

RELATIVE ABUNDANCE AND DOMINANCE OF FAMILIES OF EPIGEIC COLEOPTERA (ORDER COLEOPTERA) IN MAIZE FIELDS, BRĂILA (BRĂILA COUNTY) AND MOLDOVA (ROMANIA) 1978-2010 (12 seasons)

VARVARA Mircea

Abstract. The paper is a statistical, relevant synthesis of the original collecting data on the epigeic coleopterans in the maize crops from Walachia (Brăila County) and Moldova (5 counties), in the time interval 1978 -2010, 12 seasons actually, 17 localities (six in Brăila county, Walachia and 11 in Moldova). The material of coleopterans was collected using the ecological method of Barber pitfalls with preservative liquid formalin solution of 4%, protected against rainfalls. In total, 22,231 individuals of Coleoptera were collected belonging to 22 families. In the order of their abundances, they are: 1. Carabidae, 15,638 (70.34%) present in all the crops investigated (100%) 2. Tenebrionidae, 1,687 (7.59%), 12 localities (70.59%); 3. Elateridae 1,188 (5.34 %), 15 localities (88.24%); 4. Curculionidae, 832 (3.74 %), 14 localities (88.24 %); 5. Dermestidae, 650 (2.92%), 8 localities (47.06%); 6. Coccinellidae, 534 (2.40%), 16 localities (94.12 %); 7. Staphylinidae, 509 (2.29%), 12 localities (70.59%); 8. Chrysomelidae, 403 (1.81%), 16 localities (94.12%); 9. Anthicidae, 240 (1.08%), 10 localities (58.82%); 10. Scarabaeidae, 185 (0.83%); 13 localities (76.47%); 11. Histeridae, 111 (0.50 %), 8 localities (47.06 %); 12. Silphidae, 78 (0.35 %), 7 localities (41.18%); 13. Chryptophagidae, 75 (0.34%), 6 localities (35.29%); 14. Cantharidae, 46 (0.21 %), 8 localities (47.06%); 15. Cerambycidae, 20 (0.094) localities (23.53%); 16. Nitidulidae, 11 (0.05%), 2 places (11.78%); 17. Lathridiidae, 8 (0.04%), 3 localities (17.65%). Five other families, Melyridae, Catopidae, Ptinidae, Phalacrididae, Meloidae have a total of 16 individuals, between 1 and 5 individuals.

Keywords: Maize crops, Brăila, Moldova, Coleoptera, families, distribution, abundance, dominance.

Rezumat. Abundența relativă și dominanța familiilor de coleoptere (Ord. Coleoptera) în culturile de porumb, Brăila (Județul Brăila) și Moldova (România) 1978-2010 (12 sezoane). Lucrarea este o sinteză statistică, relevantă a datelor originale de colectare a coleopterelor din culturile de porumb Muntenia, (județul Brăila) și Moldova (5 județe) în intervalul de timp 1978-2010, 12 sezoane, efectiv, 17 localități (șase în județul Brăila, Muntenia și 11 în Moldova). Materialul de coleoptere a fost colectat, folosind metoda ecologică a capcanelor Barber, cu lichid conservant, soluție de formol 4 %, protejate împotriva precipitațiilor. În total, s-au colectat 22.231 indivizi de coleoptere, aparținând la 22 de familii. În ordinea abundenței lor totale, ele sunt: 1. Carabidae, 15.638 (70,34%) prezente în toate culturile cercetate (100%); 2. Tenebrionidae, 1.687 (7,59%), 12 localități (70,59 %); 3. Elateridae, 1.188 (5,34 %), 15 localități (88,24 %); 4. Curculionidae, 832 (3,74%), 14 localități (88,24%); 5. Dermestidae 650 (2,92 %), 8 localități (47,06%); 6. Coccinellidae, 534 (2,40%), 16 localități (94,12%); 7. Staphylinidae, 509 (2,29%), 12 localități (70,59%); 8. Chrysomelidae, 403 (1,81%), 16 localități (94,12%); 9. Anthicidae, 240 (1,08%), 10 localități (58,82%); 10. Scarabaeidae, 185 (0,83%); 13 localități (76,47%); 11. Histeridae, 111 (0,50%), 8 localități (47,06%); 12. Silphidae, 78 (0,35%), 7 localități (41,18%); 13. Chryptophagidae, 75 (0,34%), 6 localități (35,29%); 14. Cantharidae, 46 (0,21%), 8 localități (47,06 %); 15. Cerambycidae, 20 (0,09%), 4 localități (23,53%); 16. Nitidulidae, 11 (0,05%), 2 localități (11,78%); 17. Lathridiidae, 8 (0,04%), 3 localități (17,65%). Alte cinci familii, Melyridae, Catopidae, Ptinidae, Phalacrididae, Meloidae au în total 16 indivizi între 1 și 5 indivizi.

Cuvinte cheie: cultura de porumb, Brăila, Moldova, Coleoptera, familii, răspândire, abundența, dominanța.

INTRODUCTION

The maize (*Zea mays* L.) is one of the most important crop plants for the food of people (21%), animals (72%), use in industry (7%). It is resistant to drought and heat (NET). Most part of Moldova (Romania) belongs to the favourable maize crop area. The maize is a monoculture, which occupies the cultivated soil from April-May until September-October. Crops (clover, alfalfa, sugar beet, wheat, maize, sunflower, sugar beet, grape vines, fruit trees, etc.) by their characteristics during the vegetation period (density of plants, degree of shading of the soil surface, vegetation period, etc.) influence the soil surface moisture and microcurrents, factors that influence the number of epigeic arthropods in their feeding activity, defense and reproduction in dependence on their ecological valences referring to humidity. There were published some papers about the species of carabids on the maize crops in the Brăila County and Moldova: ANDRIESCU et. al., 1983; BODESCU, 2013; VARVARA et. al., 1981; VARVARA et. al., 1985; VARVARA, et. al., 1987; VARVARA & BRUDEA, 1999; VARVARA & ZAMFIRESCU, 2008.

MATERIAL AND METHODS

The material of the paper is original, collected from two regions of Romania, Walachia (Brăila County) and Moldavia (the counties of Vaslui, Iași, Bacău, Neamț, Botoșani), in the period of the years 1978- 2010, 12 seasons.

