

DIVERSITY AND ECOLOGICAL ASPECTS OF THE SPECIES OF CARABIDAE (COLEOPTERA, CARABIDAE) IN THE SUGAR BEET CROP ECOSYSTEM FROM THE LOCALITY OF TRUȘEȘTI (BOTOȘANI COUNTY)

VARVARA MIRCEA, GĂLUȘCĂ SIMONA

Abstract. The present paper deals with some ecological aspects concerning the epigeic ground beetles from the sugar beet crop ecosystem of the Trușești locality (Botoșani County). It presents the alpha diversity of the ground beetles, the variation of the relative abundance, the Shannon index of the coenosis, evenness, and the main ecological requirements of the species, the general characteristics of the coenosis of ground beetles as concerns the classes of ecological requirements. reproduction, moisture, biotopes, food and geographical distribution.

Key words: Sugar beet crop, Carabidae, alpha diversity, relative abundance, dominance, Shannon index, evenness, main ecological requirements.

Rezumat. Diversitatea și aspecte ecologice ale speciilor de carabide (Coleoptera, Carabidae) în ecosistemul culturii de sfeclă de zahăr din localitatea Trușești, județul Botoșani. Lucrarea cuprinde diversitatea taxonomică epigeică a Ordinului Coleoptera și a speciilor de carabide epigeice din ecosistemul culturii de sfeclă de zahăr din localitatea Trușești (Județul Botoșani). Pentru colectarea materialului entomologic (Trușești) s-au folosit 12 capcane Barber cu lichid conservant și protejate împotriva precipitațiilor. S-au efectuat opt colectări, extrăgându-se 96 de eșantioane (8 x 12 capcane, mai – august, 2000). Din fauna epigeică s-au colectat indivizi aparținând la 6 ordine de insecte și 10 familii de coleoptere. Din totalul coleopterelor epigeice colectate, două familii sunt eudominante: Carabidae (87,56 %) și Tenebrionidae (10,81 %). Alfa diversitatea speciilor de Carabidae a fost formată din 24 de specii, totalizând, în patru luni de colectare, 2356 exemplare (22,98% din total), comparativ cu localitatea Lețcani, (Județul Iași) cu 26 specii, 6782 indivizi (66,16 %) (1981); (19 specii, 1113 indivizi, (10,86 %), Lețcani, 1982). Valoarea indicelui Shannon a fost 1,67, iar echitabilitatea 36 %.(Trușești, 2000); 2,17; 46 % (Lețcani, 1981); 1,67; 51 % (Lețcani,1982). Cenoza de carabide a ecosistemului sfeclei de zahăr în localitatea Trușești, anul 2000, s-a caracterizat prin predominarea speciilor cu reproducere în primăvară, (50 %), mezofile, (54,16 %), cu preferințe pentru biotopii de culturi și culturi-stepă (54,17%), pantofage și zoofage (87,50%), distribuite preponderent geografic în Palearctic și vest Palearctic (70,83%).

Cuvinte cheie: cultura de sfeclă de zahăr, carabide, abundența relativă, dominanța, indexul Shannon, echitabilitatea, principalele cerințe ecologice.

INTRODUCTION

Objective nature (ecosphere, biosphere, ecobioms and ecosystems) are governed by objective laws. The fundamental law in ecology is the unity and interaction between organisms and environment. There are natural and artificial ecosystems. According to the philosophical principle that in the objective and subjective nature, nothing can exist without a cause, it is absolutely logical that there should exist an unity and interaction between the components of an ecosystem (biotope and biocoenosis). The biotope, by its natural characters (geographical position, climate, soil), determines the kind of a biocoenosis.

Agrocoenoses have proceeded from natural ecosystems (deforestation of forests, the fallowing of steppe) and there was modified, for example, the moisture of soil. According to their ecological valences (historically formed), the species live in certain ecosystems. In the preferred biotopes, the species may be eudominant or dominant, expressed by the number of individuals of a species. All ecological factors act together in interaction.

In Moldavia, there were two phases in knowing the species of ground beetles: The first phase had a faunistic character and the second one, modern and of perspective, an ecological one. In Moldavia, there were known aspects of the activity of ground beetles in natural ecosystems (deciduous and coniferous forests) and agroecosystems: autumn wheat, maize, potatoes, clover, sugar beet.

MATERIAL AND METHODS

The present paper is based on the personal scientific material of ground beetles collected by one of the authors (GĂLUȘCĂ SIMONA, 2000).

