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Ground beetles (Coleoptera: Carabidae) from the region of Cape Emine (Central Bulgarian Black sea coast). Part I. Taxonomic and zoogeographic structure, life forms, habitat and humidity preferences

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Abstract. For the first time the carabid fauna of the area of Cape Emine (the middle of the Bulgarian Black sea coast) was studied. Over the period 2010 – 2012 adult carabid beetles were collected. Investigations were performed at 13 sampling sites and pitfall traps were used. During the study a total of 12618 specimens were captured. They belonged to 134 species, classified into 46 genera, 18 tribes, and 3 subfamilies. *Dyschirius rufipes* Dejean, 1825 and *Laemostenus janthinus* (Duftschmid, 1812) were reported as new species for the carabid fauna of Bulgaria. Three species were new for the fauna of the Bulgarian Black Sea coast. Fifty-four species were defined as new for the area of Cape Emine. Two endemics were found: *Pterostichus merkli* Frivaldszky, 1879 (Bulgarian endemic) and *Cychrus semigranosus balcanicus* Hopffgarten, 1881 (Balkan endemic). Species of ground beetles were characterized and classified according to their zoogeographical belonging, degree of endemism and rarity, habitat and humidity preferences; the life forms they refer to were determined.

Keywords: Carabidae, ground beetles, Bulgarian Black Sea coast, Cape Emine, zoogeography, habitats, life forms.

Introduction

The territory of the zoogeographical region of Bulgarian Black Sea coast (Gruev & Kuzmanov 1994) is one of the most interesting, but not sufficiently explored areas in relation to the carabid fauna. Of particular scientific interest is Cape Emine (the middle of the Bulgarian Black sea coast).

Geo-strategic location of this part of the coast, specific environmental conditions, and the presence of various habitats has led to the creation of unique biocoenoses and original fauna. The climate specificity, coupled with a variety of plant formations have predetermined the forming of a wide range of carabid species and their communities

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(Teofilova *et al.* 2012c).

The area of Cape Emine is too outstanding regarding its main priorities. Some clashes between developers and environmentalists have occurred there and are still continuing. Natural resources are the reason for investors' appetites, associated with construction and drastic habitat and landscape changes, directly affecting the spatial distribution of the carabid communities (Pena *et al.* 2003, etc.). In addition, in the selected area comprehensive biological and ecological analyses are missing.

The study aimed at clarifying the species composition and analyzing of the ecological and zoogeographical structure of the carabid fauna and subsequent assessment of the anthropogenic impact in the area.

Material and Methods

In connection with the participation in a project for biological monitoring studies in the area, a series of observations and samplings were carried out in 2010 – 2012. Ground beetles were collected with terrestrial pitfall traps (Barber 1931; Hertz 1927; Dahl 1896). The traps were made of plastic bottles, buried at the level of the substrate. As fixation fluid a 4% solution of formaldehyde was used. The investigations were performed at 13 different types of sampling sites (pine plantation, oak forests, steppe-like and riparian habitats, wheat fields and ecotones).

Specimens were identified according to: Kryzhanovskij (unpublished data), Arndt *et al.* (2011), Lindroth (1974), Hůrka (1996), Reitter (2006), Trautner & Geigenmüller (1987). Systematics follows Kryzhanovskij *et al.* (1995).

According to their zoogeographical belonging species were separated in zoogeographical categories and faunal types according to Vigna Taglianti *et al.* (1999) with some changes (Kodzhabashev & Penev 2006). Categorization of the species in respect of their life forms was made according to the classification of Sharova (1981). The most favourable and typical habitats were pointed and species were divided into groups according to their habitat and humidity preferences.

Results

Diversity of species and taxonomic structure

An inventory of the carabid fauna is made for the region of Cape Emine, where similar studies have not been conducted so far. During the study, total of 12618 specimens were captured. Beetles belonged to 134 species, classified into 46 genera, 18 tribes, and 3 subfamilies (Cicindelinae, Carabinae, Brachininae) (see **Appendix**). This figure represents respectively 18% of all established for Bulgarian carabid fauna species, 37% of the genera and 49% of the tribes (Guéorguiev & Guéorguiev 1995). Regarding the known Carabidae taxa from the Bulgarian Black Sea coast (Teofilova *et al.* 2012b), the ones found during the investigation represented respectively 29% of the species, 48% of the genera and 55% of the tribes.

Generally, the least-represented is the subfamily Cicindelinae – with only 2 species from 1 genus and less than 1% of the number of identified specimens. Subfamily Brachininae is represented also with only 1 genus, but there are 8 species and 14.5% of the captured specimens referring to it. Most numerous is the subfamily Carabinae – 16 tribes, 44 genera, 124 species and 85.5% of the specimens (**Table 1**).

Taxonomic structure showed the highest proportion attributable to the representatives of tribe Harpalini (**Fig. 1**). Similar results were obtained by Kodzhabashev & Penev (2006) and Popov & Krusteva (1999) and this group is also characteristic of the Bulgarian Black Sea coast as a zoogeographical region (Teofilova *et al.* 2012b; Teofilova *et al.* 2011).

Table 1. Taxonomic structure of the established carabid complex.

Subfamily	**Tribe**	**Number of genera**	**%**	**Number of species**	**%**	**Number of specimens**	**%**
Cicindelinae	Cicindelini	1	2,2	2	1,5	8	0,06
Carabinae	Nebriini	2	4,4	2	1,5	1939	15,4
	Notiophilini	1	2,2	3	2,2	83	0,7
	Carabini	2	4,4	9	6,7	1967	15,6
	Cychrini	1	2,2	1	0,7	11	0,09
	Dyschiriini	1	2,2	1	0,7	1	0,01
	Trechini	1	2,2	2	1,5	320	2,5
	Tachyini	2	4,4	2	1,5	3	0,02
	Bembidiini	2	4,4	10	7,5	122	1,0
	Pterostichini	5	10,9	7	5,2	958	7,6
	Sphodrini	2	4,4	10	7,5	1044	8,3
	Platynini	2	4,4	2	1,5	546	4,3
	Amarini	2	4,4	11	8,2	110	0,9
	Harpalini	12	26,0	47	35,1	1468	11,6
	Callistini	2	4,4	5	3,7	1944	15,4
	Licinini	1	2,2	1	0,7	1	0,01
	Lebiini	6	13,0	11	8,2	260	2,1
Brachininae	Brachinini	1	2,2	8	6,0	1832	14,5
	Total:	46	100%	134	100%	12618	100%

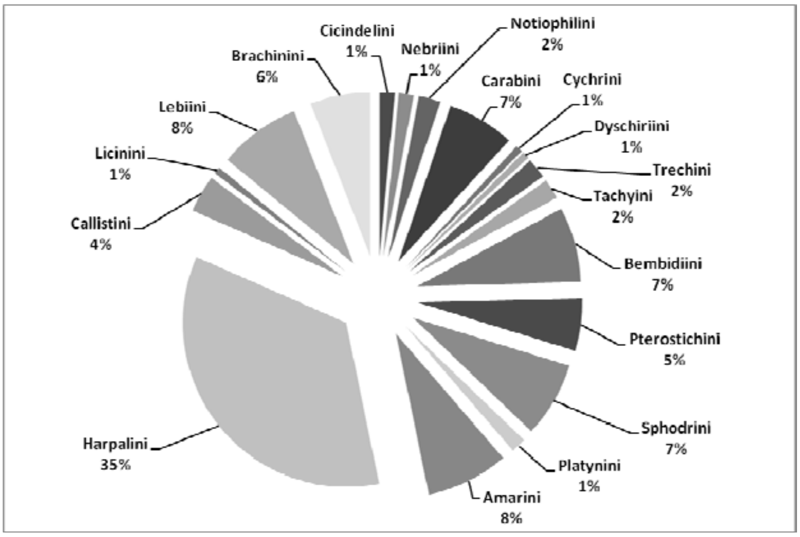

Fig. 1. Proportions of the species among the tribes.

