RESEARCH ARTICLE

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A contribution to the study of ground beetles (Coleoptera: Carabidae) in the Western Rhodope Mts. (Bulgaria)

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ABSTRACT
The available information on the diversity of the ground beetle fauna in the region of the Western Rhodope Mts. was enriched. A total of 133 species were found, including 16 endemic (12% of all) and 5 relict species. Ten species were new for the studied area: *Amara morio nivium*, *Badister bullatus*, *Harpalus caspius*, *Laemostenus janthinus*, *Microlestes apterus*, *Pterostichus leonisi*, *Syntomus obscuroguttatus*, *Tachyura quadrisignata*, *Trechus asiaticus*, *Tachys micros*. Genera *Badister* and *Tachys* were reported for the first time from the Western Rhodopes. The faunistic contribution was made for a region researched in detail for the last in 2006. The results proved the predominantly mesophilous nature of the habitats due to the large percentage of forest territories. The life forms of the carabids showed the prevalence of the zoophages over the mixophytophages both in qualitative (67% : 33%) and in quantitative terms (85.5% : 14.5%).

Key words: new records, ground beetles, Carabidae, Western Rhodope Mts., life forms

Introduction

The Western Rhodope Mountains are a part of the Rila-Rhodope geographic area. They extend between Rila Mts. and Pirin Mts. to the west, the Thracian Lowland to the north, the Eastern Rhodopes to the east and the Aegean Lowland to the south. A small part of them is situated in Greece. Western Rhodopes are the larger and the higher part of the Rhodope Mts., which are one of the faunistically richest areas in Europe. The Law on the Biological Diversity (2002) includes 7 species of insects and 5 of them are present in the Rhodopes. About 11% of the territory of the Western Rhodopes is placed under protection.

This mountainous region enables the coexistence of highly diverse habitats, as well as various types of ecotones and intra- end extrazonal biotopes. Four main vegetation formations can be observed along the altitudinal gradient: xeromesophilous deciduous forests and shrubs of Submediterranean type, mesophilous beech forests of Nemoral type, mesophilous coniferous forest of Boreal type, and open high-mountain pastures of Alpine type (Guéorguiev & Lobo, 2006).

Data about Carabidae from the region of the Western Rhodopes are found in the works of Nedelkov (1909) and Guéorguiev (1992). There are some single records and descriptions in the works of Schmidt (1994), Sakalian & Guéorguiev (1997), Guéorguiev & Muilwijk (2001), Turin et al. (2003), Guéorguiev (2005), Jaeger (2007), Bonavita & Vigna Taglianti (2010), Giachino et al. (2011), Guéorguiev (2011). In a study of the carabid fauna around the high mountain huts in Bulgaria Guéorguiev & Guéorguiev (1995) established for the Rhodopes 7 species. Researching the problems of the zoogeography of the endemic species occurring in Bulgaria, Guéorguiev et al. (1997) note 31 endemics (25% of all) for the region of the Western Rhodopes. According to the authors, the taxonomic diversity in the region is relatively high, compared to the level of endemism in the different regions of Bulgaria. Studied area was also mentioned in the work of Guéorguiev et al. (1998), who established 25 species. In the study of the reserve territories, in particular, "Kupena" and "Mantaritsa", Kostova (2009) analyzed a carabid coenose, consisting of 59 species. Forest habitats of southern Bulgaria were subject to a study by Kostova (2015), and for the region of the Western Rhodopes the author established 29 species. Guéorguiev & Lobo (2006) made an inventory of the species composition of the Adephaga from the Bulgarian and Greek parts of the Western Rhodopes and reported a total of 297 carabid species. According to the latest complete inventory of the Bulgarian ground beetle fauna (Guéorguiev & Teofilova, in litt.), within the boundaries of the Western Rhodopes 310 species occur.

The aim of the present study is to complement the knowledge of the ground beetle fauna from the Western Rhodopes, and to analyze the conservation value of the researched area and the indicative power of the carabids, with a subsequent assessment of the anthropogenic impact and environmental trends.