For the collecting of the material there was used the method of pitfall traps, a classical, standard, ecological and continuous method. In total, 268 Barber pitfalls were used, between 5 and 24 traps in each research locality (Table 1). We used tin cans, 800 ml capacity, with a height of 11 cm and a diameter of 8 cm. Each pitfall was protected against precipitations by a cover sheet with four pillars stuck in the ground. The distance between the ground surface and lid was 5 cm. As the preservative liquid it was used a solution of 4% formaldehyde, about 350 ml in each trap. In 10 localities, there were placed 12 traps, covering an area of capturing of 400 square metres. The purpose of this paper is to present, synthetically, the diversity of

the families of the order Coleoptera, their comparative abundance and dominance on the basis of original collectings, 12 seasons, actually.

Objectives of the paper:

Collecting and preserving of the material;

Taxonomic determination of the individuals, classification in families and their analysis; Drawing up tables and figures. Each family is concretized through a general collecting table (locality, year, abundance and dominance of the family, a synthetic table with the presence and absence of families in localities and the distribution of families in the structure of dominance); Synthesis of data, establishing the hierarchy of families based on the number of individuals, and the drafting of the text.

RESULTS

In this chapter, the work materializes the effort of displacement in the field, the effort of collecting, preservation of samples, the time consumed for determining of the individuals, analysis, the work of synthesis. Thus, there were accomplished 152 collectings during 12 seasons (1978-2010), meaning the taxonomic determination of the individuals from 40,736 samples (152 collectings x 268 pitfalls), 17 localities (Table 1).

Table 1. Localities, years and parameters of collecting of the epigeic Coleoptera in maize crops, 1978-2010.

No.	Crop, locality, county	Year	Exposition of traps	Days	Traps	Coll.	Sam.
1	Brăila (Brăila County)	1978	May 7-October 10	150	24	5	1,322
2	Brăila	1979	May 25-Sept.20	118	24	5	1,367
3	NegruVoda	1979	May 20-Sept.20	123	24	5	724
4	Brăila	1980	May 24- Sept 11	110	56	6	6,213
5	Braila.Terasă	1984	May 10-Sept.30	144	12	15	651
6	Brăila, Lacul Sărat	1984	May 10-Sept.30	144	12	15	567
7	Pogana (Vaslui C.)	1989	April 24- July 30	97	10	6	462
8	Negrești	1992	May 10-Aug.15	97	12	7	1,706
9	Negrești	1997	May 5- July 16	72	12	5	1,157
10	Osoi, (Iasi County)	1986	April 15-Sept.23	162	5	11	1,455
11	Osoi	1989	May 15-Sept.18	126	5	10	517
12	Breazu	2001	June 15-Sept.13	90	12	6	55
13	Hemeiusi(Bacău C.)	1981	June 10-Oct.18	130	12	14	933
14	Târgu Neamț (Neamț C.)	1998	May 10-Sept.1	114	12	8	1,498
15	Săbăoani,	1999	May 10-Sept.9	122	12	9	1,551
16	Cherchejeni, (Botoșani C.)	2000	May 5-Sept.12	130	12	9	676
17	Trușești.	2010	May 10-Sept.15	128	12	10	1,376
				2,057	268	152	22,230

Those 22,230 collected individuals belong, taxonomically, to 22 families of Coleoptera (Table 2). In the same table, it is mentioned the numerical and percentage presence and absence of the families in localities.

Table 2. Numerical and percentage variation of the individuals of coleopteran families in maize fields, from Brăila and Moldova, 1978- 2010.

No.	1	2	3	Present		Absent	
				4	5	6	7
1	Carabidae	15,638	70.34	17	100	0	0
2	Tenebrionidae	1,687	7.59	12	70.59	5	29.41
3	Elateridae	1,188	5.34	15	88.24	2	11.76
4	Curculionidae	832	3.74	14	88.24	2	11.76
5	Dermestidae	650	2.92	8	47.06	9	52.94
6	Coccinellidae	534	2.40	16	94.12	1	5.88
7	Staphylinidae	509	2.29	12	70.59	5	29.41
8	Chrysomelidae	403	1.81	16	94.12	1	5.88
9	Anthicidae	240	1.08	10	58.82	7	41.18
10	Scarabaeidae	185	0.83	13	76.47	4	23.53
11	Histeridae	111	0.50	8	47.06	9	52.94
12	Silphidae	78	0.35	7	41.18	10	58.82
13	Chryptophagidae	75	0.34	6	35.29	11	64.71
14	Cantharidae	46	0.21	8	47.06	9	52.94
15	Cerambycidae	20	0.09	4	23.53	13	76.47
16	Nitidulidae	11	0.05	2	11.76	15	88.24
17	Lathridiidae	8	0.04	3	17.65	14	82.35
18	Melyridae	5	0.02	3	17.65	14	82.35
19	Catopidae	5	0.02	1	5.88	16	94.12
20	Ptinidae	4	0.02	1	5.88	16	94.12
21	Phalacrididae	1	0.00	1	5.88	16	94.12
22	Meloidae	1	0.0	1	5.88	16	94.12
	Total	22,231	99.98				

Legend. 1. Name of families, 2. No. of individuals, 3. %, 4. No. of localities, 5. %, 6. No. of localities, 7. %.

Carabidae Family occupies the first position in the number of individuals 15,638 (70.34%) captured on the soil surface in those 17 maize crops. The family Carabidae is eudominant in each locality (Table 3).

Table 3. Distribution, variation of activity abundance (A) and dominance (D) of Carabidae family in the investigated maize crops, Brăila and Moldova, 1978-2010.

No.	Locality and Year	A	D	No.	Locality, Year	A	D (%)
1	Brăila, 1978	1,122	84.87	9	Negrești, 1997	821	70.96
2	Brăila, 1979	1,266	92.61	10	Osoi, 1986	404	27.77
3	Negru Vodă, 1979	644	71.96	11	Osoi, 1989	409	79.11
4	Brăila, 1980	4,910	79.03	12	Breazu, 2001	16	29.09
5	Brăila, Terrace, 1984	334	51.31	13	Hemeiuși, 1981	826	88.53
6	Brăila, Sărat Lake, 1984	480	84.66	14	Târgu Neamt, 1998	1,138	75.72
7	Pogana, 1989	122	26.41	15	Săbăoani, 1999	1,131	72.87
8	Negrești, 1992	384	25.53	16	Cherchejeni, 2000	641	94.82
				17	Trușești, 2010	990	71.94
					Total individuals	15,638	

Table 4 and Figure 1. Numerical and percentage variation of the presence and absence of Carabidae family and their dominance classes in maize fields, Brăila and Moldova, 1978-2010.

