, 1806)
Harpalus (Harpalus) rufipalpis Sturm, 1818
Harpalus (Harpalus) sulphuripes Germar, 1823
Harpalus (Harpalus) tardus (Panzer, 1796)
Harpalus (Semiophonus) signaticornis (Duftschmid, 1812)
Laemostenus (Pristonychus) terricola (Herbst, 1784)
Lebia (Lebia) cruxminor (Linnaeus, 1758)
Licinus (Licinus) cassideus (Fabricius, 1792)
Molops (Molops) rufipes golobardensis Mlynář, 1977
Ocys quinquestriatus (Gyllenhal, 1810)
Ophonus (Hesperophonus) azureus (Fabricius, 1775)
Ophonus (Metophonus) melletii (Heer, 1837)
Ophonus (Metophonus) parallelus (Dejean, 1829)
Philorhizus notatus (Stephens, 1827)
Platyderus (Platyderus) rufus (Duftschmid, 1812)
Pterostichus (Feronidius) incommodus Schaum, 1858
Zabrus (Pelor) spinipes (Fabricius, 1798)

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