Materials and Methods

Field work was carried out in a 4 years period – from 2014 to 2017, in parallel with the conduction of monitoring research works in some protected territories and other target areas. Ground beetles were collected via: 1) transect method with observations *in situ* or collection of material by handpicking; 2) stationary method with terrestrial „pitfall" traps made of plastic bottles, buried at the level of the ground surface.

Table 1 and Figure 1 contain detailed information about the sampling sites where pitfall traps were set and the periods and methods of collection of the material. From several localities, only single collections by hand were conducted (Table 2).

Almost all of the localities represent a new data for the Western Rhodope Mts., regarding the carabid fauna.

Captured animals were determined with the help of several main literary sources: Trautner and Geigenmüller (1987), Hůrka (1996), Arndt et al. (2011), Kryzhanovskij (Fauna Bulgarica – Carabidae, manuscript, unpublished data), and are deposited in the Carabidae collection of the Institute of Biodiversity and Ecosystem Research (Bulgarian Academy of Sciences, Sofia).

The systematic list follows Kryzhanovskij et al. (1995).

Figure 1. *Map of the Western Rhodope Mts. with the main towns (in blue) and the sampling sites, where pitfall traps were set (in green).*

According to their ecological requirements in terms of humidity, established carabid species were divided into 5 categories: hygrophilous, mesohygrophilous, mesophilous, mesoxerophilous, xerophilous.

The categorisation of the species in respect of their life forms follows the classification of Sharova (1981). The following codes were used: *Life form class 1. Zoophagous*. Life form subclass: 1.2 – Epigeobios; 1.3 – Stratobios;. 1.4 – Geobios. Life form groups: 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–

Table 1. *List of the sampling sites where pitfall traps were set, with dates of exposing of the traps and additional collecting by hand.*

№	Locality	Altitude	Hand picking	Pitfall traps [number of traps, fixative]	GPS coordinates
1.	Grashtitsa hamlet, in the land of the village of Stoykite	1340 m	31.VIII.2015; 3.V, 18.VI, 26.VII, 23.VIII.2016; 15.IV.2017	6.V–18.VI, 18.VI–5.IX, 5.IX–6.XI.2016; 6.XI.2016–16.IV.2017; 16.IV–9.IX.2017; 9.IX–31.XII.2017 [6, formaldehyde]	41°39'05"N; 24°37'04"E
2.	SW Patalenitsa vill.	500 m		5.V–25.IX.2016 [16, formaldehyde]	42°06'45"N; 24°11'39"E
3.	SE Krastava vill.	~ 1200 m	23.IV, 24.IV, 25.V, 27.VI, 25.XI.2015	23.IV–25.IX.2015 (monthly) [5, salt-vinegar saturated solution]	41°56'25"N; 23°51'49"E
4.	„Kupena" Reserve	~ 1000 m	11.VII, 17.X.2014	11.VII–17.X.2014 [12, formaldehyde]	42°00'50"N; 24°19'50"E
5.	„Mantaritsa" Reserve	~ 1550 m	12.VII, 19.X.2014	12.VII–19.X.2014 [12, formaldehyde]	41°56'00"N; 24°05'05"E
6.	„Dupkata" Reserve	~ 1100 m	13.VII.2014	13.VII–18.X.2014 [12, formaldehyde]	41°45'50"N; 24°16'30"E
7.	„Beglika" Reserve	~ 1750 m		14.VII–20.X.2014 [5, formaldehyde]	41°51'40"N; 24°04'04"E
8.	N Smolyan, Nevyastata Peak	1510 m	18.V, 18.VI.2016	18.V–18.VI.2016 [5, propylene glycol]	41°36'46"N; 24°40'46"E

Table 2. *List of the localities where only single collections by hand were conducted.*

