

THE STRUCTURE AND THE VALUES OF SOME ECOLOGICAL PARAMETERS OF THE EPIGENOUS BEETLES SPECIES FROM THE PLUM ORCHARDS

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Abstract

For the study of the epigenous beetles species of plum orchards and observations were made of the collected material by the soil traps type Barber.

The traps placed in plantation were six in number, it's situated on two row, by three per line.

The traps were put in a formaldehyde solution with a concentration of 3-4%. The gathering of the material was made on the following dates: 31.05; 15.06; 28.06; 12.07; 26.07; 10.08; 23.08.

*The most common species of beetles were collected : *Onthophagus ovatus* L., *Anisodactylus binotatus* F., *Dermestes lanarius* L., *Onthophagus taurus* Schr. și *Pseudophonus griseus* Panz.*

Keywords: ecological parameters, Coleoptera, gatherings, plum.

1. INTRODUCTION

The plum plantations occupies large areas, particularly in areas with lower temperatures, where it has replaced the other culture more resistant Poland, Germany, U.K., Scandinavian countries etc. (Balachowschi and Mesnil, 1935- 1936; Manolache et al., 1946-1957; Arion, 1957; Manolache and Boguleanu, 1967).

In our country, although it has a long tradition, being cultivated since the first decades of last century, in recent years this culture has suffered a strong revival, the area under cultivation, sometimes being beyond 100 000 ha (Panin, 1951; Săvescu, 1962-1964; Baicu, 1982; Bărbulescu et al., 1993; Șandru, 1996).

Following progress in the ameliorating process, by obtaining varieties which are more resistant for some protection problems, especially caused by pests (Manolache and Boguleanu, 1967; Paulian et al., 1979; Perju, 1995; Tălmăciu, 2010).

2. MATERIALS AND METHODS

The soil traps type Barber were used to collect the biological material. These consisted in the introduction into the soil of recipients in which a solution of formalin (40%) diluted with water to a concentration of 5% was placed (Herea , 2010).

The experience was organized in a plum orchard cultivated with Rivers timpuriu cultivar, which belongs to the Pietrarie stationary.

The location of the traps has been done on two rows at a distance of 12 m between the rows and 6 meters from the traps by three per row (Tălmăciu, 2011).

The gathering of the entomological material was done between May of August at intervals of 10-20 days.

At each harvest, the insects collected from each trap were put into gauze cloth, each sample separately, and the liquid in the trap was replaced or filled. The material was then labeled, on the label specifying: the date of collection; trap number and the variant.

In the laboratory, the material was cleaned from plant debris and then washed under the jet of water, selected by order or species. The situation of sampling in the stationary studied is the following:

Harvest. I. 31.05.2015

Harvest. II. 15.06.2015

Harvest. III. 28.06.2015

Harvest. IV. 12.07.2015

Harvest. V. 26.07.2015

Harvest. VI. 10.08.2015

Harvest. VII. 23.08.2015

As for the data interpretation, a number of ecological indices have been calculated as follows: abundance, constancy, dominance, and ecological significance.

Abundance (A) – Expresses the number of collected specimens.

Constancy (C) - represent the number of specimens in which the species appears, based on the number of samples taken, according to the formulate:

$$C_A = \frac{N_p \cdot A \cdot 100}{N_p}$$

C_A - constancy of species

N_{pA} - The number of traps in which species A appears;

N_p - Total number of traps with 4 classes of constants

C_1 - Accidental species (1–2%)

C_2 - Accessory species (25.1–50%)

C_3 - Constant species (50.1–75%)

C_4 - Euconstant species (75.1–100%)

Dominance (D) Is the total number of specimens relative to the total number of individuals harvested according to the formula:

$$D_A = \frac{N_A \cdot 100}{N_t}$$

D_A - constancy of the A

N_A - total number the samples of A species

N_t -total number of samples for all species with 5 dominance classes

D_1 - subrecedent (sub 1.1%)

D_2 - recedent (1.1–2%)

D_3 - subdominant (2.1–5%)

