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## **Estimating population size of *Marmota marmota* in the Rodnei Mountains National Park, Romania**

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**Abstract.** We have not detailed data after 1988 about Alpine marmot populations from the Rodnei Mountains. In 2009, we identified seven burrows of the *M. marmota* above the Iezer Lake (near the Pietrosul Rodnei Peak). After some calculations, we estimate that could be about 47 marmots there and about 126 individuals inside the Rodnei Mountains National Park.

**Keywords.** Alpine marmot, population size, Rodnei Mountains

### **Introduction**

Alpine marmots (*Marmota marmota*) are the largest ground-dwelling squirrels (Allaine, 2004) in Romania. The basic social unit is a family group of 2-20 individuals (Allaine & Theuriau, 2004). *Marmota marmota* is mainly inhabitant of the subalpine and alpine meadows where they dig burrows (Mann et al., 1993).

The past existence of the alpine marmots (*Marmota marmota*) in the Romanian Carpathians is under a big question mark. After some deliberation, in

1972 were introduced 12 individuals in the Pietrosul Rodnei Reservation (Almășan, 1981) (the ancient core of the present Rodnei Mountains National Park, Romania), from the Vanois National Park (France) (Ramousse & La Berre, 1993). These 12 marmots felt good in the new, but similar habitat, and their effectives increased well. After few years, some naturalist observed that the marmots have a tendency for dispersing along the main mountain range, therefore, we can hear now in 7-10 locations the whistling marmots inside the National Park.

It was considered necessarily to estimate the population size of the Alpine marmots from the Rodnei Mountains, because of the incomplete data which was registered along the years after the re(-colonization).

In 2009, above the lake Iezer, in the heart of the Pietrosul Rodnei Scientific Reservation (Eastern Carpathians, Romania), we searched the entrances of the marmot's burrows to estimate the effectives of the alpine marmots population.

### Material and methods

We took the field-data during 3-5 July 2009, from the Pietrosul Rodnei Scientific Reservation (Fig. 1.). Inside of the Scientific Reservation is situated the glacial lake Iezer. Above the lake, we searched the entrances of the marmot galleries. The slopes above the lake we divided in 3 major zones, each zone is corresponding for the general exposition of the slopes: zone R (right, general exposition is Northwest) zone C (center, general exposition is North - Northeast) and zone L (left, general exposition is East - Southeast).

Between 6:30 AM and 11:30 AM, we identified the entrances. We noted every entrance with a code with the follow type: the code of the slope (R, C, or L) followed by the order of the burrow system where the entrance is belonging (A, B, C...) and the number of the entrance (1, 2, 3...). For example, the fifth entrance from the right slope, what is belonging to the second burrow-system, we noted with RB5. We also found some single entrances that we noted with S1, S2 or S3. We considered this entrance as a "single", because they are too far from other burrow entrances, which are constitute a burrow-system. We measured the distance between two entries with 30 m long tape measure.

### Results

We identified 37 access grouped in 7 burrow-systems:

→zone C (N-NE): 4 galleries = 14 entries (1 gallery with 7 entries and 2 gallery with 3 entries and one single-entrance);

