

COMPARATIVE ANALYSIS OF SMALL RODENT FAUNA IN AGROCENOSSES FROM CENTRAL PART OF THE REPUBLIC OF MOLDOVA AND MIDDLE BASIN OF SIRET RIVER, BACAU DISTRICT, ROMANIA

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ABSTRACT

The comparative analysis of rodent fauna (Rodentia, Mammalia) in several types of agricultural ecosystems from central part of R. Moldova (CM) was accomplished during 2008-2011 and from middle basin of Siret River (SB) in Bacau district during 2008-2010 in spring-autumn period. The studied agrocenoses were: orchard, wheat, maize and alfalfa crops. In both zones 11 species were registered: *Apodemus flavicollis*, *A. sylvaticus*, *A. uralensis*, *A. agrarius*, *Mus musculus*, *M. spicilegus*, *Microtus sp.* (*M. arvalis* and *M. rossiaemeridionalis*), *Pitymys subterraneus*, *Clethrionomys glareolus*, *Cricetulus migratorius* and *Micromys minutus*. The total number of studied rodent individuals was 709 from 9 species in CM and 430 from 9 species in SB. The rodent diversity is rather high in both studied areas, the Shannon index varying from 1.51 in SB maize crop to 1.87 in CM maize crop. The highest similarity was established between maize and wheat crops from SB (86.54%), between orchard and wheat crop from CM (72.3%), while the lowest similarity – between CM alfalfa crop and the rest of agrocenoses, varying from 23% to 44%. In CM agrocenoses the dominant species was *A. sylvaticus*, except alfalfa crop with *M. arvalis* dominant species. In SB agrocenoses the dominant species was *A. flavicollis* in orchard and alfalfa crop, and *A. agrarius* in wheat and maize crops. The differences in fauna composition, species abundance and dominance between the two studied zones can be explained by different ecological conditions.

Key words: Central Moldova, Siret Basin, agrocenoses, small rodents, diversity, dominance, similarity

Introduction

The rodents are the most spread group of mammals and quickly adapt to environmental changes. Therefore, they are important elements of terrestrial ecosystems, being the dominant vertebrate species in agricultural lands.

In the Republic of Moldova the monitoring of rodent communities is of high priority, because about 80% of its territory is occupied by agrocenoses. The economic changes from the last decades, when large fields cultivated with single culture disappeared from the agrarian landscape and at present the cultivated lands have mosaic aspect lead to changes in small mammal community composition and species dominance (1,2,3,4,5,6,7). The central part of Moldova is represented by various types of natural and anthropogenic ecosystems, the agricultural ones occupying large areas.

The middle basin of Siret river in Romania

is represented by a variety of habitats, from the mountain area to the Siret riverside. Important areas are covered with natural or seminatural forests, others with fields cultivated with mild agricultural techniques which do not seriously affect the small rodent fauna.

For the first time the comparative analysis of small rodent fauna of agricultural ecosystems from central part of the Republic of Moldova and from middle basin of Siret river was performed in order to establish the influence of environmental conditions upon the diversity and structure of small rodent communities.

Materials and methods

The comparative analysis of rodent fauna (Rodentia, Mammalia) in several types of agricultural ecosystems from central part of R. Moldova (CM) was accomplished during 2008-2011 and from middle basin of Siret River (SB) in Bacau district during 2008-2010 in spring-autumn period. The studied agrocenoses were: orchard, wheat, maize and alfalfa crops, which are rather spread in both studies areas (8,9,10,11).

The central part of Moldova includes the inferior middle and lower Dniester basin with its

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main tributaries Raut and Byc, a part of Moldavian Plain (Middle Prut Valley) and Central Moldavian Plateau with relatively large areas covered with Codri forest.

The middle basin of Siret river includes the middle valley of Siret river, with its tributaries emptying in this portion, of which the most important are: Moldova, Bistrița and Trotuș. The northern limit of the researched area is conventionally established at the 47° northern latitude and at the 46° southern longitude.

The rodents were caught with snap traps and live traps. The individuals were determined, measured, weighed, sex, age, physiological and reproductive states were registered, the skulls were preserved for further morphological studies.

