CONSIDERATIONS ON THE TIMBERLINE IN THE RODNA MOUNTAINS NATIONAL PARK

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Betrachtungen über die obere Waldgrenze im Nationalpark der Rodna-Gebirge. In den Rumänischen Karpaten, verzeichnet die obere Waldgrenze beträchtliche Variationen. Dies verdankt sich sowohl den natürlichen Faktoren (klimatische Bedingungen, Höhe und geographische Breite wo die Gebirge liegen, Reliefgestaltung, geomorphologische Besonderheiten usw.) als auch dem menschlichen Einfluss. In den Rodna-Gebirgen, widerspiegelt sich der menschliche Eingriff heutzutage, mit dem Wunsch die Weidenflächen, als auch jene für die Ausbeutung der Wälder in der Nähe deren Grenze, auszuweiten, in der viel niedrigeren oberen Waldgrenze im Vergleich zu jener natürlichen, insbesondere in den am meisten zugänglichen Orten. Die Höhenabweichung der oberen Waldgrenze ist im Durchschnitt bei 200–300 m eingeschätzt, mit höheren Werten auf den südlichen Hängen, wo, in manchen Stellen, die obere Waldgrenze durch den menschlichen Eingriff auch bis zu 1 200–1 300 m hinabgestiegen ist.

INTRODUCTION

Situated in the vicinity of the transition area between the forest vegetation and the alpine meadows, the timberline (pre-sub-alpine forest) (Bândiu and Doniță 1988) presents a special interest due to its ecological importance. Avoided because of difficult access, the tree line still preserves a natural character in many places. In the Romanian Carpathians, the timberline exists in all the mountain ranges above altitude of 1,500–1,600 m (Geanana 1972). They cover larger areas in those mountains that display a developed alpine belt, such as the Rodna, Călimani, Bucegi, Piatra Craiului, Făgăraş, Parâng, Retezat, etc.

The specialist literature distinguishes two special types of tree line, namely:

– *the natural limit*, where trees of all ages are rather low and have a small diameter. The upper limit of the forest is established where tree height is below 8 m (Bândiu and Doniță 1988). The natural upper limit of forests in the Romanian Carpathians is generally climate-related and varies according to latitude and altitude, exposure, geo-morphological particularities, etc.;

and

– *the anthropic limit*, affected especially by grazing and wood exploitation, which result in the lowering of the natural limit.

STUDY AREA

The Rodna Mountains National Park is part and parcel of the Rodna Mountains situated in the north of Romania, approximately in the central part of the Carpathian Chain (47°31'N, 24°45'E) (Fig. 1).

The Park itself lies at some 1,600 m a.s.l., basically between 700 and 2,303 m (Pietrosu), featuring one of the most imposing alpine landscapes in the Romanian Carpathians. The Park displays a multitude of glacial and cryo-nivation traces, glacial lakes –the Iezerul Pietrosului, Iezerul Buhăescului, as well as endo- and exo-karstic forms modelled in crystalline limestone (Bălteanu *et al.* 2006).

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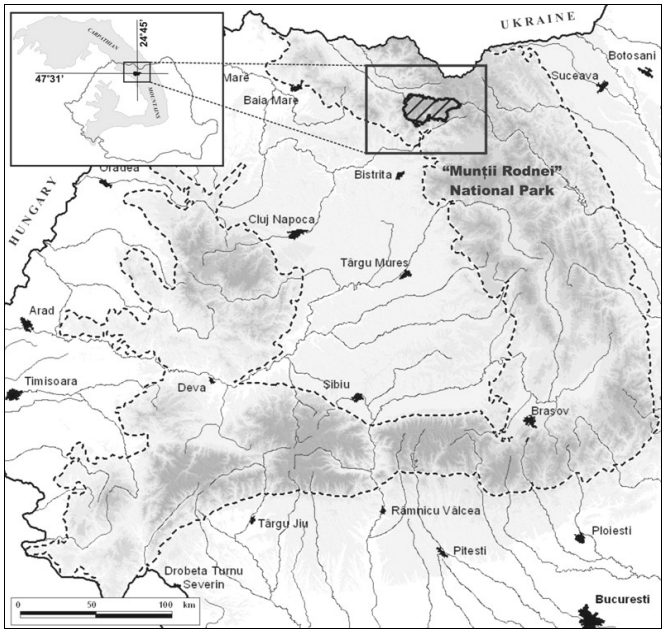

Fig. 1 – Location of the study area in Carpathian Mountains.

From a total of approximately 32,000 sq km of mountain forest in Romania, about 2% lie in the Rodna Mountains and nearly 1% in the Rodna Mountains National Park. Here, forests represent the main category of land use, making up for 60% of the Park's surface area (ca 280 sq km).