Based on the number of specimens, the most numerous tribes were Carabini, Callistini and Nebriini (**Fig. 2**).

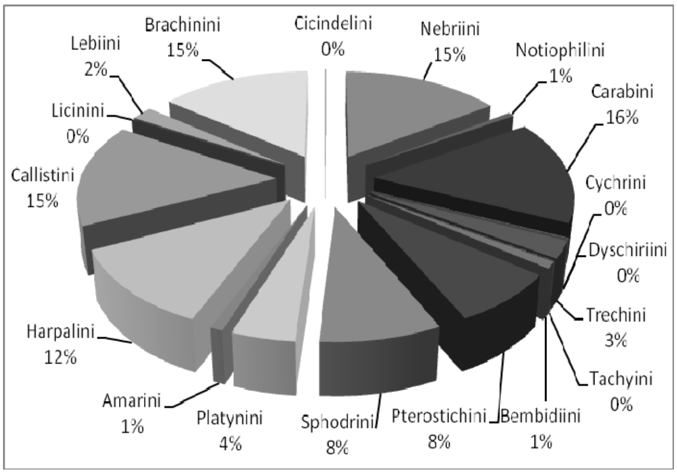

Fig. 2. Proportions of the species among the tribes.

In the open habitats Harpalini and Callistini predominated, and to a lesser extent – Sphodrini and Brachinini. In the transitional habitats, with increasing humidity, we have observed a greater proportion of the tribe Carabini. In less exposed areas a higher proportion of the tribe Pterostichini is present. In the forest habitats normally more representatives of the tribes Pterostichini and Carabini are present. High humidity along the banks of the rivers appeared to be the defining factor for the distribution of the tribes Platynini and Nebriini.

Results of this study showed that the most species rich genus is *Harpalus* Latreiille, 1802 (21 species), followed by the genera *Ophonus* Dejean, 1821 (12 species), *Amara* Bonelli, 1810 (10 species), *Bembidion* Latreille, 1802 (9 species), *Brachinus* F. Weber, 1801 (8 species), *Carabus* Linnaeus, 1758 and *Calathus* Bonelli, 1810 (7 species each).

The most numerous genera in regard to the collected specimens are: *Chlaenius* Bonelli, 1810 (1941 indvs.), *Nebria* Latreille, 1825 (1890 indvs.), *Brachinus* (1832 indvs.) and *Carabus* (1776 indvs.), *Calathus* (955 indvs.), *Pterostichus* Bonelli, 1810 and *Harpalus* (885 indvs. each) and *Anchomenus* Bonelli, 1810 (399 indvs.).

The most abundant species are: *Chlaenius nitidulus* (Schrank, 1781) (1927 indvs.), *Nebria brevicollis* (Fabricius, 1792) (1890 indvs.), *Carabus coriaceus* Linnaeus, 1758 (1240 indvs.), *Brachinus crepitans* (Linnaeus, 1758) (1213 indvs.), *Pterostichus melas* (Creutzer, 1799) (880 indvs.), *Calathus fuscipes* (Goeze, 1777) (623 indvs.), *Harpalus dimidiatus* (Rossi, 1790) (555 indvs.), *Brachinus psophia* Serville, 1821 (458 indvs.), *Anchomenus dorsalis* (Pontoppidan, 1763) (399 indvs.), *Trechus quadristriatus* (Schrank, 1781) (319 indvs.), *Carabus convexus* Fabricius, 1775 (288 indvs.).

New, endemic and rare species

During the investigation some species with conservation and biogeographical significance were found, including endemic, new, rare or species with limited distribution:

- ✓ *Pterostichus (Pterostichus) merkli* – Bulgarian endemic;
- ✓ *Cychrus semigranosus balcanicus* – Balkan endemic.

Two species are new to the carabid fauna of Bulgaria:

- ✓ *Dyschirius (Dyschiriodes) rufipes*;
- ✓ *Laemostenus (Laemostenus) janthinus.*

Three species are new to the fauna of the Bulgarian Black Sea coast:

- ✓ *Amara (Amara) communis* Panzer, 1797;

- ✓ *Zabrus (Pelor) graecus* Dejean, 1828;
- ✓ *Harpalus (Harpalus) quadripunctatus* Dejean, 1829.

Fifty-four species are established as new for the area of Cape Emine due to the lack of studies in this region. Thus, the number of the species, which are new to the region, increases to fifty-nine.

Some of the species (e. g. *Carabus scabriusculus* Olivier, 1795) are rare species across their entire area, and others (e. g. *Carabus ullrichi* Germar, 1824, *Carabus intricatus* Linnaeus, 1761, *Stomis pumicatus* (Panzer, 1796) and *Leistus rufomarginatus* (Duftschmid, 1812) have become rare under the action of anthropogenic pressures and changes in their primary habitats. *Carabus cancellatus* Illiger, 1798, *Calosoma inquisitor* (Linnaeus, 1758) and *Calosoma sycophanta* (Linnaeus, 1758) are usually highly sensitive to chemical agents and any intensification of the agriculture leads to severe reductions in their range and numbers (Huusela-Veistola 2000). Typical stenotopic species are some intrazonal psammobionts (*Harpalus melancholicus* Dejean, 1829), halobionts (*Bembidion inoptatum* Schaum, 1857, *Microlestes fulvibasis* Reitter, 1900) and inhabitants of coastal habitats (*Dyschirius rufipes*, *Chlaenius festivus* (Panzer, 1796), *Chlaenius vestitus* (Paykull, 1790), as well as the most of the representatives of the genus *Bembidion*). Inhabitants of the mesophilous forests are: *Leistus rufomarginatus*, *Calosoma sycophanta*, *Carabus intricatus*, *Cychrus semigranosus*, *Stomis pumicatus*, while the occupants of the xerophilous ones are: *Notiophilus rufipes* Curtis, 1829, *Calosoma inquisitor*, *Carabus montivagus* Palliardi, 1825, *Myas chalybaeus* (Palliardi, 1825), *Harpalus politus* Dejean, 1829. *Cicindela germanica* Linnaeus, 1758, *Amara anthobia* Villa, 1833, *Harpalus honestus* (Duftschmid, 1812), *Harpalus hospes* Sturm, 1818, *Lebia cyanocephala* (Linnaeus, 1758) and *Cymindis ornata* Fisher-Waldheim, 1824 are found only in dry, open habitats.

Rare ground beetle species in the Cape Emine area are: *Amara reflexicollis* Motschulsky, 1844, *Harpalus hospes*, *Harpalus politus*, *Harpalus oblitus* Dejean, 1829, *Ophonus oblongus* (Schaum, 1858), *Microlestes maurus* (Sturm, 1827), *Brachinus plagiatus* Reiche, 1868.

Some of the rare species are poorly studied in respect of their way of life, which complements the scientific interest and the need for their protection (e. g. *Brachinus alexandri* F. Battoni, 1984, *Notiophilus interstitialis* Reitter, 1889 and *Notiophilus danieli* Reitter, 1897).

Zoogeographical peculiarities

Carabid species belonged to 25 zoogeographical categories or chorotypes, grouped into 4 major “faunal types” (or complexes). All the zoogeographic complexes show similar percentage of species (**Fig. 3**), but the Mediterranean (*s. lato*) type prevailed, consisting of 37 (28%) species, distributed in the so-called region of the “Ancient Mediterraneum” (Kryzhanovskij 1965; Popov 1927). This complex is closely followed by the European-Asiatic faunal type (species ranges lie between the European-Siberian and Mediterranean zones), which includes 36 species (27%). Representatives of the Northern Holarctic and European-Siberian faunal complex (distributed mainly in the northern regions of the Holarctic, mostly in Europe and Siberia) are 33 species (25%), and of the European complex (species connected to the middle and southern part of Europe) – 28 species (21%).

