Ecology of the ground beetles (Insecta: Coleoptera: Carabidae) from the Sarnena Sredna Gora Mts.

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ФОНД НАУЧНИ ИЗСЛЕДВАНИЯ
МИНИСТЕРСТВО НА ОБРАЗОВАНИЕТО И НАУКАТА

Introduction

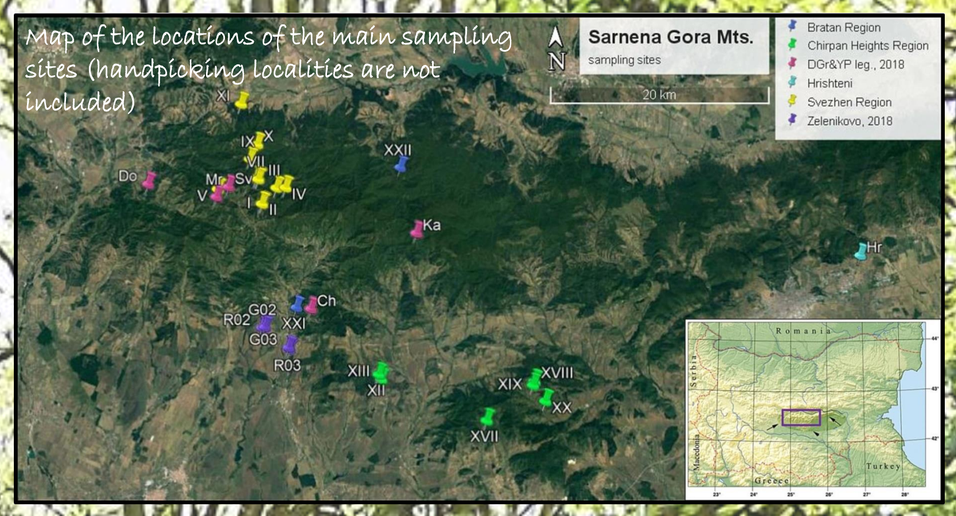
This is the second part of the first purposive study on the ground beetles (Coleoptera: Carabidae) from Sarnena Gora Mts. So far, 175 species (23% of all Bulgarian Carabidae species) are to be found there.

The present study aimed at analyzing the ecological structure of the carabid coenoses in relation to main ecological parameters, e.g. dominance structure, life form categorization, wing development, humidity and habitat preferences, with a subsequent assessment of the environmental trends and anthropogenic impact in the studied area.

Material

The species list is completed on the basis of the available bibliographic data and material collected during field trips carried out in 2017–2020.

Ground beetles were collected with pitfall traps, hand picking and light attraction, and different types of habitats were sampled.



Map of the locations of the main sampling sites (handpicking localities are not included)

Results

Category	Dominance structure	No
eudominant	Laemostenus cimmerius	1
dominant	Aptinus bombarda, Carabus montivagus, C. convexus, Molops piceus, Pterostichus oblongopunctatus	5
subdominant	Abax carinatus, Calathus distinguendus, C. fuscipes, Carabus hortensis, [C. intricatus], Harpalus tardus, [Limodromus assimilis], Myas chalybaeus, [Xenion ignitum]	6
recedent	Abax ovalis, A. parallelus, Brachinus crepitans, Br. explodens, Calosoma inquisitor, Carabus intricatus, C. coriaceus, Limodromus assimilis, Notiophilus rufipes, Pterostichus niger, Trechus quadristriatus, Xenion ignitum	12
Subrecedent	all the rest	82

F	Frequency of occurrence	No
> 50% constant	91%: Laemostenus cimmerius; 82%: Carabus convexus, Myas chalybaeus; 68%: Abax carinatus, Carabus montivagus; 64%: Carabus coriaceus, Trechus quadristriatus; 55%: Calathus fuscipes, Calosoma inquisitor, Harpalus tardus, Pterostichus oblongopunctatus	11
25–50% accompanying	45%: Carabus intricatus, Molops piceus, Notiophilus rufipes; 36%: Calathus distinguendus, Carabus hortensis, Xenion ignitum; 32%: Cychrus semigranosus, Pterostichus niger; 27%: Abax ovalis, Aptinus bombarda, Brachinus explodens, Carabus scabrosus, Laemostenus venustus, Molops alpestris	14
< 25%	all other	81

