THE COMPARATIVE ANALYSIS OF THE CAPTURE INDEX AND OF THE RELATIVE ABUNDANCE FOR THE RODENT SPECIES (MAMMALIA: RODENTIA) FROM THE MIDDLE BASIN OF THE SIRET RIVER, ACCORDING TO THE ECOSYSTEM TYPE

PARASCHIV Dalia

Abstract. This study presents the results of the research concerning the rodent diversity, a research accomplished during 2008-2010, in seven ecosystem types belonging to the middle basin of the Siret river (four types of agro-ecosystems: crops of alfalfa, wheat, maize, orchard and three natural ecosystems: deciduous forest, mixed deciduous-coniferous forest and coniferous forest). Because the number of the days of study for each researched ecosystem was not equal, the comparison of the obtained data was made according to the capture index (Ind. cpt). Its highest value (Ind.cpt. = 8.64) was obtained in the mixed deciduous-coniferous forest. The calculation of the relative abundance (A%) of the rodent species in each researched ecosystem type indicates the *Apodemus flavicollis* (MELCHIOR 1834) species as having the largest spread area and the largest trophic spectrum, being identified in most ecosystem types in the middle basin of the Siret river.

Keywords: rodents, ecosystems, capture index, relative abundance, distribution.

Rezumat. Analiza comparativă a indicelui de capturare şi a abundenţei relative pentru speciile de rozătoare (Mammalia: Rodentia) din bazinul mijlociu al râului Siret, în funcţie de tipul de ecosistem. Acest studiu prezintă rezultatele cercetărilor, privind diversitatea rozătoarelor, efectuate în perioada 2008-2010, în 7 tipuri de ecosisteme din bazinul mijlociu al Siretului (4 tipuri de agroecosisteme: cultură de lucernă, cultură de grâu, cultură de porumb, livadă şi 3 ecosisteme naturale: pădure de foioase, pădure de amestec foioase-răşinoase şi pădure de răşinoase). Întrucât numărul zilelor de studiu pentru fiecare ecosistem cercetat nu a fost egal, compararea datelor obţinute s-a făcut pe baza indicelui de capturare (Ind.cpt.). Valoarea cea mai ridicată a acestuia (Ind. cpt. = 8,64) s-a înregistrat în pădurea de amestec foioase-răşinoase. Calculul abundenţei relative (A%) a speciilor de rozătoare în fiecare tip de ecosistem investigat, indică specia *Apodemus flavicollis* (MELCHIOR 1834) ca având cel mai mare areal de răspândire şi spectru trofic, fiind identificată în cele mai multe tipuri de ecosisteme din bazinul mijlociu al Siretului.

Cuvinte cheie: rozătoare, ecosisteme, indice de capturare, abundenţă relativă, răspândire.

INTRODUCTION

The middle basin of the Siret river includes the middle valley of the Siret river and its tributaries along this sector, of which the most important are: the Moldova, the Bistriţa, and the Trotuş. The northern limit of the researched area is conventionally established at the 47° northern latitude and at the 46° southern longitude. The fauna of the Siret middle basin is very diverse and rich, due to various environment conditions and diverse habitats, from the mountain area to the Siret riverside. Important areas are covered by natural or seminatural forests, others with fields cultivated with mild agricultural techniques, which do not seriously affect the local fauna.

Our research studies were made both in agricultural ecosystems and in natural ecosystems: each type has its specific characteristics and thus its specific groups of cohabitant species.

MATERIAL AND METHODS

During 2008-2010 we studied the rodent diversity in various types of ecosystems in the middle basin of the Siret river. To obtain the samples in all types of ecosystems we used the same number of hatch traps (to catch rodents alive), 50 traps for each ecosystem, distributed in the field according to the net method, the distance between traps being 10 m (SIMIONESCU, 1984). The traps were maintained in the field three days successively per month.

The material was determined using the specialty literature (IONESCU, 1968; POPESCU & MURARIU, 2001; PUCEK, 1981).

Because the number of study days for each researched ecosystem was not equal, the comparison of the data obtained from the investigation of the agricultural ecosystems and of the forest ecosystems was made by using the capture index (Ind.cpt). To establish the most abundant species in every type of investigated ecosystem we counted their relative abundance (A%).

