Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 14, Issue 3, 2014
PRINT ISSN 2284-7995, E-ISSN 2285-3952

DIVERSITY AND THE MAIN ECOLOGICAL REQUIREMENTS OF THE EPIGEIC SPECIES OF FOREST ECOSYSTEMS IN THE SIBIU COUNTY, IN THE YEARS 2013-2014

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Abstract

Epigeous insects in the "Dumbrava Sibiului" oak forest were captured between 2013-2014. From April to September in each year. 12 traps were installed in a circle 147 individuals collected belonged to 28 species and 6 families: Carabidae – 14 species (50.0%), 187 individuals (77.37 %), Staphylinidae – 7 species (25.0 %), 15 individuals (6.17 %), Silphidae – 3 species (10.72 %), 29 individuals (11.93 %), Elateridae – 1 species (3.51 %), 1 individual (0.41 %), Scarabaeidae – 2 species (7.14 %), 8 individuals (3.29 %), Forficulidae – 1 species (3.51 %), 2 individuals (0.82 %)). Also, we presented in tables the ecological requirements of the species of Carabidae collected, the variation of their relative abundance and the structure of dominance Composition of species corresponded to communities from drier forms of irregularly flooded the floodplain forests with decreased level of ground water, known from Central Europe.

Key words**:** *abundance, dominance, ecological requirements, entomofauna, Forest "Dumbrava Sibiului"*

INTRODUCTION

The faunistic and zoogeographic direction is represented by a plenty of earlier works. Some of these also include the biological characteristics of species [1, 9, 10, 11, 12, 13, 14-16, 18-21]. The second direction of research is oriented of structure of *Carabid* communities in a wide scale of natural and artificial ecosystems.

Some papers on carabids from mixed forests in Moldova (Romania) were published by Solomon L., Varvara M., (1986) [17] and also Varvara (2004, 2005) [19, 20]; while those in beech forests and in coniferous forests and besides it some collaborators published many papers on structure of the carabid communities in the field of potatoes, sugar beet, wheat, maize, sunflower, clover and in apple orchards in Moldova. The observations on the taxonomic composition and ecological structure of populations of *Carabidae* in the same forest ecosystems are published in the other papers [17,18,19,20,21,22].

The carabids in Romania were studied in two basic directions, one purely faunistic (zoogeographic) and the other one ecologic and coenotic.

The aim of the present paper is the faunistic and ecologic evaluation of the epigeic insects collected in the "Dumbrava Sibiului" oak forest.

MATERIALS AND METHODS

The insects were collected in the Dumbrava Sibiului oak forest (Fig. 1) situated in the Municipality Sibiu, in Sibiu County, at the contact between the Cindrel Mountains and the sediments of the piemontan plaine and hills in the S of the city Sibiu. „Dumbrava Sibiului" (GPS: 45°44'35''N, 24°05'51''E) has a surface of 978 ha and it is distributed in four forests (Fig.2).

The traps were set in a circle of 12.5 m diameter. The traps were put in the first decade of April, 2011, 2012 till September and were emptied twenty times.

The species dominance is characterized by the following scale: eudominant > 10 %,dominant species 5-10%, subdominant 2 - 5%, recedent 1 -2 % and subrecedent < 1 %. They were

installed 12 pitfalls having the capture possibilities of 29.37% from the circle circumference [5,15].

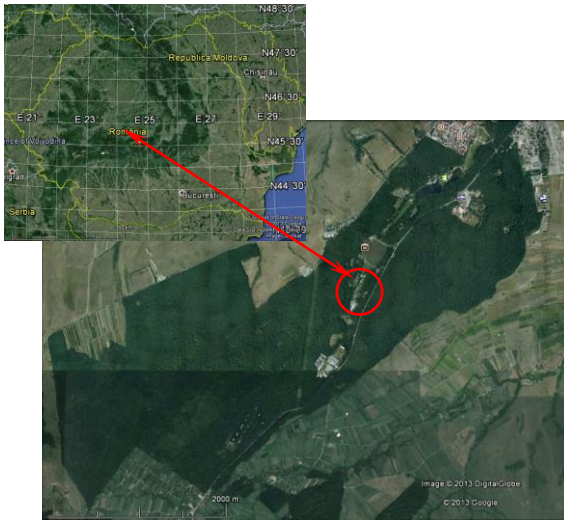

Fig. 1. The satellite map of the "Dumbrava Sibiului" oak forest, the circle mark the study plot (after http://maps.google.ro)

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In order to attract the insects inside the trap, at the aperture of every collector bottle a funnel made of a thin of a sheet of PVC, dark colored.