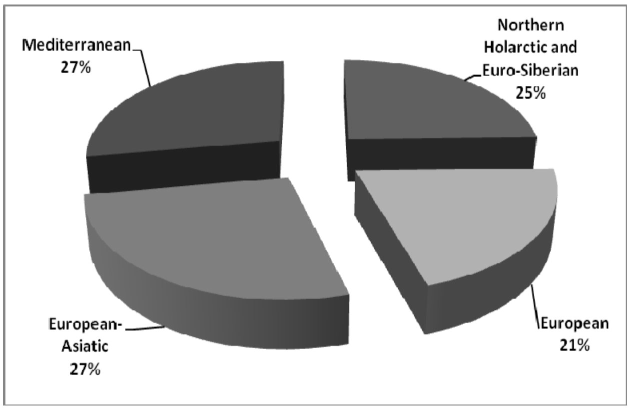

Fig. 3. Proportions of the carabid species by zoogeographical complexes.

We found the highest number of species in the Balkan-Neareastern category – 17 species (13% of all species). The Palearctic and European-Neareastern categories consist of 14 species (about 10%) each of them. In the Mediterranean faunal type the most numerous category in view of the species number is the European-Neareastern-Mediterranean chorotype. It includes 10 species or 7.5% of all species in the region. A similar distribution of categories was also established for the region of the Bulgarian Black sea coast (Teofilova *et al.* 2012b).

Life forms

The 134 ground beetle species established for the area of Cape Emine relate to two classes of life forms of the adult stage, according to the classification proposed by Sharova (1981).

Life forms typification showed predominance of class Zoophaga, represented by 76 species. Mixophyitophagous are 58 species (**Fig. 4**). The most numerous are respectively the crevice-dwelling surface & litter-dwelling stratobionts from class Zoophaga, and the harpaloid geohortobionts from class Mixophytophaga.

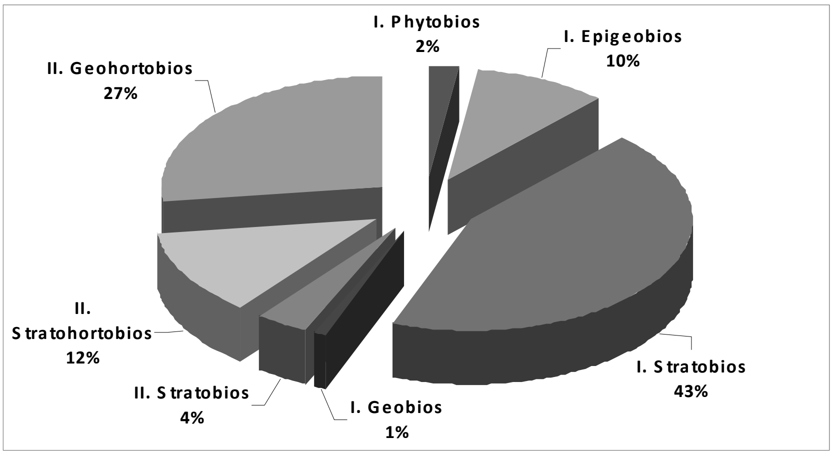

Fig. 4. Proportions of the subclasses of life forms in the carabid complex (I – class Zoophaga, II – class Mixophytophaga).

The analysis of distribution of life form subclasses in the various sampling areas showed that zoophagous stratobionts were the most abundant group in all sampling areas with exception of the steppe-like habitat, where the mixophytophagous geohortobionts prevailed. This was in full concordance with the typical predominance of species with mixed feeding in the open territories. It was found (Teofilova *et al.* 2012b) that zoophagous stratobionts and mixophytophagous geohortobionts were most abundant in the region of the Bulgarian Black sea coast too. Similar patterns were found in study of the carabid fauna of South Dobrudzha (Kodzhabashev & Penev 2006).

Habitat preferences

Ground beetles were separated to 3 major groups, defined by the senior author: stenotopic (living in very restricted environmental conditions), oligo- and polytopic (inhabitants of several habitats), and eurytopic species (ecologically plastic inhabitants of all kinds of habitats).

The analysis of the preferred habitat types showed that the majority of the species (79 species, 59%) inhabit more than one type of habitat. A significant part of the carabid beetles however (42 species, 32%) are stenobionts and are bound to particular conditions, which makes them especially sensitive to any changes in environmental conditions. The group of ecologically plastic and resistant eurytopic species includes 12 species (only 9% of all) (**Fig. 5**). A similarly small amount of eurytopic species was characteristic for the Bulgarian Black sea coast (Teofilova *et al.* 2012b) and South Dobrudzha (Kodzhabashev & Penev 2006) too.

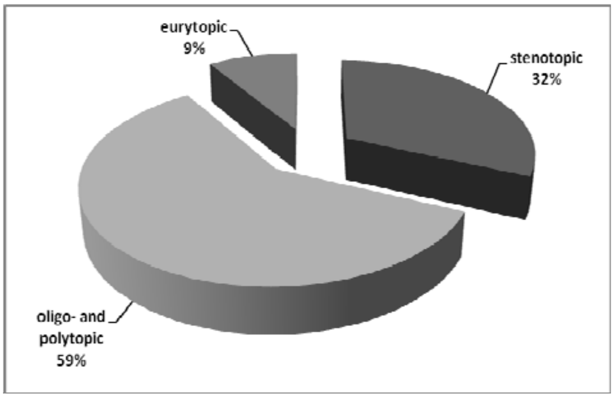

Fig. 5. Proportions of the species according to their habitat preferendum.

According to their occurrence in the studied habitats, carabids were further separated to: 1) dwellers of dry open habitats; 2) inhabitants of humid open habitats; 3) inhabitants of dry forest habitats; 4) inhabitants of humid forest habitats; 5) inhabitants of open, insolated banks; 6) inhabitants of canopy, shady banks; 7) halobionts; 8) bothrobionts; 9) eurybionts.

More than a half of the species are bound to open habitats (**Fig. 6**), as the majority of the species (48%) prefer arid areas and are representatives mainly of the Mediterranean and, to a lesser extent – of the European-Asian faunal complex. Forest species (19%) are mostly representatives of the European faunal complex. Eurybionts (9%) are mainly Holarctic or Palearctic elements (**Table 2**).

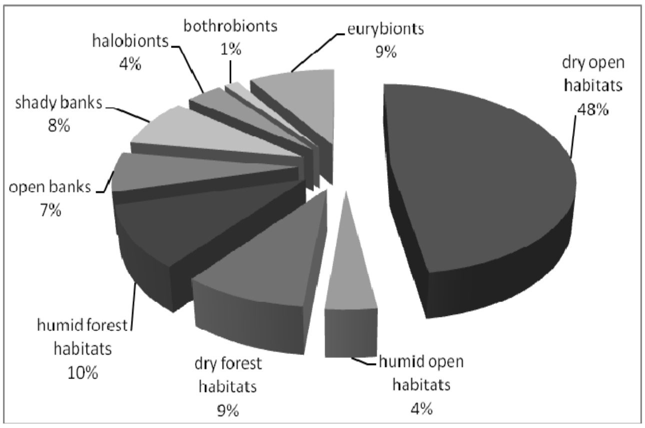

Fig. 6. Proportions of the species according to the type of preferred habitat.

Table 2. Distribution of the zoogeographical elements in the different habitat types (number of species).