	Specification	No.	%
1	Presence in localities	17	100
2	Absence	0	0
1	Subrecedent below 1%	0	0
2	Recedent 1.1 - 2%	0	0
3	Subdominant 2.1 -5%	0	0
4	Dominant 5.1 -10%	0	0
5	Eudominant over 10.1%	17	100
	Total	17	100

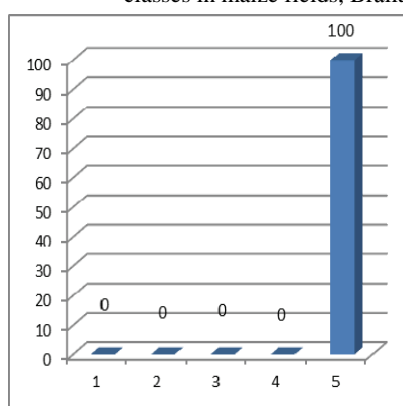


Figure 1.

Tenebrionidae Family occupies the second position in the order of the number of individuals, 1,687 (7.59 %) (i.e. nine times less than the family Carabidae). It was present only in 12 localities (70.59 %) and absent in five maize crops (29.41 %) (Table 5, Table 6, Fig. 2).

Table 5. Distribution, variation of activity abundance (A) and dominance (D) of Tenebrionidae family in the investigated maize crops, Brăila and Moldova, 1979-2010.

No.	Locality and Year	A	D	No.	Locality, Year	A	D (%)
1	Brăila, 1979	20	1.46	7	Negrești, 1997	122	10.54
2	Negru Vodă, 1979	33	3.69	8	Osoi, 1986	1	0.07
3	Brăila, 1980	22	0.35	9	Breazu, 2001	3	5.45
4	Brăila, Terrace, 1984	1	0.15	10	Săbăoani, 1999	180	11.60
5	Pogana, 1989	231	50.0	11	Cherchejeni, 2000	5	0.74
6	Negrești, 1992	906	60.24	12	Trușești, 2010	163	11.84
					Total individuals	1,687	

Table 6 and Figure 2. Numerical and percentage variation of the presence and absence of Tenebrionidae family and their dominance classes in maize fields, Brăila and Moldova, 1979-2010.

	Specification	No.	%
1	Presence in localities	12	70.59
2	Absence in sites	5	29.41
1	Subrecedent below 1%	4	23.53
2	Recedent 1.1 - 2%	1	5.88
3	Subdominant 2.1 -5%	1	5.88
4	Dominant 5.1 -10%	1	5.88
5	Eudominant over 10.1%	5	29.41
	Total	12	70.59

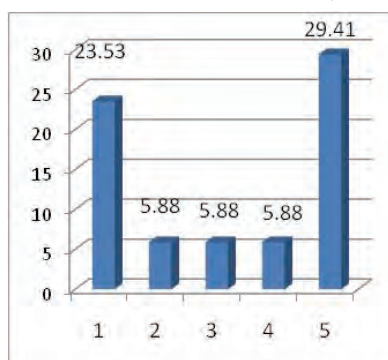


Figure 2.

Elateridae Family takes the third position in the maize crops, with a total number of 1,188, individuals, i.e. 5.34%, being present in 15 localities (88.24%) and absent in two localities (11.76 %) (Table 7, Table 8, Fig. 3).

Table 7. Distribution, variation of activity abundance (A) and dominance (D) of Elateridae Family in the investigated maize crops, Brăila and Moldova, 1978-2000.

No.	Locality and Year	A	D	No.	Locality, Year	A	D (%)
1	Brăila, 1978	67	5.07	9	Osoi, 1986	911	62.01
2	Negru Vodă, 1979	28	3.13	10	Osoi, 1989	7	1.35
3	Brăila, 1980	41	0.66	11	Breazu, 2001	3	5.45
4	Brăila, Terrace, 1984	27	4.15	12	Hemeiuși, 1981	25	2.68
5	Brăila, Sărat Lake, 1984	9	1.59	13	Săbăoani, 1999	1	0.06
6	Pogana, 1989	1	0.22	14	Târgu Neamț, 1998	4	0.27
7	Negrești, 1992	45	2.99	15	Cherchejeni, 2000	13	1.92
8	Negrești, 1997	6	0.52		Tot. individuals	1.188	

Table 8 and Figure 3. Numerical and percentage variation of the presence and absence of Elateridae family and their dominance classes in maize fields, Brăila and Moldova, 1978-2000.

	Specification	No.	%
1	Presence in localities	15	88.24
2	Absence in sites	2	11.76
1	Subrecedent below 1%	5	29.41
2	Recedent 1.1 - 2%	3	17.65
3	Subdominant 2.1 -5%	4	23.53
4	Dominant 5.1 -10%	2	11.76
5	Eudominant over 10.1%	1	5.88
	Total	15	88.23

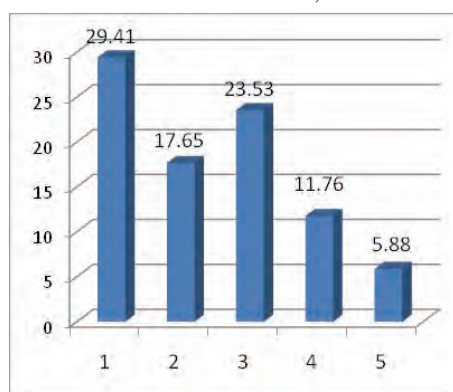


Figure 3.

The next family in the order of abundance is Curculionidae family with 832 individuals (3.74%), present in 15 localities (88.24%) and absent in two places (11.76 %) (Table 9, Table 10, Fig. 4).

Table 9. Distribution, variation of activity abundance (A) and dominance (D) of Curculionidae Family in the investigated Maize crops, Brăila and Moldova, 1979-2010.

No.	Locality and Year	A	D	No.	Locality, Year	A	D (%)
1	Brăila, 1979	36	2.63	8	Osoi, 1989	27	5.22
2	Brăila, 1980	524	8.43	9	Breazu, 2001	3	5.45
3	Brăila, Terrace, 1984	106	16.28	10	Hemeiuși, 1981	3	0.32
4	Brăila, Sărat Lake, 1984	3	0.53	11	TârguNeamț, 1998	20	1.33
5	Negrești, 1992	21	1.40	12	Săbăoani, 1999	44	2.84
6	Negrești, 1997	11	0.95	13	Cherchejeni, 2000	1	0.15
7	Osoi, 1986	15	1.03	14	Trușești, 2010	18	1.30
					Tot. individuals	832	

Table 10 and Figure 4. Numerical and percentage variation of the presence and absence of Curculionidae family and their dominance classes in maize fields, Brăila and Moldova, 1979-2010.

