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SMALL MAMMALS FROM NATURAL AND ANTROPIC HABITATS IN NORTH-EASTERN ROMANIA – AN ECOLOGICAL STUDY

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***Key words**: small mammals, natural habitat, antropic habitat*

INTRODUCTION

The present study compares several natural habitats and agricultural fields with the aim of assessing the effect that human modifications of habitat have on the species composition and relative abundance of small mammals.

MATERIAL AND METHOD

The field research has been carried out in the summer of 2004, in natural and antropic habitats located in the north-eastern part of the country.

The natural habitats were situated in the Ceahlau massif, at different altitudes. They are represented by: a mixed forest (beech and spruce) situated at 900m altitude, near Durau resort; a compact spruce forest, situated at 1500 m altitude, in the south-eastern side of the massif; a clearing also located on the south-eastern side, at 1500m altitude, and the sub-alpine meadow, on the high plateau, at 1800m altitude.

The antropic habitats were located in the vicinity of two villages in Botosani County, at 400m altitude: a wheat field near Leorda village; a vetch field, a corn field and an orchard in the vicinity of Roma village.

Metallic spring traps set in a grid, with 10 m spacing between them were used in order to capture the animals.

The data obtained from different trapping sites was compared using the capture index (per100 traps/night), with the formula:

$$\frac{\text{Nr. of individuals captured}*100}{\text{Nr. of traps}*\text{Nr. of nights}}$$

The MVSP (Multivariate Statistical Package) software was used for data processing. An analysis of the dissimilarity between habitats was performed using the Bray-Curtis method, while diversity and evenness were assessed by the Shannon-Wiener method.

RESULTS AND DISCUSSIONS

During field research, 74 small mammals from 17 species were captured (13 species from Rodentia Order and 4 species from Insectivora Order) - tables I-II.

Figure 1 shows the differences in species dominance between the investigated antropic habitats: In the wheat field the dominant species are *Apodemus sylvaticus*, *Citellus citellus* and *Mus spicilegus*. In the vetch field, the majority of captured individuals belong to *Microtus arvalis, Apodemus flavicollis* and *Mus spicilegus. Apodemus flavicolis* is the dominant species in the orchard as well. A different situation is present in the corn field, where a small number of individuals was captured, belonging to four species in equal proportions. The orchard distinguishes itself by greater species diversity (according to Shannon-Wiener and evenness index) – table III.

These results support the idea that most small mammal species prefer crops where the agro technical interventions are less intensive (in this case the vetch field and the apple orchard). This preference can be explained by the constant presence of food, by favorable conditions for tunnel construction and also by the presence of places to hide in case of predator attack. Greater species diversity is attained in these habitats and the dominant species are *Microtus arvalis, Apodemus flavicollis* and *Mus spicilegus*. The values of the Shannon –Wiener index and the Bray-Curtis dendrogram confirm the similarity between the vetch field and the orchard (Figure 4).

High values for diversity and evenness are also achieved in the wheat field - results explained by the fact that the trapping period coincided with the ripening season. The abundance of food in the wheat field usually induces the migration of small mammals from neighboring crops and an increase of rodent density in the wheat field. The fact that the wheat field had the highest trapping index among antropic habitats supports this assumption.

As opposed to the other crops, the corn field was poorly populated by small mammals during the research period. This can be explained by the various agro technical interventions associated with this crop. The interventions hamper the construction of galleries, and also remove weeds that could have served as food for rodents. Therefore, the high values obtained for diversity and the maximal value for evenness should be interpreted as the result of the small number of individuals caught, and not of favorable habitat conditions.

Apodemus flavicollis was the dominant species in three of the four natural habitats that were investigated (in the sub alpine meadow, clearing and mixed forest).

Clethrionomys glareolus was dominant in the spruce forest (fig. 2).