Habitat	**Northern Holarctic**	**European**	**European-Asiatic**	**Mediterranean (*s. lato*)**	**Total**
Dry open	13	6	19	26	64
Humid open	1	1	2	1	5
Dry forest	3	7	1	1	12
Humid forest	2	7	3	2	14
Open banks	2	2	3	2	9
Shady banks	5	1	4	1	11
Halobionts	0	3	1	1	5
Bothrobionts	1	0	0	1	2
Eurybionts	6	1	3	2	12

Ecological groups in respect of the humidity

Division of the carabid beetles into environmental groups regarding their relation to humidity values show predominance of the xerophilic forms both by number of species (**Fig. 7**) and number of specimens (**Fig. 8**), and these include mainly representatives of tribes Harpalini, Amarini and some Sphodrini (58 species; 44%).

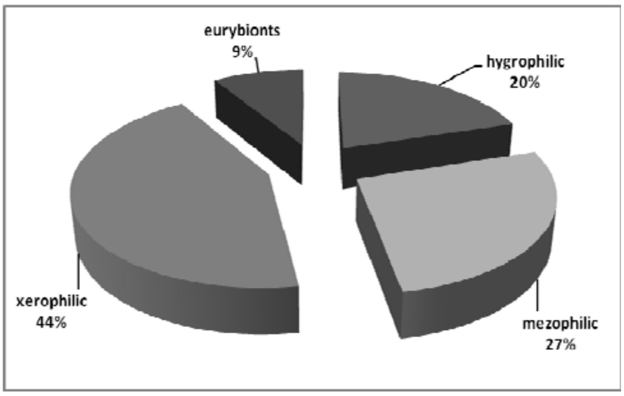

Fig. 7. Ecological groups of carabids in terms of humidity (number of species).

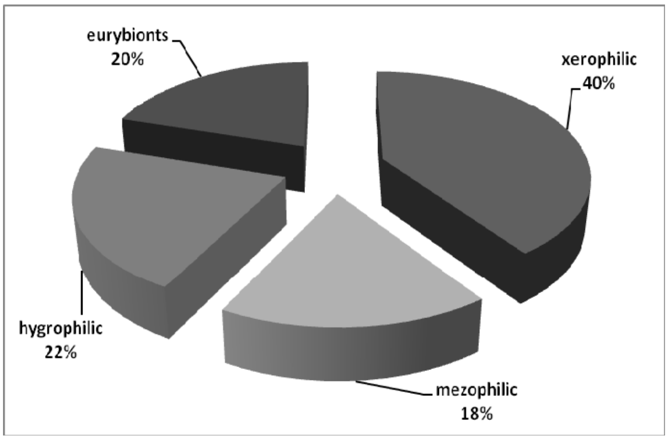

Fig. 8. Ecological groups of carabids in terms of humidity (number of specimens).

Mesophilic species are 36 (27%) and hygrophilic are 27 species (20%). They are represented primarily by the nemoral part of the tribes Carabini, Pterostichini, Platynini, Sphodrini and Brachinini and the typical shore inhabitants of Bembidiini.

The results could be explained by global climate changes, related to xerophytization of habitats and formation of conditions for the settlement of southern, in particular – Mediterranean, and xerophilic species (*Scybalicus oblongiusculus* (Dejean, 1829), *Harpalus pygmaeus* Dejean, 1829, *Ophonus ardosiacus* (Lutshnik, 1922), *Acinopus megacephalus* (Rossi, 1794), *Cymindis ornata*, *Microlestes negrita* (Wollaston, 1854), *Brachinus ejaculans* Fischer-Waldheim, 1829). The movement of southern species to the north, as well as in altitude, has been shown all across Europe (Ohlemüller *et al.* 2006).

Discussion

Taxonomic structure of the carabid coenose from the region of the study showed dominance of the tribe Harpalini, due to the large number of species typical for open territories (usually created or modified by human activity – arable lands and xerophilous steppe-like grasslands). This dominance was found in other areas of the country too (Teofilova *et al.* 2012b; Kodzhabashev & Penev 2006; Kostova 2004; Shishiniova *et al.* 2001; Kodzhabashev & Mollov 2000; Popov & Krusteva 1999).

Over the past decades intensified processes of secondary xerophytization have been seen, a possible consequence of global climate changes and destruction of natural ligneous vegetation with changes in its species and age structure (Ohlemüller *et al.* 2006). This successive degradation of the primarily habitats strongly reflects on the contemporary state of the fauna, which manifests through species impoverishment, severe dystrophy of the zoocoenoses and substitution of native species and communities with ecologically plastic, invasive elements. This state is evidenced by a gradual and successful penetration of Mediterranean and European-Asian species characteristic of open habitats and by a reduction of the number of the forest inhabiting European faunal elements.

Global drought, as a result of climatic and anthropogenic changes, has led to serious detrimental changes in the faunistic complexes with possible unforeseen alterations and trends in the future. A key characteristic is the expansion of the northern limits of distribution of some historically southern species (Aleksandrowicz 2011; Ohlemüller *et al.* 2006). Typical thermophilic species, found so far only in the Southern part of the coast (Teofilova *et al.* 2012b; Guéorguiev & Guéorguiev 1995), have been identified during the study: *Tachys fulvicollis* (Dejean, 1831), *Bembidion inoptatum*, *Bembidion castaneipenne*

Jacquelin-Duval, 1851, *Scybalicus oblongiusculus*, *Gynandromorphus etruscus* (Quensel, 1806), *Harpalus pygmaeus*, *Dixus obscurus* (Dejean, 1825), *Ophonus ardosiacus*, *Microlestes fulvibasis* Reitter, 1900, *Microlestes negrita*, *Cymindis ornata*. Also important trend appear to be the local degradation processes of anthropogenic origin, such as the substitution of natural biotopes with anthropogenic habitats, in particular wheat fields, which favours the penetration of Near Eastern faunal elements, which predominantly live in open habitats. The abandonment of previous agrocoenoses, on the other hand, leads to ruderalization of vegetation and its associated fauna.

A high percentage of Mediterranean elements showed their successful penetration along the Black Sea coast, where they settle primarily in extra- and intrazonal habitats (seashore, sand dunes, sunny aspects, etc.). Predominance of the Mediterranean species has already been demonstrated for the region of the Bulgarian Black sea coast (Teofilova *et al.* 2012b).

The low percentage of European species might be due to continued deforestation affecting large parts of the whole of Europe. Substitution of forests with open biotopes and arable lands was the reason for the displacement of the European nemoral complex by more adaptable European-Asian species attached to such types of habitats (Aleksandrowicz 2011; Kodzhabashev & Penev 2006; Desender & Turin 1989). Degradation of forest communities led to formation of new carabid complex, represented mainly by xerophilous species inhabiting open biotopes, while the old nemoral carabid complex (Carabini, Pterostichini, Platynini) has shifted to plots with preserved forest biotopes. Those remnants preserve forest elements in denuded and anthropogenized territories and their conservation is essential for maintaining a diverse fauna of mostly European and European-Siberian forest species (Kodzhabashev & Penev 2006).

The results from the zoogeographical analysis demonstrated high presence of southern forms, which together with the mixing of various biogeographical elements (Popov 2007; Tzonev *et al.* 2005), provided further evidence for the questionable qualification of Cape Emine as a border point for the separation of the biogeographic regions of Northern and Southern Black Sea coast.

The high percentage of stenobionts once again showed the urgent need to expand the protection of certain natural and semi-natural habitats in the region, such as significant biotopes and "islands" for the conservation of biodiversity: coastal and riparian habitats, marshes, swamps and lakes, floodplains, mesophilous and xerophilous forests, steppe-like and semi-steppe plots, as well as salinized habitats along the coast.