To characterize the biotopic distribution of the species the following indexes were considered: trappability $C_c = 100n/C$, where n – number of individuals, C – number of traps; the frequency $F = 100p/P$, where P – number of samples, p – samples where the species is present, and the species abundance $A_i = 100n_i/N$, where n_i – number of individuals of the species i in the sample, N – total individual number.

To emphasize the position of certain species in habitat the ecological significance was calculated (W_a) using the formula $W_a = F_a \cdot A_a / 100$, where F_a is frequency of the species and A_a – abundance index. The species with the significance lower than 1% in the studied biocenoses are considered recedent; 1.1 – 5 % - subdominant; 5.1-10% – dominant and $W > 10\%$ - eudominant for the given biocenosis.

The diversity of rodent communities were calculated using the Shannon index and the similarity of rodent fauna in studied agroecosystems was performed using Cluster analysis.

Results and discussions

In both zones 11 species were registered: *Apodemus flavicollis*, *A. sylvaticus*, *A. uralensis*, *A. agrarius*, *Mus musculus*, *M. spicilegus*, *Microtus sp.* (*M. arvalis* and *M. rossiaemeridionalis*), *Pitymys subterraneus*, *Clethrionomys glareolus*, *Cricetulus migratorius* and *Micromys minutus*. The total number of studied rodent individuals was 709 from 9 species in CM and 430 from 9 species in SB. In the studies performed in CM the species *P. subterraneus* and *M. minutus* are missing, while in SB studies the species *C. migratorius* and *D. nitedula* weren't caught.

In orchard there were recorded 8 species in CM and 8 in SB, in wheat crop the results were the same, in corn 8 species were registered in CM and

only 6 in SB, while in alfalfa crop 7 species in CM and 8 species in SB. We have to mention the presence of the species *P. subterraneus* and *M. minutus* in agricultural ecosystems of SB, which are rather rare in the fauna of R. Moldova and practically absent in the republic agroecosystems. At the same time in CM wheat and corn crops was recorded *C. migratorius*, which was very frequent about 20-30 years ago, but in the last years its frequency decreased drastically. The grey hamster feed on green parts of young plants, were less abundant and less frequent – less than 12%, the species being caught at the beginning of vegetation period, when the corn plants are young. The species *D. nitedula* was registered at the edge of wheat crop, near a row of walnut (*Juglans regia*).

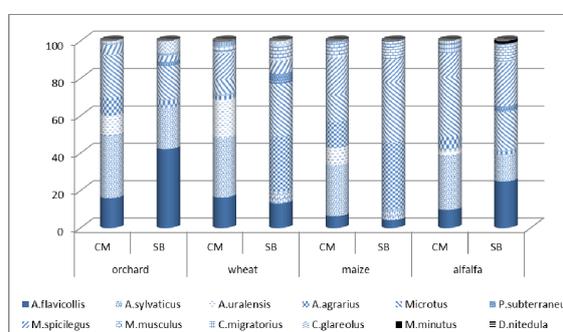


Fig. 1 – Structure of small rodent communities in agroecosystems from Central Moldova (CM) and middle Siret basin (SB)

In CM agroecosystems the dominant species was *A. sylvaticus* with the abundance between 27% and 33.5%, except alfalfa crop with *M. arvalis* dominant species (32.26%). In SB agroecosystems the dominant species was *A. flavicollis* in orchard (42.22%) and alfalfa (25%) crop, and *A. agrarius* in wheat (29.82%) and maize (36.16%) crops. The field vole was also rather abundant in CM orchard (23.39%) and corn (14.22) and had low abundance in wheat, similar data were mentioned in other studies (7). In SB wheat (28.07%), corn (31.92%) and alfalfa (20.46%) the vole had a high abundance, being the second dominant species. The mound building mouse is rather abundant in CM corn, in wheat and alfalfa being a subdominant species, while in orchard it was recedent. *A. uralensis* is sibling species with *A. sylvaticus* and is wide spread in CM agroecosystems, being dominant ($W > 25$) on the agricultural fields (3, 4). In CM biotopes it was a dominant species in wheat (20.39%) and subdominant in orchard (10.55%).

Other species registered less than 10%, being subdominant or recedent for the given biotope. The species *P. subterraneus* and *M. minutus* weren't

recorded in CM agroecosystems, while *A. uralensis* and *C. migratorius* weren't registered in SB agroecosystems (fig. 2).