Although more species were found to be present in the antropic habitats, the capture index shows a higher density of small mammals in natural habitats (fig. 3). According to this index, the best habitat for small mammals is represented by the mixed forest. This type of habitat provides various foods and shelter opportunities, and is free of disturbance from agro-technical interventions. Because of its homogeneity, the spruce forest is a less favorable habitat than the mixed forest. However, these two types of habitat (the mixed forest and the spruce forest) show strong similarities (fig 4).

The smaller capture index recorded for the open natural habitats (sub-alpine meadow and clearing) can be explained by a high predation pressure, due to the lack of hiding places. Although they are located at different altitudes, both clearing and alpine meadow are covered with herbaceous vegetation, which explains their very high similarity in respects of their small mammal fauna.

The Bray-Curtis dendrogram also makes evident that all natural habitats make a separate group from the antropic ones and that notable differences exist between the first and the second category of habitats.

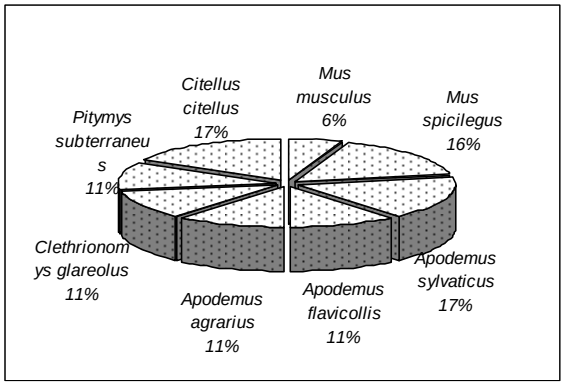
Among all natural habitats, the highest value for the Shannon-Wiener diversity index is recorded in the mixed forest, but because a small number of species were present in captures, the values for natural habitat's diversity index are low.

Table 1. Statistics of small mammal captured in antropic habitats

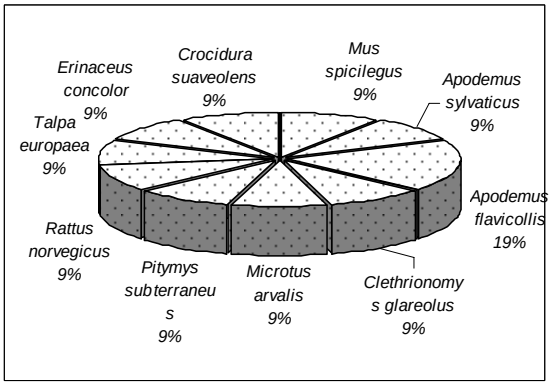
Nr. crt.	Species	Habitat											
		Vetch			Apple orchard			Corn			Wheat		
		nr.ind.	%	Capt. index	nr.ind.	%	Capt. index	nr.ind.	%	Capt. index	nr.ind.	%	Capt. index
1	*Mus musculus*	0	0	0	0	0	0	0	0	0	1	5.56	1.11
2	*Mus spicilegus*	2	20	1.33	1	9.09	0.67	1	25	0.67	3	16.67	3.33
3	*Apodemus sylvaticus*	1	10	0.67	1	9.09	0.67	1	25	0.67	3	16.67	3.33
4	*Apodemus flavicollis*	2	20	1.33	2	18.18	1.33	0	0	0	2	11.11	2.22
5	*Apodemus agrarius*	0	0	0	0	0	0	1	25	0.67	2	11.11	2.22
6	*Apodemus uralensis*	0	0	0	0	0	0	1	25	0.67	0	0	0
7	*Pitymys subterraneus*	0	0	0	1	9.09	0.67	0	0	0	2	11.11	2.22
8	*Microtus arvalis*	2	20	1.33	1	9.09	0.67	0	0	0	0	0	0
9	*Cletryonomys glareolus*	0	0	0	1	9.09	0.67	0	0	0	2	11.11	2.22
10	*Citellus citellus*	1	10	0.67	0	0	0	0	0	0	3	16.67	3.33
11	*Micromys minutus*	1	10	0.67	0	0	0	0	0	0	0	0	0
12	*Rattus norvegicus*	0	0	0	1	9.09	0.67	0	0	0	0	0	0
13	*Erinaceus concolor*	0	0	0	1	9.09	0.67	0	0	0	0	0	0
14	*Talpa europaea*	0	0	0	1	9.09	0.67	0	0	0	0	0	0
15	*Crocidura suaveolens*	0	0	0	1	9.09	0.67	0	0	0	0	0	0
16	*Sorex araneus*	1	10	0.67	0	0	0	0	0	0	0	0	0
	Total	10	100	6.67	11	100	7.33	4	100	2.67	18	100	20

