THE NATURE OF NATIONAL PARK DURMITOR (MONTENEGRO)[1]

SUMMARY

Durmitor national park is situated at the northwest of Montenegro, at the distance of about 200 km from Podgorica (Titograd) and about 400 km from Belgrade. From the aspect of morphology the Park is situated in the Montenegrin hills and tablelands and the watersheds of the Piva and Tara rivers. The central place in which the National park Headquarters are seated is the townlet of Zabljak perched at the altitude of about 1.400 m above sea level. It is therefore evident that the national park is a highland park with mountainous ecosystems predominating. One can come to Zabljak by train (the nearest railway station is Mojkovac - 79 km away), by air (the nearest airport is Podgorica, 200 km away) but the easiest way is to drive along the modern roads from either Pljevlja or Mojkovac or Niksic. Due to extremely jointed terrain around (the canyons of the Piva and Moraca rivers, deep valleys of the Lim and Cehotina rivers and the high mountains around) it was not possible to build a good transport infrastructure all the way to the Park whose location cannot be described as a convenient one).

The nature in the National park is complex, diversified and contrasting. Its main characteristics are the very complex geological structure, the very interesting morphology, diverse forms of almost all genetic types of the relief, numerous hydrologic rarities and attractions, very rich flora and fauna and a multitude of endemic and relict specimens. This gives birth to a genuine ecosystem mosaic formed of submediterranean to alpine forms. The features existing in the territory of the Durmitor National park are the reason that the Parliament of the Republic of Montenegro proclaimed this territory a national park in 1952. The worthiness of the nature and of the cultural and historical monuments in the Park transcend the boundaries of Montenegro and Yugoslavia so the Park became a protected area on the grounds of international agreements. In 1977 first the Tara river basin and its canyon in particular were included in the M & B programme (l\'fan and Biosphere) and treated as a "preserve of biosphere" and a territory of international interest. Such status and the preserved nature in the territory led UNESCO to put the Park on the List of World Nature and Cultural Heritage in 1980.

The Park extends over the territory of 368.57 sq.km. which accounts for about 2 per cent of the territory of l\lontenegro. The altitudes in the park vary more than 2 000 m since the lowest point lies at 508 m. and the highest peak at 2 522 m. above sea level. The main problems in controlling the Park is how to preserve it and avoid conflicts with tourist trade, how to resolve problems of water supply to Zabljak, and how to deal with the requests to usc the Tara river water potential for electric power generation. As of later, a major hroblem appeared with withering of almost all of the forest stands in the Park.

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As for geomorphology, three entities are distinetly separated: the mountain mass of Durmitor with the peaks above the level of 2 000 m, the very jointed plastic, tluvio denuded table lands surrounding the mountain mass and the canyons of the Tara river and of its tributaries the Susica and Draga rivers. The Mt. Durmitor mass is broken into four parallel ranges. Their present appearance and characteristics result from the modifying processes caused by external forces. Beside the initial tectonic formation of the whole area the relief underwent numerous changes mostly due to the effect of fluvial and glacial erosion and accumulation. Numerous are the remnants of these two kinds of erosion. Twenty and odd cirques and tive glacial canyons of which the deepest and the largest one is the canyon of the Susica river (about 20km long) modified the initial relief on Mt.Durmitor. Everywhere in the surroundings, but also at the beds and on the walls of the cirques and glacial canyons lie thick moraine deposits. This is particularly pronounced at the eastern mountain sides, where a large ice plateau existed in Pleistocene. The most important and strongest cause of relief changes lay in fluvial erosion. It carved decp eanyons, built vast tablelands, left traces on the valley walls in forms of terraces and beds. Great differences in altitude, thick beds of limestone rocks, abundant preeipitation and good tectonic relations led to intense karstification of the area. Those are decp funnel-like sink holes, lapies of all the types recorded in literature, numerous uvalas and three karst fields Bitinsko, Konjsko(Rudo) and Crkvicko at the edges of the Park. The richness in speleological bodies is egtreme (278 caves, holes and grottos are recorded) with approximately one body at each square km of area.