	Specification	No.	%
1	Presence in localities	14	82.35
2	Absence in sites	3	17.65
1	Subrecedent below 1%	4	23.53
2	Recedent 1.1 - 2%	4	23.53
3	Subdominant 2.1 -5%	2	11.76
4	Dominant 5.1 -10%	3	17.65
5	Eudominant over 10.1%	1	5.88
	Total	14	88.24

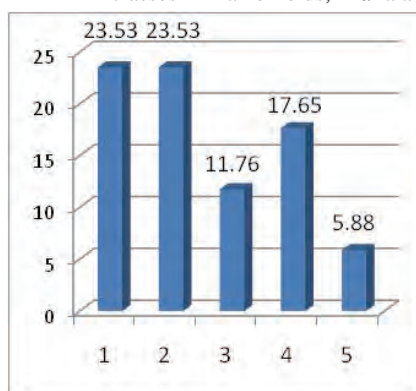


Figure 4.

Dermestidae Family totaled 650 individuals (2.92 %). The individuals of this family were collected from 8 localities (47.06 %) and they were not found in 9 places (52.94 %) (Table 11, Table 12, Fig. 5).

Table 11. Distribution, variation of activity abundance (A) and dominance (D) of Dermestidae Family in the investigated Maize crops, Brăila and Moldova, 1980-2010.

No.	Locality and Year	A	D	No.	Locality, Year	A	D (%)
1	Brăila, 1980	109	1.75	5	Breazu, 2001	2	3.64
2	Pogana, 1989	46	9.96	6	TârguNeamt, 1998	23	1.53
3	Negrești, 1992	238	33.66	7	Săbăoani, 1999	14	0.90
4	Negrești, 1997	165	14.26	8	Trușești, 2010	53	3.85
					Total individuals	650	

Table 12 and Figure 5. Numerical and percentage variation of the presence and absence of Dermestidae family and their dominance classes in maize fields, Brăila and Moldova, 1980-2010.

	Specification	No.	%
1	Presence in maize fields	8	47.06
2	Absence in sites	9	52.94
1	Subprecedent below 1%	1	5.88
2	Recedent 1.1 - 2%	2	11.76
3	Subdominant 2.1 -5%	2	11.76
4	Dominant 5.1 -10%	1	5.88
5	Eudominant over 10.1%	2	11.76
	Total	8	47.0

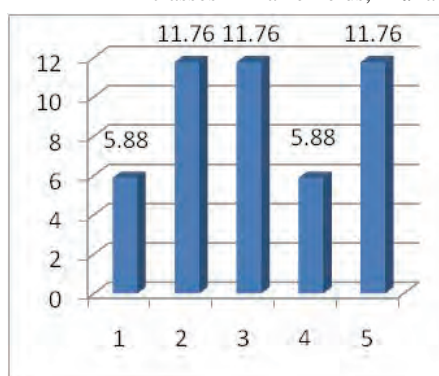


Figure 5.

Coccinelidae Family totaled 534 (2.40 %), occupying the 6th position in the numerical hierarchy. The individuals of this family were collected from 16 localities (94.12 %) (Table 13, Table 14, Fig. 6).

Table 13. Distribution, variation of activity abundance (A) and dominance (D) of Coccinelidae Family in the investigated Maize crops, Brăila and Moldova, 1978-2010.

No.	Locality and Year	A	D	No.	Locality, Year	A	D (%)
1	Brăila, 1978	106	0.02	9	Negrești, 1997	3	0.26
2	Brăila, 1979	40	2.93	10	Osoi, 1989	1	0.19
3	Negru Vodă, 1979	15	1.68	11	Breazu, 2001	8	14.55
4	Brăila, 1980	176	2.83	12	Hemeiuiși, 1981	16	1.71
5	Brăila, Terrace, 1984	22	3.38	13	TârguNeamt, 1998	18	1.20
6	Brăila, Sărat Lake, 1984	13	2.29	14	Săbăoani, 1999	1	0.06
7	Pogana, 1989	4	0.87	15	Cherchejeni, 2000	5	0.74
8	Negrești, 1992	72	10.18	16	Trușești, 2010	34	2.47
					Total individuals	534	

Table 14 and Figure 6. Numerical and percentage variation of the presence and absence of Coccinelidae Family and their dominance classes in maize fields, Brăila and Moldova, 1978-2010.

	Specification	No.	%
1	Presence in localities	16	94.12
2	Absence in sites	1	5.88
1	Subprecedent below 1%	6	35.29
2	Recedent 1.1 - 2%	3	17.65
3	Subdominant 2.1 -5%	5	29.41
4	Dominant 5.1 -10%	-	-
5	Eudominant over 10.1%	2	11.76
	Total	16	94.11

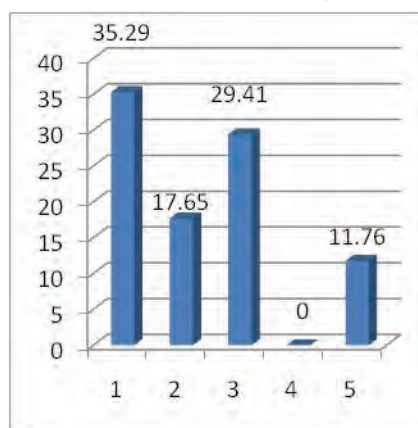


Figure 6.

Staphylinidae Family totalized 509 individuals (2.29%), present in 13 localities (76.47%) and absent in 5 localities (29.41%) (Table 15, Table 16, Fig. 7).

Table 15. Distribution, variation of activity abundance (A) and dominance (D) of Staphylinidae Family in the investigated Maize crops, Brăila and Moldova, 1980-2010.