RESULTS AND DISCUSSIONS

In the three years of study (2008, 2009 and 2010) we captured a number of 640 rodent individuals in 7 ecosystem types in the middle basin of the Siret river (4 types of agricultural ecosystems: crops of alfalfa, wheat, maize, orchard and 3 natural ecosystems: deciduous forest, mixed deciduous-coniferous forest and coniferous forest), which belonged to 12 species (Table 1). Thus:

- in the alfalfa crop we captured 133 individuals belonging to 9 rodent species (*Pitymys subterraneus, Microtus arvalis, Rattus norvegicus, Mus musculus, M. spicilegus, Apodemus agrarius, A. flavicollis, A. sylvaticus, Micromys minutus*);

- in the wheat crop we captured 117 individuals belonging to 10 rodent species (*Spermophilus citellus, Clethrionomys glareolus, Pitymys subterraneus, Microtus arvalis, Rattus norvegicus, Mus musculus, M. spicilegus, Apodemus agrarius, A. flavicollis, A. sylvaticus*);

- in the maize crop during the whole period of study we captured 95 rodent individuals and we identified 7 species (*Microtus arvalis, Rattus norvegicus, Mus musculus, M. spicilegus, Apodemus agrarius, A. flavicollis, A. sylvaticus*);

- in the orchard investigated by us we captured 91 rodent individuals belonging to 9 species (*Clethrionomys glareolus, Pitymys subterraneus, Microtus arvalis, Rattus norvegicus, Mus musculus, M. spicilegus, Apodemus agrarius, A. flavicollis, A. sylvaticus*);

- in the deciduous forest ecosystem we captured 54 rodent individuals and we identified 6 species (*Clethrionomys glareolus, Pitymys subterraneus, Mus musculus, Apodemus flavicollis, A. sylvaticus* şi *Micromys minutus*).

- in the mixed forest we captured 103 rodent individuals belonging to 8 species (*Clethrionomys glareolus, Pitymys subterraneus, Micromys minutus, Microtus arvalis, Mus musculus, Apodemus flavicollis, A. sylvaticus* and *Muscardinus avellanarius*);

- in the coniferous forest ecosystem we captured 47 individuals belonging to 6 rodent species (*Clethrionomys glareolus, Pitymys subterraneus, Mus musculus, Apodemus flavicollis, A. sylvaticus* and *Micromys minutus*).

Table 1. Species of rodents identified in the ecosystems surveyed during 2008-2010.
Tabel 1. Specii de rozătoare identificate în ecosistemele investigate în perioada 2008-2010.

No.	Species	Ecosystem						
		Alfalfa	Wheat	Maize	Orchard	Deciduous forest	Mixed forest	Coniferous forest
		Number of specimens						
1	*Spermophilus citellus* (LINNAEUS, 1766)	0	1	0	0	0	0	0
2	*Clethrionomys glareolus* (SCHREBER, 1780)	0	3	0	6	7	26	21
3	*Pitymys subterraneus* (DE SELYS-LONGCHAMPS, 1836)	4	6	0	2	2	1	2
4	*Microtus arvalis* (PALLAS, 1779)	27	32	30	16	0	1	0
5	*Rattus norvegicus* (BERKENHOUT, 1769)	1	2	1	1	0	0	0
6	*Mus musculus* (LINNAEUS, 1758)	13	9	9	1	2	6	2
7	*Mus spicilegus* (NORDMANN, 1840)	31	8	12	3	0	0	0
8	*Apodemus agrarius* (PALLAS, 1771)	3	34	34	4	0	0	0
9	*Apodemus flavicollis* (MELCHIOR, 1834)	33	15	4	38	14	35	4
10	*Apodemus sylvaticus* (LINNAEUS, 1758)	19	7	5	20	28	32	17
11	*Micromys minutus* (PALLAS, 1841)	2	0	0	0	1	1	1
12	*Muscardinus avellanarius* (LINNAEUS, 1758)	0	0	0	0	0	1	0
Total		**133**	**117**	**95**	**91**	**54**	**103**	**47**

Because the number of study days for each researched ecosystem was not equal, the comparison of the data obtained from the investigation of the agricultural ecosystems and of the forest ecosystems was made by using the capture index (Ind. cpt.) (Table 2).