Depending on changes in the environmental factors, there is a distinctive difference in limits between the tree cover in belts and sub-belts. More often than not, the present limit between belts and sub-belts is not the natural one, because man has largely influenced elevation and lowering (Coldea 1990; Bălteanu and Kucsicsa 2010), particularly of the timberline.

TIMBERLINE IN THE RODNA MOUNTAINS NATIONAL PARK

Taking into account the present climatic conditions, as well as the altitude and latitude at which forests lie, the timberline in the Rodna Mountains is considered to be at 1,800–1,850 m alt. on the southern slope and by 100–150 m lower on the northern slope (Geanana 1972).

The most common natural timberline species in these mountains is *Picea abies*, but also *Pinus cembra* (mostly in the east). When the man-induced tree line goes down, deciduous species are seen beside the resinous ones, *e.g*. *Fagus sylvatica* (largely in the south and south-west), *Sorbus aucuparia* and *Betula pendula.*

In most cases, the height of timberline trees in the Rodna Mountains exceeds 8–10 m, which indicates that, in general, the present forest is not at its natural limit. In the transition area between the forest belt and the sub-alpine belt the upper limit of the forest is usually artificially lowered by human pressure (Fig. 2). Here, especially 20th century deforestations to expand grazing fields and obtain timber have destroyed mainly the dwarf pine and the open wood land spruce, large compact areas having been cleared up.

Since spruce woods in the Rodna Mountains are the last forest belt and softwood timber is the main material for the internal and external markets, or for the reinforcement of mining galleries, the areas occupied by sub-alpine and alpine meadows have kept lowering in the wake of deforestation. As a matter of fact, numerous toponyms found in these areas *(nedeie, tomnatic, prelucă, pleş, poiană, arşiţă, secătură,* etc.*)* reflect the practice of shepherding and deforestation (Kucsicsa 2009).

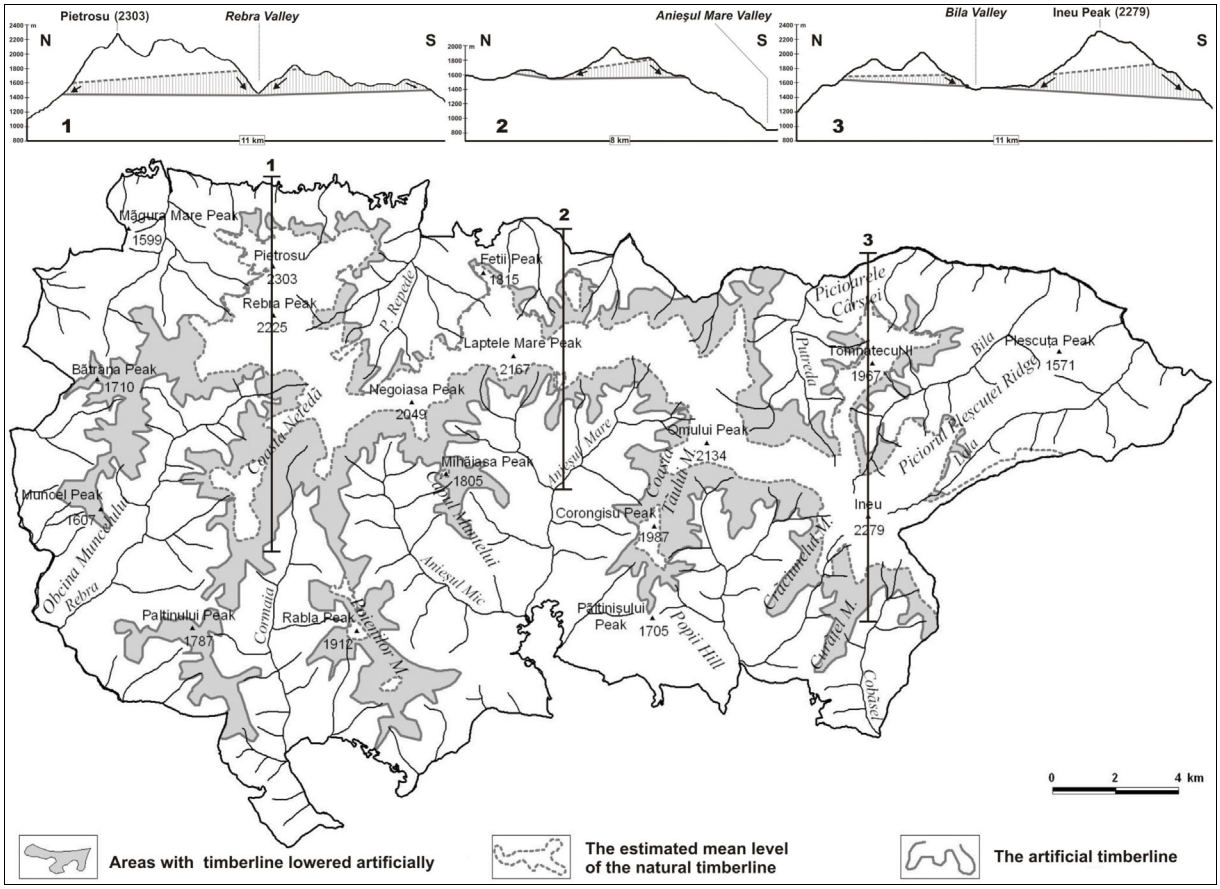

Fig. 2 – Lower timberline than the natural limit in the Rodna Mountains National Park.