Fig. 2. Interior of the study plot in the oak forest

RESULTS AND DISCUSSIONS

In the" Dumbrava Sibiului" oak forest, Carabid were represented by 188 individuals (77.37%) belonging to 14 species (50% of species collected). Four species were eudominant (*Pterostichus oblongopunctatus, Platynus assimilis, Pterostichus niger* and *P. melanarius)* whose number of individuals ranged from 29 (13.89%) (*Pterostichus melanarius*) to, 60 (31.91%) (*Pterostichus oblongopunctatus).* Four species were subdominant (*Carabus violaceus*, C. ullrichi, C. gigas and Harpalus latus) and the remaining six species were recedent (Table 3). Table 2 the main ecological requirements of the species of Carabidae. Five species (35.71%) are spring breeders and three species (28.57%) are autumn breeders. In the spring 2012, the spring breeding *Pterostichus oblongopunctatus*, *Platynus assimilis* were captured in the period from 1 to 6 April.

According to the variation of moisture preferences, *Loricera pilicornis* is an euyrytopic mesohygropilous species, particularly typical for intial stages of succession of vegetation cover. *Carabus scheidleri* is mesohygropholius, preferably forests species, but it is able to survive succesfully in open landscape. *Carabus ullrichi, Carabus coriaceus, Carabus gigas, Pterostichus oblongopunctatus* are mesohyhrophilous forests species, *Carabus violaceus* and *Pterostichus melanarius are* moderately hydrophilous. *Carabus violaceus* is primarily a forest species, but at higher altitudes it is able to colonize high stands of grasses. *Pterostichus melanarious* is a eurytopic species abundant in floodplain forests, in fields and in to certain degree also in moutain forests. *Platynus assimilis* and *Pterostichus niger* are hygrophilous species typical for floodplaun forests and one. *Harpalus latus* and *Anisodactylus binotatus* are open landscape species. *Harpalus latus* is mesohydrophilous, while *Ansisodactylus binotatus* prefers increased humidity and heavy soils.

In total, during 2013-2014 there were collected 147 individuals of 28 species of epigeic insects of the "Dumbrava Sibiului" oak forest belonging to two orders (*Coleoptera*, five families *Dermaptera*, one family), (Table 1), among them 28 species. The families of *Carabidae* and *Staphylinidae* were represented by 75% and 203 individuals (83.54%). The other families (*Silphidae*,

Elateridae, Scarabaeidae and *Forficulidae*) were represented by 7 species (25 %) and 40 individuals (16.47%).

Most of species are zoofaphagous 78.57%. *Harpalus latus* and *Anisodactylus binotatus* are pantofaghous. Most species are palaearctic in the "Dumbrava Sibiului" oak forest.

Table 1. The taxonomic structure of the epigeic insects collected from the Dumbrava Sibiului oak forest during 2013-2014

Families	Species	%	Individuals	%
Carabidae	14	50.0	92	77.37
Staphylinidae	7	25.0	15	6.17
Silphidae	3	10.71	29	11.93
Elateridae	1	3.57	1	0.41
Scarabaeidae	2	7.14	8	3.29
Forficulidae	1	3.57	2	0.82
Total	**28**	**99.99**	**147**	**99.99**

Table 2. Ecological and zoogeographic characteristics of Carabid collected in the Dumbrava Sibiului oak forest

Species	Reproduction	Hum.	Habit.	Food	Distribution
C. gigas		M	F	Z	
C. coriaceus	A	M.	F	Z	Eur.
C. violaceus	A	M	F, St.	Z	West Pal.
C. ullrichi	S	M	F	Z	Transpal.
C. scheidleri		M	F	Z	
C. nemoralis		M	F	Z	
H. latus	A	M.	F,St.	P	Transpal.
P. niger	plastic	M	E	Z	Transpal.
P. melanarius	Plastic	M	F	Z	West pal.
P. oblongopunctatus	S	M	F	Z	Transpal.
P. assimilis	S	H	F	Z	Transpal.
Agonum sp.					
A. binotatus	S	M	O	P	Westpal.
L. pilicornis	S	M	F	Z	Holarct.