A relatively high percentage of sporadic and rare intra- and extrazonal and hygrophilous Carabidae species was found due to the specific climatic conditions and geographic location of Cape Emine, as well as to the set natural features in the area.

Conclusions

This paper represents the first study of the carabid fauna of the area of Cape Emine. A total of 134 species were found, which included two endemics and 59 new species.

Taxonomic structure of the carabid complex in the region of Cape Emine testified to the predominance of species associated with open biotopes – particularly representatives of the tribe Harpalini.

Zoogeographical characterization of the ground beetle fauna showed complicated composition of geographical elements and evidenced successful penetration of Mediterranean and European-Asiatic species with a smaller amount of European categories, which is probably the result of deforestation and global xerophytization of habitats.

The wide range of life forms demonstrated full utilization of existing ecological niches, and the distribution of species between the classes and groups testified about relative evolutionary completion of the region of Cape Emine (Lövei 2008, etc.).

The smaller number of species in anthropogenically affected habitats proved once again the negative impact of urbanization and anthropogenic phenomena on species richness (Weller & Ganzhorn 2004, etc.).

Measures are needed for rehabilitation and protection of the biodiversity as a whole. Special efforts should be undertaken for the restoration of the destroyed part of the bed of the Vaya River near Irakli site and for the revival of all affected riparian forests. That would ensure the microhabitat variegation, which defines the high variety of communities (Baiocchi *et al.* 2012).

Of extreme importance for the conservation of essential habitats is the reversion and maintenance of extensive farming practices in abandoned cultivated lands (grazing, extensive viticulture and gardening).

Despite of all negative anthropogenic activities (Teofilova *et al.* 2012a), we face with a rich, original and diverse ground beetle fauna, which reinforces the need to extend the network of protected areas so that they cover all of the main natural habitats of the region of Cape Emine.

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Appendix. List of Carabidae beetles, established in the area of Cape Emine (central Bulgarian Black sea coast)

№	Species	Material examined	Range type	Life form	Habitat	Faunistic records from the literature	Sampling area in which the species was established
1.	*Cicindela (Cylindera) germanica* Linnaeus, 1758	1♂	E-PAS	1.2.4.	1	H-W	VBd
2	*Cicindela (Cicindela) campestris* Linnaeus, 1758	2♀♀, 3♂♂	PAL	1.2.4.	1	*	Il, VBd
3.	*Leistus (Pogonophorus) rufomarginatus* (Duftschmid, 1812)	15♀♀, 33♂♂, 1n	EUR	1.3(1).2.	4	*	Id, Ib, IrV, In1, VBb, VBd, Rd
4.	*Nebria (Nebria) brevicollis* (Fabricius, 1792)	889♀♀, 978♂♂, 23n	E-PAS	1.3(1).2.	4	H-W	Il, Id, Ib, IrV, In1, In2, I2e, VBb, VBd
5.	*Notiophilus interstitialis* Reitter, 1889	3♂♂	B-PAS	1.3(1).1.	1	H-W	In2, Rs, Rd
6.	*Notiophilus danieli* Reitter, 1897	1♀	B-PAS	1.3(1).1.	6	*	Rd
7.	*Notiophilus rufipes* Curtis, 1829	36♀♀, 43♂♂	CE-PAS	1.3(1).1.	3	Apf.	Id, Ib, IrV, In1, VBb, Rd
8.	*Calosoma (Calosoma) sycophanta* (Linnaeus, 1758)	17♀♀, 109♂♂	PAL	1.2.2(1).	4	*	Ib, VBd, Rs, Rd
9.	*Calosoma (Acalosoma) inquisitor* (Linnaeus, 1758)	14♀♀, 49♂♂, 2n	PAL	1.2.2(1).	3	*	Id, Ib, In2, VBd, Rs, Rd
10.	*Carabus (Eucarabus) ullrichi* Germar, 1824	65♀♀, 82♂♂	C-EE	1.2.2.	4	*	Il, Id, Ib, IrV, In1, In2, I2e, VBd
11.	*Carabus (Autocarabus) cancellatus* Illiger, 1798	14♀♀, 16♂♂	E-SI	1.2.2.	6	*	IrV, In1
12.	*Carabus (Trachycarabus) scabriusculus* Olivier, 1795	28♀♀, 37♂♂, 2n	CE-PAS	1.2.2.	1	*	Id, Ib, VBd, Rd
13.	*Carabus (Archicarabus) montivagus* Palliardi, 1825	2♀♀, 1♂	BAL-K	1.2.2.	3	*	Id
14.	*Carabus (Tomocarabus) convexus* Fabricius, 1775	139♀♀, 130♂♂, 19n	E-PAS	1.2.2.	3	*	all without Rn and Rne
15.	*Carabus (Chaetocarabus) intricatus* Linnaeus, 1761	1♂	EUR	1.2.2.	4	*	VBd
16.	*Carabus (Procrustes) coriaceus* Linnaeus, 1758	639♀♀, 574♂♂, 27n	E-PAS	1.2.2.	9	Apf., H-W	all
17.	*Cychrus semigranosus* Palliardi, 1825	1♀, 9♂♂, 1n	BAL-K	1.2.2.	4	*	VBb, VBd
18.	*Dyschirius (Dyschiriodes) rufipes* Dejean, 1825	1♀	CE-PAS	1.4.2(1).	5	***	IrV
19.	*Trechus quadristriatus* (Schrank, 1781)	117♀♀, 197♂♂, 5n	E-CA-M	1.3(1).2.	9	H-W	all
20.	*Trechus crucifer* La Brulerie, 1875	1♀	B-PAS	1.3(1).2.	4	*	Id
21.	*Tachys (Paratachys) fulvicollis* (Dejean, 1831)	1♂	E-PA-M	1.3(1).4.	6	H-W	IrV
22.	*Porotachys bisulcatus* (Nicolai, 1822)	1♀, 1♂	E-PA-M	1.3(1).1.	8	H-W	IrV
23.	*Asaphidion flavipes* (Linnaeus, 1761)	23♀♀, 34♂♂	W-PAL	1.2.3.	6	*	IrV
24.	*Bembidion (Metallina) lampros* (Herbst, 1784)	17♀♀, 25♂♂	OLA	1.3(1).1.	9	H-W	Id, IrV, In1
25.	*Bembidion (Metallina) properans* (Stephens, 1828)	3♀♀, 2♂♂	E-WSI	1.3(1).1.	5	H-W	IrV, In1, Rne
26.	*Bembidion (Philochthus) inoptatum* Schaum, 1857	1♂	E-PAS	1.3(1).1.	7	H-W	IrV
27.	*Bembidion (Philochthus) lunulatum* (Fourcroy, 1785)	2♀♀, 4♂♂	E-MED	1.3(1).1.	5	*	Ib, VBb, VBd
28.	*Bembidion (Talanes) subfasciatum* Chaudoir, 1850	1♂	B-PAS	1.3(1).1.	7	*	VBd
29.	*Bembidion (Leja) articulatum* (Panzer, 1796)	1♂	PAL	1.3(1).1.	5	H-W	VBd
30.	*Bembidion (Euperyphus) combustum* Ménétriés, 1832	1♀	B-CAS	1.3(1).1.	5	*	IrV
31.	*Bembidion (Peryphanes) dalmatinum* Dejean, 1831	4♀♀, 2♂♂	CE-PAS	1.3(1).1.	6	H-W	Id, Ib, In1 Rn
32.	*Bembidion (Peryphanes) castaneipenne* Jacquelin-Duval, 1851	2♂♂	B-PAS	1.3(1).1.	5	H-W	I2e, Rn
33.	*Stomis pumicatus* (Panzer, 1796)	1♀, 2♂♂	E-PAS	1.3(1).2.	4	*	IrV
34.	*Myas chalybaeus* (Palliardi, 1825)	41♀♀, 24♂♂, 1n	BAL-K	1.3(2).1.	3	*	Id, Ib, IrV, In2, VBb, VBd, Rs, Rd
35.	*Poecilus (Poecilus) cupreus* (Linnaeus, 1758)	2♀♀, 1♂	E-AS	1.3(2).1.	1	H-W	IrV, In1, Rne
36.	*Pterostichus (Melanius) nigrita* (Paykull, 1790)	1♀	PAL	1.3(2).1.	4	*	In1