D_4 - dominant (5.1–10%)

D_5 - eudominant (above 10%)

The Significance Ecological Index (W) by formulate:

$$W_A = \frac{C_A \cdot D_A \cdot 100}{10000}$$

W_A - ecological significance index of the A species;

C_A - constance of the A species

D_A - dominance of the A species, with 5 classes:

W_1 - Less than 0.1% (Accidental species);

W_2 - 0.1–1%;

W_3 - 1.1-5%(Accompanying species)

W_4 - 5.1-10%

W_5 - above 10%(Edifying species)

The Ecological Significance Index is used to deepen the interrelationships between constancy and dominance, emphasizing even more clearly the structure of some species, reflecting its importance in the analyzed community.

3. RESULTS AND DISCUSSIONS

In order to achieve the proposed objectives and following the activities carried out, a series of seven harvests were carried out in the Pietrarie stationary with the help of six Barber type soil traps.

At the first trap (table1) following the seven harvests a total of 104 specimens of invertebrates belonging to nine species of insects were collected as follows: *Ontophagus ovatus*, *O. taurus*, *Hister purpurascens*, *Ontophagus semicornis*, *Anisodactylus binotatus*, *Harpalus distinguendus*, *Carabus coriaceus*, *Silpha obscura*, *Polydrosus amoenus*.

Table 1. Structure and abundance of coleopteran species collected at trap no.1

No	Name of species	Harvest							Total
		1	2	3	4	5	6	7	
		31.05	15.06	28.06	12.07	26.07	10.08	23.08	
1.	<i>Ontophagus ovatus</i> L	-	-	-	50	-	-	2	52
2.	<i>Ontophagus taurus</i> Schr.	-	-	-	15	-	-	-	15
3.	<i>Hister purpurascens</i> Herbst	-	-	-	-	9	-	-	9
4.	<i>Ontophagus semicornis</i> Panz.	-	-	-	8	-	-	-	8
5.	<i>Anisodactylus binotatus</i> F.	-	3	3	-	-	-	-	6
6.	<i>Harpalus distinguendus</i> Duft	-	-	5	-	-	-	-	5
7.	<i>Carabus coriaceus</i> L.	-	-	-	3	-	-	-	3
8.	<i>Silpha obscura</i> L.	-	-	-	-	3	-	-	3
9.	<i>Polydrosus amoenus</i> Schall	-	-	3	-	-	-	-	3
TOTAL 7 species		-	3	11	76	12	-	2	104

At the second trap (table 2), the total number of specimens was 33 after the six traps, and these belong to a number of seven species of coleoptera, as follows: *Pseudophonus rufipes*, *Polydrosus sericeus*, *Coccinella 14 punctata*, *Calathus fuscipes*, *Stomodes gyrosicollis*, *Ceuthorrhynchus crucifer*, *Anisodactylus binotatus*.

Table 2. Structure and abundance of coleopteran species collected at trap no.2

No	Name of species	Harvest							Total
		1	2	3	4	5	6	7	
		31.05	15.06	28.06	12.07	26.07	10.08	23.08	
	<i>Pseudophonus rufipes</i> Muller	-	-	-	-	-	8	-	8
	<i>Polydrosus sericeus</i> Schall.	-	-	-	6	-	-	-	6
	<i>Coccinella 14 punctata</i> L.	-	-	-	3	3	-	-	6
	<i>Calathus fuscipes</i> Gaeze	-	-	-	-	-	6	-	6
	<i>Stomodes gyrosicollis</i> Boh.	-	-	-	-	3	-	-	3
	<i>Ceuthorrhynchus crucifer</i> F.	-	-	-	-	2	-	-	2
	<i>Anisodactylus binotatus</i> F.	-	-	2	-	-	-	-	2
	TOTAL 7 species	-	-	2	9	8	14	-	33

In the third trap (table 3), a total of 15 species of coleoptera were collected, totaling 85 copies at the end of the seven harvesting periods, and the following: *Pseudophonus griseus*, *Dermestes laniarius*, *Polydrosus amoenus*, *Harpalus calceatus*, *Anisodactylus binotatus*, *Harpalus distinguendus*, *Blaps letifera*.