The most used, classical and standard method in collecting the ground beetles is the use of pitfalls with preserving liquid and protected from rainfalls. This method permits the qualitative and quantitative collection of the material in a given period of time established by the researcher in order to obtain data on a series of parameters such as: The relative abundance of the species, their constancy and dominance, the diversity of the population of carabids, the dynamics of the whole population in connection with the natural characteristics of biotops, comparisons among collecting sites and discussions on the results.

The site from which the material was collected was Trușești (South part of Botoșani County)

The material was collected in the year 2000: May, June, July, August .

For the collection of the individuals of carabids, 12 pitfalls were used, as an optimum, in order to collect the subrecedent, recedent, subdominant, dominant and eudominant species of Carabidae. The sugar beet crop was bordered by a forest and by a maize crop.

Each soil pitfalls had a volume of 700 cubic centimetres; 7 centimetres in diameter and 10 centimetres in height, being protected from rainfalls .

The pitfalls were placed in the sugar beet crop ecosystem at the beginning of the month of May (the year 2000). The pitfalls were set on three rows, each row having four pitfalls. The distance among rows and pitfalls was five metres.

As preserving liquid we used a saturated solution of salt (250 grams per one litre of water). Each pitfall contained 300 millilitres solution.

The pitfalls functioned 90 days in the ecosystem (2000)(May, June, July and August).

THE COLLECTING OF THE MATERIAL

In the temperate area, the climate influences the activity of the ectothermic invertebrates. In order to follow the seasonal variation of the specific composition, the variation of diversity, and the number of the individuals belonging to each species, we have collected the material twice a month.

The first collecting was carried out about at the middle of each month, and the second one at the end of each month. The material was collected from each pitfall, recording the main data. (site, number of the pitfall, collecting date). In the whole period, eight collectings were made, that is 96 samples.

SCIENTIFIC DETERMINATION OF THE MATERIAL

The determination of the species, their nomenclature, were done according to FREUDE, HARDE, LOHSE 1974.

AIM AND THE OBJECTIVES OF THE PAPER

Moldavia, by its zoogeographical position and its pedo-climatic characteristics, is a zoogeographical region of Romania. The northern counties of Moldavia (Suceava, Botoșani) have some particular characteristics. For example, their climate is cooler. The aim at collecting the material was to give the answers at a number of objectives at the level of the Carabidae family in the ecological context of the North Moldavia in the concrete conditions of the sugar beet crop ecosystem, that is:

The taxonomic diversity of the epigeic insects: Coleoptera Order at the level of families, and of the Carabidae family in the year 2000; (genera, species, the index of diversity, evenness).

Knowledge of the concrete values of the relative abundance of the species of Carabidae in the sugar beet crop in the south part of Botoșani County;

Knowledge of the concrete values of some ecological parameters of the species of Carabidae in the concrete conditions of the sugar beet crop ecosystem in Botoșani County (dominance, the Shannon index, evenness).

The characterisation of the coenosis of Carabidae in the sugar beet crop ecosystem, relating to: the type of reproduction, preference for moisture, preference for biotope, food regime, the classes of the geographical distribution of the species.

For the characterization of the carabid coenoses in general (carabid communities) we have used the following parameters: relative abundance, ecological requirements (time of reproduction, preference for moisture, biotope, food and geographical distribution), the Shannon diversity index, evenness, similitude per cent between localities.

Nomenclature of the species was used according to: FREUDE, HARDE, LOHSE 1974.

To characterize the coenosis of ground beetles from the sugar beet crop ecosystem and other ecosystems, referring to the season of reproduction, preferences for humidity, biotopes, food regime, geographical distribution, we used our personal observation in the field and information from literature. (PETRUSENKO, C. B. 1970), (PETRUSENKO, C. B. & PETRUSENKO O. A. 1972), (TURIN and colab. 1991, 2003), (NECULISEANU 1991, 2003), (ȘUSTEK 2000). We also used some information and verifications received from ȘUSTEK and NECULISEANU, 2003.

RESULTS OBTAINED

In what follows, we present the results and their interpretation in the subunit discussions.

