DIVERSITY OF SMALL MAMMALS AND INTERSPECIFIC RELATIONSHIPS IN APPLE ORCHARD

DIVERSITATEA MAMIFERELOR MICI ŞI RELAŢIILE INTERSPECIFICE STABILITE ÎN CADRUL UNEI LIVEZI DE MĂR

TALMACIU Nela[1], HEREA Monica[1], PANUŢA S.[2*], TALMACIU M.[1], POPOVICI Mariana[3]

*Corresponding author e-mail: sorexmin@yahoo.com

Abstract. *This study was realized from April 2017 to August 2018 in a conventional apple orchard from Delesti (Vaslui, Romania). The goal of this research was relations and species diversity of small mammals from this agroecosystem. A total of 8 small mammals species were identified during the research time. Out of small mammals identified, the species Mus spicilegus and Apodemus sylvaticus are cohabitant species, while dominant species is Microtus arvalis. The results reveal that the structure of small mammals communities is correlate with condition of habitat and also, with intensity of agrotechnical procedures carried out during the vegetative season.*

Key words: apple orchard, diversity, rodents, insectivores

Rezumat. *Studiul realizat în perioada aprilie 2017 – august 2018, urmăreşte biodiversitatea mamiferelor mici dintr-o livadă convenţională de meri din localitatea Deleşti, Vaslui (România). 8 specii de mamifere mici au fost identificate în timpul cercetării. Dintre mamiferele mici, speciile Mus spicilegus şi Apodemus sylvaticus au fost specii coabitante în toată perioada de studiu, în timp ce specia dominantă în eşantioanele noastre a fost Microtus arvalis. Rezultatele obţinute au scos de asemenea în evidenţă, faptul că structura comunităţilor de mamifere mici şi diversitatea specifică sunt corelate pozitiv cu oferta de hrană şi habitat, precum şi cu intensitatea lucrărilor agrotehnice desfăşurate pe perioada sezonului vegetativ.*

Cuvinte cheie: livadă de meri, diversitate, rozătoare, insectivore

INTRODUCTION

Knowing the structure of a biocenosis by tracking it over time leads to an understanding of the mechanisms of self-regulation of these biological systems. This is currently the main objective of global environmental research, thus allowing the development of rational exploitation of natural resources and disease and pest control. In this context, the goal of this research is relations and species diversity of small mammals from the apple orhard agroecosystem.

[1] University of Agricultural Sciences and Veterinary Medicine Iasi, Romania
[2] State Agrarian University of Moldova, Republic of Moldova
[3] Institute of Biological Research Iasi, Romania

MATERIAL AND METHOD

The research was carried out between May-November 2017 and April-August 2018, in apple orchard in Delesti, Vaslui (N46.705864, E27.5797611). Monthly, samples were collected using live traps (30 live-trips). The distance between two successive traps was 15 m, respecting the rule that the distance between two successive traps is not greater than the radius of a circle with an area equal to the surface area of the target species (Jones *et al.*, 1996).

The time of a fieldwork session was 48 h/ month, during which traps were activated during the night to capture small mammals. Specimens were identified to species level. They were released after application of the individual marking (Ionescu et al., 2013).

The traps covered 7 types of vegetal carpet between rows of trees: type 1 – land covered with grassland; type 2 - land covered with *Lotus corniculatus*; type 3 - land covered with *Trifolium repens*; type 4 – land covered with *Trifolium pratense*; type 5 - land covered with *Medicago sativa*; type 6 - land covered with the mixture of the four leguminous species; type 7- untilled field.

Trap index for each studied period was computed by following formula (Jackson,1952):

Trap index (TI) =[Total no. of small mammals/ No. of trapping days xNo. of traps]*100

The differences between habitats were estimated by using some indices of Alpha and Beta diversity (Gomoiu and Skolka, 2001).

The correlation between species and types of vegetal carpet is evaluated using Correspondence Analysis.

RESULTS AND DISCUSSIONS

In total 63 rodents and insectivores were collected from the studied area during 2017 - 2018, of which 35 specimens were captured in 2017 and 28 specimens in 2018 (fig. 1). The trap index indicate no significant diferences between captures for the two period (One Way ANOVA: F = 0.36; p = 0.57), beeing in according with vegetative season and agrotechnical activities.

A total of 8 small mammal species were indentified during the collecting time: 5 species of rodents and 3 species of insectivores.

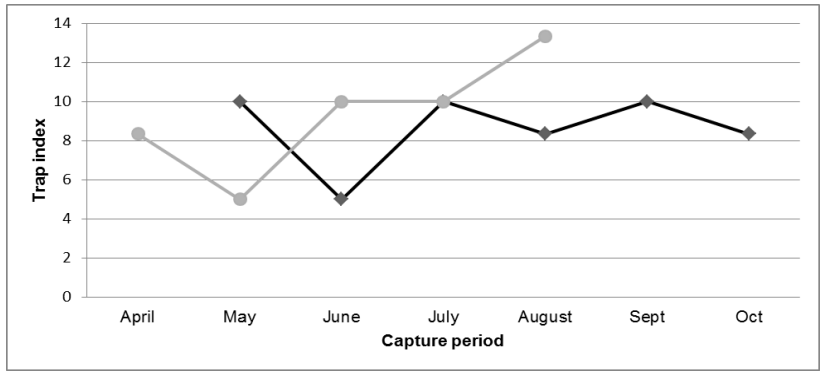

Fig. 1 Variation of Trap index of small mammals for collecting period (2017, 2018)

The most abundant species were *Microtus arvalis* (23.73% of total identified species) and *Mus musculus* (22.03%), followed by *Mus spicilegus* (13.56%) and *Sorex araneus* (11.86%).