Table 3. Structure and abundance of coleopteran species collected at trap no.3

No	Name of species	Harvest							Total
		1	2	3	4	5	6	7	
		31.05	15.06	28.06	12.07	26.07	10.08	23.08	
1.	<i>Pseudophonus griseus</i> Panz.	-	-	-	-	-	-	15	15
2.	<i>Dermestes laniarius</i> Illig.	-	-	-	5	-	4	2	11
3.	<i>Polydrosus amoenus</i> Schall.	-	-	6	-	-	-	-	6
4.	<i>Harpalus calceatus</i> F.	4	-	-	-	-	-	5	9
5.	<i>Anisodactylus binotatus</i> F.	-	-	-	6	-	-	-	6
6.	<i>Harpalus distinguendus</i> Duft	-	-	-	-	-	-	6	6
7.	<i>Calopus serraticornis</i> L.	-	4	-	-	-	-	-	4
8.	<i>Blaps letifera</i> Marsh	-	-	-	-	-	8	-	8
9.	<i>Carabus coriaceus</i> L.	-	-	-	-	-	4	-	4
10.	<i>Opatrum sabulosum</i> L.	3	-	-	-	-	-	-	3
11.	<i>Polydrosus sericeus</i> Schall	-	-	3	-	-	-	-	3
12.	<i>Carabus scabriusculus</i> Ol.	-	-	-	-	3	-	-	3
13.	<i>Ceuthorrhynchus crucifer</i> Pallas	-	-	-	-	3	-	-	3
14.	<i>Tomoxia biguttata</i> Gyll.	-	-	-	-	-	2	-	2
15.	<i>Notiophilus palustris</i> Duft	-	-	-	-	-	-	2	2
	TOTAL 15 species	7	4	9	11	6	18	30	85

As a result of the harvests of the vegetation period, the number four trap (table 4) was summed up to 6 species with 16 specimens, and these were: *Anisodactylus binotatus*, *Harpalus distinguendus*, *Polydrosus sericeus*, *Dorcadion fulvum*, *Ontophagus ovatus*, *Dermestes laniarius*.

Table 4. Structure and abundance of coleopteran species collected at trap no.4

No	Name of species	Harvest							Total
		1	2	3	4	5	6	7	
		31.05	15.06	28.06	12.07	26.07	10.08	23.08	
1.	<i>Anisodactylus binotatus</i> F.	3	-	-	2	-	-	-	5
2.	<i>Harpalus distinguendus</i> Duft.	-	3	-	-	-	-	-	3
3.	<i>Polydrosus sericeus</i> Schall	2	-	-	-	-	-	-	2
4.	<i>Dorcadion fulvum</i> Scopoli	-	2	-	-	-	-	-	2
5.	<i>Ontophagus ovatus</i> L.	-	-	-	3	-	-	-	3
6.	<i>Dermestes laniarius</i> Illig.	-	1	-	-	-	-	-	1
	TOTAL 6 species	5	6	-	5	-	-	-	16

The 5th trap(table 5) registered a total of seven species, totaling 24 samples represented by *Tomoxia biguttata*, *Anisodactylus binotatus*, *Dermestes laniarius*, *Ptosima 11 maculata*, *Polydrosus amoenus*, *Oberea oculata*, *Necrophorus vespillo*.

