

DYNAMICS AND ALTITUDINAL DISTRIBUTION OF THE RODENTS' COMMUNITIES FROM SOUTHERN ROMANIAN CARPATHIANS IN THE 2000-2005 PERIOD

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The present study, carried out in 2000-05, in some massifs of the Southern Romanian Carpathians (namely Retezat, Țarcu-Godeanu and Lotru Mountains), aimed to reveal and put forward some hypothesis on the dynamics of the rodent communities, both in space and time. A special interest was paid to the relations between rodents and insectivores populations' dynamics.

In Retezat Mountains 20 stations and about 40 habitats and in Țarcu-Godeanu 10 stations and 20 habitats were researched at different heights and in different habitat types, during the summer - autumn months. In Lotru Mountains 5 stations were established along a transect from 600 up to 2000 m altitude. The lower stations were researched both in the warm and in the cold season, while in the higher stations investigations were carried on only during summer.

Investigations were carried out by live-trapping of rodents using Longworth-like wooden box traps. The traps were set either in a rectangular net (in forests) or in transect (along river banks), at 10 m distance one from another. They were checked twice a day, in the night and at dawn. Captured animals were determined based on external morphological features. They were marked by cutting their fur in different parts of the body, and then released.

The rodent's community from the Southern Romanian Carpathians is dominated by the two typical forest species: *Apodemus flavicollis* and *Clethrionomys glareolus*.

Specific diversity and abundance of rodents' communities decrease on altitude. The highest number of species is found in the lower areas, in the beech forests zone, while in the alpine level, above the upper limit of the subalpine shrubs, only 3 rodent species were recorded (*Marmota marmota* - only in Retezat Mountains, *Pitymys subterraneus* and *Chionomys nivalis*). The impoverishment of small mammals' communities at higher altitudes is recorded both in years with low and high populational densities. However, some factors can influence the normal altitudinal distribution. Thus, due to the habitat disturbance by timber exploitation at lower altitudes, in the year 2003 in Țarcu-Godeanu Mountains no significant numerical increase of the community was observed here.

The seasonal dynamics of rodent populations was registered in one station from Lotru Mountains at 850 m a.s.l. (on Cailor Rivulet). The study revealed a discontinuous presence of the typical forest rodent *Apodemus flavicollis* in the area. The period of its presence in the monitored habitat is confined to the warm season, but it varies greatly from year to year. In 2000 this species was captured until November, while in 2001 no individual was found after August. In 2001 the first specimen was captured in May, while in 2004 the species was already present in February. Downstream on the same valley, this rodent recorded in winter relative high capture frequencies. This result leads to the assumption that vertical migrations take place during the year, probably along the river. *A. flavicollis* breeds at

higher altitudes but in autumn it withdraws along the valley. An argument for the hypothesis of altitudinal migration of *A. flavicollis* is its disappearance among the captured specimens at higher altitudes in Retezat Mountains at the beginning of autumn 2004. This is unlikely to be caused by the death of animals, or to be a sampling effect (the differences are too big). The period of *A. flavicollis* presence in the breeding area from high altitudes is probably determined mostly by the climatic and food conditions during winter. Thus, in years with harsh winter conditions their density in spring is low and only few individuals (maybe only sub adults born that spring) migrate upstream, so they do not reach high altitudes (in 2003 and 2005 no *A. flavicollis* specimen was encountered above 1000 m altitude in either of the investigated mountain regions), whereas in years with mild winter conditions the population density at the beginning of the breeding season being high, many of the over wintered adults leave the area. In these years they reach high altitudes (up to the subalpine zone).

Clethrionomys glareolus is present in the mentioned station also during winter, but its abundance registers an intense variation and in years with low rodent population densities (2003 and 2005) it was not captured at all. In this station the presence of *C. glareolus* juveniles is confined to September, which represents the end of its breeding season. The absence of young individuals during May and July, when their breeding reaches its highest intensity, probably means that most of the *C. glareolus* individuals migrate in the warm season and breed mostly in other areas. Not all the individuals undertake these migrations; some of them remain in the same area during the whole year. The argument for this statement is the fact that in June and July most of the *C. glareolus* individuals were recaptures.

A distinct separation between the breeding periods of the dominant species can be observed in the station from Cailor Rivulet. There is no overlapping of young *C. glareolus* and *A. flavicollis* individuals in the specified area. This fact may suggest a competition between the two species. Among them, *A. flavicollis* seems more competitive, having a higher reproductive rate and tolerance to human pressure caused by timber exploitation compared to *C. glareolus* and other rodent species.

Chionomys nivalis lives in pairs, frequently both male and female were captured in the same site. They show a high fidelity for their territories and a reduced mobility, especially the females, which are captured in the same spot not only from month to month but even from year to year. This species probably also undertakes vertical migrations, as in Retezat Mountains it was captured and observed during summer in the subalpine and alpine zones, but in autumn it was found only in the spruce forest. On Cailor Rivulet the species was never encountered during July-October period.

The multiannual dynamics of rodent communities from the researched mountain areas in 2000-2005 period presents a cyclic character, given especially by the two-year numerical oscillations of *A. flavicollis* and *C. glareolus* populations, with high densities in even years (2000, 2002, and 2004). The differences between these density values are significant, suggesting that the two-year cycles are only parts of a longer term population and community cycles. *A. flavicollis* presents the broadest ranges in the multiannual rodent population dynamics. The rodent and insectivore (especially *Sorex araneus* and *S. alpinus*) species' dynamics are interdependent, being negatively correlated. These trends were recognizable during the whole research period, but there are however some peculiarities in different massifs and at different heights. In Lotru Mountains during the low density years *C. glareolus* was not captured at all, whereas in the other massifs it was encountered in most of the stations up to the spruce forests, its multiannual numerical variations being much lower here. In Retezat and neighbouring mountains the rodents' numerical regression

was accompanied by an increase in *Sorex araneus* populations' density (higher in some areas, like the upper sector of Lăpușnic Valley), while in Lotru Mountains no significant dynamics of this species was recorded. The only important change in the insectivore community was the appearance, in 2003, of *S. alpinus*. This is a rare species captured by the author for the first time in this year, simultaneously in all the researched massifs, suggesting an increase of its population densities in the entire mountain area, on the background of strong regression of rodent communities.

Muscardinus avellanarius recorded a higher abundance in 2003 and 2005 in all the researched areas, maybe due to a competition relationship with *A. flavicollis* (and at a lesser extent with *C. glareolus*).

The other rodent species present low densities. In the mentioned period their maximum relative abundance was recorded in 2003, a year of significant decline of the dominant rodents. The dynamics of these species does not seem to present a high amplitude. Their absence in some years or in some suitable habitats is probably due to their low densities that makes capturing them a stochastic event.