Insectivores were poorly represented in the monthly samples in both collection periods (only 11.86% of total identifies). There were identified individuals of 3 species: *Sorex araneus*, *Crocidura suaveolens* and *Talpa europaea*.

In 2017 constant and coabitant species in studied area are *Mus spicilegus* and *Apodemus sylvaticus*, and in 2018 *Mus spicilegus* and *Sorex araneus*.

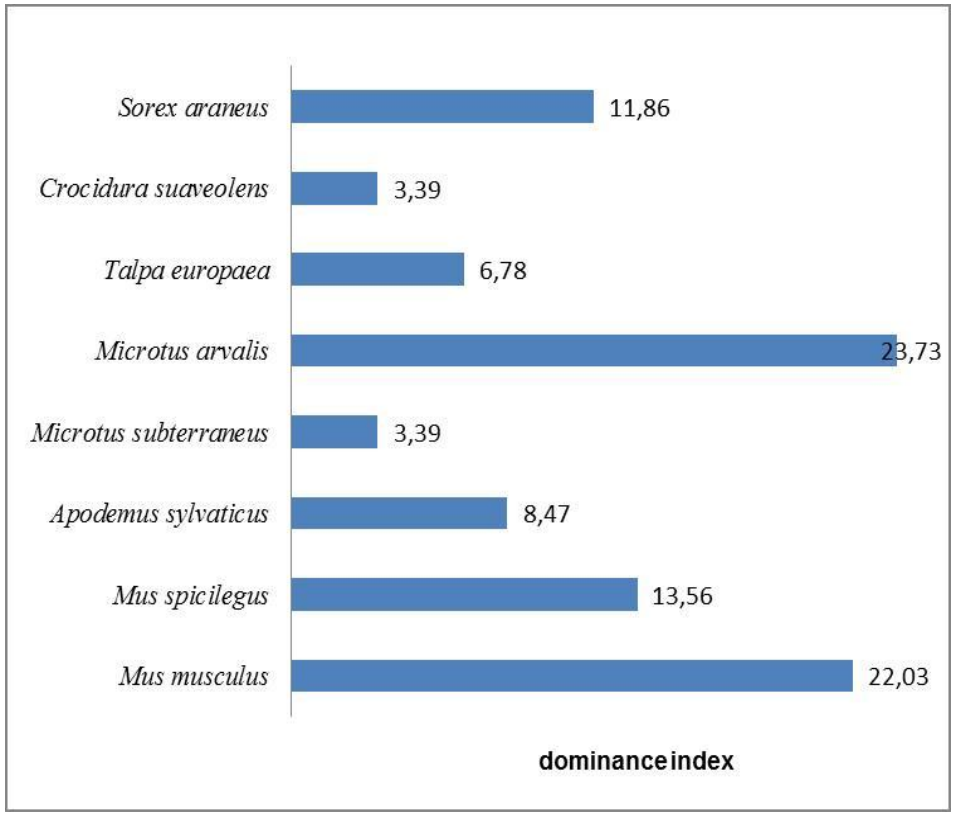

Fig. 2 Composition of small mammals in our samples

The values of diversity indices for every type of vegetal carpet are presented in table 1. Because there were no significant differences between the captures by type of vegetal cover (MANOVA: $F = 0.25$; $p = 0.6$), it cannot discuss about specific or intraspecific small mammals diversity between the types of vegetal carpets. Distance between these types is small and the mobility of the small mammals is much larger. An adult of *Mus spicilegus*

may have between 400 and 800 sqm and one of *Apodemus sylvaticus* may have an individual territory of up to 1200 sqm (Simionescu 1965, 1970; Popovici 2005, 2006).

Table 1

Diversity indices

INDEX	T1	T2	T3	T4	T5	T6	T7
Taxa	4	5	4	1	3	2	3
Simpson_1-D	0.72	0.8	0.7222	0	0.625	0.4444	0.625
Shannon_H	1.332	1.609	1.33	0	1.04	0.6365	1.04
Evenness_e^H/S	0.9473	1	0.9449	1	0.9428	0.9449	0.9428
Menhinick	1.789	2.236	1.633	0.7071	1.5	1.155	1.5
Margalef	1.864	2.485	1.674	0	1.443	0.9102	1.443
Equitability_J	0.961	1	0.9591	0	0.9464	0.9183	0.9464

The multivariate analysis applied gives us an overview of the similarity or difference between the types of vegetal carpets according to the captures of small mammals made and not according to the specific diversity characteristic of vegetal carpets.