The natural limit usually exists in hardly accessible areas, especially on the northern slope of the Rodna Mountains (Hotarul, Curmătura Pietrosului and Piciorul Plescuței summits, Mount Gaja, etc.).

Timberline variations. The present finger-shaped timberline shows great variations in the south and south-west of the Park. The average vertical amplitude is estimated at some 200–300 m. The greatest variations occur on the southern summits of the Park (Coasta Netedă, Coasta Tăului, Mount Poienilor, Mount Crăciunelul and Mount Curățel), where the limit stands at 1,200–1,300 m, which is by 500–600 m lower than the natural limit on the northern slope (Fig. 3), where notable variations can be found in the hydrographic basins of the Izvorul Repede, Bistricioara, Putreda and Bila.

In relation to the natural tree line, the largest deforested areas are seen on the southern slope (approx. 70%), basically between 1,600 and 1,800 m (35%) and 1,400–1,600 m (31%) (Fig. 4). These differences are due not only to the larger surface of the slope, hence a much larger forested area than on the northern slope, but also to more favourable natural factors.

Since forest exploitation and grazing are closely related to the degree of terrain accessibility and to the value of the grazing fields, human pressure on the timberline of the northern slope was less intense. Here, geomorphological conditions (fragmented relief, large areas of debris-covered outcropping rocks, unfavourable exposure) have largely stopped forest exploitation at higher altitudes, and reduced shepherding as well (Morariu 1937).

The present tree line in the Rodna Mountains National Park lies at some 1,600 m on average, with a difference of about 50 m between the two main slopes. Thus the upper limit of the forest on the

northern slope is situated at approx. 1,600–1,650 m, and at some 1,550–1,600 m on the southern slope, even though it lies 50–100 m higher on the latter compared to the former. About 56% of the timberline is situated at 1,400–1,600 m alt., while approximately 32% lie at 1,600–1,800 m (Fig. 5).