37.	*Pterostichus (Feronidius) melas* (Creutzer, 1799)	410♀♀, 408♂♂, 62n	E-PAS	1.3(2).1.	2	*	all without Rs
38.	*Pterostichus (Pterostichus) merkli* Frivaldszky, 1879	1♀, 3♂♂	BGE	1.3(2).1.	4	*	IrV
39.	*Abax carinatus* (Duftschmid, 1812)	1♀	C-EE	1.3(2).1.	4	*	IrV
40.	*Calathus (Calathus) distinguendus* Chaudoir, 1846	36♀♀, 24♂♂, 2n	B-PAS	1.3(1).2.	1	*	In1, VBb, Rs, Rd
41.	*Calathus (Calathus) fuscipes* (Goeze, 1777)	292♀♀, 283♂♂, 48n	PAL	1.3(1).2.	1	H-W	all without Rn
42.	*Calathus (Calathus) longicollis* Motschulsky, 1864	11♀♀, 25♂♂	B-PAS	1.3(1).2.	1	*	Il, IrV, Rs, Rd
43.	*Calathus (Neocalathus) ambiguus* (Paykull, 1790)	24♀♀, 5♂♂	E-AS	1.3(1).2.	1	H-W	Il, Ib, I2e, VBb, VBd, Rs, Rd
44.	*Calathus (Neocalathus) melanocephalus* (Linnaeus, 1758)	41♀♀, 23♂♂	OLA	1.3(1).2.	1	*	Ib, In2, I2e, VBd, Rs, Rd
45.	*Calathus (Neocalathus) mollis* Marsham, 1802	1♀	NM-CAS	1.3(1).2.	1	H-W	Rs
46.	*Calathus (Neocalathus) cinctus* (Motschulsky, 1850)	83♀♀, 55♂♂, 2n	E-PAS	1.3(1).2.	1	*	Il, Id, Ib, In2, VBb, VBd, Rs, Rd
47.	*Laemostenus (Laemostenus) venustus* (Dejean, 1828)	1♀	E-MED	1.3(1).1.	3	*	Id
48.	*Laemostenus (Laemostenus) janthinus* (Duftschmid, 1812)	2♀♀	C-EE	1.3(1).1.	3	***	Ib
49.	*Laemostenus (Pristonychus) terricola* (Herbst, 1783)	50♀♀, 25♂♂, 11n	W-PAL	1.3(1).6.	8	*	Il, Id, Ib, VBb, VBd, Rs, Rd
50.	*Agonum (Europhilus)* sp.	96♀♀, 49♂♂, 2n	PAL	1.3(1).1.	2		Il, In1, VBd, Rs, Rd, Rn, Rne
51.	*Anchomenus dorsalis* (Pontoppidan, 1763)	269♀♀, 129♂♂, 1n	PAL	1.3(1).1.	1	*	IrV, In1, VBd
52.	*Amara (Zezea) reflexicollis* Motschulsky,1844	1♂	E-PA-M	2.2.1.	1	H-W	I2e
53.	*Amara (Amara) aenea* (De Geer, 1774)	31♀♀, 16♂♂, 1n	OLA	2.3.1.	1	Apf., H-W	all without Id и IrV
54.	*Amara (Amara) anthobia* Villa, 1833	15♀♀, 13♂♂	E-PAS	2.1.1.	1	*	Il, Id, Ib, IrV, VBb, Rs, Rd
55.	*Amara (Amara) communis* Panzer, 1797	4♀♀, 2♂♂	E-SI	2.3.1.	1	**	In1, VBd, Rs
56.	*Amara (Amara) familiaris* (Duftschmid, 1812)	8♀♀, 11♂♂	OLA	2.1.1.	9	*	Il, Ib, In1, VBb, VBd, Rs, Rd
57.	*Amara (Amara) lucida* (Duftschmid, 1812)	1♀, 1♂	E-PA-M	2.3.1.	9	H-W	Il, Rs
58.	*Amara (Amara) similata* (Gyllenhal, 1810)	1♂	E-CA-M	2.3.1.	1	H-W	Rn
59.	*Amara (Celia) ingenua* (Duftschmid, 1812)	1♀, 1♂	E-AS	2.3.1.	1	*	In1, In2
60.	*Amara (Bradytus) apricaria* (Paykull, 1790)	1♂	OLA	2.3.1(1).	1	Apf., H-W	Rd
61.	*Amara (Bradytus) majuscula* (Chaudoir, 1850)	1♀	PAL	2.3.1(1).	1	G-G, H-W	Rs
62.	*Zabrus (Pelor) graecus* Dejean, 1828	1♂	B-PAS	2.3.2.	4	**	VBd
63.	*Scybalicus oblongiusculus* (Dejean, 1829)	1♀, 1♂	MED	2.3.1.	1	G-G, H-W	In1, Rs
64.	*Gynandromorphus etruscus* (Quensel, 1806)	5♂♂	NMED	2.2.1.	1	*	Rs, Rn, Rne
65.	*Stenolophus mixtus* (Herbst, 1784)	1♂	PAL	2.1.1.	6	H-W	IrV
66.	*Acupalpus (Ancylostria) interstitialis* Reitter, 1884	1♂	B-PAS	2.1.1.	5	H-W	Rd
67.	*Acupalpus (Acupalpus) meridianus* (Linnaeus, 1767)	1♀, 1♂	E-PAS	2.1.1.	5	H-W	I2e, Rn
68.	*Parophonus (Tachyophonus) laeviceps* (Ménétriés, 1832)	1♀, 3♂♂	B-PAS	2.2.1.	1	G-G, H-W	IrV, In1, Rn
69.	*Parophonus (Tachyophonus) mendax* (Rossi, 1790)	25♀♀, 23♂♂	B-PAS	2.2.1.	2	*	Il, Ир, In1, In2, I2e, Rs, Rd, Rn, Rne
70.	*Pseudoophonus rufipes* (Degeer, 1774)	7♀♀, 6♂♂, 4n	PAL	2.2.1.	9	H-W	Ib, In1, I2e, VBd, Rd, Rne
71.	*Pseudoophonus calceatus* (Duftschmid, 1812)	1♀	E-AS	2.3.1.	1	H-W	Rs
72.	*Harpalus (Cryptophonus) melancholicus* Dejean, 1829	1♀	E-PAS	2.3.1.	7	H-W	Rs
73.	*Harpalus (Harpalus) rufipalpis* Sturm, 1818	1♀	W-PAL	2.3.1.	1	*	Il
74.	*Harpalus (Harpalus) honestus* (Duftschmid, 1812)	1♀	E-SI	2.3.1.	1	*	Rs
75.	*Harpalus (Harpalus) rubripes* (Duftschmid, 1812)	8♀♀, 13♂♂	OLA	2.3.1.	9	H-W	Il, Id, In1, I2e, VBd, Rs, Rd, Rn
76.	*Harpalus (Harpalus) attenuatus* Stephens, 1828	19♀♀, 20♂♂	MED	2.3.1.	4	H-W	Il, Id, Ib, Rs, Rd
77.	*Harpalus (Harpalus) atratus* Latreille, 1804	2♂♂	E-CAS	2.3.1.	9	*	Id
78.	*Harpalus(Harpalus) quadripunctatus* Dejean, 1829	1♀	OLA	2.3.1.	3	**	Rs
79.	*Harpalus (Harpalus) serripes* (Quensel, 1806)	1♀, 2♂♂	PAL	2.3.1.	1	H-W	IrV, In2, I2e
80.	*Harpalus (Harpalus) politus* Dejean, 1829	1♂	E-SI	2.3.1.	3	Apf.	Il
81.	*Harpalus (Harpalus) flavicornis* Dejean, 1829	31♀♀, 77♂♂	CE-PAS	2.3.1.	3	H-W	Il, Id, IrV, In1, VBd, Rn, Rne