Table 1. The taxonomic diversity (orders) of the epigeic insects in the sugar beet crop, Trușești (County Botoșani, 2000)

	Names of the orders	Individuals collected	%
A	Grylloidea	223	7.06
B	Orthoptera	21	0.66
C	Heteroptera	202	6.39
D	Coleoptera	2692	85.22
E	Hymenoptera	17	0.54
F	Diptera	4	0.13
	Total individuals	3159	100.00

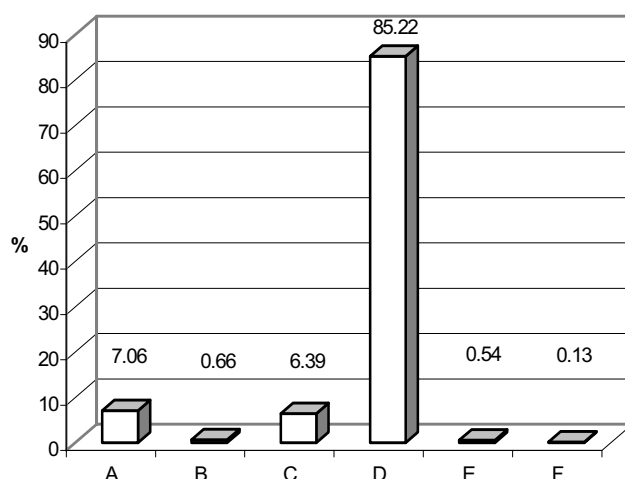


Figure 1. Percentage representation of the orders of epigeic insects collected from the sugar beet crop, Trușești, 2000.
(Legend in table 1)

Figura 1. Reprezentarea procentuală a ordinelor de insecte epigeice, colectate din cultura de sfeclă de zahăr, Trușești, 2000
(Legenda în tabelul 1)

Table 2. The taxonomic diversity (families) of the epigeic coleopterans in the sugar beet crop ecosystem, Trușești (Botoșani County), 2000

Tabel 2. Diversitatea taxonomică (familii) a coleopterelor epigeice în ecosistemul culturii de sfeclă de zahăr, Trușești (Județul Botoșani), 2000

	Names of families	Individuals collected	%
A	Carabidae	2357	87.56
B	Tenebrionidae	291	10.81
C	Scarabaeidae	13	0.48
D	Chrysomelidae	13	0.48
E	Silphidae	7	0.26
F	Cantharidae	5	0.19
G	Coccinellidae	2	0.07
H	Curculionidae	2	0.07
I	Histeridae	1	0.04
J	Dermestidae	1	0.04
	Total	2692	100.00

Table 3. The specific diversity of the epigeic species of ground beetles (Carabidae) in the sugar beet crop, Trușești (Botoșani County, 2000)

Tabel 3. Diversitatea specifică a speciilor de carabide în cultura de sfeclă de zahăr, Trușești (Județul Botoșani), 2000

	Names of the species	Individuals collected	%	CLs D
1	<i>Carabus cancellatus tuberculatus</i> (DEJEAN)	8	0.34	SR
2	<i>Carabus besseri</i> (F.W.)	3	0.13	SR
3	<i>Brosicus cephalotes</i> (LINNÉ)	19	0.81	SR
4	<i>Anisodactylus signatus</i> (PANZER)	146	6.20	D
5	<i>Anisodactylus binotatus</i> (FABRICIUS)	1	0.04	SR
6	<i>Ophonus sabulicola</i> (PANZER)	1	0.04	SR
7	<i>Metoponus puncticeps</i> (STEPHENS)	2	0.08	SR
8	<i>Metoponus azureus</i> (FABRICIUS)	1	0.04	SR
9	<i>Pseudoponus rufipes</i> (DE GEER)	863	36.63	ED
10	<i>Pseudoponus griseus</i> (PANZER)	2	0.08	SR
11	<i>Harpalus calceatus</i> (DUFTSCHMID)	14	0.59	SR
12	<i>H. aeneus</i> (FABRICIUS)	4	0.17	SR
13	<i>H. distinguendus</i> (DUFTSCHMID)	1229	52.16	ED

14	<i>H. latus</i> (LINNÉ)	2	0.08	SR
15	<i>H. tardus</i> (PANZER)	1	0.04	SR
16	<i>Poecilus cupreus</i> (LINNÉ)	10	0.42	SR
17	<i>P. striatopunctatus</i> (DUFTSCHMID)	1	0.04	SR
18	<i>P. lepidus</i> (LESKE)	1	0.04	SR
19	<i>Pterostichus melas</i> (CREUTZER)	4	0.17	SR
20	<i>Pt. melanarius</i> (Illiger)	9	0.38	SR
21	<i>Calathus fuscipes</i> (GOEZE)	2	0.08	SR
22	<i>Dolichus halensis</i> (SCHALLER)	5	0.21	SR
23	<i>Brachinus crepitans</i> (LINNÉ)	19	0.81	SR
24	<i>Brachinus explodens</i> (DUFTSCHMID)	9	0.38	SR
	Total	2356	99.96	