Durmitor and the canyon of the Tara river are predominantly built of rock of Mesozoic age. Limestones and dolomites predominate. The older Paleozoic rocks occur only as outerops at the places of Djurdjevica Tara and Lever Tara. These are mostly grey stratified phylites, limestones and siltstones. Other than carbonate rocks include outerops of andesite and keratophyre of Middle Triassic age in the region of the Mlinski creek and Jablan lake on the Jezerska tableland, in the vicinity of Crne pode, Dobrilovina and in the village of Tepca in the Tara canyon as well as at the entrance sections to the Draga river canyon. Verfenian sandstones (Lower Triass) of other than carbonate series occur in the zone stretehing from the Poscensko lake to Black lake and in the upper section of the Tepca village. Diabase-hornstone series occur in some places in the areas of the villages of Premcani and Vaskovo at the boundary of the Park. The most frequent are l\'Icsozoic carbonate rocks their structure ranging from thinly bedded to massive. They may be even above 2000m thick. A very important is the series of "Durmitor flyseh" bisecting Durmitor in the east-west direction. This series is built of various carbonate facies (thin beds of limestones, sandstones and marls) with hornstone nodules. Their thickness exceeds 1000 m. Of Cenozoic rocks there are only Oligo-miocene and Pliocene deposits in karst fields at the park boundaries then the Quatemary deposits of moraine, fluvial, fluvioglacial and colluvial materials and major drifts of travertine in the Tara canyon.

Very interesting are hydrological phenomena and rarities. Among them the most impressive one is the Tara river and numerous glacier lakes. By the place of origin the lakes are divided into cirque, glacial canyon and intermoraine lakes. Among the cirque lakes the best known are Great and Small Skrcko lakes, the Zeleni vir (Green whirlpool) and Jablan lake under the Crvena greda (Red bar). These lakes all lie above the altitude

of 1,700m. The Skrcka lakes lie in the Skrcka cirque in the central part of the Durmitor massive. The Great Skrcko lake is 800m long and up to 150m wide, up to 3 m. dcep. It used to be the well known habitat of endemic species of Triturus alpsetris montenegrino but due to inadequate stocking with stream trout this species has been exterminatcd. The Small lake is slightly higher than the Great lake. It is round, its average diameter is about 120m and the depth is 7m. The lake of Zeleni vir is situated below the southern slopes of the Minina bogaz its average area of 0.6 ha dropping down to 0.1 ha in summer. It is up to 2.5m deep maximum with the minimum depth of lm. The Jablan lake under the Crvena greda is about 100m long, about 70m wide, maximum depth 7m. This lake as well as all the glacial lakes loses area and volume. The glacial canyon lakes are also the Modro, the Srablje, the Valovito, the Poscensko, the Zmijinje, the Black, the Barno and the Susicko lakes. The first four lakes lie in a row one below another in the glacial canyon of the Poscenska valley. The highest one is the Valovito lake (1695m) and the lowest one is the Poscensko lake (1496m). The largest lake is the Poscensko lake (4 ha) and the smallest one the Srablje lake (below O.Iha). In the glacial canyon of the Alisnica river are the Zmijinje, the Black and the Barno Lakes. The first of them lies in the canyon itself while the other two have developed in the terminal basins. The Zminje lake is among the most beautiful ones, and the Black Lake is both the largest and the most well known lake in the Park. Its area amounts to 67 ha and the maximum depth is 49.5m. In the canyon of the Susica river is the Susicko lake 7 ha in area with 9m in depth maximum but drying up in summer. The intermoraine lakes are more spacious but of smaller depths. These lakes all bear fish whieh was the cause of destruction that endangered the endemic species of fauna in them.

Beside the lakes the most important hydrological body in the Park is the Tara river. Its course through the national park is 60 km long and its whole watershed is 1,900 km square. It enters the Park at the mouth of the Ravnjak creek and leaves it downstream of the mouth of the Susica river.The Tara river abounds in water.Its average flow is about 89 cu.m. per sec at the end of the course. The Ravnjak creek is the first left tributary with over l 00 lit per sec of inflowing water.

The Vaskovska river is the first tributary on the right side drying up in the course of dry years. The Selacka and Leverska rivers are minor tributaries from the right. The Ljutica river is a short tributary that starts at powerful headwaters having 2 cu.m. per sec capacity. The Susica river is the longest tributary but it also dries up. The Mlinski creek is the strongest surface water course in the Park that supplies water to the Black lake.

There is a number of hydrological rarities by which this Park is characteristic. In the Black lake there is a lacustrine bifurcation. namely the lake water tlows into the Tara canyon from the lponor at the outflow end springing at the opposite side after having passed under the river bed. There are ten and odd springs whose maximum capacity is more powerful than one cu.m. per sec. There are strong waterfalls, the Bailovica sige (dripstones) being among the strongest.