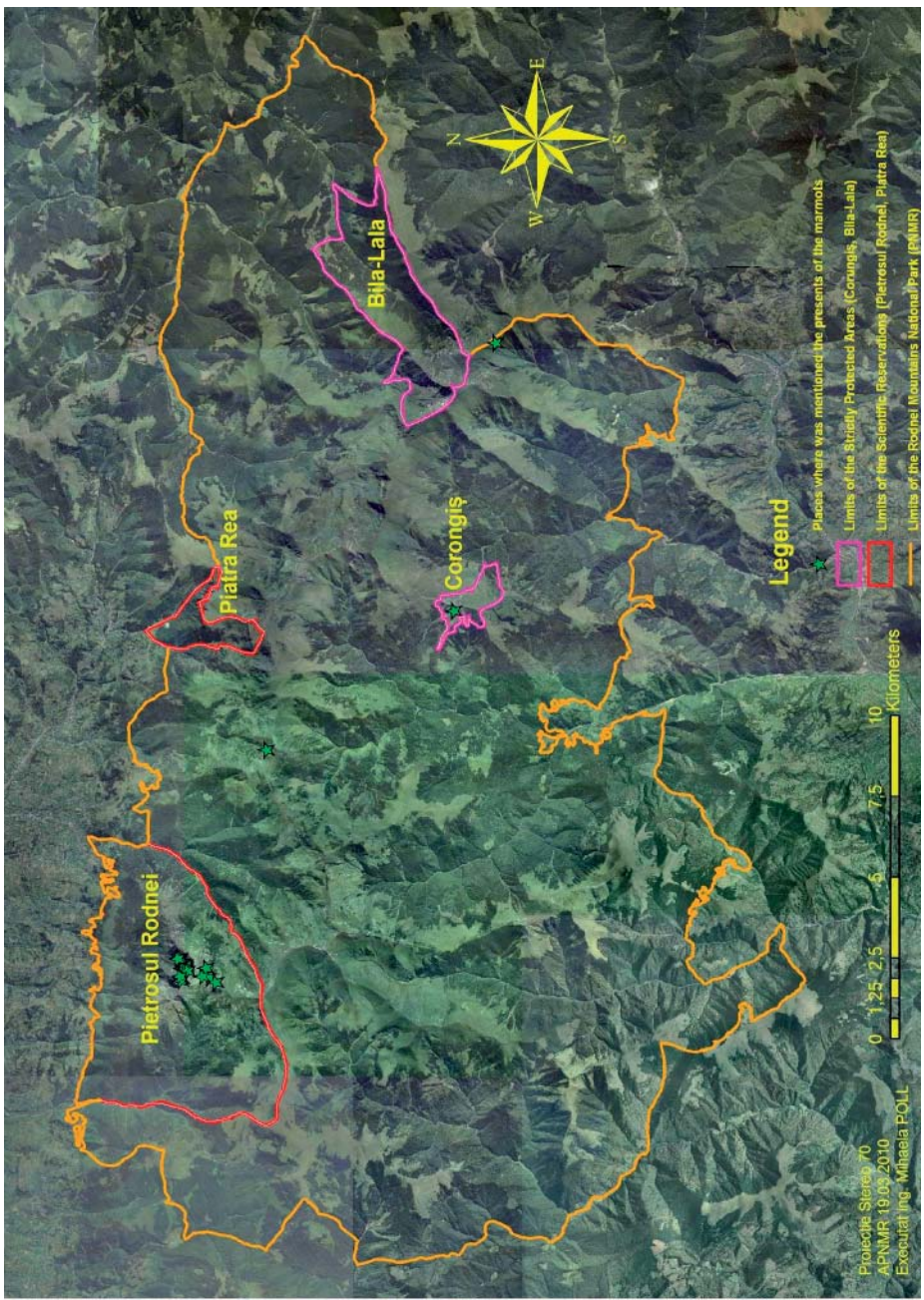


Fig. 1. Map of the Rodnei Mountains National Park, Romania. Inside the park is situated the "Pietrosul Rodnei" Scientific Reservation where was located our research. Green stars indicate the presence of the alpine marmots.