82.	*Harpalus (Actephilus) pumilus* (Sturm, 1818)	1♀, 1♂	E-CAS	2.3.1.	1	H-W	VBd
83.	*Harpalus (Harpalus) subcylindricus* Dejean, 1829	1♀	E-CAS	2.3.1.	9	*	Il
84.	*Harpalus (Harpalus) tardus* (Panzer, 1797)	25♀♀, 23♂♂, 1n	E-CAS	2.3.1.	9	*	Il, Id, IrV, In1, In2, I2e, VBb, VBd, Rd
85.	*Harpalus (Harpalus) albanicus* Reitter, 1900	2♀♀, 2♂♂	E-PAS	2.3.1.	1	H-W	IrV, Rs
86.	*Harpalus (Harpalus) cupreus* Dejean, 1829	13♀♀, 13♂♂	NMED	2.3.1.	1	*	Id, IrV, In1, I2e, Rn, Rne
87.	*Harpalus (Harpalus) dimidiatus* (Rossi, 1790)	269♀♀, 277♂♂, 9n	E-PAS	2.3.1.	3	H-W	all
88.	*Harpalus (Harpalus) metallinus* Ménétriés, 1838	1♀, 5♂♂	B-PAS	2.3.1.	4	H-W	Rs
89.	*Harpalus (Harpalus) pygmaeus* Dejean, 1829	2♀♀, 6♂♂	E-PA-M	2.3.1.	1	*	Il
90.	*Harpalus (Harpalophonus) hospes* Sturm, 1818	14♀♀, 19♂♂	CE-PAS	2.3.1.	7	Apf.	I2e, VBb, Rs, Rn
91.	*Harpalus (Harpalus) distinguendus* (Duftschmid, 1812)	8♀♀, 14♂♂	PAL	2.3.1.	9	Apf., H-W	Il, Ib, IrV, I2e, Rs, Rd, Rn, Rne
92.	*Harpalus (Harpalus) oblitus* Dejean, 1829	1♀	E-PA-M	2.3.1.	1	*	VBd
93.	*Acinopus (Oedematicus) megacephalus* (Rossi, 1794)	86♀♀, 188♂♂, 3n	NMED	2.3.2.	1	H-W	Il, Id, Ib, IrV, In1, In2, VBd, Rs, Rd
94.	*Ophonus (Metophonus) nitidulus* Stephens, 1828	5♀♀, 1♂	E-SI	2.2.1.	1	*	IrV, In1, Rs
95.	*Ophonus (Metophonus) rupicola* (Sturm, 1818)	1♀	E-PAS	2.2.1.	1	H-W	Rs
96.	*Ophonus (Metophonus) puncticeps* (Stephens, 1828)	6♀♀, 4♂♂	E-CAS	2.2.1.	1	H-W	Il, Rs, Rd
97.	*Ophonus (Metophonus) parallelus* (Dejean, 1829)	1♂	E-MED	2.2.1.	1	G-G, H-W	Rs
98.	*Ophonus (Metophonus) brevicollis* (Serville, 1821)	1♀	SE	2.2.1.	1	H-W	Rne
99.	*Ophonus (Hesperophonus) similis* (Dejean, 1829)	2♀♀, 3♂♂	P-SMED	2.2.1.	1	G-G, H-W	In1, VBb, Rs
100.	*Ophonus (Hesperophonus) azureus* (Fabricius, 1775)	48♀♀, 68♂♂, 2n	E-CA-M	2.2.1.	1	H-W	Il, Ib, In1, I2e, VBd, Rs, Rd, Rn, Rne
101.	*Ophonus (Hesperophonus) subquadratus* (Dejean, 1829)	1♀	MED	2.2.1.	1	H-W	VBd
102.	*Ophonus (Hesperophonus) cribricollis* Dejean, 1829	4♂♂	E-CAS	2.2.1.	1	H-W	VBd
103.	*Ophonus (Ophonus) ardosiacus* (Lutshnik, 1922)	5♀♀, 4♂♂	E-MED	2.2.1.	1	G-G	Il, Rs
104.	*Ophonus (Ophonus) sabulicola* (Panzer, 1796)	15♀♀, 25♂♂	E-PA-M	2.2.1.	1	H-W	Il, I2e, Rs, Rd, Rne
105.	*Ophonus (Macrophonus) oblongus* (Schaum, 1858)	1♀, 2♂♂	B-PAS	2.2.1.	1	*	Rs, Rn
106.	*Carterus (Carterus) rufipes* Chaudoir, 1843	2♀♀, 3♂♂	B-PAS	2.3.3.	1	*	Rs, Rne
107.	*Carterus (Pristocarterus) angustipennis* Chaudoir, 1852	2♂♂	B-PAS	2.3.3.	1	H-W	Rs
108.	*Ditomus calydonius* (Rossi, 1790)	12♀♀, 4♂♂	NM-CAS	2.3.3.	1	H-W	Ib, Rs, Rd, Rn, Rne
109.	*Dixus obscurus* (Dejean, 1825)	2♀♀, 1n	NM-CAS	2.3.3.	1	H-W	Il, Ib, Rd
110.	*Dinodes decipiens* (Dufour, 1820)	1♀, 2♂♂	E-MED	1.3(1).1.	1	H-W	Il, Rs
111.	*Chlaenius (Chlaenius) festivus* (Panzer, 1796)	4♀♀, 6♂♂, 2n	E-CAS	1.3(1).1.	6	H-W	IrV, In1
112.	*Chlaenius (Chlaeniellus) nitidulus* (Schrank, 1781)	998♀♀, 903♂♂, 26n	E-CAS	1.3(1).1.	6	*	all without IrV и VBd
113.	*Chlaenius (Chlaeniellus) nigricornis* (Fabricius, 1787)	1♀	E-AS	1.3(1).1.	6	H-W	IrV
114.	*Chlaenius (Chlaeniellus) vestitus* (Paykull, 1790)	1♂	W-PAL	1.3(1).1.	6	H-W	IrV
115.	*Badister (Badister) bullatus* (Schrank, 1798)	1♂	OLA	1.3(1).1.	6	H-W	IrV
116.	*Lebia (Lamprias) cyanocephala* (Linnaeus, 1758)	1♀, 1♂	E-PA-M	1.1.3.	1	*	Ib, Rd
117.	*Paradromius (Manodromius) linearis* (Olivier, 1759)	1♂	E-MED	1.3(1).5.	5	G-G, H-W	Il
118.	*Philorhizus (Philorhizus) notatus* (Stephens, 1827)	3♀♀, 2♂♂	E-PA-M	1.3(1).3.	1	*	In2, Rs, Rd, Rne
119.	*Syntomus obscuroguttatus* (Duftschmid, 1812)	6♀♀, 4♂♂	E-PA-M	1.1.2.	1	H-W	Il, IrV, In1, Rd, Rne
120.	*Syntomus pallipes* (Dejean, 1825)	3♀♀, 2♂♂	E-CA-M	1.1.2.	1	*	IrV, In1, VBd
121.	*Microlestes fissuralis* Reitter, 1901	5♀♀, 7♂♂	E-CAS	1.3(1).3.	1	*	Il, In2, I2e, Rs
122.	*Microlestes fulvibasis* Reitter, 1900	1♀, 2♂♂	CA-MED	1.3(1).3.	7	G-G, H-W	In2, Rs
123.	*Microlestes maurus* (Sturm, 1827)	15♀♀, 36♂♂	E-CAS	1.3(1).3.	1	H-W	Il, Ib, IrV, In1, I2e, Rs, Rd, Rn
124.	*Microlestes minutulus* (Goeze, 1777)	20♀♀, 44♂♂	OLA	1.3(1).3.	1	H-W	Il, Ib, In2, I2e, Rs, Rd
125.	*Microlestes negrita* (Wollaston, 1854)	48♀♀, 48♂♂	MED-PAS	1.3(1).3.	1	H-W	all without Id
126.	*Cymindis (Cymindis) ornata* Fisher-Waldheim, 1824	5♀♀, 6♂♂	B-PAS	1.3(1).3.	1	*	Ib, Rs, Rd