The climate in the park is full of real contrasts. While in the canyon valley of the Tara river snow is very short timed, particularly on its sunny sides and at the bottom, on the massive of Durmitor it falls abundantly and the snow cover lasts more than 180 days

even. Temnerature amplitudes are large, both daily and annual ones. The largest amplitudes can be encountered due to temperature inversions in depressions. The minimum temperature recorded at Zabljak is -22.2°C but the temperatures are much lower in the cirque in the Durmitor massive. The maximum temperatures on the rocky sunny sides are over 40oC even. Insolation is strong and sunshine lasts more than 1,800 hours in a year. The Park belongs to humide regions with abundant precipitation. Due to different altitudes and positions some parts of the Park get different annual average precipitation. So, the ridges of Durmitor receive 2,500 to 3,000 mm of rain, the tablelands about 2,000 mm and the canyon valleys 1,000 to 1,200mm. The climatic elements play a very important role in the development of plant and animal communities and of the corresponding ecosystems. The climate is an important factor of succession in an ecosystem, the factor and the modifier of relief formation and changing, the decisive factor of quality and number of hydrological phenomena and processes. The climate is a factor in the quality of living everywhere, in this region too. The climatic conditions here are not the best possible for living, one would rather deseribe them as harsh, but they are very good for some activities, winter tourism for egample. The climate is also an important therapeutic factor and this matter has been thought of and the use of the available amenities for health and recreational purposes has been voted for.

The pedologic cover in the park is the result of the action of the climate upon the geological substrata the vegetation acting as a modifier. There are several types of soil in this territory. The soils occurring are rendzinas or limestone blackearth, brown rendzinas, brown locssired podsolic soils and podsols. The soils are mostly built on limestone substrata or loose limestone materials (debris, moraines and other). Very small areas are covered with soils that overly sandstones, phyllites and acidic igneous rocks. The soils differ in origin, and in the effects of vegetation and the bedrock on which they occurred and developed. The most widespread soil is loess, a brown and humus brown soil formed in the community of deciduous and conifer forests though the fact is that the forest cover was removed long time ago. These soils cover the tablelands. Higher up, these soils pass into mountainous black soil (rendzina) and are characteristic of dry mountain areas. The sinkhole bottoms are mostly of red soil while the bottoms of the uvalas contain richer soils, humus brown soil predominating with peat at some_ places. A large area is covered with skeleton soils, namely the soils of the C horizon (seree at the canyon sides, mountain sides and other).

Due to the mountain size and the vertical diversifcation a variegated vegetation cover was formed in the par-k. The lowest belt is a community of hornbeam and plane and oak trees growing in the valley and on the warmest southern sides. Above it is the forest of black hornbcam trees in high and steep habitats on the canyon walls. It is intermingled with solitary tees or clr.rsters of Austrian pine that inhabit cliffs and serees. At the terraces or wherever tluvio glacial terraces and thicker soils occur beech trees grow in the community with black hornbeam trees. In this zone grows a rare species of conifers - yew-tree (Taxus bocata) and in some localities occurs the relict Bosnian pine. At higher sections grows the community of beech with frs and spruce trees prevailing at the mormtain sides towards the lakes and the Mala Crna Gora. The highest forest belt contains the community of beech and sycamore trees. In the region of Durmitor the interest-

ing forest community is that of spruce and Scots pine that occurs sporadically on the Jezerska tableland. The highest forest belt is composed of dwarf pine as high as the altitudes of 2,300 m even. The most important meadow and pasture types are grass communities of golden oak grass and plantain growing on limestone clearings in forests. Depending on substrata this land is either a good pasture or a lea. The grass community of fescue grass and bearfoot is characteristic for the Jezerska tableland with vast meadows. In the higher parts are the pastures with this same grass community.

This land is verry rich in floral rarities and endemic forms. These are the well known Montenegrin ftoral endemics: gentian (*Gentiana laevicalyx* R o h l.), great mullein (*Verbascum durmitoreum* R o h l), Glisic's grass bell (*Edrianthus glisicu* C e r n j n. S o s k a), some of caraways (*Carum velenovsky* R o h l.), a violet species (*Viola nicolai* P a n t.), daphne (*Daphne malyana* B l e c), valerian (*Valeriana bruniiblanquetii* L a k). Among the Balkanic endemics are spurge laurel (*Daphne blagayana* F r e y e r), Balkan maple (*Acer heldrichii* O r p h.), Bosnian pine (*Pinus heldrichii Christ.*), viper's grass (*Moltkea petraea* T r a t t), iris (Iris bosniaka B e c k.), *Pancicia serbica* V i s. Of the Balkanic endemics appear here *Phuteuma pseudoorbiculata* P a n t., *Potentilia montenegrina* P a n t., *Amphoricarpus autariatus* B l e c. et M a y., *Crepis incarnata* (W i l f), *Euphorbia montenegrina* (B a l d),l\Maly, *Micromeria croatica* (P e r s), *Aconitum toxicum* R o h l., *Lilium bosniacum*, *Viola speciosa* P a n t., *Aubrietia croatica* S e h.N. K y., *Edrianthus Yugoslavicus* L a k., *Garduus ramosissmiumum* P a n c.