Table 5. Structure and abundance of coleopteran species collected at trap no.5

No	Name of species	Harvest							Total
		1	2	3	4	5	6	7	
		31.05	15.06	28.06	12.07	26.07	10.08	23.08	
1.	<i>Tomoxia biguttata</i> Gyll.	-	-	-	-	-	6	-	6
2.	<i>Anisodactylus binotatus</i> F.	3	2	-	-	-	-	-	5
3.	<i>Dermestes laniarius</i> Illig.	-	-	-	-	-	4	-	4
4.	<i>Ptosima 11 maculata</i> Herbst.	-	3	-	-	-	-	-	3
5.	<i>Polydrosus amoenus</i> Schall.	-	-	3	-	-	-	-	3
6.	<i>Oberea oculata</i> L.	1	-	-	-	-	-	-	1
7.	<i>Necrophorus vespillo</i> L.	-	-	-	-	-	2	-	2
	TOTAL 7 species	4	5	3	-	-	12	-	24

The three species trapped in the six trap have totalized 7 samples belonging to them: *Polydrosus sericeus*, *Anisodactylus binotatus*, *Dermestes laniarius*.

Table 6. Structure and abundance of coleopteran species collected at trap no.6

No	Name of species	Harvest							Total
		1	2	3	4	5	6	7	
		31.05	15.06	28.06	12.07	26.07	10.08	23.08	
	<i>Polydrosus sericeus</i> Schall	2	-	-	-	-	-	-	2
	<i>Anisodactylus binotatus</i> F.	3	-	-	-	-	-	-	3
	<i>Dermestes laniarius</i> Illig.	-	-	-	-	-	2	-	2
	TOTAL 3 species	5	-	-	-	-	2	-	7

Following the graphical representation (figure 1) of the total number of collected samples in each trap during the seven harvests, the situation is as follows: At the first trap was recorded with 104 samples, being the largest number collected of samples, followed by the trap number three with 85 samples. Of the second trap, we counted 33 samples, the trap number fifth with 24 samples, followed by the four trap with 16 samples, and in the trap number six we counted 7 samples.

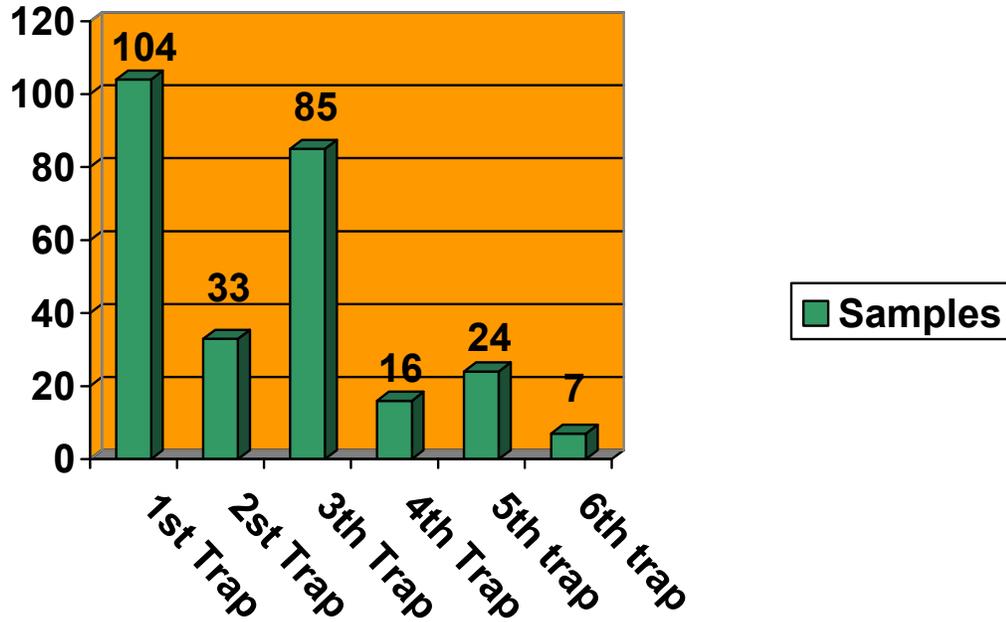


Figure 1. The number of Coleoptera specimens collected from the 6 traps

For a good presentation of the obtained results from the researches regarding the collected entomofauna in the six traps, a graphic representation (figure 2) was made with the percentages of the collections of the total number of samples from the period studied in the Pietrarie stationary.