127.	*Brachinus alexandri* F. Battoni, 1984	7♀♀, 8♂♂	P-SMED	1.3(1).3.	1	G-G, H-W	Rs, Rne
128.	*Brachinus berytensis* Reiche, 1855	14♀♀, 8♂♂	B-PAS	1.3(1).3.	1	*	Il, In1, Rs, Rd, Rn, Rne
129.	*Brachinus brevicollis* Motschulsky, 1844	21♀♀, 15♂♂	B-CAS	1.3(1).3.	3	G-G	Rs, Rd
130.	*Brachinus crepitans* (Linnaeus, 1758)	761♀♀, 439♂♂, 13n	PAL	1.3(1).3.	1	H-W	IrV, In1, In2, I2e, Rs, Rd, Rn, Rne
131.	*Brachinus ejaculans* Fischer-Waldheim, 1829	2♀♀, 2♂♂	B-CAS	1.3(1).3.	2	H-W	Rs, Rd
132.	*Brachinus explodens* Duftschmid, 1812	49♀♀, 30♂♂	E-CA-M	1.3(1).3.	1	H-W	IrV, In1, In2, I2e, Rs, Rd, Rne
133.	*Brachinus plagiatus* Reiche, 1868	4♀♀, 1♂♂	P-SMED	1.3(1).3.	2	*	Rs
134.	*Brachinus psophia* Serville, 1821	301♀♀, 157♂♂	E-CAS	1.3(1).3.	1	H-W	IrV, In1, In2, Rs, Rd, Rne

Explanations to the Appendix

Column № 1. Consecutive number.
Column № 2. List of the species recorded from the area of Cape Emine.
Column № 3. Numbers of examined specimens.
♀ - female; ♂ - male; n - not determined.
Column № 4. Zoogeographical categories and faunal types:
I. Northern Holarctic and Euro-Siberian faunal type:
OLA - Holarctic; PAL - Palearctic; W-PAL - Western Palearctic; E-SI - Eurosiberian; E-WSI - Euro-Westsiberian.
II. European faunal type:
EUR - European; E-PAS - European-Neareastern; CE-PAS - Central European and Neareastern; CEE-PA - Central and Eastern European and Neareastern; C-EE - Central and Eastern European; CEUR - Central European; BAL-K - Balkan-Carpathian.
III. Euroasiatic faunal type:
E-AS - Euroasiatic steppe complex; E-CAS - European and Central Asian; B-CAS - Balkan and Central Asian; B-PAS - Balkan-Neareastern (+ Balkan-Anatolian).
IV. Mediterranean (s. lato) faunal type (species of the Ancient Mediterraneum):
E-CA-M - European-Centralasian-Mediterranean; E-PA-M - European-Neareastern-Mediterranean; CA-MED - Mediterranean-Centralasian; MED-PAS - Mediterranean-Neareastern; MED - Mediterranean; E-MED - Eastmediterranean; P-SMED - Pontic-Submediterranean; PON - Pontic; SE - South European; NMED - Northmediterranean; NM-CAS - Northmediterranean-Centralasian; BAL - Balkan; BgE - Bulgarian endemic.
Column № 5. Explanation to the indexes of the life forms:
The first figure in the index shows the class of life form, the second – the subclass, the third – the life form group. In brackets after the subclass the series is shown, when it exists.
Life form class 1. Zoophagous.
Life form subclass: 1.1 - Phytobios; 1.2 - Epigeobios; 1.3 - Stratobios; 1.4 - Geobios; 1.5 - Psammocolimbets.
Life form groups: 1.1.1 - dendrobionts; 1.1.2 - stem-dwelling hortobionts; 1.1.3 - leaf-dwelling dendrohortobionts; 1.2.1 - small walking epigeobionts; 1.2.2 - large walking epigeobionts; 1.2.2(1) - large walking dendroepigeobionts; 1.2.3 - running epigeobionts; 1.2.4 - flying epigeobionts; 1.3(1) - series crevice-dwelling stratobionts; 1.3(1).1 - surface & litter-dwelling; 1.3(1).2 - litter-dwelling; 1.3(1).3 - litter & crevice-dwelling; 1.3(1).4 - endogeobionts; 1.3(1).5 - litter & bark-dwelling; 1.3(1).6 - bothrobionts; 1.3(1).7 - troglobionts; 1.3(2) - series digging stratobionts; 1.3(2).1 - litter & soil-dwelling; 1.3(2).2 - litter & crevice-dwelling; 1.3(2).3 - bothrobionts; 1.3(2).4 - troglobionts; 1.4.1 - running & digging geobionts; 1.4.2(1) - small digging geobionts; 1.4.2(1) - large digging geobionts 1.5.1 - shore psammobionts.
Life form class 2. Mixophytophagous.
Life form subclass: 2.1 - Stratobios; 2.2 - Stratohortobios; 2.3 - Geohortobios.
Life form groups: 2.1.1 - crevice-dwelling stratobionts; 2.2.1 - stratohortobionts; 2.3.1 - harpaloid geohortobionts; 2.3.1(1) - crevice-dwelling harpaloid geohortobionts; 2.3.2 - zabroid geohortobionts; 2.3.3 - dytomeoid geohortobionts.
Column № 6. Habitat preferences of the species in the region of the Cape Emine:
1 – inhabitants of dry open habitats; 2 – inhabitants of humid open habitats; 3 – inhabitants of dry forest habitats; 4 – inhabitants of humid forest habitats; 5 – inhabitants of the open, sunny coasts; 6 – the inhabitants of canopy, shady shores; 7 – halobionts; 8 – bothrobionts; 9-eurybionts.
Column № 7: Abbreviations of the publications containing records on ground beetles from the region:
Apf. – Apfelbeck (1904); G-G – Guéorguiev, Guéorguiev (1995); H-W – Hieke, Wrase (1988); *** - new for Bulgaria, ** - new for the Bulgarian Black Sea coast, * - new for Cape Emine.
Column № 8: Abbreviations of the sampling areas:
Il-Irakli, abandoned vineyard; Id – Irakli, oak forest; Ib – Irakli, shore – ecotone; IrV-Irakli, River Vaya; In1 – Irakli, wheat field 1; In2 – Irakli, wheat field 2; I2e – Irakli, field 2 – ecotone; VBd – Military base, gully; VBb-Military base, pine forest; Rs – Signal repeater, steppe-like habitat; Rd – Signal repeater, oak forest; Rn - Signal repeater, field; Rne – Signal repeater, field – ecotone.