T1, T2 and T3 types have a successive positioning and have as common characteristics the species *Apodemus sylvaticus*, *Mus musculus* and *Microtus arvalis*. The putting on the dimensional graph of the T4 and T6 is explained by the lack of common captured species. In T4 the species *Mus spicilegus*, *Apodemus sylvaticus* and *Crocidura suaveolens* were identified while in T6 *Microtus subterraneus*, *Microtus arvalis* and *Talpa europaea* were identified. A positive correlation between *Apodemus syvaticus* and *Sorex araneus* in the T2 could be explained by the lack of competition between these two species as they have different requirements regarding the trophic spectrum.

The small number of recaptured individuals (24% of captured species) it was not possible to study the population renewal degree.

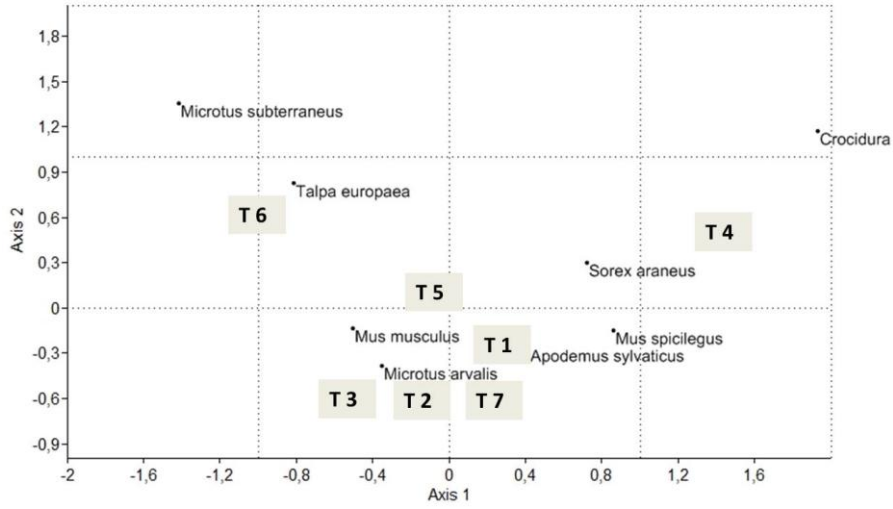

Fig.3 The graph of Correspondence Analysis (T1-7: types of vegetal carpet)

CONCLUSIONS

1. Of the total, 5 species of rodents and 3 species of insectivores were indentified during the research time.

2. The common and constant species in our samples were *Microtus arvalis* and *Mus musculus*.

3. Corespondence analysis show that is no significant correlation between species and type of vegetal carpet.

4. The structure of small mammals communities is correlate with condition of habitat and also, with intensity of agrotechnical procedures carried out during the vegetative season.

Acknowledgments*: This paper was carried out by the Partnership in priority areas - PN III, developed with the support of UEFISCDI, project no. 29/2016(PN-III-P2-2.1-29BG-2016-0374) "Establishing the vegetal carpet variants and monitoring the dynamics of ecosystem indicators "*

REFERENCES

1. Gomoiu M.T., Skolka M., 2001 - *Ecologie – metodologii pentru studii ecologice*, Ed. Univ. "Ovidius", Constanța, p. 170.

2. Ionescu O., Ionescu G., Jurj R., Cazacu C., Adamescu M., Cotovelea A., Paşca C., Popa M., Mirea I., Sîrbu G., Chiriac S., Pop M., Attilla S., Deju R., 2013 - *Ghid sintetic de monitorizare pentru speciile de mamifere de interes comunitar din România*, Ed.Silvică, Bucureşti, p. 236.

3. Jackson, W.B. 1952 - *Population of wood mouse (Peromyscus leucopus) subjected to the application of DDT and parathio*n. Ecological Monographs, 22, p. 259.

4. Jones C., McShea W.J., Conroy M.J., Kunz T.H, 1996 - *Capturing mammals. In: Measuring and Monitoring Biological Diversity: Standard Methods for Mammals*, New York: Smithsonian Institution Press, p. 115–155.

5. Popovici M., 2005 - *Contributions in knowledge regarding the interspecific relations the dynamics and structure of populations of small mammals from the alfalfa crops of Botosani district in year 2004*, Simpozion stiințific „Facultatea de Zootehnie", Ed. „Ion Ionescu de la Brad". Vol. 48, p. 851-856.

6. Popovici M., 2006 - *Biodiversitatea mamiferelor mici (Mammalia: Rodentia, Insectivora) din diferite agroecosisteme din nordul Moldovei*, Univ. Alexandru Ioan Cuza, Iasi (doctoral thesis).

7. Simionescu V., 1965 - *Contribuții la cunoaşterea sistematicii şi răspândirii geografice a faunei de rozătoare (Glires) din Moldova*, Analele Stiințifice ale Univ. "Al. I. Cuza", Iaşi, seria nouă, II, Biologie, XI (1), p.127-141.

8. Simionescu V., 1970 - *Cercetări privind dinamica populației mamiferelor mici din câteva tipuri de biocenoze naturale din Moldova*. Societatea de Stiințe Biologice din R.S.R., Comunicări de zoologie, p. 289-304.