Legend. SR= Subrecedent (Subsporadic), D= Dominant, ED= Eudominant
 Legenda. SR= Subrecedentă (Subsporadică), D = Dominantă, ED= Eudominantă

Table 3. Main ecological requirements of the species of Carabidae in the sugar beet crop ecosystem, Trușești (Botoșani County), 2000

Tabel 3. Principalele cerințe ecologice ale speciilor de Carabidae în ecosistemul culturii de sfeclă de zahăr, Trușești (Județul Botoșani), 2000

	Name of the species	1	2	3	4	5
1	<i>Carabus cancellatus</i> (ILLIGER) 1798	Sp	M	F	Z	Pl
2	<i>Carabus besseri</i>	A	M	St,Cr	Z	EstE
3	<i>Brosicus cephalotes</i> (LINNE) 1758	Sp	X	St,Cr	Z	E
4	<i>Anisodactylus signatus</i> (PANZER) 1797	Sp	M	Cr	P	Pl
5	<i>A. binotatus</i> (FABRICIUS) 1787	Sp	M	St	P	Wp
6	<i>Ophonus sabulicola</i> (PANZER)1796	A	M	Cr, St.	Fit	Es
7	<i>Metoponus puncticeps</i> (STEPHENS) 1828	A	M	Cr	Fit.	Wp
8	<i>Metoponus azureus</i> (FABRICIUS) 1775	A	M	Cr,St	Fit	Wp
9	<i>Pseudoponus rufipes</i> (DE GEER)1774	A	M-X	Ols	P	Wp
10	<i>P. griseus</i> (PANZER) 1797	A	M-X	Ols	P	Pl
11	<i>Harpalus aeneus</i> (FABRCIUS) 1775	Sp	M-X	Cr	P	Pl
12	<i>H. calceatus</i> (DUFTSCHMID) 1812	A	M-X	St	P	Pl
13	<i>H. distinguendus</i> (DUFTSCHMID) 1812	Sp,S	M	Ols	P	Pl
14	<i>H. latus</i> (LINNE) 1758	A	M	F, St	P	Pl
15	<i>H.tardus</i> (PANZER) 1797	Sp	M-X	St	P	Es
16	<i>Poecilus cupreus</i> (LINNE) 1758	Sp	M	Cr	Z	Wp
17	<i>Poecilus striatopunctatus</i> (DUFTSCHMID) 1812	Sp	H-M	Cr	Z	Wp
18	<i>P. lepidus</i> (LESKE) 1785	A	M-X	Cr	Z	Es
19	<i>Pterostichus melas</i> (CREUTZER) 1799	Sp	M-X	F	Z	Ec
20	<i>Pt. melanarius</i> (Illiger) 1798	Sp	M	F,Cr	Z	Wp
21	<i>Calathus fuscipes</i> (GOEZE) 1777	A	M	Eu	P	Wp
22	<i>Dolichus halensis</i> (SCHALLER) 1783	A	M	Cr	P	Pl
23	<i>Brachinus crepitans</i> (LINNE) 1758	Sp	M-X	St,Cr	Z	Wp
24	<i>Brachinus explodens</i> (DUFTSCHMID) 1812	Sp	M-X	St,Cr	Z	E.md

1 = Reproduction type; 2 = Moisture preference; 3 = Biotope preference; 4 = Food regime; 5 = Zoogeographical distribution

Legend: Sp = Spring; A = Autumnal; S = Summer; M = Mesophilous; H-M = Hygro-mesophilous; M-X = Mesoxerophilous; X = Xerophilous; F = Forest; St = Steppe; Eu = Eurytopic; Ols = Open landscape; Cr = Crops; Z = Zoophag; P = Pantophag; Fit= Phytophag; Wp = West Palaearctic; Pl = Palaearctic; E = European; Em = Euromediterranean; Ec = Eurocaucasian; Es = Eurosiberian; EstE = East - European;

1 = Tipul de reproducere; 2 = Preferință umiditate; 3 = Preferință biotop; 4 = Regimul de hrană; 5 = Răspândirea geografică

Legenda: Sp =Primăvara; A = Toamna ; S = Vara; M = Mesofilă; H-M = Hygro-mesofilă; M-X =Mesoxerofilă; X= Xerofilă; F = Pădure; St = Stepă; Eu = Eurytopic; Ols =Camp deschis; Cr = Culturi; Z = Zoofag; P = Pantofag; Fit= Phytofag; Wp = West Palaearctic; Pl = Palaearctic; E = European; Em = Euromediterranean; Ec = Eurocaucasian; Es= Eurosiberian; EstE = Est- European;

Table 4. Types of reproduction of the species of carabids in the sugar beet crop ecosystem, Trușești (130 county Botoșani), 2000

Tabel 4. Tipurile de reproducere ale speciilor de carabide în ecosistemul culturii de sfeclă de zahăr, Trușești (Județul Botoșani), 2000.