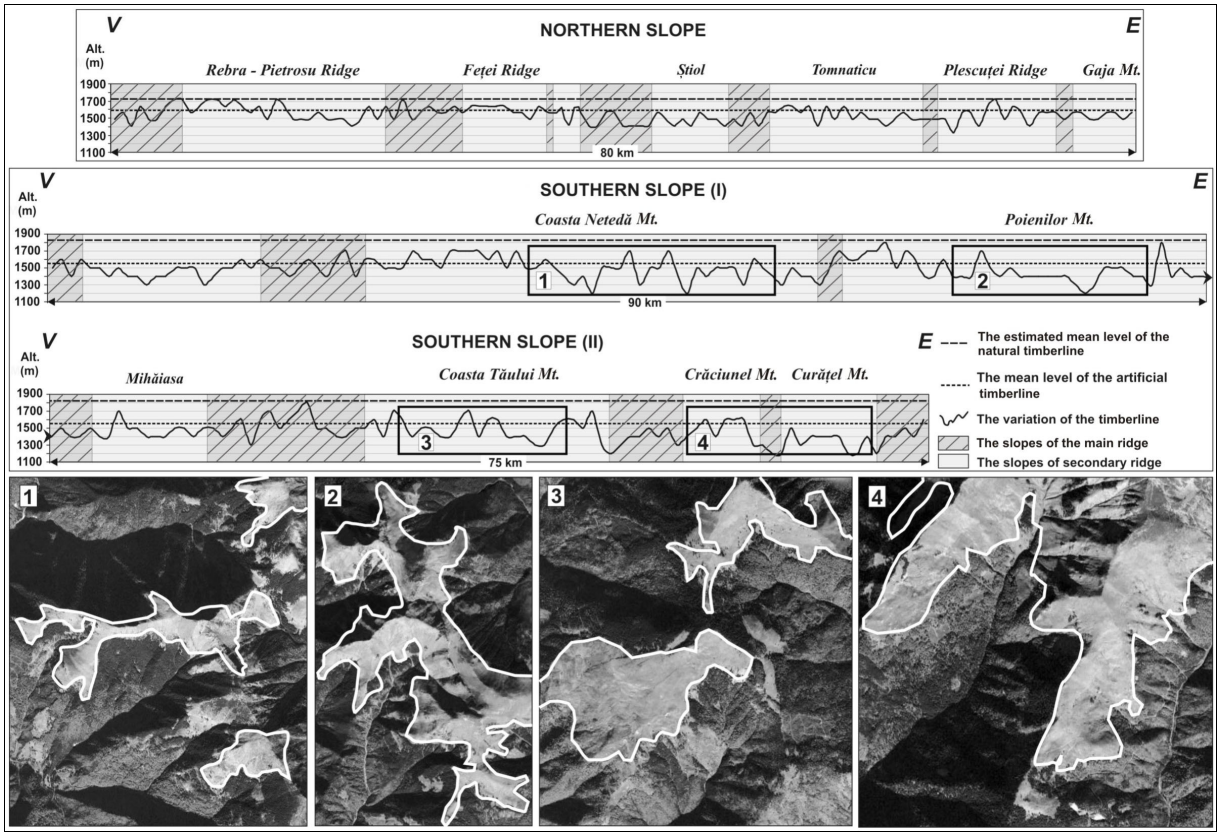

Fig. 3 – Timberline variations on the slopes of the main and the secondary ridges in the Rodna Mountains National Park.

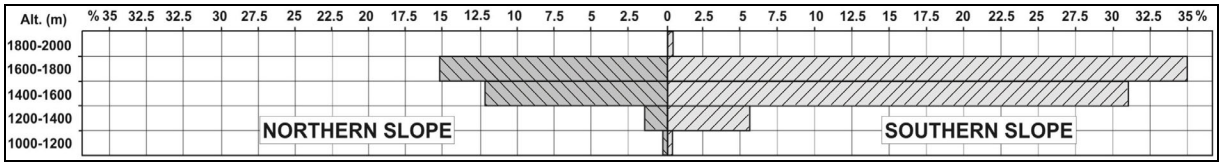

Fig. 4 – The rate of deforested areas by relief steps to the natural timberline in the Rodna Mountains National Park.

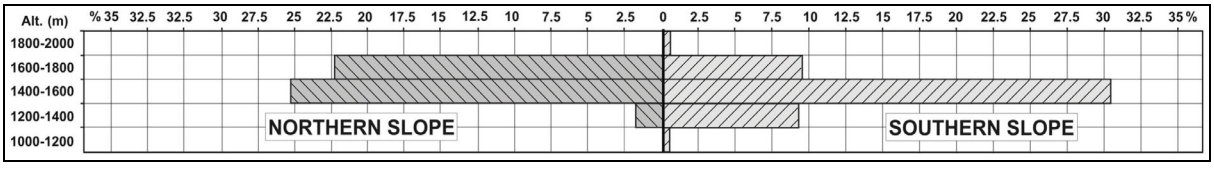

Fig. 5 – Timberline distribution by relief steps in the Rodna Mountains National Park.

CONCLUSIONS

Human pressure exerted on the forest vegetation in the Rodna Mountains National Park is reflected in fragmented forests over large areas with an upper limit significantly lower than the natural one.

Notable changes are seen especially on the southern slope, which being more accessible has favoured large-scale shepherding; also deforestations in the transition area between the forest and the sub-alpine belts have been intense more than on the northern slope.

In the Rodna Mountains National Park, the present finger-shaped timberline is situated at approximately 1,600 m, with significant differences at the level of the two main slopes.

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REFERENCES

Bălteanu, D., Kucsicsa, Gh. (2010), *Presiunea antropică asupra mediului în Parcul Naţional Munţii Rodnei,* Revista Geografică, **XVII**, Institutul de Geografie, Academia Română, Bucureşti, pp. 3–9.

Bălteanu D., Dumitraşcu, Monica, Ciupitu, D. *et al.* (2006), *Protected natural areas*. In: Bălteanu D. coordinator. Romania – Space, Society, Environment*,* 328 – 339, The Publishing House of the Romanian Academy, Bucharest.

Bândiu, C., Doniţă, N. (1988), *Molidişurile presubalpine din România*, Edit. Ceres, Bucureşti.

Coldea, Gh. (1990), *Munţii Rodnei, studiu geobotanic*, Edit. Academiei Române, Bucureşti.

Geanana, M. (1972), *L'influence de l'altitude et de la massivité sur la limite supérieure de la forêt dans les Carpates roumaines*, Travaux du Symposium de Géographie Physique des Carpates, Institutul de Geografie, Academia Română, Bucureşti, pp. 417 – 424.

Kucsicsa, Gh. (2009), *Modificările mediului reflectate în toponimia Munţilor Rodnei,* Revista Geografică, **XVI**, Institutul de Geografie, Academia Română, Bucureşti, pp. 54–57.

Morariu, T. (1937), *Viaţa pastorală din Munţii Rodnei*, Societatea Regală Română de Geografie. Studii şi cercetări geografice, II, Bucureşti.

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