Referring only to agricultural ecosystems the highest value of the capture index was obtained in the wheat crop (Ind. cpt. = 4.84) and the lowest was obtained in the orchard (Ind. cpt. = 2.66). We can explain this situation by the fact that during the period of wheat ripening, rodents migrate from the neighbouring crops in correlation with the food abundance. Our research demonstrated that in the maize crop there can be noticed rodent migrations from the neighbouring crops during the autumn season, but still the capture index value is lower to that obtained in the wheat crop; we can explain this situation by the fact that during the maize vegetating period weeding was made. This action of weeding led to the obstruction of gallery building and also to the removal of plants, which could be used as food for rodents.

Among the forest ecosystems we investigated, the mixed forest offers to rodents the richest food resources. This fact reflects in the highest value of the capture index (Ind. cpt. = 8.64) both in comparison to the other types of forest ecosystems and to the agricultural ecosystems researched by us (Table 2, Fig. 1).

Even if the specific diversity was the lowest in the forest ecosystems, the capture index had higher values in comparison to agricultural ecosystems, a situation which can be explained by the fact that these biotopes are to a very low extent anthropogenically influenced in comparison to the agricultural ecosystems.

Looking at the graph of the relative abundance of species in every type of researched ecosystem (Table 2, Fig. 2), we can notice that in the forest ecosystems the most abundant are the following species: *Apodemus sylvaticus, A. flavicollis* and *Clethrionomys glareolus*, and in agricultural ecosystems the following species: *Microtus arvalis*, *Apodemus agrarius, A. flavicollis* and *Mus spicilegus*.

On the basis of the results of our study we can state the fact that the *Apodemus flavicollis* species has the largest spreading area and the largest trophic spectrum, being identified in most ecosystem types in the middle basin of the Siret river.

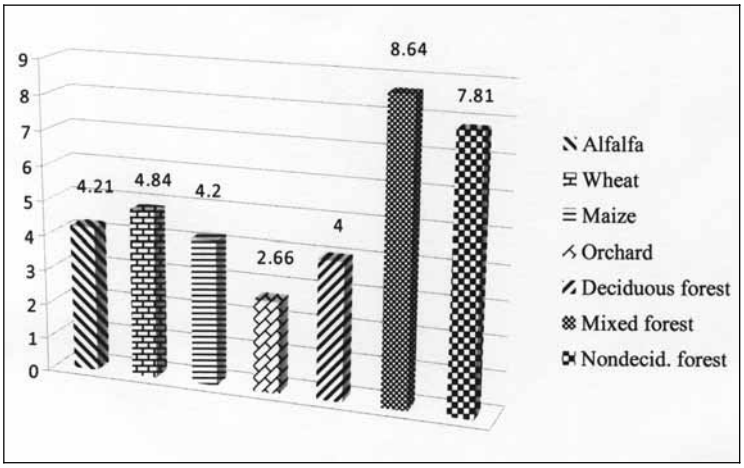

Figure 1. The graphic representation of the capture index in the surveyed ecosystems (2008-2010).
Figura 1. Reprezentarea grafică a indicelui de capturare din ecosistemele investigate (2008-2010).

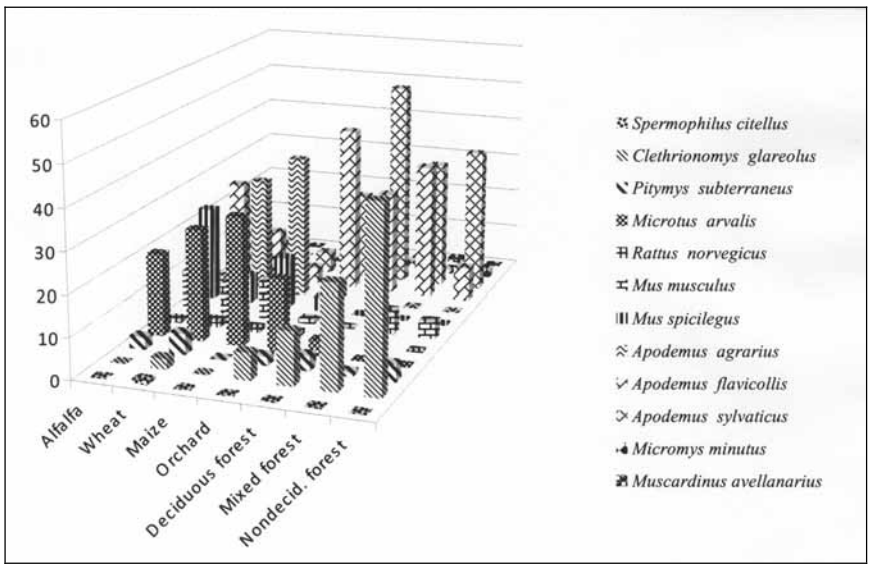

Figure 2. The relative abundance of rodent species in the surveyed ecosystems (2008-2010).
Figura 2. Abundenţa relativă a speciilor de rozătoare în ecosistemele investigate (2008-2010).