	A	B	C	D
No of species	12	11	1	24
% of total	50.00	45.83	4.17	100.00

Legend: A =.Spring; B=Autumnal; C = Spring- Summer, D = Total species
 Legenda: A = Primăvara; B =Toamna; C = Primăvara -Vara, D = Total specii

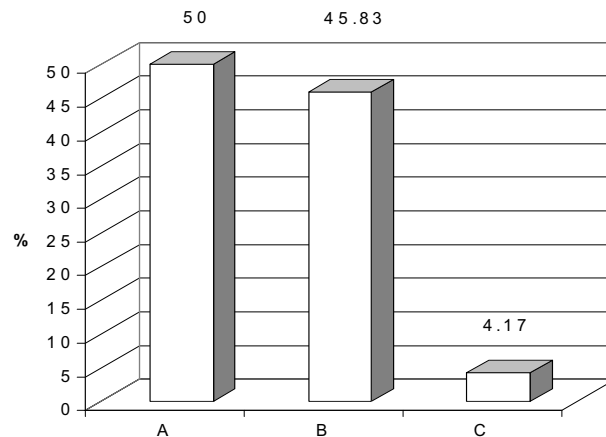


Figure 2. Percentage representation of the reproduction types of the species of carabids in the sugar beet crop Trușești, 2000. (Legend in Table 4)

Figura 2. Reprezentarea procentuală a tipurilor de reproducere ale speciilor de carabide în cultura de sfeclă de zahăr, Trușești, 2000 (Legenda în tabel 4)

Table 5. General moisture preferences of the species of carabids in the sugar beet crop ecosystem, Trușești (Botoșani County), 2000

Tabel 5. Preferințele față de umiditate ale speciilor de carabide în ecosistemul culturii de sfeclă de zahăr, Trușești (Județul Botoșani), 2000

	A	B	C	D	E
No of species	13	9	1	1	24
% of total	54.16	37.50	4.17	4.17	100.00

Legend: A. Mesophilous; B. Meso-xerophilous; C. Higo-mesophilous, D Xerophilous; E= Total species
 Legenda: A. Mesofile; B. Meso-xerofile; C .Higo-mesofile, D Xerofile; E= Total specii

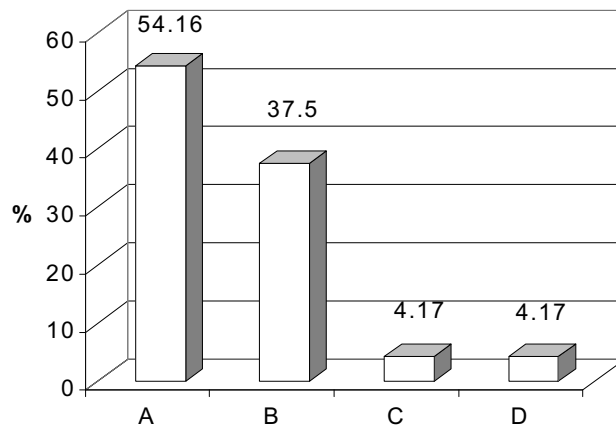


Figure 3. Percentage representation of the moisture preferences of the species of carabids in the sugar beet crop, Trușești, 2000. (Legend in table 5).