№	Locality	Altitude	Date	GPS coordinates
1.	N Smolyan, Sveti Georgi Peak	1545 m	18.V.2016	41°36'20"N; 24°41'55"E
2.	N Smolyan, quarter Ezerovo	1580 m	18.V.2016	41°36'40"N; 24°41'04"E
3.	N Hvoyna vill.	1080 m	17.V.2016	41°53'04"N; 24°41'00"E
4.	SE Pavelsko vill.	1100 m	17.V.2016	41°50'52"N; 24°43'08"E
5.	E Ribnitsa vill.	890 m	19.V.2016	41°28'10"N; 24°52'39"E
6.	N Varba vill.	1036 m	19.V.2016	41°28'29"N; 24°52'41"E
7.	S Kuklen vill.	760 m	15.VI.2016	42°00'49"N; 24°46'27"E
8.	NE Ravnogor vill.	1166 m	29.VI.2016	41°58'27"N; 24°25'37"E
9.	N Dedevo vill.	790 m	30.VI.2016	42°00'37"N; 24°39'44"E
10.	N Sitovo vill.	1205 m	11.VII.2016	41°56'35"N; 24°36'51"E
11.	NE Lilkovo vill.	1190 m	11.VII.2016	41°56'38"N; 24°36'35"E
12.	N Boykovo vill.	724 m	11.VII.2016	42°01'19"N; 24°36'52"E
13.	S Ustina vill.	580 m	12.VII.2016	42°01'40"N; 24°31'41"E
14.	E Krichim Dam	1650 m	12.VII.2016	41°53'26"N; 24°30'48"E
15.	SW Semchinovo vill.	685 m	13.VII.2016	42°10'19"N; 24°03'58"E
16.	NE Gostun vill.	1166 m	28.VI.2016	41°50'17"N; 23°42'04"E
17.	N Trigrad	1058 m	31.VIII.2015	41°37'26"N; 24°23'49"E
18.	S Rakitovo	1627 m	1.IX.2015	41°53'39"N; 24°04'27"E
19.	„Chervenata stena" Reserve	~ 1000 m	29.VI, 18.V.2014	41°54'42"N; 24°52'35"E
20.	SW Dobrostan vill.	1380 m	16.V.2014	41°53'35"N; 24°52'10"E
		1349 m	17.V.2014	41°53'31"N; 24°52'11"E
		1323 m	18.V.2014	41°54'30"N; 24°52'09"E
		1282 m	18.V.2014	41°54'14"N; 24°52'40"E

litter & bark-dwelling; 1.3(1).6 – bothrobionts; 1.3(2) – series digging stratobionts; 1.3(2).1 – litter & soil-dwelling; 1.3(2).2 – litter & crevice-dwelling; 1.4.2(1) – small digging geobionts. *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; 2.3.2 – zabroid geohortobionts; 2.3.3 – dytomeoid geohortobionts. 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.

Results

During the field work were captured 2470 specimens belonging to 133 species, 46 genera and 19 tribes of ground beetles. This represents, respectively, 18% of all established for Bulgarian carabid fauna species and 37% of the genera (Guéorguiev & Teofilova, in prep.). Regarding the known Carabidae taxa from the Western Rhodopes, the ones found during the investigation represented respectively 40% of the species and 54% of the genera.The largest in number of species was the share of the tribes Harpalini, Amarini and Pterostichini, and the most abundant were the specimens from the tribes Pterostichini (one third of all), Carabini, Bembidiini and Harpalini (Table 3).

Regarding the number of species in the individual genera, the results for the whole carabid complex showed that the most species rich was the genus Amara (19 species), followed by the genera *Harpalus* (16 species) and *Bembidion* (11 species). The genera *Carabus* and *Pterostichus* were represented by 9 species each, and the genera *Calathus*, *Laemostenus* and *Ophonus* – by 4 species each. Genus *Trechus* was represented by 5 species. From the genera *Poecilus*, *Agonum* and *Microlestes* were captured 3 species each. Following were the genera *Cicindela*, *Leistus*, *Nebria*, *Notiophilus*, *Abax*, *Molops*, *Chlaenius*, *Syntomus* and *Cymindis*, represented by 2 species each, and *Calosoma*, *Cychrus*, *Clivina*, *Tachys*, *Elaphropus*, *Asaphidion*, *Stomis*, *Xenion*, *Myas*, *Tapinopterus*, *Limodromus*, *Anchomenus*, *Synuchus*, *Zabrus*, *Anisodactylus*, *Bradycellus, Stenolophus*, *Dixus*, *Panagaeus*, *Callistus, Badister*, *Paradromius*, *Lionychus*, *Aptinus* and *Brachinus*, with only one species each.