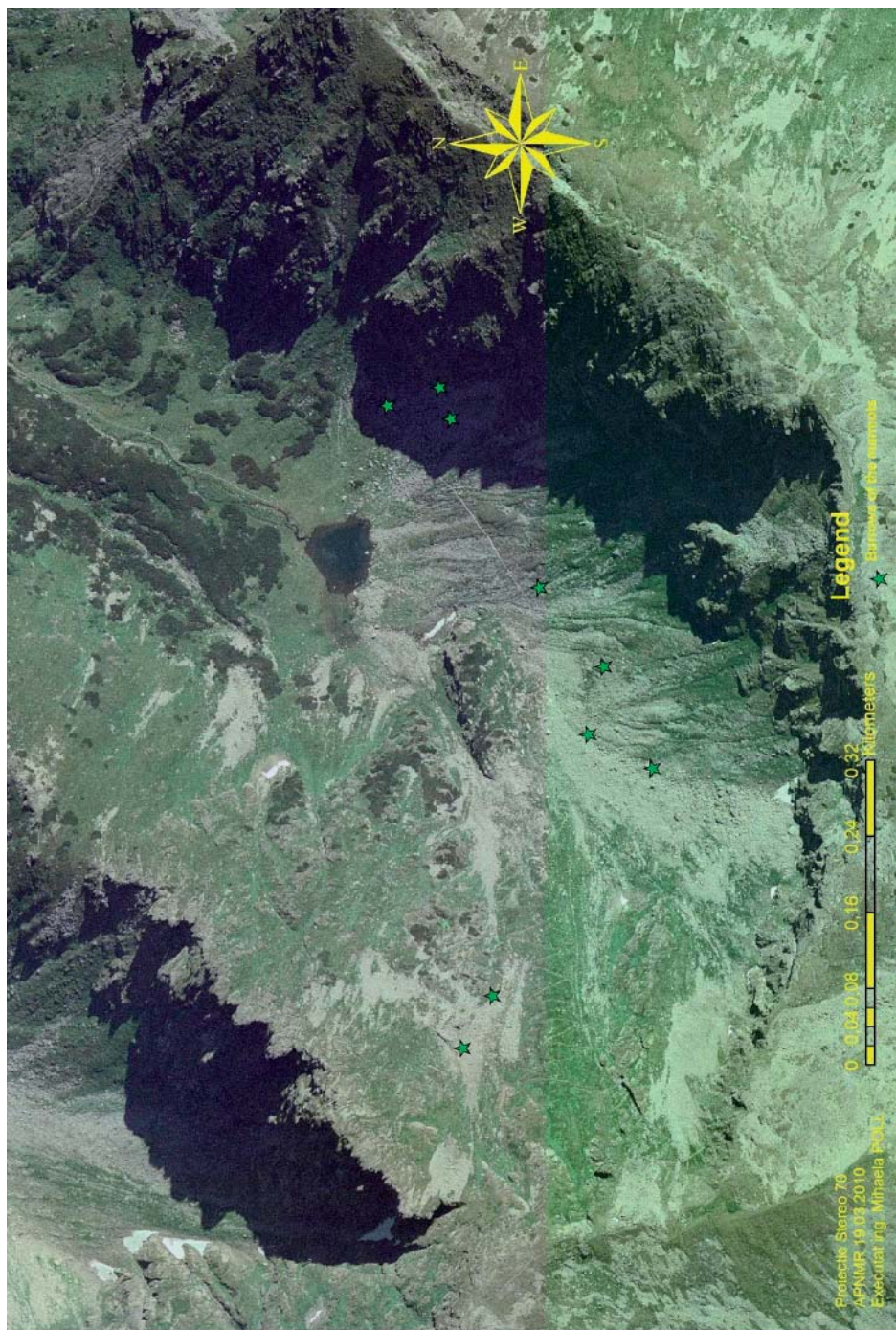


Fig. 2. Map representing the research area. The green stars indicate the burrows of the marmots.

→zone L (E-SE): 3 galleries = 9 entries (1 gallery with 3 entrances and 1 gallery with 6 entrances);

→zone R (N-NW): 2 galleries = 14 entries (2 galleries with 6 entries and 2 single-entrance) (see Fig. 2.).

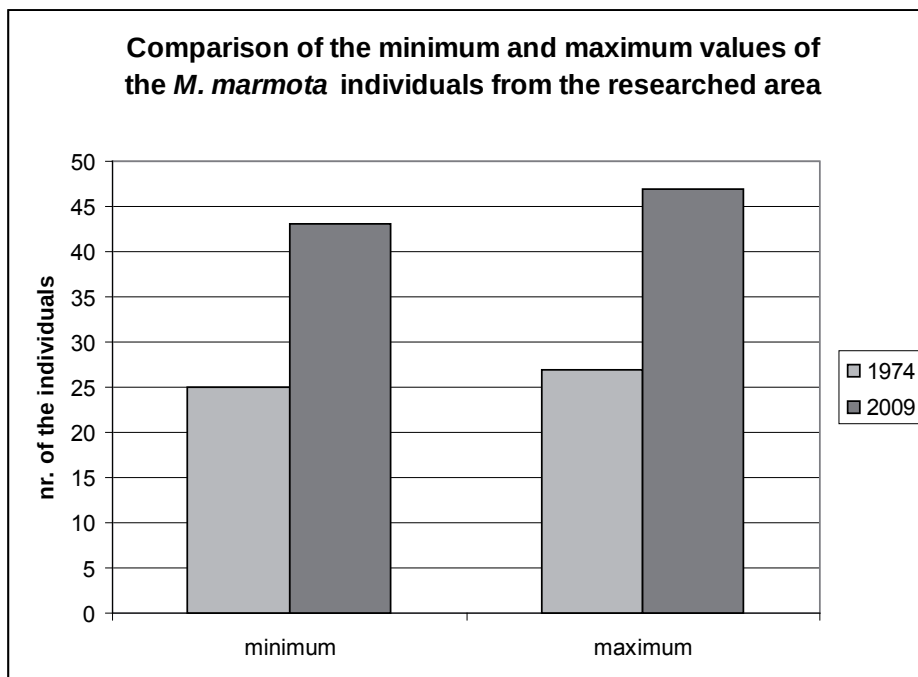
## Discussions

Almășan (1981) shared some important information about the Alpine marmot populations in the Pietrosul Rodnei Reservation. He related, that in 1974, two years after the colonization, the number of the marmots were about 50-60 individuals. He mentioned also, that from the total 8-9 colonies, four were at the “Iezerul Pietros” (at the valley of the Iezer glacial lake). Therefore, we can make some easy calculations and we can find that in four colonies (where we considered that one colony live in one burrow (Borgo, 2003)) were 25-27 individuals. So, in 7 galleries what we identified should be 43-47 marmots. These mean, that in 30 years, the alpine marmot population increased well above the glacial lake (Fig. 3.).