Figura 3. Reprezentarea procentuală a preferințelor față de umiditate ale speciilor de carabide în cultura de sfeclă de zahăr, Trușești, 2000 (Legenda în tab. 5)

Table 6. General biotope preferences of the species of carabids in the sugar beet crop ecosystem, Trușești (Botoșani County), 2000

Tabel 6. Preferințele generale față de biotopi ale speciilor de carabide în ecosistemul culturii de sfeclă de zahăr, Trușești (Județul Botoșani), 2000

	A	B	C	D	E	F	G	H	I
No of species	6	7	3	3	2	1	1	1	24
%	25.00	29.16	12.50	12.50	8.33	4.17	4.17	4.17	100.00

Legend: A. Crops- Steppe; B Crops, C. Open landscape, D.Steppe, E Forest, F. Forest –Steppe; G. Forest-crops; H. Eurytopic; I = Total species

Legenda: A.Culturi- stepă; B Culturi, C. Câmp deschis, D. Stepă, E Pădure, F. Pădure – stepă; G.Pădure-culturi; H. Eurytopic; I = Total specii

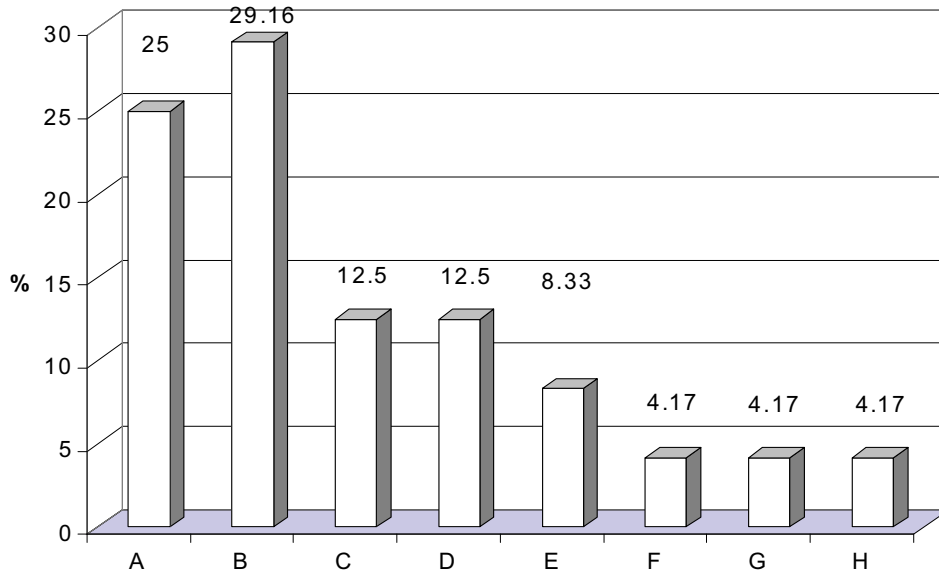


Figure 4. Percentage representation of the general biotope preferences of the species of carabids in the sugar beet crop, Trușești, 2000. (Legend in Table 6).

Figura 4. Reprezentarea procentuală a preferințelor generale față de biotopi ale speciilor de carabide în cultura de sfeclă de zahăr, Trușești, 2000 (Legenda în tabel 6).

Table 7. General trophic regime of the species of carabids in the sugar beet crop ecosystem, Trușești (Botoșani County), 2000

Tabel 7. Regimul trofic general al speciilor de carabide în ecosistemul culturii de sfeclă de zahăr, Trușești (Județul Botoșani), 2000

	A	B	C	D
No of species	10	11	3	24
%	41.67	45.83	12.50	100.00

Legend: A. Zoophags; B. Pantophags; C . Phytophags D. Total species .Legenda: A. Zoofagi; B. Pantofagi; C. Phytofagi D. Total specii

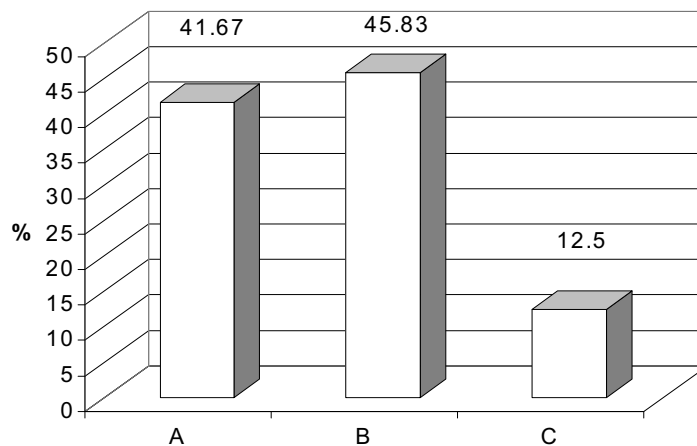


Figure 5. Percentage representation of the general trophic regime of the carabids in the sugar beet crop, Trușești, 2000. (Legend in Table 7).