Among the identified carabids the most abundant species were: *Bembidion lampros* (278 ex., 11% of all) and *Pterostichus niger* (231 ex., 9%). Less abundant were: *Carabus scabriusculus* (118 ex.), *Carabus convexus* (106 ex.), *Poecilus cupreus* (105 ex.), *Ophonus laticollis* (98 ex.), *Carabus hortensis* (95 ex.), *Tapinopterus balcanicus* (92 ex.), *Poecilus versicolor* (88 ex.), *Calathus fuscipes* (83 ex.), *Molops dilatatus* (81 ex.), *Carabus violaceus* (80 ex.).

Carabus hortensis has been found as indicator for the beech and Norway spruce forests of the Rhodopes (Kostova, 2015), along with *Cychrus semigranosus balcanicus* and *Calathus metallicus*, also found during the present study, but with lesser abundance. *Carabus convexus* and *Carabus*

Table 3. *Taxonomic structure of the established carabid complex.*

Tribes	Genera		Species		Specimens	
	number	%	number	%	number	%
1. Cicindelini	1	2.2	2	1.5	16	0.65
2. Nebriini	2	4.3	4	3.0	33	1.3
3. Notiophilini	1	2.2	2	1.5	9	0.4
4. Carabini	2	4.3	10	7.5	512	20.7
5. Cychrini	1	2.2	1	0.75	64	2.6
6. Clivinini	1	2.2	1	0.75	2	0.1
7. Trechini	1	2.2	5	3.8	45	1.8
8. Tachyini	2	4.3	2	1.5	3	0.1
9. Bembidiini	2	4.3	12	9.0	338	13.7
10. Pterostichini	8	17.4	20	15.0	833	33.7
11. Sphodrini	2	4.3	8	6.0	120	4.9
12. Platynini	4	8.7	6	4.5	72	2.9
13. Amarini	2	4.3	20	15.0	98	4.0
14. Harpalini	6	13.2	24	18.1	259	10.5
15. Panagaeini	1	2.2	1	0.75	6	0.2
16. Callistini	2	4.3	3	2.3	6	0.2
17. Licinini	1	2.2	1	0.75	2	0.1
18. Lebiini	5	10.9	9	6.8	45	1.8
19. Brachinini	2	4.3	2	1.5	7	0.3
Total:	*46*	*100*	*133*	*100*	*2470*	*100*

hortensis were dominant species for the oak forests in "Kupena", along with *Myas chalybaeus* and *Laemostenus terricola* (Kostova, 2009). *Molops dilatatus* and *Carabus hortensis* have been found dominant in the mixed beech forest and in the spruce forest in "Mantaritsa". *Carabus violaceus* was also dominant in the spruce forest in "Mantaritsa" (Kostova, 2009).

With only one specimen were represented 33 species (25% of all): *Leistus spinibarbis*, *Calosoma sycophanta*, *Trechus subnotatus*, *Tachyura quadrisignata*, *Bembidion brunnicorne*, *B. monticola*, *Poecilus lepidus*, *Pterostichus leonisi*, *Pt. vernalis*, *Pt. quadrifoveolatus*, *Pt. melas*, *Laemostenus janthinus*, *L. cimmerius*, *Amara anthobia*, *A. eurynota*, *A. familiaris*, *A. nitida*, *A. morio*, *A. quenseli*, *A. equestris*, *Anisodactylus binotatus*, *Bradycellus caucasicus*, *Stenolophus teutonus*, *Harpalus attenuatus*, *H. xanthopus*, *H. dimidiatus*, *H. hospes*, *Ophonus cribricollis*, *Callistus lunatus*, *Chlaenius decipiens*, *Paradromius linearis*, *Cymindis axillaris*, *C. humeralis*.

Some *species with conservation significance* were established. From the protected species, in the Red Data Book of Bulgaria (Golemanski et al., 2015) as Vulnerable (VU) is included *Carabus scabrosus*. *Calosoma sycophanta* and *Carabus intricatus* are included in the Annexes of CORINE and ESC Red List.