No.	Locality and Year	A	D	No.	Locality, Year	A	D (%)
1	Brăila, 1980	106	1.71	8	Osoi, 1989	5	0.97
2	Brăila, Terrace, 1984	26	3.99	9	Breazu, 2001	1	1.82
3	Brăila, Sărat Lake, 1984	3	0.53	10	Hemeiusi, 1981	6	0.64
4	Pogana, 1989	5	1.08	11	Tîrgu Neamț, 1998	180	11.98
5	Negrești, 1992	13	1.84	12	Săbăoani, 1999	104	6.70
6	Negrești, 1997	3	0.26	13	Trușești, 2010	8	0.58
7	Osoi, 1986	49	3.37		Total individuals	509	

Table 16 and Figure 7. Numerical and percentage variation of the presence and absence of Staphylinidae and their dominance classes in maize fields, Brăila and Moldova, 1978-2010.

	Specification	No.	%
1	Presence in localities	13	76.47
2	Absence in sites	4	23.53
1	Subrecedent below 1%	5	29.41
2	Recedent 1.1 - 2%	4	23.53
3	Subdominant 2.1 - 5%	2	11.76
4	Dominant 5.1 - 10%	1	5.88
5	Eudominant over 10.1%	1	5.88
	Total	13	76.46

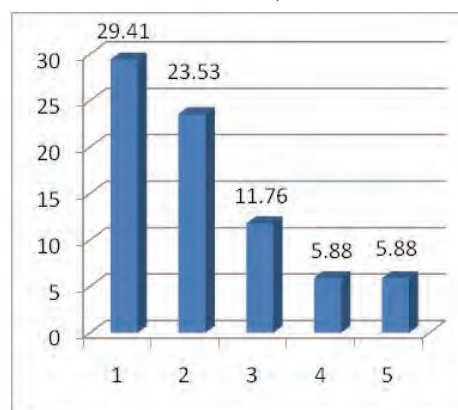


Figure 7.

Chrysomelidae registered a total number of individuals 403 (1.81%), present in 16 localities (94.12%), absent in one locality (5.88%) (Table 17, Table 18, Fig. 8).

Table 17. Distribution, variation of activity abundance (A) and dominance (D) of Chrysomelidae Family in the investigated maize crops, Brăila and Moldova, 1978-2010.

No.	Locality and Year	A	D	No.	Locality, Year	A	D (%)
1	Brăila, 1978	27	2.04	9	Osoi, 1986	42	2.89
2	Brăila, 1979	2	0.15	10	Osoi, 1989	34	6.58
3	Negru Vodă, 1979	1	0.11	11	Breazu, 2001	6	10.91
4	Brăila, 1980	122	1.96	12	Hemeiusi, 1981	21	2.25
5	Brăila, Terrace, 1984	44	6.76	13	Târgu Neamț, 1998	21	1.40
6	Brăila, Sărat Lake, 1984	7	1.23	14	Săbăoani, 1999	51	3.29
7	Negrești, 1992	8	1.13	15	Cherchejeni, 2000	4	0.59
8	Negrești, 1997	7	0.61	16	Trușești, 2010	6	0.43
					Tot. individuals	403	

Table 18 and Figure 8. Numerical and percentage variation of the presence and absence of Chrysomelidae Family and their dominance classes in maize fields, Brăila and Moldova, 1978-2010.

	Specification	No.	%
1	Presence in localities	16	94.12
2	Absence in sites	1	5.88
1	Subrecedent below 1%	5	29.41
2	Recedent 1.1 - 2%	4	23.53
3	Subdominant 2.1 - 5%	4	23.53
4	Dominant 5.1 - 10%	2	11.76
5	Eudominant over 10.1%	1	5.88
	Total	16	94.11

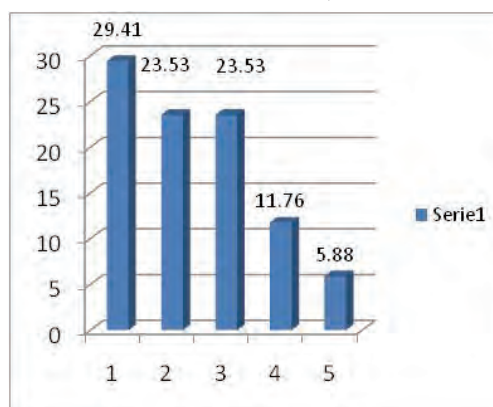


Figure 8.

Anthicidae Family is the last family that has a percentage of 1.08%, 240 individuals present in 10 localities (58.82%), 7 localities absent (41.18%) (Table 19, Table 20, Fig. 9).

Table 19. Distribution, variation of activity abundance (A) and dominance (D) of Anthicidae Family in the investigated Maize crops, Brăila and Moldova, 1980-2001.

No.	Locality and Year	A	D	No.	Locality, Year	A	D (%)
1	Brăila, 1980	110	1.77	7	Osoi, 1989	4	0.77
2	Brăila, Terrace, 1984	47	7.22	8	Breazu, 2001	2	3.64
3	Brăila, Sărat Lake, 1984	25	4.41	9	Săbăoani, 1999	13	0.84
4	Pogana, 1989	13	2.81	10	Cherchejeni, 2000	6	0.89
5	Negrești, 1997	6	0.52		Tot. individuals	240	
6	Osoi, 1986	14	0.96				

Table 20 and Figure 9. Numerical and percentage variation of the presence and absence of Anthicidae family and their dominance classes in maize fields, Brăila and Moldova, 1980-2001.

	Specification	No.	%
1	Presence localities	10	58.82
2	Absence in sites	7	41,18
1	Subrecedent below 1%	5	29,41
2	Recedent 1.1 - 2%	1	5,88
3	Subdominant 2.1 -5%	3	17,65
4	Dominant 5.1 -10%	1	5,88
5	Eudominant over 10.1%	0	0
	Total	10	58.82

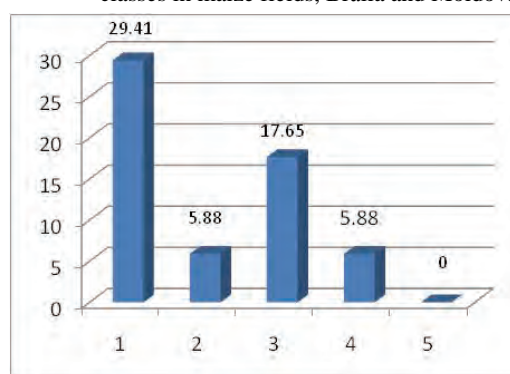


Figure 9.