Table 2. Statistics of small mammal captured in natural habitats

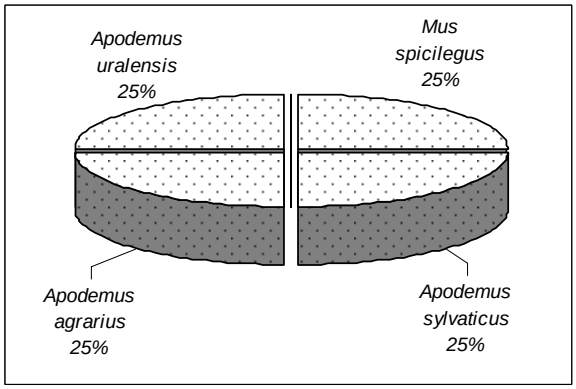
Nr. crt.	Species	Habitat											
		Sub alpine meadow			Clearing			Spruce forest			Mixed forest		
		nr.ind.	%	Capt. index	nr.ind.	%	Capt. index	nr.ind.	%	Capt. index	nr.ind.	%	Capt index.
1	*Apodemus flavicollis*	2	66.67	8.33	2	66.67	6.67	2	25	6.67	10	58.82	33.33
2	*Pitymys subterraneus*	1	33.33	4.17	0	0	0	0	0	0	0	0	0
3	*Cletryonomys glareolus*	0	0	0	1	33.33	3.33	6	75	20	6	35.29	20
4	*Muscardinus avellanarius*	0	0	0	0	0	0	0	0	0	1	5.88	3.33
	Total	3	100	12.5	3	100	10	8	100	27	17	100	57