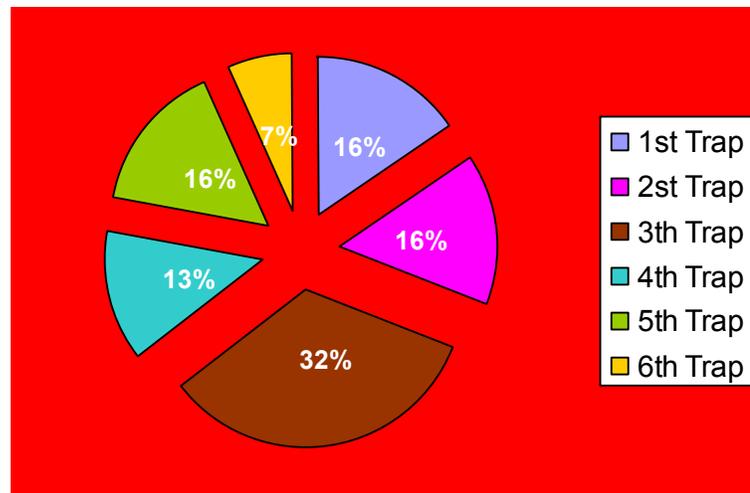


Figure 2. Graphic representation of the species collected from the 6 traps

Table7. The structure species (of taxon) collected from the plum plantation in 2015, the Petrărie stationary

No.	Name of species	The number of traps has been collected	Total samples	%
1.	<i>Ontophagus ovatus</i> L	3	55	20,91
2.	<i>Anisodactylus binotatus</i> F.	9	27	10,27
3.	<i>Dermestes lanarius</i> Illig.	6	18	6,84
4.	<i>Ontophagus taurus</i> Schr.	1	15	5,70
5.	<i>Pseudophonus griseus</i> Panz.	1	15	5,70
6.	<i>Harpalus distinguendus</i> Duft	2	14	5,32
7.	<i>Polydrosus sericeus</i> Schall	4	13	4,94
8.	<i>Polydrosus amoenus</i> Schall	3	12	4,56
9.	<i>Hister purpurascens</i> Herbst	1	9	3,42
10.	<i>Harpalus calceatus</i> Duft.	2	9	3,42
11.	<i>Pseudophonus rufipes</i> Muller.	1	8	3,04
12.	<i>Tomoxia biguttata</i> Gyll.	2	8	3,04
13.	<i>Ontophagus semicornis</i> Panz.	1	8	3,04
14.	<i>Carabus scabriusculus</i> Ol.	2	6	2,28
15.	<i>Cccinella 14 punctata</i> L.	2	6	2,28
16.	<i>Calathus fuscipes</i> Gaeze	1	6	2,28
17.	<i>Ceuthorrhynchus crucifer</i> L.	2	5	1,90
18.	<i>Calopus serraticornis</i> L.	1	4	1,52
19.	<i>Carabus coriaceus</i> L.	1	4	1,52
20.	<i>Silpha obscura</i> L.	1	3	1,14
21.	<i>Stomodes gyrosicollis</i> Boheman	1	3	1,14
22.	<i>Opatrum sabulosum</i> L.	1	3	1,14
23.	<i>Ptosima 11 maculata</i> Herbst.	1	3	1,14
24.	<i>Blaps letifera</i> Marsh	1	2	0,76
25.	<i>Notiophilus palustris</i> Duft	1	2	0,76
26.	<i>Dorcadion fulvum</i> Scopoli.	1	2	0,76
27.	<i>Necrophorus vespillo</i> L.	1	2	0,76
28.	<i>Oberea oculata</i> L.	1	1	0,38
Total 28 de species (taxa)		-	263	100

Following the centralization of the seven crops from the six traps in the plum tree plantation station, we recorded a total of 28 carabid species with a total of 263 specimens.

To determine the structure and dynamics of a biocenosis, the collected material undergoes a mathematical analysis, estimating a series of indicators that highlight the characteristics of the ecosystem.

To achieve this goal, the sinecological analysis of Coleoptera fauna of plum agroecosystems was performed to assess the ratio of each species in the analyzed biocenosis.