Scarabaeidae Family is the first family of Coleoptera in maize crops with a percentage of individuals below 1%. The total number of individuals collected was 185 (0.83 %), present in 13 localities (76.47%) and absent in 4 places (23.53 %). The number of individuals collected from localities varied between 1 (Negrești, 1992, Săbăoani, 1999 - Neamț County) and 51 (Trușești, 2010 - Botosani County) (Tabel 21, Table 22, Fig. 10).

Table 21. Distribution, variation of activity abundance (A) and dominance (D) of Scarabaeidae Family in the investigated Maize crops, Brăila and Moldova, 1979-2010.

No.	Locality and Year	A	D	No.	Locality, Year	A	D (%)
1	Brăila, 1979	3	0.22	7	Negrești, 1992	1	0.07
2	Brăila, 1980	30	0.48	8	Negrești, 1997	7	0.61
3	Brăila, Terrace, 1984	20	3.07	9	Osoi, 1989	11	2.93
4	Brăila, Sărat Lake, 1984	9	1.59	10	Săbăoani, 1999	1	0.06
5	Negru Vodă, 1979	3	0.34	11	Târgu Neamț, 1998	12	0.60
6	Pogana, 1989	26	5.63	12	Cherchejeni, 2000	1	0.15.
				13	Trușești, 2010	61	4.43
					Tot. individuals	185	

Table 22 and Figure 10. Numerical and percentage variation of the presence and absence of Scarabaeidae family and their dominance classes in maize fields, Brăila and Moldova, 1979-2010.

	Specification	No.	%
1	Presence in localities	13	76.47
2	Absence in sites	4	23.53
1	Subrecedent below 1%	8	47.06
2	Recedent 1.1 - 2%	1	5.88
3	Subdominant 2.1 -5%	3	17.65
4	Dominant 5.1 -10%	1	5.88
5	Eudominant over 10.1%	-	-
	Total	13	76.47

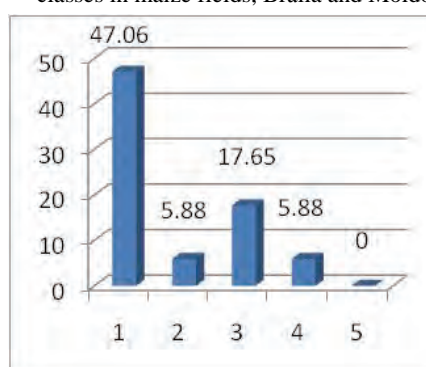


Figure 10.

Histeridae Family registered 111 individuals (0.50%), present in 8 localities (47.06%), absent in 9 localities (52.94 %) (Table 23, Table 24, Fig. 11).

Table 23. Distribution, variation of activity abundance (A) and dominance (D) of Histeridae Family in the investigated maize crops, Brăila and Moldova, 1980-2010.

No.	Locality and Year	A	D	No	Locality, Year	A	D (%)
1	Brăila, 1980	1	0.02	5	Osoi, 1986	1	0.07
2	Pogana, 1989	1	0.22	6	Hemeiusi, 1981	23	2.47
3	Negrești, 1992	11	0.73	7	Târgu Neamț, 1998	60	3.99
4	Negrești, 1997	1	0.09	8	Trușești, 2010	13	0.94
					Tot. individuals	111	

Table 24 and Figure 11. Numerical and percentage variation of the presence and absence of Histeridae family and their dominance classes in maize fields, Brăila and Moldova, 1980-2010.

	Specification	No.	%
1	Presence in maize fields	8	47.06
2	Absence in sites	9	52.94
1	Subrecedent below 1%	6	35.29
2	Recedent 1.1 - 2%	0	0
3	Subdominant 2.1 - 5%	2	11.76
4	Dominant 5.1 - 10%	0	0
5	Eudominant over 10.1%	0	0
	Total	8	47.05

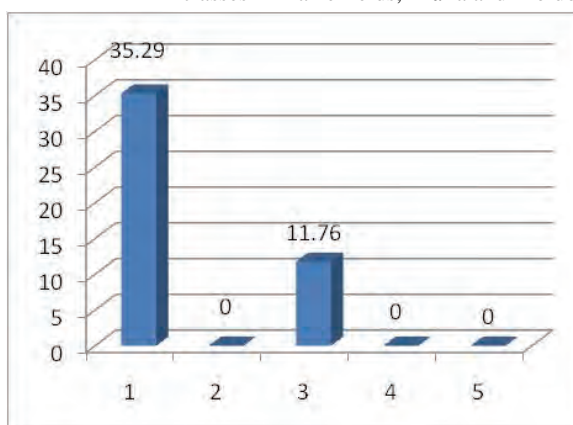


Figure 11.

Silphidae Family had 78 individuals (0.35%), present 7 localities (41.18%), absent in 10 localities (58.82%) (Table 25, Table 26, Fig. 12).

Table 25. Distribution, variation of activity abundance (A) and dominance (D) of Silphidae Family in the investigated Maize crops, Brăila and Moldova, 1980-2010.

No.	Locality and Year	A	D	No.	Locality, Year	A	D (%)
1	Brăila, 1980	1	0.02	4	Breazu, 2001	11	20
2	Pogana, 1989	13	2.81	5	Hemeiusi, 1981	12	1.29
3	Osoi, 1989	7	1.35	6	Săbăoani, 1999	7	0.45
				7	Trușești, 2010	27	1.96
					Tot. individuals	78	

Table 26 and Figure 12. Numerical and percentage variation of the presence and absence of Silphidae family and their dominance classes in maize fields, Brăila and Moldova, 1980-2010.

	Specification	No.	%
1	Presence in localities	7	41.18
2	Absence in sites	10	58.82
1	Subrecedent below 1%	2	11.76
2	Recedent 1.1 - 2%	3	17.65
3	Subdominant 2.1 - 5%	1	5.88
4	Dominant 5.1 - 10%	0	0
5	Eudominant over 10.1%	1	5.88
	Total	7	41.18

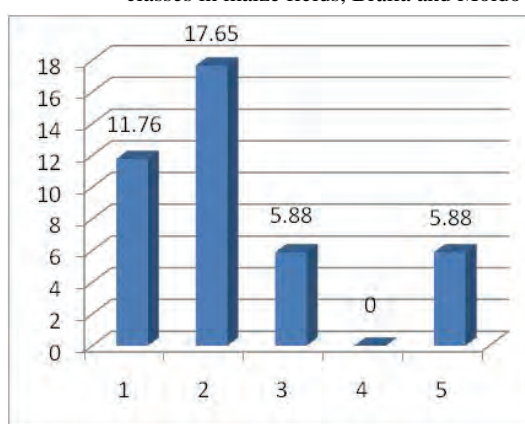


Figure 12.