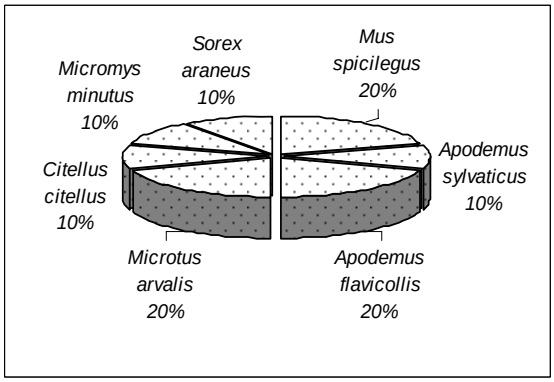
Wheat



Apple orchard

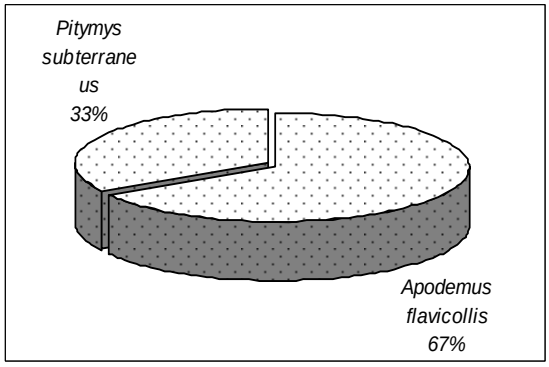


Corn

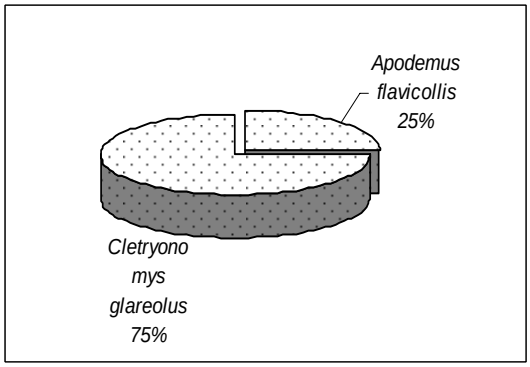


Vetch

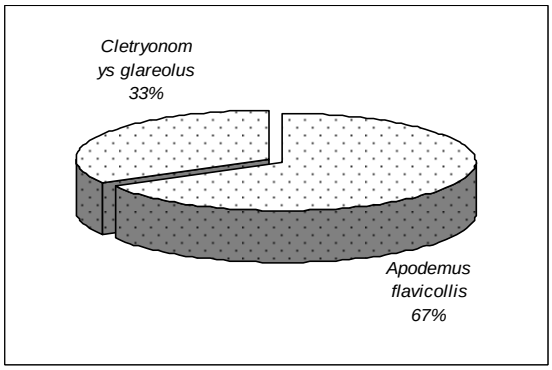
Fig. 1 Dominance of small mammal species in antropic habitats