CONCLUSIONS

During 2008-2010 we studied the rodent diversity in 7 ecosystem types in the middle basin of the Siret river, capturing a number of 640 individuals belonging to 12 species.

The highest value of the capture index (Ind. cpt. = 8.64) was obtained in the mixed deciduous-coniferous forest.

On the basis of the relative abundance values of rodents in every type of the researched ecosystem, the *Apodemus flavicollis* species has the highest tolerance for the type of habitat, being identified in the most numerous types of ecosystems in the middle basin of the Siret river.

REFERENCES

IONESCU V. 1968. *Vertebratele din România*. Edit. Academiei R.S.R. Bucureşti: 424-443.

SIMIONESCU V. 1984. *Lucrări practice de ecologie*. Edit. Universităţii „Al. I. Cuza", Iaşi: 75-87.

POPESCU ALEXANDRINA & MURARIU D. 2001. *Rodentia. Mammalia.* In: Fauna României. Edit. Academiei Române, Bucureşti. **16**(2): 1-214.

PUCEK Z. 1981. *Key to Vertebrates of Poland – Mammals*. Polish Scientific Publishers, Warszawa: 62-248.

Dalia Paraschiv
"Ion Borcea" Natural Sciences Museum Complex Bacău,
Vivariu Department, Popa Şapcă, No. 3, Bacău, Romania
E-mail: dalia_yvs@yahoo.com

Received: March 28, 2012
Accepted: June 15, 2012

Table 2. The values of the capture index and of the relative abundance in the surveyed ecosystems (2008-2010).
Tabel 2. Valorile indicelui de capturare şi a abundenţei relative în ecosistemele investigate (2008-2010).

No.	Species	Ecosystem													
		Alfalfa		Wheat		Maize		Orchard		Deciduous forest		Mixed forest		Coniferous forest	
		Ind.cpt	A%	Ind.cpt	A%	Ind.cpt	A%	Ind.cpt	A%	Ind.cpt	A%	Ind.cpt	A%	Ind.cpt	A%
1	*Spermophilus citellus*	0	0	0.04	0.85	0	0	0	0	0	0	0	0	0	0
2	*Clethrionomys glareolus*	0	0	0.13	2.57	0	0	0.22	6.6	0..5 2	12.97	2.16	25.24	3.5	44.68
3	*Pitymys subterraneus*	0.13	3	0.26	5.13	0	0	0.07	2.2	0.15	3.7	0.08	0.97	0.33	4.26
4	*Microtus arvalis*	0.86	20.3	1.42	27.35	1.33	31.59	0.59	17.5	0	3.7	0.08	0	0	0
5	*Rattus norvegicus*	0.03	0.75	0.08	1.71	0.04	1.05	0.03	1.1	0	0	0	0	0	0
6	*Mus musculus*	0.41	9.78	0.4	7.69	0.4	9.47	0.03	1.1	0.15	0	0.5	5.82	0.33	4.26
7	*M. spicilegus*	0.98	23.31	0.03	6.84	0..53	12.63	0.11	3.3	0	0	0	0	0	0
8	*Apodemus agrarius*	0.09	2.26	1.51	29.06	1. 51	35.79	0.14	4.4	0	0	0	0	0	0
9	*A. flavicollis*	1.05	24.81	0.66	12.82	0.17	4.21	1.40	41.8	1.04	25.93	2.91	34	0.66	8.51
10	*A. sylvaticus*	0.6	14.29	0.31	5.98	0.22	5.26	0.07	22	2.07	51.85	2.75	32.03	2.83	36.17
11	*Micromys minutus*	0.06	1.50	0	0	0	0	0	0	0.07	1.85	0.08	0.97	0.16	2.12
12	*Muscardinus avellanarius*	0	0	0	0	0	0	0	0	0	0	0.08	0.97	0	0
Total		4.21	100	4.84	100	4.2	100	2.66	100	4	100	8.64	100	7.81	100