During the study we captured 10 new for the Western Rhodopes species: *Trechus asiaticus* (traps, Grashtitsa), *Tachys micros* (traps, Krastava), *Tachyura quadrisignata* (traps, "Mantaritsa"), *Pterostichus leonisi* (traps, Krastava), *Laemostenus janthinus* (traps, "Kupena"), *Amara morio nivium* (traps, Krastava), *Harpalus caspius* (traps, Patalenitsa), *Badister bullatus* (traps, Krastava), *Syntomus obscuroguttatus* (traps and handpicking, Krastava) and *Microlestes apterus* (traps, Grashtitsa). It was also confirmed the presence of *Amara quenseli*, for which Apfelbeck (1904) reported, but without a specific and certain locality. The species was caught in the area of Krastava. Genera *Badister* and *Tachys* were reported for the first time from the Western Rhodopes.

During the study we captured 16 endemic species (12% of all established species). Twelve of them are Balkan endemics: *Carabus scabriusculus bulgarus* ("Kupena", "Mantaritsa", Dobrostan), *Carabus montivagus montivagus* (Patalenitsa, Krastava), *Carabus violaceus azuresens* ("Mantaritsa", "Dupkata", Nevyastata Peak, Semchinovo, Krastava, Grashtitsa), *Carabus scabrosus bureschianus* (Grashtitsa, Nevyastata Peak, Ravnogor), *Cychrus semigranosus balcanicus* ("Dupkata", "Kupena", "Mantaritsa", Nevyastata Peak, Dobrostan, Ravnogor, Ustina), *Trechus subnotatus subnotatus* (Grashtitsa), *Xenion ignitum* ("Dupkata", "Kupena", "Mantaritsa", Nevyastata Peak, Boykovo, Krastava), *Pterostichus melas depressus* (Dobrostan), *Molops dilatatus dilatatus* ("Mantaritsa", Krastava, Grashtitsa, Ezerovo), *Laemostenus cimmerius wieratheri* (Nevyastata Peak), *Laemostenus plasoni plasoni* (Grashtitsa), *Microlestes apterus* (Grashtitsa). Bulgarian endemics were represented only by *Tapinopterus balcanicus balcanicus*, found near the villages of Dobrostan and Grashtitsa, and in the reserves "Chervenata stena", "Dupkata", "Kupena" and "Mantaritsa". Bulgarian local

endemics were represented by 3 species: *Nebria rhilensis* (captured in "Mantaritsa"; distributed in Rila Mts., Pirin Mts. and Western Rhodope Mts.), *Pterostichus rhilensis rhilensis* (captured in "Mantaritsa"; distributed in Rila and Western Rhodopes), *Molops alpestris rhilensis* (captured in "Mantaritsa", "Kupena", Dorbostan, Krastava and Grashtitsa; distributed in Rila, Pirin, Slavyanka Mts. and Western Rhodopes).

Among the captured ground beetles were 5 relicts (*Carabus hortensis*, *Xenion ignitum*, *Myas chalybaeus*, *Amara erratica*, *Amara quenseli*) and some rare species (*Leistus spinibarbis*, *Bembidion balcanicum*, *Pterostichus quadrifoveolatus*, *Amara communis*, *Amara lunicollis*, *Amara morio*, *Microlestes maurus*).

During the present study we recorded new highest altitudes (in Bulgaria) for 9 carabid species, which was reported in a recent study (Teofilova, 2017) concluding that the movement of species in height is a result of the global climatic changes in combination with the presence of some anthropogenic load in the researched area.

According to the *humidity preferences*, the results of the study showed that the mesophilous species were 49 (37% of all), 41 were mesoxerophilous (31%), 24 were mesohygrophilous (18%), 14 were hygrophilous (10%) and xerophilous were only 5 species (4%). This distribution was also similar in quantitative terms. Most specimens were established for the mesophilous group (1582 ex.; 64% of all), followed by the mesoxerophilous (439 ex.; 18%) and mesohygrophilous (245 ex.; 10%). The share of the hygrophilous (80 ex.; 3%) and xerophilous (124 ex.; 5%) ones was comparatively low (Figure 2).