The rodent diversity is rather high in both studied areas, the Shannon index varying from 1.57 in SB maize crop to 1.87 in CM maize crop. Rather high diversity was recorded in wheat crops from

both areas (1.77 in CM and 1.79 in SB). The diversity in alfalfa crop is quite different in studied zones, being of 1.77 in SB and only 1.68 in CM. The lowest diversity was recorded in orchard in both studied zones: 1.69 in CM and 1.57 in SB.

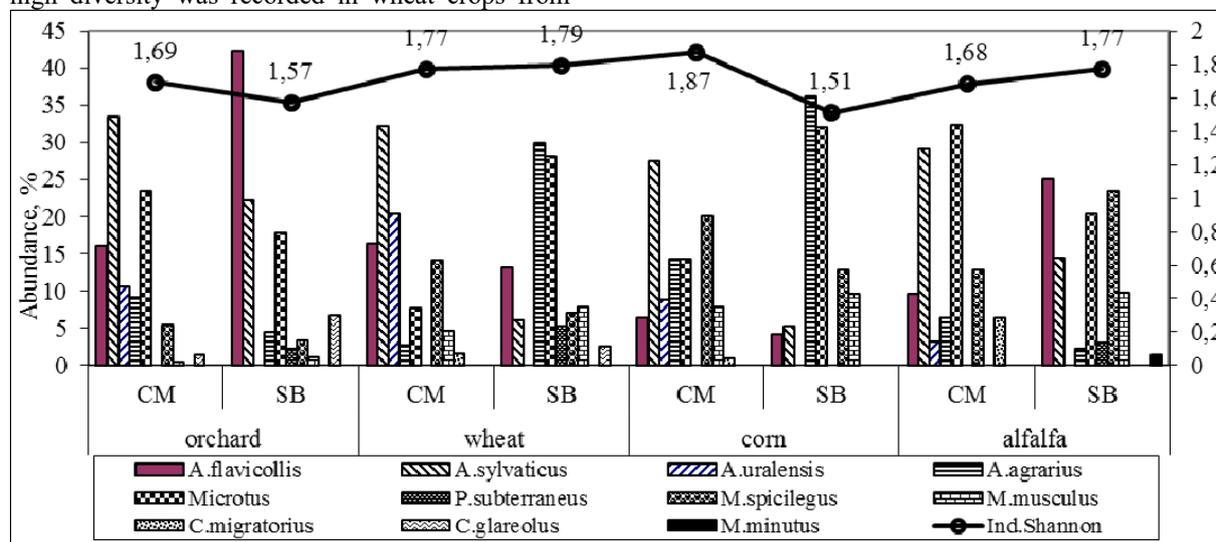


Fig. 2 – Abundance and diversity of small rodent communities in agroecosystems from Central Moldova (CM) and middle Siret basin (SB)

The similarity of rodent fauna in studied agroecosystems was performed using Cluster analysis (fig. 3). Thus, the highest similarity was established between maize and wheat crops from SB (86.54%), between orchard and wheat crop from CM (72.3%),

while the lowest similarity – between CM alfalfa crop and the rest of agroecosystems, varying from 23% to 44%.