Life forms		No sp.	%
Class: Zoophagous			
Life form subclass: 1.1 – Phytobios			
1.1.2	Stem-dwelling hortobionts	1	0.6
1.1.3	Leaf-dwelling dendrohortobionts	3	1.7
Life form subclass: 1.2 – Epigeobios			
1.2.2	Large walking epigeobionts	12	6.9
1.2.2(1)	Dendroepigeobionts	1	0.6
1.2.3	Running epigeobionts	3	1.7
1.2.4	Flying epigeobionts	3	1.7
Life form subclass: 1.3 – Stratobios			
Series: 1.3(1) – crevice-dwelling stratobionts			
1.3(1).1	Surface & litter-dwelling	19	10.6
1.3(1).2	Litter-dwelling	16	9.1
1.3(1).3	Litter & crevice-dwelling	18	10.3
1.3(1).4	Endogeobionts	2	1.1
1.3(1).5	Litter & bark-dwelling	2	1.1
1.3(1).6	Bothrobionts	3	1.7
Series: 1.3(2) – digging stratobionts			
1.3(2).1	Litter & soil-dwelling	21	12.0
1.3(2).2	Litter & crevice-dwelling	1	0.6
1.3(2).3	Bothrobionts	1	0.6
Life form subclass: 1.4 – Geobionts			
1.4.1(1)	Narrow-headed running & digging geobionts	1	0.6
	Zoophagous total	107	61.0
Class Mixophytophagous			
Life form subclass: 2.1 – Stratobios			
2.1.1	Crevice-dwelling stratobionts	9	5.1
Life form subclass: 2.2 – Stratohortobios			
2.2.1	Stratohortobionts	16	9.1
Life form subclass: 2.3 – Geohortobios			
2.3.1	Harpaloid geohortobionts	33	18.9
2.3.1(1)	Crevice-dwelling harpaloid geohortobionts	2	1.1
2.3.2	Zabroid geohortobionts	5	2.6
2.3.3	Dytomeoid geohortobionts	3	1.7
	Mixophytophagous total	68	39.0

The study proves that the region of the Sarnena Sredna Gora Mts. keeps a very rich, diverse and heterogeneous ground beetle fauna, and has a significant conservation value. The insufficient research in the area and the large carabid species richness suggest that future targeted studies would contribute to the enrichment of the species list presented here.

The results of our research and analysis suggest a well-differentiated and preserved forest carabid fauna and carabid coenosis, with a typical mountain zoning, consisting in distinguishing between species characteristic of all types of old mesophilic deciduous forests, and montane forest carabids typical for the beech mountain belt. Established forest coenoses have a relatively small number of species with high density and high level of evenness, characteristics of the climax or close to climax state forest ecosystems. All established forest species are wingless, mesophilous or mesohygrophilous stratobionts and epigeobionts, which confirms the naturalness and autochtonity of the ground beetle communities and their habitats. The established in the dominant component of the dominant structure species can be used as indicators of mountain forest mesophilic fauna. Such are also some typical forest species from the recedent category, which are being represented by a relatively large number of specimens only in mountain forest ecosystems.

Despite the large and drastic changes in the environment, there is an exceptional variety of preserved habitats of carabids in the Sarnena Gora, which is confirmed by the great species richness, the high density of species specific to natural habitats and their stable carabid coenoses.

A significant problem for natural ground beetle communities is the rapid human intervention associated with the felling of old, diverse in age forests and their transformation into even-age forests, as well as the conversion of natural forests into coniferous or exotic plantations. Another significant problem is the intensive agriculture, which destroys soil structure annually, and pesticides and mineral fertilizers destroy soil organisms and lead to irreversible degradation.

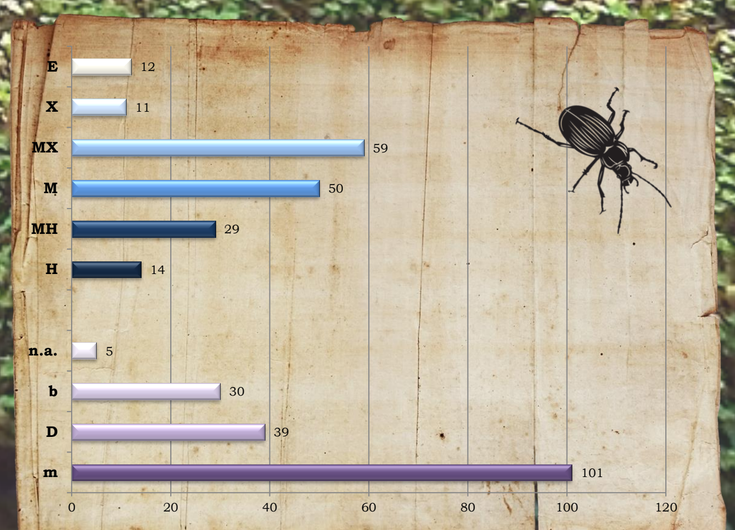
In order to assure the preservation of the natural habitats and significant species, a proclamation of some protected areas and/or zones is recommendable.

Humidity preferences

H – hygrophilous
MH – mesohygrophilous
M – mesophilous
MX – mesoxerophilous
X – xerobiont, E – eurybiont

Wing morphology

m – macropterous
D – wing di(poly)morphic
b – brachypterous
n.a. – no data



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