The material obtained from the observations was mathematically processed to obtain a series of ecological indicators: abundance (A), dominance (D), constancy (C) and ecological significance index (W).

**Table 8. The values of ecological indices of species in 2015, stationary Pietrărie
the variety Rivers timpuriu**

No.	Species (taxa)	THE ECOLOGICAL INDEX			
		A	C	D	W
1.	<i>Ontophagus ovatus</i> L	55	10,71	20,91	2,24
2.	<i>Anisodactylus binotatus</i> F.	27	28,57	10,27	2,93
3.	<i>Dermestes lanarius</i> Illig.	18	21,43	6,84	1,47
4.	<i>Ontophagus taurus</i> Schr.	15	3,57	5,70	0,20
5.	<i>Pseudophonus griseus</i> Panz.	15	3,57	5,70	0,20
6.	<i>Harpalus distinguendus</i> Duft	14	7,14	5,32	0,38
7.	<i>Polydrosus sericeus</i> Schall	13	14,29	4,94	0,70
8.	<i>Polydrosus amoenus</i> Schall	12	10,71	4,56	0,49
9.	<i>Hister purpurascens</i> Herbst	9	3,57	3,42	0,12
10.	<i>Harpalus calceatus</i> Duft.	9	7,14	3,42	0,24
11.	<i>Pseudophonus rufipes</i> Muller.	8	3,57	3,04	0,11
12.	<i>Tomoxia biguttata</i> Gyll.	8	7,14	3,04	0,22
13.	<i>Ontophagus semicornis</i> Panz.	8	3,57	3,04	0,10
14.	<i>Carabus scabriusculus</i> Ol.	6	7,14	2,28	0,16
15.	<i>Cccinella 14 punctata</i> L.	6	7,14	2,28	0,16
16.	<i>Calathus fuscipes</i> Gaeze	6	3,57	2,28	0,08
17.	<i>Ceuthorrhynchus crucifer</i> L.	5	7,14	1,90	0,14
18.	<i>Calopus serraticornis</i> L.	4	3,57	1,52	0,05
19.	<i>Carabus coriaceus</i> L.	4	3,57	1,52	0,05
20.	<i>Silpha obscura</i> L.	3	3,57	1,14	0,04
21.	<i>Stomodes gyrosicollis</i> Boheman	3	3,57	1,14	0,04
22.	<i>Opatrum sabulosum</i> L.	3	3,57	1,14	0,04
23.	<i>Ptosima 11 maculata</i> Herbst.	3	3,57	1,14	0,04
24.	<i>Blaps letifera</i> Marsh	2	3,57	0,76	0,03
25.	<i>Notiophilus palustris</i> Duft	2	3,57	0,76	0,03
26.	<i>Dorcadion fulvum</i> Scopoli.	2	3,57	0,76	0,03
27.	<i>Necrophorus vespillo</i> L.	2	3,57	0,76	0,03
28.	<i>Oberea oculata</i> L.	1	3,57	0,38	0,01
	Total 28 species	263 specimens			

4. CONCLUSIONS

During the research were collected from a number of specimens belonging to 28 species of *Carabidae* with 263 of samples. These were: *Anisodactylus binotatus* F., *Amara aenea* Dejean., *Harpalus calceatus* Duft., *Harpalus distinguendus* Duft., *Ophonus azureus* F., *Cymindis vaporariorum*, *Amara aenea*, *Anisodactylus signatus*, *Calathus melanocephalus* L. *Carabus scabriusculus*, *Pseudophonus griseus*, *Carabus coriaceus* L. and *Pterostichus niger* Schall.

The Coleoptera collected species from Pietrărie stationary in 2015 with the lowest percentage of 7 % of the total entomofauna collected specimens it was recorded at trap number six, at trap number 4 it was recorded 13%, a balanced situation with an equal number of specimens we recorded in traps

1, 2 and 5 which we have 16% for each, but the highest percentage of collections was recorded in traps number 3 and the value is 32%.

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