Chrytophagidae Family registered 75 individuals (0.34 %), present in 6 crops (35.29%), absent 11 localities (64.71%) (Table 27).

Table 27. Distribution, variation of activity abundance (A) and dominance (D) of Chryptophagidae Family in the investigated maize crops, Brăila and Moldova, 1980-1999.

No.	Locality and Year	A	D	No.	Locality and Year	A	D (%)
1	Brăila, 1980	35	0.56	4	Osoi, 1986	8	0.55
2	Terrace, 1984	13	2.00	5	Târgu Neamț, 1998	6	0.40
3	Sărat Lake, 1984	9	1.59	6	Săbăoani, 1999	4	0.26
					Tot. individuals	75	

Cantharidae Family had 46 individuals (0.21%), present in 8 maize crops (47.06%), absent in 9 localities (52.94 %) (Table 28, Table 29, Fig. 13).

Table 28. Distribution, variation of activity abundance (A) and dominance (D) of Cantharidae family in the investigated Maize crops, Brăila and Moldova, 1980-1998.

No.	Locality, Year	A	D	No.	Locality, Year	A	D (%)
1	Brăila, 1980	14	0.23	5	Negrești, 1997	3	0.26
2	Brăila, Terrace, 1984	7	1.08	6	Osoi, 1989	7	1.35
3	Brăila, Sărat Lake, 1984	6	1.06	7	Hemeiși, 1981	1	0.11
4	Negrești, 1992	2	0.13	8	Târgu Neamț, 1998	6	0.40
					Tot individuals	46	

Table 29 and Figure 13. Numerical and percentage variation of the presence and absence of Family Cantharidae and their dominance classes in maize fields, Brăila and Moldova, 1980-1998.

	Specification	No.	%
1	Presence in localities	8	47.06
2	Absence in sites	9	52.94
1	Subrecedent below 1%	5	29.41
2	Recedent 1.1 - 2%	3	17.65
3	Subdominant 2.1 -5%	0	0
4	Dominant 5.1 -10%	0	0
5	Eudominant over 10.1%	0	0
	Total	8	47.06

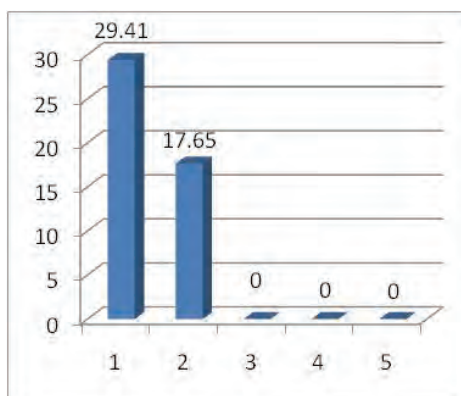


Figure 13.

Cerambycidae Family had 20 individuals (0.09%), present in 4 localities (23.53 %), absent in 13 localities (76.47 %) (Table 30, Table 31, Fig. 14).

Table 30. Distribution, variation of activity abundance (A) and dominance (D) of Cerambycidae Family in the investigated maize crops, Brăila and Moldova, 1986-2010.

No.	Locality and Year	A	D
1	Negrești, 1997	2	0.17
2	Osoi, 1986	10	0.69
3	Osoi, 1989	5	0.97
4	Trușești, 2010	3	0.21
	Tot. individuals	20	

Table 31 and Figure 14. Numerical and percentage variation of the presence and absence of Cerambycidae Family and their dominance classes in maize fields, Brăila and Moldova, 1986- 2010.

	Specification	No.	%
1	Presence in localities	4	23.53
2	Absence in sites	13	76.47
1	Subrecedent below 1%	4	23.53
2	Recedent 1.1 - 2%	0	0
3	Subdominant 2.1 -5%	0	0
4	Dominant 5.1 -10%	0	0
5	Eudominant over 10.1%	0	0
	Total	4	23.53

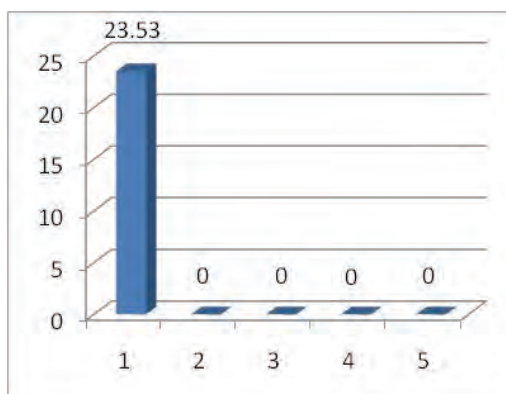


Figure 14.

The following 7 families (31.18 %) (Nitidulidae, Lathridiidae, Melyridae, Catopidae, Ptinidae, Phalacrididae, Meloidae) had between 1 (Meloidae and Phalacrididae) and 11 individuals (Nitidulidae).

DISCUSSIONS

Discussions have to point out some generalizations and interpretations of the results. The fundamental and unique form of existence of life is the individual that has all the general and specific characteristics (from the taxa of kingdom to that of species).

The numerical characteristics of the species are the number of individuals, a result of evolution and interactions with the structures of environment. There are eudominant species with bigger effective than 10.1 % and subrecedent species with effective less than 1 %.

The environment of a species is concretized by three components: ecological, biological and physical factors. The average number of individuals of Coleoptera in maize crops was 1,010 with limits extremely variable, between 1 individual (Phalacrididae, Meloidae) and 15,638 (Carabidae Family).

In the entomological analysed material in 17 maize crops, Walachia (one county) and Moldova (five counties), 12 seasons, from 1978 to 2010, the order Coleoptera is represented by 22 families (Table 2). The presence of the families of Coleoptera in maize crops is very variable. Only Carabidae Family was present in all the crops. The total effective was 15,638 individuals (70.34 %), other 21 families were present between one crop (5.88%) (Catopidae, Ptinidae, Phalacrididae, Meloidae) and 16 crops (94.12%) (Coccinellidae, Staphylinidae).