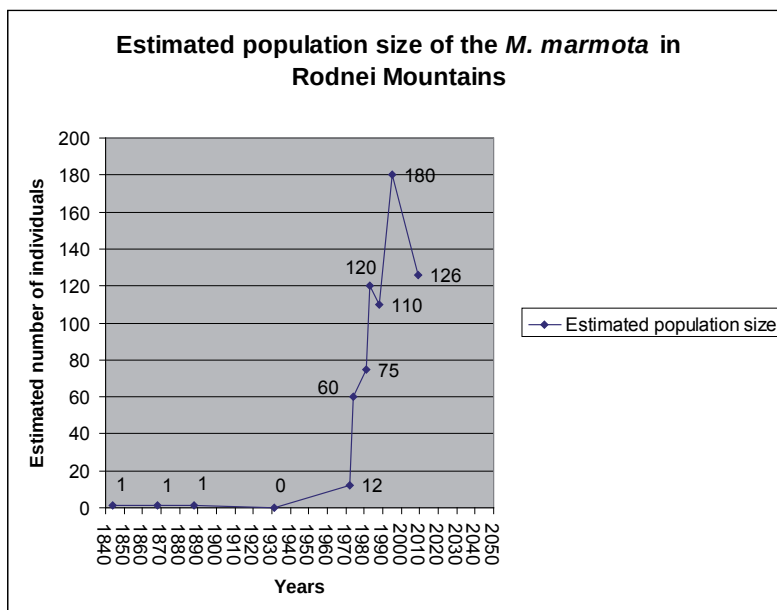
Today, we can hear the whistling marmots in many locations inside the National Park (Buhăescu, Zănoaga, Iezerul Pietros, under the Laptelui Mare Peak, at the Gârgălău valley, under the Corongișul Mare Peak, under the Negoiasa Peak and between the Ineuț and Roșu Peak). However, using the information from the literature and our results from the presented research, we can observe a fluctuation of the population size of the Alpine marmots from the 19<sup>th</sup> century to 2009 (see Table 1. and Fig. 4.). The cause of this fluctuation in the population size should be the longer and harsh winters along the years, the presence of the natural predators, annoys of the sheepdogs and the intensive tourism.

## Conclusions

1. Maximum 47 marmots could be at “Iezerul Pietros” and about 126 individuals inside the National Park. This is mean that the habitat conditions are favorable for the individuals of *M. marmota* to live in the Rodnei Mountains.
2. Marmots present a tendency for dispersion along the main chain of the Rodnei Mountains.
3. Because various causes, the Alpine marmot population size present a fluctuation inside the Rodnei Mountains National Park.



**Fig. 3.** Comparison between the minimum and the maximum values of the population effectives from 1974 and 2009.



**Fig. 4.** The fluctuation of the population size of the alpine marmots

**Table 1.** Estimated population size mentioned by different authors between 1844-2009

| Years | Authors                                 | Estimated population size |
|-------|-----------------------------------------|---------------------------|
| 1844  | Hanak J. (in Ardelean & Beres, 2000)    | 1                         |
| 1868  | Odobescu & Aurelian (in Călinescu 1956) | 1                         |
| 1888  | Bielz E. A. (in Călinescu 1956)         | 1                         |
| 1931  | Călinescu R.                            | 0                         |
| 1972  | Almășan H.                              | 12                        |
| 1974  | Almășan H.                              | 60                        |
| 1981  | Almășan H.                              | 75                        |
| 1983  | Nădișan I.                              | 120                       |
| 1988  | Ardelean G. & Beres I.                  | 110                       |
| 1995  | Nădișan I.                              | 180                       |
| 2009  | Szabo B.-M. (present work)              | 126                       |

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### Rezumat

Informațiile privind mărimea populației de *M. marmota* din Munții Rodnei sunt lacunare. De aceea, în 2009 s-au efectuat cercetări prin identificarea galeriilor de marmotă. Luând în considerare câteva lucrări de referință, am putut estima mărimea populației de marmotă deasupra lacului lezer (Rezervația Științifică Petrosul Rodnei). Conform calculelor, în 2009 puteau fi maximum 47 indivizi în căldarea glaciara lezer și aproximativ 126 marmote pe toată suprafața Parcului Național Munții Rodnei.