The analysis of the *life forms* of the ground beetles showed a predominance of the zoophages (89 species; 67%) over the mixophytophages (44 species; 33%). There were 18 life forms of ground beetles – 13 zoophagous and 5 mixophytophagous. Zoophagous life form groups are normally more numerous. The largest share of the species belonged to the harpaloid geohortobionts from Class

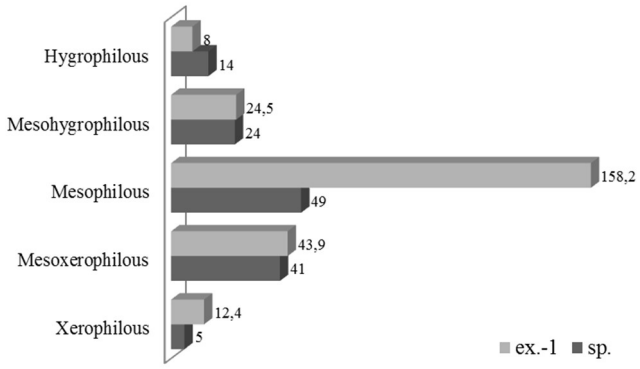


Figure 2. *Ecological structure of the ground beetles in terms of their requirements to the humidity conditions. The dark colour shows the number of species pertaining to a given category, and in light colour are the numbers of specimens, divided by 10 for the purpose of comparability of the data submitted.*

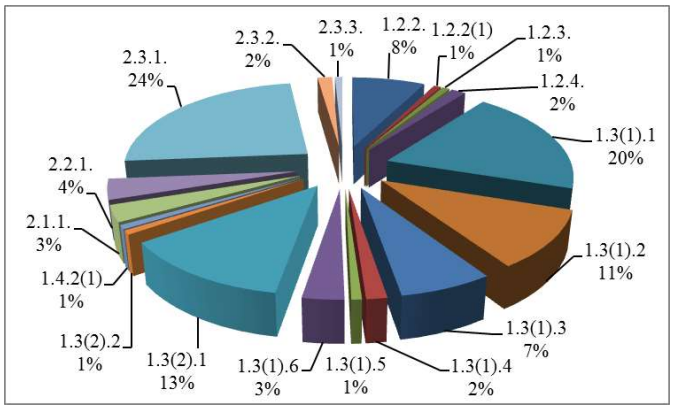
Mixophytophagous, followed by the surface & litter dwelling stratobionts from Class Zoophagous (Figure 3, left).

In quantitative terms, the prevalence of the zoophages (85.5% of all specimens) was clear, and the most numerous were the litter & soil dwelling digging stratobionts, large walking epigeobionts (genera *Carabus* and *Cychrus*) and litter dwelling stratobionts (*Trechus*, *Metallina*, *Calathus*, *Limodromus*) (Figure 3, right).

Discussion

The taxonomic structure of the established in the Western Rhodopes carabid complex showed the predominance of the ecologically plastic representatives of tribes Harpalini and Amarini, intra- and extrazonal stenobionts from tribe Bembidiini, and typical forest dwellers from tribes Carabini and Pterostichini.

Amarini and Harpalini normally occupy an essential part of the carabid communities in different regions. They are actively moving, flying forms, with low preference to the



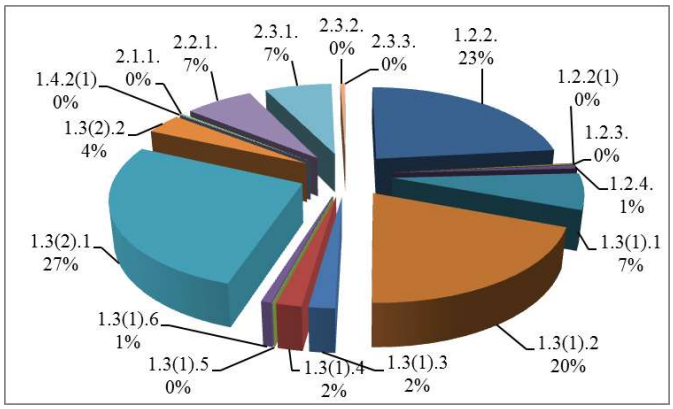


Figure 3. *Life forms of the carabids from the Western Rhodope Mts.: number of species (left) and number of specimens (right).*

food base, which makes them easily adaptable to different habitats. Most of the representatives of genus *Bembidion* are attached to habitats with greater humidity, in particular banks of the mountain rivers and small lakes. This genus is the most species-rich in Bulgaria, although its species rarely occur in high numbers. The increased presence of the genera *Carabus* and *Pterostichus* is normal for the studied forest-mountain territory. Most species of these genera are large, non-flying forms and are typical zoophages. Most of them are stenotopic and any impact on the forest habitats where they occur also affects the structure of their communities.