Due to the unity and interaction of organisms with the environment, the spectrum variations in local conditions in the maize crops, Brăila and Moldova (South, Central, North) determines the number of individuals of Coleoptera, causing the same family to have a subrecedent, recedent or subdominant dominance in some localities or dominant, eudominant position, in other favourable places.

The numerical limits of recedent families were between one crop (5.88%) (Tenebrionidae, Brăila, Terrace, 1984, Brăila county, Osoi, 1986, Iași) and four crops (23.52%), Staphylinidae (Brăila 1980, Brăila County, Pogana, 1989, Vaslui County, Negrești, 1992, Breazu 2001, Iași County).

The limits of subdominant families were between one crop (5.88%), Tenebrionidae, Negru Vodă, 1979; Brăila County; Silphidae, Pogana, 1989; Vaslui County, and five crops (29.41%) (Coccinellidae, Brăila 1979, Brăila County, Brăila 1980, Brăila Terrace, 1984; Brăila, 1984; Salt Lake, 1984.)

Four families (18%) were dominant in one crop each (Tenebrionidae, Breazu 2001, Iași County; Dermestidae, Pogana, 1989, Vaslui County; Staphylinidae, Săbăoani, 1999, Neamț County; Anthicidae, Brăila, 1984, Brăila County).

Five families, Tenebrionidae, Elateridae, Curculionidae, Staphylinidae, Chrysomelidae were eudominant in one maize crop each.

Comparing the overall results from the maize crops, 12 seasons, actually, 1978 - 2010, with those obtained from the wheat crops, 12 seasons, actually, 1977 - 2002, during their vegetation period the wheat crops favour the presence of several individuals from five families (Carabidae, Staphylinidae, Anthicidae, Silphidae, Lathridiidae), the soil moisture in the wheat crops being one of those factors that favours the number of individuals. For example, in Staphylinidae family, mesophilous one, there were collected four times more individuals in wheat crops compared to maize crops. The total number of Staphylinidae was 2,366 individuals in wheat crops, compared to 509 in maize crops.

CONCLUSIONS

The collecting effort of the material, the taxonomic identification of those 22,230 individuals from 40,736 samples collected from 17 maize crops, during a period of 12 seasons, actually (1978-2010) in Brăila County (Wallachia) and Vaslui, Iași, Bacău, Neamț, Botoșani counties (Moldova) give us the opportunity to affirm the following:

The epigenous coleopterans belong to 22 families. In the order of their total abundance, they are: Carabidae, Tenebrionidae, Elateridae, Curculionidae, Dermestidae, Coccinellidae, Staphylinidae, Chrysomelidae, Anthicidae, Scarabaeidae, Histeridae, Silphidae, Chryptophagidae, Cantharidae, Cerambycidae, Nitidulidae, Lathridiidae, Melyridae, Catopidae, Ptinidae, Phalacrididae, Meloidae.

The numerical and percentage presence of the families varied from one locality (5.88%), families (Catopidae, Ptinidae, Phalacrididae and Meloidae) to 17 localities (100 %), only Carabidae family. Carabidae Family is present in all the maize crops as eudominant.

Six families (Tenebrionidae, Elateridae, Curculionidae, Dermestidae, Staphylinidae, Chrysomelidae) are present in crops. Thus, 1. **subrecedent**, one crop (Dermestidae) and five crops (Elateridae, Staphylinidae); 2. **recedent**, one crop (Tenebrionidae) and four crops (Curculionidae, Staphylinidae, Chrysomelidae); 3. **subdominant**, one crop (Tenebrionidae) and four crops (Elateridae); 4. **dominant**, one crop (Tenebrionidae, Dermestidae) and three crops (Curculionidae); 5. **eudominant**, one crop (Elateridae, Curculionidae) and five crops (Tenebrionidae, Chrysomelidae).

Carabidae family is eudominant in each crop of maize, the percentage of individuals varying between 26.41% (Pogana, Vaslui County), 1989 and 94.82% (Cherchejeni, 2000, Botoșani County).

REFERENCES

- ANDRIESCU I., VARVARA M., MOGLAN I. 1983. The dynamics of carabids (Coleoptera, Carabidae) in the maize experimental crops (*Zea mais* L.) treated with insecticides, 1983, *Verhandlungen SIEEC X*. Budapest: 143-145.
- BODESCU C. 2013. Cercetări cu privire la structura, sistematica, dinamica, abundența și activitatea speciilor de Carabidae (Coleoptera, Carabidae) din culturile de porumb din județul Iași. (*Rezumat. Teza de doctorat*). Universitatea „Alex. I. Cuza”. Iași. 1-8. (www.uaiași.ro).
- VARVARA M., ANDRIESCU I., MOGLAN I. 1981b. Unele aspecte ale compoziției și structurii mezofaunei din câmpurile experimentale de porumb. [Aspects of the structure of the mezofauna in experimental maize fields]. *Vol. Institutului de Învățământ Superior*. Constanța. 39-44.
- VARVARA M., ANDRIESCU I., MOGLAN I. 1985. Structura cenozei de Carabidae (Coleoptera) din culturile experimentale de porumb, tratate cu insecticide, pe sol cernoziom de la Brăila. [Structure of the Carabidae coenosis in experimental maize crops treated with insecticides, on cernoziom soil near Brăila]. *Analele Științifice ale Universității „Alex. I. Cuza” Iași*. **31**: 31-33.
- VARVARA M., PISICĂ C., ANDRIESCU I., MOGLAN I. 1987. Die Struktur der Carabidenkomunitäten in einigen Agroökosystemen einiger Landwirtschaftlichen Kulturen im Bezug auf die Bedingungen der Agroökologie. *Analele Științifice Universitare. Iași, Biologie*. **33**: 6-69.
- VARVARA M. & BRUDEA V. 1999. The Structure and Distribution of the Carabid Communities in the Maize Crops from Moldavia. *Studii și Comunicări Științifice*. Universitatea Bacău: 79-84.
- VARVARA M. & ZAMFIRESCU ȘT. 2008. Composition and the structure of Ecological Requirements of the Species of Carabidae (Coleoptera, Carabidae) in the Maize Crop from Moldavia, 1984-2000. *Oltenia. Studii și comunicări. Științele Naturii*. Muzeul Olteniei Craiova. **24**: 97-108.

Varvara Mircea

University “Alexandru Ioan Cuza” Iași,
Str. Bulevardul Carol I, No 11, Iași, Romania.
E-mail: mvarvara@uaic.ro

Received: May 06, 2016

Accepted: May 19, 2016