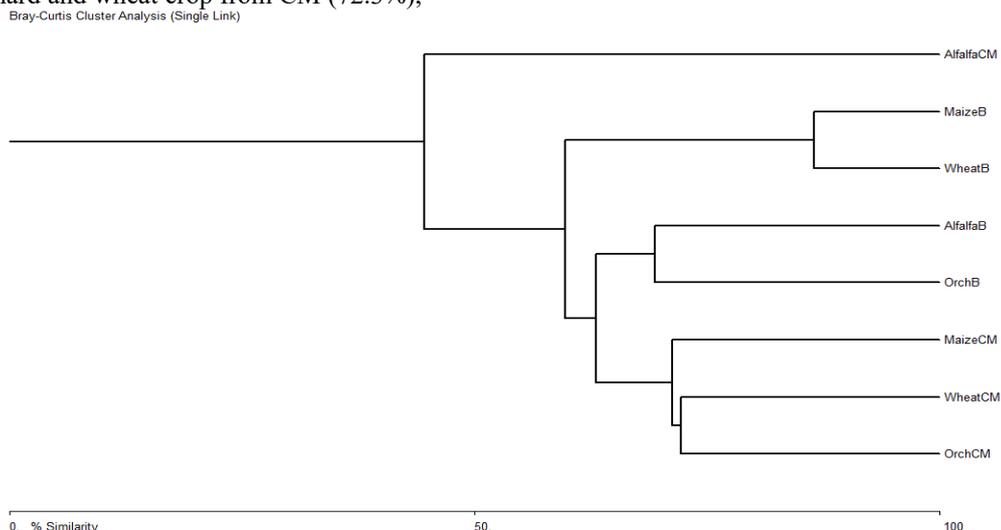


Fig. 3 – Similarity analysis of small rodent fauna in agroecosystems from CM and SB

The forest species *A. flavicollis* have adapted to the conditions of agrocenoses in R. Moldova, thus there exists the silvicolous type and the field type of yellow-necked mouse. The last one occurs in corn crops with the frequency of 36%, because in many cases these crops are situated near shelter belts, forest plantations or insulary woods. In SB this species is also rather frequent in agricultural lands, being dominant in orchards with the abundance of 43%, but also in alfalfa crops with the abundance of about 25%, due to the same presence of tree stands near the studied biotopes.

According to the ecological significance the species *A. sylvaticus* is eudominant in corn and alfalfa crop, *M. arvalis* is eudominant in alfalfa and dominant in rape, *M. spicilegus* is eudominant in rape. In corn *M. spicilegus* is dominant, the vole and grey hamster are recedent, the rest of species are subdominant. In alfalfa the house mouse is recedent, the rest of species are subdominant.

The differences in fauna composition, species abundance and dominance between the two studied zones can be explained by different ecological conditions. Therefore, the high abundance of wood species *A. flavicollis* in SB agrocenoses is due to abundant tree and shrub vegetation in adjacent biotopes, while the high abundance of *A. agrarius* in the studied biotopes is due to favorable humidity conditions, which are absent in CM wheat and alfalfa crops. In CM agrocenoses the dominance of *A. sylvaticus* was mentioned by many authors for the last years (1, 2, 3, 4, 5, 6). This species with large limits of ecological valence became dominant and eudominant in the majority of studied ecosystems, having high adaptive potential and actively occupying new territories.

In general, the SB zone is characterized by higher humidity conditions, by the presence of various forest types in adjacent ecosystems, while CM zone is characterized by more arid conditions, rare wood patches, shelter belts or tree plantations near the studied biotopes.

Rezumat

A fost efectuată analiza comparativă a faunei de rozătoare mici (Rodentia, Mammalia) din câteva tipuri de ecosisteme agrare din zona centrală a Republicii Moldova (CM) în anii 2008-2011 și bazinul mijlociu al Siretului (SB) din județul Bacău, România în anii 2008-2010 în perioada primăvara-toamnă. Agrocenozele studiate au fost reprezentate de livezi, culturi de grâu, porumb și lucernă. În ambele zone au fost înregistrate 11 specii: *Apodemus flavicollis*, *A. sylvaticus*, *A. uralensis*, *A. agrarius*, *Mus musculus*, *M. spicilegus*, *Microtus sp.* (*M.*

arvalis și *M. rossiaemeridionalis*), *Pitymys subterraneus*, *Clethrionomys glareolus*, *Cricetulus migratorius* și *Micromys minutus*. În total au fost studiați 709 indivizi din 9 specii în CM și 430 indivizi din 9 specii în SB. Diversitatea comunităților de rozătoare este destul de mare, indicele Shannon fiind cuprins între 1.51 în culturile de porumb din SB și 1.87 în aceeași cultură din CM. Cea mai mare similaritate a fost semnalată între culturile de porumb și grâu din SB (86.54%), între livezi și grâu din CM (72.3%), iar cea mai scăzută între cultura de lucernă din CM și celelalte biotopuri studiate din ambele zone (între 23% și 44%). În agrocenozele din CM specia dominantă a fost *A. sylvaticus*, cu excepția lucernei unde a dominat *M. arvalis*. În agrocenozele din SB dominant a fost *A. flavicollis* în livadă și în lucernă, iar în grâu și porumb dominant a fost *A. agrarius*. Diferențele în componența faunei de rozătoare, abundența speciilor, dominanța între cele două zone studiate se explică prin condițiile ecologice diferite.

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