In terms of humidity, the mesophilous species prevailed, and the least represented were the xerophilous species. This study proved the predominantly mesophilous nature of the habitats, probably resulting from the large percentage of forest territories, with typical carabid coenoses. In such type of habitats the most common are the representatives of the genera *Leistus*, *Calosoma*, *Carabus, Cychrus*, *Stomis*, *Myas*, *Aptinus*. To the hygrophilous and mesohygrophilous complexes refer the inhabitants of humid grasslands and forests, wetlands, coastal, swamped and marshy biotopes (*Stenolophus*, *Bembidion*, *Clivina*, *Tachys*). Xerophilous and mesoxerophilous are the most species in open habitats, including many of the alpine and subalpine species, representatives of the genera *Cicindela*, *Amara*, *Harpalus*, *Brachinus*, and many Lebiini.

The life forms of the carabids showed the prevalence of the zoophages over the mixophytophages both in qualitative (67%: 33%) and in quantitative terms (85.5%: 14.5%), which is normal for stable and late successional ecosystems (Sharova, 1981). The largest share of the harpaloid geohortobionts seems unusual, since they are the most species rich category in grasslands (Teofilova, 2018), but there were found some mountain harpaloids (*Harpalus laevipes* and four species of *Amara*), which increases their share. Harpaloid geohortobionts are also dominating in inland sparsely vegetated ecosystems like screes and rocks (Teofilova, in press), most of which are located in mountainous regions, such as the studied one.

Zoophagous surface & litter dwelling stratobionts are most of the *Bembidion* and *Agonum* species, *Notiophilus*, *Panagaeus*, *Chlaenius*. They were also found as the most species rich category in coastal shingle ecosystems (Teofilova, in press). The third most rich category are the litter & soil dwelling digging stratobionts (most of the *Poecilus*, *Pterostichus*, *Abax* and *Molops* species), which are typical forest dwellers. They hunt on the surface of the soil, and in order of hiding, they actively dig in the ground or litter.

Such as in this case, in previous study in "Kupena" and "Mantaritsa" the most abundant (quantitatively) life forms also were the litter dwelling stratobionts, litter & soil dwelling digging stratobionts and large walking epigeobionts (Kostova, 2009). The prevalence of the last two categories in biomass is indicative for stable old forest ecosystems (Szyszko, 1990).

The region of the Western Rhodope Mts. has great importance for the ground beetles, since it is treasuring specific assemblages and species with conservation significance. The endemics that we found were mostly typical forest dwellers, representatives of the old European Nemoral complex, and preserving of their characteristic habitats is a keystone for their conservation. The smaller percentage of the endemics, compared to the Guéorguiev et al. (1997), is due to the fact that the cave and alpine carabid fauna have not been studied in the present research. Comparatively higher was also the percentage of endemic species found in the reserves "Mantaritsa" and "Kupena" by Kostova (2009), which is probably due to the conservation status of the two protected territories.

Natural conditions in the region are relatively stable and provide an environment for some specific groups of species. On the other hand, there are also a number of degradation processes mainly related to the problems in the Bulgarian forestry, abandoned agricultural lands and pastures, and abidance of the nature conservation regimes in protected areas and zones. Successional processes are at different stages of development depending on the extent and nature of the disturbances and the initial condition of the ecosystems. Particularly specific are the processes occurring in the "mixed" habitats, characterized by a combination of different environmental conditions and taxonomic and ecological groups of ground beetles.

Previously known in the Western Rhodopes carabids, supplemented with the newly established in the current study species, evidence the high diversity of the ground beetle fauna and emphasize the specificity of the territory and the conservation significance of the preserved habitats. Future directions for the development of the region should include measures for conservation of these habitats and for restoration of the ones already affected by anthropogenic activity.

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