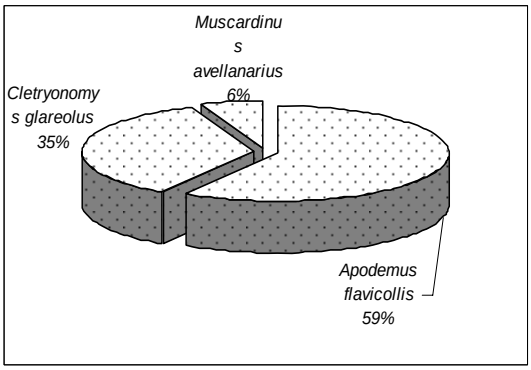
Sub alpine meadow



Spruce forest



Clearing



Mixed forest

Fig. 2. Dominance of small mammal species in natural habitats

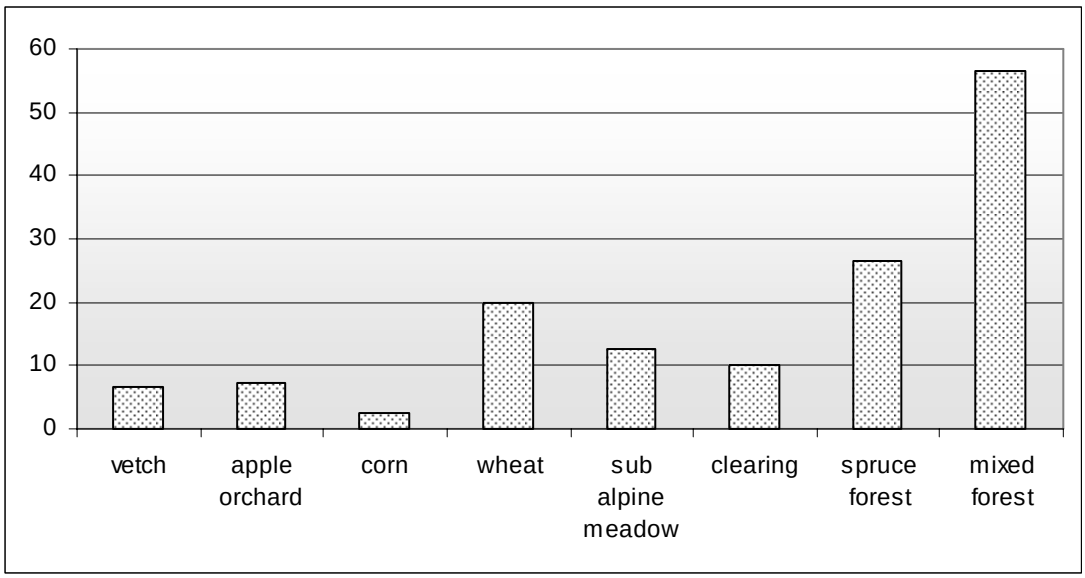


Fig. 3. Representation of capture index in investigated types of habitat

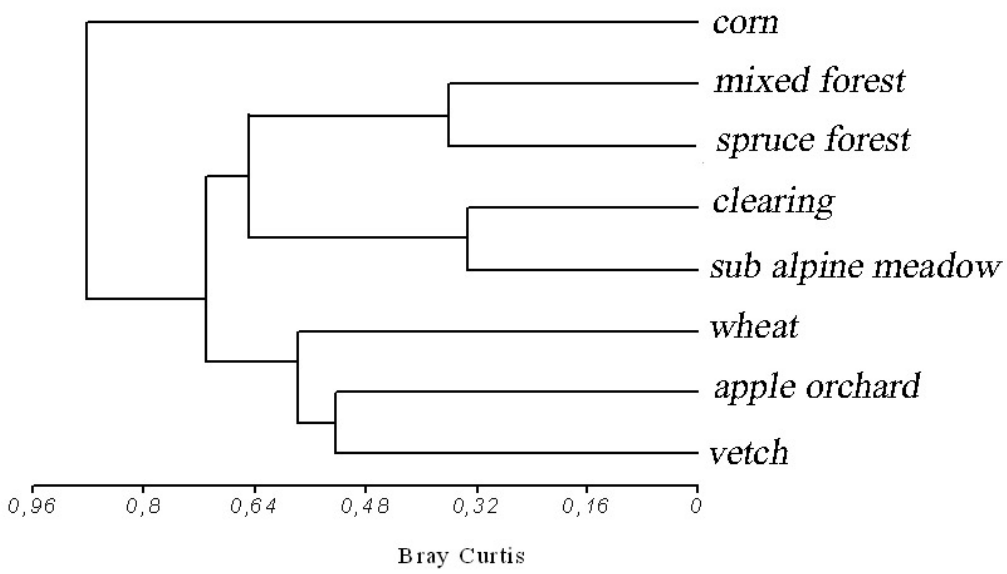


Fig. 4. Dendrogram of dissimilarity between habitats

Table 3. The values of Shannon-Wiener diversity index and evenness for investigated types of habitat.

Habitat	Shannon-Wiener	Evenness	Nr. of species
vetch	2.722	0.970	7
apple orchard	3.278	0.987	10
corn	2.000	1.000	4
wheat	2.933	0.978	8
sub alpine meadow	0.918	0.918	2
clearing	0.918	0.918	2
spruce forest	0.811	0.811	2
mixed forest	1.221	0.770	3

CONCLUSIONS

During research carried out in the summer of 2004 in natural and antropic environments, a total of 74 individuals from 17 rodent and insectivorous species were captured.

Notable differences in species diversity and small mammal density were observed between natural and antropic habitats. Species diversity was found to be higher in antropic than natural habitats, but the capture index shows a greater density of small mammals in natural environments.

The main factors influencing small mammal density in the studied habitats are considered to be food availability, the presence or absence of disturbance caused by agro-technical interventions and the degree of protection that the habitat can offer against predators (especially birds).

Apodemus flavicollis was found to be the most adaptable of all observed species, being captured in large numbers in both antropic and natural habitats. On the other side, *Clethrionomys glareolus* manifests a strong preference for natural habitats.

REZUMAT

Lucrarea prezintă rezultatele cercetărilor efectuate în vara anului 2004 în două tipuri de habitate (antropice şi naturale) în nord estul României. Materialul colectat cuprinde 74 exemplare de mamifere mici ce aparţin la 17 specii din ordinele Rodentia şi Insectivora. In habitatele antropice speciile cu cei mai multi indivizi capturati sunt *Apodemus flavicollis* si *Mus spicilegus*, iar in cele naturale *Apodemus flavicollis* şi *Clethrionomys glareolus*.

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