As to fauna, the territory of the Park is also interesting and rich. There are several fauna biotops:

l) High mountainous rocks and dry surfaces with important representatives of chamois, rarely rabbit, mole, shrew and mouse and also blind dog (*Spalix Ceukodon*). Birds in the zone are: snow fneh, shore lark, Alpine accentor, water pipit, black redstart and birds of prey: common kestrel, imperial eagle and griffn. The fauna of reptiles and amphibiae is very poor.

2) In the biotop of rocks and cliffs there are rare specics of birds that make their nests here (golden eagle, griffn, common kestrel. raven, jackdaw, Alpine chough and wall creeper.

3) In the conifer forests there is a caperc:ailties, hazel hen, woodpecker, titmice and chaffineh.

4) In the deciduous forests there are large mammals: brown bear, wolf, fox, daw, rabbit, badger, martens and weasel and small rodents, squirrel and doormouse. This biotop is rich in birds. There are buzzard, goshawk. sparrow-hawk, great tit and willow tit, chaffmeh, white-backed woodpecker, warbler and thrush. The fauna of reptiles is poor. Of these occur: Aesculapins snake, viper, and rarely horned viper. Of the amphibiae the most significant is the presence of dappled salamander, and frogs,

5) In the water biotops or in connection with them there is maltard, little grebe and some species of migratory birds that stay here. The most important representatives of ichtiofauna are Salmonidae: trout, huchen and grayling. The etnomofauna investigations

pointed to the existence of abont 130 species of butterflies out of the 160 known in Montenegro. This means that the endemic forms of insect fauna are both rare and numerous (Coenonympha arcaria philea frr., Errebia ottomana). Seventeen genera of Alticianae, new species of larvat mites -Leptusa nonveilleri and Leptusa durmitoriensis).

Thanks to sneh natural properties Mt. Durmitor and the Tara river canyon have been proclaimed a national park and classifed in the highest category for preservation. Durmitor national park unites all the natural values and amenities into a whole that is protected by laws and international conventions. Still within such highly valued territory of the park there are minor sections with wonderfully preserved nature and rare specimens of flora and fauna, extremely interesting geology, geomorphology and water bodies. Seven preserves single out: the Black Lake with surroundings, the basin of the Skreka lakes with the Snsica river canyon, the fir and spruce forests in the Mlinski creek, the Barno lake with snrroundings, the Austrian pine forest of Crna poda, the canyon valley of the Tara river and the Zabojsko lake with the surroundings. Within these selected zones the virgin forests of fir and spruce trees in the Mlinski creek and the Crna poda locatity with the Skrka watershed and basin will be the subject of the highest degree of protection. In these regions only actions such as researeh and investigations are attowed. The remaining four zones will be used so that the ecosystem of these wholes is not impaired. Activities that may take place in the zones should meet the following requirements:

- not to impair the productive capacity of the existing ecosystems,
- not to canse any changes in the basic landscape type,
- not to leave remnarrts on other parts and territory of the Park.

Specific objectives in the programme of preservation are the protection of the Tara river canyon and the central areas on Durmitor which are the capital values in this national park. Specific attention shall be devoted to the lakes that are disappearing, karst springs and waterfalls and rare but major wvater courses. For the ecosystem maintenance it is important to cany out extensive and appropriate protection of forests, to take care of them and to plant new in the areas where the forests were destroyed. Numerous endemic and relict species of plants and animals shall become part of the most strict protection programmes.

Having analized the above elements in this book one can conclude that the territory of the Durmitor national park possesses extremely valuable natural elements and the nature as a whole. For this reason all the measures of protection undertaken and to be undertaken are justified but insuffiicient.

At the time when an interest is looming to use land "everywhere and in any possible way" it is indispensable to protect this area from any form of aggression. This before all, refers to uncontrolled appetites of tourist agencies who have tendency to occupy the area and enhance winter sports though their is no economic justification for that. Another great danger for the nature in the Park is uncontrolled felling of trees which is more intense in the period of economic crisis as the case is now. It is an imperative to carefully

plan building and construction and avoid impairment of the spirit and the landscape of Durmitor and the Tara river.

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