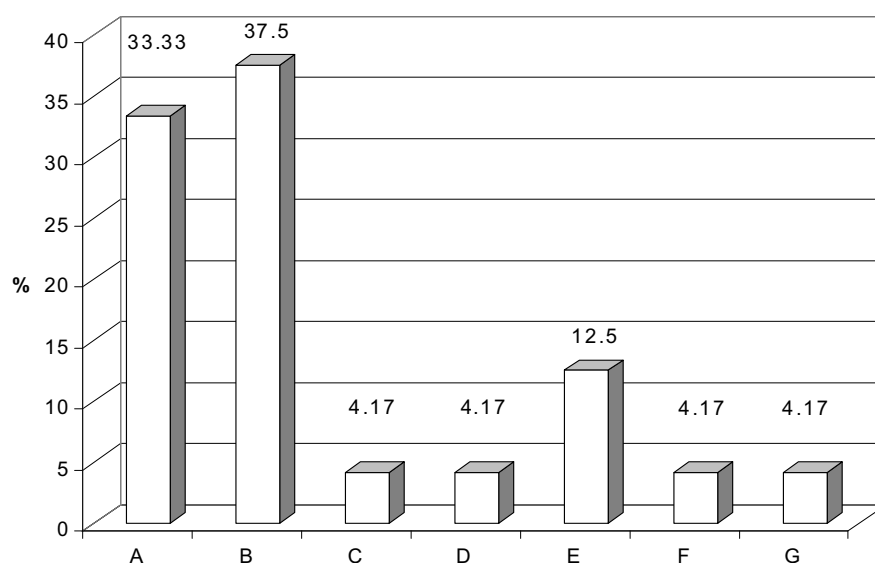
Figura 5. Reprezentarea procentuală a regimului trofic general al carabidelor în cultura de sfeclă de zahăr, Trușești, 2000. (Legenda în tabel 7)

Table 8. General geographical distribution of the species of carabids in the sugar beet crop ecosystem, Trușești (Botoșani County), 2000**Tabel 8.** Răspândirea geografică generală a speciilor de carabide în ecosistemul culturii de sfeclă de zahăr, Trușești (Județul Botoșani), 2000.

	A	B	C	D	E	F	G	H
No of species	8	9	1	1	3	1	1	24
%	33.33	37.50	4.17	4.17	12.50	4.17	4.17	100.0

Legend: A. Palearctic; B. West Palearctic; C. European; D Euro-mediterranean; E. Eurosibirian; F.Eurocaucasian; G. East European; H= Total species

Legenda: A. Palearctic; B. West Palearctic; C. European; D Euro-mediterranean; E. Eurosibirian; F.Eurocaucasian; G. Est European; H= Total specii

**Figure 6.** Percentage representation of the general geographical distribution of the species of carabis in the sugar beet crop, Trușești, 2000. (Legend in Table 8).**Figura 6.** Reprezentarea procentuală a răspândirii geografice generale ale speciilor de carabide în cultura de sfeclă de zahăr , Trușești, 2000. (Legenda în tab. 8)

DISCUSSIONS

By its geographical position within Romania (East part), Moldavia is a zoogeographical Region of Romania. Scientific papers referring to the ecological aspects of ground beetles in the forest and agricultural ecosystems were published by VARVARA and his collaborators.

Forests: VARVARA(2005). Agricultural ecosystems: winter wheat crops ecosystem: VARVARA (1991), VARVARA and BULIMAR (2002); Clover crop ecosystem: VARVARA and BRUDEA (1983), TURCULET and VARVARA (2007); maize crop ecosystem: VARVARA and BRUDEA (1999), Potatoes crop ecosystem: VARVARA, DONESCU and DASCALU (1999), VARVARA (2004); sugar beet crop ecosystem: VARVARA and ANDRIESCU (1986).

Our observation from the quoted papers showed that the number of species of Carabidae presented in those ecosystems, as well as the number of specimens of Carabidae, the value of the Shannon diversity index and evenness which characterise the coenosis of Carabidae present local variations as a result of the concrete ecological determinism.

The 12 pitfalls functioned 90 days in the sugar beet crop ecosystem (May-August included, the year 2000), and there were collected 96 samples with a total number of 3159 individuals of insects, belonging to 6 Orders of insects (Table no 1). The biggest number of individuals belonged to the Order of Coleoptera (2692 individuals (85.22 %), followed by the Orders: Grylloidea (223 individulas (7.06 %) and Heteroptera (202 individuals (6.39 %). The percentages of other three Orders (Orthoptera, Hymenoptera and Diptera) were under one per cent (Table no 1 Fig. no.1).