Legend : Reproduction type: A = Autumn, S=Spring, P= Plastic; Humidity preference: M= Mesophilous, X=Xerophilous, H=Hygrophilous; Habitat preference: F= Forest, E= Eurytopic,O=landscape; Z = Zoophagous, P=Pantophagous; E= Europe, W = Westpalaeartic, T=Transpalaearctic; H= Holarctic.

Table 3. The dominance structure of the species of Carabidae in the Dumbrava Sibiului oak forest, Sibiu County

Dominance degree	Species	%	Individuals	%
Eudominant	4	28.57	150	79.79
Dominant	0	0	0	0
Subdominant	4	28.57	21	11.17
Recedent species	6	42.86	17	9.04
Subrecedent species	0	0	0	0
Total	**14**	**100.0**	**188**	**100**

CONCLUSIONS

Within an oak tree forest, the conditions of humidity are lower than within a beech tree ecosystem. Comparing our results, as concerns the family of Carabidae, (species, percentages of indivuiduals) with those of [2,3,4] in a forests of pedunculate oak (*Quercus pedunculatus*) sessile oak (*Quercus petraea*) in Republic of Moldova [2] collected 21 species of Carabidae, while we only 14 . Among them six species were common for these two forests, viz *Platynus assimilis, Pterostichus niger, P. melanarius , Carabus ullrichi, Harpalus latus* and *Carabus coriaceus.*Eight species (57.14 % of total species) were captured only in the Dumbrava Sibiului forest, while 15 species (71.42 %) only in the forest studied by [3].

The community composition reflects the position of the sampling site close to the margin of the forests and neighbouring fields, but the forest and eurytopic species predominate over the open landscapes species represented by *Harpalus latus* [48]. Presence of *Silphids* and *Scarabaeids* in the material results from the attractivity of the caught material in the traps for these necrophagous or coprophagous species.

The variation of percentages of the common species dominance in the two sites reflect more adequately the reality of locale conditions. Thus, The "Dumbrava Sibiului"forest has better conditions of humidity for the forest is located in the Sibiu Depression with mountain influences in comparison with the "Plaiul Fagului" Reserve, located closer to Eastern steppe[2].

Pterostichus oblongopunctatus has a percentage of 31.43% in the "Dumbrava Siubiului"while in the "PlaiulFagului"it was not collected at all. The species *Carabus ullrich* had a percentage of 10.95%, in the " Plaiul Fagului" and only 2.66 % in the "Dumbrava Sibiului". Percentage differences are due to variation of the humidity in the two forests.

The following species of carabids, *Carabus coriaceus, Carabus violaceus, Carabus ullrichi, Pterostichus niger, P. melanarius, Harpalus sp.* were collected from crops near the forest, too, but in fewer individuals.

The species composition characterized by a high dominance of *Prerostichus niger,*

Pterostichus melanarius, Platynus assimilis, Carabus ullrichi and *Staphylinus erythropterus* is typical of dry types of floodplain forests in Central Europe (*Querci Fraxineta, Ulmi Fraxineta carpinea*), [5,15,21,22]. In comparison with carabid comminities in many other localities in lowlands and highlands number od species and individuals is extremely low and corresponds to the highly degraded communities [17] and corresponds to the urban parks with preserved seminatural vegetation and fauna, but isolated in the city.

The collecting and analysing of 147 individuals during 2013-2014 in the "Dumbrava Sibiului" oak forest revealed that the epigeic entomofauna poor as in number of individuals as in number of species. The epigeic fauna of insects is composed of 96.42% Ord. *Coleoptera* and 3.57% Ord. *Dermaptera*.

Five *Carabid* species are springbreeders, and 4 species autumn breeders. The majority of species were forest species, mesophilic, zoophagous, Palaearctic.

The *Carabids* were represented by 14 species, 184 individuals, *Staphylnids* 7 species, 15 individuals, and *Silphids* by 3 species, 29 individuals, *Elateridae* 1 specie, 1 individual, *Scarabaeidae* 2 species, 8 individuals and *Forficulidae* 1 specie, 2 individuals.

The eudominant species of *Carabidae* were: *Pterostichus oblongopunctatus Platynus assimilis, Pterostichus niger, P. melanarius.* The percentage of individuals of eudominant species ranged from 29 (15.43 % *Pterostichus melanarius)* to 60 (31.43 % *Pterostichus oblongopunctatus).* 6 species were recedent.

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