The Order Coleoptera was represented by individuals belonging to ten families.(Table no 2). The biggest number of individuals belonged to the Family of Carabidae (2356 individulas (87.56 %).The second family was Tenebrionidae (291 individuals (10.81 %) The percentages of the other eight families were under one per cent .

The number of species belonging to the alpha diversity of the family Carabidae in the sugar beet crop ecosystem from different localities is, of course, variable.From our observation made in three years (Lețcani, (1981, 1982) and Trușești (2000), the alpha diversity varied between 19 species (Lețcani, 1982) and 26 (Lețcani, 1981). In the Trușești locality it was

represented by 24 species. Of those 24 species, two species are eudominant and one species is dominant. They are: *Harpalus distinguendus* (1229 individuals (52.14 %)), *Pseudophonus rufipes* (863 individuals (36.61 %)), *Anisodactylus signatus* (148 individuals (6.28 %)). The percentages of the other 21 species were under one per cent. (Table no 3). The species *Poecilus cupreus* was subdominant because of the diminished humidity of the soil in the summer of the year 2000.

The synthetic relations between the number of species and the number of individuals (total and for each species) in the coenosis of Carabidae are made evident by the Shannon index. The values of this index obtained by us are included between the normal limits of variation of this index (1.50 and 3.50). Thus, in the Lețcani locality (1981) it was 2.17 (26 species, evenness 46 %), 1982, 2.20 (19 species, evenness 51 %), in the Trușești locality, it was 1.67 (24 species, evenness, 36 %). The number of species and especially the value of evenness influences the value of the Shannon index. In the case of the Trușești locality, in the conditions of the summer of the year 2000 with low precipitations, the evenness was 36 %, because the total number of individuals of those three species (*Harpalus distinguendus*, *Pseudophonus rufipes* and *Anisodactylus signatus*) represented 95.03 % of the whole coenosis of Carabidae.

The similitude index between those three localities shows that between the localities Lețcani (1981) and Lețcani (1982) there was a similitude of 71 %. The index of similitude between Trușești and Lețcani 1981 and 1982 was 38 %.

Referring to main requirements of the ground beetles to the main ecological factors (reproduction, moisture, preferred biotopes, food regime and geographical distribution), we have made classifications. "One main reason for sorting and classifying is to focus our minds on patterns that suggest underlying causes" These classifications are included in tables (Tables 4 - 8) and illustrated in Figures. (2 - 6).

Generally speaking, on the basis of conclusions published by us and collaborators in the papers quoted above and also on the basis of the present material collected from the sugar beet crop ecosystem (the year 2000), the coenosis of Carabidae may be characterised as being composed of species reproducing dominantly in Spring (50 %), followed by Autumnal species (45.83 %), mesophilous species (54.16 %) followed by meso-xerophilous species (37.50 %) (the summer of the year 2000 having less precipitations than normal).

Referring to the preferred biotopes (Table no 6, Figure. no 4), the coenosis is formed of 8 classes of species: (crops-steppe; crops, open landscape, steppe, forest, forest-steppe; forest-crops; and eurytopic). Of those, the species of Carabidae which live in crops, crops-steppe, open landscape and steppe, in total 19 species (79.17 %) form the coenosis of Carabidae.

The food regime of the species of carabids in the sugar beet crop is predominantly pantophagous and zoophagous, that is 11 species (45.83 %) and 10 species (41.67 %) are zoophagous. (Table no 7, Fig. no 5).

With reference to the geographical distribution of the species of carabids found in the sugar beet crop of Trușești, the results are shown in Table no 8 and in Fig. no 6. In general, the majority of species are West Palaearctic, Palaearctic and Eurosibirian. (9 species (37.50 %), 8 species (33.33 %) 3 species (12.50 %).

CONCLUSIONS

The alpha diversity of epigeic ground beetles in three localities of Moldavia with sugar beet crops varied between 19 species and 26.

The Shannon index had values between 1.67 and 2.17.

95.83 % of the species have their reproduction in Spring and Autumn.

54.16 % of the species are mesophilous and 37.50 % are meso-xerophilous.

The pantophagous species predominate followed by the zoophagous species.

19 species (79.17 %) in the coenosis of Carabidae prefer to live in crops, crops-steppe, open landscape and steppe.

The majority of species are West Palaearctic, Palaearctic and Eurosibirian.

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Varvara Mircea - “Al. I. Cuza” Iassy University,
Facultatea de Biologie, Iasi, (Faculty of Biology, Iassy)
e-mail: mvarvara@uaic.ro

